

FINAL

GUAM 2020 HIGHWAY MASTER PLAN REPORT

October 26, 2005

Prepared For:



Government of Guam
542 North Marine Drive
Tamuning, Guam 96913

Prepared By:



P.O. Box 8900
Tamuning, Guam 96931

BUREAU OF STATISTICS AND PLANS
(Bureau of Planning)

Government of Guam

COPY



Felix Perez Camacho
Governor of Guam

Kaleo Scott Moylan
Lieutenant Governor

P.O. Box 2950 Hagåtña, Guam 96932

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Alberto "Tony" A. Lamorena V
Acting Director

MAY 09 2006

MEMORANDUM

To: Director, Department of Public Works
From: Director, Bureau of Statistics and Plans
Subject: Comments to Proposed 2020 Master Plan Update

RECEIVED
MAY 10 2006
DEPT. OF PUBLIC WORKS
DIRECTOR'S OFFICE
Janet

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1. More road construction improvements connecting Andersen Air Force Base, to Andy South, to the Naval Base to the south of the Island, not only for usual vehicular everyday use of the roads but also for heavy equipments, ammunitions etc. Dedication of a roadway for Military use may also be needed, along Route 3 to the Navy housing. Proactive approach should be use by Guam, since the Defense Access Roads (DAR) Program is already incorporated in the Master Plan.
2. Future priorities should include construction of missing links in the street system as adjacent streets are built as part of new developments. On the standpoint of traffic management and efficiency, balance this perspective with local concerns, such as neighborhood access and protection, bicycle and pedestrian movements, and urban design.
3. The road network is essentially complete and there is little room for expansion of the roadway system. The challenge for Guam is to maintain and improve the efficiency of the existing system, complete the remaining capacity improvements, and ensure that new development does not overwhelm the road network.
4. Where several routes pass through an area of high pedestrian activity. (i.e., reduced congestion and delay, improved travel time and air quality), the transportation master plan should envision a significant increase in the amount of investment made to improve and expand the Guam Mass Transit and non-motorized systems (bike-ways). Assertive action will be necessary to achieve increased transit and non-motorized use in the long term, which in turn will help to preserve and enhance overall mobility within the Guam villages.

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Thank you for giving us the opportunity to comment.


ALBERTO A. LAMORENA V
Acting

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Government of Guam



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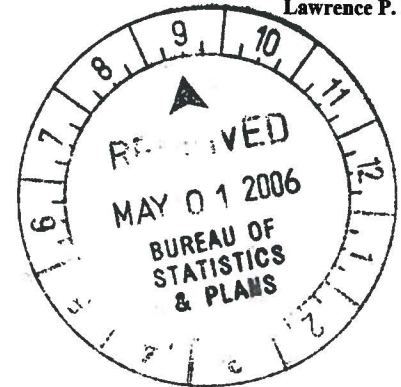
Maly

Governor
Felix P. Camacho
Lt. Governor
Kaleo S. Moylan



Director
Lawrence P. Perez

APR 26 2006
MEMORANDUM



TO: Director, Bureau of Statistics and Plans

FROM:  Director of Public Works

SUBJECT: Comments on Draft Guam 2020 Highway Master Plan Report

This is in reference to the above subject that we transmitted to your office on February 16, 2006 for your review and comments. We believe that ample time had already been given to you for your review. In the event that you don't have any comments, please respond in writing stating that you do not have any. We request that comments be submitted to our office no later than April 28, 2006 for incorporation to the Draft report as required by the consultant.

Your cooperation and support on this matter is greatly appreciated. If you have any question, or might need additional information, your point of contact is Mr. Victor Pangelinan, Acting Chief Planner and he may be reached at 646-3140. 

GOVERNOR
Felix P. Camacho
Lt. Governor
Kaleo S. Moylan



Date: 04/27/06

FAXCIMILE TRANSMITTAL**DIVISION OF HIGHWAYS**

TO: Director, Bureau of Statistics and Plans
ATTN: Alberto La Morena V

FAX NO. 477-1812

FROM: DPW
Sender : Cely Deveza

FAX NO: 646-3169
TEL. NO. 646-3228

SUBJECT: Comments on Draft Gyam 2020 Highway Master
Plan Report

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Including this Page

REMARKS:

Attached memorandum is for your advance copy. Original copy will follow.

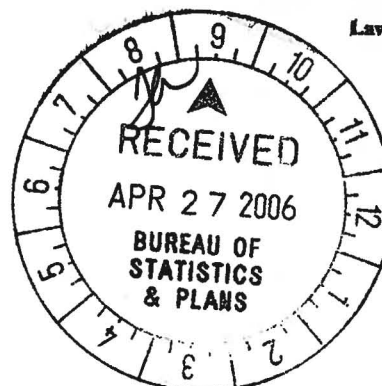
Thanks


Note: If you do not receive legible copies of all the pages, please call back as soon as possible; (671) 646-3228 and ask for sender

Governor
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DIVISION OF ENGINEERING

Letter of Transmittal



Date: February 14, 2006
To: Bureau of Statistics & Plans
Attn.: Alberto A. Lamorena V, Acting Director
From: Lawrence P. Perez, Director
Re: Guam Highway Master Plan Update
We are sending herewith the following:

- ☐ Drawing Originals ☐ Copies of Drawings ☐ Specifications ☐ Electronic File on Diskette(s)
☐ Shop Drawings ☐ Letter w/ Attachment ☒ Others See Attached Description

IF YOU DID NOT RECEIVE THE COMPLETE PACKAGE LISTED BELOW OR IF ENCLOSURES ARE NOT AS INDICATED, PLEASE CONTACT OUR OFFICE IMMEDIATELY AT (671) 646-3126

This package includes the following:

Qty	Unit	Description
1	Copy	Draft Guam 2020 Highway Master Plan Report

These is transmitted as indicated below:	
☒ For your use	☐ As Requested ☐ For Approval ☒ For Review and Comment ☐ Others
☐ Submittal Package ()	☐ Return after you have copied ☐ Return after Shop Drawing Review

Remarks:

Transmitted for your information and use is a copy of the above reference. Please review this document and submit your comments or any concern that we can include in our package for the adoption process that we are currently working on. Comments should be turned in before March 3, 2006 for incorporation into the plan. If you have any question, just call Marc Gagarin, P.E. our Highway Chief Engineer @ Tel. # 646-3126 or Victor Pangelinan, Acting Chief Planner @ 646-3140.

Charles Buleto

Received By:

Date:

Sender



Governor
Felix P. Camacho
Lt. Governor
Kalco S. Moylan



Director
Lawrence P. Perez

FEB 15 2006
MEMORANDUM

TO: **Alberto Lamorena V**
Acting Director, BS&P

FROM:  Director of Public Works

SUBJECT: **Guam Highway Master Plan Update**

DPW engaged the team of *Duenas & Associates Inc. (duenasbordallo & Associates Inc.)* and *Wilbur Smith & Associates* to update the 2010 plan for the year 2020 planning horizon. A public hearing to present the Draft 2020 Highway Master Plan was conducted on August 18, 2005 at the Tamuning Community Center. The final draft was completed and submitted to DPW on October 27, 2005.

Attached is a copy of the final draft for your review and comments. Concurrently, DPW is distributing copies of the final draft plan to governmental agencies and military commands for their review and comments as well. We request for your comments to be submitted to my office before March 3, 2006.

Once the comments are received and the plan is finalized, the plan will be presented for approval/adoption process. The Government of Guam master plan approval/adoption process may be unclear at this time since the Guam Planning Council is defunct. Therefore, we request your assistance and guidance in getting the plan approved and adopted through a legislative resolution.

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GUAM 2020 HIGHWAY MASTER PLAN REPORT

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Chapter 1

INTRODUCTION

This chapter presents the scope and the process governing the review and adoption of the update of the Guam Highway Master Plan.

1.0 Purpose and Scope of the Guam Highway Master Plan Update Project

With the island experiencing a decrease in population and a serious decline in its visitor industry, it is logical to forecast a corresponding and significant shortfall in the travel demand and traffic flow volumes predicted by the 2010 Highway Master Plan. To properly assess and plan for the anticipated severe changes in the highway transportation system demand forecasts, the Government of Guam, Department of Public Works, engaged the team of Duenas & Associates, Inc. and Wilbur Smith Associates to update the 2010 plan for the year 2020 planning horizon. This plan update, referred to henceforth in the technical and the master plan study reports as the **Guam 2020 Highway Master Plan**, consists of the following tasks:

- Update the inventory of all roads and streets on Guam that make up the federal highway system.
- Conduct a thorough analysis of the island's current demographic, land use development and economic conditions as may be appropriate to reflect significant changes in the forecasts of traffic generation and travel demand made by the 2010 plan.
- Establish current traffic levels on Guam's major roads by implementing an effective Traffic Count Program to supplement traffic data expected to be generated by the DPW's Traffic Management Center project.
- Develop forecasts of population, employment, school enrollment and other aspects of Guam's demography for the planning horizon and, specifically, target years 2015 and 2020.
- Develop a new highway computerized travel demand model using proprietary software from TransCad. The computer model shall be developed using modeling procedures established for the 2010 Plan, conversion of the TranPlan (the original modeling software program) data to the TransCad platform and updated demographic, socio-economic and land use development forecasts.
- Using the TransCad-based model analyze traffic flows for the planning period and develop transportation demand forecasts for target years 2015 and 2020.
- Evaluate the Short Range Highway Improvement Program established by the 2010 Plan and develop a new short range program to address Guam's highway transportation system needs for target years 2005 and 2010.
- Evaluate the Long Range Highway Improvement Program established by the 2010 Plan and develop a new long range program to address Guam's highway transportation system needs for target years 2015 and 2020.

2.0 Review and Update of the Highway Master Plan Goals & Objectives

The Guam 2010 Highway Master Plan established 5 broad goals which remain valid and applicable to this planning effort. They are reiterated below with minor changes to the wording and adopted as the goals of the Guam 2020 Highway Master Plan.

- Goal 1: Highway Transportation Quality** - The Highway Master Plan shall meet accepted standards of transportation safety and service.
- Goal 2: Highway Transportation Efficiency** - The Highway Master Plan shall provide a high level of efficiency in the number of vehicular trips that are made.
- Goal 3: Highway Cost Effectiveness** - The Highway Master Plan shall achieve a high level of cost effectiveness in the use of available financial and material resources.
- Goal 4: Comprehensive Planning** - The Highway Master Plan shall support a coordinated and mutually supportive relationship with other planning efforts, with due recognition of highway transportation's key role in the social and cultural life in Guam, in the development of the local economy and in the support of emergency and homeland security services.
- Goal 5: Environmental Quality and Historic Preservation** - The Highway Master Plan shall support the maintenance and enhancement of the quality of the Island's natural environment and the preservation of historic resources.

For each of these goals, updated objectives were established to define the way in which the goals are to be achieved. Exhibit 1.1 presents the updated goals, objectives and evaluation criteria that will measure achievements.

Exhibit 1.1 CRITERIA FOR EVALUATING HIGHWAY MASTER PLAN GOALS & OBJECTIVES Guam 2020 Highway Master Plan		
GOAL NUMBER 1: HIGHWAY TRANSPORTATION QUALITY		
<i>The Plan shall meet accepted standards of highway transportation safety and service.</i>		
OBJECTIVES	CRITERIA	MEASUREMENT STRATEGIES
1.1 Good Traffic Flow Quality	Total highway-miles below Level of Service (LOS) Standard	Total system miles by direction with PM Peak volume/capacity ratio greater than 1.0
1.2 Adherence to Highway Design Standards	Total highway-miles upgraded to design standards	Highway Inventory
1.3 Mobility	Average Speed	PM Peak average system speed
1.4 Accessibility to the Highway Network	Average travel time for trips with trip ends in selected zones	PM Peak travel time from selected work locations to selected residential locations
1.5 Elimination of Traffic Hazards	Number of hazardous conditions/locations addressed by improvement projects	Analysis of accident data

GOAL NUMBER 2: HIGHWAY TRANSPORTATION EFFICIENCY		
<i>The Plan shall provide a high level of efficiency in the number of vehicular trips that are made.</i>		
OBJECTIVES	CRITERIA	MEASUREMENT STRATEGIES
2.1 Vehicle-miles and vehicle hours	Number of vehicle-miles and vehicle-hours	PM Peak vehicle-miles and vehicle-hours
2.2 Vehicle-miles on congested sections of highway	Total number of vehicle-miles on highway sections with substandard LOS	Total PM Peak vehicle-miles on highway sections with volume/capacity ratios greater than 1.2
2.3 Public Transit Services	Improvements to segments which are served by existing or potential transit routes	Highway inventory, measured against links having existing or potential transit routes
2.4 Transportation Systems Management (TSM)	Inclusion of TSM strategies in improvement program	Review of types of proposed improvements
GOAL NUMBER 3: HIGHWAY COST EFFECTIVENESS		
<i>The Plan shall achieve a high level of cost effectiveness in the use of available financial and material resources.</i>		
OBJECTIVES	CRITERIA	MEASUREMENT STRATEGIES
3.1 Capital Cost	Total capital cost of all highway improvements	Capital cost estimates, based on functional plans and typical land costs
3.2 Annual Cost	Amortized capital costs, plus annual maintenance costs, less savings in travel time costs	Capital cost estimates, unit maintenance costs and model output of travel time
3.3 Private Sector Involvement	Potential for private sector involvement	Qualitative assessment of proposed improvement projects
GOAL NUMBER 4: COMPREHENSIVE PLANNING		
<i>The Plan shall support a coordinated and mutually supportive relationship with other planning efforts, with due recognition of highway transportation's key role in the social and cultural life in Guam, in the development of the local economy and in the provision of emergency and homeland security services.</i>		
OBJECTIVES	CRITERIA	MEASUREMENT STRATEGIES
4.1 Other Planning Efforts	Extent of coordination and consistency with other planning efforts	Qualitative assessment
4.2 Economic Development	Extent of support for each major sector of the local economy	Qualitative assessment

4.3 Disaster and Homeland Security Planning	a) Number of corridor-miles in major travel corridors where alternate routes are available; b) Accessibility to alternate routes	Analysis of critical corridors and availability of alternate routes
4.4 Relocations and Disruptions	Number of homes and establishments required to relocate	Estimation of affected homes and establishments
GOAL NUMBER 5: ENVIRONMENTAL QUALITY AND HISTORIC PRESERVATION		
The Plan shall support the maintenance and enhancement of the quality of the Island's natural environment and the preservation of historic resources		
OBJECTIVES	CRITERIA	MEASUREMENT STRATEGIES
5.1 Maintenance and enhancement of the quality of the Island's natural environment	a) Amount of land taken from environmentally significant areas; b) Other impacts which could adversely affect these areas, e.g. visual intrusion, accessibility	Qualitative assessment
5.2 Disruption of Social and Cultural Characteristics	Extent of adverse impacts of proposed highway facilities on the cohesiveness of existing communities and neighborhoods, either by cutting through or passing near such areas	Qualitative assessment
5.3 Visual Impact of New Highways	Extent of visual intrusion, caused by a proposed highway structure or embankment, in areas having scenic or architectural value	Qualitative assessment
5.4 Preservation of Water Quality	a) Extent of potential runoff from highway sources being directed into critical watershed areas, reservoirs and groundwater recharge areas; b) Compliance with non-point source pollution management standards and program objectives.	Qualitative assessment
5.5 Air and Noise Pollution	a) Air Quality: Extent to which congestion and high peak hour traffic volumes are reduced along arterial roads; b) Noise: Extent of increased noise levels in residential districts caused by highway improvements.	Qualitative assessment

3.0 Work Progress Review and Highway Master Plan Adoption Process

3.1 Technical Review Committee - A Technical Review Committee (TRC) consisting of representatives of government agencies and private sector organizations holding a direct interest in the project was created by the Department of Public Works to review the initial progress of work and products generated by the highway master planning effort. The membership of the TRC follows:

- Department of Public Works
- Guam Environmental Protection Agency
- Bureau of Statistics & Plans
- Department of Land Management
- Guam International Airport Authority
- Guam Economic Development & Commerce Authority
- Guam Police Department
- Mayors Council
- Mass Transit Authority
- Chamorro Land Trust Commission
- Guam Chamber of Commerce
- Guam Hotel & Restaurant Association

In addition to work progress and submittal reviews, the TRC assisted with the planning team in developing the 2020 Plan goals and objectives.

3.2 Study Documents - Technical reports, working papers, informational memoranda and supporting documents were generated during the planning effort to mark the progress and completion of planning tasks and to facilitate review and input from the government, the public and the private sector.

3.3 Government Agency and Private Sector Review - Technical documents and draft plan reports were provided to public utility agencies, the military commands, private sector enterprises whose primary business activities depend directly on the highway transportation system, and special interest/civic groups for review and comment.

3.4 Public Review and Presentations - The scope of the planning effort included arrangements for island-wide public review and comment at critical stages of the planning process and plan adoption process as follows:

- A public meeting after the submittal of Technical Report No. 5 to present the assessment of future highway traffic conditions and the range of highway transportation plan alternatives was conducted on September 23, 2004 at the Tamuning Community Center;
- A public hearing to present the Draft 2020 Highway Master Plan was conducted on August 18, 2005 at the Tamuning Community Center;
- During the planning effort, presentations were made to certain special interest and civic groups in coordination with other infrastructure and private development projects.

Chapter 2

EXISTING CONDITIONS

This chapter documents the condition of the existing highway network, the status and schedule of proposed, committed highway improvement projects and the status of short and long range projects programmed for design and construction under the 2010 Highway Master Plan.

1.0 Condition of the Existing Highway Network

The following summarizes the condition of the existing highway network as well as traffic loadings in Year 2003.

1.1 Existing Highway Network - 2003

The configuration of the existing highway transportation network is depicted by Exhibit 2.1. A detailed functional inventory of the highway was submitted in Technical Report No. 1 and is available for review upon request. These data form the basis for the computerized Highway Traffic Forecast Model developed under this project.

1.2 2003 Traffic Counts

The following summarizes the preliminary results of the 24-hour traffic counts collected in March/April 2003 and comparison with counts made in 1991.

1.2.1 Comparison of 1991 and 2003 Traffic Counts

Traffic counts were taken at over one hundred locations throughout Guam to provide input to the Highway Master Plan Update process. Counts were made at each location over a 24-hour period on weekdays using MetroCount tube counters. Counts were recorded, by direction, in 15-minute intervals. Counts were made during the period from mid-March to early May 2003.

While some counts were made at the entrance to special traffic generators, such as the Guam International Airport and the military bases, the majority of counts (88 out of 114) were made on other public roadways. Similar counts were made by DPW in 1991 in connection with the development of the 2010 Highway Master Plan. A comparison of 2003 and 1991 counts allows an overview of the growth (or decline) in traffic volumes over the 12-year period. The Project Team was provided with additional ADT (Average Daily Traffic) data by the DPW for the 1997/1998 time frame. To simplify the following discussion, the 1997/1998 data are considered to represent traffic volumes in 1998.

