FORT CAMPBELL, KENTUCKY
COMPREHENSIVE TRANSPORTATION STUDY

FINAL SUBMITTAL

October 2003

Prepared for

Fort Campbell, Kentucky

In Association with

Military Traffic Management Command
Transportation Engineering Agency
and
U.S. Army Corps of Engineers, Norfolk District

Prepared by

Gannett Fleming

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1. EXECUTIVE SUMMARY

1.1. Overview

The Military Traffic Management Command Transportation Engineering Agency (MTMCTEA), through Gannett Fleming, conducted a comprehensive transportation study at Fort Campbell, Kentucky. The purpose of the study was to assess existing conditions and to identify short-term and long-term transportation needs to safely provide for existing and future transportation demands. Primary areas of focus include Access Control Points, intersections, and roadway corridors. The goal of this study is to develop a master plan for future use by installation officials.

Throughout the development of the study, the Study Team considered:

- Fort Campbell's vision, mission and goals,
- Operational requirements and needs,
- Existing and future land uses,
- All modes of travel, and
- External projects impacting the transportation network at Fort Campbell

Throughout the study, Fort Campbell officials and other key stakeholders were engaged including:

- Kentucky Transportation Cabinet,
- Tennessee Department of Transportation,
- Clarksville – Hopkinsville Metropolitan Planning Organization,
- City of Clarksville, and
- Clarksville Transit System

As part of the study, significant data was collected. Turning Movement Counts (TMC's) were collected at 40 intersections, and 24-hour Automated Traffic Recordings (ATR's) were collected at 40 locations. Additionally, vehicle occupancy, speed and crash data was collected and reviewed.

The study was originally initiated in September of 2001, but data collection was delayed to February of 2002 due to the ramifications of September 11th. The scope of work was modified and Access Control Point assessments became the priority focus of the study. In April of 2002, the 15 percent draft study was submitted, which included finalized Access Control

Fort Campbell's Vision
To be America's premier power projection platform for the Army's most powerful contingency forces.

Fort Campbell's Mission
We are an "Installation of Excellence" that trains, supports, mobilizes, and deploys mission-ready forces. We provide the best services and facilities for the soldiers, civilian workforce, families and retirees.

Goals
- ❑ Sustain and modernize the installation infrastructure, systems and processes to enhance readiness and improve quality of life.
- ❑ Institutionalize quality of life initiatives.
- ❑ Maximize resource opportunities.

Points Assessments (Section 4). Since that time, final designs have been completed and Access Control Points have been constructed at ACP 1 (William C. Lee Road) and ACP 3 (Air Assault Street). Additionally, the need for Variable Message Signs (VMS's), discussed in Section 4 has received the support of the Kentucky Transportation Cabinet, and the Tennessee Department of Transportation.

The study is organized into eight major sections:

- Executive Summary
- Introduction
- Background Information and Existing Conditions
- Access Control Point Evaluations
- Intersection Evaluations
- Corridor and Area Evaluations
- Miscellaneous Issues
- Transportation Network Assessment and Recommendations

Issues discussed in **Intersection Evaluations**, **Corridor and Area Evaluations**, **Miscellaneous Issues** are intended to give guidance on short-term and mid-term enhancements that can improve operational performance while promoting safety.

The final section, **Transportation Network Assessment and Recommendations** is a prioritized "roadmap" of significant transportation enhancements considering significant changes at Fort Campbell and throughout the surrounding communities. Specifically, the future transportation needs consider ACP development and the resulting changing traffic flow patterns, Master Plan initiatives, the Residential Community Initiative (RCI) and external roadway projects such as the U.S. Route 41A upgrade.

1.2. Table of Recommendations

Location	Recommendation	Cost
Section 4		
ACP 1	**Short Term:**	
	Replace the plastic barrier with a raised island with curbing for better guard protection.	
	Relocate and construct two inbound lanes capable of tandem processing.	
	Long Term:	$1.4-2.0 Million
	Construct one of two presented alternatives with three inbound lanes.	
ACP 2	Maintain the closure of this gate to minimize residential impacts.	
	Type III Barricades should be installed on both approaches to the ACP.	
ACP 3	**Short Term:**	
	Concerns exist over shoulder drop-offs and barrier systems.	
	Long Term:	$1.2-1.6 Million
	Construct three inbound lanes capable of tandem processing and one outbound lane.	
ACP 4	**Short Term:**	
	Simplify visitor signing.	
	Barrier systems should be complete and continuous with an appropriate end treatment.	
	Consider opening other ACP's during DONSA conditions.	
	Long Term:	$3.1-4.1 Million
	Construct five inbound lanes capable of tandem processing. This necessitates that the ACP be moved to the west.	
	Maintain two outbound lanes through the ACP area.	
	Relocate the visitors center parking to accommodate the lane requirements of the new ACP.	
ACP 5	Maintain as outbound only, if needed.	
	Consider removing the plastic barriers.	
	Deactivate the northbound left-turn phase and adjust the timings at the intersection of U.S. Route 41A and Forest Road.	
ACP 6	**Short Term:**	
	Reconfigure the chicane with barriers running parallel to the travel way.	
	Long Term:	$1.6-2.2 Million
	Construct two inbound lanes capable of tandem processing.	
ACP 7	**Long Term:**	$2.4-3.3 Million
	Construct two inbound lanes capable of tandem processing located about 2300 feet from the intersection with Morgan Road.	
	Provide a parking area for 30 trucks to be used for queuing for inspections.	
	Install signing on U.S. Route 41A southbound approach to the intersection with Cole Road directing all truck traffic to ACP 7.	
	Maintain one lane outbound.	

Location	Recommendation	Cost
Section 4		
ACP 10	**Short Term:**	
	Add an area for local truck processing which could be used for authorized, preapproved trucks.	
	Long Term:	$2.4-3.3 Million
	Construct three inbound lanes capable of tandem processing approximately 1.8 miles from the intersection with 11th Airborne Division Road.	
	Open ACP 10 to local trucks.	
	Maintain one lane outbound.	

Location	Recommendation	Cost
Section 5		
U.S. Route 41A and Lee Road	Add an exclusive left-turn lane on the eastbound approach.	$26,000
	Reconfigure and restripe the westbound approach as an exclusive left-turn lane and a shared through/right-turn lane.	
	Reconfigure east-west phasing pattern as shared phased with protected/permitted left-turn phasing.	
	Reevaluate timing as part of improvement design process.	
U.S. Route 41A and Screaming Eagle Boulevard	Improvements to this intersection included in the U.S. Route 41A widening project in Kentucky will adequately address operational problems at this intersection.	
Bastogne Avenue and Screaming Eagle Boulevard	Add another left-turn lane to the southbound approach and a right-turn lane on the northbound approach.	$81,000
	Rephase the southbound left-turn phase to be protected/prohibited to due to the double-left turning lanes.	
	Provide pedestrian signal heads and actuation.	
	Provide pedestrian ramps and crosswalks.	
Bastogne Avenue and Reed Avenue	Monitor the traffic volumes to determine the need for a left-turn lane and protected phasing.	$41,000
	Reconfigure the northbound and southbound approaches to allow for exclusive left-turn lanes and through/right lanes.	
	Add backplates to signal heads.	
Bastogne Avenue and Hospital Drive	Consolidate access points along Bastogne Avenue, possibly with that of the Bank.	$190,000
Wickham Avenue and 1st Street	Widen the eastbound approach to have an exclusive left-turn lane.	$63,500
	Evaluate the railroad grade crossing to determine whether additional types of control should be implemented.	
Wickham Avenue and Airborne Street	Improve the northbound shoulder in accordance with AASHTO and MTMCTEA guidelines.	$6,700
	Replace STOP signs to improve night-time reflectivity.	

Location	Recommendation	Cost
Section 5		
	Construct an exclusive eastbound right-turn lane.	
Wickham Avenue and Normandy Boulevard	Add pavement marking arrows for both lanes on the westbound approach.	$1,000
	Install clearly visible lane use control signing to the westbound approach.	
	Install a fully actuated traffic signal if Screaming Eagle Boulevard will not be relocated.	$90,000
Screaming Eagle Boulevard and Normandy Boulevard Intersections with Tennessee Avenue and Kentucky Avenue	Implement signing and pavement marking improvements.	$7,000
Lee Village Traffic Circle (Morgan Circle)	Reconfigure this intersection to accommodate RCI Housing initiatives, by either eliminating a leg or by constructing a modern roundabout at this intersection.	$129,000
Ohio Road and East End Road	Provide pavement markings to indicate a through movement from East End Road to the western leg of Ohio Road.	$1,600
	Place an island on the eastbound approach of Ohio Road to allow for a dedicated right-turn onto East End Road.	
Ohio Road and Louisiana Road	Construct a conventional T-intersection at this site.	$1,000
	Reconfigure Ohio Road to have the right-of-way, and place Louisiana Road under Stop control.	
	Clear and grub as required to satisfy sight distance requirements.	
101st Airborne Division Road and 11th Airborne Division Road	Construct a three-phase traffic signal.	$118,000
	Add an exclusive left-turn lane to the southbound approach.	

Location	Recommendation	Cost
Section 6		
Bastogne Avenue Corridor	Each intersection should be adjusted so that the through movement can traverse the intersection without varying from their travel path.	$635,000
	Access management practices should be applied so that areas with many access points are consolidated into one safe and controlled access point.	
Tennessee Avenue and Kentucky Avenues	Modifying the circulation patterns to these roadways to create one-way pairs was considered, however, neither roadway has a significant crash history or operational deficiencies; therefore, a revision to the circulation plan is not recommended at this time.	
Bank of America Circulation	Restructure the traffic flow around the bank. Five alternatives were suggested. Coordinate this improvement with access management upgrades to safely accommodate the hospital and the education center access.	Alt 1: $5,250 Alt 2: $2,100 Alt 3: $3,100 Alt 4: $34,800 Alt 5: $41,200
5th Special Forces Group Barracks	The closure of Kentucky Avenue will not adversely impact traffic operations.	
Morgan Road in the area of Market Garden Road and Wickham Avenue	Reconfigure the intersection with one of the alternatives presented to accommodate the proposed PX Mini-Mall.	Alt 1: $827,000 Alt 2: $646,000 Alt 3: $1,024,000 Alt 4: $961,000
First Street near Water Treatment Facility	The closure of First Street in this area will not adversely impact traffic operations.	
Barge Point Access	Fort Campbell should coordinate with state and local governments to request a formal safety audit of the routes used to access the Barge Point.	$30,000
Intersection of KY Route 911 and KY Route 115	Consider repairing the approximately two-foot drop-off on the west side of the north leg, and implementing NO TURN ON RED restrictions on approaches with minimal sight distance.	

Location	Recommendation	Cost
Section 7		
Railroad-Highway Grade Crossing Treatments	All crossings should be reviewed to ensure compliance with MUTCD regardless of whether they warrant additional traffic control devices.	Variable
Pedestrian and Bicycle Considerations	Sign mid-block crosswalks in accordance with the MUTCD and consolidate them as much as possible to limit areas where pedestrians may cross the roadway.	Variable
	At intersections, crosswalks should be marked except at unsignalized locations where speeds exceed 45 mph.	
Road Conditions	Mitigate edge drop-offs and severe side slope hazards.	Variable
Condition and Compliance of Traffic Control Devices	Ensure that all traffic control devices are in compliance with the MUTCD.	Variable
Drainage Considerations	Where practical, provide safe, traversable drainage structures.	Variable
Lane Transitions and Turn Lane Considerations	Design lane tapers to appropriate lengths.	Variable
Noise Considerations at ACP 7	Due to significant volumes of trucks at ACP 7, and due to the proximity of base housing, a study should be conducted to determine noise levels at various locations near the ACP, considering the diminishment of sound with distance, along with the proximity to housing areas.	Variable
Proposed Fueling Center	A fueling center will be constructed near Air Assault Street and Market Garden Road, and is proposed to serve the entire base. Since this is expected to be a very significant traffic generator, a formal traffic impact study should be conducted to determine off-site impacts associated with this project.	Variable

Location	Recommendation	Cost
Section 8		
Screaming Eagle Boulevard Realignment	Avoid excessive skews in intersections, particularly that with Bastogne Avenue.	$8.3 Million
	Consider widening Bastogne Avenue in the vicinity of this intersection to two through lanes per direction to accommodate future traffic volumes.	
Realignment of Bastogne Avenue to Air Assault Street	Bastogne Avenue and Air Assault Street should be configured with appropriate turning lanes and lane transitions.	$2.1 Million
ACP 6/47th Street Connection	This proposed improvement would provide an arterial allowing for better access between ACP 6 and the northern part of the base.	$4.2 Million
Western Arterial Development	Develop a western arterial that provides access to land use development along Wickham Avenue.	$3.0 Million
Realignment of 101st Airborne Division Road near Sabre Heliport	A transportation improvement project that was identified is the realignment of 101st Airborne Division Road in the vicinity of the Sabre Heliport. The new roadway would be two lanes wide.	$5.0 Million
Market Garden Road Extension to 101st Airborne Division Road	Market Garden Road is proposed to be extended to the 101st Airborne Division Road. The new roadway would be approximately 2.5 miles in length.	$5.0 Million
ACP 4 Extension	Community stakeholders have suggested extending Screaming Eagle Boulevard to Oak Grove. This would allow for a direct connecting roadway to ACP 4.	
Pennyrile Parkway Extension to Fort Campbell	Consideration has been given to the possibility of extending Pennyrile Parkway directly into Fort Campbell.	
Pedestrian and Bicycle Opportunities	Sidewalks should be provided in areas of moderate pedestrian activity; bicycle lanes and trails should also be provided where appropriate.	Variable
Transit Opportunities	Consider the implementation of an internal transit route connecting to an external transit system.	Variable
Traffic Advisory Committee Development	Fort Campbell should consider the development of a traffic advisory committee due to ongoing changes in infrastructure.	Variable

1.3. Further Assistance

A review of traffic data, analyses, plans and drawings, and field assessments are the basis for the findings and recommendations presented in this report. Please refer all questions regarding the recommendations in this report to MTMCTEA for resolution.

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2. INTRODUCTION

Fort Campbell lies on the Kentucky-Tennessee border between the towns of Hopkinsville, Kentucky and Clarksville, Tennessee and is about 60 miles northwest of Nashville, Tennessee on I-24. A location map is presented as **Exhibit 2.1**.

Fort Campbell supports the 3rd largest military population in the Army and the 7th largest in the Department of Defense. The 101st Airborne Screaming Eagles stationed at Fort Campbell is the primary command group on the installation. Fort Campbell's population also includes the 5th Special Forces Group and the 160th Special Operations Airborne Regiment. There are numerous support and tenant groups as well. Also, the installation provides support services to family members, National Guard and Reserve units, and retirees. The population breakdown of the Fort Campbell community is as follows:

Active Duty Officer - 2,374
Active Duty Enlisted - 23,345
Family Members - 40,229
Retirees - 121,699
Civilian Employees - 2,802
Army Reserves/National Guard - 18,166

2.1. Study Purpose

The Military Traffic Management Command Transportation Engineering Agency (MTMCTEA), through Gannett Fleming, conducted a comprehensive transportation study at Fort Campbell, Kentucky. The purpose of the study was to assess existing conditions and to identify short-term and long-term transportation needs to safely provide for existing and future transportation demands.

The study considered Fort Campbell's vision, mission and goals in evaluating transportation needs. The recommendations of this study are supported by Fort Campbell's goal to, "***Sustain and modernize the installation infrastructure***, systems and processes to enhance readiness and ***improve quality of life***."

Fort Campbell's Vision

To be America's premier power projection platform for the Army's most powerful contingency forces.

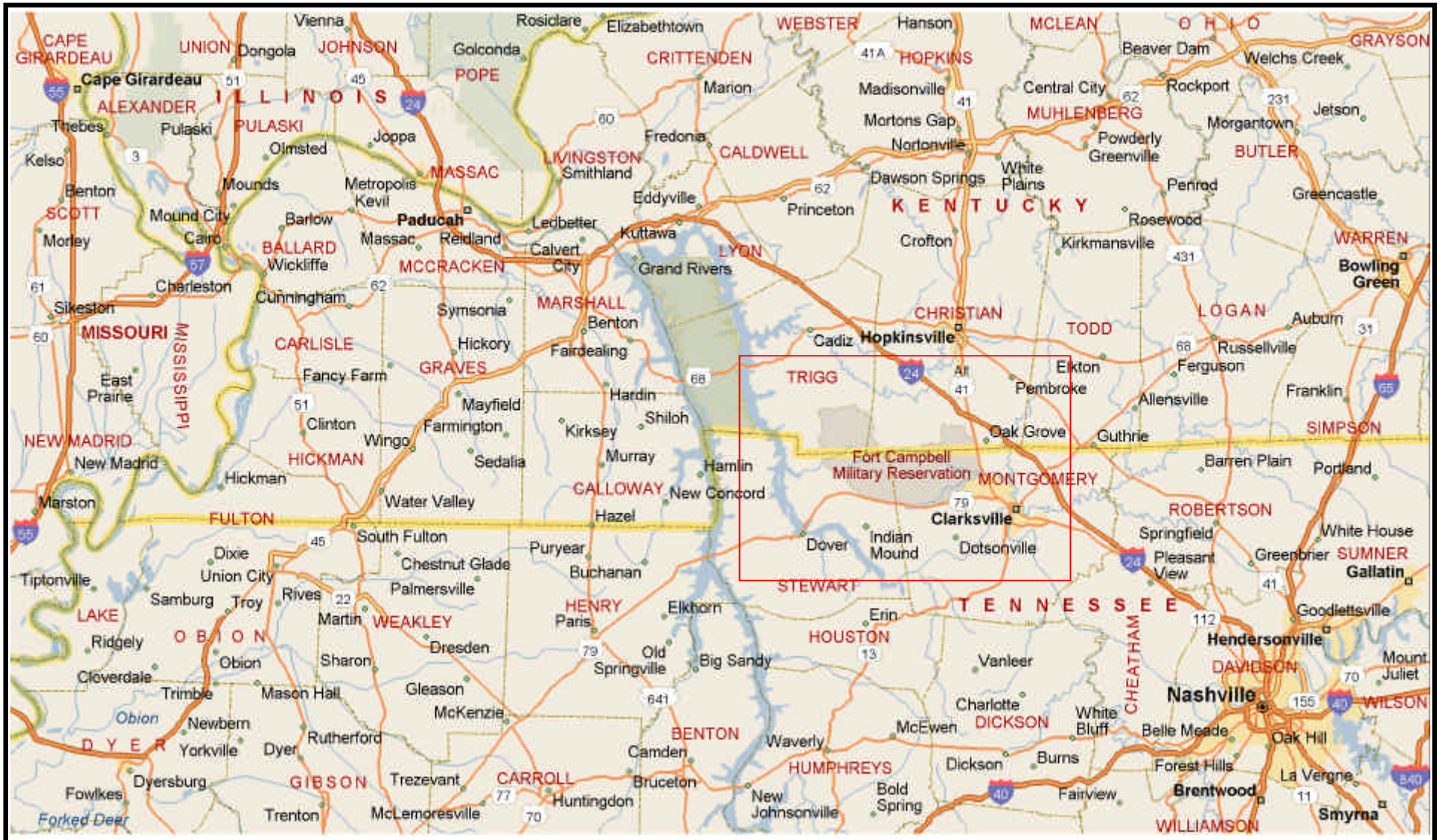

Exhibit 2.1

Legend

Study Area

Location Map

Fort Campbell, Kentucky - Traffic Study

Fort Campbell's Mission

We are an "Installation of Excellence" that trains, supports, mobilizes, and deploys mission-ready forces. We provide the best services and facilities for the soldiers, civilian workforce, families and retirees.

Goals

- ***Sustain and modernize the installation infrastructure***, systems and processes to enhance readiness and ***improve quality of life***.
- Institutionalize quality of life initiatives.
- Maximize resource opportunities.

2.2. Organization of Study

The study is organized into eight major sections:

- Executive Summary – Summary of study including key findings, recommendations and costs.
- Introduction – Introduction of study including study purpose.
- Background Information and Existing Conditions – Summary of data received and collected. Serves as the baseline for analyses.
- Access Control Point Evaluations – Evaluation of access control points including review of FORSCOM recommendations.
- Intersection Evaluations – Evaluation of intersections identified as areas of concern.
- Corridor and Area Evaluations – Evaluation of corridors and areas identified as areas of concern.
- Miscellaneous Issues – Summary of miscellaneous and general issues.
- Transportation Network Assessment and Recommendations – Assessment of transportation network including identification of long-term needs.

2.3. Resources and References

Existing and proposed roadway conditions were analyzed using traffic engineering and safety standards as documented in the following sources:

- *Highway Capacity Manual* (HCM), Transportation Research Board Special Report 209, 1997 and 2000
- Highway Capacity Software (HCS), developed by FHWA and distributed by McTrans
- Manual on Uniform Traffic Control Devices (MUTCD), FHWA, 2000

- *A Policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2000
- *Roadside Design Guide*, American Association of State Highway and Transportation Officials (AASHTO), 1996
- Traffic Engineering Handbook, 5th Edition, ITE, 1999
- Transportation Planning Handbook, 2nd Edition ITE, 1999
- *Trip Generation Handbook*, 6th Edition, ITE, 1997
- Highway Safety Design and Operations Guide, AASHTO, 1997
- SYNCHRO 5.0 Software, distributed by Trafficware
- MTMCTEA Pamphlet 55-10, Traffic Engineering for Better Roads, 1985
- MTMCTEA Pamphlet 55-14, Traffic Engineering for Better Signs and Markings, 1985
- MTMCTEA Pamphlet 55-15, Traffic Engineering for Better Gates, 1982
- Manual on Identification, Analysis and Correction of High Accident Locations, FHWA, 1975

All of these standards were applied while also considering local standards.

Key references and materials utilized as the foundation for analyses include:

- Fort Campbell, Kentucky, Traffic Engineering Study, MTMCTEA, April 1986
- Traffic and Safety Analysis of US 41A Traffic Accidents, MTMCTEA, September 1995
- Fort Campbell, Kentucky Traffic and Safety Engineering Study, MTMCTEA, June 1999
- Fort Campbell, Kentucky Crash Location Enhancement Study, MTMCTEA, November 1999
- Fort Campbell Joint Land Use Study, Greater Nashville Regional Council, January 1996
- Residential Communities Initiative, January 2002
- 2000-2025 Clarksville Area Urbanized Area Long Range Transportation Plan, Clarksville Area MPO, October 2000
- Fort Campbell Master Plan - Transportation
- Installation Security Master Plan, FORSCOM, January 2002
- Highway 41A Construction Plans, Kentucky Transportation Cabinet

2.4. Meetings and Contacts

At the outset of the study in February 2002, several meetings were held with project stakeholders and local transportation officials. The following summarizes those meetings:

- Study kick-off meeting – Introduced the study to installation and community stakeholders and received input on areas of concern.
- Kentucky Transportation Cabinet coordination meeting – Introduced the study and identified projects impacting Fort Campbell.
- Tennessee Department of Transportation coordination meeting – Introduced the study and identified projects impacting Fort Campbell.
- Residential Communities Initiative (RCI) meeting – Discussed the residential communities initiative, the required coordination between the two groups, and the needs of residents related to housing, transportation and quality of life.

Other stakeholders contacted regarding the study include:

- City of Clarksville Roads, Buildings and Grounds Department
- Clarksville Transit System
- Clarksville – Hopkinsville Metropolitan Planning Organization

2.5. Evaluation Methodology

The study team collected traffic volume and crash data, recorded field observations including geometric conditions, traffic control devices, and deficiencies, and utilized installation mapping as the basis for analyses and recommendations.

Traffic volumes and lane configurations were analyzed in SYNCHRO and HCS to determine intersection levels of service (LOS). LOS describes the operational condition of an intersection and usually falls into one of six categories, A through F. LOS A represents operating conditions with relatively little traffic and no congestion, while LOS F represents relatively high traffic and unpredictable operating conditions including high delay and driver discomfort. Generally, a facility operating at or better than LOS D is considered acceptable. **Appendix A** details and graphically shows examples and definitions of LOS A through F.

Geometric evaluations were conducted in accordance with *A Policy on Geometric Design of Highways and Streets*. All other analyses were conducted in accordance with the aforementioned references.

The study team developed recommendations considering crash data, traffic volume demands, analyses performed and field observations.

It should be noted that MTMCTEA publicizes highway safety because of the many deaths and injuries that occur on military installations each year. Highway crashes and their severity are caused by one or more of the highway system elements: the roadway, the vehicle, and/or the driver. Many times, law enforcement officials tend to blame crashes directly on the driver. Even if the driver was at fault, the road or roadside environment may have contributed to the severity of injuries or property damage costs. Too often, the driver takes the blame, while other causative factors remain hidden. The driver is expected to compensate for inadequate highway design and control measures in his/her driving tasks. Transportation engineers know a definite correlation exists between crashes or crash severity and substandard design or inadequate control measures. Crash causes and their destruction intensity must be clearly defined and related to the highway system elements.

Frequently fatal and serious injury crashes occur because motorists impact highway hazards. Even though the crash cause is listed as driver error such as running off the road, speeding, driving under the influence (medicinal drugs), driving while intoxicated, falling asleep, etc., there are contributory factors surrounding a crash that affect the severity. In other words, the highway features are not forgiving or crashworthy. Substandard or incorrectly located traffic control measures can also contribute to driver confusion and increase the probability that a crash may occur.

2.6. Further Assistance

A review of traffic data, analyses, plans and drawings, and field assessments are the basis for the findings and recommendations presented in this report. Please refer all questions regarding the recommendations in this report to MTMCTEA for resolution.

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3. BACKGROUND INFORMATION AND EXISTING CONDITIONS

This section outlines the Fort Campbell transportation system, summarizes recommendations made by previous studies, presents the data collected for this study, discusses the factors influencing the existing and future traffic patterns and provides the initial LOS analyses as part of this study.

3.1. Transportation System Overview

Fort Campbell lies on the Kentucky-Tennessee border between the towns of Hopkinsville, Kentucky and Clarksville, Tennessee and is about 60 miles northwest of Nashville, Tennessee. Today, approximately 12,000 acres of the installation have been developed into the cantonment area while the remaining 93,000+ acres of the reservation are dedicated to training and firing ranges.

Fort Campbell is bordered by “The Land between the Lakes”, Lake Barkley and Kentucky Lake to the west; U.S. Routes 41 and 41A to the east; U.S. Route 68, and the Western Kentucky Parkway to the north; and the Cumberland River and U.S. Route 79 to the south. **Exhibit 3.1** illustrates the location of Fort Campbell in relation to the surrounding transportation network.

3.1.1. External Roadway Network

The primary arteries serving Fort Campbell and the surrounding communities include Interstate 24 (I-24) to the northeast of the base, U.S. Route 41A (Ft. Campbell Boulevard) running along the east side of the base, and U.S. Route 79 which runs along the southern border of the base.

I-24 is a four lane limited access highway, which connects Nashville, Tennessee and St. Louis, Missouri. I-24 interchanges with U.S. Route 41A approximately four miles north of the base and U.S. Route 79 approximately 7 miles east of the base.

U.S. Route 41A is primarily a four to six-lane business route connecting Hopkinsville, Kentucky to Clarksville, Tennessee. Planned upgrades include widening U.S. 41A to six lanes from the Kentucky-Tennessee border north to the interchange with I-24. Construction is scheduled to start in the summer of 2002.

U.S. Route 79 is a two to six lane roadway connecting Clarksville to Bowling Green and I-65 to the east, and two to five lane roadway to I-40 leading to Memphis to the west.

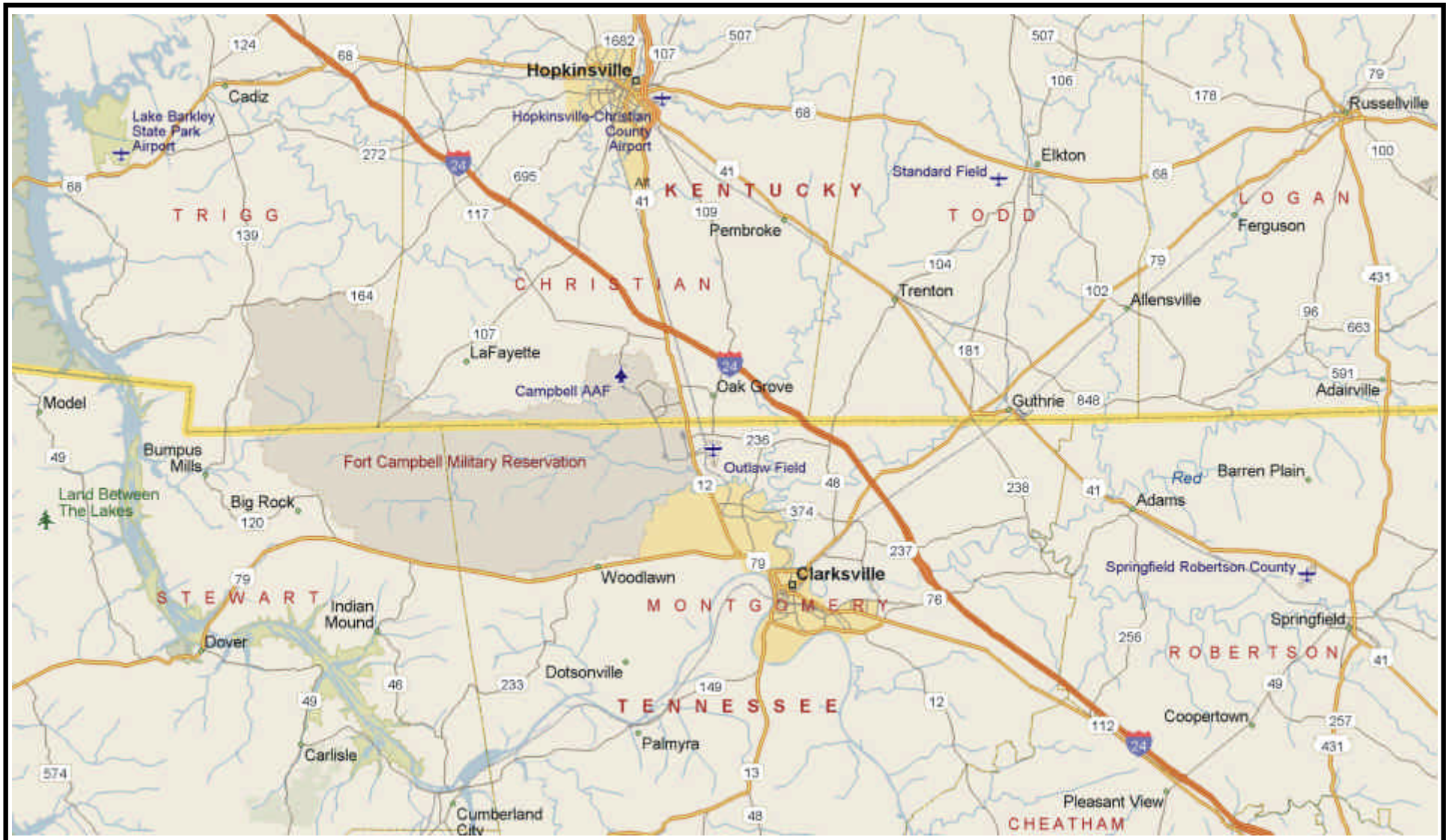

Exhibit 3.1

Regional Network

Fort Campbell, Kentucky - Traffic Study

3.1.2. Internal Roadway Network

The roadway system at Fort Campbell is set up in a grid pattern. The majority of the access points between the internal and external roadway networks are located along the eastern border and connect to U.S. Route 41A.

The roadways at Fort Campbell can be classified into one of the three types according to the function they serve in moving people and freight:

- Arterial Highways – Serve the movement of people and freight regionally between population and activity centers with a minimal level of access to adjacent properties.
- Collector Roadways – Serve the movement of people and freight from population and activity centers and funnel them onto arterial highways with a moderate level of access to adjacent properties.
- Local Roadways – Provide access to adjacent properties and move people onto collector and arterial roadways.

The roadway classifications are presented as **Exhibit 3.2** and are detailed below.

3.1.2.1. Arterial Highways

Arterial highways are divided into principal arterial highways and minor arterial highways. Principal arterial highways serve national and regional movements. Minor arterial highways serve movements between population and activity centers within a region. Minor arterial roadways generally have four, five or six lane cross-sections within developed areas. Outside of developed areas, minor arterial highways may have a cross-section with two or more lanes. Traffic demand determines the number of lanes required on a roadway. Arterial highways located in less developed areas should be designed to permit safe travel at speeds greater than 45 miles per hour. Within Fort Campbell, the following roadways function as minor arterial highways:

- Screaming Eagle Boulevard/ Normandy Boulevard
- 101st Airborne Division Road
- Glider Road/ Morgan Road
- Wickham Avenue
- Air Assault Street

3.1.2.2. Collector Roadways

Collector Roadways may be classified into major collector roadways and minor collector roadways. Major collector roadways connect larger population and activity centers with arterial highways. Minor collector roadways connect smaller areas or portions of larger areas with major collector roadways or arterial highways. Collector roadways located within Fort Campbell include:

- Market Garden Road
- Tennessee Avenue
- Kentucky Avenue
- Bastogne Avenue
- William C. Lee Road
- Airborne Street
- Forrest Road
- Morgan Road
- Angels Road
- Mabry Road

3.1.2.3. Local Roadways

The final classification of roadway located within Fort Campbell is the local roadway. Local roadways are located in all portions of Fort Campbell and serve as the direct connection to parking lots and adjacent properties. Most other roadways within Fort Campbell are local roadways.

3.1.3. Alternate Modes

In addition to vehicular transportation, Fort Campbell and the surrounding area is accessible via several alternative modes. From a military standpoint, Fort Campbell takes great pride in their flexibility to deploy troops and equipment via roadway, rail, air and water transport.

3.1.3.1. Rail

CSX Transportation System provides regional rail service to the north of Fort Campbell near Hopkinsville. From Hopkinsville, Fort Campbell owns a private spur from the CSX line that connects to the new loadout facility constructed near the southern end of Market Garden Road. Other recent upgrades of the spur line have included minor realignments and new structures over U.S. Route 41A and State Route 109. Concerns regarding the rail infrastructure have included appropriate rail crossing treatments and a secondary loadout facility.

Currently, there is no passenger service to Fort Campbell or Clarksville. The closest rail service is provided by AMTRAK to Fulton and Louisville, Kentucky, but has connecting busses to Bowling Green, Kentucky and Nashville, Tennessee.

3.1.3.2. Transit

Clarksville is served regionally by Greyhound Bus Lines and is served locally by Clarksville Transit System (CTS). CTS has two routes connecting to Fort Campbell. Both routes connect to seven additional routes via the Clarksville Transit Center. Prior to September 11, 2001, both Greyhound and CTS provided

N

MABRY RD

ANGELS RD

101st AIRBORNE

DIVISION RD

MARKET GARDEN RD

MORGAN RD

GLIDER RD

WICKHAM AVE

TENNESSEE AVE

KENTUCKY AVE

EASTOVER AVE

BASTOGNE AVE

SCREAMING EAGLE BLVD

LEGEND

ARTERIALS

COLLECTORS

EXHIBIT 3.2
INTERAL ROADWAY FUNCTIONAL CLASSIFICATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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service onto Fort Campbell; however, the required force protection upgrades due to September 11th have impacted transit service and ridership. The closest service since September 11th is provided at the Post House located in the median of U.S. Route 41A near ACP 3. CTS experienced a ridership decrease of 13,000 in November 2001 as a result of route limitations.

3.1.3.3. Air

Fort Campbell is one of the few Army installations with a Class B airfield. Campbell Army Airfield (CAAF) has experienced an increase in operations in recent years, and that trend is expected to continue. A passenger-processing center is planned at CAAF with the capability of handling up to 1,000 passengers simultaneously. Fort Campbell has two major heliports for military aircraft - Destiny Heliport, located on CAAF north of the primary fixed-wing pads and Sabre Heliport, south of Clarksville Base on 101st Airborne Division Road.

The nearest airport with scheduled commercial airline service is Nashville International, 47 miles to the southeast. For the light-civil aircraft, Outlaw Field is just northeast of Clarksville and east of Fort Campbell. The Clarksville and Montgomery County Airport Authority run Outlaw Field. Outlaw Field operates privately owned smaller aircraft and has no commercial service. Also, Hopkinsville has an airfield beside Pennyrile Parkway 0.5 miles north of U.S. Route 41.

3.1.3.4. Water

Fort Campbell has no water transportation facilities on the installation. However, the Army Corps of Engineers-Nashville District does own a facility on the Cumberland River in Clarksville, Tennessee. The facility is a barge point commonly referred to as Lock C. Access to the nation's inland waterways is via the Cumberland River at Clarksville. Navigable channels provide year round movement on the Cumberland, Ohio, Tennessee and lower Mississippi Rivers for goods moving to and from the Gulf of Mexico. The Barge Point compliments Fort Campbell's multi-modal deployment alternatives

Access to the Barge Point is provided via TN Route 233 and local roadways. Concerns have been raised regarding the geometric condition of the roadways. Crash data was requested from the Tennessee Department of Transportation, but was not received; therefore these concerns could not be validated as part of this study.

3.1.3.5. Pedestrian/ Bicycle Activity

Pedestrian and bicycle activity at Fort Campbell is substantial due to several reasons including:

- 4200 housing units
- 8 schools (5 elementary, 2 middle, 1 high school)

- Alternate commuter methods
- Daily PT activities
- Heavy young, transient population

Sidewalks are provided throughout residential areas and in areas of roadway upgrades. Crosswalk treatments are inconsistent throughout the installation and ADA compliant ramps are not present at some locations.

Daily PT activities include roadway closures on the following roadways:

- Market Garden Road
- A Shau Valley Road
- Tennessee Avenue between Normandy Boulevard and 59th Street
- Kentucky Avenue between 1st Street and 49th Street

Several roadways are restricted to no runners, single runners or 3-man formations due to traffic volumes and/ or limited right-of-way availability for runners.

3.2. Previous Studies

Fort Campbell has been the site of several previous traffic related studies. MTMCTEA and Gannett Fleming conducted the studies that were reviewed as part of this study. The studies focused on installation-wide transportation issues, as well as specific areas of concern.

In November 1999, Gannett Fleming performed a Crash Location Enhancement Study for MTMCTEA. This study focused on the Wickham Avenue corridor, including five key intersections, and three additional intersections within the installation.

Gannett Fleming also performed a Traffic and Safety Engineering Study in June 1999, which focused on four intersections within the installation. This study identified possible improvement alternatives for enhancing safety at the subject locations.

In September 1995, MTMCTEA submitted a report that analyzed several crashes along Highway 41A in both Kentucky and Tennessee with particular emphasis on the Route 41A/ I-24 interchange.

In April 1986, MTMCTEA performed a comprehensive traffic study, which analyzed safety hazards, design deficiencies, and general traffic flow within and throughout the entire base while paying particular attention to the ACP's.

Findings of these prior studies are summarized in **Exhibit 3.3**.

Exhibit 3.3 Summary of Past Traffic Studies

Intersection [Current Name / Previous Name]		Year	Recommended Improvements	Action (Y/N)	Present Relevance
Wickham Avenue and Air Assault Street	Missouri Avenue and 18th Street	1999	Revise Yellow and Red clearance intervals to 4 seconds and 2 seconds, respectively.		
			Provide 8-Phased operation.	Yes	
			Install back-plates on all east-west signal indications.	No	Yes
			Improve/ replace worn pavement markings.		Yes
			Construct an exclusive southbound right-turn lane.	No	
			Improve and upgrade intersection shoulders to eliminate drop-offs.	No	
			Improve transitions on all approaches		
			Install guardrail to protect utility poles and headwalls.	No	Yes
		1986	Reconfigure existing lanes or construct new lanes such that northbound and southbound Indiana Avenue have an exclusive left turn lane and a shared through/right lane.	Yes	
			Relocate signal faces per that study.		
Wickham Avenue and 35th Street		1999	Revise Yellow and Red clearance intervals to 4 seconds and 2 seconds, respectively. Also retime to provide a northbound maximum green time of 40 seconds.		
			Provide 8-Phased operation.	Yes	
			Install backplates on all east-west signal indications.	No	
			Improve/ replace worn pavement markings.		
			Improve and upgrade intersection shoulders to eliminate drop-offs.		
			Improve transitions on all approaches		
			Install guardrail to protect utility poles and headwalls.	No	Yes
Wickham Avenue and 1st Street	Missouri Avenue and 1st Street	1986	Reduce the posted speed on Wickham Avenue to 25 MPH until the grade on Wickham Avenue can be reduced.		
Wickham Avenue and 42nd Street		1999	Revise Yellow and Red clearance intervals to 4 seconds and 2 seconds, respectively.		
			Provide 8-Phased operation.	Yes	
			Install backplates on all east-west signal indications.	No	Yes
			Improve/replace worn pavement markings.		
			Repair the luminarie in the southwest quadrant.		
			Improve and upgrade intersection shoulders to eliminate drop-offs.	No	Yes
			Improve transitions on all approaches		

Intersection [Current Name / Previous Name]		Year	Recommended Improvements	Action (Y/N)	Present Relevance
			Install guardrail to protect utility poles and headwalls.	No	Yes
Wickham Avenue and Morgan Road		1999	Install a traffic signal.	No	
			Install exclusive northbound and southbound left-turn lanes.	Yes	
			Install a raised channelization island on the eastbound approach.	Yes	
Wickham Avenue and 59th Street		1999	Install guardrail to protect the headwall on the northwest quadrant.	No	Yes
			Repair the luminarie in the southeast quadrant.		
			Improve and upgrade intersection shoulders to eliminate drop-offs.	No	Yes
Kentucky Avenue and Screaming Eagle Boulevard		1999	Relocate the supplementary R1-3 sign (3-Way) directly under the STOP sign.	No	Yes
			Replace the "No Left Turn" and "No Right Turn" signs with One-Way signs.	No	Yes
			Increase enforcement of STOP sign violators.		
Indiana Avenue and 35th Street		1999	Install a traffic signal to improve the intersection capacity and reduce the potential for crashes.	No	
			Improve/replace worn pavement markings.	No	Yes
			Improve and upgrade intersection shoulders to eliminate drop-offs.	No	Yes
		1986	Replace existing 4-way STOP control with STOP condition on 35th Street.	No	No
101st Airborne Division Road and 11th Airborne Division Road		1999	Install a traffic signal to improve the intersection capacity and safety.	No	Yes
			Construct eastbound and westbound left-turn lanes to increase capacity.	No	Yes
			Install street lighting to improve nighttime visibility.	No	Yes
			The steel posts protecting the STOP removed on the westbound approach should be removed. Tubular flexible delineators should also be installed to protect the STOP sign.	No	Yes
			Improve/replace worn pavement markings. Include both longitudinal and arrow markings.	No	Yes
			Improve and upgrade intersection shoulder in the northwest quadrant to eliminate drop-offs.	No	Yes
59th Street and Indiana Avenue		1999	Add street lights on existing utility poles.	Yes	Yes
			Relocate guardrail and improve guardrail ends.	No	Yes
			Install Large Arrow sign.	No	Yes
Airborne Street and Wickham Avenue		1999	Upgrade northbound shoulder.	No	Yes
			Replace STOP signs.		

Intersection [Current Name / Previous Name]		Year	Recommended Improvements	Action (Y/N)	Present Relevance
			Construct eastbound right-turn lane.	No	
Screaming Eagle Boulevard/Normandy Boulevard and Wickham Avenue	25th Street/26th Street and Missouri Avenue	1999	Update yellow and all red clearance intervals and provide protected left-turn phasing on Wickham avenue.	No	
			Signalize Normandy Boulevard and realign southbound approach to provide left-turn lane transition.	No	
			Construct Normandy Boulevard extension.	No	
		1986	Remove Yield sign located on the southbound approach of Wickham Avenue to Screaming Eagle Boulevard.	No	Yes
Bastogne Avenue and Hospital Drive	Ohio Avenue and Hospital Drive	1986	Construct a separate left-turn lane on Bastogne Avenue for Hospital Drive.	Yes	
Bastogne Avenue and Screaming Eagle Boulevard	Ohio Avenue and Chaffee Road	1999	Provide additional green time for southbound approach.		
			Provide pedestrian pushbuttons and signal heads.	No	
			Provide pedestrian ramp at Education Center.		
			Install lane use control signs.	No	Yes
			Replace westbound signal head.		
		1986	Remove on-street parking in the proximity of this intersection.	No	No
Bastogne Avenue and Air Assault Street	Ohio Avenue and 18th Street	1986	Change existing northbound approach from a shared left/through lane and exclusive right turn lane to an exclusive left turn lane and a shared through/right lane.	No	
Bastogne Avenue and 30th Street	Ohio Avenue and 30th Street	1986	Convert the eastern leg of 30th Street at Bastogne Avenue into a cul-de-sac.	No	
Bastogne Avenue and Reed Ave	Ohio Avenue and Reed Avenue	1986	Add an exclusive left turn lane to the westbound approach.	No	
Air Assault Street and Indiana Avenue	18th Street and Indiana Avenue	1986	Reconfigure existing lanes or construct new lanes such that northbound and southbound Indiana Avenue has an exclusive left turn lane and a shared through/right lane.	No	
Screaming Eagle Boulevard and Indiana Avenue	25th Street and Indiana Avenue	1986	Reconfigure the existing southbound shared left/through lane to two lanes; a through and an exclusive left turning lane.	Yes	

Intersection [Current Name / Previous Name]		Year	Recommended Improvements	Action (Y/N)	Present Relevance
Normandy Avenue and Indiana Avenue	26th Street and Indiana Avenue	1986	Construct an exclusive left-turn lane for the northbound approach.	Yes	
William C. Lee Road and Tennessee Avenue		1986	Reconfigure the existing eastbound shared left/through lane to two lanes; a through and an exclusive left turning lane while maintaining the exclusive right turn lane.	No	
			Paint the black signal-head housings highway yellow.	No	
Airborne Street and Tennessee Avenue	18th Street and Tennessee Avenue	1986	Provide signalization this intersection.		
Bastogne Avenue and Forrest Road	Ohio Avenue and Forrest Road	1986	Replace 3-way STOP condition with Stop condition on Forrest Road.	No	
Morgan Circle		1986	Change the STOP control to Yield control on all approaches.	No	
			Remove the Left Turn Lane located on the westbound Morgan Road approach to Morgan circle.	No	
ACP 10 on 101st Airborne Division Road	ACP 1A on Woodlawn Road	1986	Move the ACP so that it is a minimum of 500 feet from McAuliffe Way.		
US 41A/ACP 1		1986	Coordinate with the State of Tennessee to lengthen the left-turn lane on US 41A to 600 feet for vehicles entering ACP 1.		
US 41A, William C. Lee Road, Jack Miller Boulevard		1986	Coordinate with the State of Tennessee to interconnect the Hazard Identification Beacons mounted on the Signal Ahead sign on Southbound US 41A with the traffic signal at the intersection at US 41A, William C. Lee Road, and Jack Miller Road.		
US 41A, William C. Lee Road, Jack Miller Boulevard		1986	Coordinate with the State of Tennessee to install Stop Lines on the approaches to the intersection of William C. Lee Road, Jack Miller Boulevard, and US 41A.	Yes	Yes
ACP 1/William C. Lee Road		1986	Reconstruct William C. Lee Road as shown in the MTMCTEA 1985 Study.	No	
ACP 2		1986	Extend Airborne Street (formerly 11th Street) to US 41A, and move ACP 2 to serve that new intersection.	No	No

Intersection [Current Name / Previous Name]		Year	Recommended Improvements	Action (Y/N)	Present Relevance
			Coordinate with the State of Tennessee to install a 400-foot long left-turn lane on US 41A for vehicles turning into the new ACP 2, and to signalize that intersection.	No	No
ACP 3		1986	Coordinate with the State of Tennessee to lengthen the left turn lane on US 41A to 600 feet for vehicles entering ACP 3, and signalize that intersection.	Yes	Yes
			Reconstruct the Air Assault Street (Formerly Jackson Road) approach to US 41A identical to the Screaming Eagle Boulevard (formerly Chaffee Road) approach with raised channelization islands rather than painted channelization.	No	
ACP 4		1986	Increase the length of the northbound left-turn of US 41A lane to 600 feet.	No	Yes
			Reconstruct the Screaming Eagle Boulevard (formerly Chaffee Road) approach to have raised channelization islands rather than painted channelization.	Yes	Yes
ACP 5		1986	Close ACP 5 in conjunction with the development of the post thoroughfare plan.	No	
ACP 6		1986	Increase the length of the northbound left-turn of US 41A lane to 400 feet.		No
			Increase the length of the right-turn lane off of US 41A southbound from 100 feet to 230 feet.		No
General		1995	Install Signal Ahead signs (W3-3) on US 41A in advance of traffic signals, especially where their visibility is restricted or not readily apparent for the conditions.	No	Yes
			Ensure that signs and pavement markings on US 41A are in optimal condition with good reflectivity for motorist's guidance for night visibility and during inclement weather.		Yes
		1986	Reconstruct ACP's 1, 3, 4, 6 and 10 so that they are a minimum of 500 feet from the nearest intersection.		
			Develop the MTMC recommended thoroughfare plan, which includes a four-lane arterial loop to serve the post.	No	
			Upgrade major intersections to include lane and signal improvements.		
			Request the State Highway agencies in Kentucky and Tennessee to implement the improvements recommended for US 41A at the post access roads.		
			Install controller conflict monitors at the 12 intersections that have pre-timed signal controllers.		

Intersection [Current Name / Previous Name]		Year	Recommended Improvements	Action (Y/N)	Present Relevance
			Remove all speed limit signs from intersection approaches and place them on the intersection departures.		Yes
			Install backplates on all signal housings where the sun poses a visibility problem for approaching drivers.	No	Yes

3.3. Data Collection

The study team conducted a substantial data collection program as part of this study including turning movement counts during the morning, mid-day and evening peak periods; 24-hour traffic volume recordings; vehicle occupancy counts; and field measurements and notes. Crash data was supplied from the Fort Campbell Command Safety Office.

3.3.1. Crash Data

Crash data from the period of November 2000 through November 2001 was obtained through the Fort Campbell Command Safety Office. The detailed crash data is contained in **Appendix B**. The data shows that there are several areas that are prone to crashes.

In the proximity of ACP 4, there were three crashes that involved injuries and eleven crashes resulting in property damage. Although the type of crash is not specified, these are most likely rear-end accidents resulting from unexpected queuing at the ACP or sideswipes due to lane changing and merging taking place near the ACP.

There were six crashes at ACP 10 during the time period analyzed. One involved injuries and five involved property damage. It is likely that these crashes were rear-end collisions due to queuing at the ACP.

The intersection of Reed Avenue and Bastogne Avenue was the location of six crashes.

Other crash locations include:

- Bastogne Avenue and 35th Street - three crashes, one involving injuries.
- Forrest Road adjacent to school - two crashes, no injuries
- Bastogne Avenue and Air Assault Street – two crashes, both involving injuries.
- Bastogne Avenue and Airborne Street – two crashes, both involving injuries.
- ACP 1 – two crashes, no injuries.
-
-

3.3.2. Field Observations

There were several instances in which nonstandard conditions were noted by the study team. The *MUTCD* was used as a guide in evaluating traffic control devices. Observations are noted in **Exhibit 3.4**. Reference photographs are located in **Appendix C.** This is not a list of all instances throughout the base, nor is it necessarily a complete list of all problems at the locations indicated.

Exhibit 3.4 Field Observations

No.	Intersection	Observations	Picture Number
1	TN Route 41A and ACP 1 (William C. Lee Road)		
3	TN Route 41A and ACP 3 (Air Assault Street)		
4	KY Route 41A and ACP 4 (Screaming Eagle Boulevard)	On Days of No Scheduled Activities, 6 guards are stationed per lane; traffic backs up beyond ACP 3, and significantly north on 41A.	P0004699 P0004700
		Northbound left turn lane signal head is not centered over left turn lane.	P0004724
6	KY Route 41A and ACP 6 (Morgan Road)		
7	KY Route 41A and ACP 7 (Cole Road)		
8	Bastogne Avenue and Hospital Drive	A partial left-turn arrow is in the roadway south of actual left turn storage lane.	P0004390
9	Bastogne Avenue and Screaming Eagle Boulevard	Faded yellow line striping is on the right side of traffic.	P0004439
		Parking line striping exists on east side of north leg; although no vehicles were observed to utilize the parking area.	P0004440
		Noon traffic backs up to intersection of 30th and Bastogne.	
10	Bastogne Avenue and 30th Street	The two signal heads facing the west leg of 30th Street have two different messages during one phase.	P0004399
		North of the intersection on the west side of the roadway, the sideslope hingepoint is at the edge of pavement.	P0004400
		A headwall in the northeast quadrant is in close proximity to the travel lanes.	P0004401
11	Bastogne Avenue and Forrest Road	Vermont Ave stopbar is faded and at a skew to the roadway.	P0004410
12	Indiana Avenue and Air Assault Street	The northwest quadrant ditch sideslope hingepoint is at the edge of pavement.	P0004615
		A headwall in the northeast quadrant is in close proximity to the edge of pavement.	P0004616
13	Indiana Avenue and Screaming Eagle Boulevard	A masonry ditch south of the fire department driveway along Indiana Avenue is close to the edge of pavement.	P0004569
14	Indiana Avenue and Normandy Boulevard	The east leg has a white line stripe, rather than yellow to the left of traffic at the lane edge.	P0004444
		An unrecoverable ditch begins directly past the north leg edge of road.	P0004448
		Headwalls are close to the road edge in the northeast and southeast quadrants.	P0004450 P0004451
		Overhead electric lines pass through the sight line of the northbound signal heads.	P0004452
15	Indiana Avenue and 30th Street		

No.	Intersection	Observations	Picture Number
16	Indiana Avenue and 35th Street	The northbound intersection departure has poor sight distance due to a crest curve past the intersection.	P0004548 P0004549
17	Indiana Avenue and 42nd Street	Three quadrants have headwalls with elevation differences of approximately 3 feet adjacent to the road edge.	P0004419 P0004420 P0004421
18	Indiana Avenue and 59th Street	Opposite the south leg is a run of guiderail without crash cushions, beyond, which is a guy wire for a utility pole.	P0004539
19	Kentucky Avenue and Screaming Eagle Boulevard		
20	Kentucky Avenue and Normandy Boulevard	STOP sign is 33 feet before the actual stopbar.	P0004461
21	101st Airborne Road and 11th Airborne Division Road	A possible sight distance deficiency is north of the intersection on 101st Airborne Division Road.	P0004647
22	101st Airborne Road and William C. Lee Road	South of the intersection is a sight distance deficiency.	P0004640
24	Tennessee Avenue and Screaming Eagle Boulevard	Diesel tanks are adjacent the southeast quadrant of the intersection.	P0004631
25	Tennessee Avenue and Normandy Boulevard		
26	Wickham Avenue and 1st Street		
27	Wickham Avenue and Airborne Street		
28	Wickham Avenue and Air Assault Street	Headwalls are in the southeast and northeast quadrants in close proximity to the road.	P0004608 P0004609
29	Wickham Avenue and Screaming Eagle Boulevard	There is both signal and Yield sign control for the southbound Wickham to westbound Screaming Eagle movement.	P0004495
30	Wickham Avenue and Normandy Boulevard		
31	Wickham Avenue and 35th Street	A large pothole appears at the beginning of the westbound right-turn lane taper.	P0004552
		Headwalls are in the southeast and northeast quadrants in close proximity to the road.	P0004559 P0004560
		North of the intersection, there are two white lines separating the left-turn lane and the through/right-turn lane on the approach.	P0004558
32	Wickham Avenue and 42nd Street	The traffic signal actuation loops on 42nd Street do not appear to be active.	
		The northeast quadrant has a headwall close to the intersection. Tire tracks were seen both above the headwall and in the ditch suggesting a vehicle fell over the headwall.	P0004430
33	Wickham Avenue and 59th Street	Southbound to westbound movement is not sufficient to provide truck traffic due to the narrowness of 59th Street.	P0004527
34	Wickham Avenue and Morgan Road	Conflicting pavement markings were seen at this intersection.	
35	Desert Storm Avenue and Screaming Eagle Boulevard		
36	A Shau Valley Road and Screaming Eagle Boulevard	A blunt object is adjacent the road edge in front of the STOP sign.	P0004476
38	Heliport on 101st Airborne Div. Road	The ACP is very close to the roadway.	P0004752
39	Air Assault Street and Bastogne Avenue	The southbound approach through lanes and left-turn lanes do not line up with their departures.	P0004378
		A headwall close to the road edge is in the southwest quadrant.	P0004379
		A large hole due to an unstable shoulder is in the southeast quadrant.	P0004381

No.	Intersection	Observations	Picture Number
40	Bastogne Avenue and Reed Avenue		
41	Forrest Road and Reed Avenue	Hazardous headwalls appear in the northwest and northeast quadrants.	P0004696 P0004697 P0004698
	Morgan Circle	The Morgan Road northbound intersection approach left-turn lane should be eliminated.	P0004681
	Perimeter Road	The curves on this road have short radii and are signed inappropriately.	P0004656 P0004658 P0004657
	General	The routes intersecting with the one-way portions of Screaming Eagle Boulevard and Normandy Boulevard should be signed with One-Way signage at the near right and far left quadrants of the intersecting roadways; as opposed to the No Left/Right Turn signs.	P0004562a P0004449 P0004505 P0004459
		Inlets along Indiana Avenue have a sharp drop-off at the edge of the asphalt.	P0004567 P0004754
		The dual-lane signing on Bastogne Avenue north of Screaming Eagle Boulevard Gives the implication that there are two through lanes past the intersection, when there is only one.	P0004754
		The Railroad crossbucks do not have lights or gates.	P0004626
		The ditch in the Mini-mall parking lot forces traffic to travel through the moving water, and has a sharp grade change.	P0004486

3.3.3. Average Daily Traffic Volumes

There were several locations throughout the base where traffic volumes were obtained for a 24-hour period through the use of Automatic Traffic Recorder devices (ATR). These locations are as follows:

1 William C. Lee Road just west of ACP 1.
3 Air Assault Street just west of ACP 3.
4 Screaming Eagle Boulevard just West of ACP 4.
5 Forrest Road just west of ACP 5.
6 Morgan Road just west of ACP 6.
7 ACP 7, Glider Road.
8 Bastogne Avenue between Eagle Loop and Carentan Road.
9 Air Assault Street between Mississippi Avenue and Bastogne Avenue.
10 Bastogne Avenue just south of Screaming Eagle Boulevard.
11 Bastogne Avenue between 30th Street and 33rd Street.
12 Screaming Eagle Boulevard between Indiana Avenue and Kentucky Avenue.
13 Normandy Boulevard between Indiana Avenue and Kentucky Avenue.
14 Indiana Avenue adjacent to 19th Street.
15 Indiana Avenue between 42nd Street and 39th Street.
16 Wickham Avenue between Morgan Road and Market Garden Road.
17 Tennessee Avenue just north of 42nd Street.
18 35th Street between Tennessee Avenue and Wickham Avenue.
19 Wickham Avenue between 32nd Street and 34th Street.

20 42nd Street between Tennessee Avenue and Wickham Avenue.
21 Desert Storm Avenue between 42nd Street and 46th Street.
22 59th Street between Indiana Avenue and Tennessee Avenue.
23 Tennessee Avenue between 57th Street and 58th Street.
24 Morgan Road between Beers Street and Campbell Road.
25 Indiana Avenue south of 59th Street.
26 Wickham Avenue between 57th Street and 58th Street.
27 Angels Road, west of the ACP.
28 A Shau Valley Road between Screaming Eagle Boulevard and 30th Street.
29 Screaming Eagle Boulevard just east of Market Garden Road.
30 Market Garden Road just south of Screaming Eagle Boulevard.
31 Desert Storm Avenue between Airborne Street and 13th Street.
32 Airborne Street just east of Kentucky Avenue.
33 Kentucky Avenue north of 1st Street.
34 1st Street between Wickham Avenue and Tennessee Avenue.
35 Wickham Avenue north of 1st Street.
36 Wickham Avenue north of 13th Street.
37 101st Airborne Division Road south of ACP 10.
38 Mabry Road west of the ACP.
39 Tennessee Avenue just south of Air Assault Street.
40 Air Assault Street between A Shau Valley Road and Desert Storm Avenue.
41 Connector between Angels Road and Perimeter Road.

ATR Printouts are contained in **Appendix D**, and Average Daily Traffic (ADT) volumes are shown in **Exhibit 3.5**.

In addition to traffic volume recordings, vehicle classification studies were conducted at ACP's 4, 7, and 10. **Exhibit 3.6** shows the percentage of heavy vehicles at these locations. It should be noted that heavy vehicles were classified as any vehicle in FHWA vehicle class 4 or higher. This includes larger two axle vehicles including buses and vehicles with three or more axles.

FHWA Class	Description	Study Classification
1	Motorcycle	Classified for study purposes as cars.
2	Passenger cars	
3	Pickups, vans and other two-axle, four-tire single unit vehicles	
4	Buses	Classified for study purposes as heavy vehicles.
5	Two-axle, six-tire single unit trucks	
6	Three-axle single unit trucks	
7	Four or more axles single unit trucks	
8	Four or less axle single trailer trucks	
9	Five-axle single trailer trucks	
10	Six or more axle single trailer trucks	
11	Five or less axle multi-trailer trucks	
12	Six axle multi-trailer trucks	
13	Seven or more axle multi-trailer trucks	

EXHIBIT 3.5
AVERAGE DAILY WEEKDAY TRAFFIC AT SELECT LOCATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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Exhibit 3.6 Percentage Heavy Vehicles at Select ACP's

ACP	Inbound	Outbound
ACP 4	4.1%	7.2%
ACP 7	53.3%	14.7%
ACP 10	5.7%	10.6%

It should be noted that heavy vehicle entry is restricted to ACP 7 as supported by the high inbound percentage; however, ACP's 4 and 10 experience higher heavy vehicle traffic outbound than inbound since heavy vehicle egress is permitted at all ACP's. Inbound heavy vehicle volumes at ACP's 4 and 10 consist primarily of smaller trucks and delivery vehicles.

3.3.4. Intersection Turning Movement Counts

To determine existing traffic volumes on the base roadway network, manual intersection turning movement counts (TMC's) were conducted at the following locations:

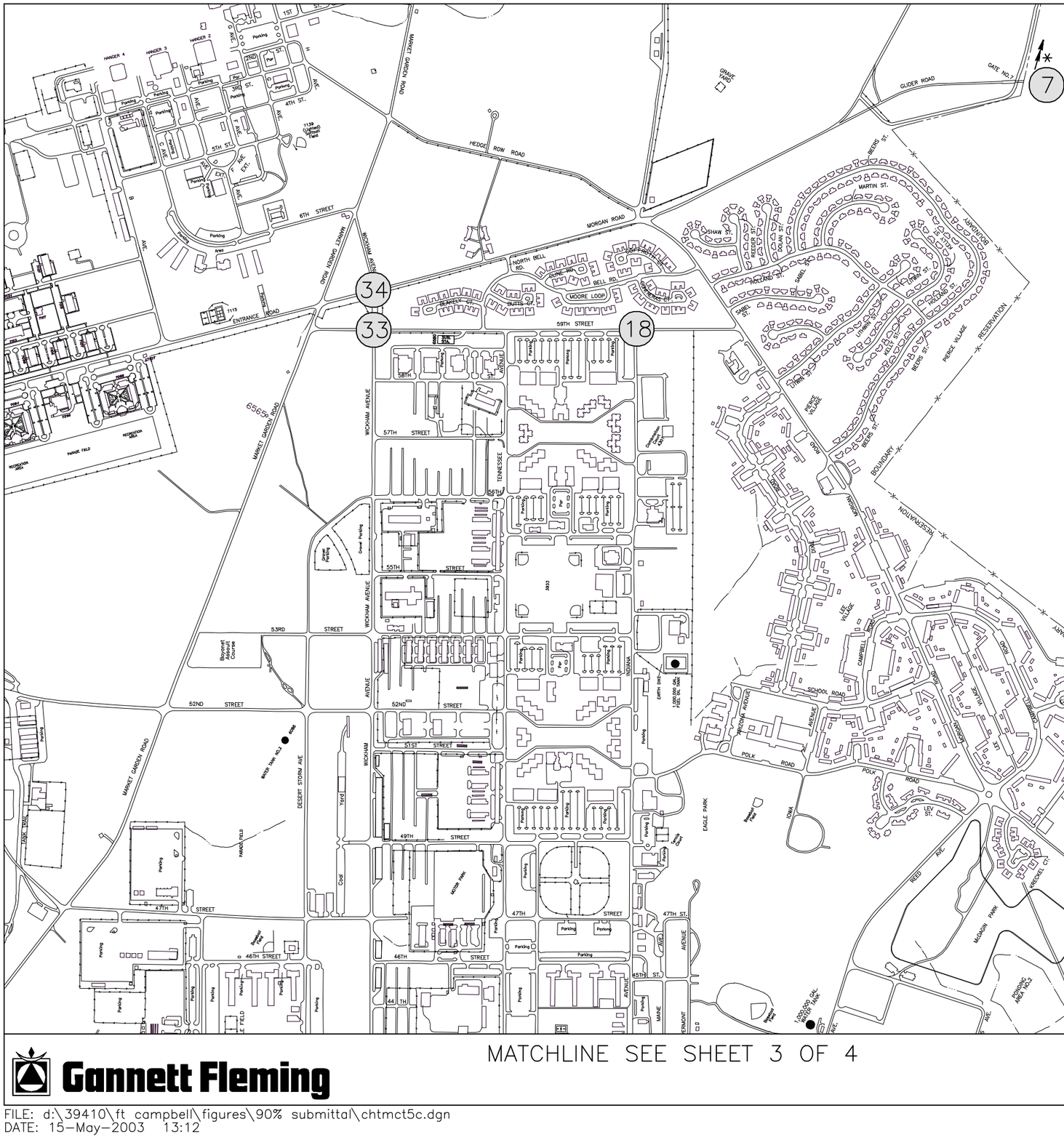
1 TN Route 41A and ACP 1 (William C. Lee Road)
3 TN Route 41A and ACP 3 (Air Assault Street)
4 KY Route 41A and ACP 4 (Screaming Eagle Boulevard)
6 KY Route 41A and ACP 6 (Morgan Road)
7 KY Route 41A and ACP 7 (Cole Road)
8 Bastogne Avenue and Hospital Drive
9 Bastogne Avenue and Screaming Eagle Boulevard
10 Bastogne Avenue and 30th Street
11 Bastogne Avenue and Forrest Road
12 Indiana Avenue and Air Assault Street
13 Indiana Avenue and Screaming Eagle Boulevard
14 Indiana Avenue and Normandy Boulevard
15 Indiana Avenue and 30th Street
16 Indiana Avenue and 35th Street
17 Indiana Avenue and 42nd Street
18 Indiana Avenue and 59th Street
19 Kentucky Avenue and Screaming Eagle Boulevard
20 Kentucky Avenue and Normandy Boulevard
21 101st Airborne Road and 11th Airborne Division Road
22 101st Airborne Road and William C. Lee Road
24 Tennessee Avenue and Screaming Eagle Boulevard
25 Tennessee Avenue and Normandy Boulevard
26 Wickham Avenue and 1st Street
27 Wickham Avenue and Airborne Street
28 Wickham Avenue and Air Assault Street
29 Wickham Avenue and Screaming Eagle Boulevard
30 Wickham Avenue and Normandy Boulevard

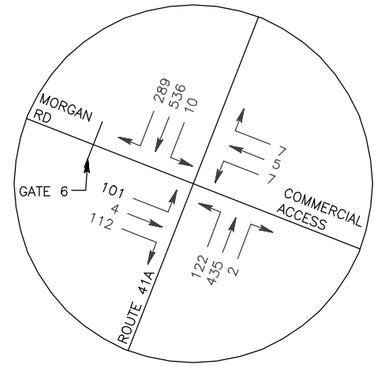
31 Wickham Avenue and 35th Street
32 Wickham Avenue and 42nd Street
33 Wickham Avenue and 59th Street
34 Wickham Avenue and Morgan Road
35 Desert Storm Avenue and Screaming Eagle Boulevard
36 A Shau Valley Road and Screaming Eagle Boulevard
39 Air Assault Street and Bastogne Avenue
40 Bastogne Avenue and Reed Avenue
41 Forrest Road and Reed Avenue

These TMC's were conducted between the hours of 0600 – 0830, 1100 – 1300, and 1500 – 1730. The data from the counts are summarized in **Appendix C**. Morning, mid-day and evening peak hour traffic counts are detailed in **Exhibits 3.7 through 3.9**. Counts shown represent individual intersection peak hours.

3.3.5. Intersection Traffic Control and Lane Assignments

Exhibit 3.10 displays the existing traffic control devices in use and the lane assignments at the intersections studied. The intersections on the installation generally utilize signalization, two-way stop control, or four-way stop control. The intersections tend to differ with respect to the utilization and pattern of left and right turn storage lanes.





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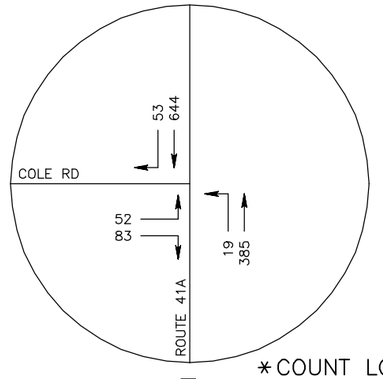

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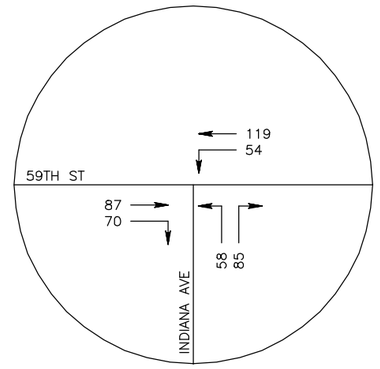
* COUNT LOCATION IS WHERE RT 41A AND COLE RD INTERSECT



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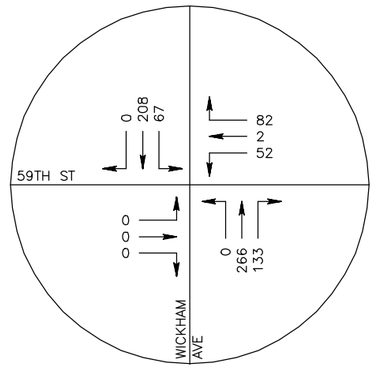

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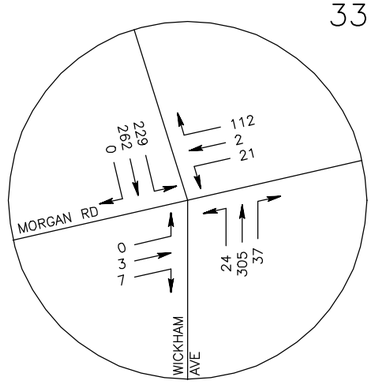

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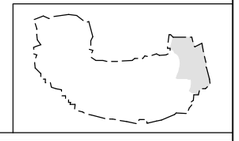

MATCHLINE SEE SHEET 3 OF 4

EXHIBIT 3.7
2002 MORNING PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

Gannett Fleming

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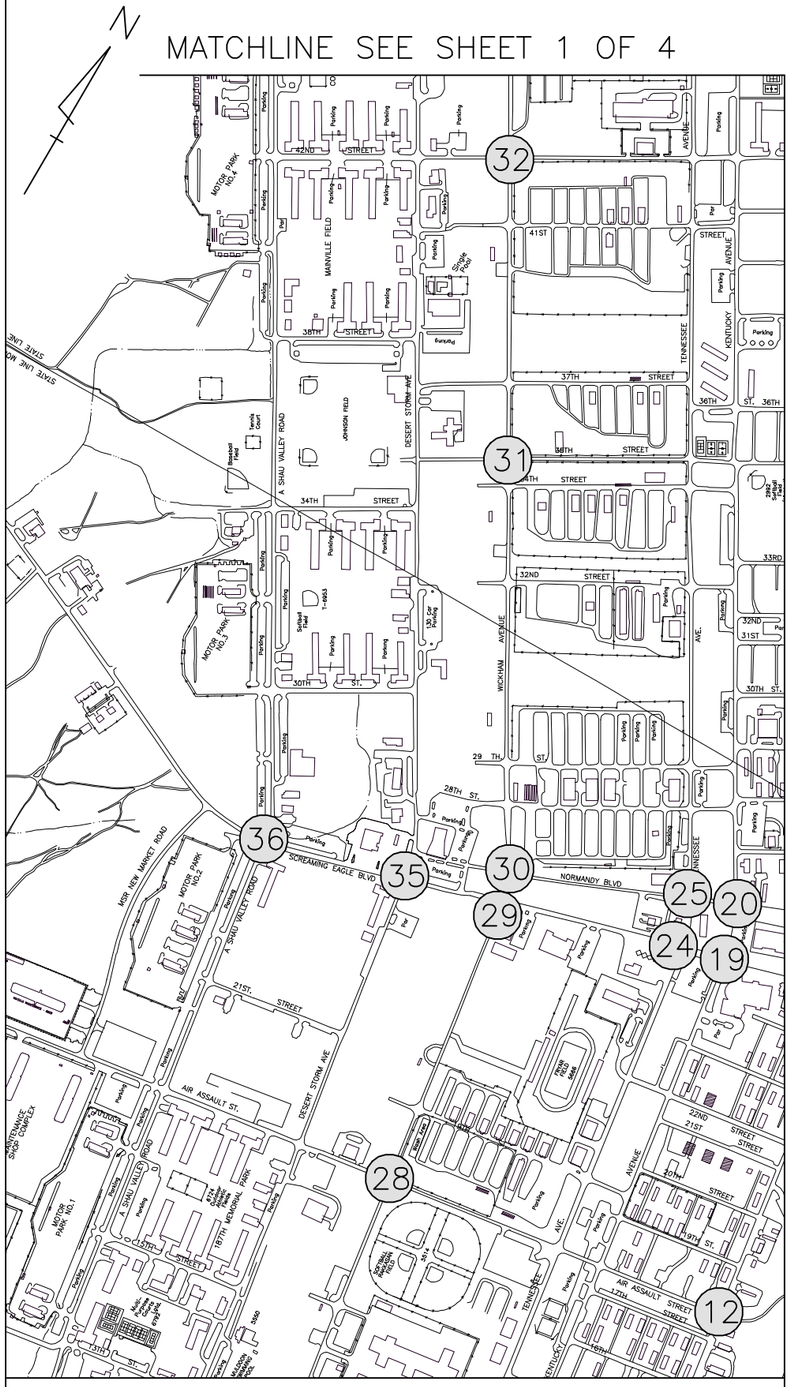

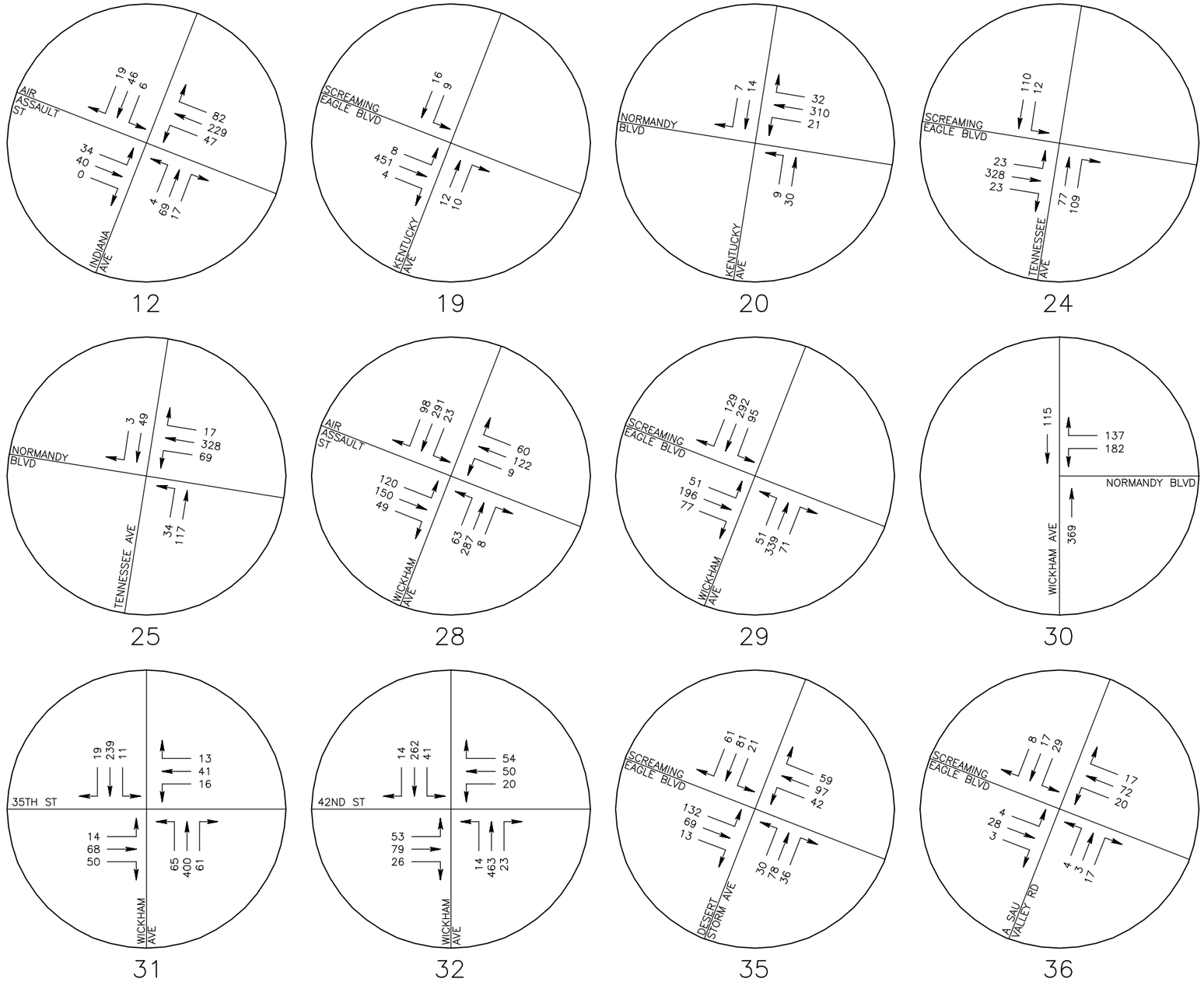

MATCHLINE SEE SHEET 3 OF 4

MATCHLINE SEE SHEET 4 OF 4

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EXHIBIT 3.7
2002 MORNING PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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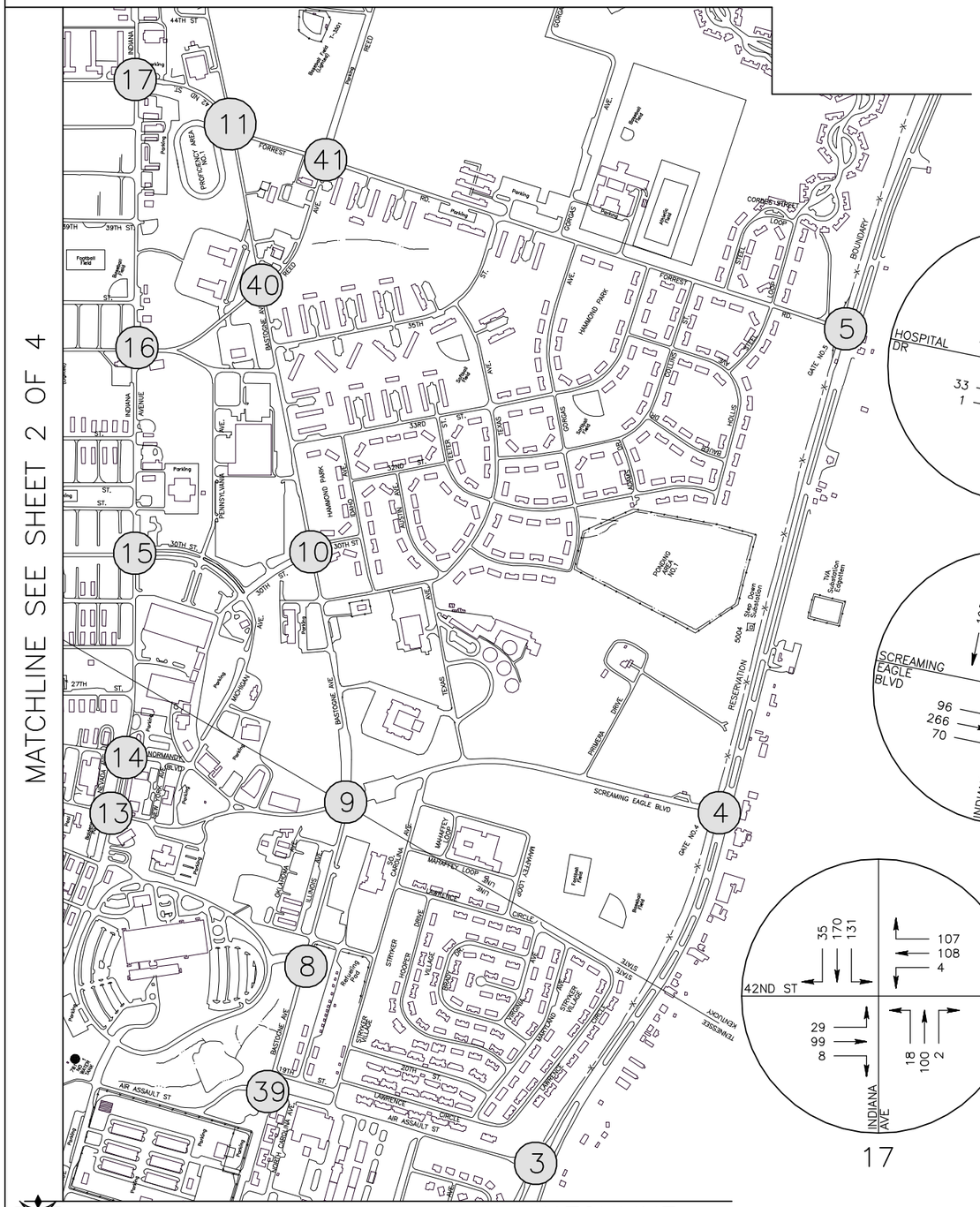

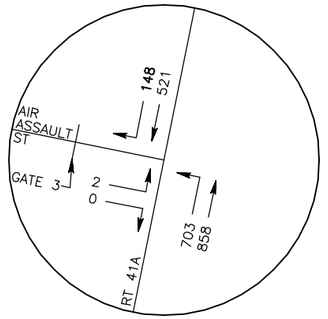

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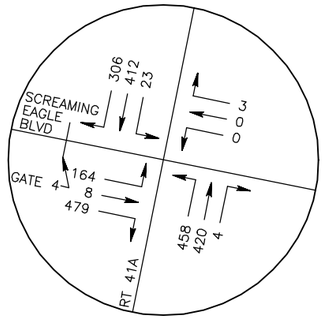

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GATE 5 NOT IN USE FOR INBOUND TRAFFIC

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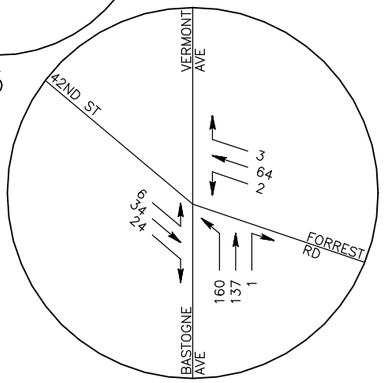

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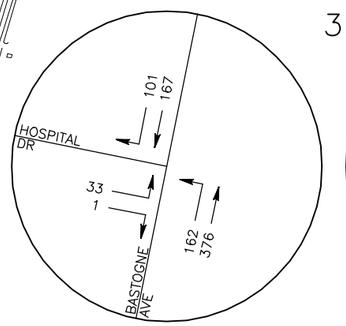

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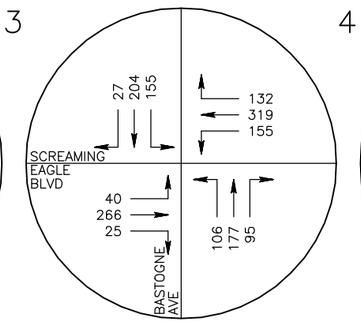

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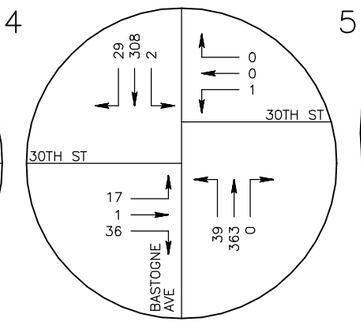

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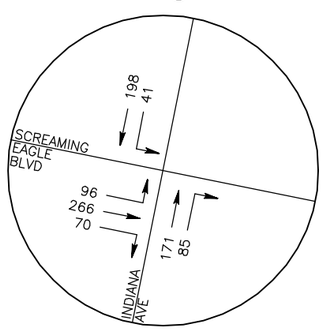

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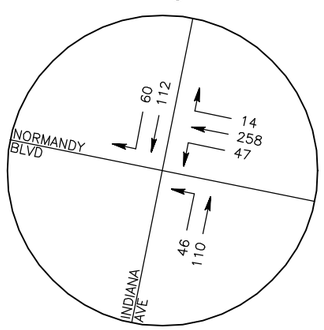

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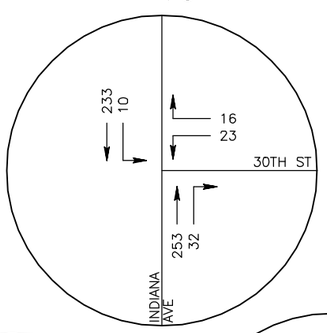

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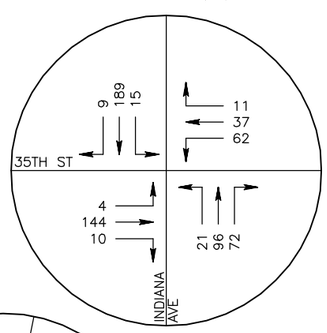

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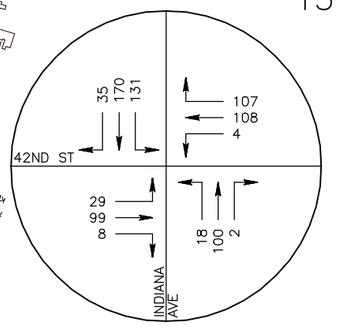

