CHAPTER 4. ROADWAYS

4.1 INTRODUCTION

4.1.1 Definition of Resource

4.1.1.1 On Base Roadways

On base roadways herein refers to transportation roadway features that support vehicular and pedestrian traffic within the Department of Defense (DoD) military bases. This chapter describes the existing roadway conditions and known operations within Andersen Air Force Base (AFB), Andersen South, Naval Computer and Telecommunications Station (NCTS) Finegayan, Finegayan South, Navy Barrigada, Air Force Barrigada, Naval Base Guam, and the Naval Munitions Site (NMS). Additionally, off base existing road conditions and operations for features directly connected to various alternatives (such as, Former Federal Aviation Administration [FAA] parcels, Harmon Annex, and Route 15 lands) have been addressed under the section of non-DoD land within each area of interest. As described in the Affected Environment subsection of Volume 2, the island is divided up into four regions: North, Central, Apra Harbor, and South.

The possible effects on roadways within the bases as a result of the increase in the number of vehicle and vehicle movements from the proposed relocation of Marines from Okinawa to Guam are also assessed and presented in Section 4.2 of this chapter.

4.1.1.2 Off Base Roadways

Off base roadways herein refers to transportation roadway features that support vehicular traffic, public transit service, pedestrian facilities and bicycle facilities outside of the DoD military bases. This section describes the existing conditions of the off base roadways within their respective regions – North, Central, Apra Harbor, and South.

<u>Data Collection</u>

Traffic Volumes and Congestion

Existing traffic volumes for all of the roadways included in this study were determined by using a TransCAD model and existing traffic counts. To understand existing traffic conditions, the existing 2003 TransCAD model was calibrated for 2008 conditions. In addition, traffic counts were taken at multiple locations across the island and compared to the TransCAD results, and they were found to be within the tolerance limits for accuracy. TransCAD is a traditional three-step model that includes:

- Trip generation – where the vehicle trips are originating from
- Trip distribution – the destination to where the vehicles are traveling
- Trip assignment – the route(s) used to get to the destination

Population and employment data are used to calculate the daily to and from trips between Traffic Analysis Zones, which are areas of land that are usually residential or commercial in nature. The results of this analysis can be found in maps for each region.

Traffic congestion is measured by dividing the number of cars on the road (i.e., volume) by the number of cars the road was designed to carry (i.e., capacity). A volume to capacity (v/c) ratio greater than 1 indicates that the roads are carrying more vehicles than they were designed to handle – the roads are congested.

Intersection Operations

Forty-two intersections along the major street network across the island were analyzed for traffic operations for signalized and unsignalized intersections. The intersections were evaluated using the methodologies outlined in the Highway Capacity Manual (Transportation Research Board 2000). Traffic counts were taken at each of the 42 intersections in 2008. The Synchro computer model, that incorporates the Highway Capacity Manual methodology, used these traffic counts to determine traffic operations for the signalized and unsignalized intersections and military access points for a.m. and p.m. peak hours.

The results of the intersection operational analyses were used to assess the Level of Service (LOS) experienced by the drivers. The LOS describes the quality of traffic operating conditions, ranging from A to F, and is measured as the duration of delay that a driver experiences at a given intersection. LOS A represents free-flow movement of traffic and minimal delays to motorists. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in congestion.

The duration of delay was measured differently for signalized intersections compared to unsignalized intersections. Because an unsignalized intersection does not generally have as much traffic as a signalized intersection, the LOS delay is typically shorter than at a signalized intersection. In addition, studies have shown that at unsignalized intersections, drivers tend to become impatient with long delays and may use inadequate and unsafe gaps in the traffic stream to make left turns or enter the major street. Table 4.1-1 provides the delay thresholds for signalized and unsignalized intersections.

Table 4.1-1. Delay Thresholds for Level of Service

LOS	*Signalized Intersection (seconds/vehicle)*	*Unsignalized Intersection (seconds/vehicle)*
A	0.0-10.0 Seconds	0.0-10.0 Seconds
B	10.1-20.0 Seconds	10.1-15.0 Seconds
C	20.1-35.0 Seconds	15.1-25.0 Seconds
D	35.1-55.0 Seconds	25.1-35.0 Seconds
E	55.1-80.0 Seconds	35.1-50.0 Seconds
F	Greater than 80.0 Seconds	Greater than 50.0 Seconds

Legend: LOS = Level of Service.
Source: Transportation Research Board 2000.

The LOS rating deemed acceptable varies by jurisdiction, facility type, and traffic control device. At signalized intersections, LOS D is generally recognized as the minimum desirable operating condition; however, according to the 2030 Guam Transportation Plan it is recommended that, “All intersections and roadway segments should operate at LOS E during peak periods. Improvements undertaken by Guam DPW would be designed to alleviate substandard LOS conditions to the extent feasible, with due consideration to physical and environmental constraints” (Guam Department of Public Works [GDPW] 2008:7-2). For purposes of this study, any LOS better than LOS F would be considered acceptable.

Roadway Network

Guam's existing roadway network has developed into a multi-lane roadway system that serves commercial, retail, military, and tourist-based travel demands. Based on a preliminary classification map, roadways included in this study are classified as one of the following:

- Major Arterial – Roadways with four to six lanes, that have a high degree of mobility and limited access points.
- Minor Arterial – Roadways with two to four lanes, that still have a higher degree of mobility and fewer access points, however, not to the extent of major arterials.
- Major Collector – Roadways with two lanes that have lower speeds than arterials and often connect local roads to arterials.

As part of the Guam and Commonwealth of the Northern Mariana Islands Military Relocation Project, much of the roadway network would require improvements from their current conditions. The proposed improvements are discussed in the Proposed Action and Alternatives chapter, Off Base Roadways section (Volume 6, Chapter 2, Section 2.5). The roads proposed for improvement with this project include (see Project Description in Volume 6, Chapter 2, Section 2.5, Figure 2.5-8):

- Route 1
- Route 2A
- Route 3
- Route 5
- Route 8
- Route 8A
- Route 9
- Route 10
- Route 11
- Route 12
- Route 15
- Route 16
- Route 25
- Route 26
- Route 27
- Route 28
- Chalan Lujuna
-

The existing conditions of the off base roadways are described in the following sections. This includes a discussion of traffic volumes and congestion, as well as intersection operations for 42 intersections. A list of the intersections both signalized and unsignalized, also included in this project can be found within each region.

Public Transportation

Public transportation on Guam includes the following modes and service types:

- Tour buses
- Shopping buses
- Taxis
- School buses
- Special service for Navy shore leave
- Guam Mass Transit
- Fixed-route (buses on designated routes at prescribed headways)
- Demand-response (reservation-type service linking residential areas with fixed-route service or nearby activity centers)
- Paratransit

For purposes of this project, the discussion focuses on Guam Mass Transit. It describes the existing conditions for fixed-route, demand-response service (DRS) areas, and paratransit service in each of the four regions. DRS provides service by reservation to activity centers or areas with fixed-route service.

There is overlap between the routes, DRS areas, and paratransit areas in the regions, so descriptions of routes and areas may be described in multiple areas.

There are currently six fixed-routes, seven DRS areas, and five paratransit areas on the island. A section of Chamorro Village, located in Hagatna, currently acts as a transit center consisting of a shared-use parking lot with two bus shelters. Only one route in the fixed system is not anchored by this location.

In addition to the fixed routes, all DRS routes originate and terminate at Chamorro Village. In this respect, the current network acts as a low-frequency "pulse" system, having most of the routes service one central location simultaneously to maximize transfer potential.

The third type of mass transit on Guam is paratransit. Paratransit service, provided by Guam Mass Transit, supplies door-to-door transportation for persons with certified disabilities and is available by advance reservation. Hours of operation are 5:30 a.m. to 7:30 p.m., Monday through Saturday, and 7:30 a.m. to 6:30 p.m. on Sundays and holidays.

There are overall scheduling issues with mass transit on the island. Buses generally run ahead of the published schedule, and they do not adhere to slower speeds or wait time to follow the schedule, that often causes passengers to miss the bus and thus does not provide a reliable public transportation system on the island.

The 2030 Guam Transportation Plan (GDPW 2008) outlines recommendations for an improved mass transit system on Guam. These recommendations included forming the Guam Mass Transit Authority and implementing high-capacity bus service on the island. In late 2009/early 2010, the Guam Regional Transit Authority was formed and will now be responsible for all public transit functions. The Guam Regional Transit Authority approved the Guam Transit Business Plan in January 2010, which includes purchasing new buses, constructing a bus maintenance facility, and modifying the bus schedule.

Pedestrian and Bike Facilities

Guam has limited accommodations for pedestrian and bicycle travel; and the type, quantity, and quality of facilities varies throughout the island. Sidewalks and roadway shoulders comprise the existing pedestrian and bicycle system. Most of the 26 miles (mi) (42 kilometers [km]) of sidewalk is on the central western portion of the island, in the Hagatna and Tumon Bay area, as described in the Central Region. No marked or designated bicycle lanes or paths exist at this time. Where no sidewalks are present, the shoulder generally functions as a pedestrian and bicycle space and is used for running and cycling. The width and condition of roadway shoulders varies throughout the island. Shoulders are present along large segments of Route 1 and on Route 3 from Route 1 to Route 28; however, pedestrian and bicycle mobility and safety on road shoulders can be impeded by conflicting uses, such as parking.

Most of the signalized intersections included in this study contain a pedestrian indication on at least one of the intersection legs. Marked crosswalks and pedestrian safety devices are present at all signalized intersections. Crosswalks use the standard (i.e., two parallel lines) or continental marking pattern.

The condition of pedestrian facilities generally mirrors general road conditions and is deteriorated in some areas. Sidewalks often contain obstructions, such as fire hydrants, power poles, traffic signal controllers, or other utilities.

Pedestrian/auto accidents are a common occurrence on Guam. Most of these accidents occur at night in areas where street lighting levels are low and where pedestrian crosswalks do not exist, are not clearly marked, or are spaced too far apart. In addition, along village streets, there is a lack of sidewalks and, in many instances, minimal shoulder space for pedestrians.

Recently passed, Guam public law (Bill 273) requires the consideration and construction of bicycle and pedestrian paths with all new road construction projects. The 2030 Guam Transportation Plan (GDPW 2008) also identifies a plan for bicycle facilities that includes detached paths, paved shoulders, and wide outside lanes, depending on the roadway. Bicycle and pedestrian improvements will be incorporated into the off base roadway improvement project as much as practicable.

4.1.2 North

4.1.2.1 On Base Roadways

<u>Andersen AFB</u>

Andersen AFB has two access gates. The Main Gate provides access between Route 1 and Arc Light Boulevard. Arc Light Boulevard is the main roadway on base and provides an east-west route across the base. The Back Gate is about 1.1 mi (1.8 km) southeast of the Main Gate and provides access between Route 15 and Santa Rosa Boulevard. Santa Rosa Boulevard passes through housing areas on base. All of the base roadways are two lanes (one lane in each direction) with additional separate turning lanes at major intersections. All the on base intersections are currently controlled by two- or all-way stop signs.

The Andersen Air Force Base Traffic and Safety Engineering Study (Andersen AFB 2008) found that most of the on base intersections were operating at acceptable levels of service with the exception of several intersections along Arc Light Boulevard. The study recommended improvements for these problem intersections.

4.1.2.2 Finegayan

NCTS Finegayan is accessed by the gate between Route 3 and Bullard Avenue. South Finegayan can be accessed at two points; the intersection between Royal Palm Drive and Route 3, and the intersection between Coral Tree Drive and Route 3. All of the base roadways are two lanes (one lane in each direction).

Based on the relatively low traffic demand on Finegayan, all roadways and intersections should be operating at acceptable levels of service for both the a.m. and p.m. peak hours.

4.1.2.3 Off Base Roadways

<u>Existing Roadway Conditions</u>

Route 1

Route 1, also known as Marine Corps Drive, is a major arterial roadway that extends approximately 22.0 mi (35.4 km) from Andersen AFB in Yigo on the northeastern corner of the island down to Naval Base Guam in Santa Rita in the central western area of the island. Route 1 from Andersen AFB to Route 29 in Yigo is a four-lane road with a raised median. The lanes are approximately 12.0 feet (ft) (3.6 meters [m]) wide. There is a shoulder on either side of the road; however, there is no curb and gutter or sidewalk. The median becomes flush at Route 29 and continues to Chalan Lujuna in Yigo. Portions of Route 1 are not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 3

Route 3 is located on the northern end of the island in Dededo. It connects with Route 9 at the Route 3A intersection and intersects Route 1 at its southern terminus. Route 3 is 5.7 mi (9.2 km) long. From Route 1 to Route 28, it is a minor arterial that consists of four lanes with intermittent center turn lanes and shoulders and no curb and gutter or sidewalks. From Route 28 to Route 9, the roadway decreases to two lanes with no median/center lane, shoulders, curb and gutter, or sidewalk. The lanes are generally 12.0 ft (3.6 m) wide. Route 3 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 9

Route 9 is located on the northern end of the island near Andersen AFB and connects Route 3 at its western terminus with Route 1 at its eastern terminus at the entrance to Andersen AFB. Route 9 is 3.1 mi (5.0 km) long and is classified as a minor collector. The road has two lanes with limited median/center turn lane, intermittent shoulders, curb and gutter, and no sidewalks. Route 9 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 15

Route 15 is located on the northeastern part of the island, with its northern terminus in Yigo and southern terminus in Chalan-Pago-Ordot at Route 4. Route 15 is 14.2 mi (22.8 km) long and is classified as a minor arterial in the North Region. The portion of Route 15 in the North Region is approximately 0.75-mi (1.2 km). From Smith Quarry to just north of Chalan Lujuna, there are two lanes with no center lane, a flush median, no shoulders, curb and gutter, or sidewalk. The lanes are generally 12.0 ft (3.6 m) wide.

Route 28

Route 28 is located on the northern part of the island and connects Route 1 with Route 3 in Dededo. Route 28 is 3.9 mi (6.3 km) long and is classified as a minor arterial. The road has two lanes with intermittent median or center lane, no shoulders, curb and gutter, or sidewalks. The lanes are generally 11.0 ft (3.4 m) to 12.0 ft (3.6 m) wide.

The intersections and military access points included in the North Region are listed in Table 4.1-2.

Table 4.1-2. Intersections and Access Points – North Region

Intersections and Military Access Points – North	
Signalized	
Route 1/9/Andersen AFB Main Gate	Route 1/29
Route 3/28	
Unsignalized	
Route 3/3A/9	Route 15/29
Military Access Points	
Route 3 – South Finegayan/Residential Gate	

Legend: AFB = Air Force Base.

<u>Existing Traffic Volumes and Capacity</u>

A summary of existing average daily traffic (ADT) volumes and capacity (2008) for the North Region can be found in Table 4.1-3.

Figure 4.1-1 and Figure 4.1-2 show existing levels of traffic congestion in the northern part of Guam for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

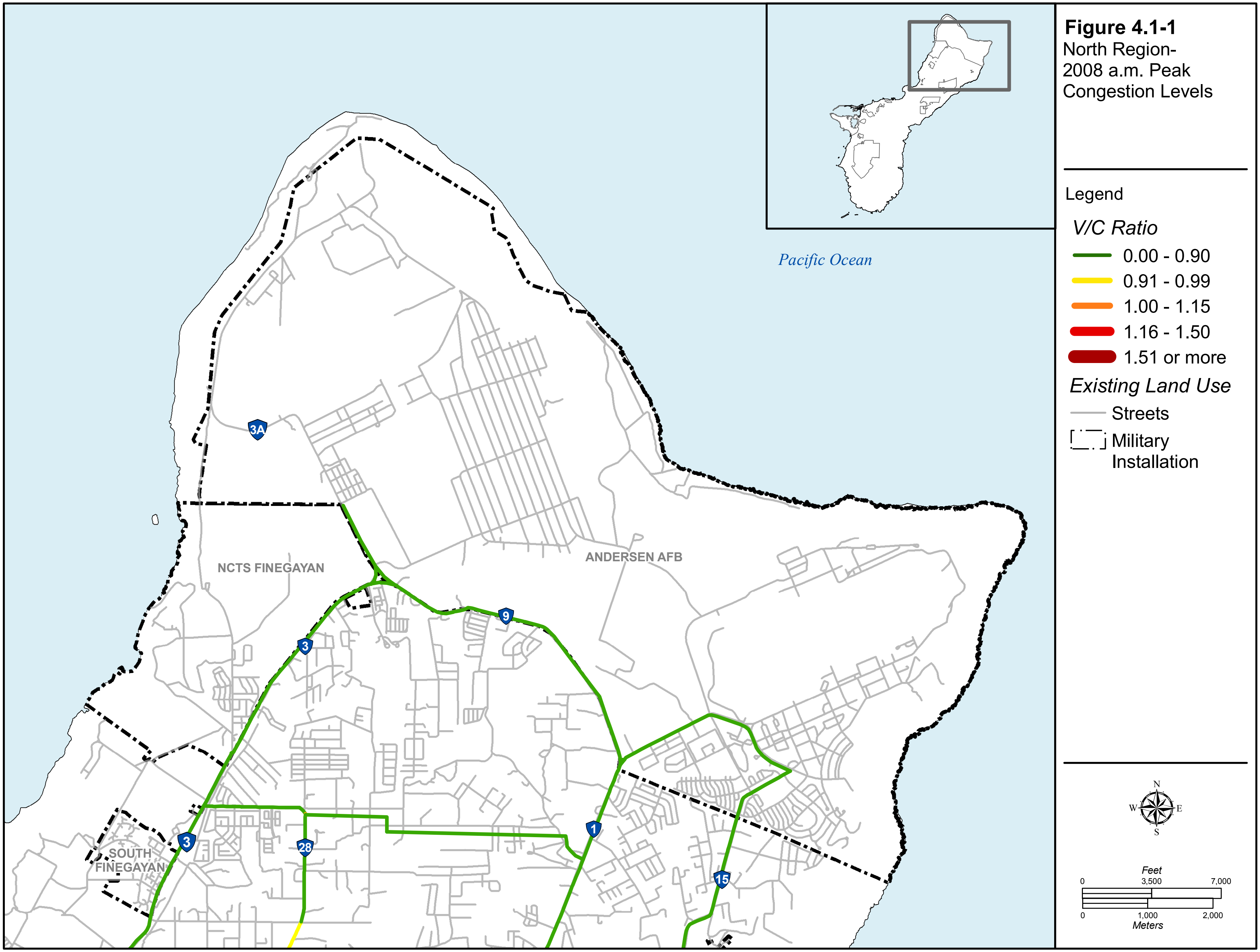


Figure 4.1-1
North Region-
2008 a.m. Peak
Congestion Levels
Legend
V/C Ratio
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
Pacific Ocean
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
9
3
1
28
15
N
S
E
W
Feet
0
3,500
7,000
0
1,000
2,000
Meters

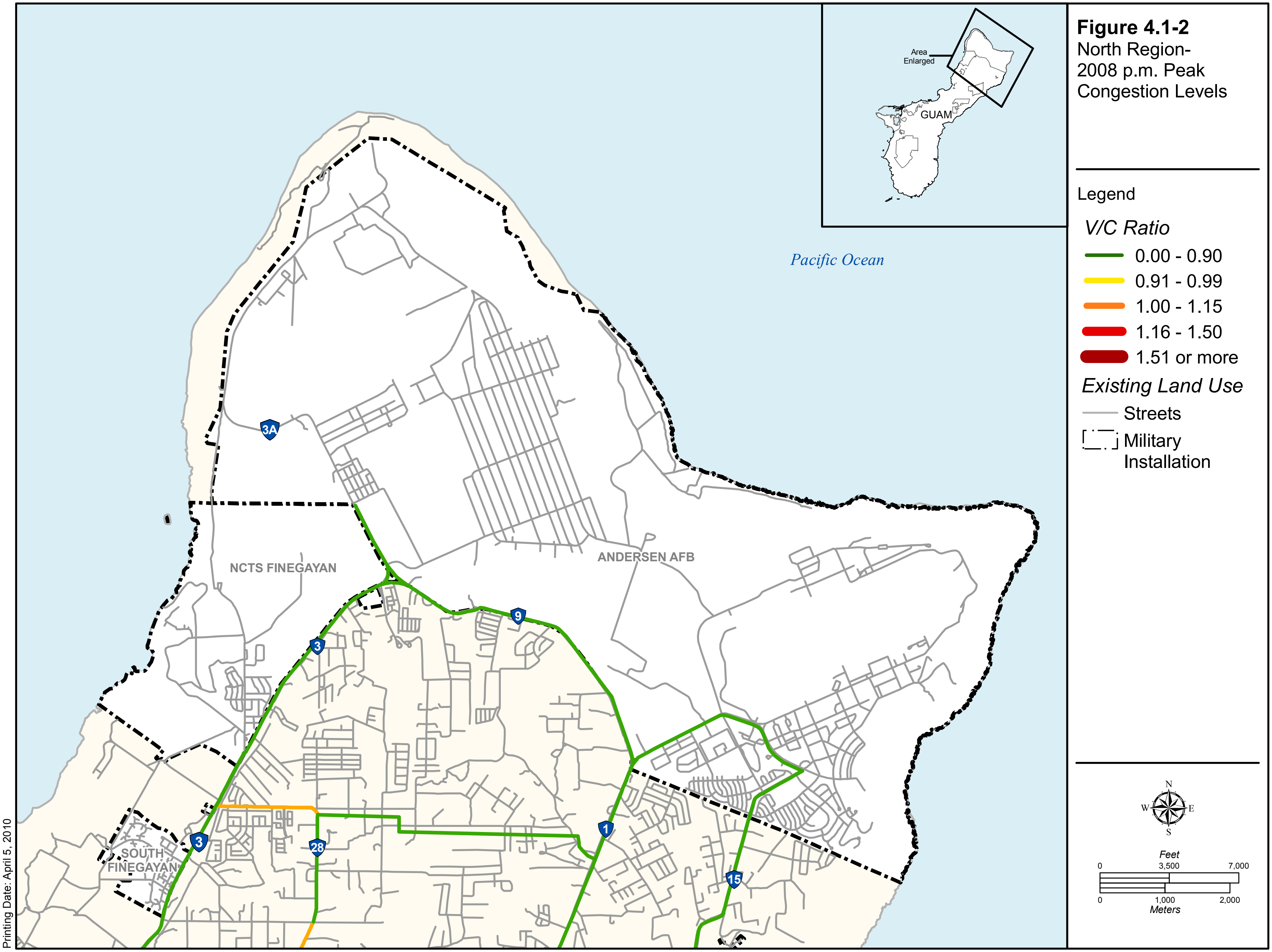


Figure 4.1-2
North Region-
2008 p.m. Peak
Congestion Levels
Area
Enlarged
GUAM
Pacific Ocean
Legend
V/C Ratio
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military
Installation
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH
FINEGAYAN
3A
9
3
28
1
15
N
S
E
W
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: April 5, 2010

Table 4.1-3. Existing ADT and Volume to Capacity Ratio Summary – North Region

Roadway	*Existing ADT Summary*	*Existing v/c Ratio*
Route 1	Route 1 ranges from 14,000 to 19,000 vehicles per day (vpd). Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.
Route 3	Route 3 ranges from 6,800 to 15,000 vpd. Traffic increases south of the intersection with Route 28.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.
Route 9	Route 9 ranges from 2,700 to 4,400 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.
Route 15	Route 15 has 4,300 vpd.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.
Route 28	Route 28 ranges from 9,400 to 9,500 vpd.	The north/south portion of Route 28 has a v/c ratio of 0.81-0.99, and the east/west portion has a v/c ratio of 0.00-0.80 in the a.m. peak. The roadway is not considered congested in the a.m. The north/south portion of Route 28 has a v/c ratio of 0.81-0.99, and the east/west (and part of the north/south) portion has a v/c ratio of 1.00-1.15 in the p.m. peak. The roadway is considered congested in the p.m. on the east/west portion.

Legend: ADT = average daily traffic; AFB = Air Force Base; v/c = volume to capacity; vpd = vehicles per day.

The roads serving major residential and employment centers, such as Dededo and Tamuning, are currently the most congested. These roads are also roads that would be heavily used by the military. During both the morning and afternoon peaks, the road with the greatest congestion levels in the North Region is Route 28; however, in the a.m. conditions, the ratio is still below 1, which means the road is not considered congested. This is not true for the p.m. conditions, as portions of Route 28 have a v/c ratio between 1 and 1.15, which indicates the road is congested.

Existing Intersection Operations

In the existing conditions, all intersections in the North Region operate at acceptable LOS E or better except for the following intersection:

- Route 1/29 (a.m. peak hour only)

Table 4.1-4 displays the LOS and delay results for the study intersections in the North Region.

Existing Public Transportation

The discussion of existing conditions in this section would focus on the Guam Mass Transit System in the North Region.

Figure 4.1-3 illustrates the fixed routes and DRS areas for the North Region. A demand-response area is a geographical area that is served by the demand-response type of bus service described earlier. Note that all of the Monday through Friday fixed routes originate at Chamorro Village, which is located in Hagatna and is not shown on this map. The Grey Line 4, which only runs on Sundays and holidays, is the only bus route that is partially included in the North Region. The DRS areas located in the North Region are

Grey 1, Grey 2, and Grey 3. These routes provide service on Monday through Saturday only, and they all observe the normal 5:30 a.m. to 7:30 p.m. hours of service. DRS is available on call and normally provides transportation to the nearest fixed-route. Table 4.1-5 shows details about the fixed route and DRS areas in the North Region.

Table 4.1-4. Existing Level of Service and Delay Results – North Region

	a.m. Peak Hour		*p.m. Peak Hour*	
	LOS	*Delay (Seconds)*	*LOS*	*Delay (Seconds)*
Signalized*				
Route 1/9	C	25.8	D	46.1
Route 1/29	F	97.4	C	24.0
Route 3/28	C	26.8	B	17.4
Unsignalized**				
Route 3/3A/9	B	10.1	A	9.6
Route 15/29	D	30.7	C	18.3
Military Access Points**				
Route 3 - Main Cantonment/Commercial Gate**	C	17.9	B	13.0
Route 3 - Main Cantonment/Main Gate**	D	25.7	C	15.9
Route 3 – South Finegayan/ Residential Gate	C	23.9	D	30.0

Legend: LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

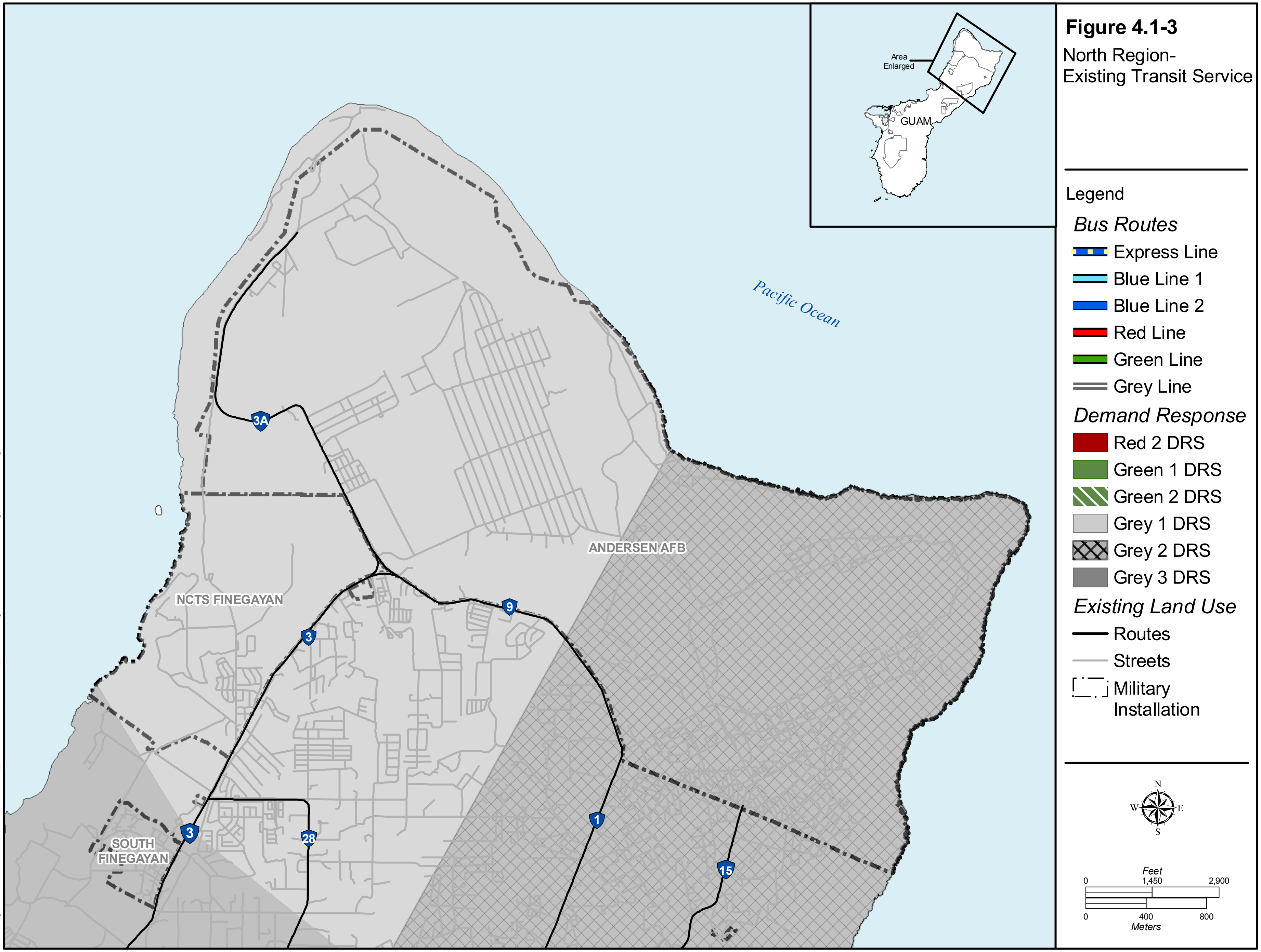
Table 4.1-5. Fixed Route and DRS Areas – North Region

Route	*Areas Served*	*Headway (hours)*	*Trips per Day, Monday-Saturday*	*Trips per Day, Sunday/Holiday*	*Scheduled Run Time Outbound (minutes)*	*Scheduled DR Time (minutes)*	*Scheduled Run Time Inbound (minutes)*
Fixed Route							
Grey Line 4*	Micronesia Mall—Yigo (Loop)	2	0	5	39 to 40	20 to 21	48 to 49
DRS Area							
Grey Line 1	Dededo, Agafa Gumas, Santa Ana, and vicinity	NA	NA	NA	NA	NA	NA
Grey Line 2	Yigo, Latte Heights, and vicinity	NA	NA	NA	NA	NA	NA
Grey Line 3	Tamuning, Tumon, Harmon, and vicinity	NA	NA	NA	NA	NA	NA

Legend: NA = Not Applicable.
Notes: *Hours of service are 5:30 a.m. to 7:30 p.m. Monday through Saturday and 7:30 a.m. to 5:30 p.m. Sundays and Holidays.

The paratransit services partially located in the North Region are:

- Freedom 1 (northern area) serving Yigo, Agafa Gumas, NCS, Santa Ana Subdivision, Astumbo, Dededo, Harmon, and Tamuning
- Freedom 5 serving the entire island



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs Figure 4.1-3. North Region - Existing Transit Service.mxd

The 12-month (2006-2007) ridership for the fixed route, DRS, and paratransit routes in the North Region can be found in Table 4.1-6. Note that there is overlap between several of the routes and service areas between the regions for this project. Because the Freedom 5 serves the entire island, ridership is not included here.

Table 4.1-6. Monthly and Total Fiscal Year 2007 Guam Mass Transit Ridership (Passengers Boarding Each Route)

Service Type	*Route Name*	*12-Month Totals*
DRS	Grey 1	30,823
	Grey 2	25,431
	Grey 3	11,826
Fixed Route	Grey 4	562
Paratransit	Freedom 1	8,129
	Total	**76,771**

Legend: DRS = Demand Response Service.

<u>Existing Pedestrian and Bicycle Facilities</u>

The northern tip of the island does not contain any dedicated pedestrian or bicycle facilities. Shoulders exist along Route 1 and on Route 3 south of Route 28. In these areas, the outside lane or shoulder, which are generally unpaved, function as the pedestrian/bicycle space. Figure 4.1-4 illustrates the existing pedestrian and bicycle facilities.

4.1.3 Central

4.1.3.1 On Base Roadways

<u>Andersen South</u>

Existing roadways and abandoned right–of-ways within areas in Andersen South were originally constructed in the 1950s timeframe and have varying levels of existing use. Air Force operations, with the exception of training at Andersen South, have stopped. The roadway facilities in the area are in a general state of disrepair. Andersen South is bounded on the north side by Route 1 and on the south side by Route 15. Andersen South can be accessed from the southern side at the intersection of Rissi Street and Route 15. The base is accessible from the northern side at the intersection of Turner Street and Route 1 near the northeastern corner of the site. Also, there are other potential access points along Route 1. Manha Street intersects Route 1 at the northwestern edge of the site. Three other unnamed streets intersect Route 1 between Turner Street in the northeast and Manha Street in the northwest. These roads (Turner Street, Manha Street, and the three unnamed streets) run perpendicular to Route 1 and Route 15 in a north-south route across the base.

Based on the relatively low roadway utilization on Andersen South, all roadways and intersections are most likely operating at acceptable levels of service for both the a.m. and p.m. peak hours.

<u>Barrigada</u>

Route 15 forms the eastern bounding edge and Route 16 forms the western bounding edge of the Navy Barrigada parcel. The Navy Barrigada can be accessed by Route 8A. Route 8A approaches the Navy Barrigada parcel from the western side and ends at the central part of the Navy Barrigada parcel. Route 8A provides the most direct access point to the golf course within the Navy Barrigada site. The Navy Barrigada golf course abuts the northeastern edge of the Air Force Barrigada parcel. The Navy Barrigada site also has gated access at Route 16 and Sabana Barrigada Drive.

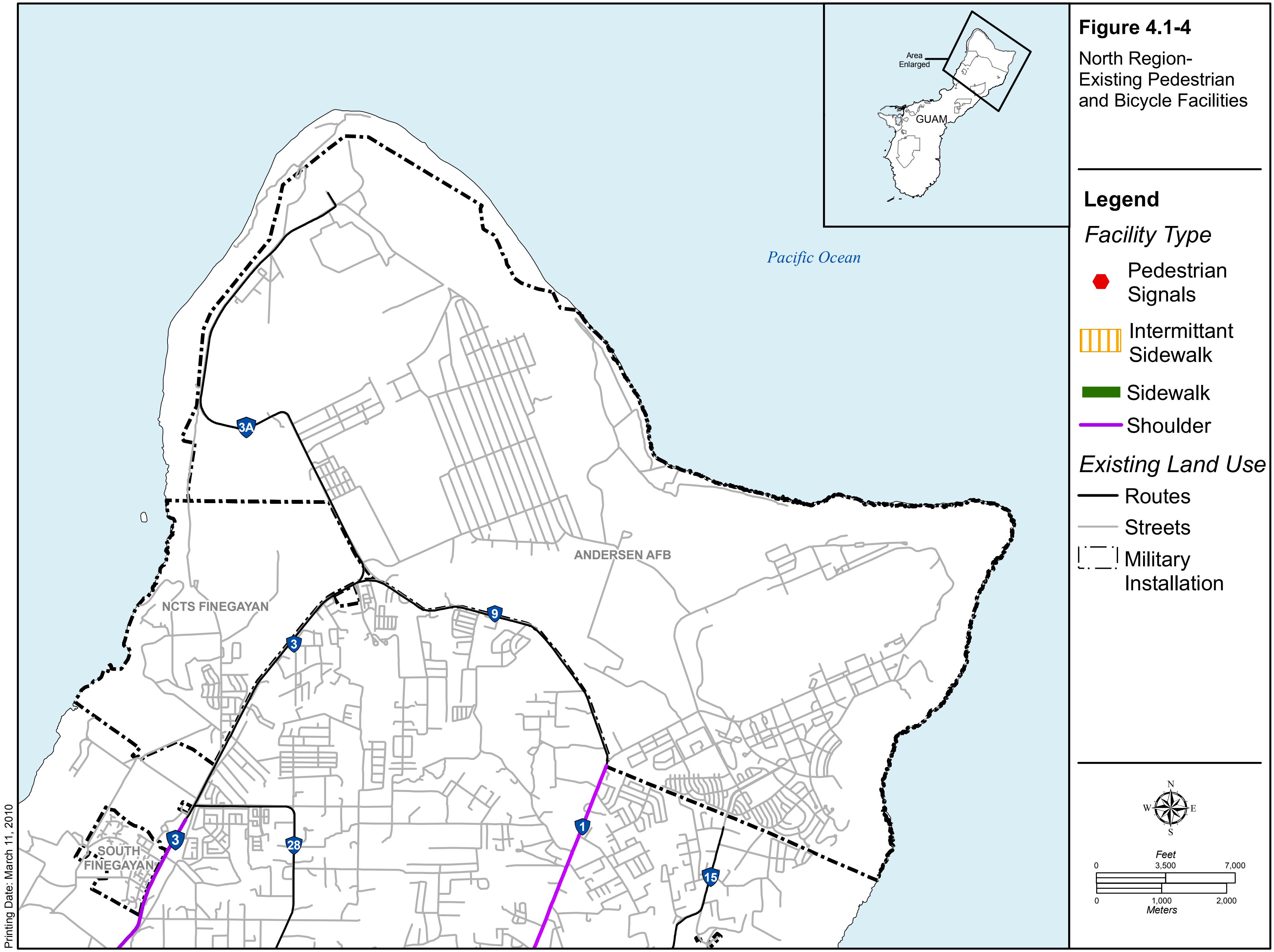


Figure 4.1-4
North Region-
Existing Pedestrian
and Bicycle Facilities
Legend
Facility Type
Pedestrian Signals
Intermittant Sidewalk
Sidewalk
Shoulder
Existing Land Use
Routes
Streets
Military Installation
Pacific Ocean
Area Enlarged
GUAM
ANDERSEN AFB
NCTS FINEGAYAN
SOUTH FINEGAYAN
3A
9
3
28
1
15
N
S
E
W
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: March 11, 2010

Route 15 forms the southern edge of the Air Force Barrigada parcel. The primary point of entry into the Air Force Barrigada site is from the south side where an unnamed access street from the Air Force Barrigada intersects Route 15. This access point is located at the intersection of Chada Street and Route 15. Chada Street is an off base road that intersects Route 15 from the southern side. The Air Force Barrigada parcel could also potentially be accessed from the western side from Route 10 by heading into Lalo Street.

Based on the relatively low traffic demand on Navy and Air Force Barrigada, all roadways and intersections should be operating at acceptable levels of service for both the a.m. and p.m. peak hours.

4.1.3.2 Off Base Roadways

<u>Existing Roadway Conditions</u>

Route 1

Route 1, also known as Marine Corps Drive, is a major arterial roadway that extends approximately 22.0 mi (35.4 km) from Andersen AFB in Yigo on the northeastern corner of the island down to Naval Base Guam in Santa Rita, which is located on the central western area of the island. Route 1 from Chalan Lujuna to Route 28 in Dededo is a four-lane road with a flush median. The lanes are approximately 12.0 ft (3.6 m) wide. There is a shoulder on either side of the road; however, there is no curb and gutter or sidewalk.

South of Route 28 in Dededo, the roadway becomes six lanes with a raised median. The six-lane portion of Route 1 extends to Route 6 in Hagatna, at which point it becomes four lanes again. The lanes are generally 12.0 ft (3.6 m) wide. There are left-turn queuing (stacking) lanes at intersections and at other access points along Route 1. There are curb and gutter and sidewalks along this section of the roadway.

Just south of the Route 6 intersection in Hagatna, the road becomes four lanes again to where it ends near Naval Base Guam in Santa Rita. There is a raised median from Route 6 to Route 11 in Piti. Portions of Route 1 are not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 3

Route 3 is located on the northern end of the island in Dededo. It connects with Route 9 at the Route 3A intersection and intersects Route 1 at its southern terminus. Route 3 is 5.7 mi (9.2 km) long. From Route 1 to Route 28, it is a minor arterial that consists of four lanes with intermittent center turn lanes and shoulders and no curb and gutter or sidewalks. From Route 28 to Route 9, the roadway decreases to two lanes with an intermittent left-turn lane, shoulders, curb and gutter, or sidewalk. The lanes are generally 11.0 ft (3.4 m) wide. Route 3 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 8/8A

Route 8 is located in the center of the island, with its eastern terminus at the Admiral Nimitz Golf Course in Barrigada and western terminus in Hagatna. Route 8 is 4.3 mi (6.9 km) long and is a major arterial between Route 10/16 and Route 1 and a major collector east of the Route 10/16 intersection. The road has four lanes with a two-way center turn lane, intermittent shoulders and sidewalks, and curb and gutter between Route 10/16 and Route 1. The lanes are generally 12.0 ft (3.6 m) wide. Route 8/8A is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 10

Route 10 is located in the center of the island, with its northern terminus in Barrigada at Route 8/16 and southern terminus in Chalan-Pago-Ordot at Route 4. Route 10 is 3.2 mi (5.1 km) long and is classified as a major arterial. Generally, the road has four lanes with a two-way center turn lane, shoulders, curb and gutter, and sidewalks. The lanes are generally 12.0 ft (3.6 m) wide. Route 10 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 15

Route 15 is located on the northeastern part of the island, with its northern terminus in Yigo and southern terminus in Chalan-Pago-Ordot at Route 4. Route 15 is 14.2 mi (22.8 km) long and is classified as both a minor arterial (north of Route 10) and a major collector (south of Route 10). The portion of Route 15 in this study is approximately 9.0 mi (14.5 km) and extends from Route 10 to Chalan Lujuna on the north. From Chalan Lujuna to Route 26, there are two lanes with no center lane, a flush median, no shoulders, curb and gutter, or sidewalk. From Route 26 to Route 10, the road has two lanes with an intermittent center lane, a flush median, no shoulders, curb and gutter, or sidewalks. The lanes are generally 12.0 ft (3.6 m) wide. Route 15 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 16

Route 16 is located on the east side of Guam International Airport and extends from Route 1 to Route 8 in Barrigada. This section of Route 16 is approximately 3.0 mi (4.8 km) long and is classified as a major arterial. From Route 8 to Route 10A, the road has four lanes with a center lane, intermittent raised and flush medians, shoulders, curb and gutter, and no sidewalks. The lanes are generally 12.0 ft (3.6 m) wide in this section. At the intersection with Route 10A, Route 16 continues below-grade under Route 10A, with four through lanes. There are two lanes that exit to the at-grade intersection with Route 10A. From Route 10A to Route 27A, the road has six lanes, a center turn lane, an intermittent raised median, shoulders, no curb and gutter, and no sidewalks. The lanes are generally 12.0 ft (3.6 m) wide in this section. Route 16 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 25

Route 25 is located in the north-central part of the island and connects Route 16 with Route 26 in Dededo. Route 25 is approximately 1.4 mi (2.3 km) long and is classified as a minor arterial. The road generally has two lanes with a two-way center turn lane, shoulders, and no sidewalks or curb and gutter for approximately 0.5-mi (0.8-km) west of Route 16. The road then decreases in width and has no center lane or median, no curb and gutter, sidewalks, or shoulders for the remainder of the route. The lanes are generally 12.0 ft (3.6 m) wide. Route 25 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 26

Route 26 is located in the north-central part of the island and connects Route 1 in Dededo with Route 15 in Mangilao. Route 26 is approximately 2.3 mi (3.7 km) long and is classified as a minor arterial. The road has two lanes with no median, intermittent shoulders, no curb and gutter, and intermittent sidewalks in the Latte Heights Estates area. The lanes are generally 12.0 ft (3.6 m) wide. Route 26 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 27

Route 27 is located in the north-central part of the island and connects Route 16 with Route 1 in Dededo. Route 27 is approximately 1.1 mi (1.8 km) long and is classified as a major arterial. The road has six lanes with a raised median and left-turn queuing lanes at intersections, curb and gutter, sidewalks, and no shoulders. The lanes are generally 12.0 ft (3.6 m) wide. Route 27 is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

Route 28

Route 28 is located on the northern part of the island and connects Route 1 with Route 3 in Dededo. Route 28 is 3.9 mi (6.3 km) long and is classified as a minor arterial. The road has two lanes with intermittent median or center lane, no shoulders, curb and gutter, or sidewalks. The lanes are generally 12.0 ft (3.6 m) wide.

Chalan Lujuna

Chalan Lujuna is located on the northern part of the island and connects Route 1 and Route 15, just south of Route 29 in Yigo. Chalan Lujuna is approximately 0.83-mi (1.3 km) long and is classified as a major collector. The road has two lanes with no median or center lane, no shoulders, curb and gutter, or sidewalks. The lanes are generally 12.0 ft (3.6 m) wide. Chalan Lujuna is not structurally capable of handling heavy truck loads due to the current condition of the pavement.

The intersections and military access points included in the Central Region are listed in Table 4.1-7.

Table 4.1-7. Intersections and Access Points – Central Region

Intersections and Military Access Points – Central Region	
Signalized	
Route 1/28	Route 1/4
Route 1/26	Route 1/6 (Adelup)
Route 1/27	Route 1/6 (West)
Route 1/27A	Route 4/7A
Route 1/3	Route 4/10
Route 1/16	Route 4/17
Route 1/14 (North San Vitores)	Route 8/33 (East)
Route 1/14A	Route 8/10
Route 1/10A	Route 10/15
Route 1/14B	Route 16/27A
Route 1/14 International Trade Center (ITC)	Route 16/27
Route 1/30	Route 16/10A
Route 1/8	
Unsignalized	
Route 7/7A	Route 26/15
Route 26/25	Route 28/27A
Military Access Points	
Route 1 - South Andersen Main Gate/(Turner Street)	Route 15 - South Andersen/Second Gate

<u>Existing Traffic Volumes and Capacity</u>

A summary of existing ADT volumes and capacity (2008) for the Central Region can be found in Table 4.1-8.

Table 4.1-8. Existing ADT and Capacity Summary – Central Region

Roadway	*Existing ADT Summary*	*Existing v/c Ratio*
Route 1	Route 1 ranges from 32,000 to 73,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally 0.00-0.80 in both the a.m. and p.m. peak conditions; however, there are small segments that have a v/c ratio of 0.81-0.99. The roadway is not considered congested.
Route 3	Route 3 ranges from 6,800 to 15,000 vpd. Traffic increases south of the intersection with Route 28.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not congested.
Route 8	Route 8 ranges from 37,000 to 39,000 vpd. There is generally no change in volume along the route.	In the a.m. peak hours, Route 8 has a v/c ratio of 0.00-0.80; however, in the p.m. peak hours, the portion of Route 8 between Route 33 and Route 1 has a v/c ratio of 0.81-0.99. The roadway is not considered congested.
Route 10	Route 10 has 30,000 vpd between Route 8 and Route 15.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not congested.
Route 15	Route 15 ranges from 6,900 to 16,000 vpd. There is a significant increase in traffic south of the intersection with Route 26.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not congested.
Route 16	Route 16 ranges from 37,000 to 49,000 vpd.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not congested.
Route 25	Route 25 ranges from 12,000 to 16,000 vpd.	The eastern portion of Route 25 has a v/c ratio of 1.00-1.15 in both the a.m. and p.m. peak hours. The western portion has a v/c ratio of 1.16-1.50 in both the a.m. and p.m. peak hours. The roadway is considered congested in both the a.m. and p.m.
Route 26	Route 26 ranges from 6,900 to 15,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	The v/c ratio is generally 0.81-0.99 in both the a.m. and p.m. peak conditions; however, there are small segments that have a v/c ratio of 0.00-0.80. The roadway is not considered congested.
Route 27	Route 27 has 32,000 vpd between Route 16 and Route 1.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not congested.
Route 28	Route 28 ranges from 12,000 to 15,000 vpd. Traffic increases at the intersection with Route 1.	Route 28 has several v/c ratios in the Central Region. In the a.m., the worst portion of the roadway is north of the intersection with Route 1, with a v/c ratio greater than 1.50. The v/c ratio in the p.m. is the worst at the intersection with Route 1, with a v/c ratio greater than 1.50. The roadway is considered congested in both the a.m. and p.m.
Chalan Lujuna	Chalan Lujuna ranges from 3,600 to 4,000 vpd.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not congested.

Legend: ADT = Average Daily Traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.1-5 and Figure 4.1-6 show existing levels of traffic congestion in Central Guam for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

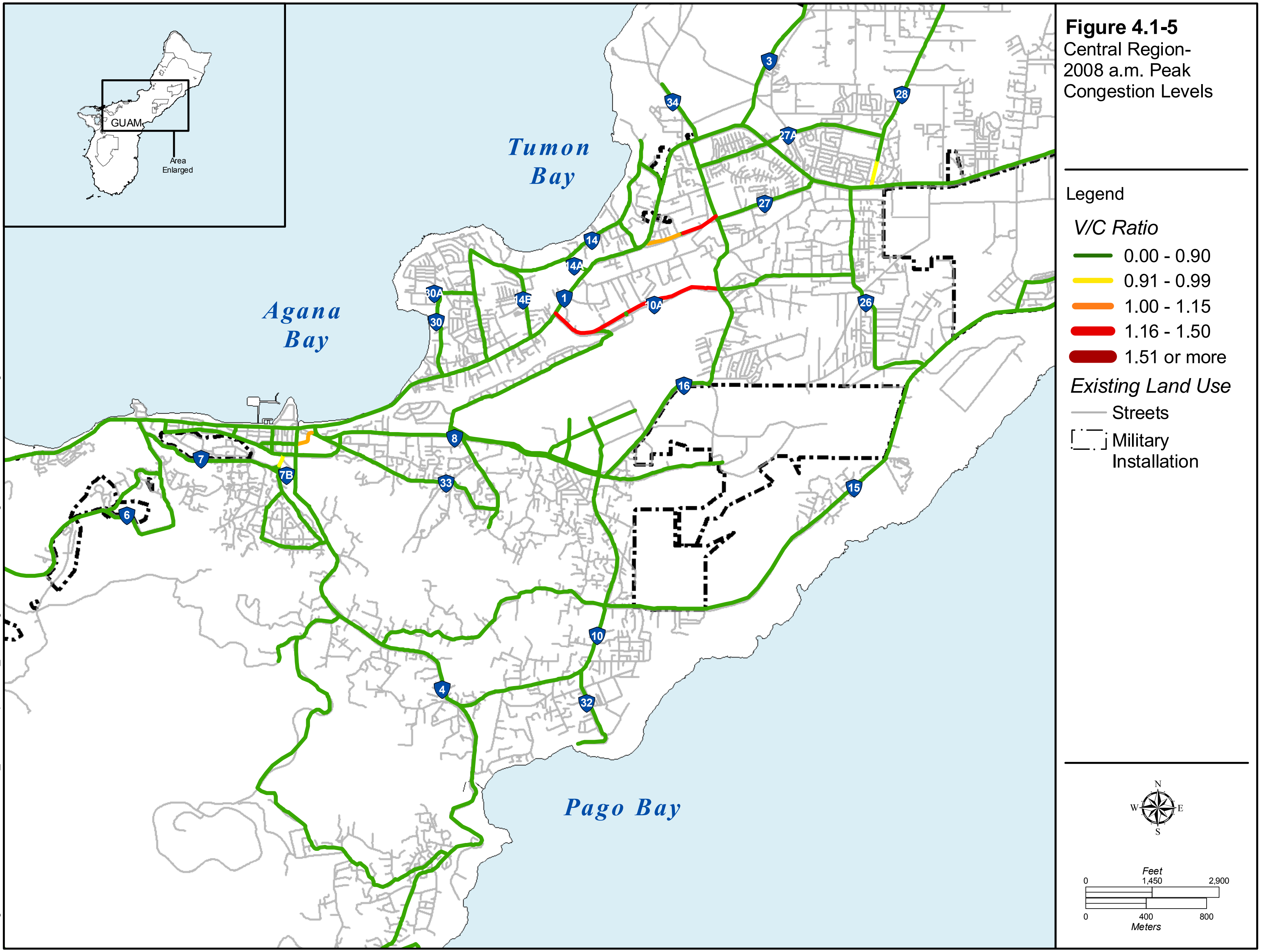


Figure 4.1-5
Central Region-
2008 a.m. Peak
Congestion Levels

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.1-5. Central Region - 2008 a.m. Peak Congestion Level.mxd

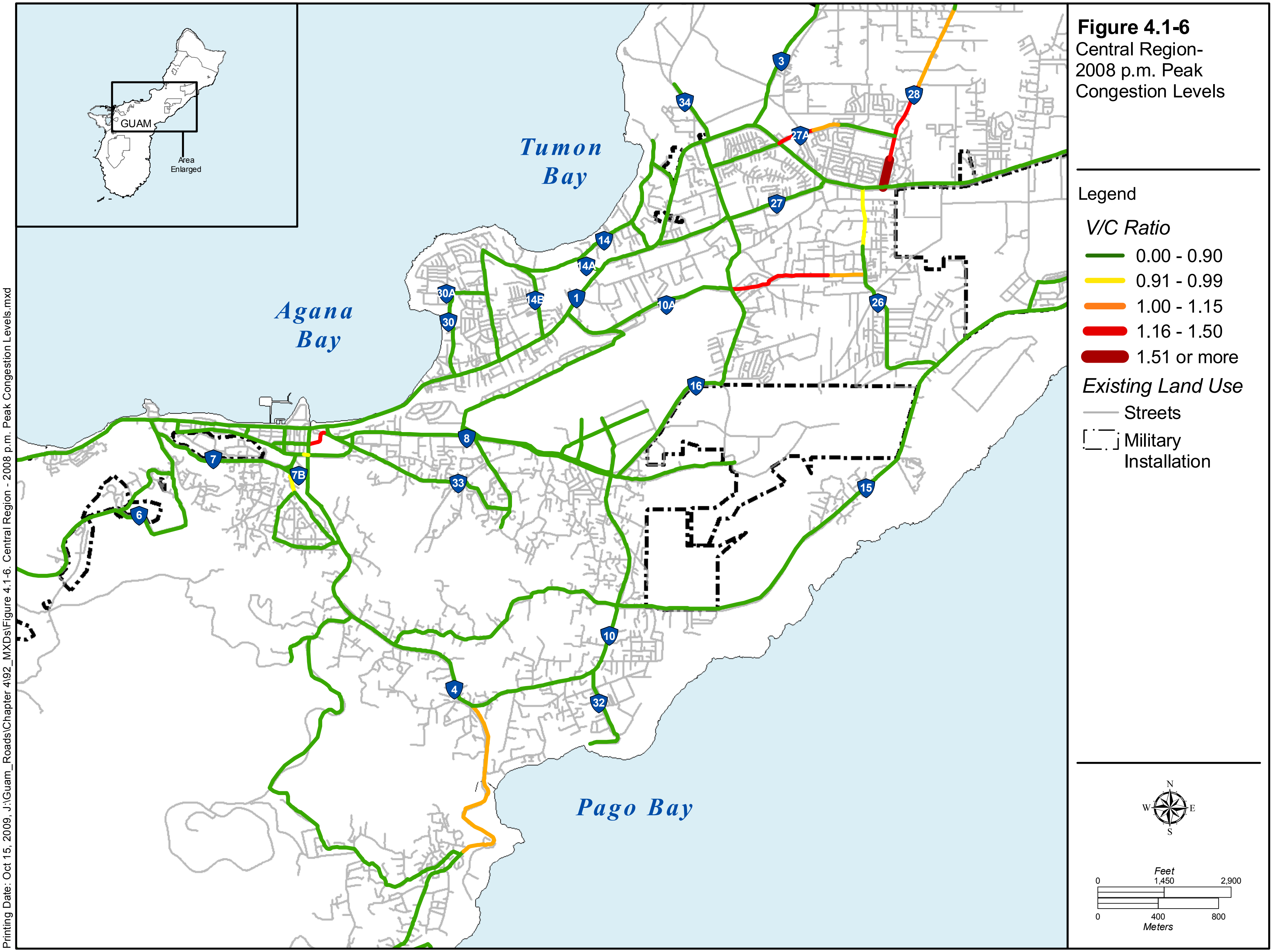


Figure 4.1-6
Central Region-
2008 p.m. Peak
Congestion Levels
Legend
V/C Ratio
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military
Installation
Feet
0
1,450
2,900
0
400
800
Meters
Tumon Bay
Agana Bay
Pago Bay
GUAM
Area Enlarged
Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.1-6. Central Region - 2008 p.m. Peak Congestion Levels.mxd

The roads serving major residential and employment centers, such as Dededo and Tamuning, are currently the most congested. These roads are also roads that would be heavily used by the military. During both the morning and afternoon peaks, the roads with the greatest congestion levels in the Central Region are Routes 28 and 25. They both have an LOS F in both the a.m. and p.m. peak hours that is considered congested. Route 28 has the highest level of congestion (v/c ratio greater than 1.50), north of the Route 1 intersection in the a.m. and at the Route 1 intersection in the p.m.

Of particular note is that the model does not show congestion along Route 1 through Tamuning even though many vehicles travel this roadway. This is because the roadway segments are designed to handle the high volume of traffic they presently serve. Even though there are many cars on the road, it does not exceed its design capacity; therefore, it is not technically "congested" (Figure 4.1-5 and Figure 4.1-6). The delay that drivers experience on Route 1 results from poor operations, such as traffic signal timing.

Existing Intersection Operations

In the existing conditions, all intersection in the Central Region operate at acceptable LOS E or better except for the following intersections:

- Route 1/27A (p.m. peak hour only)
- Route 1/3 (a.m. peak hour only)
- Route 1/10A
- Route 1/14 (International Trade Center [ITC]) (p.m. peak hour only)
- Route 8/33
- Route 8/10 (a.m. peak hour only)
- Route 10/15 (a.m. peak hour only)
- Route 16/27
- Route 16/10A
- Route 26/25
- Route 26/15 (a.m. peak hour)
- Route 28/27A (a.m. peak hour)
- Access Point at Route 16 – Navy Barrigada Residential Gate

Table 4.1-9 displays the LOS and delay results for the study intersections in the Central Region.

Existing Public Transportation

The discussion of existing conditions in this section would focus on the Guam Mass Transit System in the Central Region.

Figure 4.1-7 illustrates the fixed routes and DRS areas for the Central Region. Note that all of the Monday through Friday fixed routes originate at Chamorro Village located in Hagatna. The fixed routes included in the Central Region are Blue Line, Blue Line 2, Red Line 1, Express Line, Green Line 1, and Grey Line 4. The DRS areas located in the Central Region are Grey 2, Grey 3, Red 1, Red 2, Green 1, and Green 2. These routes provide service Monday through Saturday only, and all observe the normal 5:30 a.m. to 7:30 p.m. hours of service. DRS is available on call and normally provides transportation to the nearest fixed-route. Table 4.1-10 shows details about the fixed route and DRS areas in the Central Region.

Table 4.1-9. Existing Level of Service and Delay Results – Central Region

	a.m. Peak Hour		*p.m. Peak Hour*	
	LOS	*Delay (Second)*	*LOS*	*Delay (Second)*
Signalized*				
Route 1/28	C	33.9	D	48.6
Route 1/26	C	33.8	E	58.5
Route 1/27	E	74.6	E	51.8
Route 1/27A	D	37.1	F	91.5
Route 1/3	F	165.9	E	71.0
Route 1/16	C	32.6	E	58.6
Route 1/14 (North San Vitores)	C	33.1	F	92.9
Route 1/14A	D	52.1	E	59.6
Route 1/10A	F	96.2	F	81.9
Route 1/14B	D	43.3	C	33.6
Route 1/14 (ITC)	D	51.7	F	116.2
Route 1/30	E	67.8	D	51.5
Route 1/8	B	19.3	C	34.1
Route 1/4	C	23.2	C	20.4
Route 1/6 (west)	B	10.0	C	23.1
Route 1/6 (Adelup)	B	19.9	E	59.9
Route 4/7A	C	23.2	E	57.8
Route 4/10	E	64.5	E	59.5
Route 4/17	C	24.9	C	21.2
Route 8/33	F	81.6	F	162.8
Route 8/10	F	140.1	E	67.5
Route 10/15	F	83.8	E	56.3
Route 16/27A	C	34.4	C	25.9
Route 16/27	F	112.4	F	89.4
Route 16/10A	F	125.4	F	89.3
Unsignalized**				
Route 7/7A	C	15.1	C	19.9
Route 26/25	F	81.5	F	400.4
Route 26/15	F	202.4	E	39.5
Route 28/27A	F	152.9	F	37.4
Military Access Points				
Route 1 - South Andersen Main Gate/(Turner Street)**	B	11.5	D	34.9
Route 15 - South Andersen/Second Gate ***	-	-	-	-
Route 16 - Navy Barrigada Residential Gate *	F	75.5.	F	63.4
Route 8A – Navy Barrigada/(Residential Gate)***	-	-	-	-
Route 15 - Barrigada Air Force/(Chada Point Drive)**	E	37.4	C	18.2

Legend: ITC = International Trade Center; LOS = Level of Service.

Notes: *Signalized intersection LOS based on average delay for the overall intersection.

**Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

***The access is not built in existing conditions.

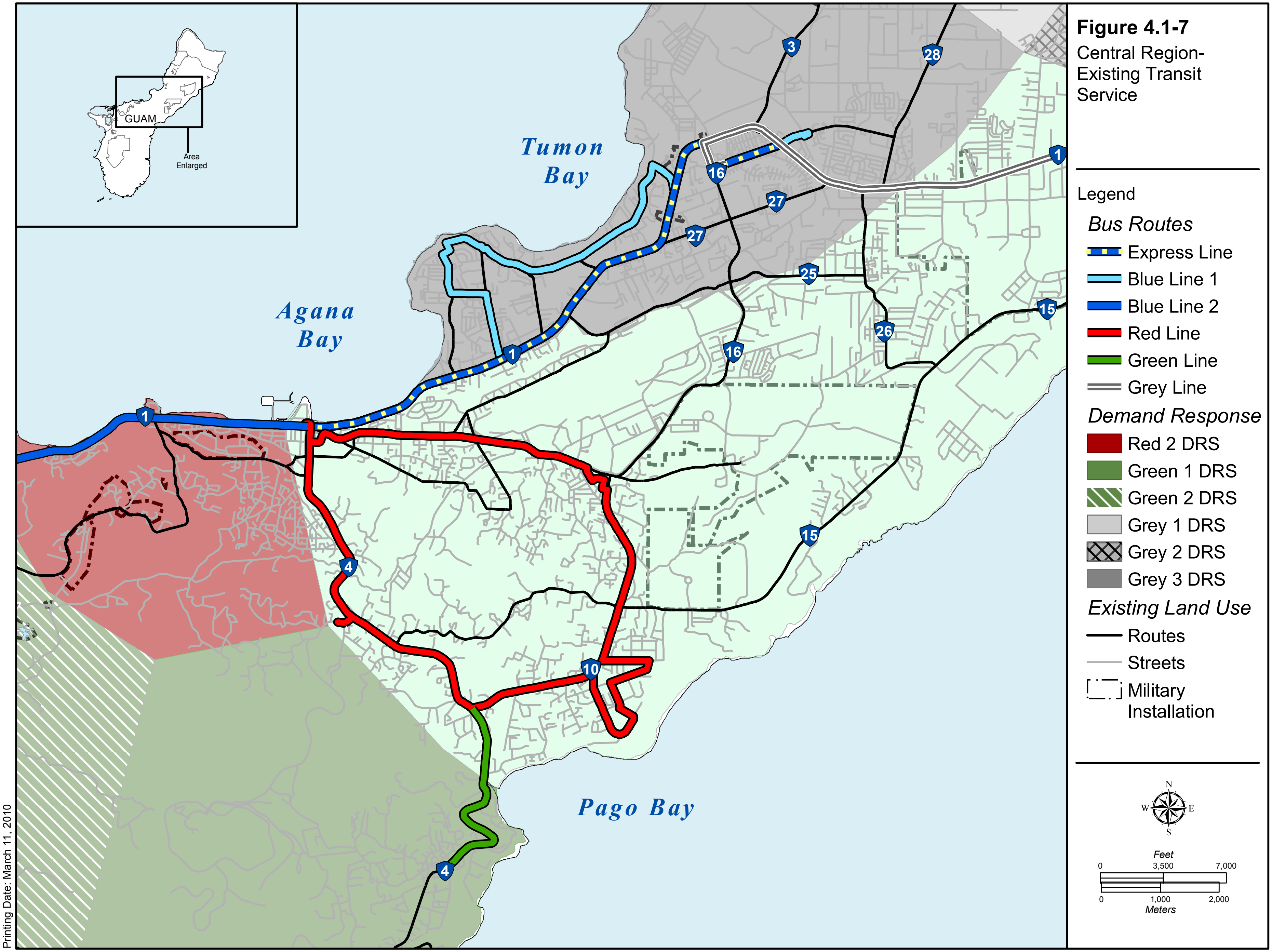

GUAM
Area Enlarged
Tumon Bay
Agana Bay
Pago Bay
Figure 4.1-7
Central Region-Existing Transit Service
Legend
Bus Routes
Express Line
Blue Line 1
Blue Line 2
Red Line
Green Line
Grey Line
Demand Response
Red 2 DRS
Green 1 DRS
Green 2 DRS
Grey 1 DRS
Grey 2 DRS
Grey 3 DRS
Existing Land Use
Routes
Streets
Military Installation
N
S
E
W
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: March 11, 2010

Table 4.1-10. Fixed Route and DRS Areas – Central Region

Route	*Areas Served*	*Headway (hours)*	*Trips per Day, Monday-Saturday*	*Trips per Day, Sunday/Holiday*	*Scheduled Run Time Outbound (minutes)*	*Scheduled DR Time (minutes)*	*Scheduled Run Time Inbound (minutes)*
Fixed Route							
Blue Line 1	Hagatna –Tumon – Micronesia Mall (Shuttle)	2	8 OB, 6 IB	6	41 to 52		44 to 54
Blue Line 2	Hagatna – Agat (Shuttle)	2	8 OB, 6 IB	5 OB, 4 IB	35 to 37		32 to 35
Red Line 1	Hagatna – Mangilao (Loop)	1	14	9	22 to 28		28 to 37
Express Line	Hagatna – Micronesia Mall (Loop)	1	13.5	9	25 to 37		28
Green Line 1*	Chamorro Village – Yona (Loop)	2	8	0	10	80	20
Grey Line 4*	Micronesia Mall – Yigo (Loop)	2	0	5	39 to 40	20 to 21	48 to 49
DRS Area							
Grey Line 2	Yigo, Latte Heights, and vicinity	NA	NA	NA	NA	NA	NA
Grey Line 3	Tamuning, Tumon, Harmon, and vicinity	NA	NA	NA	NA	NA	NA
Red Line 1	Hagatna and Asan.	NA	NA	NA	NA	NA	NA
Red Line 2	Hagatna, Anigua, Maina, and vicinity	NA	NA	NA	NA	NA	NA
Green Line 1	Hagatna, Yona, Talofofo, Malojloj, and Inarajan	NA	NA	NA	NA	NA	NA
Green Line 2	Agat, Santa Rita, Umatac, and Merizo	NA	NA	NA	NA	NA	NA

Legend: OB=Outbound; IB = Inbound; NA = Not Applicable.
Notes: *Hours of service are 5:30 a.m. to 7:30 p.m. Monday through Saturday and 7:30 a.m. to 5:30 p.m. Sundays and Holidays.
Source: Government of Guam, Department of Administration, Division of Public Transportation Services 2008.

The paratransit service partially located in the Central Region is:

- Freedom 1 (northern area) serving Yigo, Agafa Gumas, NCS, Santa Ana Subdivision, Astumbo, Dededo, Harmon, and Tamuning
- Freedom 2 (central area) serving Hagatna, Hagatna Heights, Sinajana, Chalan Pago, Pago Bay, Mongmong, and Tamuning
- Freedom 3 (southern area) serving Inarajan, Malojloj, Talofofo, and Yona
- Freedom 4 (southern area) serving Umatac, Agat, Piti, Asan, Maina, Hagatna Heights, and Hagatna
- Freedom 5 serving the entire island

The 12-month (2006-2007) ridership for the fixed route, DRS, and paratransit routes in the Central Region can be found in Table 4.1-11. Note that there is overlap between several of the routes and service areas between the regions for this project. Because the Freedom 5 serves the entire island, ridership is not included here.

Table 4.1-11. Monthly and Total Fiscal Year 2007 Guam Mass Transit Ridership (Passengers Boarding Each Route)

Service Type	*Route Name*	*12-Month Totals*
DRS	Grey 2	25,431
	Grey 3	11,826
	Red 1	NA
	Red 2	21,308
	Green 1	13,050
	Green 2	9,669
Fixed Route	Blue Line 1	30,005
	Blue Line 2	14,870
	Red Line 1	26,620
	Express Line	39,310
	Green Line 1	NA
	Grey Line 4	562
Paratransit	Freedom 1	8,129
	Freedom 2	7,846
	Freedom 3	6,728
	Freedom 4	8,892
All	**Totals**	**224,246**

Legend: DRS = Demand Response Service.

Existing Pedestrian and Bicycle Facilities

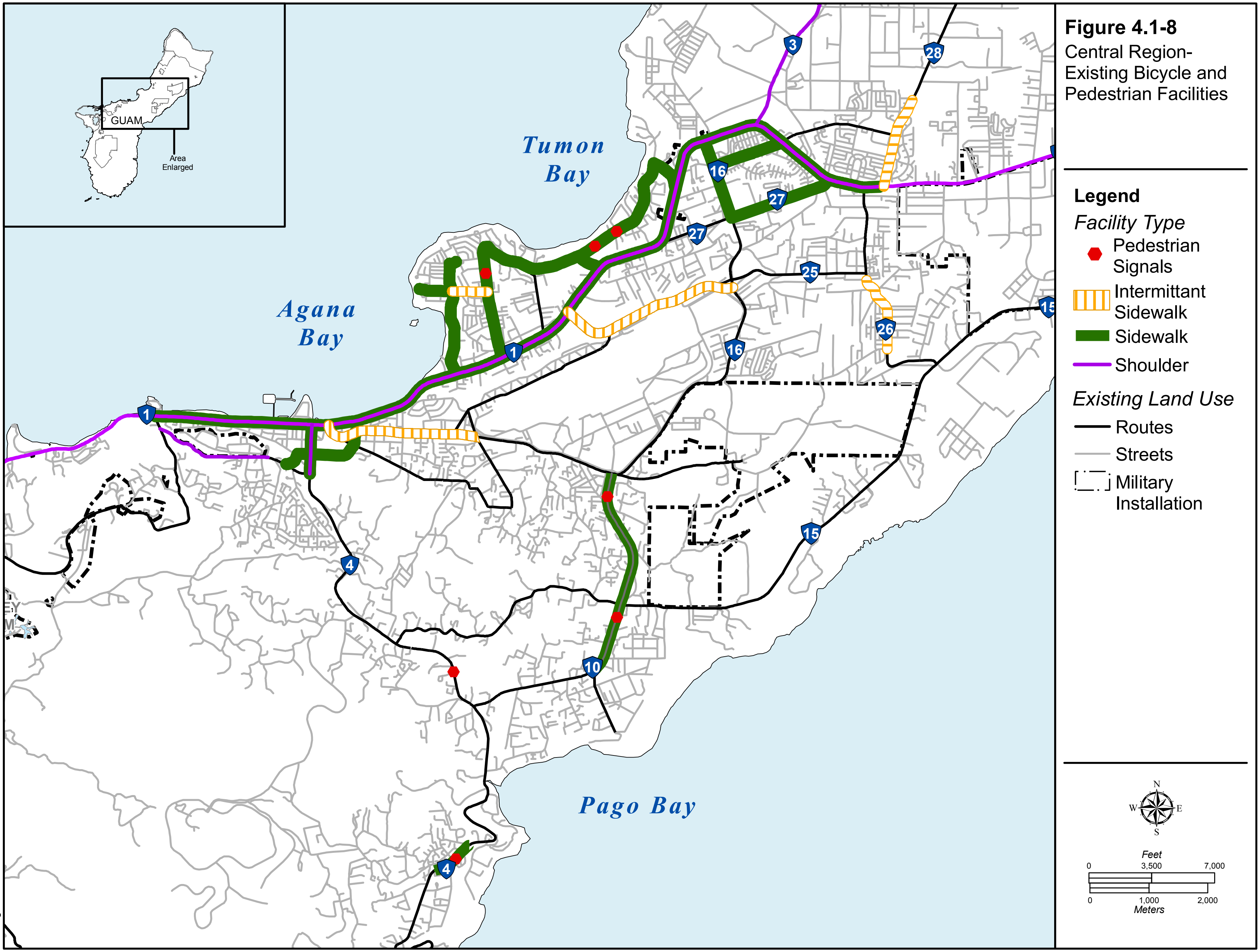
There are sidewalks on both sides of Route 1 (Marine Corps Drive) from the intersection with Route 28 in Dededo, through Tamuning, Mongmong-Toto-Maite, and Hagatna, to the intersection with Route 6 in Asan. Table 4.1-12 and Table 4.1-13 list roads with existing and intermittent sidewalks in the Central Region. Note that these are not all of the sidewalks in the Central Region, only the ones on roadways included in this study. Figure 4.1-8 shows the existing bicycle and pedestrian facilities in the Central Region.

Table 4.1-12. Roads with Existing Sidewalks

Route	*Length (miles)*
Route 1	9.42
Route 10	3.73
Route 27	2.52
Total Length	**15.67**

Table 4.1-13. Roads with Intermittent Sidewalks

Route	*Length (miles)*
Route 8	3.29
Route 26	0.97
Route 28	1.12
Total Length	**5.38**



Printing Date: March 11, 2010

4.1.4 Apra Harbor

4.1.4.1 On Base Roadways

Naval Base Guam

Naval Base Guam main gate is accessed by Marine Corps Drive. Marine Corps Drive is a north-south four-lane arterial roadway that serves as a primary route on the base.

The Traffic Impact Study, BEQ Residential Complex, Naval Base, Guam (Duenas Bordallo & Associates, Inc. 2008) analyzed the LOS for several intersections along Marine Corps Drive (Route 1) within Naval Base Guam and found them all to be operating at an acceptable LOS in both the a.m. and p.m. peak hours.

4.1.4.2 Off Base Roadways

Route 1

Route 1, also known as Marine Corps Drive, is a major arterial roadway and extends approximately 22.0 mi (35.4 km) from Andersen AFB in Yigo on the northeastern corner of the island down to Naval Base Guam in Santa Rita located on the central western area of the island. From Route 11 in Piti to Route 2A in Santa Rita, the road has four lanes. There is a combination of raised and flush median, shoulders, no curb and gutter, and no sidewalks.

Route 2A

Route 2A is located near Naval Base Guam in Santa Rita and connects Route 1 to Route 2. The portion of the road included in this study is from Route 1 to Route 5. This section of Route 2A is approximately 1.0-mi (1.6 km) long and is a two-lane minor arterial with no median, shoulders, curb and gutter, or sidewalk. The lanes are generally 12.0 ft (3.6 m) wide.

Route 11

Route 11 is located on the central west side of the island and serves as the entrance to the Port Authority and Family Beach in Piti. Route 11 is 2.9 mi (4.7 km) long and is classified as a minor arterial. The road has two lanes with no median, and intermittent shoulders, curb and gutter and sidewalks. The lanes are generally 12.0 ft (3.6 m) wide.

The intersections included in the Apra Harbor Region are listed in Table 4.1-14.

Table 4.1-14. Intersections and Access Points – Apra Harbor Region

Intersections and Military Access Points – Apra Harbor	
Signalized	
Route 1/11	Route 5/2A
Route 1/2A	Route 1/Polaris Point

Existing Traffic Volumes and Capacity

A summary of existing ADT volumes and capacity (2008) for the Apra Harbor Region can be found in Table 4.1-15.

Table 4.1-15. Existing ADT and Capacity Summary – Apra Harbor Region

Roadway	*Existing ADT Summary*	*Existing v/c Ratio*
Route 1	Route 1 ranges from 19,000 to 30,000 vpd. The traffic decreases into the entrance of Naval Base Guam, which is at the Route 1/2A intersection.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.
Route 2A	Route 2A ranges from 16,000 to 24,000 vpd. The traffic decreases after the intersection with Route 5.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.
Route 11	Route 11 has 9,100 vpd.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.

Legend: ADT = Average Daily Traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.1-9 and Figure 4.1-10 show existing levels of traffic congestion in the Apra Harbor Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. Although there are numerous intersections with capacity issues, there are currently few roadways included in this study with an existing high v/c ratio.

Existing Intersection Operations

In the existing conditions, all of the intersections in the Apra Harbor Region operate at acceptable LOS. Table 4.1-16 displays the LOS and delay results for the study intersections in the Apra Harbor Region.

Table 4.1-16. Level of Service and Delay Results – Apra Harbor Region

	a.m. Peak Hour		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*				
Route 1/11	B	14.5	C	22.2
Route 1/2A	B	15.9	C	29.1
Route 1/Polaris Point	A	2.1	A	3.9
Route 5/2A	D	37.6	C	33.9

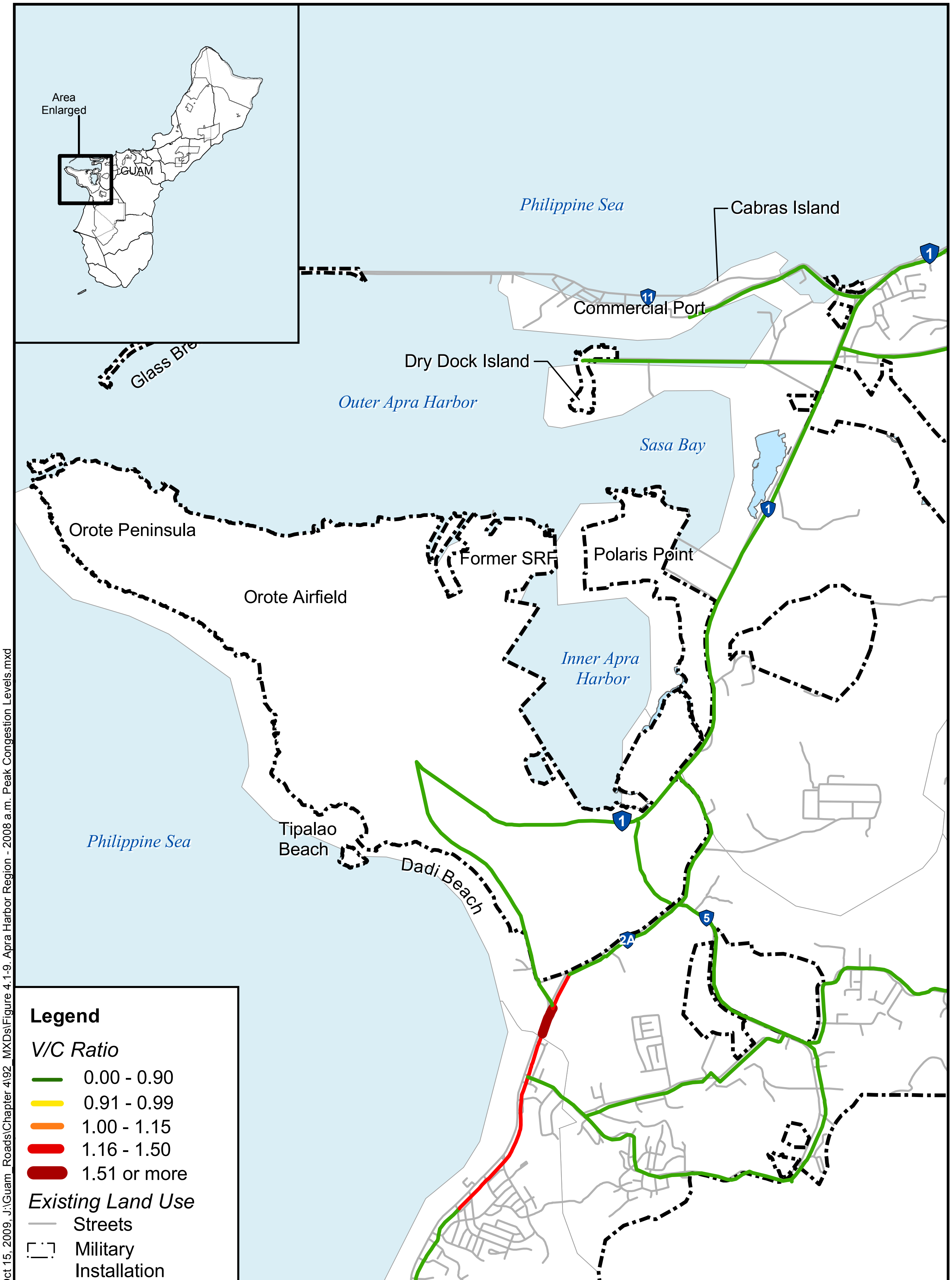
Legend: LOS = Level of Service.
Note: *Signalized intersection LOS based on average delay for the overall intersection.

Existing Public Transportation

This discussion of existing conditions would focus on the Guam Mass Transit System in the Apra Harbor Region. Figure 4.1-11 illustrates the fixed routes and DRS areas for the Apra Harbor Region. A demand-response area is a geographical area that is served by the demand-response type of bus service as described earlier.

Note that all of the Monday through Friday fixed routes originate at Chamorro Village, which is located in Hagatna and is not shown on this map. The Blue Line 2 is the only bus route that is partially included in the Apra Harbor Region. The DRS area located in the Apra Harbor Region is Green 1. This route provides service on Monday through Saturday only, and all observe the normal 5:30 a.m. to 7:30 p.m. hours of service. DRS is available on call and normally provides transportation to the nearest fixed-route.

Table 4.1-17 shows details about the fixed route and DRS areas in the Apra Harbor Region.