The overall changes in 1991, 1998 and 2003 traffic volumes at public roadway locations are summarized in Exhibit 2.2. The locations for which counts were available are not identical for all three years, however the comparisons shown are based on a minimum of 69 locations.

Exhibit 2.1
Guam Existing Highway Transportation Network

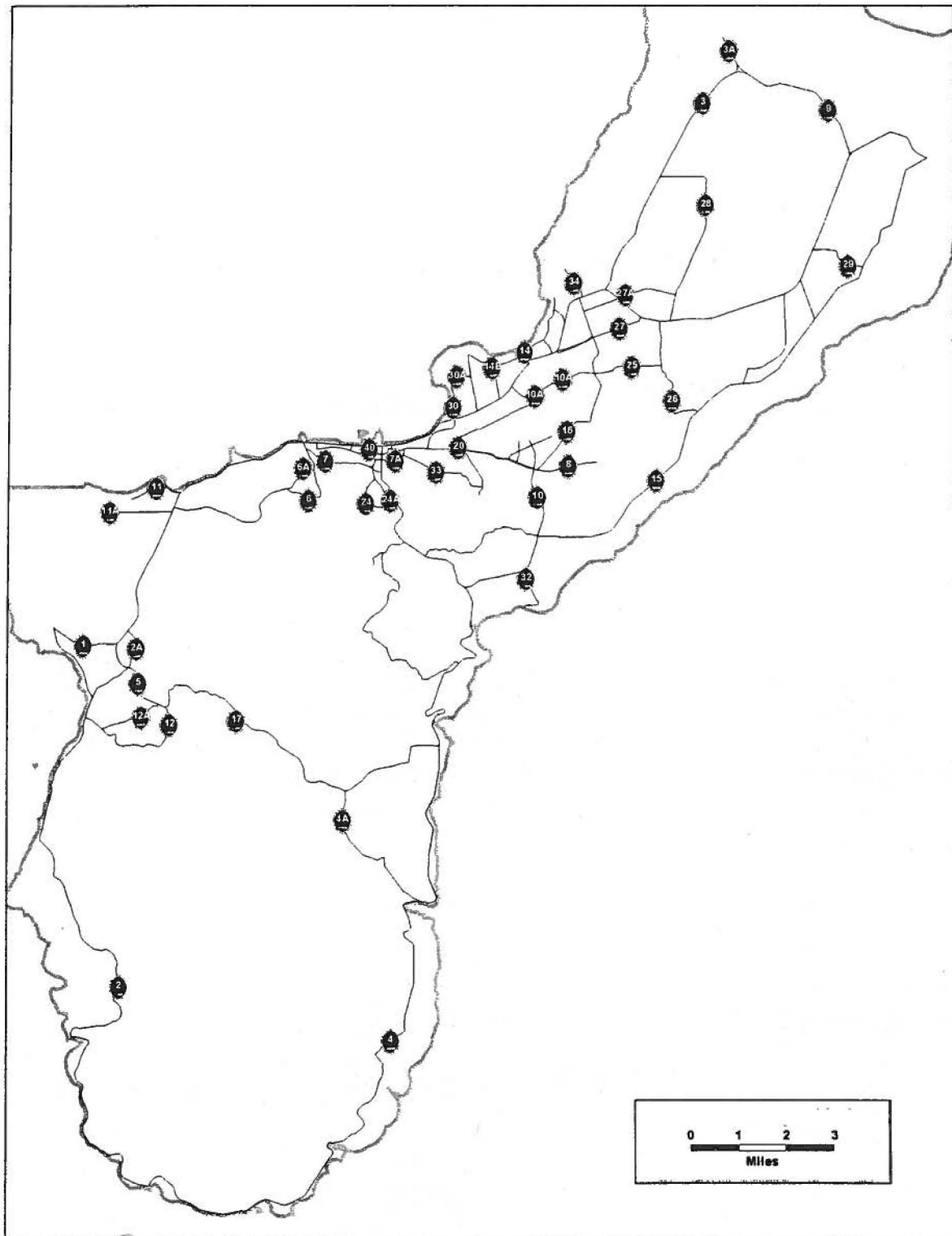


Exhibit 2.2			
Changes in Traffic Volumes between 1991 and 2003			
	Network-wide Change in Traffic		
	1991-1998	1998-2003	1991-2003
Average change over period ⁽¹⁾	17.4 %	-14.0 %	-0.9 %
Weighted change over period ⁽²⁾	12.5 %	-15.5 %	- 3.6 %
Average annual change (weighted)	1.7 %	- 3.3 %	- 0.3 %
Number of Comparable Sections	72	69	78
(1) Average change with all road sections weighted equally.			
(2) Average change with road sections weighted by traffic volume.			

Period 1991 to 1998

During the period between 1991 and 1998 it is estimated that overall traffic volumes on the island grew by 12.5 percent, representing an average annual growth rate of 1.7 percent per year. This average rate of growth, while significant, represented a moderation of the previously observed growth in traffic of 4.2 percent between 1990 and 1991 as discussed in the Guam 2010 Highway Master Plan report.

Period 1998 to 2003

In contrast to the previous period, between 1998 and 2003 overall traffic volumes **declined** by 15.5 percent, at an average annual rate of -3.3 percent per year.

Period 1991 to 2003

The net effect of increasing volumes during most of the 1990's and declining volumes since then is that overall traffic volumes have now returned to 1990 levels. Overall volumes have **declined** by -3.6 percent between 1991 and the first half of 2003.

Exhibit 2.3 located at the rear of this chapter presents a comparison of 1991 and 2003 Daily Traffic Counts.

1.2.2 Changes in Individual Road Sections

Exhibit 2.2 summarizes changes in traffic volumes for the island as a whole. Some individual road sections have experienced much greater increases or decreases in traffic than the network-wide average.

Five road sections have seen traffic growth of 35 percent or more between 1991 and 2003:

- | | | |
|----|---|------|
| 1. | Route 28, Chalan l'Bang to Route 3 (500-04) | 110% |
| 2. | Bello Road, Route 16 to Route 26 (719-00) | 50 % |
| 3. | Route 2A, Route 1 to Route 5 (140-00) | 40 % |

4.	Route 29, Route 1 to Route 15 (460-00)	39 %
5.	Route 27, Route 1 to Route 16 (440-00)	36 %

2.0 Review of Current Statewide Transportation Improvement Plan and 2010 Highway Master Plan Short and Long Range Program Projects

Documentation of the status of recent and current highway improvement-related projects is embodied in the following exhibits as follows:

- Exhibit 2.4 - Current Active Highway-Related Projects by DPW Programmed As Part of the FY 02 – FY 04 Statewide Transportation Improvement Plan (STIP) and Disaster Repair Work
- Exhibit 2.5 - 2010 GHMP Proposed Short-Range Improvements Projects Review
- Exhibit 2.6 – 2010 GHMP Proposed Long-Range Improvements Projects Review

Exhibit 2.4 CURRENT ACTIVE HIGHWAY-RELATED PROJECTS BY DPW PROGRAMMED AS PART OF THE FY 2002 - FY 2004 STATEWIDE TRANSPORTATION IMPROVEMENT PLAN (STIP) AND DISASTER REPAIR WORK			
Project Number	Location	Municipality	Status in 2003
FY 2002 STATEWIDE TRANSPORTATION IMPROVEMENT PLAN (STIP) PROJECTS			
1	Route 4 Rehabilitation & Widening, Phases 1 & 2, Route 1 to Route 10	Agana; Ordot-Chalan Pago	FY 2002 Design - Build Project. DB bid/contract documentation completed and ready for bid solicitation. This is a partial fulfillment of a 2010 HMP Long-Range Improvement Program project No. 19.
2	Route 3 Rehabilitation & Widening Project, Route 28 (Y-Sengsong Road) to Route 3A/Route 9 (Potts Junction)	Dededo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
3	Route 26 & Route 25 (Alegata Street) Intersection Rehabilitation, Widening & Traffic Signalization	Dededo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4	Island-Wide Highway Hazard Elimination Program - Various Locations	Various	Separate sites/projects as described below, 4(a) to 4(f)
4 (a)	Guardrails at School Bus Shelters along Federal-Aid Highways, Multiple Locations	Various	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (b)	Route 4 Rehabilitation & Widening, Jeff's Pirates Cove to Ipan Beach Park	Talofofo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation

4 (c)	Route 17 Rehabilitation & Resurfacing, Site No. 1: Laguina Circle (west) to Seventh Day Adventist Academy, Site No. 2: Near Camachili Store	Yona	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (d)	Route 29 Rehabilitation & Resurfacing from Country Store to Marianas Terrace (upper entrance)	Yigo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (e)	Island-wide Guardrails Rehabilitation	Various	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (f)	Route 1 & Wusstig Road Traffic Signalization	Dededo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
5	Route 26 Design Modification, Phase I: Route 1 to Route 25 (Alegeta Street), Phase II: Route 25 to Route 15	Dededo; Mangilao	FY 2002 Design Phase Project. To be re-designed; design under programming
6	Ylig Bridge	Yona	FY 2002 Design Phase Project: Completion of Plans, Specifications & Estimate (PS&E started but not completed under an earlier contract)
7	Route 2 Design Modification, Phase I: Namo River to Agat Cemetery, Phase II: Agat Cemetery to Santa Ana Chapel	Santa Rita; Agat	FY 2002 Design Phase Project: Design modification (from original design) underway
8	Route 5 Rehabilitation & Widening, Route 2A to Route 17	Santa Rita	FY 2002 Design Phase Project. This is listed as a 2010 HMP Long-Range Improvement Program project (Project No. 24)
9	Route 15, Rehabilitation & Widening, Phase I: Route 26 to Route 29 (Gayinero Road), Phase II: Route 29 to Andersen Air Force Base Back Gate	Mangilao; Yigo	FY 2002 Design Phase Project. Design phase consultant selection in progress
10	Route 17 Rehabilitation & Widening, Phase I: Route 5 to Route 4A, Phase 2: Route 4A to Route 4	Santa Rita; Yona	FY 2002 Design Phase Project. Portion from Sinifa to Apra Heights (@ Route 5) not consistent with Long Range Program Project (No. 23) description.
11	Route 27A (Fatima Road) Rehabilitation & Widening	Dededo	FY 2002 Design Phase Project. Design consultant selection in progress. This project is not included in 2010 HMP short or long range project list.
12	Route 25 (Alegeta Street) Rehabilitation & Widening	Barrigada; Dededo	FY 2002 Design Phase Project. Design consultant selection in progress. This is a 2010 short range improvement program project (No. 15)

FY 2003 STATEWIDE TRANSPORTATION IMPROVEMENT PLAN (STIP) PROJECTS			
1	GIAA Runway Extension 6R/24L	Tiyan	FY 2002 Construction Project. FHWA funds reprogrammed for GIAA use.
2	Route 2 Reconstruction & Widening, Phase I	Santa Rita; Agat	FY 2003 Construction Project. Design phase programmed under FY 2002 Design Phase project (No. 7 described above).
FY 2004 STATEWIDE TRANSPORTATION IMPROVEMENT PLAN (STIP) PROJECTS			
1	Ylig Bridge Reconstruction	Yona	FY 2004 Construction Project. Design phase programmed under FY 2002 Design Phase project (No. 6 described above).
2	Route 5 Rehabilitation & Widening, Route 2A to Route 17	Santa Rita	FY 2004 Construction Project. Design phase programmed under FY 2002 Design Phase project (No. 8 described above).
3	Route 26 Reconstruction & Widening, Phase I: Route 1 to Route 25 (Alegeta Street)	Dededo	FY 2004 Construction Project. Design phase programmed under FY 2002 Design Phase project (No. 5 described above).
4	Route 25 (Alegeta Street) Rehabilitation & Widening	Barrigada, Dededo	FY 2004 Construction Project. Design phase programmed under FY 2002 Design Phase project (No. 12 described above).
5	Route 27A (Fatima Road) Rehabilitation & Widening	Dededo	FY 2004 Construction Project. Design phase programmed under FY 2002 Design Phase project (No. 11 described above).
6	Highway Hazard Elimination Program, Island-wide replacement of pavement markers & traffic signs, etc.	Various	FY 2004 Construction Project.
PERMANENT RESTORATION - EARTHQUAKE & TYPHOON DAMAGE REPAIR & RESTORATION			
1	Agfayan Bridge, Project O. GQ-ER-22(017)	Inarajan	Programmed for design and construction in FY(s) 2003 - 2004.
2	Tinaga Bridge & Santa Rita Bridge, Project Nos. GQ-ER-22(018) & GQ-ER-22(020)	Santa Rita	Programmed for design and construction in FY(s) 2003 - 2004.
3	As-Misa Ridge (Inarajan, North Leg)	Inarajan	Programmed for design and construction in FY(s) 2003 - 2004.
4	Route 4 Earthquake & Typhoon Chata'an Damage Repairs & Restoration at As Alonso Area, Project Nos. GU-ER-GQ02(001) and GQ-ER-22(016)	Inarajan - Malojloj	Programmed for design and construction in FY(s) 2003 - 2004.

Exhibit 2.5 2010 GHMP PROPOSED SHORT-RANGE IMPROVEMENT PROJECTS REVIEW			
Project Number	Location	Municipality	Status in 2003
1	Intersection of Marine Corps Drive/Route 1 with Chalan San Antonio	Tamuning	Completed
2	Marine Corps Drive/Route 1, Airport Access Road to Y-Sengsong Road	Tamuning; Dededo	Airport Access Road to Route 16 - completed with a 6-lane dual configuration; Route 16 to Y-Sengsong Road is under construction with the same 6-lane dual configuration (3 lanes in both directions with a continuous center median provided with U-turn pockets at strategic locations.
3	Intersection of Marine Corps Drive/Route 1 with Wusstig Road	Dededo	Deferred
4	San Vitores Road, Ypao Road to JFK Road	Tamuning	Under construction using a 4-lane configuration with a landscaped center median provided with left turn pockets at strategic locations.
5	Intersections of San Vitores Blvd. With Gogna Road and Upper San Vitores Road	Tamuning	Completed/Superseded by San Vitores Blvd Reconstruction
6	JFK Road	Tamuning	Under construction using a 4-lane configuration with a center median provided with left turn pockets at strategic locations and a left turn lane and right turn lanes at its "T" intersection with San Vitores Boulevard and two north-bound left turn lanes, one through lane to Kmart and a free south-bound right turn lane at its intersection with Route 1.
7	Cold Storage Road Extension	Tamuning	Intersection w/Route 16 completed; remainder of project deferred
8	Harmon Connector and Reconstruction of Harmon Strip and Harmon Access Roads	Tamuning	Intersection w/Route 1 constructed with reduced section; remainder deferred.
9	Tumon Lane and Taitano Road	Tamuning	Deferred
10	Governor Camacho (formerly Camp Watkins) Road and Farenholt Avenue	Tamuning	Completed
11	Macheche Avenue	Dededo	To be re-designed; design modification under programming. The final lane configuration remains undetermined and will be dictated by traffic demand projections developed under this plan.

12	Jalaguac Road Connector	Tamuning; MTM	Deferred
13	Harmon Loop Road	Dededo	Completed
14	Route 3, Marine Corps Drive to Potts Junction	Dededo	Partially completed (Route 1 to Route 28) with reduced section; Route 28 to Route 9 (Potts Junction) under Design-Build programming with a 2-lane dual configuration with left turn lanes at its intersections with intersecting roadways and paved shoulders.
15	Alegeta Street, Route 25	Dededo	Route 10A to Alegeta Street completed; connection to Macheche/Carnation Avenue programmed as FY 2002 design phase project. The final lane configuration is undetermined and will be dictated by this plan.
16	Route 15, Route 10 to Carnation Avenue	Mangilao	Partially completed with asphaltic concrete overlay on the existing 2-lane configuration.
17	Route 15, Route 26 (Carnation Avenue) to Andersen Air Force Base	Mangilao; Yigo	Design phase consultant selection in progress. The final lane configuration is undetermined and will be dictated by this plan.
18	West O'Brien Drive, Aspinall Avenue to Chalan Obispo	Agana	Signal installed at Chalan Obispo; remainder of project has been deferred.
19	Peter Nelson Dr., Chalan Obispo to Route 4	Agana; Agana Heights	Deferred
20	Route 16, Route 10 to Marine Corps Drive	Barrigada; Dededo; Tamuning	Completed
21	Route 4, Route 10 to Yona Village	Chalan Pago-Ordot; Yona	Deferred
22	Route 4, Cross Island Road to Talofoto River Bridge	Yona	Deferred
23	Route 4, Yona Village to Cross Island Road	Yona; Talofoto	Yona Village to Ylig Bridge under construction with a 6 lane, dual configuration through the village and a 2-Lane dual configuration to Ylig Bridge, with a climbing lane in the north-bound direction from the bridge to the top of hill.
24	Marine Corps Drive, Polaris Point Access Road to Route 2A	Piti; Santa Rita	Completed
25	Route 2A, Marine Corps Drive to Namu River	Santa Rita	Completed

26	Route 2, Namo River to Agat Cemetery	Agat	Deferred
27	Route 2, Agat Cemetery to Santa Ana Chapel	Agat	Design modification under programming. The final lane configuration is undetermined and will be dictated by this plan.
28	Route 2, Umatac Village	Umatac	Deferred
29	Route 4, Talofofo River Bridge to Inarajan Village	Talofofo; Inarajan	Deferred; As Alonso area programmed for repair of damages from 2002 earthquake and typhoons
30	Route 4 at Inarjan Village	Inarajan	Deferred
31	Route 4, Inarajan Village to Merizo Village	Inarajan; Merizo	Portion near Inarajan Cemetery has been constructed. Remainder of the project has been deferred.
32	Route 4 at Merizo Village	Merizo	Deferred
33	Route 4, Merizo Village to Umatac Village	Merizo; Umatac	Deferred
34	Chalan Canton Tutujan Extension	Agana Heights	Deferred
35*	Route 1, Gayinero Road to Andersen AFB	Yigo	Completed

* This project was not included as part of the 2010 Highway Master Plan Short Range Program

