Three County Transportation Assessment

Prepared by RS&H

For the Hinesville Area Metropolitan Planning Organization (HAMPO)

and Fort Stewart Growth Management Partnership

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EXECUTIVE SUMMARY

Transportation Issues

The key issues within the three county study area are listed below:

Regional

- Lack of transportation alternatives
- Lack of local road connectivity
- Key arterials and designated truck routes are routed through the installation
- Coordination of transportation investments with desired development patterns and the need to preserve resources

Bryan County

- Congestion at I-95 and SR 144 interchange
- Increasing traffic on Harris Trail Road, I-95, and Belfast Siding Road

Liberty County

- Queuing at Gate 1 during elevated security levels impacts adjacent signalized intersection
- Increasing traffic levels due to developments both on and off post (IBCT and Independence community)
- Truck traffic on US 84, Main Street, 15th Street, and SR 119/Airport Rd/EB Cooper Hwy
- Startup of Liberty Transit

Long County

- Through traffic and local traffic concentrated on US 84 and SR 57
- Unpaved roads

Short Term Recommendations (by 2014)

Regional/HAMPO, Hinesville, and Fort Stewart

- Conduct an origin-destination survey for Fort Stewart employees including information about time of travel and alternatives to making the trip
- Conduct an origin-destination survey of commercial vehicle traffic entering Fort Stewart
- Conduct a survey of Liberty Transit riders and Fort Stewart residents and employees regarding quality of service of the transit system (after one year of service)
- Continue Liberty Transit startup
- Pursue the Army Mass Transportation Benefit Program to provide transit passes to Federal employees

Regional/HAMPO, Liberty County. and cities

- Study issues along eastern boundary including impact of new IBCT, potential designation of new commercial vehicle gate, proposed Flemington Loop, US 84 curve area, and Old Sunbury Road; Coordination with GDOT will be essential.
- Design and implement traffic operations strategies to address US 84 curve; pursue safety grant for improvements

- Coordinate 15th Street widening concept and Central Connector concept with Fort Stewart commercial vehicle gate designation, proposed defense roadway improvements, and Liberty County Board of Education plans for a new Middle School
- Add signage for non-permitted traffic entering Gate 1
- Promote Liberty Transit and Army Mass Transportation Benefit Program
- Pursue demand management strategies with Fort Stewart to reduce the peak hour traffic

HAMPO/GDOT/Liberty/Bryan County

- Study SR 144 going east into Bryan County from Fort Stewart to determine need and purpose for either road widening or passing lanes
- Assess operational improvements at SR 144 and I-95 interchange; coordinate impacts of commercial gate designation with Fort Stewart due to potential increases in truck traffic at this interchange in the future
- Assess maintenance issues at US 17 and I-95 interchange; resurface ramps as appropriate for commercial vehicle traffic
- Ensure road widening project concepts include access management strategies

Long Term Recommendations (beyond 2014)

HAMPO/GDOT

- Widen Airport Road , 15th Street, Frank Cochran Drive, and Military Road 47 to four lanes
- Construct Central Connector from General Screven Way to 15th Street and possibly onto SR 196 if demand justifies it
- Construct alternate route for commercial vehicles if commercial gate location is changed

Hinesville/Liberty County

- Continue to provide transit service to Fort Stewart; coordinate Army Mass Transportation Benefit Program with Fort Stewart point of contact to provide free service to Federal employees

Cities, Liberty, Long, and Bryan Counties

- Increase local road network connectivity to relieve arterials, provide more efficient travel, provide local facilities for shorter auto trips as well as walking and biking, and promote healthy development patterns
- Coordinate information sharing with Fort Stewart and troops

INTRODUCTION

Through the cooperative efforts of the Fort Stewart Growth Management Partnership (GMP) and the DoD's Office of Economic Adjustment (OEA), the Fort Stewart Regional Growth Management Plan (RGMP) will provide the framework necessary for the communities surrounding Fort Stewart to prepare for the installation's growth impacts. The development of the RGMP is a collaborative effort among the four (4) counties, their 16 respective municipalities, and key local, regional and state stakeholders and will ensure that growth impacts are addressed in a manner compatible with the communities, as well as with the mission of Fort Stewart. This report is the transportation planning component for a three-county subarea, including Liberty, Long, and Bryan Counties.

EXISTING CONDITIONS

Transportation System

Fort Stewart has an impact on the transportation system in Liberty, Long and Bryan Counties because of its location, size, and role as a major activity center in the region. Bryan County is bisected by Fort Stewart property. In Liberty County, the Fort Stewart cantonment area attracts a large number of trips through the Hinesville urbanized area. Several arterials continue through Fort Stewart including SR 144 and SR 119. These routes are needed for regional mobility as well as security. Figure 1 shows that SR 119 and SR 144 through Fort Stewart are designated truck routes. A large amount of truck traffic in the region is destined for Fort Stewart, but also includes log trucks and freight destined for other major employers such as Rayonier or the Target Distribution Center.

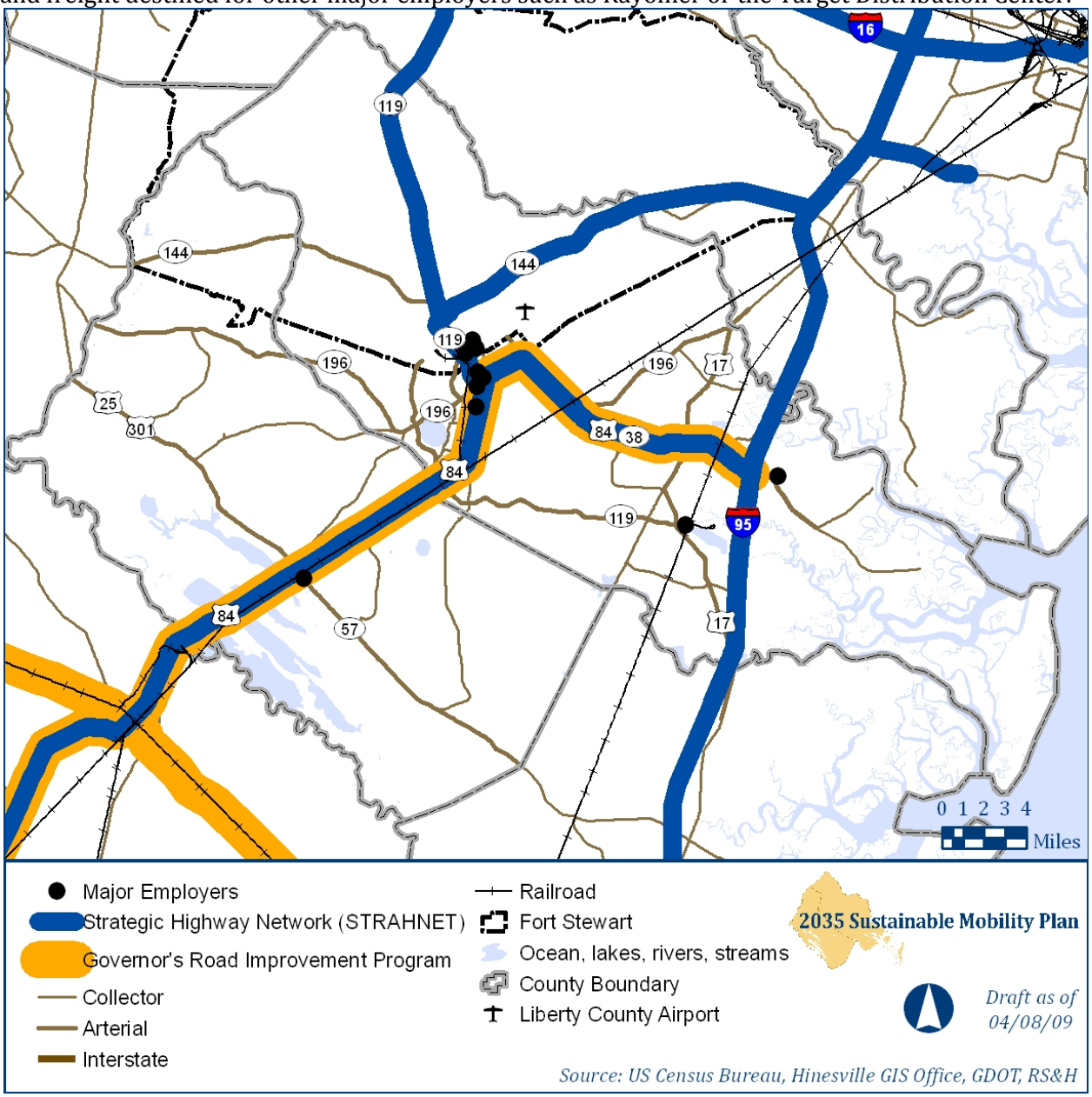

Figure 1 Designated Truck Routes

Recently, HAMPO committees and the public classified major roadways in the region. Figure 2 shows that these stakeholders classified major roads through Fort Stewart as significant corridors for mobility in the region. Note that these routes are also critical for hurricane evacuation in this coastal area. The proposed Fort Stewart bypass, which is planned for construction with defense access funding in the near future, was also classified as a mobility corridor, shown as green in the map below.

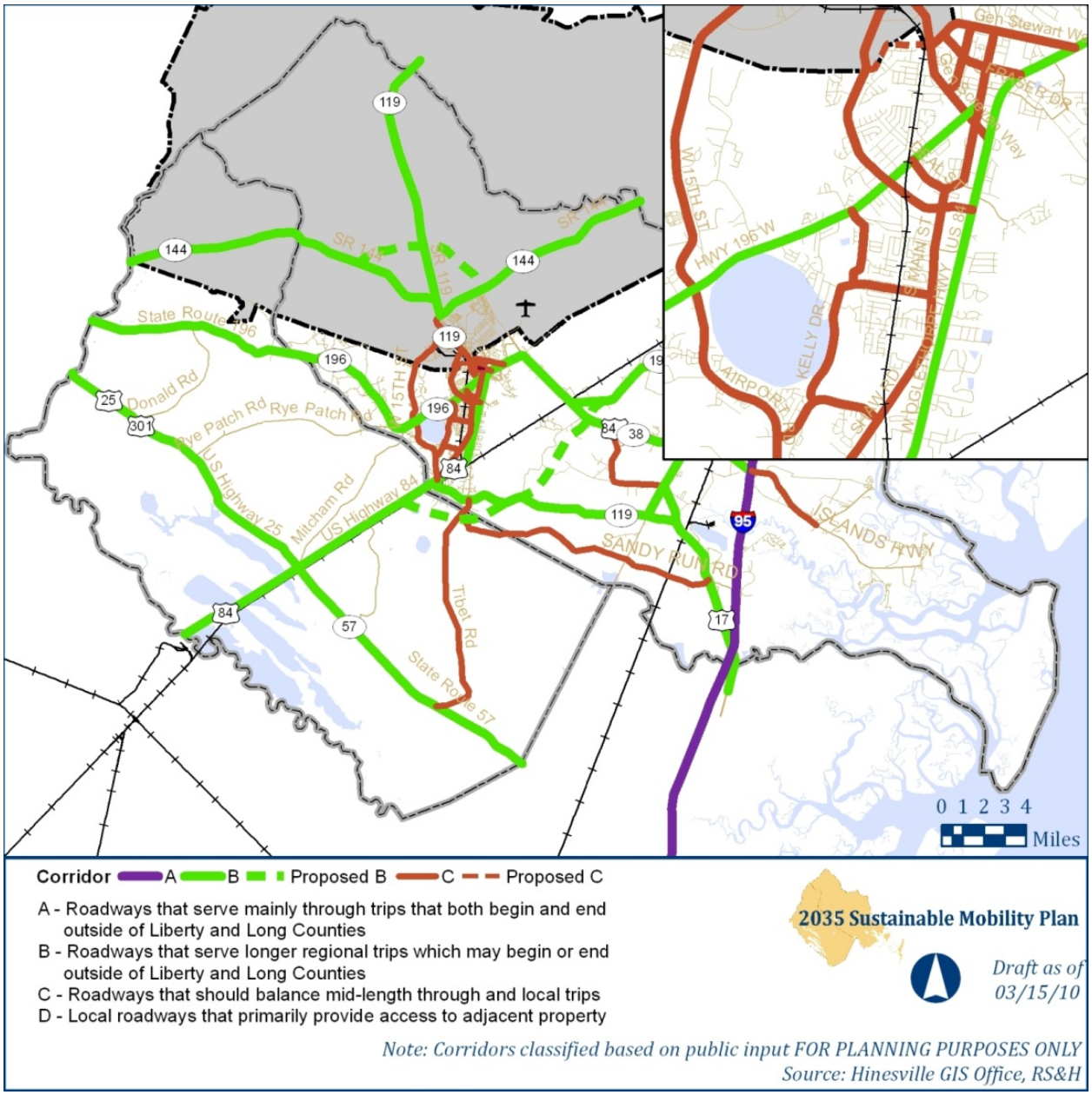

Figure 2 Corridor Classification

Traffic destined for Fort Stewart has few options other than single occupant vehicles or privately organized carpools. There is currently no public transportation in the urbanized area surrounding Fort Stewart. The lack of alternatives for travelers who have business on post means that visitors must wait in the security queues at Gate 1 or Gate 5, with the large majority traveling through Gate 1 northwest of Hinesville.

In addition to the roadways that serve the region, Fort Stewart also has railroad corridors that serve the installation. The Midcoast Regional Airport (formerly the Wright Army Airfield) is on the installation, but can be accessed through Gate 9, without a security check during normal security levels. Fort Stewart can close access to the airport during elevated security. Therefore, the local community is dependent upon the installation to allow continuous access to the airport. The nearest major airport is in Savannah, about an hour away.

Base Year Travel Demand

As discussed in detail in Appendix A Travel Demand Model Documentation, a three county travel demand model was developed for this study as well as the 2035 HAMPO Long Range Transportation Plan. The figures below show base year model results for the 2006 travel demand. The figures show estimated level of service from the volume to capacity ratios on each road segment as well as estimated vehicle hours of delay. Vehicle hours of delay are calculated by summing the delay experienced by each vehicle on a specific road segment on a typical weekday. Delay is the additional travel time due to congestion.

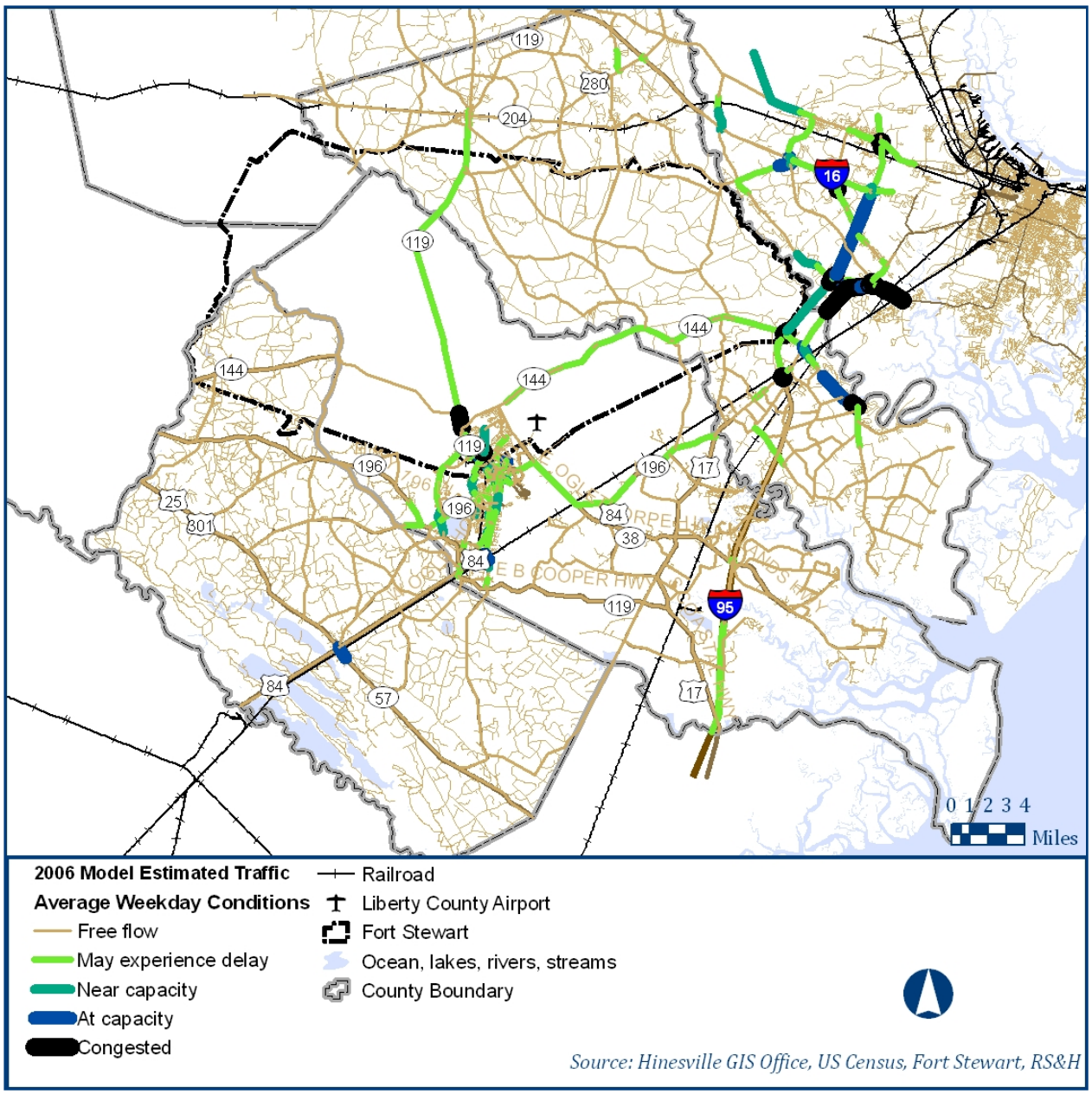

Figure 3 2006 Estimated Level of Service

Figure 3 and Figure 4 show that there is not significant roadway congestion in the study area. However, specific roadways that approach Fort Stewart are congested during peak times including SR 119 from the north, General Screven Way from the south, and Frank Cochran Drive. SR 144, which is in the training area on the installation also experiences congestion when speed limits are reduced during training activities. There has been a proposal to either widen this road or add passing lanes for some time.