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.1-9. Apra Harbor Region - 2008 a.m. Peak Congestion Levels.mxd

Figure 4.1-9
Apra Harbor Region - 2008 a.m. Peak Congestion Levels

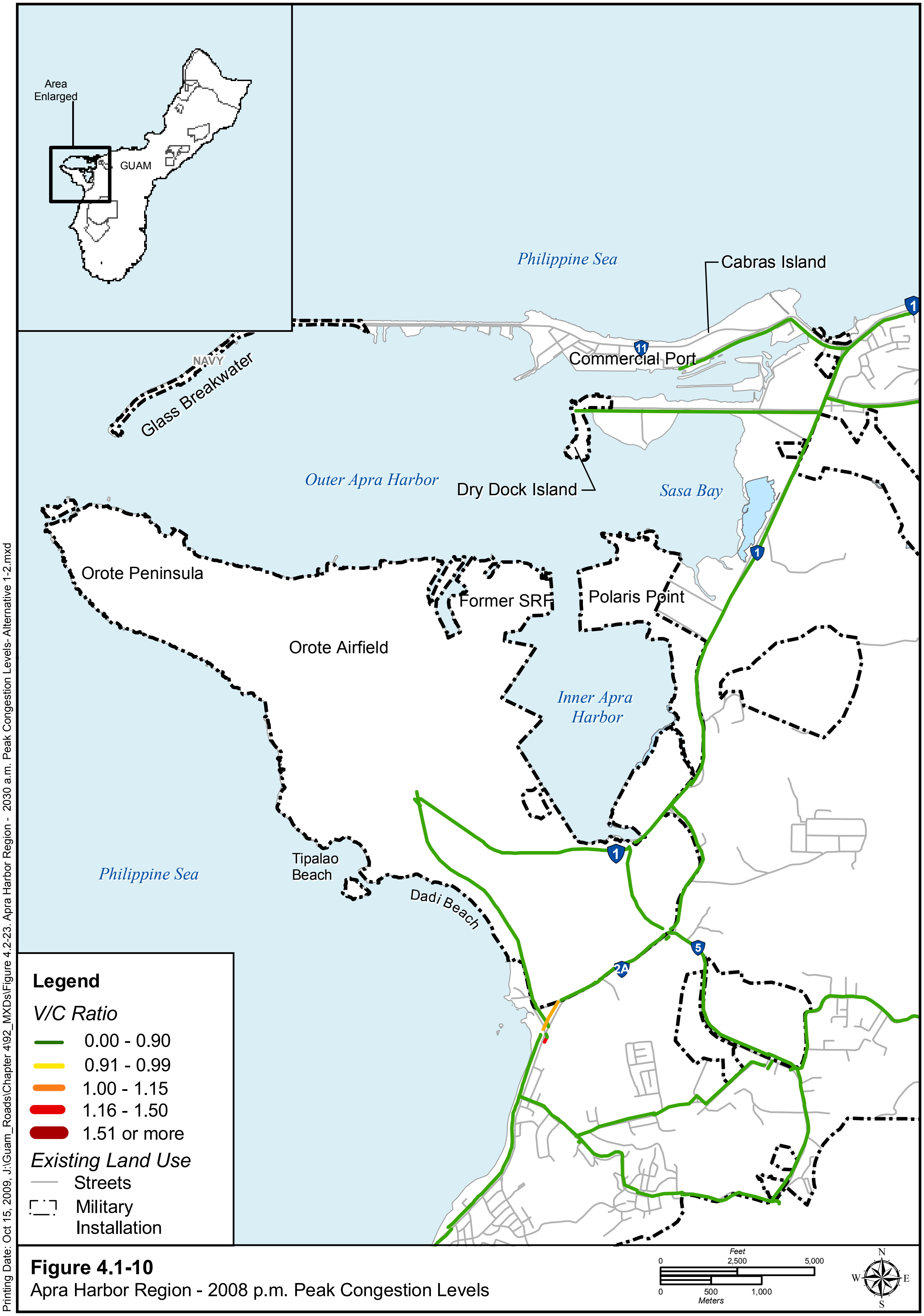
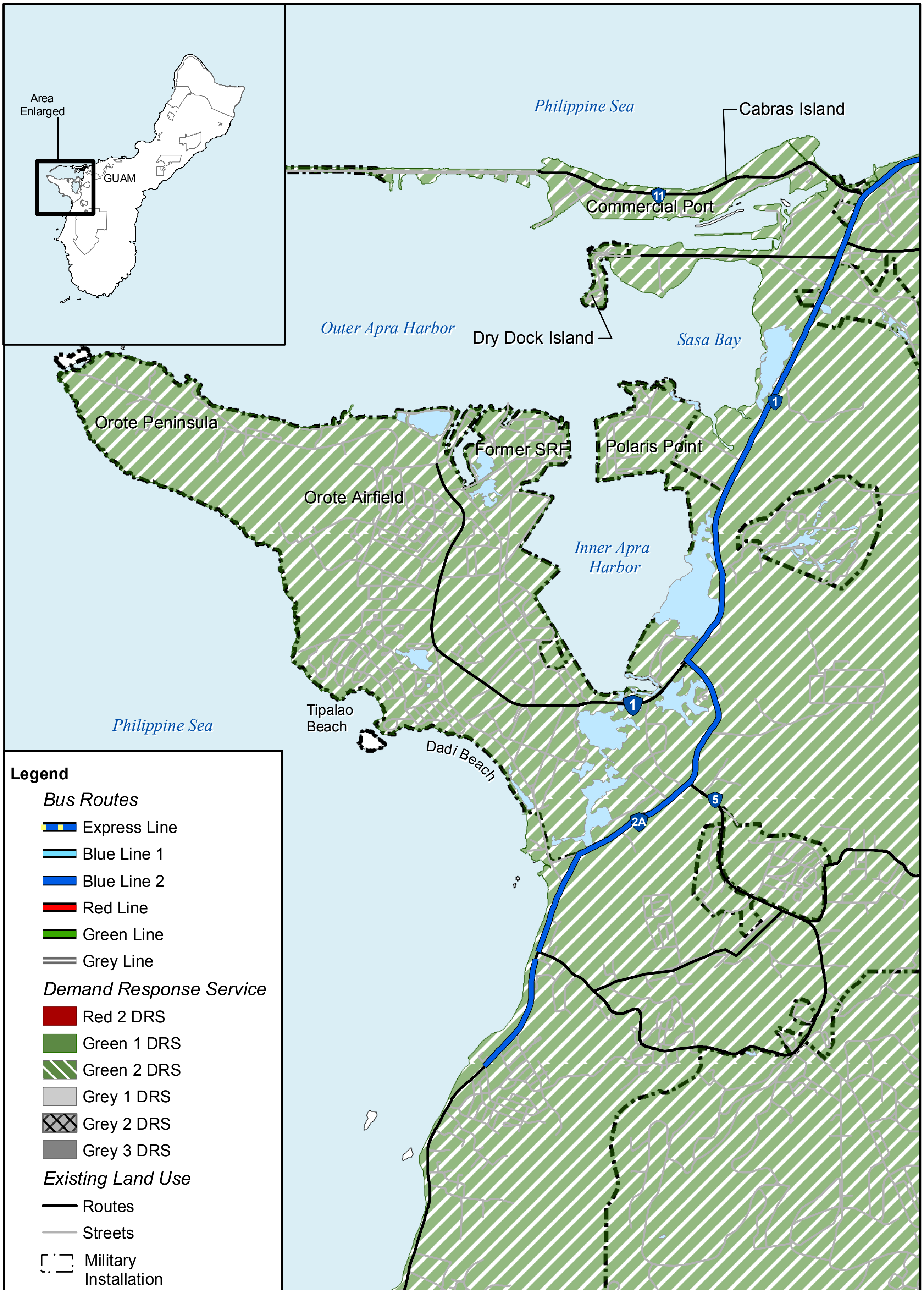


Figure 4.1-10
Apra Harbor Region - 2008 p.m. Peak Congestion Levels



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.1-11. Apra Harbor Region - Existing Transit Service.mxd

Figure 4.1-11

Apra Harbor Region - Existing Transit Service

Table 4.1-17. Fixed Route and DRS Areas – Apra Harbor Region

Route	*Areas Served*	*Headway (hours)*	*Trips per Day, Monday-Saturday*	*Trips per Day, Sunday/Holiday*	*Scheduled Run Time Outbound (minutes)*	*Scheduled DR Time (minutes)*	*Scheduled Run Time Inbound (minutes)*
Fixed Route							
Blue Line 2	Hagatna – Agat (Shuttle)	2	8 OB,6 IB	6	41 to 52		44 to 54
DRS Area							
Green 2	Agat, Santa Rita, Umatac, and Merizo	NA	NA	NA	NA	NA	NA

Legend: DRS = Demand Response Service; IB = Inbound; NA = Not Applicable; OB=Outbound.
Source: Government of Guam, Department of Administration, Division of Public Transportation Services 2008.

The paratransit services partially located in the Apra Harbor Region are:

- Freedom 4 (southern area) serving Umatac, Agat, Piti, Asan, Maina, Hagatna Heights, and Hagatna
- Freedom 5 serving the entire island

The 12-month (2006-2007) ridership for the fixed route, DRS, and paratransit routes in the Apra Harbor Region can be found in Table 4.1-18. Note that there is overlap between several of the routes and service areas between the areas of interest for this project. Because the Freedom 5 serves the entire island, ridership is not included here.

Table 4.1-18. Monthly and Total Fiscal Year 2007 Guam Mass Transit Ridership (Passengers Boarding Each Route)

Service Type	*Route Name*	*12-Month Totals*
DRS	Green 2	9,669
Fixed Route	Blue Line 2	14,870
Paratransit	Freedom 4	8,892
	Totals	**33,431**

Legend: DRS = Demand Response Service.

<u>Existing Pedestrian and Bicycle Facilities</u>

The only sidewalks in the Apra Harbor Region are intermittent and are located on Route 11. There are approximately 2.27 mi (3.70 km) of sidewalk along Route 11 (Figure 4.1-12). In addition, there are existing shoulders on Route 1 up to the entrance of Naval Base Guam.

4.1.5 South

4.1.5.1 On Base Roadways

<u>Naval Munitions Site</u>

The NMS can be accessed through the gate at the intersection of Harmon Road and Route 12 in Santa Rita. Harmon Road and Lower Harmon Road provide access to the Fena Valley Reservoir within the NMS, which is the primary source of potable water for the Navy water system.

Based on the relatively low traffic demand on the NMS, all roadways and intersections should be operating at acceptable levels of service for both the a.m. and p.m. peak hours.

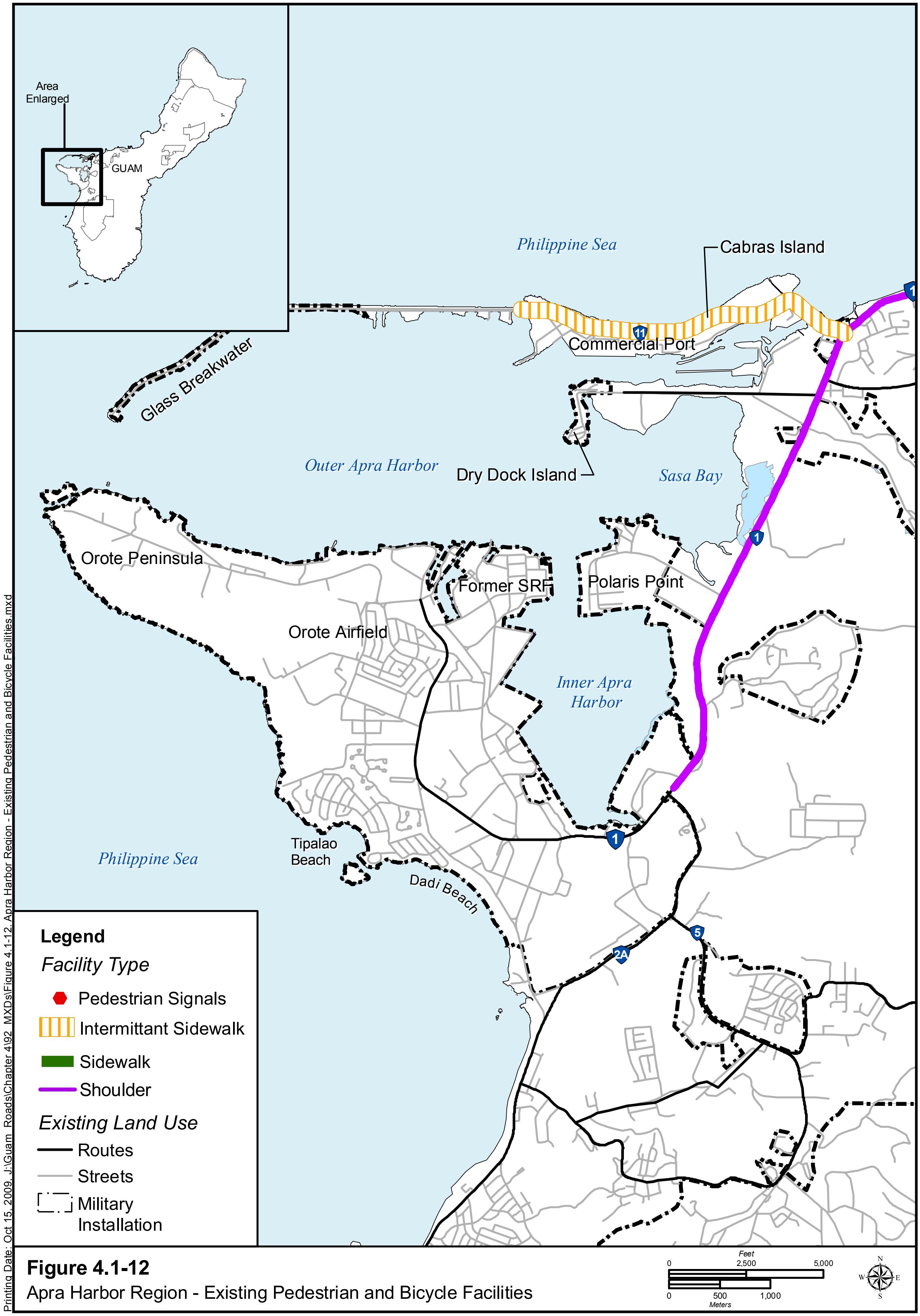


Figure 4.1-12
Apra Harbor Region - Existing Pedestrian and Bicycle Facilities

4.1.5.2 Off Base Roadways

Existing Roadway Conditions

Route 5

Route 5 is located near Naval Base Guam in Santa Rita and intersects with Route 2A at its northern terminus. It loops around to join Route 12 at its southern terminus. The portion of Route 5 included in this study is the section between Route 2A and Route 17. The road is approximately 0.5-mi (0.8-km) long and is considered a minor arterial for the portion in this project. Route 5 has two lanes with an intermediate raised median and queuing left-turn lane at intersections and no shoulders, curb and gutter, or sidewalks. The lanes are generally 12.0 ft (3.6 m) wide.

Route 12

Route 12 is located in the southern part of the island and connects with Route 5 at its eastern terminus in Santa Rita and Route 2 at the western terminus in Agat. Route 12 is 2.7 mi (4.3 km) long and is classified as a major collector; however, the only portion included in this project is the intersection with Route 2. The road has two lanes, intermittent shoulders, and no curb and gutter or sidewalks. The lanes are generally 12.0 ft (3.6 m) wide.

The intersections and military access points included in the South Region are listed in Table 4.1-19.

Table 4.1-19. Intersections and Military Access Points – South Region

Intersections and Access Points - South
Signalized
Route 2/12
Unsignalized
Route 5/17
Route 17/4A
Route 4/4A
Military Access Points
Route 5 – Naval Munitions Site / Harmon Road

Existing Traffic Volumes and Capacity

A summary of existing ADT volumes (2008) for the South Region can be found in Table 4.1-20.

Table 4.1-20. Existing ADT Summary and Capacity – South Region

Roadway	*Existing ADT Summary*	*Existing v/c Ratio*
Route 5	Route 5 ranges from 7,200 to 12,000 vpd.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.
Route 12	Route 12 ranges from 1,000 to 4,100 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.80, which indicates that the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.1-13 and Figure 4.1-14 show existing levels of traffic congestion in the South Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E;

and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

Although there are numerous intersections with capacity issues, there are currently few roadways included in this study with an existing high v/c ratio. For both the morning and afternoon peaks, the roadways in this region are not considered congested.

Existing Intersection Operations

In the existing conditions, all intersections in the South Region operate at LOS C or better. Table 4.1-21 displays the LOS and delay results for the study intersections in the South Region.

Table 4.1-21. Existing Level of Service and Delay Results – South Region

	a.m. Peak Hour		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*				
Route 2/12	C	26.3	B	19.2
Unsignalized**				
Route 5/17	B	12.1	B	11.0
Route 4/4A	C	16.8	B	11.4
Route 17/4A	B	14.0	B	11.4
Military Access Points				
Route 5 – Naval Munitions Site/Harmon Road**	A	8.8	B	10.2

Legend: LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

For both the morning and afternoon peaks, the roadways in this region are not considered congested.

Existing Public Transportation

The discussion of existing conditions in this section would focus on the Guam Mass Transit System in the South Region. Figure 4.1-15 illustrates the fixed routes and DRS areas for the South Region. Note that all of the Monday through Friday fixed routes originate at Chamorro Village, which is located in Hagatna and is not shown on this map. The bus route partially included in the South Region is Blue Line 2. The DRS areas located in the South Region are Green 1 and Green 2. These routes provide service Monday through Saturday only, and all observe the normal 5:30 a.m. to 7:30 p.m. hours of service. DRS is available on call and normally provides transportation to the nearest fixed-route. Table 4.1-22 shows details about the fixed route and DRS areas in the South Region.

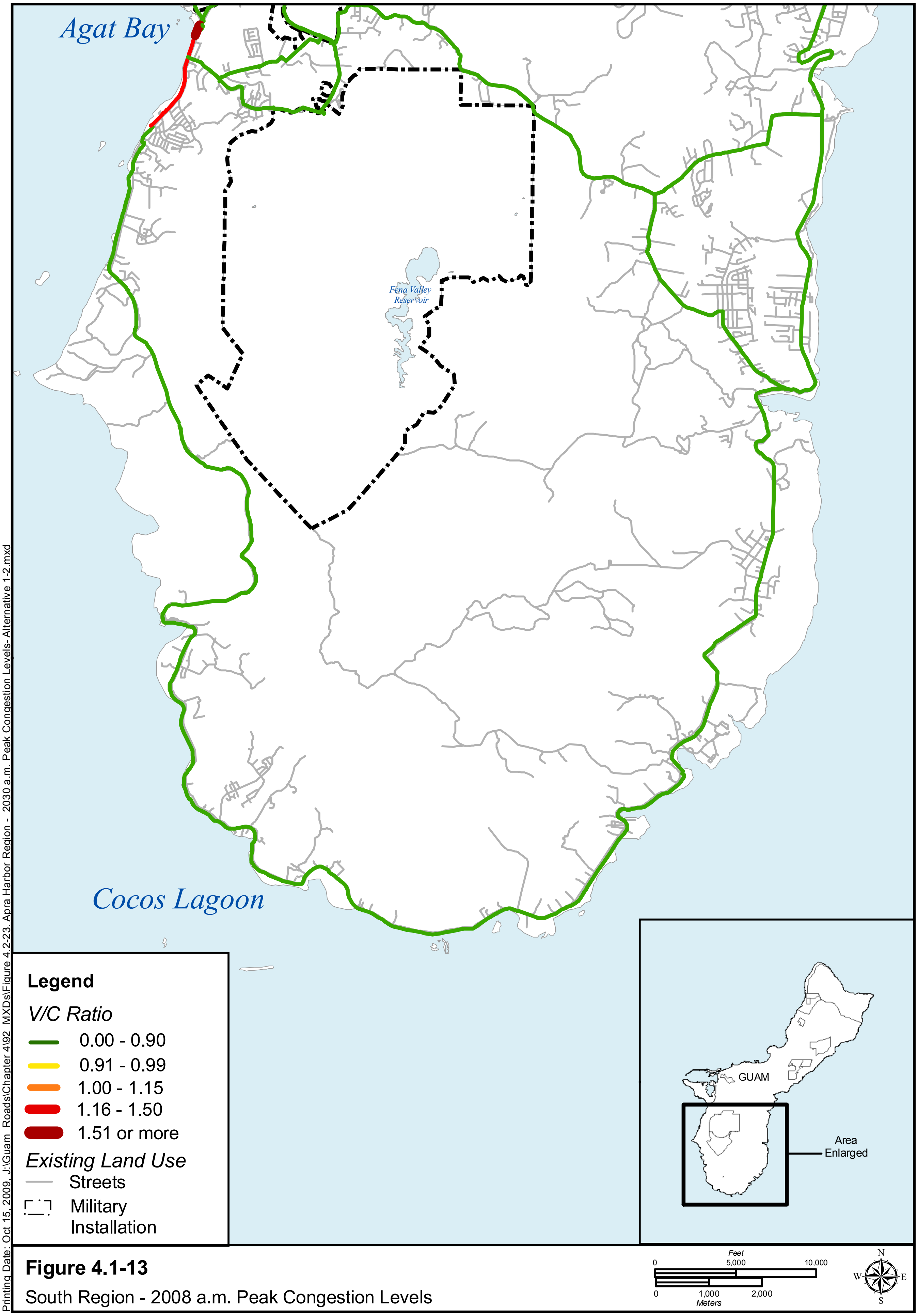


Figure 4.1-13

South Region - 2008 a.m. Peak Congestion Levels

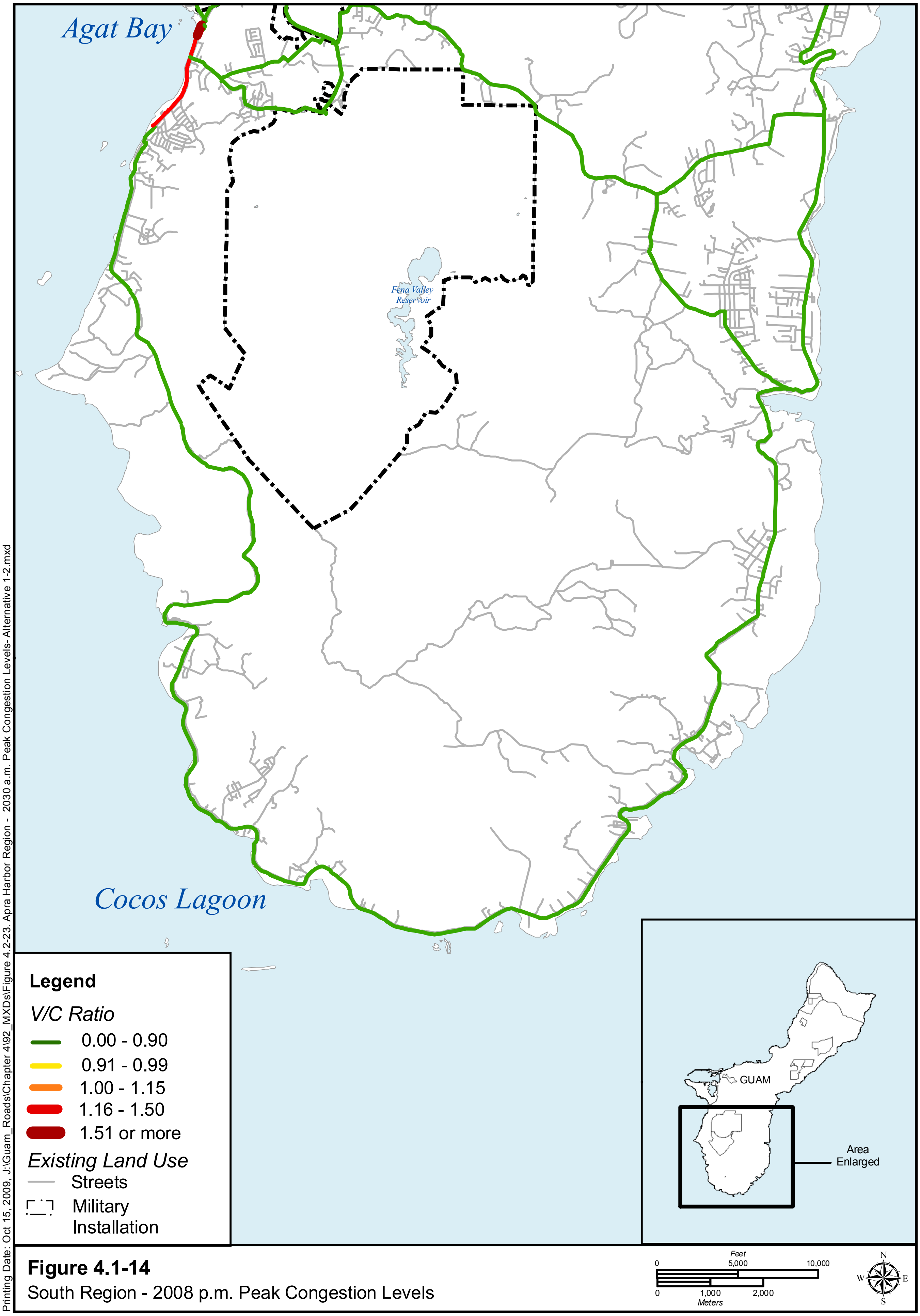
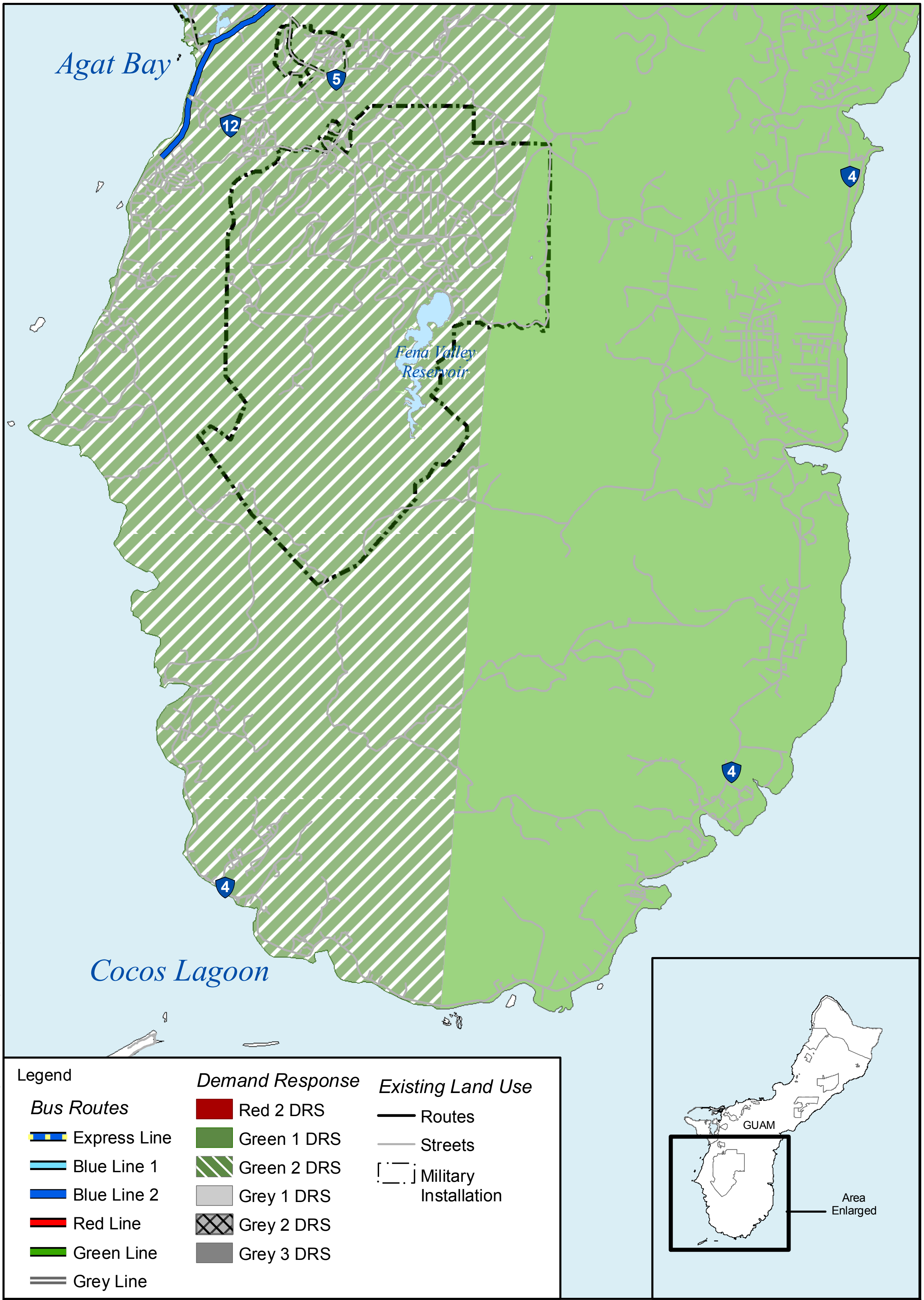


Figure 4.1-14
South Region - 2008 p.m. Peak Congestion Levels



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.1-15. South Region - Existing Transit Service.mxd

Figure 4.1-15
South Region - Existing Transit Service

Table 4.1-22. Fixed Route and DRS Areas – South Region

Route	*Areas Served*	*Headway (hours)*	*Trips per Day, Monday-Saturday*	*Trips per Day, Sunday/Holiday*	*Scheduled Run Time Outbound (minutes)*	*Scheduled Time (minutes)*	*Scheduled Run Time Inbound (minutes)*
Fixed Route							
Blue Line 2	Hagatna —Agat (Shuttle)	2	8 OB, 6 IB	5 OB, 4 IB	35 to 37		32 to 35
Green Line 1*	Chamorro Village—Yona (Loop)	2	8	0	10	80	20
DRS Area							
Green Line 1	Hagatna, Yona, Talofofo, Malojloj, and Inarajan	NA	NA	NA	NA	NA	NA
Green Line 2	Agat, Santa Rita, Umatac, and Merizo	NA	NA	NA	NA	NA	NA

Legend: IB=Inbound; NA=Not Applicable; OB=Outbound.
Note: *Hours of service are 5:30 a.m. to 7:30 p.m. Monday through Saturday and 7:30 a.m. to 5:30 p.m. Sundays and Holidays.
Source: Government of Guam, Department of Administration, Division of Public Transportation Services 2008.

The paratransit service partially located in the South Region is:

- Freedom 3 (southern area) serving Inarajan, Malojloj, Talofofo, and Yona
- Freedom 4 (southern area) serving Umatac, Agat, Piti, Asan, Maina, Hagatna Heights, and Hagatna
- Freedom 5 serving the entire island

The 12-month (2006-2007) ridership for the fixed route, DRS, and paratransit routes in the South Region can be found in Table 4.1-23. Note that there is overlap between several of the routes and service areas between the regions for this project. Because the Freedom 5 serves the entire island, ridership is not included here.

Table 4.1-23. Monthly and Total Fiscal Year 2007 Guam Mass Transit Ridership (Passengers Boarding Each Route)

Service Type	*Route Name*	*12-Month Totals*
DRS	Green 1	13,050
	Green 2	9,669
Fixed Route	Blue Line 2	14,870
	Green Line 1	NA
Paratransit	Freedom 3	6,728
	Freedom 4	8,892
	Totals	53,209

Legend: DRS = Demand Response Service.

<u>Existing Pedestrian and Bicycle Facilities</u>

The southern portion of the island does not contain any pedestrian or bicycle facilities. In addition, there are no shoulders that can function as pedestrian or bicycle lanes. As stated earlier, no formal bike lanes or paths exist on Guam.

4.2 ENVIRONMENTAL CONSEQUENCES

4.2.1 Approach to Analysis

On Base Roadways

For Andersen AFB and Navy base, on base roadway analysis approach was based on the TransCAD traffic model volumes and available traffic study data. General baseline and operating conditions were taken from the Andersen Air Force Base Traffic and Safety Engineering Study (Andersen AFB 2008) for Andersen AFB and the Traffic Impact Study, BEQ Residential Complex, Naval Base, Guam (Duenas Bordallo & Associates, Inc. 2008) for Navy base. The TransCAD 2008 and 2030 traffic volumes at Andersen Air Force and Navy base gates were compared to determine the anticipated increase in traffic entering and exiting the base. This index provides a relative measure of traffic impact and is intended to be a gauge of the general level of traffic on the base. This index does not measure the traffic impact at critical intersections.

For Andersen South, Finegayan, Polaris Point and NMS, the current base land use was compared to the traffic anticipated to be generated by the proposed action. A qualitative analysis based on roadway capacities and project trips were compared to determine level of significance.

An on base traffic study is currently being prepared and once complete will be used to identify potential mitigation options for high traffic areas.

Off Base Roadways

This section describes the future condition of off base roadways as a result of roadway improvements needed to support the military relocation to Guam. The results are discussed for the four major alternatives of Volume 2: Alternative 1, Alternative 2, Alternative 3, and Alternative 8, all of which are described in detail in Chapter 2. However, the analysis also includes the alternatives associated with the aircraft carrier berthing action and the Army Air and Missile Defense Task Force (AMDTF) action because the traffic on the roadways must be analyzed as a whole in order to determine the full impacts of the proposed action. As described in the Affected Environment subsection of Volume 2, the island is divided up into four regions: North, Central, Apra Harbor, and South. The future conditions of the off base roadways are discussed in their respective regions, as listed above.

The traffic impacts of the alternatives were determined through an analysis of future traffic volumes and intersection operations. The alternatives that were modeled are as follows:

- 2014 Peak Construction/Full Military Expansion – Alternative 1
- 2014 Peak Construction/Full Military Expansion – Alternative 2
- 2014 Peak Construction/Full Military Expansion – Alternative 3
- 2014 Peak Construction/Full Military Expansion – Alternative 8
- 2014 – No-Action Alternative
- 2030 Full Military Expansion – Alternative 1
- 2030 Full Military Expansion – Alternative 2
- 2030 Full Military Expansion – Alternative 3
- 2030 Full Military Expansion – Alternative 8
- 2030 – No-Action Alternative

Forecasting of future traffic volumes involved a three-step process (trip generation, trip distribution and assignment). All modeling efforts used the 2008 TransCAD model, as discussed in the Affected

Environment section, along with several population and employment assumptions. The assumptions included:

- Population related to the military relocation would peak in 2014 with approximately 268,000 construction and military personnel and general population of Guam. By 2030, the population would slightly decrease to approximately 255,000 because of the loss in off-island construction personnel (see Figure 4.2-1).
- All military loading, housing location, and military workplace location information was provided by the Navy. Most of the military personnel are housed in the northwest area of the island (see Figure 4.2-1 and Table 4.2-1 and Figure 4.2-2).
- Off-island construction personnel associated with the military actions are housed in community housing close to the construction sites and bused to work during off-peak hours during the construction years.
- Transient personnel (aircraft carriers, Marines, Air Force) visit periodically, do not have access to personally owned vehicles, and would have designated shuttle service to on-island locations; therefore, traffic was assumed to be negligible and subsequently not included in model.
- Off-island indirect workers associated with the military actions would live in zones concentrated around the north and central parts of the island.
- New indirect and direct jobs that result from the military actions would be concentrated around the north and central parts of the island.
- Roadway construction workers were included in the model as “Other” indirect workers. The employment at these locations would attract workers during the trip distribution step.
- Construction materials being delivered to the construction sites were also modeled.
- Delivery of roadway construction materials in the model accounts for the impact of roadway work during the construction peak phase.
- Traffic congestion was measured by dividing the number of cars on the road (i.e., volume) by the number of cars the road was designed to carry (i.e., capacity). A v/c ratio greater than 1 indicates that the roads are carrying more vehicles than they were designed to handle—the roads are congested.

4.2.1.1 Methodology

<u>On Base Roadways</u>

For Andersen AFB and Navy base, a percent increase of traffic between 2030 with and without project was used to determine the level of significance. For the purpose of this analysis, a 5 percent (%) increase in total traffic was used as an indicator for potential problem areas.

For on base construction, Andersen South, Finegayan, Polaris Point and NMS, the current traffic demand on the roadway system was compared to the traffic anticipated to be generated by the proposed action. Typically, a two lane roadway has a capacity of approximately 5,000 vehicles per day (vpd). This capacity was compared to projected traffic of the project and current traffic demand to determine the potential for impacts.

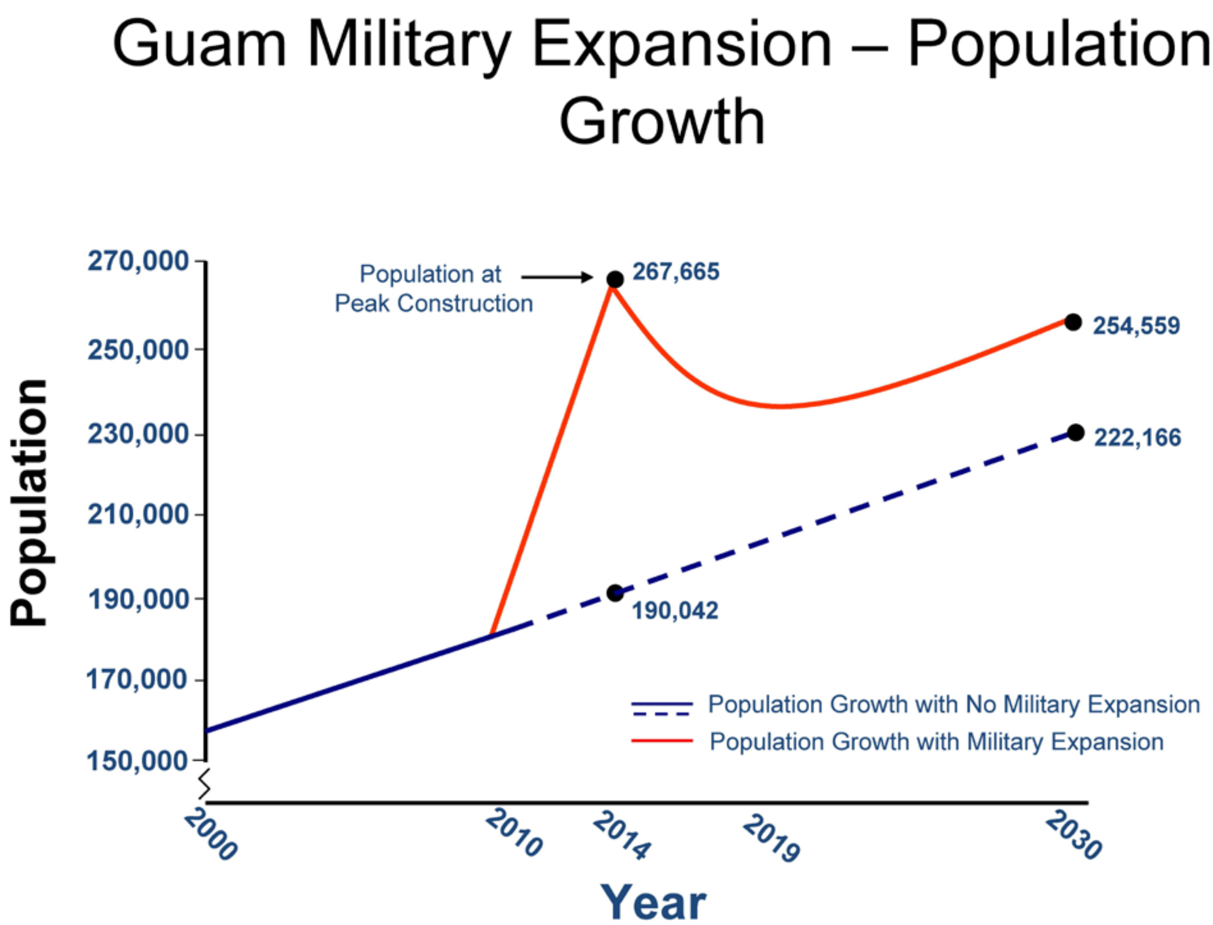


Figure 4.2-1. Island Population Growth

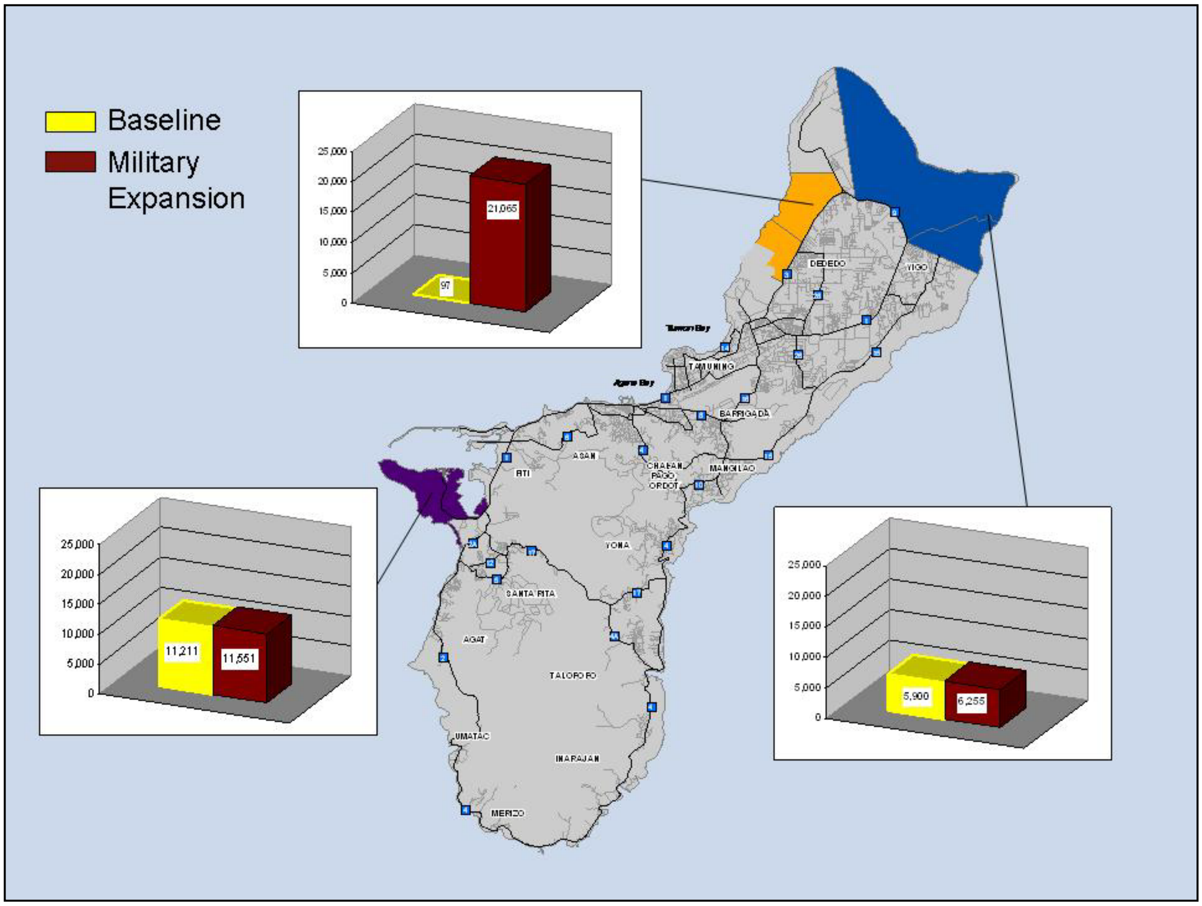


Figure 4.2-2. Military Base Population Growth

Off Base Roadways

As the first step, traffic volumes were modeled for each 2030 Alternative to understand the impacts of the military relocation on the existing roadway network, including already programmed roadway improvements. With current capacities, this initial modeling effort showed severe military-related congestion along several routes in the northern and central portions of the island. The results formed the roadway improvements needed to improve traffic congestion and improve safety of the system. The proposed projects, as described in Volume 6, Chapter 2, included roadway widening to improve the congestion levels and strengthening to improve structural capacity of roads. These projects are shown in Table 4.2-1.

Table 4.2-1. Roadway Widening Projects

Route	*Limits*	*Description*	*Alternatives 1 and 2*	*Alternative 3*	*Alternative 8*
Route 3	NCTS Finegayan to Route 28	Widen from 2 to 4 lanes, add median and shoulders.	X	X	X
Route 3	NCTS Finegayan to Route 9	Widen from 2 to 4 lanes, add median and shoulders.	X	X	X
Route 8	Route 33 (east) to Route 1	Widen from 4/6 lanes to 6 lanes, with a median.	X	X	X
Route 8A	Route 16 to Air Force Barrigada	Widen to provide median and shoulders.		X	
Route 9	Route 3 to Andersen AFB (ACE Gate)	Widen from 2 to 4 lanes, add median.	X	X	X
Route 9	Andersen AFB ACE Gate to Route 1 (Andersen AFB Main Gate)	Add median and shoulders.	X	X	X
Route 16	Route 10A to Navy Barrigada Residential Gate	Widen from 4 to 6 lanes, with a median.		X	
Route 25	Route 16 to Route 26	Widen from 2 to 4 lanes.	X	X	X
Route 26	Route 1 to Route 15	Widen from 2 to 4 lanes.	X	X	X
Route 28	Route 1 to Route 3	Add median and 4 shoulders.	X	X	X

Legend: ACE = Air Combat Element; AFB = Air Force Base; NCTS = Naval Computer and Telecommunications Station.

The existing roads are not structurally capable of handling heavy traffic due to the current condition of pavement. By improving the structural capacity of the roadways and widening selected roads to account for additional traffic, the safety and stability of the roadways would also be improved for other drivers, transit patrons, pedestrians, and bicyclists. As discussed in Chapter 2, the following roads are included in the proposed improvements for this project:

- Route 1
- Route 2a
- Route 3
- Route 5
- Route 8
- Route 8a
- Route 9
- Route 10
- Route 11
- Route 12
- Route 15
- Route 16
- Route 25
- Route 26
- Route 27
- Route 28
- Chalan Lujuna

The second step included re-modeling the 2030 traffic volumes for each 2030 Alternative with the additional projects listed in Table 4.2-1 with the exception of Routes 25 and 26, as these projects were included in the 2030 programmed roadway improvements. After incorporating the new capacities with the proposed roadway segment improvements, the results reveal decreased congestion on the routes in the north; however, some military-related congestion still exists in the Central Region.

The third step included modeling each 2014 Alternative with the full set of roadway widening improvements to obtain 2014 roadway volumes and resulting congestion levels. The final step in the off base roadway analysis was using peak-hour roadway volumes to forecast the 2014 and 2030 intersection turning movements. Geometric conditions and intersection turning movements were evaluated using Synchro to estimate intersection delay and levels of service. Intersection improvements were developed with the goal of providing LOS E or better in the 2030 condition. In some cases, achieving LOS E would have required inordinately costly and environmentally impactful roadway improvements. In most those cases, intersection improvements were recommended that would offset the traffic impacts associated with the military relocation, however intersections would still operate at LOS F. The intersection improvements were recommended at 27 intersections and were evaluated for both 2014 and 2030. LOS modeling and geometric requirements/design were completed for the access points based on the long-term steady-state condition in 2030. The 2014 analysis should be completed for the "preferred" alternative as part of a future traffic management plan during the peak construction period.

The results of this analysis are shown in the *Future Traffic Impacts* subsections of Sections 4.2.2 and 4.2.3 in this chapter.

Figure 4.2-3 through Figure 4.2-14 present the different congestion levels for each alternative. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. The congestion levels for Alternative 2 are the same as that of Alternative 1; therefore, Figure 4.2-3 through Figure 4.2-6 are applicable to both Alternatives 1 and 2.

The turning movements calculated using the methods and assumptions described above were then used to forecast the LOS at the 42 intersections. The traffic volumes from the revised TransCAD model, including the roadway widening projects associated with each alternative, were used to analyze intersection operations. The future conditions for the 42 intersections were calculated using Synchro, which is described earlier in this chapter.

4.2.1.2 Determination of Significance

<u>On Base Roadways</u>

See On base Approach to Analysis and Methodology (Sections 4.2.1 and 4.2.1.1) of this Chapter.

<u>Off Base Roadways</u>

The desired threshold for acceptable operating conditions at intersections is LOS E or better. Intersections operating at LOS F would be considered unacceptable.

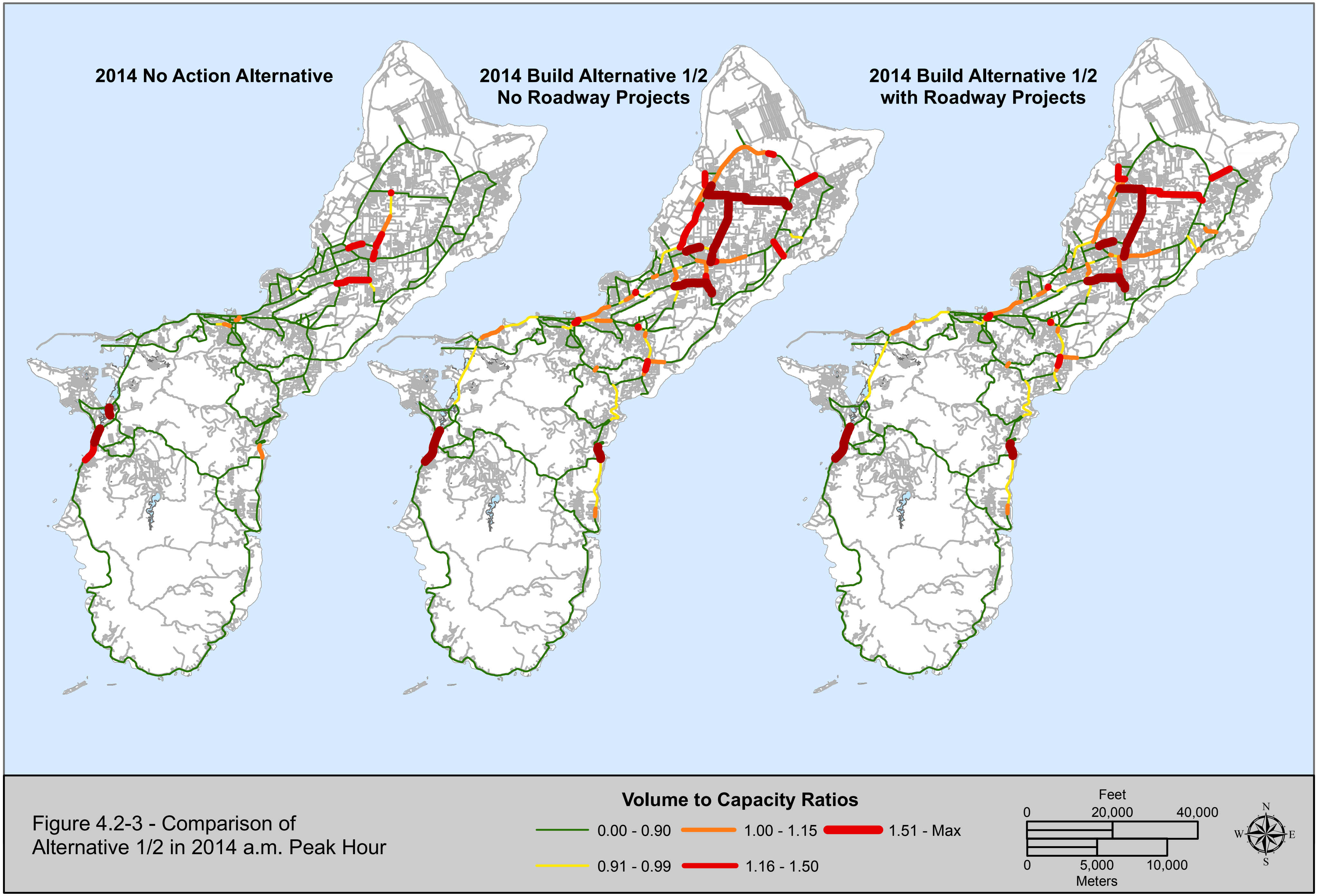


Figure 4.2-3 - Comparison of Alternative 1/2 in 2014 a.m. Peak Hour

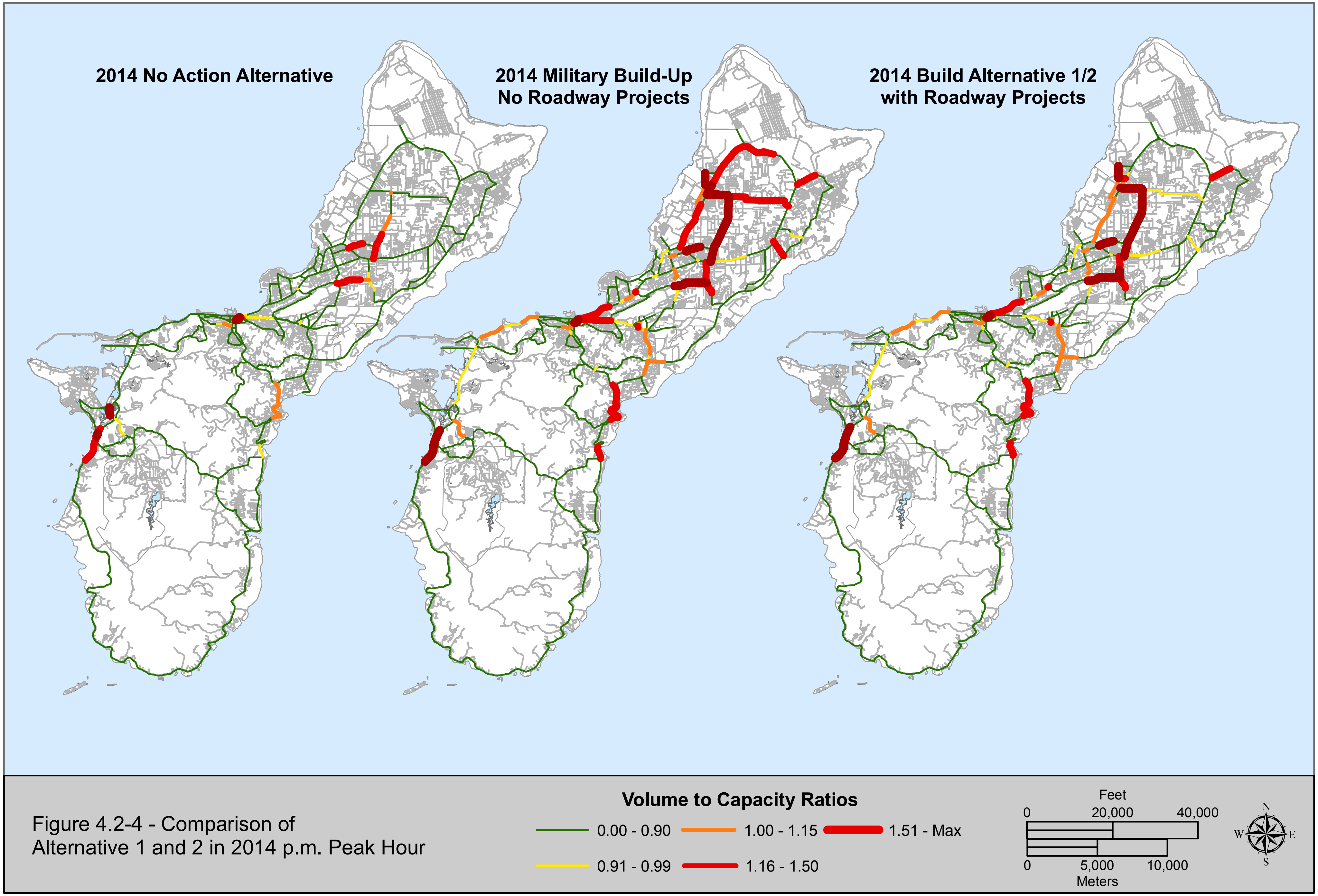


Figure 4.2-4 - Comparison of Alternative 1 and 2 in 2014 p.m. Peak Hour

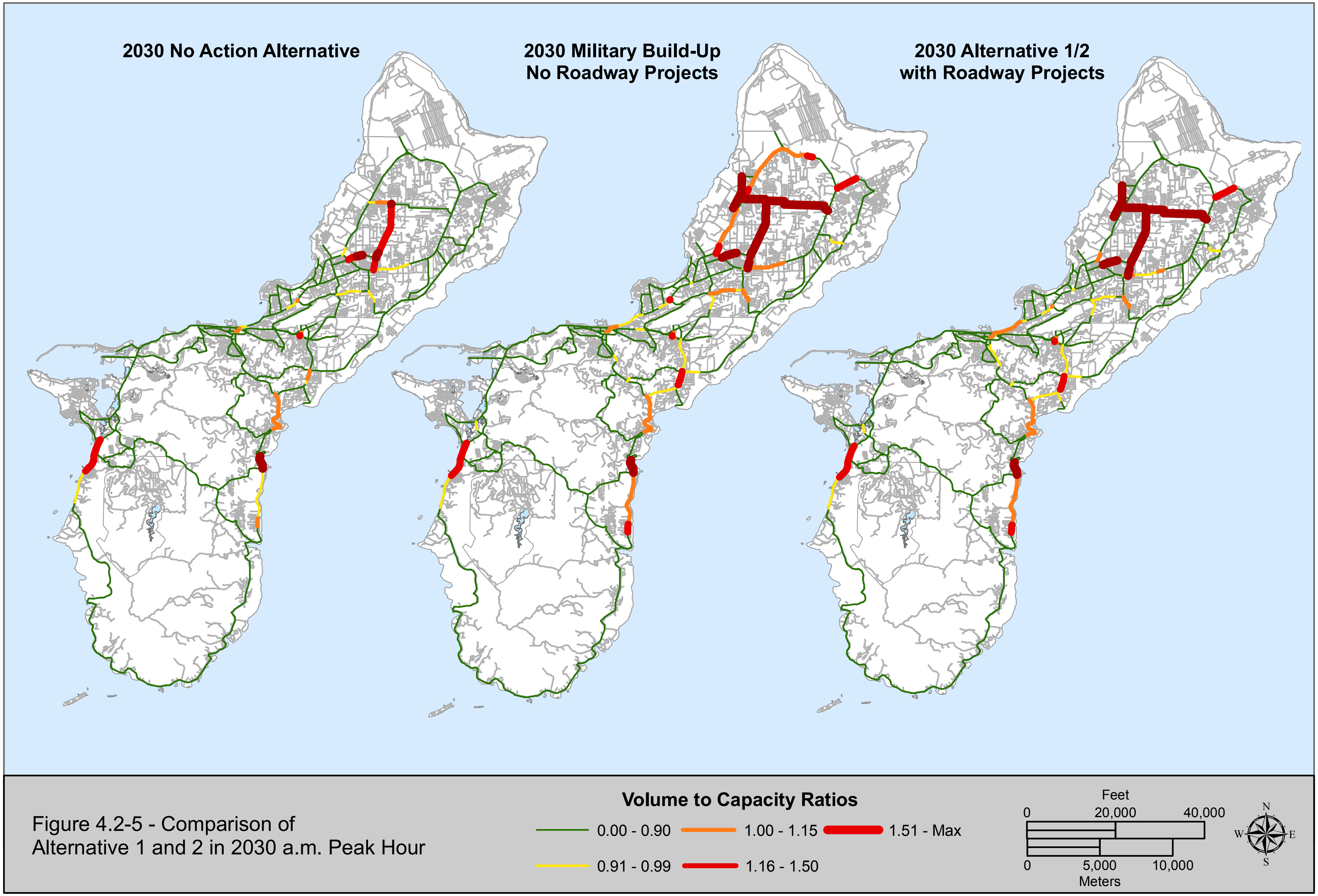


Figure 4.2-5 - Comparison of Alternative 1 and 2 in 2030 a.m. Peak Hour

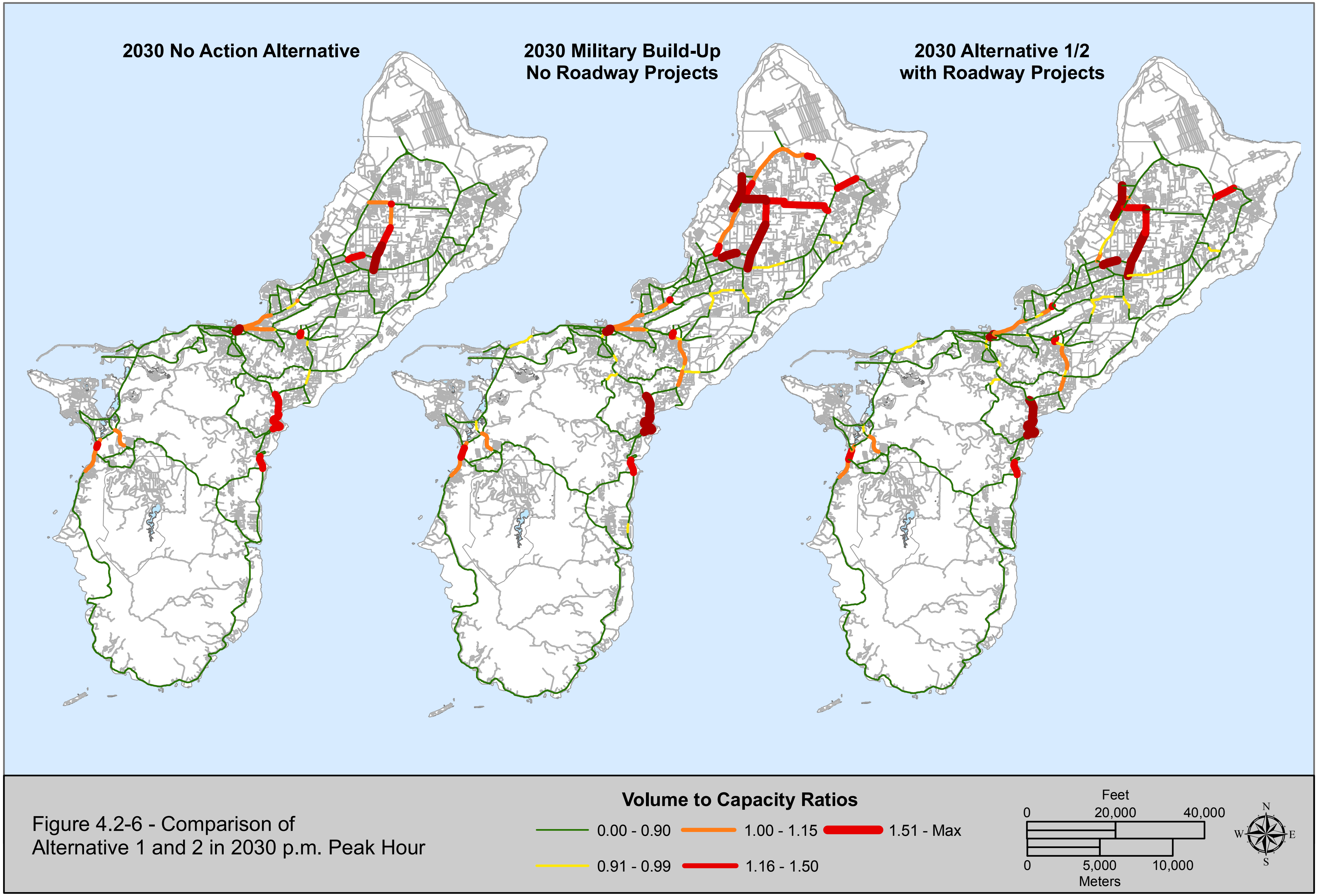


Figure 4.2-6 - Comparison of
Alternative 1 and 2 in 2030 p.m. Peak Hour

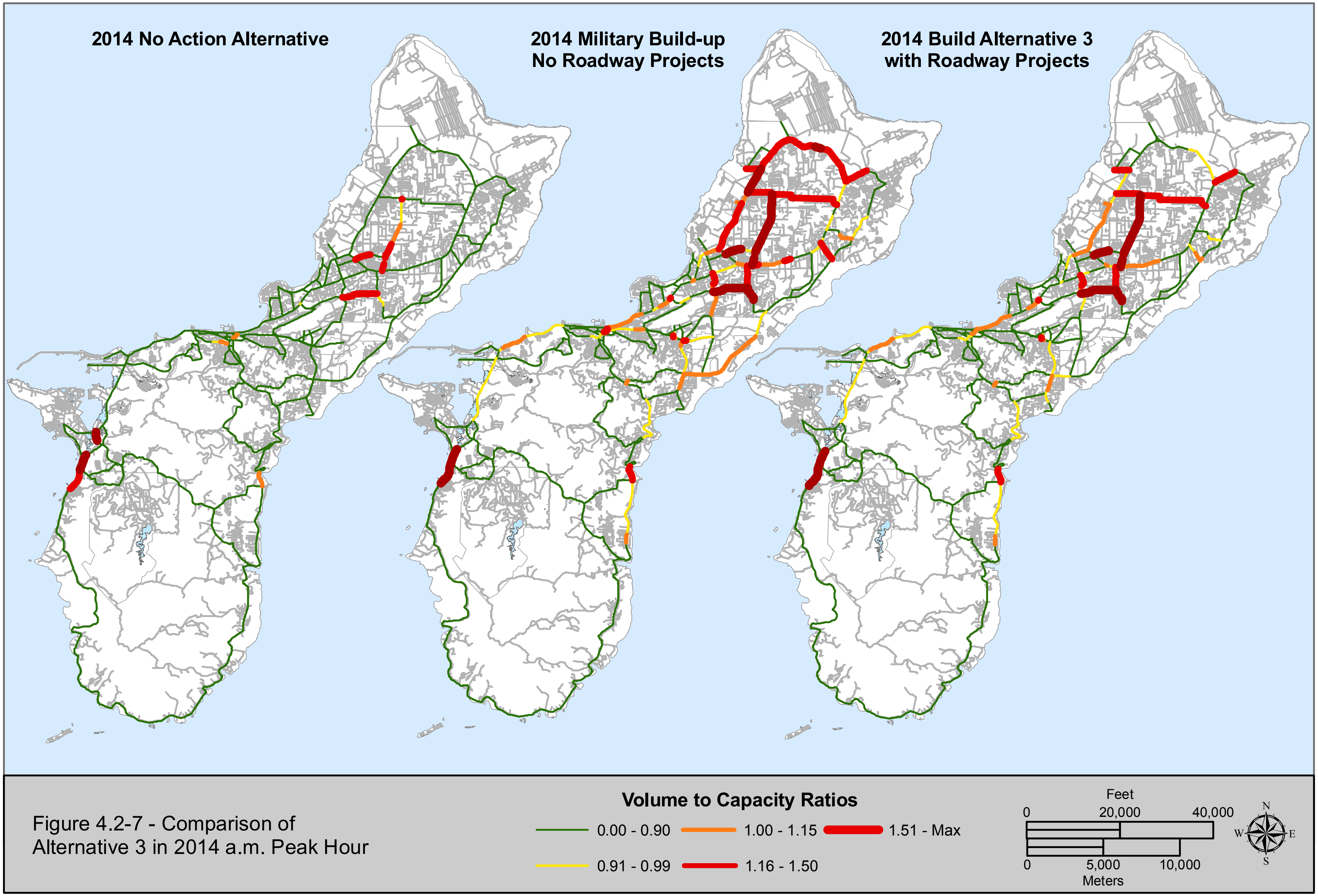


Figure 4.2-7 - Comparison of Alternative 3 in 2014 a.m. Peak Hour

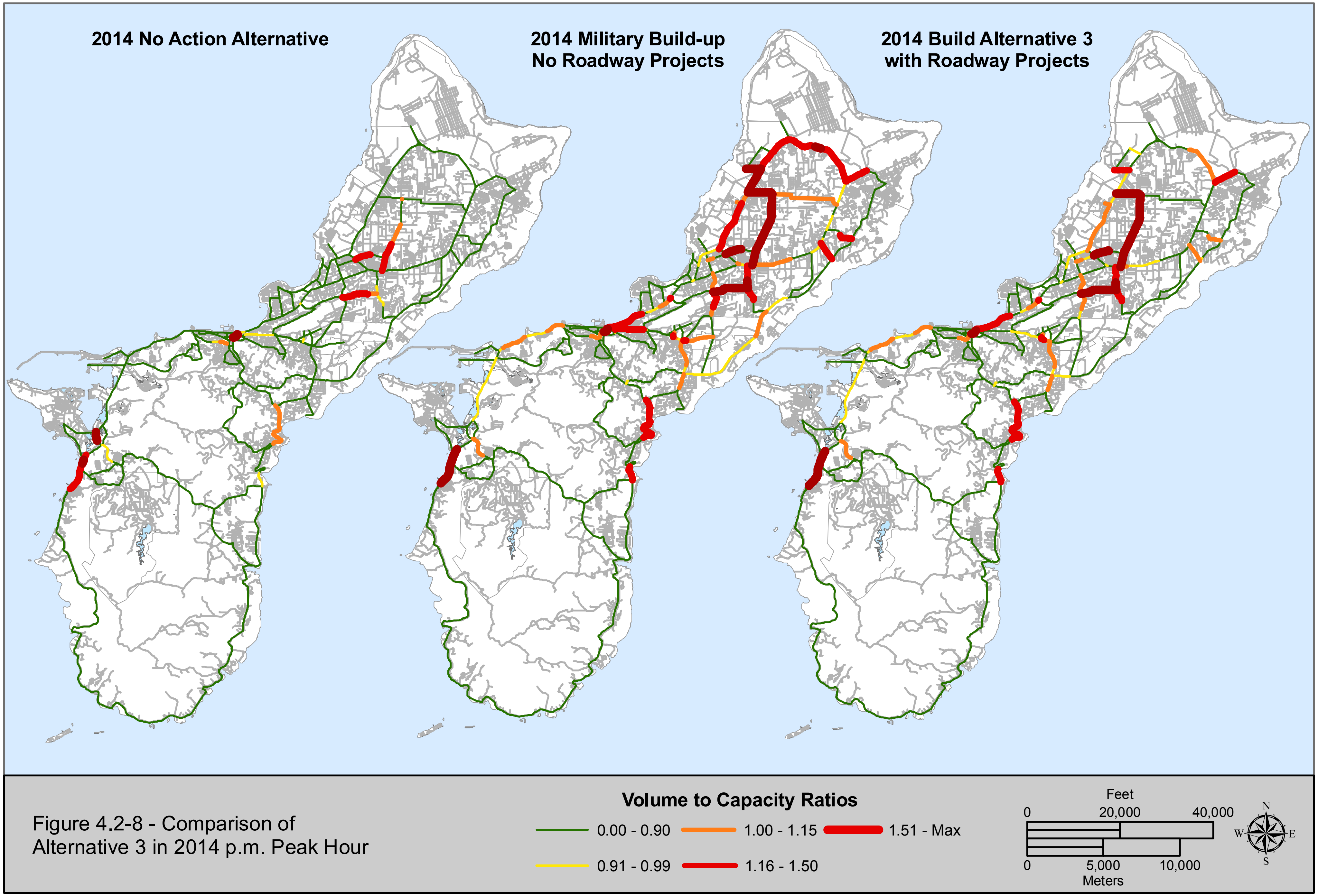


Figure 4.2-8 - Comparison of Alternative 3 in 2014 p.m. Peak Hour

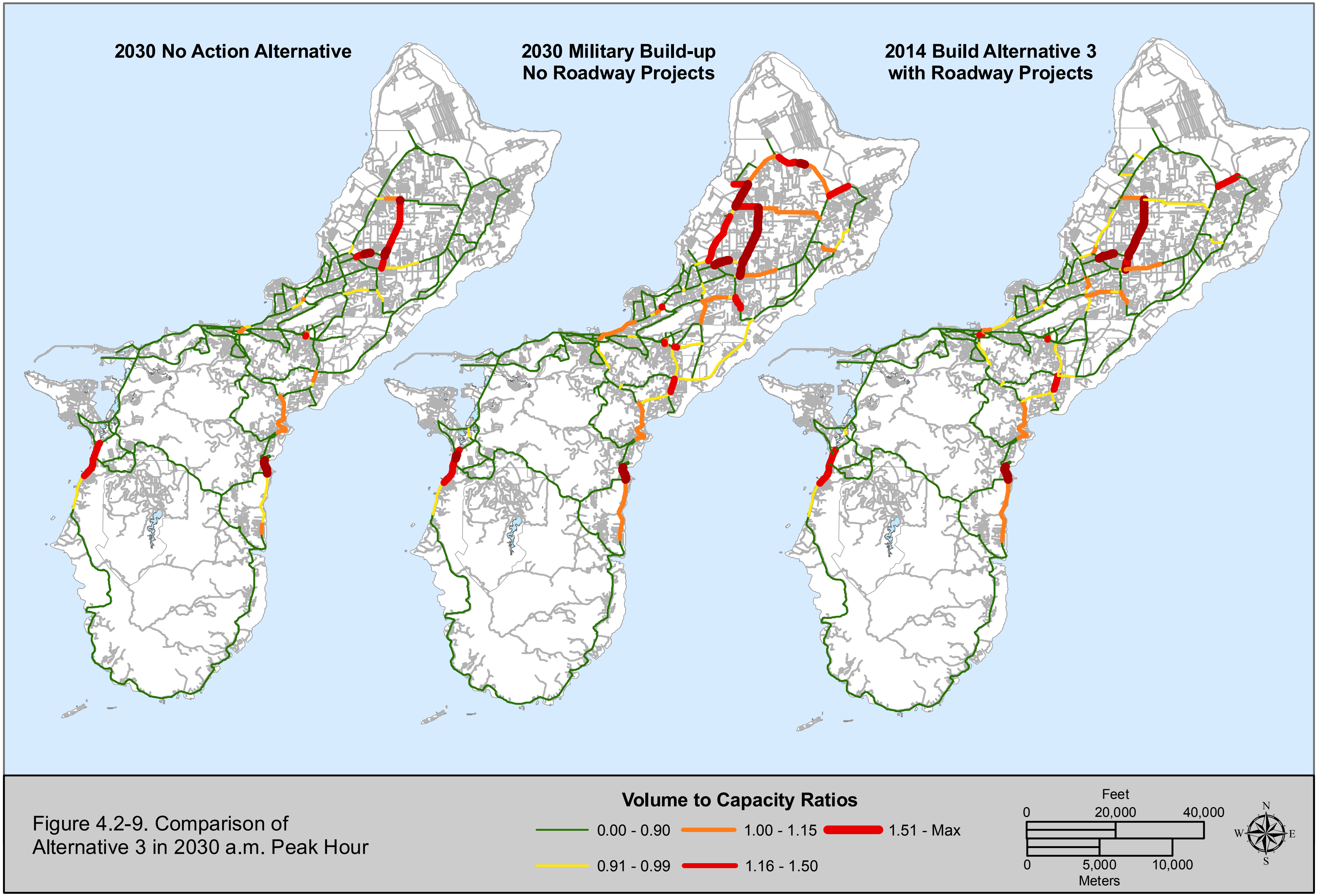


Figure 4.2-9. Comparison of Alternative 3 in 2030 a.m. Peak Hour

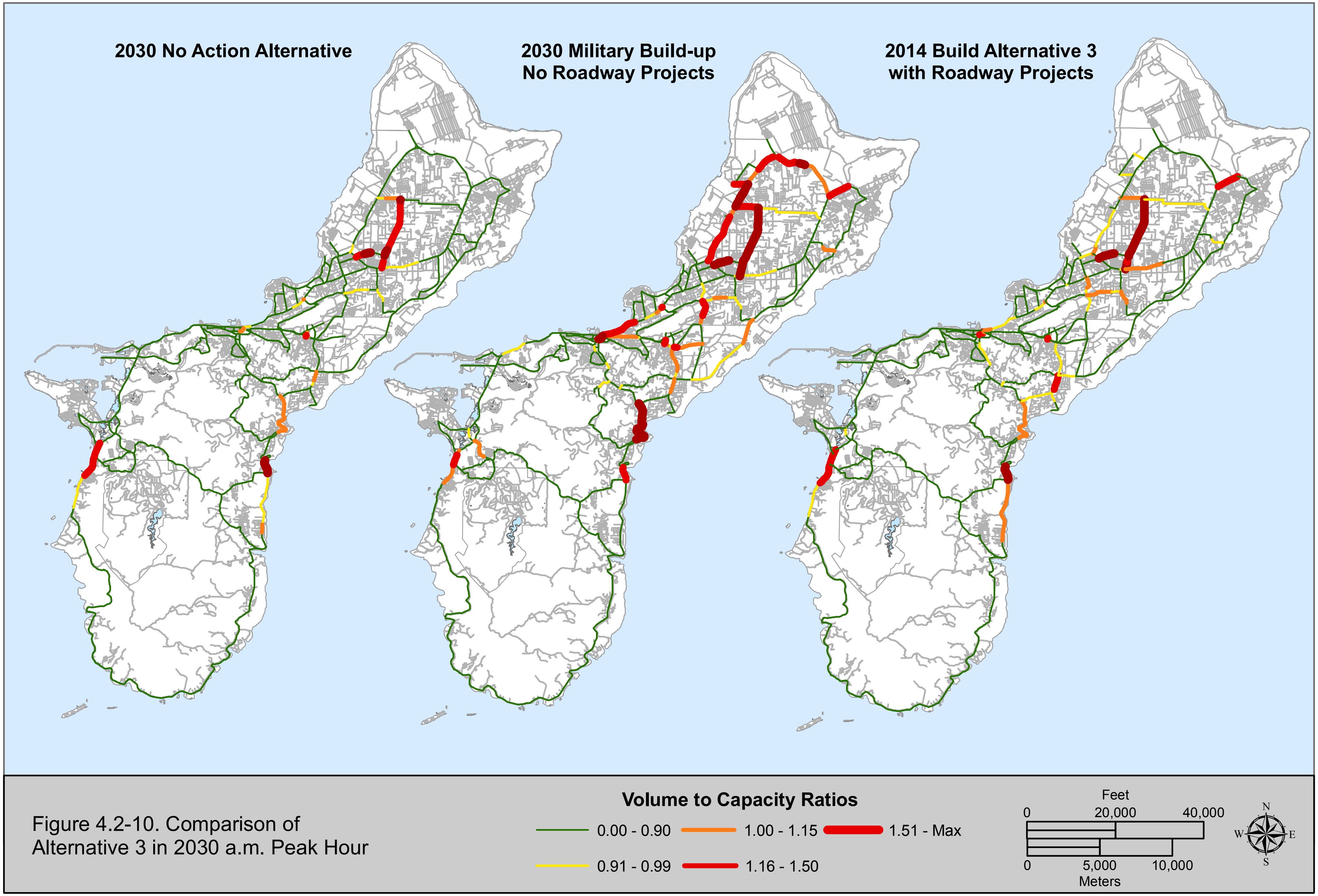


Figure 4.2-10. Comparison of Alternative 3 in 2030 a.m. Peak Hour

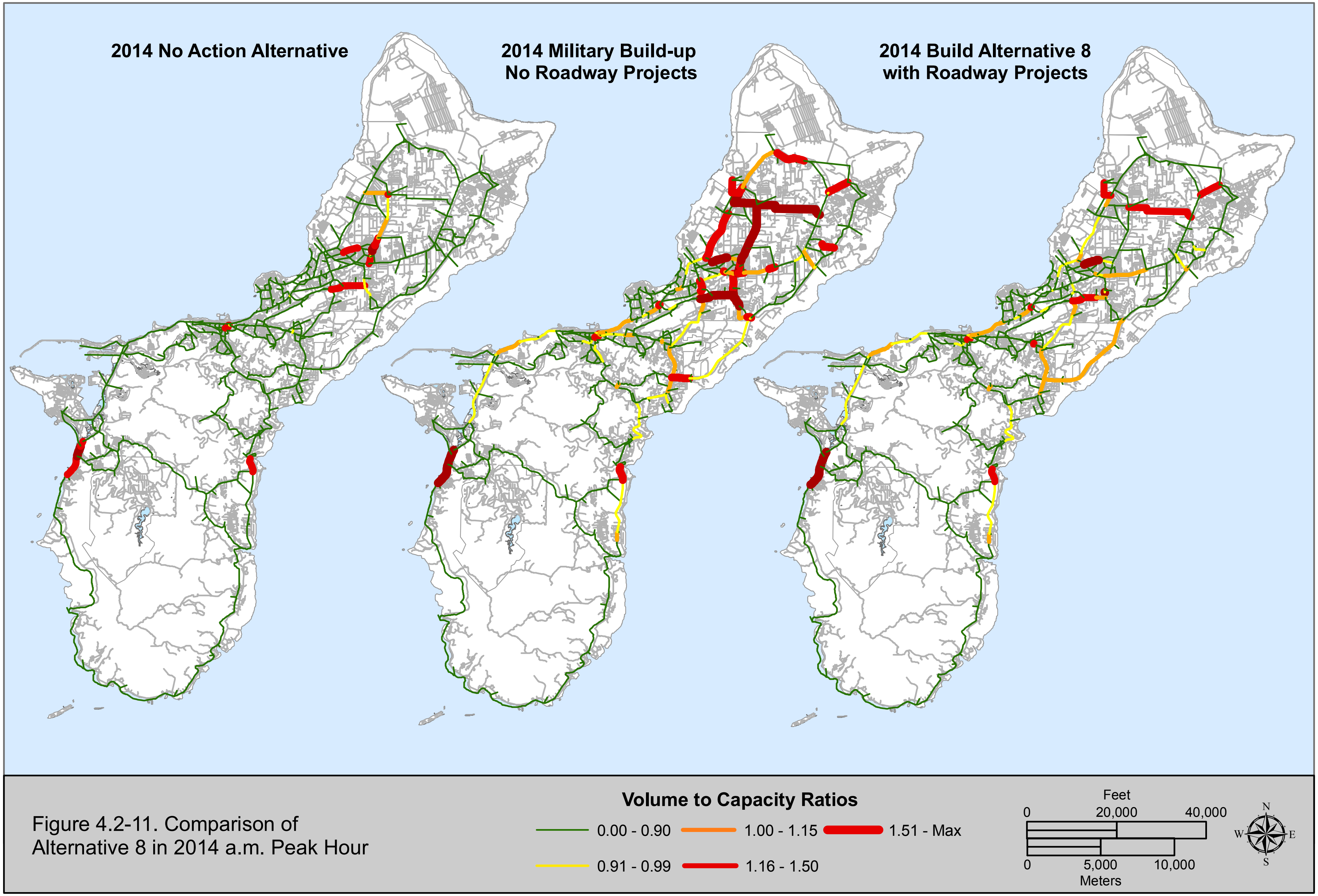


Figure 4.2-11. Comparison of Alternative 8 in 2014 a.m. Peak Hour

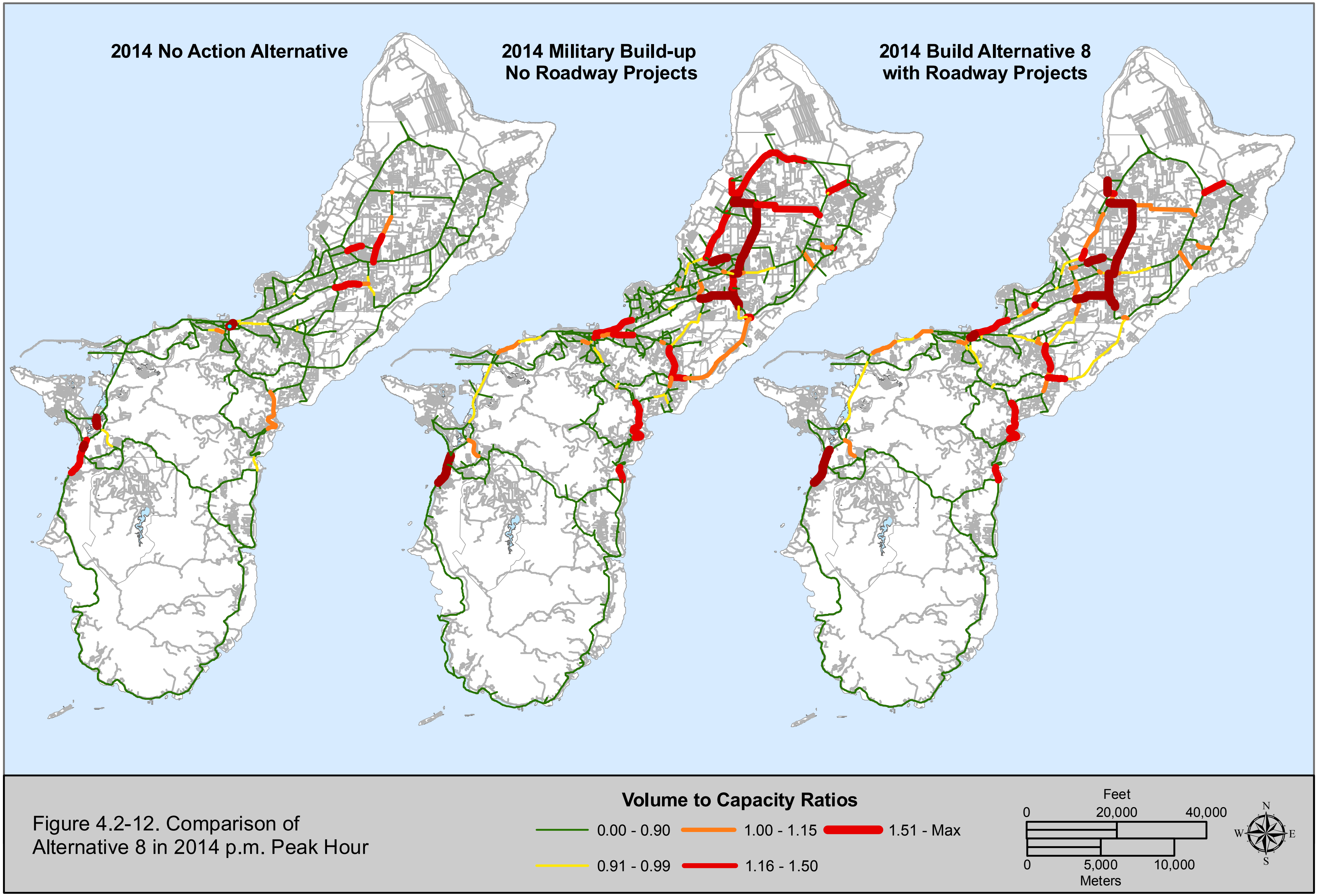


Figure 4.2-12. Comparison of Alternative 8 in 2014 p.m. Peak Hour

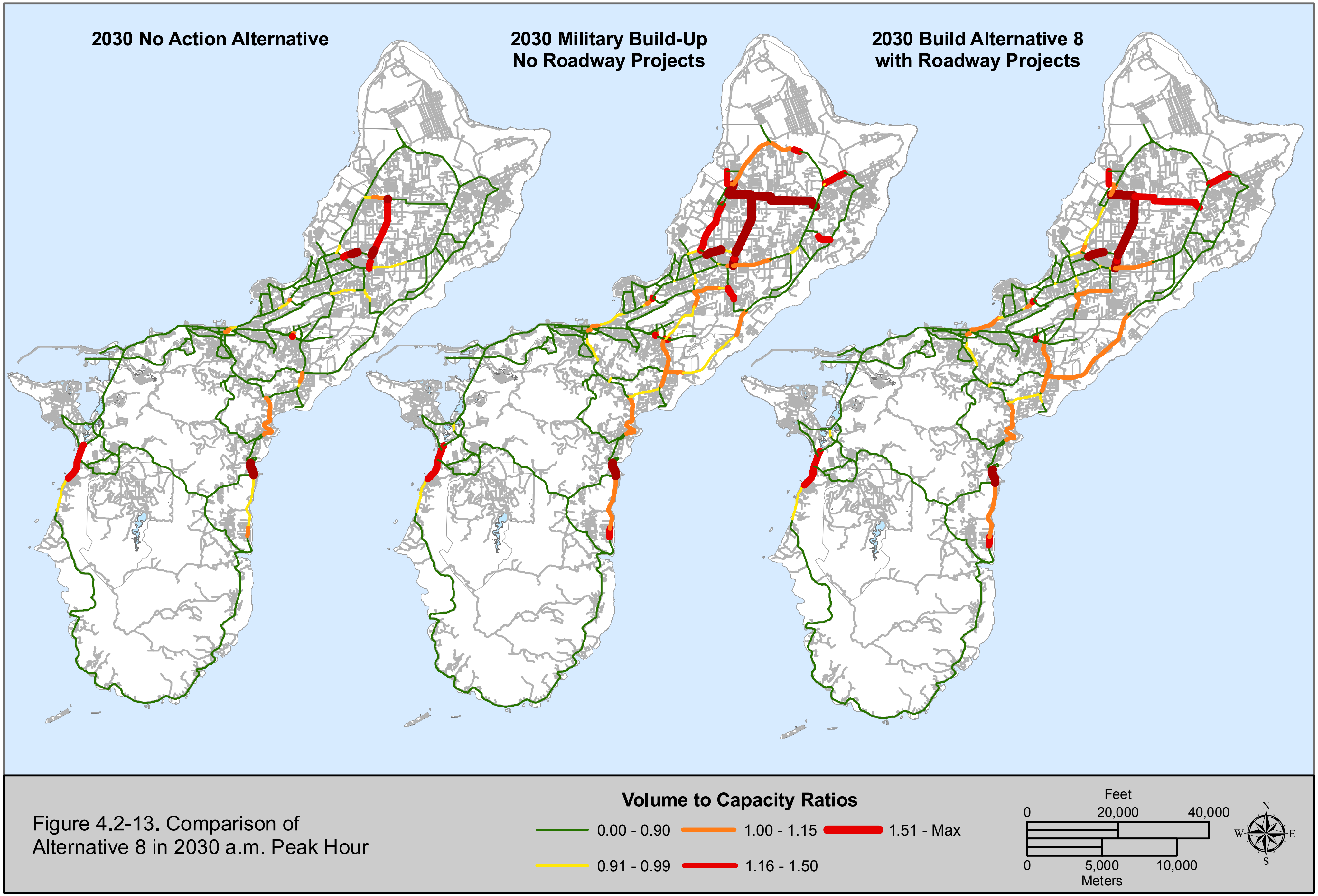


Figure 4.2-13. Comparison of Alternative 8 in 2030 a.m. Peak Hour

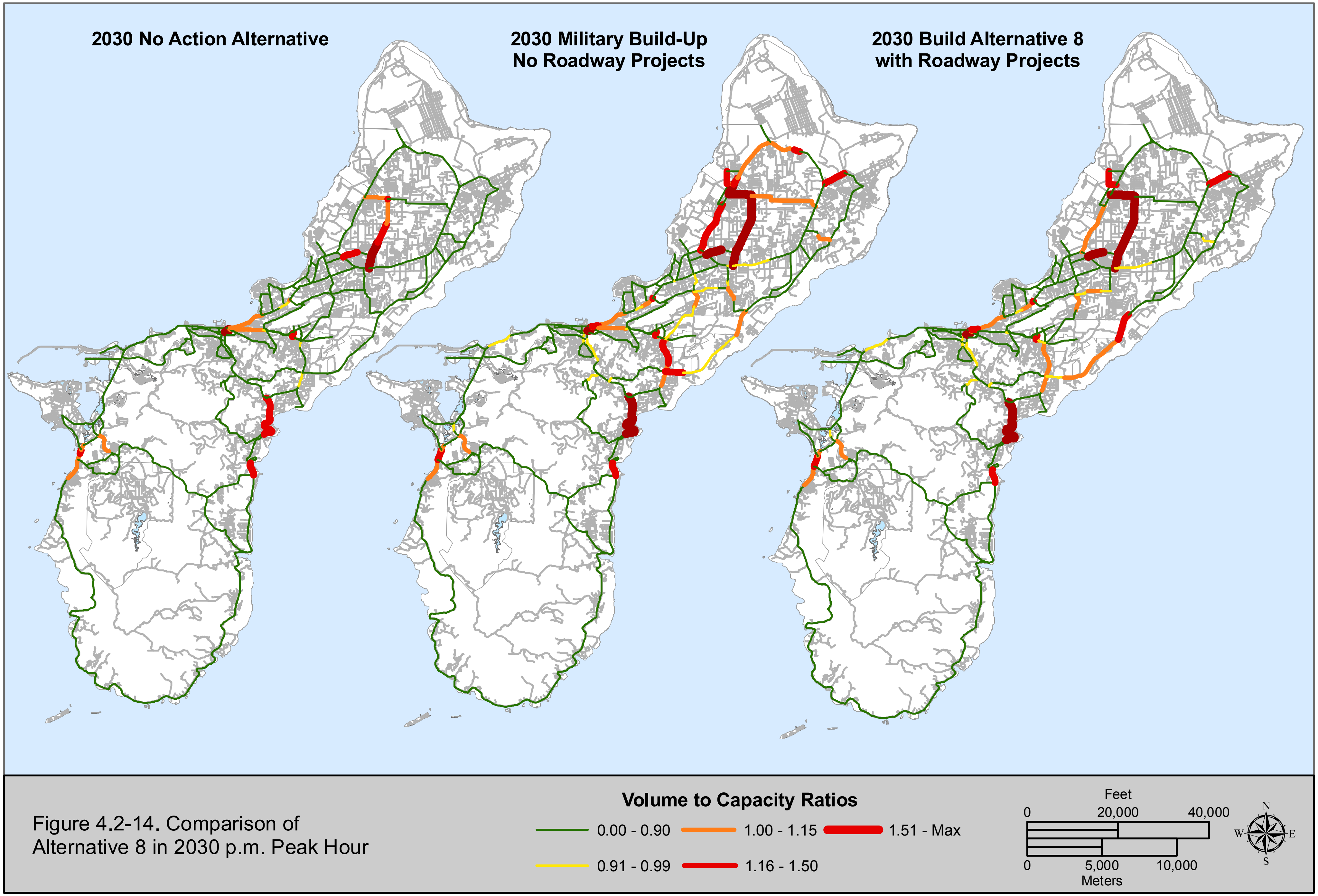


Figure 4.2-14. Comparison of Alternative 8 in 2030 p.m. Peak Hour

4.2.1.3 Issues Identified during Public Scoping Process

On Base Roadways

Although there were many traffic related comments received during the public scoping process, no on base traffic related comments were received.