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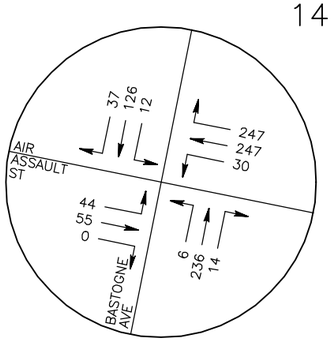

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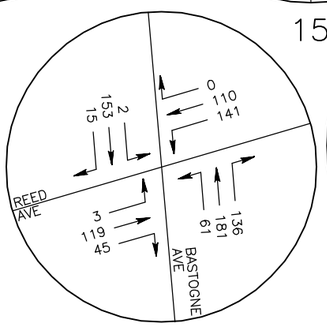

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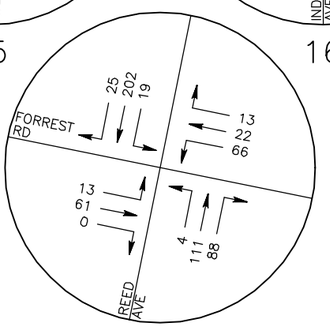

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MATCHLINE SEE SHEET 4 OF 4

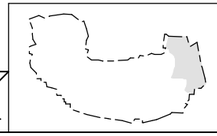

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EXHIBIT 3.7
2002 MORNING PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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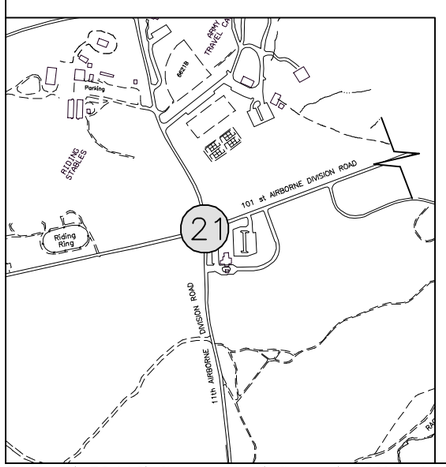

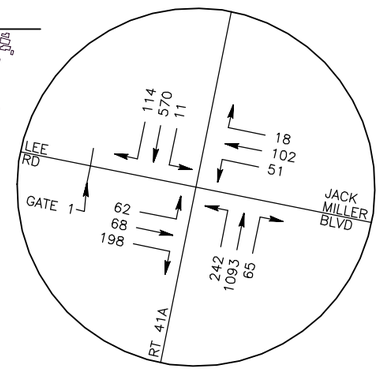

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GATE 2
NOT IN USE

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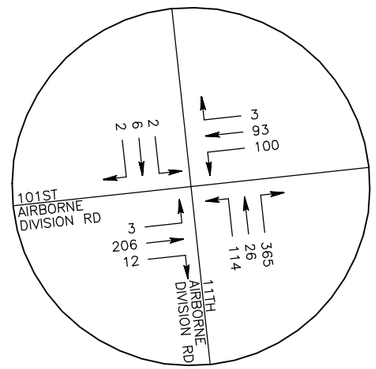

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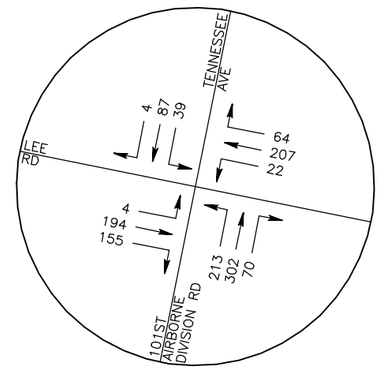

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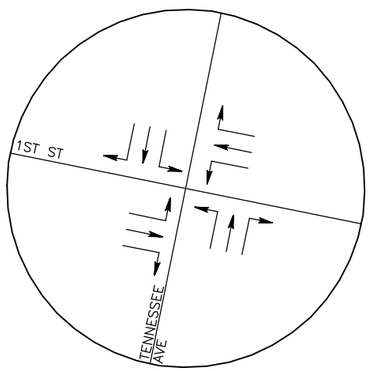

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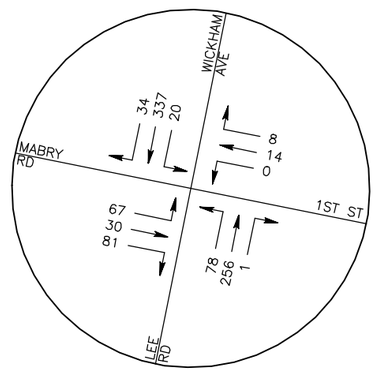

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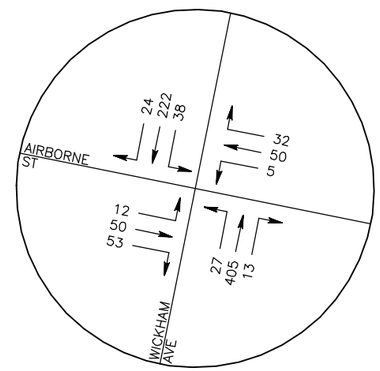

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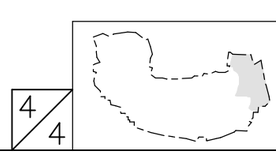

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EXHIBIT 3.7
2002 MORNING PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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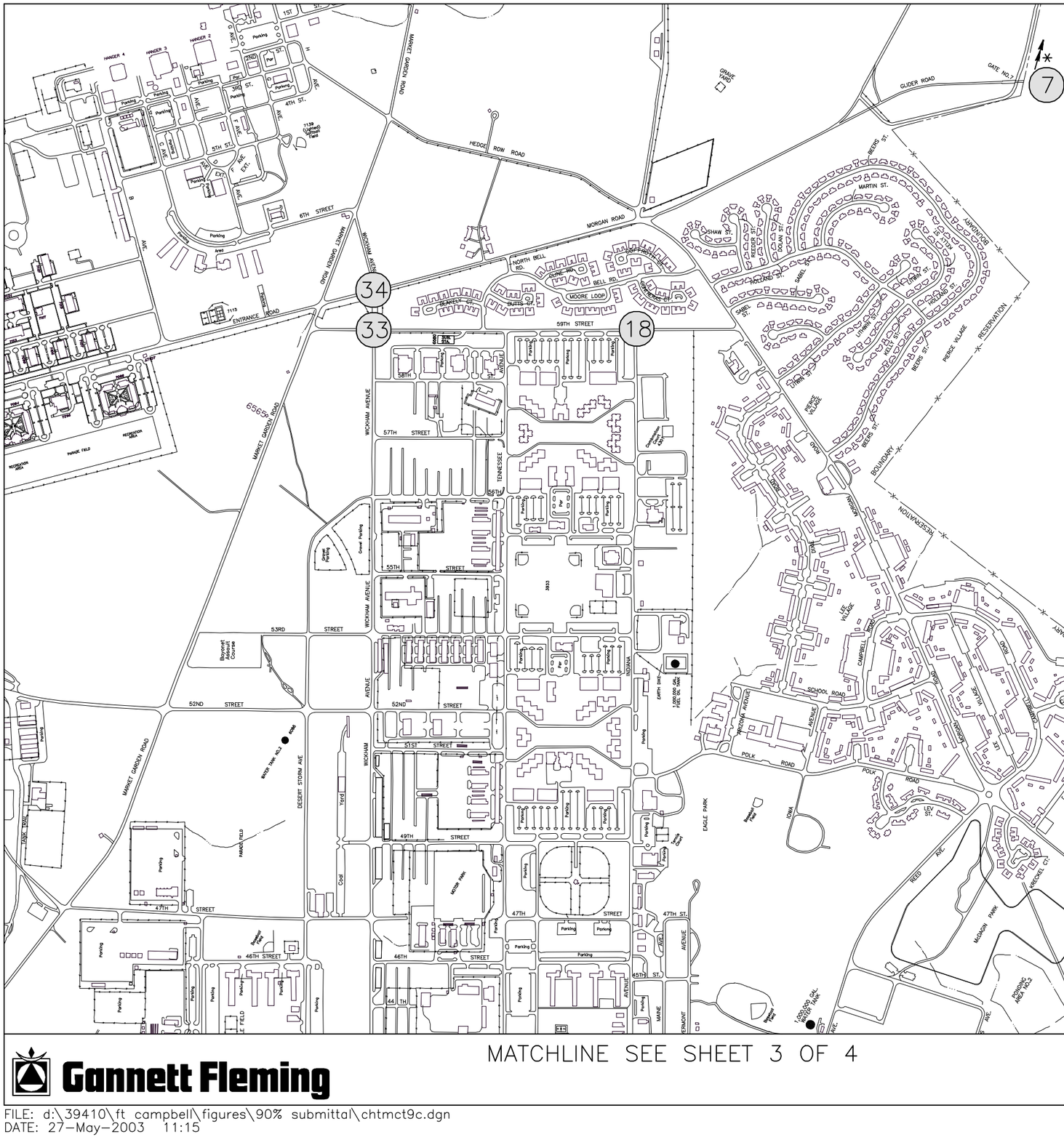

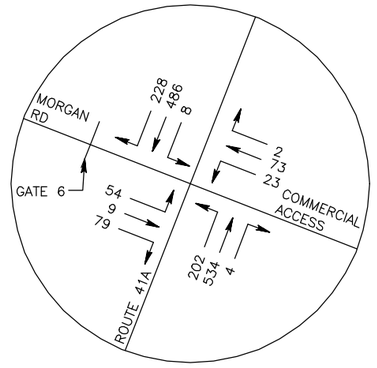

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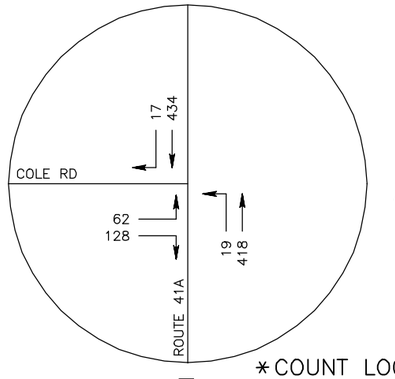

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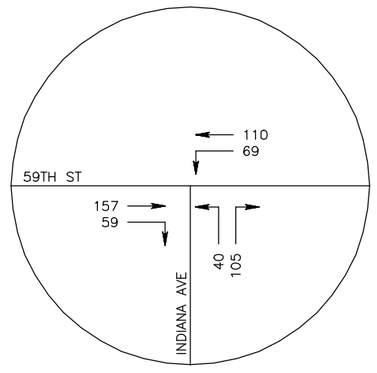
* COUNT LOCATION IS WHERE RT 41A AND COLE RD INTERSECT



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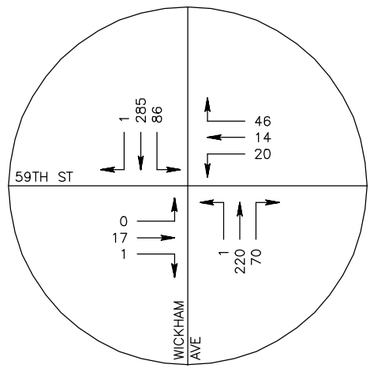

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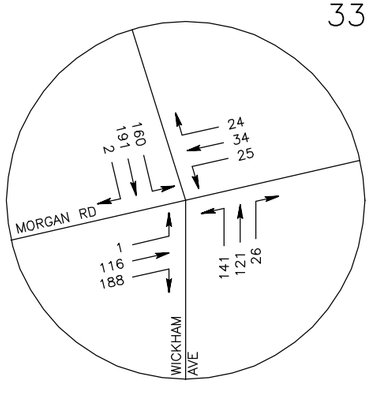

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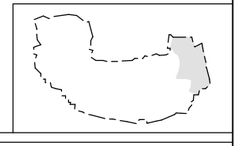

EXHIBIT 3.8
2002 MID–DAY PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

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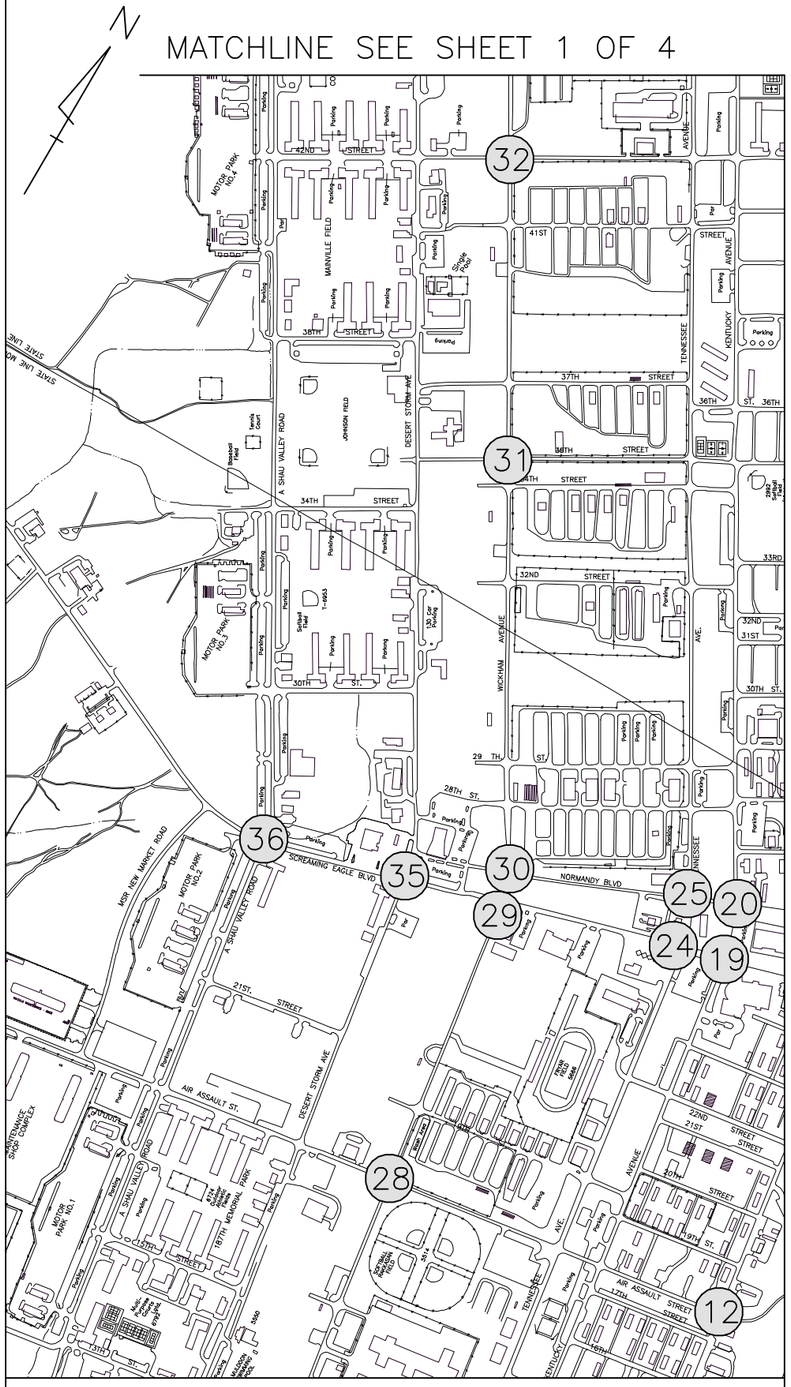
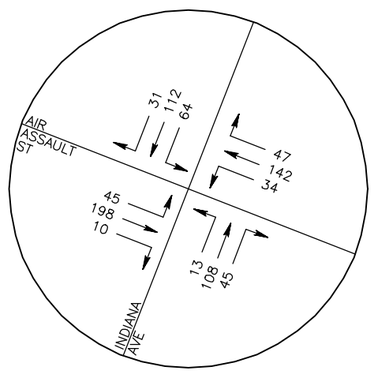


MATCHLINE SEE SHEET 3 OF 4



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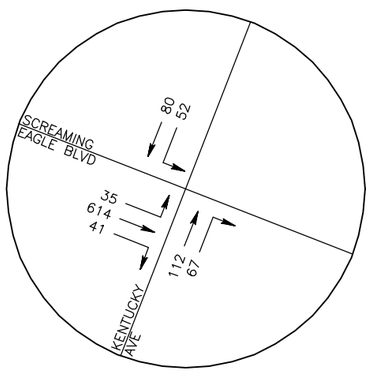

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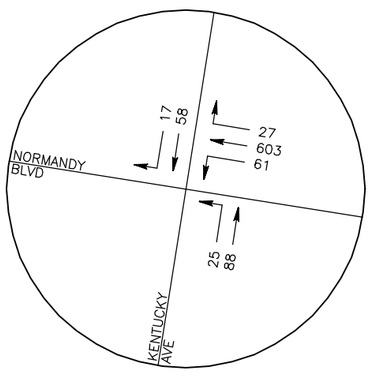

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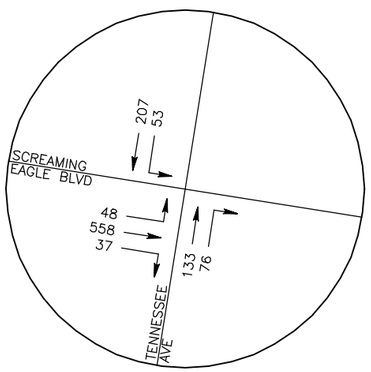

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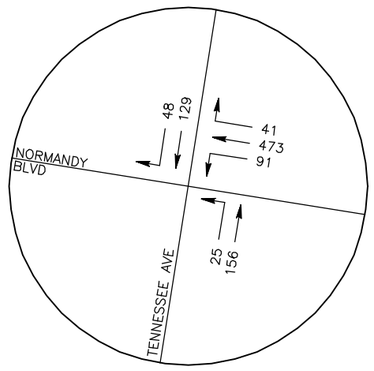

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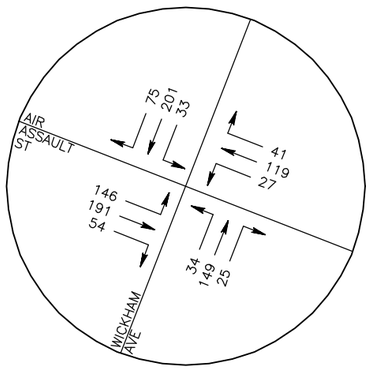

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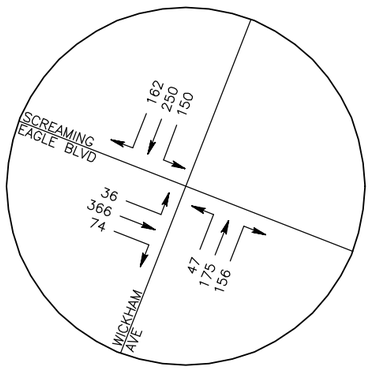

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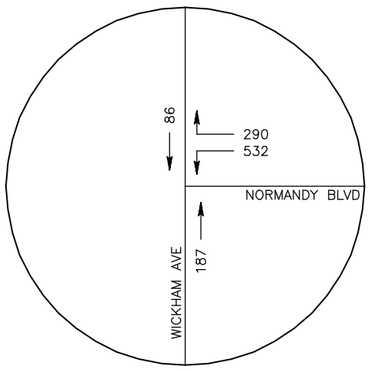

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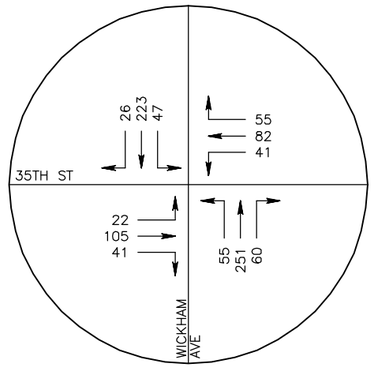

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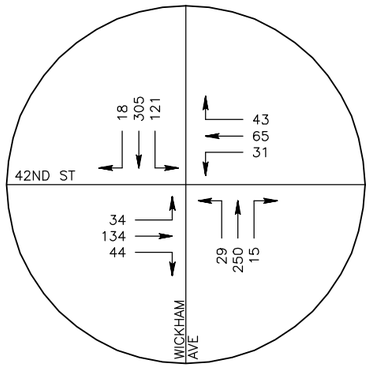

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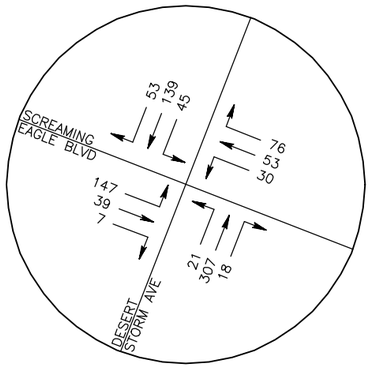

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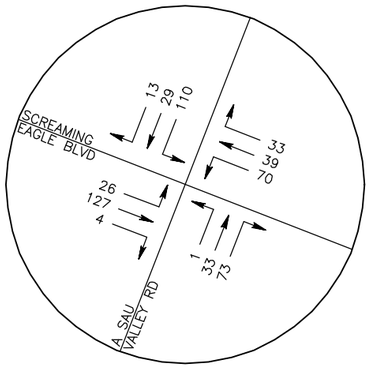

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MATCHLINE SEE SHEET 4 OF 4

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EXHIBIT 3.8
2002 MID-DAY PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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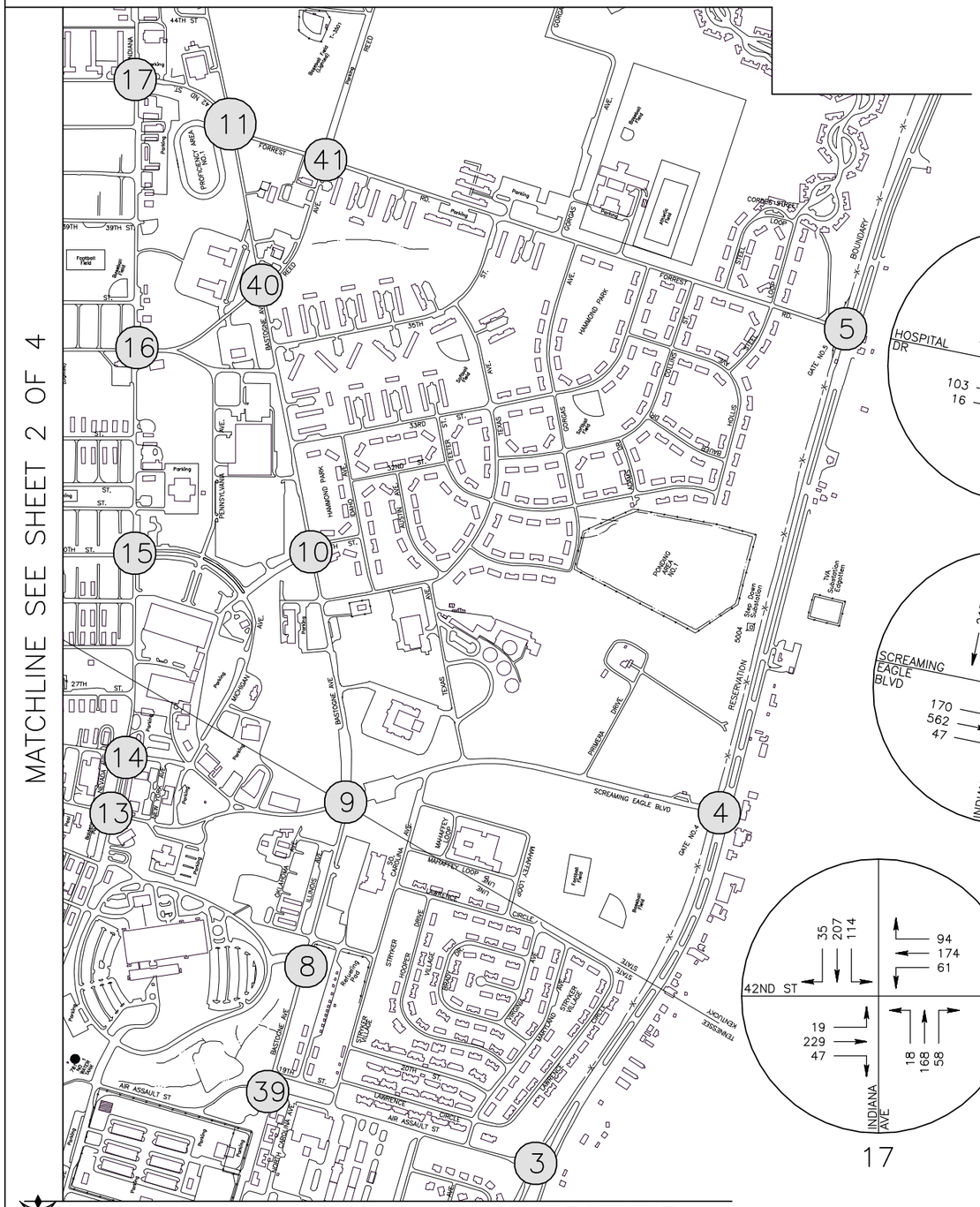
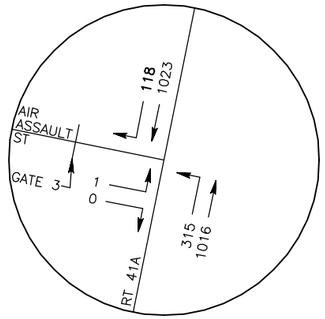
MATCHLINE SEE SHEET 2 OF 4





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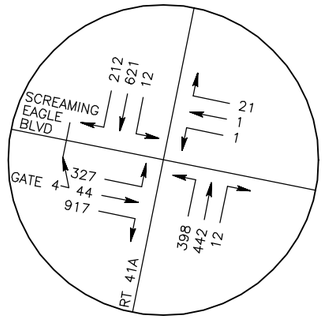

4

GATE 5 NOT IN USE FOR INBOUND TRAFFIC

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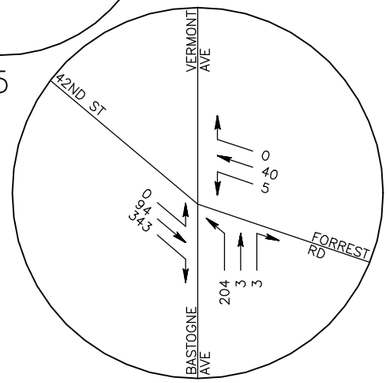

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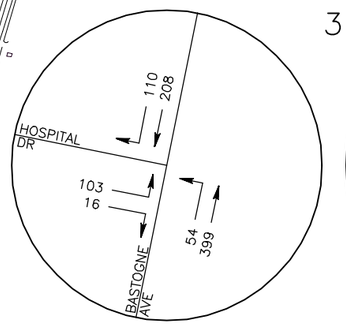

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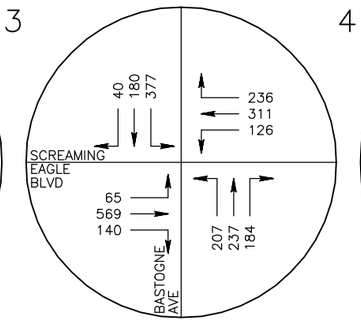

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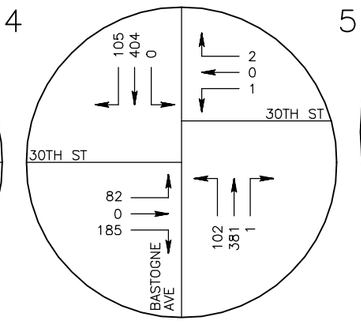

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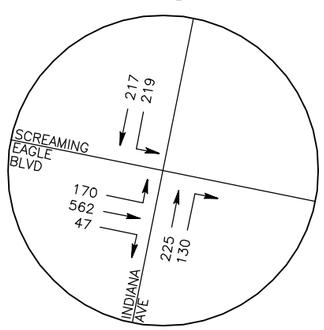

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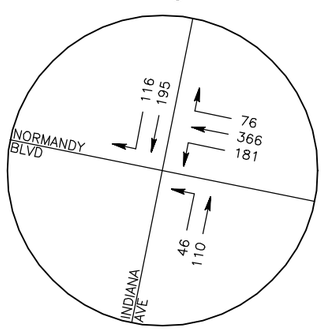

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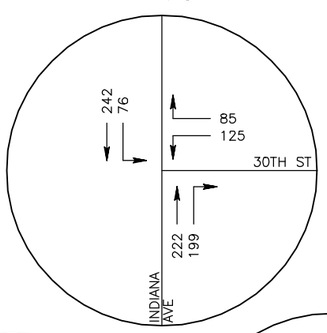

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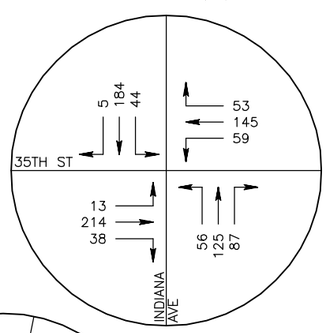

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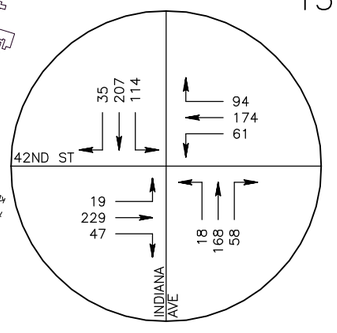

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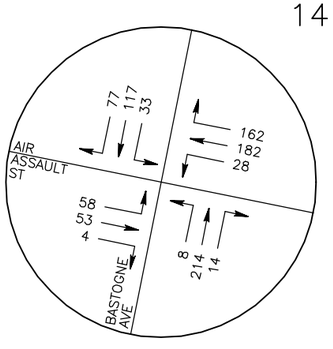

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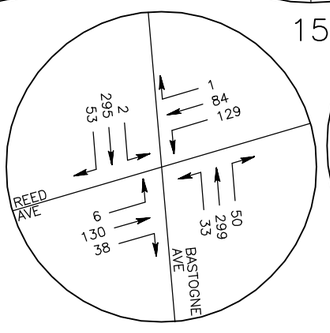

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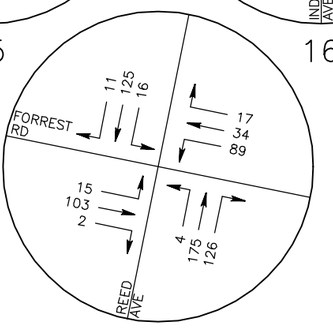

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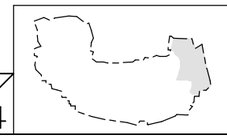

3/4

EXHIBIT 3.8
2002 MID-DAY PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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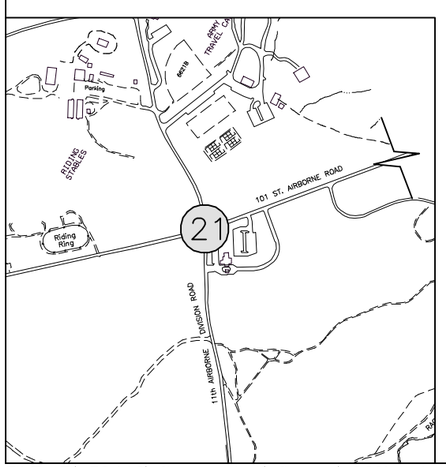

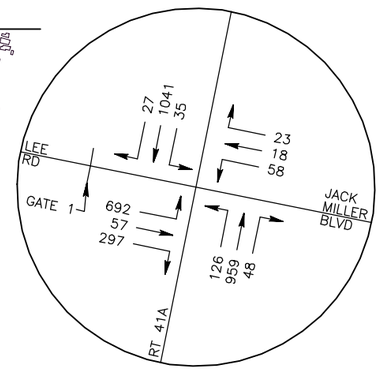

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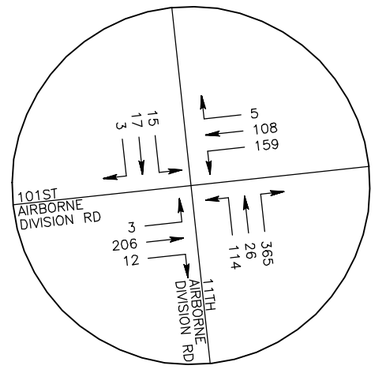

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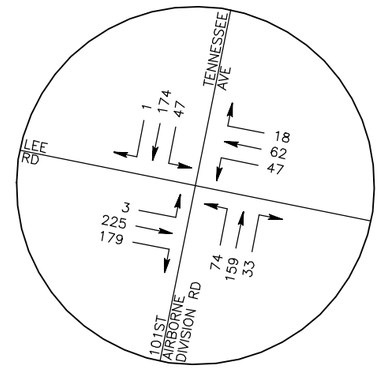

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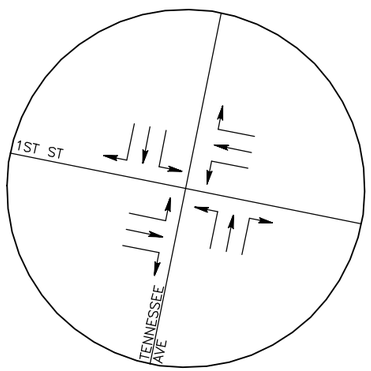

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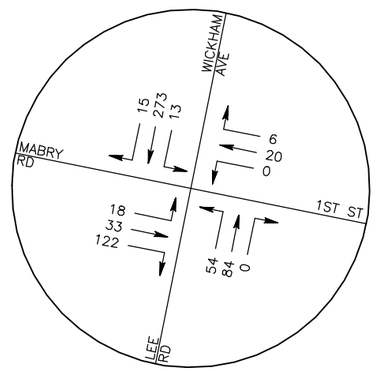

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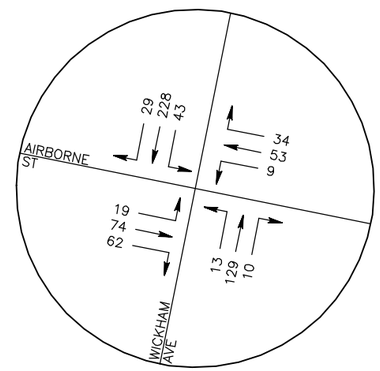

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EXHIBIT 3.8
2002 MID-DAY PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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MATCHLINE SEE SHEET 3 OF 4

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EXHIBIT 3.9
2002 AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

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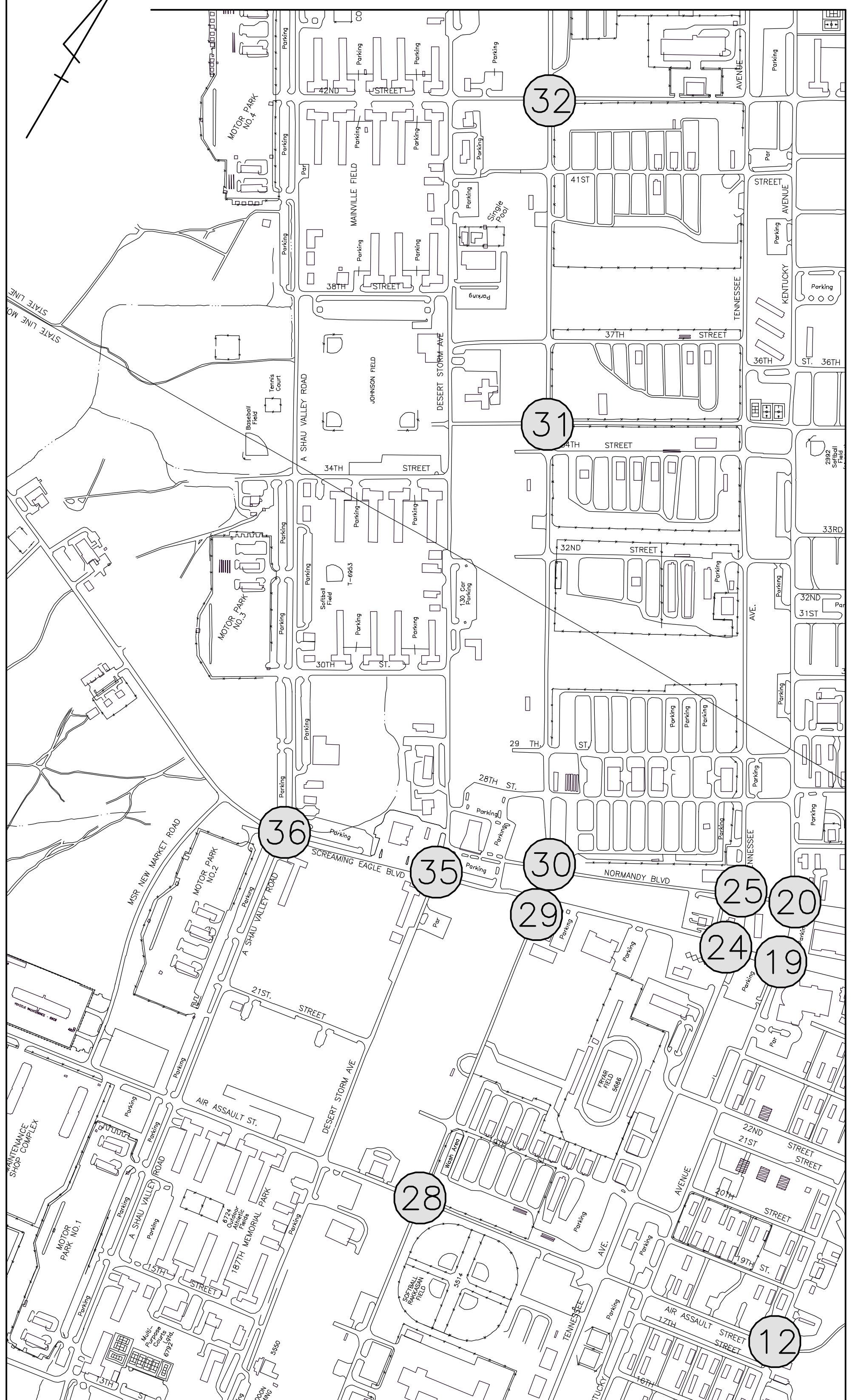

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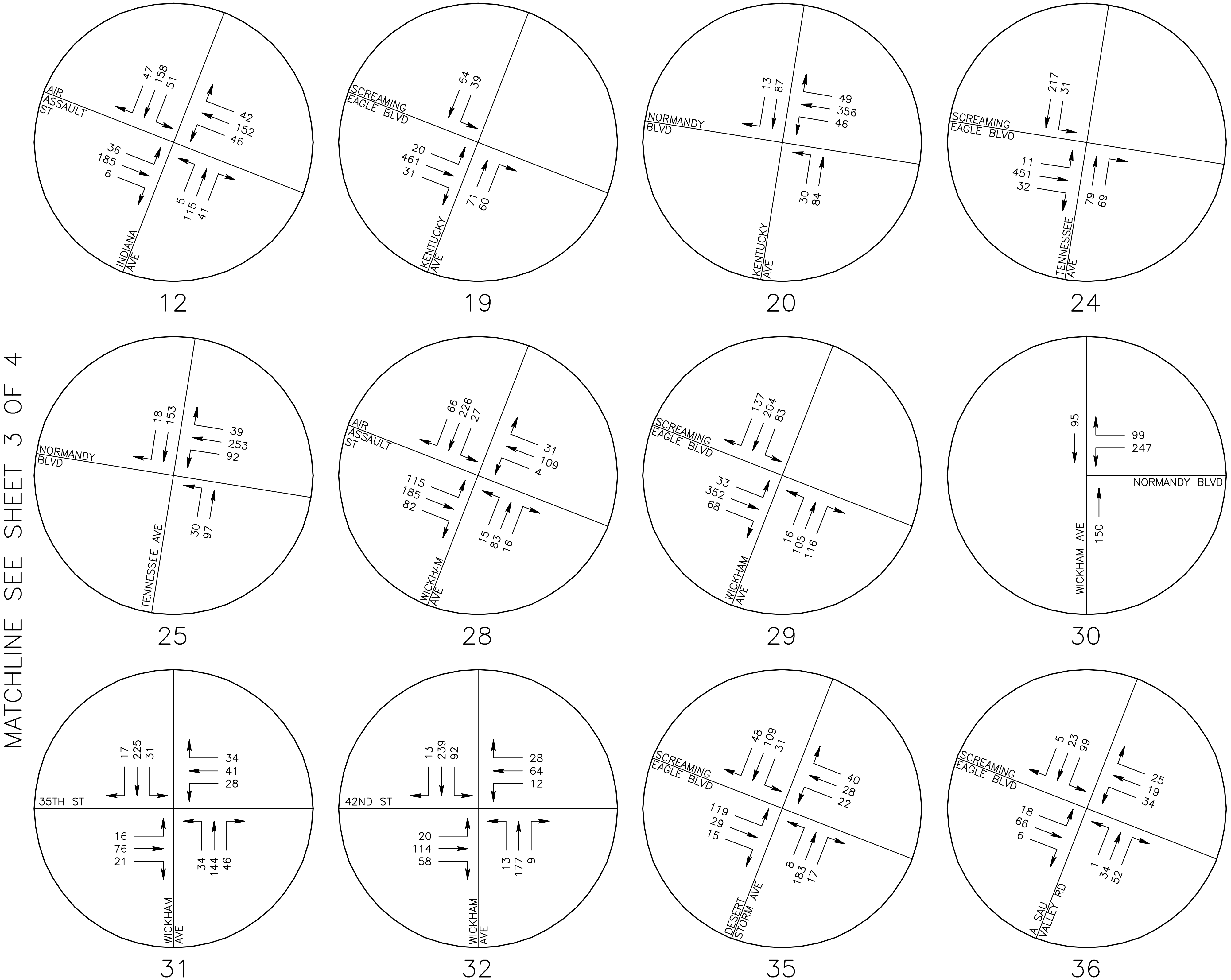

MATCHLINE SEE SHEET 4 OF 4

Gannett Fleming

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EXHIBIT 3.9
2002 AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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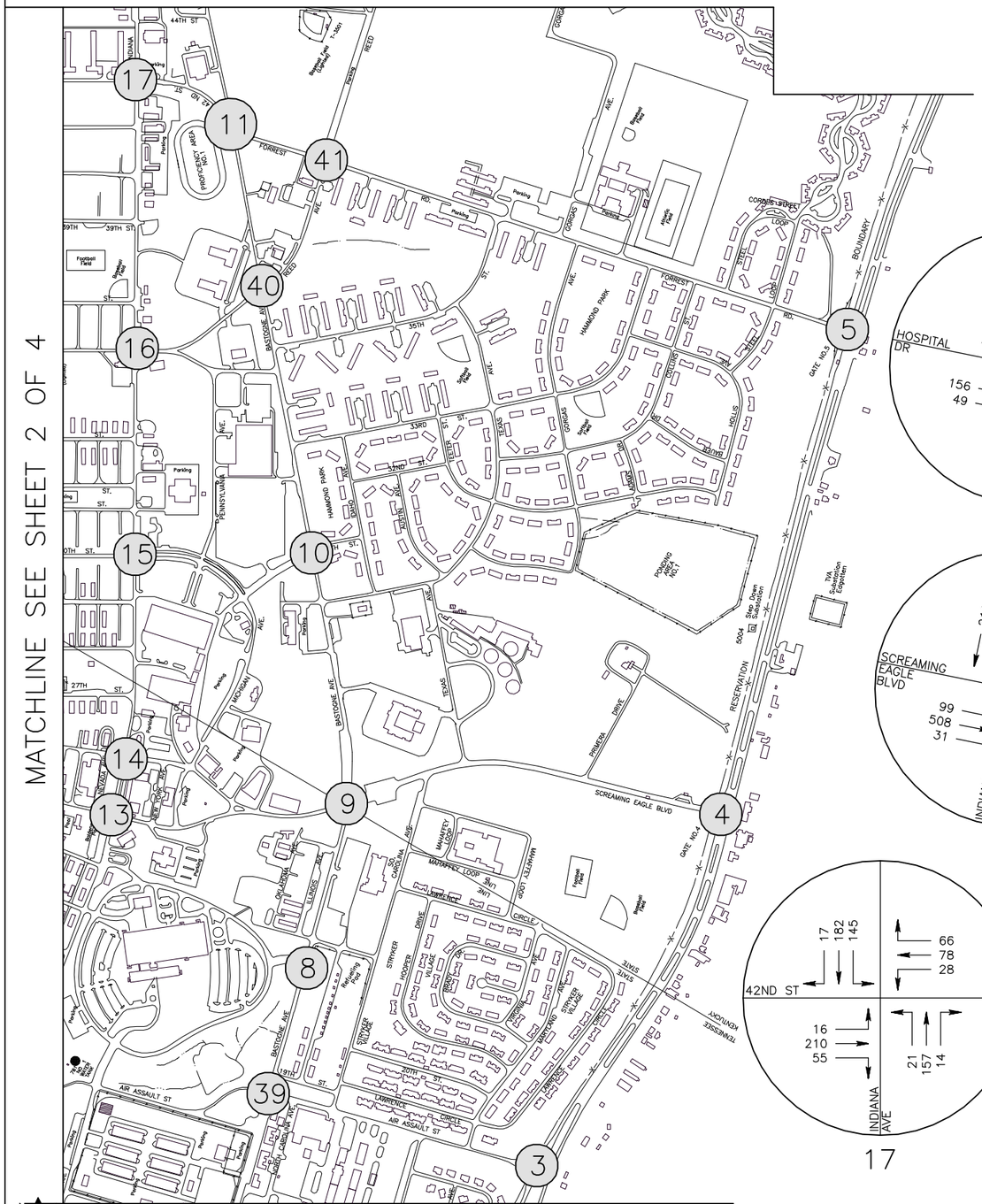

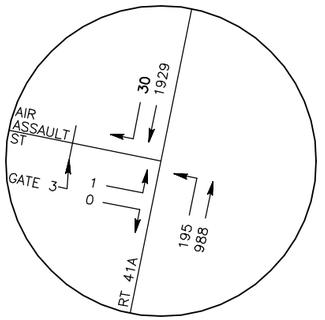

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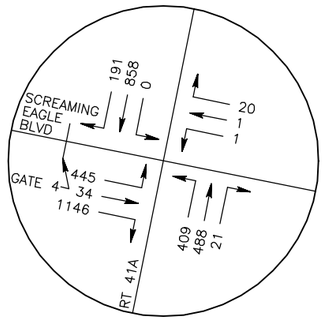

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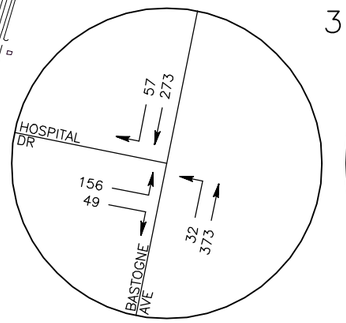

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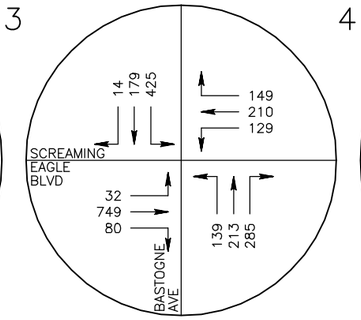

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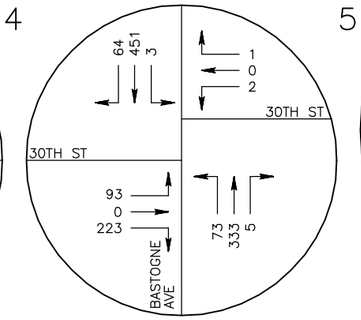

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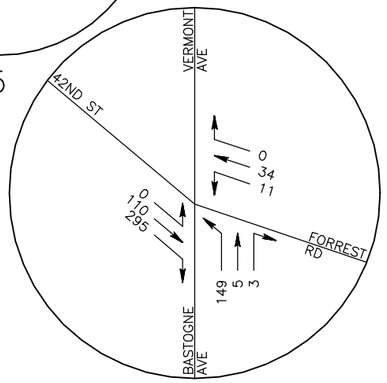

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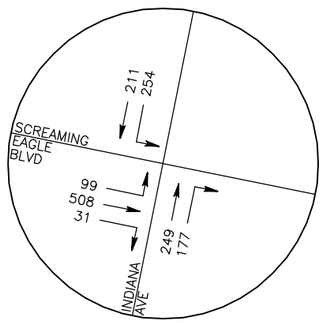

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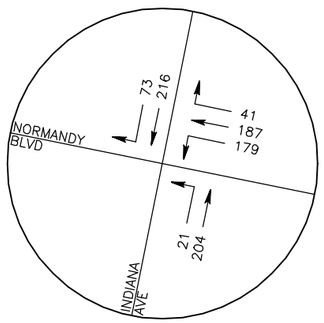

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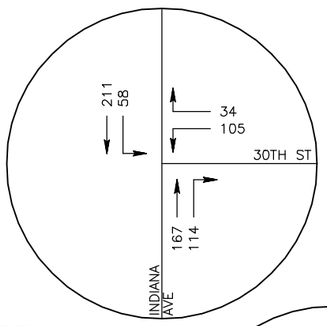

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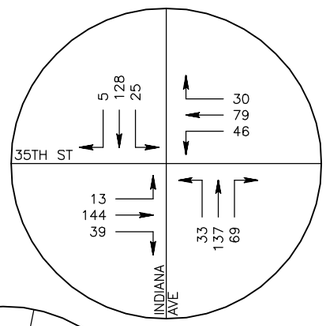

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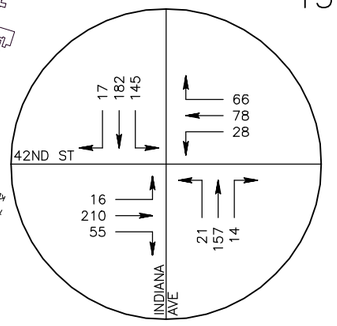

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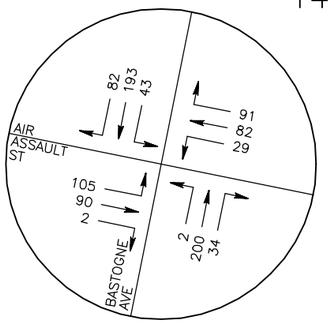

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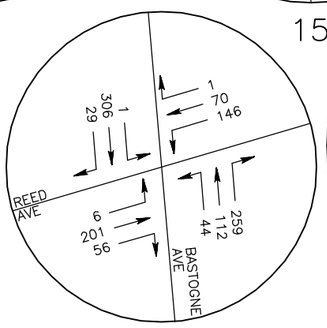

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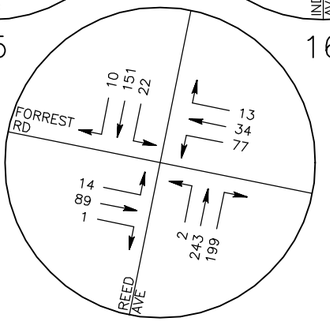

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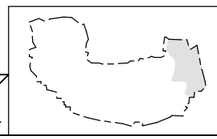

3/4

EXHIBIT 3.9
2002 AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

MATCHLINE SEE SHEET 4 OF 4

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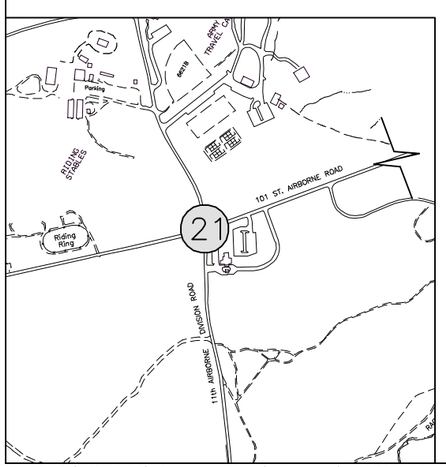

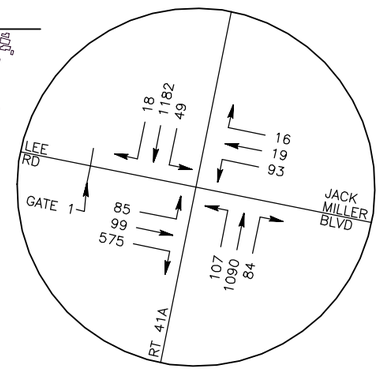

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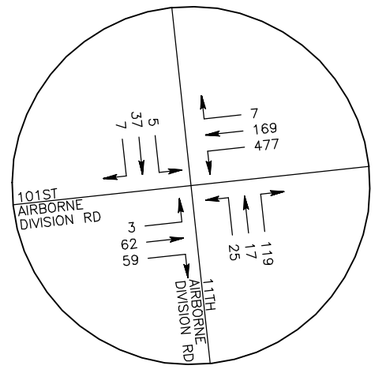

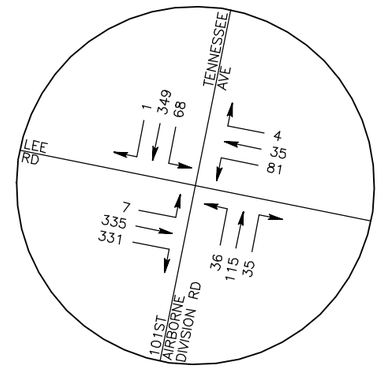

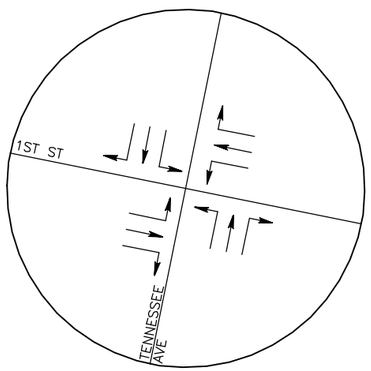

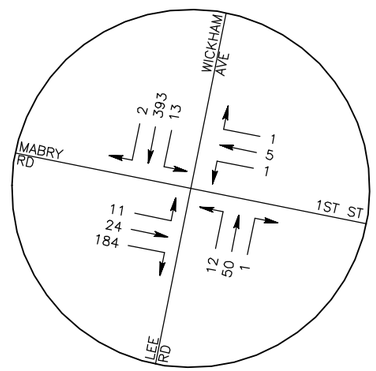

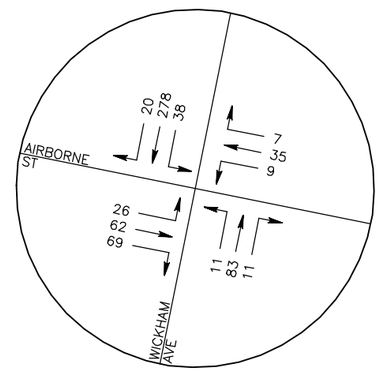

Gannett Fleming

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EXHIBIT 3.9
2002 AFTERNOON PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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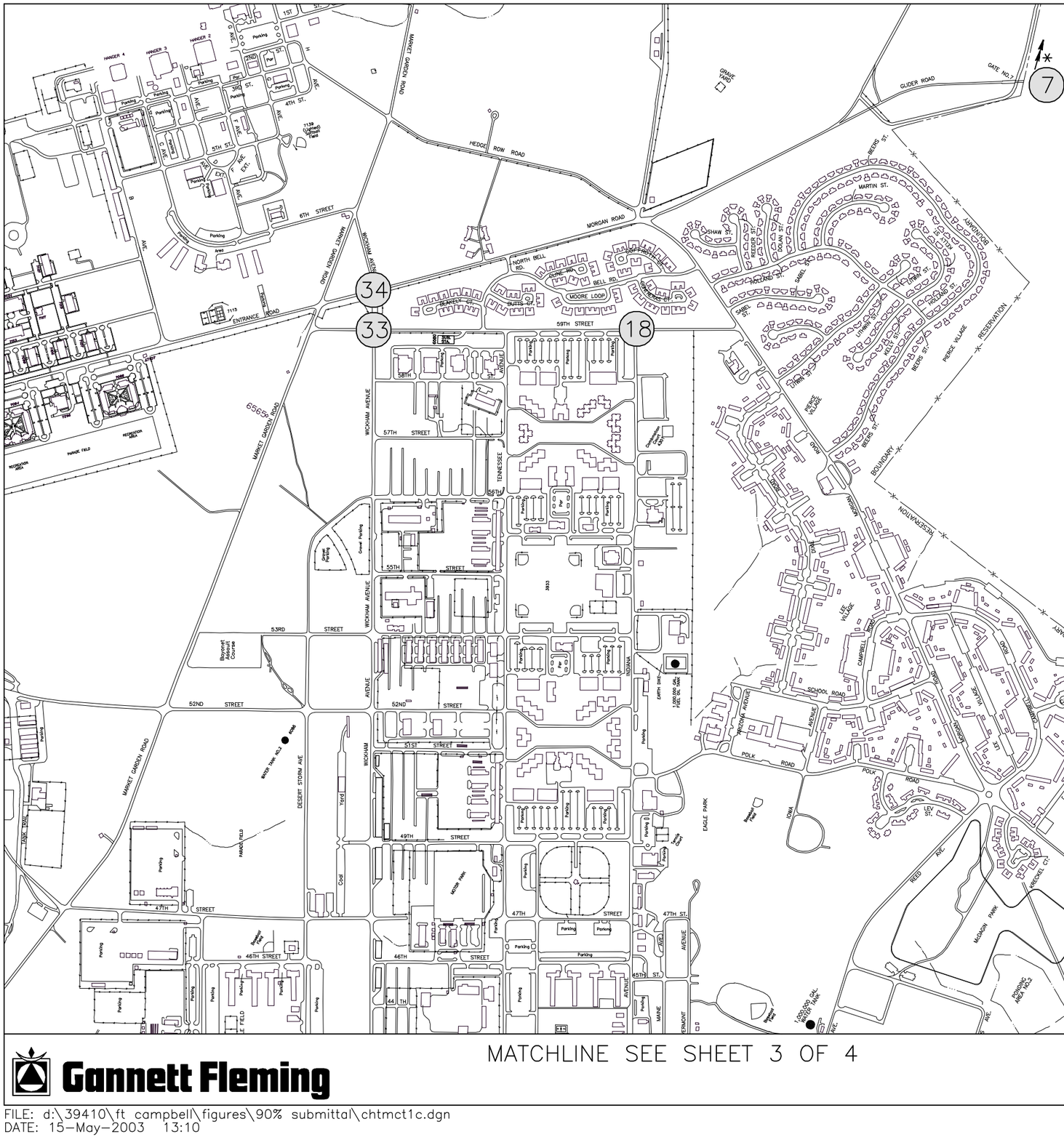

EXHIBIT 3.10
INTERSECTION CONTROL AND LANE CONFIGURATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

Gannett Fleming

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SHEET 3 OF 4

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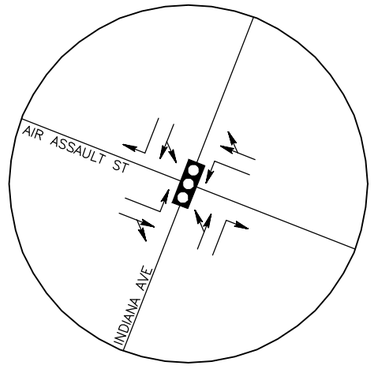

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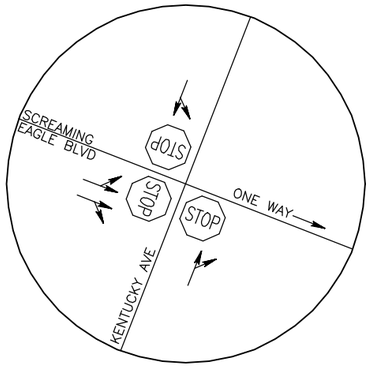

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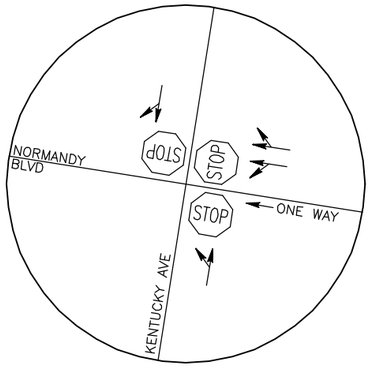

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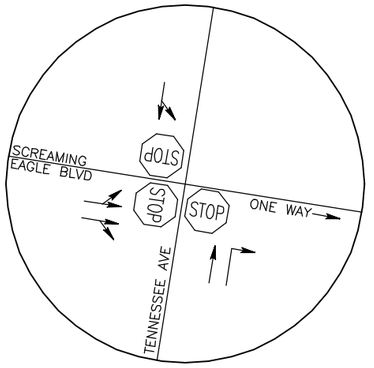

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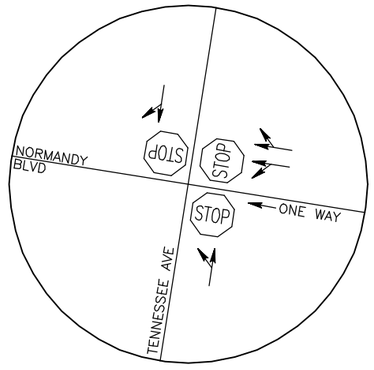

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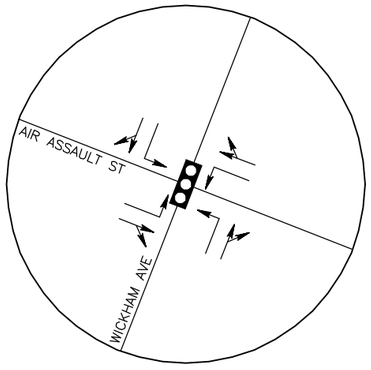

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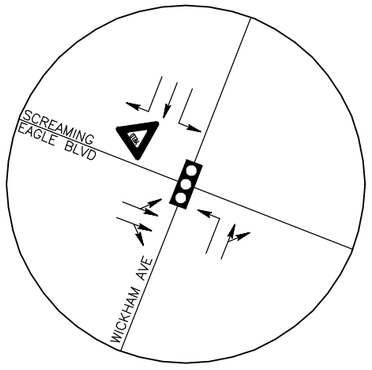

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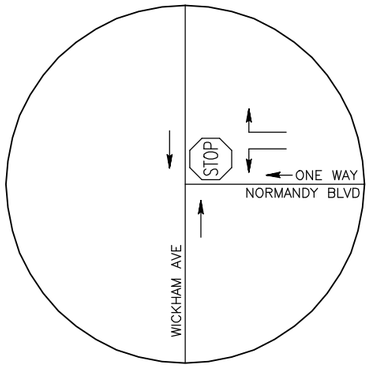

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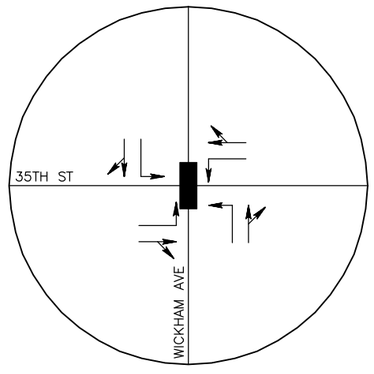

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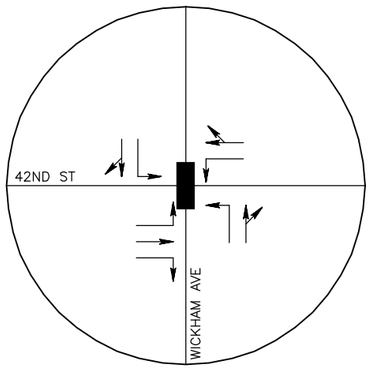

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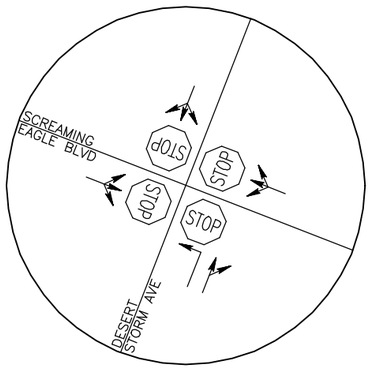

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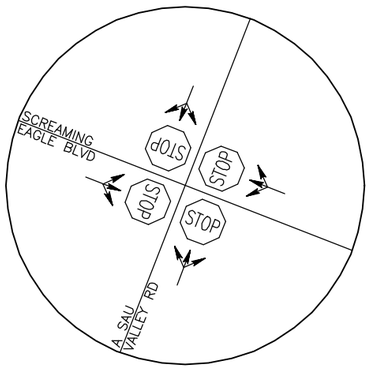

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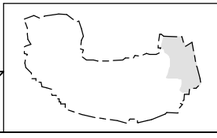

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EXHIBIT 3.10
INTERSECTION CONTROL AND LANE CONFIGURATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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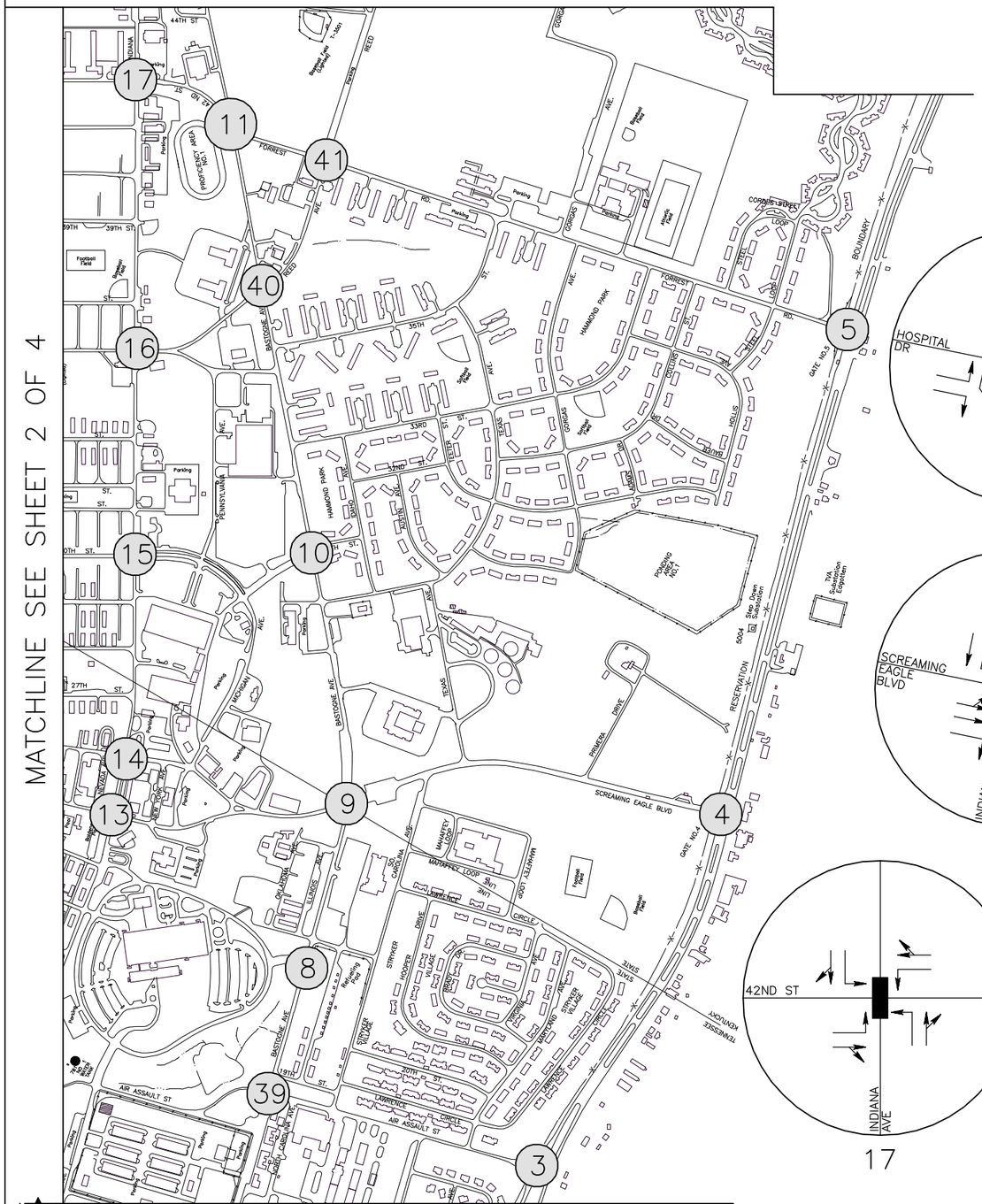

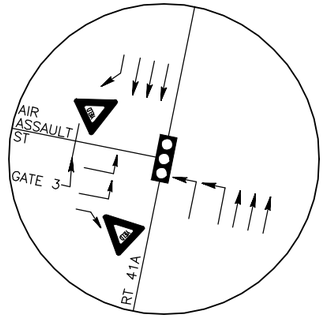

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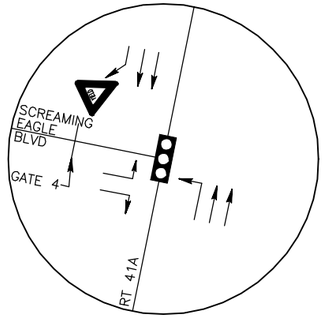

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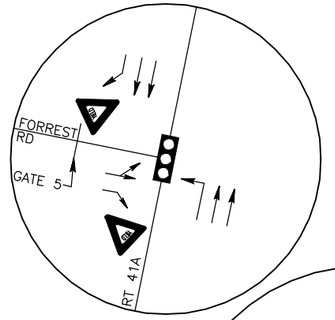

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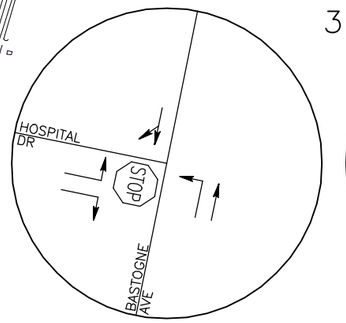

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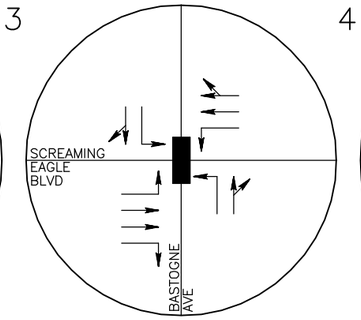

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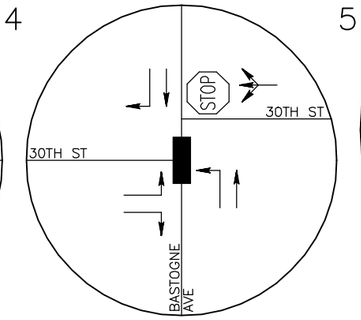

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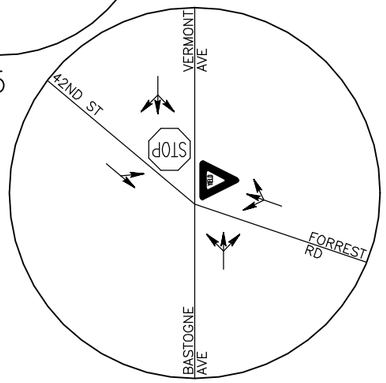

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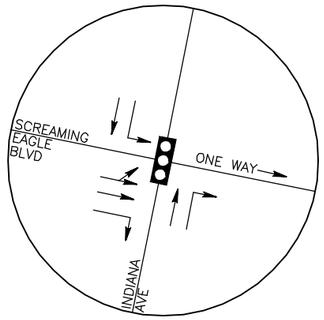

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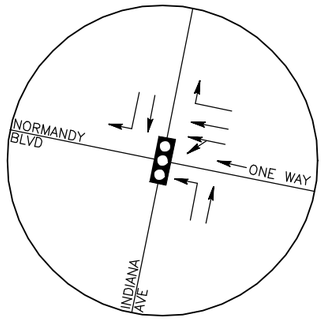

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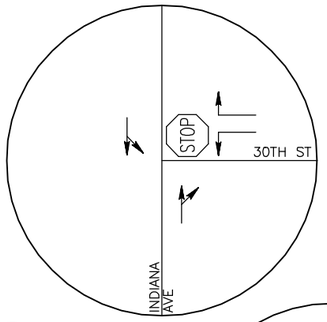

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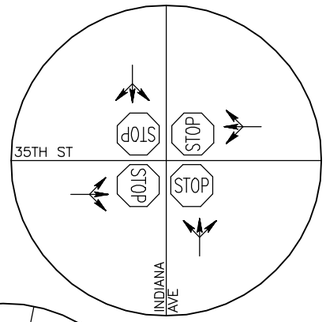

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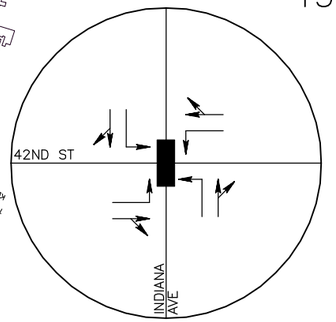

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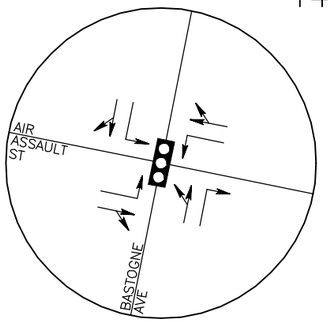

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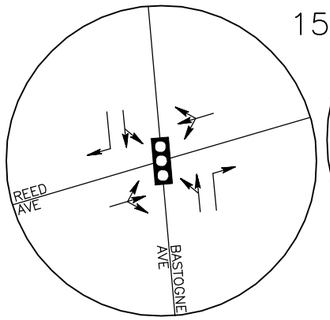

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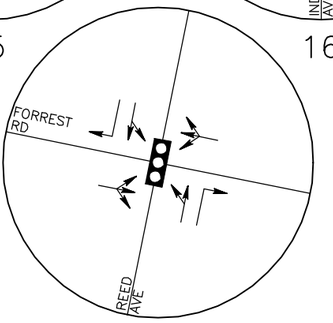

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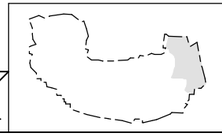

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EXHIBIT 3.10
INTERSECTION CONTROL AND LANE CONFIGURATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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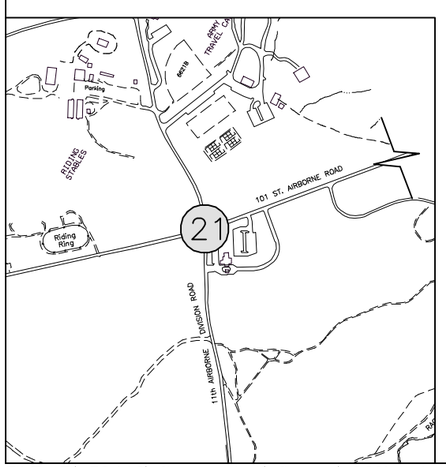

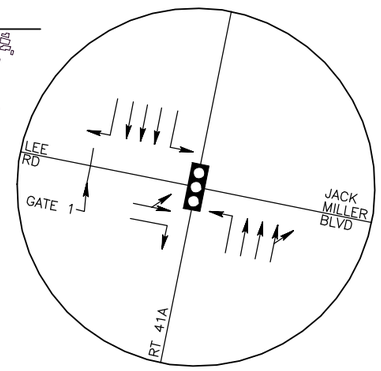

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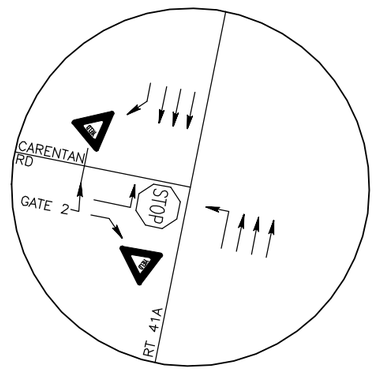

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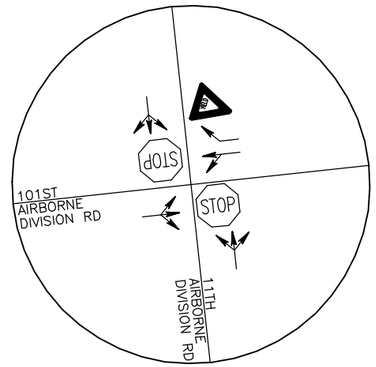

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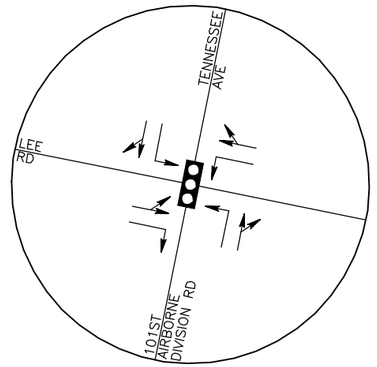

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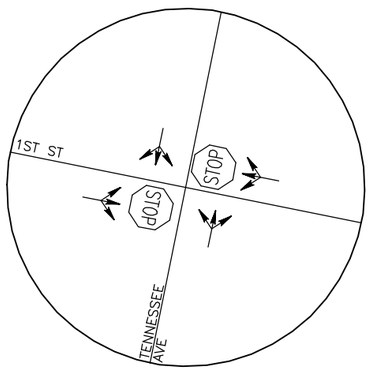

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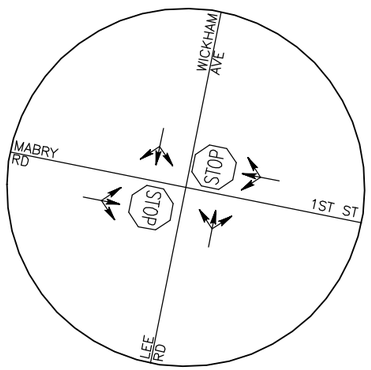

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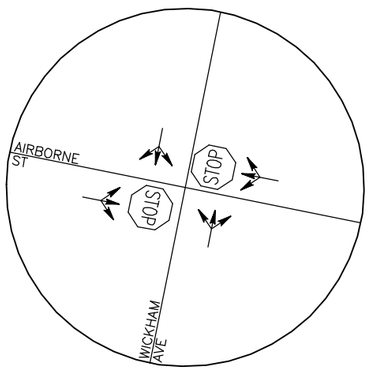

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EXHIBIT 3.10
INTERSECTION CONTROL AND LANE CONFIGURATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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3.3.6. Vehicle Occupancy Studies

Additional data collection was conducted to quantify the Average Vehicle Occupancy (AVO) of vehicles entering the installation. Vehicle occupancy counts can provide a better understanding of the facility commuters and the level of carpooling. Vehicle Occupancy counts were conducted from 0600 to 0830 hours for inbound traffic at ACP's 1, 3, 4, 6, 7, and 10. Vehicle occupancy counts are summarized in **Exhibit 3.11** and are presented in **Appendix E**.

Exhibit 3.11 Vehicle Occupancy Summary

Location	Number of Vehicles by Person						Total Vehicles	Total Persons	AVO
	1	2	3	4	5	6+			
ACP 1	1006	65	4	0	0	0	**1075**	**1148**	**1.07**
ACP 3	1155	99	10	1	0	0	**1265**	**1387**	**1.10**
ACP 4	1485	168	25	2	1	2	**1683**	**1921**	**1.14**
ACP 6	871	80	9	1	2	0	**963**	**1072**	**1.11**
ACP 7	60	11	1	1	1	0	**74**	**94**	**1.27**
ACP 10	802	87	5	1	0	0	**895**	**995**	**1.11**
Total Composite							**5955**	**6617**	**1.11**

Based on the Federal Highway Administration's *Calibration and Adjustment of System Planning Models,* these results are typical for home-based work trips, which normally range between 1.07 and 1.20 and are consistent with other military installations. The occupancy at ACP 4, the main ACP, is slightly higher than that of the other ACP's off of Highway 41A, with the exception of ACP 7. ACP 7 has the highest occupancy rate despite being the designated truck ACP.

3.3.7. Origin-Destination Evaluation

To assess existing and future transportation demands, it is important to consider the origin and destinations of roadway trips.

In discussion with Fort Campbell personnel, the general observation is that 20 percent of the military and civilian work force resides in Kentucky and 80 percent resides in Tennessee.

Further evaluation of inbound traffic volumes at the primary access points indicate that of the approximately 3,000 morning peak hour inbound trips:

- 12 percent are from locations north of the installation including Hopkinsville,
- 18 percent are from locations east of the installation including Oak Grove, and
- 70 percent are from locations south of the installation including Clarksville

3.3.8. Speed Studies

The study team conducted speed studies at three locations within Fort Campbell. **Exhibit 3.12** shows the 85th –percentile speed of all vehicles through the study area over a two-day period. The 85th –percentile speed is considered a reasonable upper limit for speeds and is a determining factor in the establishment of speed limits.

Exhibit 3.12 Spot Speed Survey Results

Roadway Section	85th-Percentile Speed	
101st Airborne Road South of ACP 10	**Northbound:** 51 mph	**Southbound:** 49 mph
Glider Road Between ACP 7 and Morgan Road	**Eastbound:** 33 mph	**Westbound:** 33 mph
Screaming Eagle Boulevard Between ACP 4 and Bastogne Avenue	**Eastbound:** 29 mph	**Westbound:** 31 mph

3.4. Factors Influencing Existing and Future Traffic

To properly assess the existing and future transportation infrastructure needs, variances from "normal" conditions as well as future growth must be considered.

3.4.1. Current Deployments

Due to military needs, a portion of the troops assigned to Fort Campbell has been deployed throughout the world. Normal deployments range between five and 20 percent of the Fort Campbell military population. Since September 11th, the deployed population has exceeded those rates and has ranged between one and two brigades. Fort Campbell officials estimated that in February 2002, (at the time of data collection) roughly 6,000 troops out of a total military and civilian population of approximately 28,500 were deployed throughout the world. This is roughly 21 percent of the installation work force.

3.4.2. Master Plan Initiatives

Fort Campbell is continuing to develop and revise the installation Master Plan. As part of the Master Plan, substantial infrastructure and land use changes are being proposed. The study team reviewed the data provided with regard to the Master Plan and considered it in the development of this study. Some of the more substantial land use impacts include:

- The redevelopment of residential areas.
- The continued development of barrack facilities to the west of Wickham Avenue.
- Development as part of CAAF.
- Development and redevelopment in the area between Wickham Avenue and Kentucky Avenue from First Street through Airborne Street.

- A new installation HQ planned for the area between Kentucky Avenue and Indiana Avenue in the vicinity of 30th Street.

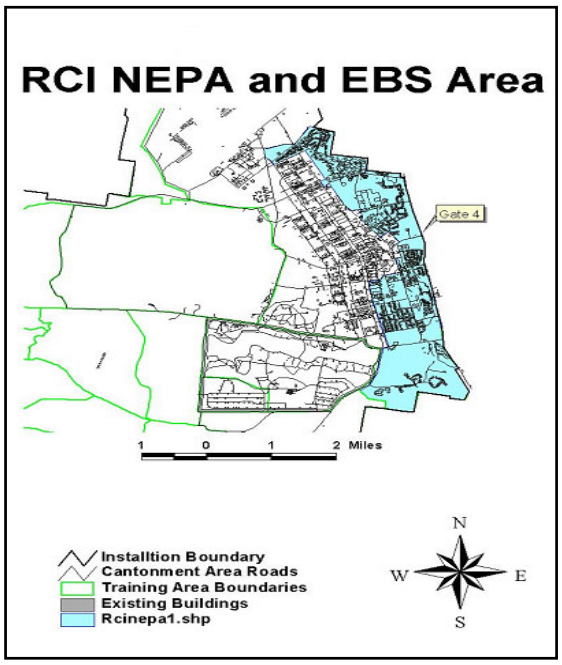
The Fort Campbell Real Property Master Plan illustrates several new transportation corridors including:

- Realignment of Screaming Eagle Boulevard
- Realignment of Bastogne Avenue and a connection to Air Assault Street
- A Wickham Avenue extension connecting to 101st Airborne Division Road
- A Market Garden extension connecting to 101st Airborne Division Road
- A Gate 6/ 47th Street Connector

3.4.3. Residential Community Initiative

Fort Campbell's housing is in the beginning phases of on-installation housing redevelopment through the Residential Community Initiative (RCI). Through RCI, the Army and Fort Campbell will partner with private developers to build, renovate, manage, and maintain family housing communities on Fort Campbell. Essentially, housing areas will become clean slates to be redeveloped. It is anticipated that 700 additional units will be added to the approximately 4200+ existing units, which will be redeveloped.

Exhibit 3.13 RCI Designated Area



To date, the process is in the environmental assessment phase. A developer will be selected near the end of 2002 and housing will be fully redeveloped by 2010.

The redevelopment of the housing areas, the timeframe of this study and ongoing master planning initiatives offers the opportunity to coordinate the needs of all Fort Campbell citizens. Housing personnel desire a transportation system that complements housing, not one that conflicts with housing. Based on the meeting held between RCI and the study team, the following issues, concerns and ideas were identified for consideration in development of this study:

- Remove arterial roadways and thoroughfares from communities.
- Arterials should provide access to collector and local roadways connecting to individual residences.

- Pedestrian and bicycle issues must be considered including localized needs as well as a possible inter-community network. ACP 4 impacts north-south inter-community pedestrian and bicycle movements.
- The developer will be responsible for residential roadway development including streetscaping, traffic calming and traffic control devices.
- ACP1 impacts housing. Consider relocating north of railroad.
- Keep ACP 2 closed.
- ACP 3 is between Stryker Village and Turner Loop.
- Consider a north-south arterial roadway (possibly Wickham Avenue or Market Garden Road) connecting ACP's 7 and 10. Move commuter traffic to the north and south.