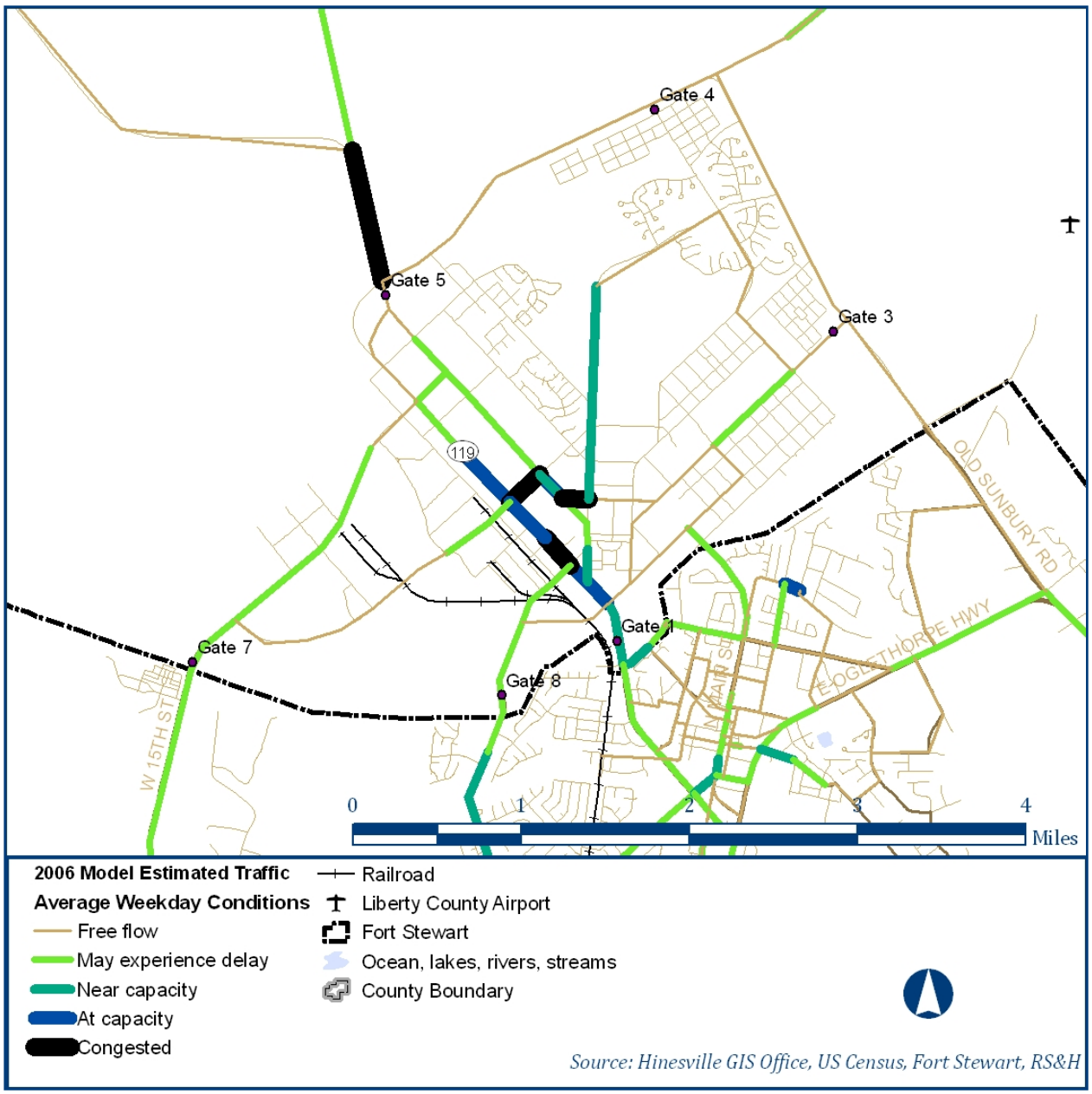

Figure 4 Cantonment Area Congestion

Figure 5 shows the delay on the base year road network. Delay is a good representation of the quality of life impacts due to congestion. Road segments that experience high levels of vehicle hours of delay impact many roadway users. This graphic represents the assumed average time for vehicle and driver identification, or three minutes per vehicle. Therefore, delay at the gates does not factor in additional inspection time during elevated security levels.

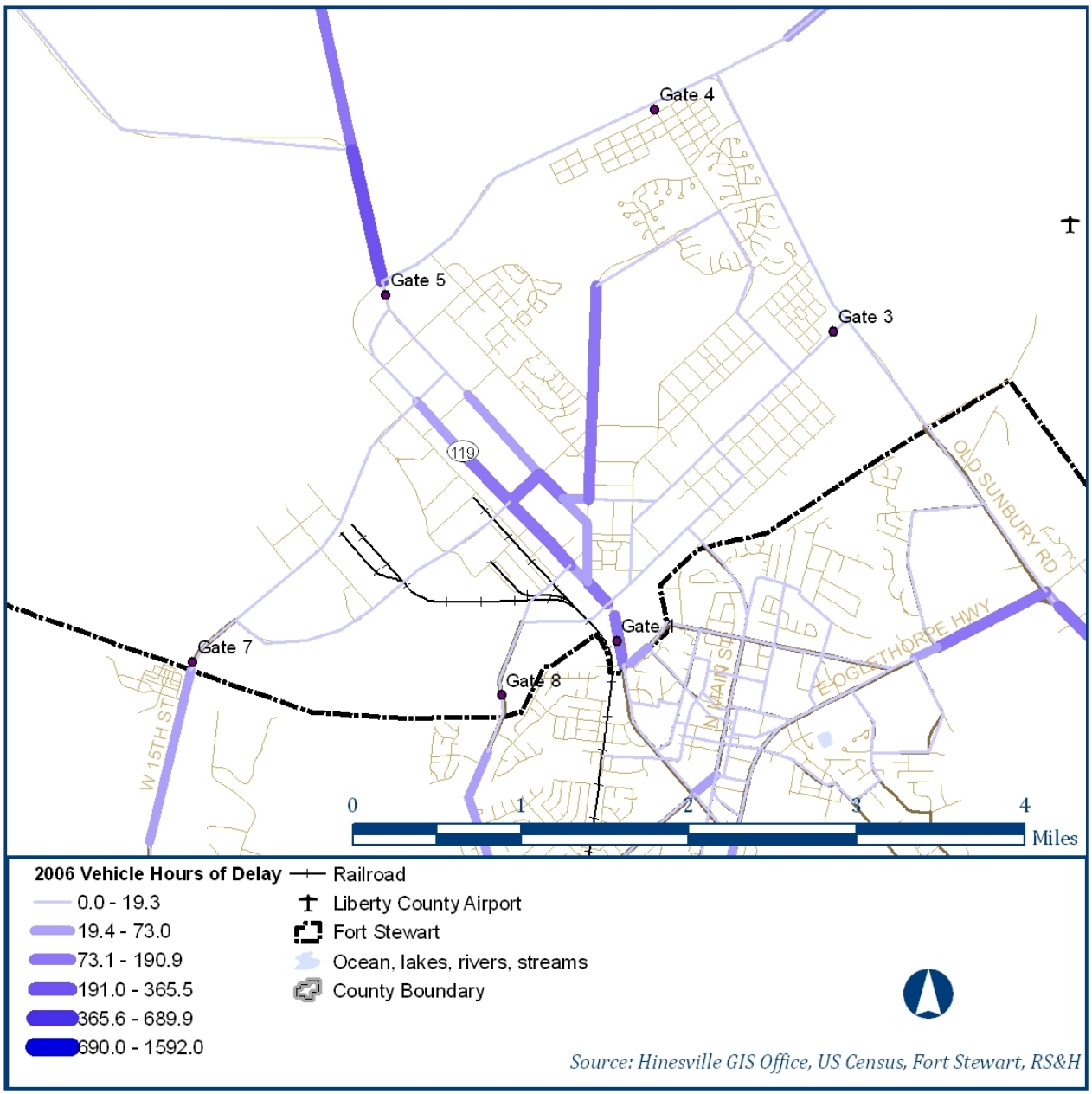

Figure 5 Vehicle Hours of Delay in 2006

Figure 6 Traffic Counts in the Study Area shows the observed traffic in the study area. The highest traffic volumes were observed on I-95, US 84, EG Miles Parkway (SR 196), General Screven Way, and I-16.

Crash History

There are several locations on the transportation network that have high crash severity ratings. Figure 7 shows the non-intersection crashes per million vehicles miles traveled. Road segments with relatively high crash history include:

- Bryan County
  - SR 119 northeast of Pembroke

  - Harris Trail Road from Brisbon Road to Port Royal Road
  - Brisbon Road from Harris Trail Road to Bryan Neck Road
  - Daniel Siding Loop Road near US 17
  - US 17 near I-95
- Liberty County
  - General Screven Way approaching Gate 1
  - Frank Cochran Drive approaching Gate 8
  - Kelly Drive east of Way Mill Pond
  - Fraser Drive near Main Street and US 84
  - EG Miles Pkwy from General Screven Way to Frank Cochran Drive
  - Military Road 47 from US 84 to Fort Stewart Boundary

In addition to these locations, the 2007 *Fort Stewart Comprehensive Traffic Engineering Study* indicates that the following locations on the installation have a high crash history:

- SR 144 north and east of the cantonment area (1 fatality in 2006)
- SR 119 north of the cantonment area
- General Screven Way approaching Gate 1 south of the cantonment area
- Military Road 47 east of the cantonment area (2 fatalities in 2005) (approaching the gate on Harmon Avenue)

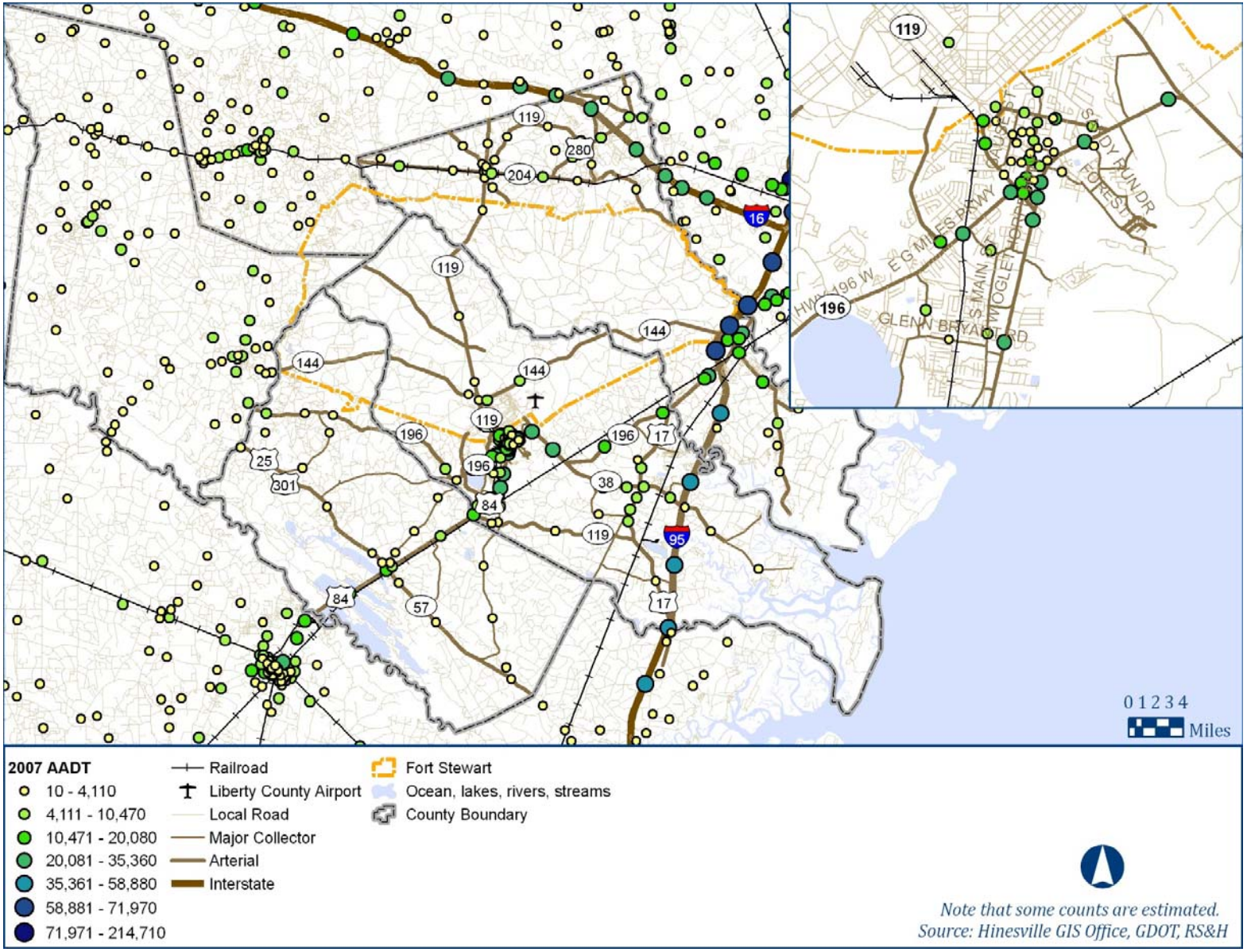

Figure 6 Traffic Counts in the Study Area

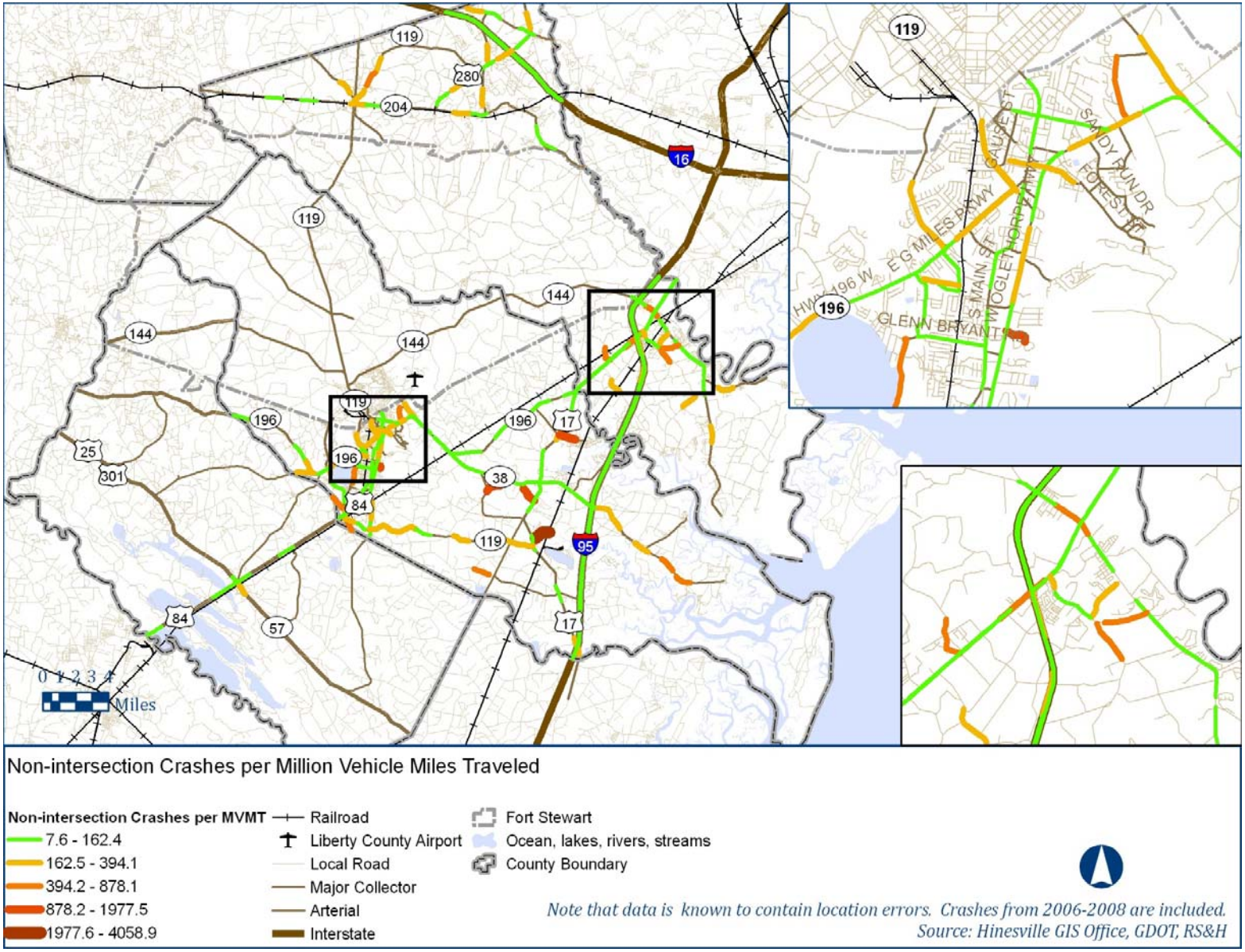

Figure 7 Crash History

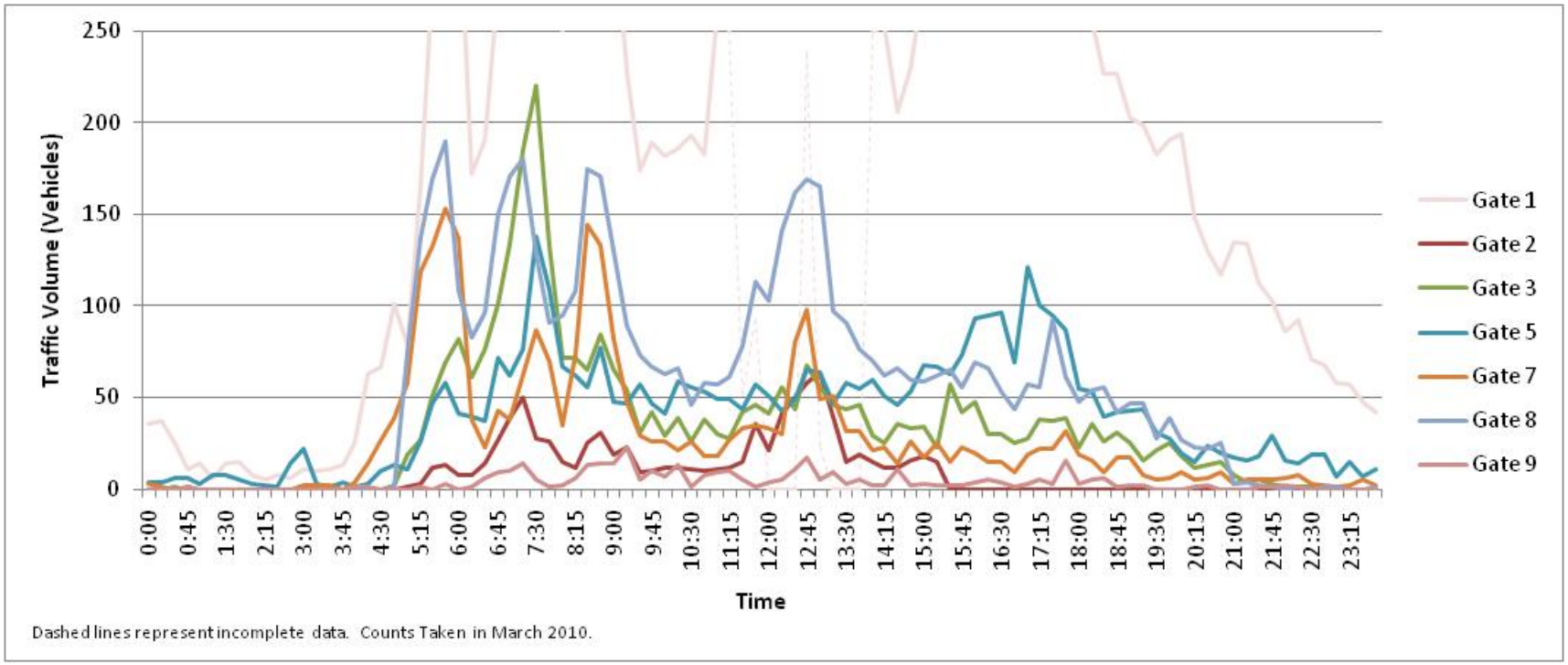

Figure 8 Traffic Counts at Access Control Points

Fort Stewart Entry Gates

There are currently eight (8) functioning access control points (ACPs) that permit entry to the Fort Stewart cantonment area. Each of these ACPs has a crucial role in maintaining safety, security, and sufficient traffic flow onto post. Without proper configuration and management of these gates, congestion, delays, and increased transportation costs will impact the facility as well as adjacent public highways. At each of these gates, identification must be shown for each vehicle, driver, and passenger (for FPCON Bravo+). Each of these gates is described in the following sections.