Off Base Roadways

During the public scoping meeting, 33 comments were received regarding the increase in traffic and roadway conditions. Several comments were received indicating that studies must be conducted to identify needs, synchronize signals, upgrade roads to federal standards, and identify impacts to primary, secondary, and tertiary roadways. The Bureau of Planning and Statistics had several comments and questions regarding the impact of population growth on existing off base roadways, the capacity of the existing system, and the interface between the planning efforts with the Guam Highway Master Plan(s). In addition, there were comments received requesting the mitigation measures for traffic impacts be identified in this Environmental Impact Statement.

4.2.2 Roadway Alternatives Analysis

4.2.2.1 Alternative 1

North

On Base Roadways:

Andersen AFB

Construction. The proposed construction at Andersen AFB is the same for Alternative 1, 2, 3 and 8 and would include a new access road and a new access gate (North Gate) on Route 9. The access road would serve as the main access to the North Ramp area where the support facilities would be constructed.

New construction associated with the access road would include the following:

- Two new lanes would be constructed on Route 9 to allow for Wheel Base-33D Turnpike-Double Combination Trucks to turn into and out of the new base access road.
- The project includes a 12 ft (3.7 m) wide access road to intersect Route 9 approximately 10,561 ft (3,219 m) north of existing Andersen AFB Entry Control Point and extend into Andersen AFB approximately 6,561.66 ft (2,000 m) until it terminates at 5th Avenue. Roadway paving, street lighting, and drainage would be constructed for the entire length of the alignment. No curbs or sidewalks are proposed along the roadway. Improvements at the new intersection would include two dedicated turn lanes per American Association of State Highway and Transportation Officials Wheel Base-33D (i.e., Minimum Turning Path for Turnpike-Double Combination), and traffic signals with demand left turn signals and pavement detectors.
- A new traffic signal is proposed at the new gate access road and Route 9, subject to Government of Guam approval.

Marianas Boulevard has relatively low traffic with an existing ADT of 1064 trips near the proposed North Ramp area. Marianas Boulevard has a capacity of approximately 5,000 vpd. With the construction of a new North Gate, construction activities related to the North Ramp area would be isolated to roadways with relatively low traffic. Therefore, the construction activities at the North Ramp area would have less than significant impacts if the construction traffic is restricted to the North Gate and the new access road.

Operation. Andersen AFB has two existing access gates, Main and Back Gate, and a new North Gate that would be constructed prior to the Marine relocation. The North Gate would be the primary access for the North Ramp area.

In 2008, there were 1,637 morning peak hour trips, 1,816 afternoon peak hour trips, and 21,984 daily trips through the Main and Back Gates. These volumes are expected to increase by Year 2030 due to the increase in base population and the proposed action. In 2030, traffic is anticipated to increase by 457 trips (28%) in a.m. peak hour, 469 trips (26%) in p.m. peak hour and 5,144 trips (23%) daily. The Andersen Air Force Base Traffic and Safety Engineering Study (Andersen AFB 2008) conducted a base-wide road survey and recommended roadway improvements. It forecast a 25% increase in on base traffic volumes based on an expected 1,000 increase in base population from the current 4,000. This 25% growth rate agrees with the 2030 baseline growth rates shown on Table 4.2-2 from the 2008 TransCAD traffic model.

In 2030, under the proposed action, the morning peak hour traffic is forecasted to increase by 1,676 mostly inbound trips (80%), the afternoon peak hour traffic by 1,719 mostly outbound trips (75%), and daily traffic by 7,058 trips (28%). The peak hour growth rates being much higher than the daily growth rates would indicate that the traffic generated by the proposed actions would primarily be work oriented and made during the major commuter periods. The proposed project would increase traffic in excess of 5%, except for the a.m. outbound period.

Table 4.2-2. 2030 Baseline Growth Rates

		2030 Baseline			*2030 w/Project*		
			2030 Base/2008			*2030 Proj/Base*	
Time Period	*2008 Volume*	*Volume*	*Number Increase*	*Percentage Increase*	*Volume*	*Number Increase*	*Percentage Increase*
Andersen AFB: Alternatives 1, 2, 3 and 8							
a.m. Inbound	869	1227	358	41%	2,869	1642	134%
a.m. Outbound	768	867	99	13%	901	34	4%
a.m. Total	1,637	2,094	457	28%	3,770	1,676	80%
p.m. Inbound	864	993	129	15%	1,064	71	7%
p.m. Outbound	952	1,292	340	36%	2,940	1,648	128%
p.m. Total	1,816	2,285	469	26%	4,004	1,719	75%
Daily	21,984	27,128	5,144	23%	34,186	7,058	26%

Legend: AFB = Air Force Base.

Finegayan

Construction. In Alternative 1, NCTS Finegayan, the Former FAA parcel, South Finegayan, and Harmon Annex land would be utilized for constructing the Main Cantonment, family housing, and community support structures for the Marines. The alternative proposes three access gates. A new Commercial Gate would be constructed on Route 3 about 0.2 mi (0.32 km) due east from the present intersection of Van Meter Street and Courtney Street. A new Main Gate would be constructed close to the point where presently Bullard Avenue meets Route 3. The present access gate to South Finegayan at Coral Tree Drive and Route 3 intersection would be upgraded to form the Residential Gate for Alternative 1. New roads, intersections, curbs, pedestrian walkways, signage, lighting, and landscaped areas would be constructed to support the constructed facilities.

Due to the reconstruction of the roadway system at Finegayan temporary impacts to on base roads may occur. The impacts are not expected to be significant.

Operation. The new transportation roadway network on the Main Cantonment is intended to accommodate the proposed relocation of Marines from Okinawa to Guam. The new base would be designed to Navy planning criteria and the features would be designed and sized to accommodate the expected future conditions.

The traffic impact from operations at the Main Cantonment would be less than significant to existing motorists on Finegayan.

Off Base Roadways:

Future Traffic Impacts. Alternative 1 of the Army AMDTF proposed action involves collocation of facilities with the Marine Corps at NCTS Finegayan. Thus, effects of Army AMDTF Alternative 1 are captured in the following analysis. The impacts for Alternative 2 are the same as Alternative 1 and the results are referred to as "Alternatives 1 and 2" in this section.

A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 1 can be found in Table 4.2-3. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.2-3 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island. These changes are most noticeable on roadways with direct access to DoD land, such as the Main Cantonment area located on Route 3.

Figure 4.2-15 through Figure 4.2-18 show future levels of traffic congestion in the North Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. The roads serving the DoD lands are expected to be the most congested. During both the morning and afternoon peaks, the roads with the greatest congestion levels in the North Region are Routes 3 and 28, south of the Main Gate. Route 28 has the highest level of congestion (v/c ratio greater than 1.50). They both have an LOS F in both the a.m. and p.m. peak hours, which is considered severely congested. The results of the future operational analysis are shown in Table 4.2-4 for both the 2014 a.m. and p.m. and 2030 a.m. and p.m. conditions.

Table 4.2-3. Alternatives 1 and 2 Future ADT and Volume to Capacity Ratio Summary – North Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 24,000 to 44,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not considered congested.	Route 1 ranges from 23,000 to 37,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not considered congested.
Route 3	Route 3 ranges from 23,000 to 46,000 vpd. Traffic decreases north of the intersection with Route 28.	The portion of Route 3 south of the Residential Gate, as well as between Route 28 and the Main Gate, have a v/c ratio of 1.00-1.15 in the a.m. and p.m. peak. This portion of the roadway is considered congested. North of the Commercial Gate, Route 3 has a v/c ratio of 0.00-0.90 during peak hours, which indicates that this part of the roadway is not considered congested.	Route 3 ranges from 20,000 to 37,000 vpd. Traffic decreases north of the intersection with Route 28.	The portion of Route 3 south of the Residential Gate has a v/c ratio of 0.91-0.99 in both the a.m. and p.m. peak hours. Aside from a stretch between Route 28 and the Main Gate, Route 3 north of the Residential Gate has a v/c ratio of 0.00-0.90 during peak hours. The roadway is not considered congested.
Route 9	Route 9 ranges from 12,000 to 20,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The western portion of Route 9 has a v/c ratio of 0.00-0.90 in both the a.m. and p.m. peak hours. The eastern portion has a v/c ratio of 0.91-0.99 in both the a.m. and p.m. peak hours. The roadway is not considered congested.	Route 9 ranges from 10,000 to 16,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not considered congested.
Route 15	Route 15 has 6,900 vpd in the North.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not considered congested.	Route 15 has 7,600 vpd in the North.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not considered congested.
Route 28	Route 28 ranges from 21,000 to 22,000 vpd. Traffic increases closer to the intersection with Route 1.	Route 28 has a v/c ratio greater than 1.51 in both the a.m. and p.m. peak hours, which indicates the roadway is considered congested.	Route 28 ranges from 16,000 to 17,000 vpd. Traffic increases closer to the intersection with Route 1.	In the a.m. peak, Route 28 has a v/c ratio greater than 1.15. In the p.m. peak, Route 28 has a v/c ratio of 1.15-1.50. The roadway is considered congested during peak hours.

Legend: ADT = average daily traffic; AFB = Air Force Base; v/c = volume to capacity; vpd = vehicles per day.

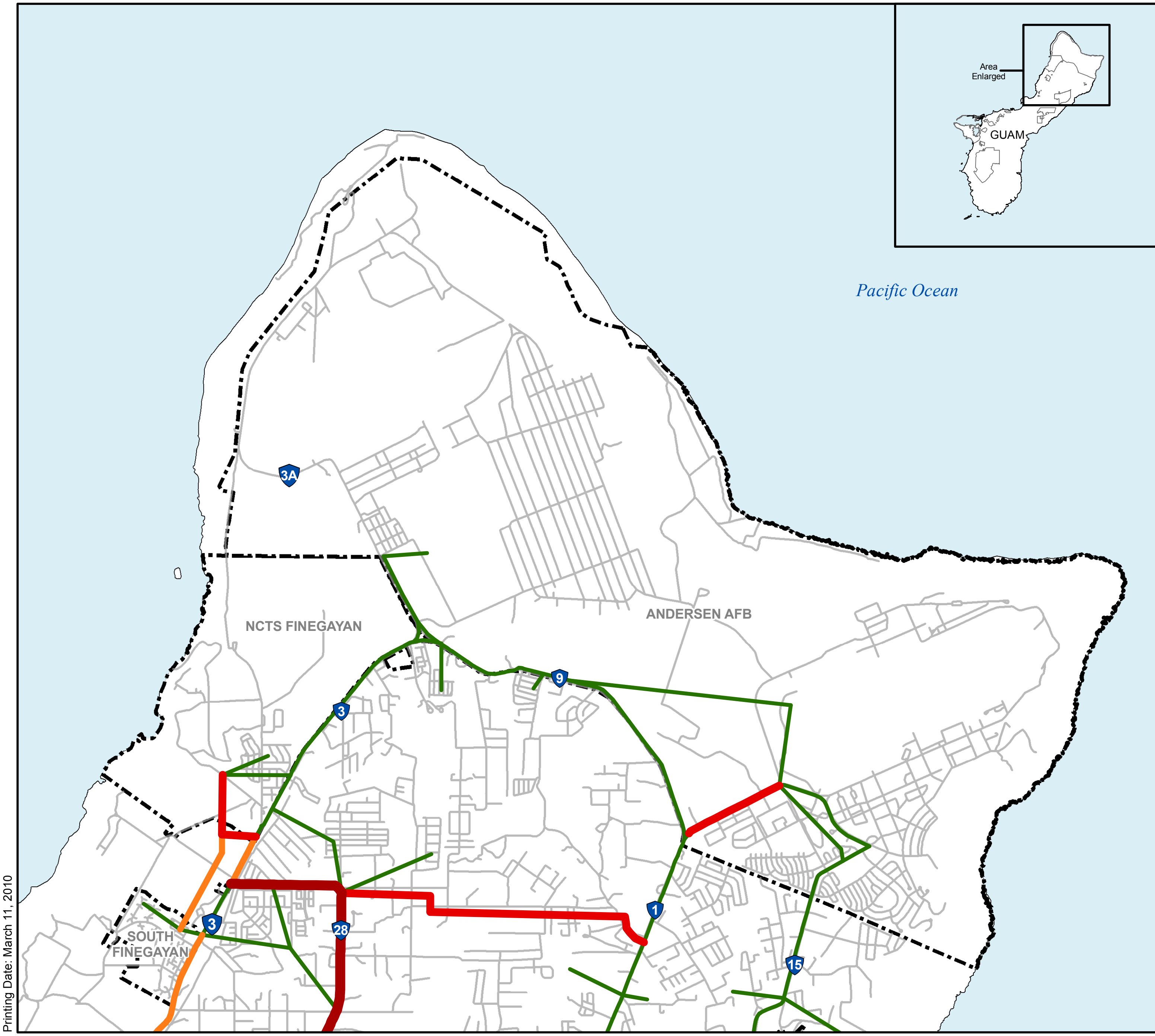


Figure 4.2-15
North Region–
2014 a.m. Peak
Congestion Levels –
Alternative 1 and 2

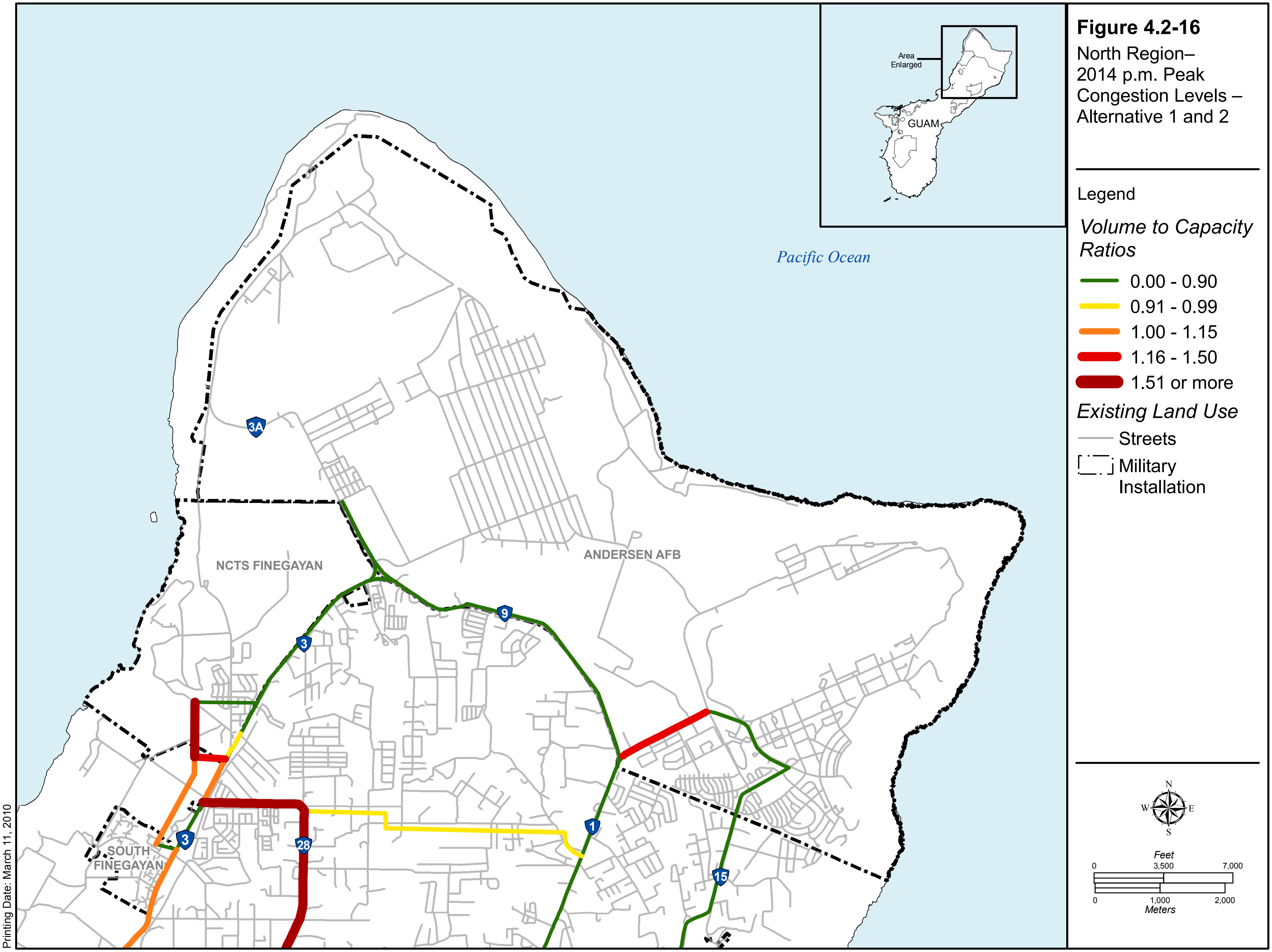
Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation


Area Enlarged
GUAM
Pacific Ocean
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
3
9
1
15
28
Figure 4.2-16
North Region–
2014 p.m. Peak
Congestion Levels –
Alternative 1 and 2
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
N
W
E
S
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: March 11, 2010

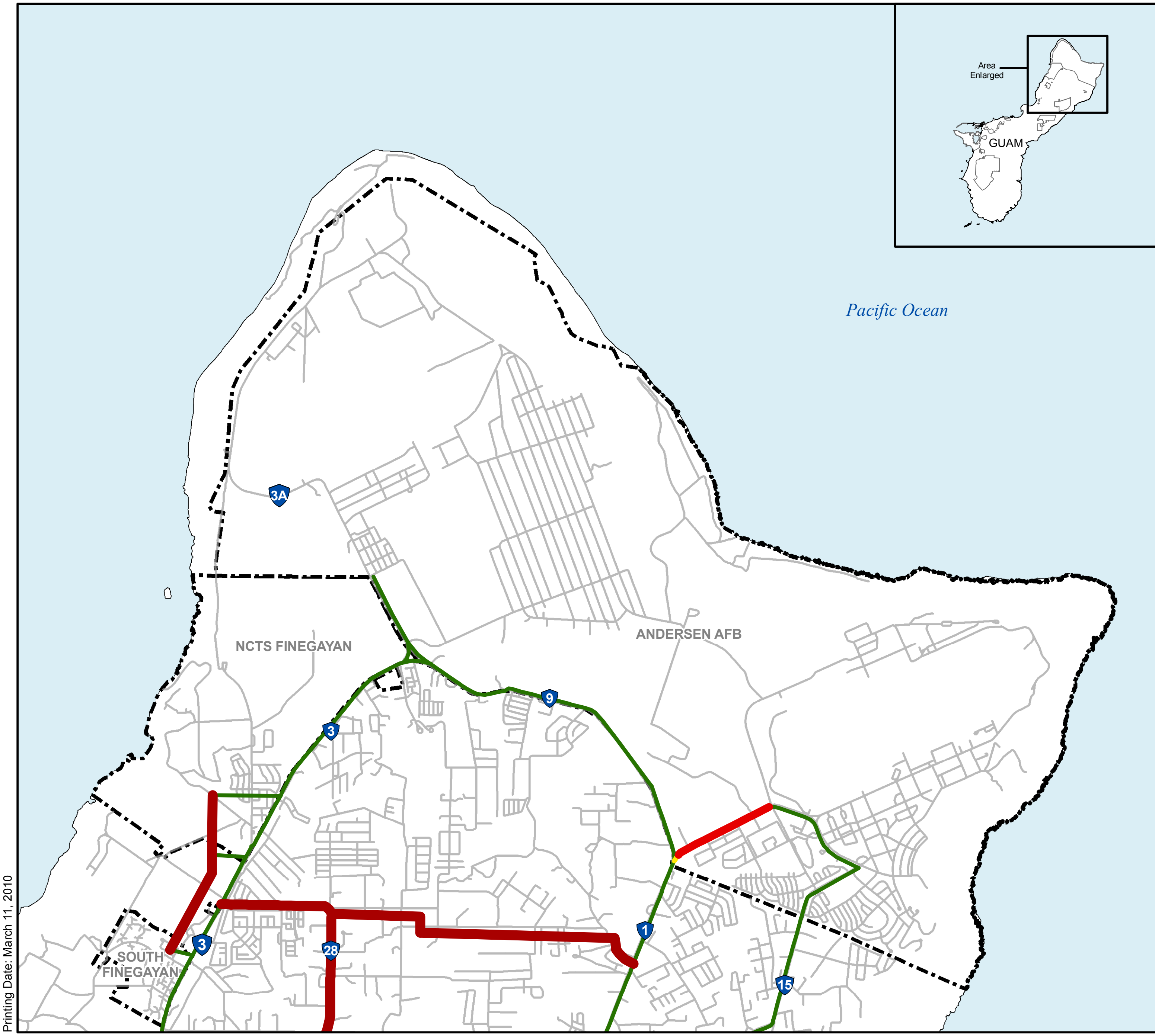


Figure 4.2-17
North Region–
2030 a.m. Peak
Congestion Levels –
Alternative 1and 2

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

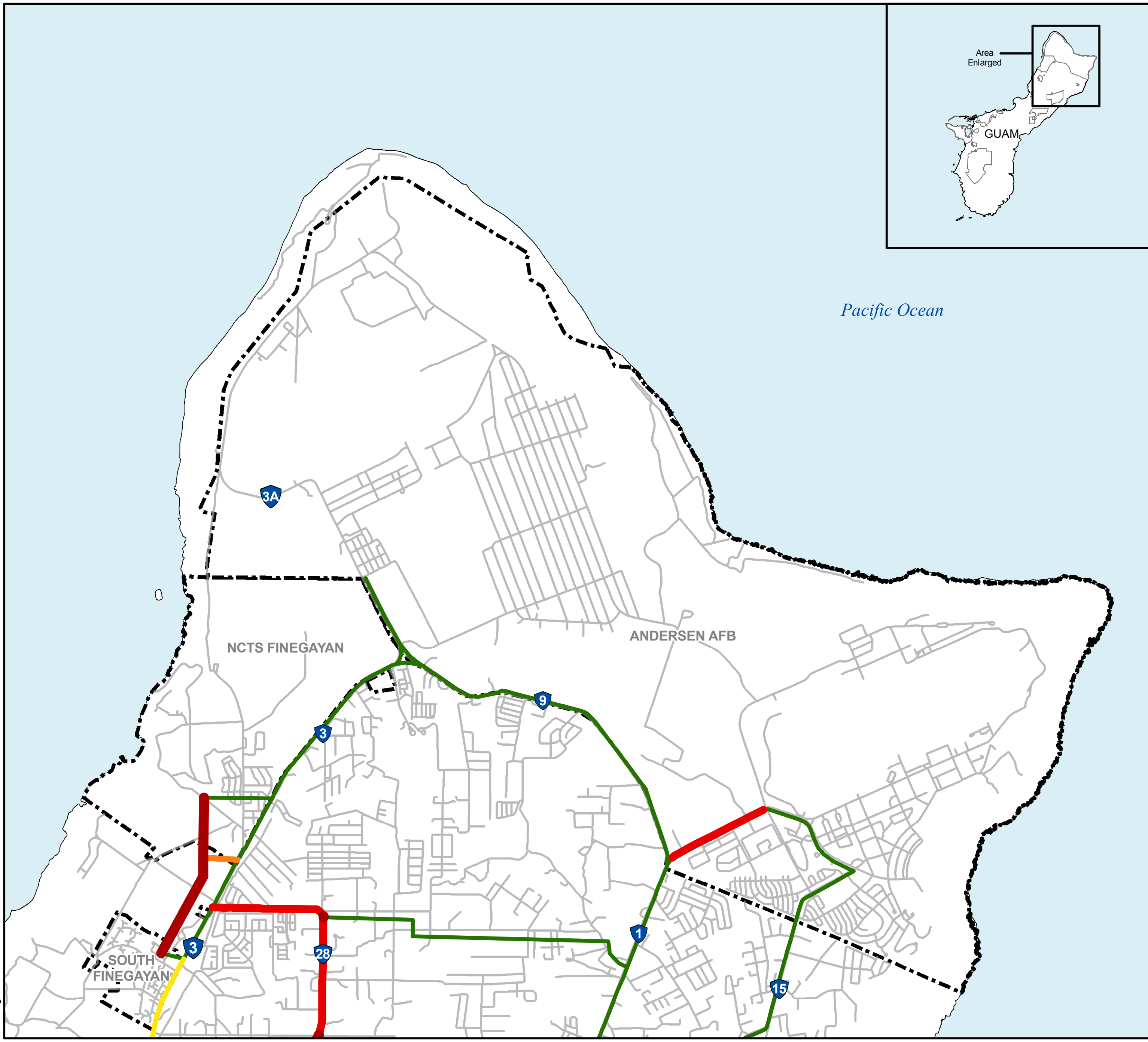


Figure 4.2-18
North Region–
2030 p.m. Peak
Congestion Levels –
Alternative 1 and 2

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

N W E S

Feet
0 3,500 7,000
0 1,000 2,000
Meters

Printing Date: March 11, 2010

For most of the intersections, the LOS in both 2014 and 2030 was below the minimum acceptable LOS E. It is important to note that in many cases, the proposed intersection improvements do not improve the LOS level; however, they do decrease the amount of delay a driver would experience at an intersection. As stated previously, each LOS has a range of seconds of delay. Anything greater than 80.0 seconds of delay at signalized intersections or 50.0 seconds of delay at unsignalized intersections is considered LOS F. There is no upper end for delay for LOS F, which is why an intersection could greatly decrease in the amount of delay while still being LOS F. For the North Region, there are three intersections for which the traffic is worse in 2014 than in 2030 in both the a.m. and p.m. peak hours. This can be attributed to an increase in traffic associated with construction activity and military personnel in 2014.

As shown in Table 4.2-4, there are four intersections and one military access point with LOS F for at least one peak hour, which is considered unacceptable; however, none of the intersections are operating at LOS F in both the a.m. and p.m. for 2030. The worst intersection in the North Region is Route 15/29, which is operating at LOS F with heavy delays in the a.m. peak hour in 2014.

Table 4.2-4. Alternatives 1 and 2 Future Level of Service and Delay Results – North Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/9	C	27.6	D	39.8	C	22.5	D	52.2
Route 1/29	F	256.2	F	138.7	E	65.5	E	67.7
Route 3/28	F	85.1	F	227.1	C	26.0	D	36.9
Route 15/29**	F	NA	F	838.9	C	27.7	C	25.4
Unsignalized**								
Route 3/3A/9	C	19.7	F	74.3	B	11.6	F	79.0
Military Access Points*								
Route 3 – Main Cantonment/Commercial Gate**	—	—	—	—	B	12.5	C	28.3
Route 3 - Main Cantonment/Main Gate**	—	—	—	—	C	33.5	E	58.6
Route 3 – South Finegayan/Residential Gate**	—	—	—	—	C	26.7	B	18.5
Route 9 – Andersen AFB/ Andersen AFB North Gate***	—	—	—	—	F	NA****	F	NA****

Legend: AFB = Air Force Base; LOS = Level of Service; NA = Not Applicable.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
****Delay exceeded maximum calculated value.

Public Transportation Impacts. Impacts to the public transportation system relate to the delays caused by increased levels of congestion on roadways and at intersections. This would affect the demand response and paratransit services, increasing passenger wait times and missed transfers. While there is no existing fixed-route service in the North Region, planning efforts have proposed new routes along Routes 1 and 3. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are no impacts to pedestrian and bicycle facilities in the North Region. Along Route 1, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian or cyclist using the shoulder as a running or biking lane. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

<u>Central</u>

On Base Roadways:

Andersen South

Construction. Proposed construction at Andersen South is independent of Alternatives 1, 2, 3, and 8. The proposed construction is geared towards constructing the Military Operations in Urban Terrain complex for providing maneuver training to the relocated Marines. The proposed construction includes:

- Construction of a new road segment to connect existing roads into a complete convoy course loop.
- Two access gates are proposed for the new base that would upgrade existing gates at the base. The proposed Main Gate would be located at the present intersection of Turner Street and Route 1. The proposed Secondary Gate would be located at the present intersection of Rissi Street and Route 15.
- The construction of the roadway improvements on Andersen South would have a less than significant impact to traffic because base operations have been abandoned with exception of training.
- Based on the relatively low traffic demand on Andersen South, traffic impact would be less than significant for construction activities.

Operation. Convoy operations, Military Operations in Urban Terrain-related maneuver training, and general maneuver and air-ground operations would vary from small unit to company-level exercises. This would occur 5 days per week, 45 weeks per year, and during both day and night. The upward estimate is that approximately 250 to 300 Marines would participate in maneuver training at Andersen South each week, for a total annual throughput of 11,250 to 13,500 Marines. The convoy operations would typically consist of 2 to 7 vehicles.

The two lane roadways on Andersen South have a capacity of approximately 5,000 vpd and can accommodate the anticipated increase in traffic. Therefore, traffic impact would be less than significant for operational impacts.

Barrigada

Construction. In Alternative 1, Barrigada is not utilized.

Operation. In Alternative 1, Barrigada is not utilized.

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 1 can be found in Table 4.2-5. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-8 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Table 4.2-5. Alternative 1 and 2 Future ADT and Volume to Capacity Ratio Summary – Central Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 59,000 to 100,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally less than 1.00 in both the a.m. and p.m. condition; however, there are small segments near the intersections with 14A, and 30 that have a v/c ratio of more than 1, which indicates the roadway is congested in Tamuning.	Route 1 ranges from 51,000 to 95,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally less than 1.00 in both the a.m. and p.m. condition; however, there are small segments near the intersections with 14A, and 30 that have a v/c ratio of more than 1, which indicates the roadway is considered congested in Tamuning.
Route 3	Route 3 ranges from 46,000 to 68,000 vpd. Traffic increases toward the Route 1 intersection.	The v/c ratio in both the a.m. and p.m. peak is 1.00-1.15. This indicates the roadway is considered congested.	Route 3 ranges from 37,000 to 54,000 vpd. Traffic increases toward the Route 1 intersection.	The v/c ratio is between 1.00-1.15, indicating that the roadway is considered congested at this location.
Route 8/8A	Route 8 ranges from 51,000 to 65,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 3,500 vpd.	During peak hours, the v/c ratio is 0.00-0.90 east of Tiyan Parkway, 0.91-0.99 west of Tiyan Parkway, and 0.00-0.90 west of Route 16. The roadway is not considered congested.	Route 8 ranges from 50,000 to 59,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 3,400 vpd.	During the a.m. peak, the v/c ratio is 0.00-0.90. During the p.m. peak, the v/c ratio is 0.00-0.90 east of Tiyan Parkway, 0.91-0.99 west of Tiyan Parkway, and 0.00-0.90 west of Route 16. The roadway is not considered congested.
Route 10	Route 10 ranges from 56,000 to 58,000 vpd between Routes 8 and 15.	In the a.m. peak, a small segment south of the intersection with Route 15 has a v/c ratio between 1.15-1.50. During the p.m. peak, Route 10 has a v/c ratio of 1.00-1.15 north of Route 32 to Route 8. The roadway is primarily congested during the p.m. peak.	Route 10 ranges from 54,000 to 56,000 vpd between Routes 8 and 15.	In the a.m. peak, Route 10 has a v/c ratio of 1.00-1.15 north of Route 32 to Route 15. During the p.m. peak, Route 10 has a v/c ratio of 1.00-1.15 north of Route 32 to Route 8. The roadway is primarily congested during the p.m. peak.

Roadway	2014		2030	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 15	Route 15 ranges from 13,000 to 24,000 vpd. There is an increase in traffic south of the intersection with Route 26.	North of Route 26 and west of Route 10, Route 15 has a v/c ratio of 0.00-0.90 during peak hours. The middle section of Route 15 has a v/c ratio of 0.91-0.99, with a v/c ratio of 1.00-1.15 at Route 10. The roadway is only congested near the intersection with Route 10.	Route 15 ranges from 7,500 to 13,000 vpd. There is an increase in traffic south of the intersection with Route 26.	The v/c ratio is less than 1.00 during peak hours. The roadway is not considered congested.
Route 16	Route 16 ranges from 59,000 to 91,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is less than 1.00 in the a.m. and p.m., except at the intersection with Route 27 where the v/c ratio is 1.00-1.15. The roadway is considered congested at this location.	Route 16 ranges from 40,000 to 77,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is less than 1.00 during peak hours. The roadway is not considered congested.
Route 25	Route 25 ranges from 24,000 to 28,000 vpd.	Route 25 has a v/c ratio greater than 1.50, indicating that the roadway is considered congested.	Route 25 ranges from 29,000 to 33,000 vpd.	The v/c ratio is less than 1.00 during peak hours. The roadway is not considered congested.
Route 26	Route 26 ranges from 10,000 to 25,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	Route 26 primarily has a v/c ratio greater than 1.00 during both the a.m. and p.m. peak. The roadway is considered congested.	Route 26 ranges from 10,000 to 30,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	The v/c ratio is less than 1.00 during peak hours, except for south of Route 25, where the v/c ratio is 1.00-1.15 in the a.m. peak. The roadway is considered congested at this location.
Route 27	Route 27 ranges from 58,000 to 61,000 vpd between Routes 16 and 1.	The v/c ratio is 0.00-0.90 during peak hours, except for the portion between Routes 16 and 1, which has a v/c ratio of 0.81-0.99 during the a.m. peak. This roadway is not considered congested.	Route 27 ranges from 49,000 to 51,000 vpd between Routes 16 and 1.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.
Route 28	Route 28 ranges from 21,000 to 26,000 vpd. Traffic generally decreases south of the Route 27A intersection.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak, indicating the roadway is congested.	Route 28 ranges from 19,000 to 23,000 vpd. Traffic generally decreases south of the Route 27A intersection.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak, indicating the roadway is considered congested.

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Chalan Lujuna	Chalan Lujuna has 22,000 vpd.	The v/c ratio is 0.91-0.99, indicating it is not considered congested.	Chalan Lujuna ranges from 6,300 to 7,100 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.

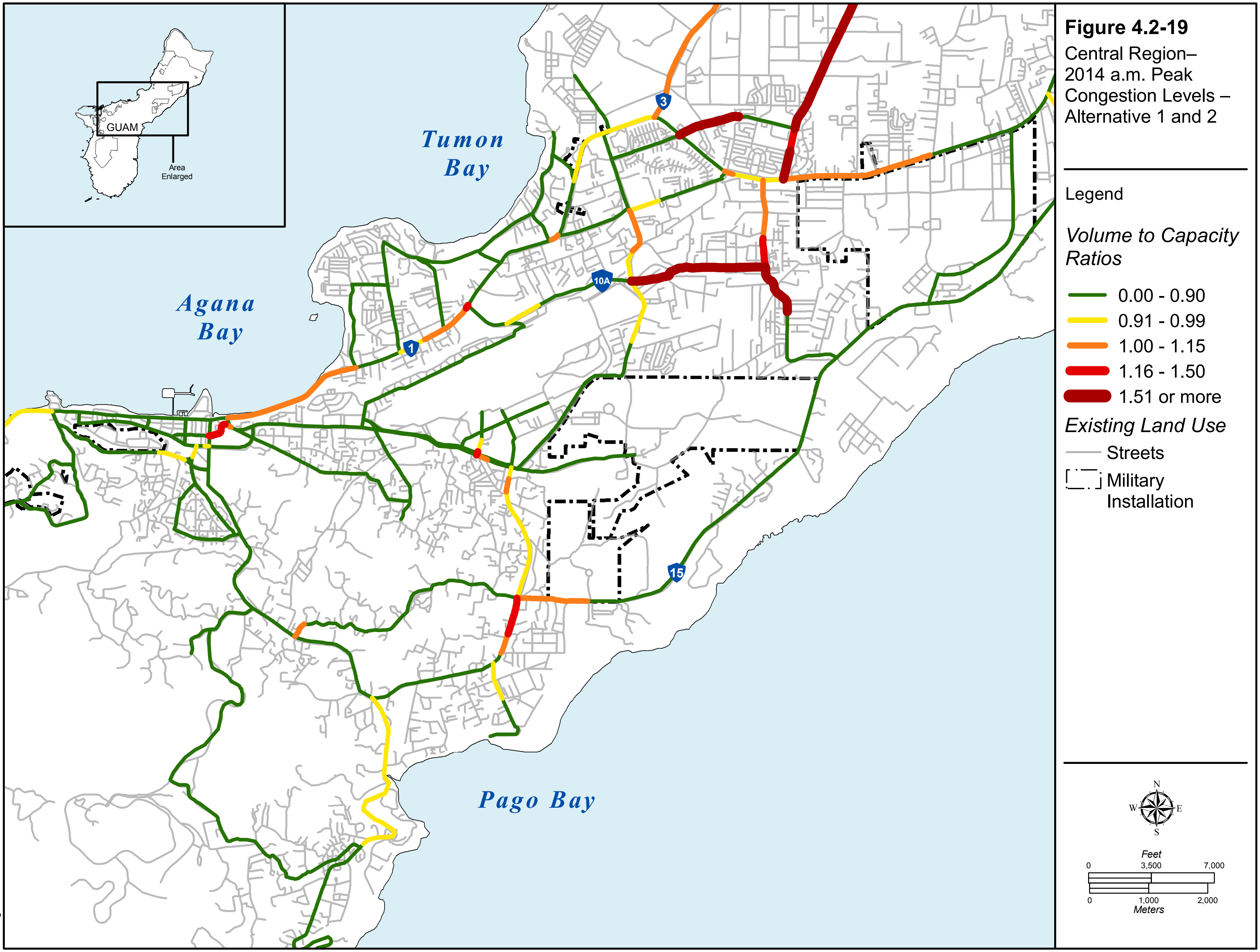
Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-19 through Figure 4.2-22 show future levels of traffic congestion in the Central Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have a LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have a LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have a LOS of F, with red being the most severely congested.

There are a few areas of congestion in the Central Region, primarily on roads that serve the DoD lands to the north. During both the morning and afternoon peaks, the roads with the greatest congestion levels in the Central Region are parts of Route 1 and 10 and Route 28. All have a LOS F in both the a.m. and p.m. peak hours, which is considered congested. Route 28 has the highest level of congestion (v/c ratio greater than 1.50) north of the Route 1 intersection in the morning.

As shown in Table 4.2-6, 24 out of 28 intersections have LOS F for at least one peak hour, which is considered unacceptable. The following intersections are operating at LOS F in the a.m. and p.m. peak hours in both 2014 and 2030:

- Route 1/28
- Route 1/27
- Route 1/14A
- Route 1/10A
- Route 1/14 (ITC)
- Route 1/30
- Route 1/8
- Route 4/7A
- Route 8/10
- Route 10/15
- Route 16/27
- Route 16/10A



Printing Date: March 11, 2010

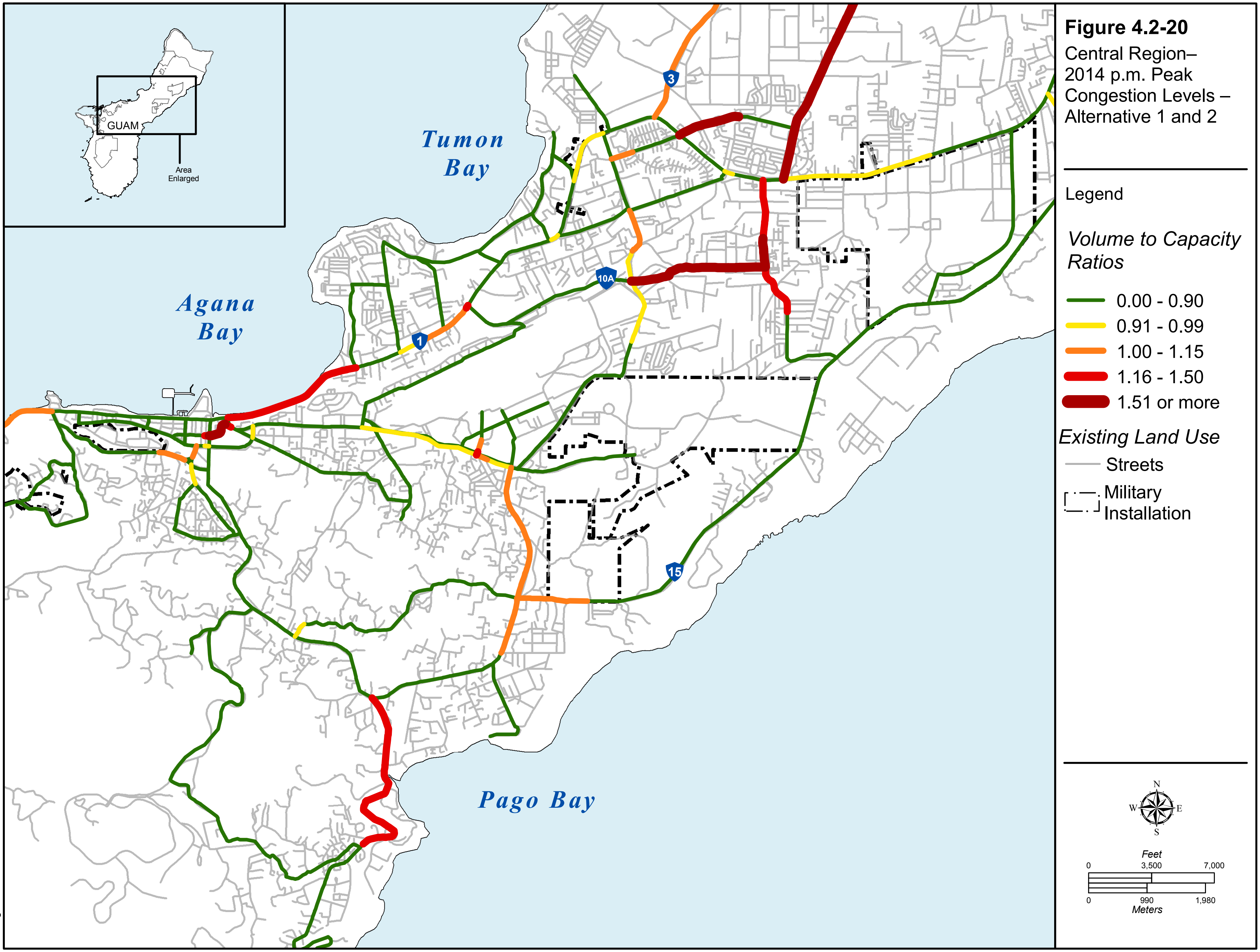


Figure 4.2-20
Central Region–2014 p.m. Peak Congestion Levels – Alternative 1 and 2

Printing Date: March 11, 2010

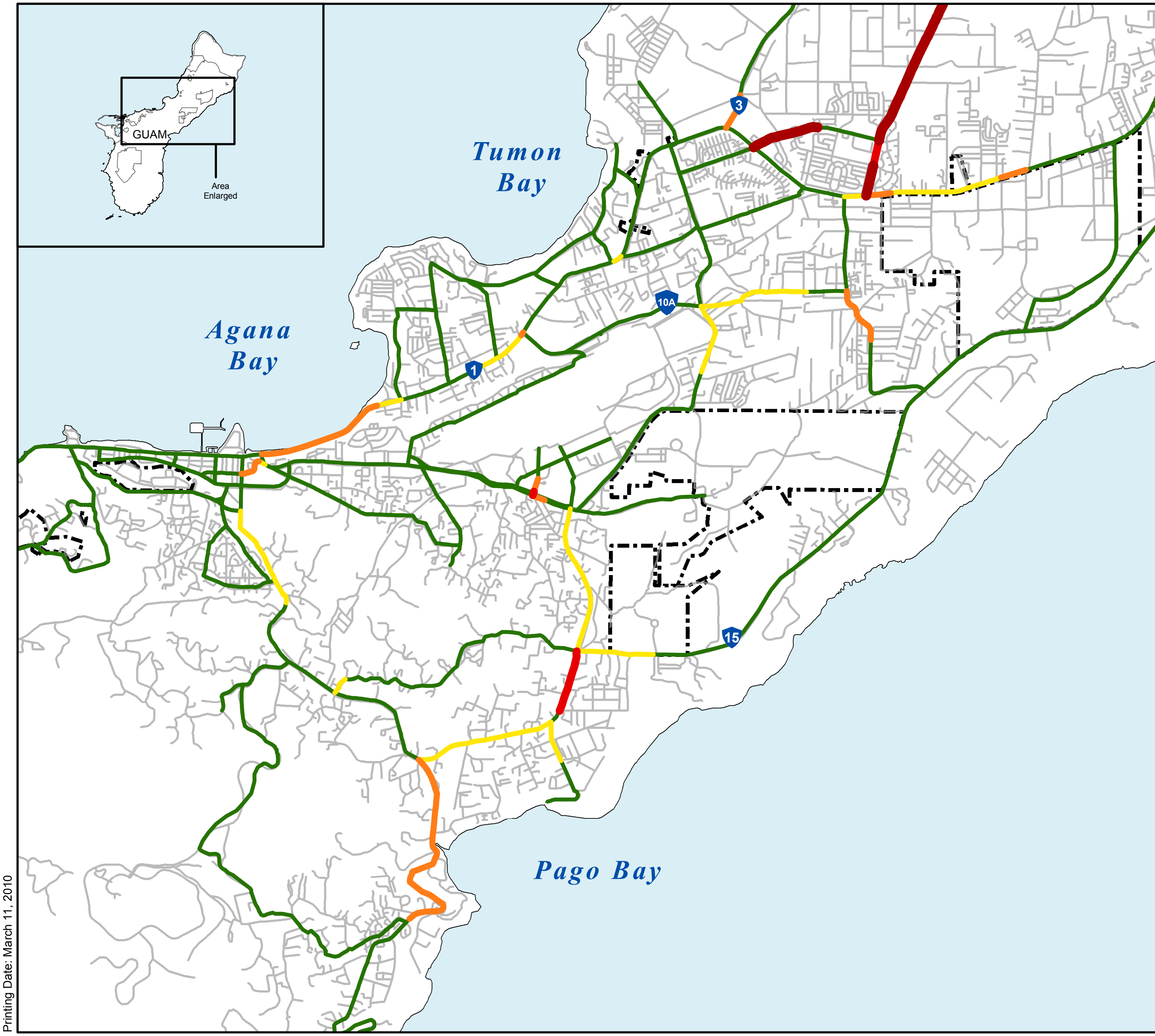


Figure 4.2-21
Central Region–
2030 a.m. Peak
Congestion Levels –
Alternative 1 and 2

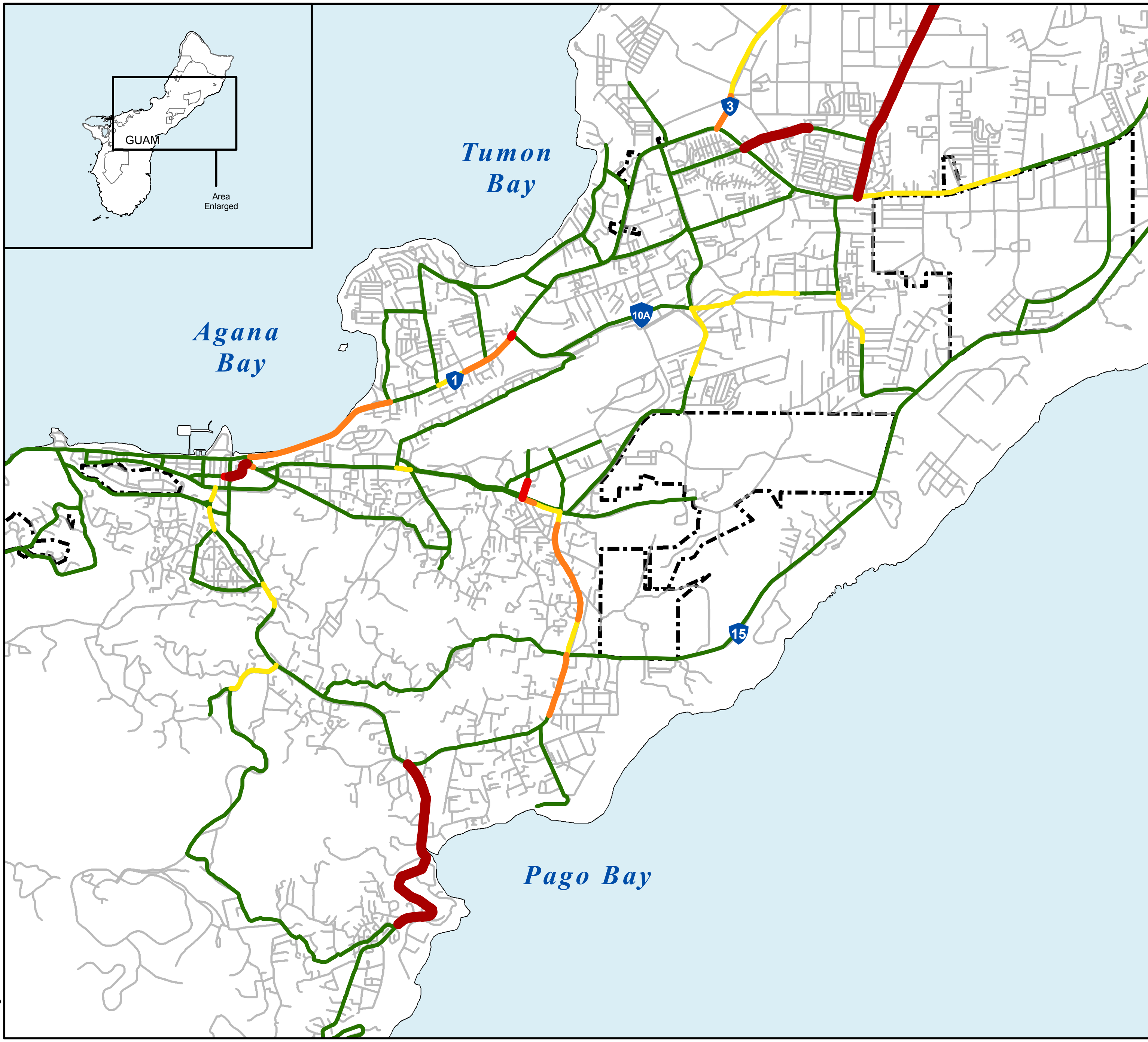


Figure 4.2-22
Central Region–2030 p.m. Peak Congestion Levels – Alternative 1 and 2

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

N E S W

Feet
0 3,500 7,000
0 1,000 2,000
Meters

Printing Date: March 11, 2010

Table 4.2-6. Alternatives 1 and 2 Future Level of Service and Delay Results – Central Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/28	F	360.8	F	331.8	F	216.8	F	104.5
Route 1/26	F	109.8	F	278.1	E	75.8	F	156.6
Route 1/27	F	1830.9	F	928.9	F	137.4	F	374.3
Route 1/27A	E	77.8	F	204.7	D	44.4	E	75.7
Route 1/3	F	495.1	F	523.8	D	48.5	D	50.6
Route 1/16	F	126.4	F	336.2	E	65.3	F	87.5
Route 1/14 (North San Vitores)	F	176.5	F	134.8	E	68.0	F	82.0
Route 1/14A	F	313.6	F	326.8	F	112.2	F	131.5
Route 1/10A	F	241.5	F	376.7	F	118.1	F	102.0
Route 1/14B	F	168.4	F	159.1	F	83.9	E	78.2
Route 1/14 (ITC)	F	234.7	F	428.6	F	182.5	F	275.1
Route 1/30	F	488.1	F	568.6	F	134.7	F	267.2
Route 1/8	F	216.2	F	143.5	F	97.6	F	127.5
Route 1/4	C	24.3	D	44.6	C	32.4	F	140.2
Route 1/6 (Adelup)	D	36.2	F	108.9	D	40.6	E	61.8
Route 4/7A	F	270.5	F	989.8	F	607.3	F	534.1
Route 4/10	F	190.2	F	165.1	F	199.5	E	65.1
Route 4/17	C	35.0	D	42.6	D	39.6	E	57.7
Route 8/33	E	64.8	F	145.2	D	54.6	F	81.7
Route 8/10	F	273.7	F	315.0	F	96.9	F	172.7
Route 10/15	F	166.4	F	144.7	F	196.9	F	152.3
Route 16/27A	C	26.3	D	51.9	C	27.4	C	34.2
Route 16/27	F	389.3	F	601.5	F	345.0	F	288.7
Route 16/10A	F	260.1	F	566.1	F	123.1	F	123.5
Route 26/25**	F	94.9	E	70.1	C	31.2	D	41.0
Route 26/15**	F	2554.1	F	3440.9	C	27.9	C	32.1
Route 28/27A**	C	31.8	F	402.8	D	35.6	D	36.6
Unsignalized***								
Route 7/7A	F	167.7	F	285.7	D	29.2	F	105.1
Military Access Points								
Route 1 - South Andersen Main Gate/(Turner Street)*	—	—	—	—	C	32.4	E	79.1
Route 15 - South Andersen/Second Gate*	—	—	—	—	C	22.1	C	22.6
Route 16 - Navy Barrigada/Residential Gate	—	—	—	—	NA	NA	NA	NA
Route 8A - Navy Barrigada/(Residential Gate)	—	—	—	—	NA	NA	NA	NA
Route 15 - Barrigada Air Force/(Fadian Point Drive)***	—	—	—	—	NA	NA	NA	NA

Legend: ITC = International Trade Center; NA = Not Applicable.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

Public Transportation Impacts. Impacts to the public transportation system relate to the delays caused by increased levels of congestion on roadways and at intersections. In the Central Region, this would affect the fixed-route service along Routes 1 and 10, as well as the demand response and paratransit services. Delays on the roadways increase passenger travel times, with longer headways and missed transfers. This would also affect the fixed-route services proposed for Routes 16 and 26. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are limited impacts to the pedestrian and bicycle facilities in the Central Region. Along Routes 1 and 10, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian using the existing sidewalk; however, it could impact a cyclist wanting to use the outside lane when unable to use the sidewalk. Future improvements to Routes 8 and 26 would also impact the intermittent sidewalk along these roadways and provide an opportunity to fully complete the facility. In addition, any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

Apra Harbor

On Base Roadways:

Naval Base Guam

Construction. The proposed construction at Naval Base Guam is independent of Alternatives 1, 2, 3, and 8. Construction of necessary facilities to support the Marine Expeditionary Unit are proposed for the Apra inner harbor. Marine and roadway traffic volumes associated with transport of dredge materials during construction are described in Volume 4, Chapter 14. Due to the expected increase of construction traffic, the impact of the construction of the facilities would be significant but mitigable. An on base traffic study is currently being prepared and once complete will be used to identify potential mitigation options for high traffic areas.

Operation. The Marine Expeditionary Unit training would bring approximately 2,000 additional military personnel to Guam as a transient population. They would not be provided family housing or be using on or off base amenities (except during periods of leave and liberty). Personnel, cargo, and equipment arriving at Apra Harbor would travel in trucks, buses, and High Mobility Multipurpose Wheeled Vehicles on civilian roads to bivouac/expeditionary camp sites at Andersen South or other training venues. It is anticipated that these transport events would occur during evening hours or other non-peak travel hours. Approximately 15 trucks would travel as a group, with distance and time between convoys to minimize interruptions to civilian traffic flow. The number of trips will vary with the mission.

In 2008, the Naval Base Guam had approximately 1,343 morning peak hour trips, 1,540 afternoon peak hour trips, and 19,286 daily trips through its Main Gate. These volumes are expected to increase by 2030 with expected increases in base activities. In 2030, under the no-action alternative, the morning peak hour traffic is forecasted to increase by 232 trips (17%), the afternoon peak hour traffic by 303 trips (20%), and daily traffic by 4,182 trips (22%).

Traffic generated by the proposed actions at Naval Base Guam is summarized on Table 4.2-7. For 2030, under the proposed action, the morning peak hour traffic is forecasted to increase by 213 (14%), the afternoon peak hour traffic by 225 trips (12%), and daily traffic by 3010 trips (13%).

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 1 can be found in Table 4.2-8. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-15 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island. The magnitude of decrease is especially noticeable on Route 11, which decreases from approximately 14,000 vpd to 8,900 vpd. This can be attributed to the high volume of construction traffic.

Table 4.2-7. Traffic Generated by the Proposed Actions at the Naval Base Guam

		2030 BASELINE			*2030 W/PROJECT*		
			2030 BASE/2008			*2030 PROJ/BASE*	
Time Period	*2008 Volume*	*Volume*	*Number Increase*	*Percentage Increase*	*Volume*	*Number Increase*	*Percentage Increase*
Naval Base Guam: Alternative 1, 2, 3 & 8							
a.m. Inbound	883	999	116	13%	1066	67	7%
a.m. Outbound	460	576	116	25%	722	146	25%
a.m. Total	1343	1575	232	17%	1788	213	14%
p.m. Inbound	603	754	151	25%	880	126	17%
p.m. Outbound	937	1089	152	16%	1188	99	9%
p.m. Total	1540	1843	303	20%	2068	225	12%
Daily	19286	23468	4182	22%	26478	3010	13%

Table 4.2-8. Alternatives 1 and 2 Future ADT and Volume to Capacity Ratio Summary – Apra Harbor Region

	2014		*2030*	
Roadway	*ADT Summary*	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 23,000 to 47,000 vpd. The traffic decreases into the entrance into Naval Base Guam, which is at the Route 1/2A intersection.	The v/c ratio is less than 1. The roadway is not considered congested.	Route 1 ranges from 24,000 to 56,000 vpd. The traffic decreases into the entrance into Naval Base Guam, which is at the Route 1/2A intersection.	The v/c ratio is less than 1, indicating the roadway is not considered congested.
Route 2A	Route 2A has 36,000 vpd. The traffic decreases after the intersection with Route 5.	The v/c ratio is 0.00-0.90, indicating the roadway is not considered congested.	Route 2A has 35,000 vpd. The traffic decreases after the intersection with Route 5.	The v/c ratio is 0.00-0.90, indicating the roadway is not considered congested.
Route 11	Route 11 has 14,000 vpd.	The v/c ratio is 0.00-0.90, indicating the roadway is not considered congested.	Route 11 has 8,900 vpd.	The v/c ratio is 0.00-0.90, indicating the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-23 through Figure 4.2-26 show future levels of traffic congestion in the Apra Harbor Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, or C; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of D or E; and the orange and red roads that have a v/c ratio above 0.99 have an LOS of F, with red being the most severely congested.

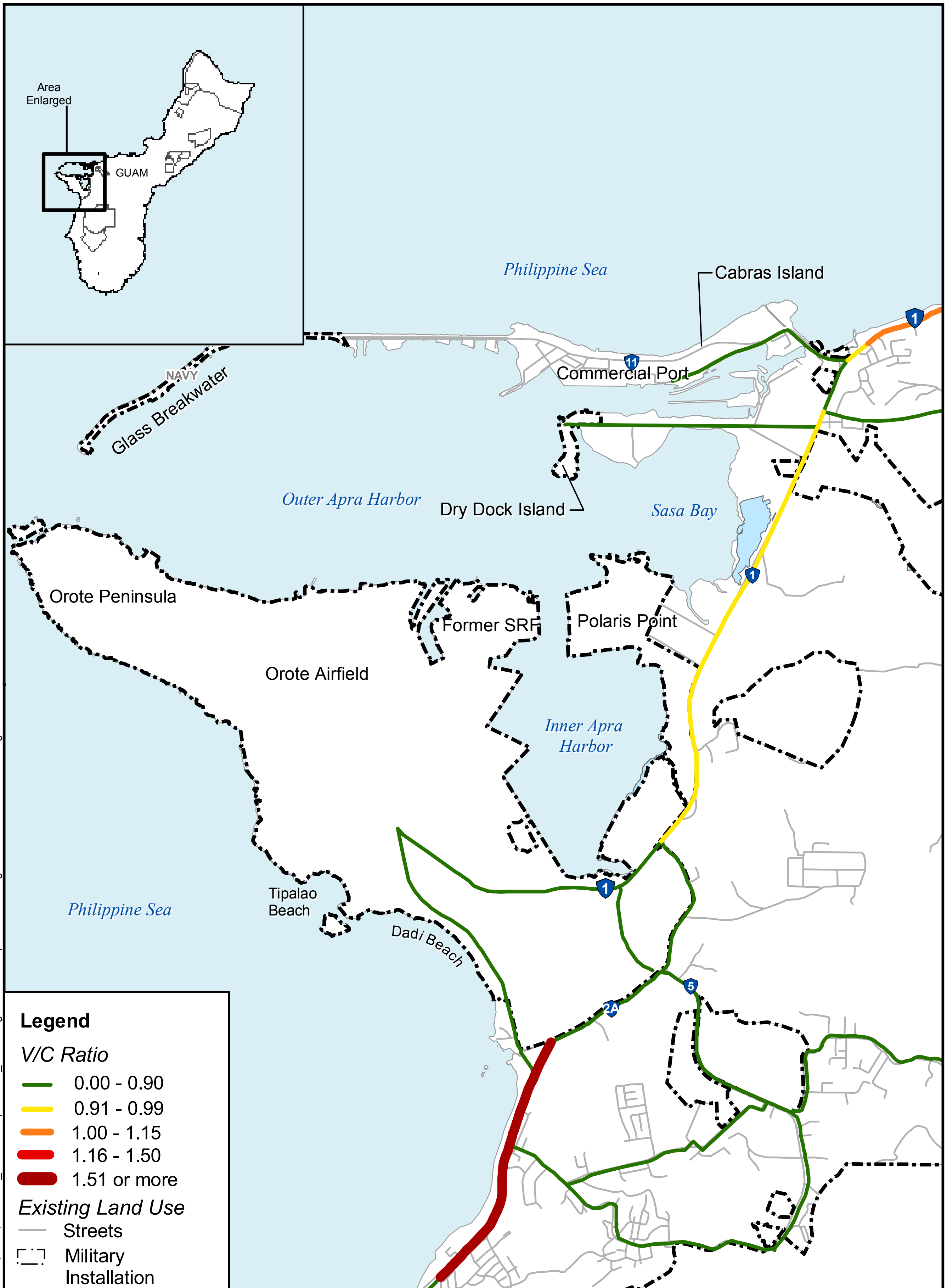


Figure 4.2-23
Apra Harbor Region - 2014 a.m. Peak Congestion Levels- Alternative 1 and 2

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-23. Apra Harbor Region - 2014 a.m. Peak Congestion Levels- Alternative 1-2.mxd

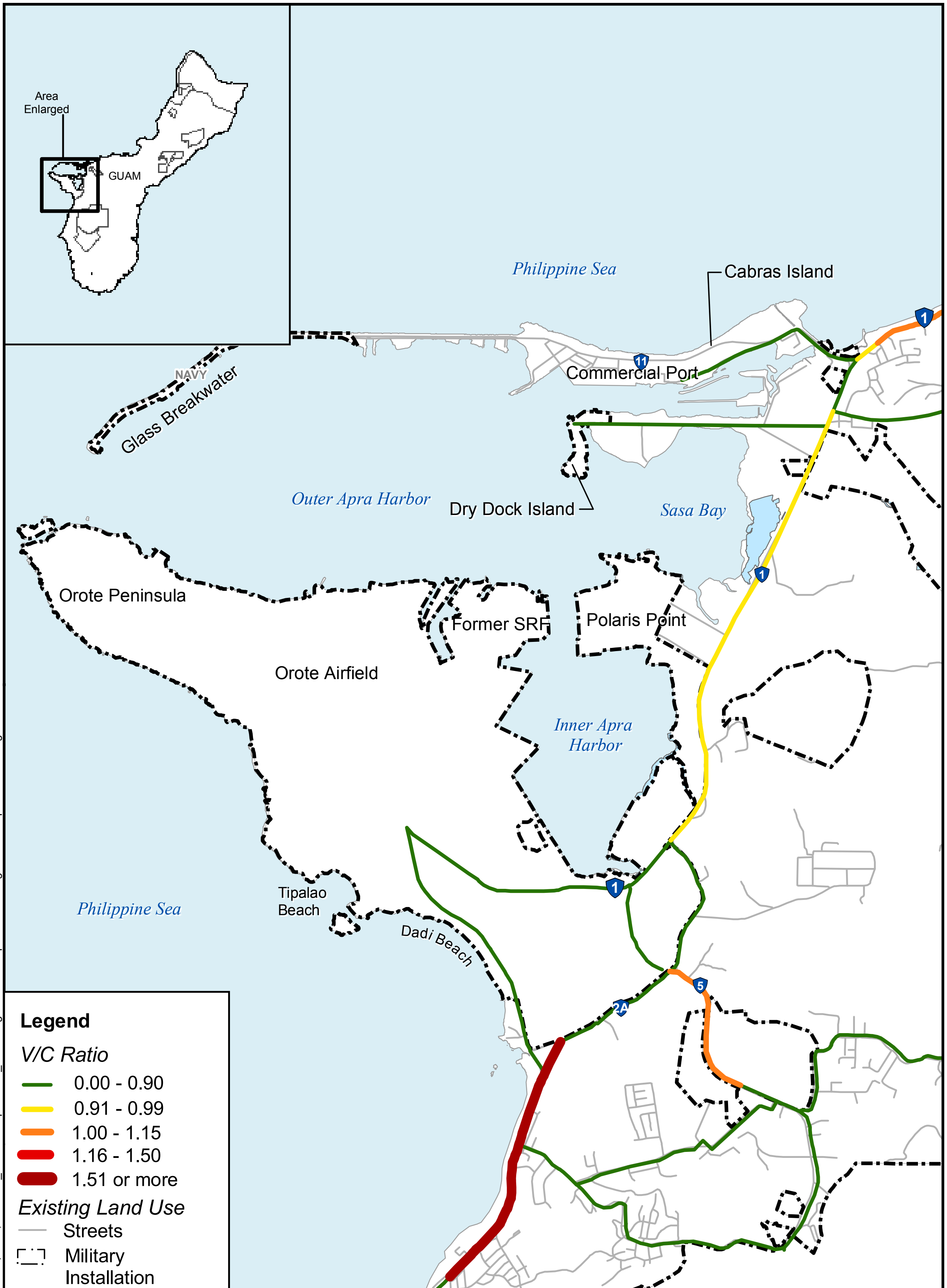


Figure 4.2-24
Apra Harbor Region 2014 p.m. Peak Congestion Levels – Alternative 1 and 2

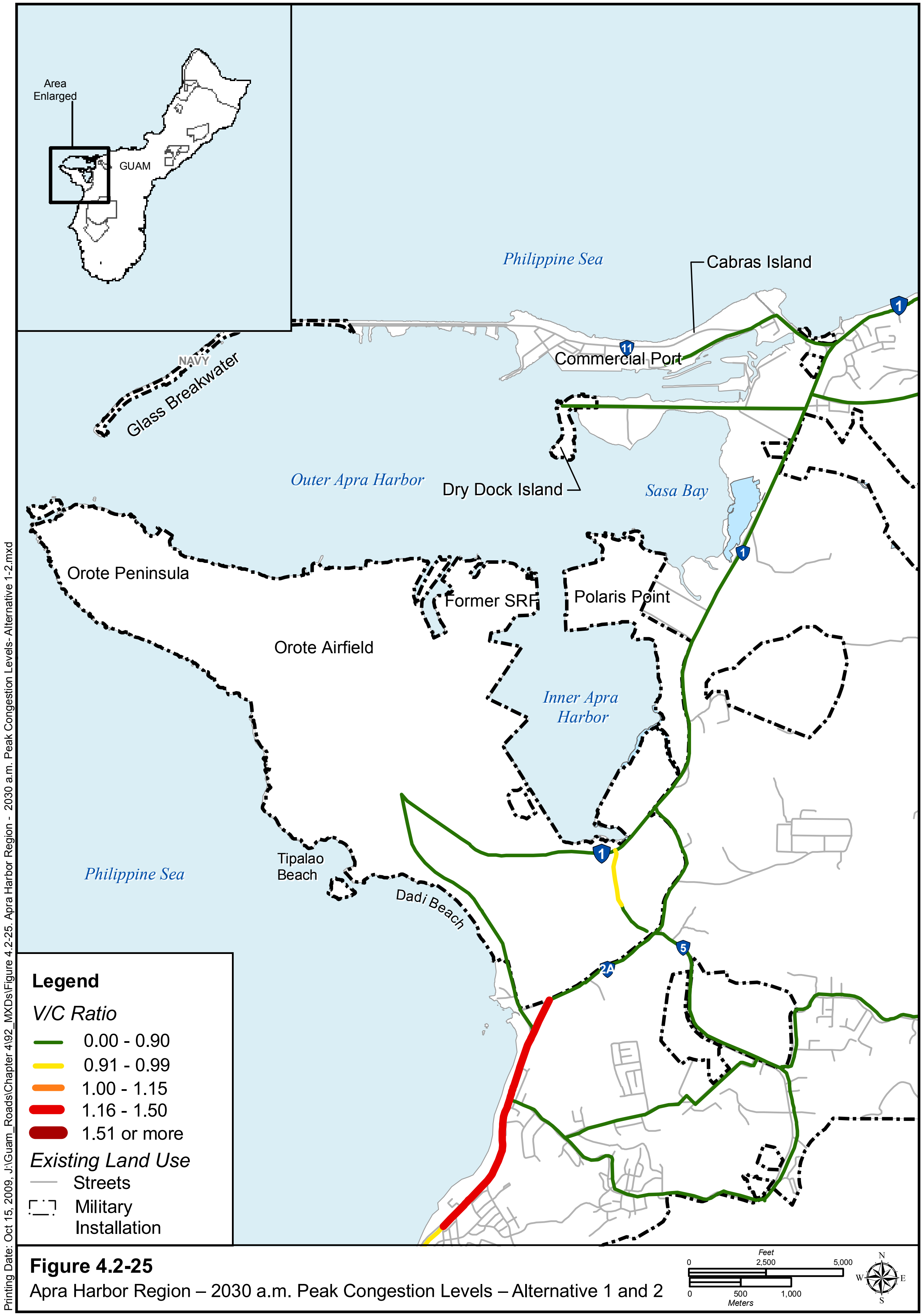


Figure 4.2-25

Apra Harbor Region – 2030 a.m. Peak Congestion Levels – Alternative 1 and 2

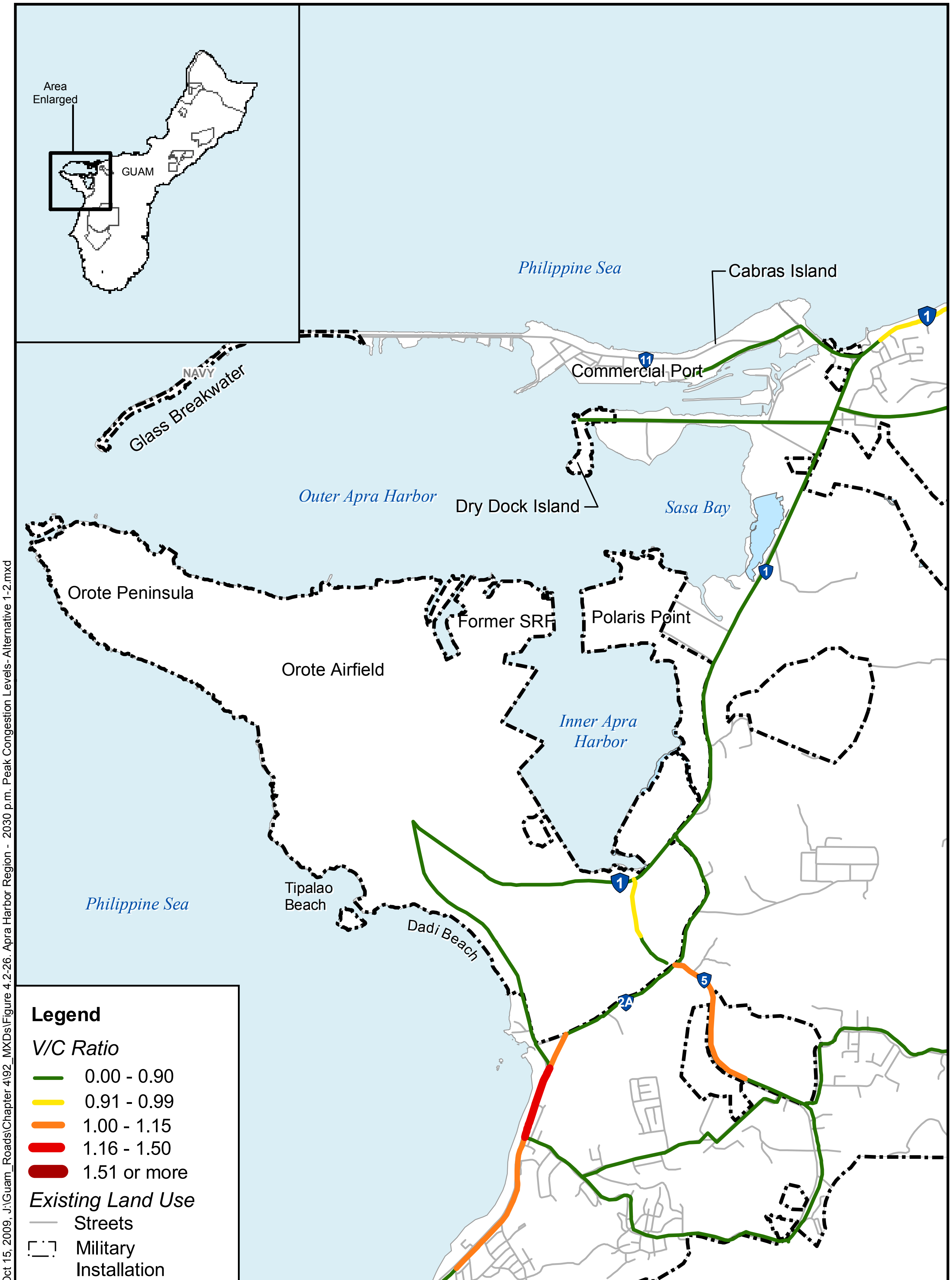


Figure 4.2-26
Apra Harbor Region – 2030 p.m. Peak Congestion Levels – Alternative 1 and 2

The proposed aircraft carrier berthing project would occur in the Apra Harbor Region. While in port, it is estimated that an average of four buses per hour would travel between Naval Base Guam and Tumon Bay. Under Alternative 1 (Polaris Point), an additional 2 buses per hour would travel between Polaris Point and Naval Base Guam. An identical number (unknown) of taxis and car rentals would be used for each alternative. Thus, for the two aircraft carrier berthing alternatives, the amount of vehicle activity would be virtually identical. However, the existing traffic conditions at the off base roadways that provide access to Polaris Point (Alternative 1) are better than the existing roadway conditions at the off base roadways that provide access to Former Ship Repair Facility (Alternative 2). Traffic associated with Alternative 1 (Polaris Point) would have access to the Guam roadway system at the existing signalized access point at Route 1/Polaris Point access road intersection. In the future, this signalized intersection operates at LOS A during weekday morning and afternoon peak hours and has adequate capacity for infrequent traffic events such as berthing of ships. Therefore, for Alternative 1 (Polaris Point), any additional traffic (e.g., rental cars, buses, and taxis) during berthing operations at peak hours would impact the LOS A condition on Route 1/Route 2A.