Exhibit 2.6 2010 GHMP RECOMMENDED LONG-RANGE IMPROVEMENT PROJECTS REVIEW			
Project Number	Reference Name & Description	Municipality	Status in 2003
1	Upi Connector - Construct connector between Marine Corps Drive and Route 15 in a 2-lane configuration with alignment adjacent to AAFB Boundary;	Yigo	Not Programmed
2	Marbo Connector - Construct connector between Marine Corps Drive and Route 15 in a 2-lane configuration along east boundary of Marbo Annex, AAFB.	Yigo	Completed - Indirectly accomplished by construction of connector between Marine Corps Drive and Route 15 along Perez Acres Townhouse Complex/Goring Villa development.
3	Marine Corps Drive, Marbo Area - Widen Marine Corps Drive, Y-Sengsong Road to Marbo Connector to a 6-lane configuration.	Dededo; Yigo	Not Programmed
4	Ukudu Connector - Construct connector between Rte 3 and Marine Dr. with an alignment along Binadu St., Rydilla St. and Batulo St. using a 3-lane configuration.	Dededo	Not Programmed
5	Mogfog Connector - Construct connector between Rte 15 and Marine Dr. with an alignment near the west boundary of Marbo Annex, AAFB using a 4-lane dual configuration from Rte 15 to Macheche Connector and a 6-lane configuration from the Macheche Connector to Marine Dr.	Mangilao; Dededo	Not Programmed

6	Macheche Connector - Construct connector between Alegeta St. and Mogfog Connector with an alignment along Nandez St using a 5-lane configuration.	Dededo	Not Programmed
7	Adacao Connector - Construct connector between Rte 16 and Rte 15 with an alignment near the north boundary of NAVCAMS/Rado Barrigada and along a portion of Carnation Ave. using a 5-lane configuration	Barrigada; Mangilao	Not Programmed
8	Route 15 - Adacao Area - Widen Route 15, Mogfog Connector to Adacao Connector using a 4-lane, dual configuration.	Mangilao	Route 15 design has been programmed and a consultant selected. Since the development of the 2010 plan, a motor raceway park has been developed on a 252 acre parcel east of Marbo Annex.
9	Airport Access Road - Widen Airport Access Rd., Marine Dr. to Rte 16 using a 6-lane configuration.	Tamuning; Barrigada	Not Programmed
10	Tamuning Bypass and Service Road - Construct bypass between Rte 8 and Airport Access Rd. using the Jalaguac Connector (a 2010 HMP short range project) and alignment along upper cliff line using a 5-lane configuration; construct service road along lower cliff line using a 5-lane configuration.	MTM; Tamuning	The upper cliff line bypass route has been addressed conceptually by the acquisition of a 120-foot wide right-of-way corridor through the BRAC process (called the Laderan Tiyan Parkway corridor), but improvements have not been programmed; the Service Road has not been programmed.
11	Route 16, Barrigada - Widen Route 16, Route 10 to Adacao Connector using a 6-lane configuration.	Barrigada	Not Programmed
12	Route 8, Barrigada - Widen Route 8, NAS (Tiyan) Gate to Route 10 using a 6-lane configuration.	Barrigada	Not Programmed
13	Route 7 Extension - Construct extension of Route 7, from Route 4 to Ordot-Mongmong Connector across Agana Swamp using a 2-lane configuration.	Agana; MTM	Not Programmed
14	Halsey Road, Adelup Area - Reconstruct Halsey Road, Route 7 to Marine Corps Drive using a 5-lane configuration.	Asan	Not Programmed
15	Ordot-Mongmong Connector - Construct connector between Route 4 and Route 8 with an alignment along Chaot River, east of Agana Swamp and along Biang Street using a 4-lane configuration from Route 4 to Route 7 Extension and a 6-lane configuration from Route 7 to Route 8.	Chalan Pago- Ordot; MTM	Not Programmed
16	Conga - Mangilao Connector - Construct connector between Ordot-Mongmong Connector and Route 15 with an alignment north of Conga and along portion of Dairy Road using a 5-lane configuration.	Chalan Pago- Ordot; Mangilao	Not Programmed
17	Route 10 - Mangilao to Barrigada - Widen Route 10, University Drive to Route 8 using a 7-lane configuration.	Mangilao; Barrigada	Not Programmed

18	Route 15 - Mangilao Area - Widen Route 15, Route 10 to Fadian Point Road using a 4-lane, dual configuration.	Mangilao	Not Programmed
19	Route 4 - Agana to Chalan Pago - Reconstruct Route 4, Peter Nelson Drive to Route 10 using a 6-lane configuration.	Agana; Sinajana; Chalan-Pago Ordot	Route 4 will be reconstructed and widened, but to a 5-lane (4-lane w/center median strip). Expansion to a 6-lane configuration has not been programmed.
20	Lonfit Access Road - Incorporate Lonfit New Town Access Road (planned) into highway system and extend road eastward to Route 4 using a 5-lane configuration.	Asan; Chalan Pago-Ordot	Lonfit New Town project has been abandoned and the Lonfit Access Road is no longer a valid consideration.
21	Manengon Hills Access Road - Incorporate Manengon Hills Access Road into highway system.	Chalan Pago-Ordot; Yona	Completed.
22	Cotal Connector - Construct connector between Leo Palace Access Road and Route 17 with an alignment along the north and west boundaries of the Leo Palace development, then southwesterly across Ylig River to a connection with Route 17 at the crest of hill east of Apra Heights using a 2-lane configuration w/climbing lanes as needed.	Yona; Santa Rita	Not Programmed
23	Cross-Island Road - Sinifa to Apra Heights - Realign Cross-Island Road between Sinifa area and Route 5 at Apra Heights using a 2-lane configuration with climbing lanes where needed.	Santa Rita	Not Programmed
24	Route 5 - Apra Heights to Camp Covington - Widen Route 5, Route 17 to Route 2A using a 5-lane configuration.	Santa Rita	Not Programmed
25	Route 5 and Route 12, Naval Magazine Area - Reconstruct Routes 5 and 12 to modern design standards, Cross-Island Road to a point east of Santa Rita Village using 2-lane configuration with climbing lanes where needed.	Santa Rita	Not Programmed
26	Agat Bypass - Construct bypass at Santa Rita and Agat; connect with Route 12 east of Santa Rita Village using alignment south of Santa Rita Village, then southwesterly along east environs of Agat Village; connect with Route 2 near Santa Ana Chapel using a 2-lane configuration with climbing lanes where needed.	Santa Rita; Agat	Not Programmed
27	Marine Corps Drive, Piti Area - Widen Marine Corps Drive, Spruance Drive to Route 2A using 6-lane configuration..	Piti; Santa Rita	Not Programmed
28	Route 2A - North of Camp Covington - Widen Route 2A, Route 5 to Marine Corps Drive using 5-lane configuration.	Santa Rita	Completed.

3.0 Existing Island Economic and Demographic Conditions

A thorough discussion of Guam's current economy and demography as they affect current and projected traffic demands is presented in Chapter 4.

Exhibit 2.3
Comparison of 1991 and 2003 Traffic Counts

Control Number	Location	From	To	1991 Daily Volumes			97/98 ADT	2003 Daily Volumes			Percentage Change		
				NB/EB	SB/WB	Total		NB/EB	SB/WB	Total	91-98	98-03	91-03
012-01	Route 1	Piti Boundary	Route 18 (Polaris)	13,090	12,969	26,059	31,116	12,599	13,914	26,513	19%	-15%	2%
031-00	Route 1	Route 11	Asan Boundary	12,934	13,203	26,137	25,442	14,468	14,902	29,370	-3%	15%	12%
032-00	Route 1	Asan Boundary	Route 6 (Adelupe)	15,272	15,019	30,291	27,084	15,311	15,320	30,631	-11%	13%	1%
043-00	Route 1	Aspinall Avenue	Route 4 (Paseo)	30,330	0	30,330	37,604	17,957	18,812	36,769	24%	-2%	21%
051-00	Route 1	Route 4 (Paseo Loop)	Route 8	32,599	22,938	55,537	66,314	27,307	18,109	45,416	19%	-32%	-18%
052-00	Route 1	Route 8	Tamuning Boundary	33,535	34,655	68,190	81,422	27,661	27,628	55,289	19%	-32%	-19%
053-00	Route 1	Tamuning Boundary	Route 30	35,327	31,172	66,499	79,403	28,073	28,184	56,257	19%	-29%	-15%
054-00	Route 1	Route 30	Route 14 (ITC)	31,152	31,608	62,760	58,191	26,700	24,567	51,267	-7%	-12%	-18%
062-00	Route 1	Route 14B	Route 10A	35,115	31,270	66,385	57,687	32,381	34,285	66,666	-13%	16%	0%
071-00	Route 1	Route 10A	Route 14A	25,341	25,882	51,223	61,163	28,167	24,824	52,991	19%	-13%	3%
072-01	Route 1	Route 14A	Harmon Access Road	24,746	24,897	49,643	59,276	24,063	23,638	47,701	19%	-20%	-4%
073-00	Route 1	Route 14 (Upper Turnoff)	Route 16	27,601	27,460	55,061	57,972	23,112	24,485	47,597	5%	-18%	-14%
080-00	Route 1	Route 16	Route 30	22,621	22,088	44,709	48,976	19,976	19,908	39,884	10%	-19%	-11%
100-01	Route 1	Route 27	Route 26	19,274	19,481	38,755	46,275	22,799	18,769	41,568	19%	-10%	7%
110-01	Route 1	Route 28	Aga Blvd. (Ypaopao)	15,696	15,923	31,619		18,458	17,636	36,094	N/A	N/A	14%
110-02	Route 1	Aga Boulevard	Jacinto Road	11,993	11,825	23,818	42,680	14,703	14,908	29,611	79%	-31%	24%
130-02	Route 1	Fungo Road	Route 9	4,175	3,954	8,129	9,706	6,360	6,044	12,404	19%	28%	53%
140-00	Route 2A	Route 1	Route 5	6,443	6,297	12,740	15,212	8,879	9,384	18,263	19%	20%	43%
160-02	Route 2	Calle Marteres	Taleyfac Bridge	4,057	4,281	8,338	9,956	2,031	2,043	4,074	19%	-59%	-51%
172-02	Route 2	War Memorial Park	Umatac Bridge	1,448	1,333	2,781	2,949	1,212	1,256	2,468	6%	-16%	-11%
182-04	Route 4	Sunay Bridge	Ajayan Bridge	825	840	1,665	1,988	780	735	1,515	19%	-24%	-9%
183-04	Route 4	Dandan Road	Asalonso Bridge	2,472	2,158	4,630	5,528	1,825	2,187	4,012	19%	-27%	-13%
191-02	Route 4	Paulino Heights Road	Yona Boundary	3,083	2,991	6,074	7,253	2,860	2,931	5,791	19%	-20%	-5%
192-00	Route 4	Yona Bdry. Togcha Bridge	Route 17	3,389	3,238	6,627	6,332	2,851	2,941	5,792	-4%	-9%	-13%
201-02	Route 4	Chalan Ayuyu	Artemio Cruz Street	8,977	8,859	17,836	12,142	7,791	8,163	15,954	-32%	31%	-11%
211-01	Rte 4 Chalan Pago	Maimai Road	Route 10	13,689	11,367	25,056	24,011	10,636	10,090	20,726	-4%	-14%	-17%
212-01	Rte 4 Chaot	Tutujan (Sinajana)	Macajan (Ordot)	12,457	12,937	25,394	30,322	13,140	12,854	25,994	19%	-14%	2%

Exhibit 2.3 (Continued)
Comparison of 1991 and 2003 Traffic Counts

Control Number	Location	From	To	1991 Daily Volumes			97/98 ADT	2003 Daily Volumes			Percentage Change		
				NB/EB	SB/WB	Total		NB/EB	SB/WB	Total	91-98	98-03	91-03
213-00	Route 4	O'Brien Drive	Tutuian Drive	13,273	12,437	25,710	28,428	12,586	12,619	25,205	11%	-11%	-2%
215-00	Route 4	Route 1	Santo Papa	14,153	8,725	22,878	39,608	13,650	9,251	22,901	73%	-42%	0%
221-00	Route 10 Tai	Uog Road	Route 4 Chalan Pago	12,184	13,003	25,187	24,981	13,117	13,388	26,505	-1%	6%	5%
223-02	Route 10	Corten Torre Road	Route 15 / Dairy Road	19,415	17,250	36,665	43,780	20,022	17,445	37,467	19%	-14%	2%
232-00	Route 10	Barrigada Boundary	Route 8	14,937	14,808	29,745	35,517	17,034	16,809	33,843	19%	-5%	14%
241-01	Route 16	Route 10	S. Sabana Barrigada Dr	20,919	20,067	40,986		19,541	19,282	38,823	N/A	N/A	-5%
241-02	Route 16	S. Sabana Barrigada Dr	Route 10A Extension	21,759	19,234	40,993	34,346	20,808	20,254	41,062	-16%	20%	0%
242-00	Route 16	Route 10A Extension	Route 27	22,264	18,993	41,257	40,322	20,899	22,641	43,540	-2%	8%	6%
250-02	Route 16	Fatima Street	Route 1	13,707	12,952	26,659	31,832	11,174	10,624	21,798	19%	-32%	-18%
261-00	Route 8	Route 1	Chalan Santo Papa	18,434	9,476	27,910		19,181	7,627	26,808	N/A	N/A	-4%
262-00	Route 8	Chalan Santo Papa	Route 7 East O'Brien Dr	14,634	13,896	28,530	30,352	16,530	16,446	32,976	6%	9%	16%
263-00	Route 8	Route 7A E. O'Brien Dr	Route 33 (Barrigada)	19,887	18,467	38,354	45,797	19,361	20,866	40,227	19%	-12%	5%
264-00	Route 8	Route 33	Route 10	18,375	16,684	35,059		21,808	18,400	40,208	N/A	N/A	15%
273-00	Rte 7 Agana Heights	O'Brien Drive	Naval Hospital	8,830	8,476	17,306	20,664	5,623	5,325	10,948	19%	-47%	-37%
280-01	Route 3	Route 1	Coral Tree Drive	7,353	7,816	15,169	18,072	8,952	9,568	18,520	19%	2%	22%
290-01	Route 3	Route 28	Fern Terrace Entrance	6,150	6,524	12,674	14,622	5,507	5,893	11,400	15%	-22%	-10%
290-02	Route 3	Fern Terrace Entrance	Potts Junction	2,874	2,800	5,674	6,775	3,493	3,675	7,168	19%	6%	26%
302-00	Route 9	Agfagumas	AAFB Front Gate	1,509	1,576	3,085	3,684	2,015	2,101	4,116	19%	12%	33%
320-00	Route 11	Route 1	Naval Boundary (Cabras)	3,307	3,445	6,752	7,093	2,318	2,303	4,621	5%	-35%	-32%
332-00	Route 12	Santa Rita Boundary	Route 17 / Route 5	1,945	1,985	3,930	4,693	1,928	1,417	3,345	19%	-29%	-15%
342-01	Route 4A	Talofoto Boundary	San Miguel Street	1,314	1,297	2,611	3,118	1,504	1,404	2,908	19%	-7%	11%
361-02	Route 17	Bishop Baumgartner St	Yona Boundary	1,476	1,512	2,988	3,568	1,361	1,477	2,838	19%	-20%	-5%
370-02	Route 17	Puag Water Reservoir	Route 4	2,607	2,682	5,289	6,186	2,628	2,564	5,192	17%	-16%	-2%
381-00	Route 6 Nimitz Hill	Route 1 Piti	Nimitz Hill Estates	2,104	1,707	3,811	4,550	1,052	965	2,017	19%	-56%	-47%
382-02	Route 6	Turner Road	Libugon Overlook Entr.	1,170	1,123	2,293	4,550	1,077	1,023	2,100	98%	-54%	-8%
391-00	Route 15	Route 10	Hawaiian Rock	3,898	4,828	8,726	10,891	4,854	5,121	9,975	25%	-8%	14%
393-01	Route 15	Mangilao Boundary	Route 26	5,156	4,900	10,056	12,007	4,692	4,974	9,666	19%	-19%	-4%

Exhibit 2.3 (Continued)
Comparison of 1991 and 2003 Traffic Counts

Control Number	Location	From	To	1991 Daily Volumes			97/98 ADT	2003 Daily Volumes			Percentage Change		
				NB/EB	SB/WB	Total		NB/EB	SB/WB	Total	91-98	98-03	91-03
400-00	Route 15	Marbo Junction	Route 15	1,625	1,892	3,517	4,199	2,001	2,599	4,600	19%	10%	31%
410-01	Route 15	Route 29	Mt. Santa Rosa Road	2,457	2,172	4,629	5,527	2,644	2,720	5,364	19%	-3%	16%
421-00	Route 10A	Route 1	Route 10A Extension	13,858	14,522	28,380	20,902	11,662	14,433	26,095	-26%	25%	-8%
422-00	Route 10A	Route 10A Extension	Route 16	11,421	11,035	22,456	17,125	9,381	12,165	21,546	-24%	26%	-4%
431-00	Route 14	Route 1 (ITC)	Route 30A	14,557	13,482	28,039	36,178	11,201	11,490	22,691	29%	-37%	-19%
432-01	Route 14	Route 30A	Rotanda	11,200	10,891	22,091	27,355	7,658	8,148	15,806	24%	-42%	-28%
432-02	Route 14	Rotanda	Route 14B	14,262	13,512	27,774	27,003	7,168	7,449	14,617	-3%	-46%	-47%
433-00	Route 14	Route 14B	Route 14A	15,701	14,470	30,171	36,026	7,189	7,784	14,973	19%	-58%	-50%
434-01	Route 14	Route 14A	Gun Beach Road (Okura)	11,127	10,910	22,037	27,857	7,857	8,165	16,022	26%	-42%	-27%
434-02	Route 14	Okura Access Road	Route 1	9,349	9,710	19,059	26,313	8,041	8,122	16,163	38%	-39%	-15%
435-00	Route 14A	Route 1	Route 14, San Vitores Rd	6,346	6,239	12,585	16,269	7,403	7,042	14,445	29%	-11%	15%
436-00	Route 14B	Route 1	Route 14, San Vitores Rd	3,328	4,178	7,506	8,601	2,649	2,690	5,339	15%	-38%	-29%
437-00	Route 30	Route 1	Route 30A	7,427	6,790	14,217	14,866	7,361	7,651	15,012	5%	1%	6%
438-00	Route 30A	Route 30	Route 14	6,470	6,401	12,871	13,749	7,641	7,573	15,214	7%	11%	18%
440-00	Route 27	Route 16	Route 1	10,876	10,517	21,393		15,585	13,606	29,191	N/A	N/A	36%
460-00	Route 29	Route 1	Route 15	4,023	3,495	7,518	10,557	5,355	5,112	10,467	40%	-1%	39%
470-00	Route 32	Route 10	University of Guam	7,164	9,534	16,698	19,938	4,282	4,247	8,529	19%	-57%	-49%
480-00	Route 33	Route 8	Route 8	3,066	4,048	7,114	8,494	3,195	3,061	6,256	19%	-26%	-12%
500-01	Route 28	Route 1	Clara Street	7,647	6,133	13,780	10,315	6,976	6,453	13,429	-25%	30%	-3%
500-02	Route 28	Clara Street	Stampa Road	5,321	4,958	10,279	12,273	6,975	6,333	13,308	19%	8%	29%
500-04	Route 28	Chalan l'Bang	Route 3	2,066	2,254	4,320	10,315	4,458	4,632	9,090	139%	-12%	110%
501-00	Route 26	Route 1	Chalan Villagomez	9,594	8,352	17,946	24,393	8,265	10,295	18,560	36%	-24%	3%
502-00	Route 26	Chalan Villagomez	Route 15	3,212	3,729	6,941	8,288	3,748	3,869	7,617	19%	-8%	10%
718-11	Harmon Access Rd	Route 1	Route 16	8,402	6,313	14,715		8,621	5,502	14,123	N/A	N/A	-4%
719-00	Bello Road	Route 16	Route 26	6,343	4,876	11,219		7,562	9,320	16,882	N/A	N/A	50%
720-01	Santa Monica Ave	Route 1	Route 28	6,374	6,452	12,826		5,327	5,427	10,754	N/A	N/A	-16%
720-02	Fatima Street	Route 1	Route 16	8,195	8,277	16,472		5,228	5,004	10,232	N/A	N/A	-38%

Chapter 3

ANALYTICAL PROCEDURES

This chapter documents the development of the Travel Demand Model used to develop the Guam 2020 Highway Master Plan. It provides a description of the structure of the model, model inputs and results of the model calibration process for the study's base year of 2003. Results from using the model to project future year road conditions will be documented in subsequent Chapters.