RCI Visions - COMMUNITY PLANNING/DESIGN GOALS

- Provide safe, convenient, affordable housing; foster community/neighborliness
- Create an architectural theme for each post
- Use local building materials (where available)
- Build using 21st Century technologies
- Increase useable open space/maximize vegetation and water space
- Reduce dependence on car
- Complement AAFES, DECA, MWR operations
- Reduce total cost to government

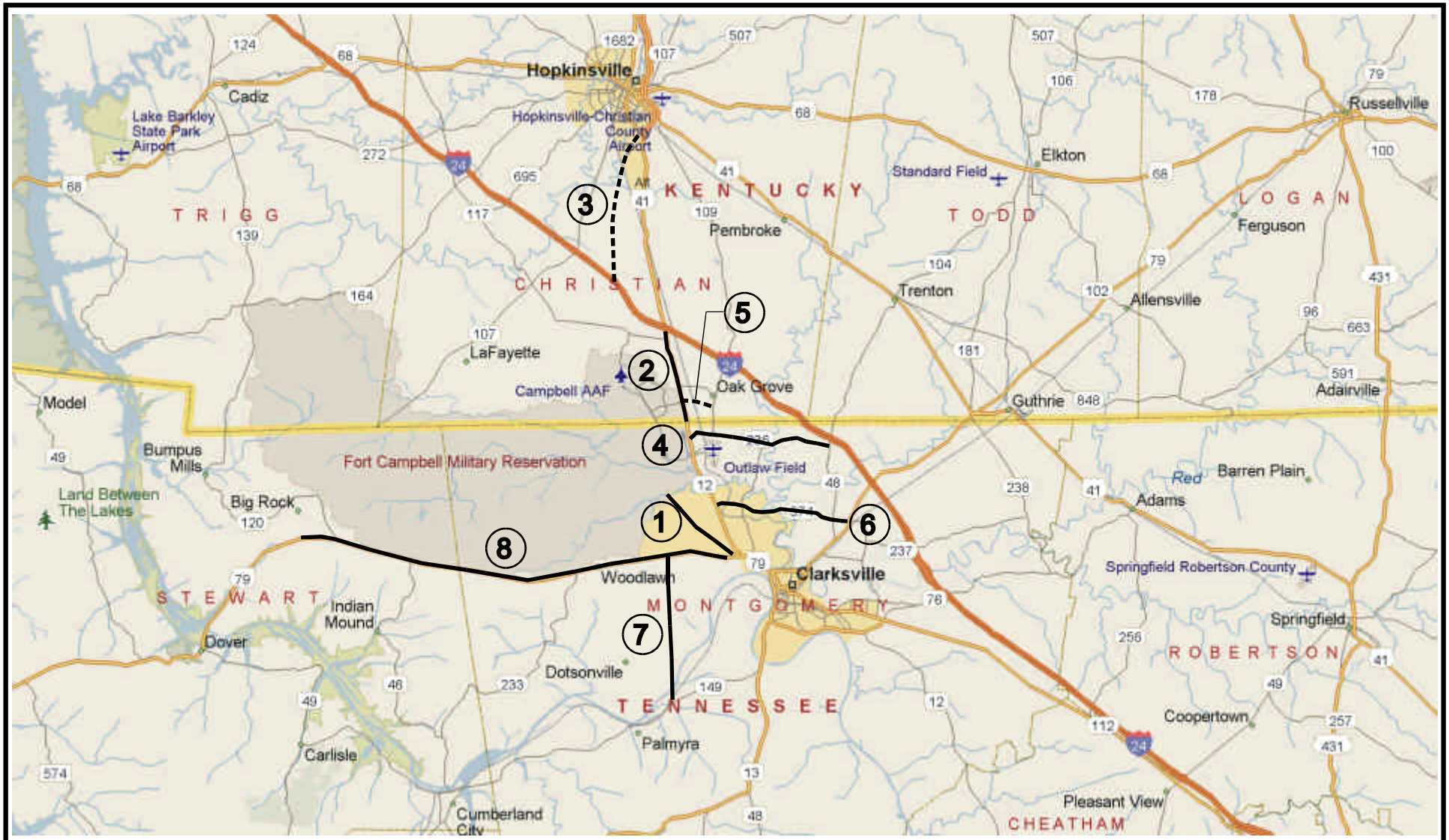
3.4.4. Regional Transportation Initiatives

There are numerous regional transportation initiatives that will improve accessibility to Fort Campbell and impact travel patterns. Several projects have been funded and designed; others are not funded and are in the planning phase. Improvements are noted in **Exhibit 3.14**.

3.4.4.1. Lafayette Road Widening

Lafayette Road which connects U.S. Route 41A, near U.S. Route 79 to Fort Campbell has been widened to a five-lane roadway up to the installation boundary. Plans will be developed to widen the two-lane section of roadway from the installation boundary to 101st Airborne Division Road.

The existing and planned improvements will make Lafayette Road a more desirable access roadway to Fort Campbell. The installation Master Plan indicates that the road will be extended to Market Garden Road.



Legend

1. Lafayette Road Widening
2. U.S. Route 41A Widening (construction-summer 02)
3. Pennyrile Parkway Extension (preliminary engineering ongoing)
4. Tiny Town Road Widening
5. ACP 4 Extension (not evaluated, unfunded)
6. 101st Parkway Widening
7. 101st Parkway Extension
8. U.S. Route 79 Widening

Exhibit 3.14

Regional Transportation Initiatives

Fort Campbell, Kentucky - Traffic Study

3.4.4.2. U.S. Route 41A

Kentucky Transportation Cabinet (KTC) will begin construction in the fall of 2002 of a reconstruction and upgrade of Ft. Campbell Boulevard (U.S. Route 41A) from four lanes to six lanes from the Kentucky/Tennessee border north to I-24.

Included in the project will be signalization upgrades at existing locations and a new traffic signal at Cole Road (ACP 7 access from Cole Road). The project includes turn lanes at critical locations, a 55-mph design speed, a center median and access management restrictions limiting access point to no closer than 1200 feet.

This project will improve safe access to Fort Campbell from I-24 and Hopkinsville.

3.4.4.3. Pennyrile Parkway

An extension to the Pennyrile Parkway, which connects Hopkinsville with I-24, is in the preliminary engineering stage. The extension will connect Hopkinsville with I-24 and will result in a decrease of vehicular traffic on U.S. Route 41A from Hopkinsville to I-24. Construction will be broken into two contracts.

Long-term discussions have included the possibility of Pennyrile Parkway receiving an interstate designation (I-69) connecting Canada (near Michigan) through Memphis, Tennessee, to Mexico.

Other discussions have included the possibility of extending Pennyrile Parkway directly into Fort Campbell. At this time, KTC has not studied this option and it would likely be very long-term due to the upgrades to U.S. Route 41A. Other concerns have been raised that such a connection would promote development to the north and west of Fort Campbell and would adversely impact airfield and training operations.

3.4.4.4. Highway 236 (Tiny Town Road) Widening

Tiny Town Road is being widened for its full length from Fort Campbell Boulevard (U.S. Route 41A) to Trenton Road (State Route 48).

3.4.4.5. ACP 4 Extension

Several stakeholders have expressed an interest in a Screaming Eagle Boulevard extension to the east connecting with KY Route 115 and the community of Oak Grove. It is doubtful, however, that this improvement would occur in the foreseeable future due to available resources and prioritization of improvements. The feasibility and benefit of this project has not been assessed. At this time, KTC favors funding other projects such as improvements to Highway 911 in lieu of the extension.

3.4.4.6. U.S. Route 79 Widening

This four-section project includes the widening from two to four or five lanes from U.S. Route 41A to the Tennessee River in Stewart County. The first section of the project from U.S. Route 41A to the 101st Airborne Division Parkway was completed in the spring of 2001. The remaining sections will be completed pending right-of-way negotiations.

3.4.4.7. 101st Airborne Division Parkway Widening

101st Airborne Division Parkway (TN Route 374) which connects U.S. Route 41A and U.S. Route 79 (William Rudolph Boulevard) will be widened from two lanes to four lanes in the near future. The funded project will improve access in the Clarksville area and is scheduled for construction in the fall of 2003.

3.4.4.8. 101st Airborne Division Parkway Extension

The Parkway will be extended south from U.S. Route 79 (Dover Road) to a point 2200 feet south of Dotsonville Road. Construction is scheduled for the fall of 2002. An extension of the Parkway southward to Route 149 is in design phases.

3.4.4.9. State Route 840 Beltway

Long-term planning has begun on the feasibility of the State Route 840 Beltway, which would be an outer beltway of the Nashville Metropolitan Area. The Beltway would extend as far north as Montgomery County (south of Clarksville) thus improving accessibility to a circumferential around Nashville and connecting to all the mid-state Interstate Routes.

3.4.4.10. U.S. Route 68 Corridor

The U.S. Route 68 Corridor, which passes through Hopkinsville, is being developed into a four lane arterial system across the southern boundary of Kentucky. This project is near completion.

3.4.5. Existing - Adjusted and Future Traffic Volumes

To properly assess existing and future transportation needs, current fluctuations due to deployments as well future growth due to land use and changes to the transportation network must be considered.

To assess the impact of current deployments on existing traffic, traffic data collected in 1999 was compared with data collected in February 2002 as presented in **Exhibit 3.15**. Based on the comparison, traffic volumes collected in February 2002 were 22 percent lower than those collected in 1999; therefore, an adjustment factor of 1.28 was used to convert “existing-deployment” volumes to “existing-adjusted/ normal” volumes. These values are consistent with the data presented in section 3.4.1.

Exhibit 3.15 Deployment - Traffic Comparison

Intersection	Previous Data		Date	Current Data	% Change
Wickham Ave/Air Assault Street	Morning	1921	November, 1999	1317	68.6
	Mid-Day	1786		1151	64.4
	Afternoon	1743		983	56.4
Wickham Ave/35th St	Morning	1230	November, 1999	1030	83.7
	Mid-Day	1245		1040	83.5
	Afternoon	1060		749	70.7
Wickham Ave/42nd St	Morning	1297	November, 1999	1134	87.4
	Mid-Day	1275		1133	88.9
	Afternoon	895		852	95.2
Wickham Ave/Morgan Rd	Morning	1012	November, 1999	1029	101.7
	Mid-Day	1168		1057	90.5
	Afternoon	2035		848	41.7
Wickham Ave/59th St	Morning	932	November, 1999	841	90.2
	Mid-Day	897		790	88.1
	Afternoon	799		585	73.2
Kentucky Ave/Screaming Eagle Blvd	Morning	601	November, 1999	512	85.2
	Mid-Day	1363		1006	73.8
	Afternoon	885		747	84.4
Indiana Ave/35th St	Morning	871	November, 1999	670	76.9
	Mid-Day	1381		1023	74.1
	Afternoon	1079		748	69.3
101st Airborne Division Road/11th Airborne Division Road	Morning	905	November, 1999	952	105.2
	Mid-Day	844		741	87.8
	Afternoon	1105		1004	90.9
Indiana Ave/59th St	Morning	704	June, 1999	496	70.5
	Mid-Day	696		553	79.5
	Afternoon	692		454	65.6
Wickham Ave/Airborne Street	Morning	1190	June, 1999	949	79.7
	Mid-Day	997		731	73.3
	Afternoon	969		654	67.5
Wickham Ave/Screaming Eagle Blvd	Morning	1652	June, 1999	1336	80.9
	Mid-Day	1512		1463	96.8
	Afternoon	1516		1134	74.8
Wickham Ave/Normandy Blvd	Morning	1285	June, 1999	1133	88.2
	Mid-Day	1225			
	Afternoon	884			
Bastogne Ave/Screaming Eagle Blvd	Morning	1799	June, 1999	1739	96.7
	Mid-Day	2773		2692	97.1
	Afternoon	2420		2613	108.0
OVERALL		48643		37889	77.9
Adjustment Factor	=	1 /	77.9	=	1.28383

Future traffic growth was assumed to be the same as historical traffic growth since future land use and population was not provided. A comparison of 1984 and 1999 traffic data indicates an annual growth of one percent per year as presented in **Exhibit 3.16**. To be conservative in future traffic volume estimates, 1.5 percent per year was assumed, which equates to a growth factor of 1.16 from 2002 to 2012.

Exhibit 3.16 Historic Traffic Volume Comparison

Intersection	Time of Day	1999 Data	1984 Data	% Change
Wickham Ave/Screaming Eagle Blvd	Morning	1652	1270	76.9
	Mid-Day	1512	1630	107.8
	Afternoon	1516	1230	81.1
Wickham Ave/Normandy Blvd	Morning	1285	840	65.4
	Mid-Day	1225	1080	88.2
	Afternoon	884	990	112.0
Bastogne Ave/Screaming Eagle Blvd	Morning	1799	1460	81.2
	Mid-Day	2773	2420	87.3
	Afternoon	2420	2200	90.9
OVERALL		15066	13120	87.1
Adjustment Factor	1 /	87.1	=	1.148323171

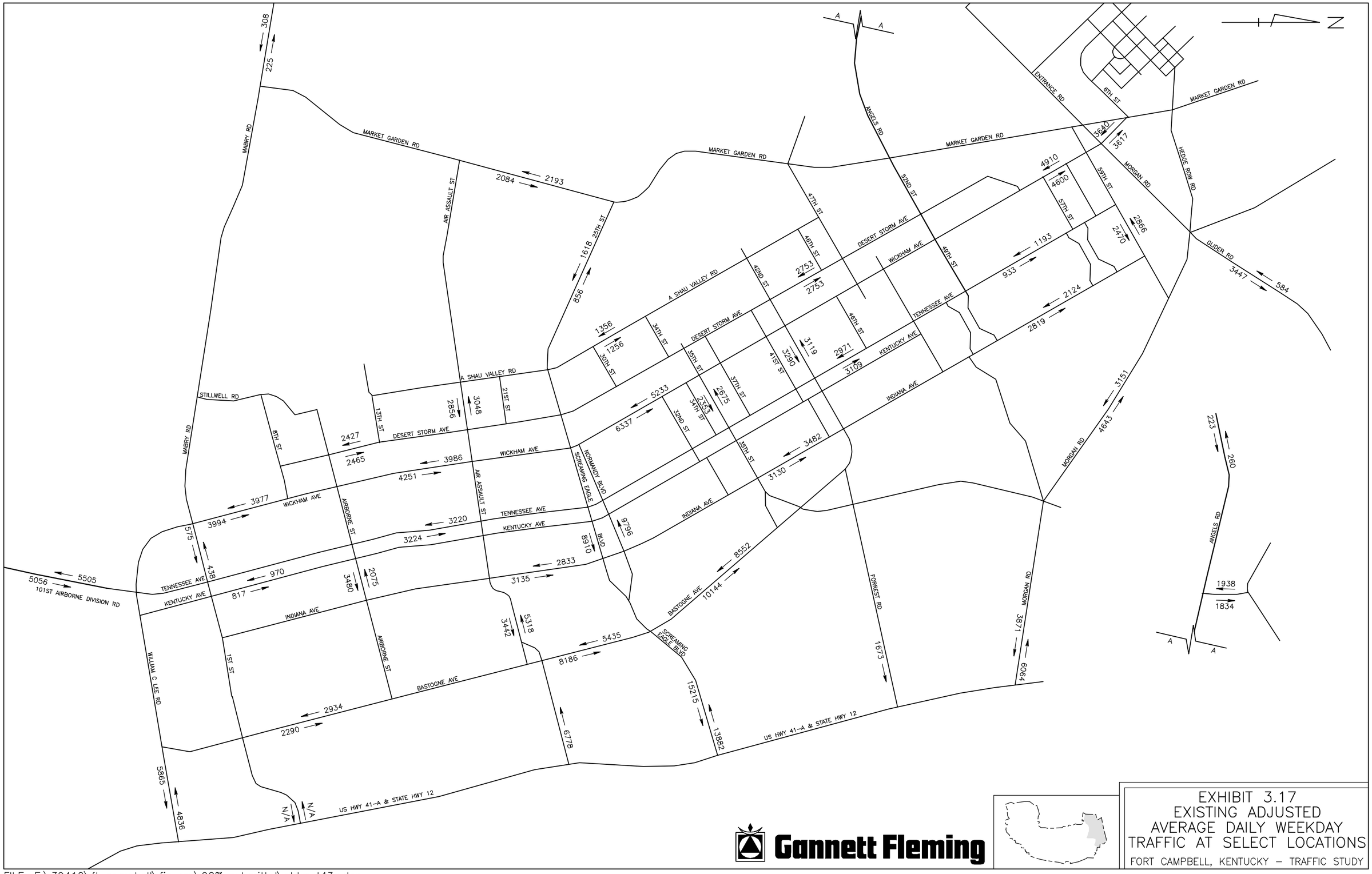
Equates to approximately 1 percent per year compounded yearly; use 1.5% year = an adjustment factor of 1.16 from 2002 to 2012

Existing traffic volumes collected in February 2002 were adjusted by 1.28 to calculate the normal, existing traffic volumes. These volumes are presented in **Exhibits 3.17 through 3.20.** Existing traffic volumes collected in February were adjusted by 1.48 (1.28 x 1.16) to calculate future (2012) traffic volumes. These volumes are presented as **Exhibits 3.21 through 3.24.**

3.5. Existing and Future Levels of Service

Level of Service (LOS) is a qualitative measure of the performance of a transportation system element as defined by the Highway Capacity Manual. **Appendix A** contains definitions of LOS for various transportation system facilities. The levels of service were determined for the existing data collected by the study team, for an adjusted existing condition to account for troop deployment, and for a future (2012) condition. The levels of service are summarized by intersection in **Exhibits 3.25 through 3.27**. In addition, the levels of service are tabulated by each approach lane in **Appendix A** for all intersections for the daily peak-hour periods for these three growth conditions.

Two different software programs were utilized to calculate the levels of service for the Fort Campbell facilities, Highway Capacity Software, HCS, and SYNCHRO. SYNCHRO assigns a level of service to an intersection's performance based on the amount of delay, measured in seconds, experienced by a vehicle while passing through an intersection. The different levels are



Gannett Fleming

EXHIBIT 3.17
EXISTING ADJUSTED AVERAGE DAILY WEEKDAY TRAFFIC AT SELECT LOCATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

FILE: E:\39410\ft campbell\figures\90% submittal\chtmct43c.dgn
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EXHIBIT 3.18
EXISTING ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

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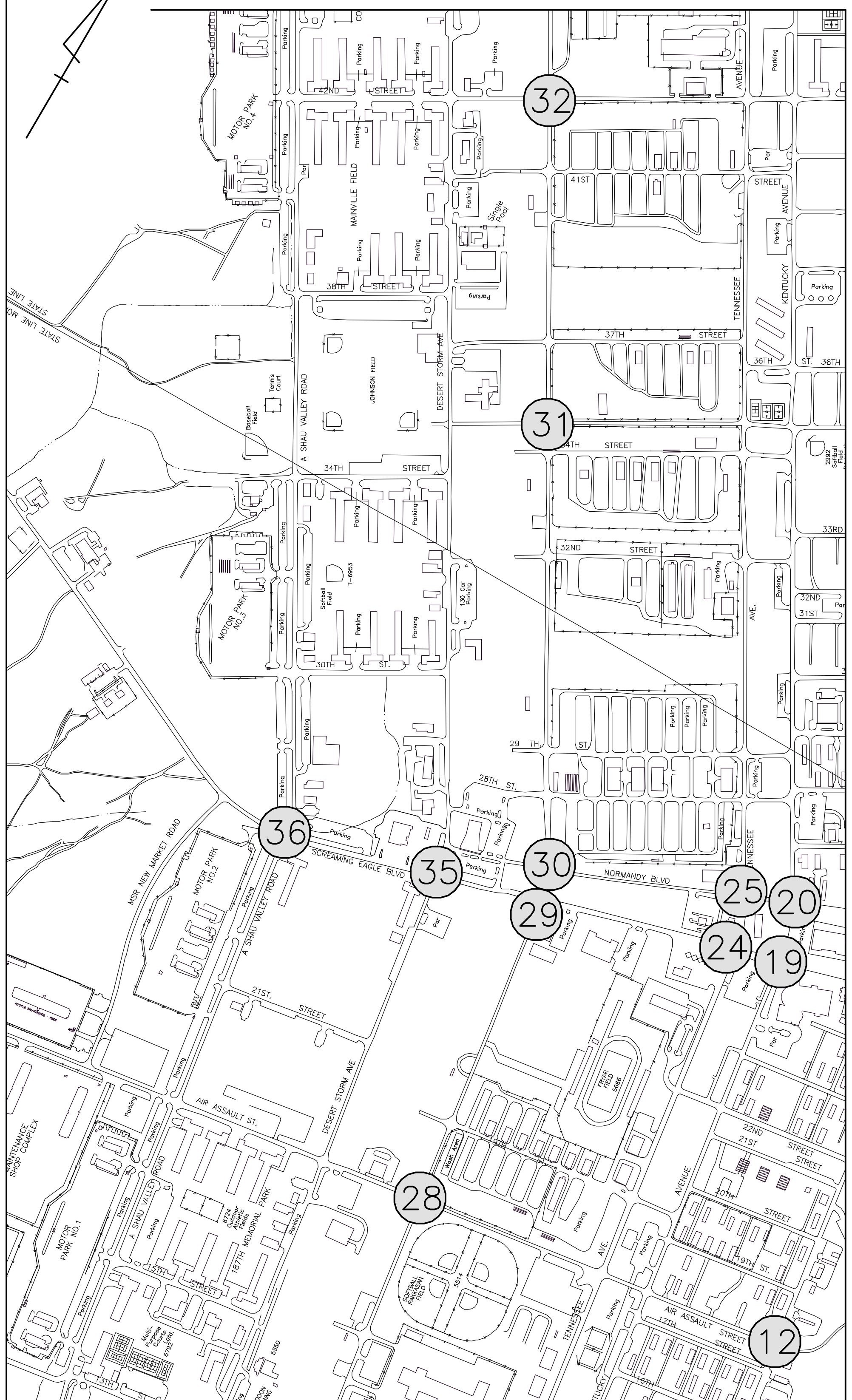

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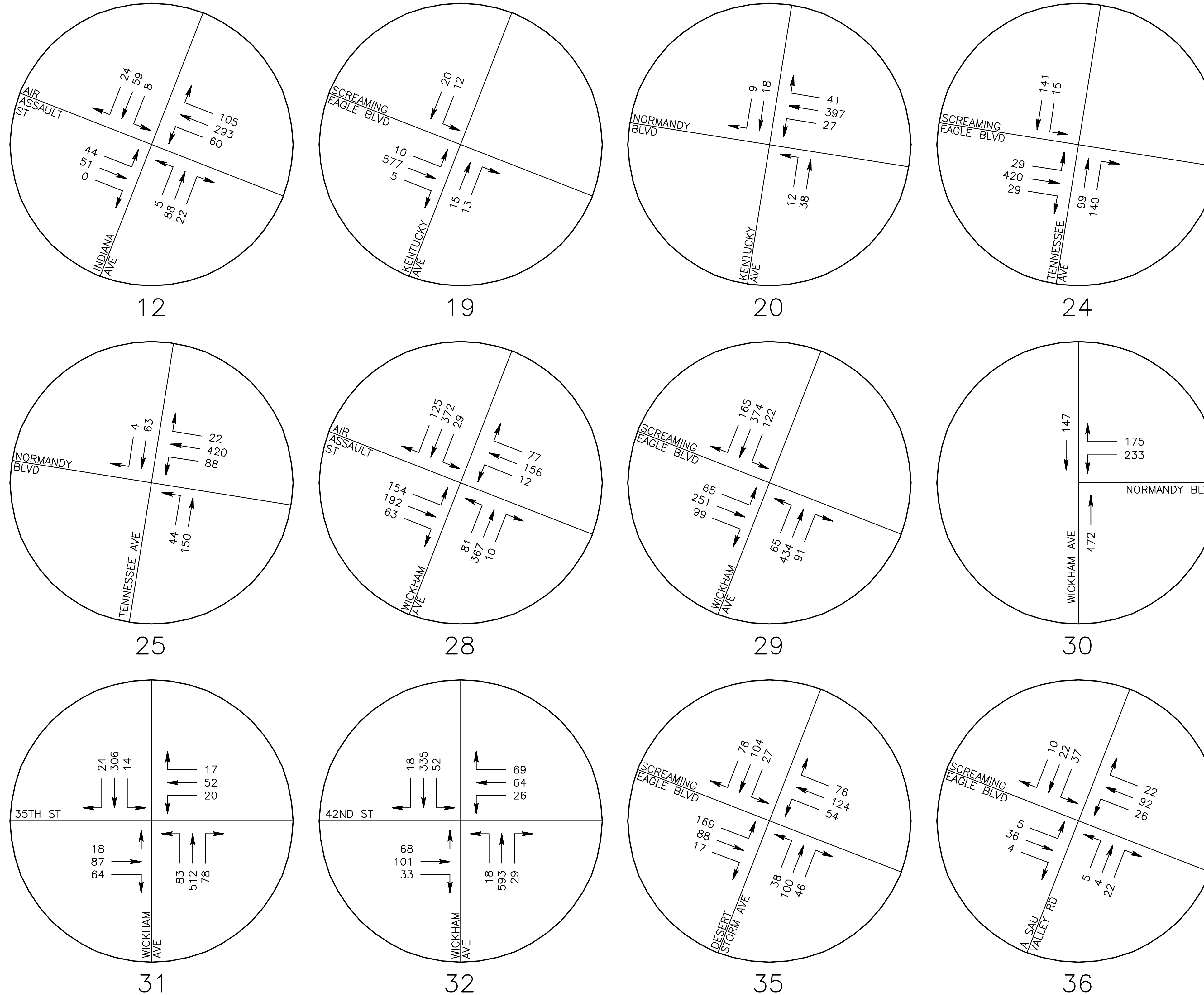

MATCHLINE SEE SHEET 4 OF 4

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EXHIBIT 3.18
EXISTING ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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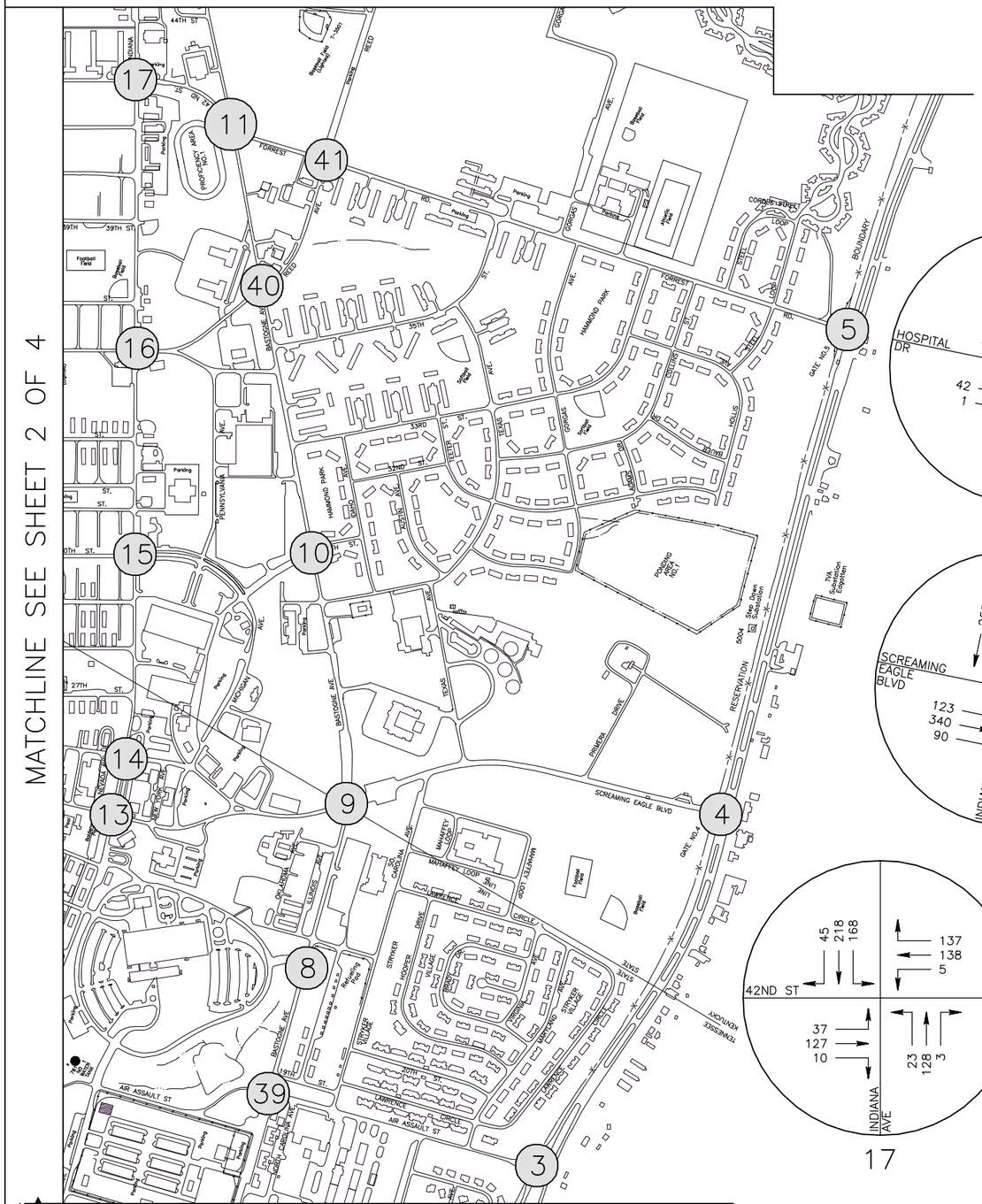

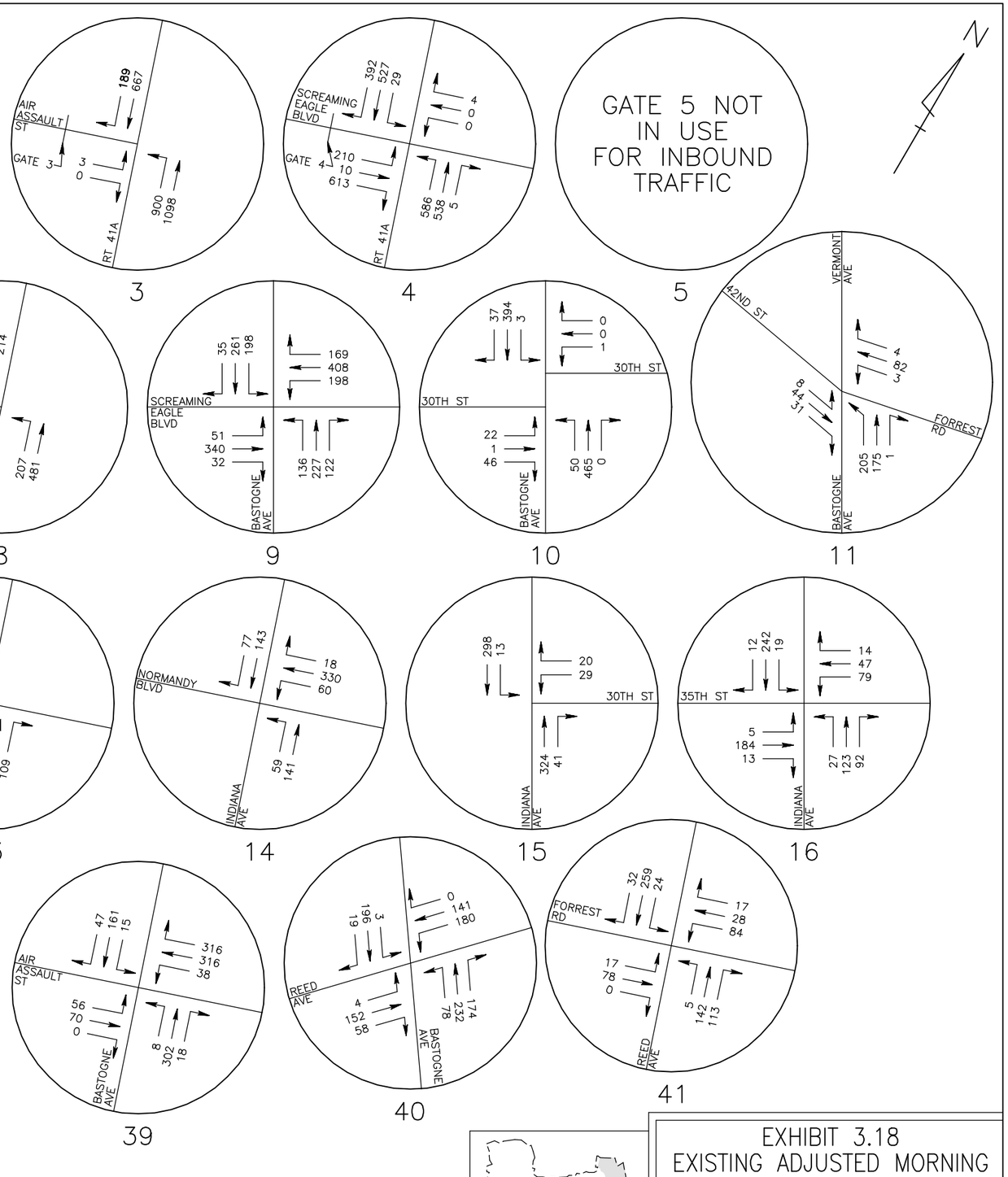

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MATCHLINE SEE SHEET 4 OF 4

3/4

EXHIBIT 3.18
EXISTING ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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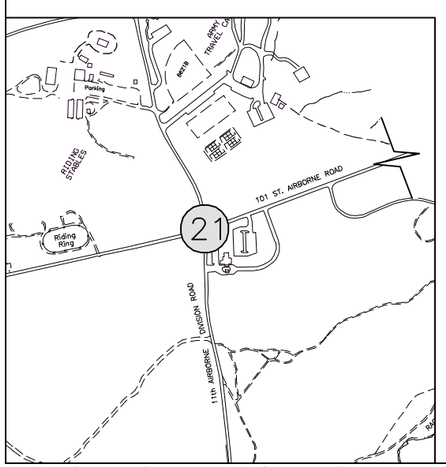

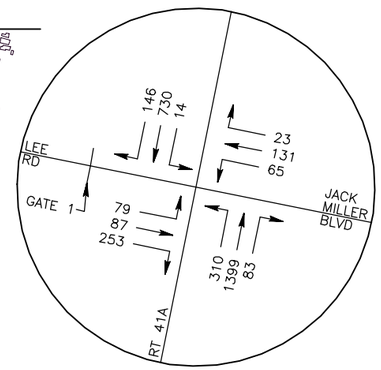

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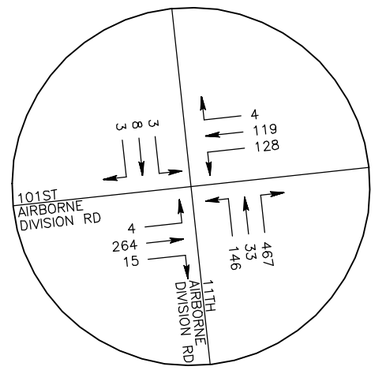
2



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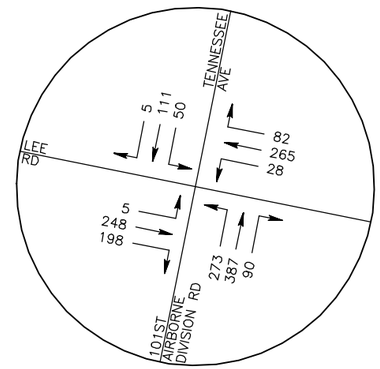

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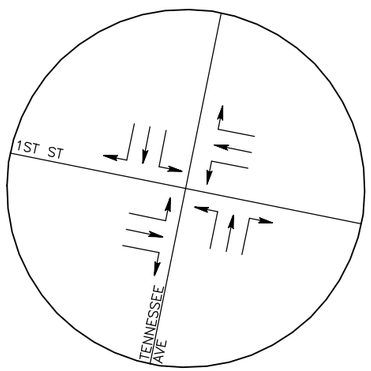

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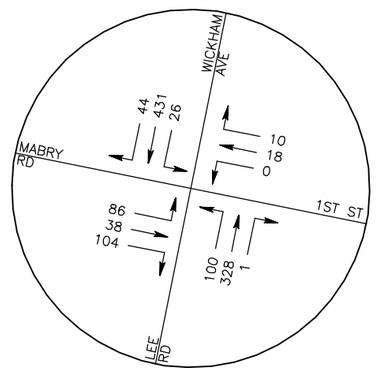

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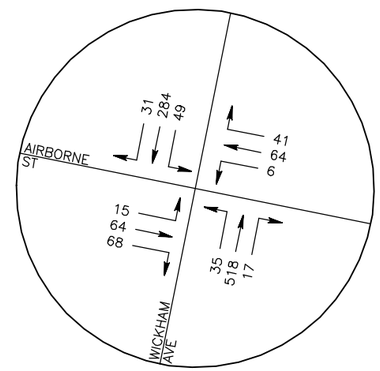

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4/4

EXHIBIT 3.18
EXISTING ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

FILE: E:\39410\ft campbell\figures\90% submittal\chtmct22c.dgn
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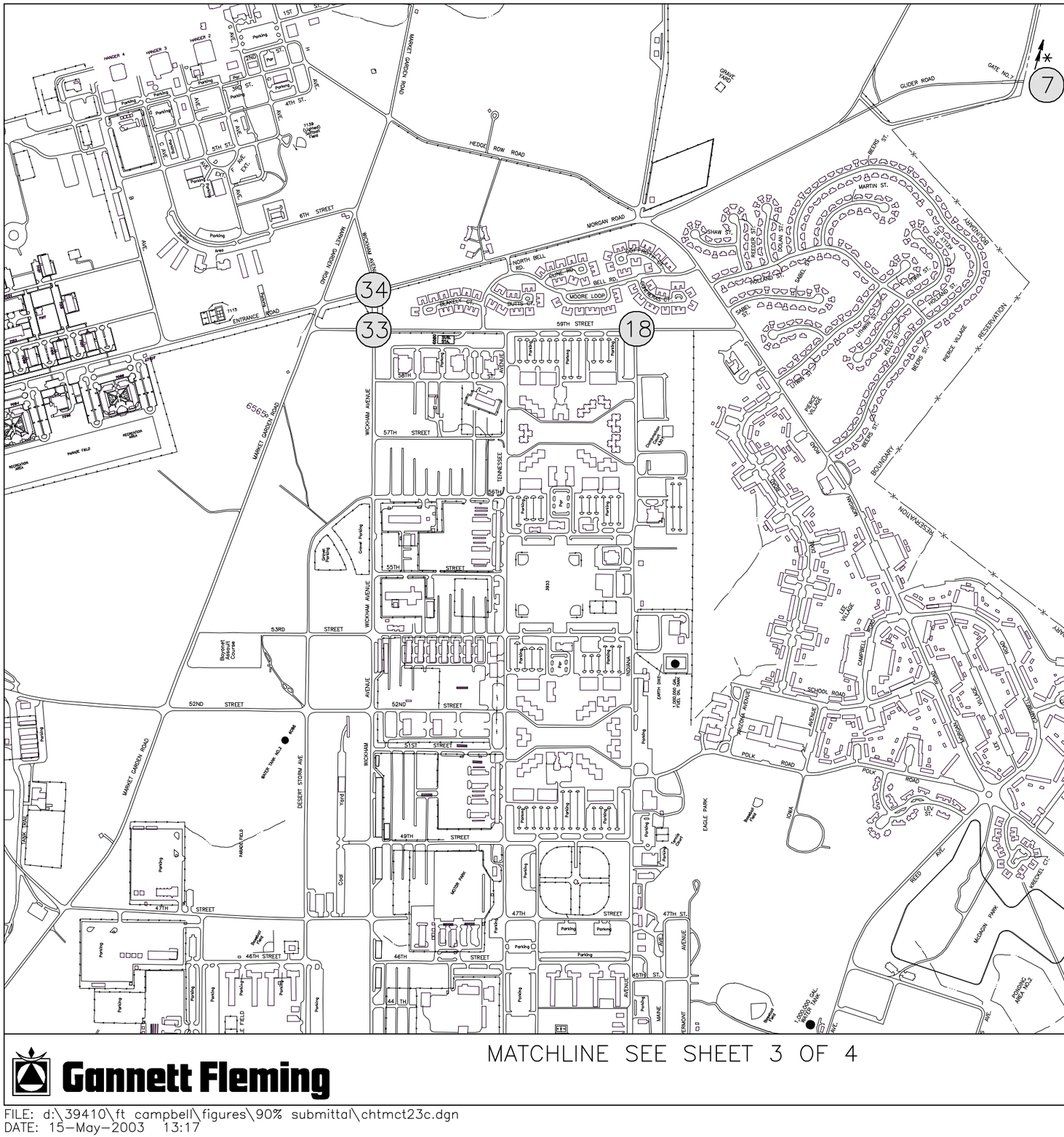

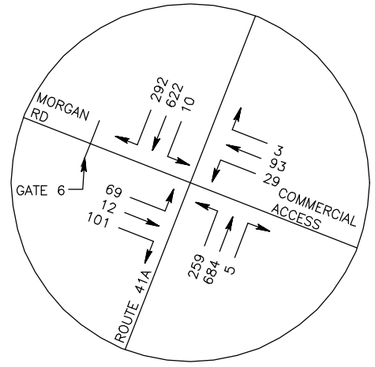

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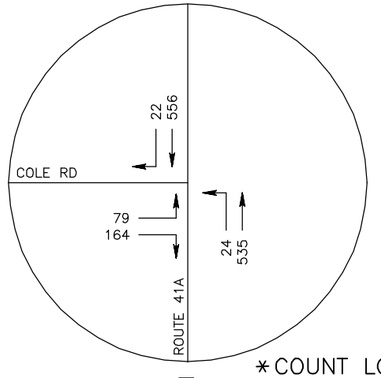

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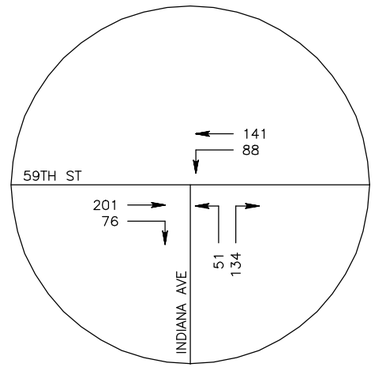
* COUNT LOCATION IS WHERE RT 41A AND COLE RD INTERSECT



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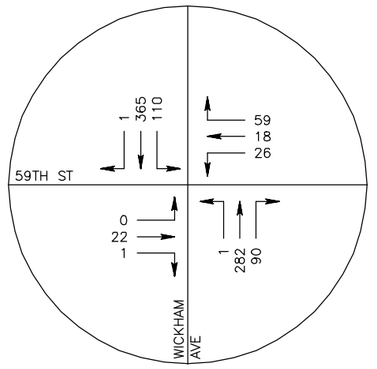

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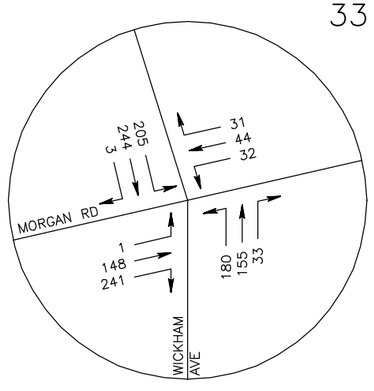

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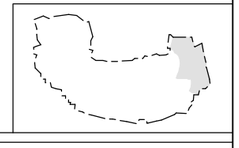

EXHIBIT 3.19
EXISTING ADJUSTED MID-DAY PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

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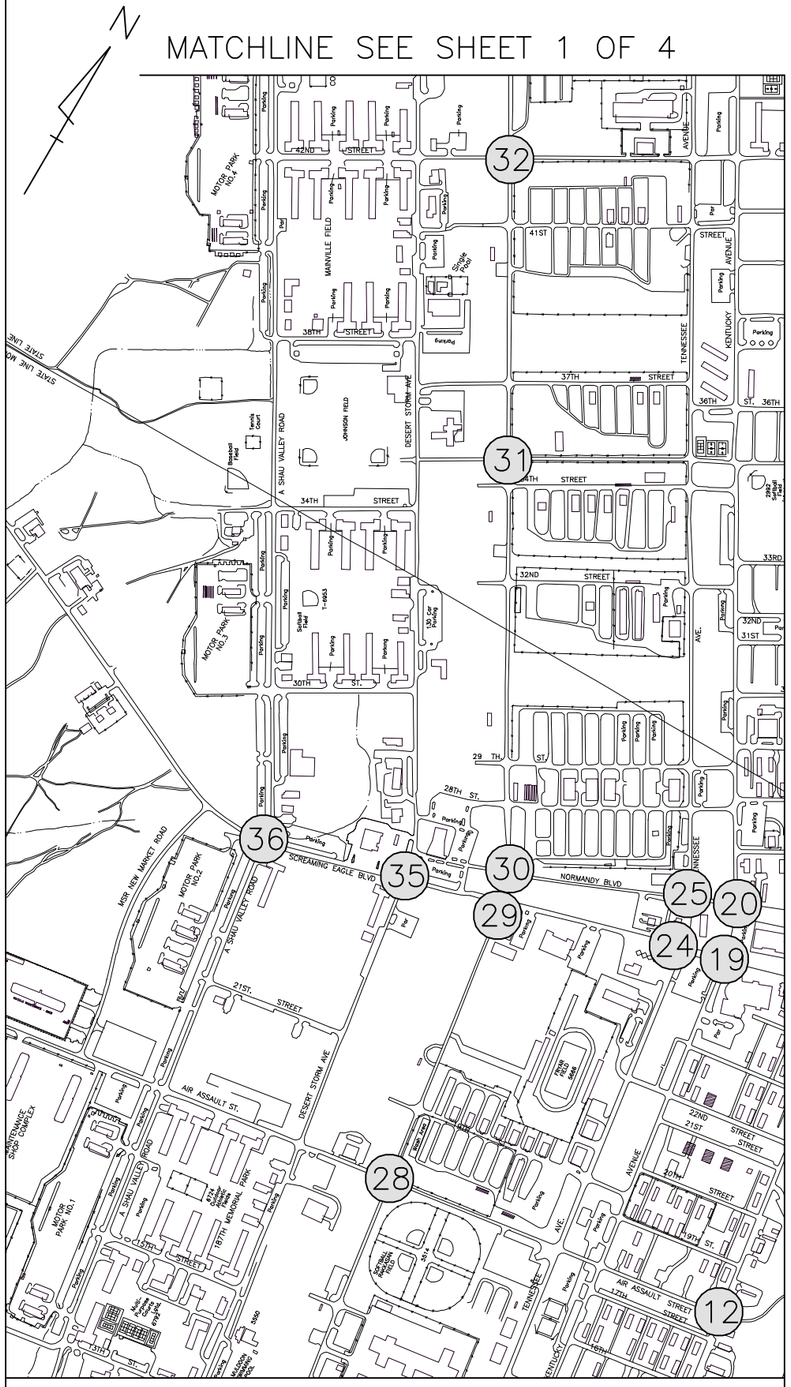

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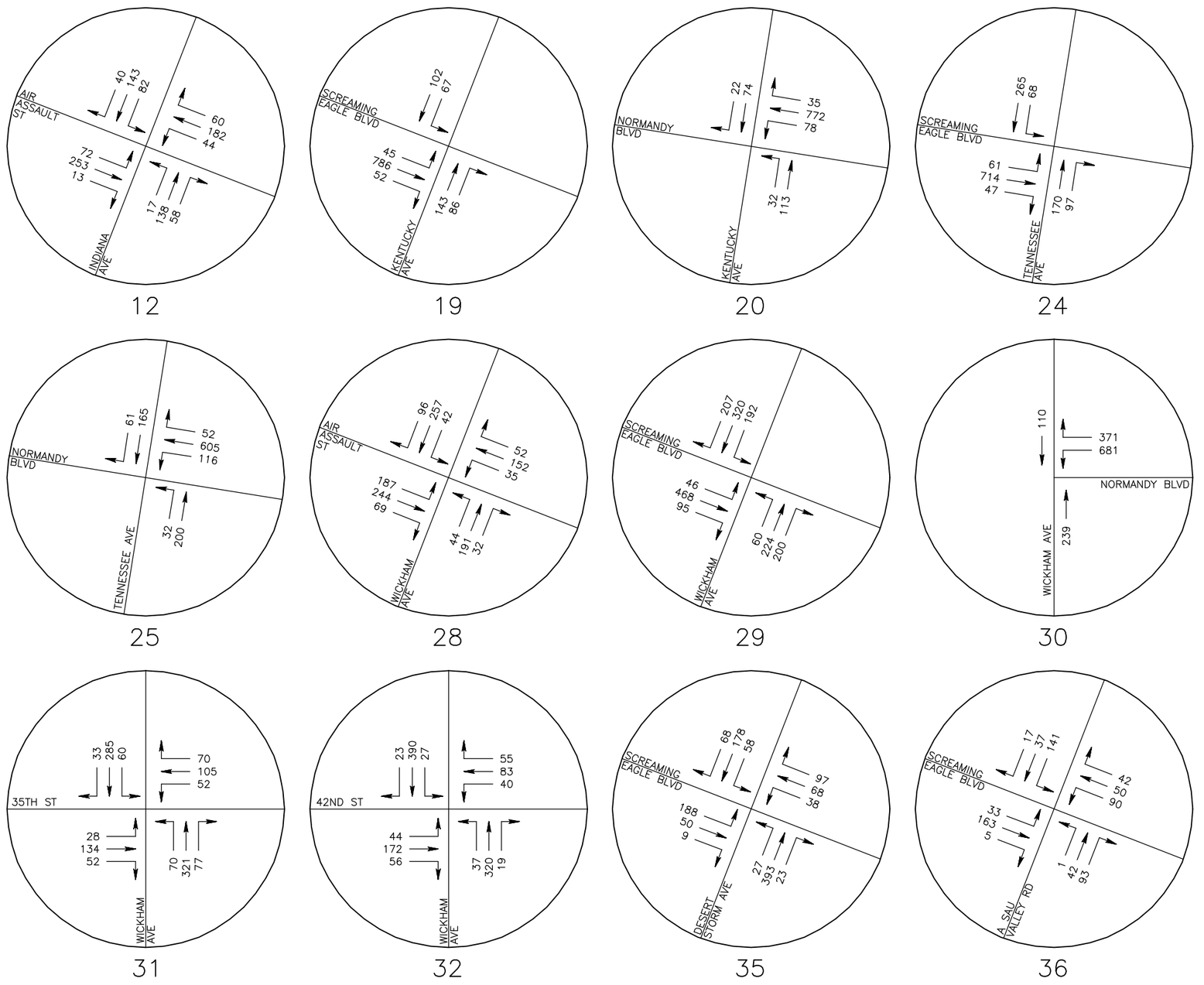

MATCHLINE SEE SHEET 4 OF 4

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EXHIBIT 3.19
EXISTING ADJUSTED MID-DAY PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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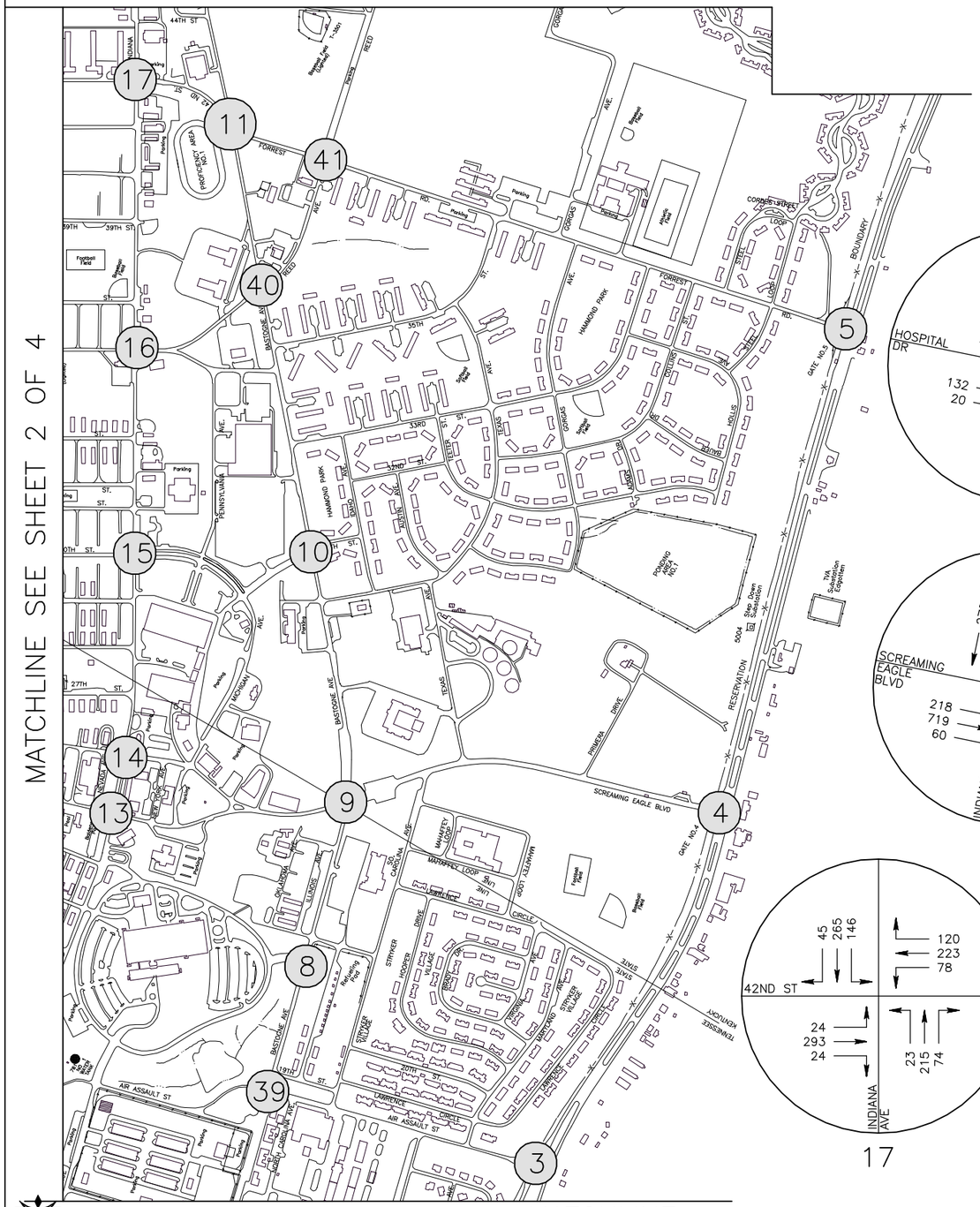

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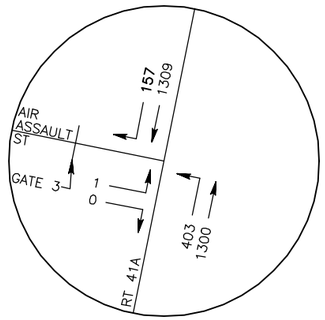

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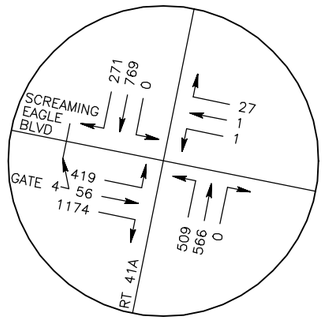

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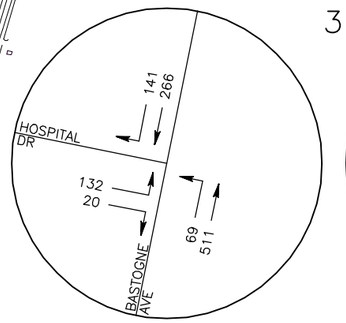

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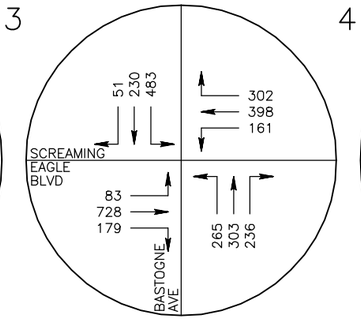

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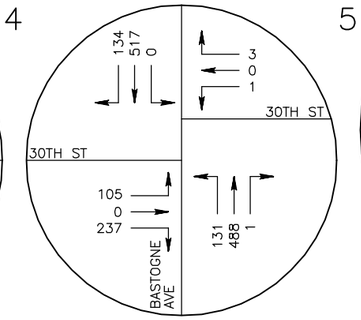

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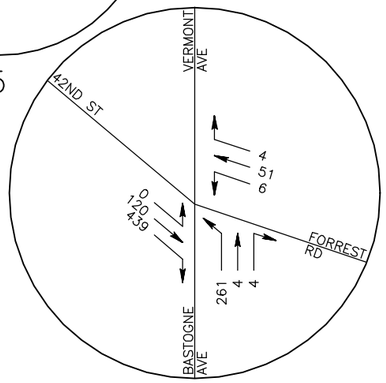

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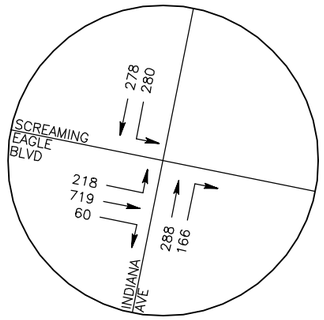

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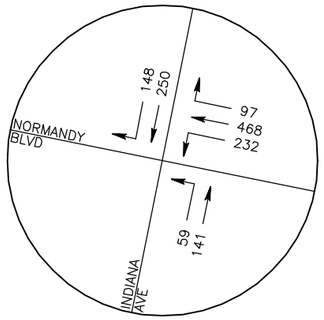

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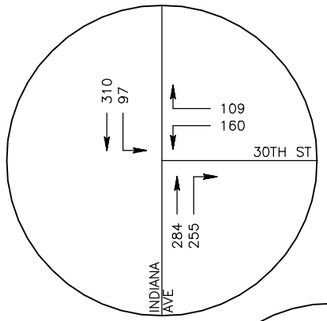

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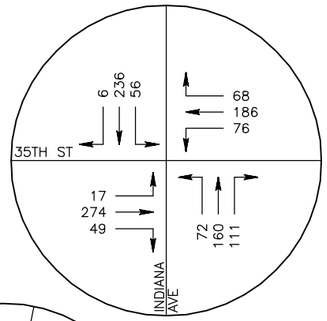

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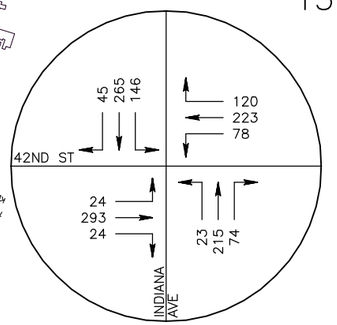

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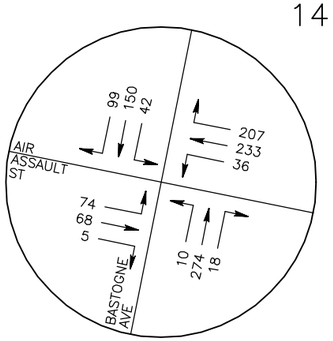

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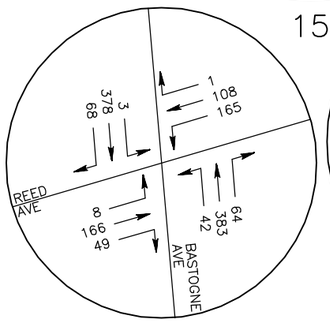

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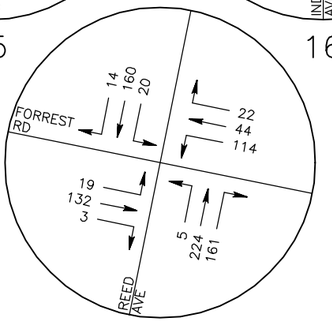

3/4

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EXHIBIT 3.19
EXISTING ADJUSTED MID-DAY PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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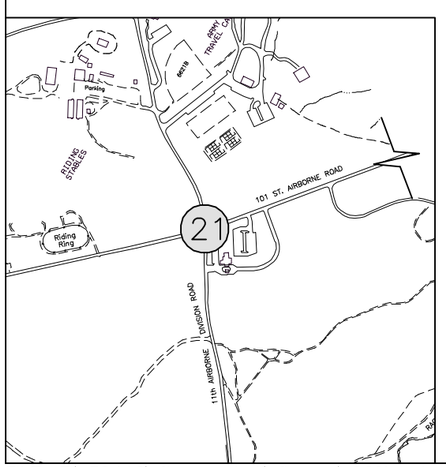

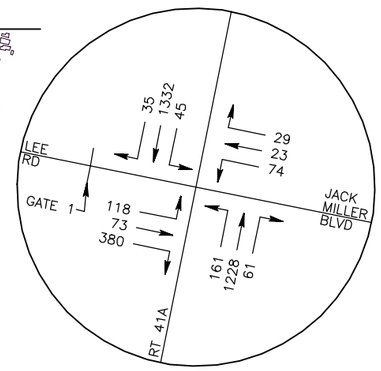

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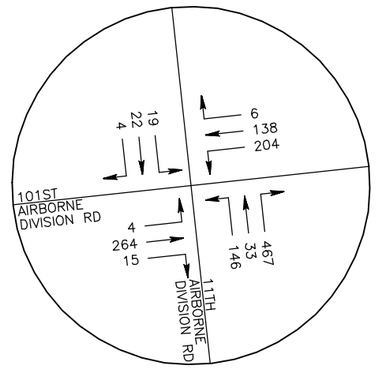

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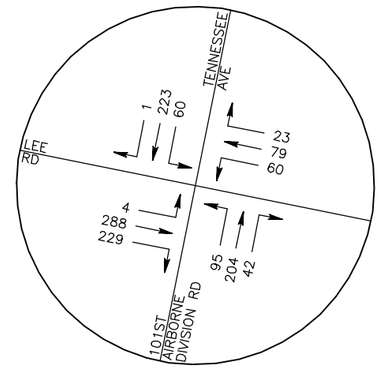

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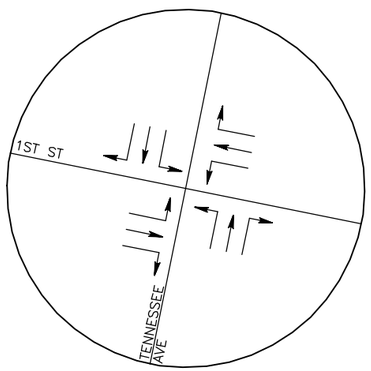

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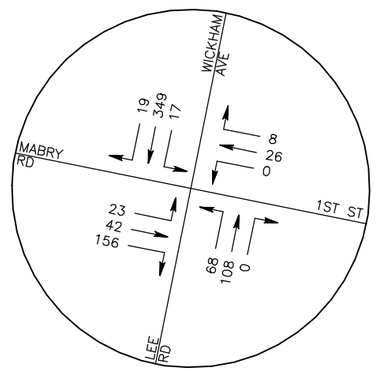

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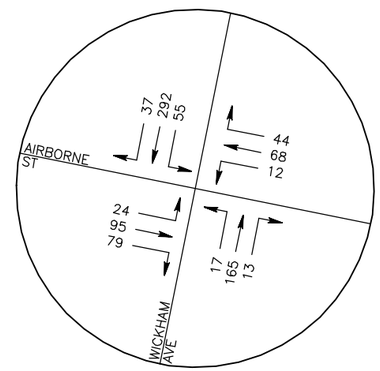

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4/4

EXHIBIT 3.19
EXISTING ADJUSTED MID-DAY PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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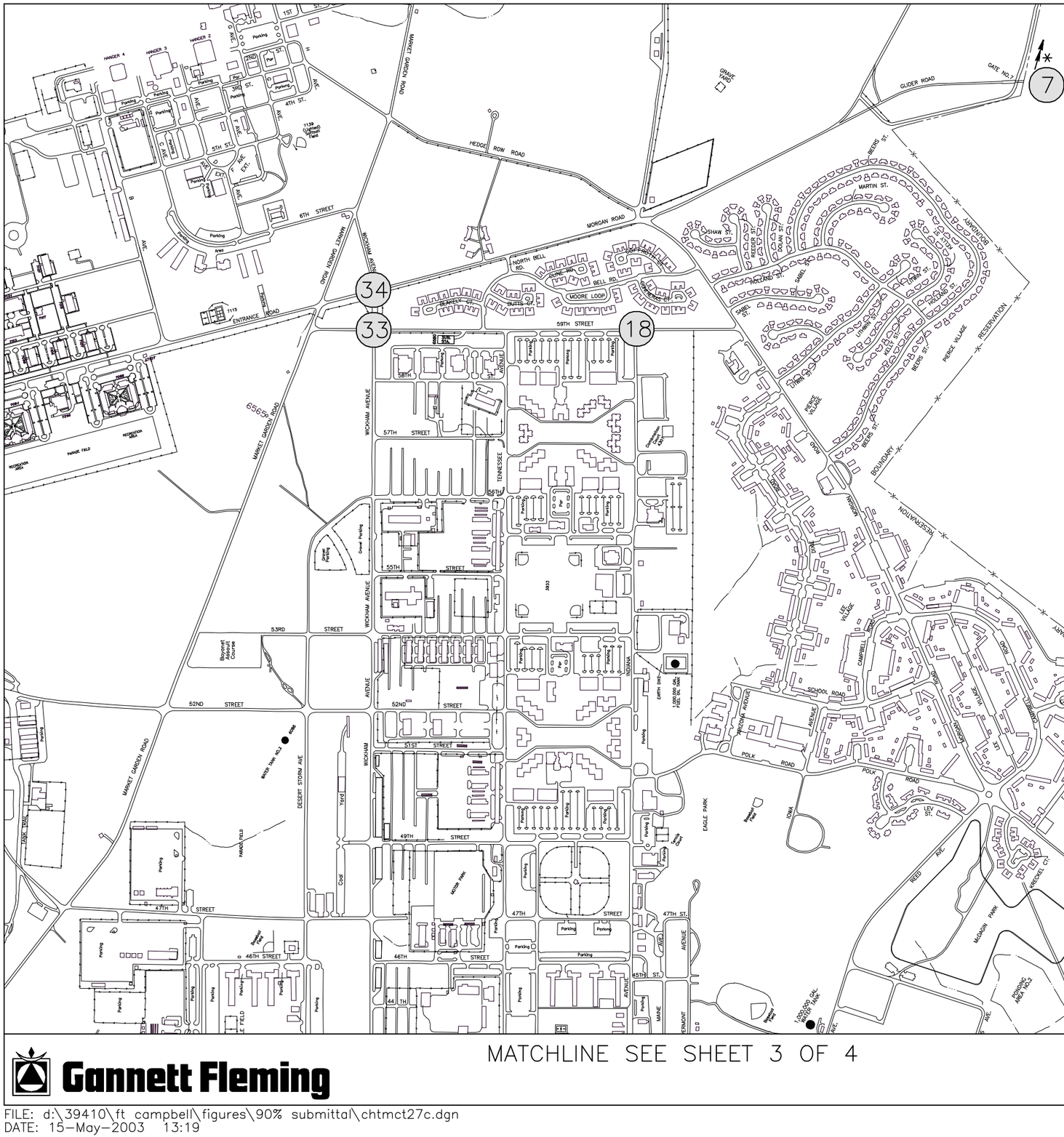

Gannett Fleming

EXHIBIT 3.20
EXISTING ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

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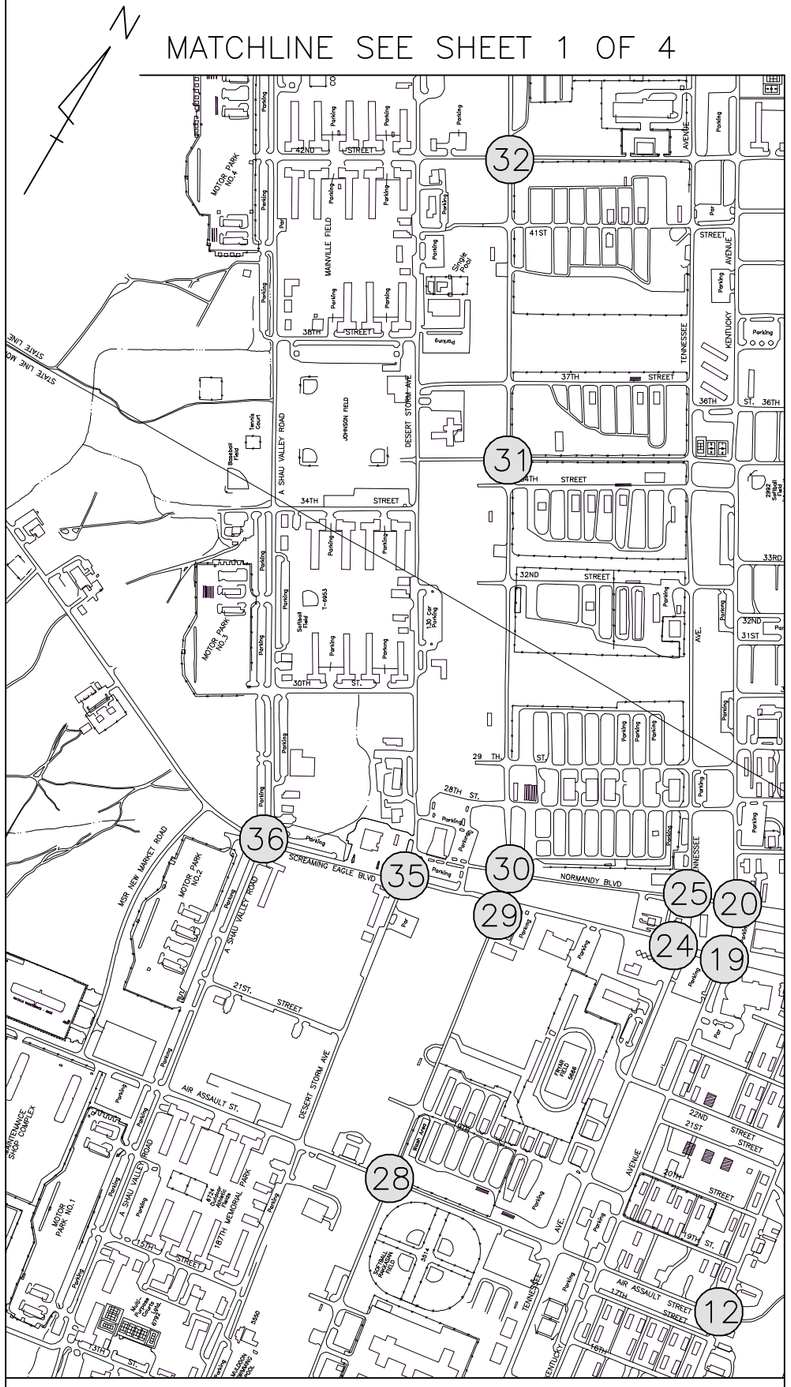

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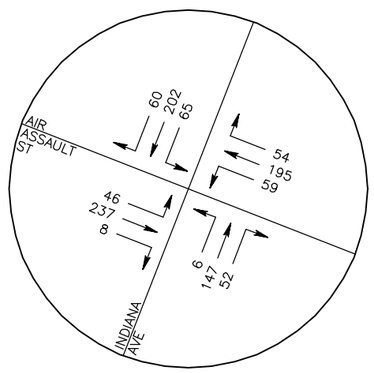

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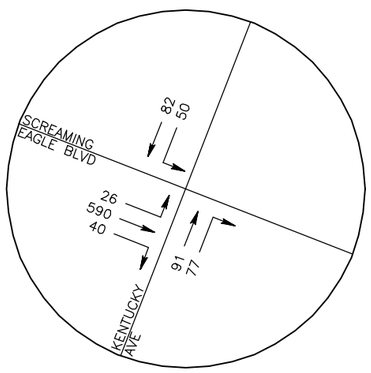

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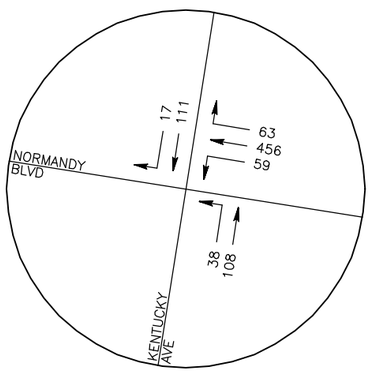

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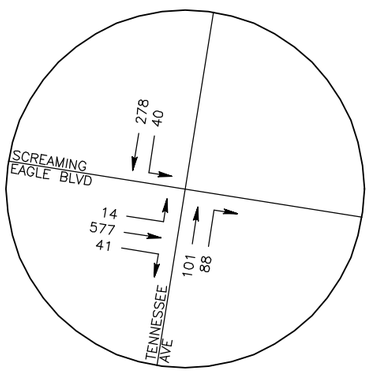

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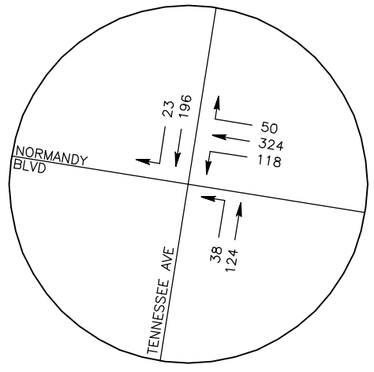

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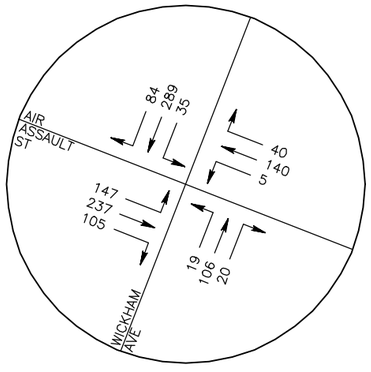

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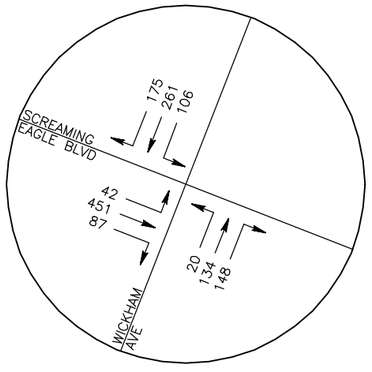

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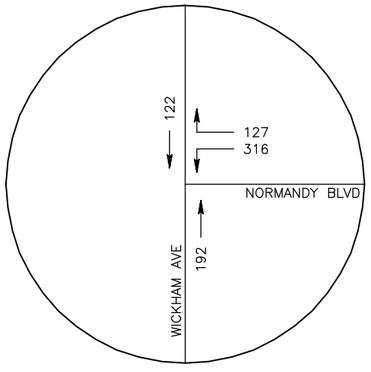

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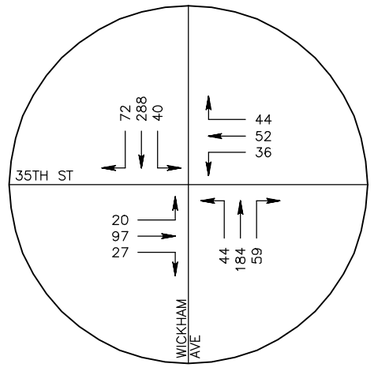

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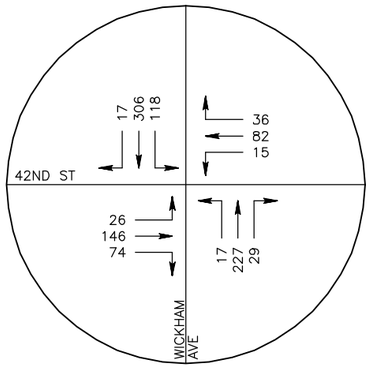

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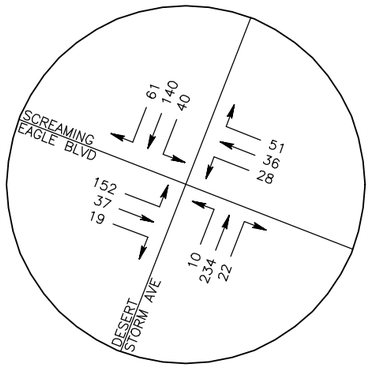

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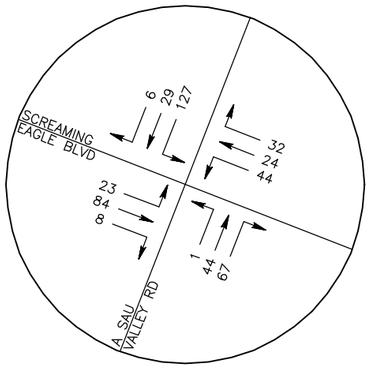

36

MATCHLINE SEE SHEET 4 OF 4

Gannett Fleming

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EXHIBIT 3.20
EXISTING ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

FILE: E:\39410\ft campbell\figures\90% submittal\chtmct28c.dgn
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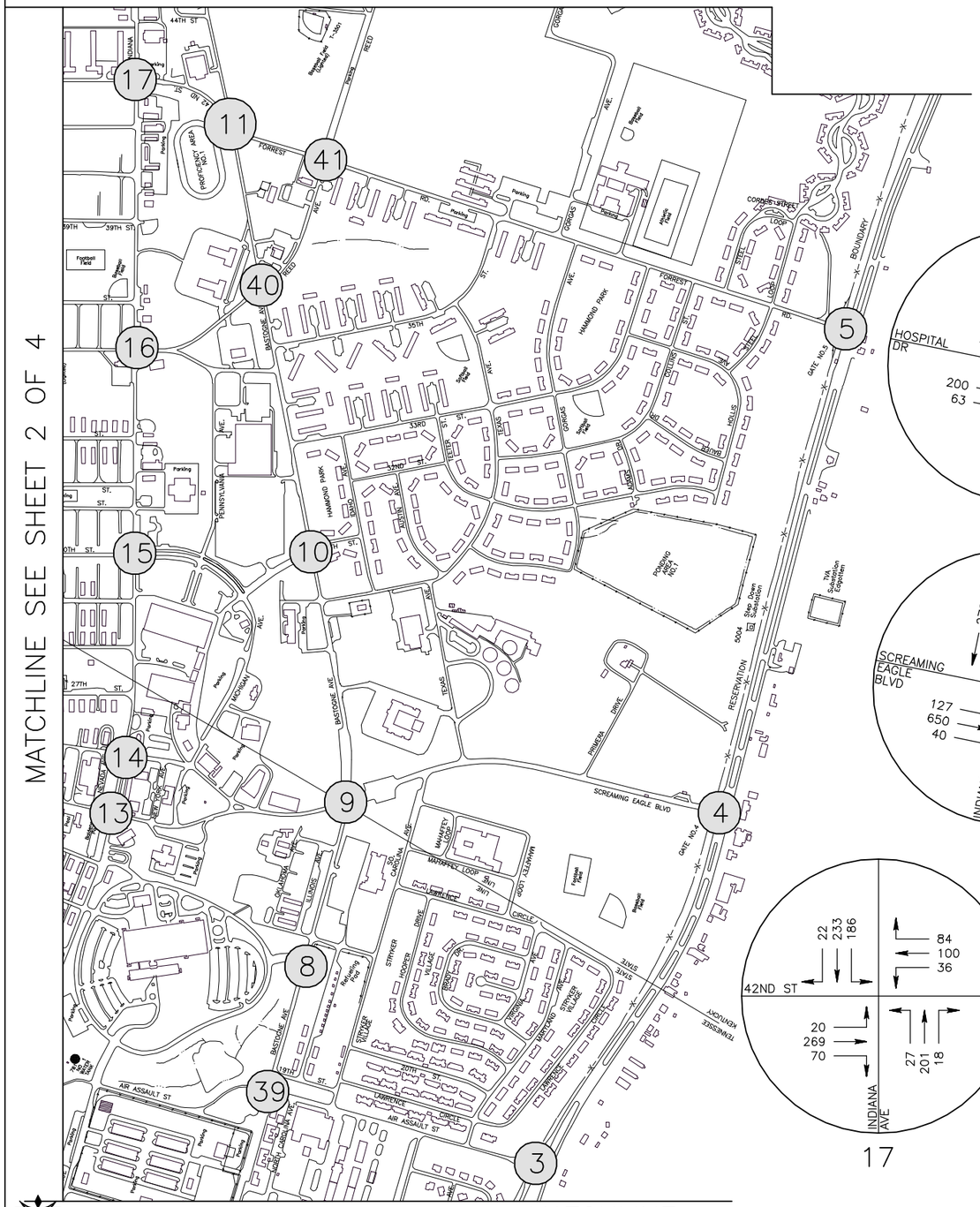

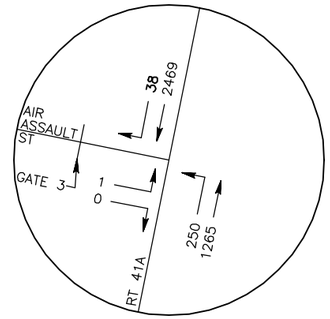

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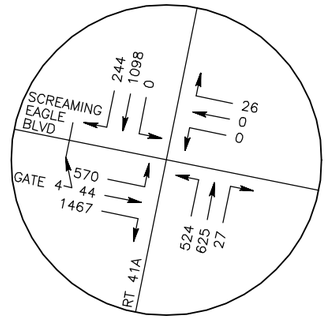

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GATE 5 NOT IN USE FOR INBOUND TRAFFIC

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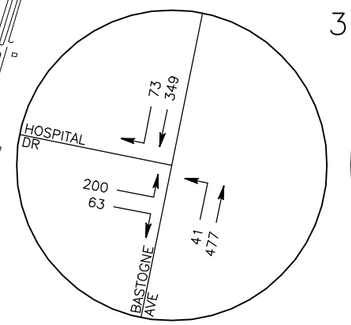

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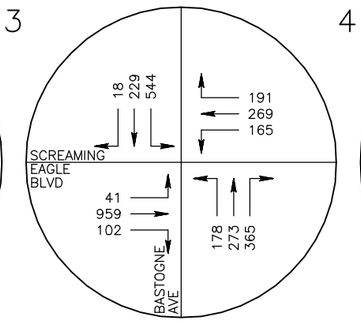

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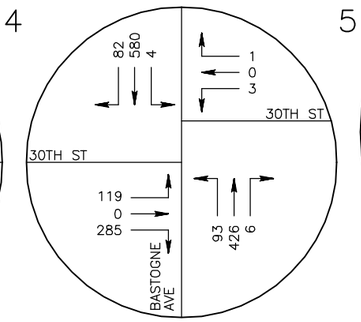

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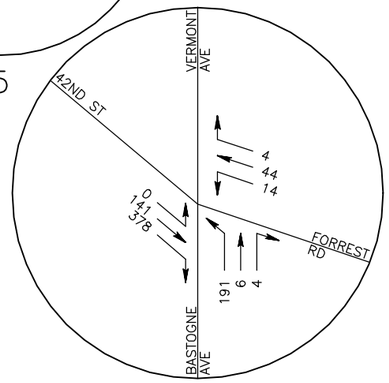

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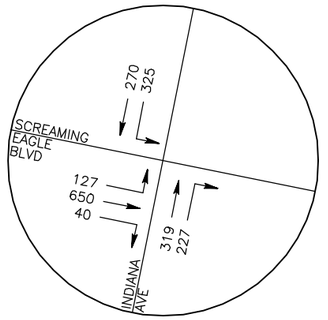

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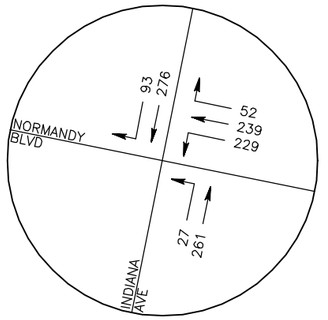

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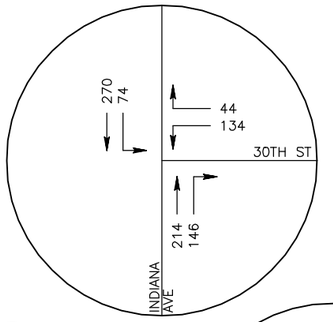

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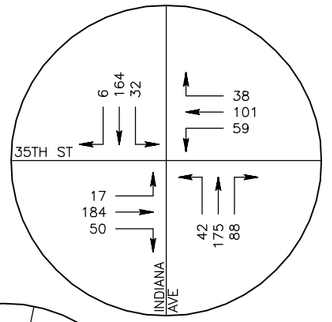

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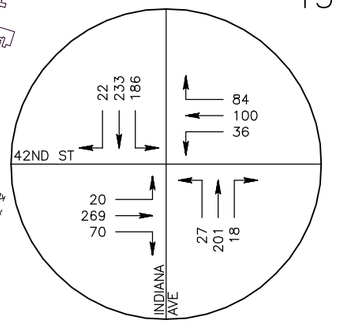

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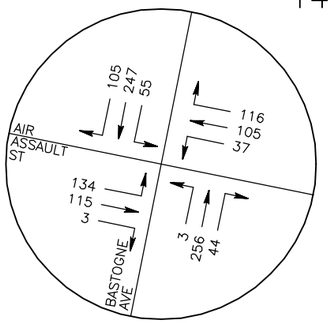

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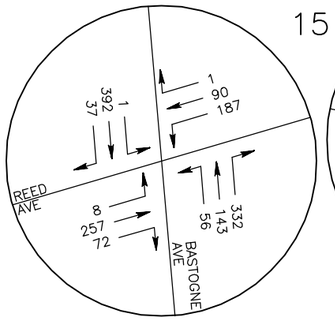

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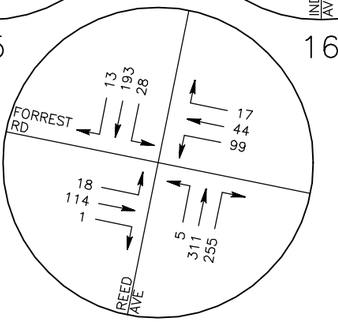

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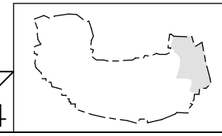

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EXHIBIT 3.20
EXISTING ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

MATCHLINE SEE SHEET 4 OF 4

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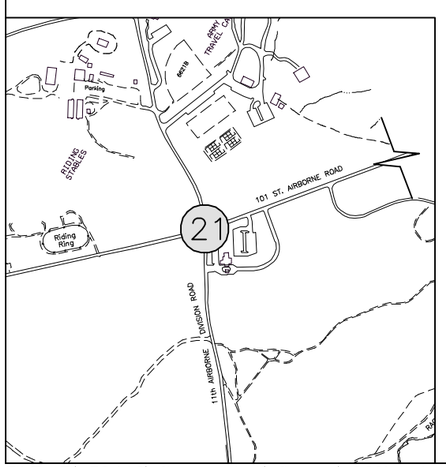
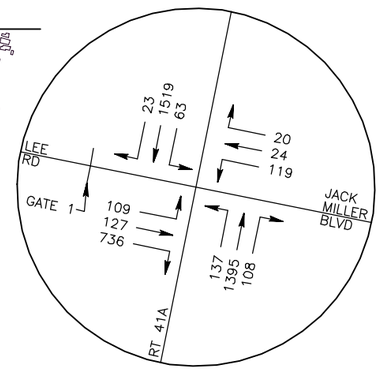
MATCHLINE SEE SHEET 3 OF 4