Gate 1

The primary gate onto post, Gate 1 is located at the southern end of Fort Stewart on General Screven Way, 0.25 miles from the signalized intersection at General Stewart Way. General Screven Way is a four-lane urban arterial. There are no planned improvements to General Screven Way. All vehicles without permits to enter post must get approval at this gate or Gate 5 from the north. There are three inbound lanes for permitted vehicles, and two separate lanes for vehicles without permits and visitor processing; however all three lanes for permitted vehicles do not remain open during all hours. Two of the three lanes are primarily used during peak operating hours and closed at certain off-peak times, while one lane remains open. The configuration of Gate 1 is shown below.

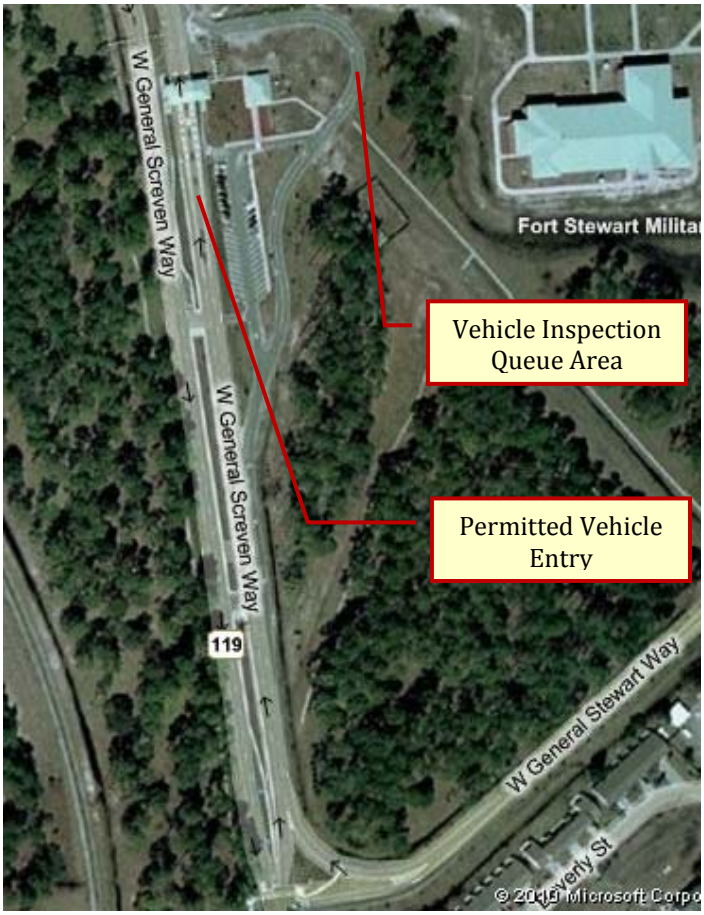

Figure 9 Gate 1 Configuration

Gate 2

Gate 2 is located on Olmstead Drive/E 4th Street. Olmstead Drive is functionally classified as a two-lane rural local road approaching the installation boundary.

Gate 3

Gate 3 is located on Harmon Avenue on the west side of Fort Stewart. Harmon Avenue is a two-lane local road that is completely on post; it is functionally classified as a rural local road. It begins at Old Sunbury Road on the western side of base at Gate 3. There are no planned improvements to Harmon Avenue.

Gate 4

Gate 4 is on Austin Road, a two lane local road that serves as a collector for a residential area on post. It is not functionally classified. This ACP is open only for limited hours.

Gate 5

Gate 5 is on Gulick Avenue, on the northern side of Fort Stewart. Gulick Avenue/SR 119 is a two-lane roadway off post and becomes a four-lane, divided highway south of Gate 5, on post. SR 119 is functionally classified as a rural minor arterial.

Gate 7

Gate 7 is located on 15th Street, and is the ACP for all commercial vehicles. At this gate, vehicles are inspected using x-ray equipment prior to being granted entry. 15th Street is a two-lane rural minor collector according to GDOT functional class. The HAMPO LRTP and Fort Stewart DPW both have improvement projects to widen 15th Street to four lanes from EG Miles Parkway to Gulick Avenue on post.

Gate 8

Gate 8 is located on Frank Cochran Drive, two-lane urban collector. The HAMPO LRTP and Fort Stewart DPW have projects to widen Frank Cochran Drive to four lanes from EG Miles Parkway to Wilson Avenue on post.

Gate 9

Gate 9 is located at Midcoast Regional Airport (a.k.a., Wright Army Airfield (WAAF)) on the northeast side of Fort Stewart. It is served by Wright Field Road, a two-lane roadway. There is a proposed long range project to provide additional access to the Midcoast Regional Airport included in the HAMPO LRTP.

Note: Gate 6 along Wilson Avenue is currently closed.

Traffic Volumes and Queues at Entry Gates

The highest traffic volumes enter at Gate 1, on General Screven Way. During peak occupancy on Fort Stewart, queues at Gate 1 may be 15 to 20 vehicles long in each of the two lanes, with the largest traffic volumes entering between 3:30 pm and 4:30 pm. Average observed processing time at Gate 1 is two to three minutes per vehicle[1]. The majority of truck traffic enters at Gate 7 on 15th Street. According to Directorate of Public Works (DPW) observations, the commercial vehicle queue at Gate 7 can be over one hundred vehicles long due to the processing required for commercial vehicles.

The greatest traffic entering through all gates occurs from 5:30 to 6:15 am before physical training, from 7:15 to 7:45 am as civilian and military employees enter for work, at 9:00 am when military employees enter for formation, and at 12:45 pm after lunch. Additionally, middle and high school students attend school off-post and must return after school or when extracurricular activities are finished for the day.

[1] Traffic was observed on May 21, 2010 to estimate an average processing time.

Traffic counts were taken during March 2010, when three of the four brigades were deployed (meaning that approximately 6,000 troops were present). **Error! Reference source not found.** shows gate operating hours and peak hourly volumes from March 2010. Figure 8 (above) shows the counts at all gates over the 24 hours period.

Table 1 Access Control Points

Gate	Operating Hours	Peak Hourly Inbound Volume (March 2010)
1 Main Gate (General Screven Way)	24 hours daily	2,519 (3:30 pm to 4:30 pm)
2 Troupe Gate	5 am to 6pm	213 (12:15 to 1:15 pm)
3 Harmon Avenue	5 am to 9 pm	672 (7:00 to 8:00 am)
4 Austin Road	7:30 am to 9 am*	N/A
5 Gulick Avenue	24 hours daily	403 (5:00 to 6:00 pm)
7 15th Street	24 hours daily	541 (5:15 to 6:15 am)
8 Frank Cochran	5 am to 9 pm	637 (12:15 to 1:15 pm)
9 Midcoast Regional Airport	24 hours daily	64 (8:30 to 9:30 am)

* On 3ID Physical Training (PT) days only

Note: Gate 6 at Wilson Avenue has been closed.

Check SDDCTEA for Current Rates

Exhibit 2.5: ECF Processing Rates

Processing Technique	Assumed FPCON	Manual Checks[1]		Checks Using Handheld Devices[2]		Automated Lanes[3]	
		Single Lane Checks	Tandem Lane Checks	Single Lane Checks	Tandem Lane Checks	Without Traffic Arms	With Traffic Arms (Up/Down For Each Vehicle)
		vphpl	vphpl	vphpl	vphpl	vphpl	vphpl
Vehicle identification only	Alpha	800 to 1,400	NA	NA	NA	800 to 1,400	550 to 800
Vehicle and occupant identification[4]	Bravo, Bravo+ and Charlie	300 to 450	400 to 600	275 to 375	350 to 475	400 to 450	325 to 350
Inspection of mission essential vehicles only	Delta	20 to 120	NA	20 to 120	NA	NA	NA

**Notes: vphpl = vehicles per hour per lane; NA - not applicable.*
Actual rates may exceed those shown (based on SDDCTEA experience).
(1) - Manual processing rates based on a compilation of SDDCTEA rates for over 200 ECF studies and revalidated as of March 2008.
(2) - Handheld processing rates based on the Assessment of Automated Processing using Handheld Devices, December 2006; and data collected at Fort Leavenworth.
(3) - Automated lane processing rates are based on the Assessment of Phantom Express at Fort Hood, February 2008; and the US Army Evaluation Center, Assessment of Phantom Express, March 2006. Assumes "trusted traveler" type program; therefore, ID of all occupants is not required.
(4) - Only minor increases in processing rates were experienced under Bravo versus Bravo+ and Charlie. This may be due in part to the fact that the majority of vehicles entering a military installation are single occupant vehicles. Driver identification only for Bravo and for automated lanes. Driver and occupant identification for Bravo+ and Charlie.

Figure 10 Processing Rates from SDDCTEA Standards (Source: Pamphlet 55-15, 2009)

The available capacity at each gate is directly proportional to the number of operational inbound lanes. As shown in the figure above, the literature indicates that optimum processing rates of 400

to 600 vehicles per hour are achieved when one guard is assigned to each lane to check occupant and vehicle identification[2]. The peak inbound volume for the inspection lanes at Gate 1 is 395 vehicles, occurring between 8:15 and 9:15 am. This is near the lower range of the 400-600 vehicle per hour per lane (vphpl) optimum rate, but also suggests that there is capacity available for inspections. During redeployment, it may be necessary for the second existing inspection lane to be opened. Additionally, vehicles requiring added review currently pull over onto an unpaved shoulder. Paving this area to accommodate those vehicles may facilitate inspections during peak periods.

Permitted traffic enters Gate 1 as shown in Figure 9. The maximum observed inbound volume per hour at Gate 1 was 1,439 vehicles in the left inbound lane, which is at the maximum processing rate of 1,400 vphpl for manual checks. The hourly inbound volume in all three lanes was 1,828 during that hour. This suggests that there is capacity available during the peak hour for between 600 and 2,400 additional vehicles. The table below shows maximum observed inbound volumes per hour at each gate.

Table 2 Maximum Hourly Inbound Traffic Volumes

Gate	Maximum Observed Inbound Volume Per Hour
1	1,828 vehicles
2	213 vehicles
3	672 vehicles
4	*Counts not available*
5	403 vehicles
6	*Closed*
7	541 vehicles
8	637 vehicles
9	47 vehicles

Because it is the main entrance, Gate 1 experiences much higher vehicle volumes than other gates. As the demand nears the available entrance capacity with the maximum feasible number of inbound lanes, then the waiting time increases and operation conditions decrease in efficiency. The figure below shows when demand at Gate 1 is at its peak and entrance queues are at their worst.

According to DPW, when security is at a heightened level, a serpentine gate and bollard outside of Gate 1 are closed between each entering vehicle. This greatly increases queues along General Screven Way and into Hinesville, beyond the signalized intersection with General Stewart Way.

[2] *Traffic and Safety Engineering for Better Entry Control Facilities,* SDDCTEA 2009

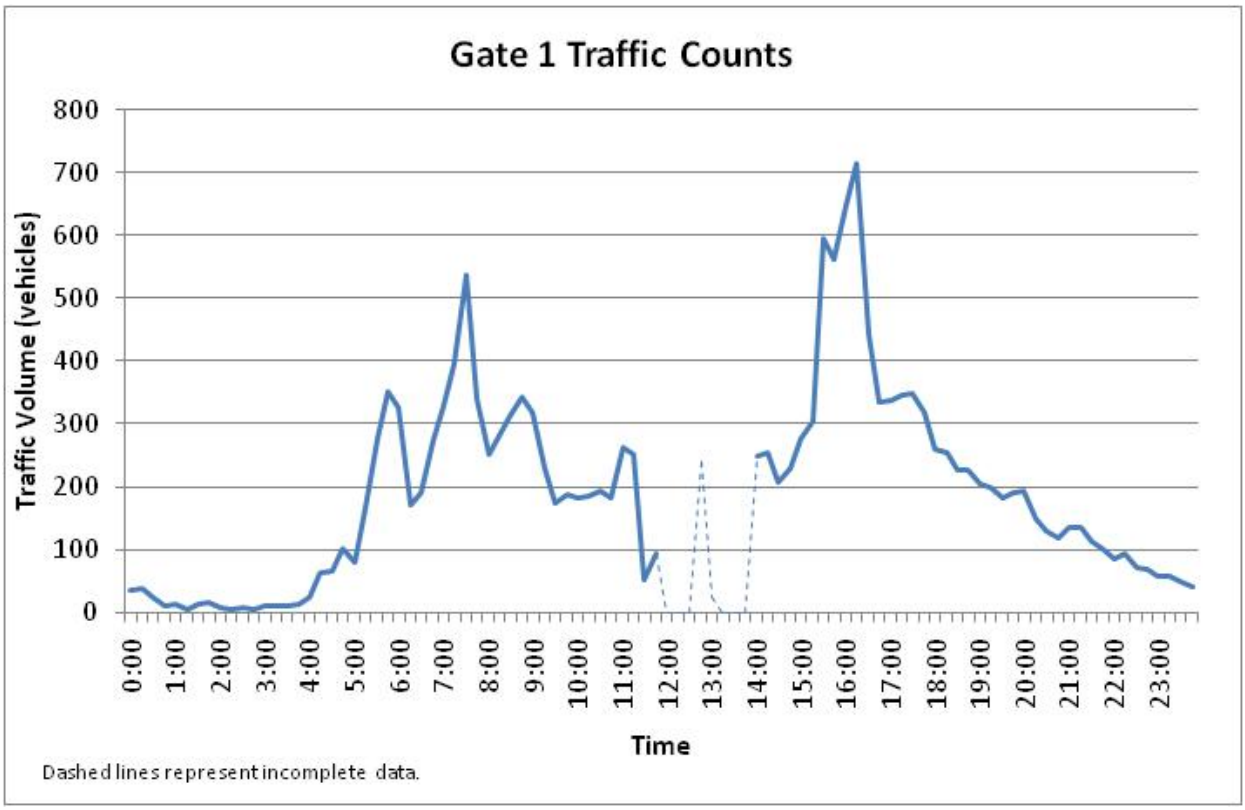

Figure 11 Inbound Traffic Volume at Gate 1 (Main Gate) in March 2010

As stated above, at the time of this analysis, three of the four 3ID brigades were deployed, meaning that approximately 6,000 troops were present on post. When all three of the four brigades stationed at Fort Stewart are on post, approximately 13,000 more troops are present, for a total of 20,000. In this event, ACPs will be under even greater pressure as a much larger number of military employees seek to enter post at similar times. The peaks shown in Figure 11 above could be tripled with this influx of personnel.

FUTURE CONDITIONS

Liberty Transit

At the present time, there is no general public transit service available on a regular schedule. There is limited paratransit service provided through the Coastal Regional Commission (CRC) to rural areas near Fort Stewart. The service focuses on transporting seniors, disabled, youth, and/or low income individuals who cannot drive or do not have the resources to own and operate a car. This paratransit service operates on a "request" basis and requires 24 hours advance notice for trips. The limited span of this paratransit service, number of available vehicles, and advance reservation requirement do not lend themselves to being a viable travel option for Fort Stewart employees or residents for work, medical, shopping, recreation, and other personal trips.

The City of Hinesville has applied for and received funds for a fixed route bus service serving the urbanized areas of Hinesville, Fort Stewart, and Flemington. The proposed system has three fixed routes with route deviation available to serve eligible passengers that cannot access regular bus

stop locations. The service area outside Ft. Stewart includes Downtown Hinesville, the Liberty County Medical Center area as well as commercial, government, medical, educational, hotel/restaurant, entertainment, and office locations in both Hinesville and Flemington. On Fort Stewart, the service area includes major family housing areas, barracks areas for single soldiers, and major activity centers, such as the PX, the Commissary, and the military hospital complex. Service is expected to begin in 2010. Figure 12 shows the proposed fixed routes and a three-quarter mile buffer where curb to curb service will be provided to eligible passengers.

Federal employees are eligible for the Department of the Army Mass Transportation Benefit Program. Under this program, both troops and civilian employees can be reimbursed for transit fares if they choose to ride the bus. Fort Stewart can apply for vouchers for their employees such that each individual employee would not have to pay for a transit pass and then apply for reimbursement for each purchase. The City of Hinesville has explored potential park and ride lot locations which would allow employees to park their personal vehicles and take the bus onto Fort Stewart, reducing the traffic volume entering each gate. The program has the potential to manage demand at the ACPs, reduce air quality impacts associated with traffic and idling during security processing, and increase the efficiency of the public transit system by increasing fare revenue and improving ridership.

Transit vehicles will also impact the flow of traffic at Gate 1, which is the only gate that Liberty Transit will be permitted to use. All three fixed routes will enter through Gate 1 beginning at 6:00 am weekdays and ending as late as 10:00 pm on Friday and Saturday nights. The maximum transit vehicle volume will be seven (7) in one hour from approximately 6:00 am until approximately 6:00 pm on weekdays. Passengers riding the bus onto the installation will be required to have proper identification.