1.0 Objectives of the Model Update Process

The objectives of the model update process are:

- To develop a travel demand model based on the modeling procedures used in the 2010 Plan Study conducted in 1991 – the original Guam Highway Master Plan (HMP) Study;
- To convert the model from TRANPLAN software to TransCAD software;
- To update model inputs for a base year of 2003; and
- To update model inputs to project traffic conditions for forecast years of 2015 and 2020.

2.0 Overview of the Travel Demand Model

This subchapter provides a brief overview of the Travel Demand Model used for the Guam Highway Master Plan Update Study. The model structure developed during the original Highway Master Plan Study was retained for the Update Study.

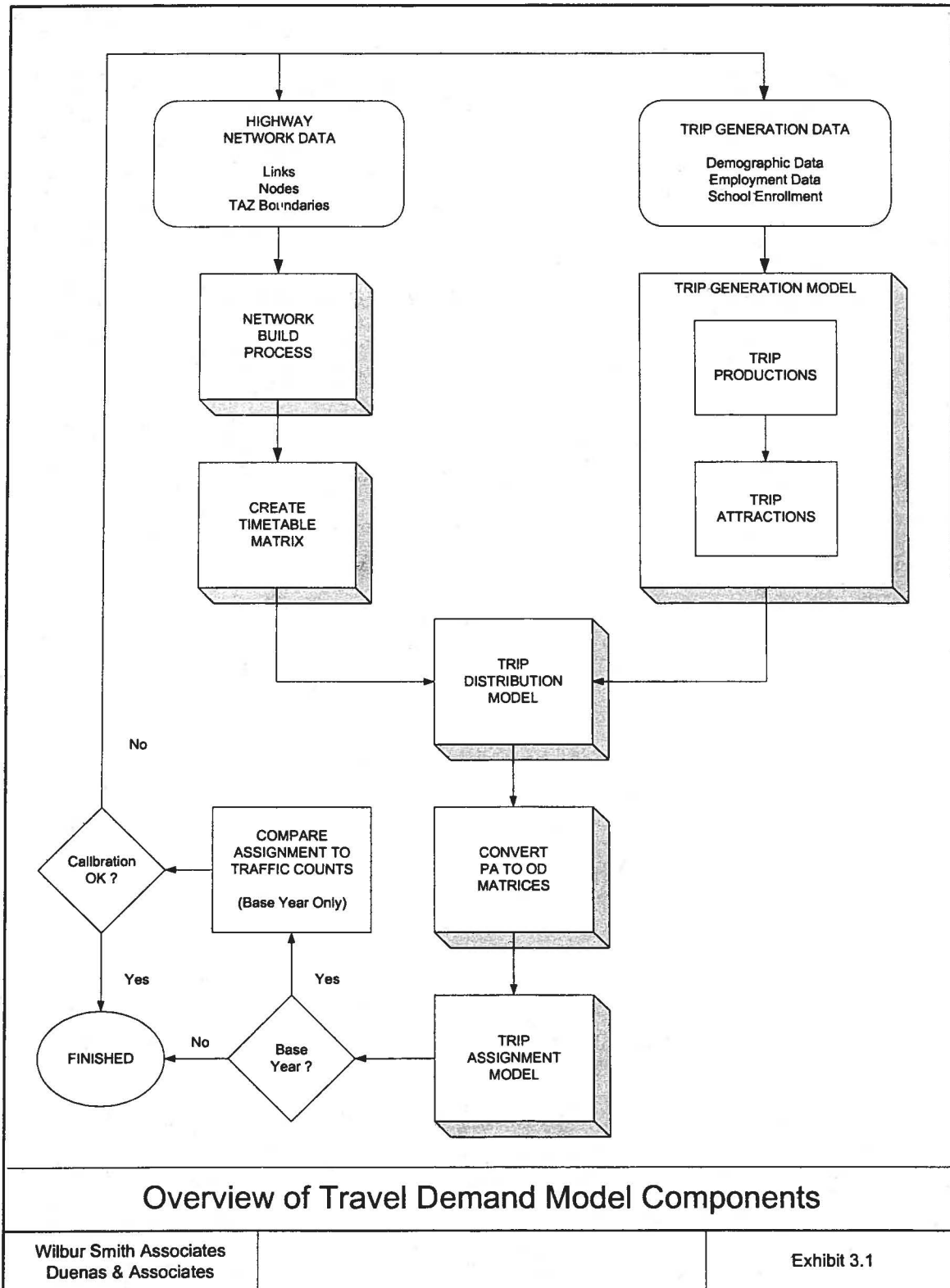
Information on model inputs and data sources is provided in subsequent paragraphs of this chapter.

2.1 Major Model Components

The Travel Demand Models are described in terms of five major components:

- Highway Network Model;
- Trip Generation;
- Trip Distribution;
- Trip Assignment; and
- Model Calibration.

The final process listed, Model Calibration, refers to the analysis of the study's base year (2003) to verify that the model is estimating highway traffic volumes with sufficient accuracy. The process of calibration is not performed in the analysis of future year travel demand. The overall structure of the model, including the base year calibration process, is shown in Exhibit 3.1



2.2 Highway Network Model

The Highway Network Model provides a computerized description of the principal highways on Guam. The initial network developed corresponds to the existing system of highways. This network will be modified in future tasks to permit testing of alternative networks for the project target years of 2015 and 2020.

2.2.1 Network Concepts – In the network model, roads are represented by “links” and major intersections by “nodes”. Within the model, links are considered as being unidirectional. Consequently, a two-way road between points A and B is represented by two links, one from A to B and the other from B to A. This permits road conditions to be defined separately for the two directions of travel.

2.2.2 Traffic Analysis Zones - In the 1991 Study, the network model representing Guam's base year highway system involved 155 traffic analysis zones (TAZ's). This zone system was adopted as the basis for the Update Study. To reflect changes at the 1991 TAZ representing the Airport and Naval Air Station (73), this TAZ was divided into three TAZ's as follows:

- 73 – International Airport
- 156 – Inside Airport Perimeter, south of runways
- 157 – Tiyán, outside Airport Perimeter, adjacent to Route 16

The TAZ system used for the Update Study is shown in Exhibit 3.2.

2.2.3 Zone Centroids - The center of traffic generating activity in each traffic analysis zone is represented by a special node, referred to as the “zone centroid”. Each zone centroid is connected to the physical highway network by special links called “centroid connectors”.

2.3 Trip Generation

Trip generation models estimate the number of trips that begin or end in a TAZ without identifying where the other ends of these trips are located. The latter is the function of the Trip Distribution model.

Two types of trip generation models were developed: trip production models and trip attraction models. Trip generation models were stratified into four trip purposes:

- Homebased-work (HBW) trips;
- Homebased-Other (HBO) trips;
- Non-Home Based (NHB) trips; and
- Commercial Vehicle (CV) trips.

For the two types of home-based trips, trip productions refer to the home end of the trip, and trip attractions refer to the non-home end of the trip. For non-home based and commercial vehicle trips, trip productions and trip attractions refer to the origin and destination of the trip, respectively.

2.3.1 Trip Productions – Trip productions were estimated on the basis of land use data, such as population, households etc., and trip rates. Trip rates were defined for

three household sizes, namely 1 to 2 persons, 3 to 4 persons and 5 or more persons. Data values used in the model are discussed in Section 4.

Trip productions by zone were estimated for the following purposes:

- Home-based Work trips; and
- Home-based Other trips.

The total number of Non-home Based trips was also estimated by the Trip Productions model, although the distribution of these trips among traffic analysis zones was defined by the Trip Attractions model.

2.3.2 Trip Attractions – The Trip Attraction model employs attraction equations to relate trips to various characteristics of zonal land use, such as School Enrollment, employment, etc. Separate equations were used for each of the four trip purposes.

2.4 Trip Distribution

The Trip Generation process provides an estimate of the number of trip ends (by purpose) in each TAZ. It is the task of the Trip Distribution process to connect trip production zones to trip attraction zones to form an estimate of zone-to-zone Production-Attraction (P/A) movements.

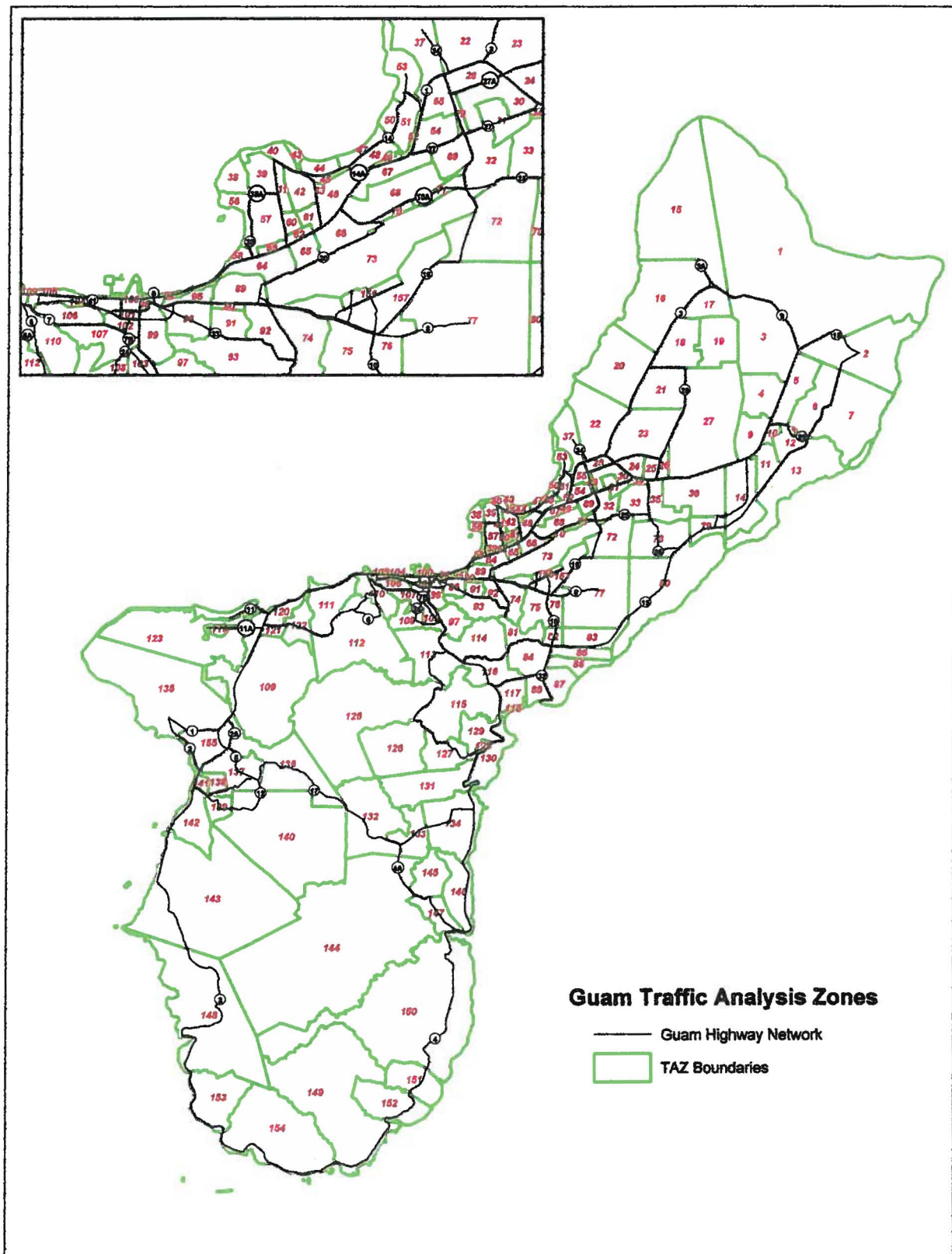
The general form of the distribution model is as follows:

$$T_{i-j} = \frac{P_i \times A_j \times F_{(t,j)} \times K_{(i,j)}}{\sum_{x=1}^n A_x \times F_{(t,x)} \times K_{(i,x)}}$$

Where	T_{i-j}	=	Trips produced in zone I and attracted to zone j.
	P_i	=	Trip productions at zone i.
	A_j	=	Trip attractions at zone j.
	$F_{t,j}$	=	Relative distribution rate, reflecting the travel-time separation between zones I and j.
	$t_{i,j}$	=	Travel time in minutes between zones I and j.
	$K_{i,j}$	=	Specific zone-to-zone adjustment factor.
	n	=	Total number of zones in the study area.

Relative distribution rates express the effect that spatial separation has on trip interchanges. These factors are measures of the impedance to inter-zonal travel due to the separation between zones. In effect, they measure the probability of trip making at each one minute increment of travel time. The relative distribution rates are also referred to as Friction Factors or Trip Distribution Curves.

Exhibit 3.2 Guam Traffic Analysis Zones



2.4.1 P/A and O/D Matrices – Following Trip Distribution it is necessary to convert the Production-Attraction (P/A) matrices to Origin – Distribution (O/D) matrices contain trips in their proper directional orientation.

Converting a P/A matrix to an O/D matrix, which represents all trips in a 24-hour period, requires a series of matrix manipulation procedures. Where analysis of peak-hour traffic conditions is required it is also necessary to create peak-hour origin-destination matrices. This is achieved by applying conversion factors to the 24-hour P/A matrix for each trip purpose. The factors used in this study are listed in Section 6. Where peak-hour characteristics differ significantly from the island-wide average, specific zones may be subject to additional adjustments. An off-peak O/D trip matrix may be obtained by subtracting peak-hour trips from the 24-hour O/D trip matrix.

2.5 Trip Assignment

Trip assignment is the process in which an Origin/Destination trip matrix is loaded onto a network, to provide an estimate of traffic volumes on each highway link.

Trip assignment was made using the Restraint Loading assignment technique. In this method, trips are loaded on the minimum time paths of the network. Travel time is then adjusted link-by-link according to a “volume/capacity time adjustment curve”. This iterative assignment procedure is then repeated, with travel times being adjusted following each assignment stage. The Restraint Loading technique may involve up to a maximum of 10 iterations. Traffic flows are calculated as the average volume assigned in each assignment iteration.

2.5.1 Highway Load – A 24-hour O/D trip matrix is loaded on to the highway network by simply using the selected assignment technique.

To project peak-hour, as well as 24-hour traffic volumes, it is necessary to separately assign AM Peak, PM Peak and Off-Peak O/D matrices to the highway network. The results may then be combined to obtain 24-hour traffic volumes.

The assignment process results in the creation of a new network description file, which contains assigned traffic volumes for each network link. This file is frequently referred to as a “loaded network” file.

2.5.2 Base Year and Future Year Analyses – In using Travel Demand Models to project future year highway conditions, the assignment process is the final step. Before the models can be used with confidence however, it is necessary to verify that they are capable of estimating base year conditions with sufficient accuracy. This additional activity is called Model Calibration.

2.6 Model Calibration

The validity of the Travel Demand Models is tested by comparing traffic volumes estimated by the model with traffic counts. Comparisons are made across screenlines and at individual highway links. Base year traffic counts used in the calibration process were collected by the study team in March and April 2003.

3.0 TransCAD Modeling Environment

The Guam Highway Master Plan Update Project differs from the 1991 Highway Master Plan Study in that it executes all modeling efforts using TransCAD Transportation GIS software. One copy of the software was purchased on behalf of the Department of Public Works (DPW), with which DPW staff will be able to create maps and conduct in house network analysis. The software may in fact be installed on more than one computer in DPW offices, but only one copy may be used at any one time due to the requirement for a hardlock (dongle) to be installed in a parallel or USB port for the software to run.

TransCAD combines capabilities for digital mapping, geographic database management and presentation graphics with tools to apply transportation planning, operations research and statistical models.

In a geographic information system (GIS), data are typically associated with points, lines, and polygons. These data structures are applied to the modeling process, as well as special generators, geographic networks, and traffic analysis zone boundaries. TransCAD takes these data features one step further in the direction of transportation modeling and has created data structures that link geographic data with mathematical networks and flow matrices.

3.1 TransCAD Modeling Capabilities

TransCAD has been designed to facilitate the implementation of the traditional four-step transportation planning model:

- Trip Generation;
- Trip Distribution;
- Modal Split (not applicable to the Guam Travel Demand Model); and
- Trip Assignment.

TransCAD provides tools to create geographic files of roads and traffic analysis zones that can be displayed on a map. It also has a variety of database tools that allow the user to create trip generation tables, as well as balance trip productions and attractions. There are also built-in planning tools that allow the user to apply the traditional gravity model for trip distribution and others for assigning trip matrices to the road network. Finally, TransCAD allows the user to display assignment results on a map using traditional GIS tools that have previously been unavailable in transportation planning modeling software.

The full range of TransCAD modeling capabilities is described in detail in TransCAD documentation "Travel Demand Modeling with TransCAD 4.5"¹, which supplements the TransCAD User's Guide².

¹ Travel Demand Modeling with TransCAD 4.5, prepared by Caliper Corporation, 2002.