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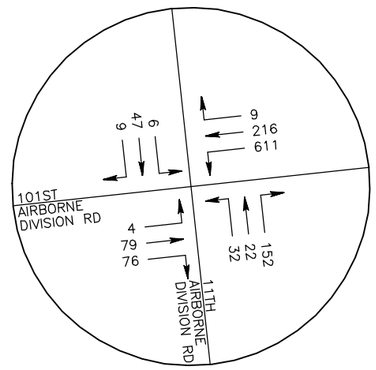

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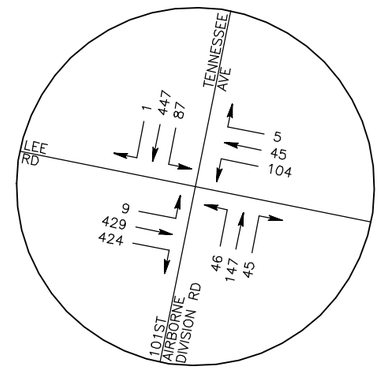

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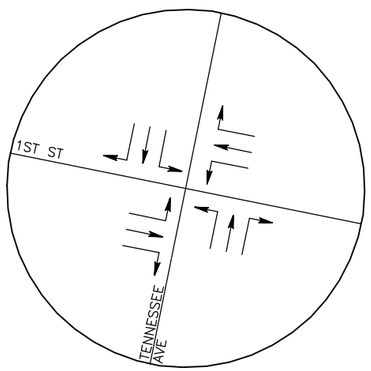

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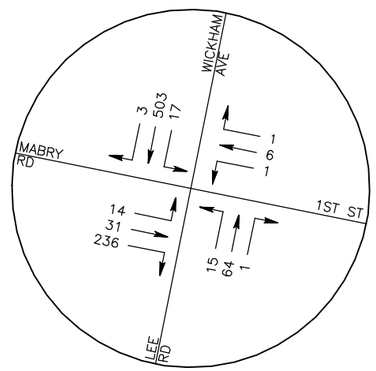

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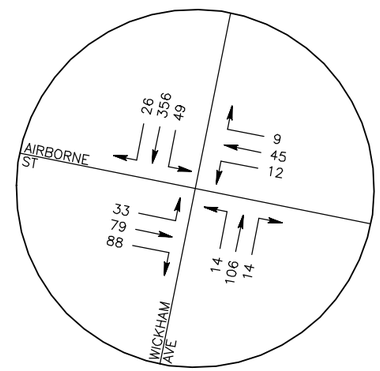

27

Gannett Fleming

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EXHIBIT 3.20
EXISTING ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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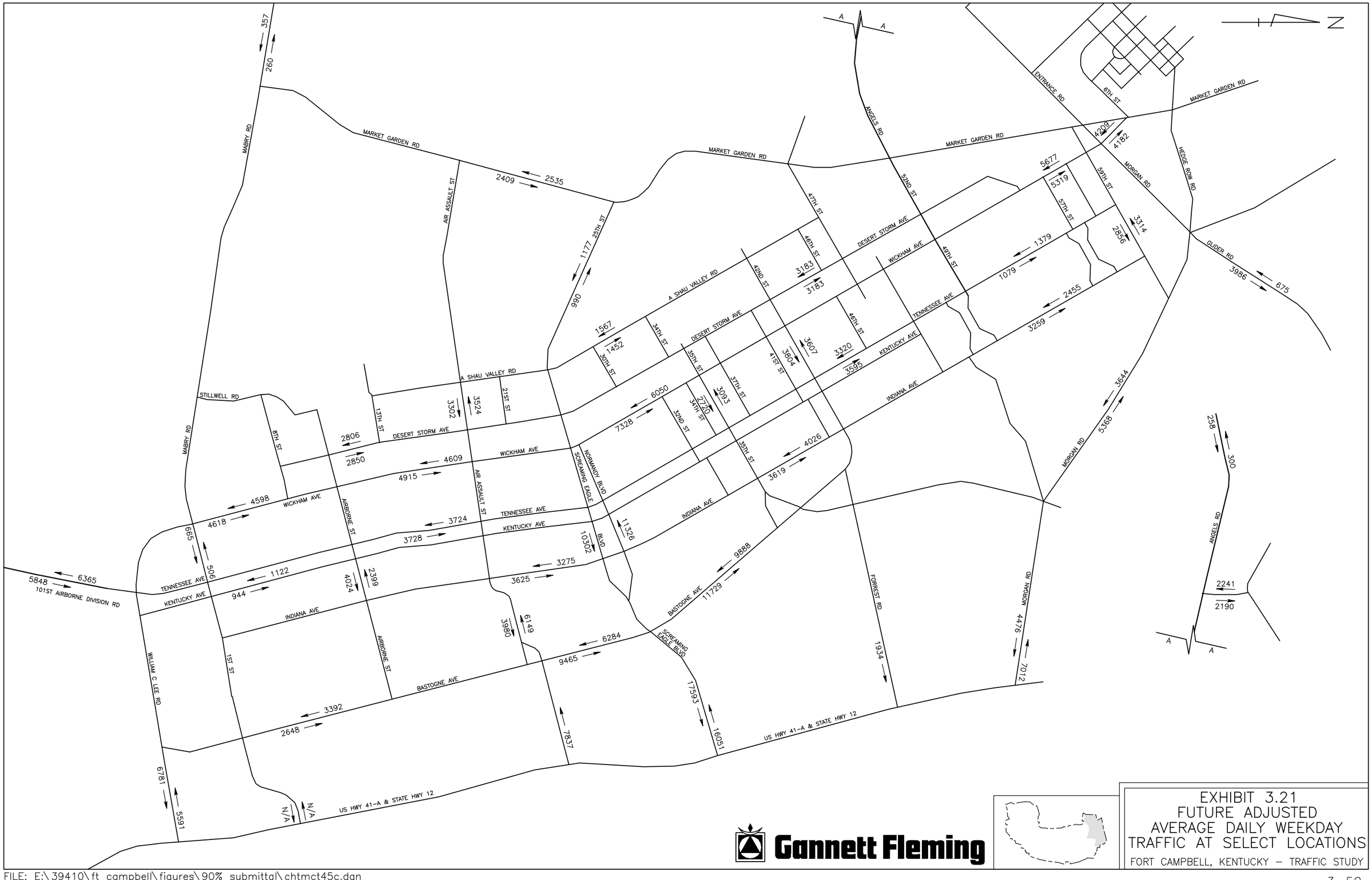

Gannett Fleming

EXHIBIT 3.21
FUTURE ADJUSTED AVERAGE DAILY WEEKDAY TRAFFIC AT SELECT LOCATIONS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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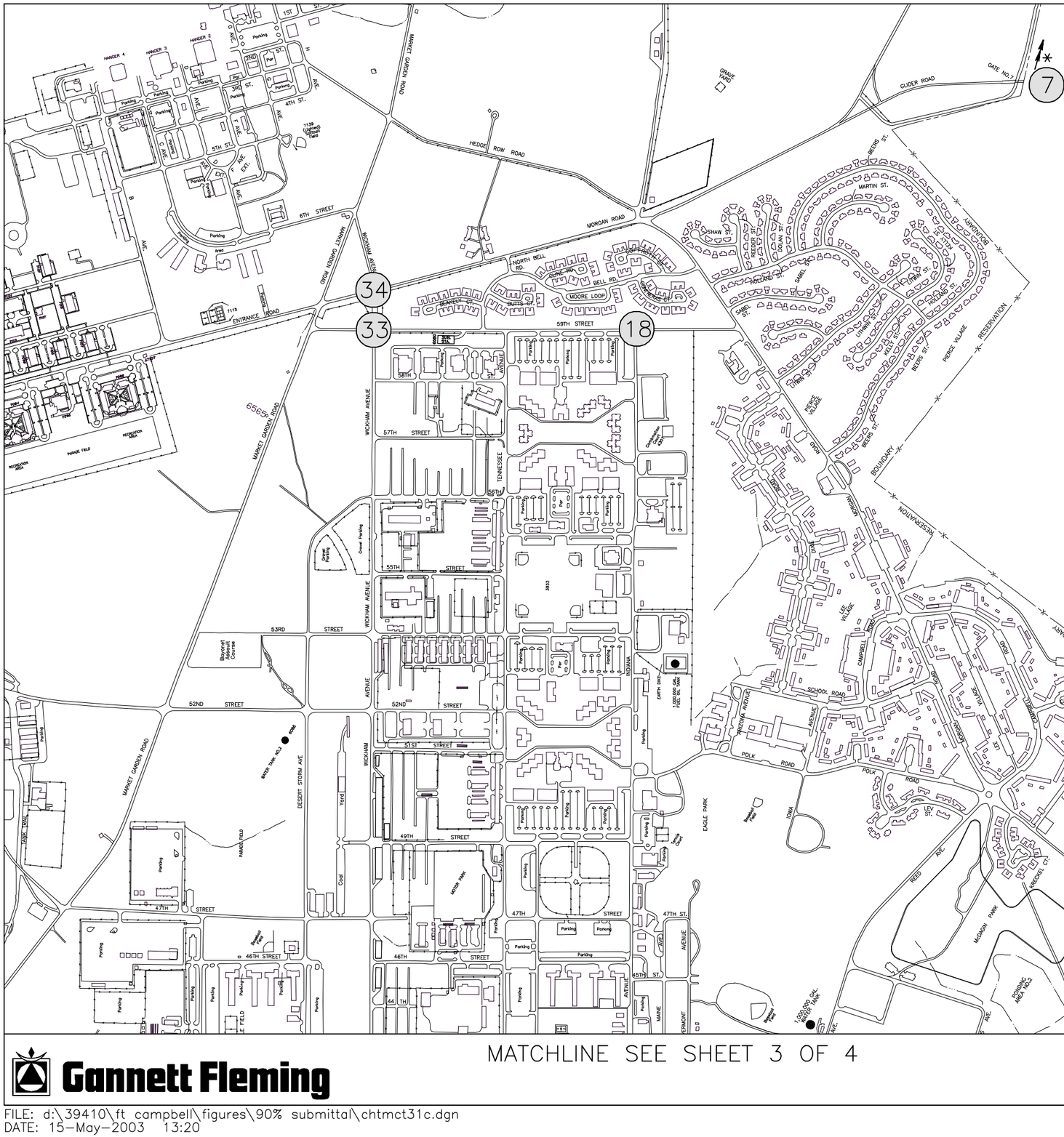

Gannett Fleming

EXHIBIT 3.22
FUTURE ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

FILE: d:\39410\ft campbell\figures\90% submittal\chtmct31c.dgn
DATE: 15-May-2003 13:20

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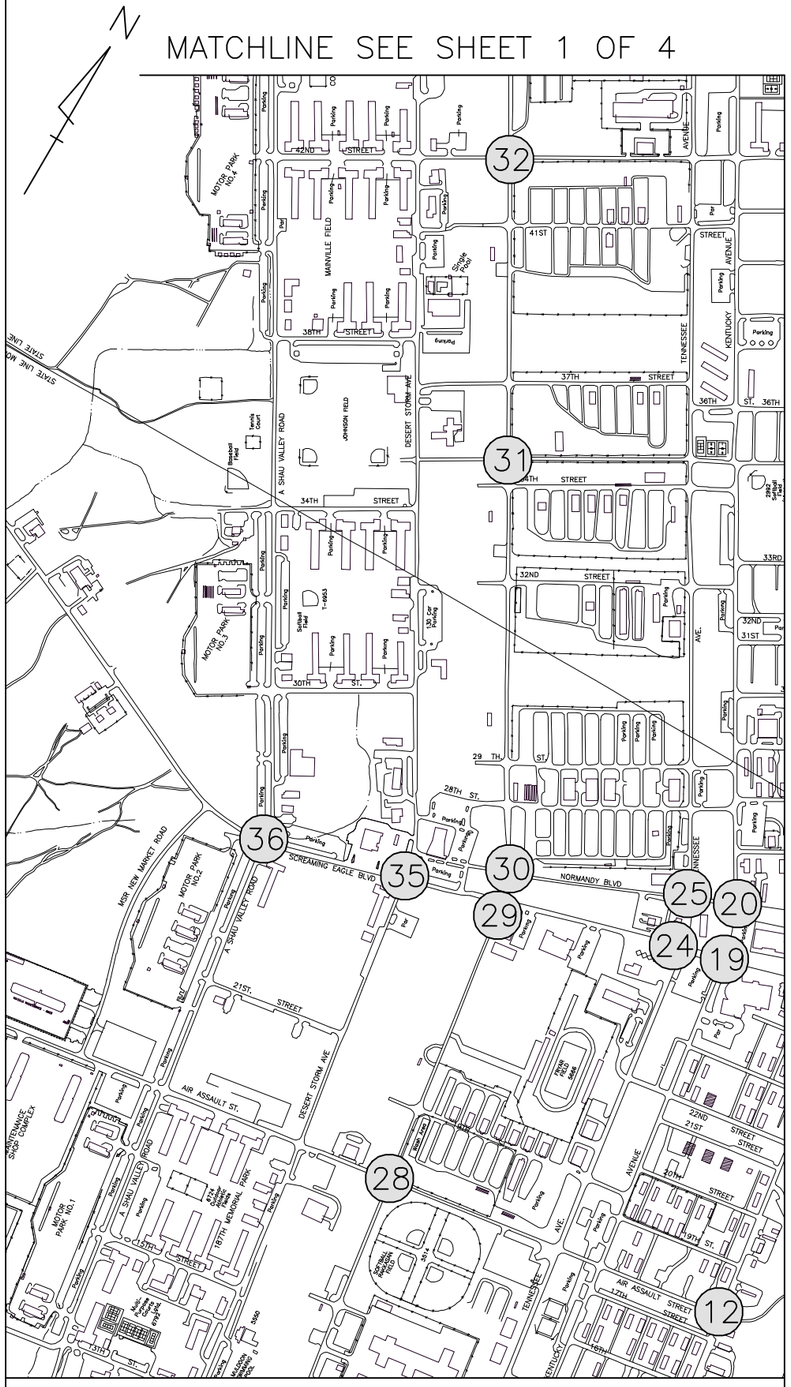

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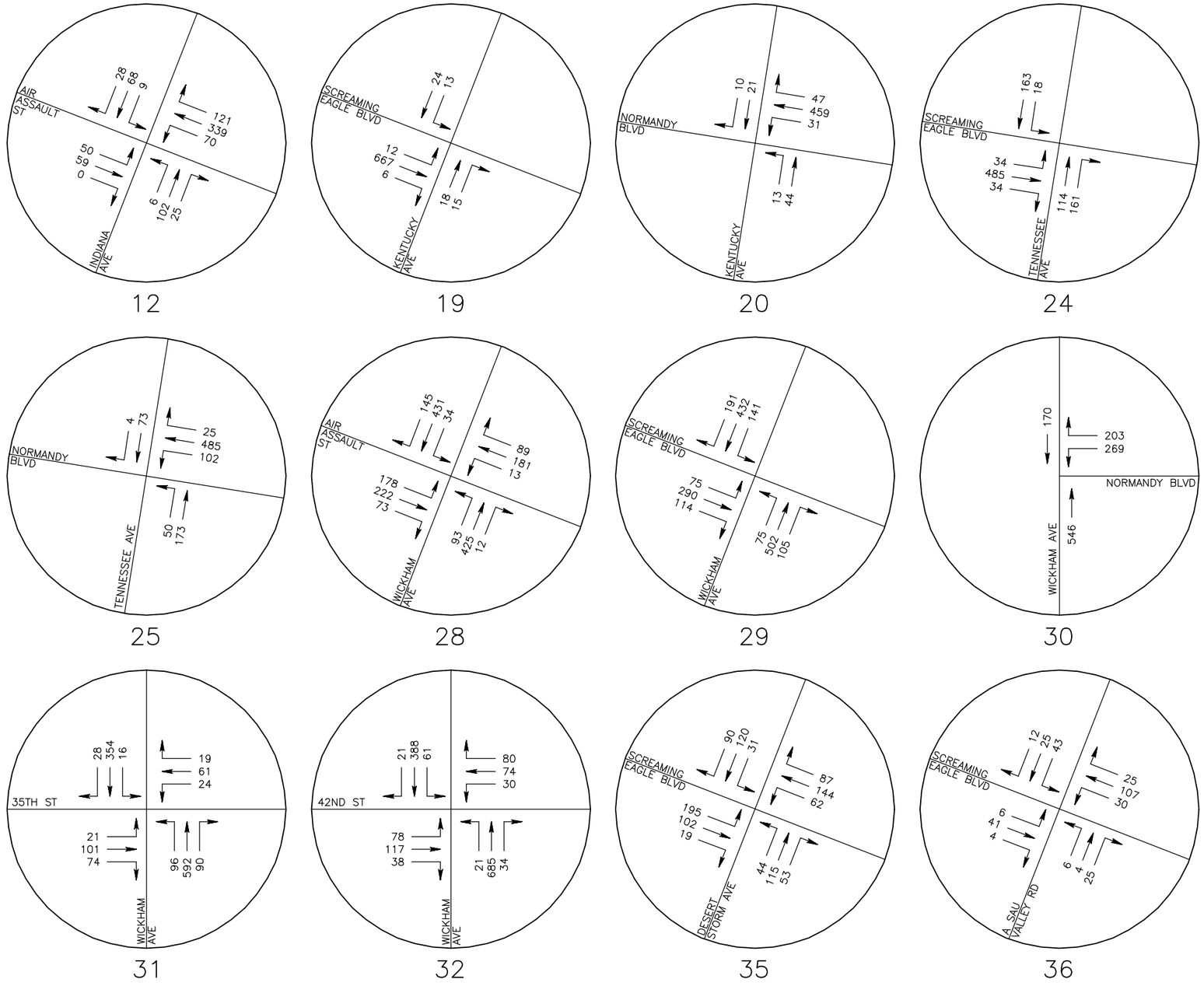

MATCHLINE SEE SHEET 4 OF 4

Gannett Fleming

2/4

EXHIBIT 3.22
FUTURE ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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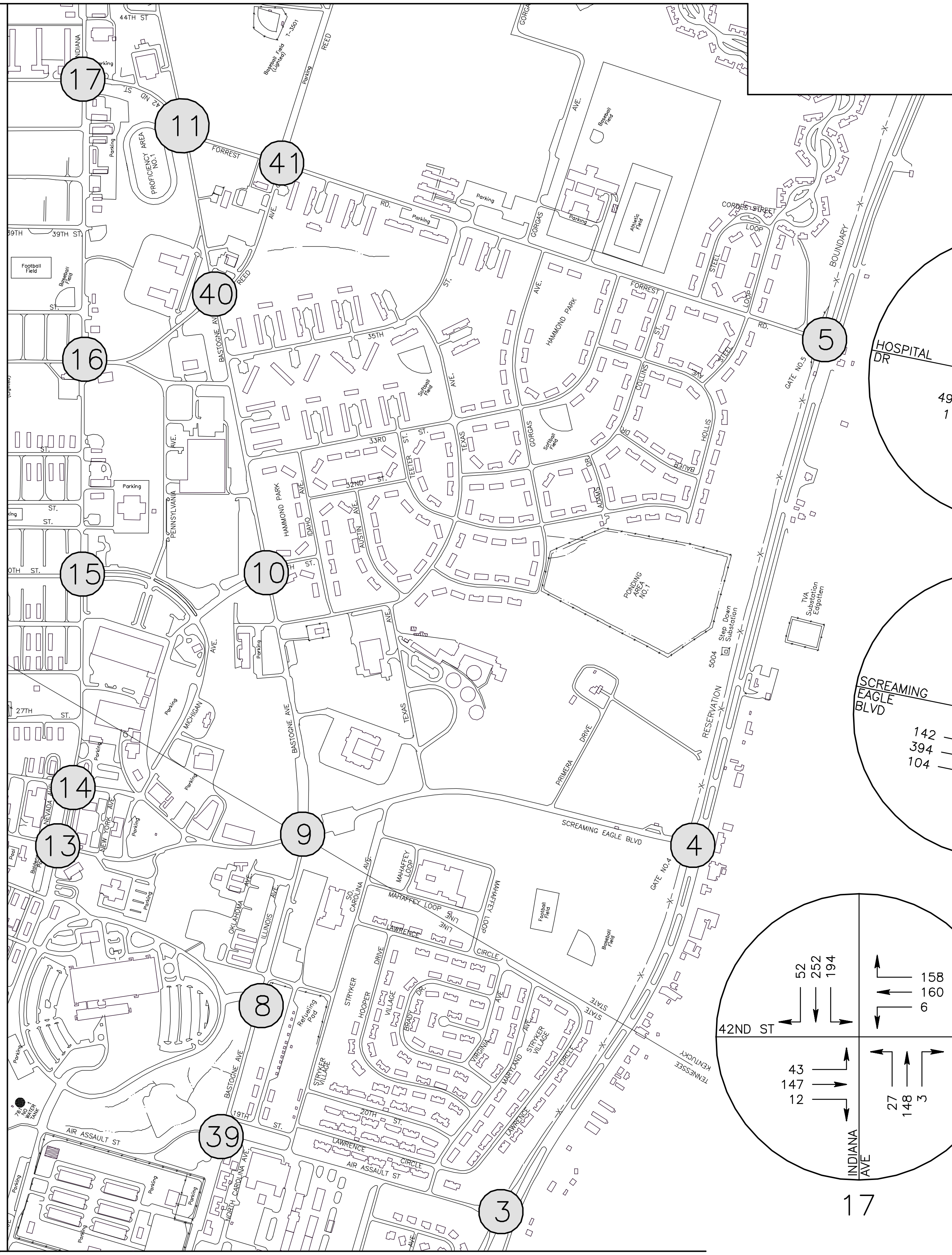
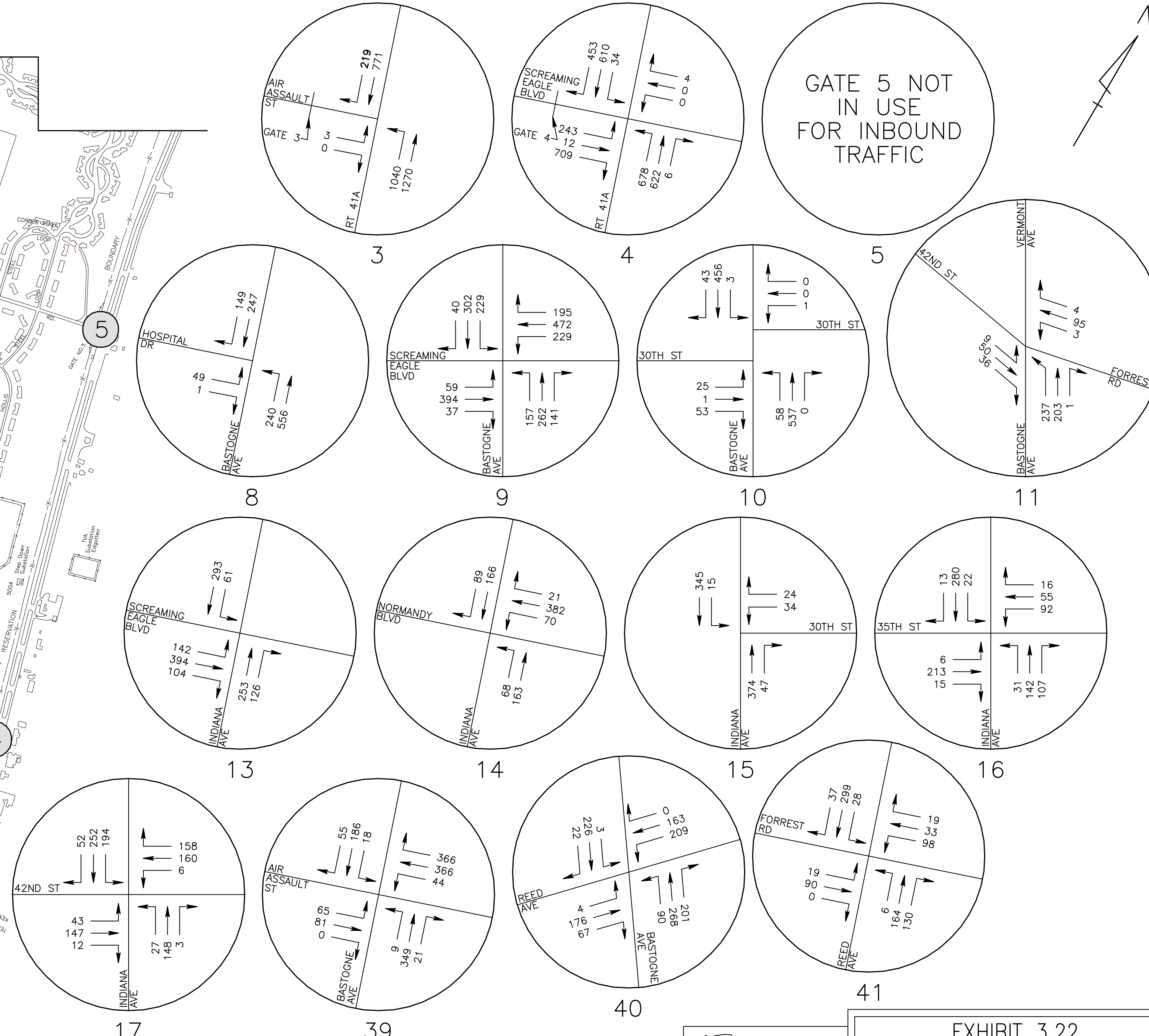
MATCHLINE SEE SHEET 2 OF 4





Gannett Fleming

MATCHLINE
SEE SHEET 4 OF 4

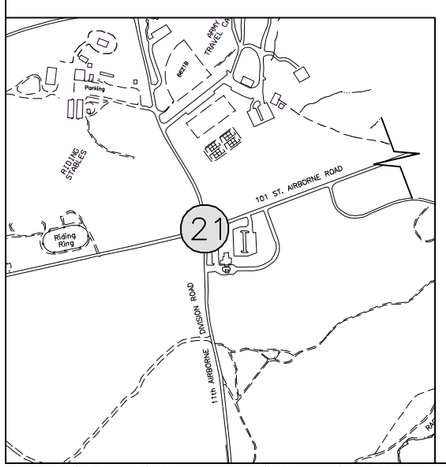
3/4

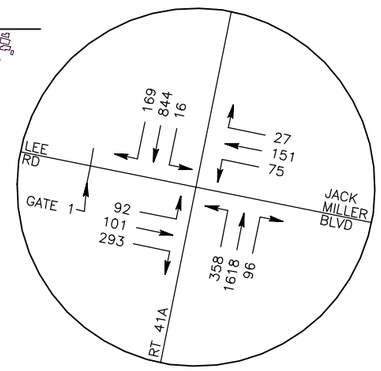
EXHIBIT 3.22
FUTURE ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

FILE: E:\39410\ft campbell\figures\90% submittal\chtmct33c.dgn
DATE: 09–Oct–2003 09:44

MATCHLINE SEE SHEET 3 OF 4





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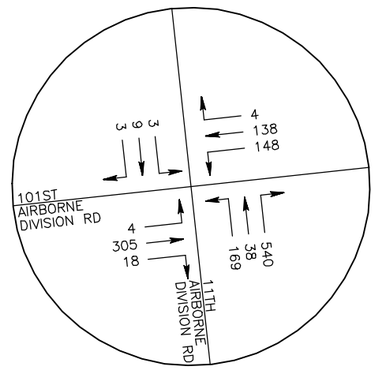

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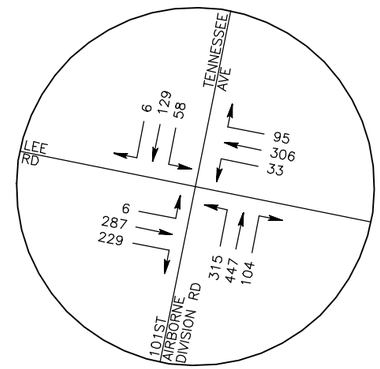

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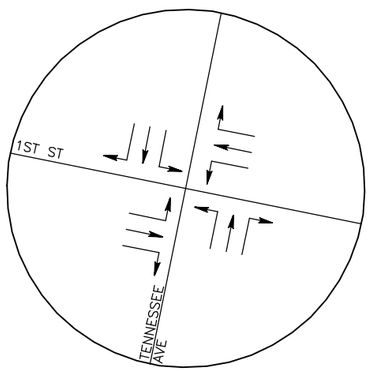

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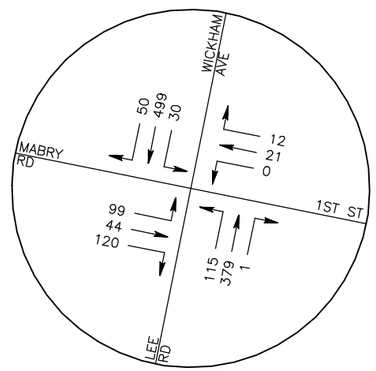

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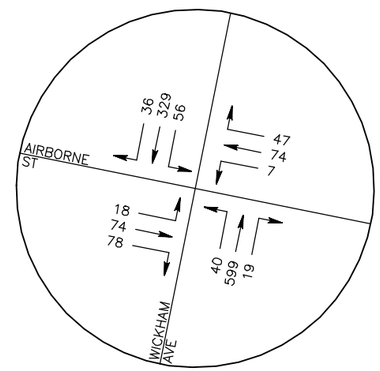

27

Gannett Fleming

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EXHIBIT 3.22
FUTURE ADJUSTED MORNING PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

FILE: D:\39410\ft campbell\figures\50% submittal\chtmct34b.dgn
DATE: 23-Aug-2002 10:58

MATCHLINE SEE SHEET 3 OF 4

Gannett Fleming

EXHIBIT 3.23
FUTURE ADJUSTED MID-DAY PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

FILE: d:\39410\ft campbell\figures\90% submittal\chtmct35c.dgn
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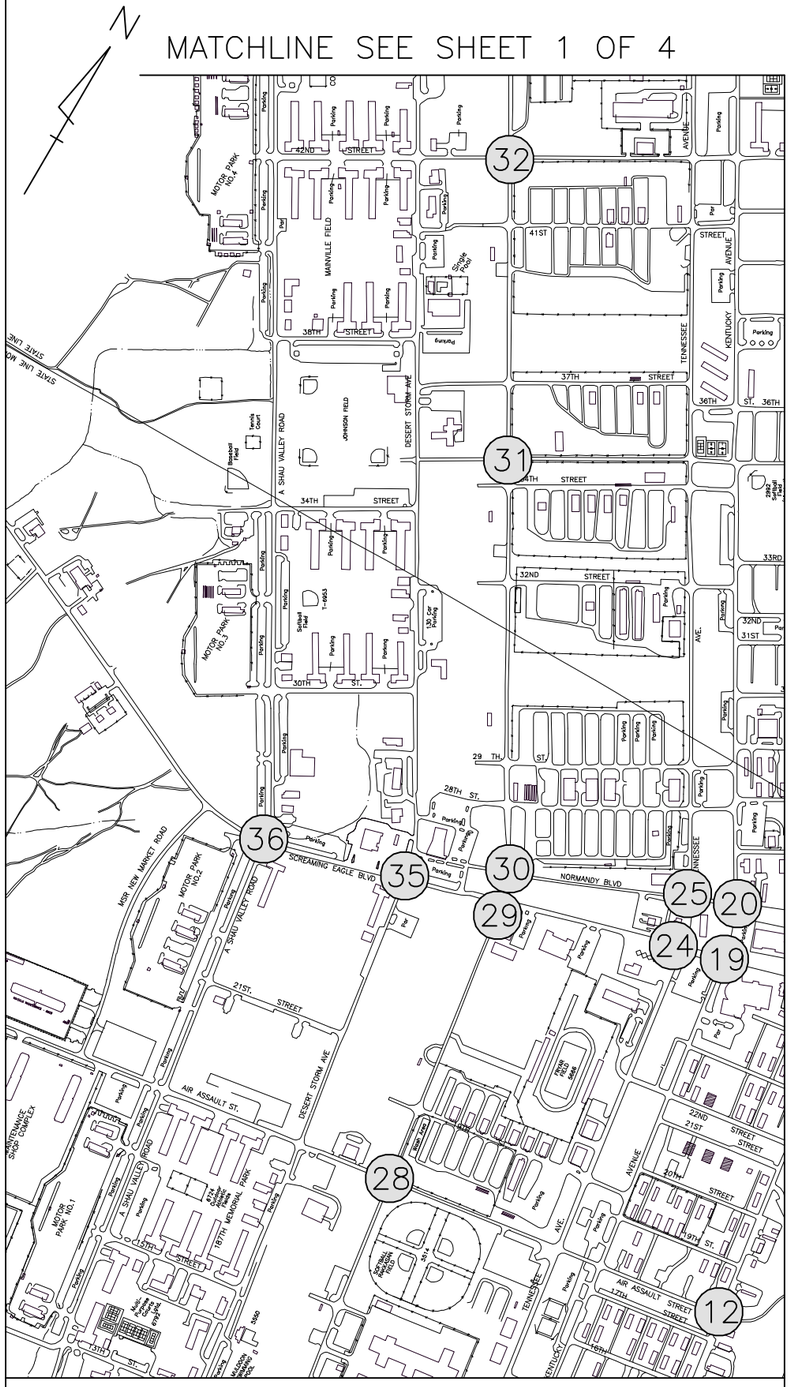
MATCHLINE SEE SHEET 1 OF 4



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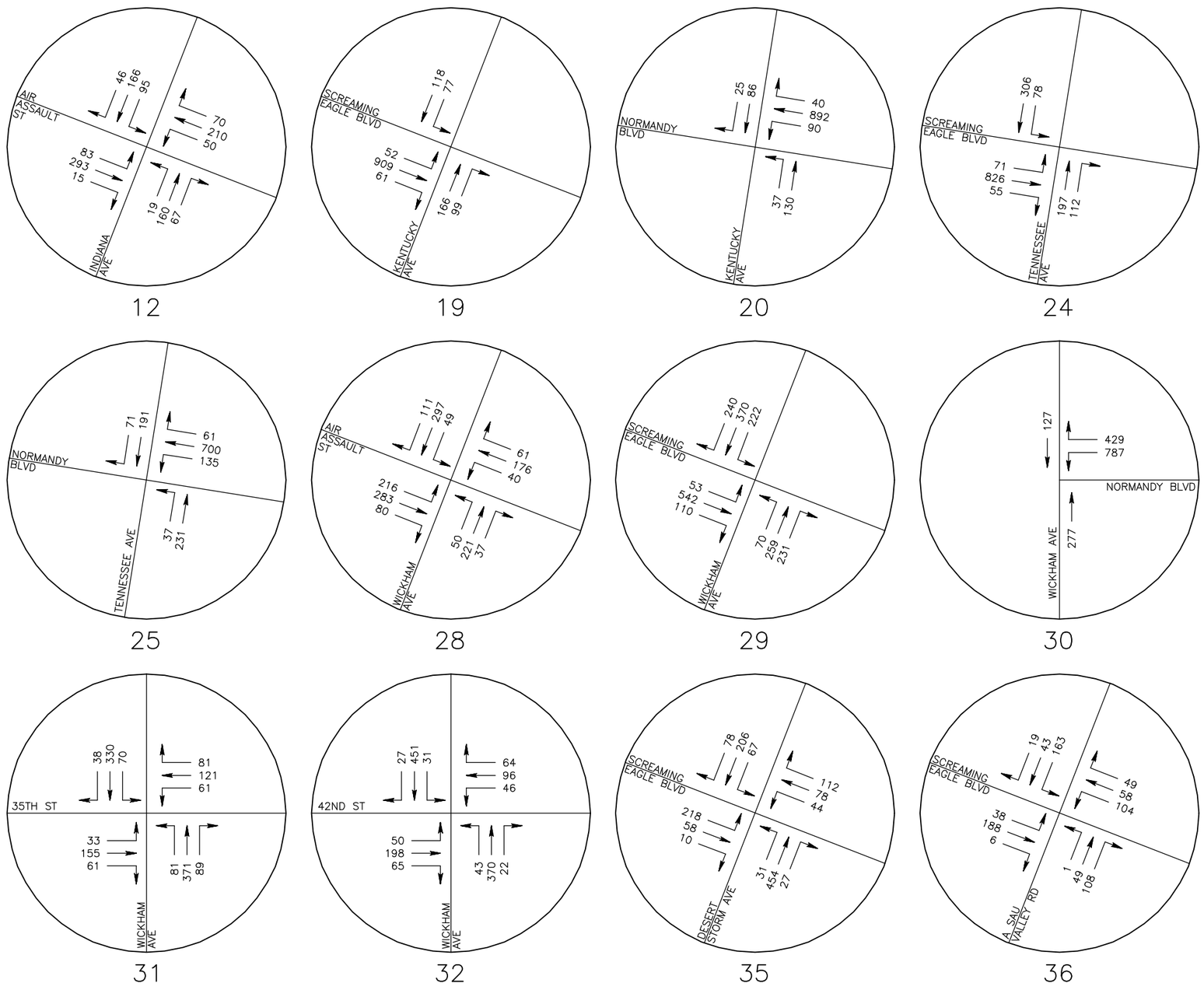

MATCHLINE SEE SHEET 4 OF 4

Gannett Fleming

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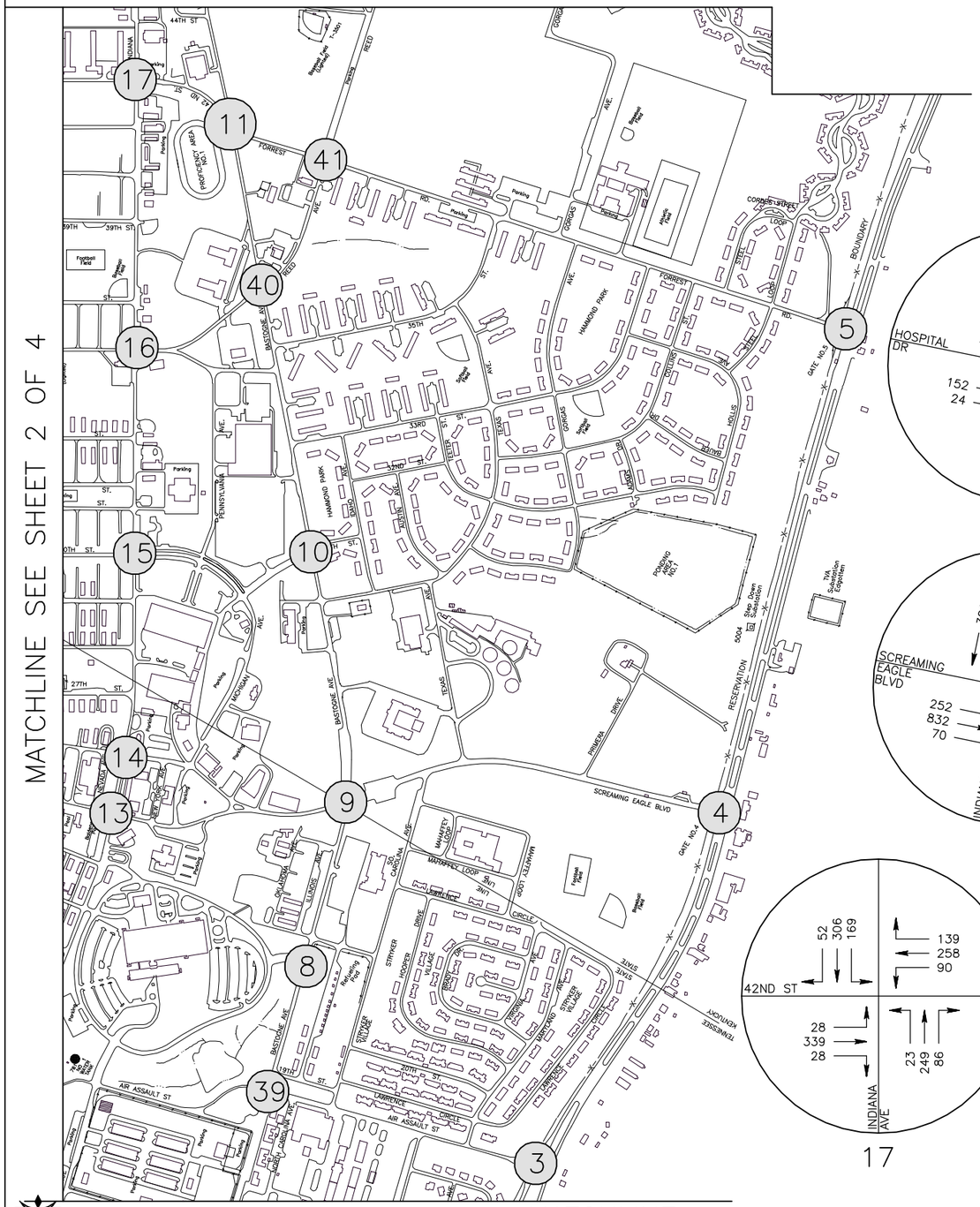
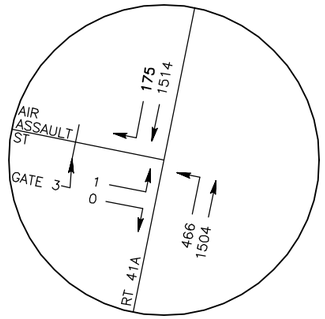
EXHIBIT 3.23
FUTURE ADJUSTED MID-DAY
PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

FILE: D:\39410\ft campbell\figures\50% submittal\chtmct36b.dgn
DATE: 23-Aug-2002 10:59

MATCHLINE SEE SHEET 1 OF 4

MATCHLINE SEE SHEET 2 OF 4





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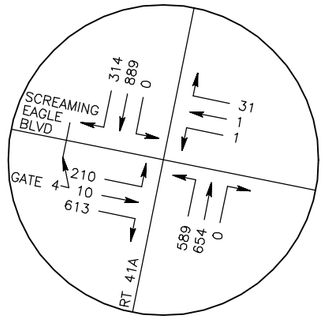

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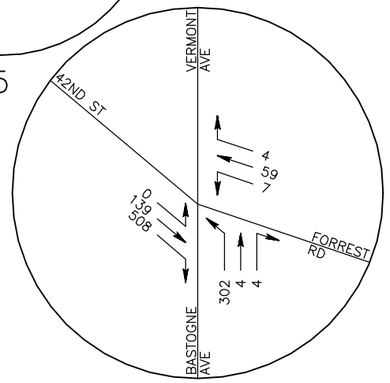
GATE 5 NOT IN USE FOR INBOUND TRAFFIC

5



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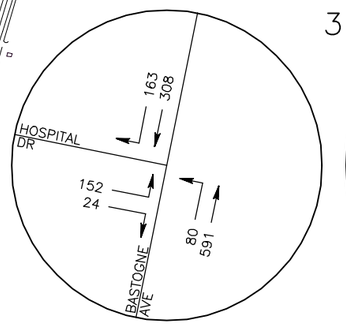

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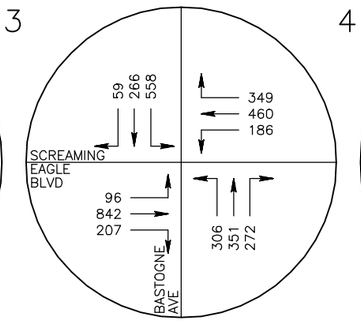

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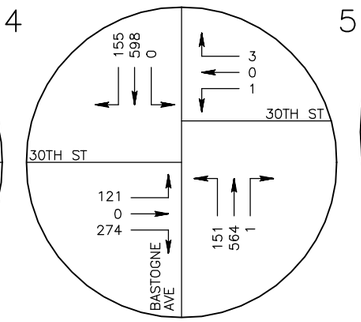

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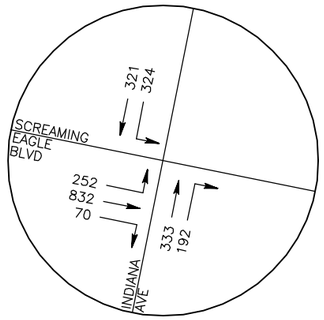

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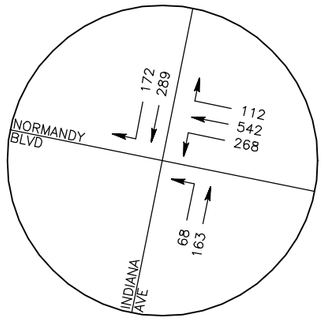

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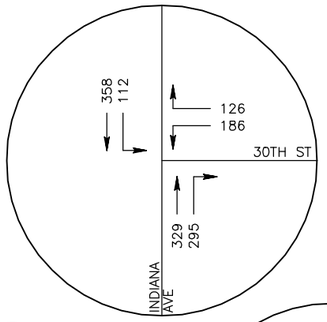

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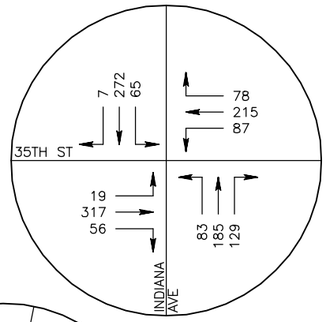

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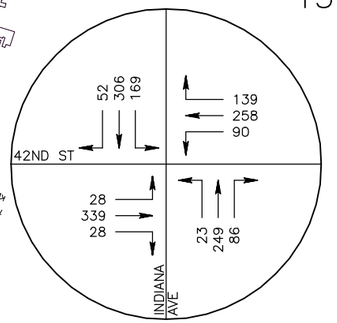

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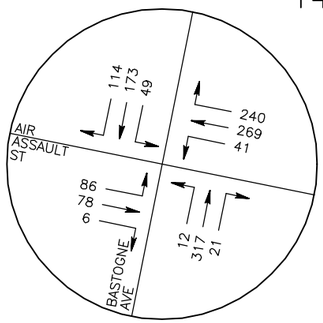

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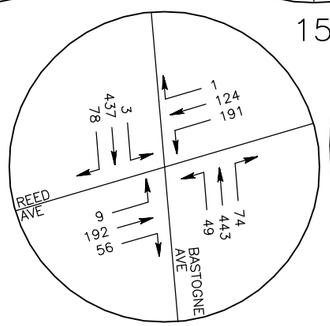

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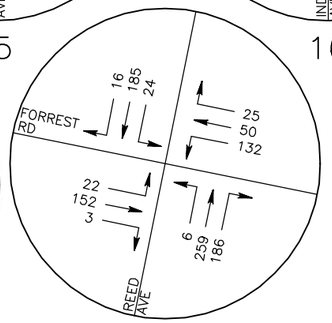

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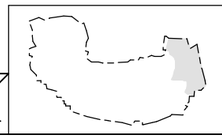

3/4

EXHIBIT 3.23
FUTURE ADJUSTED MID-DAY PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

MATCHLINE SEE SHEET 4 OF 4

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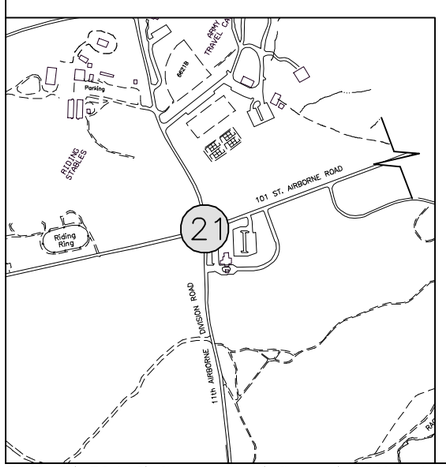

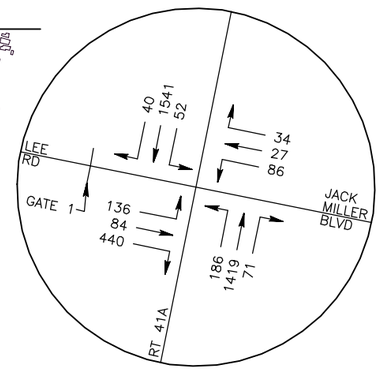

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GATE 2
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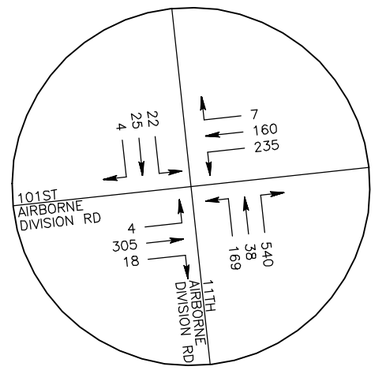
2



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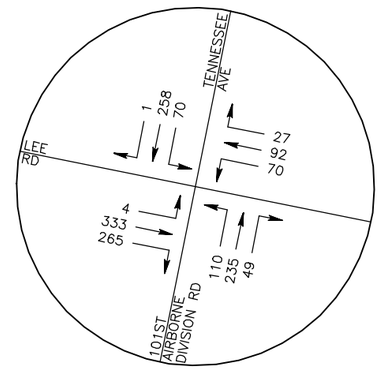

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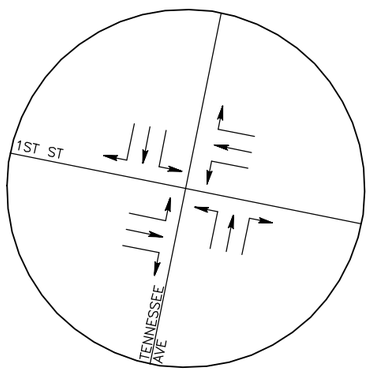

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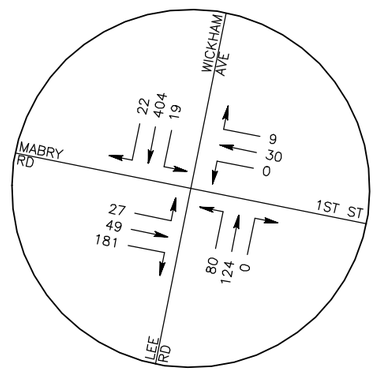

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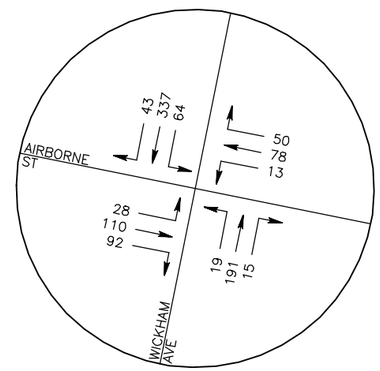

27

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EXHIBIT 3.23
FUTURE ADJUSTED MID-DAY PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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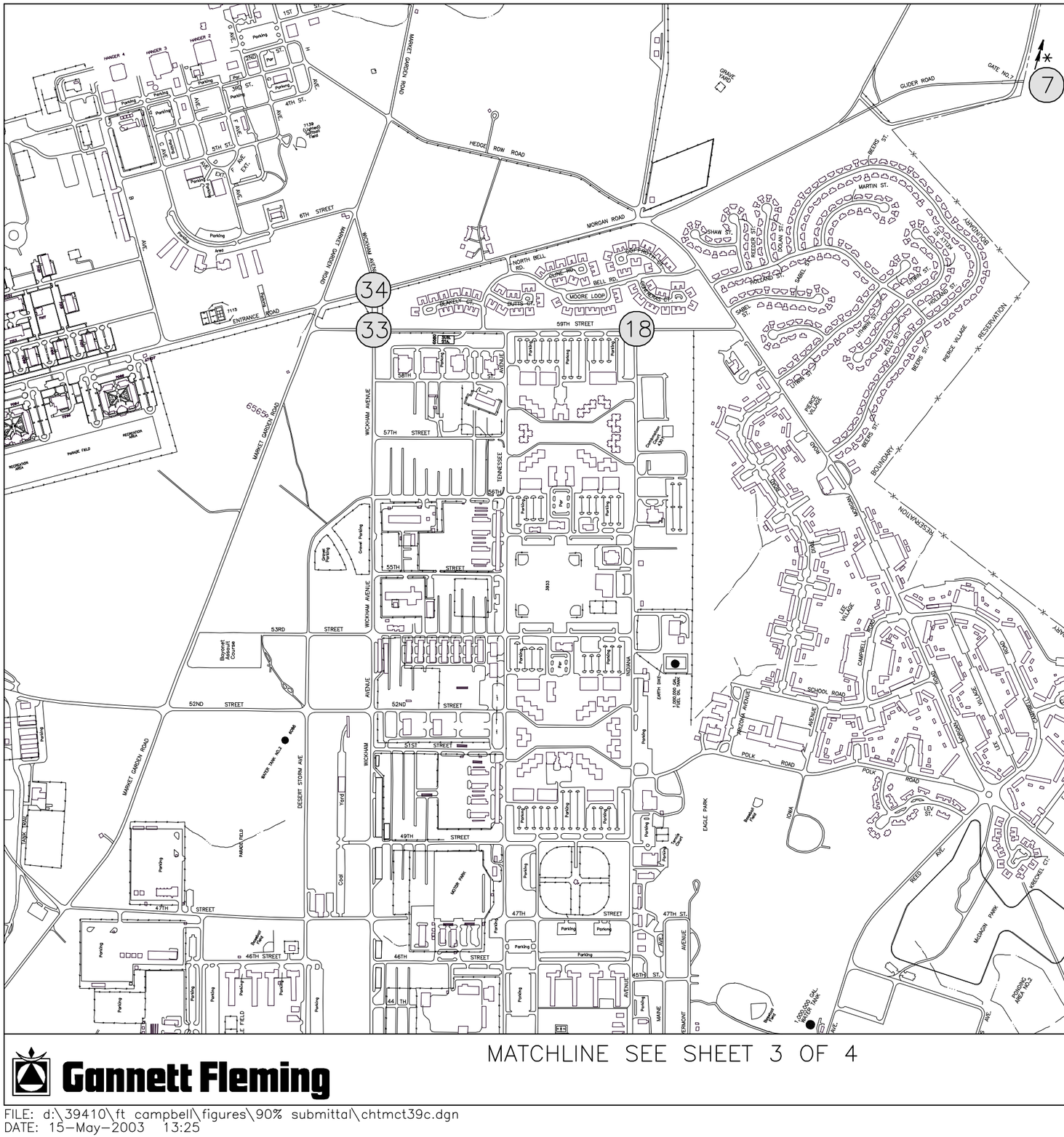

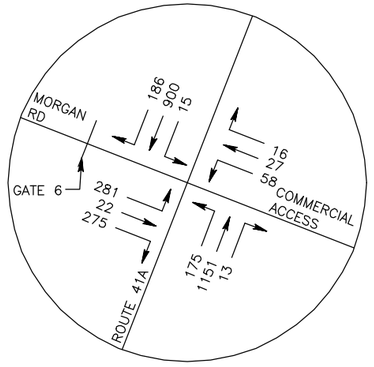

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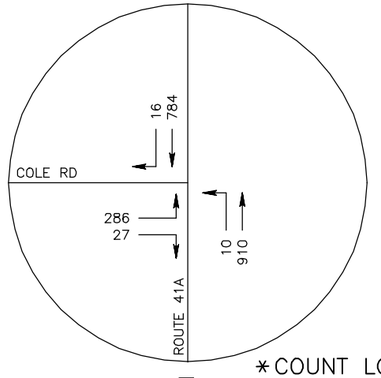

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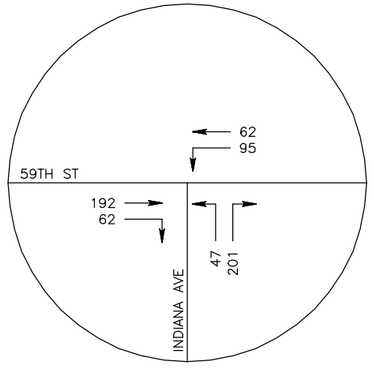
* COUNT LOCATION IS WHERE RT 41A AND COLE RD INTERSECT



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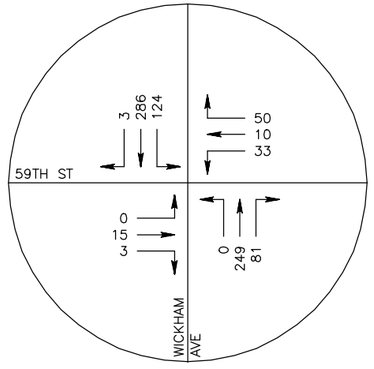

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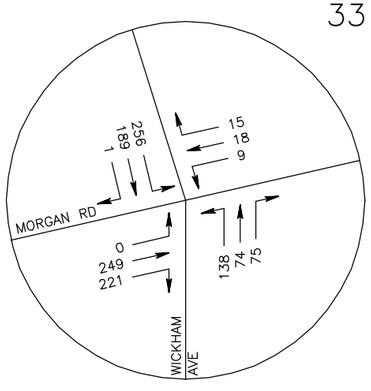

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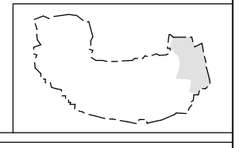

MATCHLINE SEE SHEET 3 OF 4

Gannett Fleming

EXHIBIT 3.24
FUTURE ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

1/4

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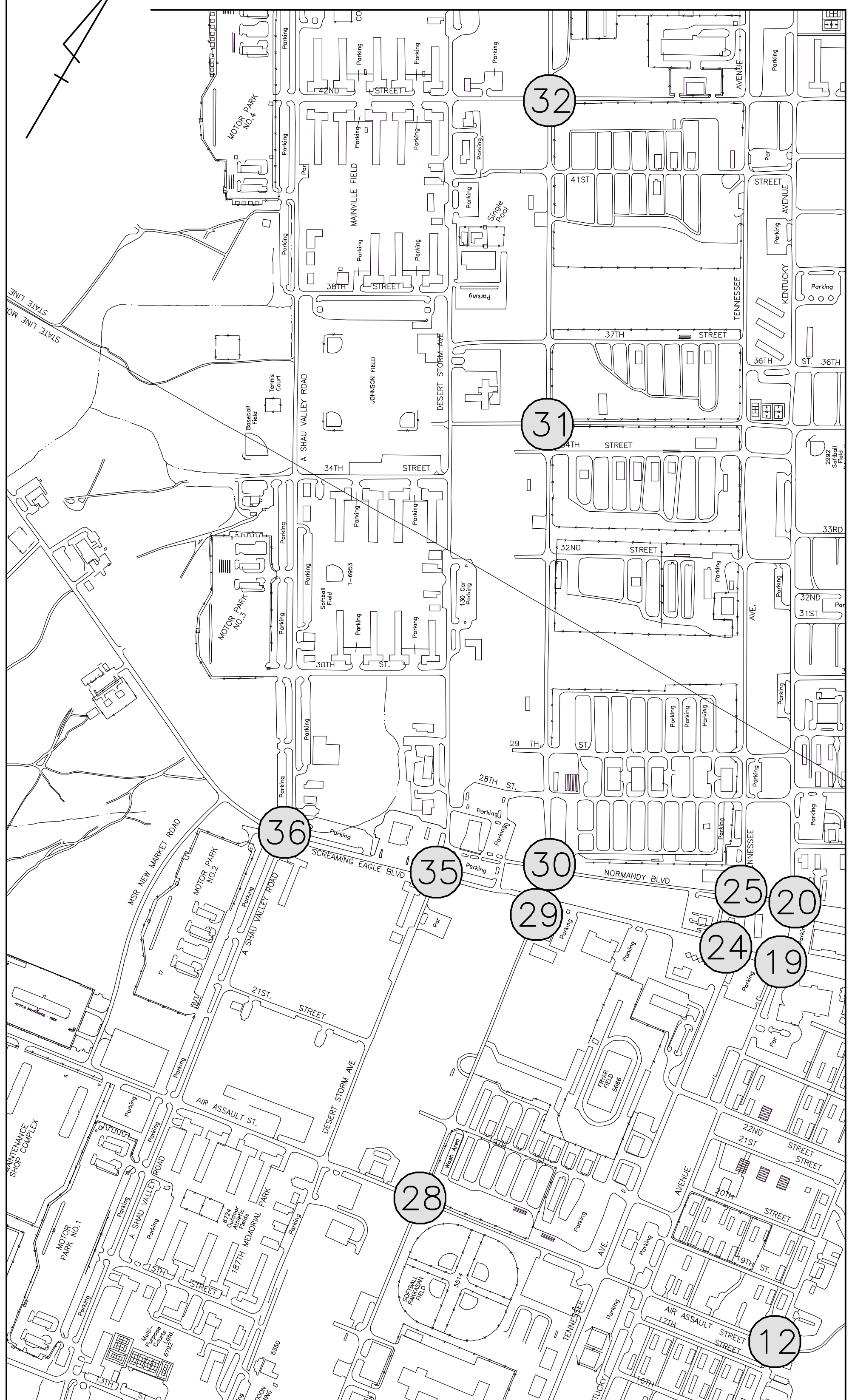

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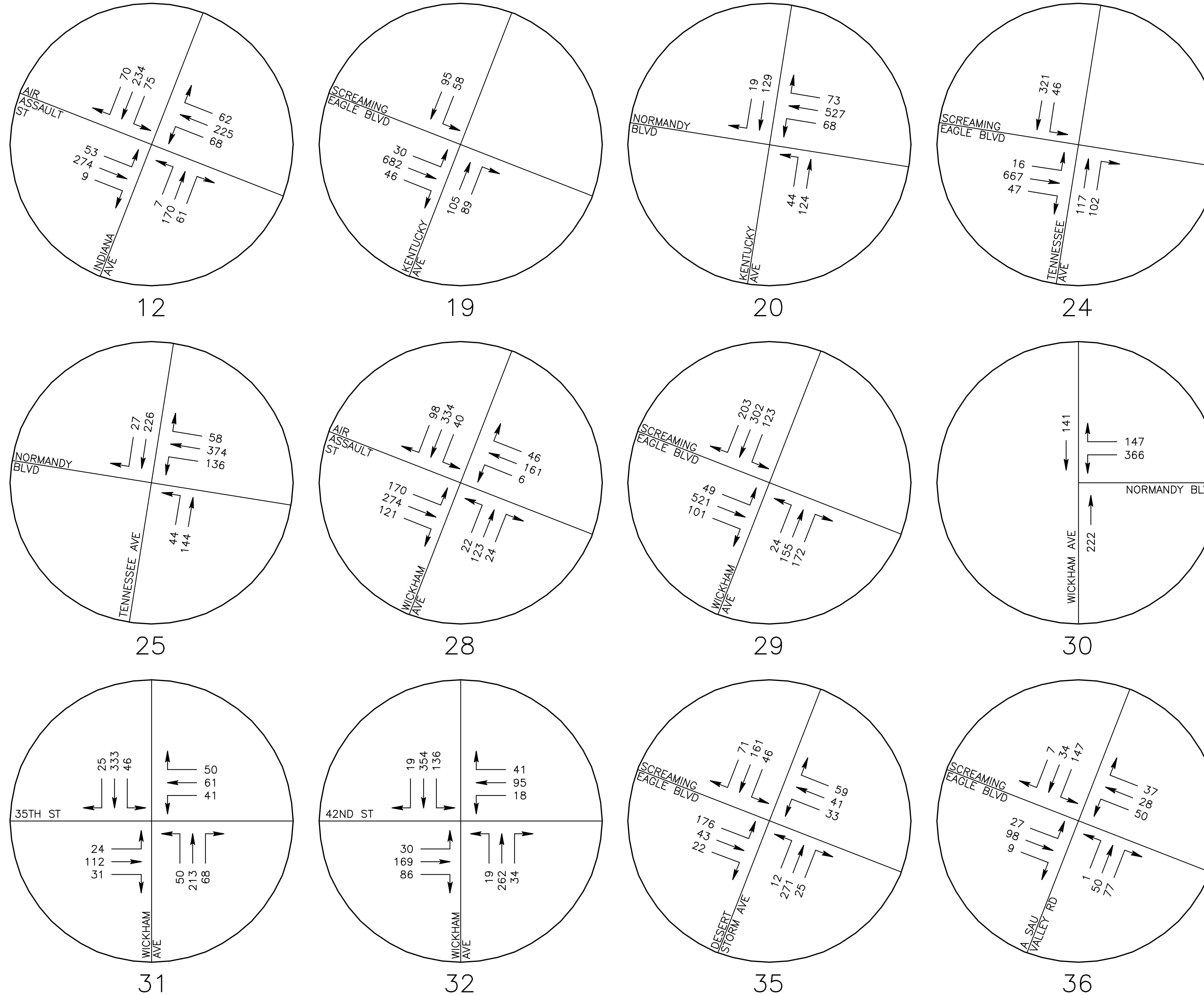

MATCHLINE SEE SHEET 4 OF 4

Gannett Fleming

2/4

EXHIBIT 3.24
FUTURE ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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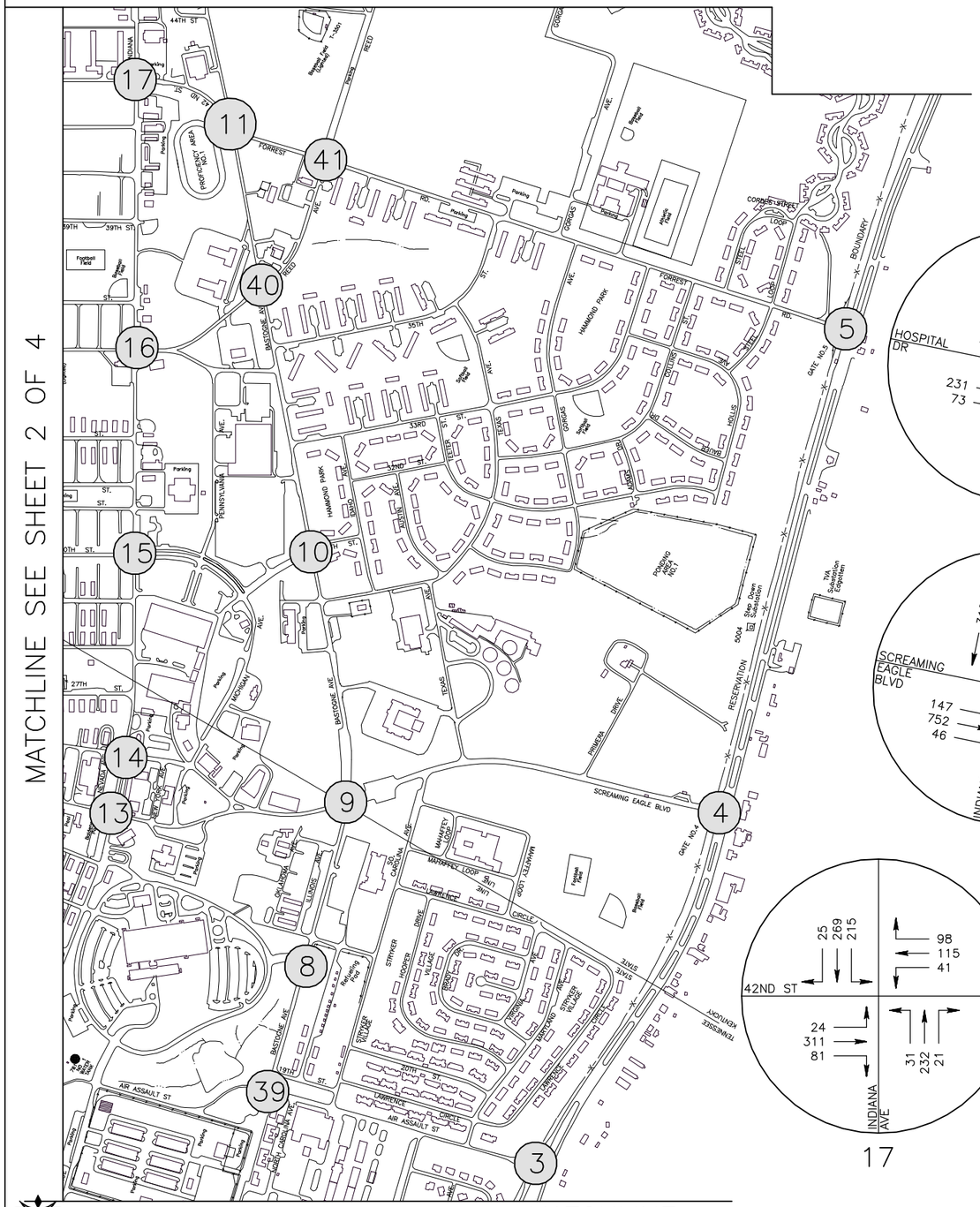
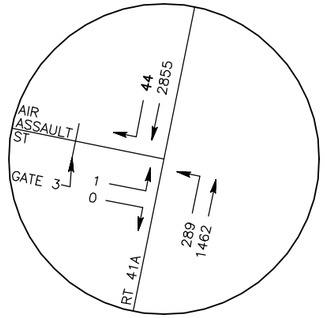
MATCHLINE SEE SHEET 1 OF 4

MATCHLINE SEE SHEET 2 OF 4





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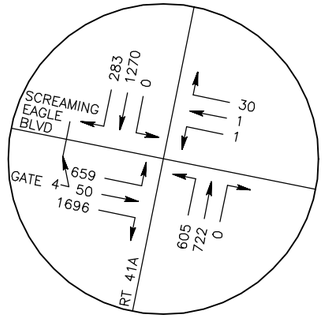
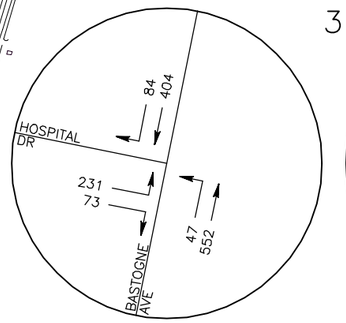


4

GATE 5 NOT IN USE FOR INBOUND TRAFFIC

5



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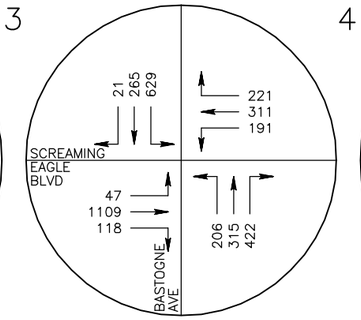

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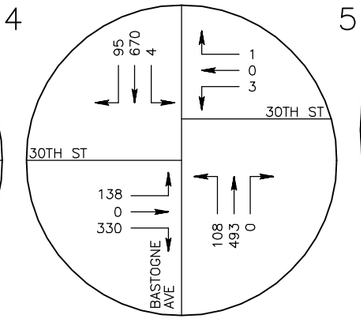

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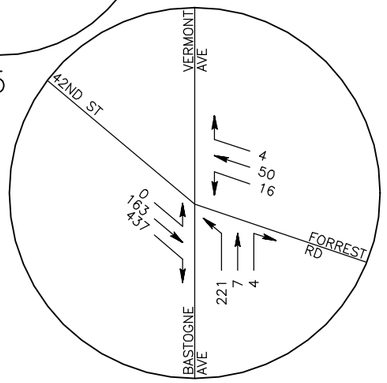

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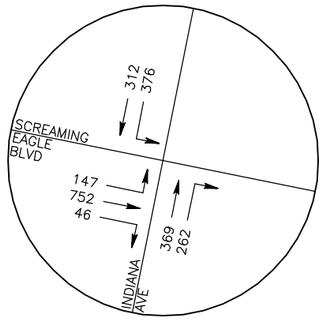

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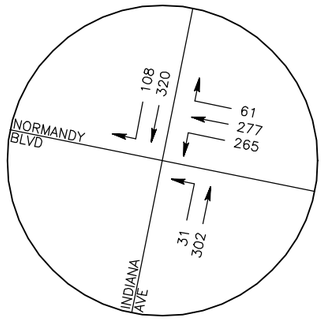

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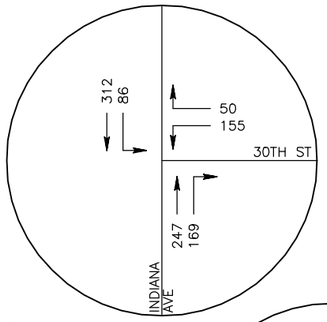

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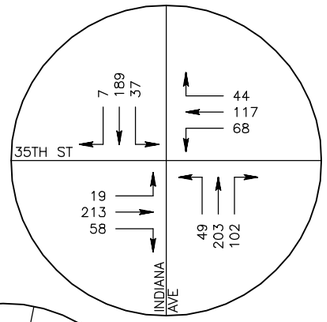

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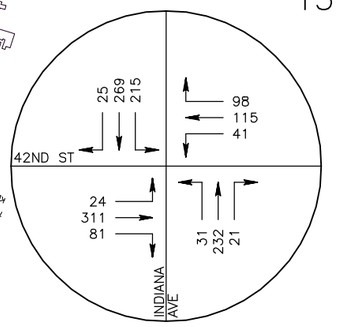

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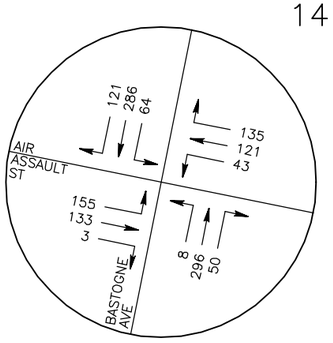

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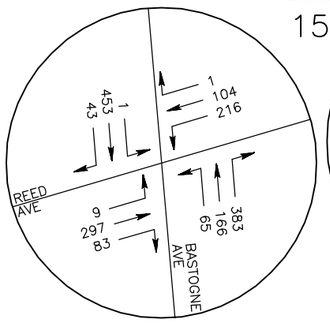

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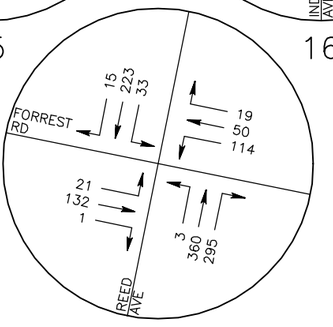

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MATCHLINE SEE SHEET 4 OF 4

3/4

EXHIBIT 3.24
FUTURE ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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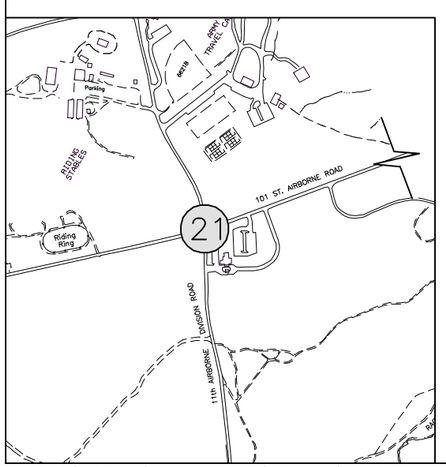
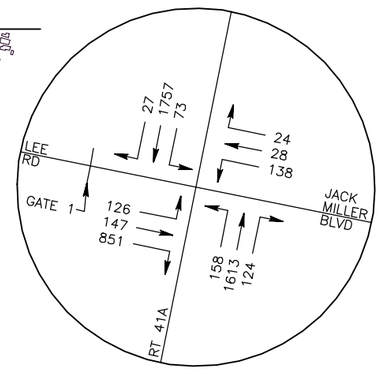
MATCHLINE SEE SHEET 3 OF 4





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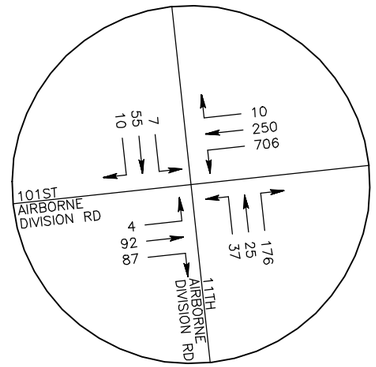
GATE 2
NOT IN USE

2



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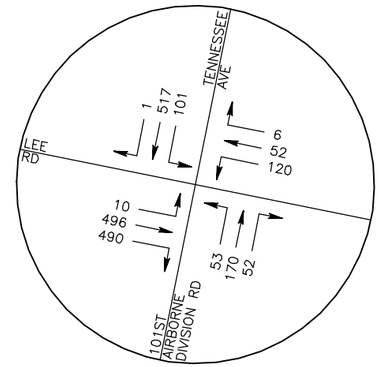

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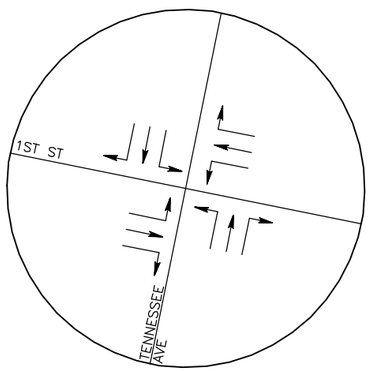

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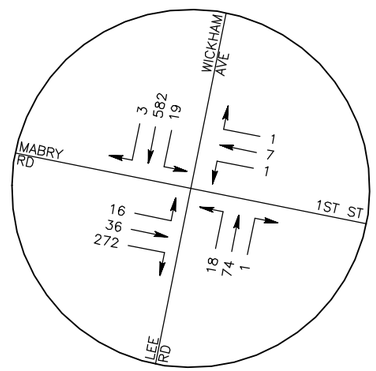

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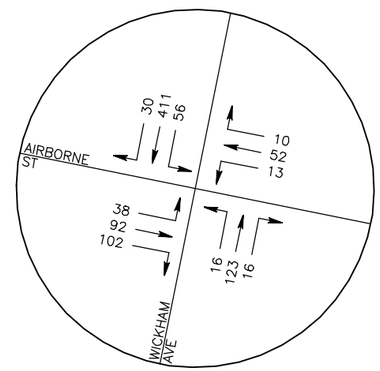

27

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EXHIBIT 3.24
FUTURE ADJUSTED AFTERNOON PEAK HOUR TRAFFIC VOLUMES
FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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DATE: 09-Oct-2003 09:53

assigned a letter to correspond with the increasing delay; “A” standing for minimal delay and “F” standing for breakdown (worst) conditions. The level is consistent with those identified in the *2000 Highway Capacity Manual.*

Intersections with operational deficiencies (E or worse) were screened and further analyzed as part of section 5 of this study. Where possible, mitigation solutions were identified.

3.5.1. Existing Level of Service

The majority of the internal intersections operate acceptably from a capacity standpoint. The intersections with the worst operational performances are mostly located along Highway 41A. Additionally, the intersections of Bastogne Avenue and Screaming Eagle Boulevard and 101st Airborne Division Road and 11th Airborne Division Road demonstrate high levels of delay.

Exhibit 3.25 Existing Levels of Service

INTERSECTION		EXISTING					
#	NAME	MORNING		MID-DAY		AFTERNOON	
		HCS	SYNCHRO	HCS	SYNCHRO	HCS	SYNCHRO
1	TN Route 41A and ACP 1 (William C. Lee Road)	D	D	D	C	F	D
3	TN Route 41A and ACP 3 (Air Assault Street)	B	B	B	A	A	A
4	KY Route 41A and ACP 4 (Screaming Eagle Boulevard)	A	A	E	E	F	F
6	KY Route 41A and ACP 6 (Morgan Road)	A	A	A	A	A	A
7	KY Route 41A and ACP 7 (Glider Road)	C **	C	C**	B	F**	F
8	Bastogne Avenue and Hospital Drive	C **	C	C**	C	C**	C
9	Bastogne Avenue and Screaming Eagle Boulevard	A	A	A	B	D	C
10	Bastogne Avenue and 30th Street	B	A	B	A	B	A
11	Bastogne Avenue and Forrest Road	C**	***	C**	***	B**	***
12	Indiana Avenue and Air Assault Street	B	A	B	A	A	A
13	Indiana Avenue and Screaming Eagle Boulevard	B	B	B	A	B	B
14	Indiana Avenue and Normandy Boulevard	B	A	B	A	B	A
15	Indiana Avenue and 30th Street	B**	B**	B**	C**	B**	B**
16	Indiana Avenue and 35th Street	A	A	A	B	B	B
17	Indiana Avenue and 42nd Street	B	A	B	A	B	A
18	Indiana Avenue and 59th Street	B**	B**	B**	B**	B**	B**
19	Kentucky Avenue and Screaming Eagle Boulevard	A	A	A	B	A	A
20	Kentucky Avenue and Normandy Boulevard	A	A	A	B	A	A
21	101st Airborne Road and 11th Airborne Division Road	E**	***	F**	***	F**	***
22	101st Airborne Road and William C. Lee Road	A	A	A	A	A	A
24	Tennessee Avenue and Screaming Eagle Boulevard	A	A	A	B	B	B
25	Tennessee Avenue and Normandy Boulevard	A	B	A	B	A	B
26	Wickham Avenue and 1st Street	D	D	D**	B**	C**	C**
27	Wickham Avenue and Airborne Street	C	C	C**	B**	C**	C**
28	Wickham Avenue and Air Assault Street	B	B	B	B	B	B
29	Wickham Avenue and Screaming Eagle Boulevard	B	A	B	A	B	A

INTERSECTION		EXISTING					
#	NAME	MORNING		MID-DAY		AFTERNOON	
		HCS	SYNCHRO	HCS	SYNCHRO	HCS	SYNCHRO
30	Wickham Avenue and Normandy Boulevard	B**	B**	B**	C**	B**	B**
31	Wickham Avenue and 35th Street	A	B	A	A	A	A
32	Wickham Avenue and 42nd Street	B	A	B	A	B	A
33	Wickham Avenue and 59th Street	C**	B**	C	C	B**	B**
34	Wickham Avenue and Morgan Road	B	B	B	A	B	A
35	Desert Storm Avenue and Screaming Eagle Boulevard	B	B	B	B	B	A
36	A Shau Valley Road and Screaming Eagle Boulevard	A	A	A	A	A	A
39	Air Assault Street and Bastogne Avenue	B	B	B	B	B	B
40	Bastogne Avenue and Reed Avenue	B	B	B	B	B	B
41	Forrest Street and Reed Avenue	B	A	B	B	B	A

*Overall LOS cannot be calculated for some unsignalized intersections – LOS based on value for intersection delay given in SYNCHRO.
**Overall LOS cannot be calculated for some unsignalized intersections – LOS based on worst movement LOS given in HCS.

***Method cannot analyze intersection due configuration of intersection.

3.5.2. Existing – Adjusted Level of Service

The existing-adjusted levels of service represent the delays that would exist upon the return of all deployed troops. The same intersections that have operational problems under existing conditions will have the same problems, possibly magnified, with more troops on the installation. Additionally, the intersection of Wickham Avenue and Normandy Boulevard will experience high delay at mid-day under existing-adjusted conditions.

Exhibit 3.25 Existing-Adjusted Levels of Service

INTERSECTION		EXISTING-ADJUSTED					
#	NAME	MORNING		MID-DAY		AFTERNOON	
		HCS	SYNCHRO	HCS	SYNCHRO	HCS	SYNCHRO
1	TN Route 41A and ACP 1 (William C. Lee Road)	E	D	D	D	E**	F
3	TN Route 41A and ACP 3 (Air Assault Street)	B	B	A	A	A	A
4	KY Route 41A and ACP 4 (Screaming Eagle Boulevard)	A	A	F	F	F	F
6	KY Route 41A and ACP 6 (Morgan Road)	A	A	A	A	A	A
7	KY Route 41A and ACP 7 (Glider Road)	A	A	A	A	A	A
8	Bastogne Avenue and Hospital Drive	E**	A	E**	A*	F**	B*
9	Bastogne Avenue and Screaming Eagle Boulevard	A	A	E	D	F	E
10	Bastogne Avenue and 30th Street	A**	B	A**	B	A**	B
11	Bastogne Avenue and Forrest Road	C**	***	D**	***	C**	***
12	Indiana Avenue and Air Assault Street	B	A	A	A	A	A
13	Indiana Avenue and Screaming Eagle Boulevard	B	A	B	B	B	B
14	Indiana Avenue and Normandy Boulevard	B	A	B	A	B	A
15	Indiana Avenue and 30th Street	C**	A*	E**	A*	C**	A*
16	Indiana Avenue and 35th Street	B	B	D	D	B	B

INTERSECTION		EXISTING-ADJUSTED					
#	NAME	MORNING		MID-DAY		AFTERNOON	
		HCS	SYNCHRO	HCS	SYNCHRO	HCS	SYNCHRO
17	Indiana Avenue and 42nd Street	B	A	B	B	B	B
18	Indiana Avenue and 59th Street	B**	A*	B**	A*	B**	A*
19	Kentucky Avenue and Screaming Eagle Boulevard	A	A	C	C	B	B
20	Kentucky Avenue and Normandy Boulevard	A	B	B	E	B	B
21	101st Airborne Road and 11th Airborne Division Road	F**	***	F**	***	F**	***
22	101st Airborne Road and William C. Lee Road	B	A	A	A	B	A
24	Tennessee Avenue and Screaming Eagle Boulevard	B	B	C	D	B	C
25	Tennessee Avenue and Normandy Boulevard	B	B	C	D	B	B
26	Wickham Avenue and 1st Street	F**	D*	C**	A*	C**	A*
27	Wickham Avenue and Airborne Street	E**	A*	C**	A*	C**	A*
28	Wickham Avenue and Air Assault Street	B	B	B	B	B	B
29	Wickham Avenue and Screaming Eagle Boulevard	B	A	B	B	B	A
30	Wickham Avenue and Normandy Boulevard	D**	A*	F**	F*	C**	A*
31	Wickham Avenue and 35th Street	B	B	B	B	B	A
32	Wickham Avenue and 42nd Street	B	B	B	B	B	A
33	Wickham Avenue and 59th Street	D**	A*	C**	A*	C**	A*
34	Wickham Avenue and Morgan Road	C	C	B	B	B	A
35	Desert Storm Avenue and Screaming Eagle Boulevard	B	B	C	C	B	B
36	A Shau Valley Road and Screaming Eagle Boulevard	A	A	B	B	A	A
39	Air Assault Street and Bastogne Avenue	C	B	B	B	B	B
40	Bastogne Avenue and Reed Avenue	B	B	B	B	B	B
41	Forrest Street and Reed Avenue	B	A	B	B	B	B

*Overall LOS cannot be calculated for some unsignalized intersections – LOS based on value for intersection delay given in SYNCHRO.

**Overall LOS cannot be calculated for some unsignalized intersections – LOS based on worst movement LOS given in HCS.

***Method cannot analyze intersection due configuration of intersection.

3.5.3. Future Level of Service

Future conditions represent operational conditions that will be experienced assuming the same rate of traffic growth that has been experienced at Fort Campbell will continue over the next ten years. Intersections that incur high delay under future conditions include the intersection of Indiana Avenue and 35th Street, Wickham and 1st, and Desert Storm and Screaming Eagle. Operational problems also exist along Tennessee Avenue under future conditions. It should be noted that some unsignalized, two-way STOP control intersections will experience operational deficiencies on the minor street approaches although overall intersection delay is acceptable.