In the future condition, Route 1/Route 2A is anticipated to operate at LOS E both in the a.m. and p.m. peak hour without the aircraft carrier berthing project, provided the associated intersection improvement project is implemented (funded). Therefore, for Alternative 2 (Former Ship Repair Facility), any additional traffic (e.g., rental cars, buses, and taxis) during berthing operations for Alternative 2 during peak hours would impact the LOS E condition on Route 1/Route 2A. Without the intersection improvement project, LOS F is expected during afternoon peak hours.

As shown in Table 4.2-9, Route 1/2A would operate at LOS F in the a.m. peak hour for 2014, which is considered unacceptable. The intersection would operate more efficiently in terms of delay in 2030, with LOS E in the a.m. This change can be attributed to a decrease in construction traffic in 2030. Route 5/2A is operating at LOS F in the p.m. peak hour for 2030, which is considered unacceptable.

Table 4.2-9. Alternatives 1 and 2 Future Level of Service and Delay Results – Apra Harbor Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/11	C	25.4	E	67.1	C	20.7	D	43.5
Route 1/Polaris Point	A	3.8	A	4.3	A	8.2	A	7.4
Route 1/6 (west)	D	53.2	C	23.6	B	18.4	C	22.0
Route 1/2A	F	94.1	F	82.1	E	66.8	E	57.2
Route 5/2A	E	79.4	D	36.9	F	96.3	C	26.2

Notes: *Signalized intersection LOS based on average delay for the overall intersection.
Legend: LOS = Level of Service.

Public Transportation Impacts. Impacts to the public transportation system in the Apra Harbor Region should be minimal and would relate to the delays caused by increased levels of congestion on Route 5 or at intersections near DoD lands. This would possibly affect the fixed-route service along Route 1, as well as any demand response and paratransit services. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are no impacts to the pedestrian and bicycle facilities in the Apra Harbor Region. Along Route 1, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian and cyclist using the shoulder as a running or biking lane. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

<u>South</u>

On Base Roadways:

Naval Munitions Site

Construction. Under the proposed action there will be no major construction at the NMS associated with maneuver training operations. The existing hiking trail at the southern end of NMS would be utilized to avoid the Explosive Safety Quantity Distance arcs generated by the ammunitions storage area that overlap the existing access to NMS (the proposed maneuver area itself would not be within the safety arcs).

Alternative A: A new access road would be constructed that is 0.4 mi (0.6 km) long, would cover 0.8 acres at a 16 ft (5 m) width, and include no stream crossings.

Alternative B: Under this alternative, the road would be the same length but would not be improved. It would be used by foot traffic. Alternative B is the preferred alternative.

Operation.

The training operations would utilize an existing hiking trail that is located away from the existing roadways in the NMS. Therefore, the training operations would have no impact to existing traffic in the NMS.

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 1 can be found in Table 4.2-10. Route 12 decreases in volume from 2014 to 2030. See Table 4.1-20 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Table 4.2-10. Alternatives 1 and 2 Future ADT and Volume to Capacity Ratio Summary – South Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 5	Route 5 ranges from 9,800 to 17,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is 0.91-0.99 in the a.m. peak and 1.00-1.15 in the p.m. peak. The roadway is congested during the p.m. peak hours.	Route 5 ranges from 11,000 to 18,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is 0.91-0.99 in the a.m. peak and 1.00-1.15 in the p.m. peak. The roadway is congested during the p.m. peak hours.
Route 12	Route 12 ranges from 1,800 to 5,600 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not considered congested.	Route 12 ranges from 2,300 to 6,000 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-27 through Figure 4.2-30 show future levels of traffic congestion in the South Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

The roads in the South Region do not exhibit high levels of congestion. During the afternoon peak in 2030, Route 5 between Naval Base Guam and the NMS has an LOS F.

As shown in Table 4.2-11, two intersections have LOS F for at least one peak hour, which is considered unacceptable: Route 2/12, Route 5/17, and Route 4/4A. Route 4/4A and Route 5/17 have fairly free-flowing conditions in 2014 and become significantly more congested in 2030.

Table 4.2-11. Alternatives 1 and 2 Future Level of Service and Delay Results – South Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 2/12	F	135.0	C	26.0	C	27.8	C	27.1
Unsignalized**								
Route 5/17	C	13.1	D	29.3	F	56.8	F	149.6
Route 4/4A	C	23.9	C	17.1	E	49.7	F	484.3
Route 17/4A	B	12.9	B	14.0	B	13.6	C	18.7
Military Access Points								
Route 5 - Naval Munitions Site/Harmon Road.**	—	—	—	—	A	9.5	A	10.6

Legend: LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

Public Transportation Impacts. Impacts to the demand response and paratransit that service the South Region are minimal. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are no impacts to pedestrian and bicycle facilities in the South Region. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

<u>Proposed Mitigation Measures</u>

On Base Roadways:

Due to increase of traffic from the proposed action, impacts to on base traffic would exist. The impacts would be more severe at Andersen AFB and Naval Base Guam. The traffic impact is less than significant at Andersen South, Barrigada, and NMS. Proposed mitigation measures for Andersen AFB and Naval Base Guam may include road widening, restriping, traffic signal, and other traffic control devices to help improve traffic operations. An on base traffic study is currently being prepared and once complete will be used to identify potential mitigation options for high traffic areas.

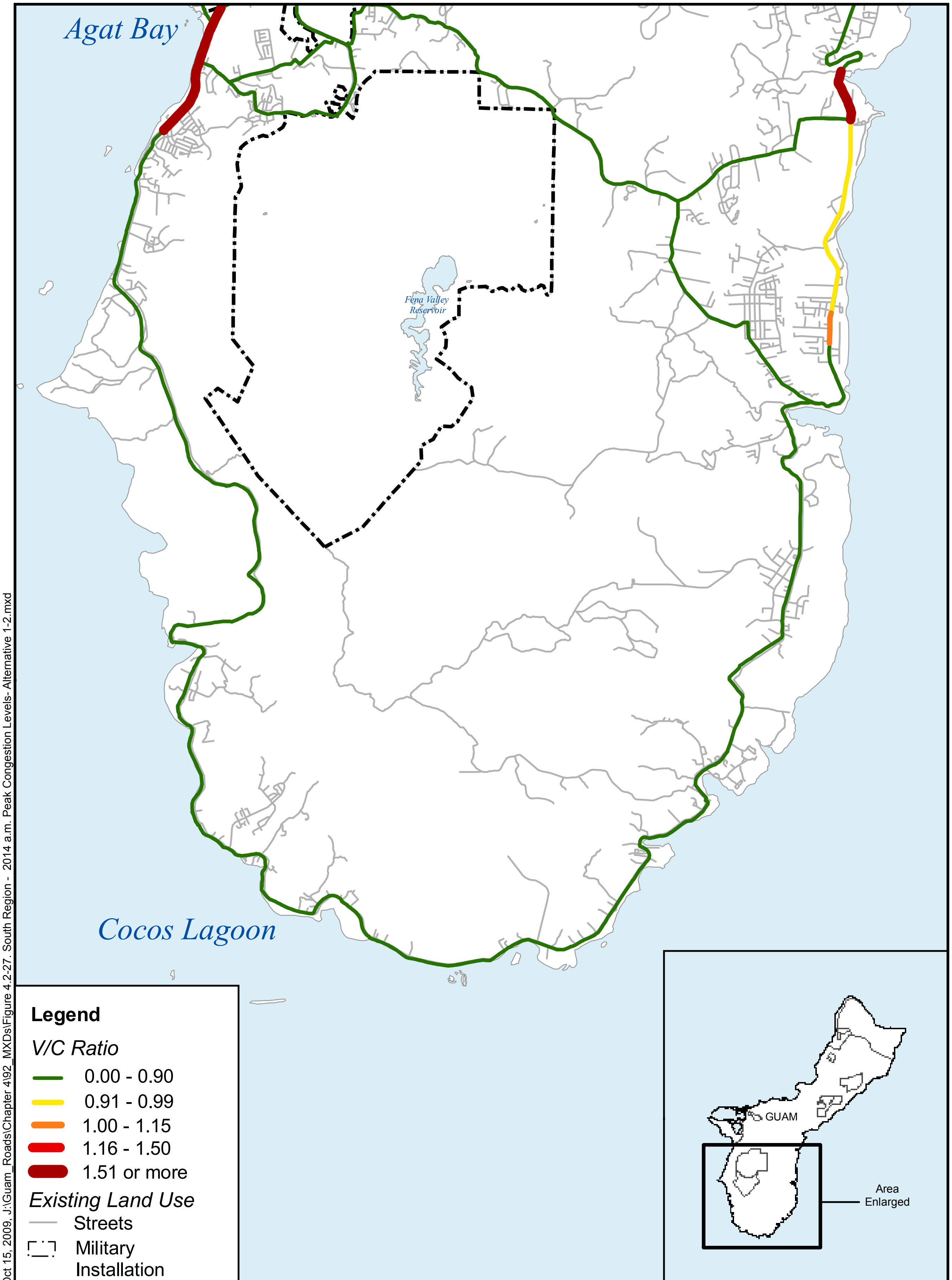


Figure 4.2-27

South Region – 2014 a.m. Peak Congestion Levels – Alternative 1 and 2

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-27. South Region - 2014 a.m. Peak Congestion Levels- Alternative 1-2.mxd

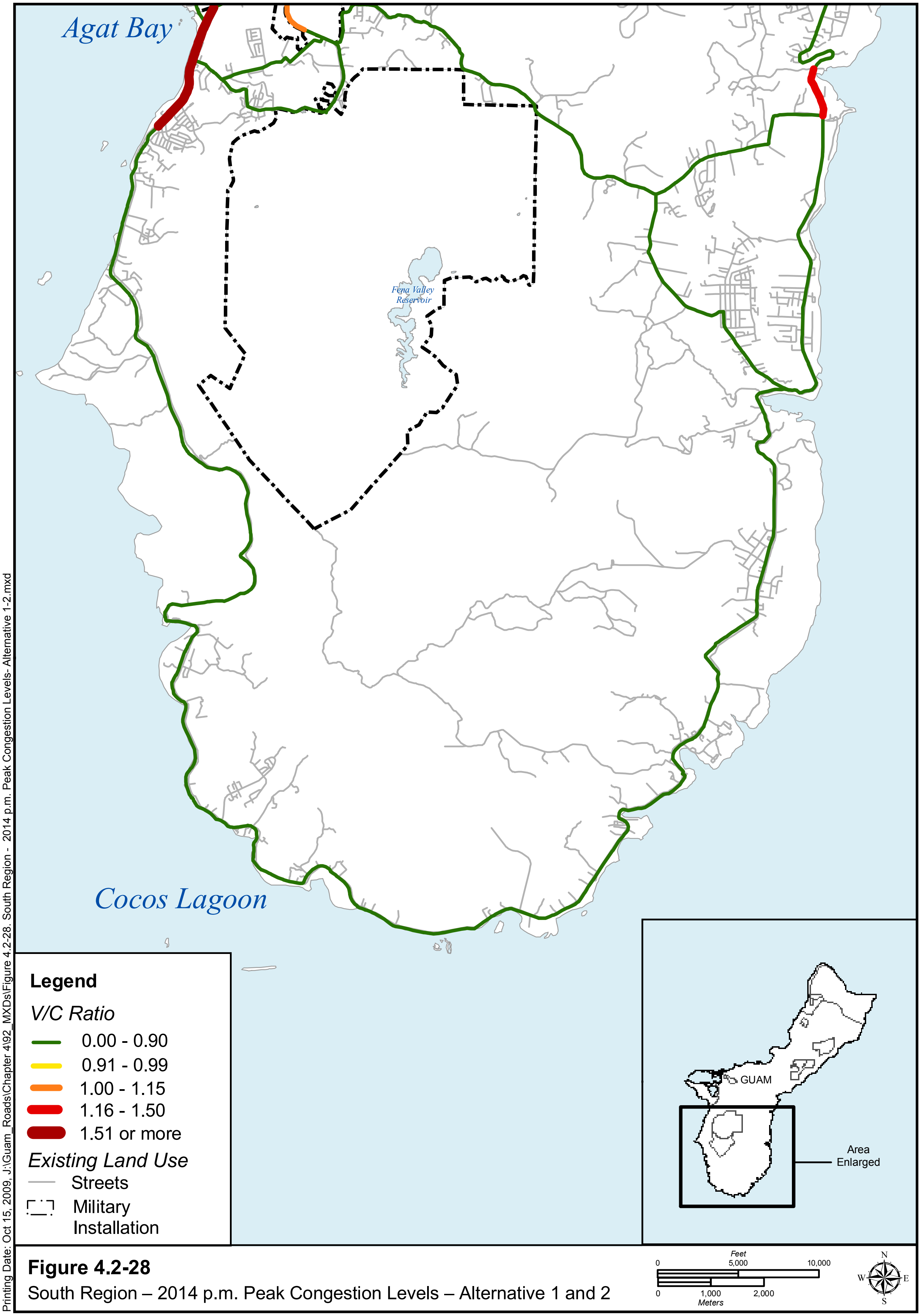


Figure 4.2-28
South Region – 2014 p.m. Peak Congestion Levels – Alternative 1 and 2

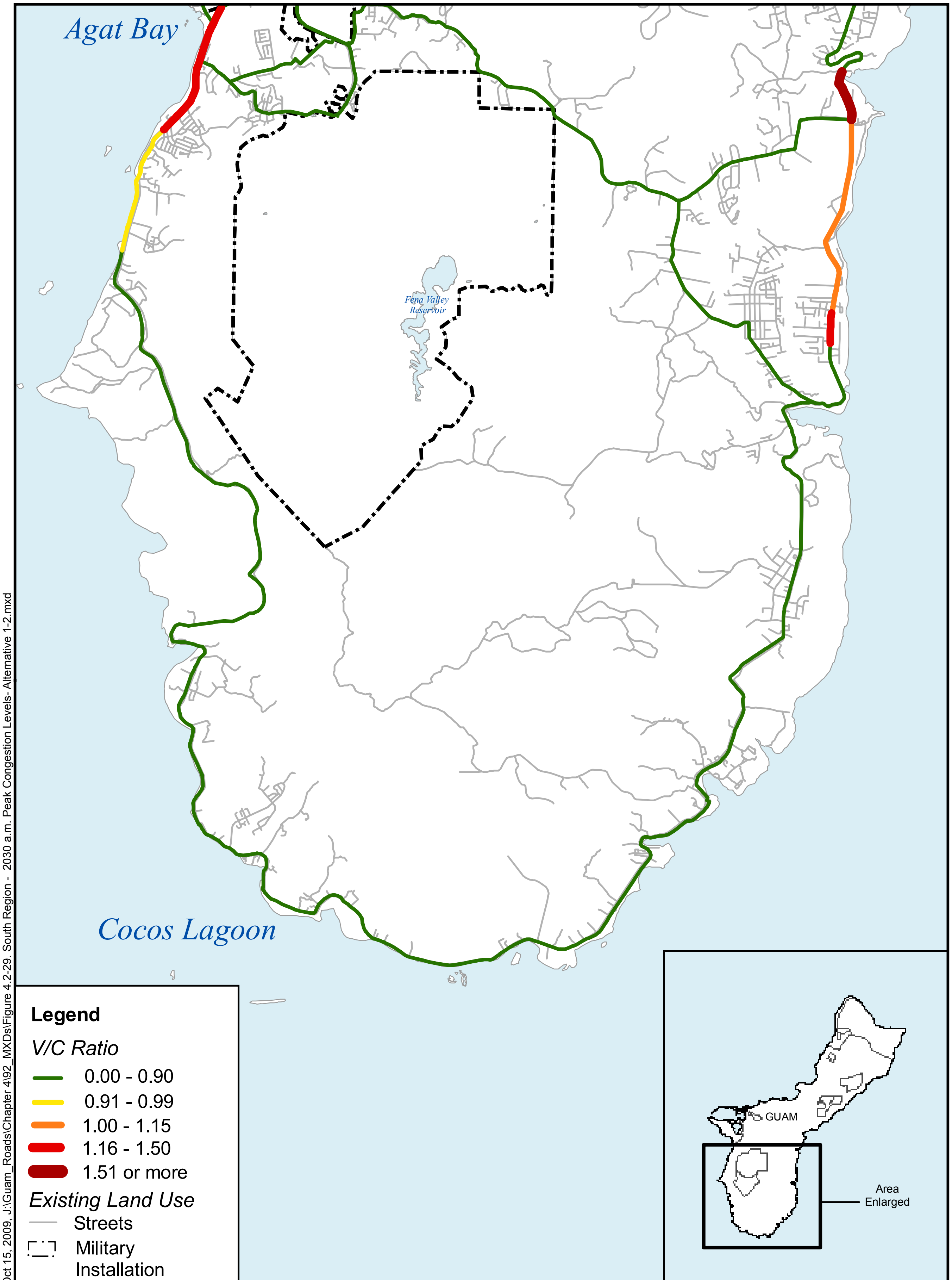
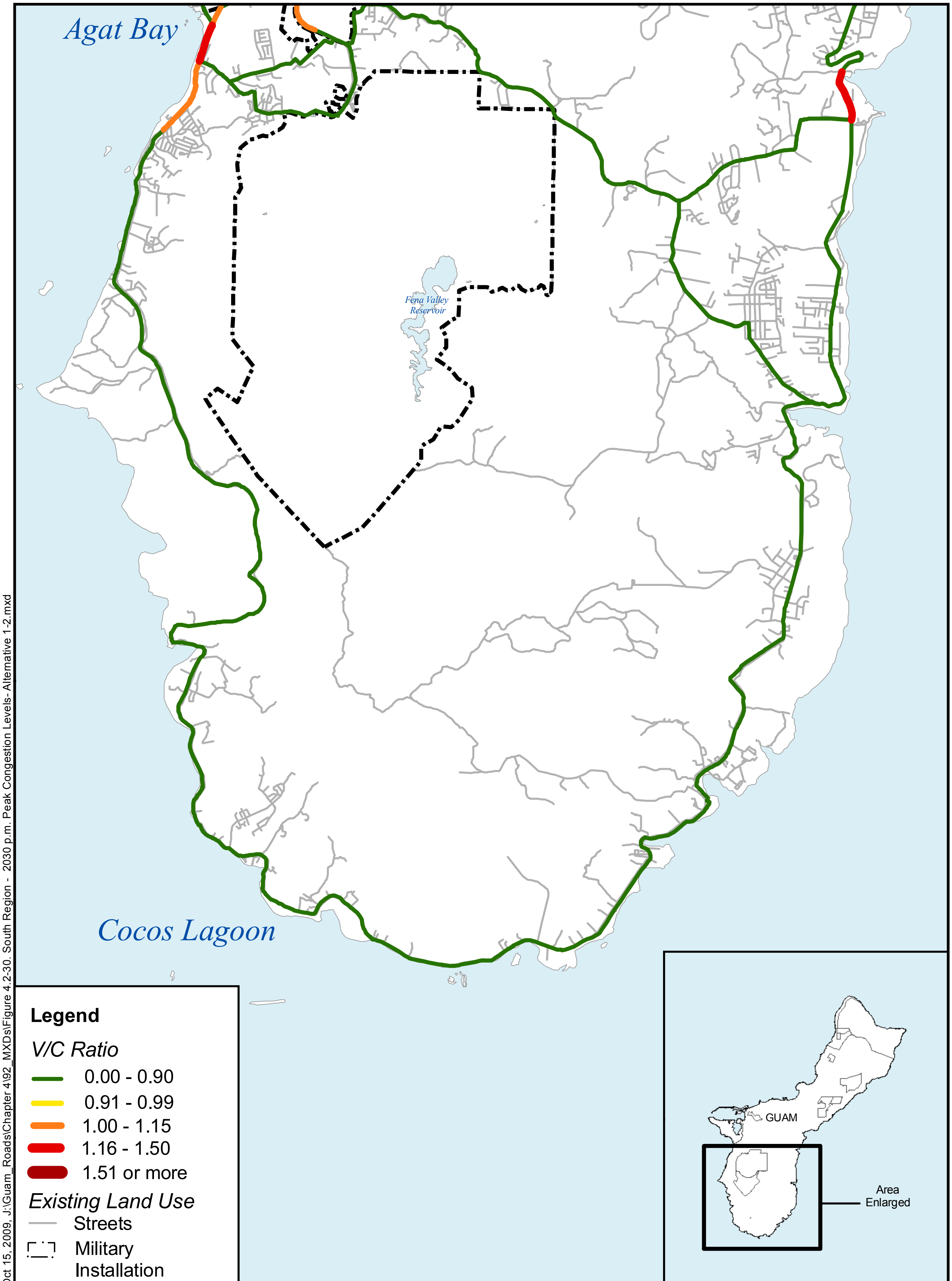


Figure 4.2-29
South Region – 2030 a.m. Peak Congestion Levels – Alternative 1 and 2

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-29. South Region - 2030 a.m. Peak Congestion Levels- Alternative 1-2.mxd



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-30. South Region - 2030 p.m. Peak Congestion Levels- Alternative 1-2.mxd

Figure 4.2-30
South Region – 2030 p.m. Peak Congestion Levels – Alternative 1 and 2

Off Base Roadways:

Mitigation for the impacts described for Alternative 1 would be under the control of Federal Highway Administration and could include the creation of a Traffic Management Plan that may incorporate the following:

- Travel demand management
- Encourage moped and motorcycle use
- Develop transportation demand measures to discourage single-occupant vehicle use
- Stagger work hours
- Provide corporate shuttles for local circulation
- Better delivery system for purchases
- Flextime – compressed work weeks
- Promote trip reduction planning
- Traffic management would follow the Manual on Uniform Traffic Control Devices, as deemed necessary and applicable
- The Manual on Uniform Traffic Control Devices provides several examples on dealing with traffic through many different types of roadway construction activities
- Whenever possible, construction would be phased to allow two lanes of traffic to remain open
- If two lanes of traffic are not permissible, traffic would be reduced to one lane
- Should it be required for all lanes of traffic to be closed, a detour route would be clearly signed
- Appropriate measures would be taken to maintain access to businesses
- Should construction require a business access to be closed, the business owner would be given reasonable notice of the construction activities and the estimated duration of closure
- Pedestrian routes would remain open and clear of any debris
- Should a pedestrian route be closed, a detour route would be clearly signed and maintained throughout construction to ensure pedestrian safety
- All emergency services would be given sufficient notice of construction activities and relative detour routes as to not affect their response times

4.2.2.2 Alternative 2 (Preferred Alternative)

North

On Base Roadways:

Andersen AFB

Construction. The impacts for Alternative 2 are the same as Alternative 1.

Operation. The impacts for Alternative 2 are the same as Alternative 1.

Finegayan

Construction. The impacts for Alternative 2 are the same as Alternative 1.

Operation. The impacts for Alternative 2 are the same as Alternative 1.

Off Base Roadways:

The impacts for Alternative 2 are the same as Alternative 1.

<u>Central</u>

On Base Roadways:

Andersen South

Construction. The impacts for Alternative 2 are the same as Alternative 1.

Operation. The impacts for Alternative 2 are the same as Alternative 1.

Barrigada

Construction. The impacts for Alternative 2 are the same as Alternative 1.

Operation. The impacts for Alternative 2 are the same as Alternative 1.

Off Base Roadways:

The impacts for Alternative 2 are the same as Alternative 1.

<u>Apra Harbor</u>

On Base Roadways:

Naval Base Guam

Construction. The impacts for Alternative 2 are the same as Alternative 1.

Operation. The impacts for Alternative 2 are the same as Alternative 1.

Off Base Roadways:

The impacts for Alternative 2 are the same as Alternative 1.

<u>South</u>

On Base Roadways:

Naval Munitions Site

Construction. The impacts for Alternative 2 are the same as Alternative 1.

Operation. The impacts for Alternative 2 are the same as Alternative 1.

Off Base Roadways:

The impacts for Alternative 2 are the same as Alternative 1.

<u>Proposed Mitigation Measures</u>

On Base Roadways:

The proposed mitigation measures would be the same as for Alternative 1.

Off Base Roadways:

The proposed mitigation measures would be the same as for Alternative 1.

4.2.2.3 Alternative 3

North

On Base Roadways:

Andersen AFB

Construction. The impacts for Alternative 3 are the same as Alternative 1.

Operation. The impacts for Alternative 3 are the same as Alternative 1.

Finegayan

Construction. The construction in Finegayan remains similar to that explained in Alternatives 1 and 2. In this alternative, the Former FAA parcel, and Harmon Annex are not utilized. The alternative includes utilizing Navy Barrigada and Air Force Barrigada for constructing the family housing and community support facilities that would not be constructed on the Former FAA parcel and Harmon Annex. The Commercial Gate, Main Gate, and Residential Gate remain at the same location. Facilities that would be constructed remain the same as explained in Alternatives 1 and 2 earlier.

The impacts for Alternative 3 would be similar to Alternative 1.

Operation. As there is no inter-connectivity between NCTS Finegayan and South Finegayan in Alternative 3; the traffic between these two neighboring bases would have to pass through Route 3. This would result in higher traffic congestion on Route 3 and impacts are discussed in the Off Base Roadway sections of this chapter.

The impacts for Alternative 3 to on base roadways are the same as Alternative 1.

Off Base Roadways:

Future Traffic Impacts. Alternative 3 of the Army AMDTF proposed action involves collocation of facilities with the Marine Corps at NCTS Finegayan, Navy Barrigada, and Air Force Barrigada. Alternative 2 of the Army AMDTF is similar in that Army facilities would be located at Navy Barrigada. Thus, effects of Army AMDTF Alternatives 2 and 3 are captured in the following analysis.

A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 3 is presented in Table 4.2-12. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-3 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island. Overall, there would be increased traffic as compared to Alternative 1 due to traffic from off base housing.

Figure 4.2-31 through Figure 4.2-34 show future levels of traffic congestion in the North Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

The road indirectly serving the DoD lands is the most congested. During both the morning and afternoon peaks, the road with the greatest congestion levels in the North Region is Route 28 with LOS F.

Table 4.2-12. Alternative 3 Future ADT and Volume to Capacity Ratio Summary – North Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 32,000 to 41,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.	Route 1 ranges from 24,000 to 40,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.
Route 3	Route 3 ranges from 23,000 to 68,000 vpd. Traffic decreases north of the intersection with Route 28.	During the a.m. and p.m. peak, Route 3 south of the Residential Gate has a v/c ratio of 1.00-1.15. North of the Residential Gate, the v/c ratio is less than 1. The roadway is considered congested south of the military installation.	Route 3 ranges from 13,000 to 53,000 vpd. Traffic decreases north of the intersection with Route 28.	During peak hours, Route 3 has a v/c ratio of less than 1 and is not considered congested.
Route 9	Route 9 ranges from 12,000 to 20,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The western portion has a v/c ratio of 0.00-0.90 during peak hours; however, the eastern portion has a v/c ratio of 0.81-0.99 during the a.m. peak and 1.00-1.15 during the p.m. peak. This section is congested during the p.m. peak.	Route 9 ranges from 9,200 to 16,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The western portion of Route 9 has a v/c ratio of 0.00-0.90 during peak hours, while the eastern portion has a v/c ratio of 0.91-0.99. The roadway is not considered congested.
Route 15	Route 15 has 6,900 vpd in the North Region.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.	Route 15 has 7,600 vpd in the North Region.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested
Route 28	Route 28 ranges from 21,000 to 26,000 vpd. Traffic increases closer to the intersection with Route 1.	The north/south portion of Route 28 has a v/c ratio greater than 1.50 during peak hours. The east/west portion has a v/c of 1.16-1.50 during the a.m. and greater than 1.50 during the p.m. The roadway is considered congested.	Route 28 ranges from 16,000 to 18,000 vpd. Traffic increases closer to the intersection with Route 1.	The north/south portion of Route 28 has a v/c ratio greater than 1.50 during peak hours. The east/west portion has a v/c of 1.00-1.15 during the a.m. and 1.16-1.50 during the p.m. The roadway is considered congested.

Legend: ADT = average daily traffic; AFB = Air Force Base; v/c = volume to capacity; vpd = vehicles per day.

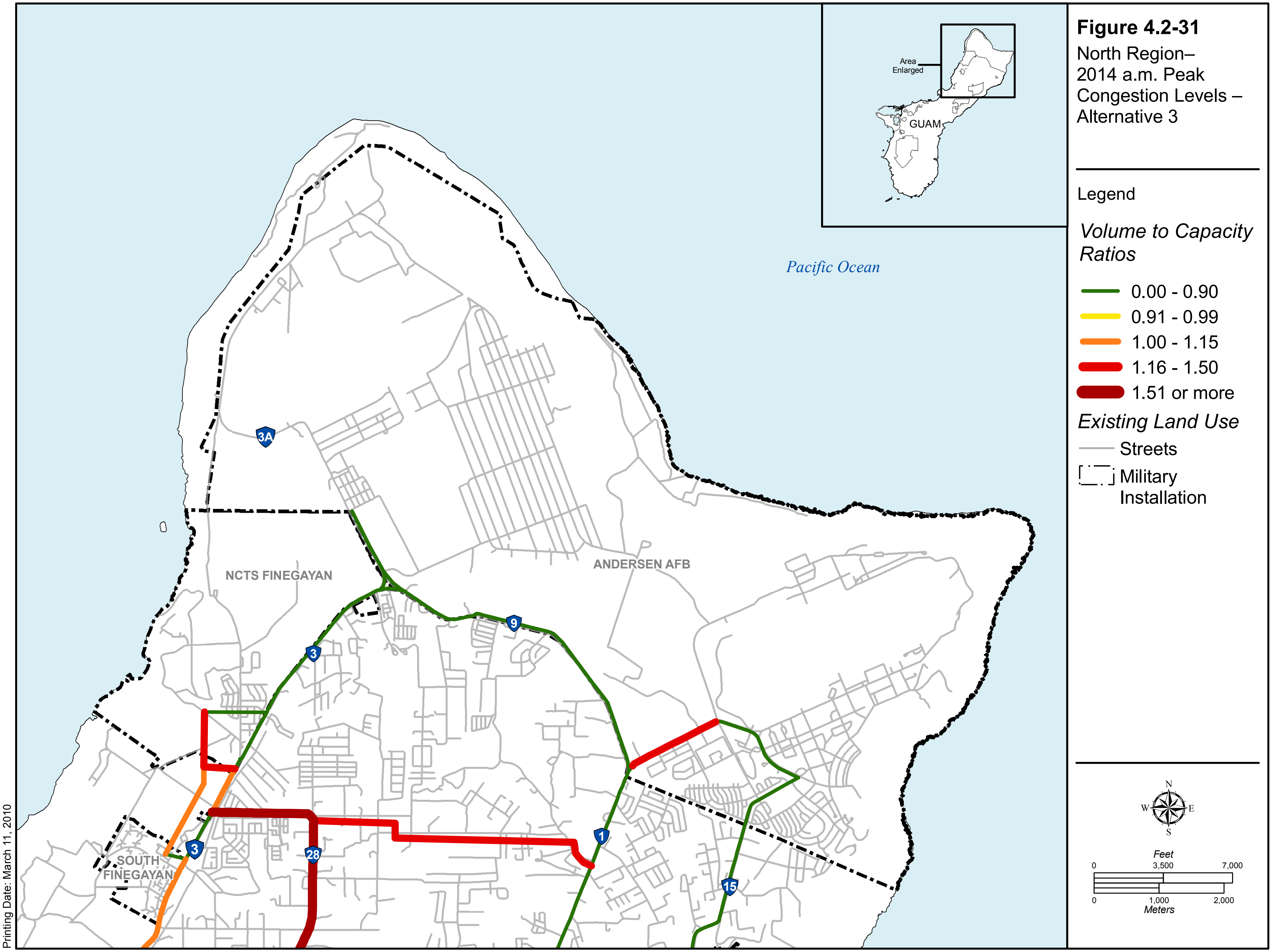


Figure 4.2-31
North Region–
2014 a.m. Peak
Congestion Levels –
Alternative 3
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
Area Enlarged
GUAM
Pacific Ocean
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
9
3
1
15
28
N
S
E
W
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: March 11, 2010

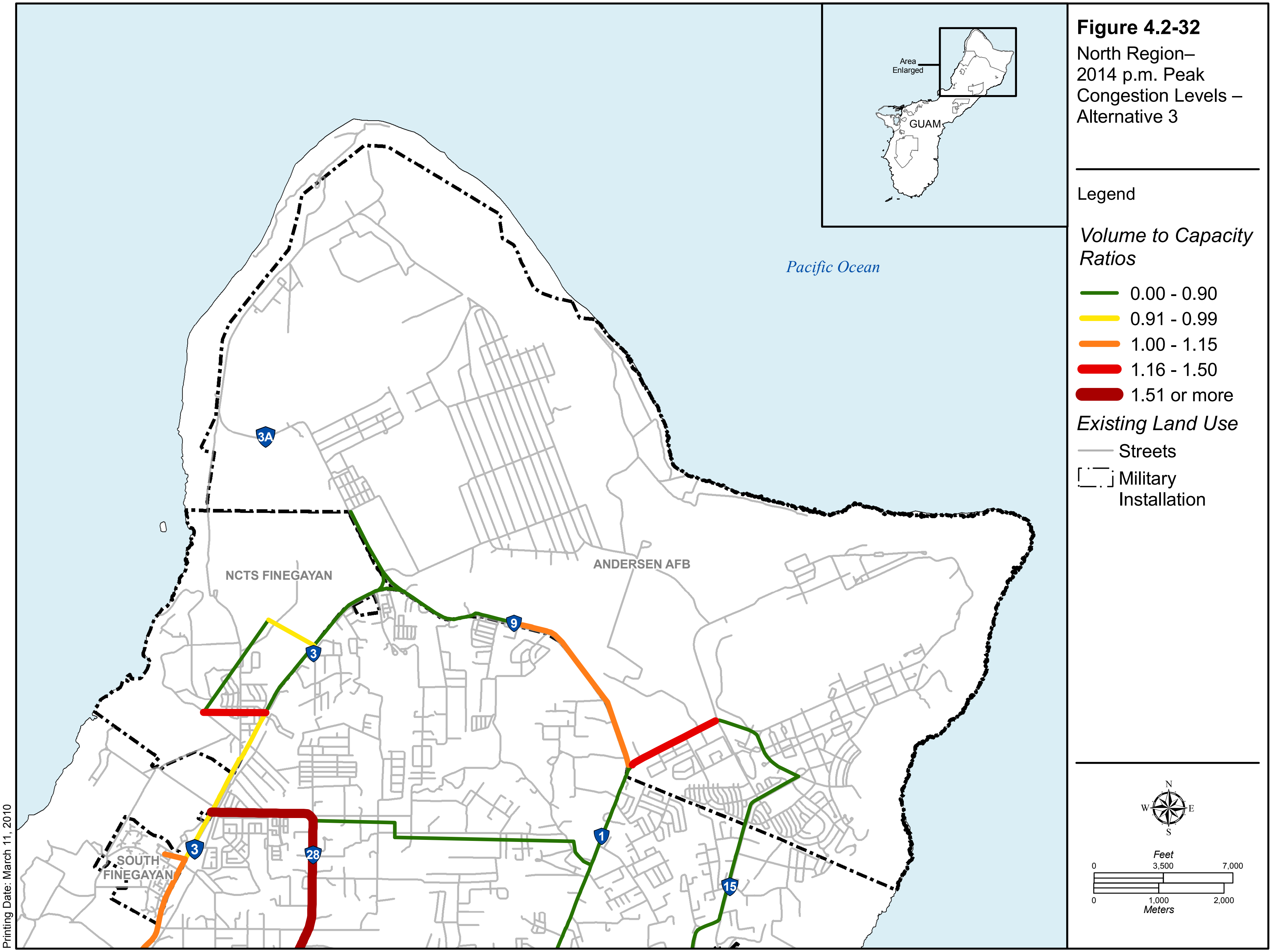


Figure 4.2-32
North Region–
2014 p.m. Peak
Congestion Levels –
Alternative 3
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
Pacific Ocean
Area Enlarged
GUAM
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
3
9
28
1
15
N
S
E
W
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: March 11, 2010

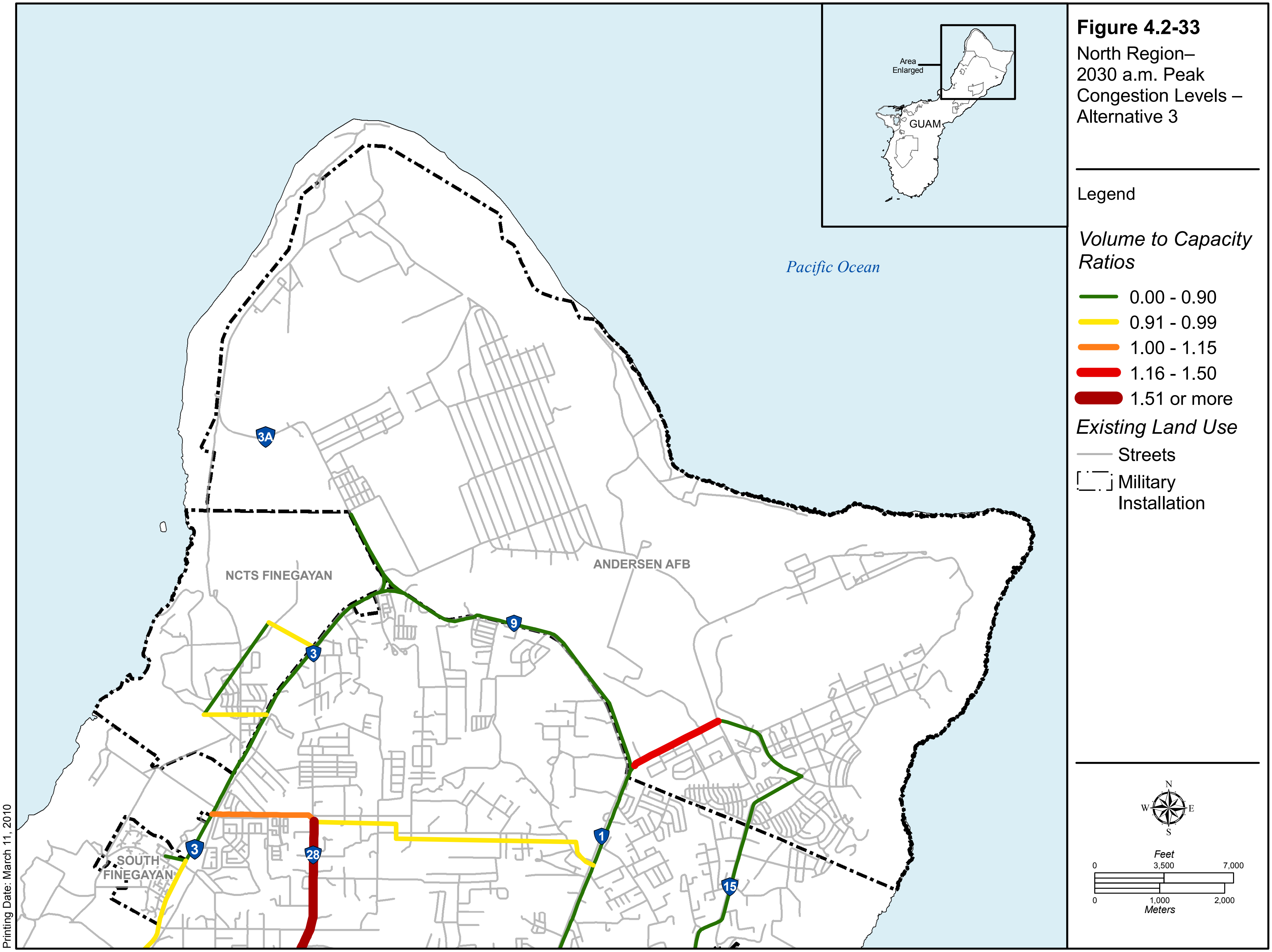
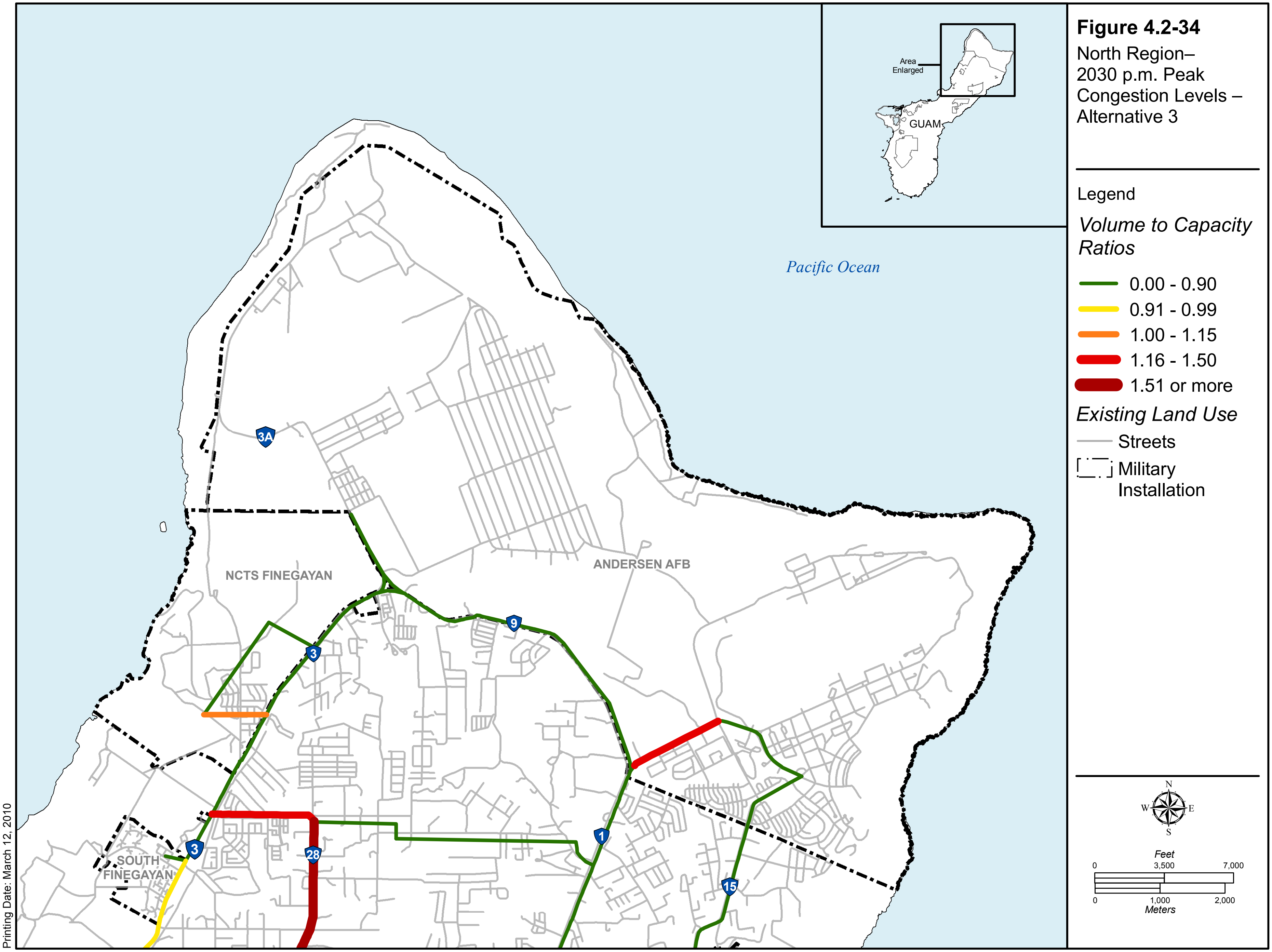


Figure 4.2-33
North Region–
2030 a.m. Peak
Congestion Levels –
Alternative 3
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
Area Enlarged
GUAM
Pacific Ocean
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
3
9
28
1
15
N
S
E
W
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: March 11, 2010


Area Enlarged
GUAM
Pacific Ocean
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
3
9
28
1
15
Figure 4.2-34
North Region–
2030 p.m. Peak
Congestion Levels –
Alternative 3
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
N
W
E
S
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: March 12, 2010

The results of the future operational analysis are shown in Table 4.2-13 for both the 2014 a.m. and p.m. and 2030 a.m. and p.m. conditions.

For the North Region, there are three intersections for which traffic is worse in 2014 than in 2030 in both the a.m. and p.m. peak hour. This can be attributed to an increase in construction equipment and personnel in addition to the first military deployment that would occur in 2010.

As shown in Table 4.2-13, there are three intersections and three access points with LOS F for at least one peak hour, which is considered unacceptable. The Route 1/29 intersection is operating at LOS F in the a.m. and p.m. peak hours in both 2014 and 2030.

Table 4.2-13. Alternative 3 Future Level of Service and Delay Results – North Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/9	C	25.9	D	38.2	C	24.4	D	53.0
Route 1/29	F	347.0	F	278.8	F	85.3	F	90.5
Route 3/28	F	95.2	F	92.8	F	90.2	D	53.9
Route 15/29**	C	27.0	C	22.8	F	161.4	C	26.2
Unsignalized* **								
Route 3/3A/9	F	142.3	F	565.0	E	47.2	F	100.7
Military Access Points								
Route 3 – Main Cantonment/Commercial Gate	—	—	—	—	F	91.6	D	39.9
Route 3 – Main Cantonment/Main Gate	—	—	—	—	D	51.6	F	155.9
Route 3 – South Finegayan/Residential Gate	—	—	—	—	F	141.7	D	50.1
Route 9 – Andersen AFB/ Andersen AFB North Gate****	—	—	—	—	F	1031.0	F	9051.1

Legend: AFB = Air Force Base; LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
****Delay exceeded maximum calculated value.

Public Transportation Impacts. Impacts to the public transportation system relate to the delays caused by increased levels of congestion on roadways and at intersections. This would affect the demand response and paratransit services, increasing passenger wait times and missed transfers. While there is no existing fixed-route service in the North Region, planning efforts have proposed new routes along Routes 1 and 3.

Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are no impacts to the pedestrian and bicycle facilities in the North Region. Along Route 1, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian and cyclist using the shoulder as a running or biking lane. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

Central

On Base Roadways:

Andersen South

Construction. The impacts for Alternative 3 are the same as Alternative 1.

Operation. The impacts for Alternative 3 are the same as Alternative 1.

Barrigada

Construction. Alternative 3 proposes to utilize Navy Barrigada and Air Force Barrigada for construction of family housing and community support structures to accommodate the relocation of Marines from Okinawa to Guam. The Residential Gate in Navy Barrigada would be located near the present intersection of Sabana Barrigada and Route 16 in the northern portion of the site. The Residential Gate for Air Force Barrigada would be located near the intersection of Route 15 and Fadian Point Road. The two bases (Navy Barrigada and Air Force Barrigada) would be connected through an approximately 1.5 mi (2.5 km) long connector road that is proposed to run alongside the eastern edge of the Admiral Nimitz Golf Course.

Based on the relatively low traffic demand on Barrigada, the construction traffic impact would be less than significant for Alternative 3.

Operation. The existing two lane roadways in Barrigada have a daily capacity of approximately 5,000 vpd. The expected increase in traffic and the current traffic demand is well below that capacity. Therefore, the impact would be less than significant for Alternative 3.

Off Base Roadways:

Future Traffic Impacts. Alternative 3 of the Army AMDTF proposed action involves collocation of facilities with the Marine Corps at NCTS Finegayan, Navy Barrigada, and Air Force Barrigada. Alternative 2 of the Army AMDTF is similar in that Army facilities would be located at Navy Barrigada. Thus, effects of Army AMDTF Alternatives 2 and 3 are captured in the following analysis.

A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 3 can be found in Table 4.2-14. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-8 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Figure 4.2-35 through Figure 4.2-38 show future levels of traffic congestion in the Central Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

Table 4.2-14. Alternative 3 Future ADT and Volume to Capacity Ratio Summary – Central Region

Roadway	2014		2030	
	ADT Summary	v/c Ratio	ADT Summary	v/c Ratio
Route 1	Route 1 ranges from 59,000 to 100,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally less than 1.00 in both the a.m. and p.m. condition; however, there are small segments near the intersections with 14A, and 30 that have a v/c ratio of greater than 1, which indicates the roadway is congested in Tamuning.	Route 1 ranges from 52,000 to 93,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally less than 1.00 in both the a.m. and p.m. condition; however, there is a segment south of Route 30 that has a v/c ratio of greater than 1 in the p.m. peak. The roadway is congested in Tamuning.
Route 3	Route 3 ranges from 57,000 to 70,000 vpd. Traffic increases toward the intersection with Route 1.	The v/c ratio in both the a.m. and p.m. peak is 1.00-1.15. This indicates the roadway is considered congested.	Route 3 ranges from 48,000 to 60,000 vpd. Traffic increases toward the intersection with Route 1.	The v/c ratio is between 1.00-1.15, indicating the roadway is considered congested at this location.
Route 8/8A	Route 8 ranges from 51,000 to 65,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 3,500 vpd.	During peak hours, the v/c ratio is 0.00-0.90 east of Tiyan Parkway, 0.91-0.99 west of Tiyan Parkway, and 0.00-0.90 west of Route 16. Other than a small section near the intersection of Route 10, the roadway is not considered congested.	Route 8 ranges from 52,000 to 60,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 2,500 vpd.	During the a.m. peak, the v/c ratio is 0.00-0.90. During the p.m. peak, the v/c ratio is 0.00-0.90 east of Tiyan Parkway, 0.81-0.99 west of Tiyan Parkway, and 0.00-0.90 west of Route 16. The roadway is not considered congested.
Route 10	Route 10 ranges from 56,000 to 58,000 vpd between Routes 8 and 15.	In the a.m. peak, a small segment south of the intersection with Route 15 has a v/c ratio between 1.15-1.50. During the p.m. peak, Route 10 has a v/c ratio of 1.00-1.15 north of Route 32 to Route 8. The roadway is primarily congested during the p.m. peak.	Route 10 ranges from 56,000 to 58,000 vpd between Routes 8 and 15.	In the a.m. peak, Route 10 has a v/c ratio of 1.16-1.50 between Route 32 and Route 15. During the p.m. peak, Route 10 has a v/c ratio of 1.00-1.15 north of Route 32 to Route 8. The roadway is primarily congested during the p.m. peak.
Route 15	Route 15 ranges from 13,000 to 24,000 vpd. There is an increase in traffic south of the intersection with Route 26.	North of Route 26 and west of Route 10, Route 15 has a v/c ratio of 0.00-0.90 during peak hours. The middle section of Route 15 has a v/c ratio of 0.91-0.99, with a v/c ratio of 1.00-1.15 at Route 10. The roadway is only congested near the intersection with Route 10.	Route 15 ranges from 8,100 to 23,000 vpd. There is an increase in traffic south of the intersection with Route 26.	The v/c ratio is less than 1.00 during peak hours. The roadway is not considered congested.

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 16	Route 16 ranges from 59,000 to 91,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is generally less than 1.00 in the a.m. and p.m. for the segment of the road south of Route 25. North of Route 25, the v/c level is greater than 1, indicating the roadway is considered congested at this location.	Route 16 ranges from 49,000 to 91,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is less than 1.00 during peak hours, except for near the intersection with Route 27. The roadway is considered congested at this location.
Route 25	Route 25 ranges from 24,000 to 28,000 vpd.	Route 25 has a v/c ratio greater than 1.50, indicating that the roadway is considered congested.	Route 25 ranges from 27,000 to 30,000 vpd.	The v/c ratio is 1.00-1.15 during peak hours, indicating congestion.
Route 26	Route 26 ranges from 10,000 to 25,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	Route 26 primarily has a v/c ratio greater than 1.00 during both the a.m. and p.m. peak. The roadway is considered congested.	Route 26 ranges from 9,000 to 27,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	The v/c ratio is less than 1.00 during peak hours, except for south of Route 25 where the v/c ratio is 1.00-1.15 in the a.m. peak. The roadway is considered congested at this location.
Route 27	Route 27 ranges from 58,000 to 61,000 vpd between Routes 16 and 1.	The v/c ratio of 0.91-0.99 during the a.m. peak. This roadway is not considered congested.	Route 27 ranges from 53,000 to 56,000 vpd between Routes 16 and 1.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.
Route 28	Route 28 ranges from 21,000 to 24,000 vpd.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak, indicating the roadway is considered congested.	Route 28 ranges from 22,000 to 24,000 vpd.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak, indicating the roadway is considered congested.
Chalan Lujuna	Chalan Lujuna ranges from 22,000 to 23,000 vpd.	The v/c ratio is 1.00-1.15 during the peak hours, indicating the roadway is considered congested.	Chalan Lujuna ranges from 7,100 to 7,800 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

For the Central Region, there are 16 intersections for which the traffic is worse in 2014 than in 2030 for both the a.m. and p.m. peak hour. As shown in Table 4.2-15, there are 23 out of 28 intersections and one out of five access points with LOS F for at least one peak hour, which is considered unacceptable. The following intersections would operate at LOS F in the a.m. and p.m. peak hours in both 2014 and 2030:

- Route 1/28
- Route 1/26
- Route 1/27
- Route 1/3
- Route 1/16
- Route 1/10A
- Route 1/14 (ITC)
- Route 1/30
- Route 1/8
- Route 4/7A
- Route 8/10
- Route 10/15
- Route 16/27
- Route 16/10A

Public Transportation Impacts. Impacts to the public transportation system relate to the delays caused by increased levels of congestion on roadways and at intersections. In the Central Region, this would affect the fixed-route service along Routes 1 and 10, as well as the demand response and paratransit services. Delays on the roadways would increase passenger travel times, longer headways, and missed transfers. This would also affect the fixed-route services proposed for Routes 16 and 26. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are limited impacts to the pedestrian and bicycle facilities in the Central Region. Along Routes 1 and 10, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian using the existing sidewalk; however, it could impact a cyclist wanting to use the outside lane when unable to use the sidewalk. Future improvements to Routes 8 and 26 would also impact the intermittent sidewalk along these roadways and provide an opportunity to fully complete the facility. In addition, any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

Apra Harbor

On Base Roadways:

Naval Base Guam

Construction. The impacts for Alternative 3 are the same as Alternative 1.

Operation. The impacts for Alternative 3 are the same as Alternative 1.

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 3 can be found in Table 4.2-16. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-15 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

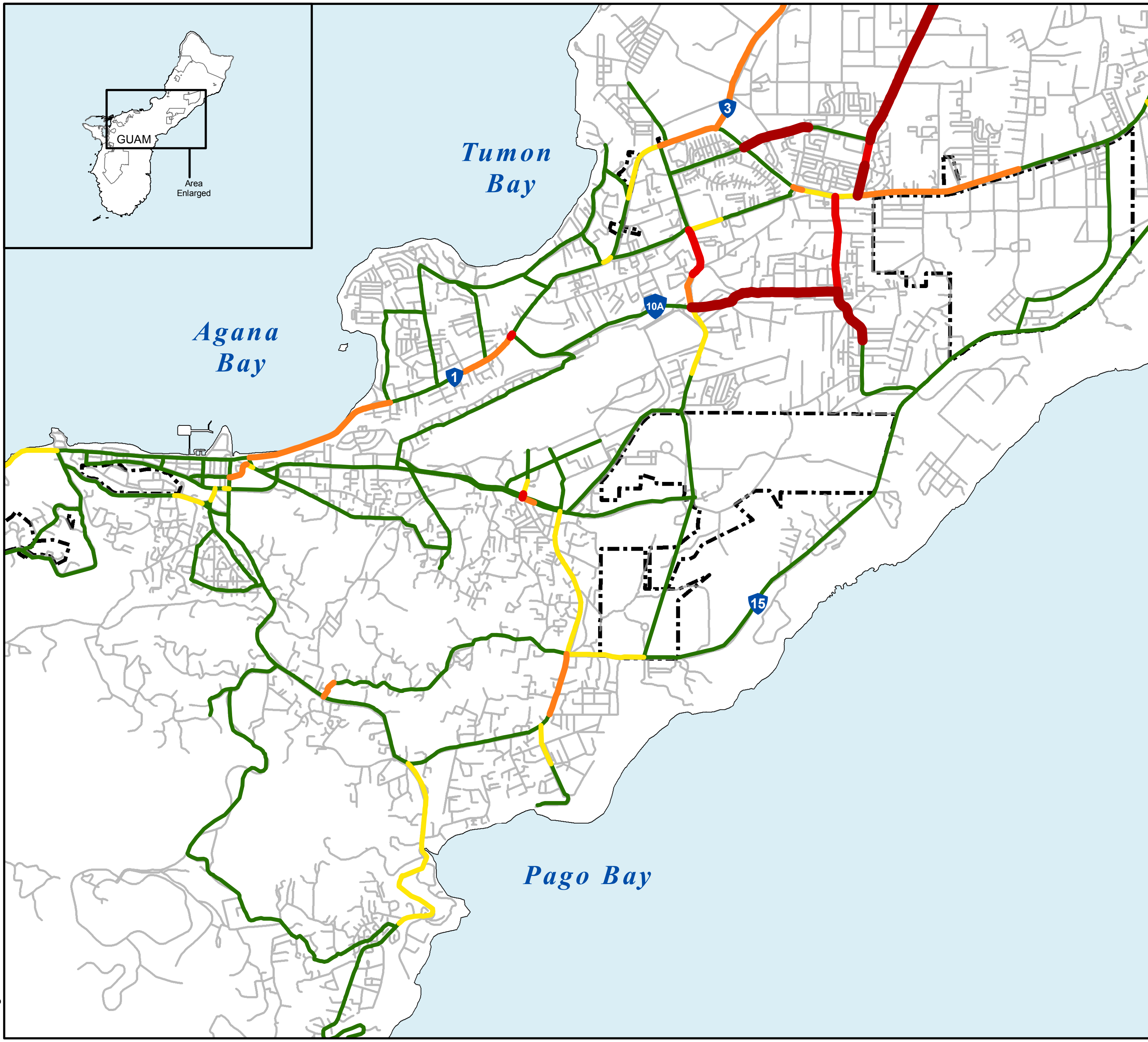


Figure 4.2-35
Central Region–2014 a.m. Peak Congestion Levels – Alternative 3

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

Printing Date: March 12, 2010

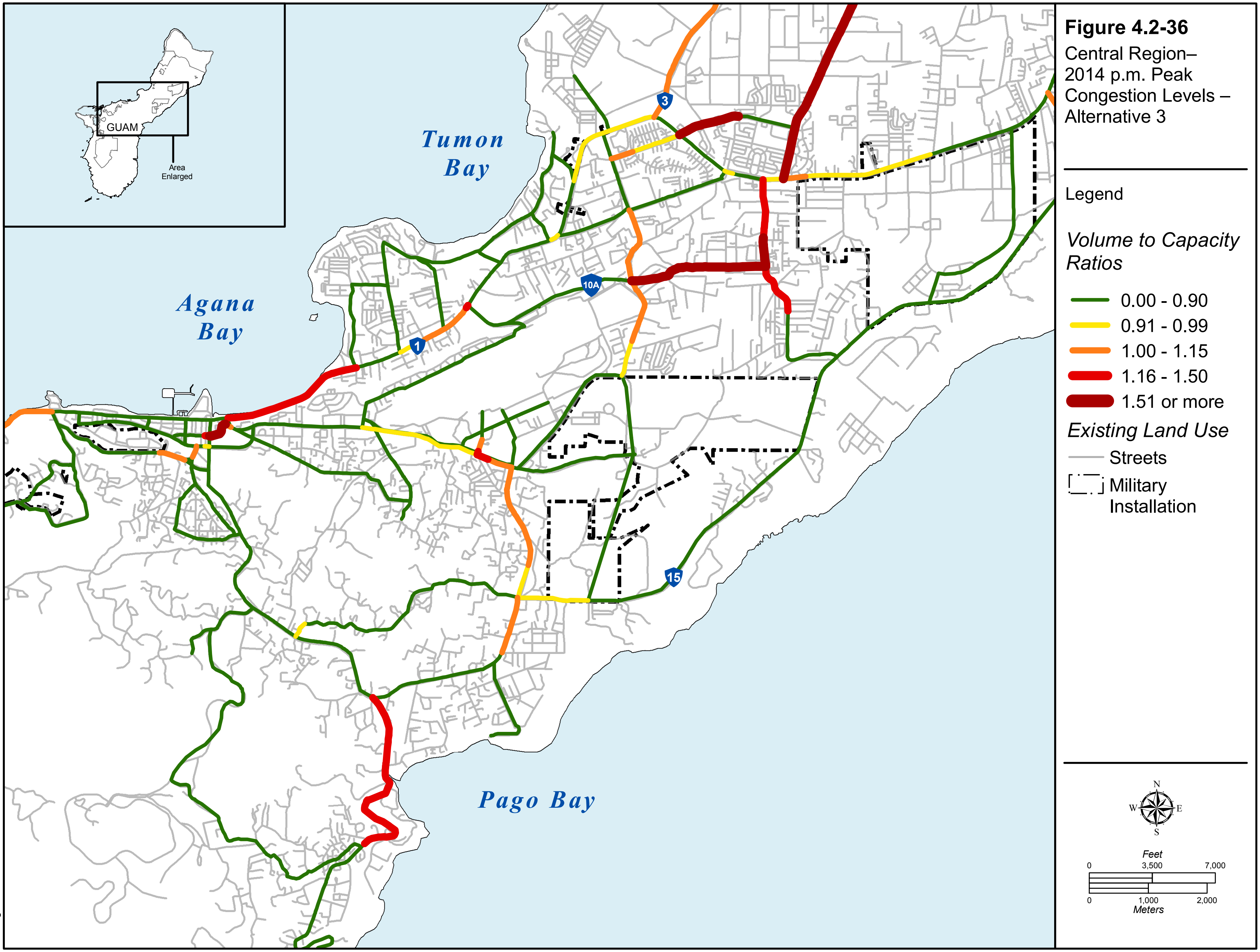


Figure 4.2-36
Central Region–2014 p.m. Peak Congestion Levels – Alternative 3

Printing Date: March 12, 2010

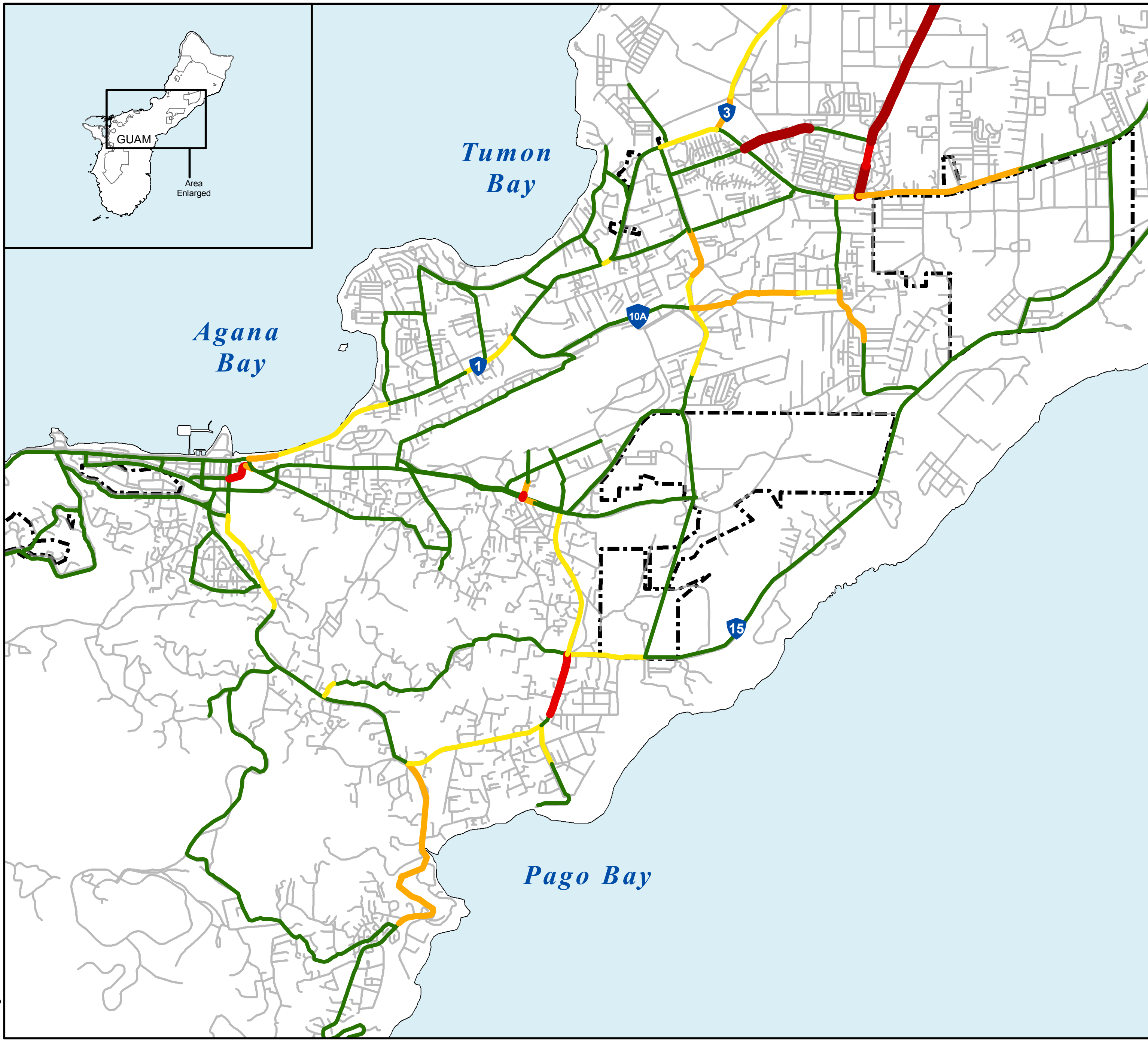


Figure 4.2-37
Central Region–2030 a.m. Peak Congestion Levels – Alternative 3

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

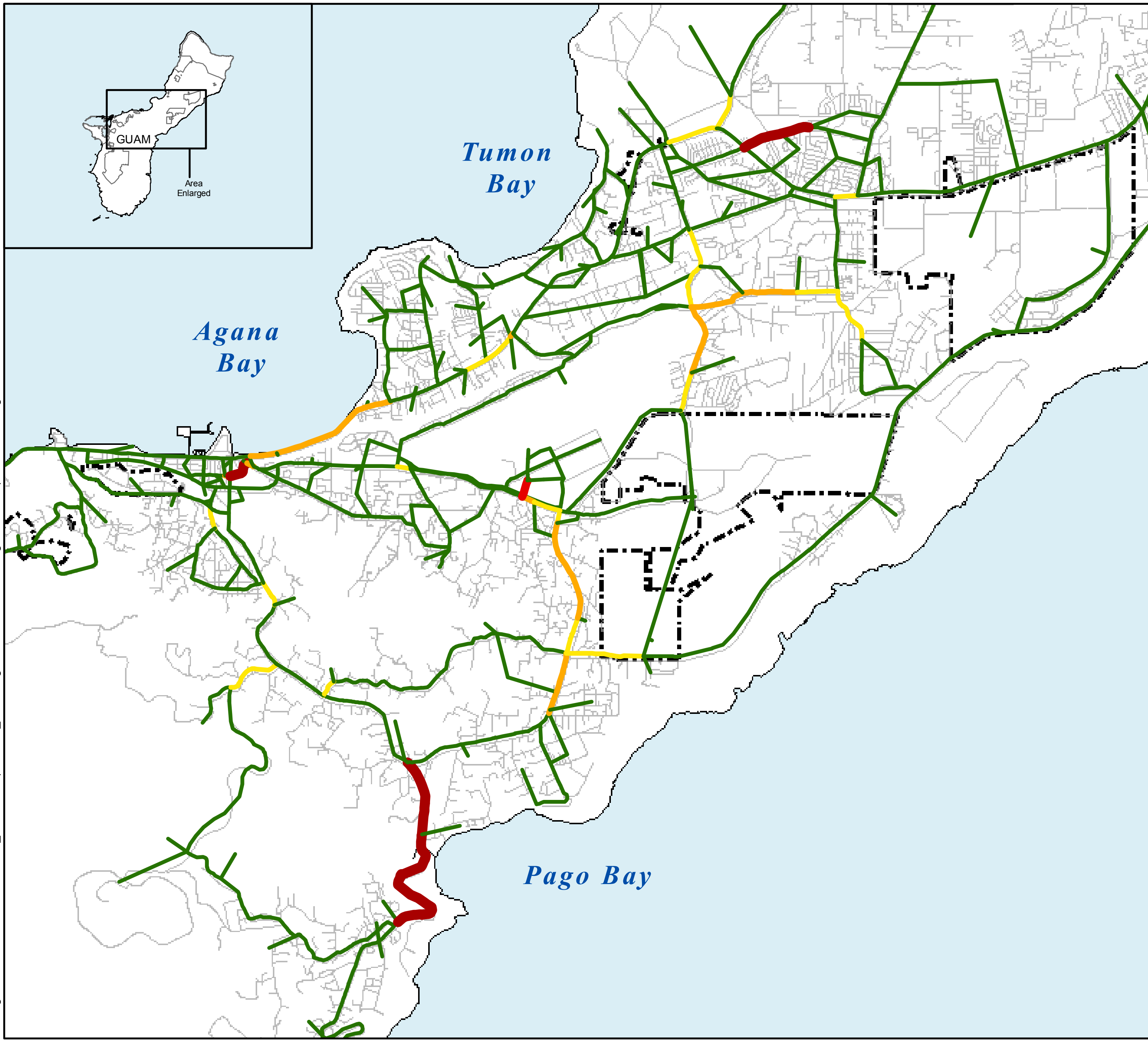


Figure 4.2-38
Central Region–2030 p.m. Peak Congestion Levels – Alternative 3

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-38. Central Region - 2030 p.m. Peak Congestion Levels- Alternative 3.mxd

Table 4.2-15. Alternative 3 Future Level of Service and Delay Results – Central Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/28	F	255.0	F	275.6	F	198.5	F	139.5
Route 1/26	F	135.1	F	278.1	F	89.4	F	209.1
Route 1/27	F	1937.3	F	1013.1	F	151.1	F	399.6
Route 1/27A	F	82.5	E	78.7	F	120.2	F	157.1
Route 1/3	F	417.1	F	357.1	F	341.3	F	474.4
Route 1/16	F	277.0	F	386.7	F	232.2	F	340.3
Route 1/14 (North San Vitores)	F	157.5	F	96.2	E	66.6	E	71.5
Route 1/14A	F	307.3	F	338.1	E	71.0	F	112.3
Route 1/10A	F	188.1	F	196.7	F	129.6	F	193.6
Route 1/14B	F	149.4	F	144.0	E	79.8	E	78.5
Route 1/14 (ITC)	F	127.0	F	294.6	F	176.8	F	315.8
Route 1/30	F	348.3	F	406.2	F	148.5	F	253.3
Route 1/8	F	162.2	F	164.3	F	102.7	F	155.5
Route 1/4	C	24.8	D	40.1	C	30.5	F	107.2
Route 1/6 (Adelup)	C	34.9	F	110.7	C	29.7	F	958.7
Route 4/7A	F	274.6	F	1007.5	F	586.7	F	339.2
Route 4/10	F	164.5	E	61.4	F	199.7	E	65.9
Route 4/17	C	34.5	D	39.4	D	39.6	E	55.9
Route 8/33	C	32.6	D	46.2	D	52.9	C	29.1
Route 8/10	F	227.5	F	317.6	F	137.9	F	171.8
Route 10/15	F	175.5	F	139.6	F	197.9	F	147.2
Route 16/27A	F	126.0	F	175.8	D	44.9	F	80.6
Route 16/27	F	534.1	F	685.7	F	455.3	F	470.0
Route 16/10A	F	232.4	F	149.5	F	210.3	F	692.7
Route 26/25**	F	165.5	D	43.1	F	85.4	E	62.3
Route 26/15**	F	3444.5	F	3416.0	C	30.2	C	25.4
Route 28/27A**	D	38.5	E	60.5	D	41.3	E	65.2
Unsignalized* **								
Route 7/7A	F	173.9	F	280.0	D	28.3	F	87.7
Military Access Points								
Route 1 - South Andersen Main Gate/(Turner Street)**	—	—	—	—	C	32.4	E	79.5
Route 15 - South Andersen/Second Gate	—	—	—	—	C	22.1	C	21.1
Route 16 - Navy Barrigada/ Residential Gate	—	—	—	—	D	37.1	F	84.5
Route 8A - Navy Barrigada/(Residential Gate) (on base)	—	—	—	—	NA	NA	NA	NA
Route 15 - Barrigada Air Force/(Chada Street)**	—	—	—	—	E	64.4	C	25.9

Legend: ITC = International Trade Center; LOS = Level of Service; NA=Not Applicable.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
****Delay exceeded maximum calculated value.

Table 4.2-16. Alternative 3 Future ADT and Volume to Capacity Ratio Summary – Apra Harbor Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 23,000 to 47,000 vpd. The traffic decreases into the entrance into Naval Base Guam, which is at the Route 1/2A intersection.	Route 1 has a v/c ratio less than 1.00. This roadway is not considered congested.	Route 1 ranges from 24,000 to 56,000 vpd. The traffic decreases into the entrance into Naval Base Guam, which is at the Route 1/2A intersection.	Route 1 has a v/c ratio less than 1.00. This roadway is not considered congested.
Route 2A	Route 2A has 36,000 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.	Route 2A has 36,000 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.
Route 11	Route 11 has 14,000 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.	Route 11 has 8,800 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

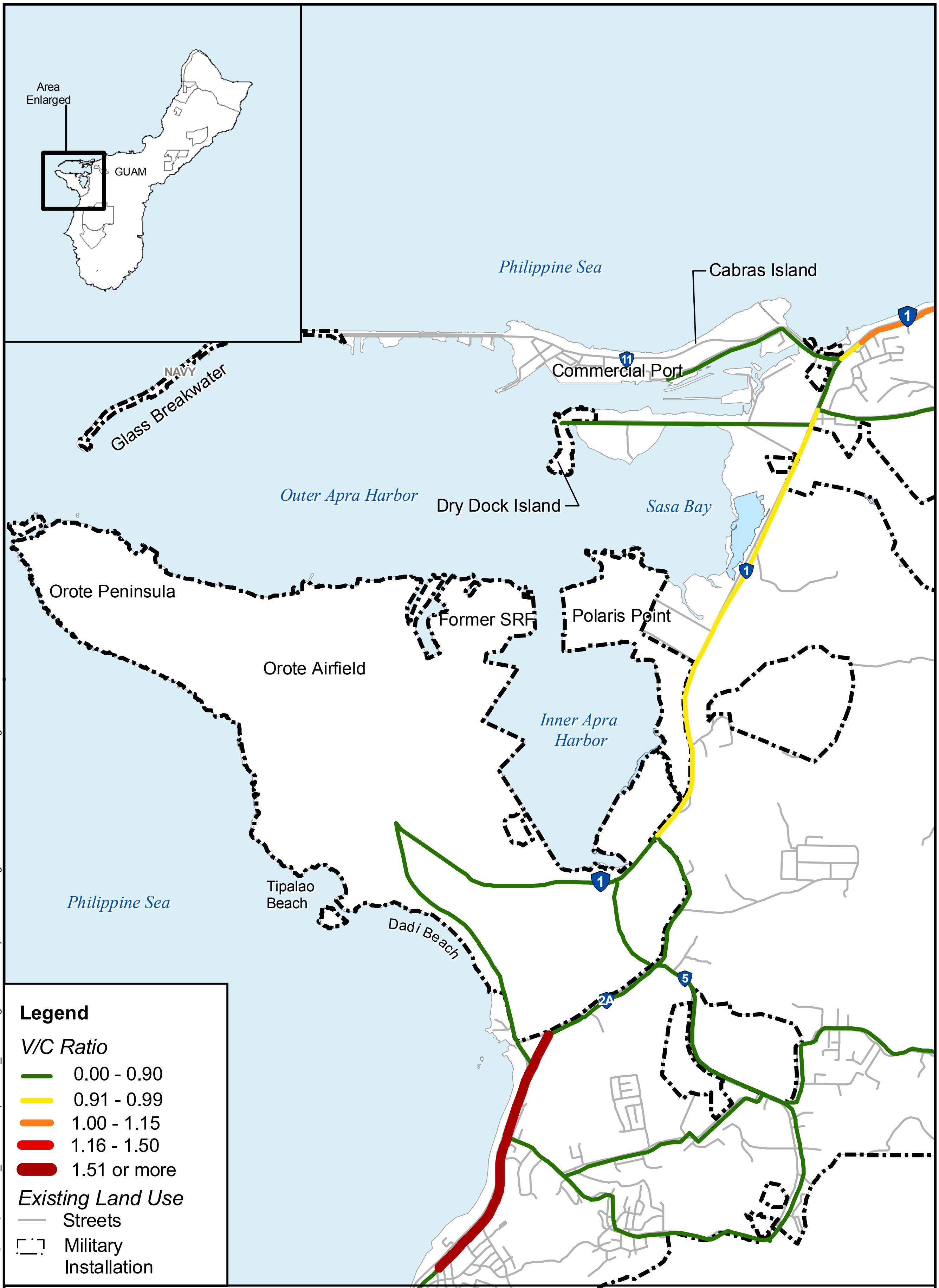
Figure 4.2-39 through Figure 4.2-42 show future levels of traffic congestion in the Apra Harbor Region for the a.m. and p.m. peak hours for 2014 and 2030, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. As shown in Table 4.2-17, Route 1/2A is operating at LOS F in the a.m. peak hour for 2014, which is considered unacceptable.