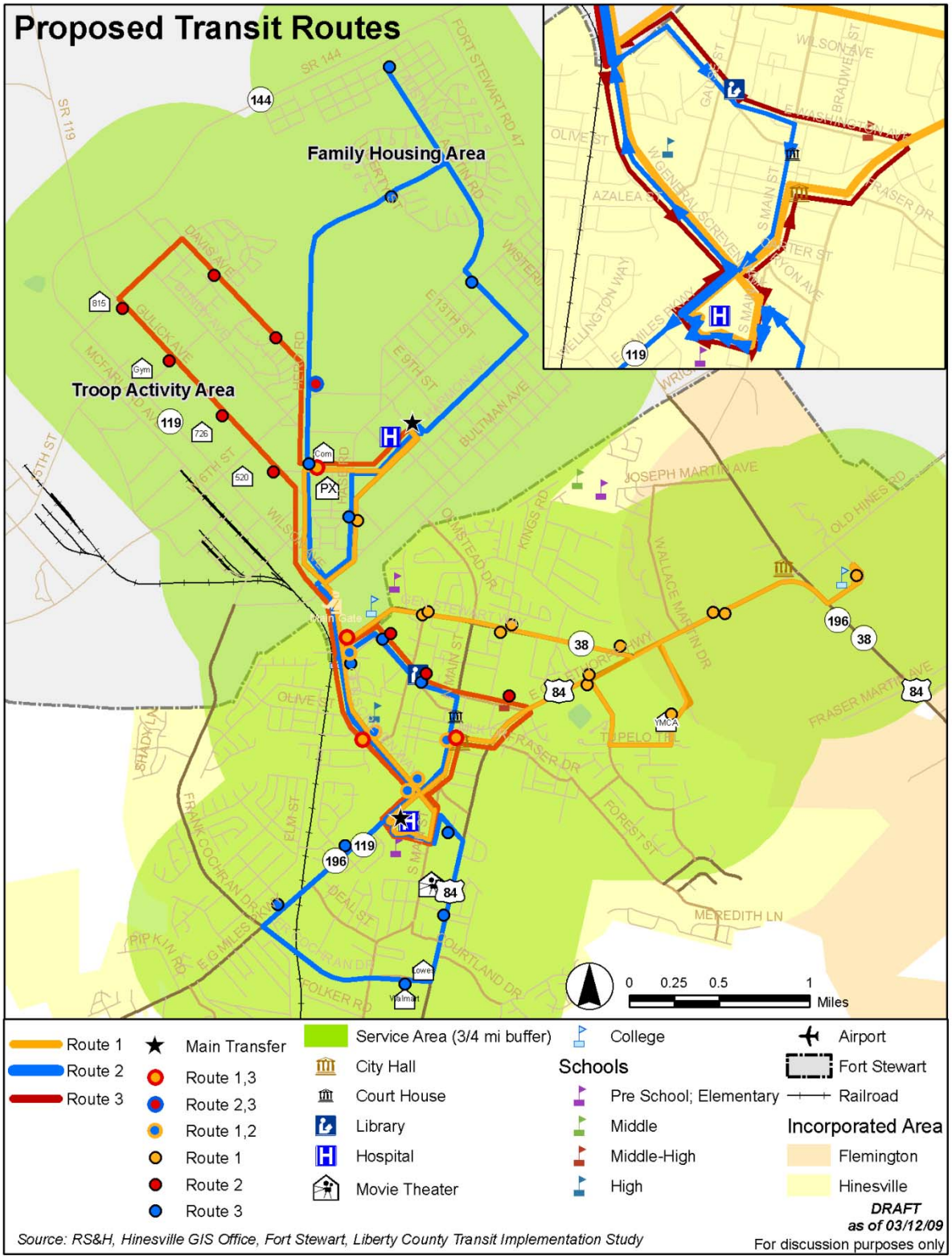

Figure 12 Proposed Liberty Transit Routes

State Control Scenario Analysis

Future year traffic volumes were developed with the HAMPO/GMP regional travel demand model. The previous HAMPO model area was expanded to include Bryan County and parts of Effingham, Bulloch, and Chatham Counties in order to meet the Growth Management Partnership analysis needs. Appendix A Travel Demand Model Documentation contains details regarding the coding and validation of the model.

The State Control Scenario assumes that population projections developed by the state Office of Planning and Budget will apply to the three counties in the study area. These projections are used by the Coastal Water Planning Region in their efforts. The state control growth assumes that Fort Stewart military and civilian employment will follow projections received from the Office of Resource Management and reviewed by the Garrison Commander.

Table 3 State OPB Population Projections

	OPB Population Projections					OPB Trend Continued	
County	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Liberty	61,940	71,937	78,740	86,448	93,821	102,059	109,886
Long	11,893	13,089	14,386	15,744	17,171	18,420	19,741
Bryan	33,326	38,984	45,272	52,466	59,634	65,766	72,376
Tattnall	24,230	26,418	28,706	31,142	33,706	35,943	38,311
Total	**133,399**	**152,443**	**169,124**	**187,825**	**206,362**	**224,223**	**242,354**

Projections received March 2010

In order to project the future performance of the transportation system, the study team modeled an existing and committed transportation network with future population and employment for three future time points. The existing and committed transportation network includes three improvements to the existing transportation network that are far enough along in the planning process that it is reasonable to assume the projects will be completed in the near future. These three projects are the widening of SR 196 (under construction at this time), widening of Frank Cochran Drive from EG miles Parkway to Wilson Avenue, and widening of Airport Road from US 84 to EG Miles Parkway. Both the Frank Cochran Drive improvement and the Airport Road improvement will increase mobility for traffic approaching Fort Stewart. The figures below show the projected congestion on the road network for the three analysis years, 2015, 2020, and 2030.

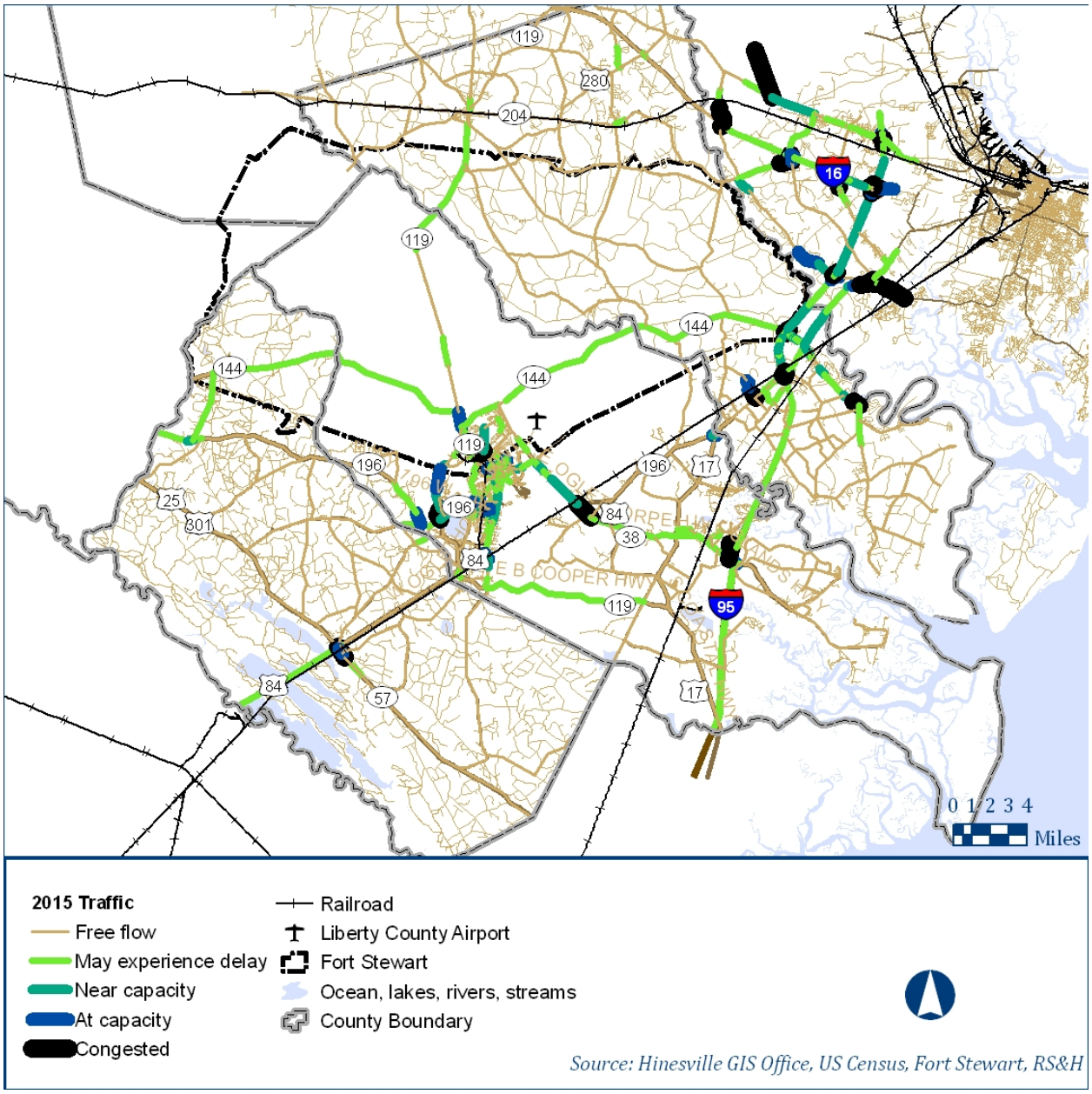

Figure 13 Traffic in 2015

Figure 13 and Figure 14 show that congestion will increase in the area as population and employment increase into the future. The travel demand model projects that roadways at Gates 1, 5 and 7 will operate at capacity in 2015. Based on feedback from the Master Planning Division, 15th Street on post will be widened by 2015 and although the construction timeline of the Fort Stewart bypass is not known, this new roadway will certainly impact the projected congestion levels. If the commercial gate is moved from Gate 7 to a new gate north of Gate 5, this would also greatly impact traffic patterns in the area.

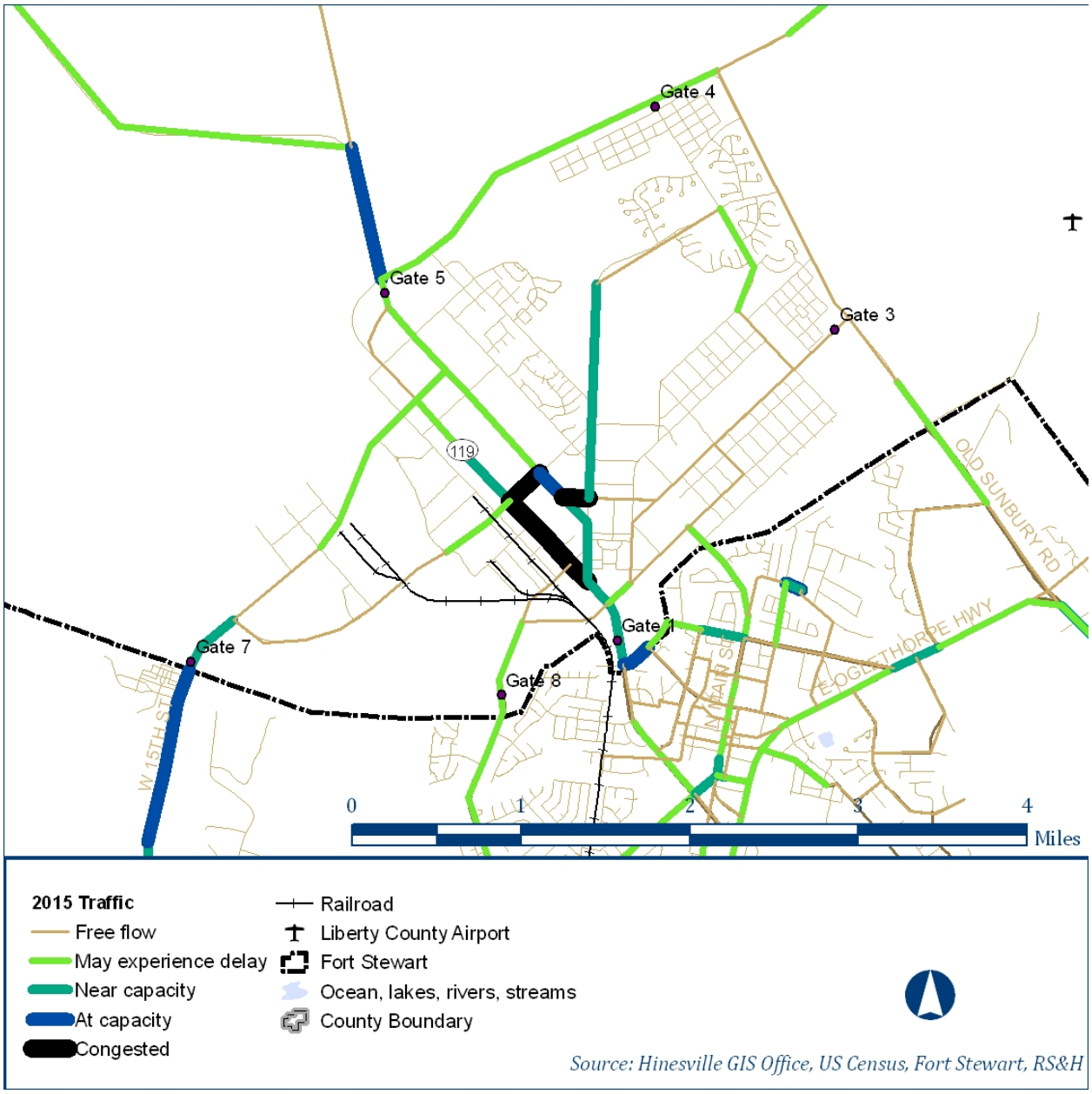

Figure 14 Traffic Level of Service at ACPs

Figure 15 shows that vehicle hours of delay will increase in the near term at SR 144 and SR 119 approaching Gate 5. This is critical because the crash history on SR 144 is already relatively high. Additionally, traffic approaching Gates 1 and 7 as well as Old Sunbury Road approaching Gate 3 will experience increasing levels of delay.

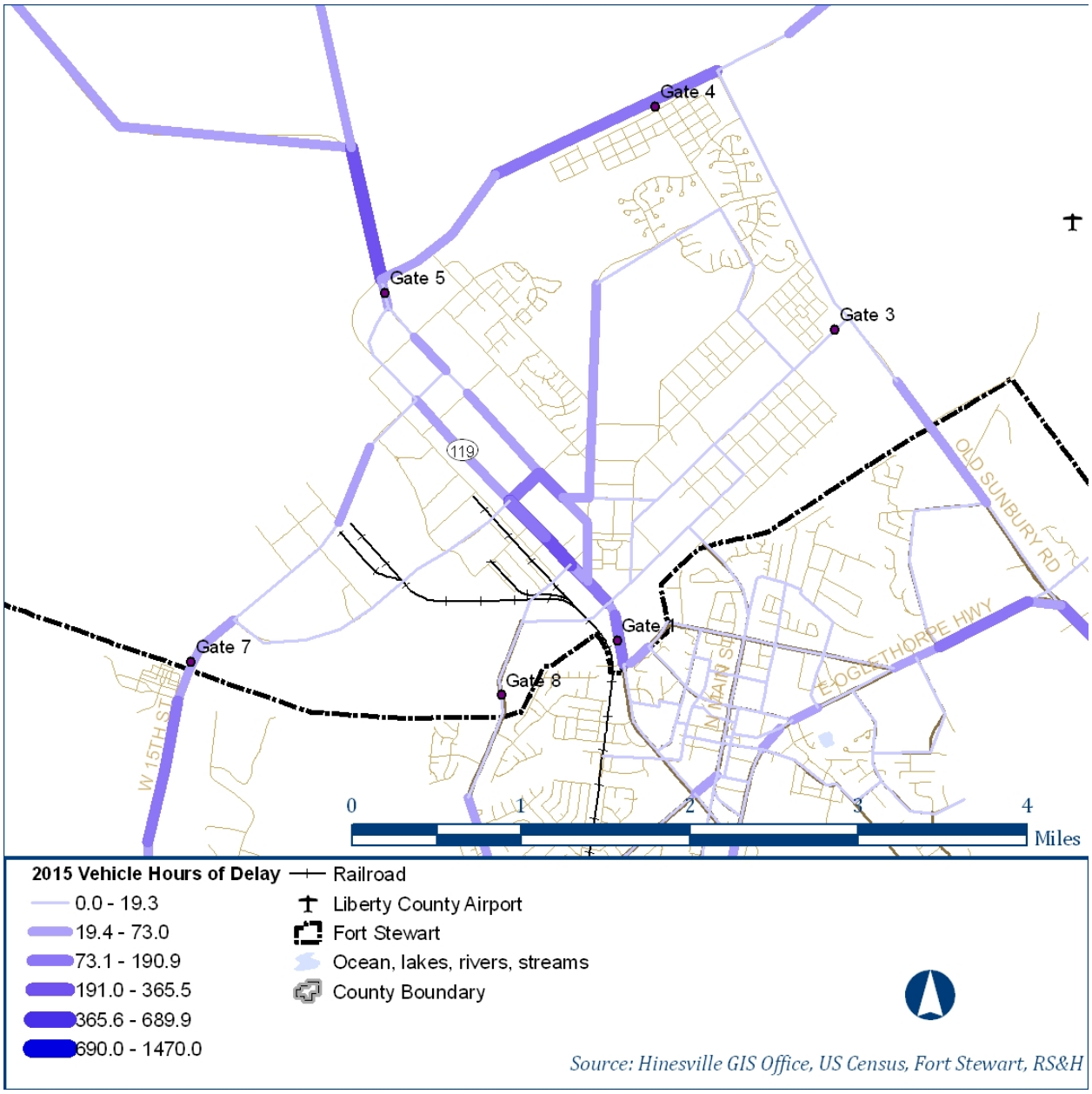

Figure 15 2015 Delay

Figure 16 and Figure 17 show the roadway level of service projected for 2020. 15th Street approaching Gate 7 will be a critical levels of congestion by 2020, in particular as the Independence community develops just outside of the installation. There is also a proposed middle school on the installation which would cause increasing traffic on 15th Street.