Exhibit 3.26 Future-Adjusted Levels of Service

INTERSECTION		FUTURE-ADJUSTED					
#	NAME	MORNING		MID-DAY		AFTERNOON	
		HCS	SYNCHRO	HCS	SYNCHRO	HCS	SYNCHRO
1	TN Route 41A and ACP 1 (William C. William C. Lee Road)	F	E	E	D	F**	F
3	TN Route 41A and ACP 3 (Air Assault Street)	C	B	B	B	A	A
4	KY Route 41A and ACP 4 (Screaming Eagle Boulevard)	A	A	F	F	F	F
6	KY Route 41A and ACP 6 (Morgan Road)	A	A	A	A	B	B
7	KY Route 41A and ACP 7 (Glider Road)	A	A	A	A	A	A
8	Bastogne Avenue and Hospital Drive	F**	A*	F**	B*	F**	C*
9	Bastogne Avenue and Screaming Eagle Boulevard	B	B	F	E	F**	E
10	Bastogne Avenue and 30th Street	A**	B	A**	B	A**	B
11	Bastogne Avenue and Forrest Road	D**	***	F**	***	D**	***
12	Indiana Avenue and Air Assault Street	B	B	B	A	B	A
13	Indiana Avenue and Screaming Eagle Boulevard	B	B	C	C	C	B
14	Indiana Avenue and Normandy Boulevard	B	A	B	B	B	A
15	Indiana Avenue and 30th Street	C**	A*	F**	C*	D**	A*
16	Indiana Avenue and 35th Street	B	B	F	F	C	C
17	Indiana Avenue and 42nd Street	B	A	B	B	B	B
18	Indiana Avenue and 59th Street	B**	A*	C**	A*	B**	A*
19	Kentucky Avenue and Screaming Eagle Boulevard	A	B	C	D	B	B
20	Kentucky Avenue and Normandy Boulevard	A	B	C	F	B	C
21	101st Airborne Road and 11th Airborne Division Road	F**	***	F**	***	F**	***
22	101st Airborne Road and William C. Lee Road	B	B	A	A	B	B
24	Tennessee Avenue and Screaming Eagle Boulevard	B	B	D	E	C	C
25	Tennessee Avenue and Normandy Boulevard	B	C	C	F	B	C
26	Wickham Avenue and 1st Street	F**	F*	D**	A*	E**	B*
27	Wickham Avenue and Airborne Street	F**	C*	E**	B*	D**	B*
28	Wickham Avenue and Air Assault Street	C	C	B	B	C	B
29	Wickham Avenue and Screaming Eagle Boulevard	B	B	B	B	B	B
30	Wickham Avenue and Normandy Boulevard	E**	B*	F**	F*	C**	B*
31	Wickham Avenue and 35th Street	B	B	B	B	B	A
32	Wickham Avenue and 42nd Street	B	B	B	B	B	B
33	Wickham Avenue and 59th Street	E**	A*	D**	A*	C**	A*
34	Wickham Avenue and Morgan Road	D	D	C	B	B	B
35	Desert Storm Avenue and Screaming Eagle Boulevard	B	C	E	E	B	B
36	A Shau Valley Road and Screaming Eagle Boulevard	A	A	B	B	A	A
39	Air Assault Street and Bastogne Avenue	C	C	B	B	B	B
40	Bastogne Avenue and Reed Avenue	B	B	B	B	B	B
41	Forrest Street and Reed Avenue	B	A	B	B	B	B

*Overall LOS cannot be calculated for some unsignalized intersections – LOS based on value for intersection delay given in SYNCHRO.
**Overall LOS cannot be calculated for some unsignalized intersections – LOS based on worst movement LOS given in HCS.

***Method cannot analyze intersection due configuration of intersection.

4. ACCESS CONTROL POINT ASSESSMENTS

Access to Fort Campbell is accomplished through several access control points. ACP 1 through ACP 7 are located along the east side of the installation and connect Fort Campbell to Route 41A. Angels Road and Mabry Road are located on the western portion of the installation. These ACP's are open only to government or tactical vehicles. ACP 10 is on the southern portion of the base along 101st Airborne Division Road, which runs to Sabre Heliport and U.S. Route 79. Bell Station Road serves as an access point for 160th personnel only.

4.1. Operations Before and After September 11th, 2001

Exhibit 4.1 and **Exhibit 4.2** list the operational characteristics for each of the access control points.

Exhibit 4.1 Operational Characteristics for ACP's before 09-11-01

ACP	Hours	Schedule	Traffic Type
ACP 1 – William C. Lee Rd.	0500-2400	7 days	No Trucks
ACP 2 – Carentan Rd.	CLOSED		
ACP 3 – Air Assault St.	0500-2330	Mon-Sat	No Trucks
ACP 4 – Screaming Eagle Blvd.	24 hrs	7 days	No Trucks
ACP 5 – Forest Rd.	0500-2330	Mon-Sat	No Trucks
ACP 6 – Morgan Rd.	0500-2200	7 days	No Trucks
ACP 7 – Glider Rd.	0500-2300	7 days	All Traffic
ACP 10 – 101st Airborne Division Rd.	24 hrs	7 days	No Trucks
Angels Rd.	24 hrs	7 days	All Types
Mabry Rd.	24 hrs	7 days	All Types
Bell Station Rd.	24 hrs	7 days	All Types
Market Garden (CAAF)	24 hrs	7 days	All Types
Destiny (CAAF)	24 hrs	7 days	All Types
Sabre Army Airfield	24 hrs	7 days	All Types

Exhibit 4.2 Operational Characteristics of ACP's after 09-11-01

ACP	Hours	Schedule	Traffic Type
ACP 1 – William C. Lee Rd.		Mon-Fri	No Trucks
ACP 2 – Carentan Rd.	CLOSED		
ACP 3 – Air Assault St.		Mon-Fri	No Trucks
ACP 4 – Screaming Eagle Blvd.	24 hrs	7 days	No Trucks
ACP 5 – Forest Rd.		Mon-Fri	Exit Only
ACP 6 – Morgan Rd.		Mon-Fri	No Trucks
ACP 7 – Glider Rd.		7 days	Truck Processing/Decals*
ACP 10 – 101st Airborne Division Rd.		7 days	No Trucks
Angels Rd.	24 hrs	7 days	Gov./Mil. **
Mabry Rd.	24 hrs	7 days	Gov./Mil. **
Bell Station Rd.	24 hrs	7 days	160th only, Gov./Mil. **
Market Garden (CAAF)	24 hrs	7 days	All Types
Destiny (CAAF)	24 hrs	7 days	All Types
Sabre Army Airfield	24 hrs	7 days	All Types

* This ACP is for trucks only on Mon.-Fri. Other vehicles can use it on the weekends.
** Government and Military Vehicles Only

It is important to note that since September 11, 2001, schedules and times have changed frequently.

4.2. FORSCOM Evaluations

In January 2002, FORSCOM prepared the *Installation Security Master Plan*. A major component of the plan was an analysis of installation access control points considering security, safety and traffic flow. FORSCOM Evaluations focused on and identified several areas of concern. The list below was developed using requirements found in the US Army FORSCOM ACP Standards and information provided by MTMC. These areas are:

- ACP Capacity
- Proximity to Nearby Intersections
- Transition Tapers
- Traffic Control
- Turn-Around Area
- Search Area
- ACP House
- ACP
- Barriers
- Surveillance Equipment
- Communications
- Information Access
- Lighting

Exhibit 4.3 identifies the problems areas at each of the ACP's.

Exhibit 4.3 FORSCOM Evaluation of ACP Problem Areas

ACP No.	Roadway	ACP Problem Area			
		ACP Capacity	Proximity to Intersections	Transition Tapers	Traffic Control
1	William C. Lee Rd.		•		•
2	Carentan Rd.		•		•
3	Air Assault St.		•		•
4	Screaming Eagle Blvd.	•	•		•
5	Forest Rd.				•
6	Morgan Rd.				•
7	Glider Rd.				•
10	101st Airborne Division Rd.				•
	Angels Rd.				•
	Mabry Rd.				•

4.2.1. FORSCOM Recommendations

General guidance was given and specific recommendations were made including:

- For cost estimating purposes, a minimum required number of lanes at each ACP was determined. Providing the recommended number of lanes will ensure that decal checks and ID checks can occur at these points without impeding traffic flow on the off-post roadway system.

- Maintain ACP 7 as a truck ACP and open ACP 2 to provide access to the post. Development of ACP 2 requires the movement of the checkpoint back a minimum of 500 feet from the intersection of Route 41A and closure of Seminole Road. In addition, a bypass road should be constructed connecting 1st Street and Bastogne Avenue at a cost of approximately $250,000.
- Maintain ACP 1 provided that two homes are closed and removed to provide adequate storage.
- It is recommended that improvements to ACP designs incorporate appropriate traffic control (consistent with the MUTCD) and geometric design principles (to treat transition taper) as recommended by MTMC.
- Develop a guide sign plan to direct vehicles to appropriate ACP's for processing and entry into the post. ACP's, which are restricted to commercial vehicles and visitors, should be clearly identified and signing should be provided to direct vehicles to the appropriate ACP.

FORSCOM presented conceptual designs for four layouts.

- Main ACP
- Primary ACP with truck inspection
- Primary ACP without truck inspection
- Secondary ACP with truck inspection

All four layouts are similar in many ways including:

- Upstream turn-around and downstream turnaround lanes provided. The upstream turn-around allows vehicles that do not wish to enter the installation to turn around prior to processing. The downstream turn-around provides a mechanism to reject vehicles prior to entering the installation. The use of the downstream turn-around must be coordinated by security personnel with the use of downstream vehicle arrest devices.
- Wide median to accommodate u-turns and for guard booth.
- Rumble strips to encourage speed reduction.
- The use of vehicle arrest systems to prevent access from outbound lanes, to trap control point violators and to prevent rejected vehicles from gaining access to the installation.
- The use of intelligent transportation systems (ITS) such as "speed pass" to improve processing.
- The use of security cameras. An ancillary benefit of security cameras may be to provide traffic data to installation personnel.

The FORSCOM - Main ACP is presented as **Exhibit 4.4.** The primary differences between the four types include: the number of lanes shown (four at main ACP, two at all others), a visitors control center (main ACP only), and inspection capabilities and devices utilized. FORSCOM cost estimates are $850K for the main ACP layout; greater than $545K for the primary ACP layout (not including

truck inspection equipment); and greater than $335K for the secondary ACP layout.

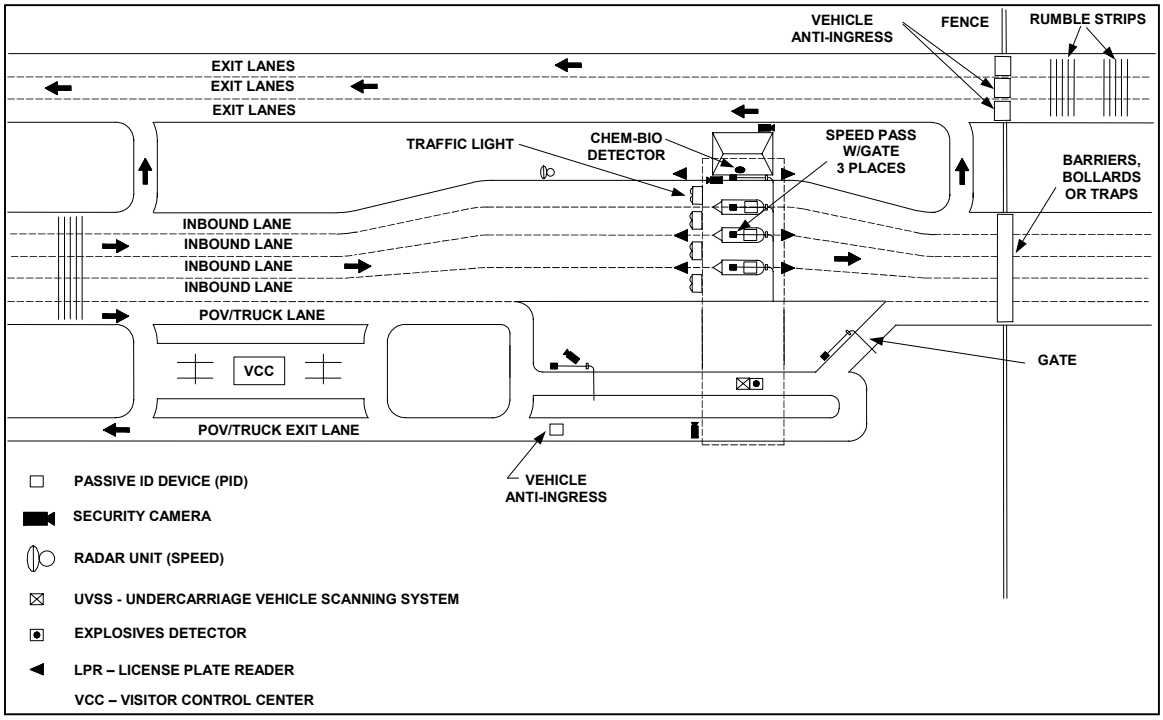

Exhibit 4.4 FORSCOM Main ACP Layout

Overall FORSCOM provides sound security and traffic guidance. Specific comments related to the FORSCOM concepts include:

- The plan does not provide complete guidance on general issues such as access control point restrictions and usage. For example, a visitor-processing lane is shown on all layouts. Consideration should be given to providing visitor processing at one location such as the Main ACP (ACP 4); thereby reducing the need for such facilities at other ACP's.
- The location of businesses serving Fort Campbell should be considered. It is agreed that the primary truck processing access control point should be located at ACP 7; however, consideration should be given to providing some truck inspection capabilities at ACP 10 due to the location of the landfill as well as the proximity of Clarksville. Due to restrictions and the cost of truck inspection equipment, ACP 10 could be restricted to authorized, pre-approved, local trucks only which are still inspected but have had some level of background screening completed.
- The plan provides lane requirements, but it does provide backup calculations. Lane requirements calculated may not consider deployments and future growth.
- The plan recommends an ACP 2 expansion and connector to First Street and Bastogne Avenue. This would impact housing (RCI) plans.

- Cost estimates may be underestimated based on similarly constructed projects.

4.3. Roadway Projects Impacting ACP's

As was discussed previously, there are several regional transportation projects impacting Fort Campbell traffic flow.

Lafayette Road which connects U.S. Route 41A, near U.S. Route 79 to Fort Campbell has been widened to a five-lane roadway up to the installation boundary. Plans have been developed to widen the two-lane section of roadway from the installation boundary to 101st Airborne Division Road. The existing and planned improvements will make Lafayette Road a more desirable access roadway to Fort Campbell.

KTC will begin construction in the fall of 2002 on a reconstruction and upgrade of Fort Campbell Boulevard (U.S. Route 41A) from four lanes to six lanes from the Kentucky/Tennessee border north to I-24.

Included in the project will be signalization upgrades at existing locations and the installation of a new traffic signal at the intersection of Cole Road and U.S. Route 41A, thus enhancing accessibility between ACP 7 and U.S. Route 41A.

At ACP 4, KTC will be bringing two left-turn lanes from U.S. Route 41A northbound along with the right turn lane from U.S. Route 41A southbound. The outbound traffic from Fort Campbell at ACP 4 will also be widened to three lanes. Two of these lanes will be left-turn lanes onto U.S. Route 41A northbound and the third lane will be a right-turn onto U.S. Route 41A southbound.

4.4. Access Control Point (ACP) Assessments

ACP's were evaluated considering short-term (0-3 years) and long-term (3+ years) needs. The evaluation considered short-term and long-term lane requirements; planned and programmed roadway improvements; and future land use impacts. The planned redesign of ACP's provides the opportunity to coordinate transportation and land use needs with logical ACP layouts and locations. The priorities in ACP evaluations are:

1. Force Protection and Security
2. Guard and Motorist Safety
3. Capacity and Traffic Flow

4.4.1. Lane Requirements

The number of lanes required at each ACP was determined for existing, existing-adjusted and future conditions and considered deployed troops and future growth. To calculate lane requirements, peak hour volume was applied to an

average processing rate for Force Protection "Charlie". This rate is a composite of rates obtained at more than 20 military installations. It should be noted that the peak hour volumes obtained in February 2002 **DO NOT** account for vehicles, which may have been waiting to be processed; however, the adjusted condition likely accounts for any delayed vehicles. Also, lanes calculated will not support normal traffic levels under Force Protection "Delta" conditions. Under Delta conditions, certain types of traffic should be restricted from the installation. Lane calculations and recommendations are presented in **Exhibit 4.5**. Detailed backup is provided in **Appendix F**.

Exhibit 4.5 ACP Lane Requirements

						Charlie (Design Condition)				
						Processing Rate (vphpl)		350		
Location	Feb 02 Inbound Peak Hour Volume	Existing Adjusted Inbound PHV	Future Adjusted Inbound PHV	Existing Lanes	FORSCOM Rec. Lanes	Existing	Existing Adjusted	Future Adjusted	Short-term Rec. Lanes	Long-term Rec. Lanes
ACP 1 -- William C. Lee Road	522	669	776	1	2	2	2	3	2	**3**
ACP 2 -- Carentan Road	CLOSED	CLOSED	CLOSED	CLOSED	2	N/A	N/A	N/A	CLOSED	**CLOSED**
ACP 3 -- Air Assault Street	926	1186	1375	2	2	3	4	4	2	**3**
ACP 4 -- Screaming Eagle Boulevard	778	996	1156	2	4	3	3	4	4	**5**
ACP 5 -- Forest Road	OUT ONLY	OUT ONLY	OUT ONLY	OUT ONLY	1	N/A	N/A	N/A	OUT ONLY	**OUT ONLY**
ACP 6 -- Morgan Road	513	657	762	2	2	2	2	3	2	**2**
ACP 7 -- Glider Road	53	68	79	1	2	1	1	1	2	**2**
Angels Road	45	58	67	1	2	1	1	1	1	**1**
Mabry Road	60	77	90	1	1	1	1	1	1	**1**
ACP 10 – 101st Airborne Division Road	627	803	931	1	1	2	3	3	3	**3**

Lane requirements calculated and recommended for the short-term are consistent with FORSCOM recommendations with a few exceptions.

- ACP 2 – FORSCOM recommended two lanes. The study team supports Fort Campbell's decision to close due to the proximity of housing areas.
- ACP 5 - FORSCOM recommended one lane. The study team supports Fort Campbell's decision to restrict this ACP to outbound traffic only, but agrees with FORSCOM's recommendation if ACP 5 is reopened inbound.
- Angels Road ACP - FORSCOM recommended two lanes. The study team calculated one lane.
- ACP 10 - FORSCOM recommended one lane. The study team calculated three lanes.

Long-term lane requirements considered 10-year traffic growth. In general lane requirements at ACP's required the same number of lanes or one additional lane than short-term requirements. In two areas, lane needs are constrained by the geometric conditions; therefore, adjustments were made at neighboring ACP's to accommodate future demands.

- ACP's 3 and 4 – Long-term requirements calculated needing four lanes at each ACP. Due to constraints at ACP 3 and that ACP 4 is the main ACP, it is recommended that ACP 3 be constructed for three lanes and ACP 4 be constructed for five lanes.
- ACP's 6 and 7 – Long-term requirements calculated needing three lanes and one lane, respectively. ACP 6 leads into housing areas and long-term plans for an ACP 6 arterial connection have been abandoned. Also, the intersection of Glider Road (ACP 7) and U.S. Route 41A will be signalized in the near future which will make ACP 7 a more desirable access point. Therefore, it is recommended that ACP 6 be constructed for two lanes and ACP 7 be constructed for two lanes.

4.4.2. General Guidance

Like most installations, Fort Campbell quickly modified existing operations to accommodate higher security needs resulting from the events of September 11th. Since September 11th, modifications have been made to enhance ACP operations and safety. Fort Campbell has implemented many of the mechanisms and improvements recommended to improve operations, safety and security including:

- Restricting visitor processing and truck processing to one location each. This results in decreased delays at decal only ACP's.
- Implementing tandem processing at ACP's with heavier volumes. Tandem processing will increase in-lane capacity by 33 percent; however, there are diminishing returns if more than two checkpoints per lane are utilized.
- Providing adequate lighting at ACP's through the use of temporary, permanent and low-level lighting.
- Consistent signing of ACP's utilizing "REDUCE SPEED AHEAD" and "15 MPH" signs at most locations. In areas with long access roadways consider advanced warning signs with the message, "VEHICLE CHECKPOINT XXX FEET".

Additional enhancements and modifications can further improve ACP operations, safety and security. The following provides general and specific recommendations to improve ACP's in the short-term and long-term.

4.4.2.1. Short-term Recommendations

The following short-term improvements are recommended for all Fort Campbell ACP's. Many of these improvements should be carried forward with long-term improvements.

- Implementation of a directional and ACP usage signing plan utilizing static signs that are MUTCD compliant and variable message signs (VMS) to inform motorists of ACP locations, usage (visitor, truck, decal only, etc.), and operational status (open, closed, etc.) in advance of ACP areas and access roadways. Currently, there is static and VMS directional signing at the access roadways to several ACP's. **Exhibit 4.6** illustrates the VMS placement along Cole Road approaching ACP 7. **Exhibit 4.7** illustrates restrictions at ACP 3. Placing signing on access roadways and ACP approaches provides information at a point that is too late for motorists to avoid the ACP area and results in vehicles making u-turn movements. Providing information earlier allows motorists to better plan their route, reduces delays and congestion, and reduces conflicts. The primary signing locations should be along northbound U.S. Route 41A before ACP 1 and southbound U.S. Route 41A before ACP 7. Permanent VMS should be considered at these locations that be controlled from a operation center located at ACP 4. Close coordination with Kentucky and Tennessee Departments of Transportation is required for implementation.
- Remove unwarranted and other less important signs in ACP areas. Signs in close proximity to the ACP's should be clear and concise and should be related to the ACP itself. All signs should be MUTCD compliant and should have proper retro-reflectivity. An example of a sign that should not be located at an ACP is presented in **Exhibit 4.8.**
- Crash cushions in advance of ACP can offer additional crash protection.
- Temporary curbing and platforms can provide delineation and additional protection of guard areas.
- Rumble strips in advance of ACP's can encourage speed reduction. When used, rumble strips should be placed in a series of four to eight with each series placed 100 feet apart.

Exhibit 4.6 Intersection of U.S. Route 41A and Cole Road – ACP 7 (westward view of VMS)

Exhibit 4.7 Westward view of signing at ACP 3

Exhibit 4.8 Westward view of signing at ACP 3

4.4.2.2. Long-term Recommendations

General long-term recommendations for ACP's at Fort Campbell include the following:

- Continue to expand and improve directional signing plan.
- Visitor processing is not suggested at each ACP. It is recommended that all visitors (non-truck) be directed to ACP 4 as is the current operation; therefore eliminating the need for a processing area at other ACP's. ACP 7 may be a desirable location to have a secondary visitors center in the long-term if demand dictates expansion.
- Consider an intermodal center at ACP 4 to include a park-n-ride lot and on-installation and off-installation transit stops.
- Direct all regional truck traffic to ACP 7, but permit local truck traffic at ACP 10 due to the location of the landfill as well as the proximity of Clarksville. Due to inspection restrictions associated with the cost of truck inspection equipment, ACP 10 could be restricted to authorized, pre-approved, local trucks only which are still inspected but have had some level of background screening completed.
- Utilize ITS and other technologies to improve operations and safety.

Suggested long-term usage is presented as **Exhibit 4.9**.

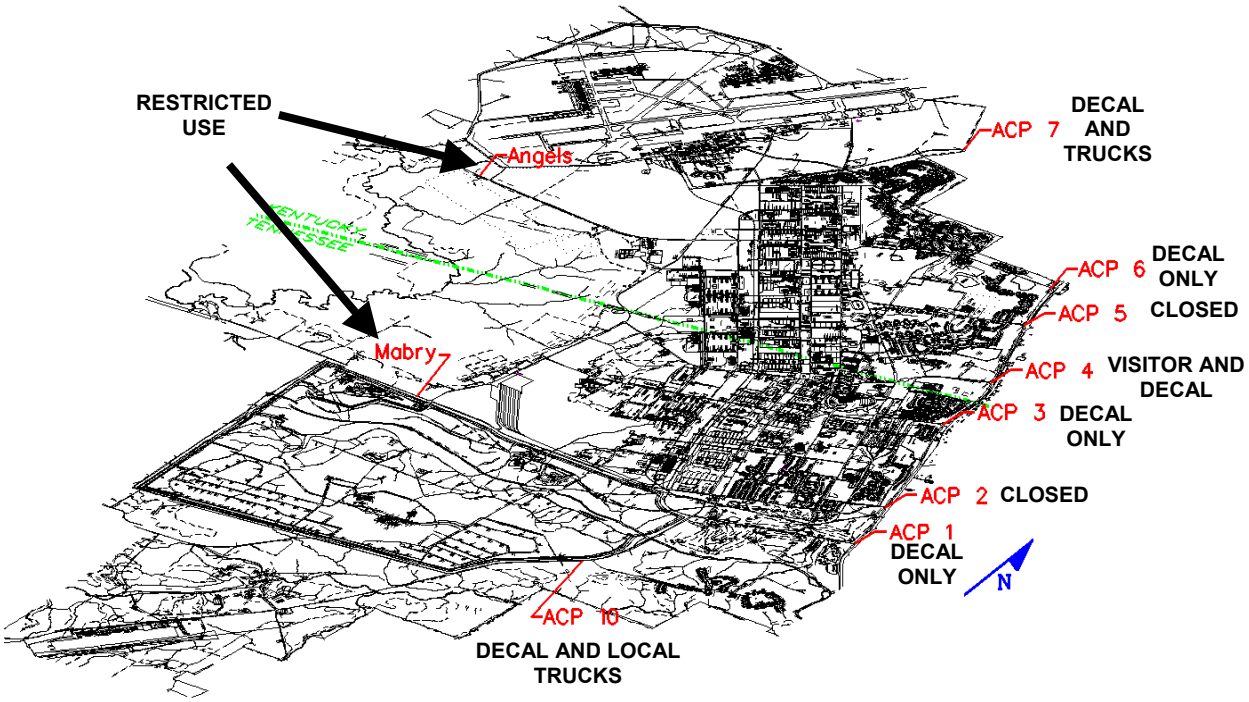

Exhibit 4.9 Suggested Long-term ACP Usage

4.4.3. ACP 1 – William C. Lee Road

4.4.3.1. Existing Conditions

- ACP 1 (**Exhibit 4.10**) has one inbound lane for vehicles with decals and visitors with passes. It provides access from the southeast and is currently located approximately 1775 feet from the intersection of William C. Lee Road and Bastogne Avenue. There is one outbound lane plus a right-turn lane at the intersection with U.S. Route 41A.
- The ACP is open Monday through Friday from 0500 to 2400 processing all vehicles except trucks.
- The peak hour volume is 522 vehicles per hour.
- Backups were observed during morning peak hour.
- The ACP has adequate lighting.

4.4.3.2. Short-term Recommendations

- The plastic barrier illustrated in **Exhibit 4.11** is a hazard due to the length and angle of the barrier. Barrier systems should be continuous and should not flare at a rate that is more than 8:1 for speed under 30 mph. The existing barrier may pinch if struck, trapping security personnel. For better guard protection, consider installing a raised island with curbing and a crash cushion in advance of the island.
- ACP 1 experiences delays during the morning peak hour. At Force Protection Charlie with a full population, it is estimated that two processing lanes are needed. Relocate and construct two inbound lanes capable of tandem processing as presented as **Exhibit 4.12**. Maintain one outbound lane. This improvement will impact two homes along William C. Lee Road. Consider abandoning or providing alternate access.

4.4.3.3. Long-term Recommendations

Long-term considerations at ACP 1 must consider housing initiatives, engineering constraints due to environmental resources and the rail line as well as the golf course. It is estimated that three inbound lanes are required in the long-term. Two alternatives have been developed to accommodate the required number of lanes. These alternatives are presented in **Exhibit 4.13**.

- Alternative 1 keeps ACP 1 on William C. Lee Road; however, this alternative will impact housing initiatives, existing housing, and the golf course.
- Alternative 2 closes ACP 1 and opens ACP 2 along a new roadway. The new roadway (1st Street) would be constructed to the south of existing 1st Street impacting housing to the south of 1st Street. This alternative would also impact the third green of the golf course. The new roadway would then cross Bastogne Avenue between the green of the seventh hole and the tee box of the eighth hole tying into William C. Lee Road

approximately 515 feet from the existing intersection of Bastogne Avenue and William C. Lee Road. Bastogne Avenue and the cut-off portion of William C. Lee Road coming from existing ACP1 would be realigned to form “T” intersections with the new roadway. Existing 1st Street would be for residential use only.

Exhibit 4.10 ACP 1 (westward view)

Exhibit 4.11 Barrier at ACP 1 (westward view)

N

US HWY 41A & STATE HWY 12

INSPECTION AREA

8'x10' GUARD HOUSE

VEHICLE ARREST SYSTEM

W/24"@ 8'C-C (TYP)

CRASH CUSHION (TYP)

W/8" (TYP)

Y/4" (TYP)

Y/24"@ 8'C-C (TYP)

DY/6"

DY/6"

FENCE

10'

CANOPY

10'

10'

WILLIAM C LEE RD

GUARD BOOTH (TYP)

6' (TYP)

ANTI INGRESS SYSTEM

ANTI INGRESS SYSTEM

TRUCK TURNAROUND

VEHICLE ARREST SYSTEM

TRUCK TURNAROUND

EXHIBIT 4.12

ACP 1 CONCEPTUAL PLAN
SHORT TERM

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

SCALE: 1"=100'

Gannett Fleming

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ACP 1 LONG TERM ALIGNMENT–ALTERNATIVE1

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

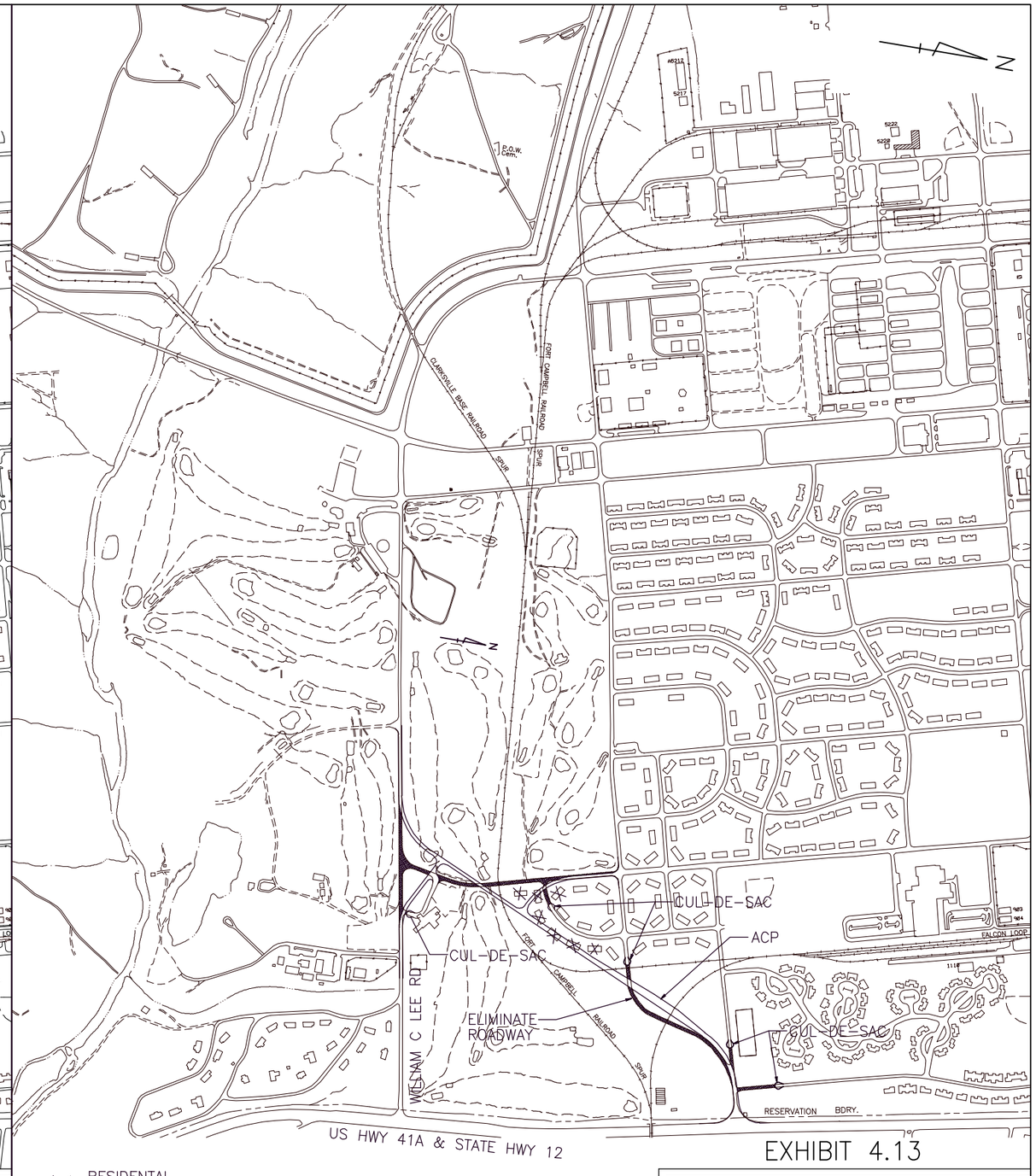

EXHIBIT 4.13

SCALE: NOT TO SCALE

ACP 1 LONG TERM ALIGNMENT–ALTERATIVE 2

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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4.4.4. ACP 2 – Carentan Road

4.4.4.1. Existing Conditions

- ACP 2 (**Exhibit 4.14**) has one inbound and one outbound lane.
- ACP 2 is closed during all time periods.
- Traffic data is not available due to closure.

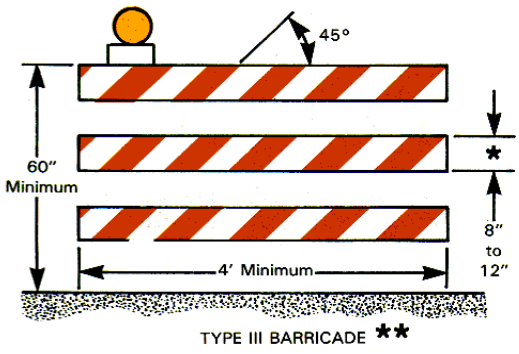
Exhibit 4.14 ACP 2 (eastward view)

4.4.4.2. Short-term Recommendations

- TYPE III barricades should be installed on both approaches to the ACP.
- Keep closed due to residential impacts.

4.4.4.3. Long-term Recommendations

- Keep closed. Possibly combine use with ACP 1.



TYPE III BARRICADE **

* Nominal lumber dimensions are satisfactory for barricade rail width dimensions

** Rail stripe widths shall be 6 inches except where rail lengths are less than 36 inches, then 4 inch wide stripes may be used.
The sides of barricades facing traffic shall have retroreflective rail faces

4.4.5. ACP 3 – Air Assault Street

4.4.5.1. Existing Conditions (April 2002)

- ACP 3 (**Exhibit 4.15**) has two inbound lanes for vehicles with decals or passes. It provides access to the central east portion of the base and is approximately 1700 feet from the intersection of Bastogne and Air Assault Street. There is one outbound lane that splits into three turning lanes at the intersection of U.S. Route 41A. The outbound lane configuration at the intersection is two left turn lanes and a right turn lane.
- The ACP is open Monday through Friday 0530-2000 processing all vehicles except trucks.
- The peak hour volume is 926 vehicles per hour. This volume does not reflect vehicles that may have been waiting to pass through the ACP.
- The ACP has adequate lighting.

4.4.5.2. Short-term Recommendations

Between the outset of the data collection portion of the study in February 2002 and the visit by the Gannett Fleming study team in April 2002, Fort Campbell has instituted substantial changes in the short-term operations at ACP 3. The roadway was widened to provide an additional lane allowing for two inbound lanes and one outbound lane during all time periods. Previously, ACP 3 was inbound only during the morning peak period. **Exhibits 4.15** through **4.18** illustrate ACP 3 operations in February 2002 and April 2002.

Overall, short-term enhancements improve traffic operations and safety and eliminate changing directional configurations. Concerns with the revised short-term operations include:

- Barrier systems are not complete and continuous and may create a safety hazard
- There are select areas where shoulder drop-offs are a concern

4.4.5.3. Long-term Recommendations

- Construct three inbound lanes capable of tandem processing and one outbound lane as presented in **Exhibit 4.19.**

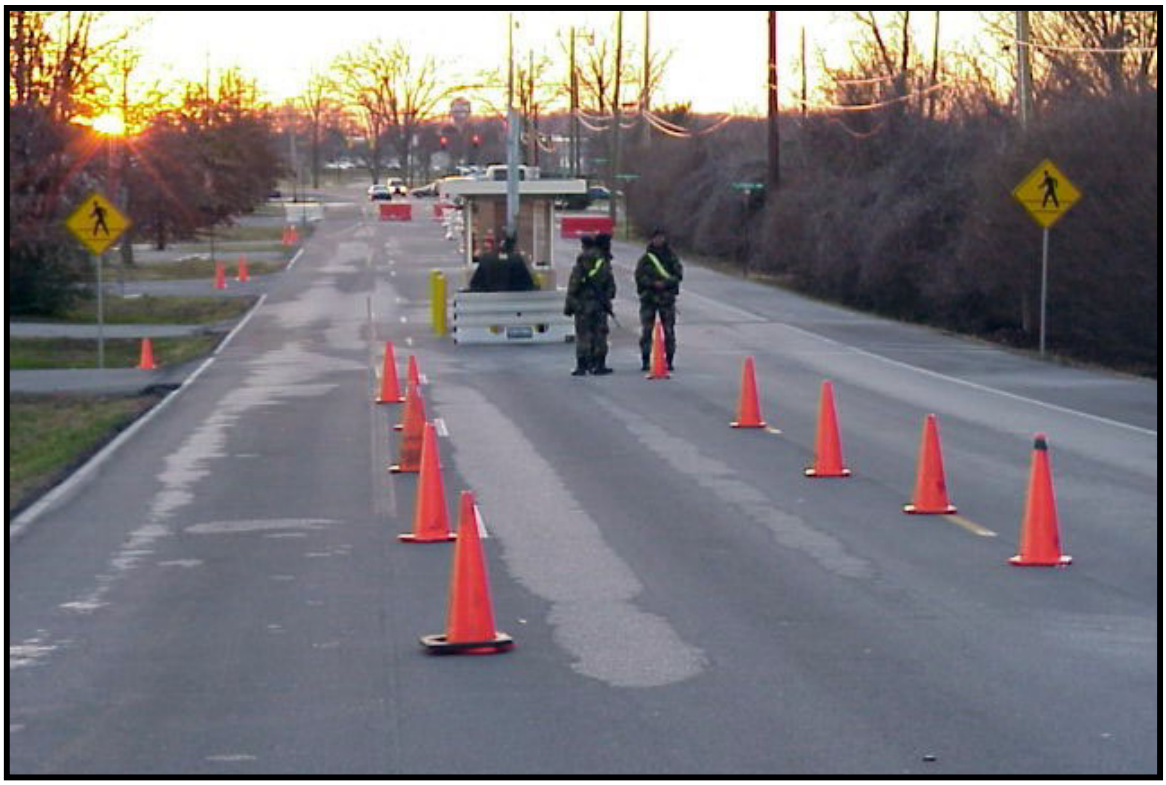


Exhibit 4.15 ACP 3 in February 2002 (westward view)

Exhibit 4.16 ACP 3 in February 2002 (eastward view)

Exhibit 4.17 ACP 3 in April 2002 (westward view)

Exhibit 4.18 ACP 3 in April 2002 (westward view away from ACP)

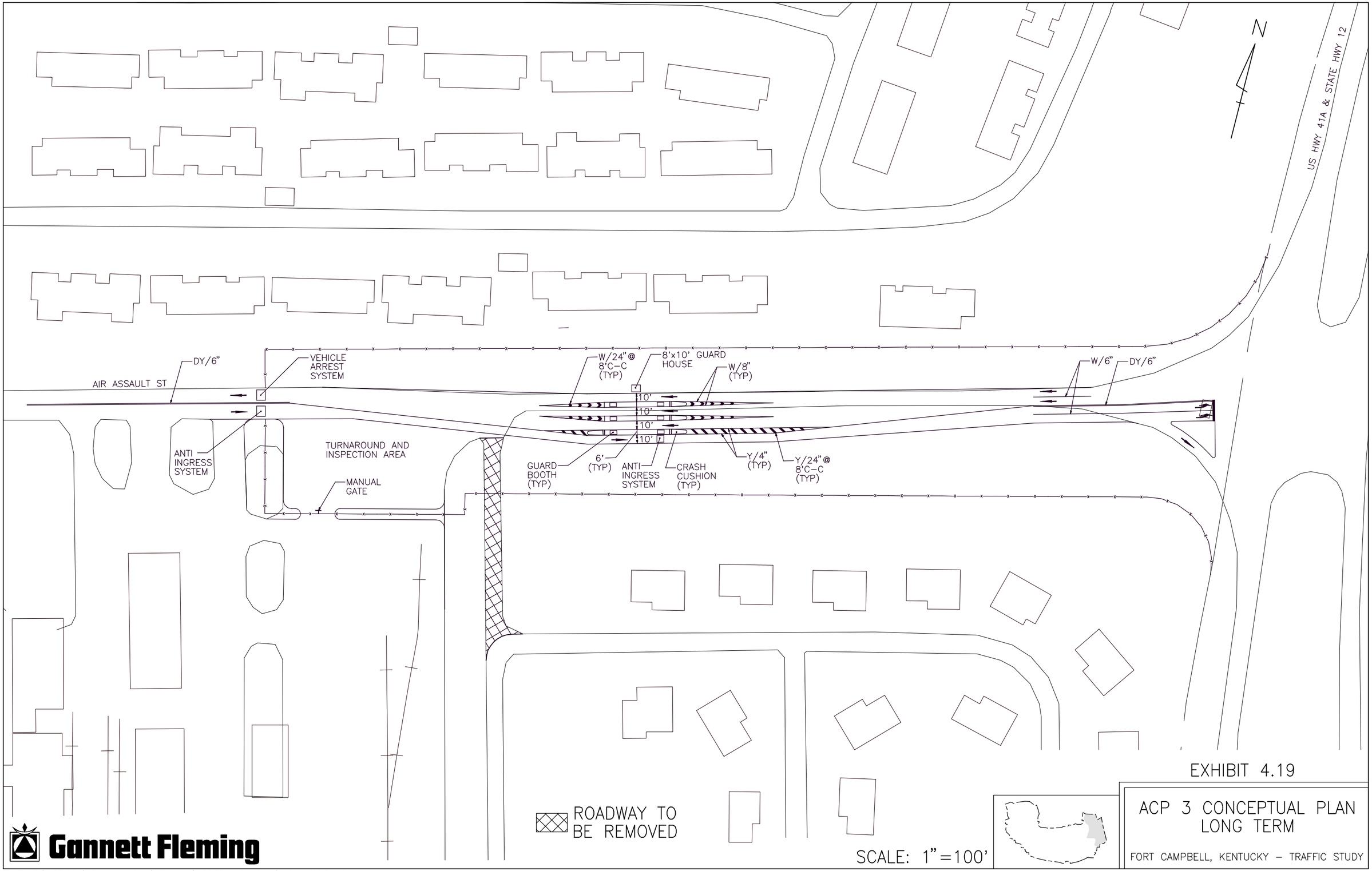


EXHIBIT 4.19

ACP 3 CONCEPTUAL PLAN LONG TERM

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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4.4.6. ACP 4 – Screaming Eagle Boulevard

4.4.6.1. Existing Conditions

- ACP 4 (**Exhibit 4.20**) is the main access point to Fort Campbell providing access from both the north and south from U.S. Route 41A. A visitor center is found in the northwest quadrant of the Screaming Eagle Boulevard/ U.S. Route 41A intersection.
- The ACP has two inbound lanes.
- Smaller commercial vehicles are permitted at ACP 4.
- The ACP is open 24 hours a day, 7 days a week.
- The peak hour volume is 778 vehicles per hour. This volume does not reflect vehicles that may have been waiting to pass through the ACP.
- The inbound lanes are over signed with several types and styles of visitor signs as is illustrated in **Exhibit 4.21**.
- The ACP has adequate lighting.

4.4.6.2. Short-term Recommendations

- Simplify visitors signing as detailed in **Exhibit 4.22**. Once visitors are directed into the processing area provide additional signing to direct motorists to specific areas.
- Barrier systems should be complete and continuous with an appropriate end treatment.
- Tandem processing is good but has diminishing returns when there are more than three checkpoints per lane. During DONSA conditions, six checkpoints per lane were open at ACP 4, while other ACP's were closed. Substantial delays were noted as illustrated in **Exhibit 4.23**. Consider opening additional ACP's under DONSA conditions and limiting ACP to two or three checkpoints per lane. The extra manpower should be relocated to other ACP's

4.4.6.3. Long-term Recommendations

- Construct five inbound lanes capable of tandem processing. The needed lane transitions will require that the checkpoint be relocated to the west of the existing location and will require the relocation of Primera Drive.
- Maintain two outbound lanes through the ACP area. At the intersection there will be three lanes, including two left turn lanes and a right turn lane.
- Relocate the visitor's center parking to accommodate the lane and transitional requirements of the new ACP. Consider integrating a park-and-ride and transit center at the visitor's center.

Long-term improvements are shown as **Exhibit 4.24.**

Exhibit 4.20 ACP 4 (eastward view)

Exhibit 4.21 Visitor signing approaching ACP 4

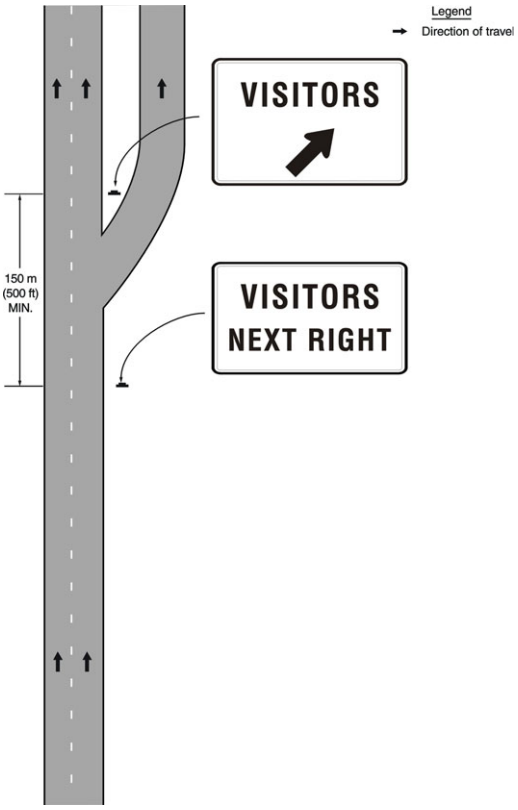
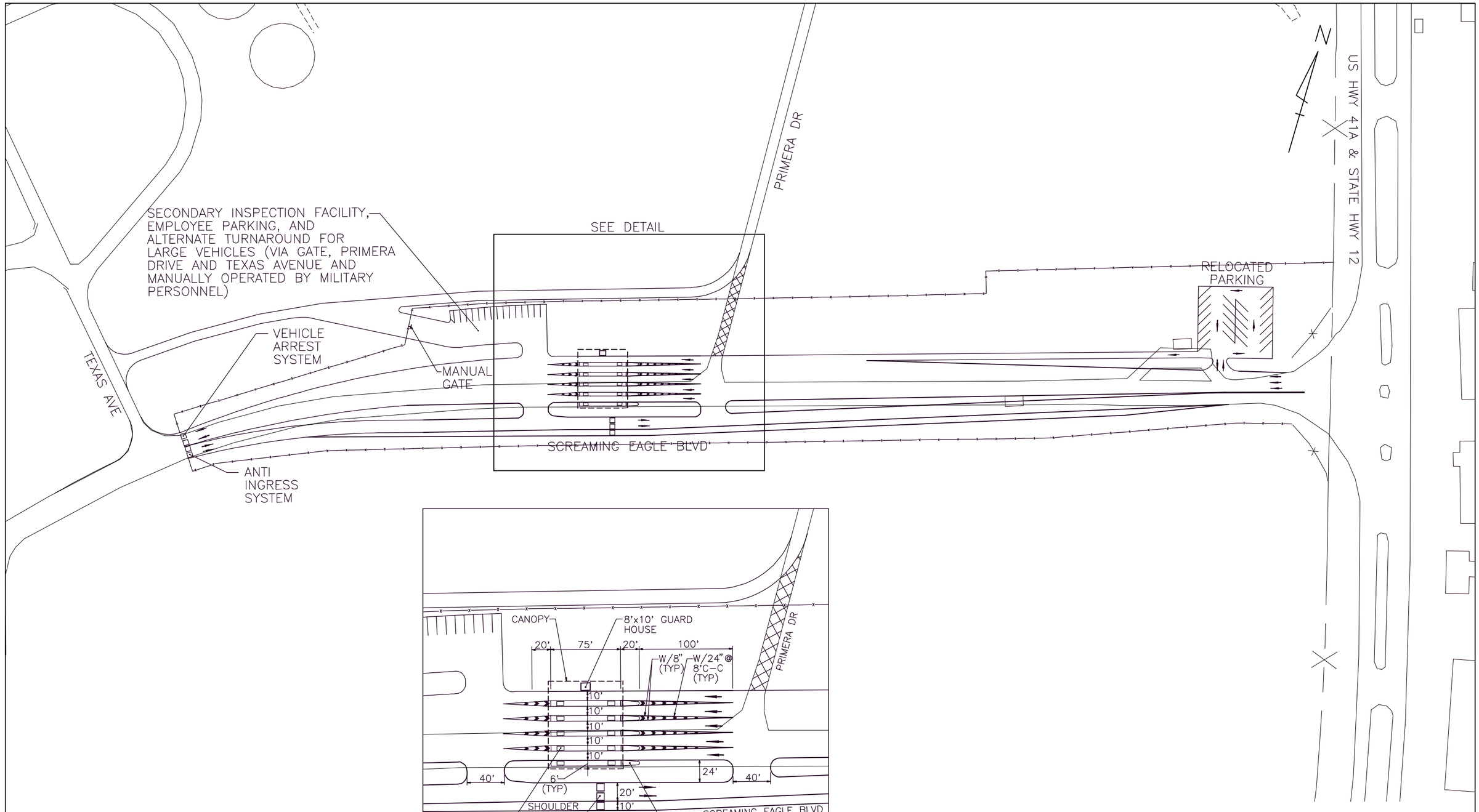
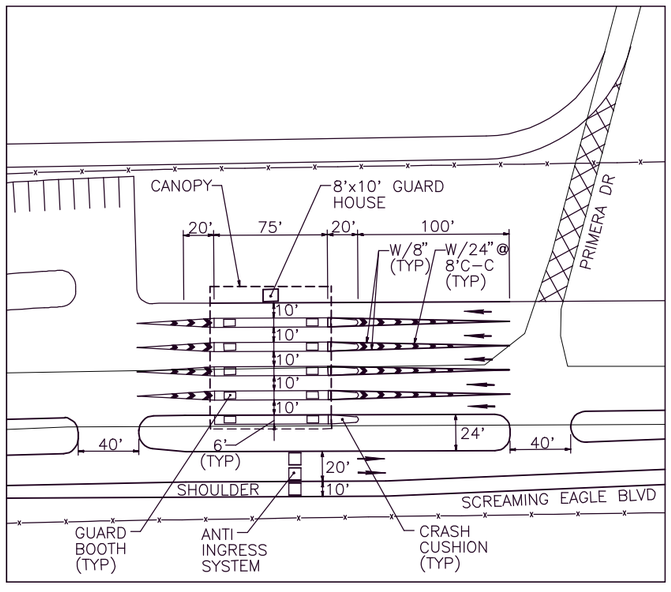


Exhibit 4.22 Recommended Visitors Signing

Exhibit 4.23 Intersection of U.S Route 41A and Screaming Eagle Boulevard (southward view)





DETAIL
SCALE: 1"=100'

SCALE: 1"=150'

EXHIBIT 4.24

ACP 4 CONCEPTUAL PLAN
LONG TERM

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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4.4.7. ACP 5 – Forest Road

4.4.7.1. Existing Condition

- ACP 5 has one inbound and outbound lane.
- The estimated peak hour volume is 778 vehicles per hour. This volume does not reflect vehicles that may have been waiting to pass through the ACP.

4.4.7.2. Short-term Recommendations

- Maintain as outbound only, if needed.
- Consider removing barriers shown in **Exhibit 4.25.** They provide no benefit.
- Modify traffic signal at U.S. Route 41A and Forest Road. Deactivate northbound left-turn phase and adjust timings as needed.

Exhibit 4.25 ACP 5 (eastward view)

4.4.8. ACP 6 – Morgan Road

4.4.8.1. Existing Conditions

- ACP 6 has one inbound lane for vehicles with decals and visitors with passes. There is one outbound lane with a right turn lane at the intersection with Fort Campbell Boulevard.
- The ACP is open Monday through Friday processing all vehicles except trucks.
- The estimated peak hour volume is 513 vehicles per hour. This volume does not reflect vehicles that may have been waiting to pass through the ACP.
- The ACP has adequate lighting.

4.4.8.2. Short-term Recommendations

- There are force protections in place at ACP 6 that are too closely spaced as can be seen in **Exhibits 4.26** and **4.27**. Chicanes are spaced between 20 and 30 feet apart, but should be spaced at least 55 feet, if used.
- Chicanes should be made up of complete and continuous barriers systems running parallel to the travel way and not barriers place perpendicular to the roadway.

4.4.8.3. Long-term Recommendations

- Construct two inbound lanes capable of tandem processing as illustrated in **Exhibit 4.28.**
- Long-term considerations should be coordinated with housing initiatives and include an upgrade to Morgan Road such that housing does not have direct access onto Morgan Road. Access between Morgan Road and housing should be accomplished through a local roadway system resulting in a reduced number of access points and improved residential safety.

Exhibit 4.26 ACP 6 (westward view)

Exhibit 4.27 ACP 6 (westward view)

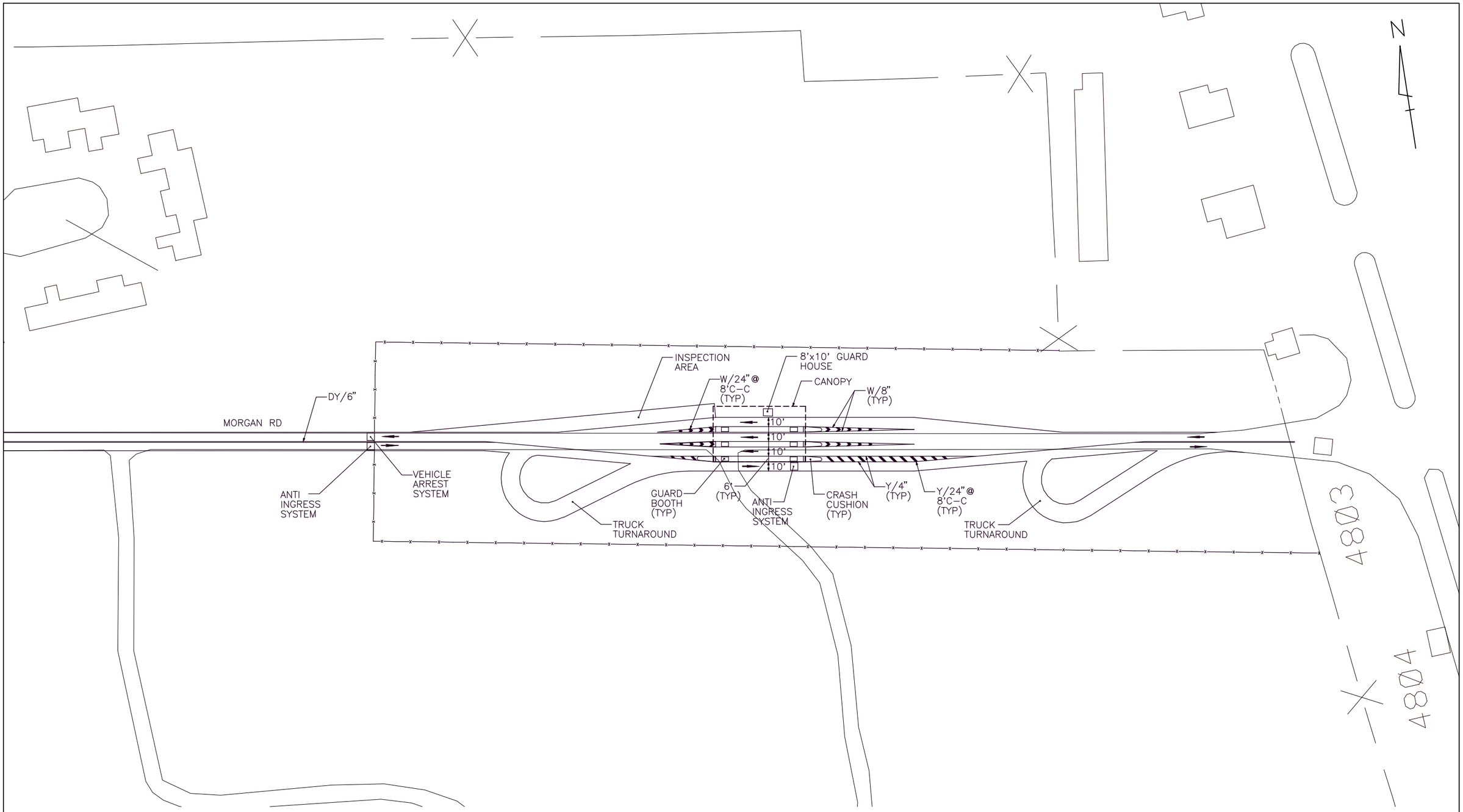

EXHIBIT 4.28

SCALE: 1"=100'

ACP 6 CONCEPTUAL PLAN LONG TERM

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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4.4.9. ACP 7 – Glider Road

4.4.9.1. Existing Conditions

- ACP 7 (**Exhibit 4.29**) has two inbound lanes for vehicles with decals and visitors with passes. It provides access to the northeast portion of the base (Route 41A). There is one outbound lane with a right turn lane at the intersection with Fort Campbell Boulevard.
- The ACP is open 24 hours a day processing all vehicles.
- The estimated peak hour volume is 53 vehicles per hour. The percentage of trucks is 80.7. This volume does not reflect vehicles that may have been waiting to pass through the ACP.
- Based on field observations, truck processing ranges between two and five minutes.

4.4.9.2. Short-term Recommendations

Between February and April 2002, the ACP 7 checkpoint was relocated from a temporary location to a more permanent location. As part of the relocation, a second inbound processing lane was added. The second lane provides additional traffic capacity. Also, the second lane provides a location to park a large vehicle while being inspected and processed without impacting traffic operations.

4.4.9.3. Long-term Recommendations

- Construct two inbound lanes capable of tandem processing approximately 2300 feet from the intersection of Morgan Road and Glider Road.
- ACP 7 will remain the primary entrance for all truck traffic with a new x-ray machine and inspection equipment. Due to the limited number of machines that will be utilized for inspection, only one truck will be processed at a time. A parking area for 30 trucks should be provided. This area can also be used for preliminary inspection and can be expanded for future growth. To determine the number of parking spaces needed, a processing rate of 3-5 minutes per truck was assumed; this rate has been observed at other installations. **Exhibit 4.31** illustrates how the number of spaces was determined. It should be noted that parking requirements do not consider cumulative queuing that may occur as a result of the previous hours.
- Install signing on U.S. Route 41A southbound prior to the intersection with Cole Road directing all truck traffic to ACP 7.
- Maintain one lane outbound. The intersection with U.S Route 41A will have a single left turn lane and a single right turn lane.

Long-term improvements are presented as **Exhibit 4.32**.

Exhibit 4.29 ACP 7 (southward view)

Exhibit 4.30 Intersection of U.S. Route 41A and Cole Road (northward view)

Exhibit 4.31 Long-term Truck Parking Requirements at ACP 7

Condition	Truck Peak Hour Volume	Processing Rate minutes / truck	Trucks / Hour	Required Truck Parking
Existing	43	3	20	23 spaces
Existing	43	5	12	31 spaces

Assumes no cumulative queuing. Assumes no substantial future growth in truck traffic.

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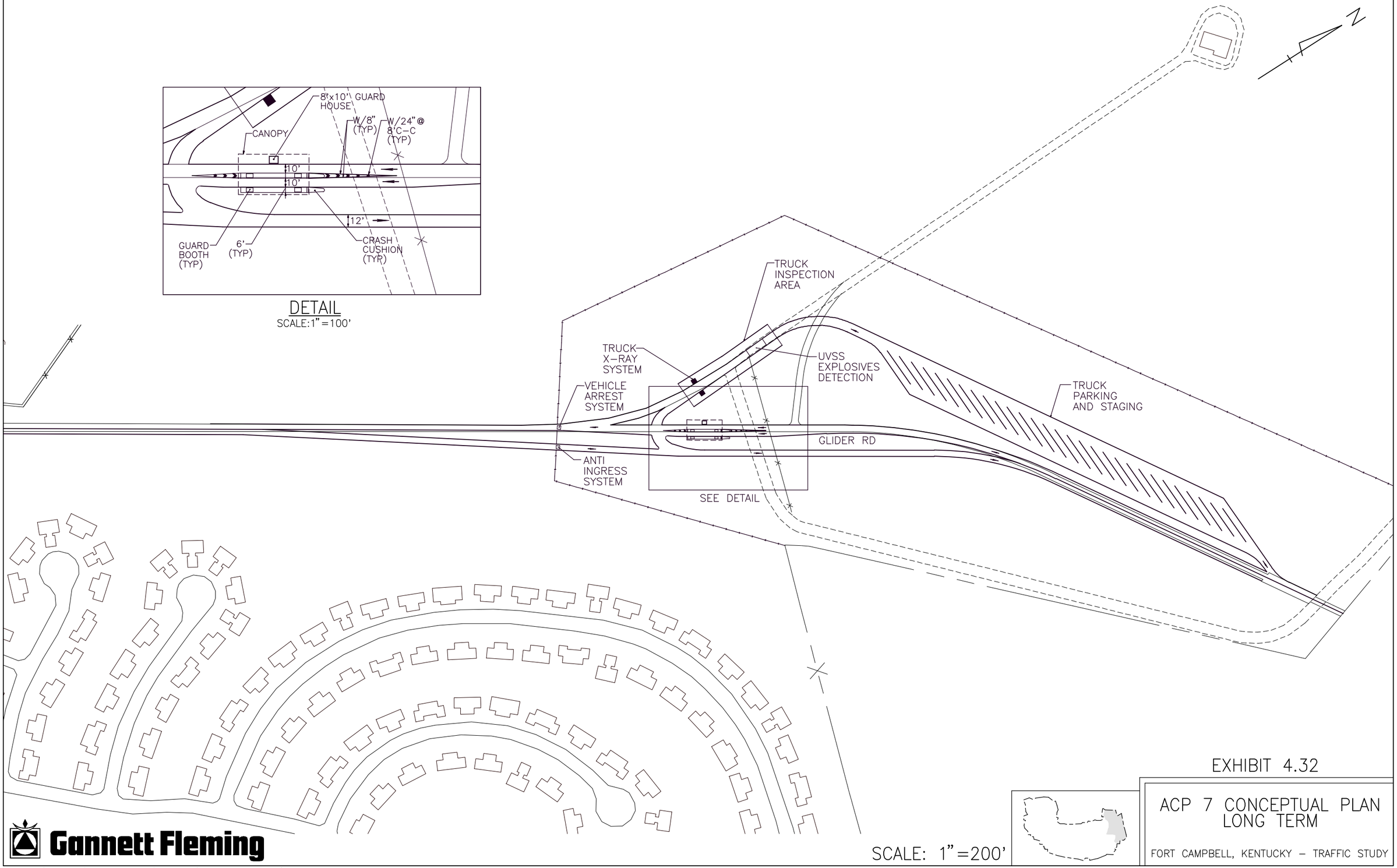

Gannett Fleming

SCALE: 1"=200'

EXHIBIT 4.32

ACP 7 CONCEPTUAL PLAN
LONG TERM

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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4.4.10. ACP 10 – 101st Airborne Division Road

4.4.10.1. Existing Conditions

- ACP 10 has three inbound lanes for vehicles with decals and visitors with passes (**Exhibit 4.33 and 4.34**). It provides access to the southern portion of the base and is approximately 1.8 miles from the intersection of 11th Airborne Division Road and 101st Airborne Division Road. There is one outbound lane.
- The ACP is open seven days a week processing all vehicles except trucks.
- According to traffic counts, the estimated peak hour volume is 627 vehicles per hour. This volume does not reflect vehicles that may have been waiting to pass through the ACP.

4.4.10.2. Short-term Recommendations

- Add an area for local truck processing. Permit local truck traffic at ACP 10 due to the location of the landfill as well as the proximity of Clarksville. ACP 10 could be restricted to authorized, pre-approved, local trucks only which are still inspected but have had some level of background screening completed

4.4.10.3. Long-term Recommendations

- Construct three inbound lanes capable of tandem processing approximately 1.8 miles from the intersection of 11th Airborne Division Road and 101st Airborne Division Road.
- Open ACP 10 to local trucks. Permit local truck traffic at ACP 10 as stated previously. Construct a truck-processing center parallel to the ACP.
- Maintain one lane outbound.

Long-term recommendations are presented in **Exhibit 4.35**.

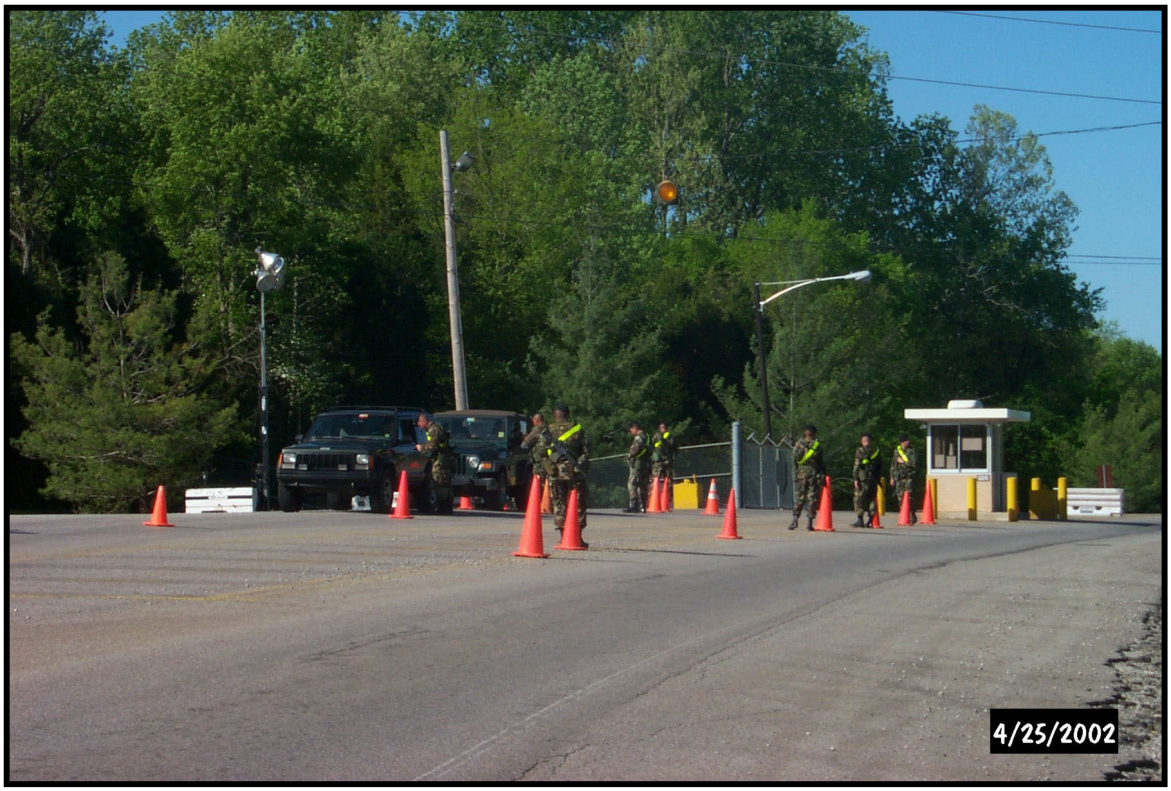


Exhibit 4.33 ACP 10 (southward view)

Exhibit 4.34 ACP 10 (northward view)

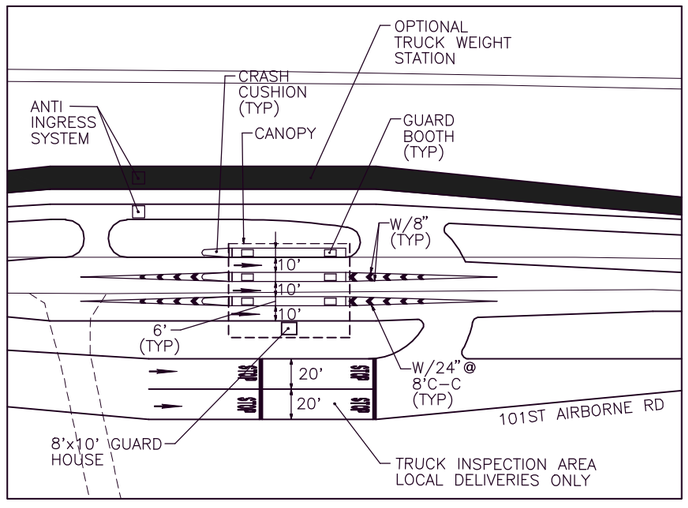
N

ANTI
INGRESS
SYSTEM

VEHICLE
ARREST
SYSTEM

101ST AIRBORNE RD

SEE DETAIL



DETAIL
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EXHIBIT 4.35

SCALE: 1"=150'

ACP 10 CONCEPTUAL PLAN LONG TERM

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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4.4.11. Other Access Control Points

Three other ACP's were evaluated as part of this study: Angels, Mabry and Bell Station. All three ACP's are 24-hour, seven day a week ACP's. At the time of the Study Team's site visit in February 2002, access was restricted to authorized, government, tactical and contractor vehicles only. Since then, Angels Road and Mabry Road have been reopened to POV traffic. Bell Station is still for the 160th only. The 160th will be building a memorial for "Fallen Soldiers" just west of the present ACP, which will require the relocation of this ACP to the west.

Exhibit 4.36 illustrates a conceptual layout for a two-lane ACP.

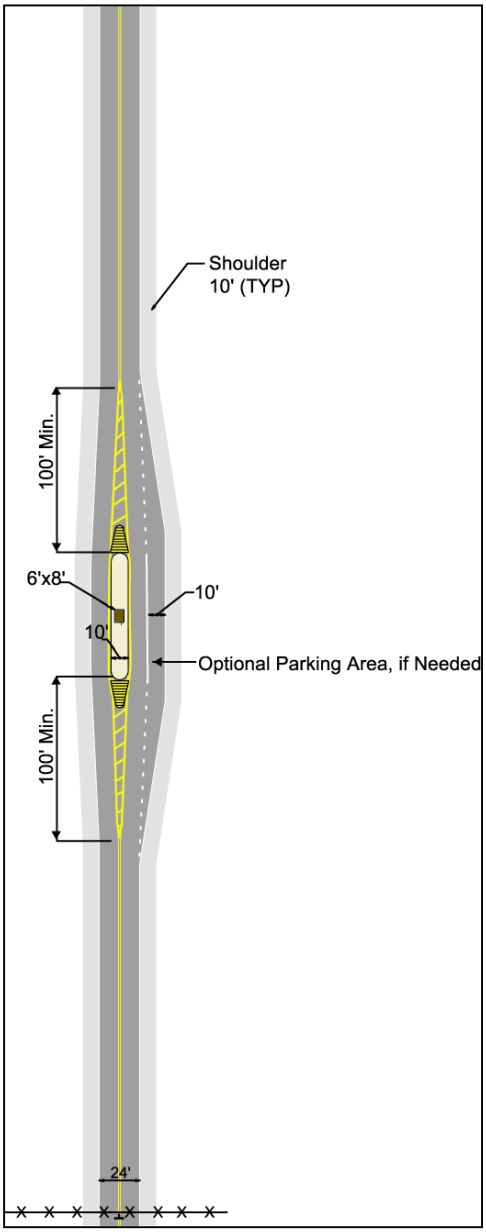


Exhibit 4.36 Conceptual Layout of Two-lane ACP

4.4.11.1. Mabry Road

Mabry Road has an existing-adjusted peak hour volume of 58 vehicles, which is serviced by a gatehouse on the right-hand side of the roadway.

At the present time, Mabry Road functions acceptably operationally. No substantial upgrades are recommended. Safety enhancements such as crash cushions and improved markings should be considered.

4.4.11.2. Angels Road

Angels Road has an existing-adjusted peak hour volume of 77 vehicles, which is serviced by a gatehouse on the right-hand side of the roadway.

Discussions have taken place regarding combining the Angels Road ACP with the CAAF ACP through realignments and road closure. Operationally, this is acceptable provided lane requirements are satisfied (350 vphpl) and sufficient spacing between intersections and ACP's can be maintained (300 feet minimum). However, these ACP's serve different purposes and the realignments would prove difficult and costly. Therefore, the combination of these gates is not recommended.

4.4.11.3. Bell Station

Traffic data and field notes for Bell Station were unavailable due to security concerns. The Bell Station ACP provides control to the 160th Headquarters. Operations at the ACP are complicated by the addition of a roadway connecting to points off the installation to the north and to an additional access roadway to the south. The layout of Bell Station resembles an ACP located in the center of an intersection where all traffic must circle to the right.

One improvement option identified as part of this study is to relocate the side roadways (north and south roadways) 500 feet to the west of the Bell Station ACP. As part of the improvement, restrict access at the north (off-installation) roadway to authorized vehicles to be controlled by an additional ACP. Bell Station will become a conventional use ACP.

Installation personnel are exploring other options.

4.5. ACP Long-term Cost Estimates

Preliminary cost estimates were developed for long-term ACP upgrades as presented in **Exhibit 4.37.** These cost estimates are preliminary and may vary as design and construction proceed. The unit cost of the items used is dependent on the type and quality of the materials.

Exhibit 4.37 Preliminary ACP Cost Estimate

ACP	Preliminary Estimate (Millions)	FORSCOM Estimate* (Millions)
1	$1.4 - $2.0	$0.35
3	$1.2 - $1.6	$0.35
4	$3.1 - $4.1	$0.85
6	$1.6 - $2.2	$0.35
7	$2.4 - $3.3	$0.60
10	$2.4 - $3.3	$0.55

*Includes technology and vehicle arrest systems

5. INTERSECTION ASSESSMENTS

As part of the study, over 40 intersections were screened to identify if further analysis was required. The goal of the screening process was to identify intersections possibly warranting improvements. The screening process considered three criteria:

1. **Operational Deficiencies** – Intersections with operational deficiencies (LOS E or worse) were screened for existing, existing-adjusted and future conditions.

2. **Crash History** – Intersections with a significant crash history (three or more crashes per year or one or more fatalities per year) were screened.

3. **Stakeholder Concern** – Locations identified by the Project Team and stakeholders as areas of concern.

It should be noted that some of the intersections have been previously studied as noted in Section 3 of this study and that some intersections are undergoing enhancements at this time. **For the purpose of this study, improvements necessary to provide acceptable operating conditions for existing - adjusted volumes were identified.** Where reasonable and feasible, improvements to accommodate future – adjusted traffic volumes were identified.

Baseline conditions for intersections with ongoing construction were assumed to be the design condition. In some cases, this mitigated operational deficiencies and safety concerns. An example of this is the intersection of U.S. Route 41A and Cole Road (ACP 7) where upgrades include signalization.

5.1. U.S. Route 41A and Lee Road

5.1.1. Existing Traffic Control and Geometry

- ***Control:*** Signalized, four-leg intersection. (**Exhibits 5.1-5.4**)

- ***Speed Limit:*** 45 mph on U.S. Route 41A; 30 mph on Jack Miller Boulevard (east leg of intersection), 15 mph approaching ACP 1 (westbound).

- ***Roadway Configuration:*** U.S. Route 41A has three lanes and an exclusive left-turn lane on each approach. The southbound approach has a right-turn lane. Lee Road has two lanes on the eastbound approach, including a channelized right-turn lane. Jack Miller Boulevard has a through/left-turn lane and an exclusive right-turn lane on the westbound approach.

5.1.2. Observations

- The intersection is a major access point from U.S. Route 41A to Fort Campbell and operations are often impacted by operations at ACP 1 as was discussed previously. Design impacts as a result of ACP 1 upgrades should be coordinated with needed intersection enhancements.
- There is a heavy eastbound left-turn movement out of the ACP during mid-day peak hours, which could be attributed to base traffic patronizing businesses and restaurants along U.S. Route 41A north of this intersection.

Exhibit 5.1 U.S. Route 41A and Lee Road/Jack Miller Boulevard (northward view)

Exhibit 5.2 U.S. Route 41A and Lee Road/Jack Miller Boulevard (southward view)

Exhibit 5.3 U.S. Route 41A and Lee Road/Jack Miller Boulevard (eastward view)

Exhibit 5.4 U.S. Route 41A and Lee Road/Jack Miller Boulevard (westward view)

5.1.3. Operations

As shown in **Exhibit 5.5**, the intersection experiences deficient LOS at all times of day on the eastbound approach. Additionally, it is predicted that unacceptable LOS will be experienced on the northbound and westbound approaches in the future.

Exhibit 5.5 Level of Service – U.S. Route 41A and Lee Road

Movement	Morning Peak				Mid-day Peak				Evening Peak			
	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	C	D	E	B	C	C	C	B	C	C	C	B
SB Approach	B	B	B	C	C	C	C	C	C	C	C	D
EB Approach	F	F	F	B	F	F	F	B	F	F	F	D
WB Approach	D	E	F	C	C	C	D	C	C	D	E	D
Overall	**D**	**D**	**E**	**B**	**C**	**D**	**D**	**C**	**D**	**F**	**F**	**D**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes
4. Proposed conditions and existing – adjusted traffic volumes

The operational analyses performed do not consider the operational impacts associated with ACP backups especially during the morning peak hour. In some cases, actual operations may be worse than those the model calculated. Improvements to the ACP that improve capacity and processing should enhance intersection operations.

5.1.4. Recommendations

- The addition of an exclusive left-turn lane on the eastbound approach would mitigate the eastbound approach LOS to D or better for existing-adjusted volumes during all periods.
- To better accommodate the directional distribution on the westbound approach, reconfigure and restripe as an exclusive left-turn lane and a shared through/right-turn lane.
- Reconfigure the phasing of the traffic signal.
    - The east-west phasing pattern should be shared phasing with protected/permitted left-turn phasing.
    - An overlap phase for the eastbound right-turn movement should be implemented with the northbound left-turn phase.
    - The northbound/southbound left-turn phases should be protected/prohibited due to a large conflict factor with the opposite through traffic volume.
- Reevaluate timing as part of improvement design process. Proposed timings are presented in **Exhibit 5.6.**
    - These cycle lengths and phasing differ from the existing phasing.
    - Although the eastbound afternoon through phase seems low, this is appropriate because it only represents the demand for the through and left-turning movements. There is a significant movement of

traffic in the eastbound right direction; which governs the length of the northbound left-turn phase.

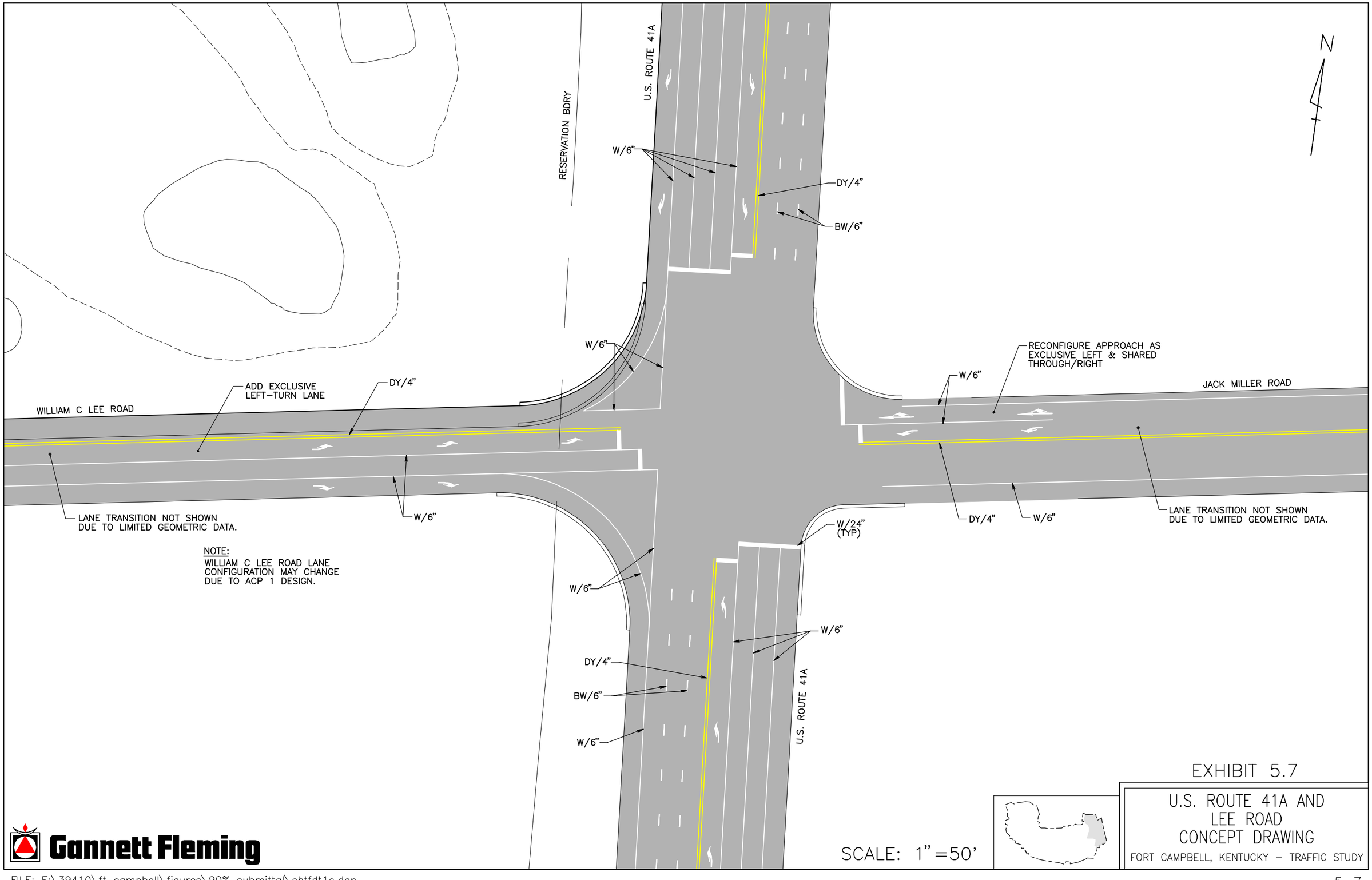
Exhibit 5.6 Proposed Timings – U.S. Route 41A and Lee Road

Movement	Phase (seconds)								Cycle Length
	1	2	3	4	5	6	7	8	
	SBL	NBT	WBL	EBT	NBL	SBT	EBL	WBT	
Morning Timings	11	70	23	31	45	36	26	28	135
Mid-Day Timings	20	59	20	36	26	53	36	20	135
Evening Timings	20	77	13	20	50	47	13	20	130

Phase 5 includes eastbound right-turn overlap phase.
The northbound/southbound approach is U.S. Route 41A.
The eastbound/westbound approach is Lee Road/Jack Miller Road.

The improvements at this intersection are expected to cost approximately $26,000.

Exhibit 5.7 shows a conceptual layout of the intersection.



Gannett Fleming

SCALE: 1" =50'

EXHIBIT 5.7

U.S. ROUTE 41A AND LEE ROAD CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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5.2. U.S. Route 41A and Screaming Eagle Boulevard

5.2.1. Existing Traffic Control and Geometry

- ***Control:*** Signalized, three-leg intersection. (**Exhibits 5.8-5.11**)

- ***Speed Limit:*** 45 mph on U.S. Route 41A; 15 mph at ACP 4.

- ***Roadway Configuration:*** U.S. Route 41A has two lanes on each approach, with an exclusive left-turn lane on the northbound approach, and a channelized free right-turn lane on the southbound approach. On the eastbound approach, exiting ACP 4, there is an exclusive left and a channelized free right-turn lane.

  There is no westbound approach to the intersection. However, commercial properties boarder U.S. Route 41A along the eastern side. The intersection is not closed off from the parking lots to these commercial properties, however there are no signal heads or actuator loops serving this approach.

  Construction is underway along U.S. Route 41A that will include an upgrade of the intersection to include a new traffic signal, three through lanes in the northbound and southbound directions two northbound left-turn lanes, an exclusive southbound right-turn lane, two eastbound left-turn lanes and an exclusive eastbound right-turn lane. East of the intersection, access points will be consolidated to a point forming a west leg for the intersection which will be controlled by the traffic signal.

- ***Signing and Marking:*** Yield sign on southbound and eastbound channelized right-turn lanes.

Exhibit 5.8 U.S. Route 41A and Screaming Eagle Boulevard (northward view)

Exhibit 5.9 U.S. Route 41A and Screaming Eagle Boulevard (southward view)

Exhibit 5.10 U.S. Route 41A and Screaming Eagle Boulevard (eastward view)

Exhibit 5.11 U.S. Route 41A and Screaming Eagle Boulevard, Looking toward the entrance of ACP 4 (westward view)

5.2.2. Observations

- This intersection serves as the main access point from U.S. Route 41A to Fort Campbell.
- Gate operations frequently interfere with the operation of this intersection.
- A visitor center is located in the northwest quadrant of the intersection. All Fort Campbell visitors are required to report to the visitor center before accessing the installation.
- The study team observed different traffic patterns on a Day Of No Scheduled Activities (DONSA) when Gates 1, 3 and 6 are closed.
- There were significant queues extending onto U.S. Route 41A. (**Exhibit 5.12**)

Exhibit 5.12 U.S. Route 41A backup to ACP 4 during DONSA (southward view)

5.2.3. Operations

For the purpose of this study, design conditions were analyzed as the intersection improvements. Scenarios 1 and 2 represent conditions prior to construction. As can be seen in **Exhibit 5.13**, intersection operations will be acceptable once intersection construction has been completed.