Table 4.2-17. Alternative 3 Future Level of Service and Delay Results – Apra Harbor Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/11	C	25.4	E	63.1	B	18.4	D	40.1
Route 1/Polaris Point	A	3.2	A	2.4	A	5.8	A	7.4
Route 1/6 (west)	D	50.7	B	17.1	C	27.4	C	23.0
Route 1/2A	F	89.7	E	58.3	E	67.5	D	54.1
Route 5/2A	E	69.4	C	21.5	E	55.1	C	22.8

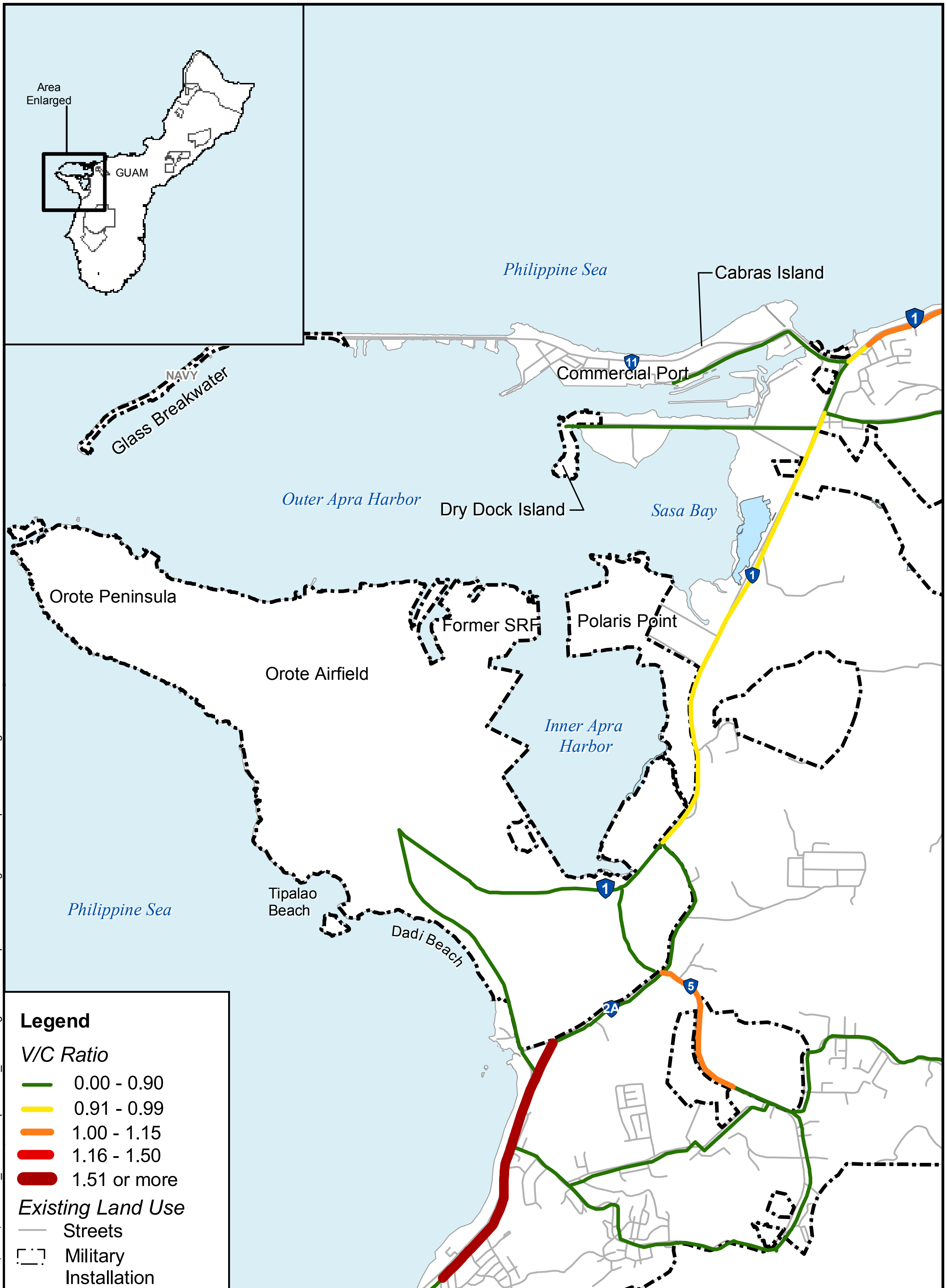
Legend: LOS = Level of Service.
Note: *Signalized intersection LOS based on average delay for the overall intersection.

Public Transportation Impacts. Impacts to the public transportation system in the Apra Harbor Region should be minimal and would relate to the delays caused by increased levels of congestion on Route 5 or at intersections near DoD lands. This would possibly affect the fixed-route service along Route 1, as well as any demand response and paratransit services. Implementation of new transit services should take into consideration the impacts of the military relocation.



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-39. Apra Harbor Region - 2014 a.m. Peak Congestion Levels- Alternative 3.mxd

Figure 4.2-39
Apra Harbor Region – 2014 a.m. Peak Congestion Levels – Alternative 3



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-41. Apra Harbor Region - 2014 p.m. Peak Congestion Levels- Alternative 3.mxd

Figure 4.2-40
Apra Harbor Region – 2014 p.m. Peak Congestion Levels – Alternative 3

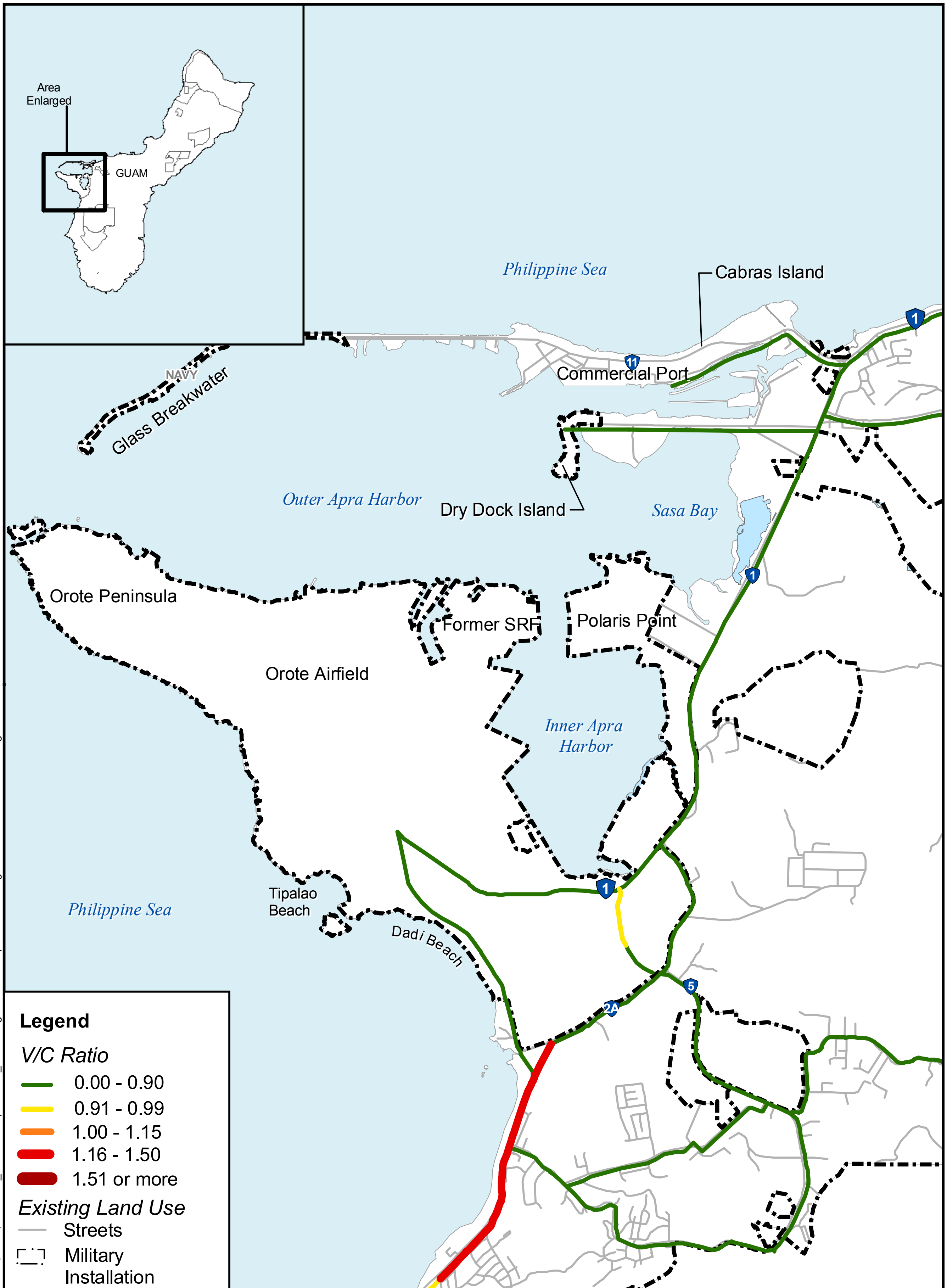
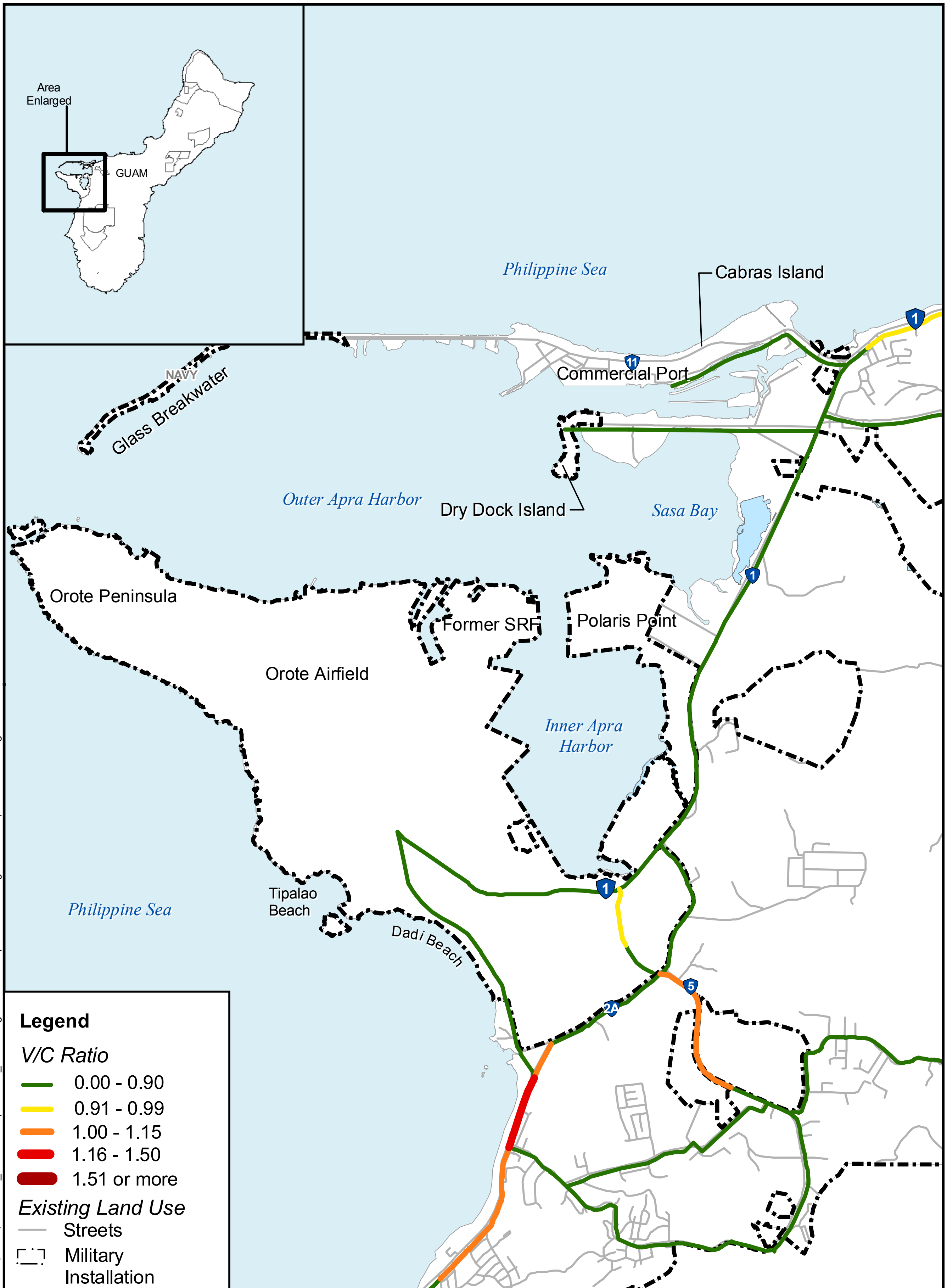


Figure 4.2-41
Apra Harbor Region – 2030 a.m. Peak Congestion Levels – Alternative 3

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-42. Apra Harbor Region - 2030 a.m. Peak Congestion Levels- Alternative 3.mxd



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-42. Apra Harbor Region - 2030 p.m. Peak Congestion Levels- Alternative 3.mxd

Figure 4.2-42
Apra Harbor Region – 2030 p.m. Peak Congestion Levels – Alternative 3

Pedestrian and Bicycle Impacts. There are no impacts to the pedestrian and bicycle facilities in the Apra Harbor Region. Along Route 1, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian and cyclist using the shoulder as a running or biking lane. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

South

On Base Roadways:

Naval Munitions Site

Construction. The impacts for Alternative 3 are the same as Alternative 1.

Operation. The impacts for Alternative 3 are the same as Alternative 1.

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 3 can be found in Table 4.2-18. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-20 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Table 4.2-18. Alternative 3 Future ADT and Volume to Capacity Ratio Summary - South Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 5	Route 5 ranges from 9,800 to 17,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is 0.91-0.99 in the a.m. peak and 1.00-1.15 in the p.m. peak. The roadway is congested during the p.m. peak hours.	Route 5 ranges from 11,000 to 17,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is 0.91-0.99 in the a.m. peak and 1.00-1.15 in the p.m. peak. The roadway is congested during the p.m. peak hours.
Route 12	Route 12 ranges from 1,800 to 5,600 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not considered congested.	Route 12 ranges from 2,300 to 6,100 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-43 through Figure 4.2-46 show future levels of traffic congestion in the South Region for the a.m. and p.m. peak hours for 2014 and 2030, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. Although there are numerous intersections with capacity issues, there are currently few roadways included in this study with an existing high v/c ratio.

The roads in the South Region do not exhibit high levels of congestion. During both the afternoon peaks, Route 5 between Naval Base Guam and the NMS has an LOS F.

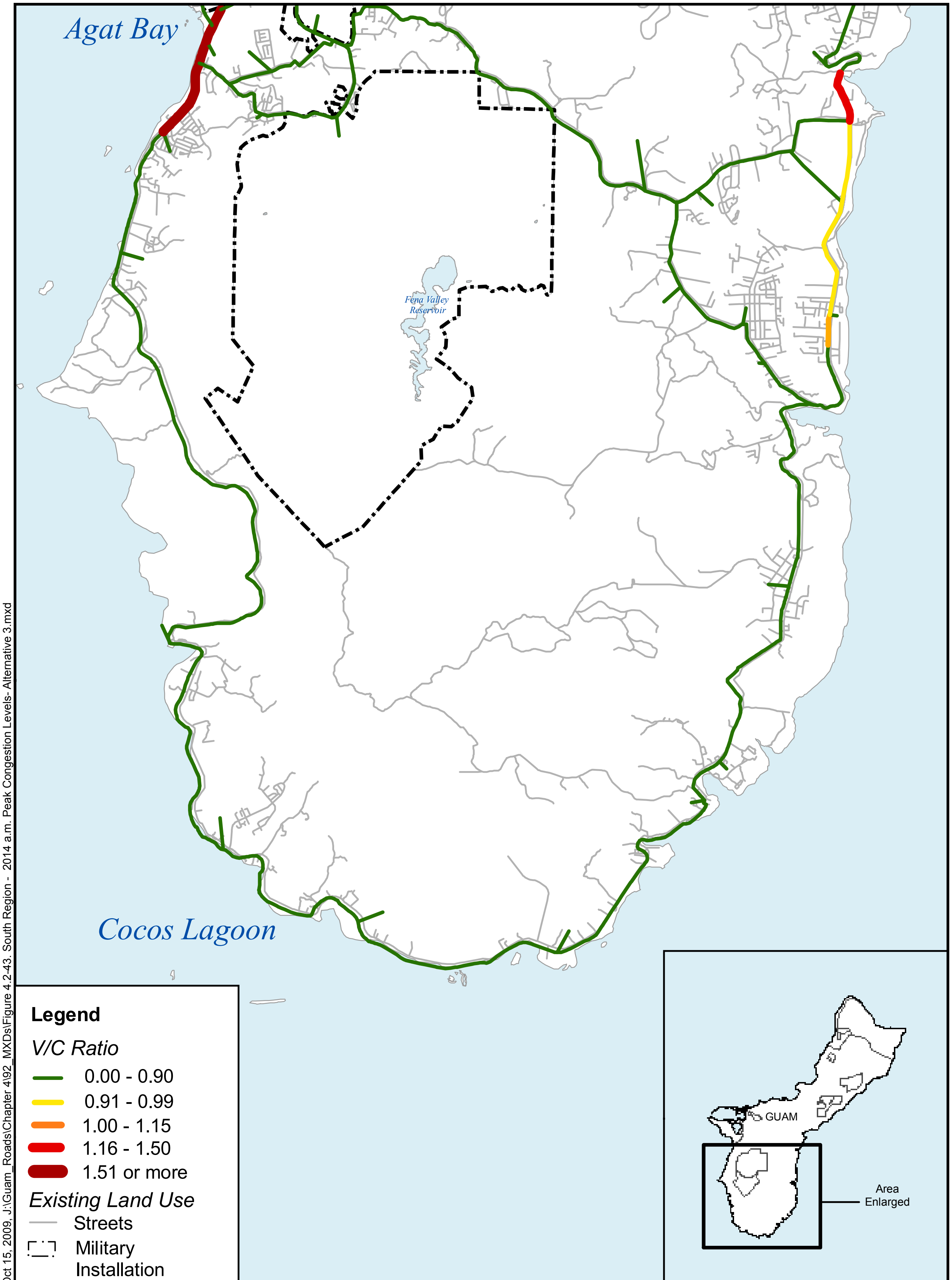
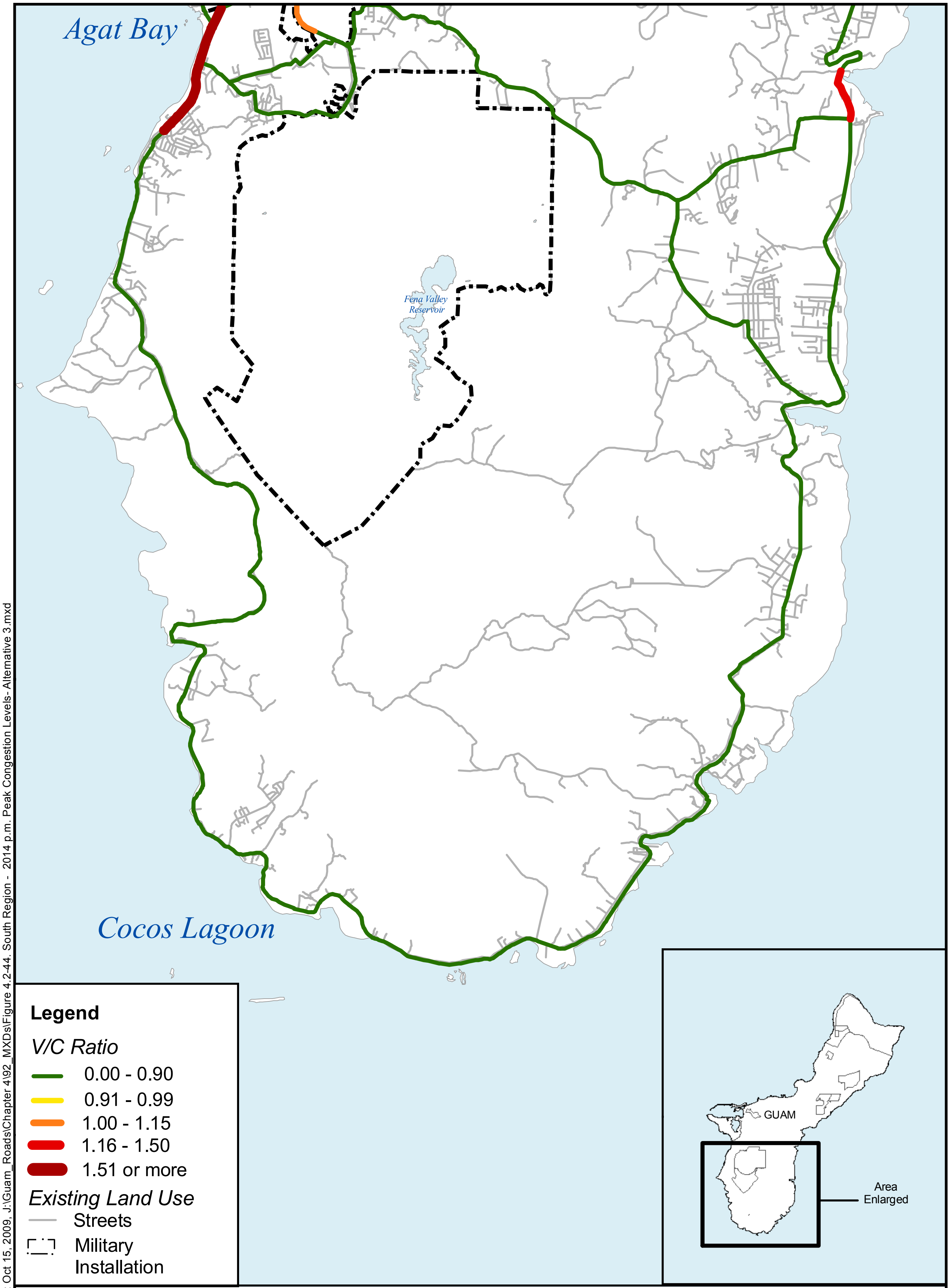


Figure 4.2-43
South Region – 2014 a.m. Peak Congestion Levels – Alternative 3

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-43. South Region - 2014 a.m. Peak Congestion Levels- Alternative 3.mxd



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-44. South Region - 2014 p.m. Peak Congestion Levels- Alternative 3.mxd

Figure 4.2-44
South Region – 2014 p.m. Peak Congestion Levels – Alternative 3

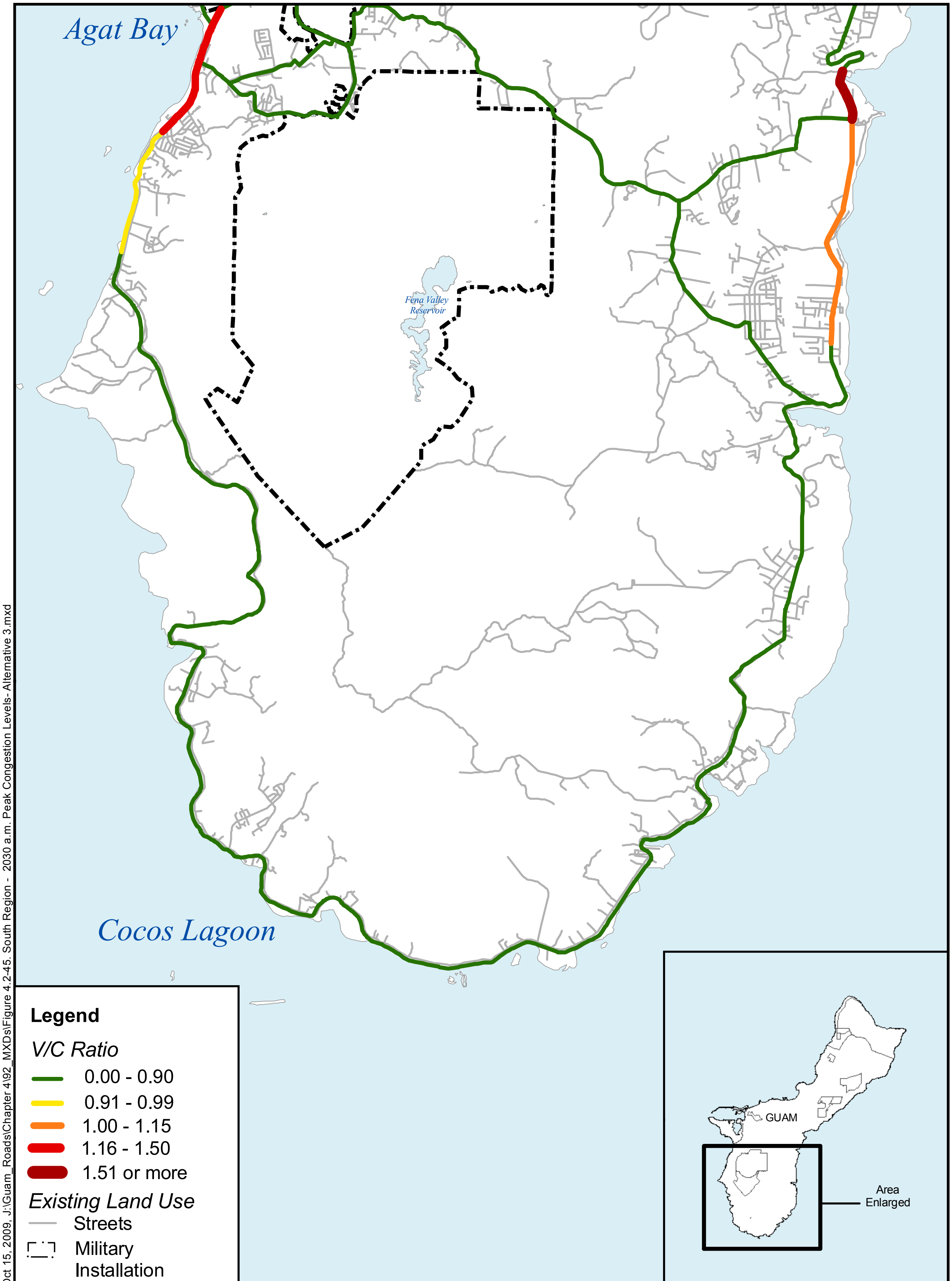


Figure 4.2-45
South Region – 2030 a.m. Peak Congestion Levels – Alternative 3

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-45. South Region - 2030 a.m. Peak Congestion Levels- Alternative 3.mxd

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-46. South Region - 2030 p.m. Peak Congestion Levels- Alternative 3.mxd

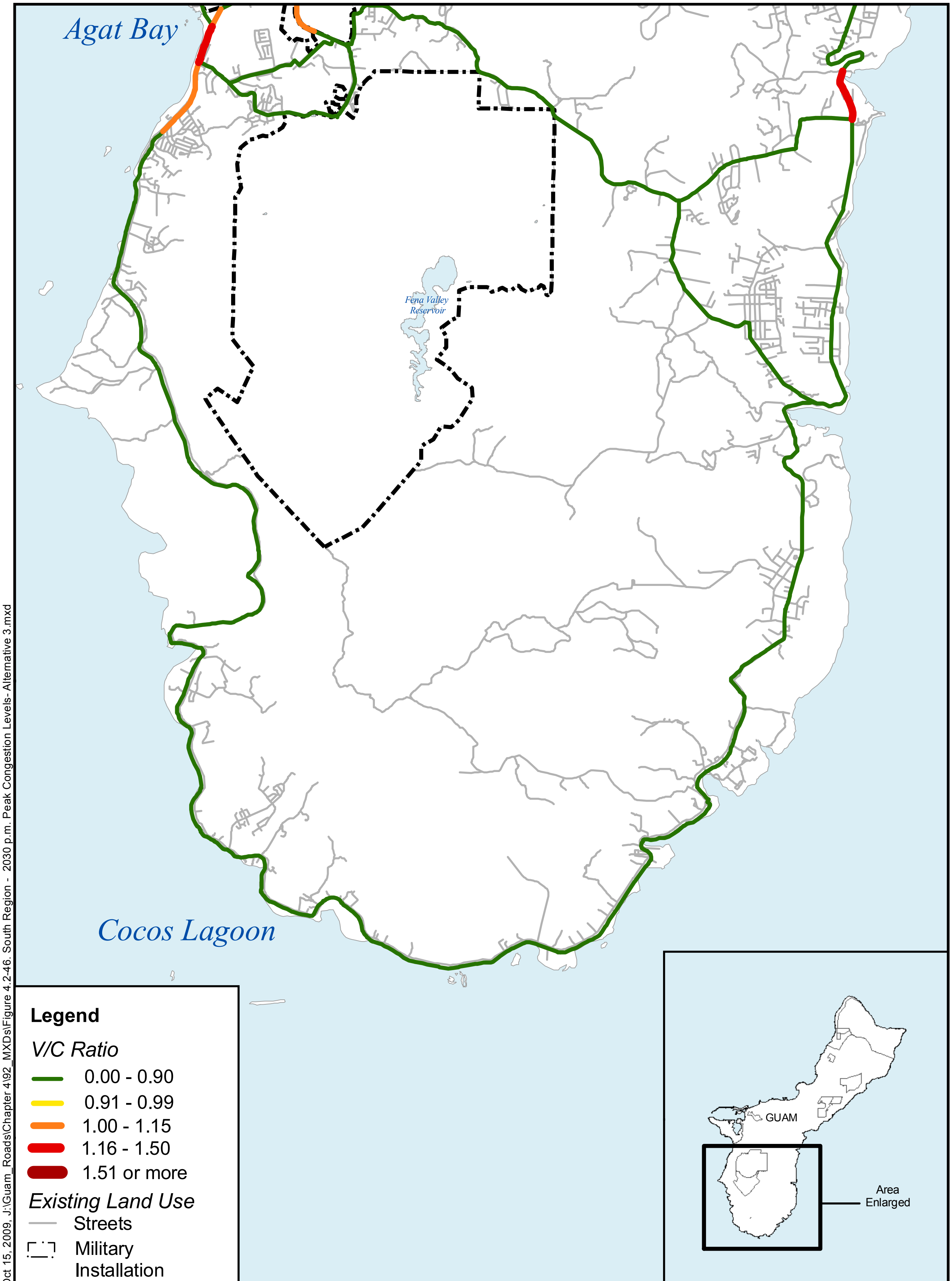


Figure 4.2-46
South Region – 2030 p.m. Peak Congestion Levels – Alternative 3

As shown in Table 4.2-19, the Route 5/17 intersection has LOS F for the p.m. peak hour in 2030, which is considered unacceptable. Route 4/4A and Route 5/17 have fairly free-flowing conditions in 2014 and become significantly more congested in 2030.

Table 4.2-19. Alternative 3 Future Level of Service and Delay Results – South Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 2/12	C	29.0	C	25.5	C	30.6	C	24.9
Unsignalized**								
Route 5/17	B	13.3	C	18.3	E	42.5	F	128.5
Route 4/4A	C	21.7	B	17.0	E	44.3	C	21.9
Route 17/4A	B	13.2	B	14.0	C	16.5	C	18.5
Military Access Points								
Route 5 - Naval Munitions Site/Harmon Road**	—	—	—	—	A	9.5	A	10.6

Legend: LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

Public Transportation Impacts. Impacts to the demand response and paratransit that service the South Region are minimal. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are no impacts to pedestrian and bicycle facilities in the South Region. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

Proposed Mitigation Measures

On Base Roadways:

The proposed mitigation measures would be the same as for Alternative 1.

Off Base Roadways:

The proposed mitigation measures would be the same as for Alternative 1.

4.2.2.4 Alternative 8

North

On Base Roadways:

Andersen AFB

Construction. The impacts for Alternative 8 are the same as Alternative 1.

Operation. The impacts for Alternative 8 are the same as Alternative 1.

Finegayan

Construction. In this Alternative, the Former FAA parcel is utilized but Harmon Annex is not used. Additional housing is constructed at Air Force Barrigada. The alternative has very similar construction in Finegayan as explained in Alternative 2.

The impacts for Alternative 8 are the same as Alternative 1

Operation. The impacts for Alternative 8 are the same as Alternative 1

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 8 can be found in Table 4.2-20. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-3 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island. Overall, traffic is comparable to Alternative 1.

Figure 4.2-47 through Figure 4.2-50 show future levels of traffic congestion in the North Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

The road indirectly serving the DoD lands is the most congested. During both the morning and afternoon peaks, the road with the greatest congestion levels in the North Region is Route 28 with LOS F.

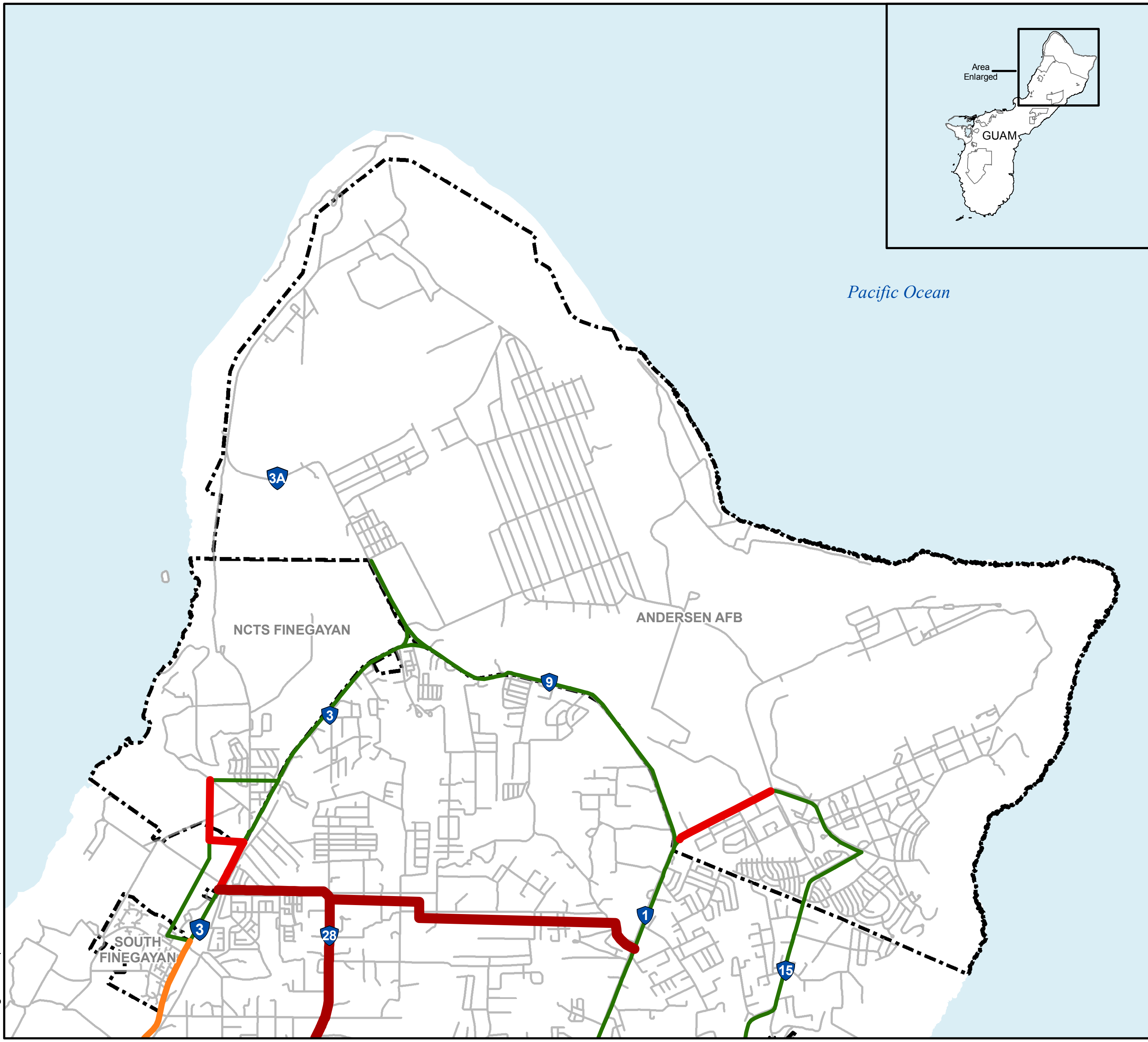


Figure 4.2-47
North Region–
2014 a.m. Peak
Congestion Levels –
Alternative 8

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

Printing Date: April 1, 2010

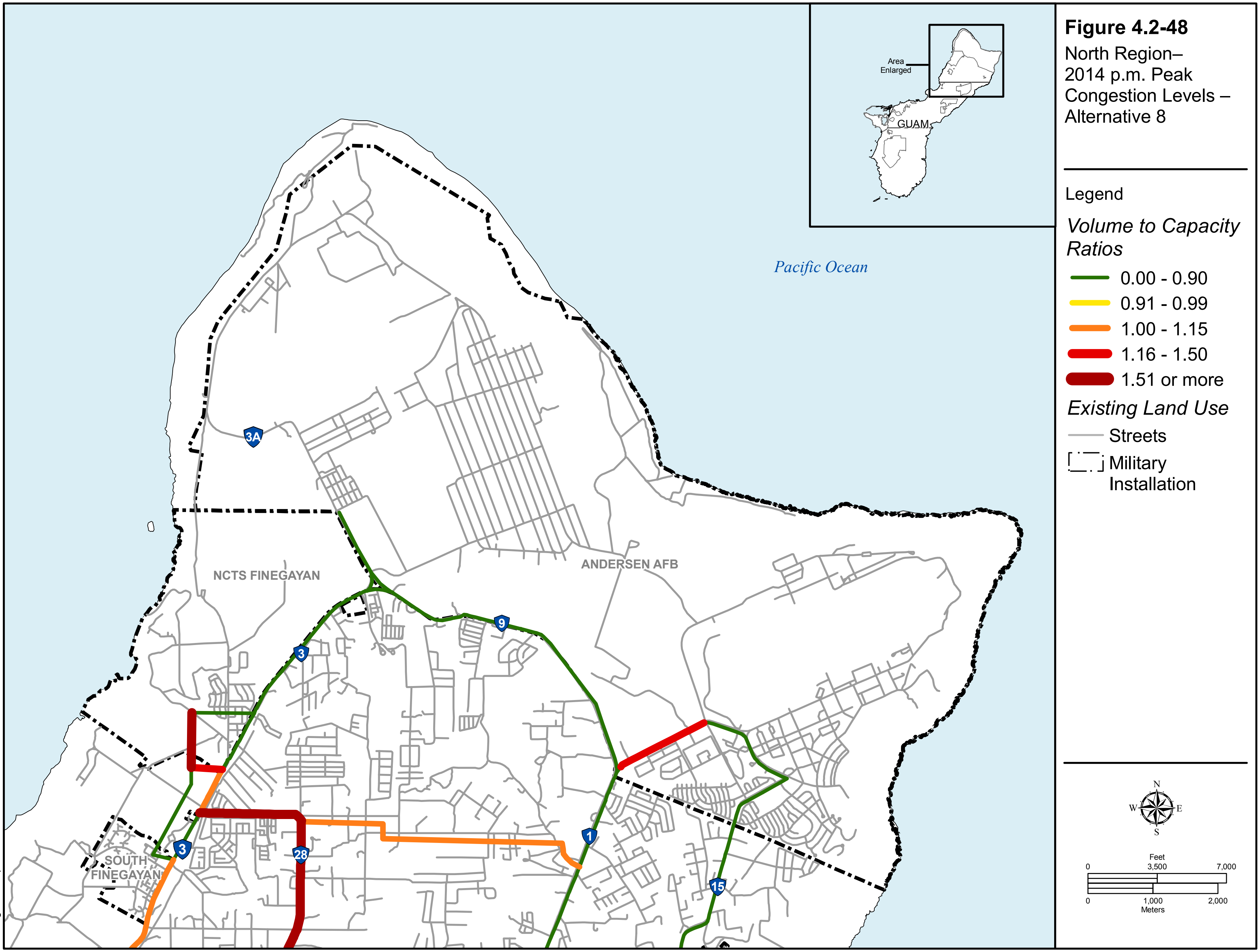


Figure 4.2-48
North Region–2014 p.m. Peak Congestion Levels – Alternative 8

Printing Date: April 1, 2010

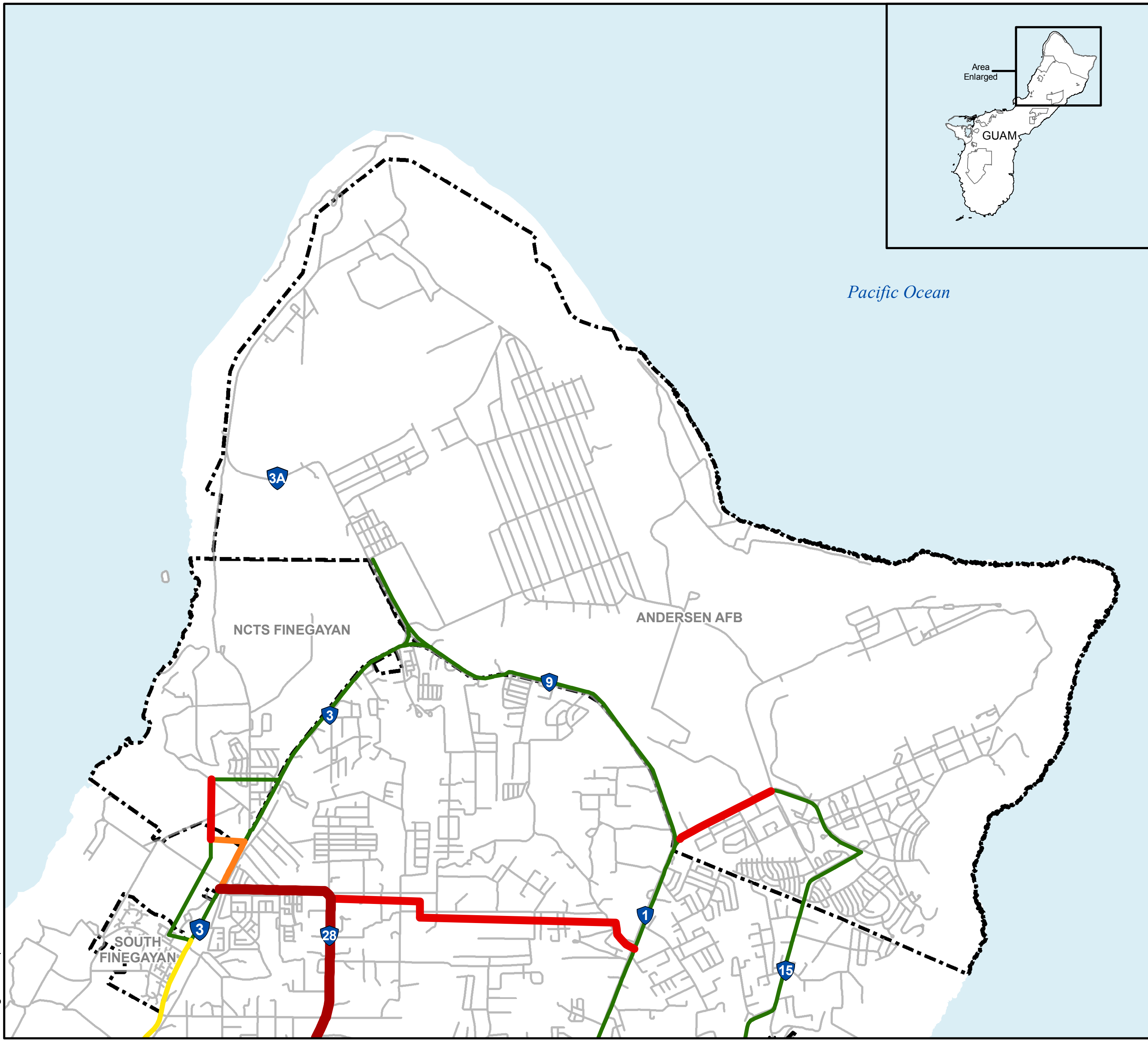


Figure 4.2-49
North Region–2030 a.m. Peak Congestion Levels – Alternative 8

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

N W E S

Feet
0 3,500 7,000
0 1,000 2,000
Meters

Printing Date: April 1, 2010

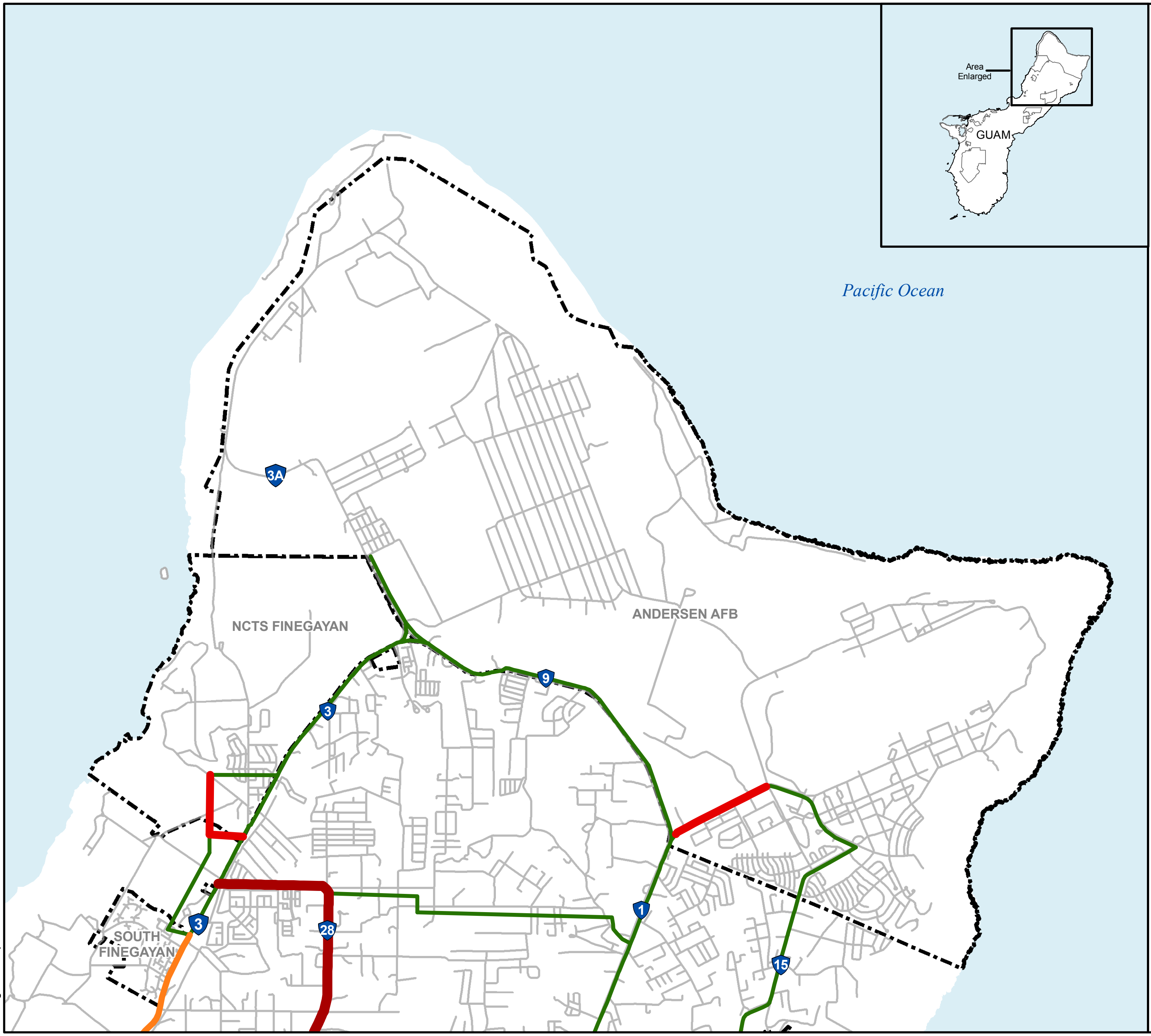


Figure 4.2-50
North Region–
2030 p.m. Peak
Congestion Levels –
Alternative 8

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

Printing Date: April 1, 2010

Table 4.2-20. Alternative 8 Future ADT and Volume to Capacity Ratio Summary – North Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 27,000 to 48,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.	Route 1 ranges from 20,000 to 40,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.
Route 3	Route 3 ranges from 22,000 to 69,000 vpd. Traffic decreases north of the intersection with Route 28.	During the a.m. and p.m. peak, Route 3 south of the Residential Gate has a v/c ratio greater than 1. North of the Residential Gate, the v/c ratio is less than 1. The roadway is congested south of the military installation.	Route 3 ranges from 19,000 to 53,000 vpd. Traffic decreases north of the intersection with Route 28.	During peak hours, Route 3 has a v/c ratio of less than 1 and is not considered to be congested, with the exception of a small portion north of the intersection with Route 28.
Route 9	Route 9 ranges from 12,000 to 19,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.	Route 9 ranges from 10,000 to 16,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.
Route 15	Route 15 has 6,000 vpd in the North.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.	Route 15 has 7,500 vpd in the North.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.
Route 28	Route 28 ranges from 22,000 to 26,000 vpd. Traffic increases closer to the intersection with Route 1.	The v/c ratio is greater than 1.51 in the a.m. and p.m. peak hours. The roadway is considered congested.	Route 28 ranges from 16,000 to 21,000 vpd. Traffic increases closer to the intersection with Route 1.	The v/c ratio is greater than 1.51 in the a.m. and p.m. peak hours. The roadway is considered congested.

Legend: ADT = average daily traffic; AFB = Air Force Base; v/c = volume to capacity; vpd = vehicles per day.

The results of the future operational analysis are shown in Table 4.2-21 for both the 2014 a.m. and p.m. and 2030 a.m. and p.m. conditions.

For the North Region, there are three intersections for which the traffic is worse in 2014 than in 2030 in both the a.m. and p.m. peak hour. This can be attributed to an increase in construction equipment and personnel in addition to the first military deployment that would occur in 2010.

As shown in Table 4.2-21, there are three intersections and two access points with LOS F for at least one peak hour, which is considered unacceptable. None of the intersections are operating at LOS F in the a.m. and p.m. peak hours in both 2014 and 2030.

Table 4.2-21. Alternative 8 Future Level of Service and Delay Results – North Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/9	C	25.8	D	38.2	C	23.3	D	53.0
Route 1/29	F	338.4	F	192.3	E	73.2	E	57.7
Route 3/28	E	57.3	F	131.1	C	33.2	D	47.5
Route 15/29**	C	22.9	C	24.1	C	32.9	C	30.0
Unsignalized***								
Route 3/3A/9	F	176.0	F	561.5	D	27.0	F	140.7
Military Access Points								
Route 3 - Main Cantonment/Commercial Gate	—	—	—	—	B	18.4	C	30.4
Route 3 - Main Cantonment/Main Gate	—	—	—	—	D	41.0	E	56.7
Route 3 - South Finegayan/Residential Gate	—	—	—	—	C	31.1	B	19.0
Route 9 – Andersen AFB/ Andersen AFB North Gate****	—	—	—	—	F	1031.0	F	NA

Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
****Delay exceeded maximum calculated value.
Legend: AFB = Air Force Base; LOS = Level of Service; NA = Not Applicable.

Public Transportation Impacts. Impacts would be similar to those of Alternative 1.

Pedestrian and Bicycle Impacts. Impacts would be similar to those of Alternative 1.

<u>Central</u>

On Base Roadways:

Andersen South

Construction. The impacts for Alternative 8 are the same as Alternative 1.

Operation. The impacts for Alternative 8 are the same as Alternative 1.

Barrigada

Construction. Only Air Force Barrigada is used for constructing off base housing and community support structures. The construction is similar to explained in Alternative 3, except there is no Connector road to the Navy Barrigada base (because Navy Barrigada is not being utilized).

The impacts for Alternative 8 are similar to those of Alternative 3.

Operation. Impacts for Alternative 8 would be similar to those of Alternative 3; however, there would be more impacts to the Air Force Barrigada area near Route 15, due to heavier traffic loading in that area.

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 8 can be found in Table 4.2-22. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-8 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Figure 4.2-51 through Figure 4.2-54 show future levels of traffic congestion in the Central Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. There are a few areas of congestion in the Central Region, primarily on roads that serve the DoD lands to the north and the commercial districts in Tamuning and Hagatna. During the morning and afternoon peaks in both 2014 and 2030, the road with the greatest congestion levels in the Central Region is Route 28 and a portion of Route 26. Segments of Routes 1, 10, 15, 16, 25, and 26 also exhibit failing congestion levels. All have an LOS F in both the a.m. and p.m. peak hours.

For the Central Region, there are 13 intersections for which the traffic is worse in 2014 than in 2030 for both the a.m. and p.m. peak hour. As shown in Table 4.2-23, there are 22 out of 28 intersections with LOS F for at least one peak hour, which is considered unacceptable. The following intersections would operate at LOS F in the a.m. and p.m. peak hours in both 2014 and 2030:

- Route 1/28
- Route 1/26
- Route 1/27
- Route 1/10A
- Route 1/14 (ITC)
- Route 1/30
- Route 4/7A
- Route 8/10
- Route 10/15
- Route 16/27
- Route 16/10A
- Route 7/7A

Table 4.2-22. Alternative 8 Future ADT and Volume to Capacity Ratio Summary – Central Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 40,000 to 100,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally less than 1 in the p.m. condition. In the a.m. condition, there are segments near the intersections with 14A, 30, 28, 16, and Route 6 that have a v/c ratio of more than 1, which indicates the roadway is congested in Tamuning.	Route 1 ranges from 33,000 to 96,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally less than 1 in both the a.m. and p.m. condition; however, there are segments south of Route 30, near Route 14, and north of 28 that have a v/c ratio of more than 1 in the p.m. peak. The roadway is congested in Tamuning.
Route 3	Route 3 ranges from 57,000 to 71,000 vpd. Traffic increases toward the intersection with Route 1.	The v/c ratio in both the a.m. and p.m. peak is 1.00-1.15. This indicates the roadway is considered congested.	Route 3 ranges from 48,000 to 59,000 vpd. Traffic increases toward the intersection with Route 1.	The v/c ratio is generally between 1.00-1.15, indicating the roadway is considered congested at this location.
Route 8/8A	Route 8 ranges from 52,000 to 67,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 5,800 vpd.	During peak hours, the v/c ratio is generally 0.00-0.90 Other than a small section near Tiyan Parkway, the roadway is not considered congested.	Route 8 ranges from 50,000 to 59,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 5,700 vpd.	During peak hours, the v/c ratio is generally 0.00-0.90 Other than a small section near Tiyan Parkway, the roadway is not considered congested.
Route 10	Route 10 ranges from 60,000 to 63,000 vpd between Routes 8 and 15.	The v/c ratio in the a.m. and p.m. conditions is greater than 1. The roadway is considered congested.	Route 10 ranges from 58,000 to 60,000 vpd between Routes 8 and 15.	The v/c ratio in the a.m. and p.m. conditions is greater than 1. The roadway is considered congested.
Route 15	Route 15 ranges from 6,600 to 26,000 vpd. There is an increase in traffic south of the intersection with Route 26.	North of Route 26, Route 15 has a v/c ratio of 0.00-0.90 in both a.m. and p.m. conditions. South of Route 26, the v/c ratio is generally greater than 1.00 in the a.m. and less than 1.00 in the p.m. The roadway is congested between Routes 10 26 in the a.m. condition.	Route 15 ranges from 8,200 to 24,000 vpd. There is an increase in traffic south of the intersection with Route 26.	North of Route 26, Route 15 has a v/c ratio of 0.00-0.90 in both a.m. and p.m. conditions. South of Route 26, the v/c ratio is generally greater than 1.00 in the a.m. and less than 1.00 in the p.m. The roadway is congested between Routes 10 26 in the a.m. and p.m. condition.

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 16	Route 16 ranges from 50,000 to 96,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is generally less than 1.00 in the a.m. and p.m. for the segment of the road south of Route 25. North of Route 25 (and around the intersection), the v/c level is greater than 1.00, indicating the roadway is congested at this location.	Route 16 ranges from 42,000 to 80,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is less than 1.00 during peak hours, except for south of the intersection with Route 25. The roadway is considered congested at this location.
Route 25	Route 25 ranges from 24,000 to 28,000 vpd.	Route 25 has a v/c ratio greater than 1.00, indicating that the roadway is congested.	Route 25 ranges from 30,000 to 34,000 vpd.	The v/c ratio is generally greater than 1.00 during peak hours, indicating the roadway is congested.
Route 26	Route 26 ranges from 14,000 to 28,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	Route 26 generally has a v/c ratio greater than 1.00 during both the a.m. and p.m. peak conditions. The roadway is considered congested.	Route 26 ranges from 17,000 to 36,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	The v/c ratio is less than 1.00 north of Route 25 during peak hours. South of Route 25, the v/c ratio is greater than 1.00 in the both a.m. and p.m. peak conditions. The roadway is considered congested at this location.
Route 27	Route 27 ranges from 60,000 to 63,000 vpd between Routes 16 and 1.	The v/c ratio is less than 1.00 during the a.m. and p.m. peak conditions. This roadway is not considered congested.	Route 27 ranges from 49,000 to 52,000 vpd between Routes 16 and 1.	The v/c ratio is 0.00-0.90 during peak conditions, indicating the roadway is not considered congested.
Route 28	Route 28 ranges from 23,000 to 26,000 vpd.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak hours, indicating the roadway is considered congested.	Route 28 ranges from 18,000 to 24,000 vpd.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak, indicating the roadway is considered congested.
Chalan Lujuna	Chalan Lujuna has 23,000 vpd.	The v/c ratio is 1.00-1.15 during the a.m. and p.m. peak hours, indicating the roadway is considered congested.	Chalan Lujuna ranges from 6,000 to 7,000 vpd.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

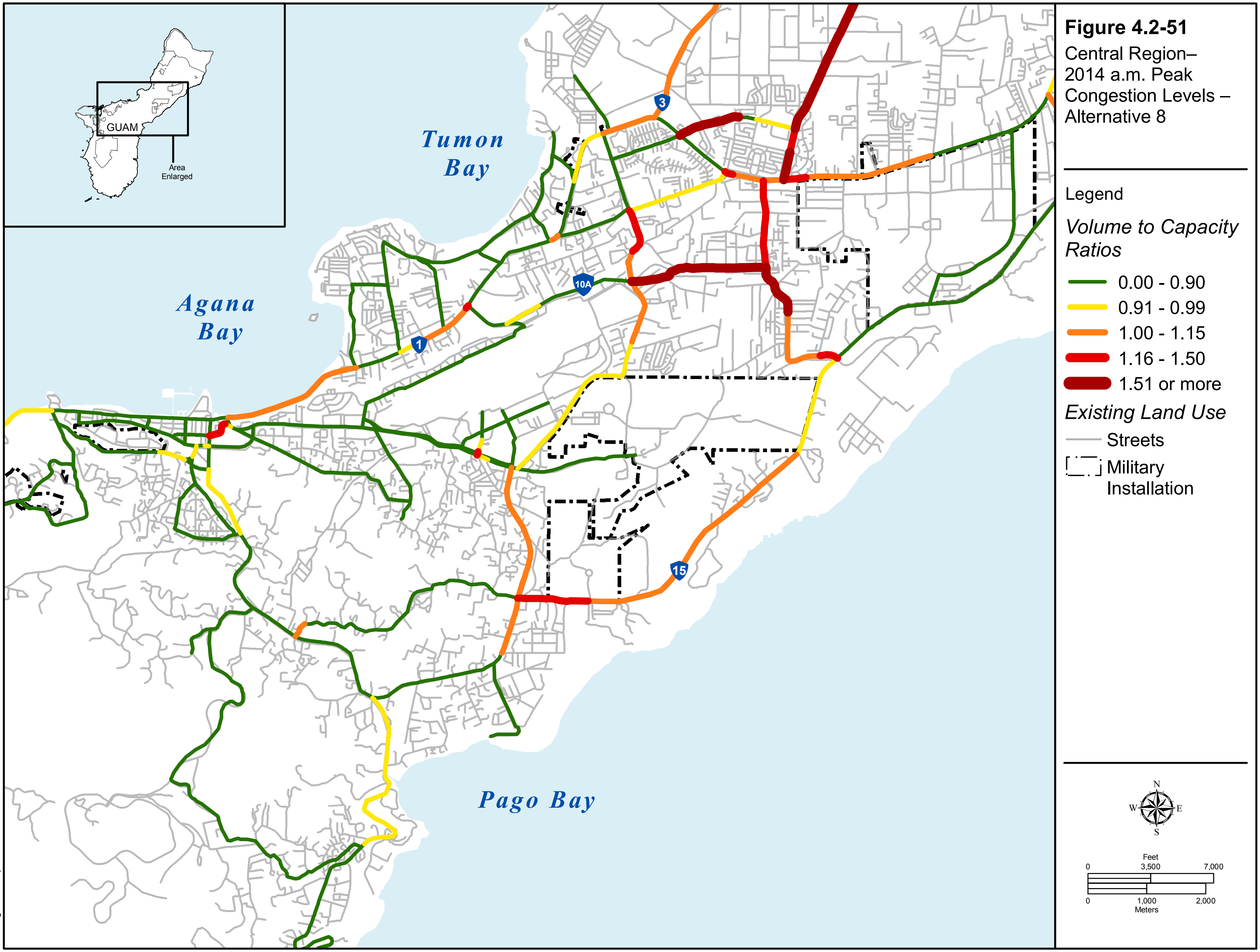


Figure 4.2-51
Central Region–2014 a.m. Peak Congestion Levels – Alternative 8

Printing Date: April 1, 2010

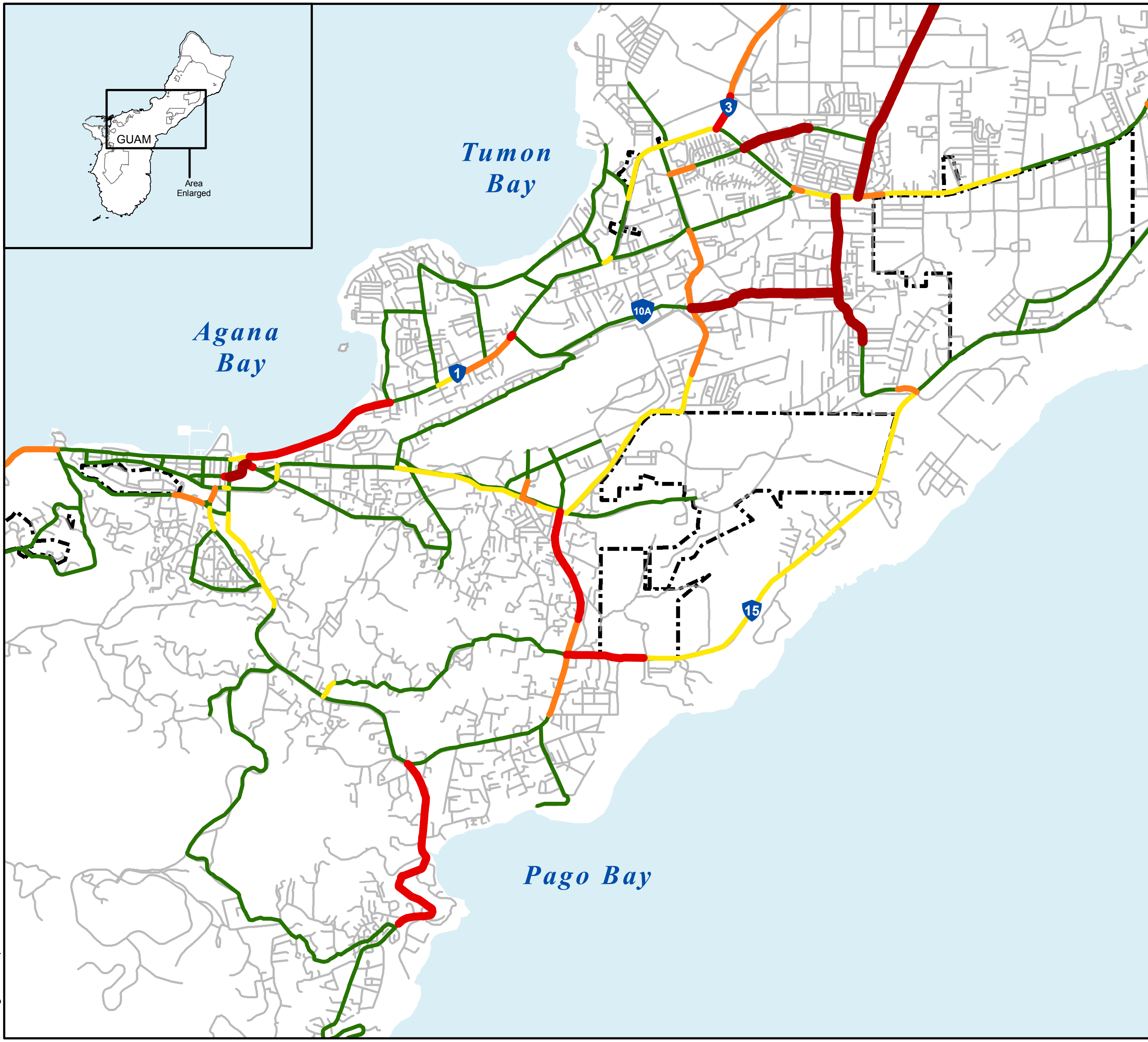


Figure 4.2-52
Central Region–2014 p.m. Peak Congestion Levels – Alternative 8

Legend

Volume to Capacity Ratios
- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

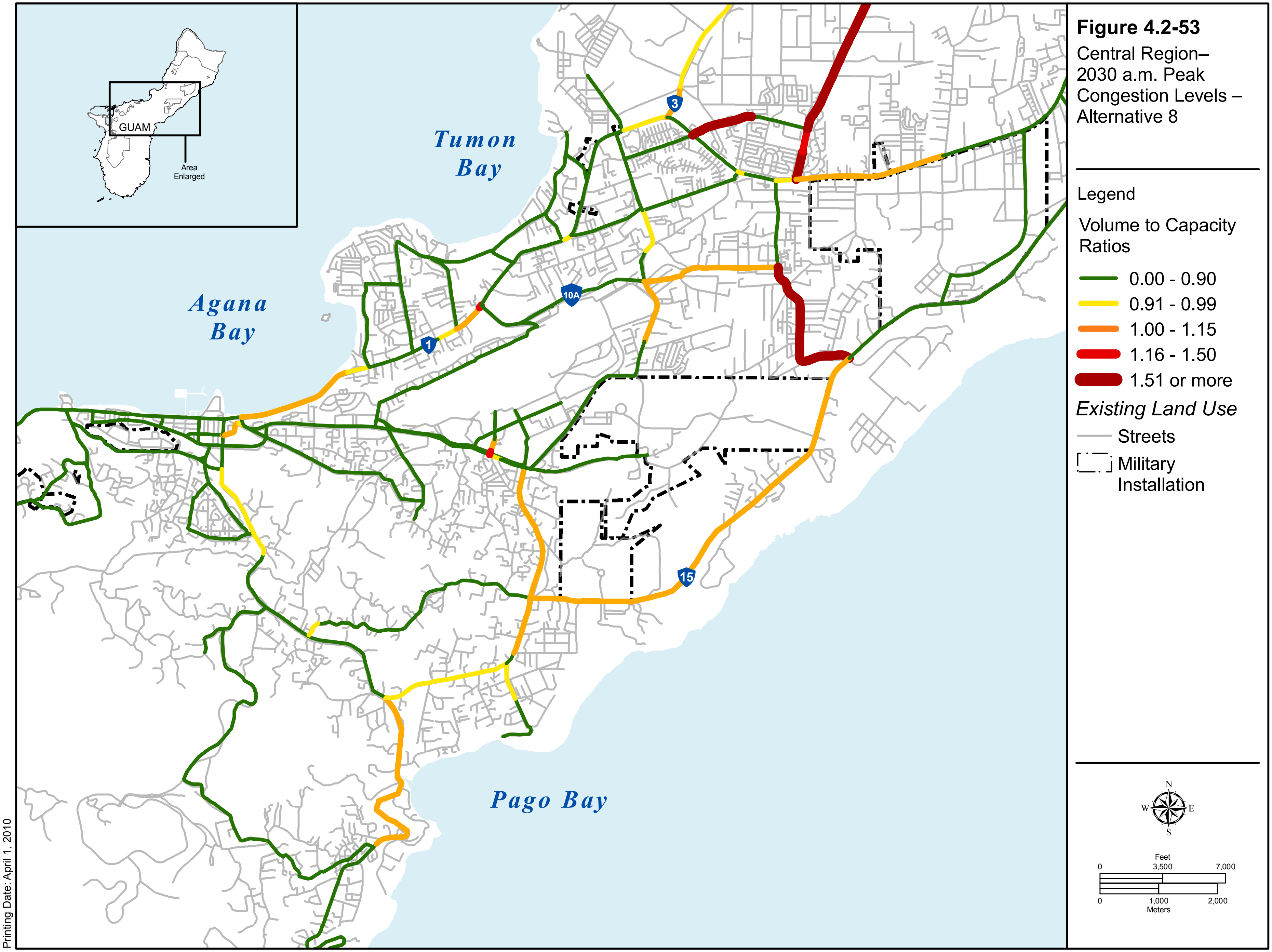
Existing Land Use
- Streets
- Military Installation

N
W
E
S

Feet
0 3,500 7,000
0 1,000 2,000
Meters

Printing Date: April 1, 2010

Figure 4.2-53
Central Region–2030 a.m. Peak Congestion Levels – Alternative 8



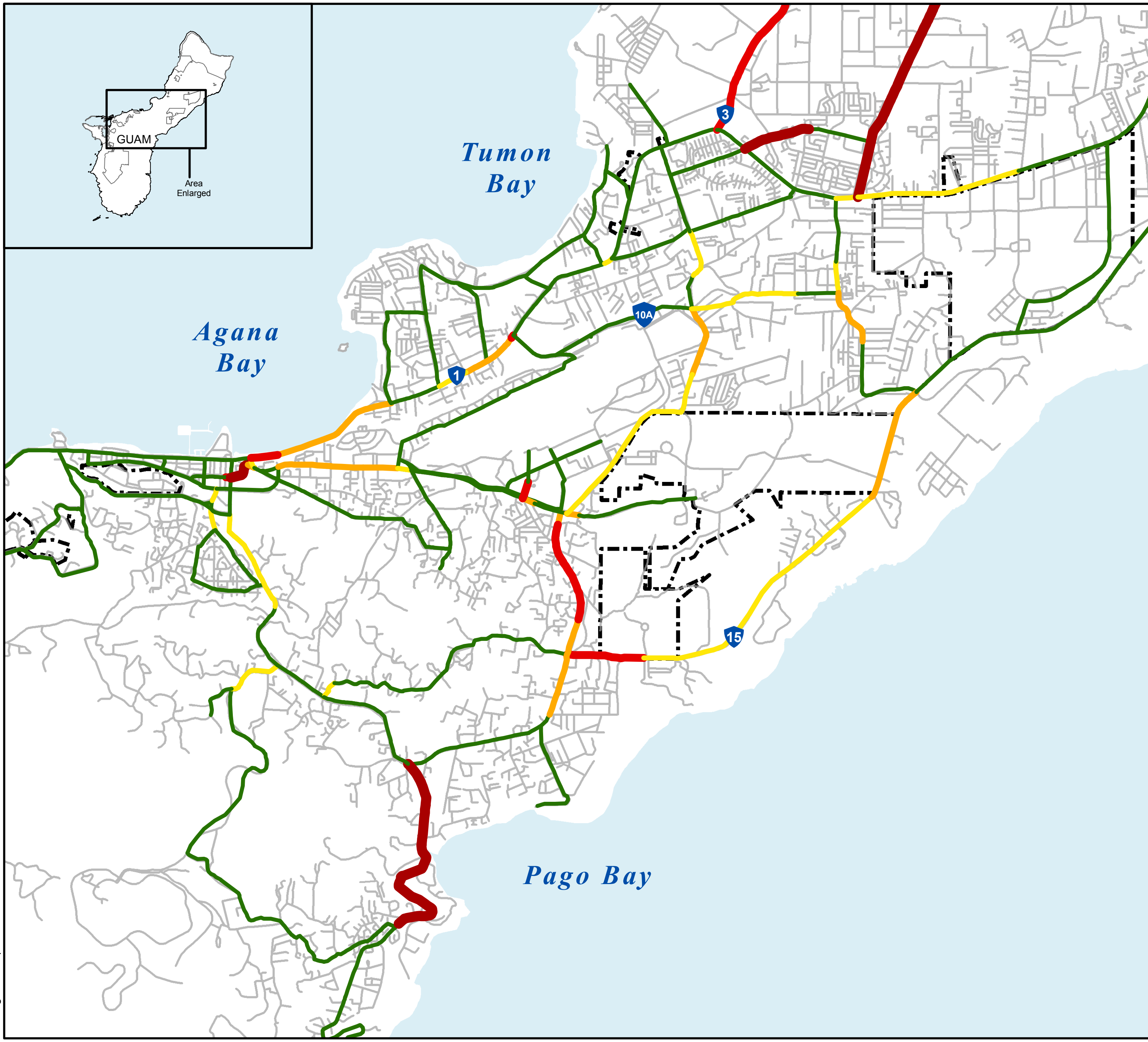


Figure 4.2-54
Central Region–2030 p.m. Peak Congestion Levels – Alternative 8

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

N E S W

Feet: 0, 3,500, 7,000
Meters: 0, 1,000, 2,000

Printing Date: April 1, 2010

Table 4.2-23. Alternative 8 Future Level of Service and Delay Results – Central Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/28	F	275.4	F	252.3	F	215.5	F	115.3
Route 1/26	F	154.6	F	265.3	F	145.9	F	250.6
Route 1/27	F	210.5	F	627.3	F	178.8	F	329.4
Route 1/27A	F	98.4	F	178.0	D	53.9	D	51.2
Route 1/3	F	113.9	F	106.8	E	70.5	E	64.7
Route 1/16	F	180.3	F	144.6	E	57.0	F	103.9
Route 1/14 (North San Vitores)	F	178.9	F	146.8	E	69.6	E	77.6
Route 1/14A	F	313.4	F	328.3	E	74.2	F	126.0
Route 1/10A	F	182.1	F	221.3	F	126.1	F	186.0
Route 1/14B	F	153.4	F	146.2	F	90.4	E	79.5
Route 1/14 (ITC)	F	158.9	F	318.3	F	113.6	F	267.2
Route 1/30	F	365.0	F	338.6	F	146.3	F	285.3
Route 1/8	F	200.1	F	199.7	E	77.8	F	150.4
Route 1/4	C	25.4	D	36.0	C	33.6	D	33.5
Route 1/6 (Adelup)	C	34.5	F	114.0	D	38.1	D	44.9
Route 4/7A	F	273.8	F	541.8	F	372.9	F	654.2
Route 4/10	F	160.5	F	82.9	F	198.7	E	71.0
Route 4/17	C	33.9	C	34.3	D	40.1	E	56.2
Route 8/33	D	38.7	E	72.1	D	45.5	E	77.8
Route 8/10	F	351.4	F	474.5	F	177.3	F	218.4
Route 10/15	F	260.9	F	235.5	F	197.9	F	178.1
Route 16/27A	C	28.9	E	75.0	C	31.4	D	35.5
Route 16/27	F	459.6	F	587.3	F	361.1	F	336.6
Route 16/10A	F	556.5	F	494.6	F	582.9	F	488.7
Route 26/25**	F	116.2	D	42.4	F	113.1	F	119.3
Route 26/15**	D	45.0	C	34.1	F	154.9	F	168.2
Route 28/27A**	C	47.4	F	89.4	C	31.3	E	59.6
Unsignalized***								
Route 7/7A	F	174.7	F	290.0	F	174.7	F	300.8
Military Access Points								
Route 1 - South Andersen Main Gate/(Turner Street)**					C	32.4	E	78.8
Route 15 - South Andersen/Second Gate	—	—	—	—	C	22.1	C	22.6
Route 16 - Navy Barrigada/ Residential Gate	—	—	—	—	NA	NA	NA	NA
Route 8A - Navy Barrigada/(Residential Gate) (on base)	—	—	—	—	NA	NA	NA	NA
Route 15 - Barrigada Air Force/(Chada Street)**	—	—	—	—	D	48.4	D	43.2

Legend: ITC = International Trade Center; LOS = Level of Service; NA= Not Applicable.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
****Delay exceeded maximum calculated value.

Public Transportation Impacts. Impacts would be similar to those of Alternative 1.

Pedestrian and Bicycle Impacts. Impacts would be similar to those of Alternative 1.

Apra Harbor

On Base Roadways:

Naval Base Guam

Construction. The impacts for Alternative 8 are the same as Alternative 1.

Operation. The impacts for Alternative 8 are the same as Alternative 1.

Off Base Roadways:

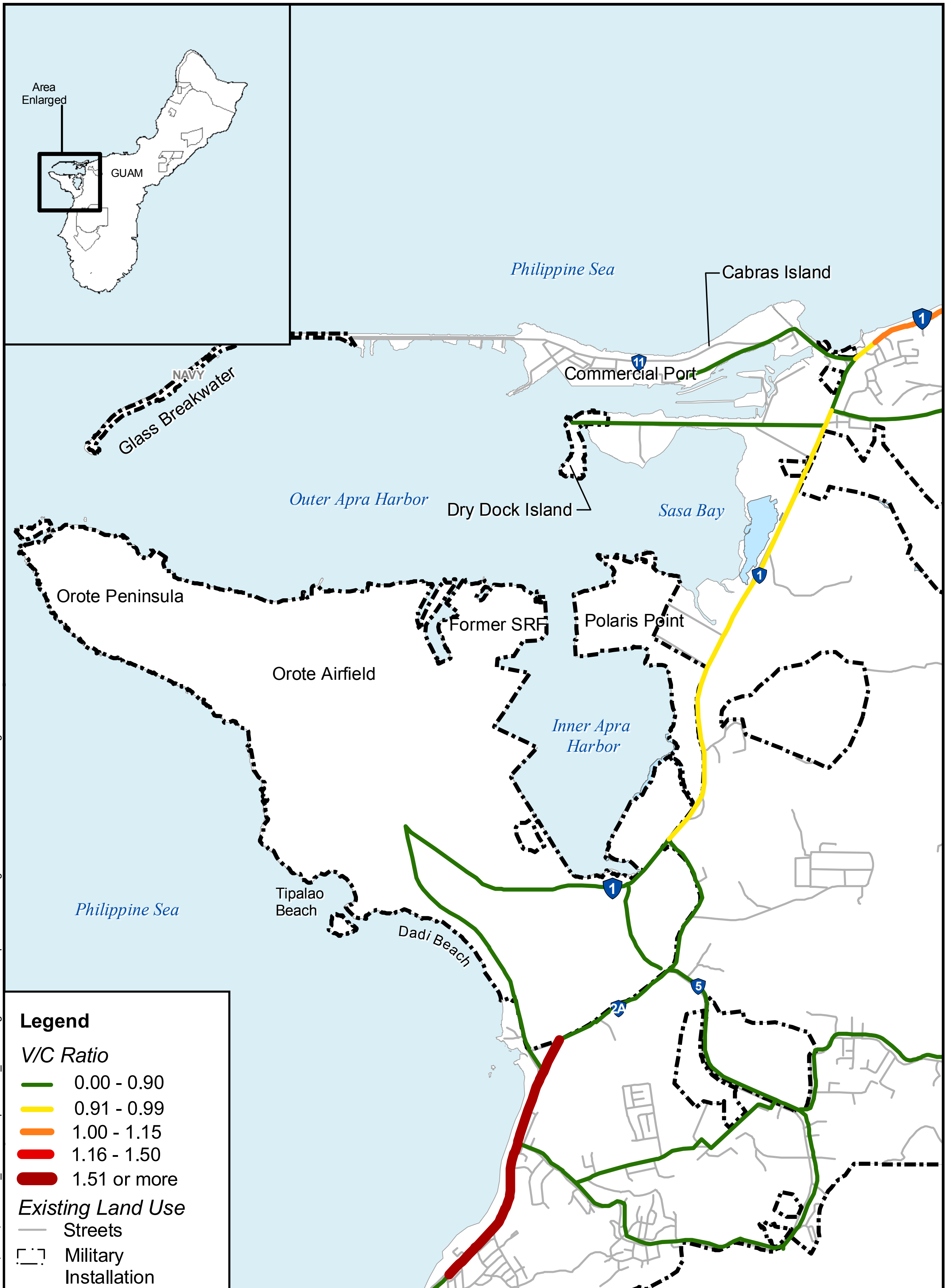
Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 8 can be found in Table 4.2-24. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-15 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Table 4.2-24. Alternative 8 Future ADT and Volume to Capacity Ratio Summary – Apra Harbor Region

	2014		*2030*	
Roadway	*ADT Summary*	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 23,000 to 63,000 vpd. The traffic decreases into the entrance into Naval Base Guam, which is at the Route 1/2A intersection.	The v/c ratio is generally less than 1.00. This roadway is not considered congested.	Route 1 ranges from 24,000 to 56,000 vpd. The traffic decreases into the entrance into Naval Base Guam, which is at the Route 1/2A intersection.	The v/c ratio is less than 1.00. This roadway is not considered congested.
Route 2A	Route 2A has 35,000 vpd.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.	Route 2A has 35,000 vpd.	The v/c ratio is 0.00-0.90 during the a.m. and p.m. peak hours, indicating the roadway is not considered congested.
Route 11	Route 11 has 14,000 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.	Route 11 has 8,800 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not considered congested.