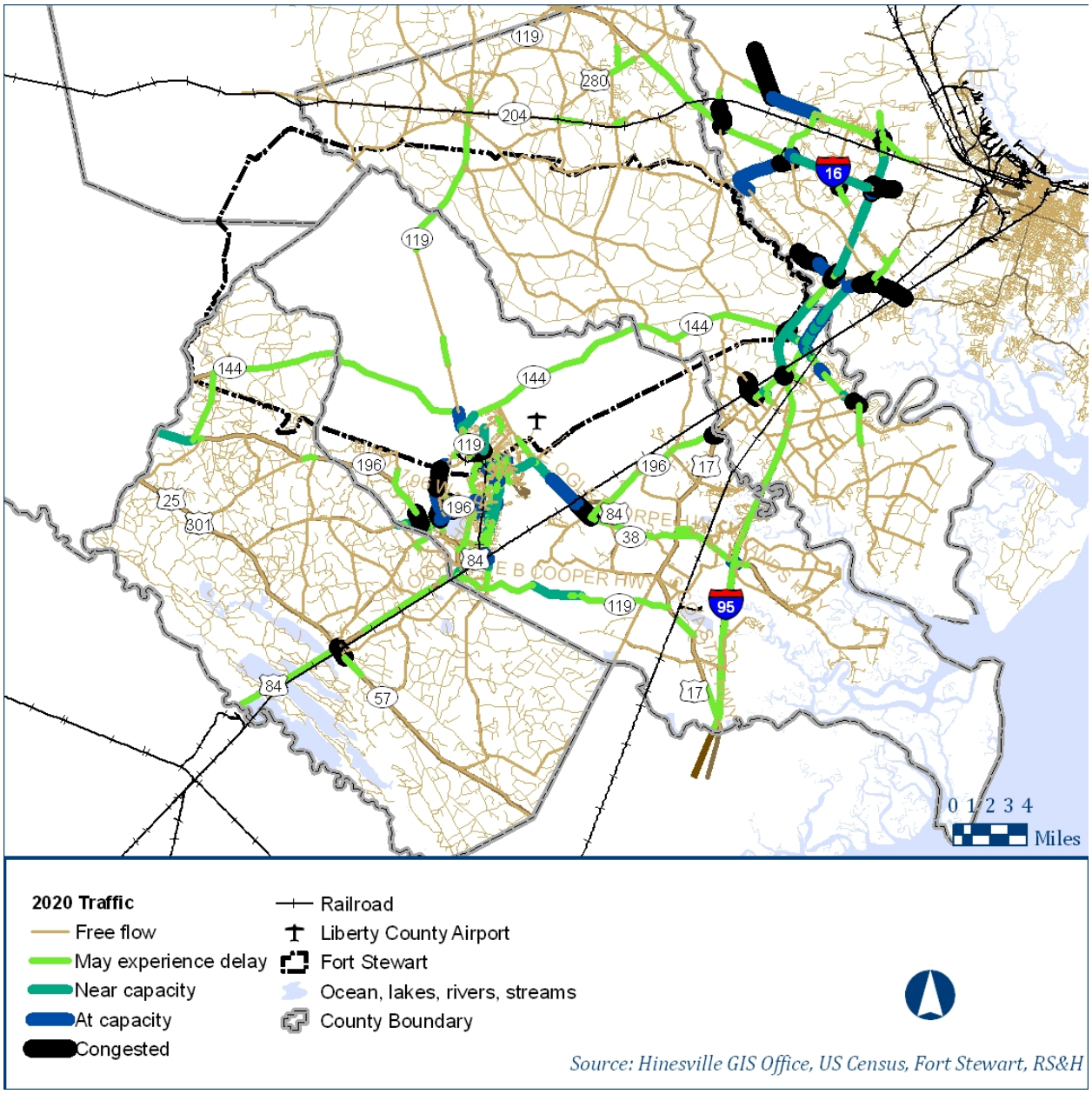

Figure 16 Traffic in 2020

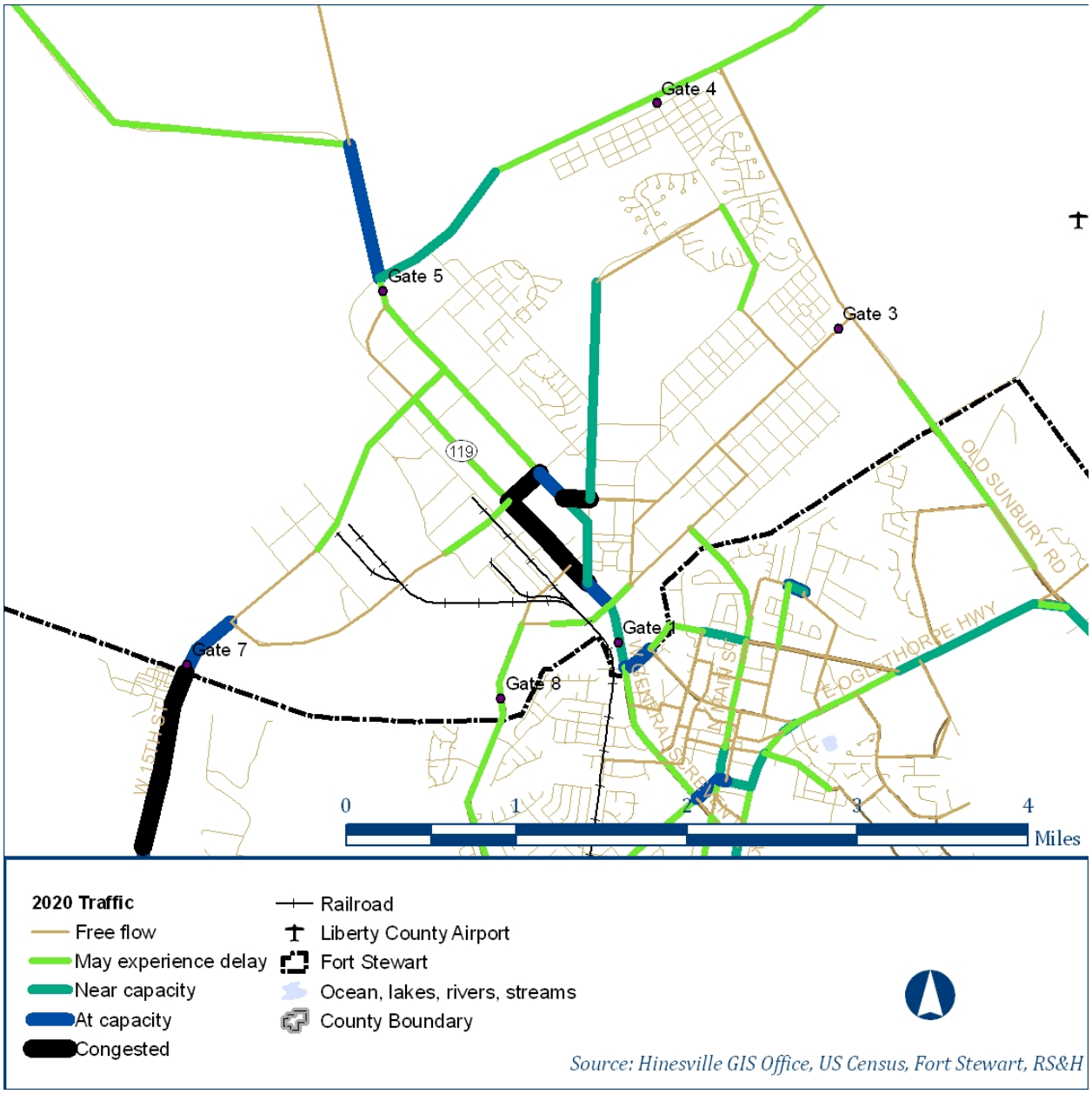

Figure 17Traffic Level of Service at ACPs

Figure 18 shows the vehicle hours of delay projected for 2020. While delay increases in the study area, the congested road segments generally remain the same.

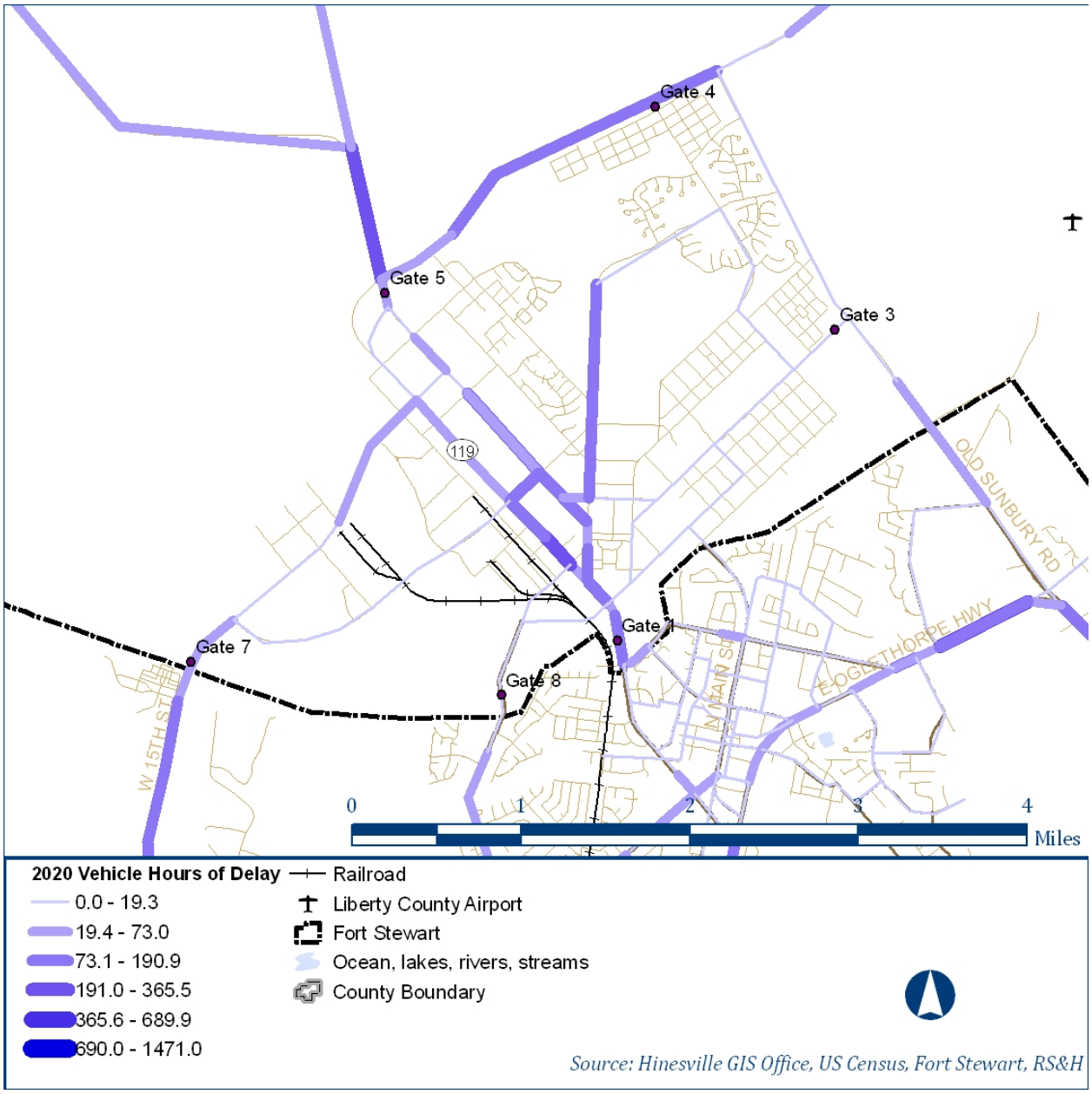

Figure 18 2020 Delay

Figure 19 and Figure 20 show the projected roadway level of service in 2030. Congestion levels are expected to increase approaching all gates, with 15th Street and SR 119, at critical levels. Because General Screven Way will be at capacity at this time, long range capacity improvements in the Gate 1 area may be necessary. However, demand management strategies as well as transit should be promoted before capacity improvements are considered.

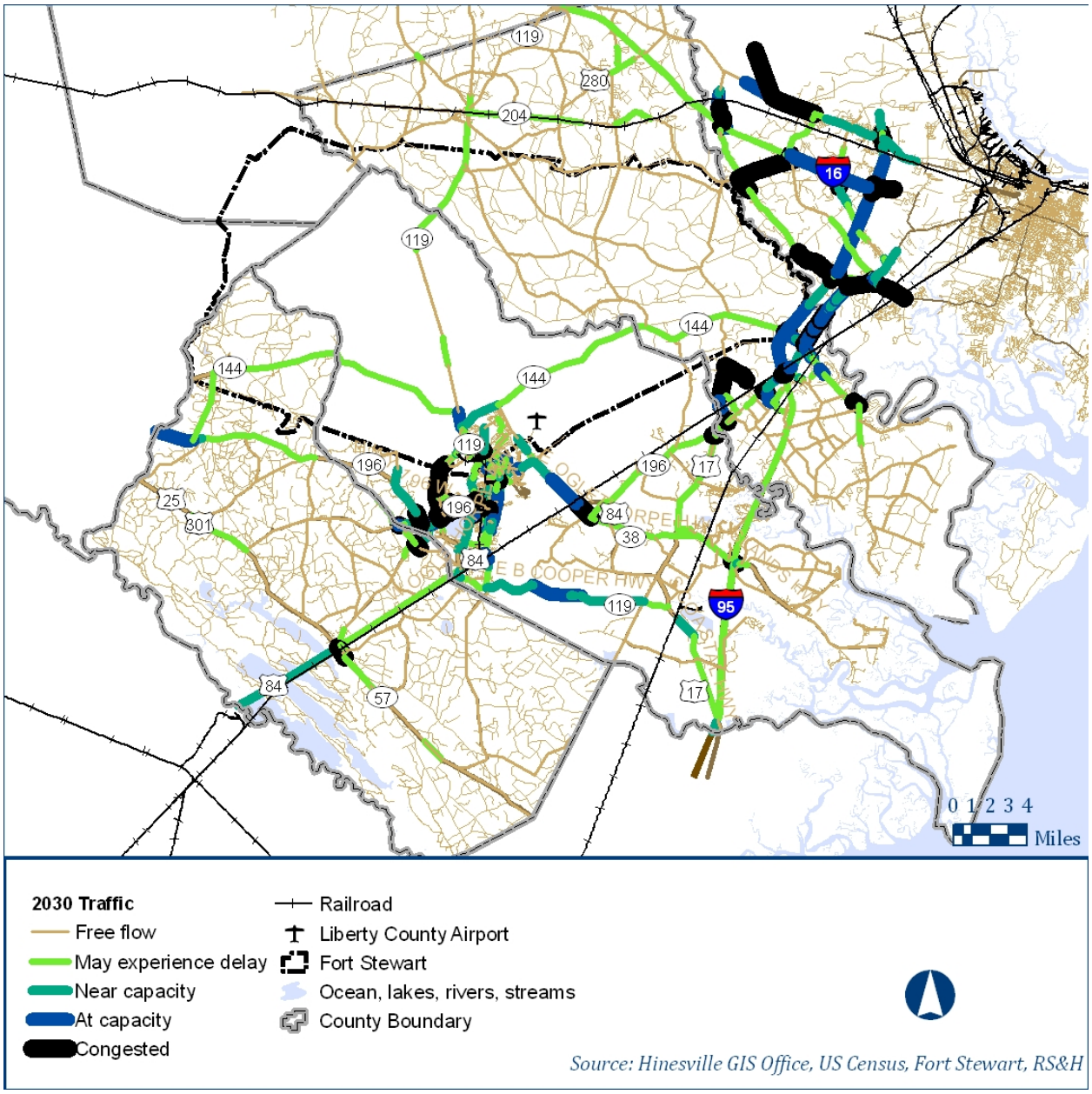

Figure 19 Traffic in 2030

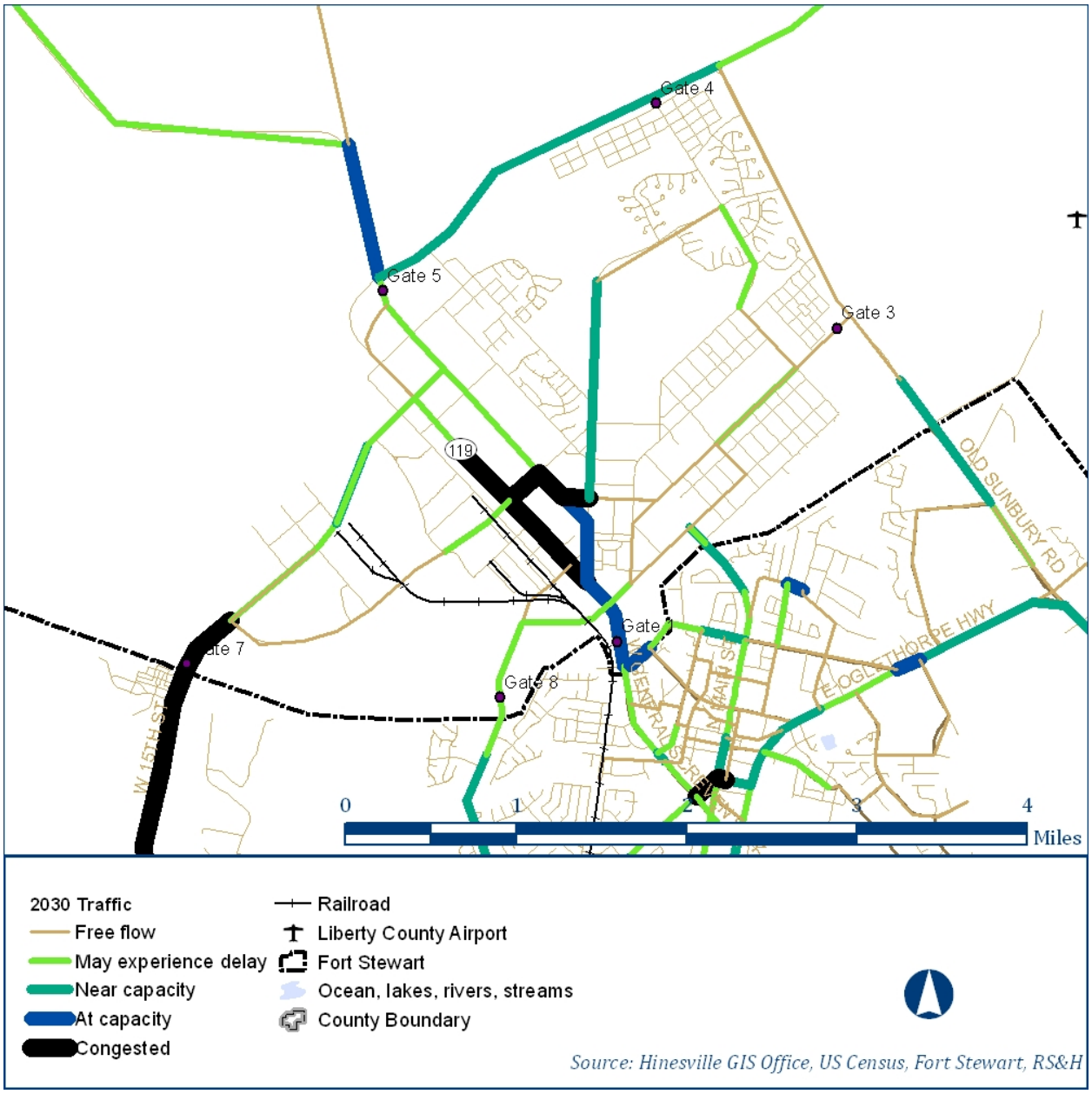

Figure 20 Traffic Level of Service at ACPs

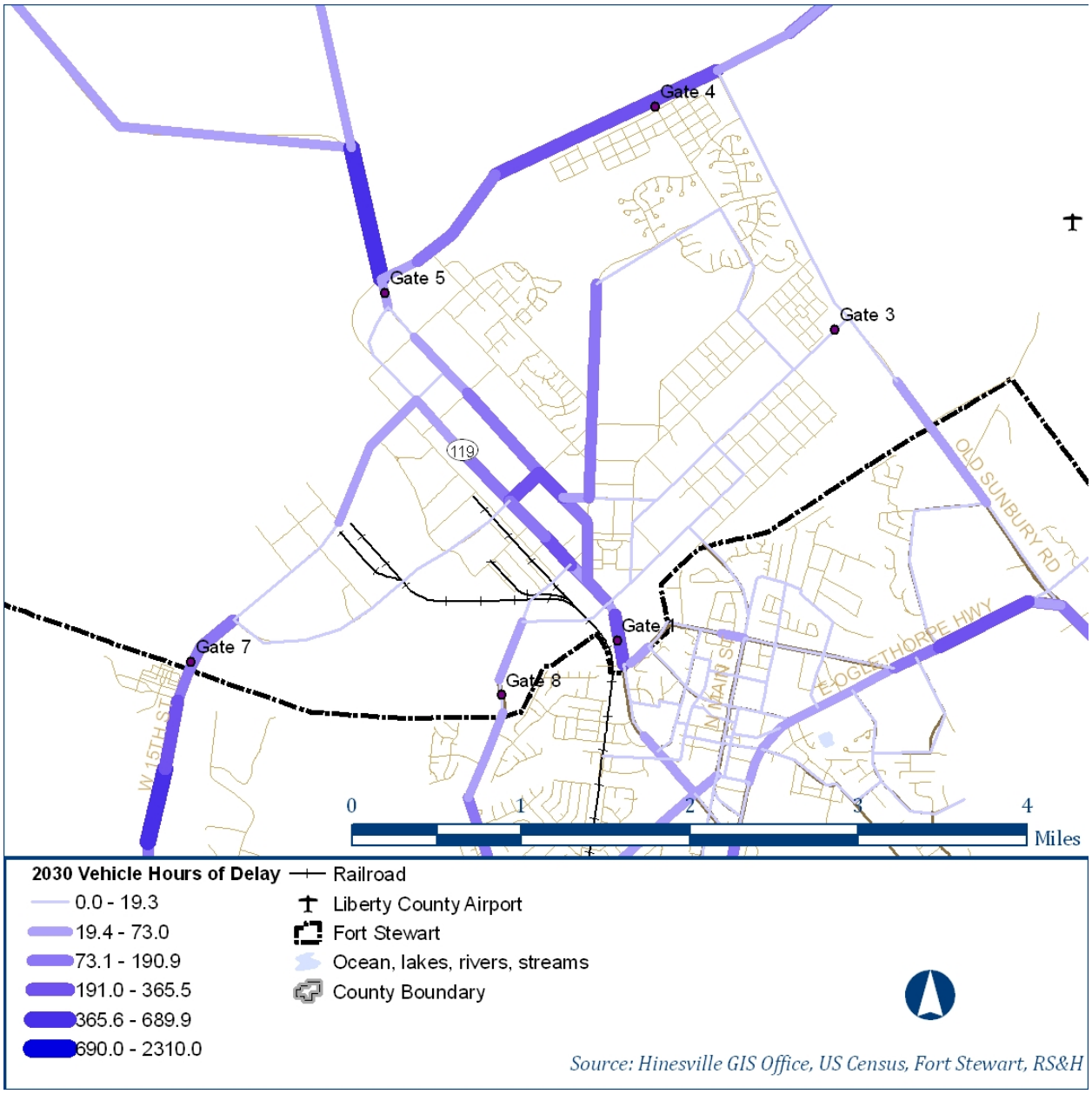

Figure 21 2030 Delay

NEAR TERM RECOMMENDATIONS

Access Control Points

Several modifications could be made to existing ACPs to assist vehicles entering post in a more smooth and efficient manner. At Gate 1, existing signage directing non-permitted vehicles to parking and inspection on the right side of the gate is located adjacent to the turn-off lanes, not allowing for appropriate reaction time for drivers in all incoming lanes to navigate to the right-most lanes. Vehicles must traverse as many as three lanes in order to get to the correct lane. Signage should be duplicated and enlarged, and placed further in advance of the inspection lanes. Directional signage should be placed prior to the start of the right turn lane, and again at the end. These locations are illustrated in the following figure.