Exhibit 5.13 Level of Service – U.S. Route 41A and Screaming Eagle Boulevard

Movement	Morning Peak				Mid-day Peak				Evening Peak			
	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	A	A	B	A	D	F	F	B	F	F	F	B
SB Approach	A	A	A	A	B	B	B	B	C	B	B	B
EB Approach	A	A	A	A	E	F	F	A	F	F	F	D
Overall	**A**	**A**	**A**	**A**	**D**	**F**	**F**	**B**	**F**	**F**	**F**	**C**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes
4. Proposed conditions and existing – adjusted traffic volumes

The operational analyses performed do not consider the operational impacts associated with ACP backups especially during the morning peak hour. In some cases, actual operations may be worse than those the model calculated. Improvements to the ACP that improve capacity and processing should enhance intersection operations.

Currently, ACP 4 is the Main Gate and the location at which visitor processing and vehicle registration occurs. It was questioned if these activities impact roadway operations and if the transportation network would be better served if these activities were directed to another ACP. Although these activities may impact operations, ACP 4 is viewed as the Main (visitors) Gate and therefore unless an aggressive educational campaign (signing, news, etc.) it may have little benefit to redirect these activities to other ACP's. It would be likely that visitors and vehicle registration would go to ACP 4 anyway only to be redirected to another ACP adding more traffic to local roadways. Furthermore it is unlikely that other ACP's have the space necessary for these types of operations.

5.2.4. Recommendations

Based on the analyses performed as part of the study, the ongoing improvements will adequately improve operations to accommodate existing adjusted traffic volumes. Therefore no additional recommendations for improvement have been identified at this time.

An example of appropriate traffic signal timings for this intersection is presented in **Exhibit 5.14**.

Exhibit 5.14 Proposed Signal Timings – U.S. Route 41A and Screaming Eagle Boulevard

Movement	Phase (seconds)								Cycle Length
	1	2	3	4	5	6	7	8	
	SBL	NBT	WBL	EBT	NBL	SBT	EBL	WBT	
Morning Timings	N/A	40	N/A	20	20	20	N/A	20	80
Mid-Day Timings	N/A	40	N/A	20	19	21	N/A	20	80
Evening Timings	N/A	46	N/A	24	19	27	N/A	20	90

The northbound/southbound approach is U.S. Route 41A.
The eastbound/westbound approach is Screaming Eagle Boulevard.

These timings are based on split side road phasing, and a protected/prohibited northbound left-turn phase.

Although there are timings presented in **Exhibit 5.14** for the westbound commercial access, they are based on traffic volumes that were approximated. Turning movement counts of the existing intersection would not be reliable because that approach is not currently under control of the traffic signal. Additionally, when this approach becomes signalized, it may attract traffic that currently uses other access points. Further investigation of this intersection should be conducted to further confirm timings for this approach.

Exhibit 5.15 shows the proposed improvements to this intersection, part of the U.S. Route 41A upgrade project.

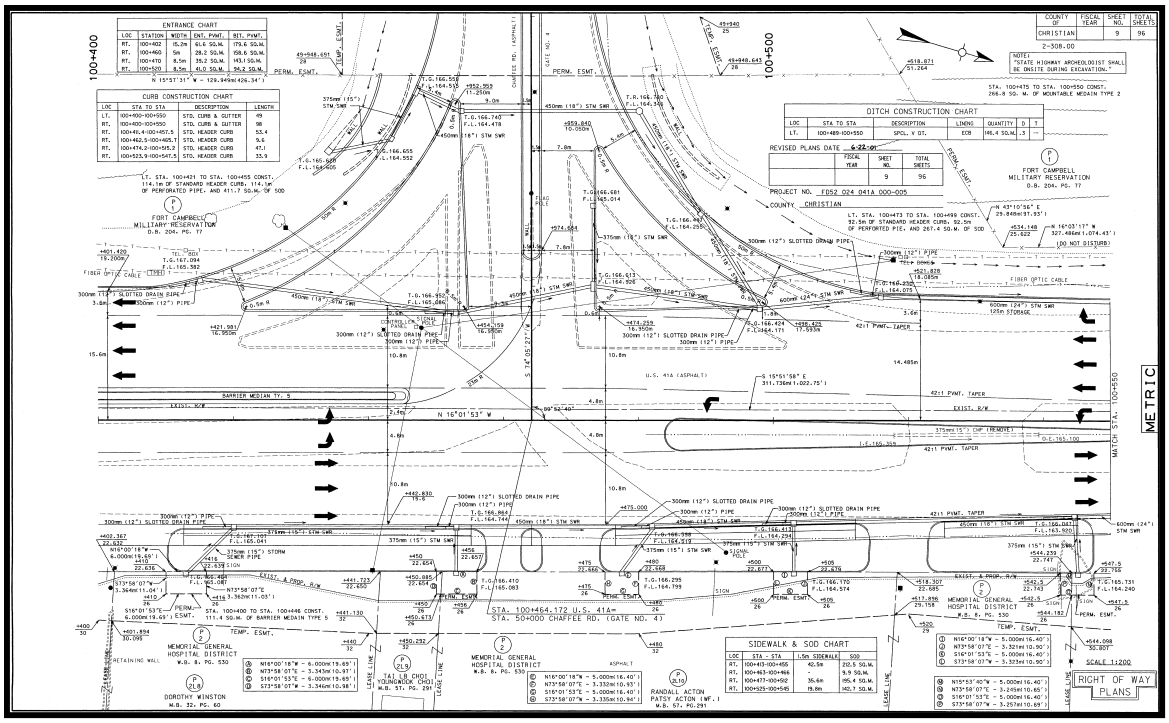


Exhibit 5.15 U.S. Route 41A and Screaming Eagle Boulevard Intersection Improvements, from KTC plans for U.S. Route 41A widening.

5.3. Bastogne Avenue and Screaming Eagle Boulevard

5.3.1. Existing Traffic Control and Geometry

- ***Control:*** Actuated, 8-phase signalized, four-leg intersection. (**Exhibits 5.16-5.19**)

- ***Speed Limit:*** 35 mph on Bastogne Avenue, unposted on Screaming Eagle Boulevard.

- ***Roadway Section:*** Bastogne Avenue has one through lane, and an exclusive left-turn lane on each approach. Screaming Eagle Boulevard has two through lanes and an exclusive left-turn lane on each approach, and an exclusive right-turn lane on the eastbound approach.

5.3.2. Observations

- Mid-day peak hour traffic was queued between Screaming Eagle Boulevard and 30th Street along southbound Bastogne Avenue.
- Parking stalls along the northbound intersection departure conflicts with through traffic on Bastogne Avenue.
- There are no backplates on the signal head. This creates visibility problems, especially in the east-west direction where the sun rises and sets.
- The pavement marking arrows on the eastbound approach right-turn lane are not centered in the lane.
- There are conflicting pavement markings on the along the taper of the eastbound right-turn lane.
- The eastbound left-turn lane has an inappropriately placed left-turn arrow in advance of the left-turn lane.

Exhibit 5.16 Bastogne Avenue and Screaming Eagle Boulevard (northward view)

Exhibit 5.17 Bastogne Avenue and Screaming Eagle Boulevard (southward view)

Exhibit 5.18 Bastogne Avenue and Screaming Eagle Boulevard (eastward view)

Exhibit 5.19 Bastogne Avenue and Screaming Eagle Boulevard (westward view)

5.3.3. Operations

Evident in **Exhibit 5.20**, the intersection experiences operational deficiencies during the mid-day and evening peak hours. These operational deficiencies can be attributed to capacity constraints on the southbound approach.

Exhibit 5.20 Level of Service – Bastogne Avenue and Screaming Eagle Boulevard

Movement	Morning Peak				Mid-day Peak				Evening Peak			
	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	A	A	A	B	A	A	B	B	A	A	D	C
SB Approach	A	B	B	C	C	F	F	C	D	F	F	D
EB Approach	A	A	A	B	B	B	B	C	C	C	B	C
WB Approach	A	A	A	B	B	D	D	B	D	D	C	C
Overall	**A**	**A**	**B**	**B**	**B**	**D**	**E**	**C**	**C**	**E**	**E**	**C**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes
4. Proposed conditions and existing – adjusted traffic volumes

5.3.4. Recommendations

Extensive delays were observed at this intersection and are very common. To achieve acceptable levels of service on all approaches, the intersection would need to be expanded geometrically by adding a second left-turn lane on the southbound approach and a dedicated right-turn lane on the northbound approach. The southbound left-turn phase would need to become a protected/prohibited phase due to the double left-turning lanes. This intersection should be improved in conjunction with Bastogne Avenue C**orridor improvements noted in Section 6.1**. The improvement at this intersection gives an overall level of service D or better during the three peak hours analyzed. Timing modifications should be included as part of any intersection improvements.

The long-term recommendations presented in the *Traffic and Safety Engineering Study* that was conducted in June 1999 were reviewed and are still applicable. The improvements identified as part of that study included:

- Provide a second southbound left-turn lane
- Provide pedestrian signal heads and actuation
- Provide pedestrian ramps and crosswalks

An additional long-term consideration affecting this intersection is the realignment of Screaming Eagle Boulevard. The preferred alignment alternative would have a portion of Screaming Eagle Boulevard, including its intersection with Bastogne Avenue, realigned to the north.

These recommendations are applicable to the existing alignment of Screaming Eagle Boulevard. The **impacts of the proposed Screaming Eagle Boulevard realignment are further discussed in Section 8.4.1.** Assuming similar traffic volumes for the relocated Screaming Eagle Boulevard intersection with Bastogne Avenue, the eastbound approach would need a left-turn lane, and two through lanes. The westbound approach would need a left-turn lane, two through lanes, and a right-turn lane. In order to satisfy future-adjusted traffic volumes, it would be necessary to have two through lanes along Bastogne Avenue. The northbound approach would need a left-turn lane, two through lanes, and a free-right-turning lane. The southbound approach would need two left-turning lanes, and two through lanes. Additional data could be collected and analyzed to determine the proportion of traffic that would utilize the realigned roadway versus existing Screaming Eagle and Normandy Boulevards, assuming the roadways remain intact.

Exhibit 5.21 shows proposed traffic signal timings effective in conjunction with the widening of the existing intersection.

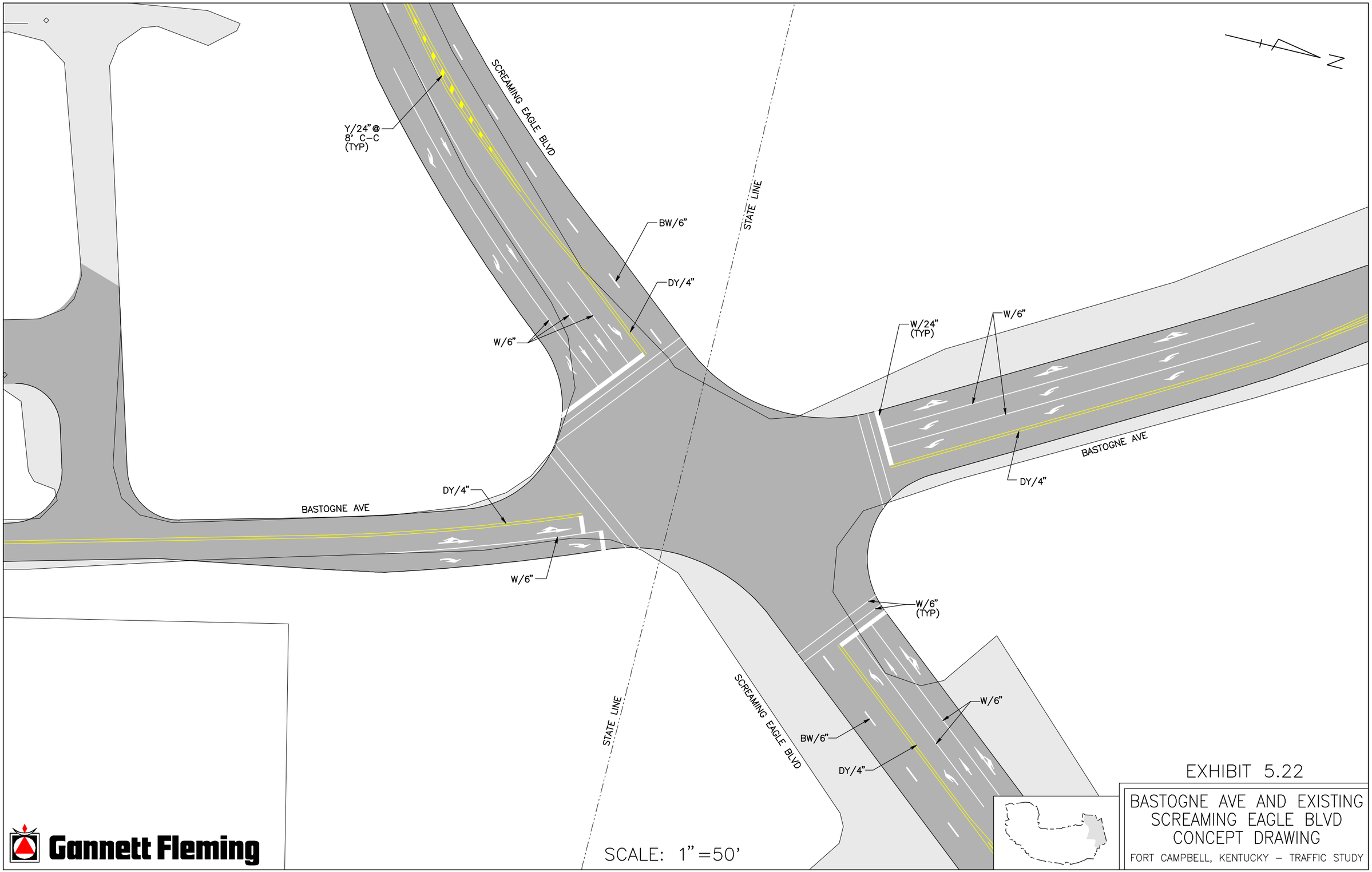
Exhibit 5.21 Proposed Signal Timings – Bastogne Avenue and Screaming Eagle Boulevard

Movement	Phase (seconds)								Cycle Length
	1	2	3	4	5	6	7	8	
	SBL	NBT	WBL	EBT	NBL	SBT	EBL	WBT	
Morning Timings	10	21	9	20	8	23	8	21	60
Mid-Day Timings	15	20	9	30	12	23	8	22	65
Evening Timings	19	22	9	30	13	28	8	31	80

The northbound/southbound approach is Bastogne Avenue.
The eastbound/westbound approach is Screaming Eagle Boulevard.

Exhibit 5.22 shows the proposed intersection widening. The drawing is effective for both Screaming Eagle Boulevard and Bastogne Avenue remaining in their present location.

The estimated cost of improvements at this intersection is $81,000.



Gannett Fleming

SCALE: 1"=50'

EXHIBIT 5.22

BASTOGNE AVE AND EXISTING SCREAMING EAGLE BLVD CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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5.4. Bastogne Avenue and Reed Avenue

5.4.1. Existing Traffic Control and Geometry

- ***Control:*** Two-phased signalized control, four-leg intersection. (**Exhibits 5.23-5.26**)

- ***Speed Limit:*** 35 mph on Bastogne Avenue; 25 mph on Reed Avenue.

- ***Roadway Section:*** Each approach on Bastogne Avenue has two lanes, comprised of a shared through/left-turning lane and a right-turning lane. Reed Avenue has one lane on each approach.

5.4.2. Observations

- Six crashes were reported during a one-year period.
- The pavement markings on Reed Avenue are faded and are in poor condition.
- There is a broken yellow line approaching this intersection on the north, east and west legs, indicating that passing is permitted.

Exhibit 5.23 Bastogne Avenue and Reed Avenue (northward view)

Exhibit 5.24 Bastogne Avenue and Reed Avenue (southward view)

Exhibit 5.25 Bastogne Avenue and Reed Avenue (eastward view)

Exhibit 5.26 Bastogne Avenue and Reed Avenue (westward view)

5.4.3. Operations

As previously stated, there are no apparent operational problems at this intersection; all LOS values are satisfactory, as shown in **Exhibit 5.27**.

Exhibit 5.27 Level of Service – Bastogne Avenue and Reed Avenue

Movement	Morning Peak				Mid-day Peak				Evening Peak			
	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	A	A	A	B	B	B	B	B	A	A	A	A
SB Approach	B	B	B	B	A	B	B	B	A	B	B	B
EB Approach	A	A	A	B	A	B	B	B	B	B	B	B
WB Approach	C	C	C	A	B	B	B	A	B	C	C	A
Overall	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**A**	**B**	**B**	**B**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes
4. Proposed conditions and existing – adjusted traffic volumes

5.4.4. Recommendations

Although the intersection has acceptable levels of service, the operational patterns and lane assignments as well as the worn markings may be contributing cause of the six crashes.

Analyses of the traffic volumes at the intersection indicated that there is a significant westbound left-turn volume on Reed Avenue, which does not have an exclusive lane or protected phasing. Based on the traffic volumes collected in February 2002, the approach warrants an exclusive left-turn lane with protected/permitted phasing per the *ITE Traffic Engineering Handbook.* **It is recognized that these volumes may not represent the present demand due to the closure of Reed Avenue between Forest Road and Morgan Road**. This closure would likely remove a significant portion of the traffic on this approach. Traffic volumes should be monitored at this intersection. If the product of the eastbound left-turn hourly volume and the opposing (westbound) hourly volume exceeds 50,000, protected/permitted left-turn phasing should be reconsidered.

In the north-south direction along Bastogne Avenue, it is recommended that the approaches be reconfigured to accommodate exclusive left-turn lanes and shared through right-turn lanes versus the existing configuration. Also, the closure of Reed Avenue will likely reduce the northbound right-turn demand, thus lessening the need for an exclusive right-turn lane. The reconfiguration of the north-south lane assignments should satisfy transitions requirements and should be in accordance with the MUTCD.

Pavement markings should be upgraded in accordance with the MUTCD. Backplates should also be added to signal heads.

The estimated cost of improvements at this intersection is $41,000. **Exhibit 5.28** shows a conceptual layout for this intersection. If westbound left-turn volumes are significantly less than those recorded as part of this study, the exclusive left-turn lane may not be needed. However, the transition upgrades and marking improvements should improve intersection safety.

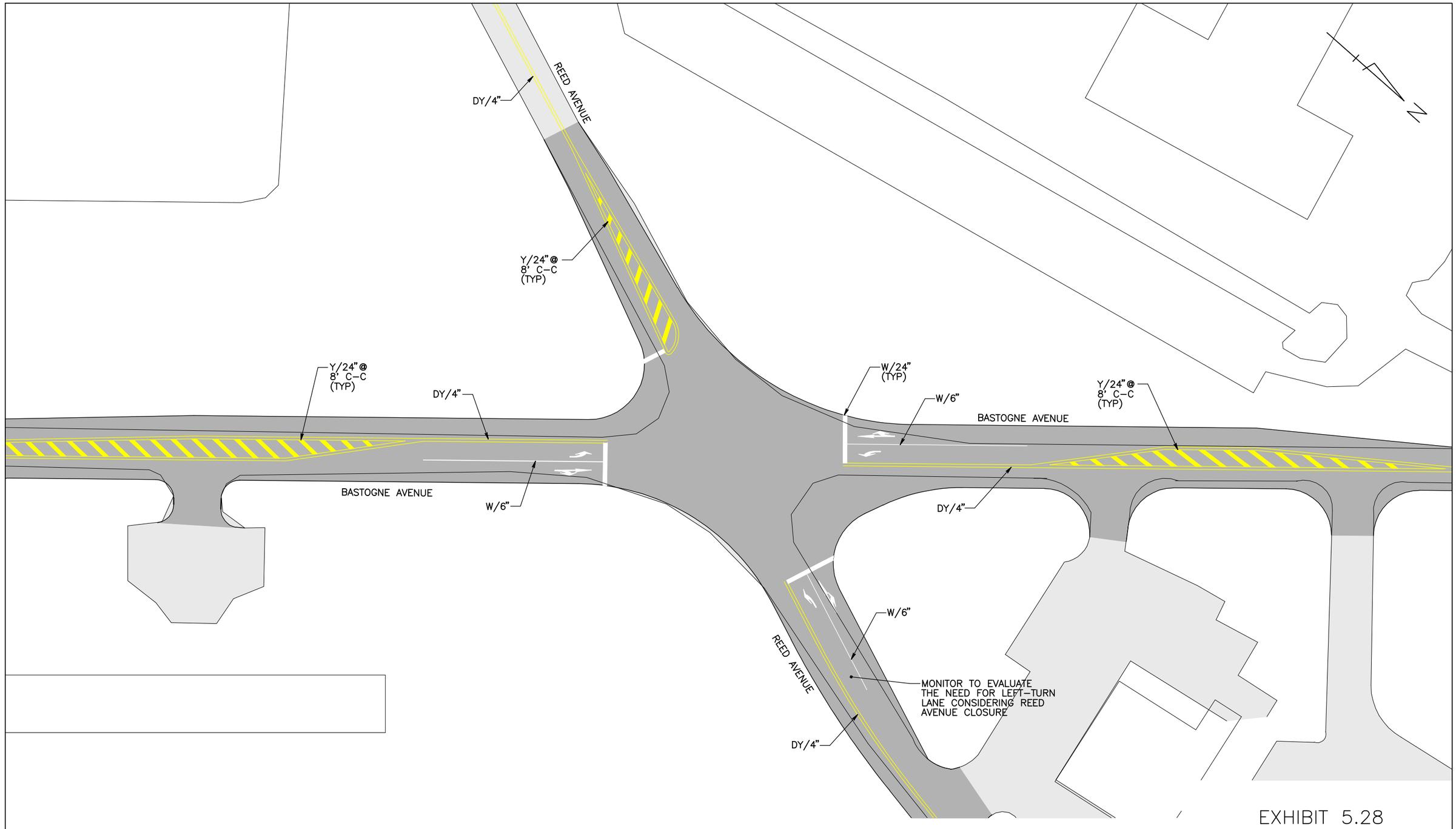

EXHIBIT 5.28

SCALE: 1"=50'

BASTOGNE AVENUE AND REED AVENUE CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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5.5. Bastogne Avenue and Hospital Drive

5.5.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, three-leg intersection with the eastbound approach under STOP control (**Exhibits 5.30-5.33**).
- ***Speed Limit:*** 35 mph on Bastogne Avenue; 20 mph on Hospital Drive.
- ***Roadway Section:*** Bastogne Avenue has one shared through/right lane on the southbound approach, and one through lane plus an exclusive left-turn lane on the northbound approach. On the eastbound approach of Hospital Drive, there is an exclusive left-turn lane and an exclusive right-turn lane.
- ***Roadway Configuration:*** Hospital Drive ends at its intersection with Bastogne Avenue.
- ***Signing and Marking:*** STOP sign at end of Hospital Drive.

5.5.2. Observations

- The left-turn volumes on the eastbound approach are significantly higher than the right-turn volumes.
- Vehicles turning left from Hospital Drive may have difficulty completing the movement due to the free movement of Bastogne Avenue. This can cause substantial queue lengths in the left-turn lane.
- Vehicles turning right are less prone to delays since they do not need a gap in both directions of Bastogne Avenue traffic stream.
- There is a partial left-turn arrow south of the left-turn lane along Bastogne Avenue. (**Exhibit 5.29**)

Exhibit 5.29 Partial left-turn arrow along Bastogne Avenue (northward view)

Exhibit 5.30 Bastogne Avenue and Hospital Drive (northward view)

Exhibit 5.31 Bastogne Avenue and Hospital Drive (southward view)

Exhibit 5.32 Bastogne Avenue and Hospital Drive (eastward view)

Exhibit 5.33 Bastogne Avenue and Hospital Drive (westward view)

5.5.3. Operations

The eastbound approach has unacceptable LOS E or worse for the existing-adjusted and future-adjusted traffic volumes at all times of day; this is because of high left-turn volumes. **Exhibit 5. 34** shows levels of service at this intersection.

Exhibit 5.34 Level of Service – Bastogne Avenue and Hospital Drive

Movement	Morning Peak			Mid-day Peak			Evening Peak		
	1	2	3	1	2	3	1	2	3
NB Approach	A	A	A	A	A	A	A	A	A
SB Approach	A	A	A	A	A	A	A	A	A
EB Approach	C	E	E	C	E	E	C	F	F
Overall	A	A	A	A	A	B	A	B	C

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes

5.5.4. Recommendations

Since the left turn from Hospital Drive is already a separate movement, the approach movement cannot be enhanced with lane additions while maintaining unsignalized control. A signal warrant analysis was performed using Warrant 3, Peak Hour, from the MUTCD. The analysis indicated that based on estimated growth factors, the installation of a signal at this intersection may be necessary sometime in the future, but is not warranted under existing-adjusted traffic volumes.

Consolidation of access should be considered along Bastogne Avenue such that safe, controlled and efficient access is provided. A possible solution to consider in the area of the Hospital Drive intersection is the combination of this intersection with the intersection directly north of it that provides access to the bank and other facilities, as discussed in Section 6.1. It is estimated that this access consolidation would cost approximately $190,000, assuming that the new intersection would be signalized, and the existing Hospital Drive intersection would be reconfigured to right-turn in/right-turn out.

Another consideration is coordinating with the realignment of Screaming Eagle Boulevard Alternative 3. As discussed in Section 8.4.1.1, the need is illustrated for a roadway connecting the old alignment with the new alignment of Screaming Eagle Boulevard. This roadway is in the vicinity of the Hospital and provides an opportunity for consolidation of access points.

5.6. Wickham Avenue and 1st Street

5.6.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, four-leg intersection with two-way STOP control on1st Street approaches (**Exhibits 5.35-5.38**)
- ***Speed Limit:*** 35 mph on Wickham Avenue; 25 mph on 1st Street.
- ***Roadway Section:*** Both Wickham Avenue and 1st Street are two-lane roadways.
- ***Signing and Marking:*** South of the intersection – Railroad grade crossing and stop bars in the northbound and southbound lanes

5.6.2. Observations

- Proximity of intersection to railroad grade crossings on eastbound and westbound approaches.
- 81 feet on eastbound approach
- 122 feet on northbound approach
- Limited sight distance to north from eastbound approach.

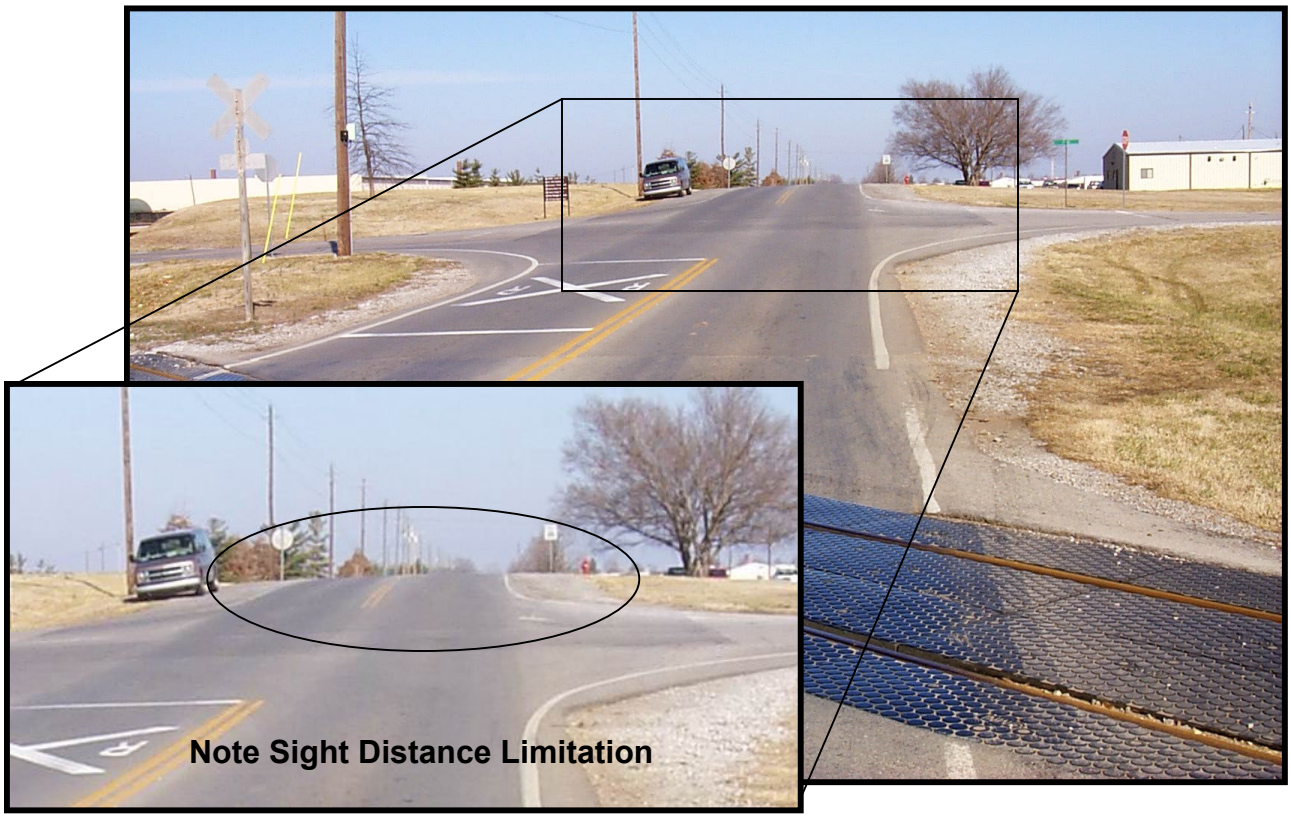

Exhibit 5.35 Wickham Avenue and 1st Street (northward view)

Exhibit 5.36 Wickham Avenue and 1st Street (southward view)

Exhibit 5.37 Wickham Avenue and 1st Street (eastward view)

Exhibit 5.38 Wickham Avenue and 1st Street (westward view)

5.6.3. Operations

The intersection experiences operational deficiencies on the eastbound approach in the morning and evening peak hours as shown in **Exhibit 5.39**.

Exhibit 5.39 Level of Service – Wickham Avenue and 1st Street

Movement	Morning Peak				Mid-day Peak				Evening Peak			
	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	A	A	A	A	A	A	A	A	A	A	A	A
SB Approach	A	A	A	A	A	A	A	A	A	A	A	A
EB Approach	D	F	F	E	B	C	D	C	C	C	E	C
WB Approach	C	C	D	C	B	C	C	C	B	C	C	C
Overall	**A**	**D**	**F**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**B**	**A**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes
4. Proposed conditions and existing – adjusted traffic volumes (Alternative 1)

5.6.4. Recommendations

This intersection currently operates with unacceptable delays on the eastbound approach in the morning peak hour. There are three alternatives that can improve this intersection.

Alternative 1: As shown in **Exhibit 5.40**, this alternative includes the addition of an eastbound exclusive left-turn lane to mitigate operational deficiencies. The eastbound approach would improve to a LOS E. Another benefit of widening this approach is that it would reduce potential queues over the adjacent railroad tracks. Widening will affect the railroad grade crossings on this leg. The disadvantage of this alternative is that it would require widening east of the intersection.

Alternative 2: This alternative includes the widening of the eastbound approach to provide an eastbound right-turning lane. This alternative should be considered for two reasons: 1- The traffic volumes support it due to the very high right-turning volume and 2- Widening would not be needed on opposite leg. The disadvantage of this alternative is that it would not result in acceptable approach LOS during the morning peak hour due to higher northbound/southbound traffic volumes and the delay to the eastbound left-turning movement. The LOS for this approach would be an F for the morning peak hour.

Alternative 3: This alternative includes the consideration of four-way STOP control at this intersection. This would achieve acceptable levels of service on all approaches; however, additional data must be collected to determine whether this type of control is warranted. It is likely that it would not be warranted because the side road, 1st Street, has an Existing-Adjusted average daily traffic of 438 vehicles per day on the westbound approach. There was an ATR placed on the eastbound approach roadway, however, it was located far to the west of

this intersection, west of Market Garden Road, which would not give reliable traffic data for this intersection. For a four-way Stop, it is required that there be 200 vehicles per hour required from both side road approaches for 8 hours of a typical day.

Grading should occur on the north leg of the intersection in order to reduce the sight distance deficiency north of the intersection. This improvement should be considered in all alternatives.

An evaluation of the future traffic volumes concluded that a traffic signal might be warranted in the future, according to the MUTCD Peak Hour Warrant; however, a traffic signal is not warranted under current conditions using existing-adjusted traffic volumes.

The intersection is in close proximity to railroad grade crossings accessing loading facilities. Under normal conditions, these rail lines have low volume; however, usage may increase based on military operation conditions. Due to the close proximity of railroad grade crossings to the study intersection, treatments should be implemented in accordance with proper design standards. This is discussed further in Section 7.1. These crossings should be evaluated to determine whether additional types of control are necessary.

Improvements at this location, including Alternative 1 improvements: widening of both the eastbound and westbound approaches, widening three grade crossings, and performing excavation on the north leg of the intersection, are expected to cost approximately $63,500.

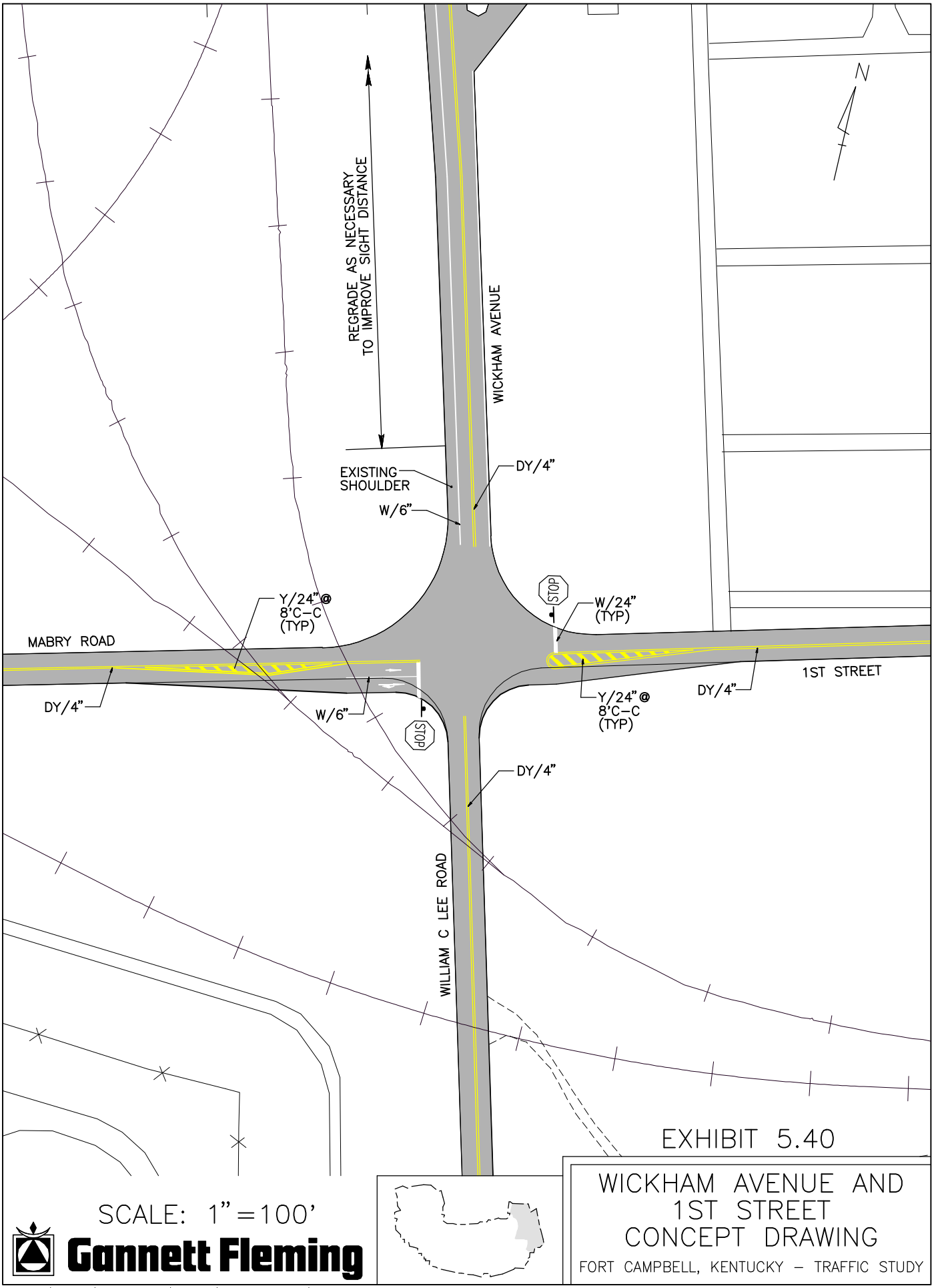

EXHIBIT 5.40

SCALE: 1" = 100'

Gannett Fleming

WICKHAM AVENUE AND 1ST STREET CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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5.7. Wickham Avenue and Airborne Street

5.7.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, four-leg intersection with two-way STOP control on Airborne Street approaches (**Exhibits 5.41-5.44**)

- ***Speed Limit:*** 35 mph on Wickham Avenue; 25 mph on Airborne Street.

- ***Roadway Section:*** Both Wickham Avenue and Airborne Street are two-lane roadways.

- ***Signing and Marking:*** Wickham Avenue has a dashed yellow centerline, indicating that passing is permissible. Airborne Street has a double yellow line, but is not continuous on the westbound approach.

5.7.2. Observations

- Right-turning traffic on the eastbound approach of this intersection use the shoulder to get around vehicles turning left.

- There is a railroad grade crossing on Airborne Street 150 feet west of Wickham Avenue. At the time of the study team's site visit; a train was sitting on the railroad track. At the crossing, two train cars were uncoupled to maintain access on Airborne Street.

Exhibit 5.41 Wickham Avenue and Airborne Street (northward view)

Exhibit 5.42 Wickham Avenue and Airborne Street (southward view)

Exhibit 5.43 Wickham Avenue and Airborne Street (eastward view)

Exhibit 5.44 Wickham Avenue and Airborne Street (westward view)

5.7.3. Operations

The eastbound approach on this intersection is the most in need of improvement, as shown in **Exhibit 5.45**. Traffic uses the eastbound shoulder to make right-turn movements when traffic queues in the through lane waiting for a gap in both directions of traffic on Wickham Avenue. The use of this shoulder as a de facto right-turn lane is undesirable in present condition due to the poor condition of the shoulder, and the proximity of an unprotected drainage headwall.

Exhibit 5.45 Level of Service - Wickham Avenue and Airborne Street

Movement	Morning Peak				Mid-day Peak				Evening Peak			
	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	A	A	A	A	A	A	A	A	A	A	A	A
SB Approach	A	A	A	A	A	A	A	A	A	A	A	A
EB Approach	D	F	F	D	B	C	D	C	C	C	E	C
WB Approach	C	C	D	D	B	C	C	C	B	C	C	C
Overall	**D**	**F**	**F**	**D**	**B**	**C**	**D**	**C**	**B**	**C**	**E**	**C**

5.7.4. Recommendations

- Improve the northbound shoulder in accordance with AASHTO and MTMCTEA guidelines.

- Replace STOP signs to improve night-time reflectivity.

- Construct an exclusive eastbound right-turn lane. This improvement will improve the eastbound right-turn movement. Additionally, the improvement will directly improve safety due to the use of the gravel shoulder as a de facto right-turn lane. It would also reduce the potential of queuing over the railroad track.

- Using existing-adjusted traffic volumes, a traffic signal is not warranted under the MUTCD Peak-Hour Warrant. A traffic signal would be warranted using this method with the future-adjusted traffic volumes.

Although these recommendations were originally presented in a study conducted in June, 1999, they are still valid.

The estimated cost of improvements at this intersection is $6,700.

Exhibit 5.46 shows a schematic of this intersection.

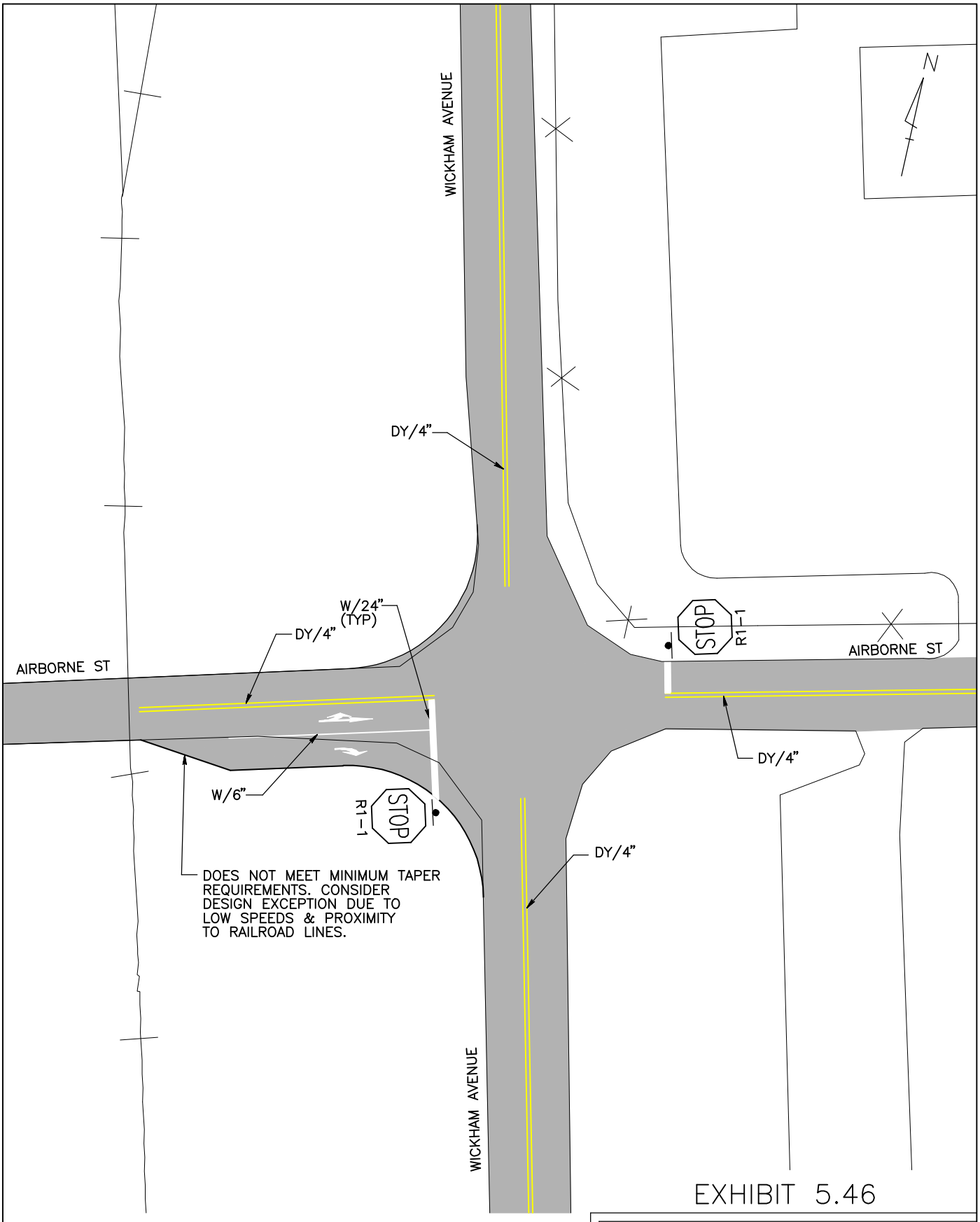
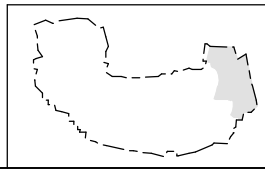


EXHIBIT 5.46

SCALE: 1" =50'

Gannett Fleming



WICKHAM AVENUE AND AIRBORNE STREET CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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5.8. Wickham Avenue and Normandy Boulevard

5.8.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, three-leg intersection with stop control on the westbound approach. (**Exhibits 5.47-5.49**)

- ***Speed Limit:*** 35 mph on Wickham Avenue; 25 mph on Normandy Boulevard.

- ***Roadway Section:*** Wickham Avenue is a two-lane roadway north of the intersection. South of the intersection, Wickham Avenue has a through lane in each direction in addition to a southbound left-turn lane. Normandy Boulevard (westbound approach) is one-way westbound with one left-turn lane and one right-turn lane. Screaming Eagle Boulevard is the sister one-way roadway eastbound.

- ***Roadway Configuration:*** Normandy Boulevard ends at its intersection with Wickham Avenue.

- ***Signing and Marking:***

    - DO NOT ENTER – Eastern leg of Normandy Boulevard.
    - RIGHT LANE MUST TURN RIGHT – Westbound approach of Normandy Boulevard.
    - The north leg of Wickham Avenue has a broken yellow line indicating passing is allowed up to the intersection with Normandy Boulevard.

5.8.2. Observations

- It is difficult to read the RIGHT LANE MUST TURN RIGHT sign due to small lettering.
- There are no arrow pavement markings on Normandy Boulevard indicating right or left-turn lane use control.
- Through westbound traffic using Normandy Boulevard turns left at Wickham Avenue and right immediately at Screaming Eagle Boulevard, thus having potential conflicts with through traffic on Wickham Avenue.

Exhibit 5.47 Wickham Avenue and Normandy Boulevard (northward view)

Exhibit 5.48 Wickham Avenue and Normandy Boulevard (southward view)

Exhibit 5.49 Wickham Avenue and Normandy Boulevard (westward view)

5.8.3. Operations

Operationally, the westbound approach experiences deficient operations during the mid-day peak hour as shown in **Exhibit 5.50**. The intersection operates acceptably during both the morning and evening peak hours for all scenarios.

Exhibit 5.50 Level of Service – Wickham Avenue and Normandy Boulevard

Movement	Morning Peak				Mid-day Peak				Evening Peak			
	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	A	A	A	A	A	A	A	B	A	A	A	A
SB Approach	A	A	A	A	A	A	A	B	A	A	A	A
WB Approach	B	C	D	A	C	F	F	A	B	B	C	A
Overall	**A**	**A**	**B**	**A**	**C**	**F**	**F**	**A**	**A**	**A**	**B**	**A**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes
4. Proposed conditions and existing – adjusted traffic volumes

5.8.4. Recommendations

The deficient operations in westbound direction cannot be mitigated since exclusive left-turn and right-turn lanes are already provided at the intersection.

Signing and pavement markings should be upgraded at the intersection to clearly distinguish the left-turn and right-turn lane. Suggestions include:

- Add pavement marking arrows for both lanes on the westbound approach.
- Install clearly visible lane use control signing to the westbound approach.

Long-term improvements should consider the possible Screaming Eagle Boulevard Relocation as identified in the Fort Campbell Master and discussed in Section 8. If the Relocation plan is not carried forward, long-term improvements at this intersection should consider the installation of a fully-actuated traffic signal, as well as the extension of Normandy Boulevard as was recommended in June 1999, *Traffic Engineering and Safety Study*.

The proposed levels of service reported above reflect the installation of a traffic signal at this intersection, which would cost approximately $90,000. Alternatively, the signing and pavement marking improvements to the Normandy Boulevard approach would cost approximately $1,000.

One potential disadvantage of the Normandy Boulevard extension is that it would require one additional railroad crossing; however, there would be the same amount of traffic crossing the railroad tracks as would without the extension, assuming that the extension would accommodate the traffic that would otherwise use Screaming Eagle Boulevard westbound from Wickham Avenue.

It should be noted that the projected future traffic volumes at Wickham Avenue and Normandy Boulevard meet the MUTCD peak hour warrant for the morning and mid-day peak hours. The installation of a traffic signal at the intersection would mitigate deficient operations. The signal should be coordinated with the signal at Screaming Eagle Boulevard and Wickham Avenue.

5.9. Screaming Eagle Boulevard and Normandy Boulevard Intersections with Tennessee Avenue and Kentucky Avenue

The following intersections were evaluated together since they are in close proximity to one another and since they have similar lane configurations and traffic control.

- Screaming Eagle Boulevard and Tennessee Avenue
- Screaming Eagle Boulevard and Kentucky Avenue
- Normandy Boulevard and Tennessee Avenue
- Normandy Boulevard and Kentucky Avenue

5.9.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, four-leg intersections with 3-way STOP control.
- ***Speed Limit:*** 35 mph on Tennessee Avenue; 25 mph all other roadways
- ***Roadway Section:*** Tennessee Avenue and Kentucky Avenue are two-lane roadways. Screaming Eagle Boulevard and Normandy Boulevard are one-way pairs with two approach lanes.

5.9.2. Observations

- Several items were noted that were not in accordance with the MUTCD (**Exhibits 5.51-5.54**).
- Pavement markings are in poor condition.
- The intersections do not have the needed ONE-WAY signs.
- ONE-WAY signs should be placed on the near right and the far left corner of each approach to the one-way roadway.
- ONE-WAY signs should also be placed above STOP signs.
- The 3-WAY signs mounted beneath the STOP signs on the three approaches are not sized consistently.
- There is driver confusion over right-of-way due to the multi-lane approaches as a STOP controlled intersection.
- STOP signs are placed far in advance of stop bars.

Exhibit 5.51 Normandy Boulevard and Kentucky Avenue. Note STOP sign is placed 33 feet in advance of Stopbar (northwestward view).

Exhibit 5.52 Normandy Boulevard and Tennessee Avenue. Note lack of One-Way signing for Normandy Boulevard (northward view).

Exhibit 5.53 Screaming Eagle Boulevard and Tennessee Avenue. Note inappropriate use of "No Left-Turn" sign (northward view).

Exhibit 5.54 Screaming Eagle Boulevard and Kentucky Avenue. Note that crosswalk is not at intersection (northward view).

5.9.3. Operations

Exhibits 5.55-5.58 summarize the levels of service at the four intersections.

Exhibit 5.55 Level of Service – Screaming Eagle Boulevard and Tennessee Avenue

Movement	Morning Peak			Mid-day Peak			Evening Peak		
	1	2	3	1	2	3	1	2	3
NB Approach	A	A	A	B	B	B	A	A	B
SB Approach	B	B	B	C	C	D	B	C	D
EB Approach	A	B	B	C	D	F	B	C	C
Overall	**A**	**B**	**B**	**B**	**D**	**E**	**B**	**C**	**C**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes

Exhibit 5.56 Level of Service – Screaming Eagle Boulevard and Kentucky Avenue

Movement	Morning Peak			Mid-day Peak			Evening Peak		
	1	2	3	1	2	3	1	2	3
NB Approach	A	A	A	B	B	B	A	B	B
SB Approach	A	A	A	B	B	B	A	B	B
EB Approach	A	A	B	B	C	E	B	B	C
Overall	**A**	**A**	**B**	**B**	**C**	**D**	**A**	**B**	**B**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes

Exhibit 5.57 Level of Service – Normandy Boulevard and Tennessee Avenue

Movement	Morning Peak			Mid-day Peak			Evening Peak		
	1	2	3	1	2	3	1	2	3
NB Approach	A	B	B	B	B	C	A	B	B
SB Approach	A	A	A	B	B	B	A	B	B
WB Approach	B	C	C	C	E	F	B	B	C
Overall	**B**	**B**	**C**	**C**	**D**	**F**	**B**	**B**	**C**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes

Exhibit 5.58 Level of Service – Normandy Boulevard and Kentucky Avenue

Movement	Morning Peak			Mid-day Peak			Evening Peak		
	1	2	3	1	2	3	1	2	3
NB Approach	A	A	A	B	B	B	A	B	B
SB Approach	A	A	A	A	D	D	A	B	B
WB Approach	A	B	B	C	F	F	B	C	C
Overall	**A**	**B**	**B**	**C**	**E**	**F**	**A**	**B**	**C**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes

5.9.4. Recommendations

None of the four intersections analyzed warrant signalization based on existing – adjusted peak hour traffic volumes and the guidance set forth in the MUTCD.

The STOP signs on Normandy Boulevard and Screaming Eagle Boulevard should remain intact. Although removing these STOP signs would allow Normandy Boulevard and Screaming Eagle Boulevard to move freely, thus improving the level of service for those respective approaches, during the mid-day peak hour it would create queues of nearly 400 feet and delays of nearly 700 seconds on the approach roadways.

Additional analysis should be performed to evaluate the traffic control requirements at these intersections when Screaming Eagle Boulevard is realigned. The MUTCD sets forth the following volume related warrants for Four-Way Stop Control:

- The volume entering the intersection from both of the major street approaches is 300 vehicles for hour for 8 hours of an average day, and
- The combined vehicular, pedestrian, and bicycle volume entering the intersection from both of the minor street approaches averages at least 200 units per hour for the same 8 hours.
- If there are 5 or more reported crashes during a 12-month period, susceptible to correction by a multiway Stop condition.

From a driver expectancy standpoint, it would be beneficial to have the same type of traffic control at all four of these intersections to minimize potential driver confusion over which approach has the right-of-way.

Signing and pavement markings should be improved at these intersections as noted in **Exhibit 5.59**. The estimated cost of the signing and pavement marking improvements at these intersections is $7,000.

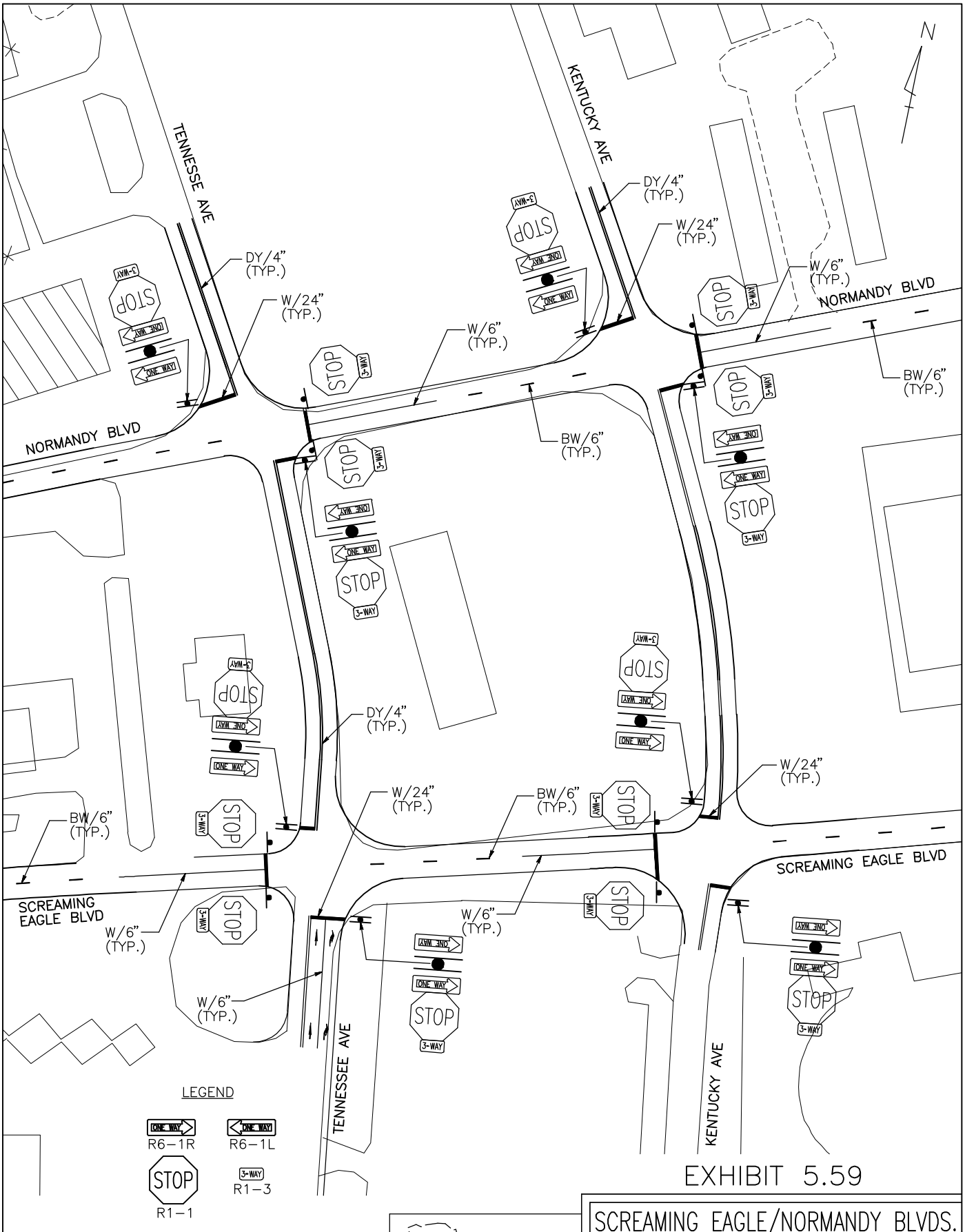

EXHIBIT 5.59

SCALE: 1" = 100'

Gannett Fleming

SCREAMING EAGLE/NORMANDY BLVDS. AND KENTUCKY/TENNESSEE AVES. CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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5.10. Lee Village Traffic Circle (Morgan Circle)

5.10.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, six-leg traffic circle with STOP control (**Exhibits 5.60-5.65**).

- ***Speed Limit:*** 15 mph – 25 mph on approach roadways

- ***Roadway Section:*** One lane approaches on all roadways except westbound Morgan Road, which has an exclusive left-turn lane. Intersecting roadways include:

    - Morgan Road (2 approaches)
    - Campbell Road
    - Polk Avenue
    - Reed Avenue
    - McDagin Park Access

- ***Signing and Marking:***

    - STOP sign on all approaches except McDagin Park Access, which has no control

5.10.2. Observations

- Circular island is not centered in the intersection.
- The westbound left-turn lane on Morgan Road is a confusing, unconventional layout. This lane configuration may encourage drivers to travel a portion of the circle in a clockwise direction. Traffic circles and roundabouts typically do not permit turns of this nature.
- A school crossing sign blocks the view of the STOP sign on the Reed Avenue approach.

Exhibit 5.60 From Morgan Road looking northward

Exhibit 5.61 From Morgan Road looking southward

Exhibit 5.62 From Reed Avenue looking eastward

Exhibit 5.63 From Campbell Road looking westward

Exhibit 5.64 From Polk Road looking eastward

Exhibit 5.65 From park entrance looking northward

5.10.3. Recommendations

This intersection was not identified for data collection; therefore current traffic data is not available for analyses.

The area surrounding this intersection is undergoing several changes. Reed Avenue between the circle and Bastogne Avenue has been partially closed to address safety concerns. With this closure, it is anticipated that traffic volumes will increase on Polk Road due to diversionary traffic travel between Bastogne Avenue and Morgan Road. Also, as part of the RCI initiative, Lee Village will be experiencing redevelopment in the future, which provides an opportunity to consider and fund intersection enhancements. Current RCI plans show the intersection as a five-legged intersection with another T-intersection to the immediate north of the intersection. The goal to restrict traffic from the housing area may result in more conflicts between vehicles with this configuration.

Also, A new roadway is proposed to be constructed that would reduce the traffic burden on the western portion of Morgan Road by connecting Morgan Road to 49th Street. In discussion between RCI officials and the Study Team, this connection was favored since traffic is diverted from the housing area and since the extension could serve traffic diverted due to the Reed Avenue closure as well as serve a portion of the installation experiencing development. It is likely that this extension could utilize the Polk Road approach to this intersection; however the alignment should avoid wetlands to the east of Vermont Avenue and Eagle Park if possible.

Intersection improvements should address two issues:

- Reduce the number of approach legs. The *1986 Traffic Engineering Study* recommended constructing a cul-de-sac on Polk Road to reduce the number of legs at the intersection. Although geometrically this improvement is valid, the closure of Reed Avenue and the increase of traffic on Polk Road may make this improvement unrealistic. It is recommended that the McDagin Park access be reconfigured to intersect Reed Avenue and not the circle, thus reducing the number of legs to five.
- The intersection should be upgraded to satisfy MUTCD and AASHTO design guidelines for a modern roundabout as is presented below. An alternate consideration may be to consider replacing the intersection with a traffic signal per the *1986 Traffic Engineering Study* assuming traffic volumes would warrant a traffic signal.

A typical modern roundabout is presented as **Exhibit 5.66**. It should be noted that roundabouts differ from traditional traffic circles and are characterized by three features:

- A requirement to yield at entry, which gives a vehicle on the circular roadway the right-of-way.
- A deflection of the approaching vehicle around the circular island.
- A flare or widening of the approach to match the width of the circular roadway.

It is recommended that a similar concept be applied at the Lee Village to replace the current configuration. The modern roundabout concept for this location is presented in **Exhibit 5.67**. This is an ideal configuration for this intersection due to the presence of five legs, where conventional STOP or signalization control may not be as efficient.

The estimated cost of the improvements at this intersection is $129,000.

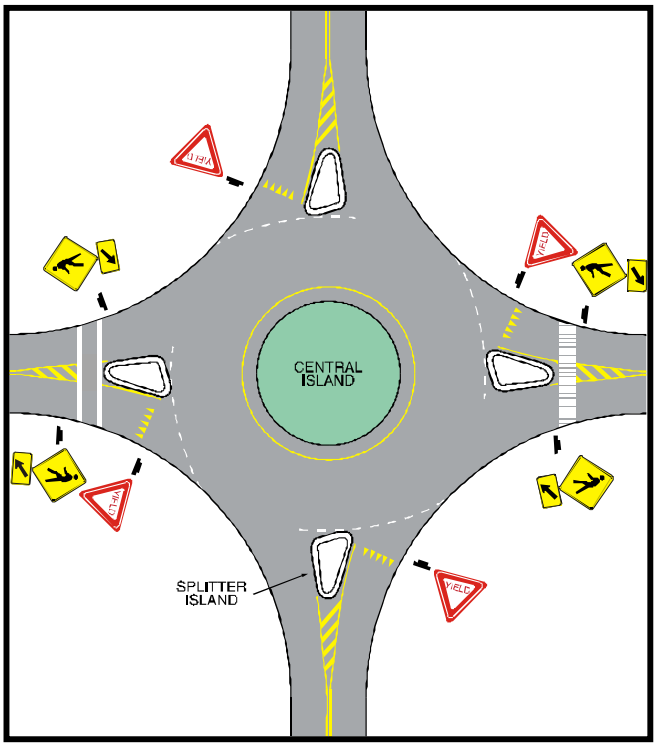

Exhibit 5.66 Conceptual Modern Roundabout (From MUTCD)

It should be noted that a traffic impact study prepared by RPM Transportation Consultants for the Lee Village housing redevelopment bases the roadway network off of a design that does not support the configuration presented in **Exhibit 5.67**. This intersection is replaced with a four-leg intersection, with the western leg of Morgan Road eliminated. It is expected that Morgan Road would still accommodate significant traffic volumes, but it would not remain a through roadway due to the redesign of several intersections. An alternative consideration would be to construct a four-leg roundabout at this intersection. This would serve as a traffic calming device to slow traffic in the residential area.

MORGAN ROAD

CAMPBELL ROAD

POLK ROAD (POSSIBLE 47TH STREET EXTENSION)

MORGAN ROAD

REED AVENUE

MCDAGIN PARK ACCESS

DY/4"

W/8"

Y/8"@ 20' C-C (TYP)

Y/8"

W/8"

W/8"

Y/8"

Y/8"@ 20' C-C (TYP)

W/8"

W/8"

W/8"

W/8"

Y/8"

PROPOSED SIDEWALK (TYP)

W/8"

Y/8"@ 20' C-C (TYP)

W/8"

Y/8"

Y/8"@ 20' C-C (TYP)

BW/12" 3' STRIPE, 3' GAP (TYP)

W/24"x10' WITH 24" SPACING (TYP)

W/8"

Y/8"

Y/8"@ 20' C-C (TYP)

W/8"

ACCESS TO BE RELOCATED TO REED AVENUE (NOT SHOWN)

REED AVENUE CLOSED TO SOUTH APPROACH SERVES LOCAL LAND USE INCLUDING MCDAGIN PARK

LEGEND

W13-1 (20 M.P.H.)

W3-2a

W11-2

W16-7P

R1-2 (YIELD)

R6-1R (ONE WAY)

W1-8a

SCALE: 1"=50'

EXHIBIT 5.67

LEE VILLAGE TRAFFIC CIRCLE CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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5.11. Ohio Road and East End Road (Clarksville Base)

5.11.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, three-leg intersection with STOP control on the East End Road and eastern Ohio Road legs (**Exhibits 5.68-5.71**).
- ***Speed Limit:*** 25 mph on Ohio Drive and East End Road
- ***Roadway Section:*** Ohio Road and East End Road are both two-lane sections on each leg. The intersection is very large due to the radius returns needed for the truck traffic.
- ***Roadway Configuration:*** East End Road forms a "T" intersection with Ohio Road.
- ***Signing and Marking:*** STOP signs on the eastbound approach of Ohio Road and the southbound approach of East End Road. No pavement markings are used at this location.

5.11.2. Observations

- The through movement is not evident at this intersection partially due to the lack of pavement markings. There is a STOP control on the southbound approach of East End Road and the western approach of Ohio Road.

Exhibit 5.68 Ohio Road and East End Road - Clarksville Base (northward view)

Exhibit 5.69 Ohio Road and East End Road - Clarksville Base (southward view)

Exhibit 5.70 Ohio Road and East End Road - Clarksville Base (eastward view)

Exhibit 5.71 Ohio Road and East End Road - Clarksville Base (westward view)

5.11.3. Recommendations

- Provide pavement markings to indicate a through movement from East End Road to the western leg of Ohio Road.
    - The eastern leg of Ohio Road would form a T-intersection with the new through movement using additional pavement markings.
- In addition to the new pavement markings, an island should be placed on the eastbound approach of Ohio Road to allow for a dedicated right-turn onto East End Road. Refer to **Exhibit 5.72**.
- Another option at this location, which could be constructed if desired, would be to construct concrete channelized islands and remove excess pavement. Although this may be a preferable solution to the proposed pavement markings as shown on the drawing, it may not be cost effective due to the low traffic volumes observed at this intersection.

The estimated cost of improvements at this intersection is $1,600.

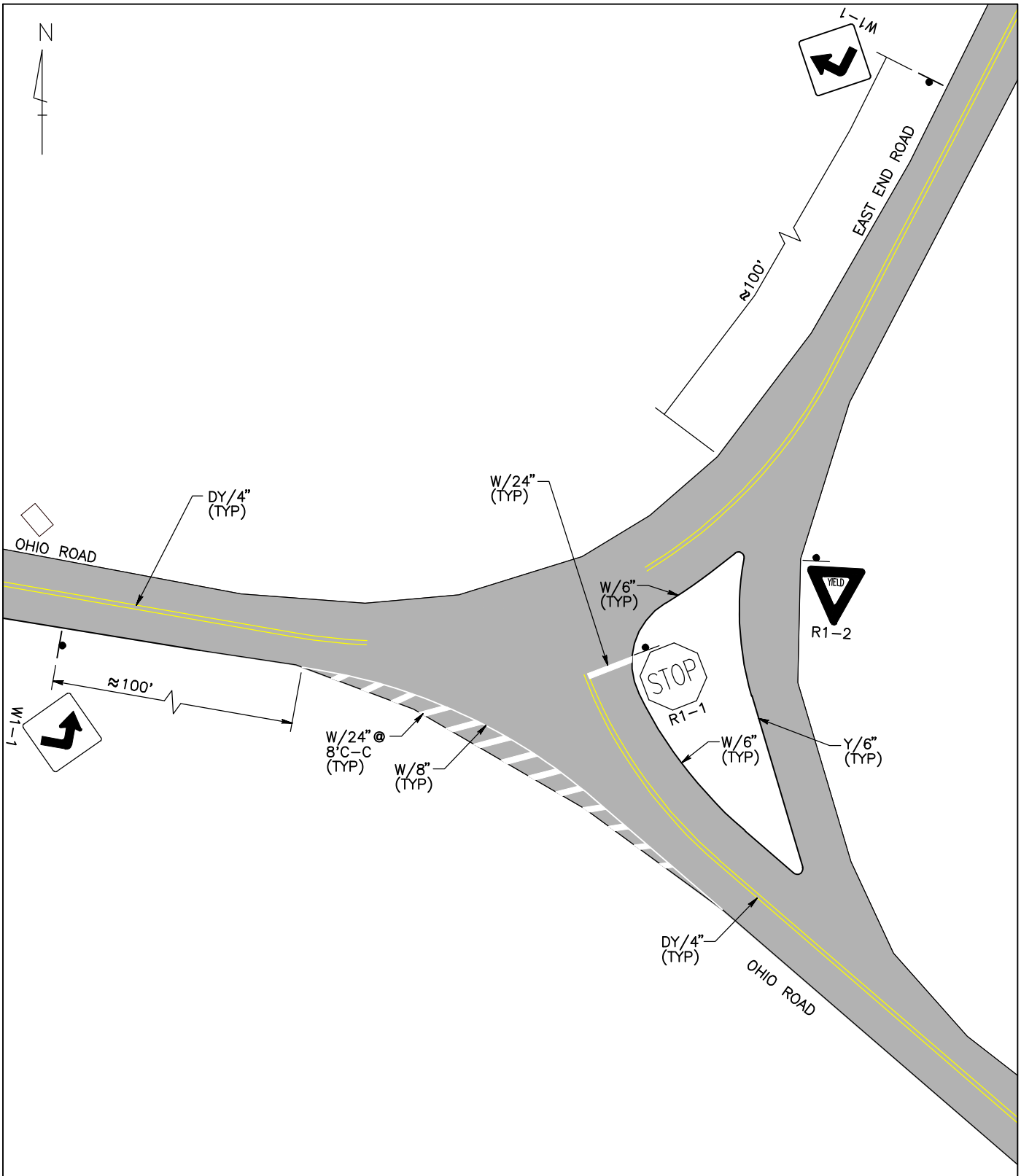

EXHIBIT 5.72

SCALE: 1"=50'

OHIO ROAD AND EAST END ROAD CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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5.12. Ohio Road and Louisiana Road (Clarksville Base)

5.12.1. Existing Traffic Control and Geometry

- ***Control:*** Unsignalized, three-leg intersection with STOP control on the western leg of Ohio Road (**Exhibits 5.73-5.76**).
- ***Speed Limit:*** Not Posted.
- ***Roadway Section:*** Ohio Road and Louisiana Road are two-lane sections approaching the intersection. The intersection is large due to the radius returns needed for the truck traffic.
- ***Roadway Configuration:*** Louisiana Road forms a "T" intersection with Ohio Road.
- ***Signing and Marking:*** None.

5.12.2. Observations

- Observed traffic volumes indicate that the mainline is from the eastern leg of Ohio Road and Louisiana Road. Geometrically this cannot work without widening the intersection in the southeast quadrant.
- There is the potential for head-on collisions due to vehicle travel paths. For a WB-50 to make the turn from Louisiana Road onto eastbound Ohio Road, it must turn into the opposing lane of traffic before returning to its own lane.

Exhibit 5.73 Ohio Road and Louisiana Road - Clarksville Base (northward view)

Exhibit 5.74 Ohio Road and Louisiana Road - Clarksville Base (southward view)

Exhibit 5.75 Ohio Road and Louisiana Road - Clarksville Base (eastward view)

Exhibit 5.76 Ohio Road and Louisiana Road - Clarksville Base (westward view)

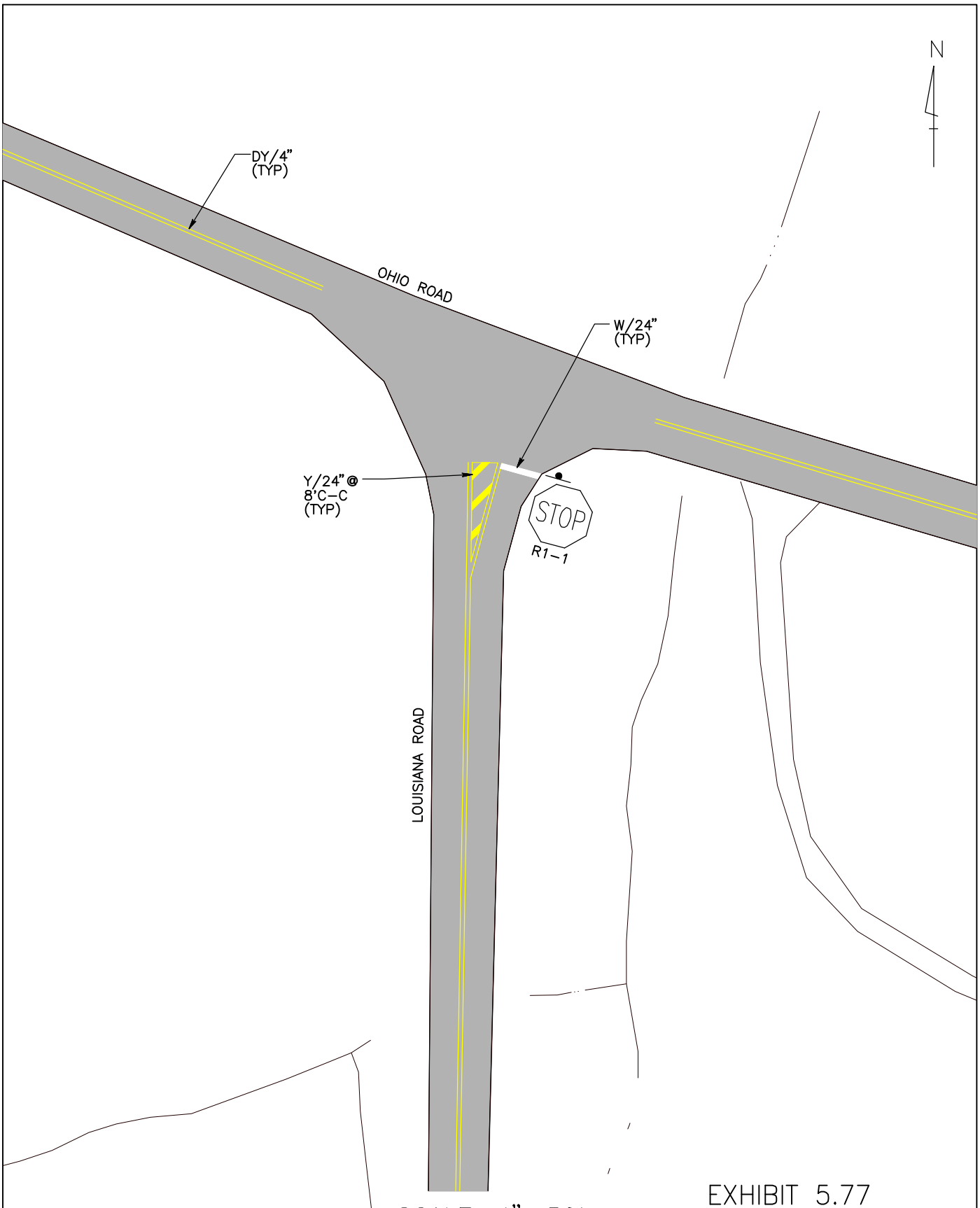
5.12.3. Recommendations

- A conventional T-intersection is proposed at this site even though it does not accommodate the heaviest vehicular path.

- Ohio Road should be reconfigured to have the right-of-way, and Louisiana Road should be under Stop control. Refer to **Exhibit 5.77**.

- Clear and grub as required to satisfy sight distance requirements.

The estimated cost of improvements at this intersection is $1,000.



SCALE: 1"=50'

EXHIBIT 5.77

OHIO ROAD AND LOUISIANA ROAD CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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5.13. 101st Airborne Division Road and 11th Airborne Division Road

5.13.1. Existing Traffic Control and Geometry

- ***Control:*** STOP control on all approaches (**Exhibits 5.78-5.81**)
- ***Speed Limit:*** 45 mph on 101st Airborne Division Road, 35 mph on 11th Airborne Division Road
- ***Roadway Section:*** Two-lane roadways with one approach lane on all approach legs. The southbound right-turning movement is under Yield control

5.13.2. Observations

- Queues in the evening peak hour exceed ½ mile.
- There is a significant westbound right-turn volume and southbound left-turn volume

Exhibit 5.78 101st Airborne Division Road and 11th Airborne Division Road (northward view)

Exhibit 5.79 101st Airborne Division Road and 11th Airborne Division Road (southward view)

Exhibit 5.80 101st Airborne Division Road and 11th Airborne Division Road (eastward view)

Exhibit 5.81 101st Airborne Division Road and 11th Airborne Division Road (westward view)

5.13.3. Operations

Under existing conditions the intersection experiences operational deficiencies during all time periods (**Exhibit 5.82**). Some of these deficiencies can be attributed due the lack of turn lanes to accommodate large traffic movements as well as the current traffic control.

Exhibit 5.82 Level of Service – 101st Airborne Road and 11th Airborne Division Road

	Morning Peak				Mid-day Peak				Evening Peak			
Movement	1	2	3	4	1	2	3	4	1	2	3	4
NB Approach	E	F	F	A	F	F	F	B	F	F	F	B
SB Approach	C	D	F	A	E	F	F	A	F	F	F	A
EB Approach	A	A	A	B	A	A	A	B	A	A	A	B
WB Approach	A	A	A	B	A	A	A	A	A	A	A	A
Overall	**C**	**F**	**F**	**B**	**D**	**F**	**F**	**B**	**C**	**F**	**F**	**A**

1. Existing conditions and existing traffic volumes
2. Existing conditions and existing - adjusted traffic volumes
3. Existing conditions and future – adjusted traffic volumes
4. Proposed conditions and existing – adjusted traffic volumes

5.13.4. Recommendations

The *Crash Location Enhancement Study* conducted in November 1999 recommended signalization of the intersection based on the MUTCD Peak Hour Delay warrant. This remains a valid recommendation. Additionally, turning lanes must be added on three of the four approaches.

A review of traffic volumes collected in 1999 and those collected as part of this study indicated significant changes in certain flow patterns. These changes may be a result of the 101st Airborne Parkway Extension being constructed between those periods. As a result, the recommended phasing pattern would utilize a three-phase pattern with timings consistent with **Exhibit 5.83** (SB left, N-S, E-W).

Upgrades to this intersection should consider the possible realignment and relocation of 101st Airborne Division Road. Unless construction will be completed in the near future, a traffic signal should be considered. There are also planned improvements to the 11th Airborne Division Road in the area of the intersection as well as new motor pools planned at Sabre Heliport, which will increase and change traffic patterns, thus increasing the need for a traffic signal.

If it is expected that the intersection would be relocated in the mid-term with either of these improvements, a possible interim solution is to install less-costly traffic signal equipment, such as span wires rather than mast arms.

The estimated cost of improvements at this intersection is $118,000.

Exhibit 5.84 is a graphical representation of the intersection.

Exhibit 5.83 Proposed Signal Timings - 101st Airborne Road and 11th Airborne Division Road

Movement	Phase (seconds)								Cycle Length
	1	2	3	4	5	6	7	8	
	SBL	NBT	WBL	EBT	NBL	SBT	EBL	WBT	
Morning Timings	8	20	N/A	32	N/A	28	N/A	32	60
Mid-Day Timings	9	20	N/A	26	N/A	29	N/A	26	55
Evening Timings	20	20	N/A	20	N/A	40	N/A	20	60

The northbound/southbound approach is 101st Airborne Division Road.
The eastbound/westbound approach is 11th Airborne Division Road.

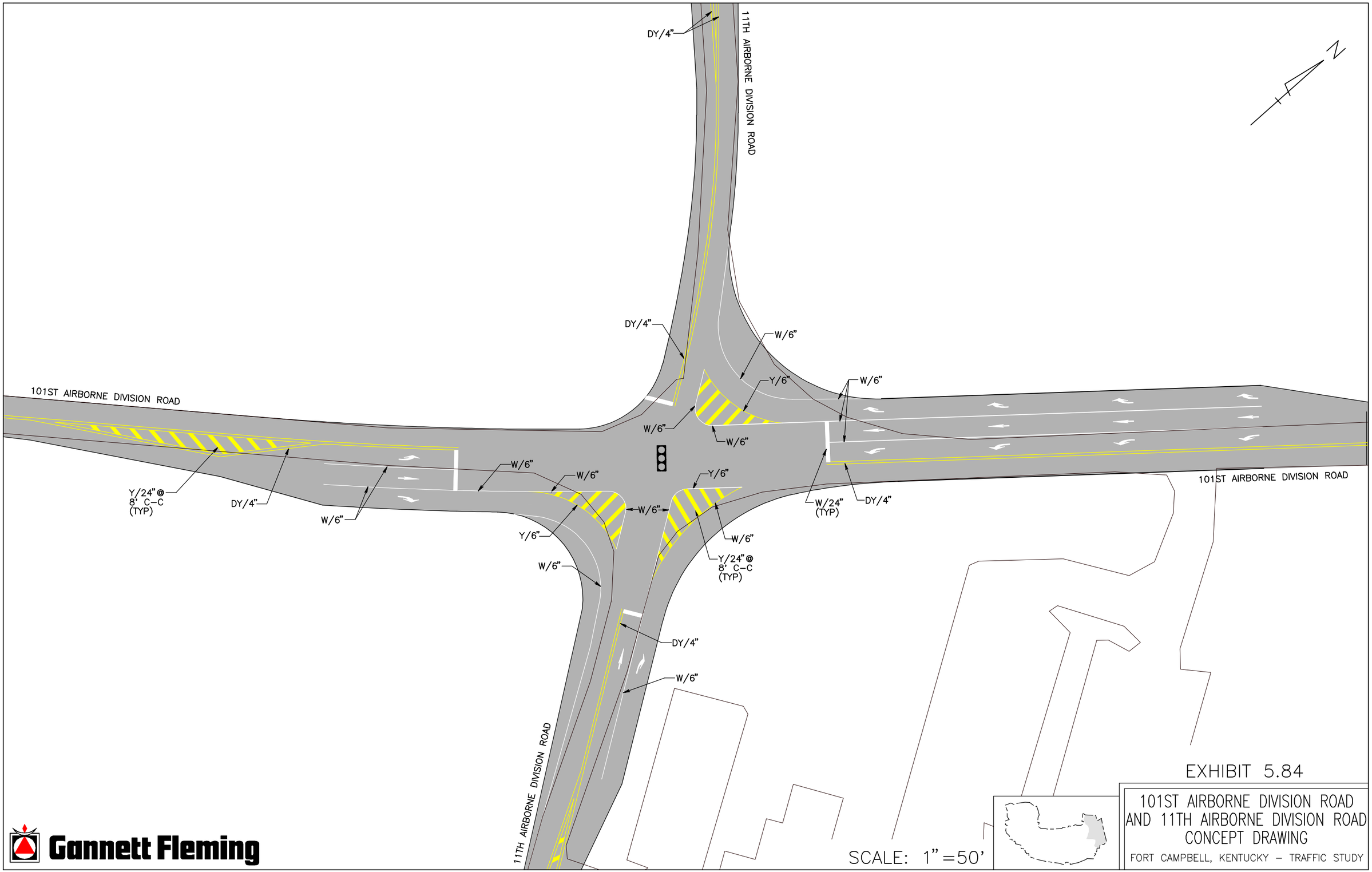

EXHIBIT 5.84

101ST AIRBORNE DIVISION ROAD AND 11TH AIRBORNE DIVISION ROAD CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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6. CORRIDOR AND AREA ASSESSMENTS

Project Stakeholders requested that the Project Team review and provide guidance on several corridors and areas. Additional areas based on baseline capacity assessments are presented in Section 6.

6.1. Bastogne Avenue

6.1.1. Background

Bastogne Avenue serves primarily as a commercial corridor from Airborne Street north to 42nd Street. South of Airborne Street the corridor is primarily residential. The corridor has several intersections that warrant upgrades that were discussed in Section 5.

The Study Team noted deficient transitions between intersections throughout the entire corridor as well as unacceptable lane shifts at intersections. Additionally, there are several locations where the bearing of the road changes with little or no horizontal curvature. The corridor can be improved with minor changes to the horizontal alignment.

Lane balancing is another deficiency in the corridor. **Exhibit 6.1** below lists the intersections and their deficiencies.

Exhibit 6.1 Bastogne Avenue Corridor Deficiencies

Intersection of Bastogne Avenue with:	Lane Shifting	Lane Transitions/Tapers
30th Street	•	•
Screaming Eagle Boulevard		•
Hospital Driveway	•	•
Air Assault Street	•	•

6.1.2. Guidance

Each intersection should be adjusted so that the through movement can traverse the intersection without varying from their travel path. Proper geometric design should incorporate adequate lane transitions and should consider lane balancing between intersections. Unbalanced lanes can create driver indecision and confusion, which could be a contributing factor in crashes. Any proposed improvements should be evaluated on both macro and micro scales. All geometric upgrades should be designed and constructed according to AASHTO and MUTCD standards. A conceptual layout of the proposed Bastogne Avenue corridor based on existing conditions is presented as **Exhibit 6.2**. This exhibit does not consider planned projects such as the realignment of Screaming Eagle Boulevard, but can be modified as needed to address the preferred alignment of

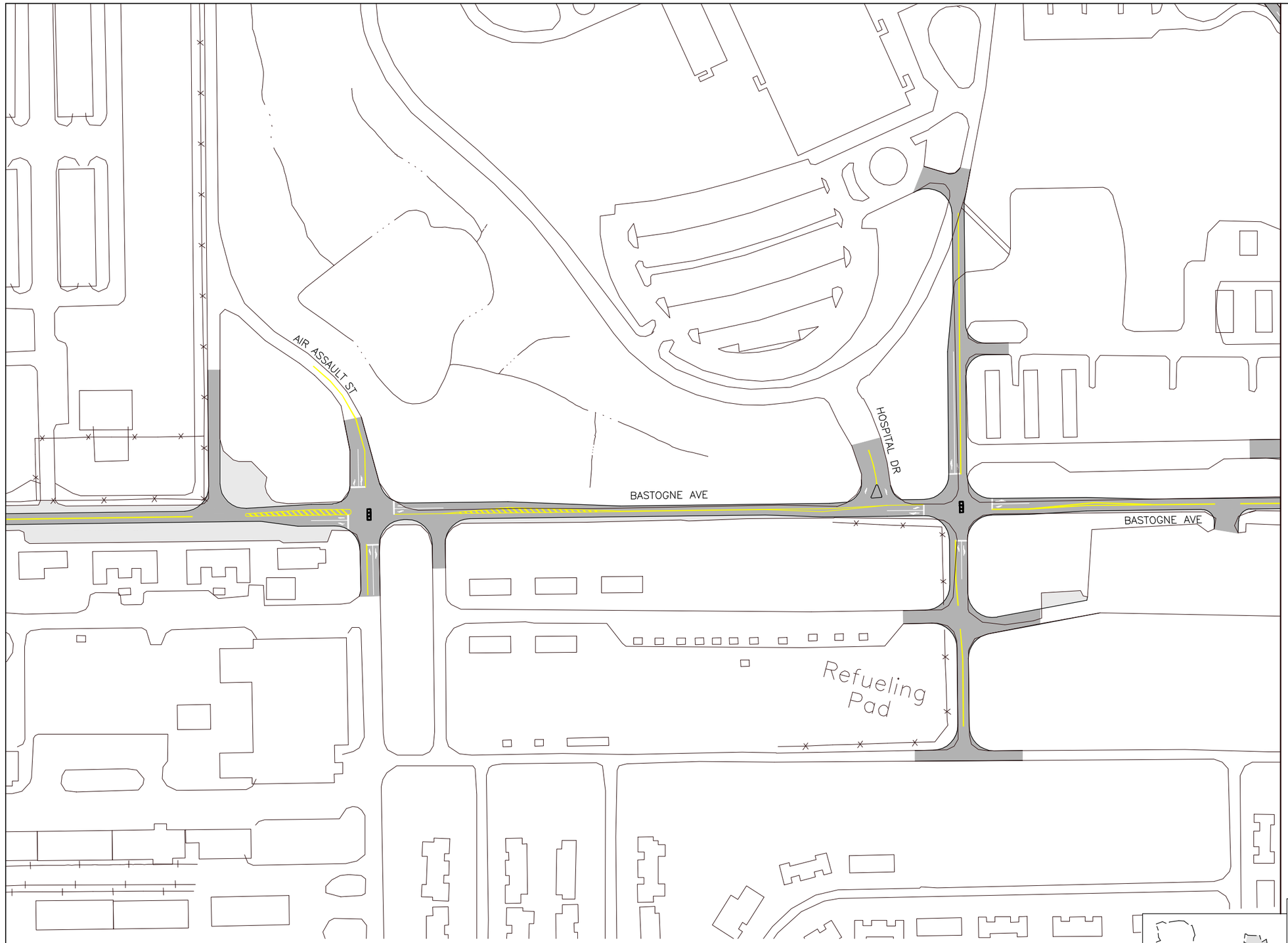
that project. Also, as part of the PX expansion the intersection with 30th Street may be eliminated. As currently portrayed in **Exhibit 6.2**, the estimated cost of the corridor upgrade is approximately $635,000.