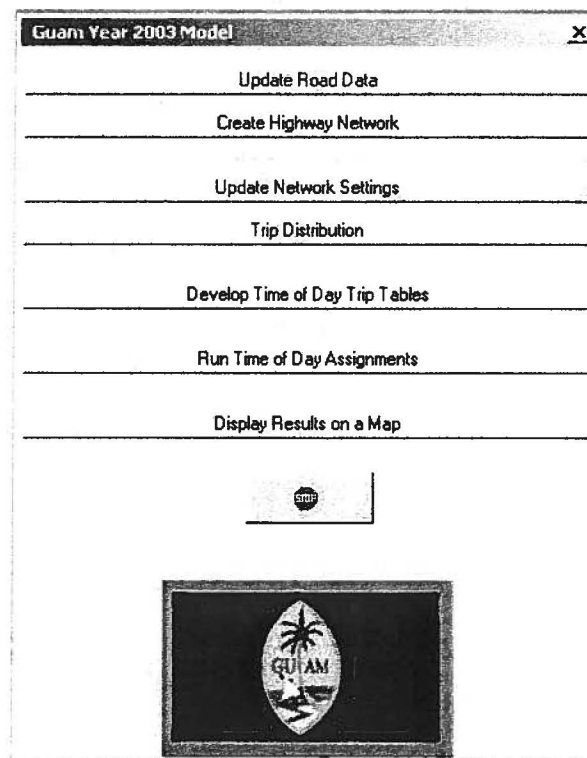
² TransCAD Transportation GIS Software, User's Guide, prepared by Caliper Corporation, 2000.

3.2 Using TransCAD's Batch Mode

To assist in the running of the Guam Travel Demand Model, a number of "scripts" (programs) have been written by the Consultants to automate the execution of various modeling processes. These scripts allow model processes to be run in TransCAD's "Batch Mode". The scripts are executed by selecting *Tools, Add-Ins* from the standard TransCAD menus and then selecting the Guam Model menu. The scripts assume the use of certain file names for the input and output of various processes. These file names are shown in the Exhibits illustrating each process in subsequent sections of the Report.

The current Guam Travel Demand Model Menu is illustrated in Exhibit 3.3. The menu system is subject to change during the remainder of the project.

Exhibit 3.3
Guam Travel Demand Model Menu



4.0 Highway Network Model

The highway network model provides a computerized description of the principal highways on Guam. These data are stored in both a TransCAD geographic file of LINKS and NODES, as well as a TransCAD network file.

The network consists of LINKS that are connected by NODES. The links are the line segments that represent the principal roads on Guam. The geography of the links is based directly on TIGER 2003 lines from the US Bureau of the Census. Each link has a unique ID number. The Guam model network contains directional data. This means that each link has attributes from A to B and B to A. This permits road conditions to be coded directionally, as the road characteristics often differ directionally. The nodes in the Guam highway network represent signalized intersections, non-signalized intersections, and endpoints of DPW control sections. Like the links, the nodes have unique ID numbers. Link ID numbers are arbitrary. Node ID numbers are arbitrary except for centroid nodes, which are numbered according to their respective traffic analysis zone.

A special node, referred to as the zone centroid, represents the center of traffic generating activity in each traffic analysis zone. Each zone centroid is connected to the physical highway network by special links called centroid connectors.

The Guam Highway network used for the base year (2003) Travel Demand Model is illustrated in Exhibit 3.4

4.1 Network Model Processes

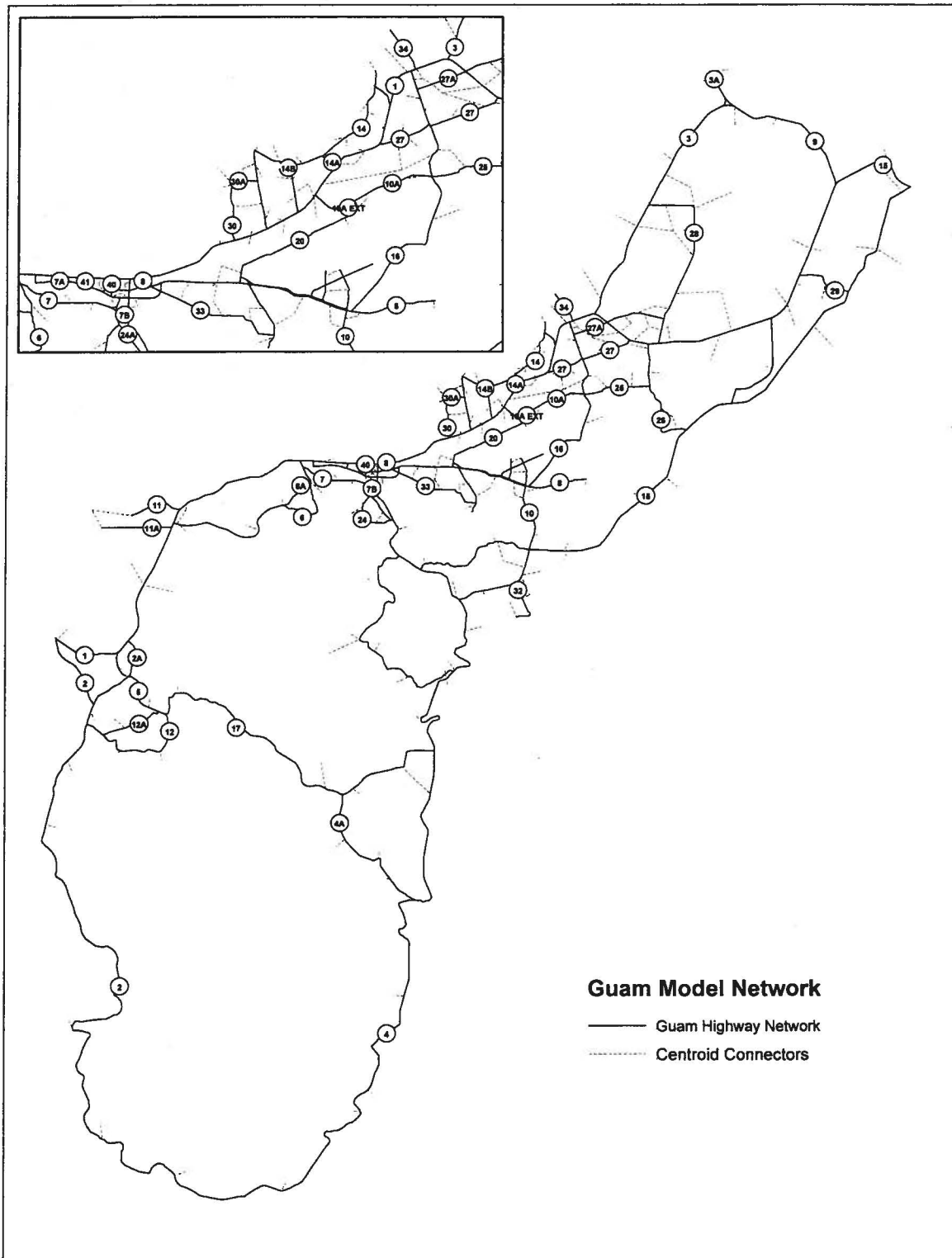
The process of building and checking a computerized description of the highway network required the use of a number of TransCAD functions. These included:

- Import TIGER 2003 Geography from the US Bureau of the Census;
- Import Guam roadway characteristics from 1991 TRANPLAN network;
- Update current roadway characteristics from the 2003 Highway Master Plan Database;
- Create centroids and centroid connectors;
- Develop highway network;
- Develop shortest path time table matrix; and
- Build intrazonal impedances.

The importing of TIGER files (Topologically Integrated Geographic Encoding and Referencing system) was conducted using TransCAD's import tools that read in spatial data from Census Bureau shape files (ESRI format shape geographic files). Once the TIGER roads were imported into TransCAD geographic files, roadway characteristics were obtained from the previous model network. The network was imported from TRANPLAN format into TransCAD using the *Planning - Import Planning Data* tool.

Maps were created to display the previous roadway characteristics, and those attributes were compared to updated 2003 highway characteristics detailed in the Highway Master Plan Database. Once all necessary roadway characteristics were updated, the highway network was then finalized.

Exhibit 3.4
Guam Base Year Highway Network



4.1.1 Network Attributes - The essential characteristics for developing and applying a transportation model for Guam are link lengths, speeds (posted and observed) and capacities. Other attributes included in the network for informational and mapping purposes are detailed in Appendix A, Data Dictionary of Technical Report No. 2.

4.2 Revising the Network

Changes to the highway network are implemented through editing the network geographic file – by moving, adding or deleting links/nodes and/or by editing the values of link or node attributes.

After the geographic file has been edited, the TransCAD Network file must be re-created to reflect the edits. This involves three steps, as illustrated in Exhibit 3.5.

- Update Road Data – updating the travel time fields, based on length and speed;
- Create Highway network – re-create the TransCAD network file; and
- Update Network Settings – incorporating zone centroids and turn penalties into the network.

For the base year the Network Build processes require / create the following files:

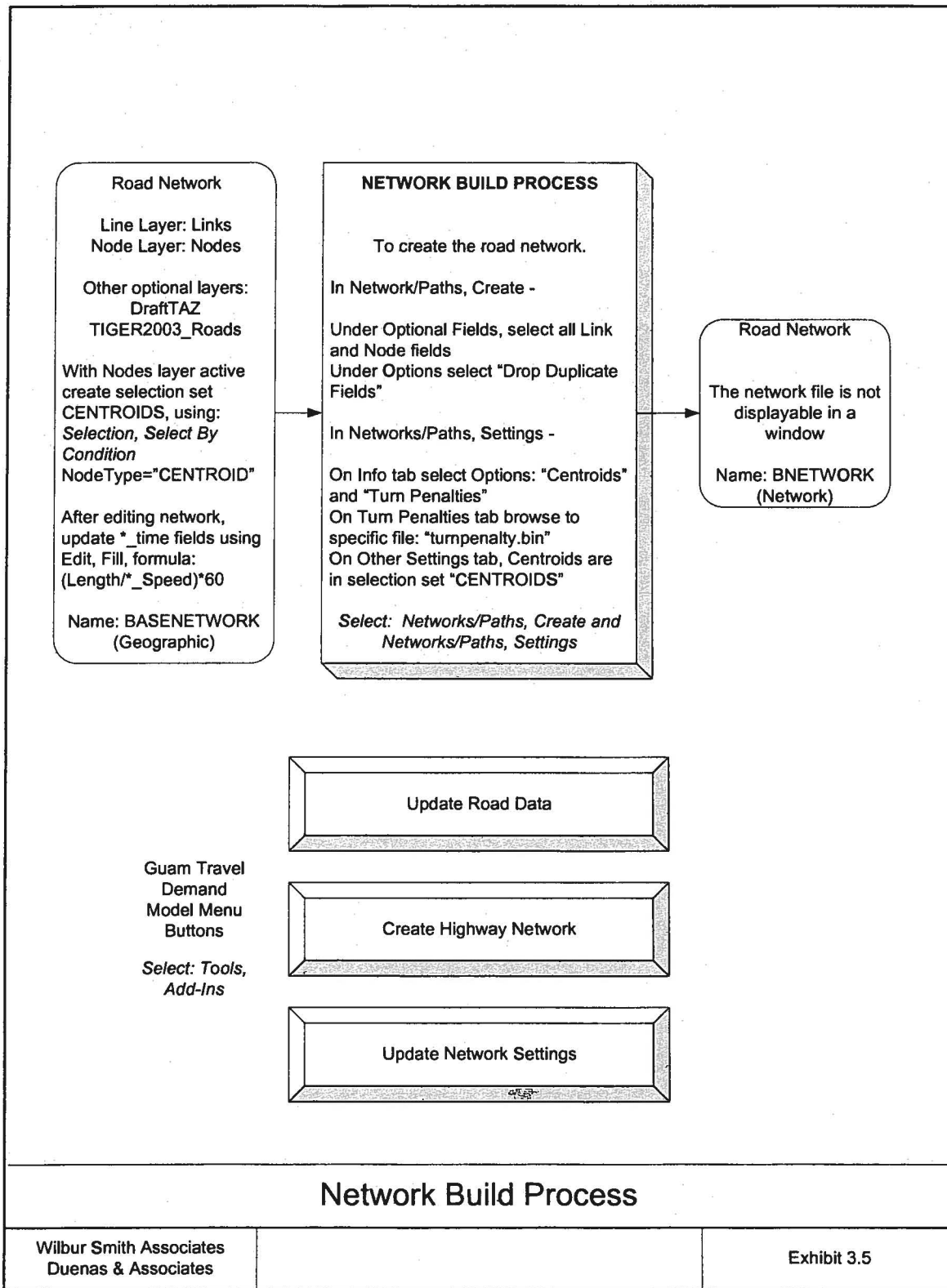
- Require: BaseNetwork.dbd (Geographic file); and
- Create: Bnetwork.net (Network file).

5.0 Trip Generation

Trip generation models estimate the number of trips that begin or end in a zone without identifying where the other ends of these trips are located. The latter is the function of the Trip Distribution model, as discussed in Section 6

The Trip Generation Models were developed in an Excel spreadsheet. The resulting trip productions and trip attractions by zone and by trip purpose were then imported into TransCAD. The TransCAD software package does provide a range of internal tools to facilitate the development of Trip Generation models, including cross-classification, regression models and discrete choice models. However, an Excel spreadsheet was used for the Guam Highway Master Plan Update Study for the following reasons:

- Many of the data inputs were developed or available in Excel format;
- Ease of updating key parameters (trip rates, adjustment factors, etc) during the calibration process; and
- Ease of understanding the computational processes involved for those with limited TransCAD experience.



5.1 Introduction to Trip Generation

Two types of trip generation models were developed: trip production models and trip attraction models. Trip generation models were stratified into four trip purposes:

- Home-based Work trips;
- Home-based Other trips;
- Non Home-based trips; and
- Commercial Vehicle trips.

For the two types of home based trips, trip productions refer to the home end of the trip, and trip attractions refer to the non-home end of the trip. For non-home based and commercial vehicle trips, trip productions and trip attractions refer to the origin and destination of the trip, respectively.

The overall Trip Generation Process is illustrated in Exhibit 3.6.

5.2 Trip Production Models

Trip productions were estimated on the basis of demographic data, such as population, households etc., and trip rates. Trip rates were defined for three household sizes, namely 1 to 2 persons, 3 to 4 persons and 5 or more persons. For purposes of the Trip Production Models, people living in non-institutional group housing, such as military barracks, dormitories, etc., were considered as living in 1-person households.

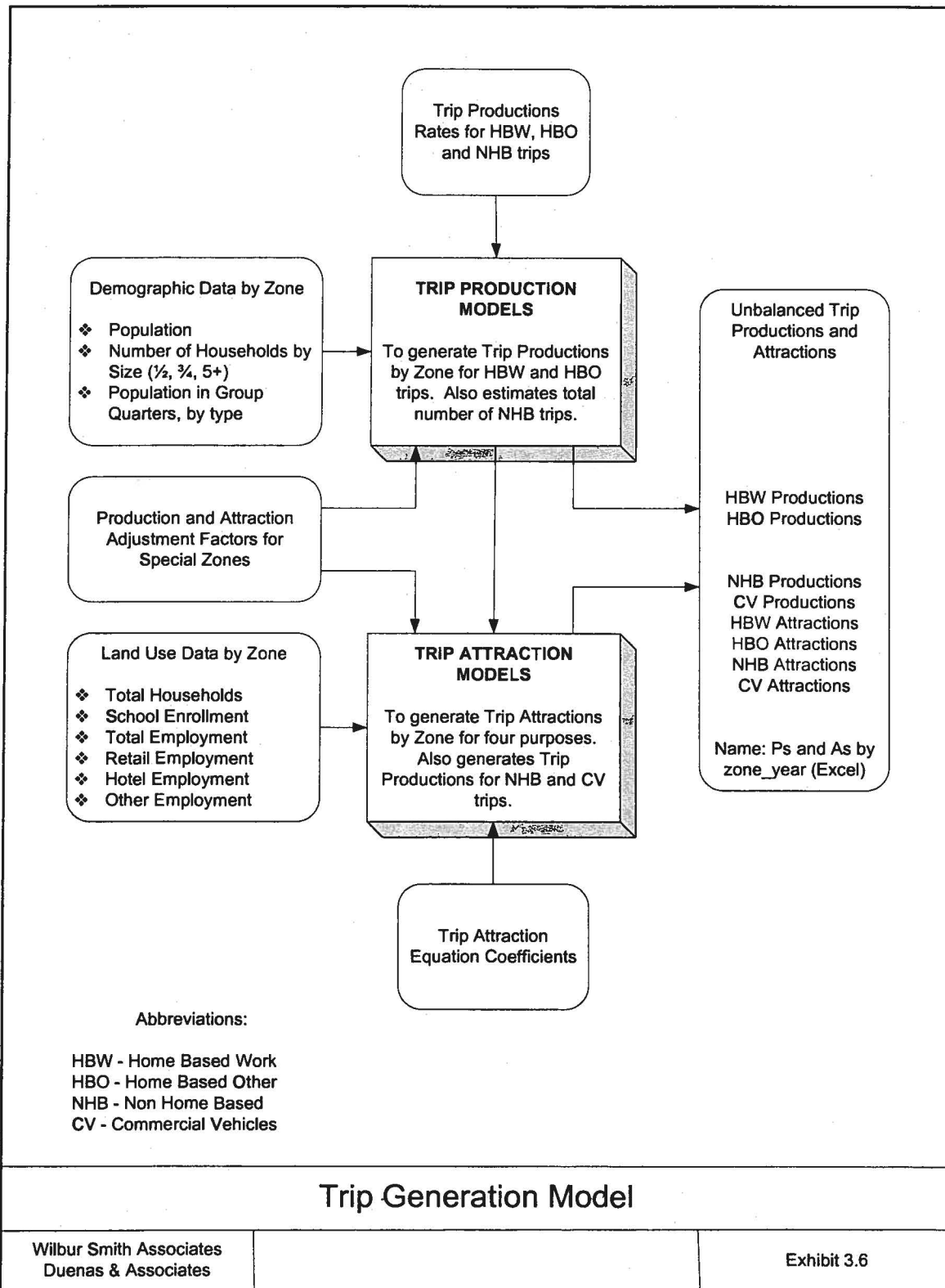
Trip rates used in the Update Study were based on those used in the original Guam HMP Study, which in turn were based on rates used in previous comparable studies. The rates were adjusted to provide compatibility between observed traffic volumes and model estimates, as described in Section 8. Trip productions by zone were estimated for the following purposes:

- Home-based Work trips; and
- Home-based Other trips.

The Trip Productions model also estimated the total number of Non-home Based trips, although the distribution of these trips among traffic analysis zones was defined by the Trip Attractions model. The number of Commercial Vehicle trips was estimated using the Trip Attraction models, as discussed later in this Section.

5.2.1 Demographic Data – Trip Production models used data from the Census 2000 data files for Guam. Selected items from the Census 2000 data for each Traffic Analysis Zone (TAZ) are listed in Appendix B of this report, including:

- Field P001001: Total population;
- P018001: Total Households;
- HH_12Person: Households with 1 - 2 People;
- HH_34Person: Households with 3 - 4 People;
- HH_5MorePerson: Households of 5 or More People;
- PopGrpQuarters: Population living in group quarters;
- Inst_Total: Population living in Institutional group quarters; and
- NonInst_Total: Population living in Non-institutional group quarters.



5.2.2 Changes from 2000 to 2003 – To reflect changes in population and other demographic data between the Census (2000) and the study's base year (2003) demographic data were adjusted downwards by an overall factor of 12 percent, in accordance with the findings presented in the Inception Report³.