Figure 22 Recommended Signage Location for Non-Permitted Vehicles at Gate 1

This signage should be placed in accordance with the *Roadside Design Guide*, published by the American Association of State Highway and Transportation Officials (AASHTO). Based on the 35 mph speed limit on General Screven Way, it calls for a clear zone width of 14 to 16 feet. All signs or other obstacles placed within this distance should have breakaway posts. If an obstacle does not have breakaway posts, it should be placed at least 14 feet from the edge of travel.

Figure 23 Gate 1 Configuration

Once the remaining three brigades return from deployment, all gates will experience much greater demand, but particularly Gate 1. This could be resolved by the addition of two lanes, one for permitted vehicles and one for non-permitted vehicles. For non-permitted vehicles, a third lane could be added along the outside of the existing lanes. Additional personnel should also be added so that more vehicles could be processed simultaneously. For permitted vehicles, a fourth lane could be added to the outside of the existing lanes, beginning at the turn-off for non-permitted vehicles. Additional personnel would also be needed at this new lane. This would affect the ACP's existing parking lot, but an additional parking area should be added to compensate for this, on the eastern side of the vehicle lanes where there is currently not any development. The addition of these lanes would relieve pressure on the signalized intersection of General Screven Way and General Stewart Way, particularly at peak times.

Demand Management

Although the current physical capacity of the access control points (ACPs) is sufficient, peak periods with high levels of security will result in queues that impact the adjacent road network and local

community. To lessen those impacts, installation operations could be adjusted to reduce peak demands at the ACPS. Fort Stewart could set civilian employee start times, physical training, troop work start times, and lunch breaks in shifts so that the peaking at the ACPs is spread across the morning and midday periods. These staggered start times would ease pressure on the ACPs as fewer vehicles would be entering the installation at one time. This will be even more critical once the three additional brigades return from deployment and there is a much greater number of people seeking access for work, physical training, and formation. Staggered start times and formation times would also have a significant effect on queues at Gate 1 for non-permitted vehicles.

A ride sharing program sponsored by Fort Stewart would decrease the number of vehicles entering at any one time. The latest U.S. Census Bureau Local Employment Dynamics (LED) data indicates concentrations of Fort Stewart employees in several locations as shown in the figure below; the Transportation Division could assist those employees interested in ride-sharing to locate a carpool or vanpool group. Additionally, vans are available from the Coastal Regional Commission vanpool program for employees who wish to ride-share regularly. As discussed above, Liberty Transit is scheduled to begin fixed route service to Fort Stewart in 2010. The public transit service is an opportunity to reduce traffic at the ACPs.

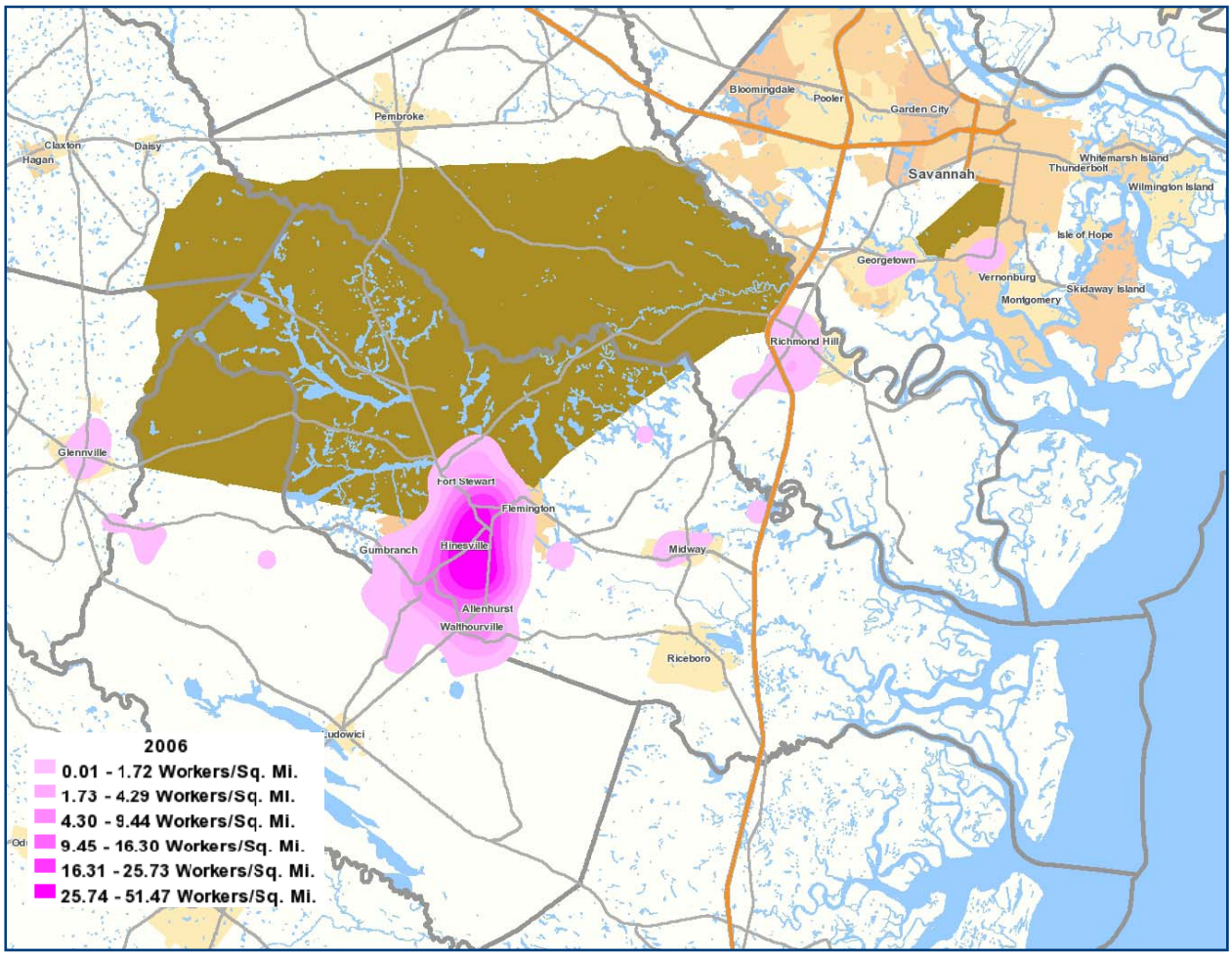

Figure 24 Density of Commuters to Fort Stewart, 2006

Source: US Census Bureau, LED

Commercial Vehicle Traffic

Due to the extensive queues at Gate 7 for commercial vehicle inspection, it is recommended that commercial vehicle inspection capacity be increased. This could be accomplished with an additional gate equipped for these inspections to relieve pressure on Gate 7 or by providing an adequate truck holding area to meet the commercial vehicle demand. DPW noted that because the existing truck/commercial ACP is on the southern/western side of Fort Stewart, it would be beneficial for a new or additional inspection gate on the northern side of the cantonment area. This would increase the efficiency of commercial travel accessing post because the volume of vehicles that currently arrives from the north would no longer be required to travel around Fort Stewart, saving time and relieving truck traffic in and around Hinesville. However, the traffic pattern on Old Sunbury Road should be carefully evaluated before relocating the commercial vehicle gate.

Local governments, including the Hinesville Area Metropolitan Planning Organization (HAMPO), should actively pursue continuous coordination regarding designation of the Fort Stewart commercial vehicle gate. HAMPO plans for transportation improvements in Liberty and Long Counties and is dependent upon coordination with Fort Stewart to ensure consistent investments are being made on and off post. There is potential to shift the commercial vehicle gate from Gate 7 on the west side of the cantonment area to a new gate on the northern boundary of the cantonment area, as shown in Figure 25. This would re-route commercial vehicle traffic through the HAMPO area and may have severe impacts on local traffic and resources if adequate roads are not provided before the designation is changed. Specifically, the impact on Old Sunbury Road through Flemington could be detrimental to adjacent households and the historic downtown if an alternate route for commercial vehicles is not provided before relocating the commercial vehicle gate. The proposed Flemington Loop, a project in the HAMPO LRTP, is intended to provide an alternate route for commercial vehicles if the designated ACP is shifted to SR 119 or SR 144 north of the cantonment area in the future. At this time, the funding status of the Flemington Loop has not been determined; an update to the LRTP scheduled for adoption in October 2010 will indicate the timeframe that the Flemington Loop may be constructed. However, defense funds would accelerate the design and construction of the proposed Flemington Loop and would help to lessen the impacts of additional heavy truck traffic through the area.

Additional Study

To fully understand the travel patterns of troops and their dependents, an origin destination survey should be conducted. This survey could be completed in conjunction with a survey for Liberty Transit. The survey should collect information about trip start times, alternatives to making the trip, alternative modes available, and modes chosen for the trip. Additionally, a survey of commercial vehicle traffic origins would indicate possible impacts of moving the commercial vehicle gate. Understanding the proportion of trucks arriving from the north would inform plans for designating truck routes and mitigating the impacts of increasing truck traffic to Fort Stewart.

The Flemington Loop project discussed above as an alternate route for commercial vehicles would also help to reduce the traffic impacts generated by the new IBCT north of SR 144; the area is shown in Figure 25. The IBCT is expected to house 1,500 troops and employ 3,500. The Flemington Loop is currently in the planning stages but requires engineering and assessment of environmental impacts before any improvements could be constructed; therefore, it will be more than two years (at a minimum) before the new roadway could be open to traffic, even if it is a high priority in the 2035 LRTP and is included in the next TIP for funding within the next four years. Near term solutions to the impacts of increased commercial vehicle traffic will require additional study and close coordination with Fort Stewart. HAMPO is currently participating in a traffic engineering study to address the US 84 curve and Old Sunbury Road/Military Road 47 in the area.

HAMPO should pursue a safety grant for a near term solution; these grants are available for projects with a total cost of not more than $750,000. Figure 7 shows the high crash rating of roads in this area under existing traffic volumes. Additional study should include the IBCT impacts on Old Sunbury Road, Military Road 47, the US 84 curve, and the Harmon Avenue gate.

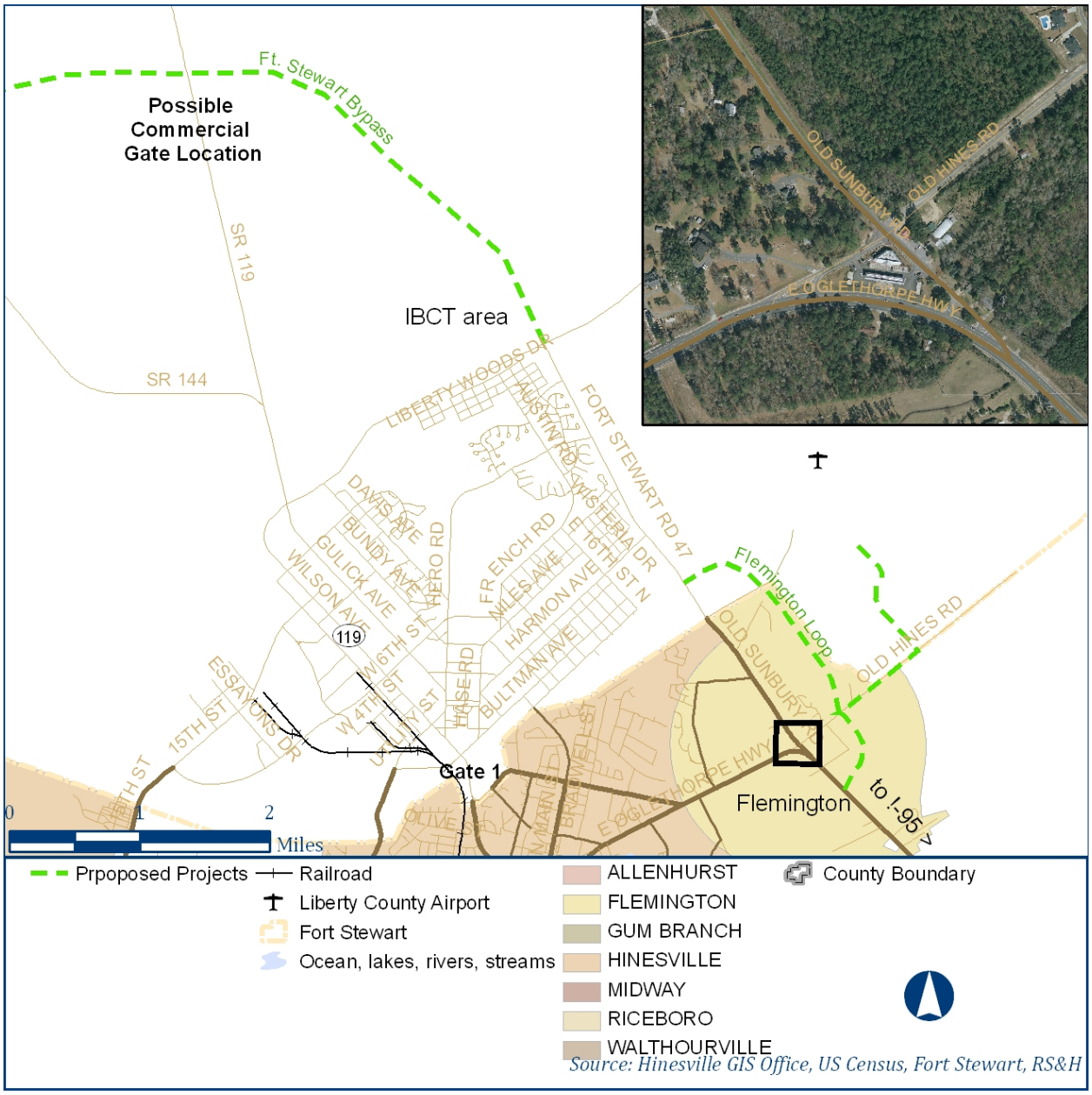

Figure 25 Location of Proposed Flemington Loop for Commercial Vehicles

There is a planned improvement on SR 144 east of the cantonment area to widen the roadway to four lanes and another project to add passing lanes. According to GDOT, both projects are on hold because there is ambiguity regarding a preference for widening or passing lanes from both Fort Stewart and local governments. There is also ambiguity about which agency has responsibility for this section of roadway, either GDOT because it is a state road, or Fort Stewart because it is on the installation. Proactive communication and a technical study to define the need and purpose for

proposed improvements should be a priority for both of these agencies and HAMPO because of the crash history on this road segment.

There is also a proposed new roadway along the southwest boundary of the installation, called the Central Connector. This roadway would serve as an alternate route to US 84 and SR 196 in the region. Plans for a new middle school should be coordinated with the proposed road alignment. Future impacts of the school traffic and school zones on the existing road network, particularly 15th Street, and the future road network constructed for major new developments in the area should be carefully assessed and coordinated with HAMPO, Fort Stewart, and the Liberty County Board of Education. Major arterials in the area are currently impacted by school zones which cause delay during the day; repeating this situation on a newly widened 15th Street would reduce the benefits from that transportation investment. The Central Connector concept development should also include review of impacts on the Gate 1 influence area as the Central Connector would change the intersection configuration and signal timing of General Screven Way at General Stewart Way.

Information for Troops and Other Workers

Because many Fort Stewart employees are short term residents of the area, continuously providing travel information to the community is critical. Many employees are on post for training as part of the National Guard or other branches of the military or are contract labor that works on post as needed. Information that should be regularly distributed includes a map of the road network and ACPs, transit routes, telephone numbers and websites for Liberty Transit and Coastal Regional Coaches, and the Army Mass Transportation Benefit available to Federal employees. A travel information packet should be distributed at intake for 3ID troops.

The ACP signage recommendations discussed above are also a public information strategy. The Gate 1 signage would allow for more reaction time for non-permitted vehicles to enter to the east of the main gate. Signs could also be placed at other ACPs to inform drivers of wait times, alternate access points, and the current FPCON level.

Long Term Recommendations (2014 and Later)

Capacity Improvements

The Department of Defense has contracted with Gannett Fleming to perform a traffic study that will make recommendations for the ACPs to bring them in line with current standards issued by the Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA). These standards, described in SDDCTEA Pamphlet 55-15 *Traffic and Safety Engineering for Better Entry Control Facilities*, call for a minimum of two inbound lanes at each ACP. Currently, gate 2 has only one inbound lane in operation. Other gates may also operate only one inbound lane at a time, but they have two lanes available.