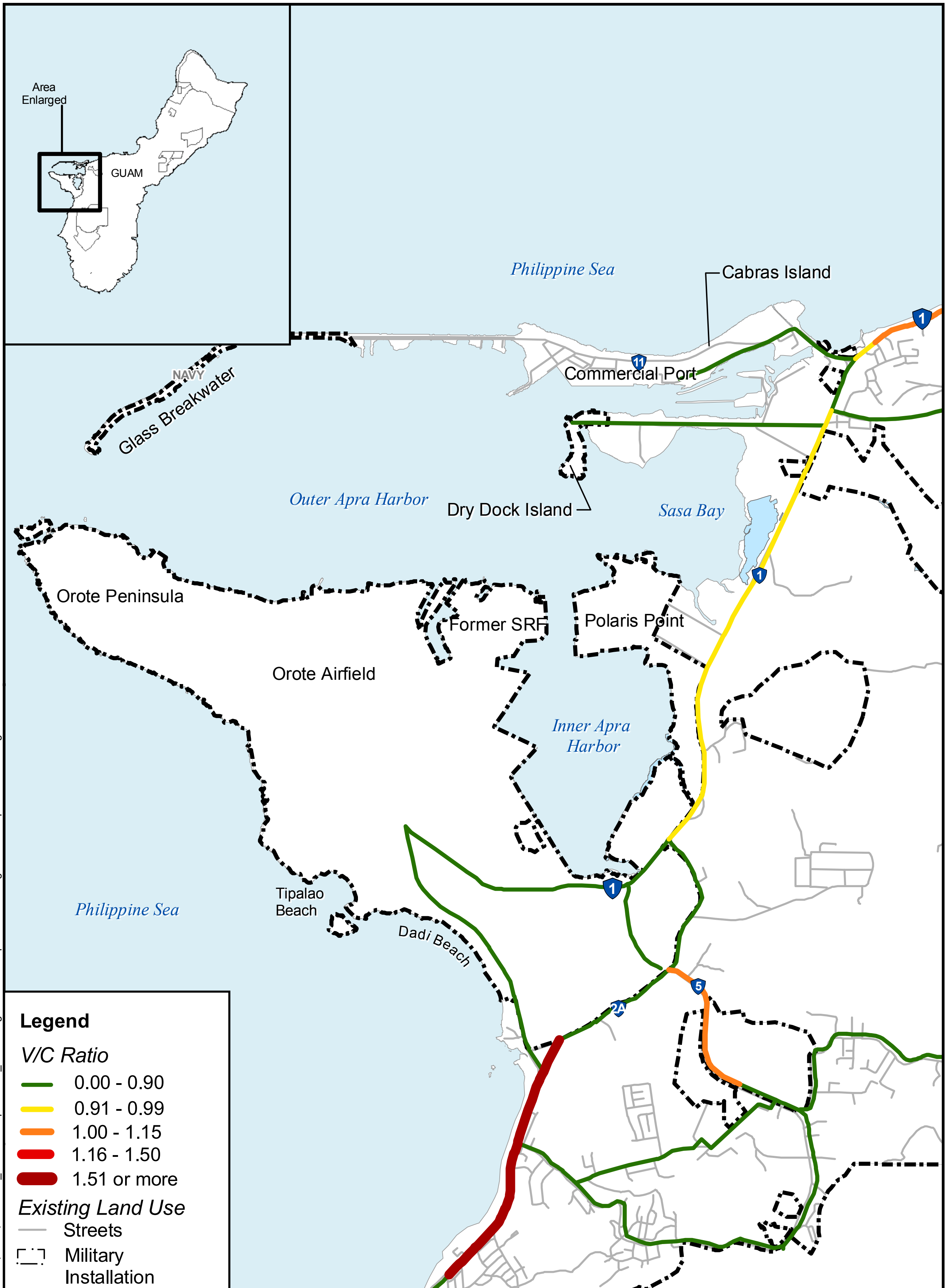
Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-55 through Figure 4.2-58 show future levels of traffic congestion in the Apra Harbor Region for the a.m. and p.m. peak hours for 2014 and 2030, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-55. Apra Harbor Region - 2014 a.m. Peak Congestion Levels- Alternative 8.mxd

Figure 4.2-55
Apra Harbor Region – 2014 a.m. Peak Congestion Levels – Alternative 8



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-56. Apra Harbor Region - 2014 p.m. Peak Congestion Levels- Alternative 8.mxd

Figure 4.2-56
Apra Harbor Region – 2014 p.m. Peak Congestion Levels – Alternative 8

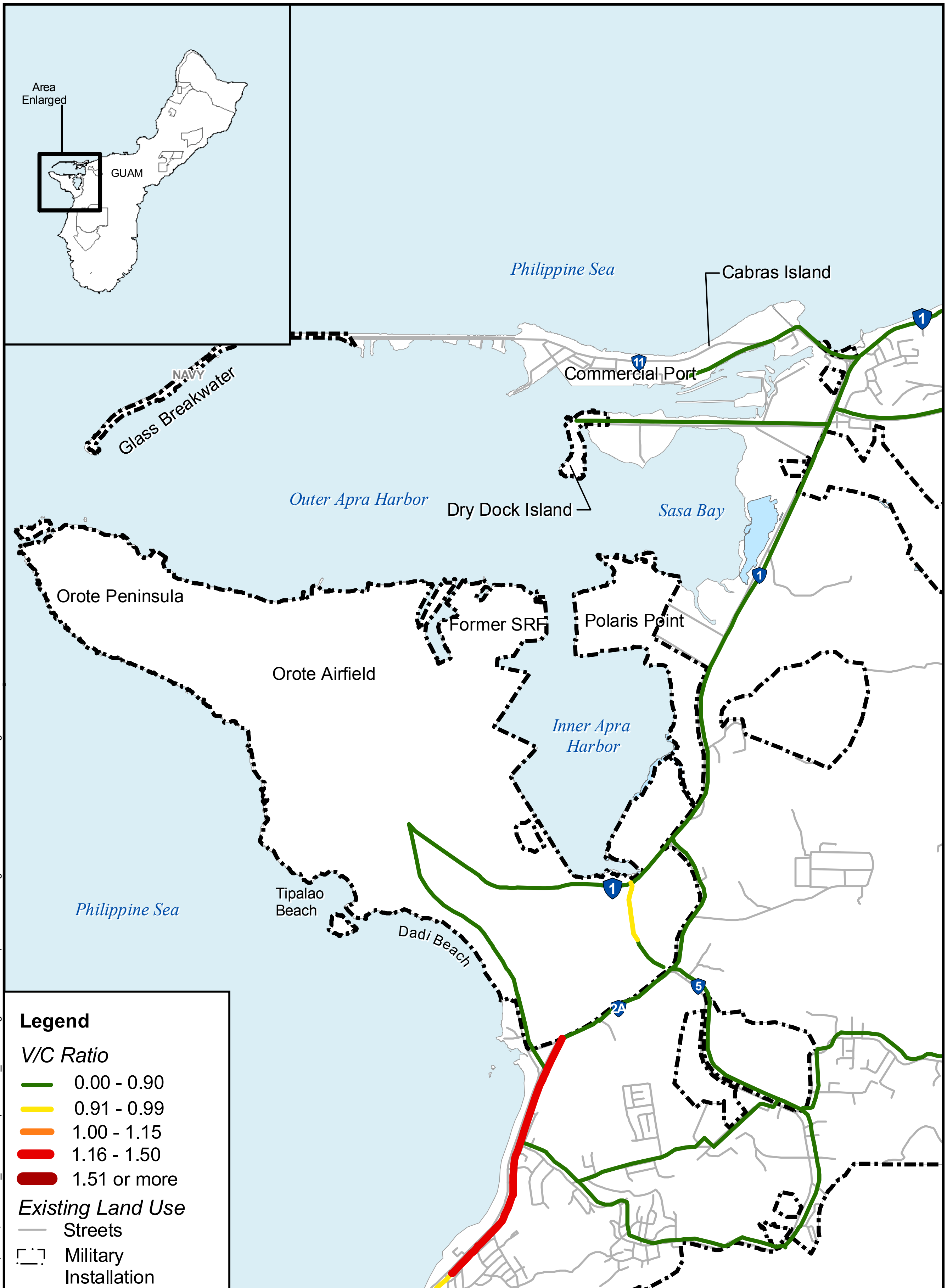
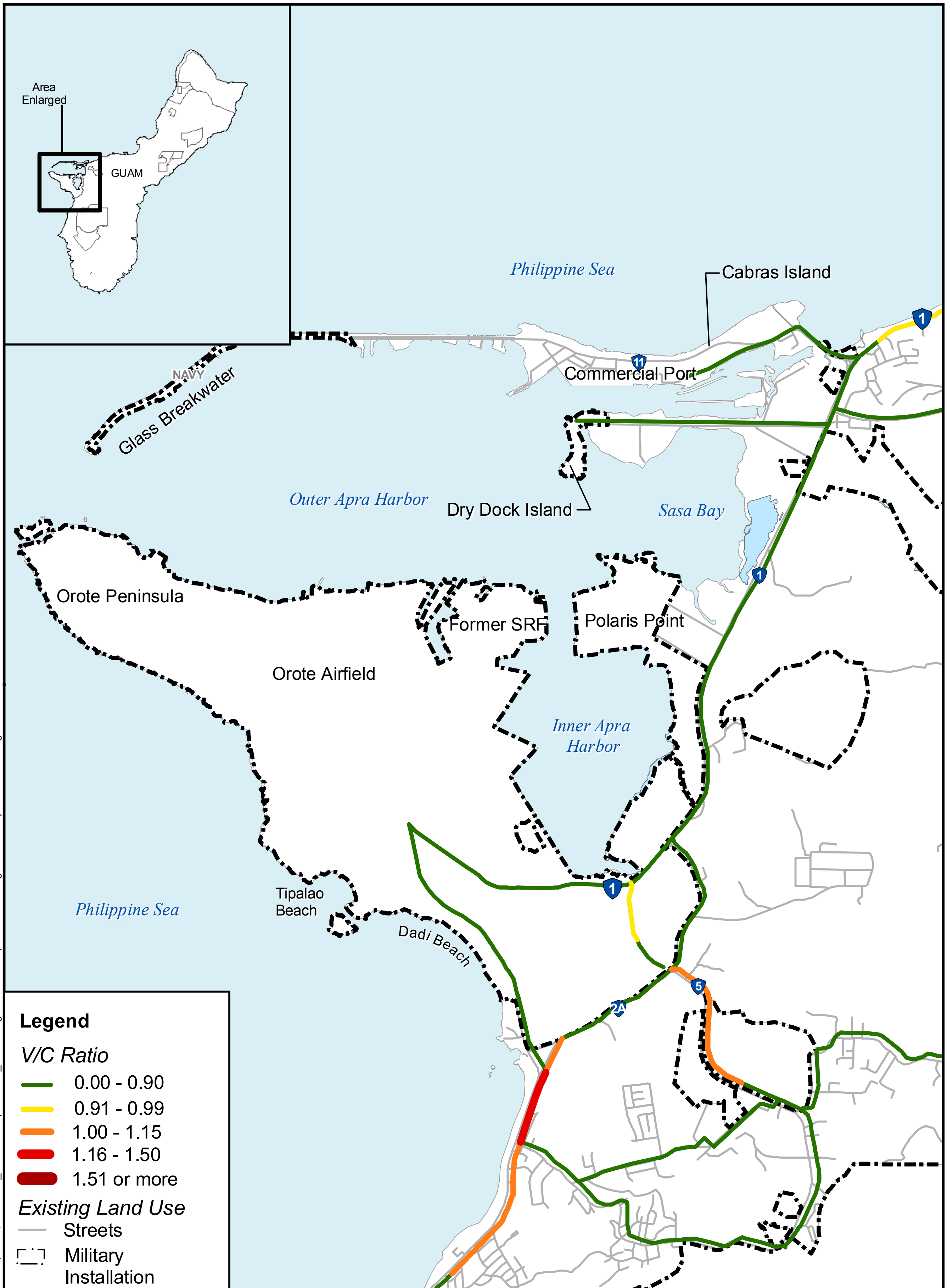


Figure 4.2-57
Apra Harbor Region – 2030 a.m. Peak Congestion Levels – Alternative 8



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-58. Apra Harbor Region - 2030 p.m. Peak Congestion Levels- Alternative 8.mxd

Figure 4.2-58
Apra Harbor Region – 2030 p.m. Peak Congestion Levels – Alternative 8

As shown in Table 4.2-25, Route 1/2A is operating at LOS F in the a.m. peak hour for 2014, which is considered unacceptable.

Table 4.2-25. Alternative 8 Future Level of Service and Delay Results – Apra Harbor Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/11	C	25.3	E	67.7	B	14.3	D	43.3
Route 1/Polaris Point	A	4.5	A	5.5	A	6.8	A	7.5
Route 1/6 (west)	D	49.5	C	24.1	B	18.4	C	22.0
Route 1/2A	F	89.4	E	59.8	E	67.5	E	57.5
Route 5/2A	E	69.6	C	22.9	E	79.9	C	25.9

Note: *Signalized intersection LOS based on average delay for the overall intersection.

Public Transportation Impacts. Impacts would be similar to those of Alternative 1.

Pedestrian and Bicycle Impacts. Impacts would be similar to those of Alternative 1.

<u>South</u>

On Base Roadways:

Naval Munitions Site

Construction. The impacts for Alternative 8 are the same as Alternative 1.

Operation. The impacts for Alternative 8 are the same as Alternative 1.

Off Base Roadways:

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 3 can be found in Table 4.2-26. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. See Table 4.1-20 for the 2008 volume summary. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Table 4.2-26. Alternative 8 Future ADT and Volume to Capacity Ratio Summary – South Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 5	Route 5 ranges from 10,000 to 17,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is generally 0.00-0.90 in the a.m. peak and 1.00-1.15 in the p.m. peak. The roadway is congested during the p.m. peak hour.	Route 5 ranges from 11,000 to 18,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is generally 0.00-0.90 in the a.m. peak and 1.00-1.15 in the p.m. peak. The roadway is congested during the p.m. peak hour.
Route 12	Route 12 ranges from 2,700 to 5,400 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not considered congested.	Route 12 ranges from 2,300 to 6,000 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not considered congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-59 through Figure 4.2-62 show future levels of traffic congestion in the South Region for the a.m. and p.m. peak hours for 2014 and 2030, respectively. The color of the roadways corresponds to the LOS on the road. The green roads have an LOS of A, B, or C; the yellow roads have an LOS of D or E; and the orange and red roads have an LOS of F, with red being the most severely congested.

The roads in the South Region do not exhibit high levels of congestion. During both the afternoon peaks, Route 5 between Naval Base Guam and the NMS has an LOS F.

As shown in Table 4.2-27, none of the intersections have LOS F in either the a.m. or p.m. peak hours in 2014 or 2030. Conditions remain fairly stable from 2014 to 2030.

Table 4.2-27. Alternative 8 Future Level of Service and Delay Results – South Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 2/12	C	31.6	C	24.9	C	30.7	C	27.0
Unsignalized**								
Route 5/17	B	13.1	C	17.1	B	14.8	E	42.4
Route 4/4A	C	23.3	C	17.2	E	47.4	C	24.0
Route 17/4A	B	13.0	B	14.0	C	16.1	C	18.6
Military Access Points								
Route 5 - Naval Munitions Sites/Harmon Road.**	—	—	—	—	A	9.5	A	10.6

Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
Legend: LOS = Level of Service.

Public Transportation Impacts. Impacts would be similar to those of Alternative 1.

Pedestrian and Bicycle Impacts. Impacts would be similar to those of Alternative 1.

Proposed Mitigation Measures

On Base Roadways:

The proposed mitigation measures would be the same as for Alternative 1.

Off Base Roadways:

The mitigation measures for Alternative 8 would be similar to those of Alternative 1.

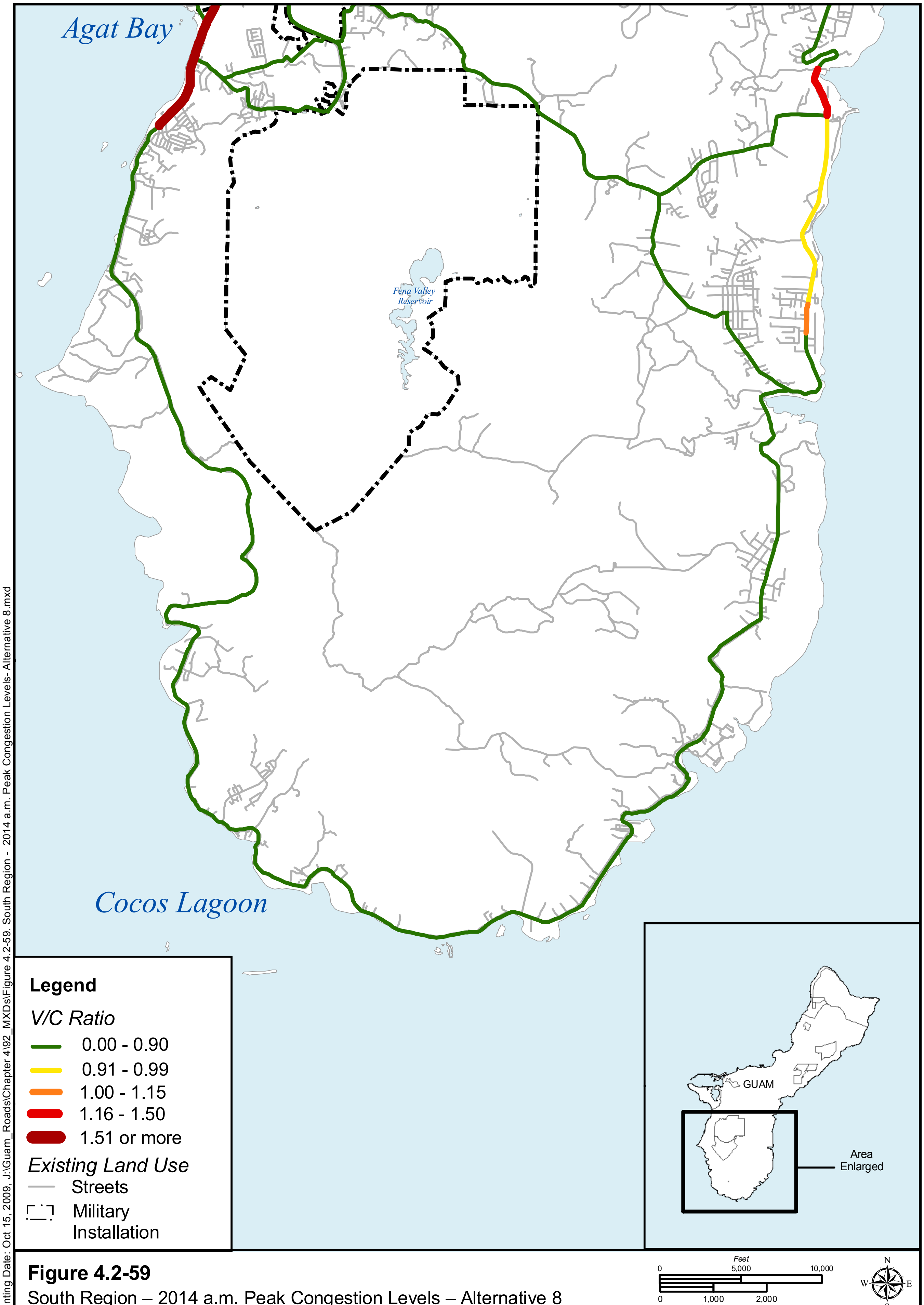


Figure 4.2-59
South Region – 2014 a.m. Peak Congestion Levels – Alternative 8

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-59. South Region - 2014 a.m. Peak Congestion Levels- Alternative 8.mxd

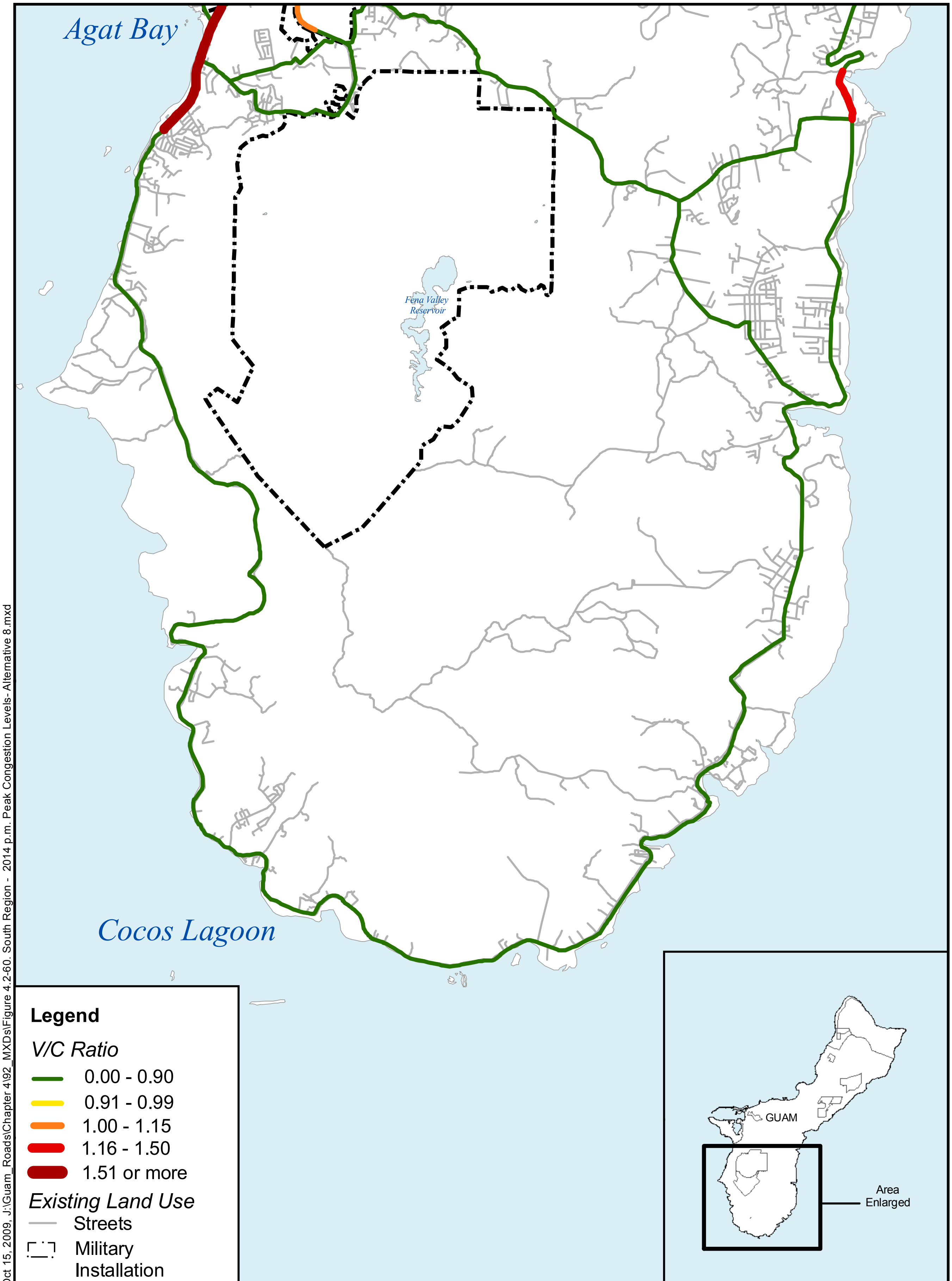


Figure 4.2-60
South Region – 2014 p.m. Peak Congestion Levels – Alternative 8

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-60. South Region - 2014 p.m. Peak Congestion Levels- Alternative 8.mxd

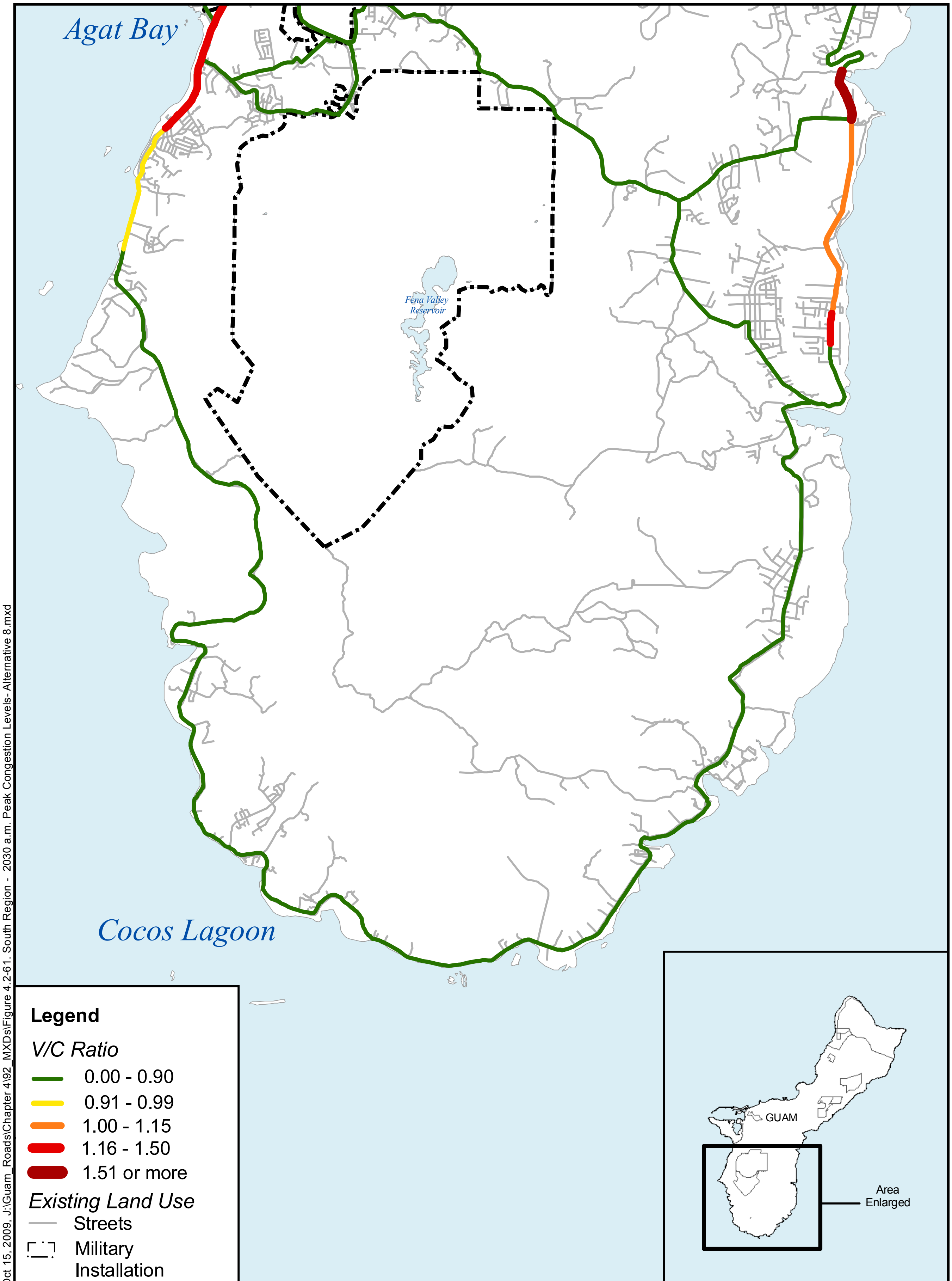


Figure 4.2-61
South Region – 2030 a.m. Peak Congestion Levels – Alternative 8

Feet 0 5,000 10,000
0 1,000 2,000 Meters
N E S W

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-61. South Region - 2030 a.m. Peak Congestion Levels- Alternative 8.mxd

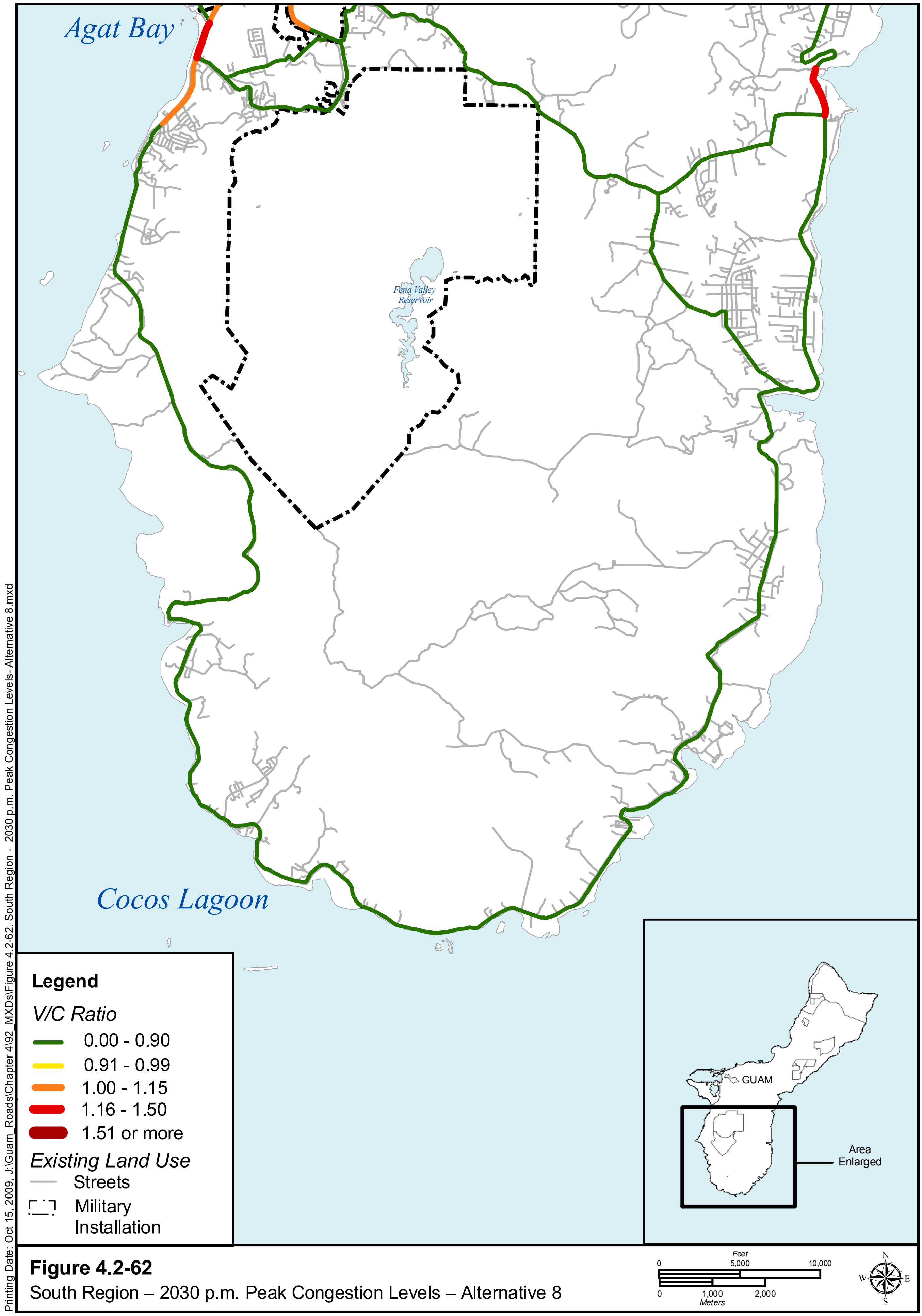


Figure 4.2-62
South Region – 2030 p.m. Peak Congestion Levels – Alternative 8

4.2.2.5 No-Action Alternative (Off Base Roadways)

The no-action alternative includes all projects included in the fiscally constrained 2030 Guam Transportation Plan; however, it does not include the military relocation or roadway projects proposed specifically for the relocation as described in the build alternatives.

2014

Future Traffic Impacts

Most of the roads included in this study are considered congestion-free in 2014. A summary of future ADT volumes and the v/c ratio for 2014 for the no-action alternative can be found in Table 4.2-28. The exceptions are Route 25 and the southern portion of Route 28, which both have a v/c ratio greater than 1, indicating that the roadway is congested. The v/c ratios are considerably better compared to Alternatives 1/2, 3, and 8 in 2014, most noticeably on the following roadways, which all have congestion where there is no congestion in the no-action alternative in 2014:

Alternatives 1 and 2
- Route 1
- Route 3
- Route 8
- Route 10
- Route 15
- Route 26
- Route 28

Alternative 3
- Route 1
- Route 3
- Route 10
- Route 16
- Route 26

Alternative 8
- Route 1
- Route 3
- Route 5
- Route 8
- Route 10
- Route 25
- Route 26

Figure 4.2-63 through Figure 4.2-70 show future levels of traffic congestion in the North, Central, Apra Harbor, and South Regions for the a.m. and p.m. peak hours for 2014. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

The results of the future operational analysis are shown in Table 4.2-29 for both the 2014 a.m. and p.m. conditions.

As shown in Table 4.2-29, islandwide, there are 17 out of 42 intersections with LOS F for at least one peak hour, which is considered unacceptable. The following intersections are operating at LOS F in the a.m. and p.m. peak hours in 2014:

- Route 1/28
- Route 1/27
- Route 1/3
- Route 1/14A
- Route 1/10A
- Route 1/30
- Route 4/7A
- Route 16/27
- Route 16/10A
- Route 7/7A
- Route 15/29
- Route 28/27A

Table 4.2-28. No-Action Alternative Future ADT and Volume to Capacity Ratio Summary

Roadway	*2014*	
	ADT Summary	*v/c Ratio*
Route 1	Route 1 ranges from 19,000 to 81,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB and gradually increases toward the intersection with Route 4, where it decreases again.	The v/c ratio is generally between 0.00-0.80 on Route 1. There are small sections of the roadway in Tamuning that have v/c ratios between 0.81-0.99; however, none of the roadway is considered congested.
Route 2A	Route 2A has 31,000 vpd.	The v/c ratio is between 0.00-0.80 on Route 2A. The roadway is not considered congested.
Route 3	Route 3 ranges from 23,000 to 46,000 vpd. Traffic decreases north of the intersection with Route 28.	The v/c ratio is between 0.00-0.80 on Route 3. The roadway is not considered congested.
Route 5	Route 5 ranges from 9,400 to 14,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is generally between 0.81-0.99 on Route 5. The roadway is not considered congested.
Route 8/8A	Route 8 ranges from 41,000 to 48,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 3,500 vpd.	The v/c ratio is generally between 0.00-0.80 on Route 8/8A. However, in the p.m. peak hour, v/c ration for Route 8 east of Route 33 is between 0.81-0.99. The roadway is not considered congested.
Route 9	Route 9 ranges from 3,400 to 5,000 vpd.	The v/c ratio is between 0.00-0.80 on Route 9. The roadway is not considered congested.
Route 10	Route 10 ranges from 39,000 to 41,000 vpd between Route 8 and Route 15.	The v/c ratio is between 0.00-0.80 on Route 10. The roadway is not considered congested.
Route 11	Route 11 has 5,500 vpd.	The v/c ratio is between 0.00-0.80 on Route 11. The roadway is not considered congested.
Route 12	Route 12 ranges from 1,300 to 4,900 vpd. Traffic increases toward the intersection with Route 2.	The v/c ratio is between 0.00-0.80 on Route 12. The roadway is not considered congested.
Route 15	Route 15 ranges from 5,200 to 18,000 vpd. Traffic increases gradually south to the intersection with Route 10.	The v/c ratio is between 0.00-0.80 on Route 15. The roadway is not considered congested.
Route 16	Route 16 ranges from 40,000 to 56,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is between 0.00-0.80 on Route 16. The roadway is not considered congested.
Route 25	Route 25 ranges from 13,000 to 17,000 vpd.	The v/c ratio is 1.16-1.50 on Route 25 in both the a.m. and p.m. peak hour. The roadway is considered congested.
Route 26	Route 26 ranges from 6,800 to 16,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	The v/c ratio is generally between 0.00-0.80 on Route 26. There is a small section of the roadway near the intersection with Route 25 where the v/c ratio is between 0.81-0.99; however, none of the roadway is considered congested.
Route 27	Route 27 ranges from 40,000 to 42,000 vpd between Route 16 and Route 1.	The v/c ratio is between 0.00-0.80 on Route 27. The roadway is not considered congested.
Route 28	Route 28 ranges from 9,600 to 19,000 vpd. Traffic generally increases closer to the intersection with Route 1.	The v/c ratio of the northern portion of Route 28 is 0.81-0.99 in the a.m. peak hour and 0.00-0.80 in the p.m. peak hour. The v/c ratio of the southern portion of Route 28 is generally 1.16-1.50, which indicates the road is congested in both the a.m. and p.m. peak hour.
Chalan Lujuna	Chalan Lujuna ranges from 4,400 to 4,900 vpd.	The v/c ratio is between 0.00-0.80 on Chalan Lujuna. The roadway is not considered congested.

Legend: ADT = average daily traffic; AFB = Air Force Base; v/c = volume to capacity; vpd = vehicles per day.

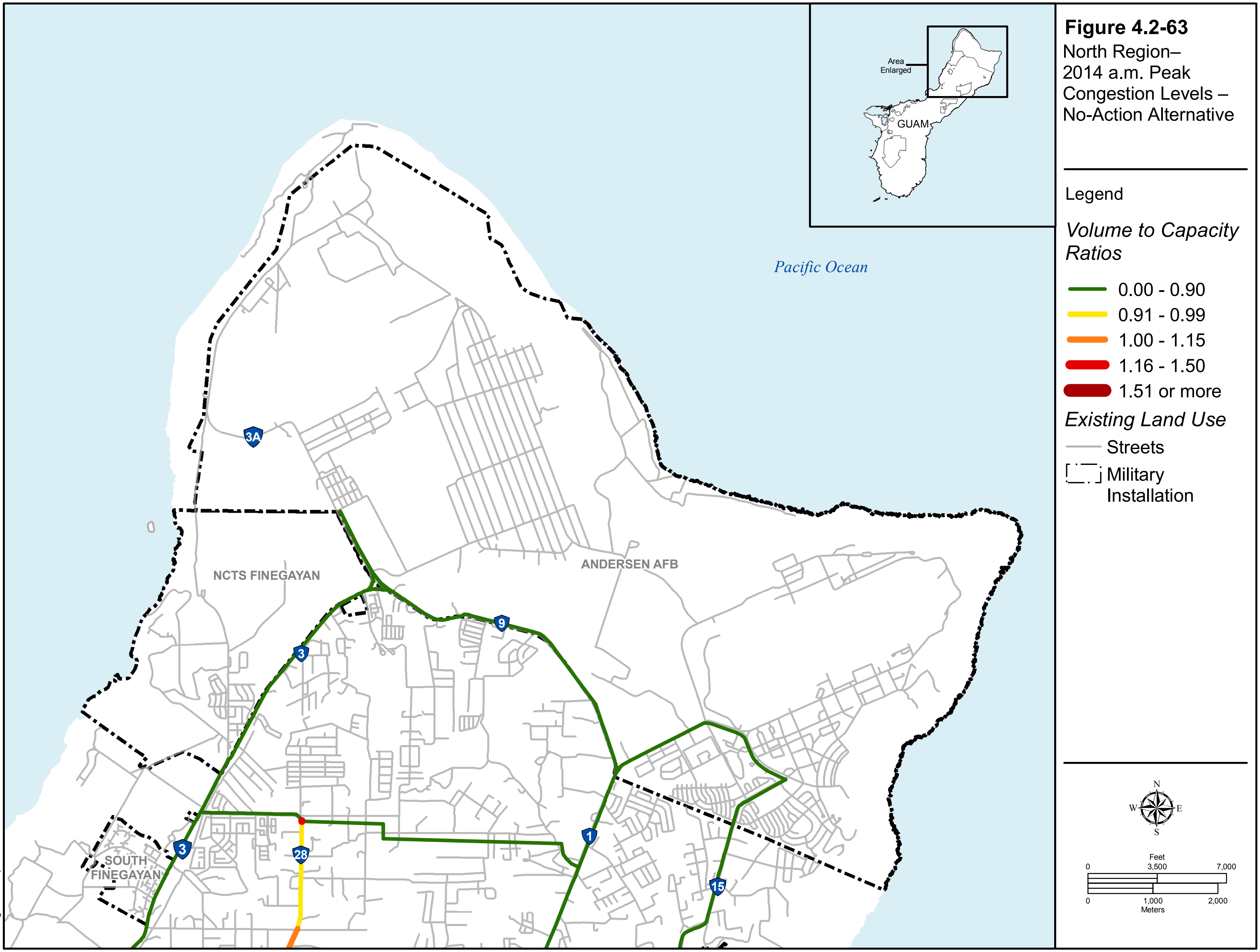
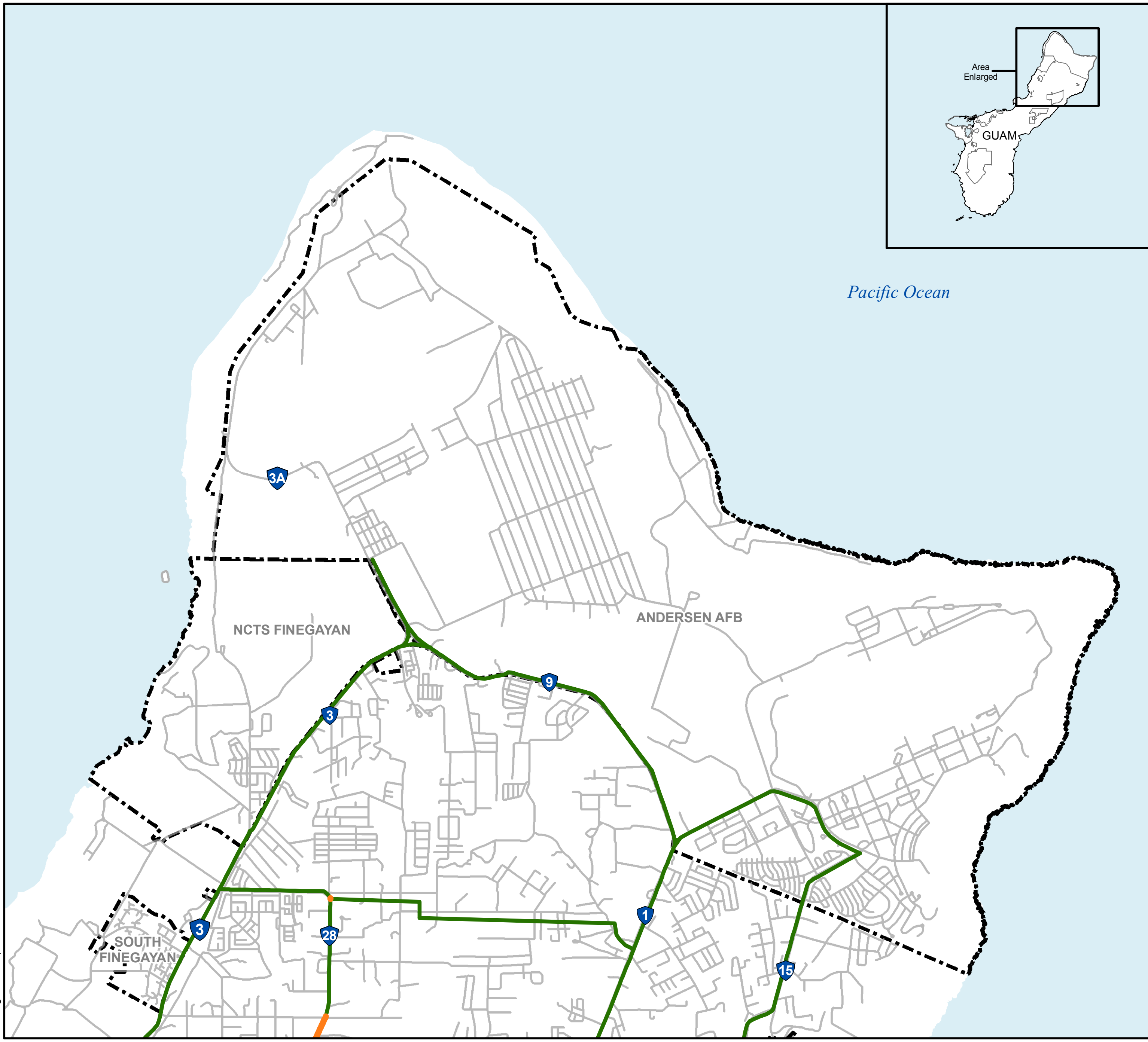


Figure 4.2-63
North Region–2014 a.m. Peak Congestion Levels – No-Action Alternative

Printing Date: April 2, 2010

Figure 4.2-64

North Region–
2014 p.m. Peak
Congestion Levels –
No-Action Alternative



Legend

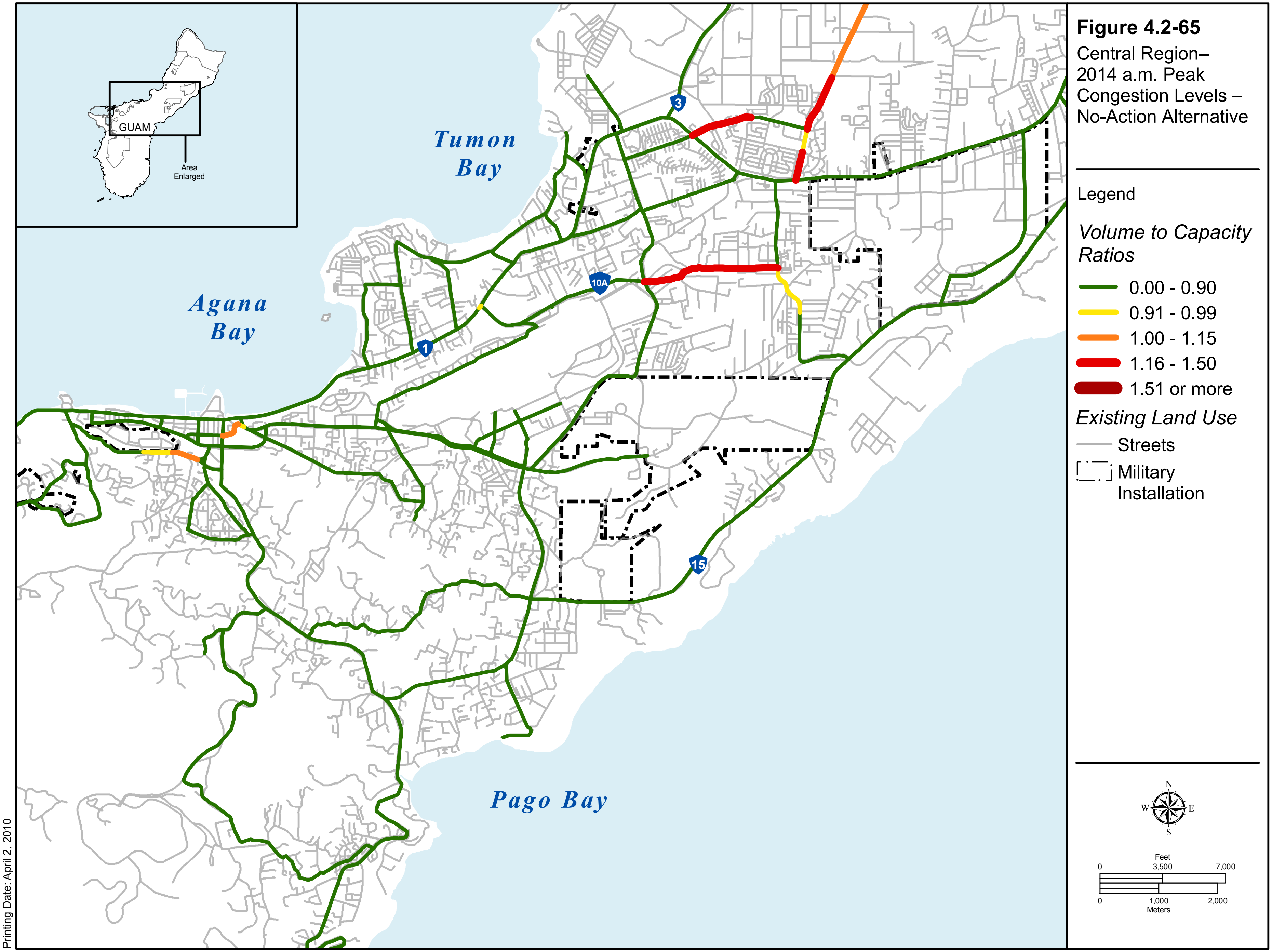
Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

Printing Date: April 2, 2010


GUAM
Area Enlarged
Tumon Bay
Agana Bay
Pago Bay
3
1
10A
15
Figure 4.2-65
Central Region–
2014 a.m. Peak
Congestion Levels –
No-Action Alternative
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
N
W
E
S
Feet
0
3,500
7,000
0
1,000
2,000
Meters
Printing Date: April 2, 2010

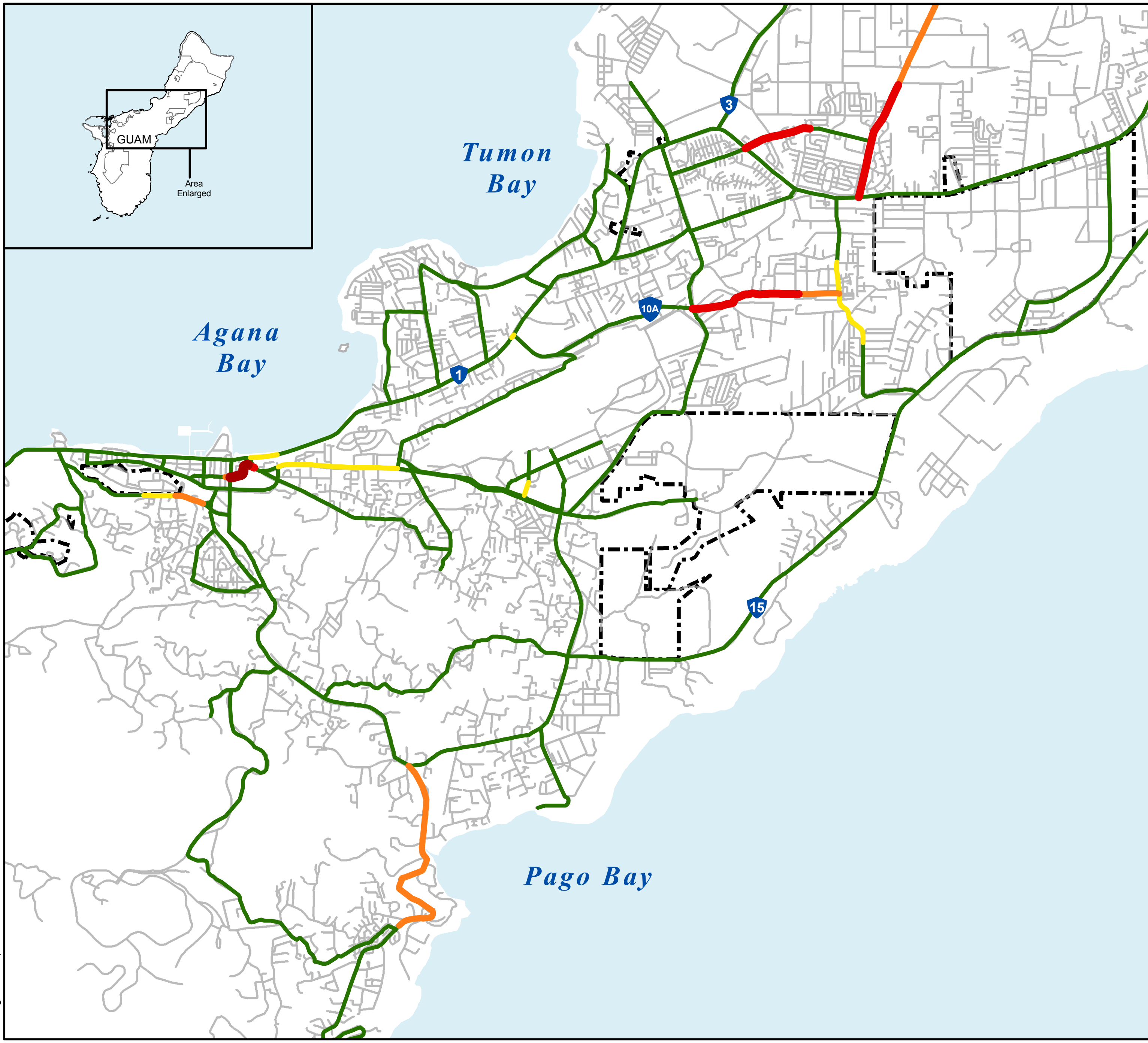


Figure 4.2-66
Central Region–
2014 p.m. Peak
Congestion Levels –
No-Action Alternative

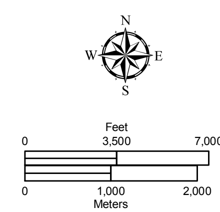
Legend

Volume to Capacity Ratios

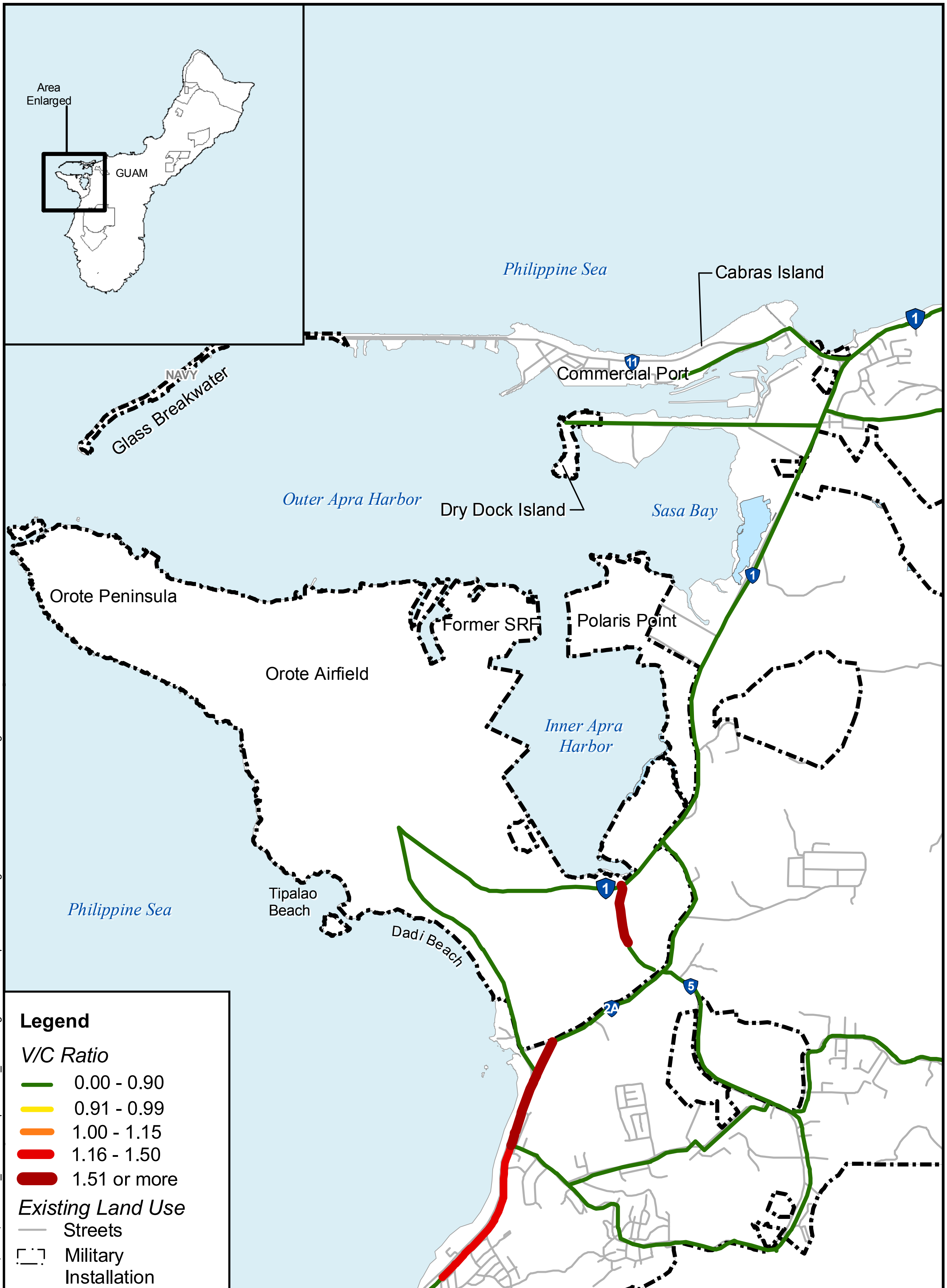
- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation



Printing Date: April 2, 2010



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-67. Apra Harbor Region - 2014 a.m. Peak Congestion Levels- No-Action Alternative.mxd

Figure 4.2-67
Apra Harbor Region - 2014 a.m. Peak Congestion Levels- No-Action Alternative

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-68. Apra Harbor Region - 2014 p.m. Peak Congestion Levels- No-Action Alternative.mxd

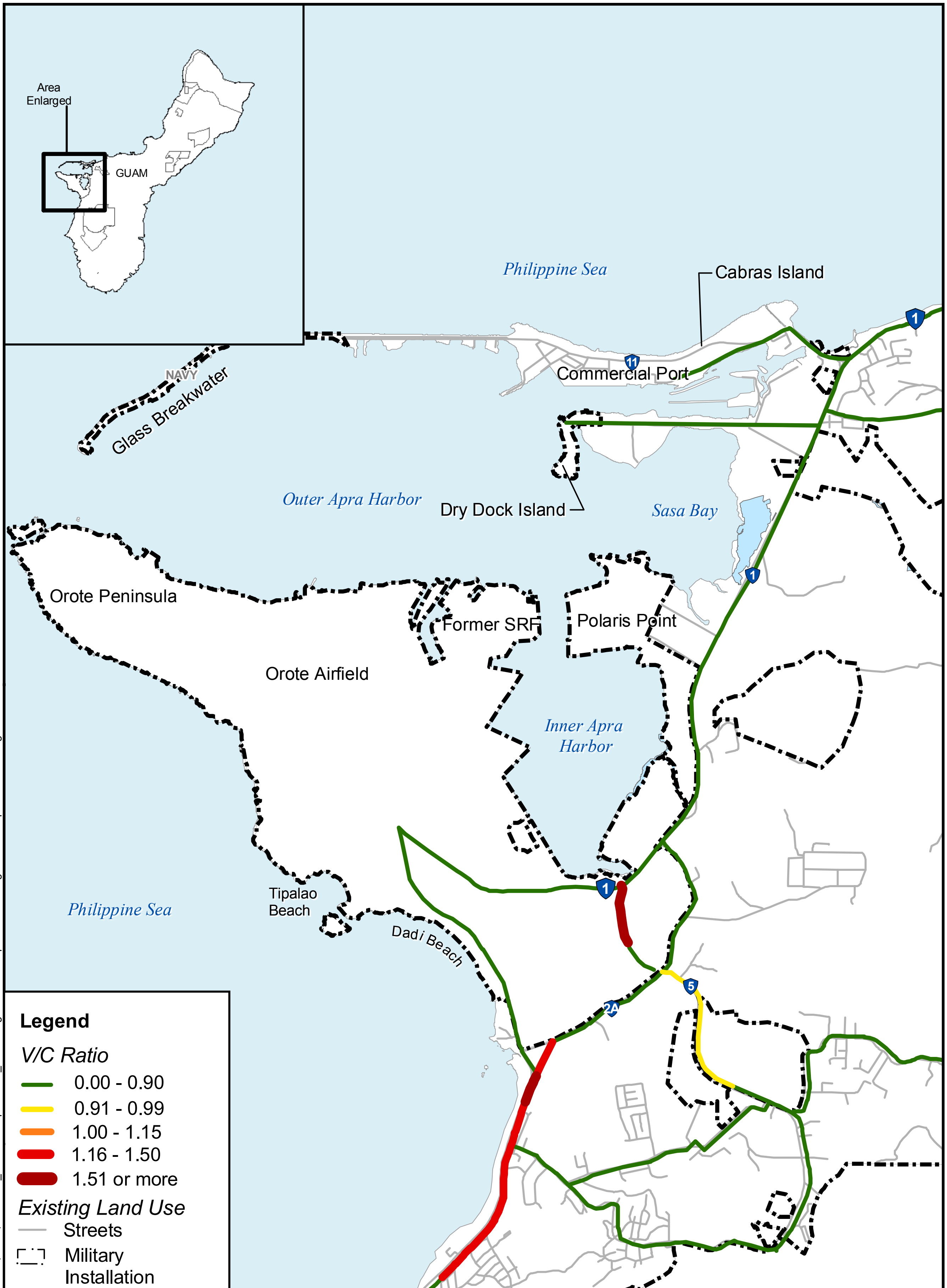


Figure 4.2-68
Apra Harbor Region - 2014 p.m. Peak Congestion Levels- No-Action Alternative

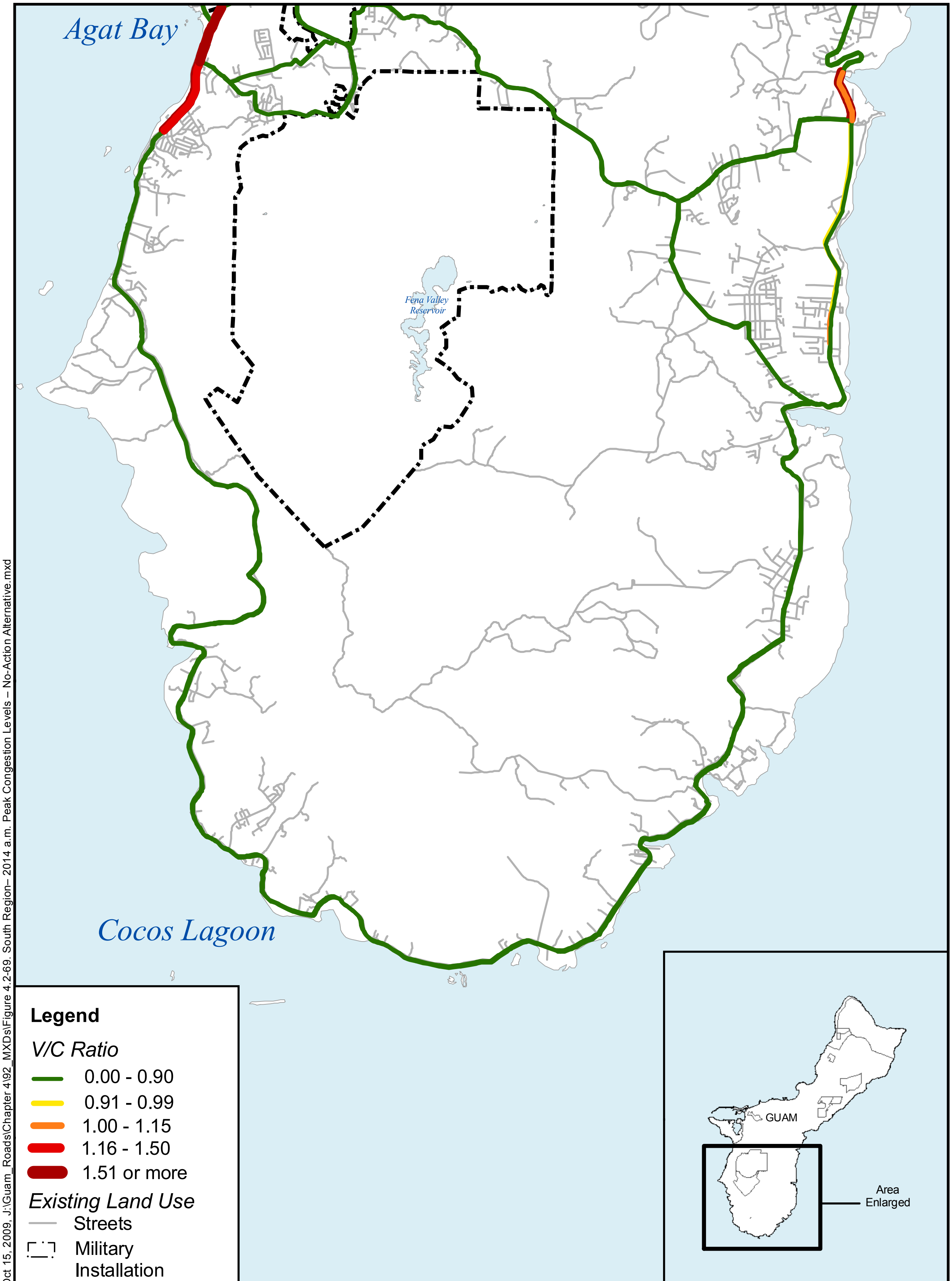


Figure 4.2-69
South Region– 2014 a.m. Peak Congestion Levels – No-Action Alternative

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-69. South Region– 2014 a.m. Peak Congestion Levels – No-Action Alternative.mxd

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-70. South Region– 2014 p.m. Peak Congestion Levels – No-Action Alternative.mxd

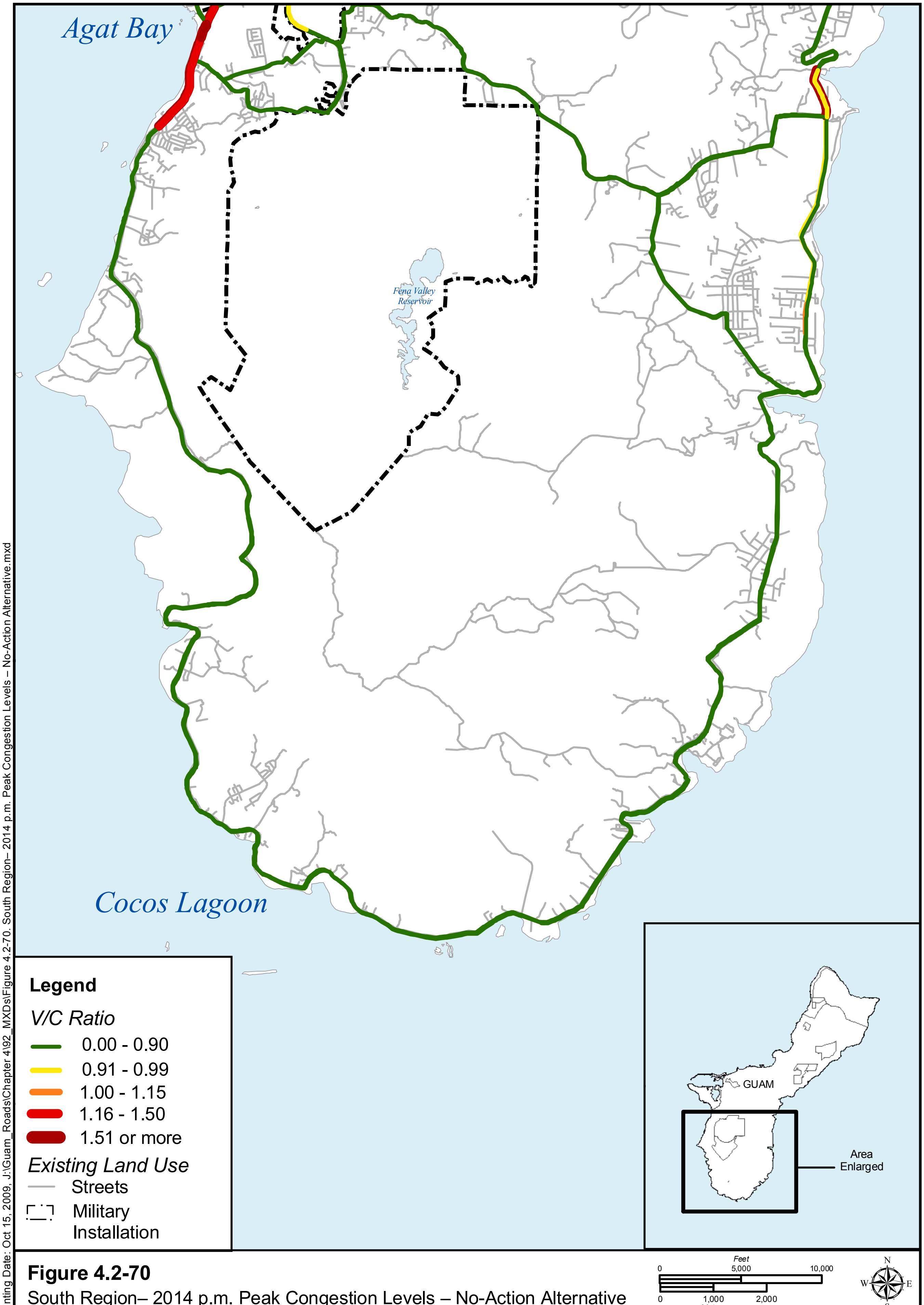


Figure 4.2-70
South Region– 2014 p.m. Peak Congestion Levels – No-Action Alternative

Table 4.2-29. No-Action Alternative Future Level of Service and Delay Results

	2014			
	a.m. Peak Hour		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*				
Route 1/9	C	21.8	B	19.5
Route 1/29	D	52.2	C	32.5
Route 1/28	F	207.3	F	120.7
Route 1/26	C	21.0	F	84.1
Route 1/27	F	1213.9	F	514.1
Route 1/27A	D	37.0	E	58.4
Route 1/3	F	113.5	F	191.7
Route 1/16	C	27.7	F	143.7
Route 1/14 (North San Vitores)	F	102.8	D	53.7
Route 1/14A	F	205.8	F	155.4
Route 1/10A	F	89.6	F	207.8
Route 1/14B	E	77.6	D	44.3
Route 1/14 (ITC)	E	70.3	F	171.3
Route 1/30	F	371.7	F	263.5
Route 1/8	C	29.0	D	46.4
Route 1/4	C	27.1	C	30.1
Route 1/6 (westerly)	B	10.5	B	12.8
Route 1/11	B	16.6	B	19.9
Route 1/6 (Adelup)	C	20.9	D	39.7
Route 1/Polaris Point	A	4.3	A	6.5
Route 1/2A	F	92.1	E	70.5
Route 5/2A	D	44.5	C	20.9
Route 2/12	E	65.4	B	17.6
Route 3/28	C	20.8	B	10.9
Route 4/7A	F	106.0	F	181.3
Route 4/10	E	59.7	E	79.2
Route 4/17	C	25.8	C	24.1
Route 8/33	D	38.4	F	91.5
Route 8/10	E	58.9	F	105.5
Route 10/15	E	79.3	D	53.9
Route 16/27A	C	25.1	B	15.0
Route 16/27	F	207.6	F	303.1
Route 16/10A	F	540.8	F	674.4
Route 26/25**	C	23.9	C	27.8
Unsignalized***				
Route 5/17	C	23.7	C	15.9
Route 3/3A/9	B	11.9	A	9.7
Route 4/4A	C	16.7	C	15.2
Route 7/7A	F	225.7	F	127.7
Route 15/29	F	142.7	F	220.8
Route 17/4A	C	15.9	C	15.6
Route 26/15	E	43.2	E	46.2
Route 28/27A	F	190.1	F	207.3
Military Access Points				
Route 3 – Main Cantonment/Commercial Gate	—	—	—	—
Route 3 – South Finegayan/Residential Gate	—	—	—	—
Route 1 – South Andersen Main Gate/(Turner Street)	—	—	—	—

	2014			
	a.m. Peak Hour		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*
Route 16 – Navy Barrigada Residential Gate	—	—	—	—
Route 15 – Barrigada Air Force/(Chada Street)	—	—	—	—
Route 5 – Naval Munitions Site/Harmon Road	—	—	—	—

Legend: ITC = International Trade Center; LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection would be signalized in future no action scenario.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

There is a noticeable difference between the no-action alternative and Alternatives 1 and 3 in terms of LOS in 2014. Islandwide, there are 12 intersections with the no-action alternative that have LOS F in both the a.m. and p.m. peak hours in 2014. For Alternatives 1 and 2, this number increases to 24 intersections in 2014; for Alternative 3, 23 intersections; and, for Alternative 8, 22 intersections. This is due to the proposed action, which increases the population and number of vehicles on the island, especially during peak construction time, which would occur in 2014. In addition, in 2014, the widening of Routes 25 and 26 will not have been constructed; thereby, affecting the intersection analysis.

Public Transportation Impacts

The impacts to the public transportation system would result from construction delays associated with the roadway improvements included in the no-action alternative. This could affect the LOS for transit riders by increasing travel times, longer headways, and missed transfers.

Pedestrian and Bicycle Impacts

Impacts to the existing pedestrian and bicycle facilities would occur during construction of roadway improvements included in the no-action alternative. This includes a loss of intermittent sidewalk when widening Route 10A. Intersection improvements would impact safe pedestrian and bicycle crossing during the period of reconstruction.

<u>2030</u>

Future Traffic Impacts

Most of the roads included in this study are considered congestion-free in 2030. A summary of future ADT volumes and the v/c ratio for 2030 for the no-action alternative can be found in Table 4.2-30.

The exceptions are Route 28 and small portions of Routes 1 and 10 that have a v/c ratio greater than 1, which indicates that the roadway is congested. The v/c ratios are considerably better compared to Alternatives 1, 2, 3, and 8 in 2030, most noticeably on the following roadways, which all have congestion where there is no congestion in the no-action alternative in 2030:

<u>Alternatives 1 and 2</u>
- Route 1
- Route 3
- Route 10
- Route 26

<u>Alternative 3</u>
- Route 1
- Route 10
- Route 16
- Route 25
- Route 26

<u>Alternative 8</u>
- Route 1
- Route 3
- Route 10
- Route 15
- Route 25
- Route 26

Table 4.2-30. No-Action Alternative Future ADT and Volume to Capacity Ratio Summary

Roadway	*2030*	
	ADT Summary	*v/c Ratio*
Route 1	Route 1 ranges from 16,000 to 86,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB and gradually increases toward the intersection with Route 4, where it decreases again.	The v/c ratio is generally between 0.00-0.80 on Route 1. There are small sections of the roadway in Tamuning and Andersen South that have v/c ratios between 0.81-0.99. In the p.m. peak hour, a portion of the roadway south of Route 30 has a ratio of 1.00-1.15, which is considered congested.
Route 2A	Route 2A has 33,000 vpd.	The v/c ratio is between 0.00-0.80 on Route 2A. The roadway is not considered congested.
Route 3	Route 3 ranges from 23,000 to 46,000 vpd. Traffic decreases north of the intersection with Route 28.	The v/c ratio is generally between 0.00-0.80 on Route 3 in the a.m. peak hour; however, in the p.m. peak hour, generally south of Route 28, the ratio is 0.81-0.99. The roadway is not considered congested.
Route 5	Route 5 ranges from 10,000 to 16,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is between 0.81-0.99 on Route 5 in the a.m. peak hour; however, in the p.m. peak hour, the ratio is between 1.00-1.15 and is considered congested.
Route 8/8A	Route 8 ranges from 47,000 to 54,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 2,900 vpd.	The v/c ratio is generally between 0.00-0.80 on Route 8/8A in the a.m. peak hour; however, in the p.m. peak hour, v/c ratio for Route 8 east of Route 33 is between 1.00-1.15 and is considered congested.
Route 9	Route 9 ranges from 4,400 to 6,900 vpd.	The v/c ratio is between 0.00-0.80 on Route 9. The roadway is not considered congested.
Route 10	Route 10 ranges from 48,000 to 50,000 vpd between Route 8 and Route 15.	The v/c ratio is generally 0.81-0.99 on Route 10; however, there is a portion of Route 10 where the v/c ratio is 1.00-1.15 south of the intersection with Route 15 in the a.m. peak hour. Only that portion of the roadway is considered congested.
Route 11	Route 11 has 7,600 vpd.	The v/c ratio is between 0.00-0.80 on Route 11. The roadway is not considered congested.
Route 12	Route 12 ranges from 2,100 to 5,700 vpd. Traffic increases toward the intersection with Route 2.	The v/c ratio is between 0.00-0.80 on Route 12. The roadway is not considered congested.
Route 15	Route 15 ranges from 7,100 to 21,000 vpd. Traffic increases gradually south to the intersection with Route 10.	The v/c ratio is generally 0.00-0.80 on Route 15; however, there is a portion of Route 15 where the v/c ratio is 0.81-0.99 east of the intersection with Route 10. The roadway is not considered congested.
Route 16	Route 16 ranges from 30,000 to 64,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is generally 0.00-0.80 on Route 16; however, there is a portion of Route 16 where the v/c ratio is 0.81-0.99 south of the intersection with Route 25. The roadway is not considered congested.
Route 25	Route 25 ranges from 22,000 to 26,000 vpd.	The v/c ratio is generally 0.81-0.99 on Route 25. The roadway is not considered congested.
Route 26	Route 26 ranges from 8,300 to 24,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	The v/c ratio is generally between 0.00-0.80 on Route 26. There is a small section of the roadway near the intersection with Route 25 where the v/c ratio is between 0.81-0.99; however, none of the roadway is considered congested.
Route 27	Route 27 ranges from 43,000 to 46,000 vpd between Routes 16 and 1.	The v/c ratio is between 0.00-0.80 on Route 27. The roadway is not considered congested.
Route 28	Route 28 ranges from 11,000 to 22,000 vpd. Traffic generally increases closer to the intersection with Route 1.	The v/c ratio of the southern portion of Route 28 is generally greater than 1, which indicates the road is congested in both the a.m. and p.m. peak hours.
Chalan Lujuna	Chalan Lujuna ranges from 5,400 to 6,100 vpd.	The v/c ratio is between 0.00-0.80 on Chalan Lujuna. The roadway is not considered congested.

Legend: ADT = average daily traffic; AFB = Air Force Base; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-71 through Figure 4.2-78 show future levels of traffic congestion in the North, Central, Apra Harbor, and South Regions for the a.m. and p.m. peak hours for 2030. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

The results of the future operational analysis are shown in Table 4.2-31 for both the 2030 a.m. and p.m. conditions. As shown in Table 4.2-31, islandwide, there are 24 out of 42 intersections and three out of six access points with LOS F for at least one peak hour, which is considered unacceptable. The following intersections are operating at LOS F in the a.m. and p.m. peak hours in 2030:

- Route 1/28
- Route 1/27
- Route 1/3
- Route 1/14 (North San Vitores)
- Route 1/14A
- Route 1/10A
- Route 1/14 (ITC)
- Route 1/30
- Route 1/8
- Route 4/7A
- Route 4/10
- Route 8/10
- Route 16/27
- Route 16/10A
- Route 15/29
- Route 26/15
- Route 28/27A
- Access Point at Route 16 – Navy Barrigada Residential Gate

There is also a difference between the no-action alternative and Alternatives 1 and 3 in terms of LOS in 2030. Islandwide, there are 17 intersections and one access point in the no-action alternative that have LOS F in both the a.m. and p.m. peak hours in 2030. For Alternative 1, this number decreases to 13 intersections and one access point in 2030; for Alternative 3, 16 intersections and one access point; and for Alternative 8, 14 intersections and one access point. This is due to the proposed action, which includes the roadway widening and intersection improvement projects; however, the results for the no-action alternative in 2030 are worse than 2014 due to natural population growth. That, in conjunction with the departure of the construction population around 2019, accounts for the similarity in the number of intersections operating at LOS F in Alternatives 1, 3, and 8, as compared with the no-action alternative. In addition, the inclusion of the roadway widening projects in 2030 accounts for a lessening in congestion impacts.

Public Transportation Impacts

The impacts to the public transportation system would result from construction delays associated with the roadway improvements included in the no-action alternative. This could affect the LOS for transit riders by increasing travel times, longer headways, and missed transfers.

Pedestrian and Bicycle Impacts

Impacts to the existing pedestrian and bicycle facilities would occur during construction of roadway improvements included in the no-action alternative. This includes a loss of intermittent sidewalk during the widening of Routes 8 and 26, as well as the removal of a shoulder along Route 1. Intersection improvements would impact safe pedestrian and bicycle crossing during the period of reconstruction.