5.2.3 Adjustments for Specific Zones – Guam's military bases and other special generators exhibit unique trip generating characteristics. To reflect these characteristics, adjustment factors were applied to trip productions for a number of zones, as shown in Exhibit 3.7.

Exhibit 3.7
Zones with Production and Attraction Model Adjustments

Zone	Description of Zone	Original Study		Update Study	
		Prod. Model	Attr. Model	Prod. Model	Attr. Model
1	Andersen Air Force Base, including Main gate	Yes	Yes	Yes	Yes
2	Andersen Air Force Base, including Back gate	Yes	Yes	Yes	Yes
9	In Dededo	No	No	Yes	Yes
14	Andersen South (Housing now closed)	No	Yes	No	No
15	West of Andersen AFB	Yes	No	Yes	No
16	Finegayan (NCTAMS)	Yes	Yes	Yes	Yes
19	In Dededo	Yes	Yes	No	No
20	South Finegayan and FAA Headquarters	Yes	Yes	Yes	Yes
27	In Dededo	Yes	Yes	Yes	Yes
39	Guam Memorial Hospital	No	No	No	Yes
43-45	Major tourist area (Tumon Bay)	Yes	Yes	No	Yes
47-48	Major tourist area (Tumon Bay)	Yes	Yes	No	Yes
50-51	Major tourist area (Tumon Bay)	Yes	Yes	No	Yes
53	Major tourist area (Tumon Bay)	Yes	Yes	No	Yes
56	Major tourist area (Agana Bay)	No	No	No	Yes
70	Guam International Airport Terminal	No	Yes	Yes	Yes
72	U.S. Post Office, Barrigada	Yes	Yes	Yes	Yes
73	Airport and Naval Air Station (now closed)	Yes	Yes	No	Yes
77	NAVCAMS in Barrigada	No	No	No	Yes
79	In Mangilao	Yes	Yes	No	No
87	University of Guam	No	Yes	No	Yes
89	Naval Air Station Offices	Yes	Yes	No	No
112	Nimitz Hill (COMNAVMAR Headquarters)	Yes	Yes	Yes	Yes

³ Guam 2020 Highway Master Plan. Technical Report No. 1: Inception report, page 3-5, dated June 4, 2003.

119	Port of Guam	No	Yes	No	Yes
135	U.S. Navy Base	Yes	Yes	Yes	Yes
140	Naval Magazine	Yes	Yes	No	Yes
155	U.S. Navy Base	Yes	Yes	Yes	Yes
156	Airport (south and west of runways)	N/A	N/A	No	Yes
157	Department of Motor Vehicles (Tiyan)	N/A	N/A	No	Yes

5.2.4 Trip Rates – Trip rates used in the Trip Productions models are shown in Exhibit 3.8 for each Household Size Group and for each trip purpose.

Exhibit 3.8 Trip Production Rates Guam 2020 Highway Master Plan			
Trip Purpose	Daily Vehicle Trips Per Household (1)		
	Group 1 1 - 2 People	Group 2 3 - 4 People	Group 3 5 or more
Home-based Work (HBW) Trips	1.559	2.612	3.608
Home-based Other (HBO) Trips	2.249	4.784	7.880
Non-Home-based (NHB) Trips	2.806	5.626	6.852

Notes: (1) Households divided into 3 groups by size of Household

5.3 Trip Attraction Models

The Trip Attraction model employs attraction equations to relate trips to various characteristics of zonal land use, such as school enrollment, employment, etc. Separate equations were used for each of the four trip purposes. Equation coefficients used in the model are shown in Exhibit 3.9.

Trip attraction equations require school enrollment and employment data by the zone where the school or employment is located. These types of data are not available from Census data files. Such data was obtained independently of Census data and generally correspond to the end of 2002 timeframe. No further overall adjustment was made to school enrollment and employment data for the base year. The number of total households was taken from the Census 2000 data and was adjusted to estimated 2003 levels, as discussed previously.

School enrollment data were adjusted manually for zones 46 and 87. The December 2003 Typhoon resulted in the temporary closure of the John F. Kennedy High School in Tamuning (zone 46), with students using the George Washington High School in Mangilao (zone 87). The 2,925 students originally in zone 46 were therefore transferred to zone 87, for purposes of the base year model.

Exhibit 3.9 Trip Attraction Equations Guam 2020 Highway Master Plan	
Trip Purpose	Trip Attraction Equations
Home-based Work (HBW) Trips	1.000 x Total Employment
Home-based Other (HBO) Trips	0.403 x Total Households +
	0.600 x School Enrollment +
	2.180 x Retail Employment +
	0.703 x Hotel Employment +
	0.703 x Other Employment
Non-Home-based (NHB) Trips	0.709 x Total Households +
	0.137 x School Enrollment +
	6.672 x Retail Employment +
	3.400 x Hotel Employment +
	1.290 x Other Employment
Commercial Vehicles	0.105 x Total Households +
	0.202 x Retail Employment +
	0.062 x Hotel Employment +
	0.062 x Other Employment

5.3.1 Adjustments for Specific Zones – As with trip productions, Guam's military bases and other special generators exhibit unique trip attracting characteristics. To reflect these characteristics, adjustment factors were applied to trip attractions for a number of zones, as shown in Exhibit 2.7.

5.4 Changes in Land Use Data from 1990

Exhibit 3.10 summarizes estimated changes in the principal demographic data land use characteristics for Guam since 1990.

Exhibit 3.10 Changes in Land Use Data Since 1990			
Land Use Characteristic	1990	2000	2003
Total Population	133,152	154,782	136,213
Total Households	30,987	38,761	34,077
School Enrollment	33,281		40,666 ⁽²⁾
Total Employment	64,914		63,263
Retail Employment	10,149		11,300
Hotel Employment	3,804		4,110
Other Employment ⁽²⁾	50,961		47,856
Notes: (1) Includes DODEA Schools (2) Military and Government Employees			

5.5 Trip Production and Attraction Totals

The total numbers of Trip Productions and Trip Attractions generated by the Trip Generation Models are shown in Exhibit 3.11.

Exhibit 3.11 2003 Trip Production and Attraction Totals			
Trip Purpose	Trip Productions (1)	Trip Attractions	Percent of Productions
Home-based Work	89,368	60,854	20.0%
Home-based Other	169,403	111,549	38.0%
Non-Home-based	177,227	177,229	39.7%
Commercial Vehicles	10,022	10,022	2.2%
Totals:	446,020	N/A	100.0%

Notes: (1) Trip Production totals are used as control totals in the Trip Distribution Stage

6.0 Trip Distribution

The Trip Generation process provides an estimate of the number of trip ends (by purpose) in each zone. It is the task of the Trip Distribution process to connect trip production zones to trip attraction zones to form an estimate of zone-to-zone Production-Attraction movements.

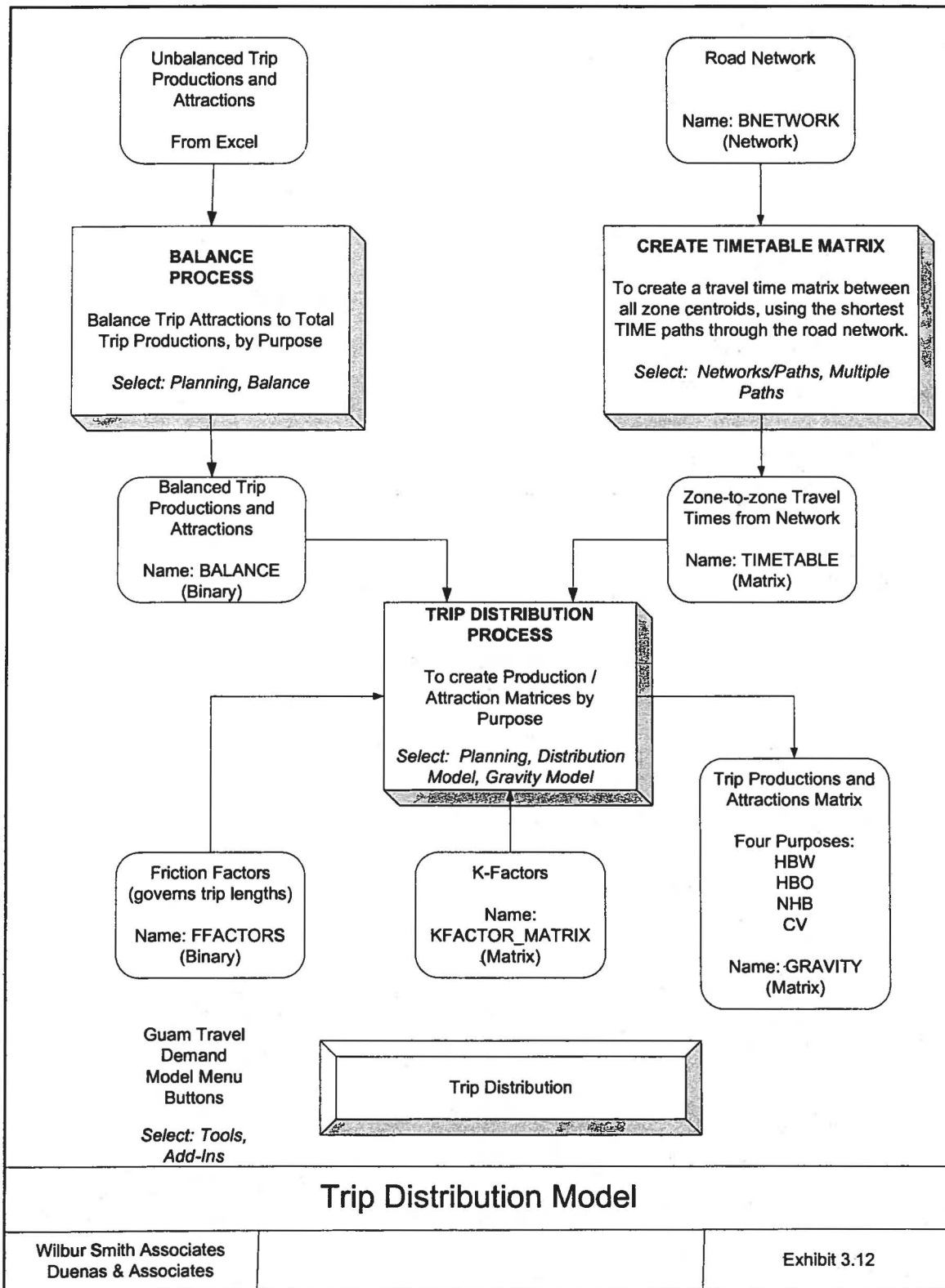
6.1 The Gravity Model

In the Guam model, the traditional gravity model is applied. The following data are necessary to apply the gravity model:

- The number of trips produced by (or originating in) each zone
- The number of trips attracted to (or terminating in) each zone
- The impedance between each pair of zones
- The friction factor between each pair of zones
- K-Factors between selected zone pairs

The Trip Distribution Model processes are illustrated in Exhibit 3.12

6.1.1 Productions and Attractions - The number of trips produced and attracted by each zone provides the values to which the rows and columns of the production-attraction matrix are balanced. The productions and attractions are stored in a table (BALANCE.DBF) that is associated with the traffic zone layer by TAZ ID number. These values are the output of trip generation.



6.1.2 Balancing Attractions to Productions – As discussed in Section 5, trip Productions and Trip Attractions are estimated independently of each other. Before being used by the Distribution Model it is necessary for Productions and Attractions to be balanced – meaning that for each trip purpose the total number of Productions equals the total number of Attractions. Estimates of Trip Productions are generally considered to be more reliable than Attraction estimates. Therefore, zonal Trip Attractions are adjusted to ensure total Attractions are equal to total Productions. This is accomplished using TransCAD's *Balance* tool.

6.1.3 Impedances - Travel time is the measure of impedance for the Guam gravity model. The model requires zone-to-zone travel times. To derive this information from the Highway Network Model, the *Networks - Multiple Paths* tool is used to create a timetable matrix, called TIMETABLE.MTX. The matrix stores travel times in units of minutes.

6.1.4 Friction Factors - Friction factors are inversely proportional to impedance: as the travel time between zones increases, the friction factor decreases. For the Guam gravity model, a friction factor lookup table has been developed (FFACTORS.BIN). In this case, the friction factors are partitioned into impedance ranges or cost bins, so that all trips belonging to a given time impedance in minutes will have the same friction factor value. This is essentially a discrete impedance function. The friction factor lookup table has one field that contains the friction factors and another field that contains the lower bound of the time impedance for which the friction factors apply. This lookup table is read by the TransCAD gravity application procedure.

6.1.5 K-Factors - The Guam gravity model also uses a K-Factors matrix. K-Factors are zone-to-zone parameters that have been developed for the Island of Guam in order to improve the performance of the gravity model. These K-Factors have been estimated to help distribute trips between trip ends that are farther apart than the traditional gravity model would estimate. For example, the K-Factors were used to increase model trips between zones containing military bases despite their relatively long distances apart. K-Factors are also used to increase or decrease the proportion of trips that are "intrazonal" trips, i.e., trips where the origin zone and the destination zone are the same. K-Factors developed for the original 1991 Study were used as a basis and where adjusted, as necessary, to improve calibration for the current model.

K-Factors developed for Guam are stored in a matrix file called "KFACTOR_MATRIX.MTX," and are incorporated into the gravity model by the TransCAD gravity application procedure. There is a separate matrix of K-Factors within the KFACTOR_MATRIX file for each trip purpose, namely HBW, HBO, NHB, and CV.

6.1.6 Applying the Gravity Model - The inputs necessary for the Guam gravity model are the Friction Factor lookup table (FFACTOR.BIN), a balanced productions and attractions table (BALANCE.bin), an impedance matrix (TIMETABLE.MTX), and the K-Factors developed for the Guam traffic analysis zone system (KFACTOR_MATRIX.MTX).

The result of the gravity model procedure is a zone-to-zone trip matrix. Note that there are trips for each purpose in the gravity output matrix file (GRAVITY.MTX). These are *Production / Attraction* matrices, not *Origin / Destination* matrices. Converting productions and attractions to origins and destinations is the next step in the modeling process.

6.2 Converting P/A to O/D Matrices

6.2.1 Conversion - The process of converting Production / Attraction (P/A) trips to Origin / Destination (O/D) trips is illustrated in Exhibit 3.13. The conversion of productions and attractions to origins and destinations is based on an estimation of when the P/A trips depart and return.

In the TransCAD translation from a 24-hour P/A matrix (GRAVITY.MTX) to a 24-hour O/D matrix, it is easy to estimate the time of departure and return -- it is assumed that all trips depart and return during the same day. Thus, the only input necessary to do a 24-hour to 24-hour translation is the P-A matrix. The Guam GRAVITY.MTX is simply the input file to the Planning - PA-to-OD procedure. The output from this procedure, which is a four-purpose O/D matrix file, is called PA2OD.MTX.

6.2.2 Development of Time of Day Trip Tables - The gravity model produces a 24-hour P/A trip table, and the PA to OD procedure simply converts the 24-hour trip matrix into a 24-hour O/D trip matrix. For the Guam model, the 24-hour trips have been divided into three time periods: A.M. Peak, P.M. Peak, and Off-Peak. This methodology is used to more accurately replicate the peak hour travel characteristics on Guam, which are significantly different from the 24-hour, island wide averages. Through a series of matrix manipulations within TransCAD, formulae have been applied to the 24-hour P/A trip matrices to create time-of-day O/D trip matrices for those three time periods.

The factors shown in Exhibit 3.14 have been applied to the 24-hour matrices to develop the time-of-day matrices found in the final trip table matrix file (TRIPTABLE.MTX). The multiple components of this matrix file are listed in Exhibit 3.15. Note that of the 44 matrices in the TRIPTABLE.MTX file, only three are assigned to the highway network in the Assignment stage described in Section 7. These matrices are:

- A.M. Peak (All purposes);
- P.M. Peak (All purposes);
- And Off-Peak (All Purposes)

Exhibit 3.14
24-Hour to Peak Hour Conversion Factors

<i>Trip Purpose</i>	Percent of P/A Matrix	Percent of Transposed P/A Matrix
<i>A.M. Peak Hour</i>		
Home-based Work	9.60 %	0.96 %
Home-based Other	8.70 %	2.11 %
Non-Home based	1.38 %	1.38 %
Commercial Vehicles	2.37 %	2.37 %
<i>P.M. Peak Hour</i>		
Home-based Work	1.10 %	9.04 %
Home-based Other	3.80 %	6.35 %
Non-Home based	2.93 %	2.93 %
Commercial Vehicles	2.55 %	2.55 %