Roadway improvements in the area that are necessary to reduce congestion impacts of the traffic generated by Fort Stewart include:

- Frank Cochran Drive Widening from 2 to 4 lanes with a median from EG Miles Pkwy/SR 196 to Wilson Avenue
- Airport Road Widening from 2 to 4 lanes with a median from US 84 to EG Miles Pkwy/SR 196
- 15th Street Widening from 2 to 4 lanes with a median from EG Miles Pkwy/SR 196 to Hero Road

- Flemington Loop from US 84 to Military Rd 47 (new 2 lane roadway with a heavy truck design vehicle)
- Military Rd 47 Widening from 2 to 4 lanes from Flemington Loop to Fort Stewart Bypass
- SR 144 passing lanes or widening in addition to increased enforcement of speed limits, especially during training activities

Public Transportation

As discussed above, Liberty Transit will provide fixed route and on-demand transit service to activity centers within the Fort Stewart cantonment area in late 2010. Continued promotion of this service, provision of fare media to troops and other Fort Stewart employees, and coordination with Fort Stewart shuttle service are necessary components of the system. Liberty Transit, in coordination with Fort Stewart Directorate of Logistics, should monitor the demand for additional service, or changes to the year one service, as troops redeploy and new troops join the 3ID. Fort Stewart should inform the Liberty Transit point of contact of special events that will increase the demand on buses and/or impact the transit service schedule. Joint promotion of the transit service with any special events should be pursued.

APPENDIX A TRAVEL DEMAND MODEL DOCUMENTATION

The documentation provides information about the HAMPO travel demand model validated to 2006 base year for the 2035 Long Range Transportation Plan and the Fort Stewart Growth Management Partnership three county transportation assessment. The format generally follows the Georgia Department of Transportation (GDOT) *General Summary of Travel Demand Model Development Procedures*.

Highway Network

The HAMPO/GMP model includes road networks in Liberty, Long, and Bryan Counties as well as portion of Chatham, Effingham, and Bulloch Counties. The study team made every effort to use the Bryan County Comprehensive Transportation Plan model network for Bryan County. Coding errors such as gaps between links that form continuous roadway segments were corrected and input variables were adjusted to conform to MPO standards. Every roadway in the model area functionally classified as minor collector or above is included per GDOT standards. Local roads are included where they are significant to network connectivity, serve as a traffic analysis zone boundary, are identified for a potential roadway project, or are near a future major development.

Variables

The network field names follow GDOT naming conventions, as shown in the table below.

Table 4 Highway Network Variables

Field	Description	Comment
A	A node	
B	B node	
Lanes	Number of thru lanes (typical daily configuration)	
Distance	Distance in miles	Calculated automatically in

Field	Description	Comment
		Cube
Count	Base Year ADT by direction	Zero if not a count station; one-half of TCount if traffic count was nondirectional
TCStation	GDOT Count Station Number	Zero if not a count station
TCount	Total Base Year ADT	Zero if not a count station
FIPS	State-County FIPS Code	State FIPS+County Code
HPMS	HPMS Functional Class Designation 1 - Rural Interstate 2 - Rural Principal Arterial 6 – Rural Minor Arterial 7 – Rural Major Collector 8 – Rural Minor Collector 9 – Rural Local 11 – Urbanized Interstate 12 – Urban Freeway 14 – Urbanized Principal Arterial 16 – Urbanized Minor Arterial 17 – Urbanized Collector 19 – Urbanized Local	Numeric
Name	Road Name	Character Field
Ftype	GDOT Facility Type 1 Interstate 2 Freeway 3 Expressway 4 Parkway 6 Freeway to Freeway Ramp 7 Freeway Entrance Ramp 8 Freeway Exit Ramp 11 Principal Arterial – Class I 12 Principal Arterial – Class II 13 Minor Arterial – Class I 14 Minor Arterial – Class II	Numeric 0 - 32

Field	Description	Comment
	15 One Way Arterial 21 Major Collector 22 Minor Collector 23 One Way Collector 30 Local Road 32 Centroid Connector	
Screenline	Screenline number	0 if not on a screenline

Additional Variables

Area Type: Area Type is automatically added to the highway network links. It is based on a floating zone methodology where acreage and socio-economic data is accumulated for each zone within one mile of the centroid of the zone. The data is then used to calculate the population and employment density for that TAZ. Based on a review and analysis of the data, seven percentile ranges were determined. Using the floating zone methodology provides a smoother transition between area types for links.

Table 5 Area Type Definitions

Code	Area Type
1	High Density Urban
2	High Density Urban Commercial
3	Urban Residential
4	Suburban Commercial
5	Suburban Residential
6	Exurban
7	Rural

Link Capacity: Facility type and area type are used in combination to determine free-flow speeds and capacities. Link capacities for the model network are obtained from a lookup table of per-lane hourly capacities based on facility type and area type. The final link capacity is calculated by multiplying the hourly capacity per lane by the number of lanes which is automatically added to the links during the model application. The following table displays the hourly capacities per lane.

Table 6 Hourly Capacities per Lane

No	Facility Type	Area Type						
		1	2	3	4	5	6	7
1	Interstate	1900	1900	2000	2000	2200	2200	2000

No	Facility Type	Area Type						
		1	2	3	4	5	6	7
2	Freeway	1800	1800	1900	1900	2000	2000	1900
3	Expressway	1300	1300	1400	1400	1500	1500	1400
4	Parkway	1200	1200	1300	1300	1400	1400	1300
6	Freeway to Freeway Ramp	1600	1600	1800	1800	1900	1900	1800
7	Freeway Entrance Ramp	1400	1400	1700	1700	1800	1800	1700
8	Freeway Exit Ramp	1200	1200	1400	1400	1600	1600	1400
11	Principal Arterial – Class I	1100	1000	1200	1200	1400	1400	1200
12	Principal Arterial – Class II	900	900	1000	1000	1100	1100	1000
13	Minor Arterial – Class I	800	800	900	900	1000	1000	900
14	Minor Arterial – Class II	700	700	800	800	900	900	800
15	One Way Arterial	750	750	850	850	950	950	850
21	Major Collector	600	600	700	700	800	800	700
22	Minor Collector	500	500	600	600	700	700	600
23	One Way Collector	550	550	650	650	750	750	650
30	Local Road	400	400	500	500	600	600	500
32	Centroid Connector	0	0	0	0	0	0	0

Link Speeds: Link speeds in the model network are derived from a speed lookup table based on facility type and area type. Assumed free-flow speed are approximately 5 mph faster than typical speed limits for the various roadway classes and area types, taking into consideration control for delay (i.e. traffic signals) if applicable. Peak and off-peak free-flow speeds were evaluated using observed speeds obtained from a travel time study conducted in the Augusta area. Based on the initial study of the speeds, a revised speed table was developed. An analysis of the Augusta data determined that Augusta's characteristics and data results are appropriate for use in the other Georgian MPO models. Final free-flow calibrated speeds are shown in the matrix below.

Link Attributes: Input network attributes are shown in Table 4 Highway Network Variables. Additional attributes determined during the model run or planning process are shown below.

Table 7 Link Attributes

Attribute Name	Description
Atype	Area type
GDOT_PI	GDOT project identification number
Local_PI	Local project identification number
Open_date	Model year open to traffic

Table 8 Speed Matrix

No	Facility Type	Area Type						
		1	2	3	4	5	6	7
1	Interstate	55	60	60	60	60	70	70
2	Freeway	50	55	55	55	55	60	60
3	Expressway	50	50	50	50	55	55	55
4	Parkway	45	50	50	50	50	55	55
6	Freeway to Freeway Ramp	55	55	55	55	55	55	55
7	Freeway Entrance Ramp	45	50	50	50	50	55	55
8	Freeway Exit Ramp	22	23	30	31	34	40	47
11	Principal Arterial – Class I	25	28	33	34	37	47	52
12	Principal Arterial – Class II	23	26	31	32	35	45	49
13	Minor Arterial – Class I	22	23	30	31	34	40	47
14	Minor Arterial – Class II	21	22	27	30	32	38	45
15	One Way Arterial	23	26	30	32	35	42	48
21	Major Collector	17	18	21	27	29	34	42
22	Minor Collector	14	15	18	24	26	30	40
23	One Way Collector	17	18	21	27	29	34	42
30	Local Road	14	14	17	18	22	28	35
32	Centroid Connector	14	14	17	18	22	28	35

Turn Prohibitors

Turn Prohibitors: GDOT has a policy of adding turn prohibitions where turn movements are prohibited. Turn penalties are only to be added where **necessary.** A separate text file is created which lists the nodes for the intersection and the type of prohibition.

Sample Turn Penalty File

```
1717  1719  1744 0 -1  ;Emery Highway Median at Fort Hill
1760  1759  1789 0 -1  ;Emery Highway Median near Coliseum
1891  1776  1879 0 -1  ;Emery Highway at Spring St
```

Penalties of three (3) minutes were added to each Fort Stewart access control point to represent the delay due to security procedures at these entry points.

Traffic Analysis Zones

Traffic analysis zone boundaries were determined in consultation with GDOT, HAMPO staff, and local stakeholders including the HAMPO committees. Zone boundaries are consistent with Census boundaries as well as screenlines, major geographic features, the Fort Stewart boundary, and the road network. Bryan County CTP zones were used in that county. There are 354 internal zones in the model area. Zones 1-184 are in Liberty County; Zones 185-221 are in Long County; Zones 222-326 are in Bryan County; the remaining internal zones 327-354 are in Bulloch, Chatham, or Effingham County. There are 25 external stations, numbered 355 to 379.

Socioeconomic Data

The data for each internal zone are consistent with GDOT model guidelines, with the addition of variables unique to the Fort Stewart military installation. GDOT has reviewed base year and future year (2035) data to ensure it meets review guidelines established for all MPO models in the state. Extensive field review was conducted to ensure that current employers were located in the appropriate zone. It should be noted that a systematic error in the Department of Labor addresses was noted and that many employers were therefore located by the study team. The 2035 data was projected based on local Comprehensive Plans and known future development plans. Data was reviewed by HAMPO Committees, stakeholders, and local governments and adopted by the HAMPO Policy Committee. The socioeconomic data in Bryan County is consistent with the data developed for the Bryan County CTP. The table below shows the variable definitions.

Table 9 Socio-Economic and General Data by TAZ

Data Variables	Data Variables	Data Sources
Pop	Population excluding group quarters such as prisons and nursing homes	U.S. Census block-level data (www.census.gov) and local building and demolition permits
HH	Total number of occupied households	
Income	Median household income in 2000 dollars	
Totemp	Total Employment: Sum of retail, service, manufacturing, and wholesale employment	U.S. Census, Georgia Department of Labor (www.dol.state.ga.us), commercial sources (Dun & Bradstreet), local county building permit data, and local
Retail	Retail Employment: Retail Trade jobs in zone	

Data Variables	**Data Variables**	**Data Sources**
Service	Service Employment: Transportation and public utilities; Finance, insurance, and real estate; Services; Federal, State, Local government (or Public Administration) excluding those listed separately below	employment data including data received from Fort Stewart staff regarding troops, civilian employees, contractors, and dependents.
Manuf	Manufacturing Employment	
Whole	Wholesale Employment	
Milisingle	Military living in barracks	
Miliemp	Military employees on Fort Stewart (troops)	
Civilemp	Civilian employees on Fort Stewart	
School	School Enrollment in TAZ where educational facilities are located	Georgia Department of Education, County/Municipalities Boards of Education, Georgia Independent Schools Association, local school systems, private schools, and Georgia Board of Regents
Acres	Developable Acres calculated based on planning staff input and Hinesville GIS data.	Geographic Information Systems

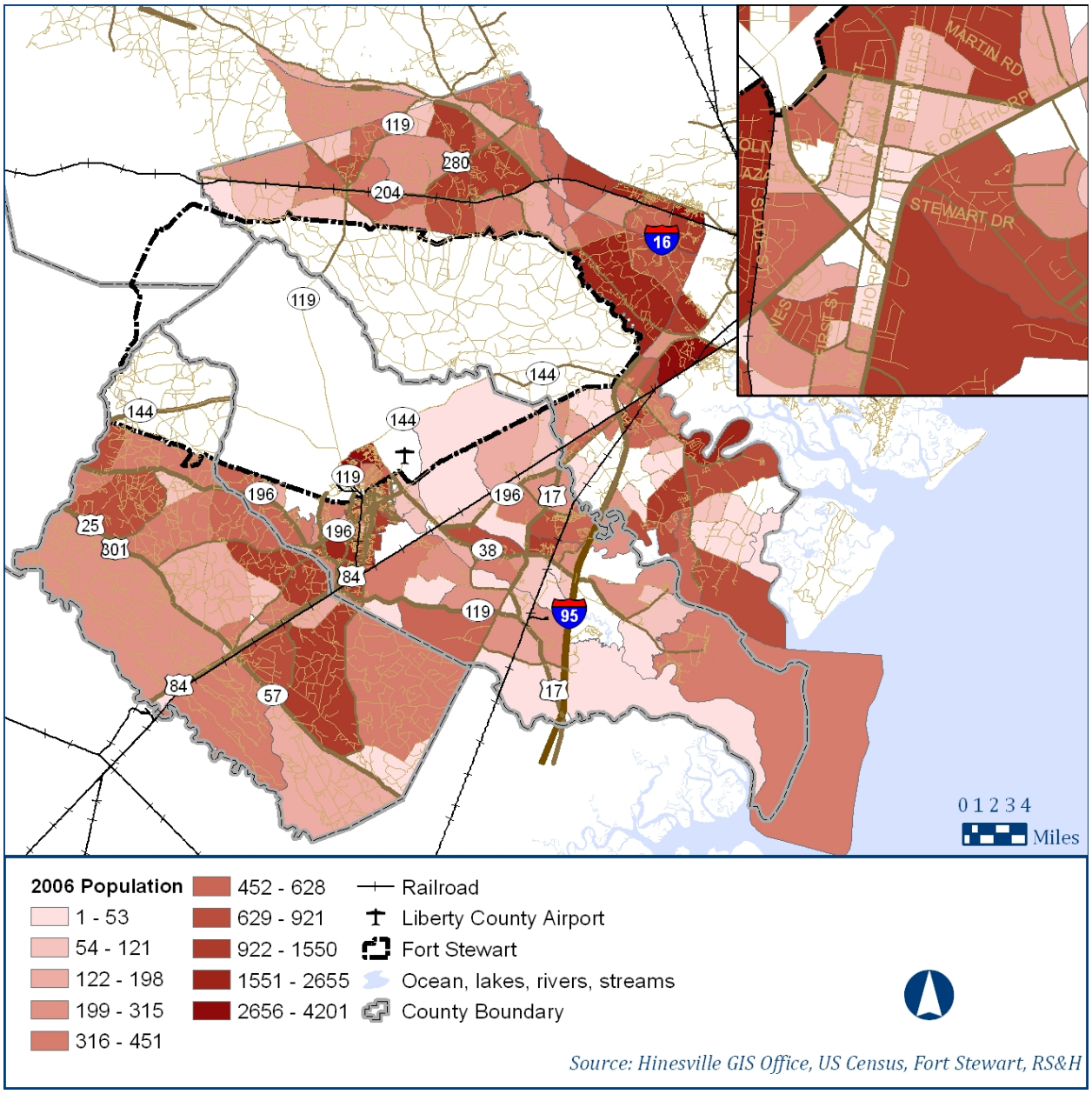

Figure 26 Base Year Population (includes Milisingle)

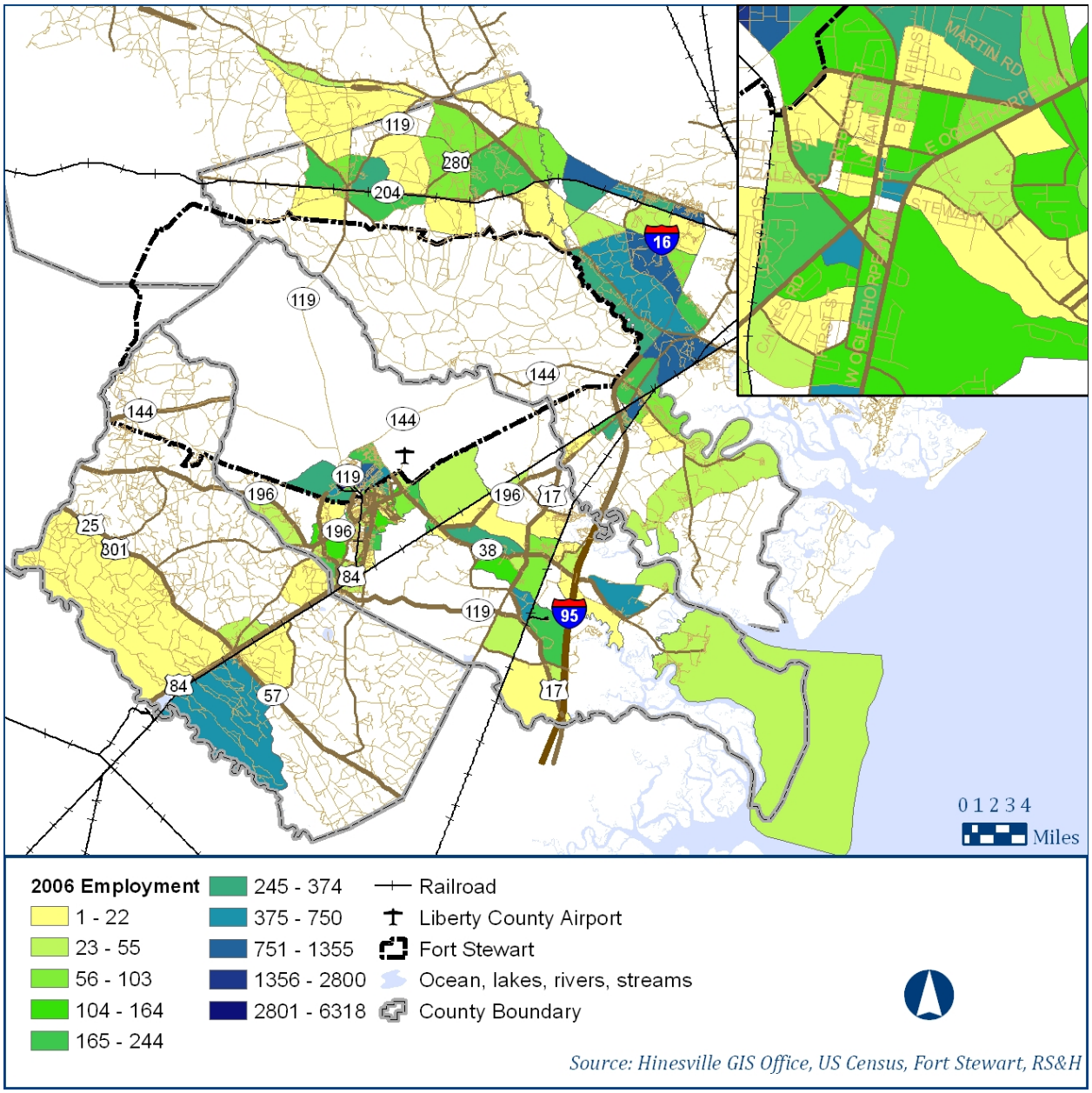

Figure 27 Base Year Employment (includes civilemp and miliemp)

External Model

External stations were coded on all federal and state routes and other significant local roads crossing the study are boundary. GDOT counts were used to identify base year traffic, truck percentages where available, and historic growth in traffic counts at each station. The external trip exchanges were validated to ensure a logical trip pattern for passenger car and truck trips.