One safety concern along Bastogne Avenue is the numerous uncontrolled access points. Where possible, access management practices should be applied so that areas with many access points are consolidated into one safe and controlled access point.

An example of this problem is remedied in **Exhibit 6.2,** where the Study Team recommends the consolidation of access points near the hospital. The new, consolidated access points would provide access to multiple land uses, which include buildings 230, 232, 234, 245, 250 and the hospital. Additionally, it may also act as a connection to Bank of America as stated in Section 6.3. Further study would be needed to validate the need for a traffic signal, but it is the study team's engineering opinion that it will likely be warranted.

The provision of roadway components that could allow for additional capacity at locations where there may not necessarily be an immediate need for additional capacity, but where future improvements would have significant effects on traffic flow patterns would be beneficial. An example of this is at the intersection of Bastogne Avenue and Air Assault Street. This intersection accommodates ACP 3 traffic and also accommodates significant volumes traveling Bastogne Avenue. It would be practical to install an eight-phase traffic signal controller at this location, even if all eight phases would not be utilized at the time of installation. Assuming that traffic volumes would increase at some point in the future, it would be a relatively easy improvement to implement the signal's additional phases.

A proposed improvement affecting this roadway is the realigning of Bastogne Avenue south of Screaming Eagle Boulevard. This improvement would reduce traffic on the existing roadway. However, if this improvement were not to occur, two through lanes should be provided along Bastogne Avenue approaching this intersection in order to accommodate future-adjusted traffic volumes adjacent to the realigned Screaming Eagle Boulevard.



MATCHLINE SEE SHEET 2 OF 3

EXHIBIT 6.2

BASTOGNE AVENUE CORRIDOR

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

SCALE: 1"=200' 1/3

Gannett Fleming

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MATCHLINE SEE SHEET 1 OF 3

SCREAMING EAGLE BLVD

PROPOSED SCREAMING EAGLE BOULEVARD REALIGNMENT

POSSIBLE
PX
EXPANSION

30TH ST

BASTOGNE AVE

BASTOGNE AVE

30TH ST

SCREAMING EAGLE BLVD

MATCHLINE SEE SHEET 3 OF 3

EXHIBIT 6.2

Gannett Fleming

SCALE: 1"=200'

2/3

BASTOGNE AVENUE
CORRIDOR

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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MATCHLINE SEE SHEET 2 OF 3

BASTOGNE AVE

REED AVE

BASTOGNE AVE

42ND ST

REED AVE

BASTOGNE AVE

FORREST RD

N

PAVEMENT TO BE REMOVED

EXHIBIT 6.2

BASTOGNE AVENUE CORRIDOR

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

SCALE: 1"=200'

3/3

Gannett Fleming

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6.2. Tennessee Avenue and Kentucky Avenues Circulation Plan

6.2.1. Background

Fort Campbell officials requested that the Study Team evaluate circulation patterns on Tennessee and Kentucky Avenues. Presently, Tennessee and Kentucky Avenues are two-way collector roadways running in the north-south direction throughout the containment area. Fort Campbell officials have considered revising the circulation on the two roadways to make Tennessee Avenue one-way in the southbound direction and to make Kentucky Avenue one-way in the northbound direction.

In the 1950's, one-way streets were implemented in cities across the United States as a means of decreasing traffic congestion. Recently, the conversion of downtown street grid systems to complete two-way operation has been discussed as a means of providing increased accessibility, hopefully resulting in a healthier economic environment. In the case of Fort Campbell, economic impacts associated with one-way systems versus two-way systems are not as critical as downtown areas. However, several other key factors should be considered including circulation, operations, safety and cost as are discussed below.

Circulation - Circulation for visitor, emergency vehicles, and transit vehicles is important in the evaluation of a roadway system. A one-way system is very efficient for commuter traffic when motorists are familiar with the street assignments. However, drivers may need to travel around the block in some cases to reach their destination, which increases overall travel distance in the system.

For visitors, a one-way pattern can be confusing, especially if complimentary pairs of one-way streets are not provided. It is generally easier to get from Point A to Point B within a two-way system if the driver is unfamiliar with the area.

Circulation of emergency vehicles and emergency response times are always of paramount importance. An emergency vehicle approaching an intersection within a one-way street system is likely to encounter traffic occupying all lanes of traffic, which inhibits the ability of the emergency vehicle to proceed. However, in a two-way system, the driver may have half of the street open for use as he is permitted to cross the centerline. In addition, the one-way system can result in a more circuitous response route.

Operations - Studies have indicated that one-way streets can increase capacity 25 to 30 percent over a two-way system. Several factors contribute to this, including the ability to provide signal offsets, which allow progressive movement of through traffic along a corridor at a reasonable pace. Also, capacity at intersection junctures is increased substantially, as the number of conflict points is significantly reduced at the intersection of two one-way streets.

Safety - Before and after studies have shown a 22 to 25 percent reduction in crashes when converting to a one-way street system. This is primarily due to the reduction in the number of conflict points as described in the operations section and as illustrated in the graphic.

The number of vehicular conflicts is 24 at the intersection of two two-way streets, while the number of conflicts is only 6 at the intersection of two one-way streets. The reduction in the number of pedestrian-vehicular conflicts is commensurate with this change also. The number of conflict points has a direct relationship to the potential for crashes at a location. The drivers and pedestrians crossing one-way streets need only be concerned with and wait for traffic approaching from one direction. Therefore, the one-way street system provides for safer operation.

However, it has been found that vehicles turning left out of one-way streets appear to hit pedestrians more frequently than do all other turning vehicles, most likely because of the “blind spot” created by the automobile roof support pillars.

6.2.2. Guidance

A revision to the circulation along Tennessee and Kentucky Avenues would require thorough analysis of traffic demands, the evaluation of traffic control devices at intersections and major revisions to signing and markings.

The primary benefits of changing circulation patterns from two-way operations to one-way operations would be a safety improvement when considering conflict movements and to improve traffic operations. However, neither roadway has a significant crash history or operational deficiencies; therefore, a revision to the circulation plan is not recommended at this time.

Additionally, Fort Campbell is planning projects, which may dictate the closure of portions of Kentucky Avenue. Additionally, there are PT routes on one, but not both of these roadways during certain hours of the day. These would further argue against one-way operation along these corridors.

6.3. Bank of America Circulation

6.3.1. Background

Fort Campbell officials expressed concerns over the circulation patterns surrounding the intersection of Screaming Eagle Boulevard and Bastogne Avenue. The primary area of concern is the Bank of America access and circulation, which is approximately 340 feet from the intersection (**Exhibits 6.3-6.6**). Two driveways for the bank are connected to the Unnamed Drive. For the purpose of this discussion the driveways will be referred to as Driveway 1 (located closer to Bastogne Avenue), and Driveway 2. The areas of concern are listed below.

- Proximity of Driveway 1 to the intersection of Bastogne Avenue and the Unnamed Drive. This creates conflicting traffic movements when vehicles make a left-turn exiting the bank.
- Oklahoma Avenue, the Unnamed Drive and the connection of Driveway 2 form a “T” Intersection. The traffic signs at this location are not in the proper locations.
- Conflicting traffic movements created by vehicles exiting the drive-thru teller lanes and vehicles driving around the bank.
- Narrow travel lanes around the bank.

Exhibit 6.3 Eastward looking at entrance to Unnamed Drive from Bastogne Avenue

Exhibit 6.4 Westward looking at Unnamed Drive to Oklahoma Avenue

Exhibit 6.5 Northward looking Entrance to Bank of America (Driveway 1)

Exhibit 6.6 Narrow travel lanes around Bank of America

6.3.2. Alternatives

The Study Team developed several circulation alternatives. The exhibits referenced below illustrate the circulation alternatives developed for the Bank of America. These exhibits are conceptual representations of the traffic flow and improvements and are not scaled drawings.

1. *Realignment of Oklahoma Avenue and Closure of Driveway 1* – A small curve would be placed to combine Oklahoma Avenue and the Unnamed Drive, eliminating the "T" intersection with Driveway 2. Oklahoma Avenue would then be a non-stop movement and Driveway 2 would be a STOP controlled. Traffic flow around the bank will be bi-directional with all access provided by Driveway 2. Driveway 1 would be closed off to all traffic. Eliminating the parking in front of the drive-thru exit can be considered. Refer to **Exhibit 6.7**.

2. *One-Way Traffic Flow Around Bank* – Traffic flow around the bank would be in one direction (counter-clockwise) with all traffic entering at Driveway 1 and exiting at Driveway 2. Refer to **Exhibit 6.8**.

3. *Right-In/Right-Out at Driveway 1* – Widen Driveway 1 and place a small concrete island, which allows traffic to make a right-turn into the driveway from the Unnamed Drive and forces traffic exiting the bank at Driveway 1 to turn right. Traffic flow around the bank would be bi-directional with vehicles being permitted to enter and exit at Driveway 2. Refer to **Exhibit 6.9**.

4. *Unnamed Drive Extension with Closure of Oklahoma Avenue* – Extend the Unnamed Drive around the bank, widening where necessary, to intersect with Screaming Eagle Boulevard and close off access to Oklahoma Avenue. Access to buildings 245, 250 and 252 would be maintained though the other end of Oklahoma Avenue. The intersection of the Unnamed Drive with Screaming Eagle Boulevard and Driveway 1 would be right-in/right-out movements. To prevent motorists from using the new drive as a shortcut around the traffic signal at the intersection of Bastogne Avenue and Screaming Eagle Boulevard, traffic delineators would be used to direct traffic into the bank. Refer to **Exhibit 6.10**.

   Another consideration for this alternative would be to close Driveway 1. This would make Driveway 2 the only access to the bank.

5. *Screaming Eagle Boulevard Driveway* – A right-in/right-out driveway would be added for the bank off of Screaming Eagle Boulevard. In addition to the new driveway, the existing Unnamed Drive would be narrowed to one lane, inbound only. Vehicles would be able to leave the bank through the right-out onto Screaming Eagle Boulevard or by taking Oklahoma Avenue to Bastogne Avenue. Refer to **Exhibit 6.11**.

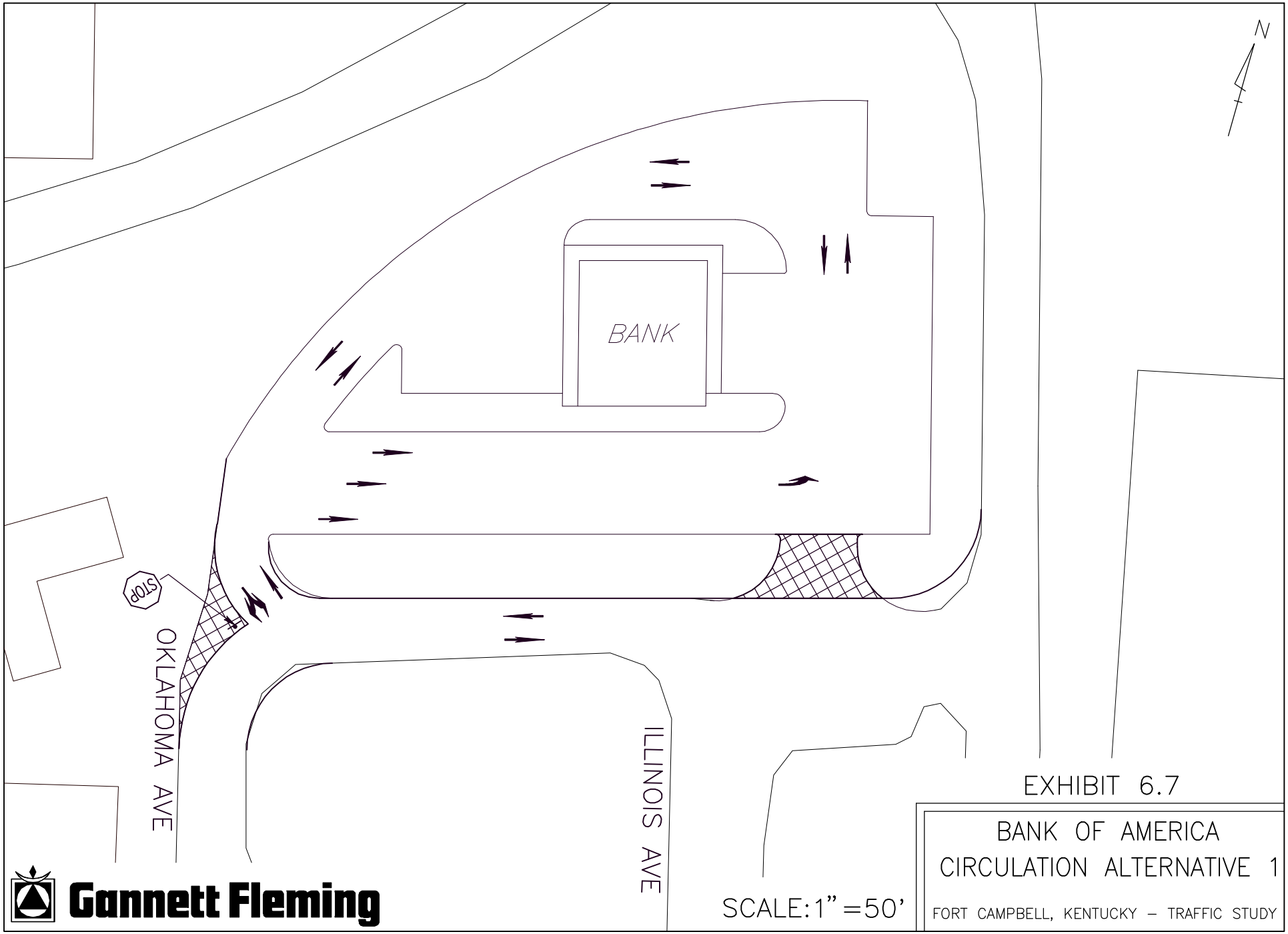

EXHIBIT 6.7

BANK OF AMERICA
CIRCULATION ALTERNATIVE 1

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

SCALE: 1" = 50'

Gannett Fleming

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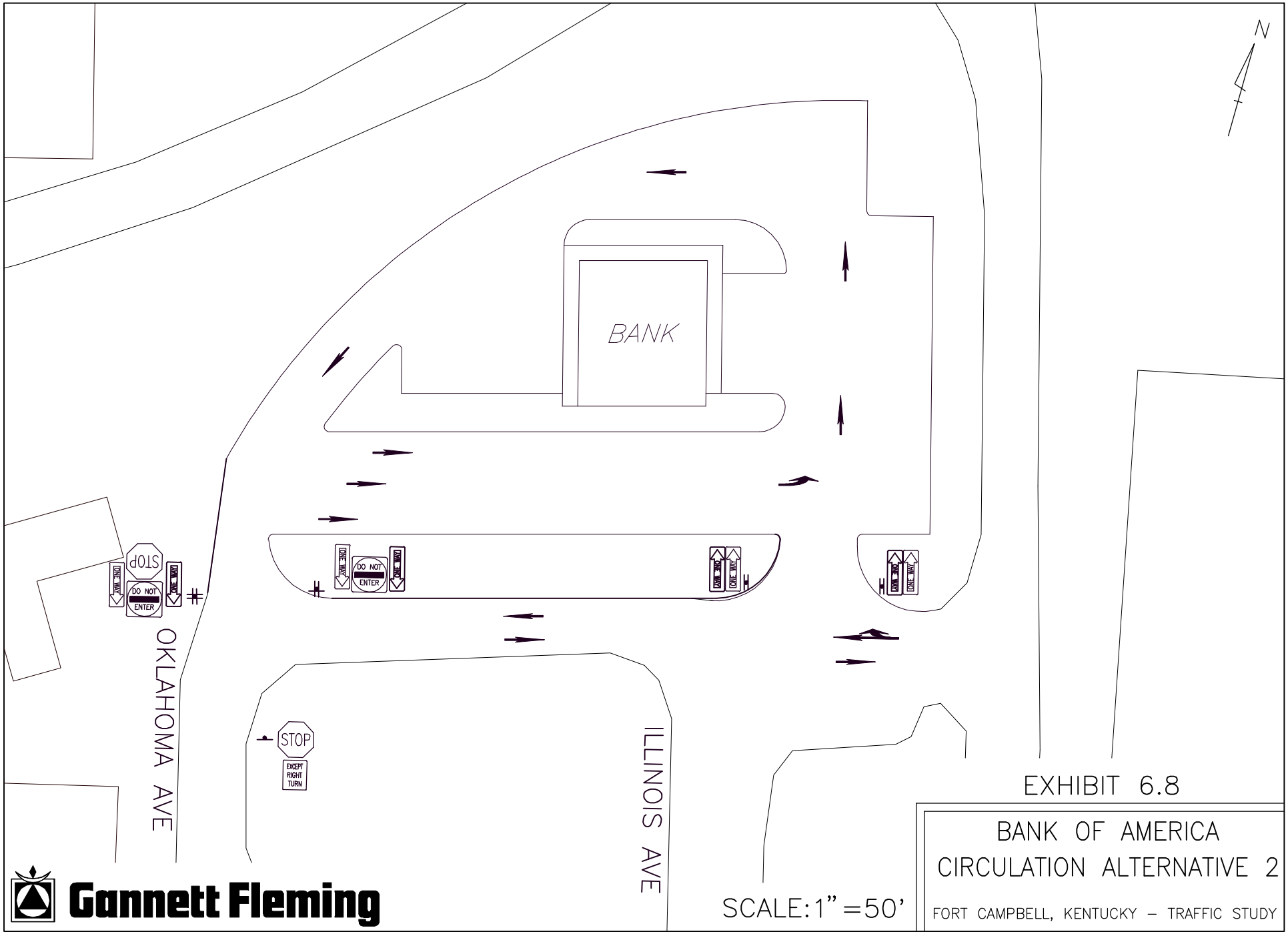

EXHIBIT 6.8

BANK OF AMERICA
CIRCULATION ALTERNATIVE 2

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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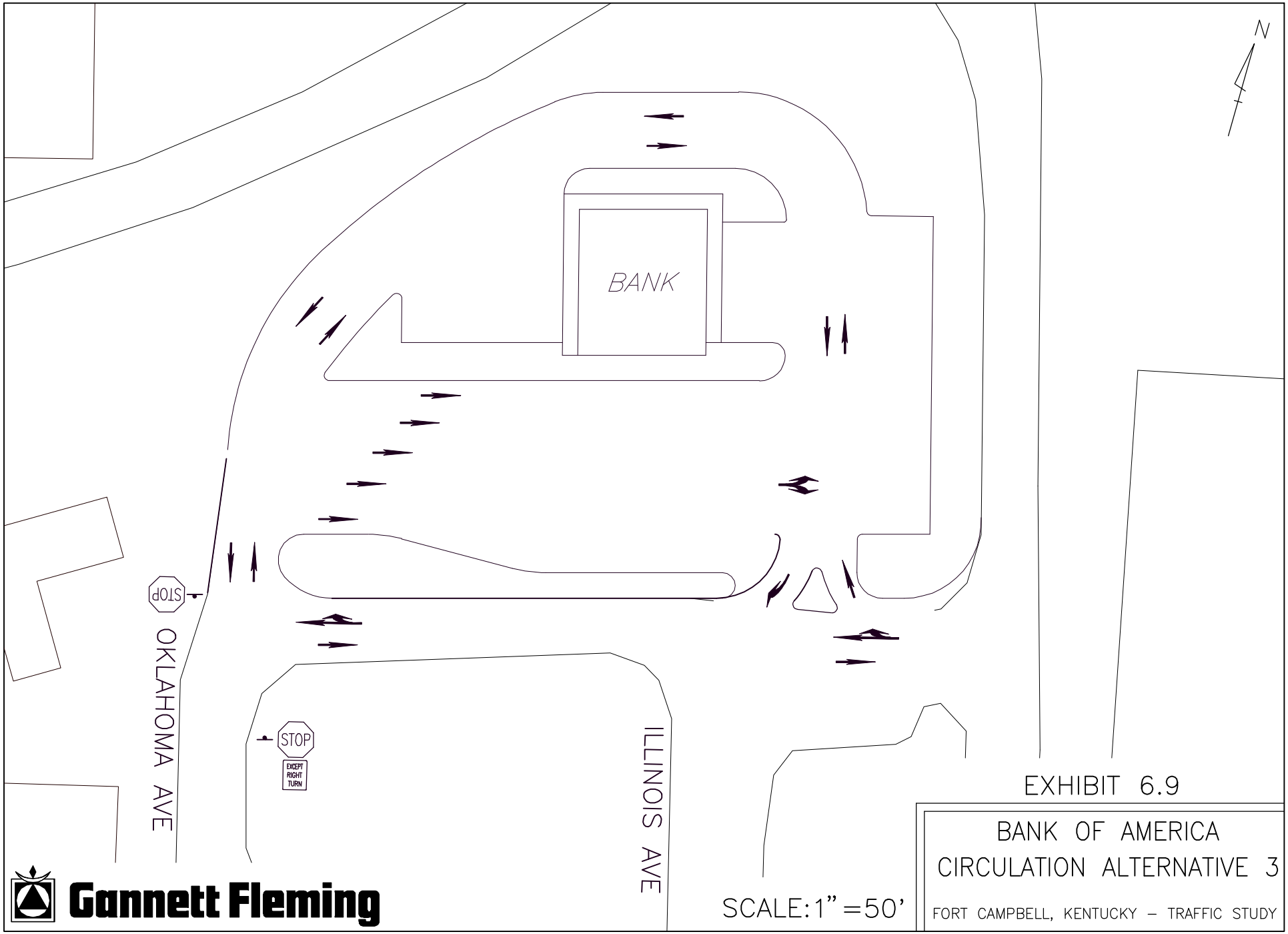

EXHIBIT 6.9

BANK OF AMERICA
CIRCULATION ALTERNATIVE 3

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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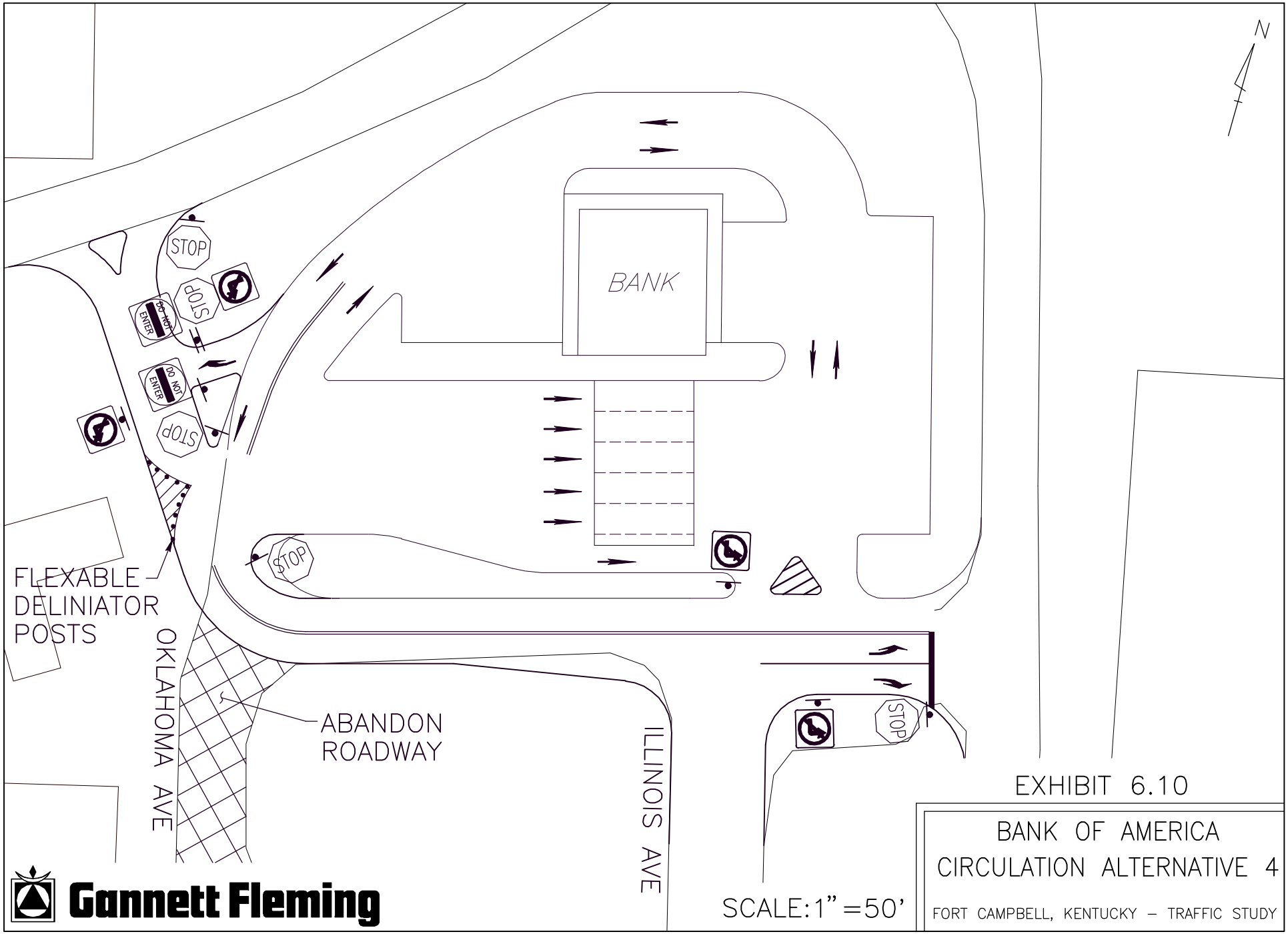

EXHIBIT 6.10

BANK OF AMERICA
CIRCULATION ALTERNATIVE 4

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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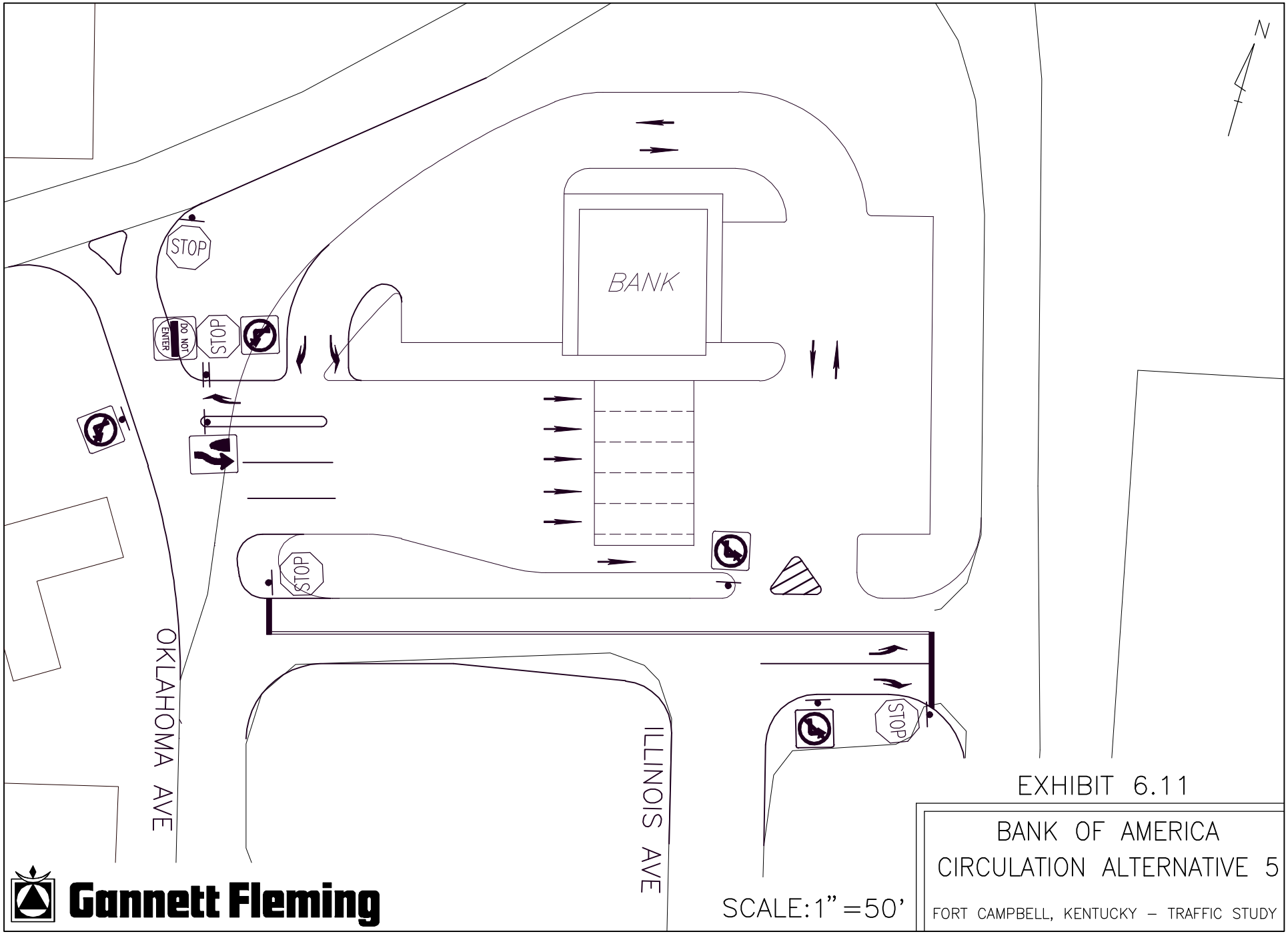

EXHIBIT 6.11

BANK OF AMERICA
CIRCULATION ALTERNATIVE 5

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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6.3.3. Guidance

Exhibit 6.12 compares all of the alternatives. Each of the alternatives would improve circulation in and around the Bank of America by reducing vehicular conflicts. Alternatives 1 and 3 would provide the best solution to eliminating traffic conflicts. Alternative 2 would be most economical. Fort Campbell stakeholders asked that alternatives with a Screaming Eagle Boulevard access also be included. This design feature is included in Alternatives 4 and 5.

Due to the Screaming Eagle Boulevard access and the minimization of traffic conflicts, Alternative 4 is the preferred alternative. This improvement should be coordinated with access management upgrades to safely accommodate the hospital and the education center access.

The advancement of the realignment of Screaming Eagle Boulevard necessitates the consideration of this project with regard to bank access. The realignment will likely result in more traffic using the Bastogne Avenue entrance to gain access to the bank. Since the realignment moves the intersection of Screaming Boulevard and Bastogne Avenue to the north more offset is provided between the intersection and the access; however, due to the likely increase in traffic the consolidation of access points described previously including the possible installation of a traffic signal to provide access to multiple land uses including buildings 230, 232, 234, 245, 250, the hospital and the to Bank of America should be considered. Also, the construction of a right-in/right-out intersection from existing Screaming Eagle Boulevard to the bank should evaluated versus the proposed terminus of the existing alignment once the new roadway is constructed.

Exhibit 6.12 Bank of America Alternative Comparison

Alternatives	Advantages	Disadvantages
1. Realignment of Oklahoma Avenue and closure of Driveway 1 Cost: $5,250.	• Closing Driveway 1 would move the entrance to the bank further away from the Bastogne Avenue/Oklahoma Avenue intersection and minimizes the number of traffic conflicts at Driveway 1. • Allows bi-directional traffic around the bank. • Eliminating the parking spaces in front of the drive-thru lanes would eliminate all traffic conflicts between vehicles exiting the drive-thru lanes and vehicles traveling clockwise around the bank.	• Forces all traffic to enter and exit the bank at a single driveway. • Does not solve problem of narrow lanes around the bank. • Cost of realigning Oklahoma Avenue and Driveway 2.
2. One way traffic flow around bank Cost: $2,150.	• Traffic flow is one-way around the bank eliminating traffic conflicts at Driveway 1 and the drive-thru exit. • Traffic waiting for the drive-thru would not be stacked onto Oklahoma Avenue or Bastogne Avenue. It would remain on bank property. • Vehicles would have wider lanes for travel assuming traffic is not queued around the bank. • Cost – Only cost is the placement of traffic signs and pavement markings.	• Drive-Thru traffic would be forced to circle around the bank twice. • If traffic is queued around the bank, the problem of narrow travel lanes would not be mitigated.
3. Right-In/Right-Out at Driveway 1 Cost: $3,100.	• Allows bi-directional flow of traffic around the bank. • Eliminates traffic conflicts at Driveway 1 by forcing vehicles to turn right. • Gives drivers two entrances/exits to choose from.	• Cost of concrete island at Driveway 1.
4. Unnamed Drive Extension with Closure of Oklahoma Avenue Cost: $35,000.	• Provides access from Screaming Eagle Boulevard for vehicles traveling westbound. • Reduces number of conflicts at Driveway 1.	• The left-turn onto Screaming Eagle Boulevard would not be allowed. • Traffic delineators would be used in an unexpected fashion. • Possible conflict point at Driveway 2 • Closes part of Oklahoma Avenue. • Cost of signing, constructing islands and driveway to Screaming Eagle Boulevard.
5. Right-In/Right-Out on Screaming Eagle Boulevard Cost: $41,200.	• Provides access from Screaming Eagle Boulevard. • Reduces the number of conflicts at Driveway 1.	• The left-turn onto Screaming Eagle Boulevard would be prohibited. • A traffic signal at the intersection of Bastogne Avenue, Oklahoma Avenue and the learning center driveway may not be warranted.

6.4. 5th Special Forces Group Barracks

6.4.1. Background

Fort Campbell officials requested that the Study Team qualitatively analyze the circulation impact associated with the proposed 5th Special Forces Group Barracks. The new barracks complex will be in the area of Indiana Avenue and between 39th Street and 42nd Street, as detailed in **Exhibit 6.13**. The new barracks will include the company, battalion and group headquarters.

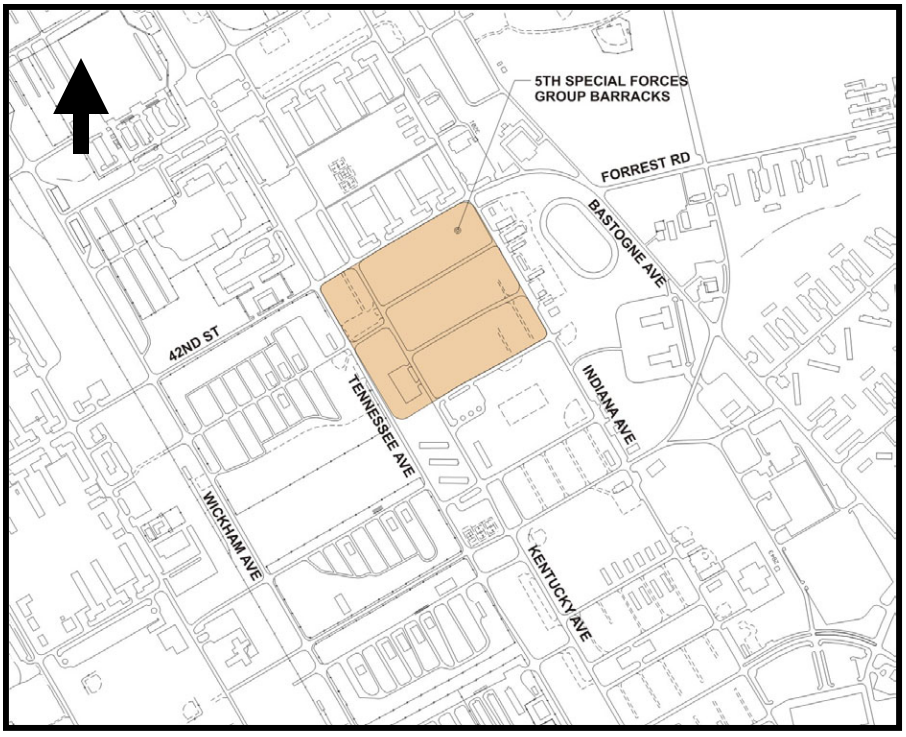


Exhibit 6.13 5th Special Forces Group Location Map

To accommodate the site development, Kentucky Avenue would need to be closed between 39th Street and 42nd Street. The layout and closure is similar to the barracks between 49th Street and 59th Street where Kentucky Avenue has been eliminated.

6.4.2. Guidance

Minimal traffic data is available in the area of the proposed site. The closest traffic data collected was at the intersection of Normandy Boulevard and Kentucky Avenue, where the north leg did not exceed a two-way volume of 300 vehicles in any of the peak hours analyzed. It is anticipated that Kentucky Avenue traffic volumes in the area of 39th Street would be minimal since there are numerous land uses between Normandy Avenue and 39th Street and since Kentucky Avenue is already closed at 49th Street.

The Study Team's engineering assessment is that the closure of Kentucky Avenue will not adversely impact traffic operations. However, traffic patterns should be monitored near neighboring intersections, which would likely accommodate diversionary traffic. Where necessary, traffic control devices should be reevaluated to ensure compliance with the MUTCD.

6.5. Morgan Road in the area of Market Garden Road and Wickham Avenue

6.5.1. Background

The area along Morgan Road in the area of Market Garden Road and Wickham Avenue has long been a concern of Fort Campbell officials. The November 1999 *Crash Location Enhancement Study* recommended installing a traffic signal at the intersection of Morgan Road and Wickham Avenue. As part of the traffic signal construction, exclusive left-turn lanes were recommended in both directions of Wickham Avenue and a channelized right-turn lane was recommended on the eastbound approach.

Fort Campbell officials have delayed the installation of the traffic signal pending decision-making regarding a proposed mini-mall to be built at the intersection of Morgan Road and Market Garden Road with access to both Market Garden Road and Morgan Road. Another consideration in the area is the security plan for CAAF including the construction of an ACP for CAAF and closure of many secondary access roads to CAAF. The new ACP is to be located approximately halfway between 6th Street and Hedge Row Road and offset requirements to the main radar tower may require roadway realignment. The secondary closures will alter existing travel patterns.

Improvements at ACP 7 (new ACP and signalization) and development in the northwest corner of the containment area will result in increased traffic on Morgan Road. A direct connection to Market Garden Road would be advantageous to provide north-south access from Morgan Road.

6.5.2. Considerations

A thorough analysis could not be conducted due the availability of data, uncertain development issues and the scope of this study. Preliminary guidance was determined recognizing the following:

- The size and function of the planned facilities as well as population data would be needed.
- The preliminary assessment is based on design experience. The attempt is to minimize the number of access points and intersections, and to avoid skewed intersections, where possible.
- The use of Market Garden Road and Wickham Avenue must be considered. Both roadways provide access from the south but to different areas. The roadways merge together at 6th Street, which creates an awkward intersection.
- Efficient access to CAAF should be considered.

6.5.3. Alternatives

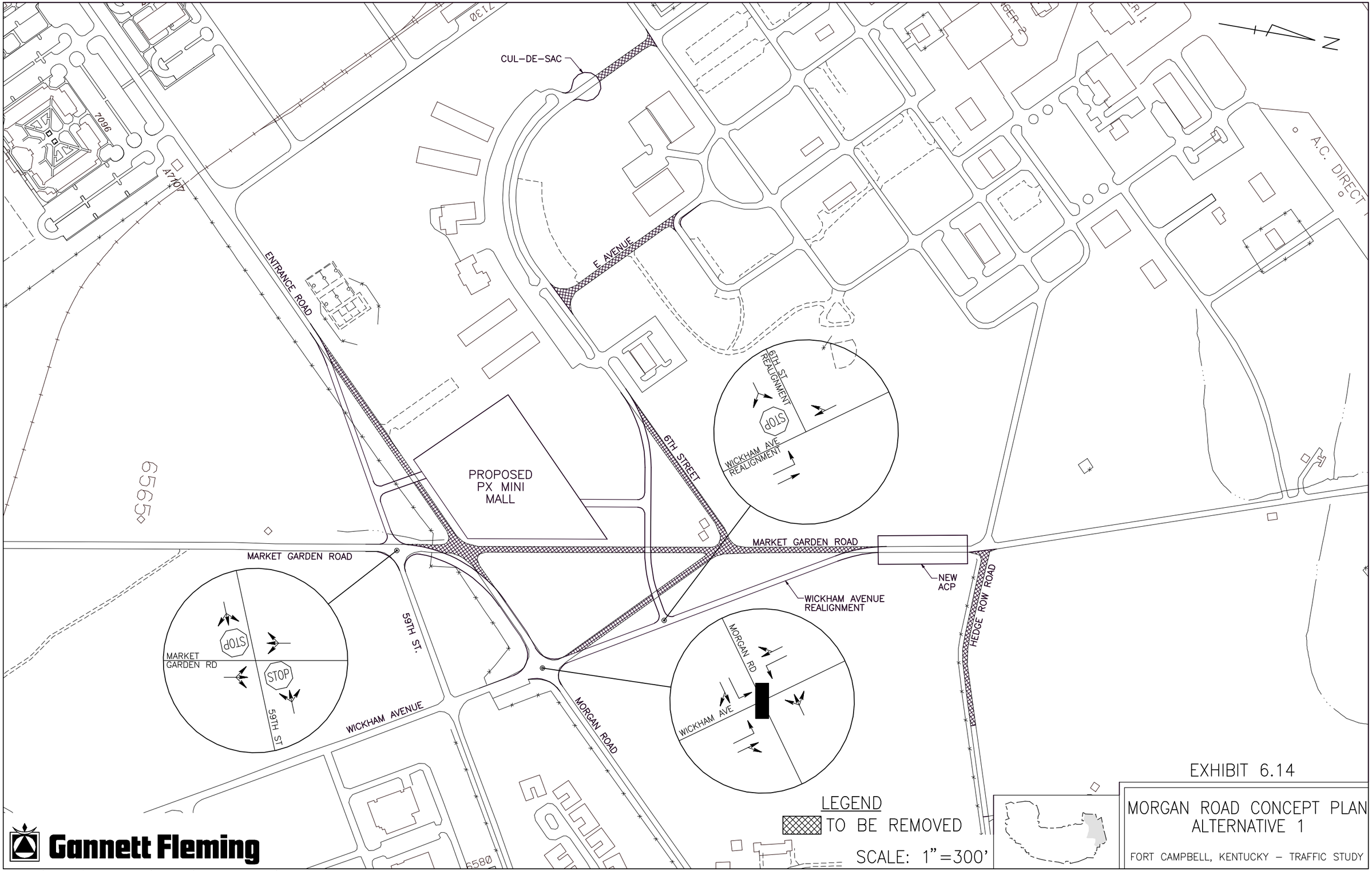
Four different alternatives were developed for this area. Their descriptions are provided below.

1. *Alternative 1* – Market Garden Road would be realigned to tie directly into Morgan Road creating a direct route from ACP 7 to the south. The intersection of Morgan Road and Wickham Avenue would be signalized and Entrance Road would be realigned to the existing intersection of Market Garden Road and 59th Street. Minor realignment of Wickham Avenue would create the necessary offset away from the radar tower. The new ACP for the CAAF would be placed on Wickham Avenue just south of the existing Wickham Avenue/Hedge Row Road intersection. Refer to **Exhibit 6.14**.

2. *Alternative 2* – Market Garden Road would be joined with Sixth Street west of the radar tower just north of the proposed PX Mini-Mall. Wickham Avenue would be realigned to provide the necessary offset from the radar tower. The new ACP for the CAAF would be placed on Wickham Avenue just south of the existing Wickham Avenue/Hedge Row Road intersection. Refer to **Exhibit 6.15**.

3. *Alternative 3* – Market Garden Road would be realigned to tie directly into Morgan Road creating a direct route from ACP 7 to the south, similar to Alternative 1. Sixth Street would be realigned and extended to run between the new PX Mini-Mall and the EM Barracks and intersect with Market Garden Road just south of the existing 59th Street intersection. Realigned Sixth Street would be used for access to the PX Mini-Mall and the EM Barracks. The new ACP for the CAAF would be placed on Wickham Avenue just south of the existing Wickham Avenue/Hedge Row Road intersection. Refer to **Exhibit 6.16.**

4. *Alternative 4* – Market Garden Road would be realigned to tie directly into Morgan Road creating a direct route from ACP 7 to the south, similar to Alternatives 1 and 3. Sixth Street would then be realigned and extended between the PX Mini-Mall and the EM Barracks similar to Alternative 3. The new ACP for the CAAF would be placed on Hedge Row Road, southeast of the existing Market Garden Road/Hedge Row Road intersection. Refer to **Exhibit 6.17**.



Gannett Fleming

EXHIBIT 6.14

MORGAN ROAD CONCEPT PLAN
ALTERNATIVE 1

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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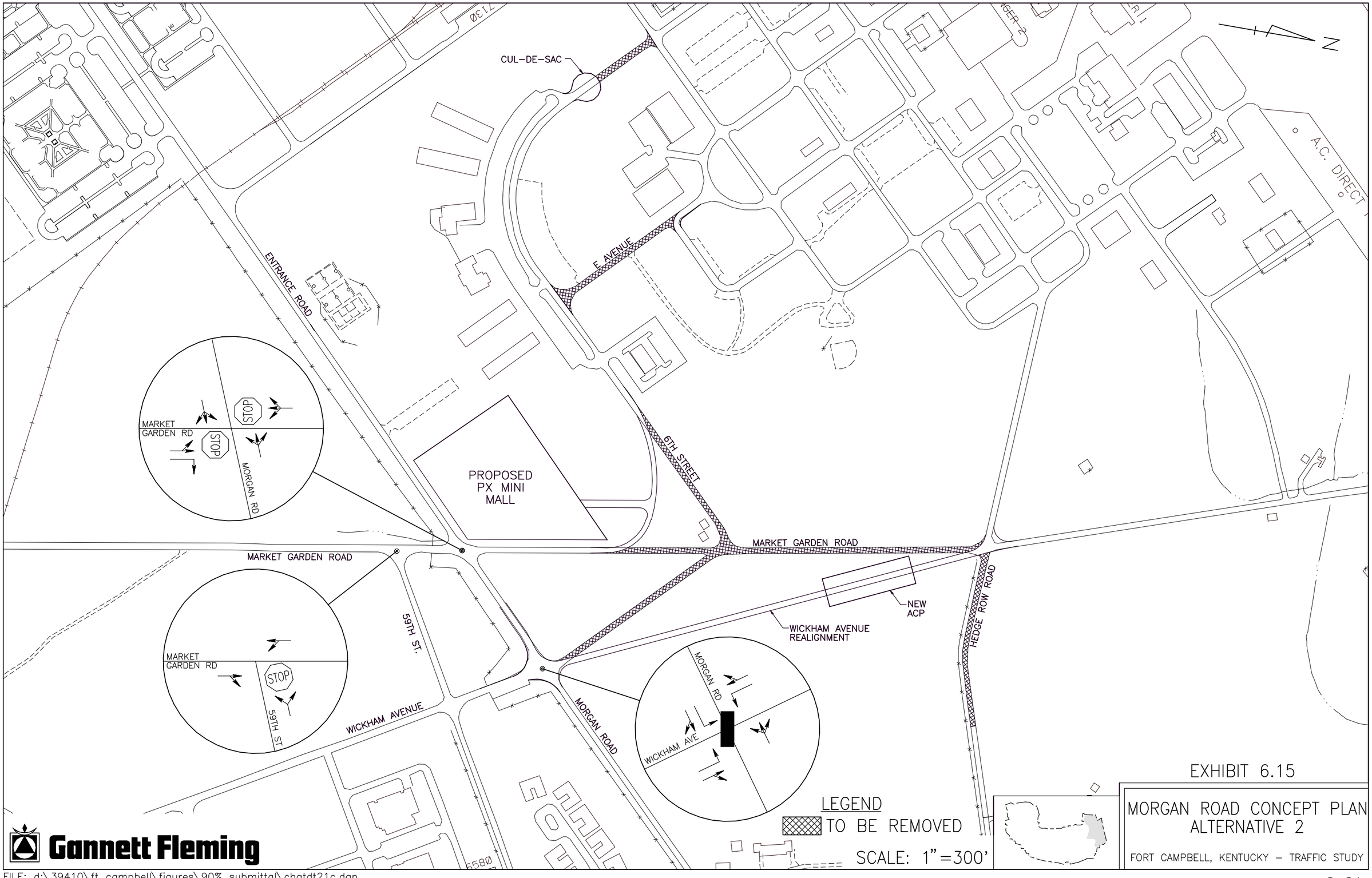

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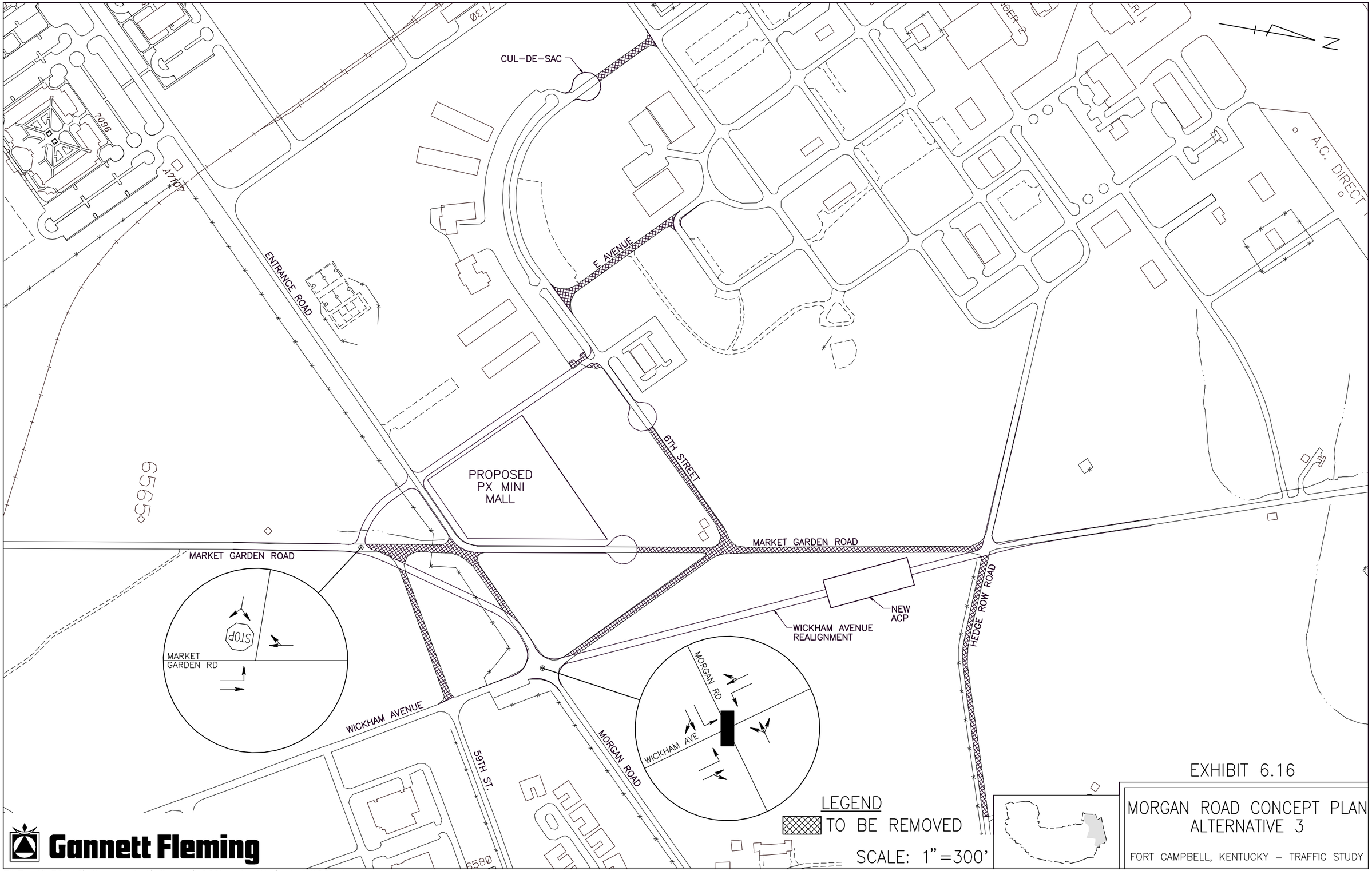

EXHIBIT 6.16

MORGAN ROAD CONCEPT PLAN
ALTERNATIVE 3

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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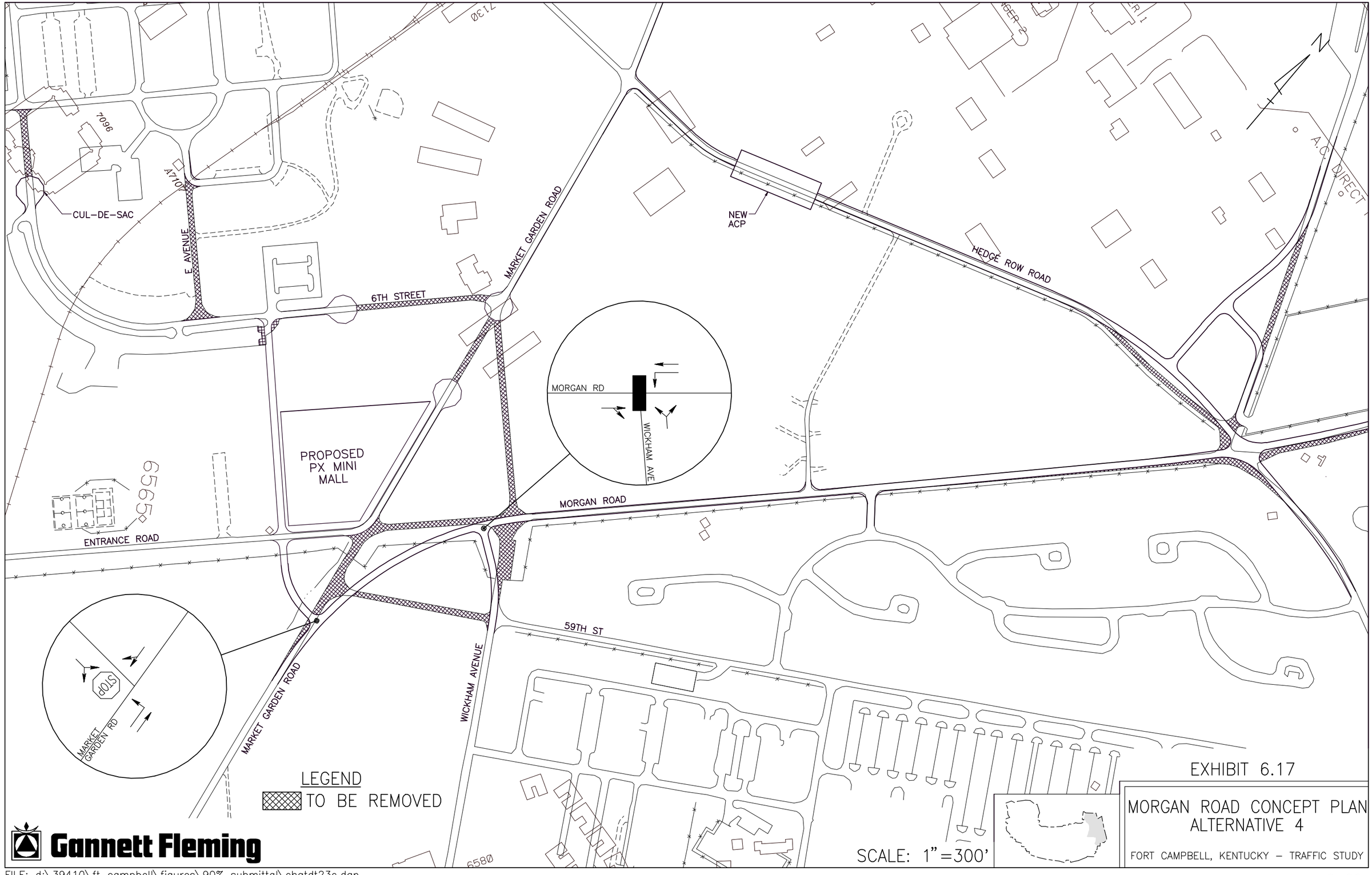

EXHIBIT 6.17

MORGAN ROAD CONCEPT PLAN
ALTERNATIVE 4

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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6.5.4. Alternative Analysis

The Morgan Road alternatives are compared in **Exhibit 6.18**.

Exhibit 6.18 Morgan Road Concept Plan Alternative Analysis

	Advantages	Disadvantages
Alternative 1 Cost: $827,000	• Provides a direct route from ACP 7 to the south on Morgan Road and Market Garden Road. • Satisfies the needed radar offset.	• Forces all traffic entering the CAAF on to Wickham Avenue north of Morgan Road. • After passing through the new ACP most traffic would be using 1st Street and Hedge Row Road west of Market Garden Road.
Alternative 2 Cost: $646,000	• Least Expensive. • Satisfies the needed radar offset. • Maintains PX Mini-Mall access points from Entrance Road and Market Garden Road.	• Forces all traffic entering the CAAF on to Wickham Avenue north of Morgan Road. • After passing through the new ACP most traffic would be using 1st Street to enter the CAAF.
Alternative 3 Cost: $1,024,000	• Provides a direct route from ACP 7 to the south on Morgan Road and Market Garden Road. • Minimizes the number of intersections. • Satisfies the needed radar offset.	• Forces all traffic entering the CAAF on to Wickham Avenue north of Morgan Road. • After passing through the new ACP most traffic would be using 1st Street to enter the CAAF. • Most Expensive.
Alternative 4 Cost: $961,000	• Provides a direct route from ACP 7 to the south on Morgan Road and Market Garden Road. • Provides the most offset between the radar tower and the roadways. • Maintains PX Mini-Mall access points from Entrance Road and Market Garden Road.	• Forces all traffic entering the CAAF to Hedge Row Road. • Significant traffic volumes currently using Wickham Avenue north of Morgan Road would be redirected to Hedge Row Road.

6.5.5. Guidance

Each of the alternatives presented above would provide the required access to the proposed mini-mall and the CAAF while improving traffic flow along Morgan Road as well as satisfy radar tower offset requirements. Further guidance from Fort Campbell is needed to establish a preferred alternative.

Using existing-adjusted traffic volumes, the MUTCD Peak-Hour traffic signal warrant is satisfied for the intersection of Morgan Road and Wickham Avenue. It is recommended that this intersection be signalized with all Alternatives. Additionally, traffic volumes would likely increase through this intersection for two reasons, thus reinforcing the need for signalization:

- The closure of Market Garden Road northwest of Morgan Road would force through traffic on Market Garden Road to use this intersection.

- The opening of the proposed PX Mini-Mall would also likely increase traffic volumes in this area.

Preliminary guidance for turning lanes at intersections in this area is provided on all of the Alternatives. Further investigation should be performed to confirm the adequacy of the proposed lane use for the following reasons:

- At some intersections, turning lanes may be warranted based on approximated turning movement counts developed using counts at adjacent intersections.

- The traffic volumes that were used do not reflect potential increases in traffic volumes that may result from the ACP relocation or the CAAF.

6.6. First Street near Water Treatment Facility

6.6.1. Background

Fort Campbell officials requested a qualitative review of a possible closure of First Street between Kentucky Avenue and Tennessee Avenue due to an undisclosed operational issue associated with the plant's proximity to the roadway. The location of the area in question is detailed in **Exhibit 6.19**.

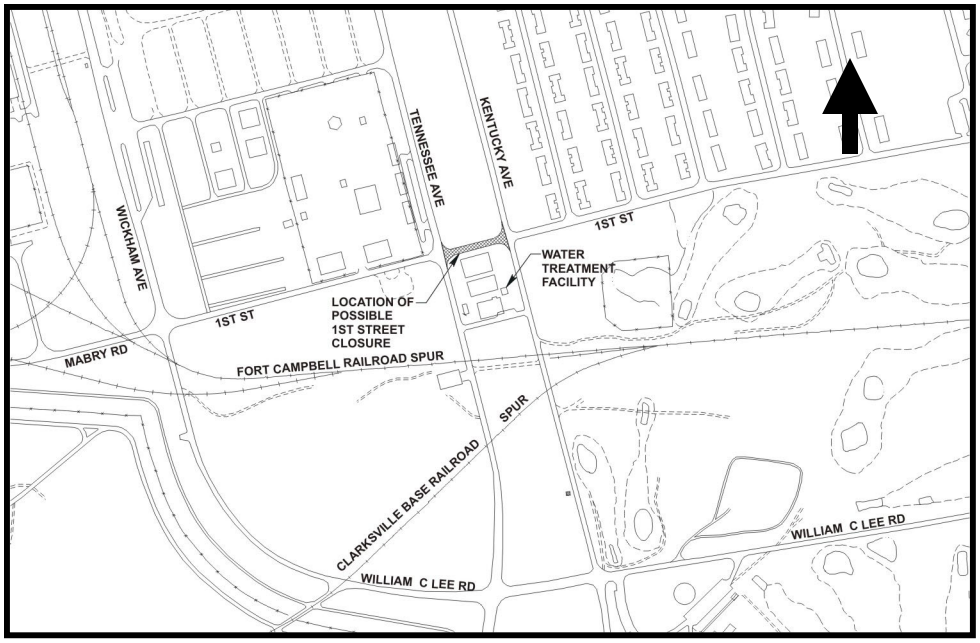

Exhibit 6.19 First Street near Water Treatment Facility Location

6.6.2. Guidance

Existing-adjusted two-way traffic volumes do not exceed 100 vehicles per hour in any of the peak hours analyzed. The low volumes can be partially attributed to the closure of ACP 2 that will not be reopened on a permanent basis. Due to the low usage in the area in question, it is the Study Team's engineering opinion that the closure of First Street in this area will not adversely impact traffic operations.

6.7. Parking Evaluation

6.7.1. Background

Fort Campbell has cited problems relating to a possible lack of parking in several areas including CAAF. The parking condition could not be quantified since daytime aerials were not available to the Study Team; therefore specific guidance could not be given. Fort Campbell can identify specific parking shortages by performing a parking utilization study in areas of concern. This study compares the highest number of vehicles parked at each facility to the available parking supply. The survey should be conducted at least twice daily, ten o'clock and two o'clock for long-term parking; and every one to two hours for short-term parking. MTMCTEA Pamphlet 55-8 provides more information on data collection procedures.

6.7.2. Guidance

Guidelines exist that suggest employee to parking spot ratios. For example, ITE's *Parking Generation* recommends that light industrial land uses provide parking at a rate of 0.79 times the number of employees and that industrial park land uses provide parking at a rate of 0.74 times the number of employees.

Generally, short- and long-term parking areas should not be more than 85- and 90-percent full, respectively. Should the parking utilization rate exceed these figures, consider adding parking.

Urban Land Institute's Dimensions of Parking states that when planning employees' parking, it is assumed that they are not willing to walk more than 1000 feet. Other sources state 1500 feet. When distances exceed 1000-1500 feet, a parking problem is perceived regardless of actual parking availability.

If the construction of additional surface parking lots were limited due to lack of land availability, one possible remedy would be the construction of a parking garage. This type of solution would be optimal if land is heavily developed. Although it appears that Fort Campbell does not have an overall lack of undeveloped land, there may be areas where space constraints exist. Two disadvantages of parking garages are:

- Cost – On average, parking structures cost around $15,000 per space versus $1,500 per space for a conventional surface lot.
- Usage – Motorists in non-urban areas often view parking garages as inconvenient, preferring to park in "more accessible" surface lots or undesignated parking areas.

A park and ride program as well as a ridesharing program warrant consideration as a relatively inexpensive solution if existing and future parking shortfalls are expected to become a serious problem.

6.8. Barge Point Access

6.8.1. Background

Fort Campbell officials have requested that the Study Team provide guidance on access to the Barge Point, which is outside of Fort Campbell's property. Roadway access to the Barge Point is accomplished via 101st Airborne Division Road, U.S. Route 79, TN Route 233 and Lylewood Road (**Exhibit 6.20**). The Barge Point (**Exhibit 6.21**) provides water deployment capability via the Cumberland River, the Mississippi River and the Gulf of Mexico. Concerns have been raised regarding the geometric quality and safety of TN Route 233 and Lylewood Road to accommodate large vehicles needed for deployment purposes. (**Exhibits 6.22-6.24**)

6.8.2. Guidance

As part of the assessment, traffic and crash data was requested through the State of Tennessee's Department of Transportation. The Montgomery County, Tennessee Sheriff's office indicated that there were a total of 48 vehicular crashes over three-years between US Highway 79 and the Old Lock C. It was not noted whether these where reportable (injury and/or towing) or non-reportable crashes. Furthermore, data whether crashes involved military vehicles was not available. A windshield assessment of the corridor by the Study Team noted several concerns including:

- Minimal shoulders and eroded shoulders
- Lack of guardrail
- Undesirable horizontal and vertical alignment features
- Sight distance limitations

Based on the assessment, it is recommended that Fort Campbell coordinate with state and local governments to request a formal safety audit of the routes noted above. The safety audit should consider crash history, usage (amount and type) and Fort Campbell's special needs to be able to rapidly and safely deploy through alternate modes of travel. Ultimately, the Fort Campbell and local governments should work together to explore funding mechanisms to implement safety audit enhancements. Based on the windshield survey performed as part of this study, it is our engineering opinion that many safety enhancements could be done at relatively low cost such while some improvements may require more resources. These enhancements would not only benefit Fort Campbell but the local community as well. A detailed safety audit would cost approximately $30,000.

It should be noted, there is an initiative to construct a multi-modal facility on the Cumberland River near where the 101st Airborne Division Road will cross the river. This facility could be a back up for rail deployment if Fort Campbell's facility is not usable. Also, it would have port facilities and truck facilities.

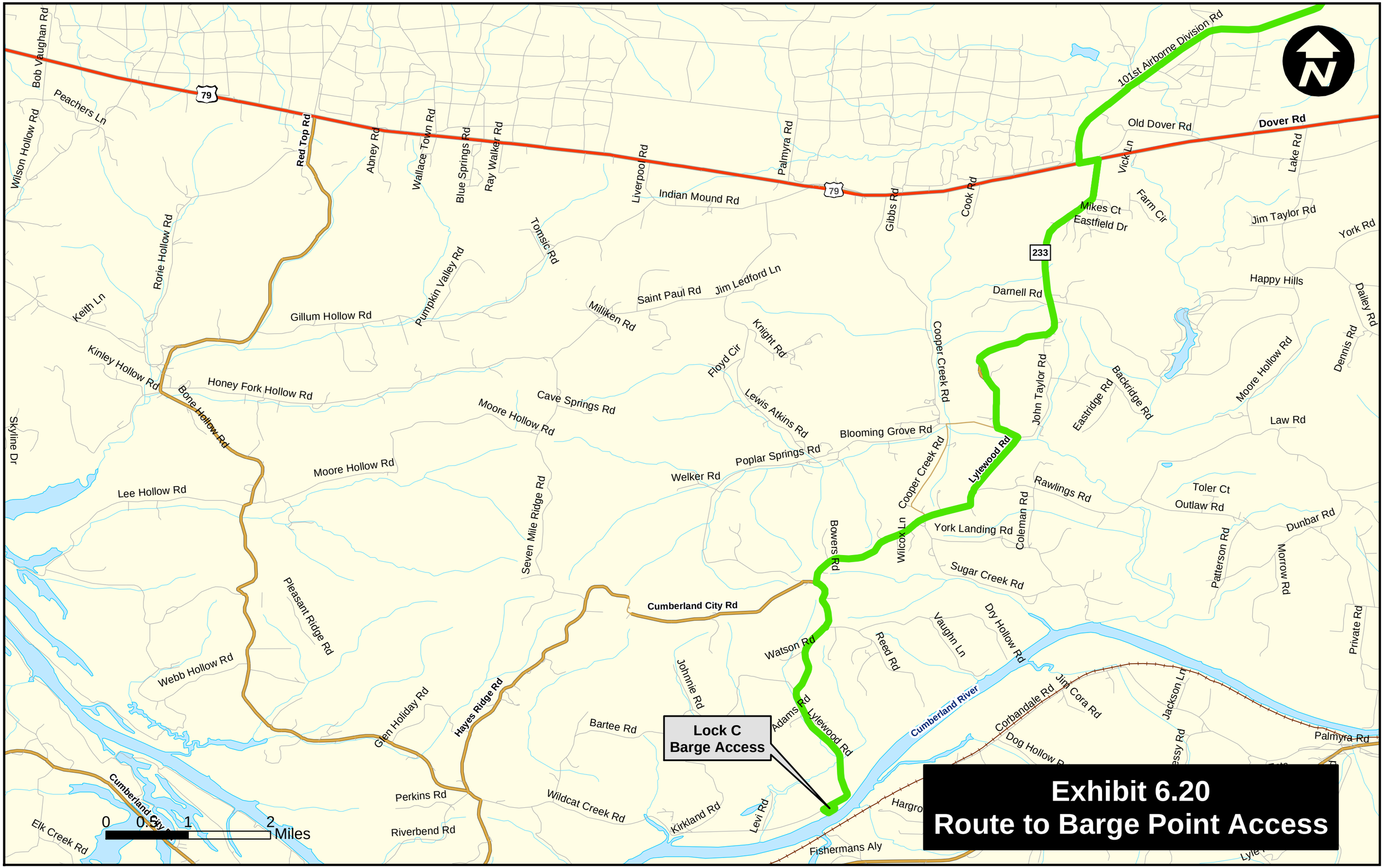

Exhibit 6.20
Route to Barge Point Access

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Exhibit 6.21 Barge Point Dock

Exhibit 6.22 TN Route 233, Adjacent to Milepost 5

Exhibit 6.23 Sight Distance Limitation along TN Route 233

Exhibit 6.24 Unprotected dropoff along TN Route 233

6.9. Intersection of KY Route 911 and KY Route 115

6.9.1. Background

Fort Campbell officials requested that the Study Team evaluate the intersection of KY Routes 911 and 115 (**Exhibits 6.23-6.25**) due to concerns over safety and operations even though it is not on Fort Campbell's property. It was stated by a concerned resident that, "90 percent of the traffic at the intersection comes from Fort Campbell."

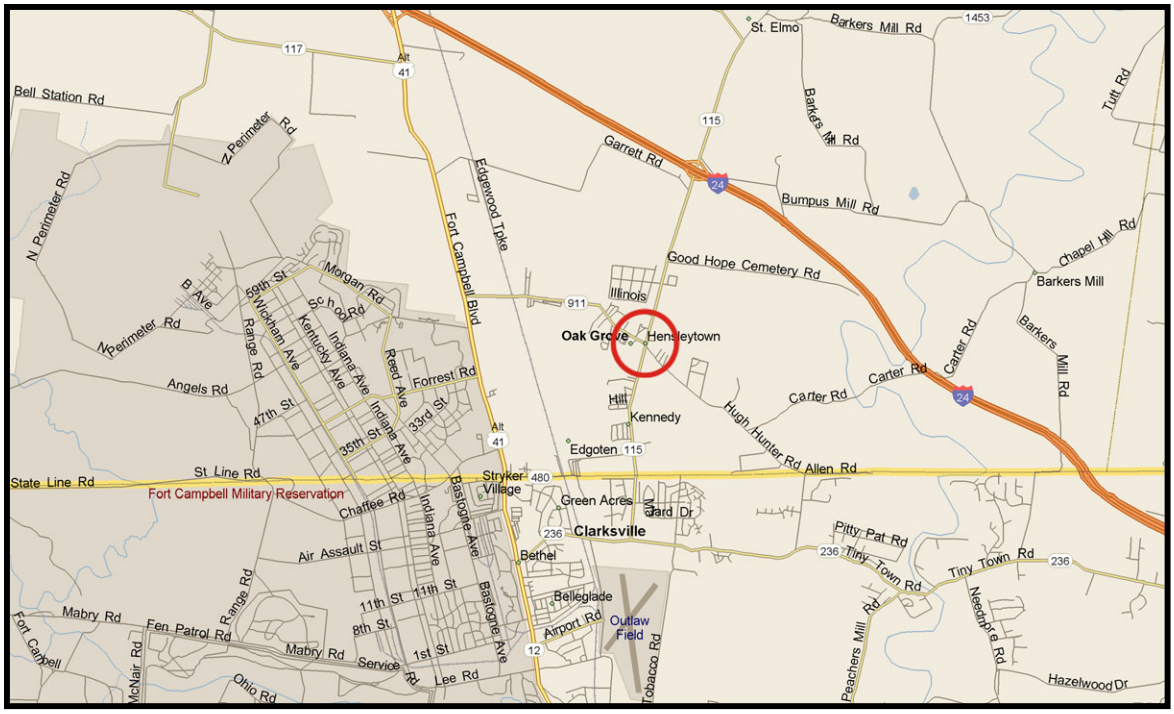


Exhibit 6.23 Intersection of KY Routes 911 and 115 Location Map

6.9.2. Guidance

Traffic data was not available for the intersection, but crash data was obtained from the Kentucky Transportation Cabinet for the intersection and the approaches in the proximity of this intersection. There were 11 crashes in this area in the three years of requested crash history. Of the total crashes, there were 5 at the intersection of KY Routes 911 and 115. These were all rear-end accidents. Four of these crashes occurred prior to the installation of a traffic signal when the traffic control type was an all-way stop condition. The KY Route 115 corridor was the scene of the remaining 6 crashes. Three of these involved only one vehicle. One hit a deer, one hit a tree, and one hit a house. There was also a head-on crash, and one angle crash.

Based on the crash data provided and a field assessment of the intersection, it is the Study Team's engineering opinion that the installation of the traffic signal will

help mitigate safety issues at the study location. However, other safety enhancements may need considered at the intersection including:

- Repairing approximately two-foot drop-off on the west side of the north leg.
- Repairing the drop off on the south side of the west leg by flattening the sideslope (preferred) or installing a barrier. The type of barrier treatment is dependant on the ADT at this location on the roadway.
- The implementation of NO TURN ON RED restrictions on approaches with minimal sight distance.

Long-term improvements may warrant the addition of turning lanes to accommodate traffic demands.

According to Fort Campbell officials, redesign of this intersection is underway.

Exhibit 6.24 Intersection of KY Routes 911 and 115 (southward view)

Exhibit 6.25 Intersection of KY Routes 911 and 115 (westward view)

7. MISCELLANEOUS

The items in this section of the study are general areas of concern identified based on the Study Team's field assessments and discussions with Fort Campbell officials. Due to the study constraints, these issues were not evaluated in detail, but general guidance was provided.

7.1. Railroad-Highway Grade Crossing Treatments

7.1.1. Background

Officials requested that the Study Team provide guidance on railroad-highway grade crossings. Fort Campbell has numerous grade crossings associated with their rail line, which extends to the off-installation and ties into CSX's rail service near Hopkinsville.

The purpose of this task was to provide guidance for improving the safety and operation of each crossing. The criteria set forth in the Federal Highway Administration's *Railroad-Highway Grade Crossing Handbook (*RHGCH*), Guidance on Traffic Control Devices at Highway-Rail Grade Crossings* and the MUTCD should be utilized in evaluating the signing and marking requirements of railroad crossings. Additionally, local regulations and guidance should be utilized.

7.1.2. Existing Situation

Currently, traffic control devices at rail crossings are inconsistent. During rail deployments, military forces manually control rail crossings both on Fort Campbell and off Fort Campbell by running trucks along the tracks in front of the vehicles to block the railroad crossings off while trains go through. This deployment has recently been outsourced to private companies.

Fort Campbell officials stated that no at-grade railroad crossings are equipped with flashing warning devices or automatic gates. The typical treatment of railroad-roadway grade crossings is shown in **Exhibit 7.1**. Base officials also stated that equipping rail crossings with automated traffic control devices would reduce manpower requirements significantly.

7.1.3. Guidance on Assessing Crossings

It is important that grade crossings near intersections are properly protected, and their approaches properly signed and marked. Several publications outline various methods for evaluating railroad crossings. Two of those publications are the MUTCD and the RHGCH published by the Federal Highway Administration.

Exhibit 7.1 Typical grade crossing treatment, this from Wickham Avenue south of 1st Street

Form OMB 2130-0017, "U.S. DOT – AAR Crossing Inventory Form" from the RHGCH should be completed for all railroad crossings on base. This form establishes the existing conditions of the site and aids in assessing what modifications are appropriate for the crossing.

The MUTCD outlines the appropriate traffic control measures for railroad crossings. According to the MUTCD, at a minimum, R15-1 (Railroad Crossing) signs must be placed at each approach and all items placed at each approach must have a uniform retroreflective value that is visible to approaching roadway users during the day as well as at night.

Advance warning signs are installed on railroad approaches to advise the driver that a decision point is ahead. Proper placement of advance warning signs that give the driver time to process the sign's message and make a decision based on that message is an important key to reducing accidents at potentially dangerous points along the roadway corridor. Advance warning signs should be placed 325 feet in advance of the railroad crossing on roadways with a posted speed limit of 30 miles per hour. Other placement distances based on the posted speed limit can be viewed in Table 2C-4 of the December 2000 edition of the MUTCD.

The RHGCH provides several methods for identifying crossings that have the most need for safety and/or operational improvements. One commonly used methodology taken from the *National Cooperative Highway Research Program Report (NCHRP) 50* is the Expected Accident Frequency (EAF). The EAF is computed using the following data:

- Existing control devices
- Train traffic volumes
- Vehicular traffic volumes

From Figure 14 of the RHGCH (**Appendix *G***), the EAF is computed as follows:

EAF = A x B x Trains per day

Where: A is an equivalency factor based on average daily traffic (ADT) volumes,
B is an equivalency factor based on existing control devices, and
EAF is the expected number of accidents per year.

If the computed EAF is greater than 0.02 crashes per year, a higher level of control than what exists is needed at the crossing.

7.1.4. Guidance on Traffic Control for Railroad Grade Crossings

All grade crossings of railroads and public streets or highways should be equipped with approved passive devices (signs and markings) such as the following:

- One reflectorized crossbuck sign on each roadway approach to the highway-rail grade crossing.
- Pavement markings on paved roadway approaches to the crossing as described in the MUTCD.
- Railroad Advance Warning (W10-1) on each roadway except as described in the MUTCD.
- Supplemental Passive Traffic Control Applications subject to engineering evaluation.

Automatic Gates with flashing lights should be considered at highway-rail grade crossings whenever one or more of the following conditions exist:

- High Speed train operation combined with limited sight distance at either single or multiple track crossings.
- A combination of high speeds and moderately high volumes of highway and railroad traffic.
- Either a high volume of vehicular traffic, high number of train movements, substantial numbers of school buses or trucks carrying hazardous materials, unusually restricted sight distance, continuing accident occurrences, or any combination of these conditions.
- A diagnostic team recommends them.

Warning/Barrier Gate Systems can be considered as supplemental safety devices at:

- Crossings with passenger trains.
- Crossings with high-speed trains.
- Crossings in quiet zones.
- As otherwise recommended by an engineering study.

Part 8 of the MUTCD provides guidance on traffic control devices at rail crossings (**Exhibits 7.2-7.4**). All crossings should be reviewed to ensure compliance with MUTCD regardless of whether they warrant additional traffic control devices.