Source: Wilbur Smith Associates

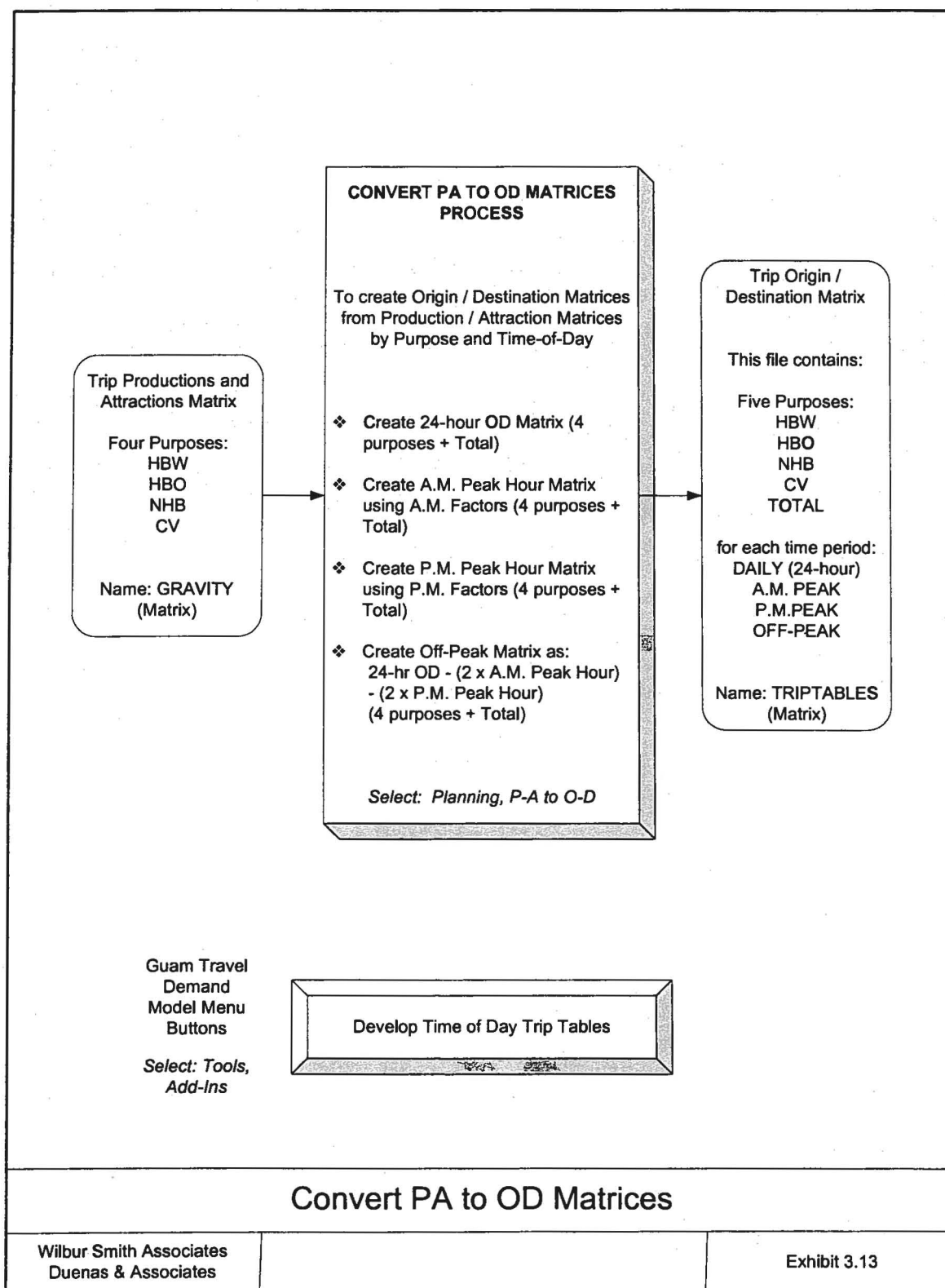


Exhibit 3.15
Components of the Trip Table Matrix

MATRIX NAME	DESCRIPTION	FORMULA
HBW (0-24) OD	Home Based Work, 24-Hour, Origins & Destinations	Output from PA-to-OD Procedure
HBO (0-24) OD	Home Based Other, 24-Hour, Origins & Destinations	Output from PA-to-OD Procedure
NHB (0-24) OD	Not Home Based, 24-Hour, Origins & Destinations	Output from PA-to-OD Procedure
CV (0-24) OD	Commercial Vehicle, 24-Hour, Origins & Destinations	Output from PA-to-OD Procedure
HBW PA	Home Based Work, 24-Hour, Productions & Attractions	Output from the Gravity Model
HBO PA	Home Based Other, 24-Hour, Productions & Attractions	Output from the Gravity Model
NHB PA	Not Home Based, 24-Hour, Productions & Attractions	Output from the Gravity Model
CV PA	Commercial Vehicle, 24-Hour, Productions & Attractions	Output from the Gravity Model
HBW PA TP	Home Based Work, 24-Hour, Productions & Attractions, Transposed	Output from the Transposed Gravity Model
HBO PA TP	Home Based Other, 24-Hour, Productions & Attractions, Transposed	Output from the Transposed Gravity Model
NHB PA TP	Not Home Based, 24-Hour, Productions & Attractions, Transposed	Output from the Transposed Gravity Model
CV PA TP	Commercial Vehicle, 24-Hour, Productions & Attractions, Transposed	Output from the Transposed Gravity Model
HBW AM PEAK PA	AM Peak Productions & Attractions	$[HBW PA] * 0.0960$
HBW AM PEAK PA TP	AM Peak Productions & Attractions Transposed	$[HBW PA TP] * 0.0096$
HBW AM PEAK TOTAL	AM Peak Total Trips	$[HBW AM PEAK PA] + [HBW AM PA TP]$
HBO AM PEAK PA	AM Peak Productions & Attractions	$[HBO PA] * 0.0870$
HBO AM PEAK PA TP	AM Peak Productions & Attractions Transposed	$[HBO PA TP] * 0.0211$
HBO AM PEAK TOTAL	AM Peak Total Trips	$[HBO AM PEAK PA] + [HBO AM PEAK PA TP]$
NHB AM PEAK PA	AM Peak Productions & Attractions	$[NHB PA] * 0.0138$
NHB AM PEAK PA TP	AM Peak Productions & Attractions Transposed	$[NHB PA TP] * 0.0138$
NHB AM PEAK TOTAL	AM Peak Total Trips	$[NHB AM PEAK PA] + [NHB AM PEAK PA TP]$
CV AM PEAK PA	AM Peak Productions & Attractions	$[CV PA] * 0.0237$
CV AM PEAK PA TP	AM Peak Productions & Attractions Transposed	$[CV PA TP] * 0.0237$
CV AM PEAK TOTAL	AM Peak Total Trips	$[CV AM PEAK PA] + [CV AM PEAK PA TP]$

HBW PM PEAK PA	PM Peak Productions & Attractions	[HBW PA] * 0.0110
HBW PM PEAK PA TP	PM Peak Productions & Attractions Transposed	[HBW PA TP] * 0.0904
HBW PM PEAK TOTAL	PM Peak Total Trips	[HBW PM PEAK PA] + [HBW PM PEAK PA TP]
HBO PM PEAK PA	PM Peak Productions & Attractions	[HBO PA] * 0.0380
HBO PM PEAK PA TP	PM Peak Productions & Attractions Transposed	[HBO PA TP] * 0.0635
HBO PM PEAK TOTAL	PM Peak Total Trips	[HBO PM PEAK PA] + [HBO PM PEAK PA TP]
NHB PM PEAK PA	PM Peak Productions & Attractions	[NHB PA] * 0.0293
NHB PM PEAK PA TP	PM Peak Productions & Attractions Transposed	[NHB PA TP] * 0.0293
NHB PM PAK TOTAL	PM Peak Total Trips	[NHB PM PEAK PA] + [NHB PM PEAK PA TP]
CV PM PEAK PA	PM Peak Productions & Attractions	[CV PA] * 0.0255
CV PM PEAK PA TP	PM Peak Productions & Attractions Transposed	[CV PA TP] * 0.0255
CV PM PEAK TOTAL	PM Peak Total Trips	[CV PM PEAK PA] + [CV PM PEAK PA TP]
HBW OFF PEAK	HBW Total Off Peak Trips	[HBW (0-24) OD] - ((2 * HBW AM PEAK TOTAL) + (2 * HBW PM PEAK TOTAL))
HBO OFF PEAK	HBO Total Off Peak Trips	[HBO (0-24) OD] - ((2 * HBO AM PEAK TOTAL) + (2 * HBO PM PEAK TOTAL))
NHB OFF PEAK	NHB Total Off Peak Trips	[NHB (0-24) OD] - ((2 * NHB AM PEAK TOTAL) + (2 * NHB PM PEAK TOTAL))
CV OFF PEAK	CV Total Off Peak Trips	[CV (0-24) OD] - ((2 * CV AM PEAK TOTAL) + (2 * CV PM PEAK TOTAL))
AM PEAK (ALL PURPOSE)	Total AM Peak Trips- AM Peak Trip Table	[HBW AM PEAK TOTAL] + [HBO AM PEAK TOTAL] + [NHB AM PEAK TOTAL] + [CV AM PEAK TOTAL]
PM PEAK (ALL PURPOSE)	Total PM Peak Trips- PM Peak Trip Table	[HBW PM PEAK TOTAL] + [HBO PM PEAK TOTAL] + [NHB PM PEAK TOTAL] + [CV PM PEAK TOTAL]
OFF PEAK (ALL PURPOSE)	Total Off Peak Trips- Off Peak Trip Table	[HBW OFF PEAK] + [HBO OFF PEAK] + [NHB OFF PEAK] + [CV OFF PEAK]
24 HOUR OD TRIPS	Total 24-Hour Origins & Destinations (All Purposes)	[HBW (0-24) OD] + [HBO (0-24) OD] + [NHB (0-24) OD] + [CV (0-24) OD]

7.0 Traffic Assignment

Trip assignment is the process in which the trip matrices are loaded onto a road network to provide an estimate of traffic volumes on each highway link.

7.1 TransCAD Assignment Options

TransCAD provides the following types of traffic assignment models:

- All – or – Nothing (AON);
- Stochastic Assignment;
- Incremental Assignment;
- Capacity Restraint
- User Equilibrium (UE);

- Stochastic User Equilibrium (SUE); and
- System Optimum Assignment (SO).

Some methods, such as All-or-Nothing Assignment, ignore the fact that link travel times are flow dependent when there is congestion, i.e. that they are a function of link volumes or that multiple paths are used to carry traffic for each specific O/D pair.

7.1.1 Equilibrium Assignment Models - Equilibrium methods take account of the volume dependence of travel times, and result in the calculation of link flows and travel times that are mutually consistent. Equilibrium flow algorithms require iteration between assigning flows and calculating loaded travel times. Despite the additional computational burden, equilibrium methods will almost always be preferable to other assignment models.

TransCAD provides two equilibrium methods. The key behavioral assumptions underlying the User Equilibrium assignment model are that every traveler has perfect information concerning the attributes of network alternatives, all travelers choose routes that minimize their travel time or travel costs, and all travelers have the same valuations of network attributes. At user equilibrium, no individual travelers can unilaterally reduce their travel time by changing paths. A consequence of this principle is that all used paths for an O/D pair have the same minimum cost. Unfortunately, this is not a realistic description of loaded traffic networks.

An alternative and more realistic equilibrium, known as Stochastic User Equilibrium, is premised on the assumption that travelers have imperfect information about network paths and/or vary in their perceptions of network attributes. At stochastic user equilibrium, no travelers believe that they can increase their expected utility by choosing a different path. Because of variations in traveler perceptions and also in the level of service which is experienced, utilized paths do not necessarily have identical generalized costs. The SUE model is consistent with the concept of applying discrete choice models for the choice of route, but with the necessary aggregation and equilibrium solution.

Following a review of the traffic assignment models available in TransCAD, the Stochastic User Equilibrium model was selected for the Guam Travel Demand Model.

7.1.2 Stochastic User Equilibrium – Stochastic User Equilibrium⁴ is a generalization of user equilibrium that assumes travelers do not have perfect information concerning network attributes and/or they perceive travel costs in different ways. SUE assignments produce more realistic results than the deterministic UE model, because SUE permits use of less attractive as well as the most-attractive routes. Less-attractive routes will have lower utilization, but will not have zero flow as they do under UE. SUE is computed in TransCAD using the Method of Successive Averages (MSA), the only known convergent method. Due to the nature of this method, a large number of iterations should be used.

⁴ Travel Demand Modeling with TransCAD 4.5, Chapter 9: Traffic Assignment, page 185, prepared by Caliper Corporation.

7.2 Assignment to the Guam Highway Network

Trips are assigned to the Guam highway network using the Planning - Traffic Assignment procedure. This procedure is illustrated in Exhibit 3.16. Three assignments are run in the Guam model: A.M. Peak, P.M. Peak and Off-Peak Trips. These three trip tables are located in the TRIPTABLES.MTX file developed in the trip distribution step of the model process. Each of the peak hour trip tables is assigned using a one-hour capacity value to replicate actual travel conditions. Off-peak trips are assigned using twelve-hour capacity values.

The output files of the traffic assignment procedure are called:

- AMPEAK_ASSIGN.BIN;
- PMPEAK_ASSIGN.BIN; and
- OFFPEAK_ASSIGN.BIN.

These files can be "joined" to the LINKS network geographic file using the "ID" number of each database. During the batch mode modeling process, the results of each assignment are stored in permanent fields in the network geographic file. These fields are "AMPEAK," "PM PEAK," "OFFPEAK," and "DAILY." The "DAILY" field is filled by calculating: $(2 * [\text{AM PEAK}]) + (2 * [\text{PM PEAK}]) + [\text{OFFPEAK}]$.

8.0 Model Calibration

The calibration of the Travel Demand Model for Guam is described below. The objectives and methodology of calibration are summarized and the results obtained are presented.

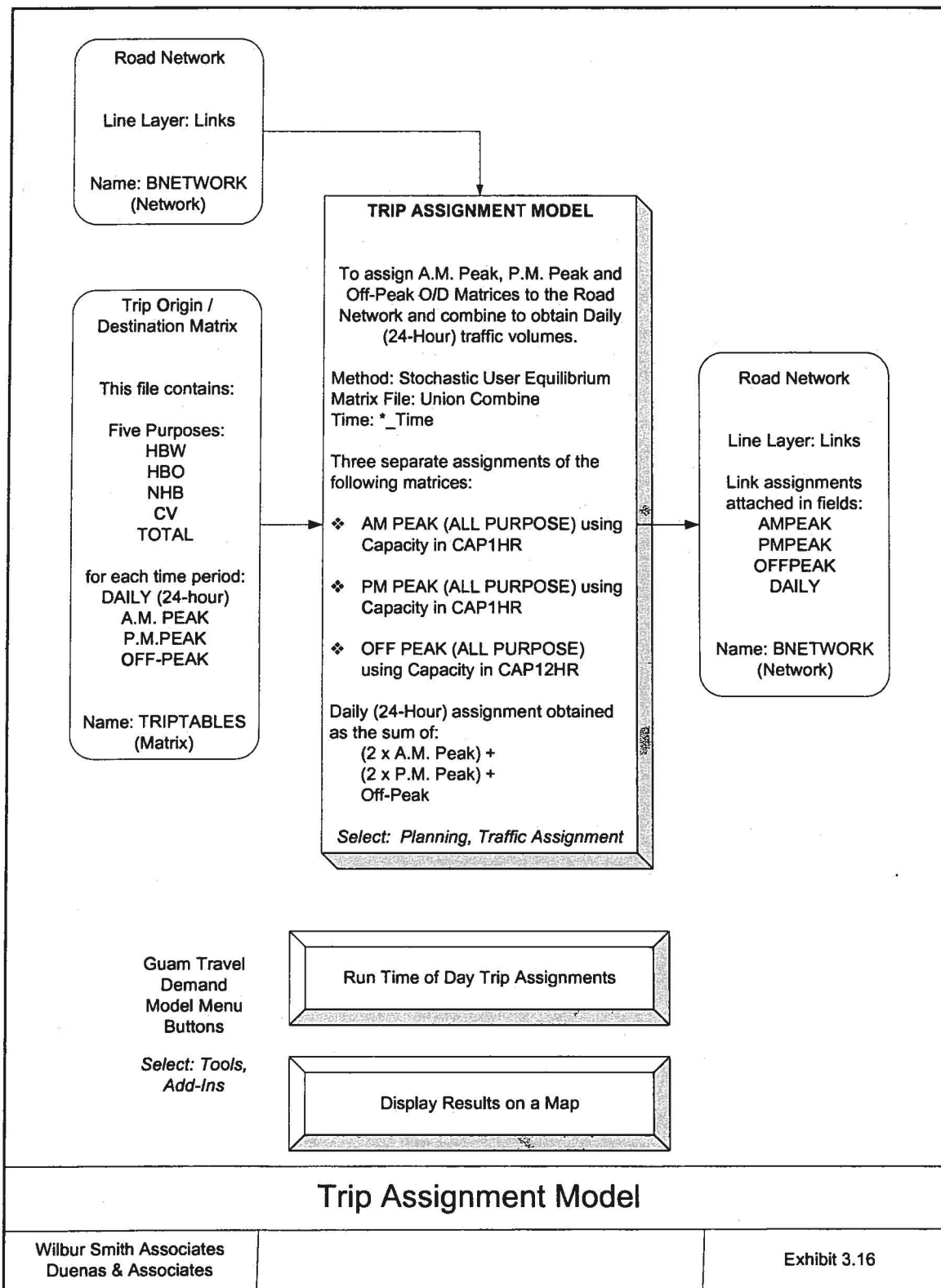
8.1 Calibration Objectives

The Travel Demand Models are used to project future year highway conditions. To verify the validity of the models it is necessary to ensure that the models can estimate existing conditions with sufficient accuracy.

Using base year highway network and land use data, the model was used to estimate base year traffic volumes. Model estimates were compared to base year traffic counts to verify the model's ability to estimate traffic volumes with sufficient accuracy for highway planning purposes.

8.1.1 Calibration Criteria – The Transportation Research Board has defined calibration criteria for highway planning models as a function of highway volume⁵. The criteria are based on the assumption that the maximum desirable traffic assignment deviation should not result in a design deviation of more than one highway travel lane. Therefore, the "acceptable" deviation is higher on low volume roads where a large percentage deviation will not have major design considerations.

⁵ National Cooperative Highway Research Program 255, Transportation Research Board, December 1982, page 41.



8.2 Base Year Trip Assignments

As discussed in Section 7, trip assignments to the base year highway network were undertaken for the following periods of the day:

- A.M. Peak Hour
- P.M. Peak Hour
- Off-Peak period

A 24-hour assignment was obtained by combining the results from these time periods.

8.3 Base Year Traffic Counts

Traffic counts were collected by Duenas & Associates (D & A) staff at 100 locations throughout the island. At each location traffic was counted separately in each direction for a 24-hour period (in 15-minute increments). The major of count sites were located on the public highway network, while others were positioned at the entrances to the Airport and military bases.

8.3.1 Comparison with 1991 Counts - Traffic counts, made between March and June 2003, are listed in Appendix E of Technical report No. 2. Count locations are illustrated in Appendix F of Technical report No. 2. A comparison of 1991 and 2003 counts is provided in Exhibit 2.3. Where available, this comparison also shows counts for the 1997/1998 period. As noted in Chapter 2, overall traffic volumes have declined since 1991⁶.

The overall changes in 1991, 1998 and 2003 traffic volumes at public roadway locations are summarized in Exhibit 3.17. The locations for which counts were available are not identical in all three years; however, the comparisons shown are based on a minimum of 69 locations.

Exhibit 3.17
Changes in Traffic Volumes between 1991 and 2003

	Network-wide Change in Traffic		
	1991-1998	1998-2003	1991-2003
Average change over period ⁽¹⁾	17.4 %	-13.8 %	-0.6 %
Weighted change over period ⁽²⁾	12.5 %	-15.7 %	- 3.9 %
Average annual change (weighted)	1.7 %	- 3.4 %	- 0.3 %
Number of Comparable Sections	72	69	78

(1) Average change with all road sections weighted equally.

(2) Average change with road sections weighted by traffic volume.

8.3.2 Period 1991 to 1998 - During the period between 1991 and 1998 it is estimated that overall traffic volumes on the island grew by 12.5 percent, representing an average

⁶ Guam 2020 Highway Master Plan, Technical Report No. 1, prepared for the Department of Public Works, Government of Guam, by Duenas & Associates, in association with Wilbur Smith Associates, June 4, 2003.

annual growth rate of 1.7 percent per year. This average rate of growth, while significant, represented a moderation of the previously observed growth in traffic of 4.2 percent between 1990 and 1991.⁷

8.3.3 Period 1998 to 2003 - In contrast to the previous period, between 1998 and 2003 overall traffic volumes declined by 15.7 percent, at an average annual rate of -3.4 percent per year.