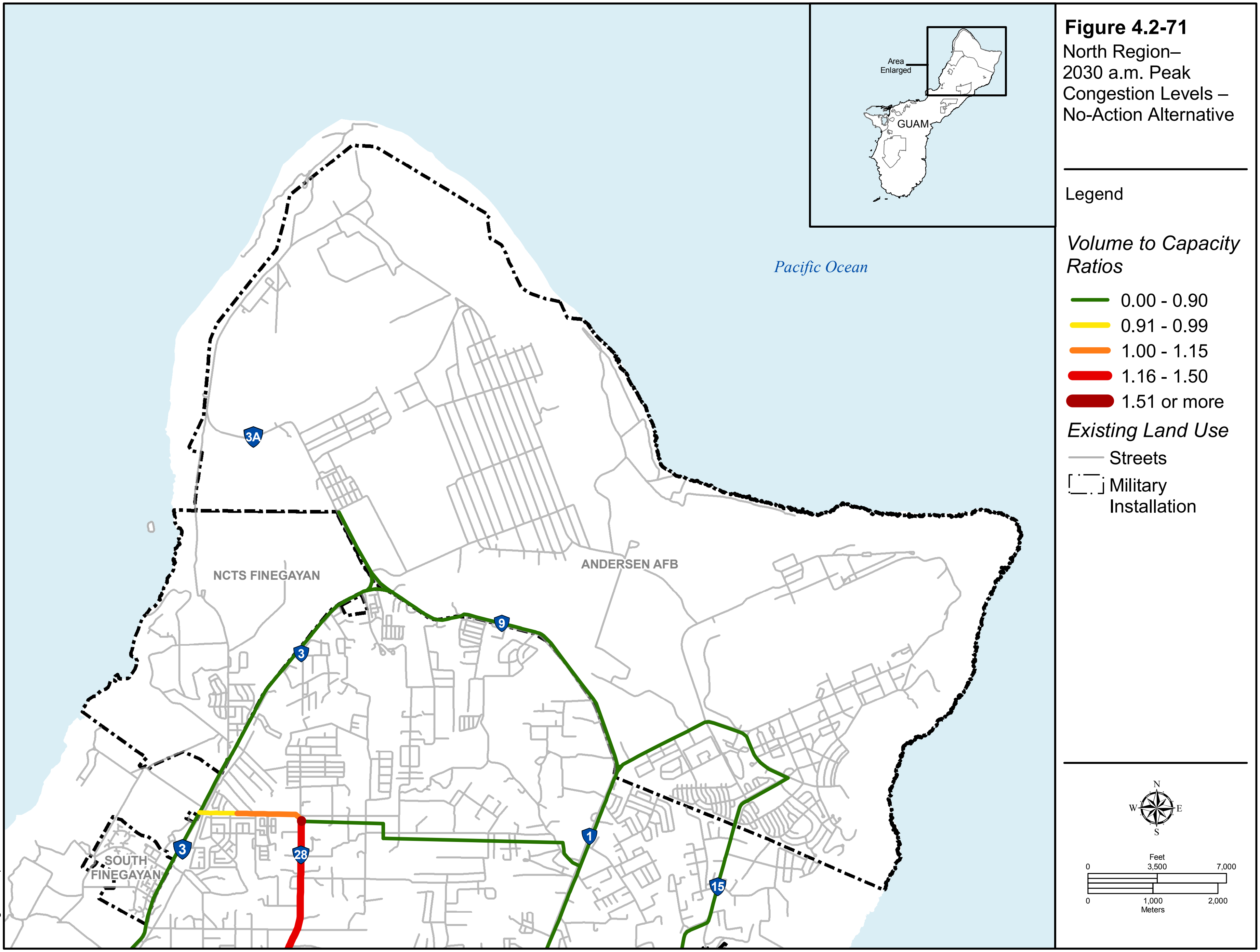


Figure 4.2-71
North Region–
2030 a.m. Peak
Congestion Levels –
No-Action Alternative

Printing Date: April 2, 2010

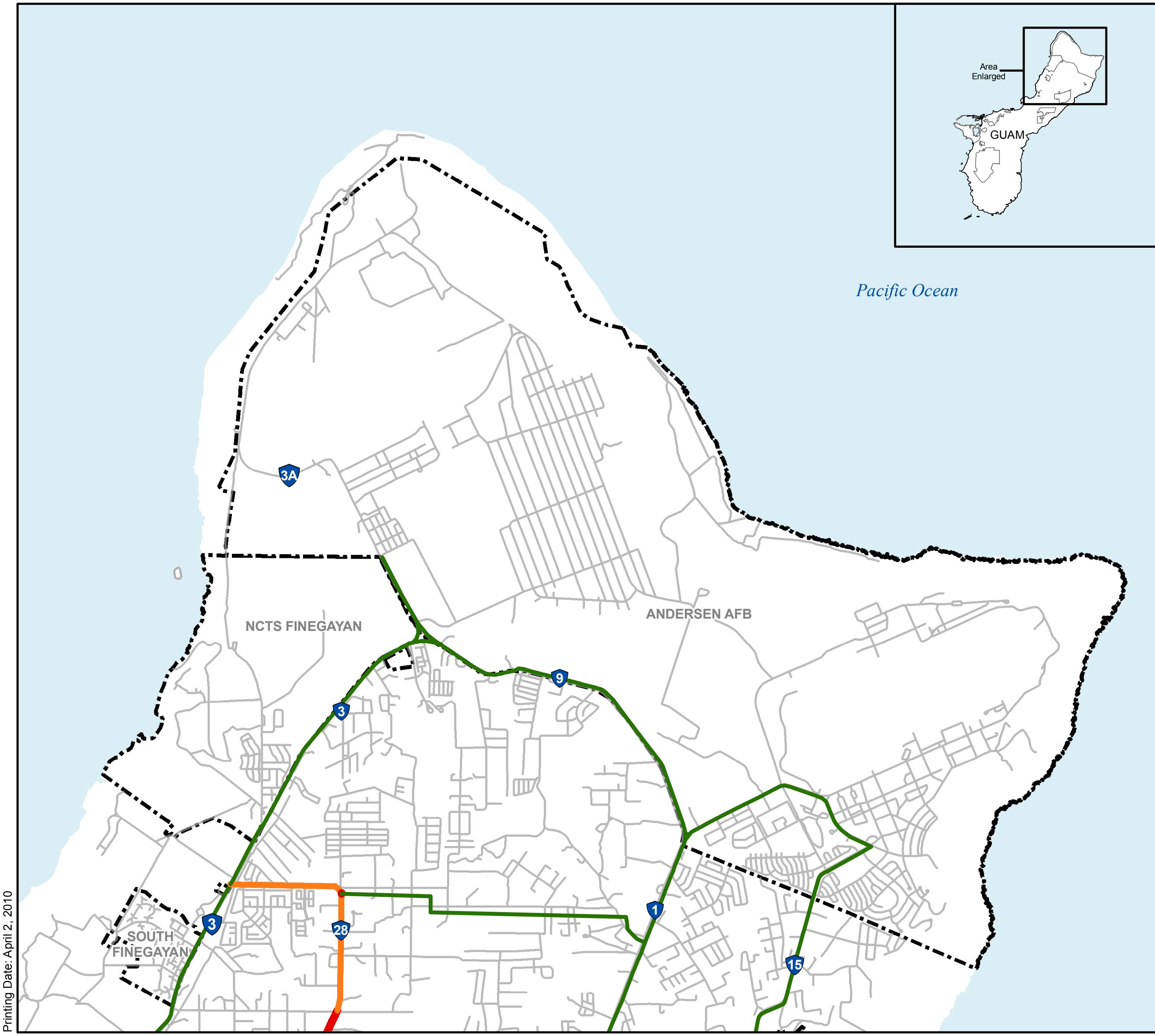


Figure 4.2-72
North Region–
2030 p.m. Peak
Congestion Levels –
No-Action Alternative

Legend

Volume to Capacity Ratios

- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use

- Streets
- Military Installation

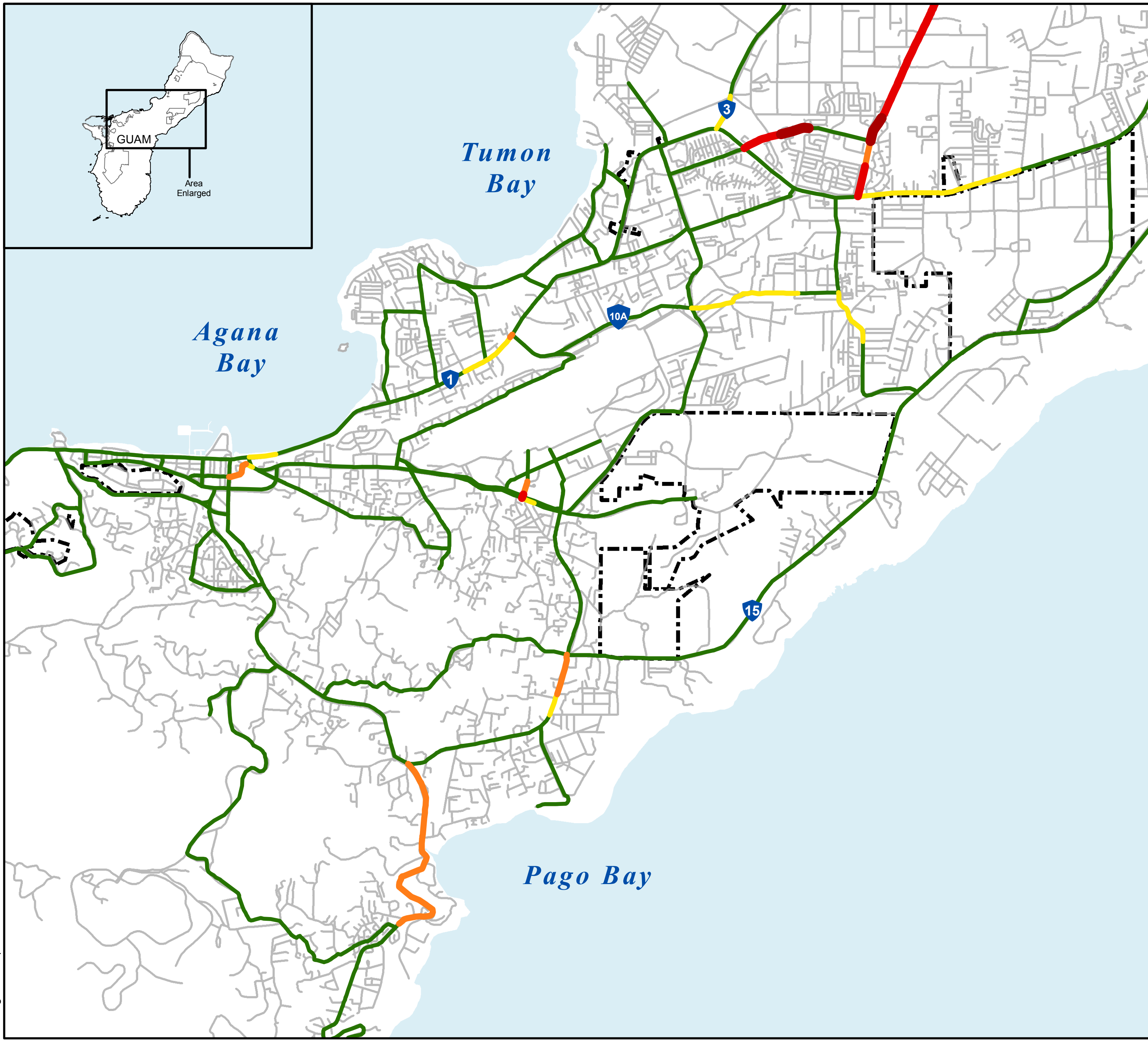


Figure 4.2-73
Central Region–2030 a.m. Peak Congestion Levels – No-Action Alternative

Legend

Volume to Capacity Ratios
- 0.00 - 0.90
- 0.91 - 0.99
- 1.00 - 1.15
- 1.16 - 1.50
- 1.51 or more

Existing Land Use
- Streets
- Military Installation

Printing Date: April 2, 2010

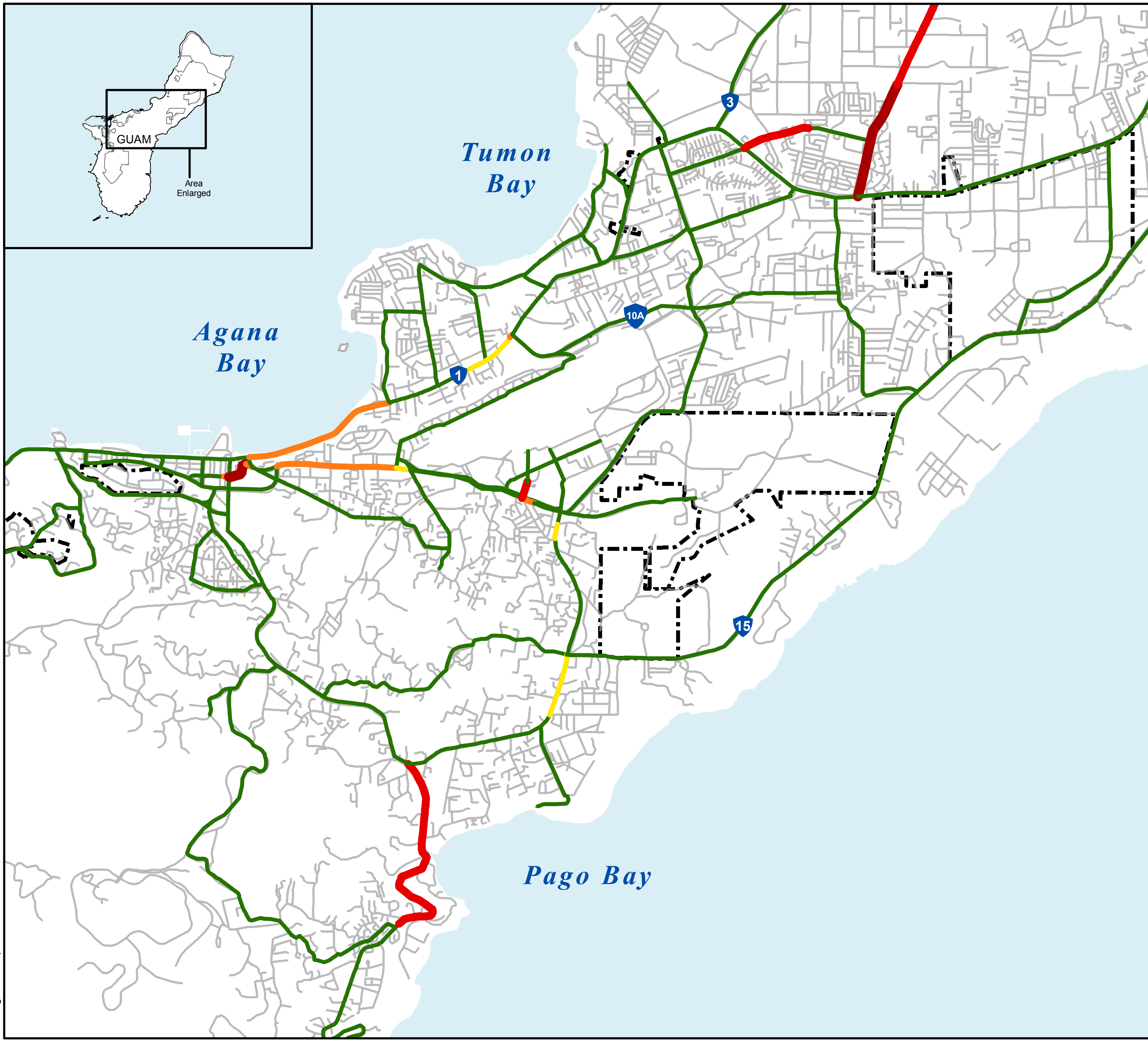
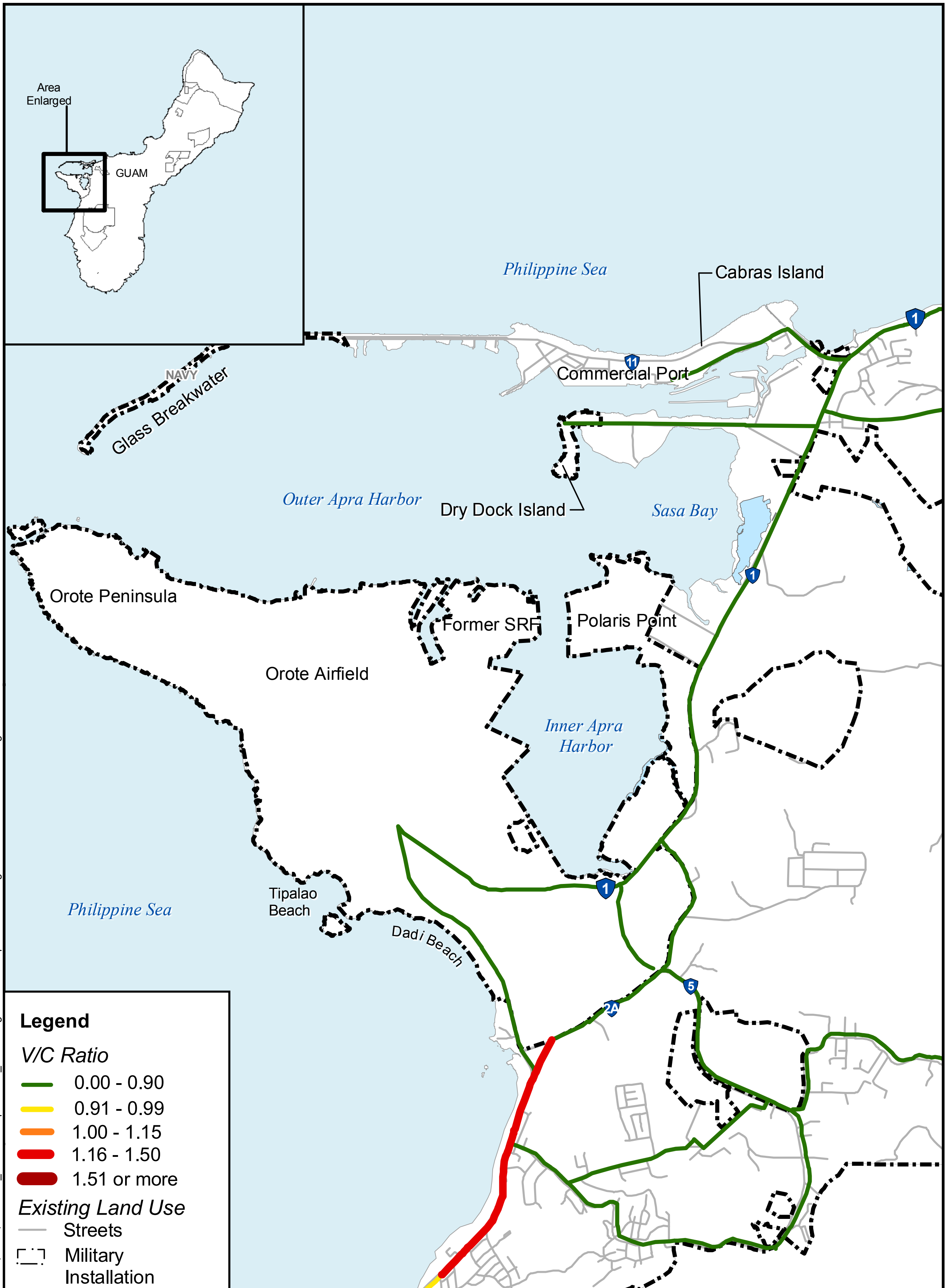


Figure 4.2-74
Central Region–2030 p.m. Peak Congestion Levels – No-Action Alternative

Printing Date: April 2, 2010



Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4192_MXDs\Figure 4.2-75. Apra Harbor Region - 2030 a.m. Peak Congestion Levels- No-Action Alternative.mxd

Figure 4.2-75
Apra Harbor Region - 2030 a.m. Peak Congestion Levels- No-Action Alternative

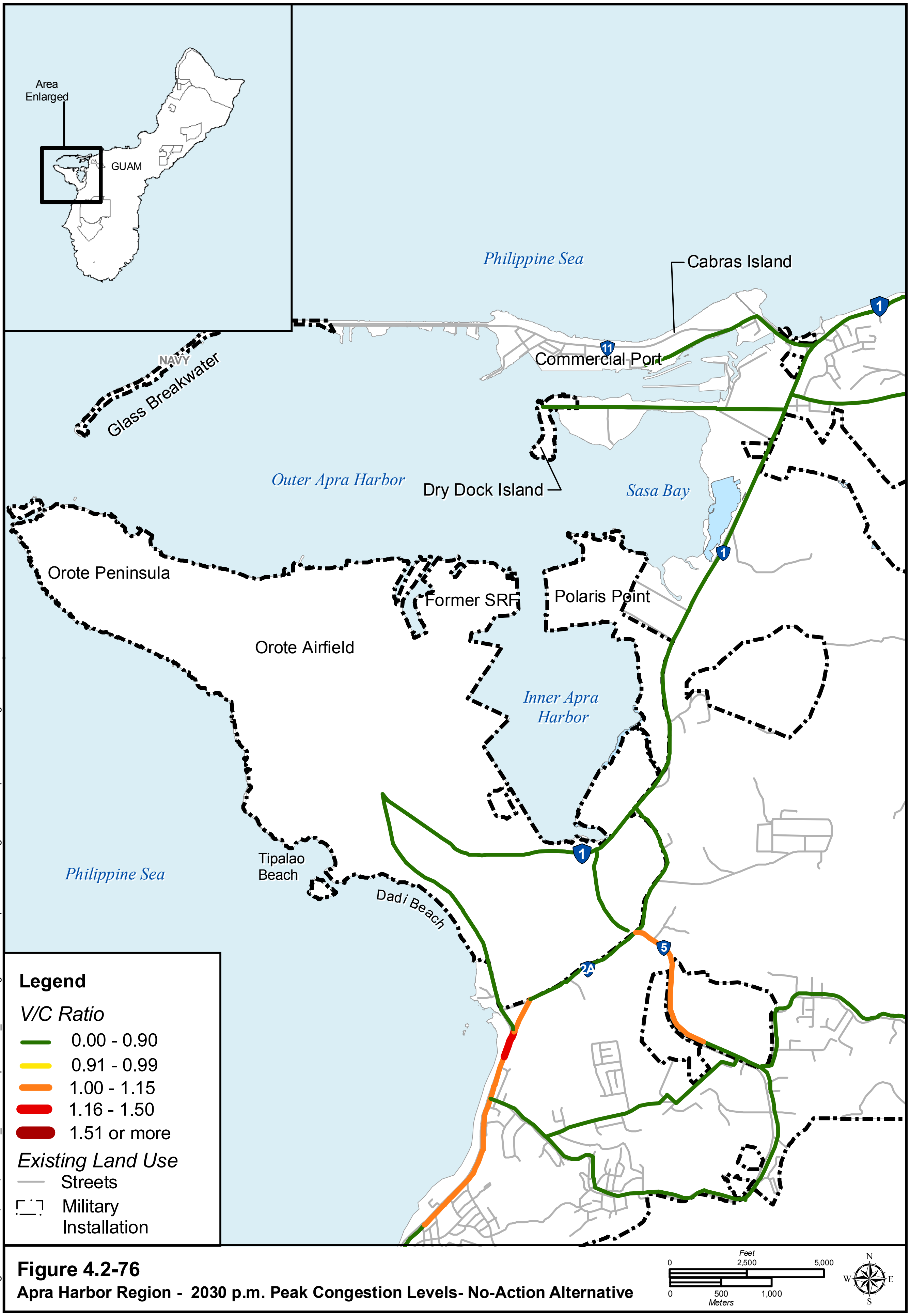


Figure 4.2-76
Apra Harbor Region - 2030 p.m. Peak Congestion Levels- No-Action Alternative

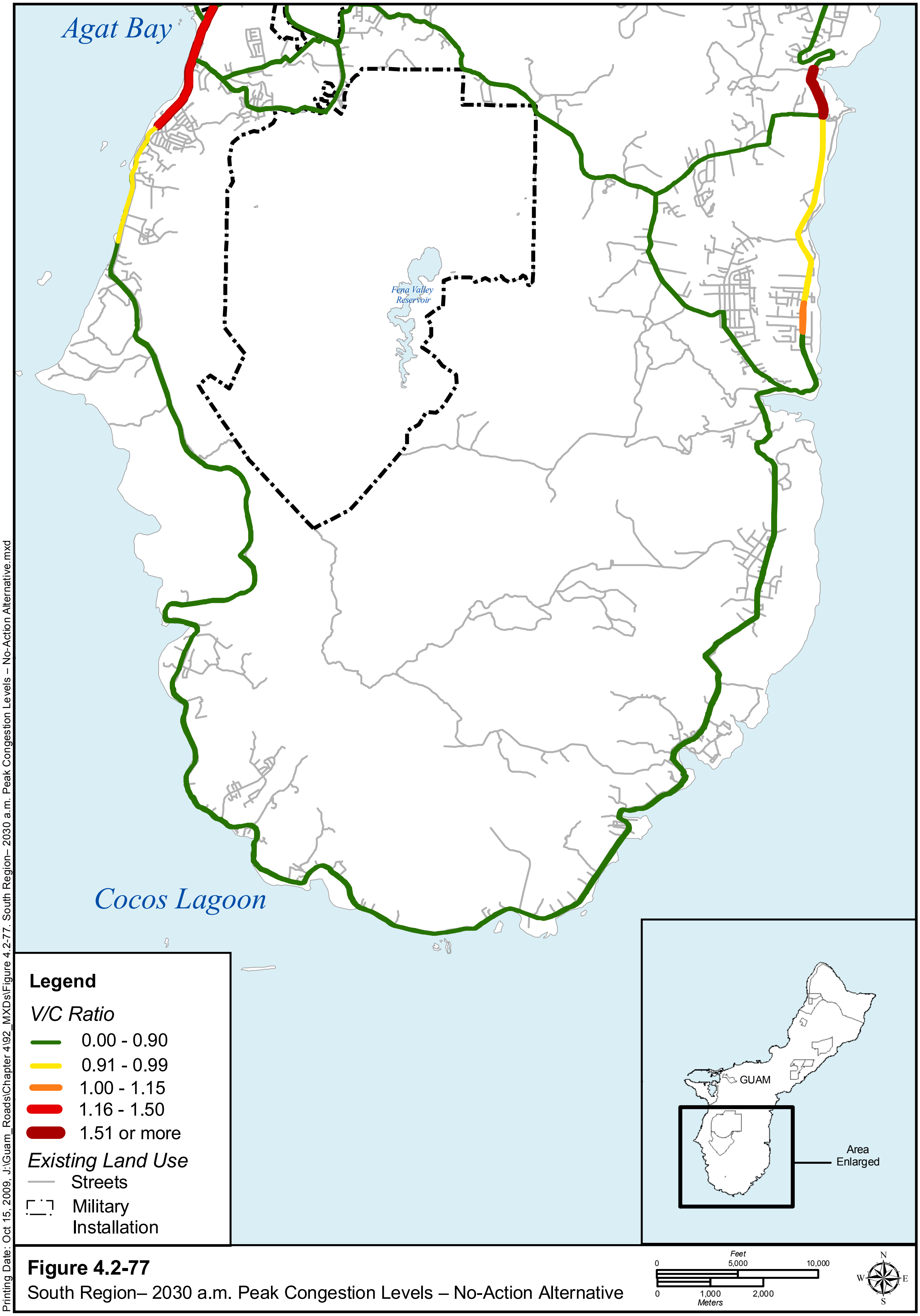


Figure 4.2-77
South Region– 2030 a.m. Peak Congestion Levels – No-Action Alternative

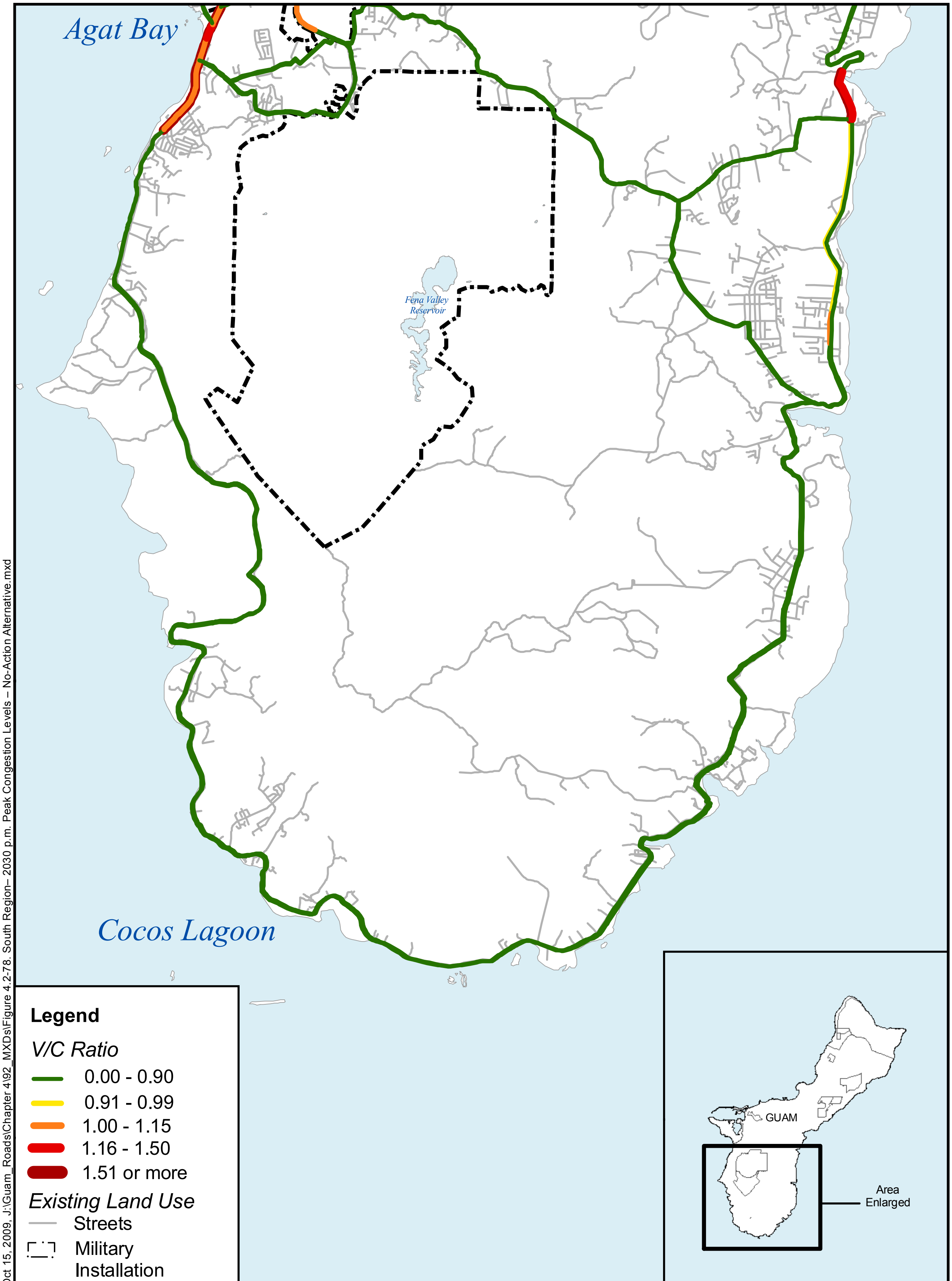


Figure 4.2-78
South Region– 2030 p.m. Peak Congestion Levels – No-Action Alternative

Printing Date: Oct 15, 2009, J:\Guam_Roads\Chapter 4\92_MXDs\Figure 4.2-78. South Region– 2030 p.m. Peak Congestion Levels – No-Action Alternative.mxd

Table 4.2-31. No-Action Alternative Future Level of Service and Delay Results

	2030			
	a.m. Peak Hour		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*				
Route 1/9	B	15.8	B	14.6
Route 1/29	F	87.6	E	60.5
Route 1/28	F	226.2	F	157.7
Route 1/26	E	75.8	F	229.8
Route 1/27	F	157.2	F	533.7
Route 1/27A	E	67.2	F	189.5
Route 1/3	F	158.4	F	306.9
Route 1/16	D	52.2	F	305.5
Route 1/14 (North San Vitores)	F	82.8	F	361.2
Route 1/14A	F	124.1	F	259.9
Route 1/10A	F	82.9	F	117.2
Route 1/14B	E	60.5	F	91.8
Route 1/14 (ITC)	F	93.3	F	212.5
Route 1/30	F	273.9	F	440.9
Route 1/8	F	107.6	F	94.1
Route 1/4	D	43.4	D	38.6
Route 1/6 (westerly)	A	7.8	B	15.6
Route 1/11	B	18.8	C	26.8
Route 1/6 (Adelup)	C	24.1	F	91.7
Route 1/Polaris Point	A	4.3	A	6.2
Route 1/2A	E	58.8	E	55.5
Route 5/2A	D	53.0	C	22.7
Route 2/12	F	83.1	C	25.4
Route 3/28	B	17.8	C	21.4
Route 4/7A	F	298.8	F	196.9
Route 4/10	F	95.5	F	115.9
Route 4/17	D	46.6	D	48.2
Route 8/33	C	31.2	F	147.3
Route 8/10	F	122.0	F	116.5
Route 10/15	D	49.7	F	101.1
Route 16/27A	C	24.3	C	26.4
Route 16/27	F	275.1	F	486.4
Route 16/10A	F	874.2	F	208.7
Route 26/25**	F	270.1	E	71.7
Unsignalized***				
Route 5/17	D	28.9	E	47.8
Route 3/3A/9	A	9.5	B	10.1
Route 4/4A	D	27.9	C	21.2
Route 7/7A	F	77.7	E	114.5
Route 15/29****	F	NA	F	NA
Route 17/4A	C	17.0	C	17.9
Route 26/15	F	134.8	F	2494.6
Route 28/27A	F	353.1	F	437.8
Military Access Points				
Route 3 - Main Cantonment/Commercial Gate	C	21.4	C	15.7
Route 3 – Main Cantonment/Residential Gate	D	32.1	C	20.7
Route 3 - South Finegayan/Residential Gate	C	22.1	F	51.4

	2030			
	a.m. Peak Hour		p.m. Peak Hour	
	LOS	Delay Seconds	LOS	Delay Seconds
Route 1 – South Andersen Main Gate/(Turner Street)	B	13.5	F	458.6
Route 16 – Navy Barrigada Residential Gate****	F	NA	F	NA
Route 15 – Barrigada Air Force/(Chada Street)	E	50.0	E	44.4
Route 5 – Naval Munitions Site/Harmon Road	A	9.7	A	9.8

Legend: ITC = International Trade Center; LOS = Level of Service; NA = Not Applicable.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection would be signalized in future no action scenario.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
****Delay exceeded maximum calculated value.

4.2.2.6 On Base Roadways Summary of Impacts

A summary of potential impacts is described in Table 4.2-32.

Table 4.2-32. Summary of Potential Impacts by Alternative for On Base Roads

Potentially Impacted Resource	*Alternative 1*	*Alternative 2**	*Alternative 3*	*Alternative 8*
North				
Andersen: Construction	LSI	LSI	LSI	LSI
Andersen: Operation	LSI	LSI	LSI	LSI
Finegayan: Construction	LSI	LSI	LSI	LSI
Finegayan: Operation	LSI	LSI	LSI	LSI
Central				
Andersen South: Construction	LSI	LSI	LSI	LSI
Andersen South: Operation	LSI	LSI	LSI	LSI
Barrigada: Construction	LSI	LSI	LSI	LSI
Barrigada: Operation	LSI	LSI	LSI	LSI
South				
Naval Base Guam: Construction	LSI	LSI	LSI	LSI
Naval Base Guam: Operation	LSI	LSI	LSI	LSI
NMS: Construction	NI	NI	NI	NI
NMS: Operation	NI	NI	NI	NI

Legend: LSI = Less Than Significant Impact; NI= No Impact; SI = Significant Impact; *Preferred Alternative.

4.2.2.7 Off Base Roadways Summary of Impacts

Table 4.2-33 shows the LOS results for all of the intersections for the following:

- 2008 Existing Conditions
- 2014 No Action
- 2014 Alternative 1
- 2014 Alternative 3
- 2014 Alternative 8
- 2030 No Action
- 2030 Alternative 1
- 2030 Alternative 3
- 2030 Alternative 8

Table 4.2-33. Comparison of the No-Action Alternative, Alternatives 1 and 2, Alternative 3, and Alternative 8

Overall Intersection Level of Service Analysis Results - Existing Conditions and Alternatives Comparison

S.NO	INTERSECTION	Existing Conditions				2014 No Action				2014 Alternative 1/2				2014 Alternative 3				2014 Alternative 8				2030 No Action				2030 Alternative 1/2				2030 Alternative 3				2030 Alternative 8			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]
1	ROUTE 1 AND ROUTE 9	C	25.8	D	46.1	B	11.6	B	11.9	C	27.6	D	39.8	C	25.9	D	38.2	C	25.8	D	38.2	B	15.8	B	14.6	C	22.5	D	52.2	C	24.4	D	53.0	C	23.3	D	53.0
2	ROUTE 1 AND ROUTE 29	F	87.4	C	24.0	D	52.2	C	32.5	F	256.2	F	128.7	F	347.0	F	278.8	F	338.4	F	192.3	F	87.6	E	60.5	E	65.5	E	67.7	F	85.3	F	90.5	E	73.2	E	67.7
3	ROUTE 1 AND ROUTE 28	C	30.5	D	40.6	F	207.3	F	120.7	F	300.8	F	301.8	F	256.0	F	275.0	F	275.4	F	252.3	F	226.2	F	157.7	F	216.8	F	104.5	F	190.5	F	130.5	F	215.5	F	115.3
4	ROUTE 1 AND ROUTE 26	C	33.8	E	58.5	C	21.0	F	84.1	F	102.0	F	278.1	F	126.1	F	279.1	F	184.6	F	258.3	E	75.8	F	229.8	E	75.8	F	166.6	F	99.4	F	209.1	F	146.9	F	250.6
5	ROUTE 1 AND ROUTE 27	E	74.6	D	51.8	F	1213.8	F	814.1	F	1830.9	F	928.8	F	1937.2	F	1013.1	F	210.8	F	427.3	F	167.2	F	533.7	F	137.4	F	274.3	F	181.1	F	289.6	F	178.8	F	229.4
6	ROUTE 1 AND ROUTE 27A	D	37.1	F	91.5	D	37.0	E	68.4	E	77.4	F	204.7	F	82.6	E	78.7	F	98.4	F	178	E	67.2	F	189.5	D	44.4	E	76.7	F	120.2	F	157.1	D	53.9	D	61.2
7	ROUTE 1 AND ROUTE 3	F	165.5	E	71.0	F	113.5	F	191.7	F	495.1	F	523.8	F	417.1	F	367.1	F	113.9	F	106.8	F	168.4	F	306.9	D	48.5	D	50.6	F	341.3	F	474.4	E	70.5	E	64.7
8	ROUTE 1 AND ROUTE 16	C	32.6	E	58.6	C	27.7	F	143.7	F	126.4	F	306.2	F	277.0	F	386.7	F	180.3	F	144.6	D	52.2	F	365.5	E	65.3	F	87.5	F	232.2	F	340.0	E	57.0	F	180.9
9	ROUTE 1 AND ROUTE 14 (North San Vitoris)	C	39.1	F	92.9	F	102.8	D	63.7	F	176.5	F	134.8	F	167.5	F	96.2	F	178.9	F	146.8	F	82.8	F	361.2	E	68.0	F	82.0	E	66.6	E	71.5	E	69.6	E	77.6
10	ROUTE 1 AND ROUTE 14A	D	52.1	E	69.6	F	206.9	F	158.4	F	313.6	F	326.8	F	307.3	F	338.1	F	313.4	F	329.3	F	124.1	F	289.9	F	112.2	F	131.5	E	71.0	F	112.3	E	74.2	F	126.0
11	ROUTE 1 AND ROUTE 10A	F	96.2	F	81.9	F	99.6	F	207.8	F	241.5	F	376.7	F	188.1	F	199.7	F	182.1	F	221.3	F	82.9	F	117.2	F	118.1	F	102.0	F	129.6	F	193.6	F	125.1	F	186.0
12	ROUTE 1 AND ROUTE 14B	D	43.3	C	30.6	E	77.6	D	44.3	F	188.4	F	159.1	F	149.4	F	144.0	F	153.4	F	146.2	E	60.5	F	91.8	F	83.9	E	78.2	E	79.8	E	78.5	F	90.4	E	79.5
13	ROUTE 1 AND ROUTE 14 (ITC)	D	51.4	F	116.2	E	70.3	F	171.3	F	204.7	F	428.6	F	127.0	F	294.6	F	158.9	F	318.3	F	93.3	F	212.5	F	182.5	F	275.1	F	176.9	F	315.8	F	113.6	F	247.2
14	ROUTE 1 AND ROUTE 30	E	67.8	D	51.5	F	371.7	F	252.8	F	488.1	F	568.6	F	348.3	F	466.2	F	365	F	338.6	F	273.9	F	440.9	F	154.7	F	257.2	F	148.5	F	253.3	F	146.3	F	285.3
15	ROUTE 1 AND ROUTE 8	B	19.3	C	34.1	C	29.0	D	46.4	F	216.2	F	143.5	F	162.2	F	164.3	F	280.1	F	199.7	F	107.6	F	94.1	F	97.6	F	127.5	F	162.7	F	166.5	E	77.8	F	180.4
16	ROUTE 1 AND ROUTE 4	C	23.2	C	20.4	C	27.1	C	30.1	C	24.3	D	44.6	C	24.8	D	40.1	C	26.4	D	36	D	43.4	D	38.6	C	32.4	F	140.2	C	30.5	F	107.2	C	33.6	D	35.8
17	ROUTE 1 AND ROUTE 6 (Adelup)	B	19.9	E	59.9	C	20.9	D	39.7	D	36.2	F	108.9	C	34.9	F	110.7	C	34.5	F	114	C	24.1	F	91.7	D	40.6	E	61.8	C	29.7	F	988.7	D	38.1	D	44.9
18	ROUTE 1 AND ROUTE 11	B	14.5	C	22.2	B	16.6	B	19.9	C	25.4	E	67.1	C	25.4	E	63.1	C	25.3	E	67.7	B	18.8	C	25.8	C	29.7	D	43.5	B	18.4	D	40.1	B	14.3	D	43.2
19	ROUTE 1 AND ROUTE 6 (Westerly)	B	10.0	C	20.1	B	10.5	B	12.8	D	53.2	C	23.6	D	50.7	B	17.1	D	49.5	C	24.1	A	7.8	B	15.6	B	18.4	C	22.0	C	27.4	C	20.0	B	10.4	C	22.0
20	ROUTE 1 AND POLARIS POINT	C	2.1	A	3.9	A	4.3	A	6.5	A	3.8	A	4.3	A	3.2	A	2.4	A	4.5	A	5.5	A	4.3	A	6.2	A	8.2	A	7.4	A	6.8	A	7.4	A	6.8	A	7.5
21	ROUTE 1 AND ROUTE 2A	B	18.9	C	29.1	F	92.1	E	70.5	F	94.1	F	82.1	F	89.7	E	68.3	F	89.4	E	59.8	E	58.8	E	66.5	E	66.8	E	67.2	E	67.5	D	54.1	E	67.5	E	67.5
22	ROUTE 5 AND ROUTE 2A	D	37.6	C	33.9	D	44.5	C	20.9	E	79.4	D	36.9	E	69.4	C	21.5	E	69.6	C	22.9	D	53.0	C	22.7	F	96.3	C	26.2	E	65.1	C	22.8	E	79.9	C	25.9
23	ROUTE 5 AND ROUTE 17	B	12.1*	B	11.0*	C	23.7*	C	15.9*	C	13.1*	C	29.2*	B	13.3*	C	18.3*	B	13.1*	C	17.1*	D	28.9*	E	47.8*	F	56.8*	F	149.6*	E	42.5*	F	123.5*	B	14.5*	E	42.4*
24	ROUTE 2 AND ROUTE 12	C	26.3	B	19.2	E	65.4	B	17.6	F	135.0	C	26.0	C	29.0	C	25.5	C	31.6	C	24.9	F	80.1	C	25.4	C	27.8	C	27.1	C	30.6	C	24.9	C	30.7	C	27.0
25	ROUTE 3 AND ROUTE 3A	B	10.1*	A	9.6*	B	11.9*	A	9.7*	C	19.7*	F	74.3	F	142.7*	F	565.9*	F	179.0*	F	561.5*	A	9.5*	B	10.1*	B	11.6*	F	79*	E	47.2*	F	100.7*	D	27.0*	F	140.7*
26	ROUTE 3 AND ROUTE 28	C	26.8	B	17.4	C	20.8	B	10.9	F	85.1	F	227.1	F	96.2	F	92.8	E	57.9	F	131.1	B	17.8	C	21.4	C	26.9	D	36.9	F	90.2	D	59.9	C	33.2	D	47.5
27	ROUTE 4 AND ROUTE 7A	C	23.2	E	57.8	F	106.0	F	181.3	F	270.5	F	989.8	F	274.6	F	1007.5	F	273.8	F	841.8	F	298.8	F	196.9	F	607.3	F	534.1	F	586.7	F	339.2	F	372.9	F	664.2
28	ROUTE 4 AND ROUTE 10	E	64.5	E	59.5	E	59.7	E	79.2	F	190.2	F	165.1	F	164.5	E	61.4	F	160.5	F	82.9	F	95.5	F	115.9	F	159.5	E	65.1	F	159.7	E	65.9	F	198.7	E	71.0
29	ROUTE 4 AND ROUTE 17	C	24.9	C	21.2	C	25.8	C	24.1	C	35.0	D	42.6	C	34.5	D	39.4	C	33.9	C	34.3	D	46.6	D	48.2	D	39.6	E	57.7	D	39.6	E	55.9	D	40.1	E	56.2
30	ROUTE 4 AND ROUTE 4A	C	16.9*	B	11.4*	C	16.7*	C	18.2*	C	22.9*	C	17.1*	C	21.7*	B	17.0*	C	22.3*	C	17.2*	D	27.9*	C	21.2*	E	49.7*	F	424.2*	E	44.3*	C	21.9*	E	47.4*	C	24.0*
31	ROUTE 7 AND ROUTE 7A	C	18.1*	C	19.9*	F	225.7*	F	127.7*	F	167.7*	F	225.7*	F	173.9*	F	280.8*	F	174.7*	F	290.0*	F	77.7*	E	114.5*	D	29.2*	F	105.1*	D	28.3*	F	87.7*	F	174.7*	F	300.8*
32	ROUTE 8 AND ROUTE 33	F	91.6	F	162.2	D	38.4	F	91.5	E	64.8	F	145.2	C	32.6	D	46.2	D	38.7	E	72.1	C	31.2	F	147.3	D	64.6	F	91.7	D	52.9	C	29.1	D	46.5	E	77.5
33	ROUTE 8 AND ROUTE 10	F	140.1	E	67.5	E	58.9	F	105.5	F	278.7	F	336.0	F	227.5	F	317.5	F	361.4	F	474.5	F	172.0	F	116.5	F	96.9	F	172.7	F	137.9	F	171.8	F	177.3	F	218.4
34	ROUTE 10 AND ROUTE 15	F	80.8	E	56.3	E	79.3	D	53.9	F	166.4	F	144.7	F	178.5	F	139.6	F	280.5	F	235.5	D	49.7	F	101.1	F	196.9	F	152.3	F	197.3	F	147.2	F	197.8	F	173.1
35	ROUTE 15 AND ROUTE 29	D	30.7*	C	18.3*	F	142.7*	F	220.0*	F	NA*	F	830.9*	C	27.0	C	22.8	C	22.9	C	24.1	F	Error	F	633.5*	C	27.7	C	25.4	F	161.4	C	26.2	C	32.9	C	30.0
36	ROUTE 16 AND ROUTE 27A	C	34.4	C	25.9	C	25.1	B	16.0	C	26.3	D	61.9	F	126.0	F	175.8	C	28.9	E	78	C	24.3	C	26.4	C	27.4	C	34.2	D	44.9	F	90.6	C	31.4	D	35.8
37	ROUTE 16 AND ROUTE 27	F	112.4	F	89.4	F	207.6	F	303.1	F	389.3	F	601.5	F	534.1	F	685.7	F	469.6	F	887.3	F	278.1	F	486.4	F	348.0	F	288.7	F	465.3	F	470.0	F	361.1	F	336.6
38	ROUTE 16 AND ROUTE 10A	F	125.4	F	89.3	F	540.8	F	674.4	F	280.1	F	566.1	F	232.4	F	149.5	F	656.5	F	494.6	F	874.2	F	266.7	F	123.1	F	123.5	F	210.3	F	892.7	F	582.9	F	489.7
39	ROUTE 17 AND ROUTE 4A	B	14.0*	B	11.4*	C	15.9*	C	16.6*	B	12.9*	B	14.0*	B	13.2*	B	14.0*	B	13.0*	B	14.0*	C	17.0*	C	17.9*	B	13.6*	C	18.7*	C	16.5*	C	18.5*	C	16.1*	C	18.6*
40	ROUTE 26 AND ROUTE 25	F	81.5*	F	400.4*	C	23.9	C	27.8	F	94.9	E	70.1	F	166.5	D	40.1	F	116.2	D	42.4	F	270.1	E	71.7	C	31.2	D	41.0	F	85.4	E	62.3	F	113.1	F	119.3
41	ROUTE 26 AND ROUTE 15	F	202.4*	E	39.5*	E	40.2*	E	46.2*	F	2554.1*	F	3440.9*	F	2444.8*	F	2416.0*	D	45	C	24.1	F	104.8*	F	2494.0*	C	27.9	C	32.1	C	30.2	C	26.4	F	184.9	F	169.2
42	ROUTE 28 AND ROUTE 27A	F	182.9*	E	37.4*	F	190.1*	F	237.3*	C	31.8	F	402.8	D	38.5	E	60.5	C	47.4	F	89.4	F	353.1*	F	437.8*	D	36.6	D	36.6	D	41.3	E	65.2	C	31.3	E	69.6
	Access Points - NCTS Finegayan					NOT APPLICABLE, DESIGN AND EVALUATION OF ACCESS POINTS COMPLETED USING 2030 TIME HORIZON																															
1	ROUTE 3 AND NORTH (COMMERCIAL) GATE**	C	21.4	C	15.7																	N/A	N/A	N/A	N/A	D	12.5	C	20.3	F	91.6	D	39.9	D	10.4	C	30.4
2	ROUTE 3 AND SOUTH (MAIN) GATE**	D	32.1	C	20.7																	N/A	N/A	N/A	N/A	C	33.6	E	58.6	D	61.6	F	158.9	D	41.0	E	56.7
	Access Points - South Finegayan																																				
3	ROUTE 3/CONTROL TREE DRIVE (RESIDENTIAL) GATE	C	22.1	F	51.4																	F	122.3*	F	74.2*	C	26.7	B	18.5	F	114.6	D	50.1	C	31.1	B	15.0
	Access Points - AAFB																																				
5	ROUTE 3/AAFB NORTH GATE**	N/A	N/A	N/A	N/A																	E	39.8*	D	26.1*	F	Error*	F	Error*	F	1831.0*	F	6081.1*	F	1831.0*	F	Error*
	Access Points - South Anderson																																				
6	ROUTE 1/TURNER STREET (MAIN GATE)	B	11.5*	D	34.9*																	B	13.5*	F	408.8*	C	32.4	E	70.1	C	32.4	E	79.5	C	32.4	E	70.8
7	ROUTE 15/ROAD 1.36 mi e/o ROUTE 26 (SECOND GATE)**	N/A	N/A	N/A	N/A																	N/A	N/A	N/A	N/A	C	22.1*	C	22.8*	C	22.1*	C	21.1*	C	22.1*	C	22.6*
	Navy Barrigada																																				
8	ROUTE 16 AND SABANA BARRIGADA	F	75.5*	F	42.4*																	F	Error*	F	Error*	N/A	N/A	N/A	N/A	D	37.1	F	84.5	N/A	N/A	N/A	N/A
9	ROUTE 8/BARRIGADA CONNECTOR**	N/A	N/A	N/A	N/A																	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Barrigada AF																																				
10	ROUTE 15 AND CHADA STREET	E	37.4*	C	18.2*																	E	50.0*	E	44.4*	N/A	N/A	N/A	N/A	E	64.4	C	25.9	D	48.4	D	43.3
	Naval Ordnance Annex																																				
11	ROUTE 5 AND HARMON ROAD	A	8.8*	B	10.2*																	A	9.7*	A	9.8*	A	9.6*	A	10.8*	A	9.8*	A	10.6*	A	9.8*	A	10.6*

[1] Level of Service [2] Control Delay in Seconds Per Vehicle

NOTES: Signalized intersection LOS based on average delay for the overall intersection
*Unsignalized intersection LOS based on approach delay on STOP-controlled approach
**The intersections have not built in existing condition
Error = Delay exceeded maximum calculated value
Indicates LOS F

Source: Parsons Brinckerhoff

All of the LOS F listings are shown in red text. There is a considerable difference between the 2008 existing conditions and the future build conditions in both 2014 and 2030. Also important to note is the results for Alternative 3, which indicate worse intersection traffic conditions than Alternatives 1, 2, and 8. Table 4.2-34 lists the number of intersections for each alternative indicating LOS F in at least one peak hour and the number indicating LOS F in both the a.m. and p.m. peak hours.

Table 4.2-34. Comparison of Alternatives 1 and 2, Alternative 3, and Alternative 8

	No-Action Alternative 2014	*Alternatives 1 and 2 2014*	*Alternative 3 2014*	*Alternative 8 2014*	*No-Action Alternative 2030*	*Alternatives 1 and 2 2030*	*Alternative 3 2030*	*Alternative 8 2030*
LOS F in at least one peak hour	17 intersections	30 intersections	27 intersections	26 intersections	24 intersections 3 access points	22 intersections 1 access point	24 intersections 5 access points	18 intersections 1 access point
LOS F in both peak hours	12 intersections	24 intersections	23 intersections	22 intersections	17 intersections 1 access point	13 intersections 1 access point	16 intersections 1 access point	14 intersections 1 access point

Legend: LOS = Level of Service.

In both 2014 and 2030, Alternative 3 has slightly more intersections with LOS F, but the amount of delay at those intersections and other intersections is higher. For example, in 2030, the delay for the Route 16/10A intersection is 123.5 seconds in the p.m. for Alternative 1, 692.7 seconds in the p.m. for Alternative 3, and 488.7 seconds in the p.m. for Alternative 8. The comparisons in delay between alternatives can also be found in Table 4.2-33.

Table 4.2-35 summarizes the potential impacts of each action alternative and the no-action alternative. In general, the LOS are comparable or slightly better with the proposed roadway improvements than in the no-action alternative. Roadway capacity is generally better for all of the alternatives compared to the no-action alternative. The exceptions to this are Alternative 3 in the Central Region, which has more significant impacts than the no-action alternative. In addition, the most noticeable difference is in the north, where all alternatives appear to be more congested than the no-action alternative. In terms of intersection capacity, the results are more consistent than roadway capacity.

Table 4.2-35. Summary of Potential Impacts by Alternative on Roadway and Intersection Capacity**

Potentially Impacted Resource	*Alternative 1*	*Alternative 2**	*Alternative 3*	*Alternative 8*
Roadway Capacity				
North	SI	SI	SI	SI
Central	LSI	LSI	SI	LSI
Apra Harbor	LSI	LSI	LSI	LSI
South	LSI	LSI	LSI	LSI
Intersection Capacity				
North	LSI	LSI	LSI	LSI
Central	LSI	LSI	LSI	LSI
Apra Harbor	LSI	LSI	LSI	LSI
South	LSI	LSI	LSI	LSI

Legend: LSI = Less Than Significant Impact; SI = Significant Impact; *Preferred Alternative.
**Assumes all off base roadway widening and intersection improvement projects are constructed.

4.2.2.8 Off Base Roadways Summary of Proposed Mitigation Measures

Table 4.2-36 summarizes the proposed mitigation measures for impacts to traffic during construction and operation of off base roadways.

Table 4.2-36. Summary of Off Base Roadway Projects Proposed Mitigation Measures

Phase	*Mitigation Measure*
Construction	Traffic Management Plan to include the following: • Travel demand management • Encourage moped and motorcycle use • Develop transportation demand measures to discourage single-occupant vehicle use • Stagger work hours • Provide corporate shuttles for local circulation • Better delivery system for purchases • Flextime – compressed work weeks • Promote trip reduction planning • Traffic management to follow the Manual on Uniform Traffic Control Devices • Phase construction to allow two lanes of traffic to remain open whenever possible • Reduce traffic to one lane if two lanes of traffic are not permissible • Clearly sign detour routes when closing all lanes to traffic • Implement appropriate measures to maintain access to businesses • Notify business owners of construction activities and duration of road closure well in advance • Keep pedestrian routes open and clear of debris • Notify all emergency services of construction activities and provide relative detour routes so as not to affect response times
Operation	Traffic Management Plan to include the following: • Travel demand management • Encourage moped and motorcycle use • Develop transportation demand measures to discourage single-occupant vehicle use • Stagger work hours • Provide corporate shuttles for local circulation • Better delivery system for purchases • Flextime – compressed work weeks • Promote trip reduction planning • Traffic management to follow the Manual on Uniform Traffic Control Devices

Implementation of force flow and adaptive program management mitigation measures could further reduce impacts to roadways by lowering peak population levels during the construction period. As described in Volume 7, Chapter 2, Sections 2.3 and 2.4, the implementation of force flow and adaptive program management mitigation measures would result in a delay in force flow population changes and a slower construction tempo, respectively. The notional force flow mitigation scenario would result in a more gradual increase in the number of direct DoD personnel and dependents that move to Guam as well as the associated indirect employment and induced population growth over a 4-year period (2014 through 2017) instead of the planned total relocation of active duty military personnel and their dependents by the year 2014. Instead of 10,552 active duty Marine Corps personnel on Guam by 2014, the notional force flow mitigation scenario would result in the annual addition of 2,468 in 2014, 4,265 in 2015, 6,959 in 2016, and 10,552 in 2017 active duty Marine Corps personnel from 2014 through 2017. The force flow mitigation scenario presumes the same construction period as the Preferred Alternative.

While the notional force flow mitigation scenario would extend the relocation of military personnel and dependents over a 4-year period, the adaptive program management approach would modify the construction sequence to reduce the workforce population over a longer construction period (through 2020) with 2014 as the peak construction year. This longer construction period would result in fewer construction workers required each year.

DoD may implement the force flow mitigation measure as well as adaptive program management of construction sequencing to reduce work force impacts. As discussed in Volume 7, specific mitigation measures identified in the Record of Decision would be monitored and a Construction Management Council will be formed to monitor impacts and advise DoD on the tempo and sequencing of construction projects over the course of the project. In this regard, the specific population reductions associated with workforce may vary depending on the monitoring of impacts at various locations.

Based on population projections shown in Volume 7, Chapter 2, Table 2.3-1 (no mitigation) and Table 2.3-2 (force flow), the notional force flow scenario could represent a population reduction of approximately 27%[3] in the year 2014. A corresponding reduction in traffic congestion during this year would be expected under this scenario, although the specific reduction would be dependent on variables such as the sequence of construction projects, location of worker housing, number of drivers or vehicles per household, and status of roadway improvements completed by this time. Force flow reductions would result in dispersal of incremental increases in traffic over a 3-year period (2014 through 2016) and avoidance of the considerable 1-year increase in population that would occur between 2013 and 2014. By the year 2017, traffic congestion would be the same as estimated for the Preferred Alternative. Table 4.2-37 summarizes the annual percent reduction in population for the notional force flow scenario and adaptive program management.

3 Under the notional force flow scenario, there would be an estimated population increase of 57,593 persons on Guam in the year 2014, as compared to estimated population increase of 79,178 persons for the Preferred Alternative. This represents approximately 27% fewer persons than the Preferred Alternative.

Table 4.2-37. Comparison of Estimated Population Decreases on Guam from Off-Island (Direct, Indirect and Induced) from Force Flow Reduction and Adaptive Program Management

	2010	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Preferred Alternative	11,038	27,835	44,301	52,575	79,178	64,918	41,919	33,431	33,431	33,608	33,608
Notional Force Flow Scenario	1,742	14,580	25,262	50,492	57,593	59,173	52,230	33,431	33,431	33,608	33,608
Approximate Decrease (%)	84	48	43	4	27	9	None	None	None	None	None
Notional Adaptive Program Management	1,742	14,580	25,262	38,662	41,178	40,490	41,194	41,139	40,366	37,357	33,608
Approximate Decrease (%)	84	48	43	26	48	38	2	(increase)	(increase)	None	None
Approximate Decrease from Implementation of Force Flow Reduction and Adaptive program management (%) [a]	84	48	43	15	38	20	2	(increase)	(increase)	None	None

Legend: Gray-Shading. Based on updates (May 2010) to programmed construction budget for years 2010 through 2013, population numbers decreased with related decreases in subsequent years. This decrease is unrelated to the two mitigation measures, but provides a more realistic scenario of early construction population.
[a] Assumes an average reduction in population based on the estimated population increase shown in Tables 2.3-1 through 2.3-3 (Volume 7).

As shown in Table 4.2-37, annual decreases in population would result from force flow reduction and adaptive program management strategies. Given the population decreases, it is conceivable that corresponding reductions in traffic congestion could occur in 2014. It is expected that fewer vehicles on the roads would result in fewer intersections operating at LOS F and potential decrease in the duration of delays at many of these intersections in 2014. The year 2014 represents the year of the greatest potential reduction in traffic based on projected population increases, with reductions diminishing through 2018. Traffic congestion in the year 2030 are expected to be the same as the Preferred Alternative since population increases would be no different with implementation of force flow reductions and adaptive program management.

The potential decrease in the number of intersections operating at LOS F would be determined during the adaptive program management process of identifying problem areas during monitoring of impacts. Modifications to the construction tempo and sequencing would be made to directly influence work force levels. It is expected that force flow reductions and adaptive program management strategies would be most effective in reducing traffic impacts in the North Region due to potential concentration of population in the vicinity of Finegayan and the existing level of congestion on roadways in this area. It is expected that adaptive program management strategies to reduce traffic impacts would initiate as early as 2011 and be subject to the outlay of projects and roadway improvements scheduled at that time.

In summary, these two mitigation measures would be effective as follows:

- Force flow reductions could effectively reduce traffic congestion as a result of the 27% decrease in population in 2014 and 9% decrease in 2016. This mitigation could reduce traffic impacts over three of the seven construction years, with no effect on 2030 traffic.
- Adaptive program management strategies that slow the tempo of construction would increase the number of construction years from seven to nine. This mitigation could effectively reduce traffic congestion as a result of the decrease in population between 2011 and 2016. This mitigation could reduce traffic impacts over the construction years, with no effect on 2030 traffic.
- When force flow reductions are combined with adaptive program management strategies, traffic congestion can be reduced as a result of population decreases between 2011 and 2018. This mitigation could reduce traffic impacts over the construction years, with no effect on 2030 traffic.
- With implementation of force flow reductions and adaptive program management strategies, traffic congestion would not be affected as a result of population in 2019 and thereafter.
- The level of traffic congestion can be reduced over most of the construction period; however, the resultant level of congestion will continue to be greater than existing conditions as represented by the no-action alternative.

4.2.3 Additional Limited Traffic Analysis

The DoD, Federal Highway Administration, and Government of Guam continue to work cooperatively to develop a funding plan for the off base roadway and intersection capacity projects. As of February 2010, a limited number of off base projects had been identified as having funding or reasonable expectation of being funded. Additional traffic analysis was completed for the 17 roadways and 42 intersections, assuming that only a limited number of projects would be funded. These projects are either Defense Access Road (DAR)-certified or determined to be DAR-eligible at this time (see Volume 1, Chapter 1, Section 1.1.4 Project Location, Funding, and Setting). The evaluation of the remaining road projects for DAR eligibility and certification is continuing. The additional analysis that was performed for Alternative 2 (the preferred alternative) included only the following off base roadway and intersection projects:

- Route 3, Route 28 to Route 9; widen to five lanes
- Route 9, Route 3 to Andersen AFB North gate; widen to five lanes
- Route 9, Andersen AFB to Route 1; widen to three lanes
- Route 1/3 Intersection
- Route 1/8 Intersection
- Route 1/11 Intersection
- Route 3/3A Intersection
- Military Access points as described for preferred alternative (Alternative 2)

The purpose of analyzing the impacts of only these roadway improvements is to determine the impact of the housing and additional military base traffic on Guam roadways with only a select number of roadway improvement projects. Since the majority of the relocated military population will be residing in the Finegayan area, the roadways adjacent to this area, Routes 3 and 9, will receive the majority of the new traffic. The majority of the roadway projects that are expected to be funded are in the Finegayan area.

The methodology for assessing traffic impacts is the same as described in Section 4.2.1.1. Impacts for both 2014 and 2030 were analyzed in the models. The results are reported for all of the roadways included in the full Alternative 2 analysis; however, only the roadway improvements listed above were included in the modeling of the impacts.

North

Roadway Projects

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 2 with limited improvement projects can be found in Table 4.2-38. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island. These changes are most noticeable on roadways with direct access to the Main Cantonment area located on Route 3.

Figure 4.2-79 through Figure 4.2-83 show existing levels of traffic congestion in the North Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91–0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. The roads serving the DoD lands are expected to be the most congested. During both the morning and afternoon peaks of 2014 and 2030, the roads with the greatest congestion levels in the North Region are Routes 3 and 28, south of the Main Gate. Route 28 has the highest level of congestion (v/c ratio greater than 1.50). They both have an LOS F in both the a.m. and p.m. peak hours, which is considered severely congested. The results of the future operational analysis are shown in Table 4.2-38 for both the 2014 a.m. and p.m. and 2030 a.m. and p.m. conditions.

For most of the intersections, the LOS in both 2014 and 2030 was below the minimum acceptable LOS E. It is important to note that in many cases, the proposed intersection improvements do not improve the LOS level; however, they do decrease the amount of delay a driver would experience at an intersection. As stated previously, each LOS has a range of seconds of delay. Anything greater than 80.0 seconds of delay at signalized intersections or 50.0 seconds of delay at unsignalized intersections is considered LOS F. There is no upper end for delay for LOS F, which is why an intersection could greatly decrease in the amount of delay while still being LOS F. For the North Region, there are two intersections, Route 1/29 and Route 3/28, for which the traffic is worse in 2014 than in 2030 in both the a.m. and p.m. peak hours. This can be attributed to an increase in traffic associated with construction activity and military personnel in 2014.

As shown in Table 4.2-39, there are four intersections and one access point with LOS F for at least one peak hour, which is considered unacceptable; and one of the intersections, Route 15/29 is operating at LOS F in both the a.m. and p.m. for 2014 and 2030. The worst intersection in the North Region is Route 15/29, which is operating at LOS F with heavy delays in the a.m. and p.m. peak hours in 2014.

Table 4.2-38. Alternative 2 (with Limited Projects) Future ADT and Volume to Capacity Ratio Summary – North Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 24,000 to 37,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not congested.	Route 1 ranges from 23,000 to 37,000 vpd. Traffic decreases as Route 1 approaches Andersen AFB.	The v/c ratio in both the a.m. and p.m. peak is 0.00-0.90, which indicates the roadway is not congested.
Route 3	Route 3 ranges from 23,000 to 66,000 vpd. Traffic decreases north of the intersection with Route 28.	The portion of Route 3 south of the Residential Gate, as well as between Route 28 and the Main Gate, have a v/c ratio of 1.00-1.15 in the a.m. and p.m. peak. This portion of the roadway is considered congested. North of the Commercial Gate, Route 3 has a v/c ratio of 0.00-0.90 during peak hours, which indicates that this part of the roadway is not congested.	Route 3 ranges from 20,000 to 37,000 vpd. Traffic decreases north of the intersection with Route 28.	The portion of Route 3 south of the Residential Gate has a v/c ratio of 1.0-1.15 in the a.m. peak and 1.16-1.5 during the p.m. peak. Route 3 north of the Residential Gate has a v/c ratio of 0.00-0.9 during peak hours. The roadway is considered congested.
Route 9	Route 9 ranges from 11,000 to 20,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	Route 9 has a v/c ratio of 0.00-0.90 in both the a.m. and p.m. peak hours. The roadway is not considered congested.	Route 9 ranges from 10,000 to 16,000 vpd. There is a decrease in traffic east of the two residential developments on Route 9.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not congested.
Route 15	Route 15 has 7,300 vpd in the North.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not congested.	Route 15 has 7,600 vpd in the North.	The v/c ratio in both the a.m. and p.m. peak conditions is 0.00-0.90, which indicates that the roadway is not congested.
Route 28	Route 28 ranges from 21,000 to 22,000 vpd. Traffic increases closer to the intersection with Route 1.	Route 28 has a v/c ratio greater than 1.51 in both the a.m. and p.m. peak hours, which indicates the roadway is congested.	Route 28 ranges from 16,000 to 17,000 vpd. Traffic increases closer to the intersection with Route 1.	In the a.m. peak, Route 28 has a v/c ratio greater than 1.16. The roadway is considered congested during peak hours.

Legend: ADT = average daily traffic; AFB = Air Force Base; v/c = volume to capacity; vpd = vehicles per day.

Table 4.2-39. Alternative 2 (with Limited Roadway Projects) Future Level of Service and Delay Results – North Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/9	C	27.6	D	39.8	C	22.5	D	52.2
Route 1/29	F	181.2	F	136.4	E	65.5	E	67.7
Route 3/28	F	104.4	F	235.9	C	33.9	F	226.5
Route 15/29**	F	****	F	827.8	F	****	F	****
Unsignalized***								
Route 3/3A/9	B	12.7	C	22.5	B	11.6	F	79.0
Military Access Points*								
Route 3 - Main Cantonment/Commercial Gate**	—	—	—	—	B	29.7	E	60.2
Route 3 - Main Cantonment/Main Gate**	—	—	—	—	C	23.1	E	67.2
Route 3 - South Finegayan/Residential Gate**	—	—	—	—	C	32.7	C	26.5
Route 9 – Andersen AFB/ Andersen AFB North Gate***	—	—	—	—	F	1,029.7	F	9,999.0

Legend: AFB = Air Force Base; LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
****Delay exceeded maximum calculated value.

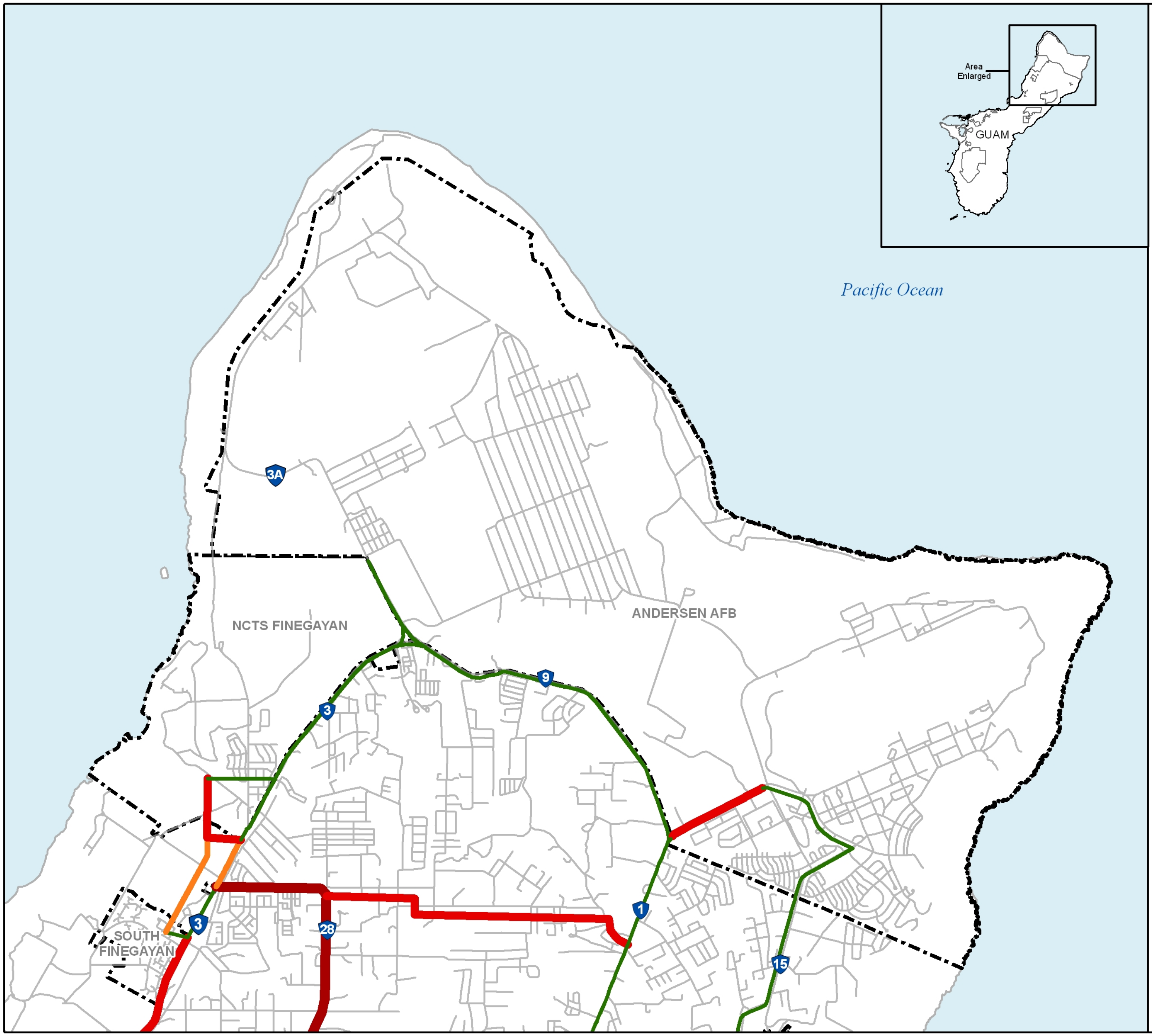


Figure 4.2-79
North Region–
2014 a.m. Peak
Congestion Levels –
Alternative 2
Limited Roadway
Improvements

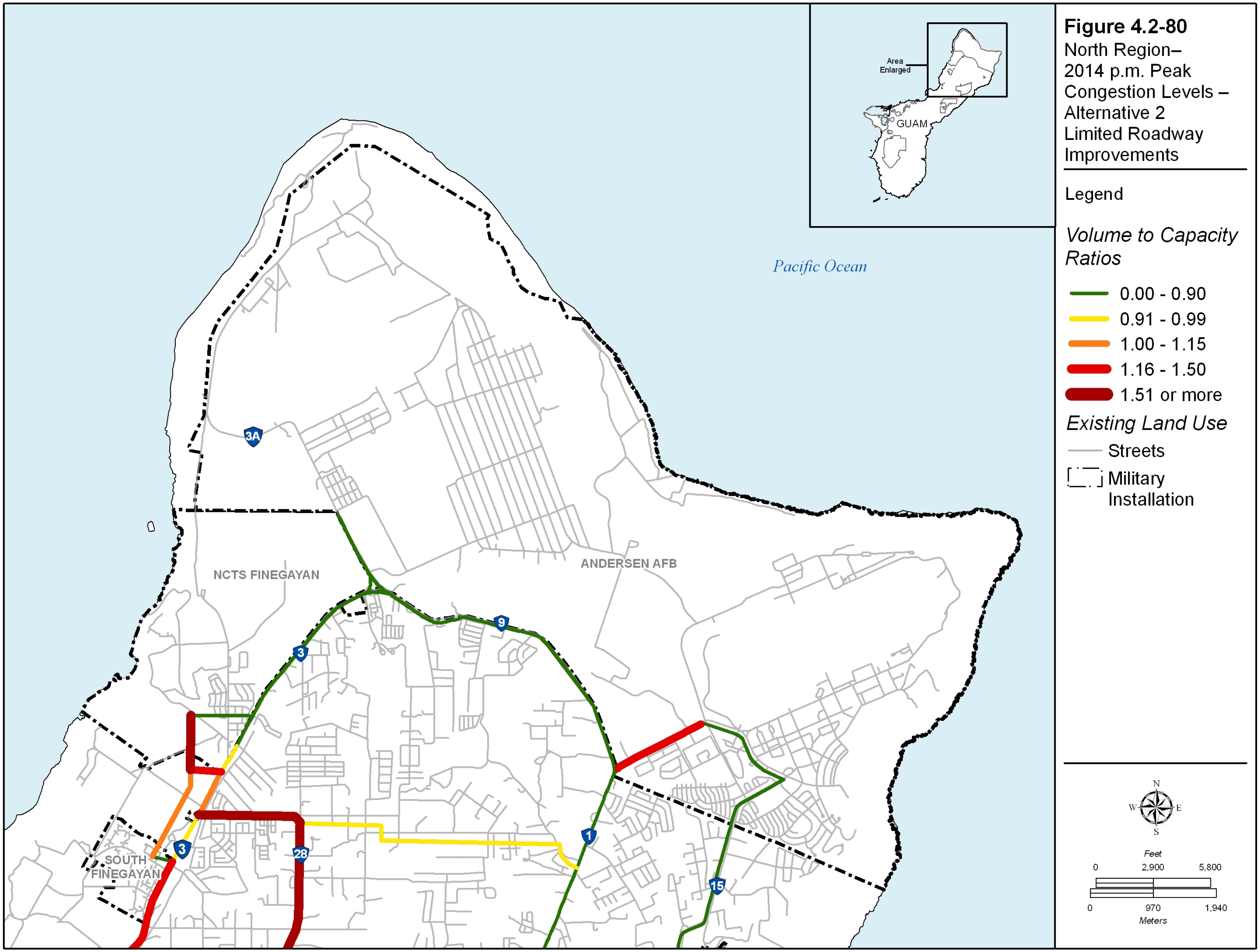


Figure 4.2-80
North Region–
2014 p.m. Peak
Congestion Levels –
Alternative 2
Limited Roadway
Improvements
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
Area Enlarged
GUAM
Pacific Ocean
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
9
3
1
28
15
N
W
E
S
Feet
0
2,900
5,800
0
970
1,940
Meters

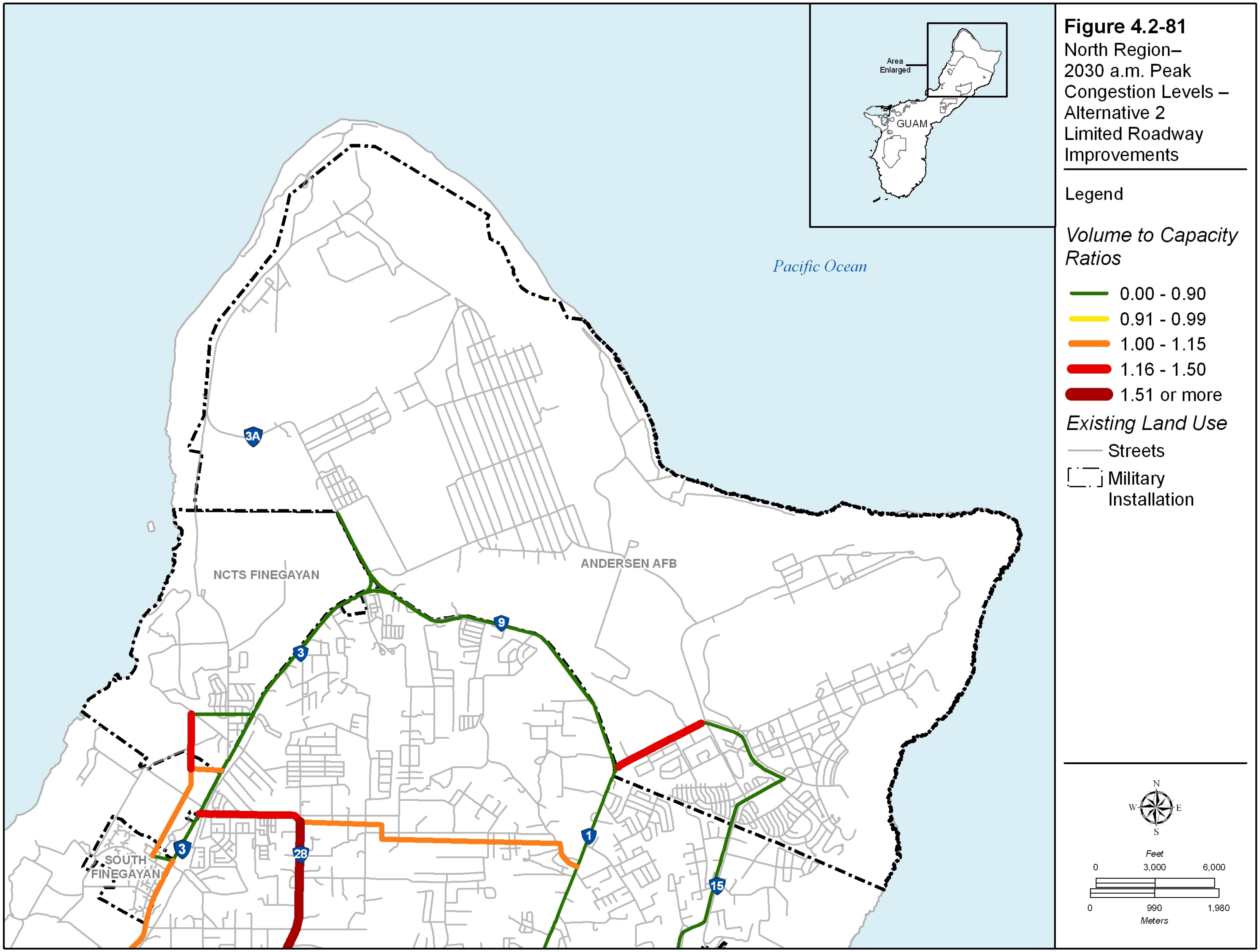


Figure 4.2-81
North Region–
2030 a.m. Peak
Congestion Levels –
Alternative 2
Limited Roadway
Improvements
Legend
Volume to Capacity
Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military
Installation
Area
Enlarged
GUAM
Pacific Ocean
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH
FINEGAYAN
3A
9
3
1
28
15
N
S
E
W
Feet
0
3,000
6,000
0
990
1,980
Meters

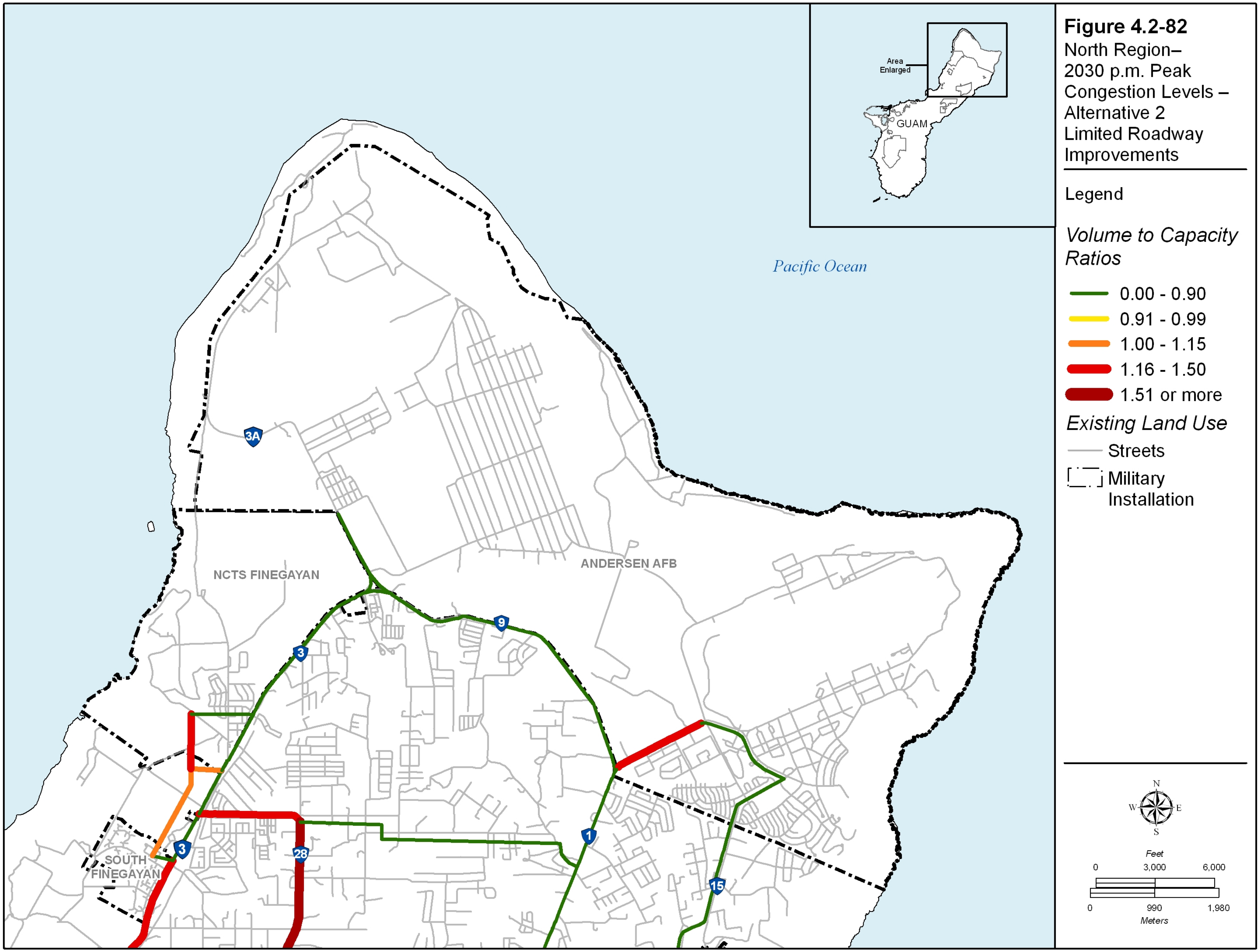


Figure 4.2-82
North Region–
2030 p.m. Peak
Congestion Levels –
Alternative 2
Limited Roadway
Improvements
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
Pacific Ocean
Area Enlarged
GUAM
NCTS FINEGAYAN
ANDERSEN AFB
SOUTH FINEGAYAN
3A
9
3
1
28
15
Feet
0
3,000
6,000
0
990
1,980
Meters

Public Transportation Impacts. Impacts to the public transportation system relate to the delays caused by increased levels of congestion on roadways and at intersections. This would affect the demand response and paratransit services, increasing passenger wait times and missed transfers. While there is no existing fixed-route service in the North Region, planning efforts have proposed new routes along Routes 1 and 3. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. Additional congestion on unimproved roadways will adversely affect pedestrian and bicycle facilities in the North Region. Along Route 1, future traffic volumes and congestion could affect the experience or safety of the pedestrian or cyclist using the shoulder as a running or biking lane. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

<u>Central</u>

Roadway Projects

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 1 can be found in Table 4.2-40. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island. The magnitude of decrease is especially noticeable on Chalan Lujuna, which decreases from approximately 22,000 vpd to between 6,300 and 7,100 vpd. This can be attributed to the high volume of construction traffic.