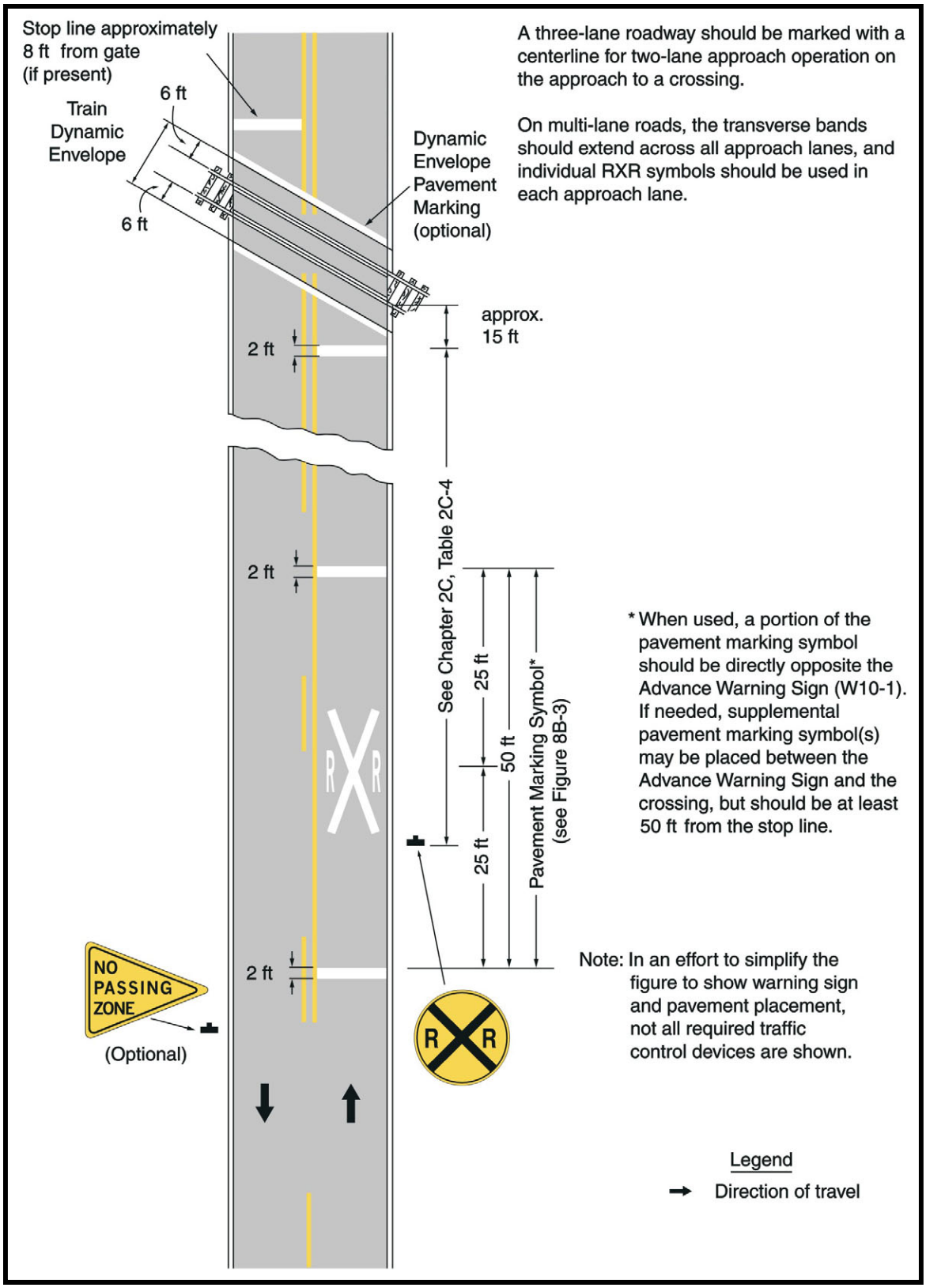


Exhibit 7.2 Typical Placement of Warning Signs and Pavement Markings at Highway-Rail Grade Crossings (From MUTCD)

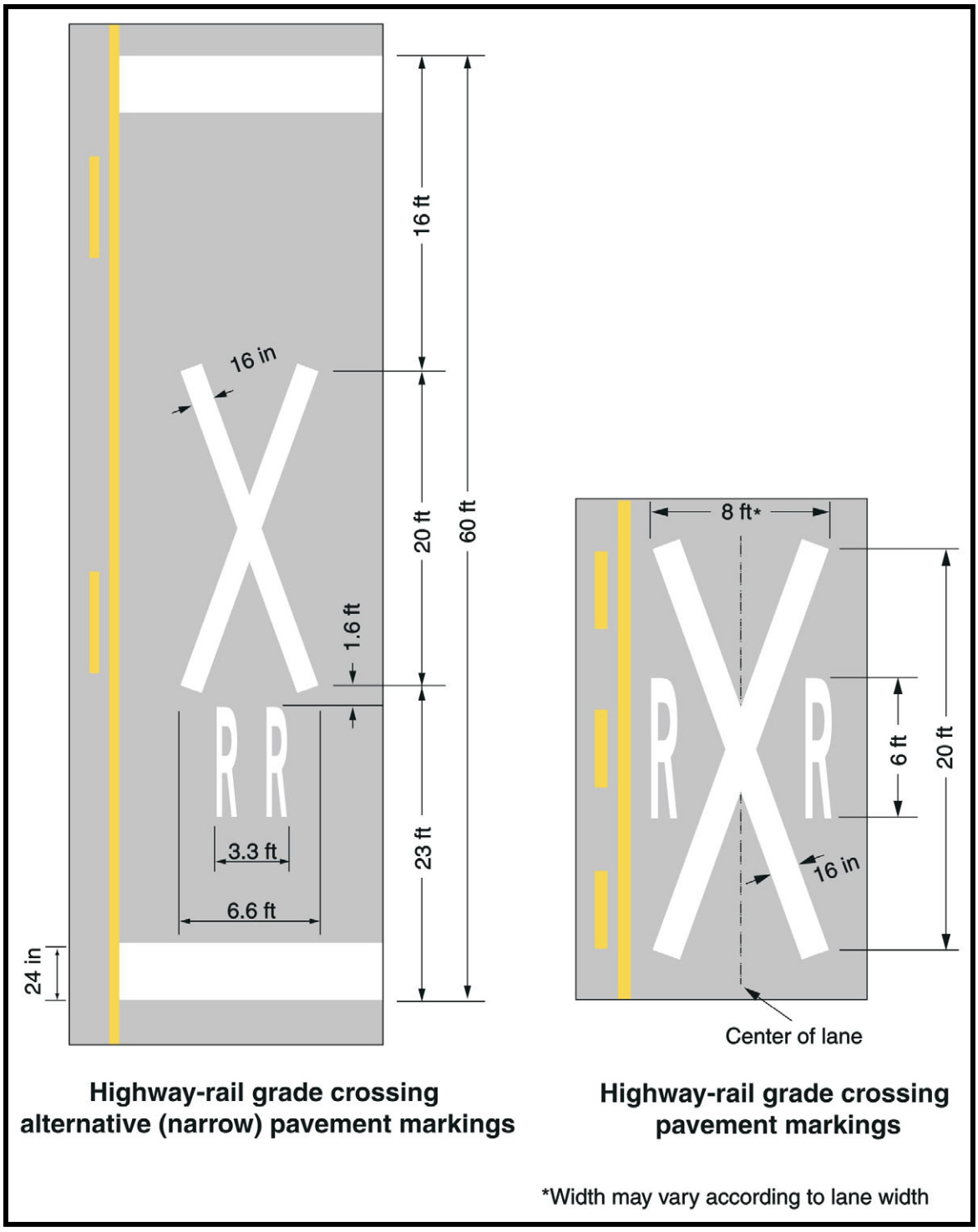


Exhibit 7.3 Typical Highway-Rail Grade Crossing Pavement Markings (From MUTCD)

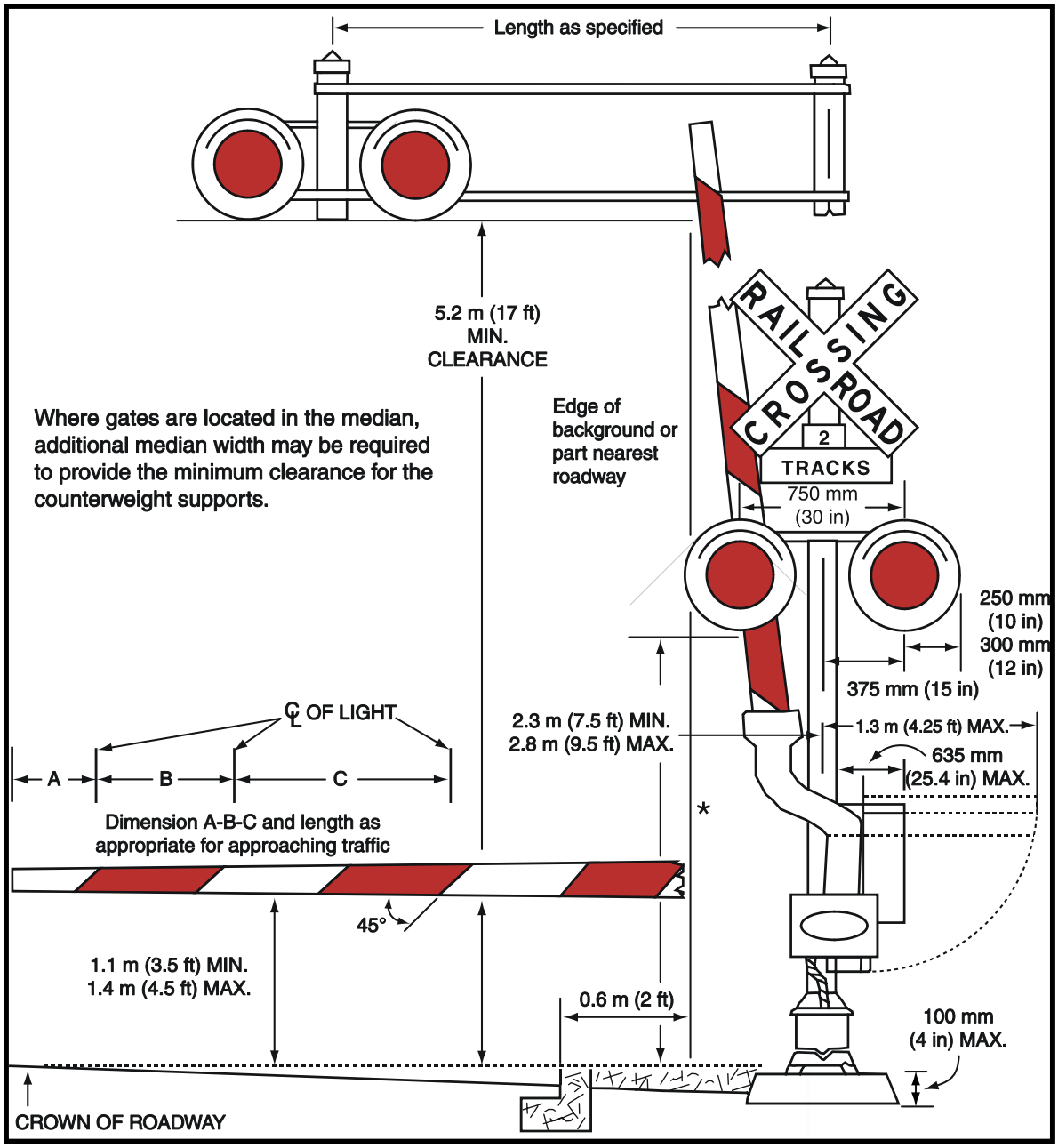


Exhibit 7.4 Typical automated gate/flashing warning lights

7.2. Pedestrian and Bicycle Considerations

7.2.1. Background

Fort Campbell is similar to many other military installations in that there is significant amount of pedestrian and bicycle traffic. There are various levels of pedestrian and bicycle traffic throughout the containment area. In family housing areas, much of the pedestrian and bicycle traffic can be attributed to children and is often associated with designated or non-designated school routes. In other areas, pedestrian and bicycle activity is mostly adult, commuter traffic. Elsewhere, PT routes require special pedestrian accommodations, including road closures, due to the volume of people participating in PT.

Several concerns were noted during the Study Team's field assessments:

- There currently is no pedestrian safe method of crossing Highway 41A adjacent to the installation.
- No signalized intersections on the installation are equipped with pedestrian signal heads.
- Most roadways on base do not have bike lanes.
- Many main roadways lack sidewalks.

7.2.2. Guidance

Transportation enhancements should consider and accommodate pedestrians and bicycles, where possible. This is critical at conflict areas such as intersections and ACP's and at locations where land use characteristics encourage mid-block crossings.

AASHTO page xlii
Emphasis has been place in the joint use of transportation corridors by pedestrians, cyclists and public transit vehicles. Designers should recognize the implications of this sharing of the transportation corridors. Designers are encouraged to consider not only vehicular movements, but also the movement of people…

Pedestrians should be accommodated with walkways, crosswalks, and associated signing. At signalized intersections where pedestrian activity occurs, pedestrian push buttons and signals should be provided.

7.2.2.1. Mid-block Crosswalks

Mid-block crosswalks should be signed in accordance with the MUTCD and should be consolidated as much as possible to limit areas where pedestrians may cross the roadway. Corridors with several crossings can be signed at the start of the corridor to make motorists aware of pedestrian activity. In this case, it is useful to supplement the pedestrian crossing sign with a placard stating over

what distance pedestrian activity takes place. It is important to be consistent in sign placement. (**Exhibit 7.5**)

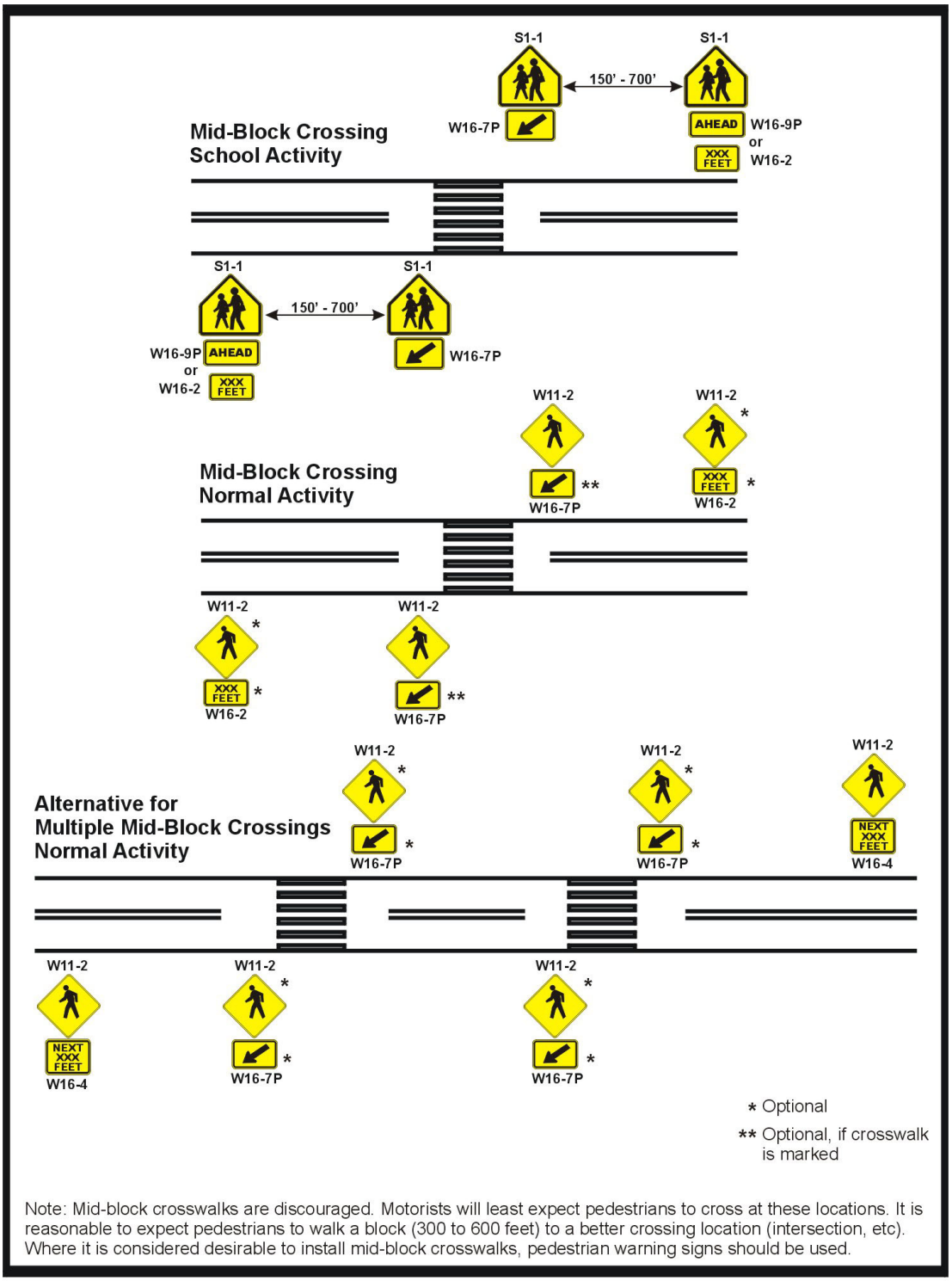


Exhibit 7.5 Mid-Block Crossing Treatment

Institute of Transportation Engineers, Design and Safety of Pedestrian Facilities - Chapter 4 Pedestrian and Motorists Signing

Page 37
The MUTCD encourages a conservative use of signs. Signs should only be installed when they fulfill a need based on an engineering study. In general, signs are often ineffective in modifying driver behavior, and overuse of signs breeds disrespect and diminishes effectiveness.

Page 40
Advance Pedestrian Crossing Signs
The warning sign used to warn motorists of possible pedestrian conflicts is the advance pedestrian crossing sign (W11-2). This sign should be installed in advance of mid-block crosswalks or other locations where pedestrians may not be expected to cross…The advance pedestrian crossing sign provides more advance warning to motorists than crosswalk markings and on some occasions it may be used when crosswalk markings do not exist. Where there are multiple crossing locations that cannot be concentrated to a single location, a supplemental distance plate may be used (NEXT XXX FEET).

7.2.2.2. Intersections

At intersections, crosswalks should be marked except at unsignalized locations where speeds exceed 45 mph. Crosswalk markings should be compliant with the MUTCD. Crosswalk lines should be between 6 inches and 24 inches wide. The total width of the crosswalk should be no less than 6 feet wide.

7.2.2.3. ACP's

The current direction of Fort Campbell officials is to permit pedestrians at ACP 4 and to restrict pedestrians access at other ACP's. MTMCTEA and the study consultant do not support this direction. MTMCTEA's experience is that no other military installations restrict pedestrian/ bicycle activity at regular use gates.

Due to the proximity of residential land uses and off-installation land uses, pedestrians and bicycles should be accommodated at ACP 1 and 6 and possibly at ACP 3. The accommodation of pedestrians and bicycles is critical to the development of "communities" as part of the RCI initiative. Also, restrictions limit access to local transit stops.

The low amount of pedestrian and bicycle volume should be able to be handled by in-lane ID checkers and other personnel at the ACP's. Restricting pedestrians and bicycles at these locations sends the message that pedestrians and bicycles are not welcomed at Fort Campbell and discourages physical fitness since some

residents and employees may be more likely to drive since they are not permitted access as a pedestrian or bicyclist.

To address security concerns pedestrians and bicycles movements should be controlled through fencing and should be directed to a sidewalk area in close proximity to the ACP where they can be seen and processed.

7.3. Hardening of Fort Campbell's Perimeter

7.3.1. Background

Since September 11, 2003, many bases have been interested in enhancing their level of security. One particular area of consideration is the perimeter and its effectiveness in maintaining security.

At Fort Campbell, there is typically a perimeter fence bordering the installation. There can be some potential vulnerability with this type of treatment. Although it may not be necessary at all locations along base, there are several additional treatment possibilities that could add to security.

7.3.2. Guidance

Perhaps one of the most visible locations of Fort Campbell's perimeter is that along U.S. Route 41A. This can often be an individual's first impression of the base, and since it borders local communities with residences and businesses, the aesthetics of a perimeter treatment may be a particular concern. At locations where the base borders less developed areas, aesthetics would be less important.

Some examples of perimeter treatments that can be more resistant to vehicular impacts are guardrail, concrete barrier, noisewalls and embankments. Guardrail would be a relatively inexpensive solution, and offers a level of protection depending on the type and strength of the guardrail. A concrete barrier, when properly installed, is more effective in stopping vehicles with less of a deflection of the barrier. A noisewall could offer limitations of visibility, could be made aesthetically pleasing, and may be optimal if housing areas border the perimeter of the facility, but is more costly. Embankments may offer blast mitigation protection, but would likely require more space and resources to construct. Dense vegetation can also be used to restrict vehicular entry.

Another consideration is to develop a detection system to alert officials when someone approaches the perimeter.

7.4. Road Conditions

7.4.1. Roadside Slopes

7.4.1.1. Background

In 1998, one-third of motor vehicle deaths involved vehicles leaving the roadway and hitting fixed objects such as trees or utility poles. A "forgiving roadside" reduces the consequences of run-off-the-road crashes. **Exhibit 7.6** shows a severe side-slope. Removing obstructions and providing a stable and flat side-slope will make the roadside more forgiving.

The "forgiving roadside" concept recommends the development of a roadside "clear zone." A clear zone is the total roadside border area, starting at the edge of the travel way, which is available for safe use by errant vehicles.

The clear zone includes all areas along the roadside that are free of fixed objects and have slopes that may be safely crossed by a vehicle. The clear zone should be wide enough to allow a vehicle to regain control and return to the roadway or come to a controlled stop. The design of a clear zone depends on traffic volumes, travel speed, and roadside geometry.

7.4.1.2. Guidance

As discussed in the *AASHTO Roadside Design Guide*, roadway side slopes should be as flat as practical. Side slopes of 4:1 or flatter are considered traversable and recoverable. Slopes of 3:1 are traversable, but are not recoverable. Slopes steeper than 3:1 are neither traversable nor recoverable. On new construction, 6:1 or flatter side slopes are desirable.

When a nonrecoverable side slope inside the clear zone cannot be flattened, consider installing an appropriate barrier system, such as a guardrail.

Exhibit 7.6 Example of severe side-slope

The clear zone varies in width from 2 feet along curbed roadways, to 7 feet along low-speed (40 mph or less) roadways, to 30 feet along high-speed roadways such as Interstate highways.

7.4.2. Edge Drop-Off Hazards

7.4.2.1. Background

A pavement edge drop-off refers to the vertical difference between the pavement edge and the adjacent ground level (**Exhibit 7.7**). Drop-offs may develop during highway work, such as resurfacing, or through the deterioration of shoulders, often by erosion. When not properly addressed, drop-offs may cause motorists to lose control of their vehicle.

7.4.2.2. Guidance

Shoulders should be properly maintained to prevent drop-offs from forming. Repair any drop-offs greater than 3 inches. A simple solution to mitigate edge drop-offs is to fill in the area with gravel. Other more elaborate solutions are to reinforce the shoulder with pavement.

Exhibit 7.7 Example of edge drop-off (From intersection of Forrest Road and Reed Avenue)

7.5. Weight Limits and Weigh Stations

7.5.1. Background

Fort Campbell has raised concerns over non-enforced regulations concerning truck weights entering gates. Reasons to consider such enforcements include:

- Rutting of asphalt pavements was noted along Glider Road due to high use by heavy vehicles.
- Construction vehicles heading for the landfill that use ACP 10 are not obeying truck weight regulations since they are not being enforced. The basewide maximum truck weight is 80,000 pounds, however, many are running at 120,000 pounds.

7.5.2. Guidance

Possible remedies include:

- Consider a weigh station near ACP 10 if truck weights are constant problems. A weigh station has been proposed with the design of ACP 10. Refer to Section 4.4.10.
- Some states use weighing devices placed flat in the pavement across exit ramps at interstate Rest Areas for the purpose of obtaining truck weights. These only require the truck to drive slowly over the scale, and there is otherwise no disruption to the flow of traffic. It would be possible to incorporate this type of feature into the ACP 7 design at the entrance to the truck parking and staging area.

7.6. Condition and Compliance of Traffic Control Devices

7.6.1. Background

All traffic control devices should be in compliance with MUTCD standards. Drivers expect to see signage that they have familiarity with for certain situations; so it is important to have uniform signage for various types of road features.

Some examples of improper signing noted by the Study Team are presented in this section. Note that this is not a complete listing of traffic control devices that are not in accordance with the MUTCD; it is an attempt to note general types of problem areas.

Exhibit 7.8 Example of inappropriate use of lane use control sign

Exhibit 7.9 Example of white edge line on left side of traffic

7.6.2. Guidance

Exhibit 7.8 shows an inappropriately placed lane use control sign. At this location along Bastogne Avenue, the intent of this sign is to inform that the shoulder can be used to pass left-turning vehicles. **Exhibit 7.9** shows a white edge line on the left side of traffic on a one-way roadway. It should be yellow. **Exhibit 7.10** has a SPEED LIMIT sign to advise of the upcoming curve; it should be an advisory sign. **Exhibit 7.11** shows different types of messages on the same signpost where messages should not be mixed.

All signing should be MUTCD compliant.

Exhibit 7.10 Example of inappropriate curve speed warning sign

Exhibit 7.11 Example of two different types of messages on same signpost

7.7. Drainage Considerations

7.7.1. Background

Several examples of undesirable drainage features were noted in **Exhibits 7.12-7.17**. Generally, problems are caused when headwalls or ditches are too close to the roadway and are within the clear zone. If they are unprotected, they pose a particular hazard.

Exhibit 7.12 Example of undesirable drainage feature

7.7.2. Guidance

A solution to many of these hazards would be to put guardrail up to protect vehicles. Other solutions that would be more costly would be to redesign the drainage systems. At a minimum, there should be permanent delineation to make clear the presence of a roadside hazard.

Exhibit 7.13 Example of undesirable drainage feature

Consider installing a subsurface drainage system or a roadside barrier system where nontraversable ditches exist. Subsurface systems provide a safer traversable system, while the introduction of a barrier system reduces the severity, but not the frequency, of crashes.

Exhibit 7.14 Example of undesirable drainage feature

Exhibit 7.15 Example of undesirable drainage feature

The use of a rounded flat-bottom ditch provides the best combination of safety and drainage.

Design culvert openings for new roadways to be traversable. Metal end sections and concrete culverts with wing walls provide for a safer roadside.

A desirable type of headwall treatment is presented in **Exhibit 7.18**. Note in this picture that the headwall allows for optimal drainage while also not posing as a blunt object hazardous to an errant motorist. The ditch is also ideal because it is relatively wide and has a rounded cross section.

Exhibit 7.16 Example of undesirable drainage feature

Exhibit 7.17 Example of undesirable drainage feature

Exhibit 7.18 Ideal headwall design

7.8. Lane Transitions and Turn Lane Considerations

7.8.1. Background

Several examples of nonstandard transitions were noted basewide. An example of this is illustrated in **Exhibit 7.19** where the taper into the right-turn lane is very abrupt. Also, the through lane is redirected abruptly within the intersection. Although the railroad-roadway grade crossing poses a limitation at this intersection, appropriate taper lengths should be used.

7.8.2. Guidance

It is important to have properly designed tapers and transitions at lane additions for turning lanes and ACP lane transitions. **Exhibit 7.20** shows design guidelines for lane tapers and transitions.

Exhibit 7.19 Nonstandard lane tapers

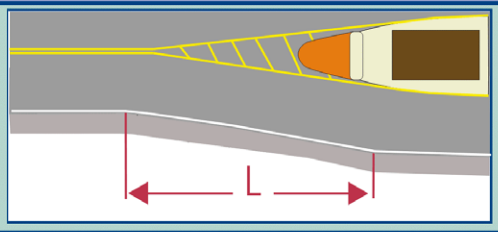
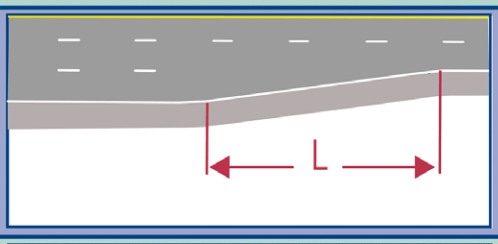
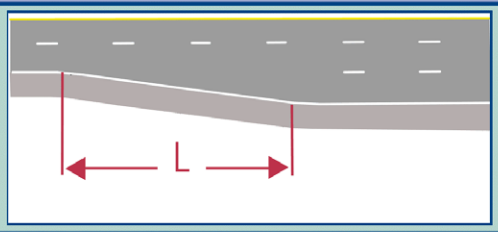
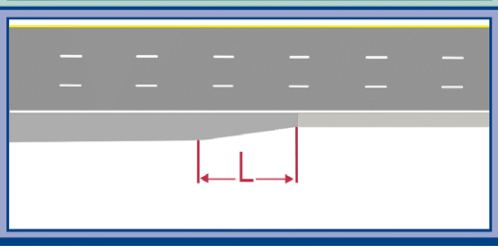
Situation	Minimum Transition Length Criteria W - transition width S - 85th percentile speed
Lane Redirected 	❖For 40 mph or less, Minimum Length = $WS^2 / 60$ ❖For 40 mph or greater, Minimum Length = W x S ❖In no case should the transition length be less than 100 feet
Lane Dropped 	❖For 40 mph or less, Minimum Length = $WS^2 / 60$ ❖For 40 mph or greater, Minimum Length = W x S
Lane Added 	❖Minimum Length = WS / 3 or a 10:1 ratio taper, whichever is greater
Shoulder-to-Curb Transition 	❖10:1 minimum taper for a transition from a shouldered roadway to a curbed, unshouldered roadway (such as a gatehouse approach) ❖Lmin = 0.33L, where $L=WS^2 / 60$ (40 mph or less) or L=WS (>45 mph)

Exhibit 7.20 Lane transition and taper lengths

7.9. Noise Considerations at ACP 7

7.9.1. Background

Due to the large expected amount of truck traffic utilizing ACP 7, it may be desired to mitigate noise pollution to land in the vicinity of the truck ACP. Currently, there are 800 trucks that use ACP 7 on a daily basis, which represents approximately 20 percent of all traffic through this ACP. During the peak hour, there are approximately 77 trucks, which represents 23 percent of all traffic through this ACP.

Near ACP 7, there is RCI housing development, the Pierce Village, just to the southeast of Cole Road. There are locations where there is only approximately 200 feet separating residences and Cole Road resulting in concerns over potential noise pollution.

7.9.2. Guidance

The 2001 AASHTO *Policy on Geometric Design of Highways and Streets* discusses noise control and presents design noise levels, consistent with FHWA noise abatement criteria for certain land uses. **Exhibit 7.21**, from AASHTO, shows design noise levels in decibels for land use categories.

The *Policy on Geometric Design of Highways and Streets* also recommends several mitigation techniques, including the construction of noisewalls, which can be constructed with concrete, wood, metal or masonry, and are most effective with a roadway along ground level. A depressed highway is effective by giving the same effect as erecting barriers. Earth berms are also possibilities where there is sufficient width.

AASHTO publishes a noise guide that can be consulted for further reference.

A noise analysis was conducted at this location. Considering existing-adjusted traffic volumes and the proportion of trucks, the analysis indicated that the most severe noise condition impacting housing areas in the vicinity of this ACP was calculated to be 61 dBA. The FHWA and most states, including Kentucky, require consideration of noise abatement for residential areas near highways when noise levels exceed 66 dBA. Therefore, noise abatement would not be required under normal conditions. However, if noise levels at this location have an adverse impact on quality of life in this residential area, noise abatement may still be desirable.

Fort Campbell should conduct further study to investigate noise intensity with relation to the ACP 7 reconstruction, along with the effects of RCI Housing initiatives. The study should determine the noise levels at various locations considering the diminishment of sound with distance, along with the proximity to housing areas.

Activity category	Category description	Design noise levels (dBA)[a] $L_{eq}(h)$[b]	$L_{10}(h)$
A	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, open spaces or historic districts which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.	57	60 (Exterior)
B	Picnic areas, recreation areas, playgrounds active sports areas and parks not included in Category A and residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.	67	70 (Exterior)
C	Developed lands, properties or activities not included in Categories A or B above.	72	75 (Exterior)
D	Undeveloped lands which do not contain improvements or activities devoted to frequent human habitation or use and for which such improvements or activities are unplanned and not programmed.		–[c]
E	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.	52	55[d] (Interior)

[a] Source: *Federal Aid Highway Program Manual*, Vol. 7, Ch. 7, Sec. 3 Transmittal 348, August 9, 1982.

[b] Either $L_{10}(h)$ or $L_{eq}(h)$ (but not both) may be used for a specific project.

[c] Noise-abatement criteria have not been established for these lands. They may be treated as developed lands if the probability for development is high. Provisions for noise abatement would be based on the need, expected benefits, and costs of such measures.

[d] Interior noise abatement criteria in this category apply to (1) indoor activities where no extreme noise-sensitive land use or activity is identified, and (2) exterior activities that are either remote from the highway or shielded so that they will not be significantly affected by the noise, but the interior activities will.

Exhibit 7.21 Noise-Abatement Criteria for Various Land Uses (from AASHTO)

7.10. Proposed Fueling Center

7.10.1. Background

It is proposed that a new fueling center will be constructed near Air Assault Street and Market Garden Road. It is expected that this will accommodate all tactical and government vehicles installation-wide. There are approximately 10,000 tactical vehicles and 1,000 government vehicles within Fort Campbell that would utilize this fueling center. **Exhibit 7.22** shows the location of the fueling center.

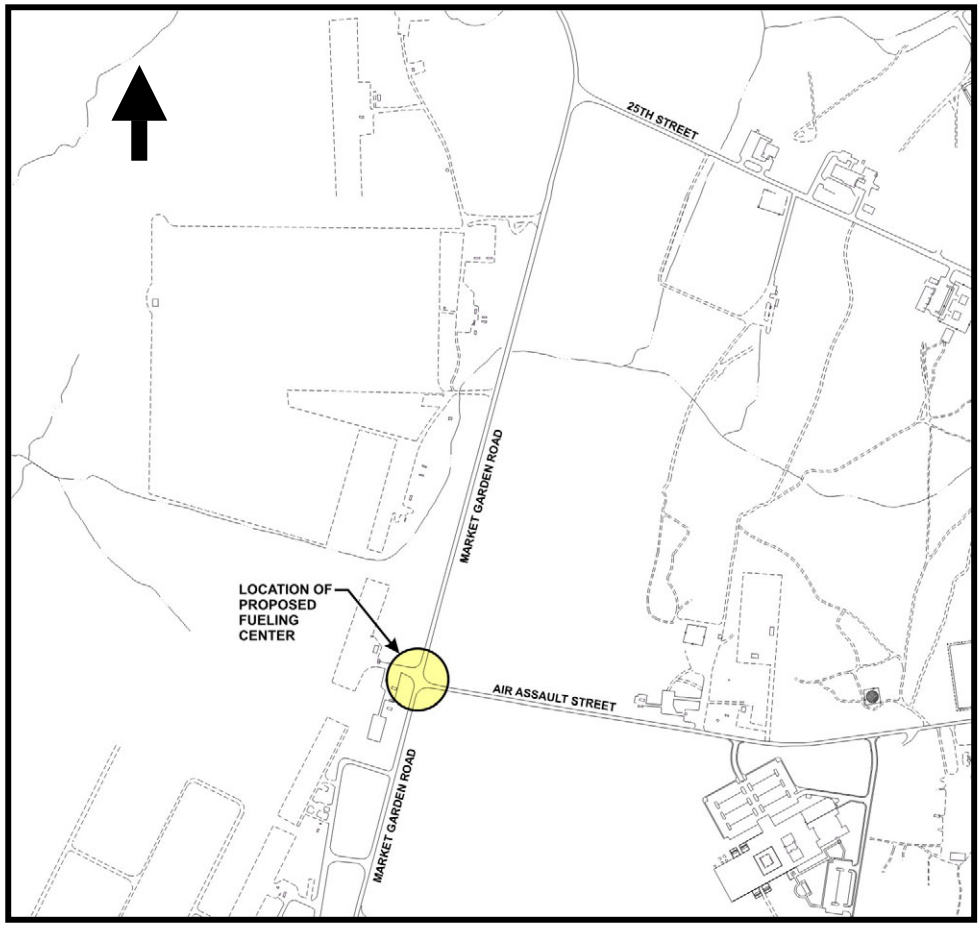


Exhibit 7.22 Fueling Center Location

7.10.2. Guidance

It is expected that this development would be a very significant traffic generator.

Base officials have indicated that under normal training conditions, at least one third of all vehicles would be training at locations off post, thus not in need of fueling on base. Many tactical vehicles in the field will be fueled by a tanker that would transport fuel from the fueling center to the field location. If the troops encounter excessive delays at the fueling center, it would be a possibility that

they will get a tanker and fuel at their motor pools. The base currently has about 1,000 government-owned vehicles. It is anticipated that most of these will fuel at the fueling center. There may be additional vehicles making arrangements to fuel at the fueling center also.

It would not be realistic for all vehicles to require fueling every week. With many fueling at training locations away from post and with many parked while they are not in the field, base officials indicate that about one third of the fleet would require fuel in the timeframe of a week. This would be approximately 4,000 vehicles per week; and approximately 800 per day, and approximately 80 per hour assuming that the fueling would occur evenly over a ten-hour day.

Fort Campbell was unable to provide more detailed traffic volumes based on fueling records. Such data should be analyzed to predict fueling patterns.

The existing-adjusted ADT on Market Garden Road exceeds 4,200 vehicles per day. The ADT on Air Assault Street is 5,900 vehicles per day. Adding an additional 800 vehicles per day would likely have a significant impact on these roadways.

Also, the project would likely have significant effects on neighboring intersections including: Market Garden Road and Air Assault Street; Market Garden Road and Mabry Road; Wickham Avenue and Air Assault Street; and Wickham Avenue and First Street. As part of this report, turning movement counts were conducted at Wickham Avenue and Air Assault Street; and Wickham Avenue and First Street.

As documented in Section 5.6, the eastbound approach of the intersection of Wickham Avenue and First Street has poor levels of service with existing-adjusted traffic volumes. This approach would likely accommodate a portion of the traffic leaving the development. Traffic delays with the current roadway configuration would increase both due to in increase in traffic on this approach, and to an increase in traffic on other approaches due to traffic traveling towards the site. Additional study for this intersection should consider the amount of traffic to be added, and also consider traffic signal warrants. This intersection is close to meeting the MUTCD Peak-Hour signal warrant, and an increase in traffic due to this development may satisfy the warrant. If signalized, acceptable operations can be provided to all approaches of this intersection.

Analysis indicates that Wickham Avenue and Air Assault Street currently demonstrates acceptable operations. This intersection could probably accommodate additional traffic due to the fueling center with no significant operational impacts, other than adjusting the timings for the traffic signal.

If this project moves forward, it would give the Market Garden Road extension project, discussed later in this document, further justification for construction.

It is recommended that a formal traffic impact study be conducted to evaluate the amount of traffic that would be generated by this development, and to document

the off-site impacts to the existing roadway network, and identify what specific roadway improvements would be needed in conjunction with this development.

8. TRANSPORTATION NETWORK ASSESSMENT AND RECOMMENDATIONS

This section considers the needs of the transportation network as Fort Campbell continues to evolve. Although the existing network generally accommodates the existing traffic flow patterns, there are localized areas of need where enhancement could address safety and congestion. As Fort Campbell continues to evolve the roadway network must consider and address how planned growth, expansions, and initiatives relate to the future needs of the transportation network.

8.1. Existing Network

As was discussed in Section 3, there are three types of roadways on Fort Campbell: arterials, collectors and local roads.

Within Fort Campbell, the following roadways function as minor arterial highways:

- Screaming Eagle Boulevard/ Normandy Boulevard
- 101st Airborne Division Road
- Glider Road/ Morgan Road
- Wickham Avenue
- Air Assault Street

Collector roadways located within Fort Campbell include:

- Market Garden Road
- Tennessee Avenue
- Kentucky Avenue
- Bastogne Avenue
- William C. Lee Road
- Airborne Street
- Forrest Road
- Morgan Road
- Angels Road
- Mabry Road

8.2. Future Considerations

The redevelopment of ACP's as well as Master Plan considerations warrant the evaluation of roadway infrastructure needs and functional class requirements. Section 3.4 highlighted Master Plan initiatives as well as the Residential Community Initiative.

8.2.1. Master Plan Considerations

As part of the Master Plan, substantial infrastructure and land use changes are being proposed. Some of the more substantial land use impacts include:

- The redevelopment of residential areas.
- The continued development of barrack facilities to the west of Wickham Avenue.
- Development as part of CAAF.
- Development and redevelopment in the area between Wickham Avenue and Kentucky Avenue from First Street through Airborne Street.
- A new installation HQ planned for the area between Kentucky Avenue and Indiana Avenue in the vicinity of 30th Street.

Much of the development is concentrated in the western portion of the containment area. Transportation enhancements to accommodate existing and additional traffic should be considered in these areas. The access of traffic onto the installation must also be considered.

8.2.2. Residential Community Initiative

Fort Campbell's housing is in the beginning phases of on-installation housing redevelopment through the Residential Community Initiative (RCI). It is anticipated that 700 additional units will be added to the approximately 4200+ existing units, which will be redeveloped.

The timeframe of this study and ongoing master planning initiatives offer the opportunity to coordinate the needs of all Fort Campbell citizens and its relation to the redevelopment of the housing areas. Housing personnel desire a transportation system that complements housing, not one that conflicts with housing. In order to achieve this goal, transportation enhancements should:

- Eliminate arterials and thoroughfares from residential areas.
- Address pedestrian and bicycle needs.
- Consider streetscaping, traffic calming and traffic control devices.

8.2.3. ACP's

The redevelopment of several ACP's and U.S. Route 41A will alter commuter traffic throughout the installation. ACP's will be or have been upgraded to provide additional capacity while providing the necessary security requirements. Access to Fort Campbell will be restricted to these ACP's therefore transportation enhancements should consider the need to provide arterial roadways at locations where ACP's exist and should consider the special uses of certain ACP's.

- ACP 1 will continue to provide access from the south to the southern portion of the installation. Several long-term considerations were explored including moving ACP 1 northward closer to the existing ACP 2, which will be closed.
- ACP 3 will continue to serve the center of the installation and mitigates some of the congestion at ACP 4, which is the Main Gate and the location for visitor processing and vehicle registration.
- ACP 5 will be closed to accommodate residential needs, but ACP 6 will need to remain near its current location to accommodate the amount of traffic entering Fort Campbell on a daily basis. The challenge is to coordinate the needs of having an ACP at this location with the needs of the residential redevelopment.
- The redevelopment of ACP 7 as well as the installation of a traffic signal at U.S. Route 41A and Cole Road will encourage additional usage of ACP 7. ACP 7 also serves as the primary truck entrance and is in close proximity to I-24. It is hoped that as the transportation network surrounding ACP 7 is enhanced some traffic will divert from ACP 6.
- ACP 10 will provide access to the south including Clarksville. Due to the proximity to local business to the south as well as the landfill and the Barge Point it is beneficial to provide secondary truck access at this location.

8.2.4. Master Plan Transportation Enhancements

The Fort Campbell Real Property Master Plan illustrates several new transportation corridors including:

- Realignment of Screaming Eagle Boulevard
- Realignment of Bastogne Avenue and a connection to Air Assault Street
- Wickham Avenue extension connecting to 101st Airborne Division Road
- Market Garden Road extension connecting to 101st Airborne Division Road
- ACP 6/ 47th Street Connector

Two of these recommendations were identified in the *1986 Traffic Engineering Study* including.

- Realignment of Screaming Eagle Boulevard
- ACP 6/ 47th Street Connector

Also identified in the *1986 Traffic Engineering Study* was realignment of Air Assault Street near Bastogne Avenue, which has been constructed as well as an 11th Street – Gate 2 Extension, which has not been carried forward.

8.3. Areas of Need

Considering the redevelopment and growth of residential areas, Master Plan initiatives as well as the upgrade and restrictions associated with ACP's several areas of need can be identified as is illustrated in **Exhibit 8.1**.

The transportation network should include arterials that support ACP's and link external roadways to internal collector roadways and major land uses; however, proper planning should take place such that these roadways do not impact residential areas and sacrifice the overall quality of the installation.

Major development is occurring to the west of Wickham Avenue. To accommodate this development, access must be considered that links this area to the appropriate ACP's as well as connects the northern and southern areas of the containment area.

Mechanisms to link heavy use ACP's (such as ACP 3 and 4) to major trip generators such as the PX/Commissary, Hospital and Headquarters should also be considered.

Finally, the needs of the residential community require strong consideration. Mechanisms to provide access to residential communities while discouraging cut-through, commuter and truck traffic should be considered. This is best accomplished through proper use of functional class types and development of surrounding land uses.

8.4. Long-term Transportation Network Improvements

The following paragraphs detail long-term transportation enhancements considered based on an assessment of traffic volume data, anticipated development and to complement the existing transportation infrastructure.

PROPOSED SABRE HELIPORT REALIGNMENT OF 101ST AIRBORNE DIVISION ROAD

ACP 10

PROPOSED FUELING CENTER

REALIGNMENT OF SCREAMING EAGLE BOULEVARD

CONTROLLED ACCESS TO CAAF & PROPOSED PX MINI MALL

ACP 7 (TRUCK GATE)

BARRACKS REDEVELOPMENT & EXPANSION

PROPOSED ACP 6/47TH CONNECTOR

RCI REDEVELOPMENT OF PIERCE VILLAGE

Barkley E.S. (Kindergarten)

Lincoln E.S.

BARRACKS REDEVELOPMENT

NEW HQ

PX EXPANSION

PLANNED REDEVELOPMENT

RCI REDEVELOPMENT OF WERNER PARK

PLANNED HOUSING REDEVELOPMENT

REDEVELOPMENT OF HAMMOND HEIGHTS

McDagin Park

Wassom M.S.

RCI REDEVELOPMENT OF LEE VILLAGE

RCI REDEVELOPMENT OF HAMMOND PARK

Youth Center

Jackson E.S.

Fort Campbell H.S.

Marshall E.S.

Mahaffey M.S.

ACP 6

RCI REDEVELOPMENT OF COLE

Drennan Park

PEDESTRIAN BICYCLE CORRIDOR

TRANSIT CENTER

ACP 3

ACP 4 (MAIN GATE)

ACP 1

UPGRADE TO AIR ASSAULT ST & BASTOGNE AVE

N

LEGEND

- PRIMARY ACP'S
- RESIDENTIAL COMMUNITY INITIATIVE
- BARRACK REDEVELOPMENT & EXPANSION
- OTHER MAJOR REDEVELOPMENT
- TRANSPORTATION PROJECTS
- INTERMODAL ENHANCEMENTS
  - •Pedestrian Bicycle Corridor
  - •Transit Center

Gannett Fleming

EXHIBIT 8.1

AREAS OF NEED AND POSSIBLE TRANSPORTATION PROJECTS

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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8.4.1. Screaming Eagle Boulevard Realignment

8.4.1.1. Description

It is proposed that Screaming Eagle Boulevard would be realigned to the north of its existing alignment (**Exhibit 8.2**). The roadway would be a five-lane typical section, and would assume a new alignment between a point just east of the intersection with Bastogne Avenue and the west of A Shau Valley Road.

The roadway would provide a direct link between the Main Gate (ACP 4), the PX and other major trip generators, the proposed Headquarters and the middle of the barracks areas along Wickham Avenue.

Exhibit 8.2 Screaming Eagle Boulevard Realignment Preferred Alternative

As shown in **Exhibit 8.3**, three alternatives have been discussed to date:

Alternative 1 would create three intersections between existing and proposed roadways. If properly designed and constructed, the intersections may be able to be coordinated and operate efficiently; however, the close proximity of intersections may result in queuing between intersections, more vehicular conflicts and driver confusion.

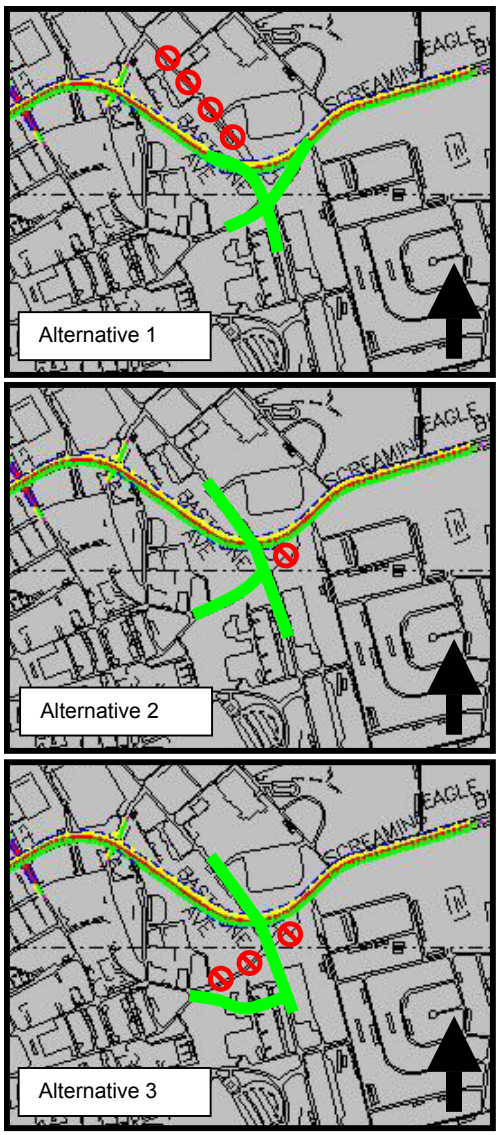


Exhibit 8.3 Alignment alternatives

Alternative 2 would create a traditional four-leg intersection with the new alignment and Bastogne Avenue, but would preserve the existing connection to existing Screaming Eagle Boulevard. This may result in vehicular conflicts due to the close proximity of the intersections.

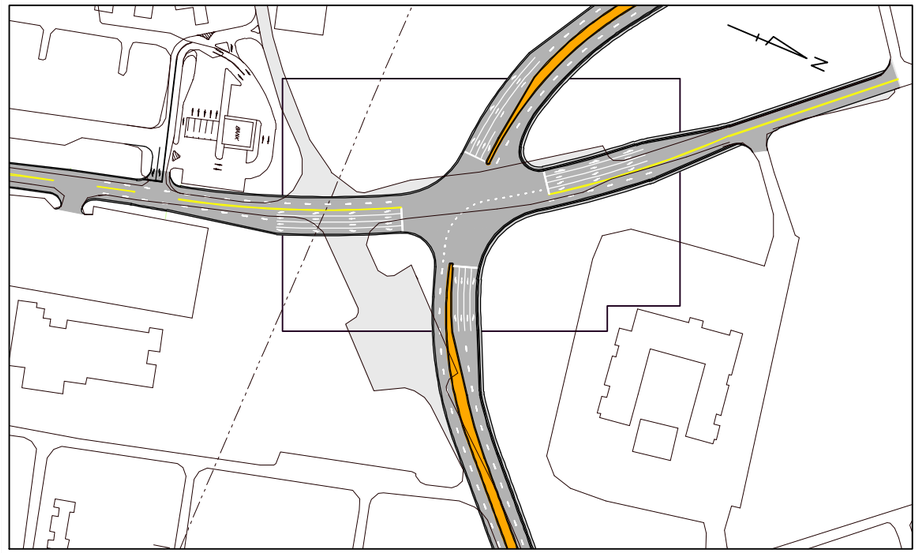
Alternative 3 is similar to Alternative 2, but creates a new connection to existing Screaming Eagle Boulevard southward to maximize queuing between this intersection and the intersection between the new alignment and Bastogne Avenue. This new connection may provide an opportunity to consolidate access to the Bank of America, the education center, the hospital and other land uses as discussed previously.

8.4.1.2. Guidance

It is our engineering opinion that this project will improve the transportation network and will support development. The preferred alternative is Alternative 3. Specific details are discussed in the 1986 Study. This study recommended that the roadway be constructed as a four-lane divided roadway. The study acknowledges that Screaming Eagle boulevard carries the highest traffic volume on the base because it serves the community area and the main gate.

The estimated cost of this project was calculated to be $8.3 million.

The realignment will necessitate that the lane assignments and traffic control needs at several major intersections be considered. It is our engineering opinion that signalization and turn lanes may be warranted at Bastogne Avenue, 30th Street, Commissary/ PX Access, Indiana Avenue, and Wickham Avenue based on current traffic volumes on the existing roadway as well as knowledge of future development. The intersection with Bastogne Avenue is presented as **Exhibit 8.4**. A detailed traffic study should precede final design.



SCREAMING EAGLE BLVD

W/6"

BW/6"

BASTOGNE AVE

W/24"
(TYP)

W/6"

BW/6"

DY/4"

BASTOGNE AVE

DY/4"

DW/6"
(TYP)

W/6"

PROPOSED
SIDEWALK

BW/6"

SCREAMING EAGLE BLVD

W/6"

SCALE: 1"=50'

EXHIBIT 8.4

BASTOGNE AVE AND PROPOSED
SCREAMING EAGLE BLVD
CONCEPT DRAWING

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

Gannett Fleming

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Other suggestions include:

- The approaches of Bastogne Avenue may need adjustment to ensure that the angles of the approach are no greater than 30 degrees off of normal, as suggested by AASHTO, although intersections as close to right angles as possible is preferred. Skewed intersections can potentially pose problems with truck turning radii and sight distance limitations.
- Consider widening Bastogne Avenue to two through lanes per direction in the vicinity of this intersection to better accommodate future-adjusted traffic volumes.
- An alternate to the alternatives presented above may be to consider abandoning the current Screaming Eagle Boulevard alignment between Bastogne Avenue and New York Avenue to avoid unfavorable five-leg at the intersection of Screaming Eagle Boulevard and Bastogne Avenue.

8.4.2. Realignment of Bastogne Avenue to Air Assault Street

8.4.2.1. Description

The *1986 Traffic Engineering Study* recommended realigning Air Assault Street to better accommodate flows from ACP 3 westward along Air Assault Street. The Master plan calls for a realignment of Bastogne Avenue to Air Assault Street so that Bastogne Avenue to Air Assault Street would be the continuous through roadway.

8.4.2.2. Guidance

It is our engineering opinion that an upgrade to the Air Assault Street corridor including the Bastogne Avenue intersection would better serve Fort Campbell than providing a continuous link between Bastogne Avenue to Air Assault Street.

The estimated cost of this project was calculated to be $2.1 million.

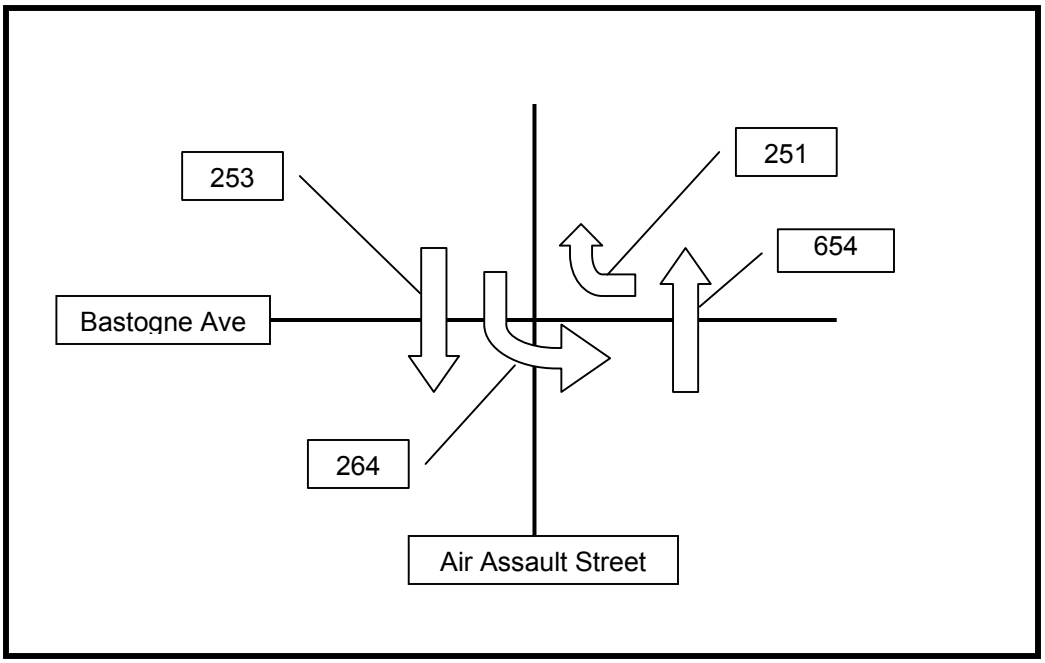

Exhibit 8.5 Daily Traffic Flow Patterns at intersection of Bastogne Avenue and Air Assault Street

Exhibit 8.5 shows the traffic flow patterns through the intersection of Bastogne Avenue and Air Assault Street, using Existing-Adjusted traffic volumes, and is a total of the three peak periods. The ratio is approximately 9 to 5 of east-west traffic versus north-west traffic.

By upgrading Air Assault Street from ACP 3 through Indiana Avenue, direct access can be provided to the Hospital and other land uses to the west. Bastogne Avenue and Air Assault Street should be configured with appropriate

turning lanes and lane transitions to accommodate flows between these roadways.

It is likely that through upgrades to ACP 3, Air Assault Street and the Bastogne Avenue intersection, traffic will be less likely to use ACP 1 and Bastogne Avenue to the south of Air Assault Street for access purposes. Consideration should be given to traffic calming measures in this residential area of Bastogne Avenue to reduce speeds and discourage cut-through traffic.

8.4.3. ACP 6/47th Street Connection

8.4.3.1. Description

This proposed improvement identified in the Transportation Master Plan would provide an arterial roadway allowing for better access between ACP 6 and the northwestern portion of the installation, which is under development. Currently, ACP 6 is heavily used since it is the northern most, non-truck ACP.

The proposed roadway would intersect with Indiana Avenue where it would assume the alignment of 47th Street, and then intersect with Tennessee Avenue, Wickham Avenue, and Market Garden Road. An alternate could connect to 49th Street if land use requirements dictate.

Originally, it was felt that this concept was not supportive of residential initiatives due to its proximity; however, discussion with housing officials identified that this roadway concept is supportive of housing initiatives since it accommodates access needs while minimizing direct conflicts with housing areas.

8.4.3.2. Guidance

It is our engineering opinion that this project would strongly support the needs of Fort Campbell by providing an arterial connection between ACP 6 and Wickham Avenue that does not directly bisect housing areas. The roadway would eliminate the need for Morgan Road to be used as an arterial section through the housing area and can complement proposed improvements to the Lee Village traffic circle discussed previously. The arterial roadway would connect to collector roadways serving residential redevelopment. The estimated cost of this project was calculated to be $4.2 million.

On a daily basis, considering Existing-Adjusted traffic volumes, it is estimated that 5,800 vehicles would utilize this roadway between ACP 6 and Indiana Avenue. This would divert approximately 75 percent of traffic off of Morgan Road west of the circle.

Care should be taken that the most suitable alignment is chosen that reutilizes existing roadways such as Polk Road and 47th Street, avoids wetland areas, and avoids Eagle Park. In conjunction with this project, consideration should be given to traffic calming measures to discourage the use of the existing alignment of Morgan Road as a cut-through roadway.

8.4.4. Western Arterial Development

8.4.4.1. Description

The proposed concept is to develop a western arterial that provides access to land use along Wickham Avenue. The arterial should connect ACP 7, Wickham Avenue, 101st Airborne Division Road and ACP 10. Part of this concept is presented in the Transportation Master Plan as the Wickham Avenue Extension to 101st Airborne Division Road.

8.4.4.2. Guidance

It is clear that Wickham Avenue serves as an arterial roadway connecting the northern and southern areas of the installation. The roadway connects various land use types, but has a heavy industrial use due to its proximity to motor pools, distribution areas, rail lines and CAAF. Wickham Avenue is in close proximity to both proposed truck gates (ACP 7 and ACP 10), but does not have direct linkage to either. At the current time, trucks must use short, but circuitous routes to gain access to the Wickham Avenue corridor. The estimated cost of this project was calculated to be $3.0 million.

Currently, ACP 7 has approximately 311 trucks entering and 500 trucks exiting the installation. ACP 10 has 288 trucks entering and 583 trucks exiting the installation. There are approximately 400 trucks traveling daily along Wickham Avenue in both directions.

It is estimated that approximately 825 vehicles in the three daily peak hours, or 26 percent of ACP 10 traffic is destined for Wickham Avenue. Similarly, it is estimated that 160 vehicles travel between Wickham Avenue and ACP 7 during the three peak hours, which was approximately 10 percent of the ACP 7 traffic.

An alignment possibility for this roadway on the southern portion of the base is to tie into the 101st Airborne Division Road just north of the bridge, south of Lee Road, and align toward Wickham Avenue, thus eliminating the current need for this traffic to utilize the existing intersection with Lee Road and possibly eliminating the need for a new structure.

8.4.5. Realignment of 101st Airborne Division Road near Sabre Heliport

8.4.5.1. Description

A transportation improvement project that was identified is the realignment of 101st Airborne Division Road in the vicinity of the Sabre Heliport. The new roadway would be two lanes. A conceptual alignment for this roadway is presented as **Exhibit 8.6**.

8.4.5.2. Guidance

Although there is not significant justification from a traffic standpoint, the roadway would provide the needed setback for the Sabre Heliport and could also allow for more room for queuing into the Sabre Heliport ACP. The estimated cost of this project was calculated to be $5.0 million.

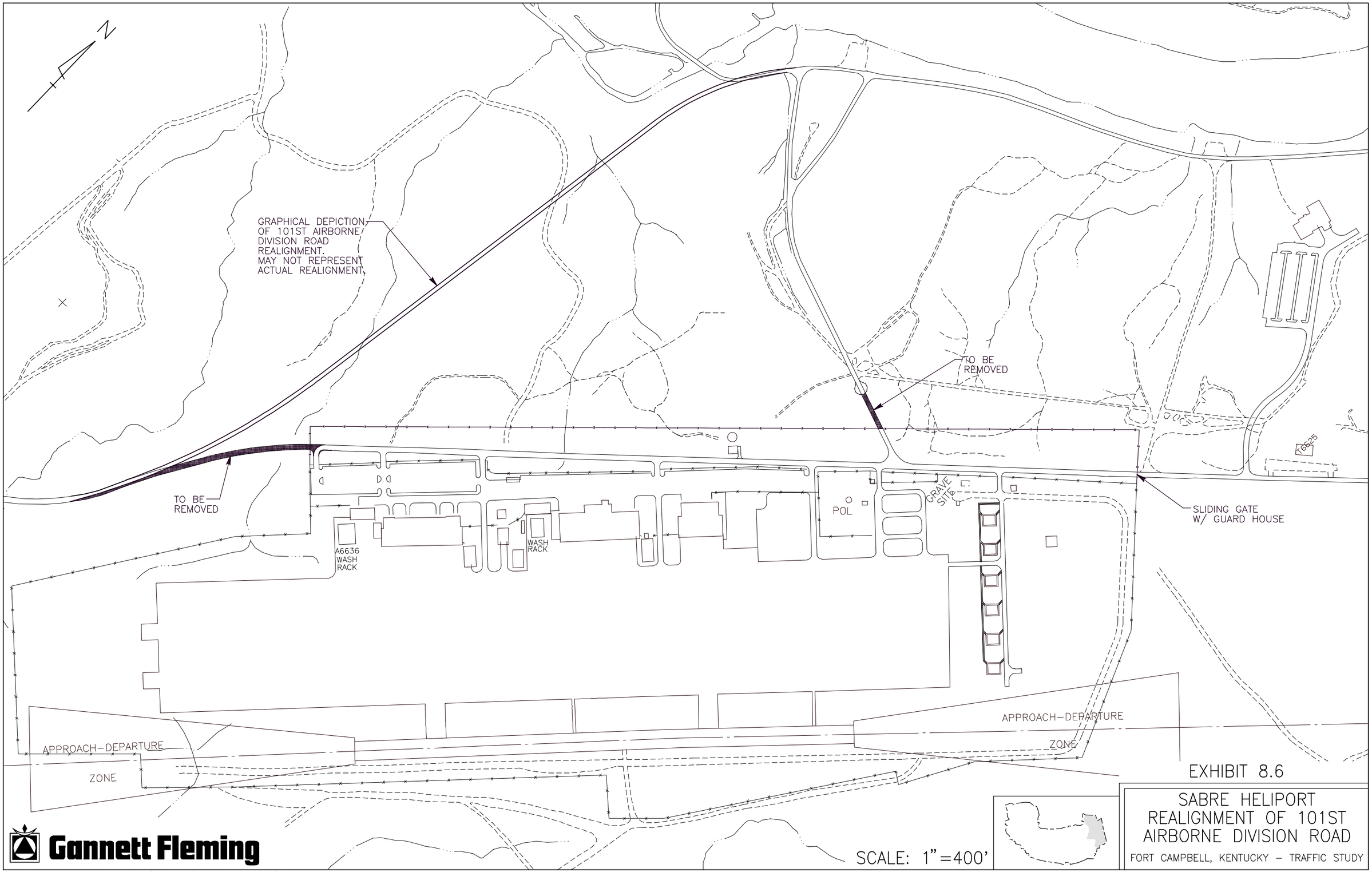

EXHIBIT 8.6

Gannett Fleming

SCALE: 1"=400'

SABRE HELIPORT
REALIGNMENT OF 101ST AIRBORNE DIVISION ROAD

FORT CAMPBELL, KENTUCKY – TRAFFIC STUDY

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8.4.6. Market Garden Road Extension to 101st Airborne Division Road

8.4.6.1. Description

As identified in the Transportation Master Plan, Market Garden Road was proposed to be extended to 101st Airborne Division Road. The new roadway would be approximately 2.5 miles in length.

8.4.6.2. Guidance

Based on current and anticipated traffic demands, it is our engineering opinion that this project should not be pursued due to minimal benefits compared with significant costs associated with construction and impacts to resources.

It is estimated that only 1300 vehicles per day, considering Existing-Adjusted traffic volumes, would utilize this roadway.

Considering roadway-related costs, the estimated cost of this roadway improvement is $5.0 million. This cost does not include any costs associated with possible environmental mitigation that may be necessary in this area.

As previously discussed, it is proposed that a fueling center be constructed near the intersection of Air Assault Street and Market Garden Road. If this development is a very significant traffic generator, and if it is expected that there would be a considerable amount of traffic destined to southern points along 101st Airborne Division Road, then there may be more justification for the Market Garden Road Extension.

The proposed Western Arterial serves much of the same purposes, but better accommodates existing and future traffic demands. If the Western Arterial is constructed in lieu of the Market Garden Road Extension, then an additional possibility for consideration would be to upgrade the existing alignment of Mabry Road between Wickham Avenue and Market Garden Road to better serve the needs of traffic generated by the fueling center.

8.4.7. ACP 4 Extension to Oak Grove

8.4.7.1. Description

Some community stakeholders have suggested extending Screaming Eagle Boulevard to Oak Grove due to the high Oak Grove commuter population entering the base on a daily basis. This would allow for a direct connecting roadway to ACP 4. As a result, there would be potential right-of-way issues with ACP 4 Extension and existing local businesses while other properties may become more developable.

8.4.7.2. Guidance

The intersection of U.S. Route 41A and Screaming Eagle Boulevard is under construction to accommodate traffic demands in the near future. These improvements should provide acceptable operating conditions during most time periods in the near future. Improvements were coordinated with ACP 4 upgrades.

With the improvements at the intersection of U.S. Route 41A and Screaming Eagle Boulevard, the east leg of the intersection will be configured to provide access to local businesses. The east leg would be modified to accommodate the extension, resulting in possible operational impacts to ACP 4 and the intersection due to additional conflict points and the accommodation of additional turning movements; however, there would likely be less turning movements and more through movements of traffic in both directions. As a result of operational issues, grade separation may be warranted with U.S. Route 41A, thus increasing project costs.

Although this project may warrant long-term consideration for the regional area, it is our engineering opinion that this project does not provide the best benefit to Fort Campbell due to limited resources. Currently the project is not funded, but is on MPO list of projects; however, KTC does not place this project on high priority due to resource limitations.

8.4.8. Pennyrile Parkway Extension to Fort Campbell

8.4.8.1. Description

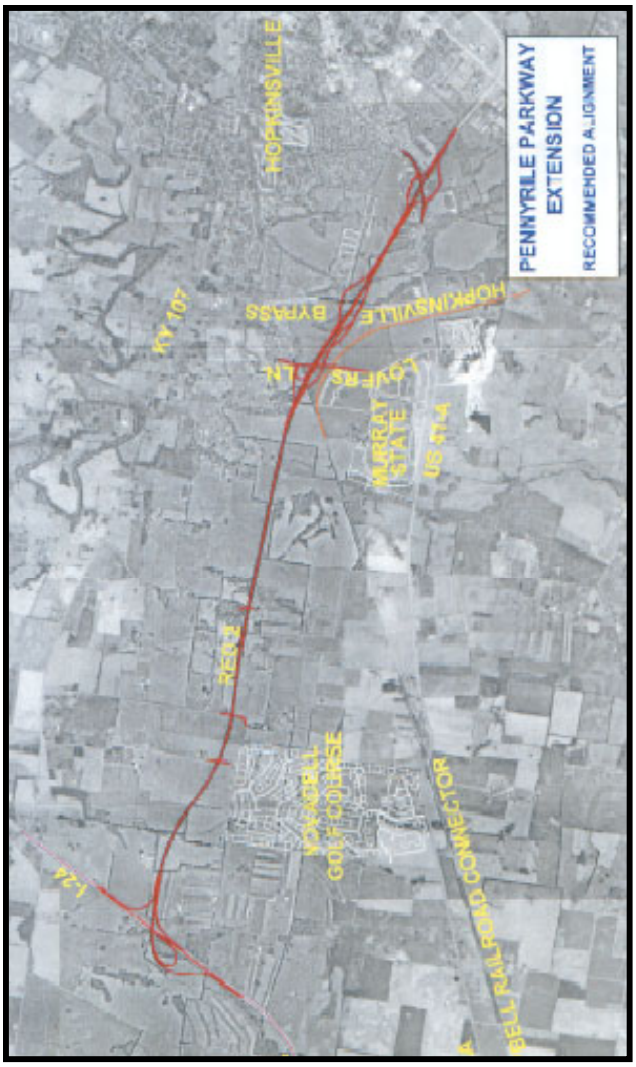

Exhibit 8.7 Pennyrile Parkway Alignment

An extension to the Pennyrile Parkway (**Exhibit 8.7**), which connects Hopkinsville with I-24, is in the preliminary engineering stage. The extension will connect Hopkinsville with I-24 and will result in a decrease of vehicular traffic on U.S. Route 41A from Hopkinsville to I-24.

Other discussions have included the possibility of extending Pennyrile Parkway directly into Fort Campbell. At this time, KTC has not studied this option and it would likely be very long-term due to the upgrades to U.S. Route 41A.

8.4.8.2. Guidance

Although the project was conceived as means to enhance mobility from I-24 to Fort Campbell, significant widening and access management along U.S. Route 41A including the signalization of Cole Road connecting to the ACP will provide similar benefits.

The proposed extension from I-24 to Fort Campbell also impacts airfield operations and is a security concern due to the proximity of the 160th SOAR.

Other factors to consider include:

- U.S. Route 41A upgrades including widening and access management restrictions will improve traffic operations from Fort Campbell to I-24 along 41A. These upgrades will accommodate near-term traffic demands.
- ACP 7 will be redeveloped along Glider Road. An extension of the Parkway would require the relocation of ACP 7.

- Concerns have been raised that such a connection to the Pennyrile Parkway would promote development to the north and west of Fort Campbell and would impact airfield and training operations.
- FHWA has questioned if there is adequate purpose and needs for the proposed roadway and questioned what the logical termini would be.
- Those benefiting would be primarily commuter traffic from Fort Campbell to Hopkinsville.
- KTC is considering a new interchange at KY Route 107, which may be more suitable as an I-24 connection. At the present time the interchange is not funded and is a long-term project.
- There is possible political interest in this project.

It is our engineering opinion that this project does not provide the best benefit to Fort Campbell since access to I-24 via U.S. Highway 41A is being upgraded and due to considerations to airfield and training operations.

8.4.9. Pedestrians and Bicycle Opportunities

8.4.9.1. Description

As was discussed in Section 3.1.3.5, pedestrian and bicycle activity is commonplace throughout Fort Campbell due to the 4200 housing units, eight schools, daily PT activities and a relatively young population. Sidewalks and designated routes are provided in some areas, but are absent in others. Sidewalks are preferable in areas of moderate pedestrian activity and should be designed in accordance with the American with Disabilities Act.

The redevelopment of housing areas should consider the needs of pedestrians and bicyclists. Where appropriate, these users should be considered and accommodated through sidewalks, bicycle lanes and designated trails. Fort Campbell is considering development of a ped/bike trail system within the installation in conjunction with RCI .

8.4.9.2. Guidance

This system of designated routes and trails should connect major pedestrian and bicycle trip generators such as residential areas, schools, parks and commercial land use and should be part of the RCI plan. Conceptual flow areas and key resources to be linked are identified in **Exhibit 8.1** presented earlier.

Where routes cross major roadways such as arterials providing access to Fort Campbell like Screaming Eagle Boulevard, the crossing should be clearly delineated in should be designed in accordance with the MUTCD. Other considerations for crossing of roadways include:

- Where appropriate, try to consolidate crossings to a single location. If necessary use fencing and other measures to prohibit illegal crossings.
- Try to utilize controlled areas, such as signalized intersections, for designated crossings. At these locations, pedestrian indications, curb ramps and crosswalks should be provided.
- If routes must cross at a mid-block crossing, evaluate warrants for pedestrian signals and grade separation.

For further reference, an AASHTO publication, the *Guide for the Development of Bicycle Facilities*, is available. This discusses planning, design, and maintenance of bicycle facilities. Design related topics include shared roadways, exclusive bike lanes, and shared use paths. Design related topics discussed include treatments for shoulders, lane widths, on-street parking, pavement quality drainage inlet grates, and signing. Bike lane widths and treatments at intersections and turning lanes are discussed. For shared use paths, general design related guidelines are discussed, including geometry, intersections, signing, pavement structure, drainage, and lighting. Additional topics discussed are treatments at railroad crossings, roundabouts, and traffic signals.

8.4.10. Transit Opportunities

8.4.10.1. Description

Clarksville Transit System (CTS) as well as Greyhound provided service onto Fort Campbell prior to September 11th 2001. Due to force protection concerns, service had to be restricted from the installation. As a result, ridership on CTS lines servicing Fort Campbell has decreased.

The implementation of a transit system onto the installation would likely reduce congestion, emissions, and delay at the ACP's on the installation by reducing the number of automobiles entering the installation on a daily basis. Transit service would also be beneficial to Fort Campbell military personnel, which has a large young, transient population.

8.4.10.2. Guidance

To address the need for transit service while preserving security considerations should be given to the development of an internal transit system that serves Fort Campbell. Previously, Clarksville Transit has volunteered three electric buses for such a service. The availability of these buses and the cost of operations should be explored.

The implementation of an on-base loop should include major roadways such as Screaming Eagle Boulevard, Bastogne Avenue and Wickham Avenue among others, and should connect major trip generators such as housing areas, commercial areas and major employment areas.

A connection between internal and external transit services would be a desirable feature provided needed security could be maintained. One possible location for a Transit Center would be at the Visitors Center. At this area, external transit service could drop-off passengers destined for Fort Campbell. Passengers could be processed as pedestrians through ACP 4 and then could be picked up by internal transit service upon entry.

To encourage internal and external transit usage, military discounts and incentives programs could be implemented. These programs would encourage ridership which provides both traffic and security benefits. A park and ride lot constructed at a location off base is another item that could be implemented in conjunction with transit systems.

8.4.11. Development of Traffic Advisory Committee

Due to ongoing changes to the Fort Campbell infrastructure including the redevelopment of housing, Fort Campbell should consider the development of a Traffic Advisory Committee (TAC).

The TAC is a standing committee, which identifies areas of concern, discusses possible solutions and acts as a conduit between public works and the community. The committee typically includes an engineer and a planner from public works, a representative from the Command Group, a representative from emergency services, a representative from the military police, a representative from the safety office and at least one citizen from each major housing area.

The TAC should hold regular meetings to discuss transportation issues. The TAC should also consider outreach programs such as surveys as well as open house programs to solicit input from the community.

8.5. Fort Campbell Transportation Needs Matrix

Fort Campbell has developed a comprehensive listing of transportation projects involving different modes of transportation. The list is a series of projects funded by different government entities that contains improvement projects to highway, water, rail and air related facilities. The benefits of the projects are also listed. The list appears as **Exhibit 8.8**.

This list was provided by Fort Campbell to be included in this study. It should be noted that many of these projects were not assessed as part of this study, hence were not discussed elsewhere within this document.

Exhibit 8.8 Transportation Needs Matrix

Project	Government entity responsible for project						Benefits
	Kentucky	Tennessee	FHWA	Fort Campbell	Regional Port Authority	City of Clarksville	
Highway							
Highway 41A (State Line to Interstate 24)	X						*Project Under Construction*
Intersection of Highway 115 and Highway 911	X						Design Underway
Cole Road	X						Need Four (4) Lanes/Access to I-24
Widen Highway 911	X						Access to I-24/Quality of Life
Widen Highway 115	X						Access to I-24/Quality of Life
Tiny Town Road and Railroad Crossing		X					Under Construction/Access to I-24/Quality of Life
Highway 79 Widening		X					Design Underway/Quality of Life
101st Parkway Extension (Highway 79 to Highway 149)		X					Access to Interstate and Proposed Port
Widen and improve Hwy 149		X					Access to Interstate
Extension of Hwy 149 to Hwy 840		X					Access to Interstate
State Route 840 Loop		X					Access to Interstate
101st Parkway Widening (Highway 41A to Wilma Rudolph Blvd)		X					Quality of life
Warfield Blvd Widening		X					Quality of life
Sound Barrier on Highway 41A	X	X					Improve Security/Noise Protection/Privacy
Variable Message Board Signs	X	X				X	Improve Traffic Flow
Directional Signs to Fort Campbell	X	X				X	Improve Traffic Flow
Access Control Points							
Gate 3				X			Improve Security *Project Completed*

Project	Government entity responsible for project						Benefits
	Kentucky	Tennessee	FHWA	Fort Campbell	Regional Port Authority	City of Clarksville	
Gate 1				X			Improve Security *Project Completed*
Gate 7				X			Improve Security *Project Under Construction*
Gate 6				X			Improve Security *Project Under Construction*
Gate 10				X			Improve Security *Project Under Construction*
Mabry Road Gate				X			Improve Security *Project Under Construction*
Gate 4							Improve Security
Angels Road Gate				X			Improve Security
CAAF Entry Point (Market Garden)				X			Improve Security
CAAF Entry Point (Destiny)				X			Improve Security
Gate 5				X			Improve Security
Gate 2				X			Improve Security
Railroad Gate (Near Gate 2)				X			Improve Security
Bell Station Road Connector Gate				X			Improve Security
Sabre Army Heliport Access/Entry Point				X			Improve Security/Will be include in MCA Project.
Screaming Eagle Boulevard Arterial				X			Improve Traffic Flow/Quality of Life
Glider Road and Morgan Road Arterial				X			Enhance Deployment/Improve Traffic Flow
Market Garden Arterial				X			Enhance Deployment/Improve Traffic Flow
Wickham Road Arterial with extension				X			Enhance Deployment/Improve Traffic Flow
Polk Road Arterial				X			Improve Traffic Flow/Quality of Life
Relocate Woodlawn Road				X			Improve Security
Lafayette Road Improvement		X		X			Improve Access and Traffic Flow
Spangler Loop				X			Improve Access to Training Areas
STRANET	X	X	X				Ensure Access to Ports are Unencumbered
Water							
Regional Port Facility with access from Fort Campbell		X		X	X		Improve Deployability
Construct an Access Highway and Facility for Barge Loading		X		X			Improve Deployability/Not Needed if Regional Port Constructed

Project	Government entity responsible for project						Benefits
	Kentucky	Tennessee	FHWA	Fort Campbell	Regional Port Authority	City of Clarksville	
Rail							
Alternate Rail Facility	X	X		X			Provide an Alternate Site for Deployment
Replace Railroad Bridge over Rock Bridge Creek				X			Improve Security/Enhance Deployment
Air							
Runway 1836 Improvements				X			Provide an Alternative Landing Capability
Relocate Destiny Heliport Runway				X			Landing Strip Will Have to be Moved to Improve Runway 1836
New Parallel Runway				X			Provide Additional Capability for CAAF

8.6. Prioritization and Cost Estimate

Exhibit 8.9 is a prioritized summary of the improvements noted in Sections 5, 6, 7. **Exhibit 8.10** summarizes projects noted in Section 8. Improvements related to the ACP's (Section 4) were not included since many of these improvements have been implemented during the development of this study. Other ACP improvements will likely be prioritized based on funding resources. The prioritization matrix differentiates between Sections 5, 6 and 7 versus Section 8 since improvements identified as part of Sections 5-7 are more likely to be short-term or near-term improvements while improvements identified in Section 8 are long-term and/or high-cost improvements. The matrix compares the benefits of completing the project to the magnitude of the cost of the project, and ranks the benefit to cost proportion for the project.

Exhibit 8.9 Short- and Mid-Term Improvement Project Prioritization, Sections 5-7

Location	Recommendation	Section No.	Benefits	Benefit	Cost	Cost	Benefit/Cost	Subjective Ranking
Condition and Compliance of Traffic Control Devices	Ensure that all traffic control devices are in compliance with the MUTCD.	7.6	Better compliance with MUTCD standards.	High	Variable	Low	High / Low	9
Traffic Advisory Committee Development	Fort Campbell should consider the development of a traffic advisory committee due to ongoing changes in infrastructure.	8.4	A better conduit would be provided between public works and the community.	High	Variable	Low	High / Low	9
Bastogne Avenue and Screaming Eagle Boulevard	Add another left-turn lane to the southbound approach and a right-turn lane on the northbound approach.	5.3	Increased levels of service and better operations, better accommodation of pedestrians.	High	$81,000	Medium	High / Medium	8
	Rephase the southbound left-turn phase to be protected/prohibited to due to the double-left turning lanes.							
	Provide pedestrian signal heads and actuation.							
	Provide pedestrian ramps and crosswalks.			Coordinate with Screaming Eagle Blvd realignment. Use long-term lane configurations presented in Section 8.				
Bastogne Avenue and Reed Avenue	Monitor the traffic volumes to determine the need for westbound protected phasing.	5.4	Increased levels of service and better operations.	Medium	$41,000	Medium	Medium / Medium	5
	Reconfigure the northbound and southbound approaches to allow for exclusive left-turn lanes and through/right lanes.							
	Add backplates to signal heads.							
U.S. Route 41A and Lee Road	Add an exclusive left-turn lane on the eastbound approach.	5.1	Increased levels of service and better operations.	High	$26,000	Medium	High / Medium	8
	Reconfigure and restripe the westbound approach as an exclusive left-turn lane and a shared through/right-turn lane.							
	Reconfigure east-west phasing pattern as shared phased with protected/permitted left-turn phasing.							
	Reevaluate timing as part of improvement design process.							
U.S. Route 41A and Screaming Eagle Boulevard	Improvements to this intersection included in the U.S. Route 41A widening project in Kentucky will adequately address operational problems at this intersection.	5.2	Increased levels of service and better operations.	Ongoing Project				
Bastogne Avenue and Hospital Drive	Consolidate access points along Bastogne Avenue, possibly with that of the Bank.	5.5	Reduction in delay along Bastogne Avenue, potential for signalization of new access roadway.	High	$190,000	Medium	High / Medium	8
Lee Village Traffic Circle (Morgan Circle)	Construct a modern roundabout at this intersection.	5.10	Increased levels of service and better operations, better compliance with MUTCD standards.	High	$129,000	Medium	High / Medium	8
101st Airborne Division Road and 11th Airborne Division Road	Construct a three-phase traffic signal.	5.13	Increased levels of service and better operations.	High	$118,000	Medium	High / Medium	8
	Add turning lanes to approaches as needed.							

Location	Recommendation	Section No.	Benefits	Benefit	Cost	Cost	Benefit/Cost	Subjective Ranking
Bastogne Avenue Corridor	Each intersection should be adjusted so that the through movement can traverse the intersection without varying from their travel path. Access management practices should be applied so that areas with many access points are consolidated into one safe and controlled access point.	6.1	Reduction of potential driver confusion at intersections, reduction in delay associated with uncontrolled access points.	High	$635,000	Medium	High / Medium	8
Bank of America Circulation	Restructure the traffic flow around the bank. Five alternatives were suggested. Coordinate this improvement with access management upgrades to safely accommodate the hospital and the education center access.	6.3	Reduction in conflict points and delay.	High	Varies: $2,100 - $41,200	Medium	High / Medium	8
Wickham Avenue and Airborne Street	Improve the northbound shoulder in accordance with AASHTO and MTMCTEA guidelines. Replace STOP signs to improve night-time reflectivity. Construct an exclusive eastbound right-turn lane.	5.7	Increased levels of service and better operations.	Medium	$6,700	Low	Medium / Low	7
Wickham Avenue and Normandy Boulevard	Add pavement marking arrows for both lanes on the westbound approach. Install clearly visible lane use control signing to the westbound approach.	5.8	Better compliance with MUTCD standards.	Medium	$1,000	Low	Medium / Low	7
	Install a fully actuated traffic signal if Screaming Eagle Boulevard will not be relocated.		Increased levels of service and better operations.	Low, Due to Screaming Eagle Boulevard realignment	$90,000	Medium	Low / Medium	2
Screaming Eagle Boulevard and Normandy Boulevard Intersections with Tennessee Avenue and Kentucky Avenue	Implement signing and pavement marking improvements.	5.9	Better compliance with MUTCD standards.	Medium	$7,000	Low	Medium / Low	7
Railroad-Highway Grade Crossing Treatments	All crossings should be reviewed to ensure compliance with MUTCD regardless of whether they warrant additional traffic control devices.	7.1	Better compliance with MUTCD crossing treatments.	Medium	Variable	Low	Medium / Low	7
Pedestrian and Bicycle Considerations	Sign mid-block crosswalks in accordance with the MUTCD and consolidate them as much as possible to limit areas where pedestrians may cross the roadway. At intersections, crosswalks should be marked except at unsignalized locations where speeds exceed 45 mph.	7.2	Better compliance with MUTCD standards.	Medium	Variable	Low	Medium / Low	7
Road Conditions	Mitigate edge drop-offs and severe side slope hazards.	7.4	Reduction in accident potential and severity.	Medium	Variable	Low	Medium / Low	7
Morgan Road in the area of Market Garden Road and Wickham Avenue	Reconfigure the intersection with one of the alternatives presented to accommodate the proposed PX Mini-Mall.	6.5	Minimization of the number of access points and intersections, and avoidance of skewed intersections, better accommodation of traffic associated with the development.	High	Varies: $646,000 - $1,024,000	High	High / High	6

Location	Recommendation	Section No.	Benefits	Benefit	Cost	Cost	Benefit/Cost	Subjective Ranking
Wickham Avenue and 1st Street	Widen the eastbound approach to have an exclusive left-turn lane. Evaluate the railroad grade crossing to determine whether additional types of control should be implemented.	5.6	Increased levels of service and better operations.	Medium	$63,500	Medium	Medium / Medium	5
Intersection of KY Route 911 and KY Route 115	Consider repairing the approximately two-foot drop-off on the west side of the north leg, the drop-off on the south side of the west leg, and implementing NO TURN ON RED restrictions on approaches with minimal sight distance.	6.9	Minimization of safety concerns.	Medium		Medium	Medium / Medium	5
Drainage Considerations	Where practical, provide safe, traversable drainage structures.	7.7	More traversable drainage structures for errant vehicles.	Medium	Variable	Medium	Medium / Medium	5
Lane Transitions and Turn Lane Considerations	Design lane tapers to appropriate lengths.	7.8	Better geometric features at intersections.	Medium	Variable	Medium	Medium / Medium	5
Ohio Road and East End Road	Provide pavement markings to indicate a through movement from East End Road to the western leg of Ohio Road. Place an island on the eastbound approach of Ohio Road to allow for a dedicated right-turn onto East End Road.	5.11	Better accommodation of traffic flows.	Low	$1,600	Low	Low / Low	4
Ohio Road and Louisiana Road	Construct a conventional T-intersection at this site. Reconfigure Ohio Road to have the right-of-way, and place Louisiana Road under Stop control. Clear and grub as required to satisfy sight distance requirements.	5.12	Better accommodation of traffic flows.	Low	$1,000	Low	Low / Low	4
Barge Point Access	Fort Campbell should coordinate with state and local governments to request a formal safety audit of the routes used to access the Barge Point.	6.8	Better recognition of substandard roadway features, opportunities for working with local governments in making improvements based on Audit recommendations.	Low	$30,000	Medium	Low / Medium	2

Exhibit 8.10 Long-Term Improvement Project Prioritization, Section 8

Location	Recommendation	Section No.	Benefits	Benefit	Cost	Cost	Benefit/Cost	Subjective Ranking
Screaming Eagle Boulevard realignment	Avoid excessive skews in intersections, particularly that with Bastogne Avenue. Consider widening Bastogne Avenue in the vicinity of this intersection to two through lanes per direction to accommodate future traffic volumes.	8.4	Better access to commissary areas, complements HQ Development plans, better basewide traffic flows.	High	$8.3 Million	High	High / High	6
ACP 6/47th Street Connection	This proposed improvement would provide an arterial allowing for better access between ACP 6 and the northern part of the base.	8.4	This roadway would eliminate the need for Morgan Road to be used as an arterial section through the housing area, and would benefit proposed housing initiatives.	High	$4.2 Million	High	High / High	6
Western Arterial Development	Develop a western arterial that provides access to land use development along Wickham Avenue.	8.4	Better accommodation of development in the western portion of the installation.	High	$3.0 Million	High	High / High	6
Pedestrian and Bicycle Opportunities	Sidewalks should be provided in areas of moderate pedestrian activity; bicycle lanes and trails should also be provided where appropriate.	8.4	Better accommodation of pedestrians and bicyclists.	Medium	Variable	Medium	Medium / Medium	5
Transit Opportunities	Consider the implementation of an internal transit route connecting to an external transit system.	8.4	Reduction in congestion, emissions and delays at ACP's by reducing the number of automobiles entering the installation on a daily basis.	Medium	Variable	Medium	Medium / Medium	5
Realignment of Bastogne Avenue to Air Assault Street	Bastogne Avenue and Air Assault Street should be configured with appropriate turning lanes and lane transitions.	8.4	This improvement would discourage use of southern Bastogne Avenue as a commuter route, thus removing traffic from housing areas.	Medium	$2.1 Million	High	Medium / High	3
Realignment of 101st Airborne Division Road near Sabre Heliport	A transportation improvement project that was identified is the realignment of 101st Airborne Division Road in the vicinity of the Sabre Heliport. The new roadway would be two lanes wide.	8.4	This would provide the needed setback for the Sabre Heliport, could allow for more room for queuing into the Sabre Heliport ACP, and may complement the Western Arterial.	Low	$5.0 Million	High	Low / High	1
Market Garden Road Extension to 101st Airborne Division Road	Market Garden Road is proposed to be extended to the 101st Airborne Division Road. The new roadway would be approximately 2.5 miles in length.	8.4	This improvement would relieve some of the burden of ACP 10, and travel time would be reduced with this improvement by providing a more direct route. However, this would be a very costly improvement.	Low	$5.0 Million	High	Low / High	1
ACP 4 Extension	Community stakeholders have suggested extending Screaming Eagle Boulevard to Oak Grove. This would allow for a direct connecting roadway to ACP 4.	8.4	Increased accessibility to Clarksville and local businesses.	Low		High	Low / High	1
Pennyrile Parkway Extension to Fort Campbell	Consideration has been given to the possibility of extending Pennyrile Parkway directly into Fort Campbell.	8.4	Commuter traffic to Hopkinsville would be benefited, but this roadway would interfere with airfield and training operations.	Low		High	Low / High	1