Trip Generation

Trip generation follows GDOT guidelines, with the following trip purposes for internal trips:

- Home Based Work (HBW)
- Home Based Other (HBO)

- Home Based Shopping (HBS)
- Non-Home Based (NHB)

The following additional purposes are used for estimation of other vehicle trips:

- Trucks (Commercial Vehicles)
- Internal-External Passenger Cars
- Internal-External Trucks (Commercial Vehicles)

Production Model

The daily person trips are estimated using GDOT trip production rates cross-classified by household size and autos available. The table below shows the trip rates used in the HAMPO/GMP model.

Table 10 Production Rates

HH Size	0 Autos	1 Auto	2 Autos	3+ Autos
Home Based Work				
1	0.285	0.751	0.733	0.909
2	0.750	1.165	1.305	1.422
3	1.556	1.780	1.625	1.983
4+	1.000	1.727	2.109	2.387
Home Based Other				
1	0.694	1.190	1.300	1.818
2	1.350	1.835	2.360	2.688
3	4.444	4.195	4.048	3.600
4+	5.833	6.523	8.122	7.312
Home Based Shopping				
1	0.367	0.411	0.200	0.636
2	0.558	0.882	0.675	0.688
3	0.222	0.585	0.490	0.733
4+	0.417	1.023	0.769	1.151
Non-Home Based				
1	0.245	1.081	1.033	1.364
2	0.500	1.518	1.939	2.016
3	0.889	2.976	2.154	2.667
4+	1.333	2.886	3.184	3.720

The HAMPO/GMP model makes use of GDOT's Household Stratification Sub-model to estimate the number of households in each of 16 strata defined by the household size and number of automobiles available. The Household Size Distribution is shown below.

Table 11 Household Size Distribution

Range of Persons/Household		Household Size Distribution			
From	To	1	2	3	4
	1.0	1.0000	0.0000	0.0000	0.0000
1.0	1.2	0.7812	0.2056	0.0133	0.0000
1.2	1.4	0.6898	0.2568	0.0331	0.0203
1.4	1.6	0.5752	0.3128	0.0687	0.0433
1.6	1.8	0.4839	0.3511	0.1021	0.0630
1.8	2.0	0.4141	0.3537	0.1279	0.1043
2.0	2.2	0.3487	0.3563	0.1464	0.1486
2.2	2.4	0.2872	0.3471	0.1689	0.1968
2.4	2.6	0.2389	0.3274	0.1879	0.2458
2.6	2.8	0.1939	0.314	0.1985	0.2935
2.8	3.0	0.1553	0.2947	0.2076	0.3424
3.0	3.2	0.1253	0.2749	0.2074	0.3924
3.2	3.4	0.1152	0.2489	0.1996	0.4363
3.4	3.6	0.1119	0.2116	0.1932	0.4832
3.6	3.8	0.1038	0.2042	0.1688	0.5232
3.8	4.0	0.1028	0.2032	0.1608	0.5332

Table 12 Household Median Income Distribution

TAZ-level Median HH Income		Income Group1	Income Group2	Income Group3	Income Group4
		<$20,000	$20,000 - $39,999	$40,000 - $59,999	>=$60,000
$0	$2,499	0.8835	0.1165	0.0000	0.0000
$2,500	$4,999	0.8549	0.1168	0.0232	0.0050
$5,000	$7,499	0.8300	0.1318	0.0300	0.0081
$7,500	$9,999	0.7585	0.1468	0.0427	0.0521
$10,000	$12,499	0.6933	0.1826	0.0718	0.0523
$12,500	$14,999	0.6311	0.2131	0.0802	0.0756
$15,000	$17,499	0.5771	0.2465	0.0894	0.0870
$17,500	$19,999	0.5031	0.2938	0.1046	0.0985
$20,000	$22,499	0.4326	0.3321	0.1257	0.1096
$22,500	$24,999	0.3927	0.3387	0.1449	0.1236
$25,000	$27,499	0.3316	0.3581	0.1702	0.1401
$27,500	$29,999	0.3071	0.3488	0.1824	0.1617
$30,000	$32,499	0.2734	0.3395	0.1945	0.1926
$32,500	$34,999	0.2399	0.3356	0.2152	0.2093
$35,000	$37,499	0.2108	0.3322	0.2254	0.2316
$37,500	$39,999	0.1825	0.3143	0.2418	0.2615
$40,000	$42,499	0.1655	0.2840	0.2612	0.2893
$42,500	$44,999	0.1501	0.2688	0.2676	0.3134
$45,000	$47,499	0.1391	0.2550	0.2663	0.3396
$47,500	$49,999	0.1207	0.2387	0.2649	0.3758
$50,000	$52,499	0.1188	0.2142	0.2569	0.4101
$52,500	$54,999	0.1016	0.2012	0.2566	0.4407
$55,000	$57,499	0.0945	0.1894	0.2480	0.4682
$57,500	$59,999	0.0901	0.1853	0.2256	0.4990
$60,000	$62,499	0.0844	0.1684	0.2102	0.5371
$62,500	$64,999	0.0766	0.1598	0.2025	0.5612
$65,000	$67,499	0.0688	0.1510	0.1948	0.5854
$67,500	$69,999	0.0653	0.1416	0.1926	0.6004
$70,000	$72,499	0.0601	0.1271	0.1833	0.6295
$72,500	$74,999	0.0535	0.1218	0.1698	0.6549
$75,000	$77,499	0.0512	0.1087	0.1636	0.6765
$77,500	$79,999	0.0485	0.1042	0.1551	0.6922
$80,000	$82,499	0.0446	0.0991	0.1465	0.7099
$82,500	$84,999	0.0405	0.0939	0.1455	0.7202
$85,000	$87,499	0.0364	0.0889	0.1359	0.7387
$87,500	$90,000	0.0350	0.0839	0.1238	0.7573

Table 13 Household Size/Income/Auto Ownership Distribution

Income Group	Persons Per Household	Autos Available			
		0	1	2	3+
1	1	0.30628	0.66893	0.02479	0.00000
	2	0.09778	0.67778	0.22222	0.02222
	3	0.07326	0.69093	0.16279	0.07302
	4+	0.10000	0.59941	0.17647	0.15412
2	1	0.25483	0.47759	0.22586	0.04172
	2	0.04000	0.21400	0.63200	0.11400
	3	0.111:1	0.12556	0.60233	0.16000
	4+	0.09000	0.17797	0.39420	0.20783
3	1	0.18333	0.60560	0.15775	0.05332
	2	0.02740	0.15767	0.63425	0.17068
	3	0.09000	0.11500	0.30333	0.30167
	4+	0.06000	0.04381	0.38619	0.51000
4	1	0.05769	0.66539	0.20000	0.07692
	2	0.06944	0.13444	0.53222	0.29389
	3	0.02000	0.05814	0.50977	0.41209
	4+	0.01892	0.04054	0.54054	0.40000

Attraction Model

Person trips attractions are estimated using GDOT standard equations. Some attractions are adjusted to reflect characteristics of model subareas. The attraction equations are:

HBW: 1.196*Total Employment

HBO: 0.5077*Population + 0.967*Total Employment + 1.5258*School Enrollment

HBS: 5.2*Retail Employment

NHB: 0.293*Population + 2.82108*(Retail Employment + Wholesale Employment) + 0.6984*(Service Employment + Civilian Employees)

Trucks

Internal truck trips include both large trucks and smaller commercial vehicles. Truck trip generation rates are based on trip rates from the *Quick Response Freight Manual (Federal Highway Administration - Travel Model Improvement Program)*. The following equation is used for truck trip productions and attractions:

Truck Trips: 1.284*(Manufacturing Employment + Wholesale Employment) + 1.206*Retail Employment + 0.514*(Service Employment + military employees + civilian employees) + 0.388*Households

External Trips

Traffic counts on highways that serve external trips (i.e., external stations) control the overall magnitude of external trips. Traffic at each external station is split into E-E passenger cars, E-E trucks, I-E passenger cars and I-E trucks. Assumed shares for external trip types are based on logical assignments. The share of E-E trips primarily depends on the facility type of the highway and its continuity with major highways that serve thru trips. Higher class roads with good thru trip

connectivity will have higher E-E trip shares than lower class roads with lesser connectivity. Classification counts or typical vehicle type distributions are used to set passenger car and truck percents. It is possible using E-E trip shares and passenger car and truck shares to determine control totals for all external trip types.

E-E trips are allocated to other external stations based on the magnitude of external trips at the potential destination and the distance between the stations. The higher the traffic count, the more likely it will attract E-E trips. The external trip estimation process assumes that the larger the distance between external stations, the higher the probability that trip interchange will serve E-E trips (i.e., since E-E trips travel completely thru the region, they are usually long distance trips).

For I-E trips, it is necessary to estimate the internal location for the trip ends. This is done using the following regression equations:

I-E Cars: 0.331*Households + 0.724*Total Employment

I-E Trucks: 0.078*Retail Employment + 0.228*Manufacturing Employment + 2.149*Wholesale Employment

Trip Generation Validation

The HAMPO trip generation component was validate to generally accepted targets. The file TRTRG00A.s contains the trip gen adjustments, which are based on the following assumptions:

- Hinesville and Fort Stewart IE productions are reduced to balance with attractions because they are local activity centers.
- Liberty County (outside of Hinesville and Fort Stewart) IE productions are reduced.
- Fort Stewart non-home based attractions are increased to account for military destinations such as business meetings and other regular events.
- Richmond Hill and the rest of Bryan County have a higher IE trip rate because of its proximity to Savannah and residential character.
- Richmond Hill and Bryan County HBW productions are reduced to account for increased IE trips from Richmond Hill.
- Pooler and Chatham County HBW productions are reduced.

These are shown in the table below.

Table 14 Trip Generation Validation

Validation Measure	Target Range / Value	Base Year Model
Person Trips Per Household	8.5 - 9.2	8.3*
Person Trips Per Person	3 - 4	3.1
HBW Trips / Employee	< 2	1.4
Shopping Trips / Retail Employment	-	5.8
P/A Ratio Before Balancing (HBW)	0.9 - 1.1	1.0
P/A Ratio Before Balancing (HBO)	0.9 - 1.1	1.0
P/A Ratio Before Balancing (HBShop)	0.9 - 1.1	1.1
P/A Ratio Before Balancing (NHB)	0.9 - 1.1	1.1

* The natural fluctuation in the population and employment on Fort Stewart is reflected in the trips/household falling below target. Because the military and their dependents were present for only part of the base year but are included in the socioeconomic data, and because we validated to traffic counts taken throughout the year, this statistic seems reasonable. There is an inherent

uncertainty in the population and employment present at Fort Stewart on any given day of the year and this uncertainty will continue into the future.

Trip Distribution Validation

Target trip lengths were based on CTPP trip lengths for the study area and generally accepted targets consistent with GDOT guidance.

Table 15 Trip Length Validation

Validation Measure	Target Range / Value	Base Year Model
Average Trip Length (HBW)	17.5-19.4 Census Transportation Planning Package Average Work Trip Time +/- 5%	18.9
Average Trip Length (HBO)	15.5-17.2 Set relative to the HBW target	17.2
Average Trip Length (HBShop)	14.7-16.3 Set relative to the HBW target	15.1
Average Trip Length (NHB)	12.9-14.3 Set relative to the HBW target	14.2
Average Trip Length (Truck)	N/A	27.2
% Intrazonal Trips	< 10%	9%

Screenlines

Table 16 shows the estimated traffic volumes versus counts taken across each screenline in the model.

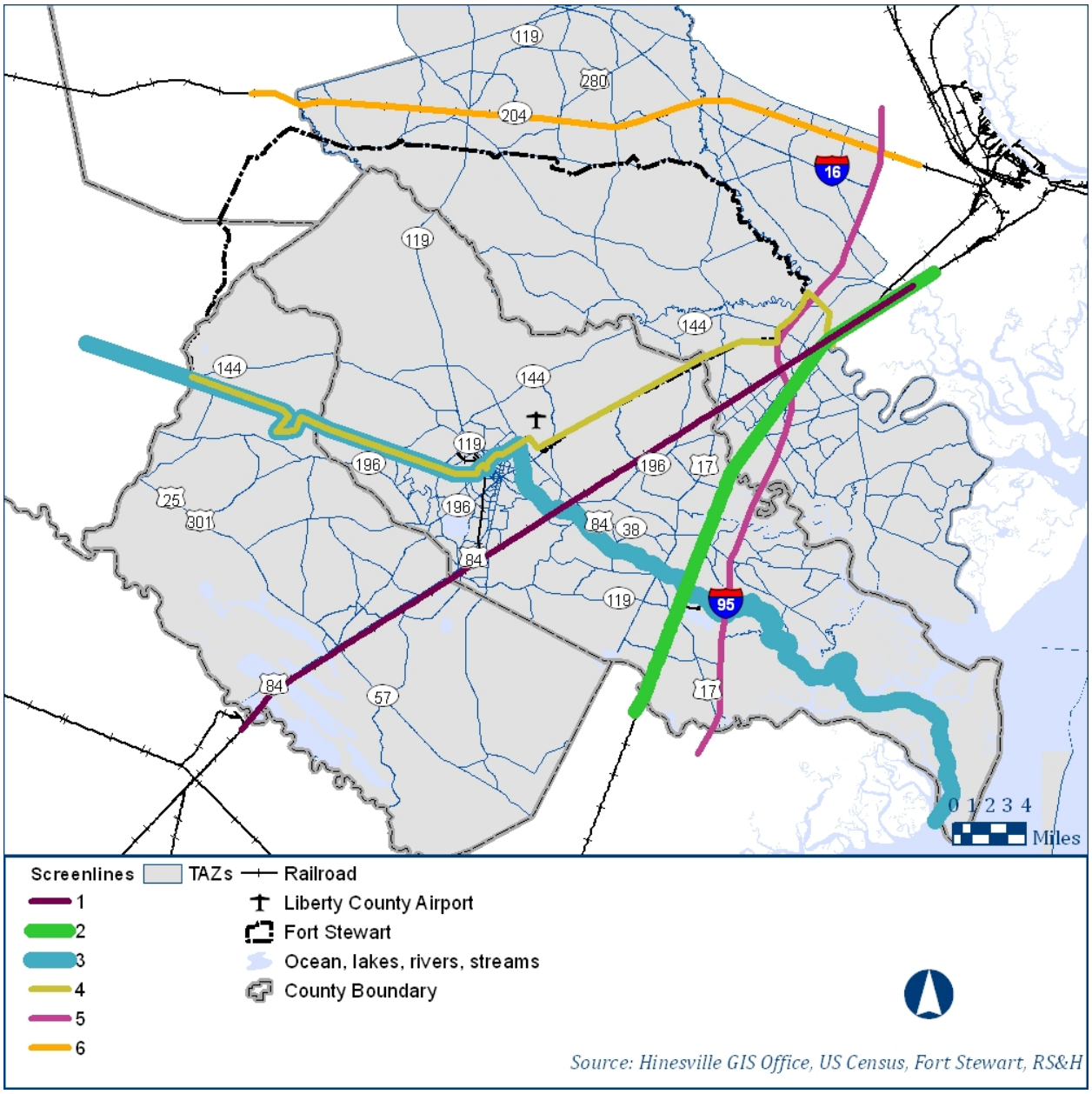

Figure 28 HAMPO/GMP Travel Demand Model Screenlines

Trip Assignment

Trip Assignment estimates the number of trips that choose specific alternative travel paths between any given pair of zones. Trip assignment in GDOT travel demand models is limited to highway vehicle trips. Both passenger cars and trucks are assigned to potential highway paths. GDOT uses equilibrium assignment methods. A passenger car equivalency of 1.5 is used for trucks. Individual volumes are stored for passenger cars by purpose, I-E, E-E and trucks for each link.

Validation

The HAMPO highway assignment module was validated by comparing assigned volumes to expected targets based on observed traffic volumes by HPMS class, facility type, magnitude of observed traffic volume, and across the screenlines discussed above.

Table 16 Trip Assignment Validation

Trip Assignment	Target	HAMPO 2006 model
VMT-Interstates	1,464,952	1,510,552
VMT-Principal Arterials	871,249	820,231
VMT-Minor Arterials	817,783	942,159
VMT-Collectors	501,496	428,995
VMT-Total	3,655,479	3,701,938
VMT / Household	72.5	73.4
VMT / Person	27.4	27.7
Screenlines		
All Counts	+/- 8 %	2%
Railroad east of Hinesville through Richmond Hill	+/- 20 %	11%
Railroad through Riceboro, east of Midway, through Richmond Hill	+/- 22 %	8%
Cay Creek south of US 84 and Fort Stewart boundary	+/- 23 %	0%
Fort Stewart southern border	+/- 21 %	14%
Eastof I-95	+/- 23 %	15%
North of Fort, east-west through Pembroke	+/- 23 %	11%
Total	< 40%	36%
AADT Volume Group: 0 - 5,000	< 100%	88%
AADT Volume Group: 5,001 - 10,000	< 75%	38%
AADT Volume Group: 10,001 - 15,000	< 50%	32%
AADT Volume Group: 15,001 - 20,000	< 30%	16%
AADT Volume Group: 20,001 - 30,000	< 30%	27%
AADT Volume Group: > 30,000	< 30%	16%

Additional information can be obtained from the GDOT model guidance.

APPENDIX B TRAVEL DEMAND TECHNICAL NOTES

This section addresses specific assumptions made to meet the needs of the GMP transportation assessment scope. Based on the state control scenario total non-military employment and population by traffic analysis zone received in June 2010, socioeconomic inputs were developed for 2015, 2020, and 2030 travel demand modeling. Per the Fort Stewart GMP Assistant Director, the baseline growth scenario and state control scenario have negligible differences. Therefore, only the state control scenario was used for the draft transportation assessment.

In order to distribute future employment into model categories, RS&H assumed that the 2035 distribution by TAZ for the LRTP model would apply to 2030 total nonmilitary employment in each TAZ. Where the TAZ 2035 LRTP employment was zero but the GMP figures were non-zero, the overall county distribution was assumed to apply to the TAZ. RS&H assumed that the distribution of military employment within Fort Stewart in future years would match the 2035 LRTP distribution. 2035 TAZ specific figures (for military and civilian employees on Fort Stewart) were factored to match the total military employment received from the GMP for 2030, 2020, and 2015. This is consistent with GMP assumptions that military employment will not increase after 2013.

When reviewing results of the travel demand model, it should always be noted that the model represents a typical weekday and is validated to traffic count data received from GDOT. Traffic counts are taken throughout each year and are factored to represent average annual daily traffic. This means that peak traffic characteristics will likely be more severe than the model indicates.