Figure 4.2-83 through Figure 4.2-86 show existing levels of traffic congestion in the Central Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

There are several areas of congestion in the Central Region, primarily on roads that serve the DoD lands to the north. During both the morning and afternoon peaks, the roads with the greatest congestion levels in the Central Region are Route 28, Route 3, and parts of Route 26 and Route 1. All have an LOS F in both the a.m. and p.m. peak hours, which is considered congested. Route 28 and portions of Route 26 have the highest level of congestion (v/c ratio greater than 1.50) in both the a.m. and p.m. peak hours for 2014 and 2030.

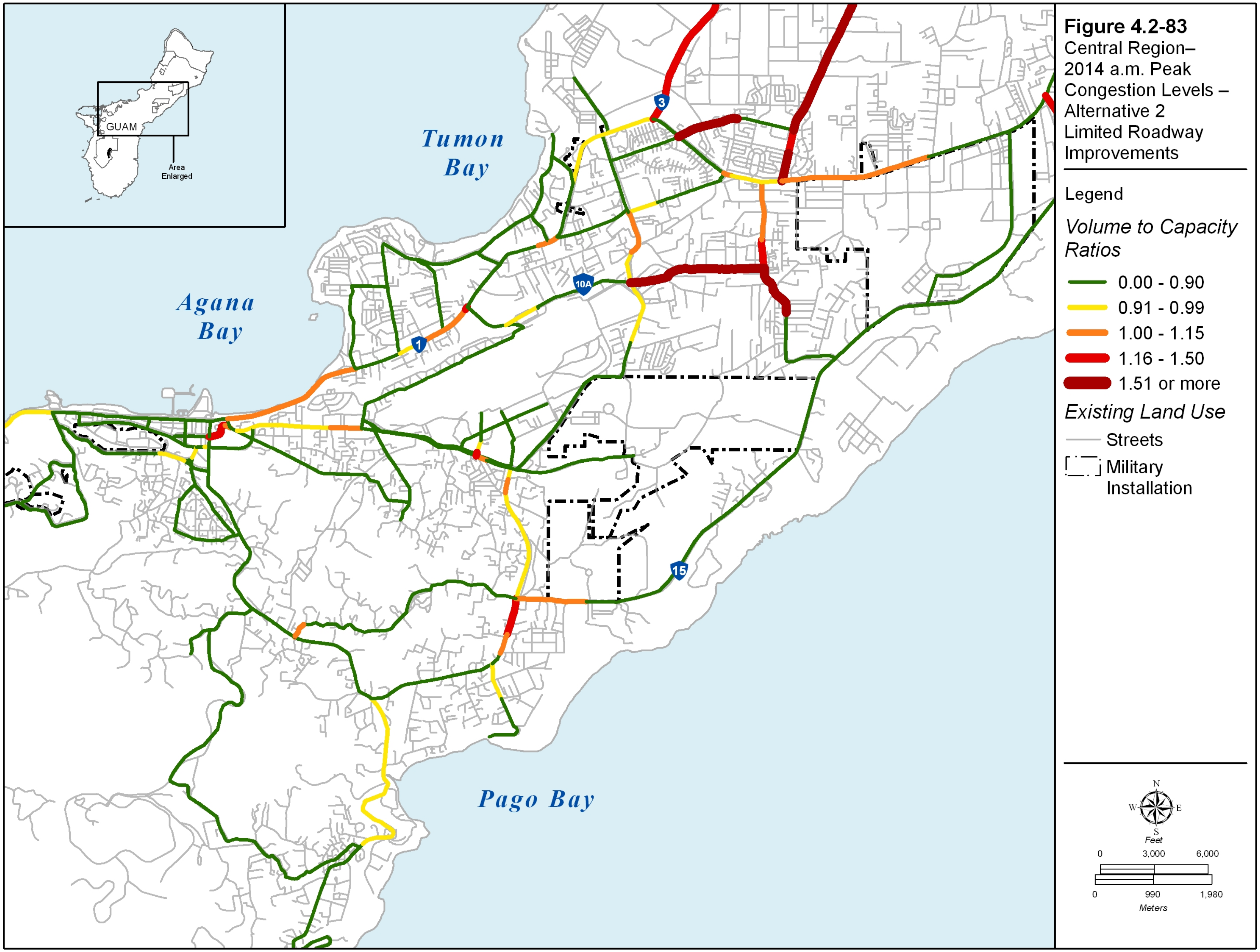
For most of the intersections, the LOS in both 2014 and 2030 was below the minimum acceptable LOS E. For the Central Region, there are eight intersections for which the traffic is worse in 2014 than in 2030 in both the a.m. and p.m. peak hours. This can be attributed to an increase in traffic associated with construction activity and military personnel in 2014.

Table 4.2-40. Alternative 2 (with Limited Roadway Projects) Future ADT and Volume to Capacity Ratio Summary – Central Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 37,000 to 101,000 vpd. Traffic decreases significantly south of the intersection of Route 4.	The v/c ratio is generally less than 1.00 in both the a.m. and p.m. however, there are small segments between the intersections 8 and 30 that have a v/c ratio of 1-1.5 in the a.m. and a v/c ratio greater than 1.5 in the p.m., which indicates the roadway is congested. Ratios of 1.0-1.15 are found east of Route 11, Finegayan St., Route 33and west of the Route 6 intersections.	Route 1 ranges from 38,000 to 95,000 vpd. Traffic decreases significantly south of the intersection with Route 4.	The v/c ratio is generally less than 1.00 in both the a.m. and p.m. however the segment east of Route 8 has a v/c ratio of 1-1.15, indicating congestion in these areas. South of the Route 33 intersection there is a small segment with a. v/c ratio of 1.0-1.15, indicating congestion.
Route 3	Route 3 ranges from 66,000 to 68,000 vpd. Traffic increases toward the Route 1 intersection.	The v/c ratio in both the a.m. and p.m. peak is 1.00-1.15. This indicates the roadway is congested.	Route 3 ranges from 47,000 to 54,000 vpd. Traffic increases toward the Route 1 intersection.	The v/c ratio is greater than 1.15, indicating that the roadway is congested at this location.
Route 8/8A	Route 8 ranges from 51,000 to 63,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 3,500 vpd.	During peak hours, the v/c ratio is less than 1.00 east of Tiyan Parkway however the intersection at Wall St. has a v/c ratio of 1.0-1.15. West of Tiyan Parkway during the a.m. and p.m. peaks the v/c ratio is greater than 1.00. This area is considered congested. Route 8A has a v/c ratio is 0.00-0.90 The roadway is not considered congested.	Route 8 ranges from 47,000 to 58,000 vpd. There is a decrease in traffic west of the intersection with Sunset Boulevard. Route 8A has 3,400 vpd.	The v/c ratio is less than 1 with exception of a small segment west of the Wall St. intersection with a v/c of 1.16-1.5. East of Tiyan Parkway the a.m. v/c ratio is less than 1, where the p.m. v/c ratio is greater than 1.16. The road is primarily congested in the p.m. peak.
Route 10	Route 10 ranges from 56,000 to 57,000 vpd between Routes 8 and 15.	In the a.m. peak, a small segment south of the intersection with Route 15 and south of Route 8 have a v/c ratio between 1.15-1.50. During the p.m. peak, Route 10 has a v/c ratio of 1.00-1.15 north of Route 32 to Route 8. The roadway is primarily congested during the p.m. peak.	Route 10 ranges from 36,000 to 64,000 vpd between Routes 8 and 15.	In the a.m. peak, Route 10 has a v/c ratio of 1.16-1.5 north of Route 32 to Route 15. During the p.m. peak, Route 10 has a v/c ratio of 1.00-1.15 north of Route 32 to Route 8. The roadway is primarily congested during the p.m. peak.

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 15	Route 15 ranges from 1,300 to 24,000 vpd. There is an increase in traffic south of the intersection with Route 26.	Route 15 has a v/c ratio less than 1, with a v/c ratio of 1.00-1.15 approaching Route 10. The roadway is only congested near the intersection with Route 10.	Route 15 ranges from 55,000 to 66,000 vpd. There is an increase in traffic south of the intersection with Route 26.	The v/c ratio is less than 1.00 during peak hours. The roadway is not considered congested.
Route 16	Route 16 ranges from 40,000 to 91,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is less than 1.00 in the a.m. and p.m., except south of the intersection with Route 27 where the v/c ratio is 1.00-1.15. The roadway is considered congested at this location.	Route 16 ranges from 35,000 to 85,000 vpd. There is a decrease in traffic south of the residential developments south of Route 25.	The v/c ratio is less than 1.00 during peak hours. The roadway is not considered congested.
Route 25	Route 25 ranges from 24,000 to 28,000 vpd.	Route 25 has a v/c ratio greater than 1.50, indicating that the roadway is congested.	Route 25 ranges from 19,000 to 23,000 vpd.	The v/c ratio is greater than 1.5 during peak hours. The roadway is considered congested.
Route 26	Route 26 ranges from 10,000 to 25,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	Route 26 primarily has a v/c ratio greater than 1.00 during both the a.m. and p.m. peak, increasing to a v/c ratio greater than 1.5 north of the Route 25 in the p.m. and south of Route 25 in the p.m. The roadway is considered congested.	Route 26 ranges from 10,000 to 21,000 vpd. There is a decrease in traffic south of the large residential development just north of the intersection with Route 15.	The v/c ratio is greater than 1.16 during peak hours, decreasing south of Route 25 where the v/c ratio is 0.91-0.99 during the a.m. peak. The roadway is considered congested north of Route 25.
Route 27	Route 27 ranges from 58,000 to 61,000 vpd between Routes 16 and 1.	The v/c ratio is 0.00-0.90 during peak hours, except for the portion between Routes 16 and 1, which has a v/c ratio of 0.91-0.99 during the a.m. peak. This roadway is not considered congested.	Route 27 ranges from 56,000 to 59,000 vpd between Routes 16 and 1.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not congested.
Route 28	Route 28 ranges from 24,000 to 26,000 vpd. Traffic generally decreases south of the Route 27A intersection.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak, indicating the roadway is congested.	Route 28 ranges from 22,000 to 23,000 vpd. Traffic generally decreases south of the Route 27A intersection.	The v/c ratio is greater than 1.50 in both the a.m. and p.m. peak; indicating the roadway is congested.
Chalan Lujuna	Chalan Lujuna has 22,000 vpd.	The v/c ratio is 1.16-1.5, indicating the road is congested.	Chalan Lujuna ranges from 6,300 to 7,100 vpd.	The v/c ratio is 0.00-0.90 during peak hours, indicating the roadway is not congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.



GUAM
Area Enlarged
Tumon Bay
Agana Bay
Pago Bay
3
1
10A
15
Figure 4.2-83
Central Region–2014 a.m. Peak Congestion Levels – Alternative 2 Limited Roadway Improvements
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
N
S
E
W
Feet
0
3,000
6,000
0
990
1,980
Meters

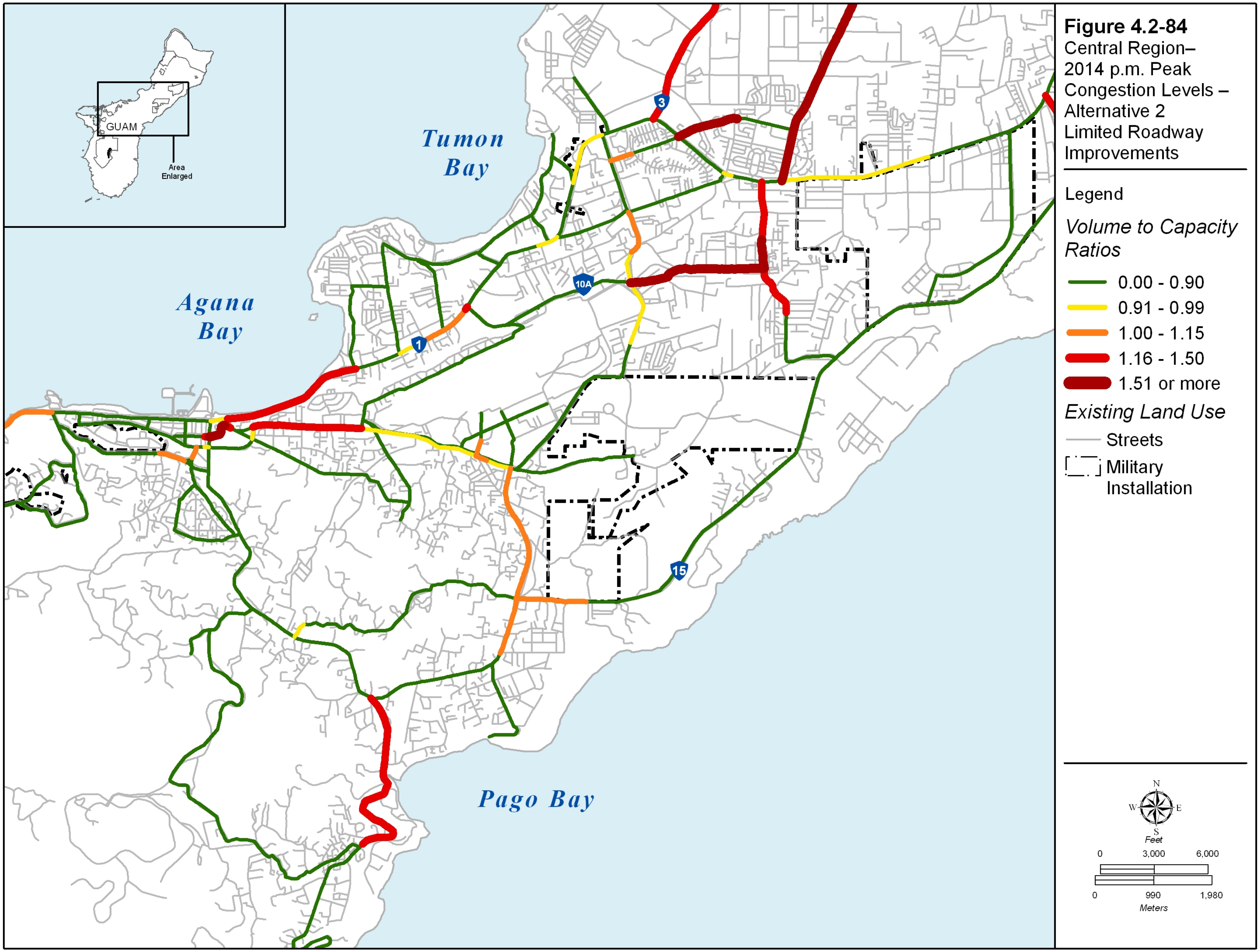


Figure 4.2-84
Central Region–2014 p.m. Peak Congestion Levels – Alternative 2 Limited Roadway Improvements
Legend
Volume to Capacity Ratios
0.00 - 0.90
0.91 - 0.99
1.00 - 1.15
1.16 - 1.50
1.51 or more
Existing Land Use
Streets
Military Installation
Tumon Bay
Agana Bay
Pago Bay
GUAM
Area Enlarged
3
1
10A
15
N
S
E
W
Feet
0
3,000
6,000
0
990
1,980
Meters

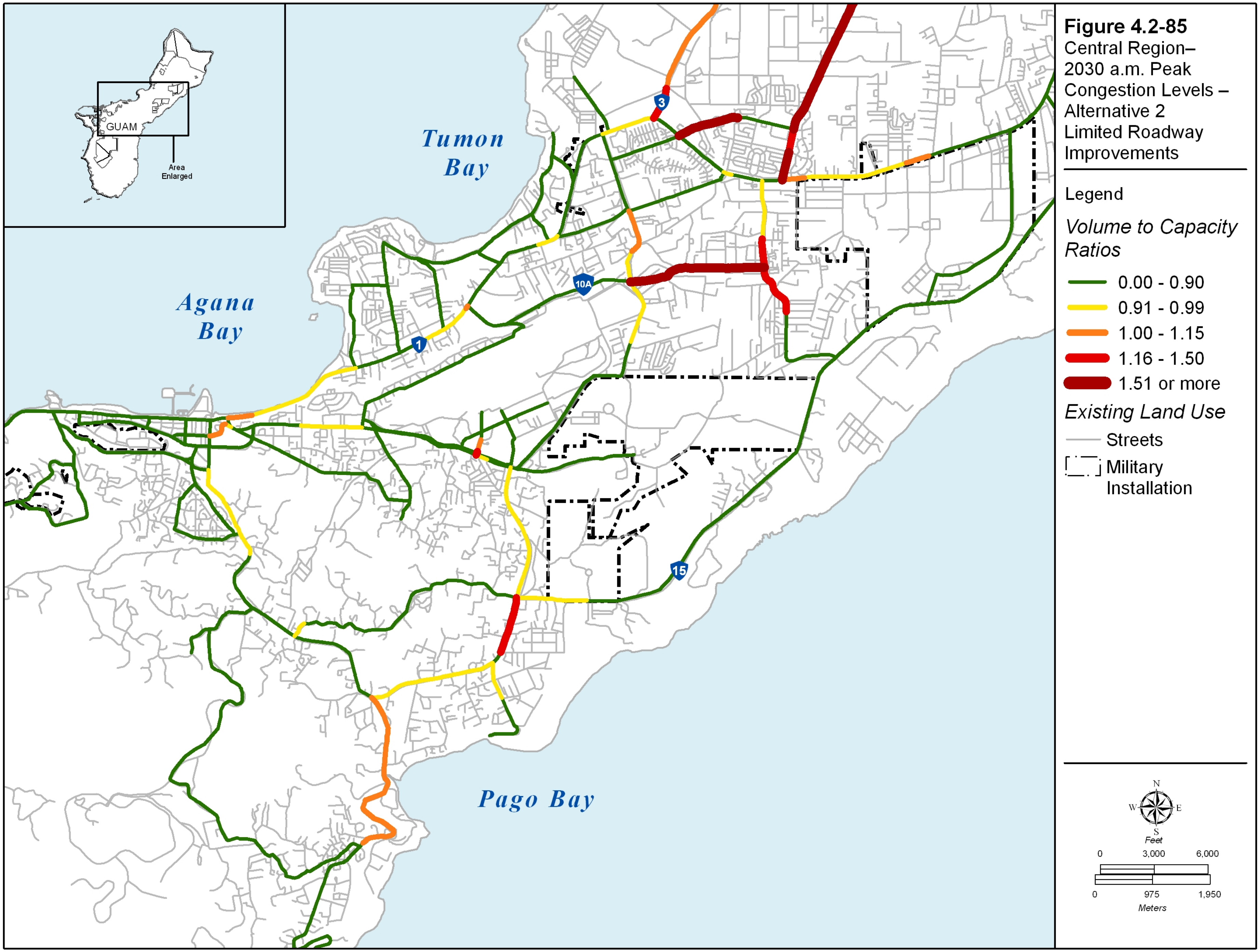


Figure 4.2-85
Central Region–
2030 a.m. Peak
Congestion Levels –
Alternative 2
Limited Roadway
Improvements

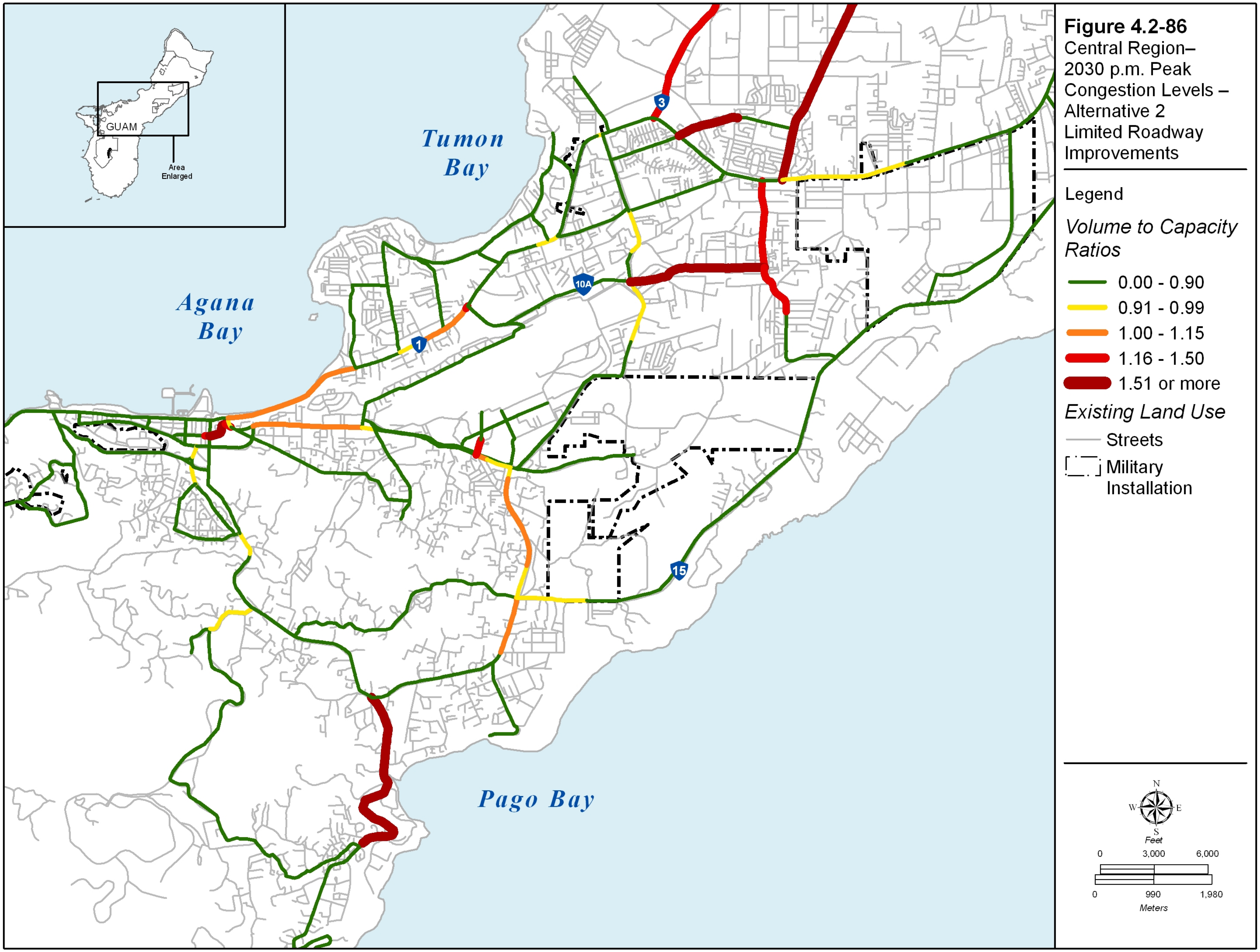


Figure 4.2-86
Central Region–2030 p.m. Peak Congestion Levels – Alternative 2 Limited Roadway Improvements

As shown in Table 4.2-41, 26 out of 29 intersections have LOS F for at least one peak hour, which is normally considered unacceptable. The following intersections are operating at LOS F in the a.m. and p.m. peak hours in both 2014 and 2030:

- Route 1/28
- Route 1/27
- Route 1/3
- Route 1/16
- Route 1/14
- Route 1/14A
- Route 1/10A
- Route 1/14 (ITC)
- Route 1/30
- Route 1/8
- Route 4/7A
- Route 4/10
- Route 8/10
- Route 10/15
- Route 16/27
- Route 16/10A
- Route 26/15
- Route 28/27A

Table 4.2-41. Alternative 2 (with Limited Roadway Projects) Future Level of Service and Delay Results – Central Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/28	F	358.3	F	3331.4	F	244.9	F	206.3
Route 1/26	F	129.2	F	248.1	E	61.9	F	251.5
Route 1/27	F	831.3	F	658.5	F	304.6	F	1091.6
Route 1/27A	F	94.7	F	205.3	D	42.7	F	211.4
Route 1/3	F	271.6	F	302.9	F	145.6	F	157.2
Route 1/16	F	146.5	F	335.4	F	98.6	F	407.5
Route 1/14 (North San Vitores)	F	197.8	F	136.8	F	113.3	F	476.1
Route 1/14A	F	210.3	F	238.2	F	151.5	F	298.8
Route 1/10A	F	184.5	F	279.3	F	101.7	F	149.4
Route 1/14B	F	160.0	F	159.0	E	79.0	F	119.9
Route 1/14 (ITC)	F	180.5	F	335.1	F	187.0	F	275.1
Route 1/30	F	518.0	F	559.6	F	270.1	F	489.8
Route 1/8	F	134.5	F	213.1	F	97.6	F	123.8
Route 1/4	C	30.4	D	44.7	C	32.4	F	140.2
Route 1/6 (Adelup)	D	38.4	F	114.2	D	41.5	F	125.3
Route 4/7A	F	202.1	F	288.5	F	244.4	F	286.4
Route 4/10	F	185.4	F	100.7	F	199.6	F	103.5
Route 4/17	C	35.0	D	42.6	D	39.6	E	61.9
Route 8/33	E	60.0	F	143.6	D	48.3	F	162.0
Route 8/10	F	224.7	F	304.1	F	96.9	F	172.7
Route 10/15	F	166.4	F	144.7	F	196.9	F	152.3
Route 16/27A	C	25.7	D	51.2	C	27.4	C	34.2
Route 16/27	F	516.6	F	602.9	F	442.7	F	764.2
Route 16/10A	F	324.8	F	482.0	F	469.1	F	123.5
Route 26/25**	F	84.9	D	41.1	E	75.3	D	53.0
Route 26/15**	F	2541.3	F	3412.4	F	2757.5	F	3327.3
Route 28/27A**	F	525.0	F	472.6	F	320.4	F	441.4
Unsignalized***								
Route 7/7A	F	167.7	F	285.7	D	29.2	F	105.1

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Military Access Points								
Route 1 - South Andersen Main Gate/(Turner Street)*	—	—	—	—	C	32.4	E	78.8
Route 15 - South Andersen/Second Gate*	—	—	—	—	C	22.1	C	22.6
Route 16 - Navy Barrigada Residential Gate	—	—	—	—	NA	NA	NA	NA
Route 8A - Navy Barrigada/(Residential Gate)	—-	—	—	—	NA	NA	NA	NA
Route 15 - Barrigada Air Force/(Fadian Point Drive)***	—	—	—	—	NA	NA	NA	NA

Legend: ITC = International Trade Center; LOS = Level of Service; NA = Not Applicable.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Intersection is proposed to be signalized in future build conditions.
***Unsignalized intersection LOS based on approach delay on STOP-controlled approach.

Public Transportation Impacts. Impacts to the public transportation system relate to the increased delays caused by severe levels of congestion on roadways and at intersections. In the Central Region, this would affect the fixed-route service along Routes 1 and 10, as well as the demand response and paratransit services. Delays on the roadways increase passenger travel times, with longer headways and missed transfers. This would also affect the fixed-route services proposed for Routes 16 and 26. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are limited impacts to the pedestrian and bicycle facilities in the Central Region. Along Routes 1 and 10, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian using the existing sidewalk; however, it could impact a cyclist wanting to use the outside lane when unable to use the sidewalk. Future improvements to Routes 8 and 26 would also impact the intermittent sidewalk along these roadways and provide an opportunity to fully complete the facility. In addition, any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

Apra Harbor

Roadway Projects

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 1 can be found in Table 4.2-42. Generally, there is a substantial increase in volumes on roadways from 2008 to 2014, and then a modest decrease in volumes on roadways from 2014 to 2030. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island. The magnitude of decrease is especially noticeable on Route 11, which decreases from approximately 14,000 vpd to 8,900 vpd. This can be attributed to the high volume of construction traffic.

Table 4.2-42. Alternative 2 (with Limited Roadway Projects) Future ADT and Volume to Capacity Ratio Summary – Apra Harbor Region

Roadway	*2014*		*2030*	
	ADT Summary	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 1	Route 1 ranges from 46,000 to 63,000 vpd. The traffic decreases into the entrance of Naval Base Guam, which is at the Route 1/2A intersection.	East of Route 11, the v/c ratio is between 1-1.15 and the v/c ratio is less than 1 south of Route 11. The area to the east of Route 11 is considered to be congested.	Route 1 ranges from 46,000 to 63,000 vpd. The traffic decreases into the entrance of Naval Base Guam, which is at the Route 1/2A intersection.	The v/c ratio is less than 1, indicating the roadway is not congested.
Route 2A	Route 2A ranges from 22,00 to 35,000 vpd. The traffic decreases after the intersection with Route 5.	The v/c ratio is 0.00-0.90, indicating the roadway is not congested.	Route 2A ranges from 22,00 to 35,000 vpd. The traffic decreases after the intersection with Route 5.	With exception of a small segment at the south end of the route with a v/c ratio greater than 1.5; the v/c ratio is 0.00-0.90, indicating the majority of the roadway is not congested.
Route 11	Route 11 has 14,000 vpd.	The v/c ratio is 0.00-0.90, indicating the roadway is not congested.	Route 11 has 8,900 vpd.	The v/c ratio is 0.00-0.90, indicating the roadway is not congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

Figure 4.2-87 through Figure 4.2-90 show future levels of traffic congestion in the Apra Harbor Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested. Portions of Route 5 have a v/c ratio greater than 1.00, which is LOS F, in both the 2014 and 2030 p.m. peak hour.

As shown in Table 4.2-43, Route 1/2A would operate at LOS F in the a.m. and p.m. peak hours for 2014 and the p.m. peak hour for 2030, which is considered unacceptable. The intersection would operate more efficiently in terms of delay in 2030, with LOS E in the a.m. This change can be attributed to a decrease in construction traffic in 2030. Route 5/2A is operating at LOS F in the a.m. peak hour for 2030, which is considered unacceptable.

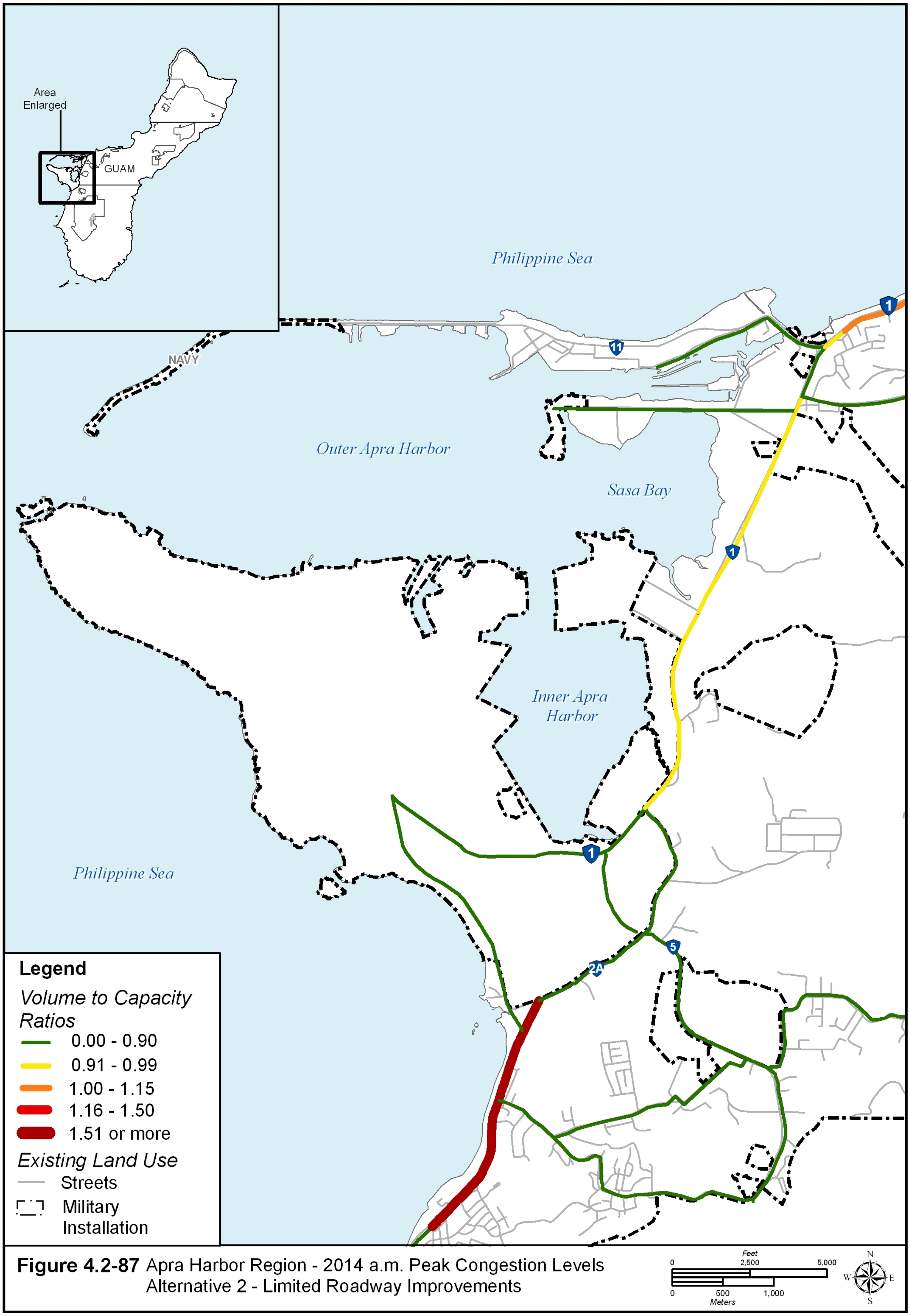


Figure 4.2-87 Apra Harbor Region - 2014 a.m. Peak Congestion Levels
Alternative 2 - Limited Roadway Improvements

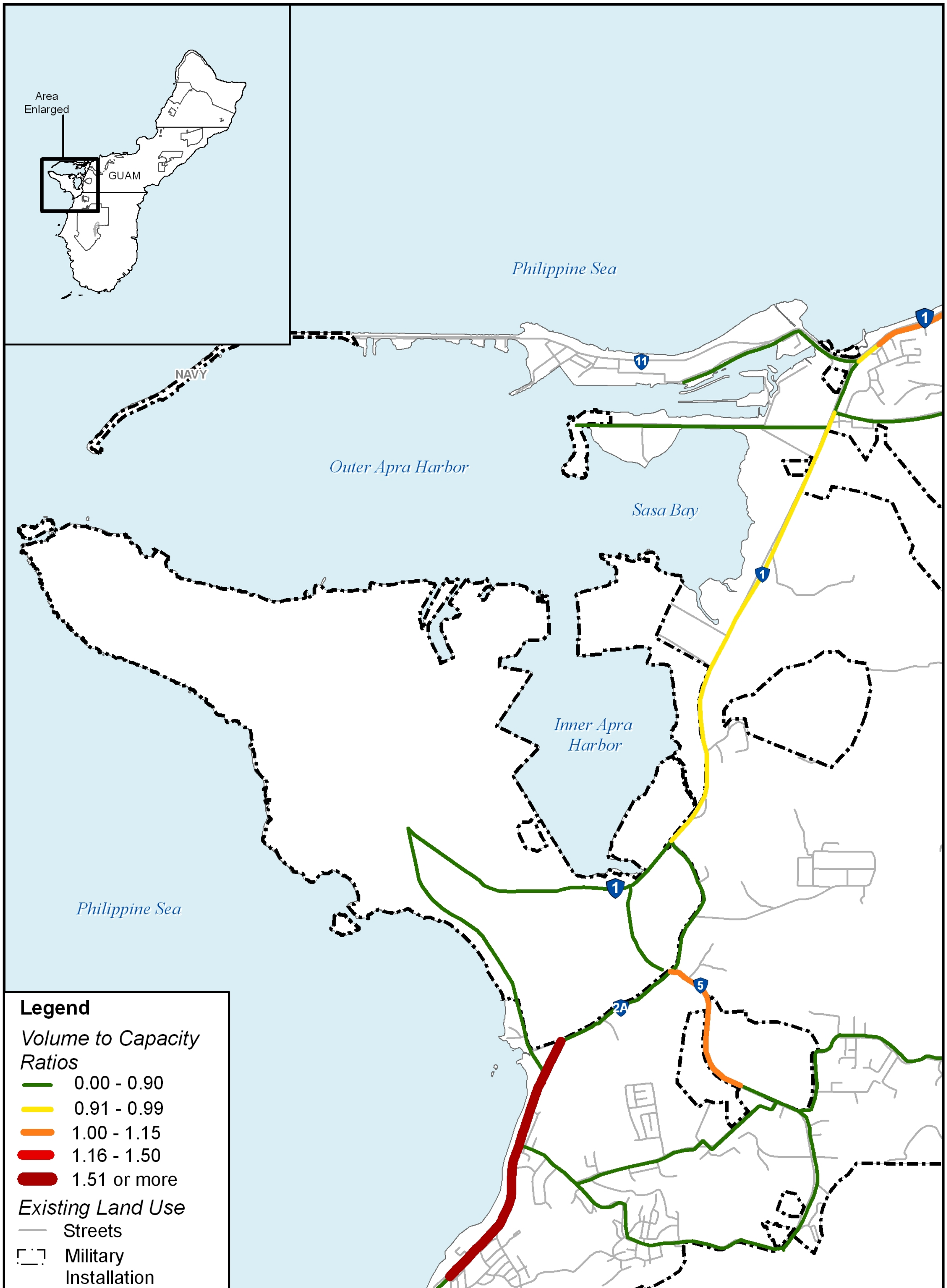


Figure 4.2-88 Apra Harbor Region - 2014 p.m. Peak Congestion Levels
Alternative 2 - Limited Roadway Improvements

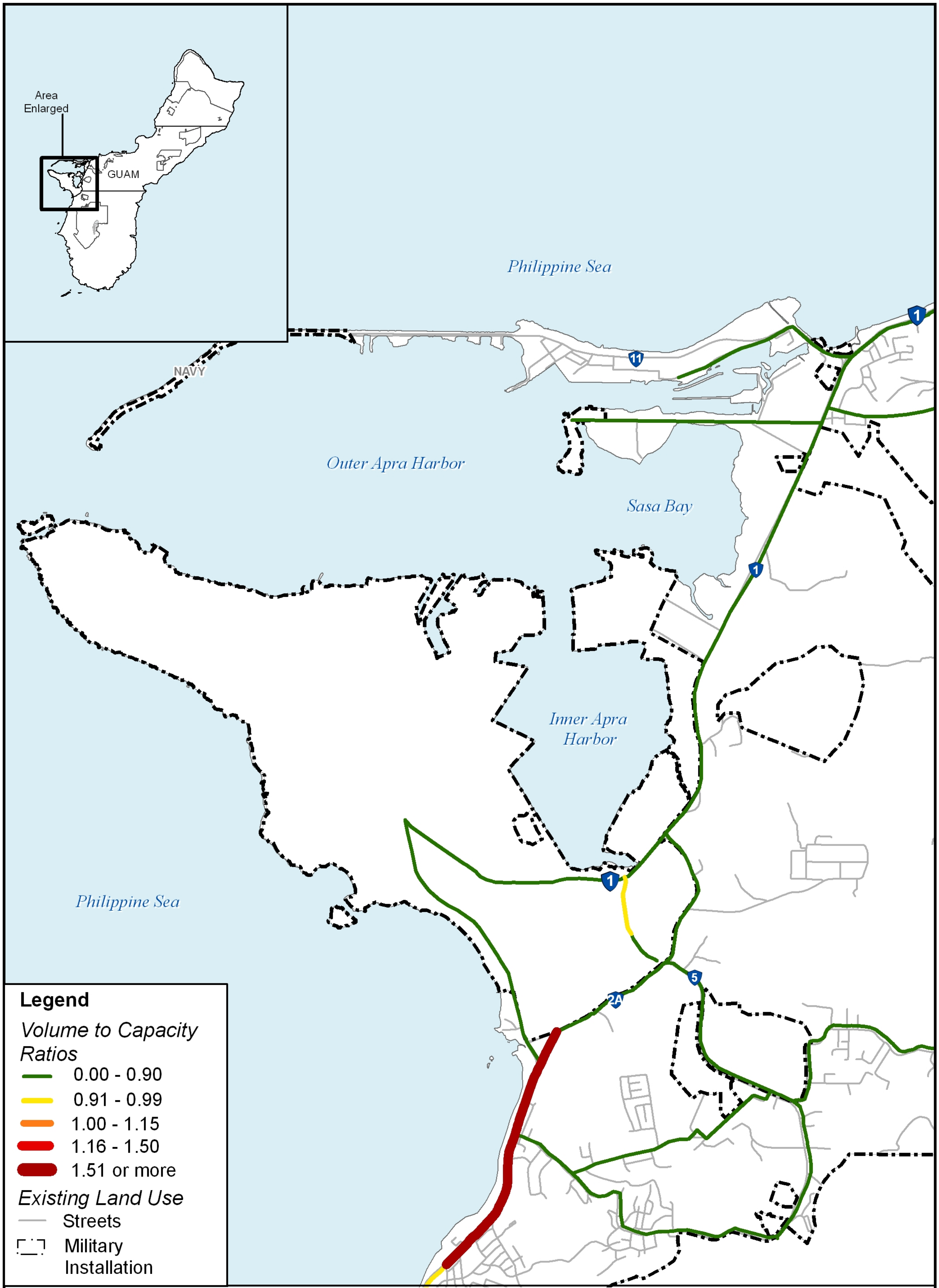


Figure 4.2-89 Apra Harbor Region - 2030 a.m. Peak Congestion Levels
Alternative 2 - Limited Roadway Improvements

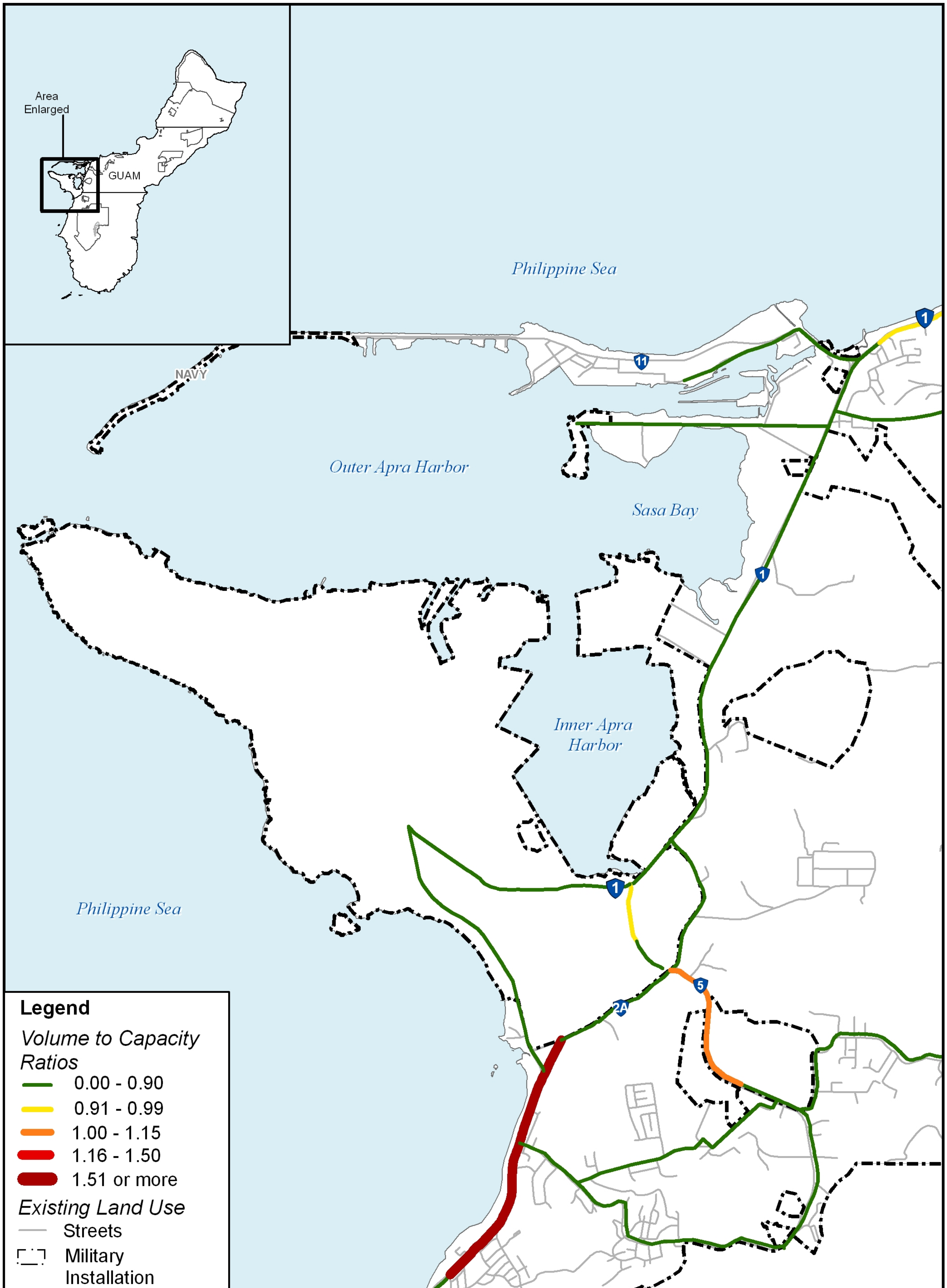


Figure 4.2-90 Apra Harbor Region - 2030 p.m. Peak Congestion Levels
Alternative 2 - Limited Roadway Improvements

Table 4.2-43. Alternative 2 (with Limited Roadway Projects) Future Level of Service and Delay Results – Apra Harbor Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 1/11	B	17.9	D	36.7	C	20.7	C	25.3
Route 1/6 (west)	D	54.3	C	23.7	B	18.4	C	22.0
Route 1/2A	F	94.6	F	82.2	E	69.5	F	84.0
Route 5/2A	E	70.5	D	36.9	F	96.3	C	26.2

Legend: LOS = Level of Service.
Notes: *Signalized intersection LOS based on average delay for the overall intersection.

Public Transportation Impacts. Impacts to the public transportation system in the Apra Harbor Region should be minimal and would relate to the delays caused by increased levels of congestion on Route 5 or at intersections near DoD lands. This would possibly affect the fixed-route service along Route 1, as well as any demand response and paratransit services. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are no impacts to the pedestrian and bicycle facilities in the Apra Harbor Region. Along Route 1, future traffic volumes and congestion should not negatively affect the experience or safety of the pedestrian and cyclist using the shoulder as a running or biking lane. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

<u>South</u>

Roadway Projects

Future Traffic Impacts. A summary of future ADT volumes and the v/c ratio for 2014 and 2030 for Alternative 1 can be found in Table 4.2-44. Route 12 decreases in volume from 2014 to 2030. This can be attributed to the increase in construction traffic and coinciding military expansion during peak construction time, which is in 2014, and then a reduction in traffic once off-island construction workers leave the island.

Figure 4.2-91 through Figure 4.2-94 show future levels of traffic congestion in the South Region for the a.m. and p.m. peak hours, respectively. The v/c ratio directly correlates to the LOS for each roadway. The color of the roadways corresponds to the LOS on the road. The green roads that have a v/c ratio of 0.00-0.90 have an LOS of A, B, C, or D; the yellow roads that have a v/c ratio of 0.91-0.99 have an LOS of E; and the orange and red roads that have a v/c ratio above 1.00 have an LOS of F, with red being the most severely congested.

Table 4.2-44. Alternative 2 (with Limited Roadway Projects) Future ADT and Volume to Capacity Ratio Summary – South Region

	2014		*2030*	
Roadway	*ADT Summary*	*v/c Ratio*	*ADT Summary*	*v/c Ratio*
Route 5	Route 5 ranges from 2,700 to 17,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is 0.91-0.99 in the a.m. peak and 1.00-1.15 south of 2A intersection in the p.m. peak. This area of the roadway is congested during the p.m. peak hours.	Route 5 ranges from 3,400 to 18,000 vpd. Traffic decreases as Route 5 approaches the intersection with Route 17.	The v/c ratio is 0.91-0.99 in the a.m. peak and 1.00-1.15 in the p.m. peak. The roadway is congested during the p.m. peak hours.
Route 12	Route 12 ranges from 1,800 to 5,600 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not congested.	Route 12 ranges from 2,300 to 6,000 vpd. The traffic increases toward the intersection with Route 2.	The v/c ratio is 0.00-0.90 during both the a.m. and p.m. peak, indicating the roadway is not congested.

Legend: ADT = average daily traffic; v/c = volume to capacity; vpd = vehicles per day.

The roads in the South Region do not exhibit high levels of congestion. During both the afternoon peaks, Route 5 between Naval Base Guam and the NMS has an LOS F.

As shown in Table 4.2-45, three intersections have LOS F for at least one peak hour, which is considered unacceptable: Route 2/12 and Route 5/17. Route 5/17 has fairly free-flowing conditions in 2014 and becomes significantly more congested in 2030.

Table 4.2-45. Alternative 2 (with Limited Roadway Projects) Future Level of Service and Delay Results – South Region

	2014				*2030*			
	a.m. Peak Hour		*p.m. Peak Hour*		*a.m. Peak Hour*		*p.m. Peak Hour*	
	LOS	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*	*LOS*	*Delay Seconds*
Signalized*								
Route 2/12	F	134.9	C	26.0	F	114.2	C	33.6
Unsignalized**								
Route 5/17	C	23.5	C	29.3	E	46.6	F	149.6
Route 4/4A	C	19.4	C	14.3	D	34.4	C	19.4
Route 17/4A	B	12.9	B	14.0	B	13.6	C	18.7
Military Access Points								
Route 5 - Naval Munitions Site/Harmon Road.**	—	—	—	—	A	9.6	A	10.6

Notes: *Signalized intersection LOS based on average delay for the overall intersection.
**Unsignalized intersection LOS based on approach delay on STOP-controlled approach.
Legend: LOS = Level of Service.

Public Transportation Impacts. Impacts to the demand response and paratransit that service the South Region are minimal. Implementation of new transit services should take into consideration the impacts of the military relocation.

Pedestrian and Bicycle Impacts. There are no impacts to pedestrian and bicycle facilities in the South Region. Any future planning for pedestrian and bicycle facilities needs to consider the impacts of the military relocation.

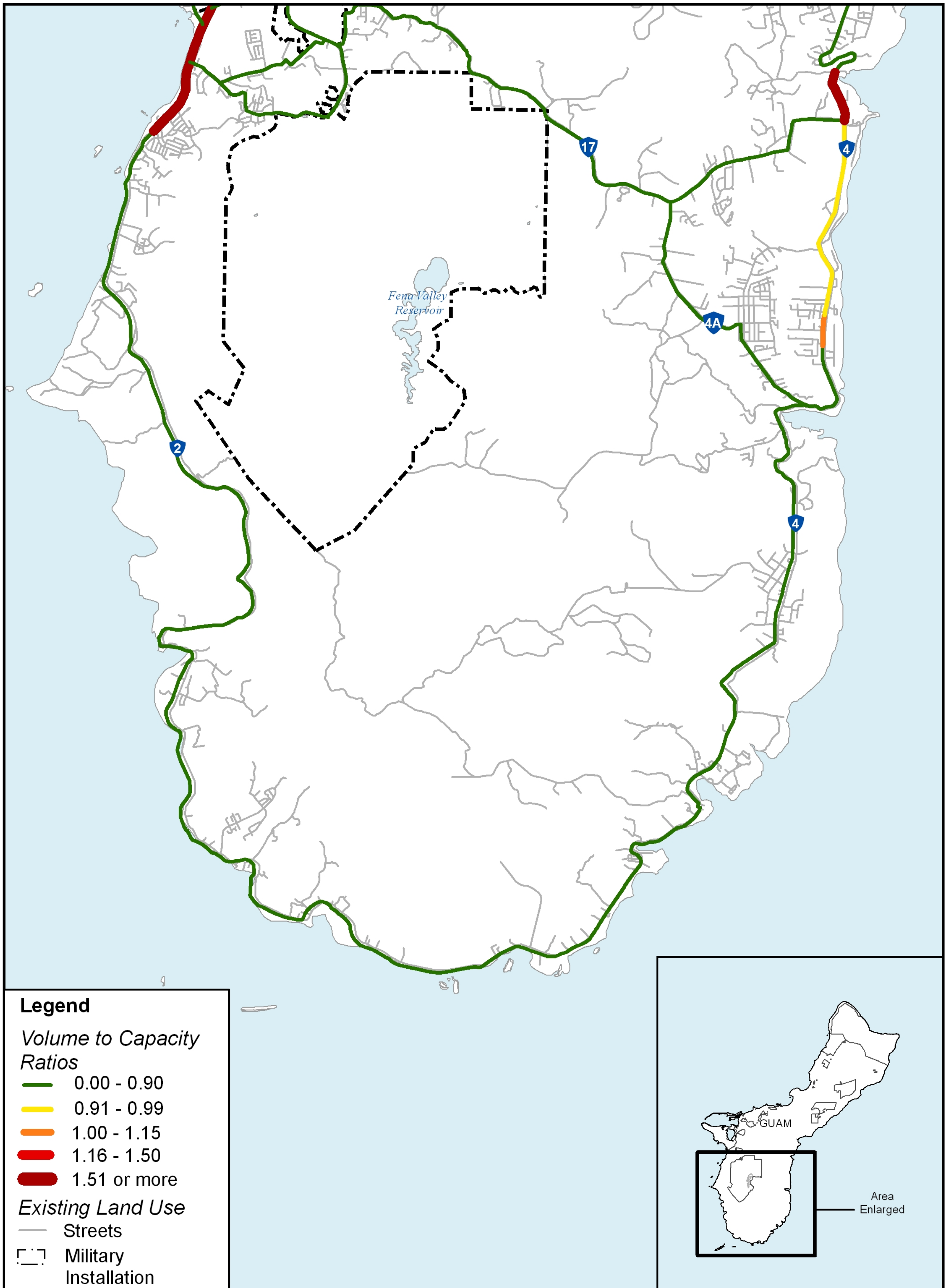


Figure 4.2-91 South Region - 2014 a.m. Peak Congestion Levels
Alternative 2 - LimitedRoadway Improvements

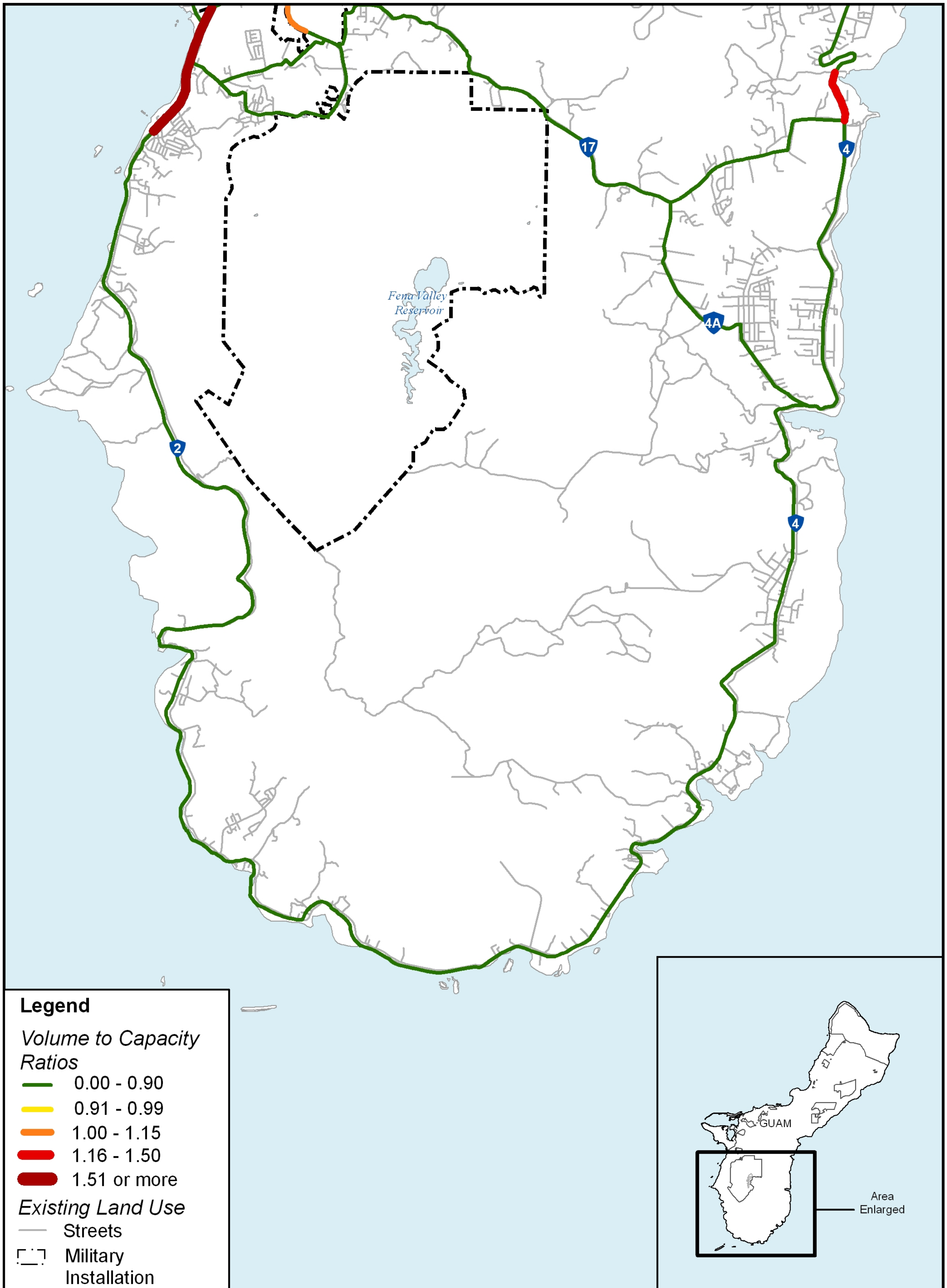


Figure 4.2-92 South Region - 2014 p.m. Peak Congestion Levels
Alternative 2 - LimitedRoadway Improvements

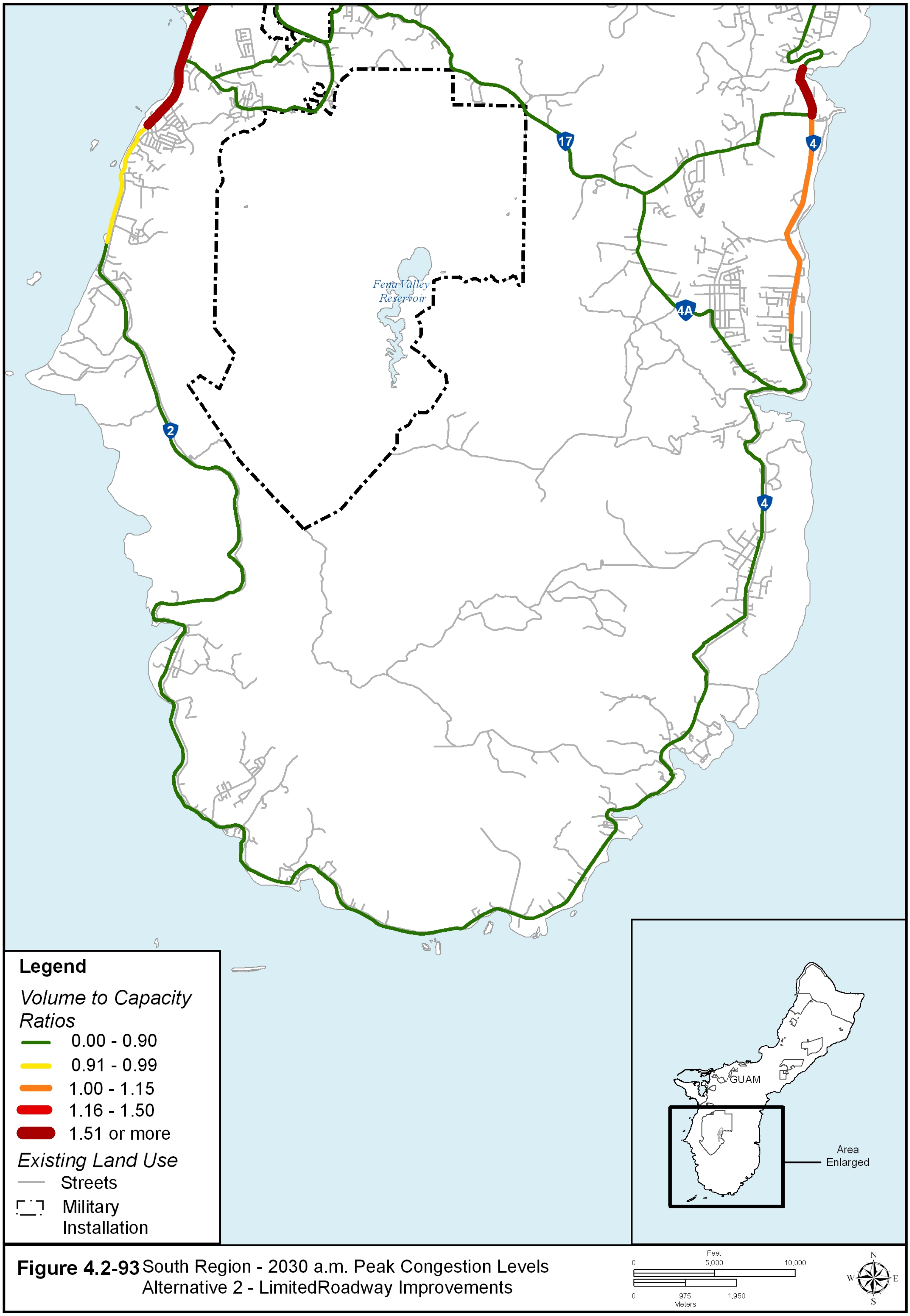


Figure 4.2-93 South Region - 2030 a.m. Peak Congestion Levels
Alternative 2 - LimitedRoadway Improvements

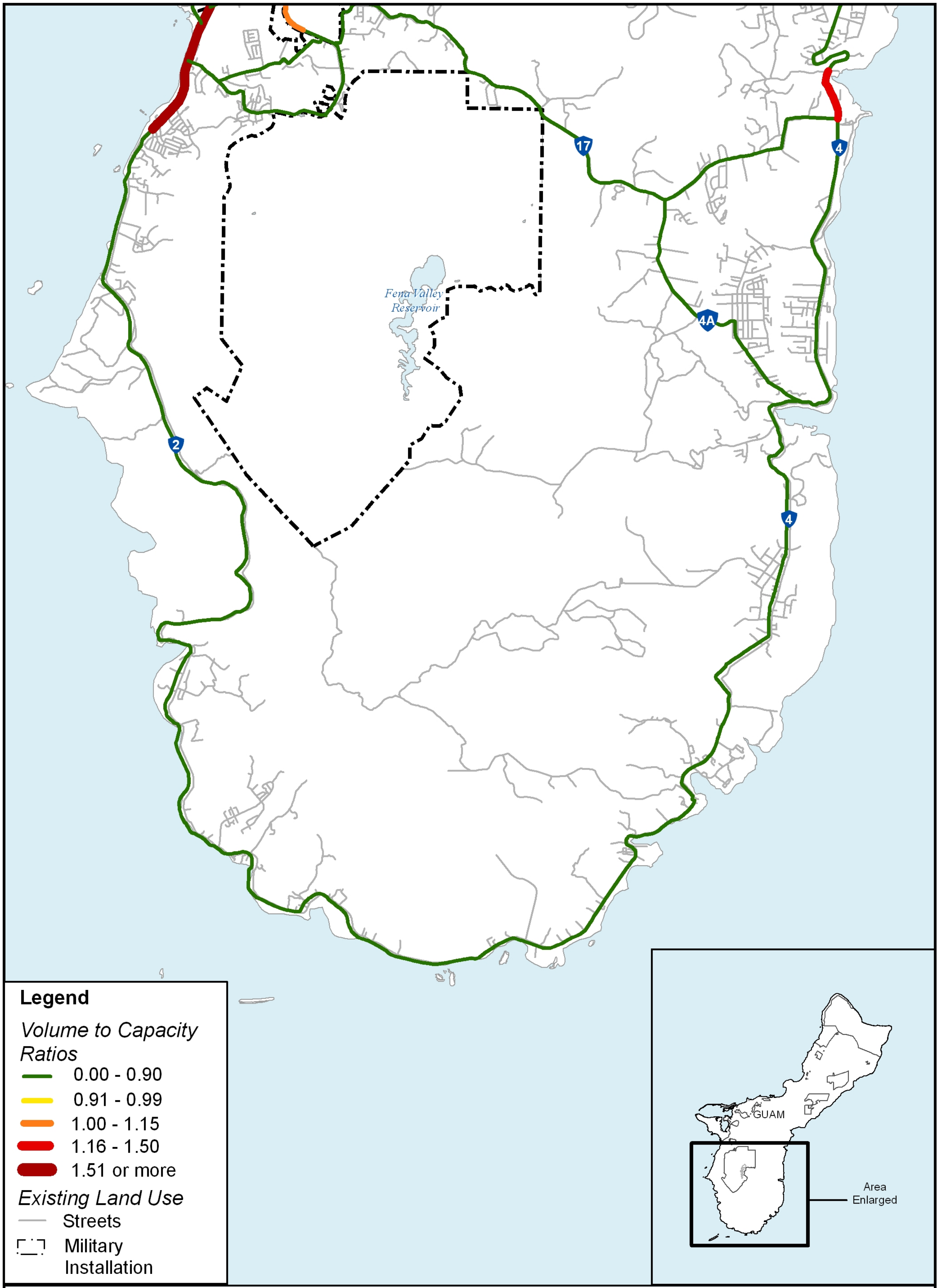


Figure 4.2-94 South Region - 2030 p.m. Peak Congestion Levels
Alternative 2 - LimitedRoadway Improvements

As shown in Table 4.2-46, in 2014 and 2030, Alternative 2 with limited roadway improvements has more intersections with LOS F in both peak hours and the amount of delay at those intersections and other intersections is substantially higher. For example, in 2030, the delay for the Route 1/27 intersection is 137.4 seconds in the a.m. and 374.3 seconds in the p.m. for Alternative 2 and 304.6 seconds in the a.m. and 1091.6 seconds in the p.m. for Alternative 2 with limited roadway improvements. While both alternatives have LOS F at the intersection in 2030, the seconds of delay for Alternative 2 with limited roadway improvements is significantly greater. The comparison in the number of intersections that would experience an LOS F between Alternative 2 and Alternative 2 with limited roadway improvements is shown in Table 4.2-45. The comparison in delay between Alternative 2 and Alternative 2 with limited roadway improvements can also be found in Table 4.2-47.

Table 4.2-46. Comparison of Alternative 2 and Alternative 2 with Limited Roadway Projects

	Alternative 2 2014	*Alternative 2 2030*	*Alternative 2 with Limited Roadway Projects 2014*	*Alternative 2 with Limited Roadway Projects 2030*
LOS F in at least one peak hour	30 intersections	22 intersections 1 access point	30 intersections	31 intersections
LOS F in both peak hours	24 intersections	13 intersections 1 access point	26 intersections	19 intersections 1 access point

Legend: LOS = Level of Service.

Table 4.2-47 and Table 4.2-48 summarize the potential impacts of Alternative 2 and Alternative 2 with limited roadway improvements. In general, LOS will worsen to severely congested levels on several roadways and at many intersections without implementation of all off base roadway projects to offset the traffic impacts associated with the housing and military base.

4.2.4 Qualitative Comparison of Alternatives – Limited Roadway Improvements

The analysis for Alternative 2 with limited roadway improvements showed that there would be significant, unmitigated congestion resulting from traffic associated with the additional housing and base activities without the full recommended off base roadway improvements. Specifically, v/c ratios were higher and there was a reduction in LOS as compared to those if all off base roadway improvements were completed. The limited roadway improvements would be similar for Alternatives 1, 3, and 8, with similar unmitigated traffic impacts. Further impacts to roadways connecting Navy Barrigada and Air Force Barrigada, such as Route 16, would occur if Alternative 3 or 8 were carried forward.

Table 4.2-47. Summary of Potential Impacts on Roadway and Intersection Capacity - Comparison of Alternative 2 and Alternative 2 with Limited Roadway Improvements**

Potentially Impacted Resource	*Alternative 2**	*Alternative 2 with Limited Roadway Improvements*
Roadway Capacity		
North	LSI	SI
Central	LSI	SI
Apra Harbor	LSI	LSI
South	LSI	LSI
Intersection Capacity		
North	LSI	SI
Central	LSI	SI
Apra Harbor	LSI	LSI
South	LSI	LSI

Legend: LSI = Less Than Significant Impact; SI = Significant Impact; *Preferred Alternative.
**Assumes only limited number of off base roadway widening and intersection improvement projects are constructed.

Table 4.2-48. Comparison of Alternatives 2 and Alternative 2 with Limited Roadway Projects

Overall Intersection Level of Service Analysis Results - Alternative 2 and Alternative 2 with Limited Roadway Improvements Comparison

S.NO	INTERSECTION	2014 Alternative 2				2014 Alternative 2 with Limited Roadway Improvements				2030 Alternative 2				2030 Alternative 2 with Limited Roadway Improvements			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[3]	Delay[4]	LOS[3]	Delay[4]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]	LOS[1]	Delay[2]
1	ROUTE 1 AND ROUTE 9	C	27.6	D	39.8	C	27.6	D	39.8	C	22.5	D	52.2	C	22.5	D	52.2
2	ROUTE 1 AND ROUTE 29	F	256.2	F	138.7	F	181.2	F	136.4	E	65.5	E	67.7	E	65.5	E	67.7
3	ROUTE 1 AND ROUTE 28	F	360.8	F	331.8	F	358.3	F	331.4	F	216.8	F	104.5	F	244.9	F	206.3
4	ROUTE 1 AND ROUTE 26	F	108.0	F	278.1	F	129.2	F	248.1	E	75.8	F	156.6	E	61.9	F	251.5
5	ROUTE 1 AND ROUTE 27	F	1830.9	F	928.9	F	831.3	F	658.5	F	137.4	F	374.3	F	304.6	F	1091.6
6	ROUTE 1 AND ROUTE 27A	E	77.4	F	204.7	F	94.7	F	205.3	D	44.4	E	75.7	D	42.7	F	211.4
7	ROUTE 1 AND ROUTE 3	F	495.1	F	523.8	F	271.6	F	302.9	D	48.5	D	50.6	F	145.6	F	157.2
8	ROUTE 1 AND ROUTE 16	F	126.4	F	336.2	F	146.5	F	335.4	E	65.3	F	87.5	F	98.6	F	407.5
9	ROUTE 1 AND ROUTE 14 (North San Vitoris)	F	176.5	F	134.8	F	197.8	F	136.8	E	68.0	F	82.0	F	113.3	F	476.1
10	ROUTE 1 AND ROUTE 14A	F	313.6	F	326.8	F	210.3	F	238.2	F	112.2	F	131.5	F	151.5	F	298.8
11	ROUTE 1 AND ROUTE 10A	F	241.5	F	376.7	F	184.5	F	279.3	F	118.1	F	102.0	F	101.7	F	149.4
12	ROUTE 1 AND ROUTE 14B	F	168.4	F	159.1	F	160.0	F	159.0	F	83.9	E	78.2	E	79.0	F	119.9
13	ROUTE 1 AND ROUTE 14 (ITC)	F	234.7	F	428.6	F	180.5	F	335.1	F	182.5	F	275.1	F	187.0	F	275.1
14	ROUTE 1 AND ROUTE 30	F	488.1	F	568.6	F	518.0	F	559.6	F	134.7	F	267.2	F	270.1	F	489.8
15	ROUTE 1 AND ROUTE 8	F	216.2	F	143.5	F	134.5	F	213.1	F	97.6	F	127.5	F	97.6	F	123.8
16	ROUTE 1 AND ROUTE 4	C	24.3	D	44.6	C	30.4	D	44.7	C	32.4	F	140.2	C	32.4	F	140.2
17	ROUTE 1 AND ROUTE 6 (Adelup)	D	36.2	F	108.9	D	38.4	F	114.2	D	40.6	E	61.8	D	41.5	F	125.3
18	ROUTE 1 AND ROUTE 11	C	25.4	E	67.1	B	17.9	D	36.7	C	20.7	D	43.5	C	20.7	C	25.3
19	ROUTE 1 AND ROUTE 6 (Westerly)	D	53.2	C	23.6	D	54.3	C	23.7	B	18.4	C	22.0	B	18.4	C	22.0
20	ROUTE 1 AND POLARIS POINT	A	3.8	A	4.3	A	4.3	A	6.5	A	8.2	A	7.4	A	7.1	A	7.4
21	ROUTE 1 AND ROUTE 2A	F	94.1	F	82.1	F	94.6	F	82.2	E	66.8	E	57.2	E	69.5	F	84.0
22	ROUTE 5 AND ROUTE 2A	E	79.4	D	36.9	E	70.5	D	36.9	F	96.3	C	26.2	F	96.3	C	26.2
23	ROUTE 5 AND ROUTE 17	C	13.1*	C	29.2*	B	23.5*	C	29.3*	F	56.8*	F	149.6*	E	46.6*	F	149.6*
24	ROUTE 2 AND ROUTE 12	F	135.0	C	26.0	F	134.9	C	26.0	C	27.8	C	27.1	F	114.2	C	33.6
25	ROUTE 3 AND ROUTE 3A	C	19.7*	F	74.3	B	12.7*	C	22.5*	B	11.6*	F	79*	B	11.6*	F	79.0*
26	ROUTE 3 AND ROUTE 28	F	85.1	F	227.1	F	104.4	F	235.9	C	26.0	D	36.9	C	33.9	F	226.5
27	ROUTE 4 AND ROUTE 7A	F	270.5	F	989.8	F	202.1	F	288.5	F	607.3	F	534.1	F	244.4	F	286.4
28	ROUTE 4 AND ROUTE 10	F	190.2	F	165.1	F	185.4	F	100.7	F	199.5	E	65.1	F	199.6	F	103.5
29	ROUTE 4 AND ROUTE 17	C	35.0	D	42.6	C	35.0	D	42.6	D	39.6	E	57.7	D	39.6	E	61.9
30	ROUTE 4 AND ROUTE 4A	C	23.9*	C	17.1*	C	19.4*	C	14.3*	E	49.7*	F	484.3*	D	34.4*	C	19.4*
31	ROUTE 7 AND ROUTE 7A	F	167.7*	F	285.7*	F	167.7*	F	285.7*	D	29.2*	F	105.1*	D	29.2*	F	105.1*
32	ROUTE 8 AND ROUTE 33	E	64.8	F	145.2	E	60.0	F	143.6	D	54.6	F	81.7	D	48.3	F	162.0
33	ROUTE 8 AND ROUTE 10	F	278.7	F	335.0	F	224.7	F	304.1	F	96.9	F	172.7	F	96.9	F	172.7
34	ROUTE 10 AND ROUTE 15	F	166.4	F	144.7	F	166.4	F	144.7	F	196.9	F	152.3	F	196.9	F	152.3
35	ROUTE 15 AND ROUTE 29	F	NA*	F	838.9*	F	Error*	F	827.8*	C	27.7	C	25.4	F	Error*	F	Error*
36	ROUTE 16 AND ROUTE 27A	C	26.3	D	51.9	C	25.7	D	51.2	C	27.4	C	34.2	C	27.4	C	34.2
37	ROUTE 16 AND ROUTE 27	F	389.3	F	601.5	F	516.6	F	602.9	F	345.0	F	288.7	F	442.7	F	764.2
38	ROUTE 16 AND ROUTE 10A	F	260.1	F	566.1	F	324.8	F	482.0	F	123.1	F	123.5	F	469.1	F	123.5
39	ROUTE 17 AND ROUTE 4A	B	12.9*	B	14.0*	B	12.9*	B	14.0*	B	13.6*	C	18.7*	B	13.6*	C	18.7*
40	ROUTE 26 AND ROUTE 25	F	94.9	E	70.1	F	84.9	D	41.1	C	31.2	D	41.0	E	75.3	D	53.0
41	ROUTE 26 AND ROUTE 15	F	2554.1*	F	3440.9*	F	2541.3*	F	3412.4*	C	27.9	C	32.1	F	2757.5*	F	3327.3*
42	ROUTE 28 AND ROUTE 27A	C	31.8	F	402.8	F	525.0*	F	472.6*	D	35.6	D	36.6	F	320.4*	F	441.4*
	Access Points - NCTS Finegayan																
1	ROUTE 3 AND NORTH (COMMERCIAL) GATE**									B	12.5	C	28.3	B	29.7	E	60.2
2	ROUTE 3 AND SOUTH (MAIN) GATE**									C	33.5	E	58.6	C	23.1	E	67.2
	Access Points - South Finegayan																
3	ROUTE 3/CONTROL TREE DRIVE (RESIDENTIAL) GATE									C	26.7	B	18.5	C	32.7	C	26.5
	Access Points - AAFB																
5	ROUTE 9/AAFB NORTH GATE**									F	Error*	F	Error*	F	1029.7*	F	9999.0*
	Access Points - South Anderson	**NOT APPLICABLE, DESIGN AND EVALUATION OF ACCESS POINTS COMPLETED USING 2030 TIME HORIZON**															
6	ROUTE 1/TURNER STREET (MAIN GATE)									C	32.4	E	79.1	C	32.4	E	78.8
7	ROUTE 15/ ROAD 1.16 m e/o ROUTE 26 (SECOND GATE)**									C	22.1*	C	22.6*	C	22.1*	C	22.6*
	Navy Barrigada																
8	ROUTE 16 AND SABANA BARRIGADA									N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9	ROUTE 8A/BARRIGADA CONNECTOR**									N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Barrigada AF																
10	ROUTE 15 AND CHADA STREET									N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Naval Ordinance Annex																
11	ROUTE 5 AND HARMON ROAD									A	9.5*	A	10.6*	A	9.6*	A	10.6*

[1]Level of Service [2]Control Delay in Seconds Per Vehicle

NOTES: Signalized Intersection LOS based on average delay for the overall intersection
*Unsignalized intersection LOS based on approach delay on STOP-controlled approach
**The intersections have not built in existing condition
Error = Delay excedeed maximum calculated value

Source: Parsons Brinckerhoff