8.3.4 Period 1991 to 2003 - The net effect of increasing volumes during most of the 1990's and declining volumes since then is that overall traffic volumes have now returned to 1990 levels. Overall volumes have declined by -3.9 percent between 1991 and the first half of 2003.

8.3.5 Truck Traffic - When counting traffic using the MetroCount tube counters, three configurations of tubes were used depending on the number of travel lanes and availability of a protected central median. At approximately half the sites two parallel tubes were installed across both directions of travel. This configuration was used mainly on two-lane roads with no raised median. This configuration allowed both directions of travel to be counted simultaneously, but separately. It also allowed counts to be classified by vehicle type. Results from classified count locations are summarized in Exhibit 3.18. With the exception of three locations, classified count locations showed low truck percentages, with an average of 2.2 percent.

Exhibit 3.18 Classified Traffic Counts		
	Cars ⁽¹⁾	Trucks
Average of all locations with Trucks less than 6 percent ⁽²⁾	97.8 %	2.2 %
Route 11, Route 1 to Naval Boundary (Cabras) (320-00)	83.0 %	17.0 %
Naval Station, Gate North of Main Gate to Route 1 (MB010A)	73.9 %	26.1 %
Access to Dump, from Leo Palace Access Rd to Dump (901-00)	67.5 %	32.5 %

Notes: (1) Car percentage includes passenger cars, pickups, cars/pickups with trailers, motorcycles (average 0.3 %) and busses (average 0.5%).

(2) Vehicles classified using MetroCounts Scheme F (non-metric), described by MetroCounts as an attempt to implement FHWA's visual classification scheme as an axle-based classification scheme.

While classification counts were generally restricted to two-lane roads, the consistency of the results indicates a relatively low percentage of commercial truck usage throughout Guam, with the exception of roads in the immediate vicinity of land uses associated with heavy truck traffic.

8.3.6 Processing of Traffic Count Data – Traffic count data from each site were exported from MetroCounts software into Excel spreadsheets for processing. Data were tabulated and presented graphically, as illustrated in Exhibit 3.19. This example shows the data collected at Control Section Site #062-00 on Route 1 between Route 14B (Ypao Road) and Route 10A (Airport Road), where some of the island's highest traffic volumes are recorded.

⁷ Guam 2010 Highway Master Plan, Technical Report Number 1: Existing Conditions, October 1991, prepared for DPW by Wilbur Smith Associates, in association with Duenas & Swavely, Inc.

Exhibit 3.19
Sample Traffic Count Processing

Guam Highway Master Plan Update

Traffic Counts: Summary

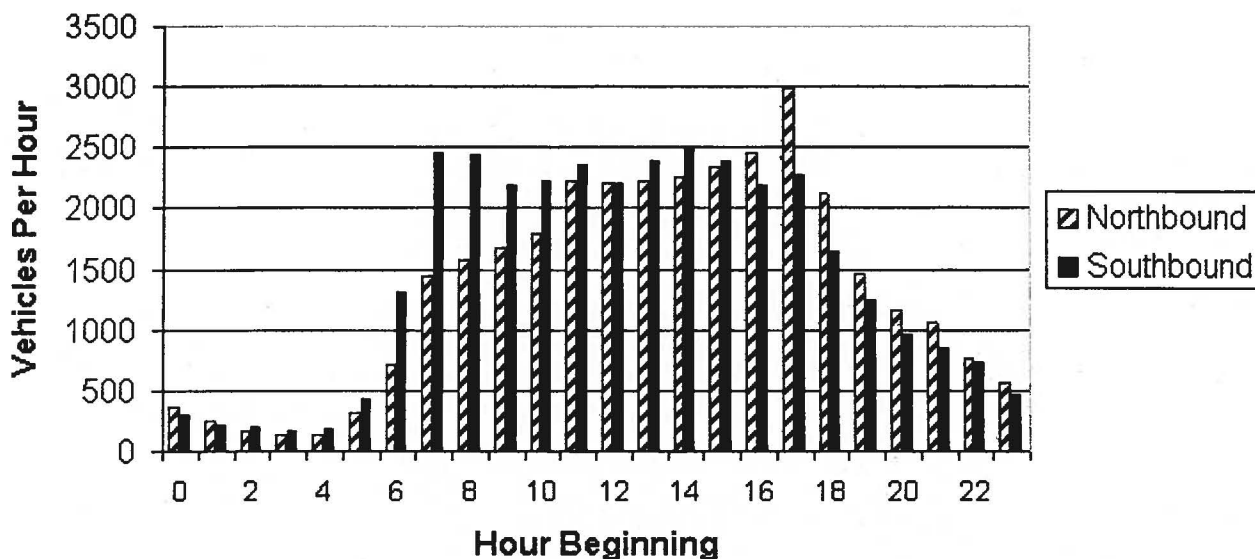
Control No 062-00

Location ROUTE 1 FROM ROUTE 14 B TO ROUTE 10 A

Count Period 13:00 Thu 27 Mar 2003 to 15:23 Fri 28 Mar 2003

Hour Begin	North Bound	South Bound	2-way Total	NB %	SB %	Hour Begin	North Bound	South Bound	2-way Total	NB %	SB %
0:00	368	303	671	55%	45%	12:00	2,207	2,209	4,416	50%	50%
1:00	250	221	471	53%	47%	13:00	2,230	2,388	4,618	48%	52%
2:00	173	191	364	48%	52%	14:00	2,258	2,480	4,738	48%	52%
3:00	131	168	299	44%	56%	15:00	2,334	2,383	4,717	49%	51%
4:00	137	189	326	42%	58%	16:00	2,450	2,184	4,634	53%	47%
5:00	308	431	739	42%	58%	17:00	2,983	2,271	5,254	57%	43%
6:00	713	1,318	2,031	35%	65%	18:00	2,124	1,646	3,770	56%	44%
7:00	1,437	2,452	3,889	37%	63%	19:00	1,456	1,239	2,695	54%	46%
8:00	1,573	2,435	4,008	39%	61%	20:00	1,168	962	2,130	55%	45%
9:00	1,683	2,196	3,879	43%	57%	21:00	1,057	845	1,902	56%	44%
10:00	1,792	2,221	4,013	45%	55%	22:00	759	723	1,482	51%	49%
11:00	2,218	2,362	4,580	48%	52%	23:00	572	468	1,040	55%	45%
Percent of 24-hr total				NB %	SB %	Total:	32,381	34,285	66,666	49%	51%
A.M. Pk	9:0-10:0 NB, 7:15-8:15 SB			5.2%	7.5%		1,683	2,559	4,242	40%	60%
Noon Pk	11:15-12:15 NB, 11:15-12:15 SB			7.1%	7.2%		2,302	2,466	4,768	48%	52%
P.M. Pk	17:0-18:0 NB, 14:15-15:15 SB			9.2%	7.5%		2,983	2,562	5,545	54%	46%

Hourly Traffic Volumes

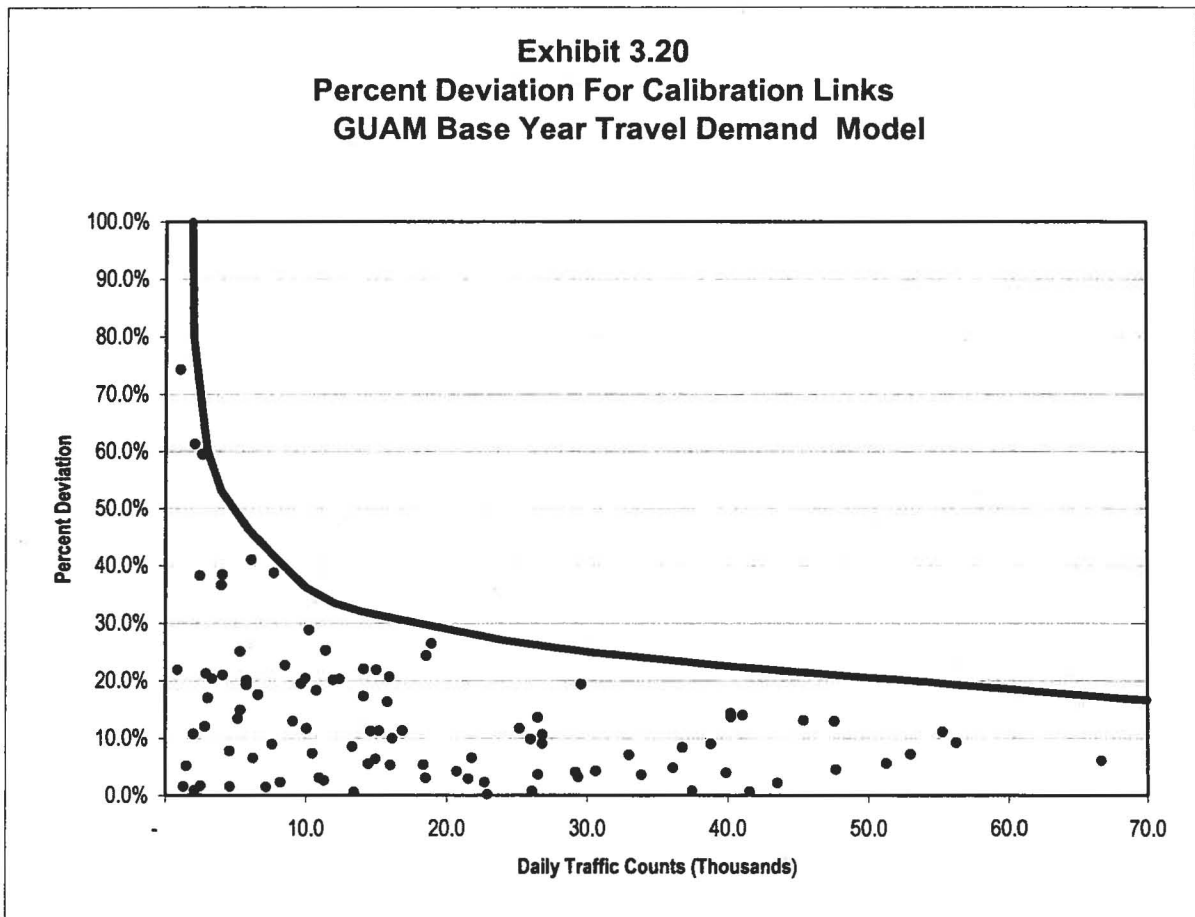


8.4 Model Calibration

Model calibration involved repeated use of the Travel Demand Models and comparisons between projected traffic flows and observed traffic counts. During this iterative procedure a variety of model inputs were adjusted, including:

- Travel speed and capacities on individual highway links;
- Trip production rates;
- Trip attraction equation coefficients;
- Production and attraction adjustment factors for individual traffic analysis zones;
- K-Factors, reflecting the special relationship between certain groups of zones, such as between military base zones; and
- 24-hour to peak hour conversion factors.

8.4.1 Calibration Results – Results obtained from the model calibration process are illustrated in Exhibit 3.20, which shows the percent deviation between assigned 24-hour volumes and observed counts, together with the Maximum Desirable Deviation curve. All 24-hour two-way assigned volumes at count locations fall below the curve.



Five screenlines were also defined to compare assigned volumes with traffic counts. Screenline locations are shown in Exhibit 3.21. Assigned volumes and traffic counts at screenline locations are summarized in Exhibit 3.22.

Exhibit 3.23 shows the number of calibration points that fall below the Maximum Desirable Deviation curve for Daily, A.M. Peak and P.M. Peak traffic. A.M. and P.M. assignments result in 87 and 94 percent of calibration points within the desirable range of deviation. This lower quality of calibration reflects the fact that it is significantly harder to calibrate peak-hour assignments than 24-hour assignments. This is mostly due to the variability in peak hour characteristics from one count site to another.

For example, the peak hour on Route 1 in Tamuning is approximately seven percent of the 24-hour volume, while on Route 15 it is 13 percent. The peak hour model, because it utilizes uniform percentages for the whole island, does not replicate this wide variability. As a second example, the P.M. Peak calibration point that is furthest from the curve is located at the access to the International Airport. Peak traffic generating activity at the Airport is clearly unrelated to the end of the normal working day, so lack of P.M. Peak calibration in this area is to be expected. Having a small number of peak hour calibration points that exceed the desirable range of deviation is therefore not unusual in the calibration process.

8.5 Summary and Conclusions

The comparison of assigned trips with observed traffic volumes across screenlines and at count sites throughout Guam, confirms that the model is in close agreement with existing traffic conditions. Review of calibration results (Exhibit 3.23) indicates that the Travel Demand Models are capable of estimating traffic flows with sufficient accuracy for highway planning purposes.

Exhibit 3.21
Screenline Locations

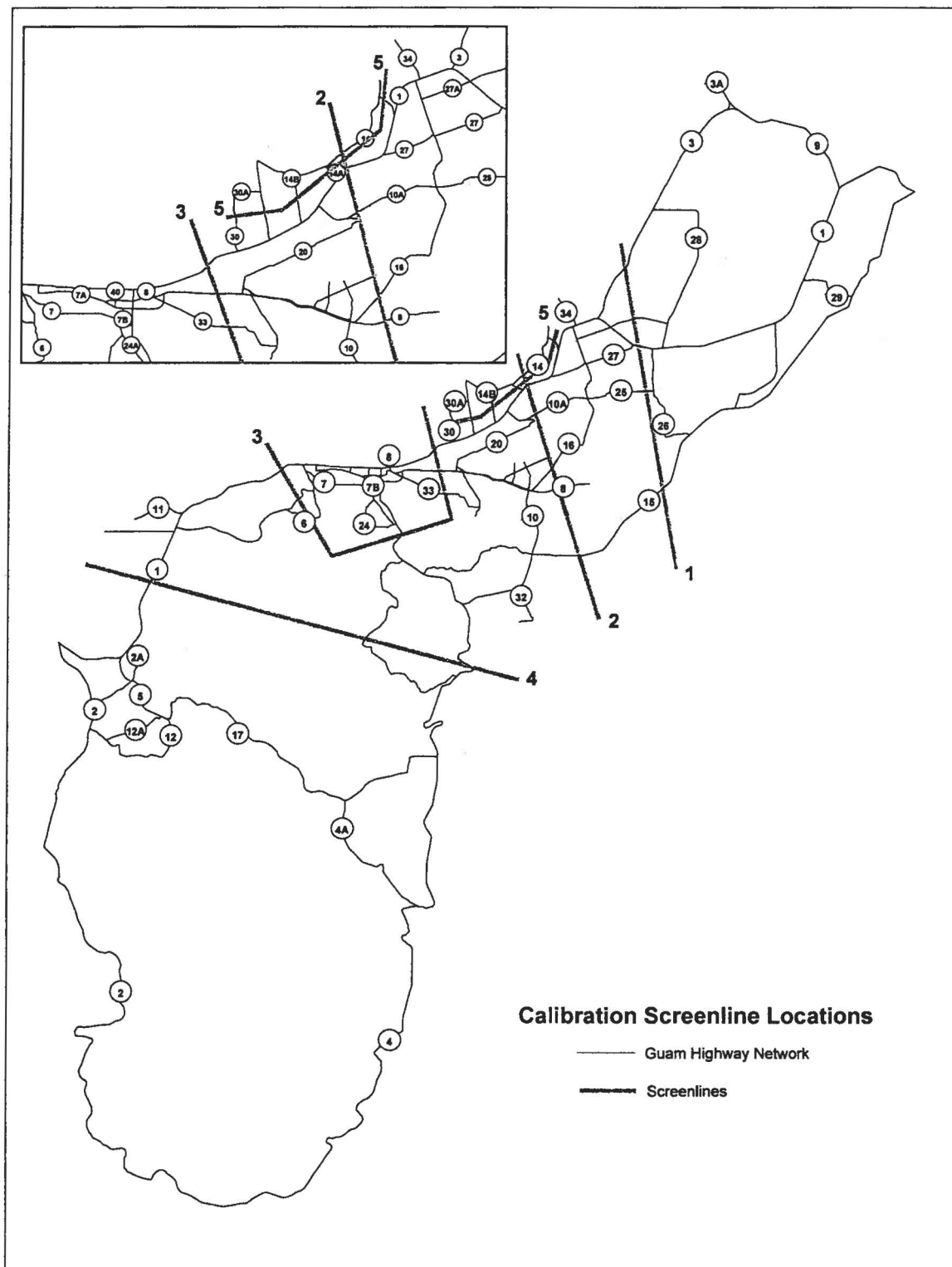


Exhibit 3.22
Daily Screenline Flows

Screenline	24-Hour Traffic Volumes		
	Traffic Count	Model Results	Ratio
Screenline 1	97,390	96,231	98.8 %
Screenline 2	136,306	131,941	96.8 %
Screenline 3	161,465	160,765	99.6 %
Screenline 4	44,999	49,212	109.4 %
Screenline 5	73,650	78,523	106.6 %
Total at Screenlines	513,810	516,672	100.6 %

Exhibit 3.23
Overall Compliance with Maximum Desirable Deviation Curve

	Traffic Assignment Period		
	Daily	A.M. Peak	P.M. Peak
Number of Calibration Points	100	100	100
Number of Points within Maximum Desirable Deviation	100	87	94
Percentage within Maximum Desirable Deviation	100 %	87 %	94 %

Chapter 4

ANALYSIS OF EXISTING AND FUTURE TRAFFIC DEMAND

This chapter documents the use of the Guam Travel Demand Model to evaluate the existing condition of the highway transportation network and the effectiveness of proposed current as well as short-range and long-range highway improvement projects.

The chapter is supported by a number of Appendices providing detailed listings of data used by the Travel Demand Model.

1.0 Guam Travel Demand Model

The development and calibration of the Travel Demand Model used for the Guam Highway Master Plan Update Study is documented in Chapter 3. The model divides the Island into 157 Traffic Analysis Zones (TAZ's), which are illustrated in Exhibit 4.1. The base year for the model is 2003. The planning horizon years for the Study are 2015 and 2020.

The base year highway network is illustrated in Exhibit 4.2. This network served as the base from which additional networks were created during development of the Highway Master Plan, including:

- Existing Plus Committed (E+C) network;
- Short-Range Improvements Network;
- Long-Range Improvements Concept A Network; and
- Long-Range Improvements Concept B Network.

Those improvement projects that result in a change in the capacity of a link are incorporated into the appropriate model network. Capacity values used in the model are shown in Exhibit 4.3. Types of improvements that change link capacity include:

- Adding through travel lanes;
- Adding central lanes for left-turn movements;
- Adding left-turn bays at signal controlled intersections, where left-turn traffic would otherwise impede through traffic; and
- Installing new traffic signals.

Improvement projects that do not significantly impact link capacity are not explicitly reflected in the model networks, unless they are accompanied by a change in posted Speed Limit. Such improvements may include:

- Repaving;
- Adding shoulders; and
- Minor roadway realignment.

Exhibit 4.1
Guam Traffic Analysis Zones

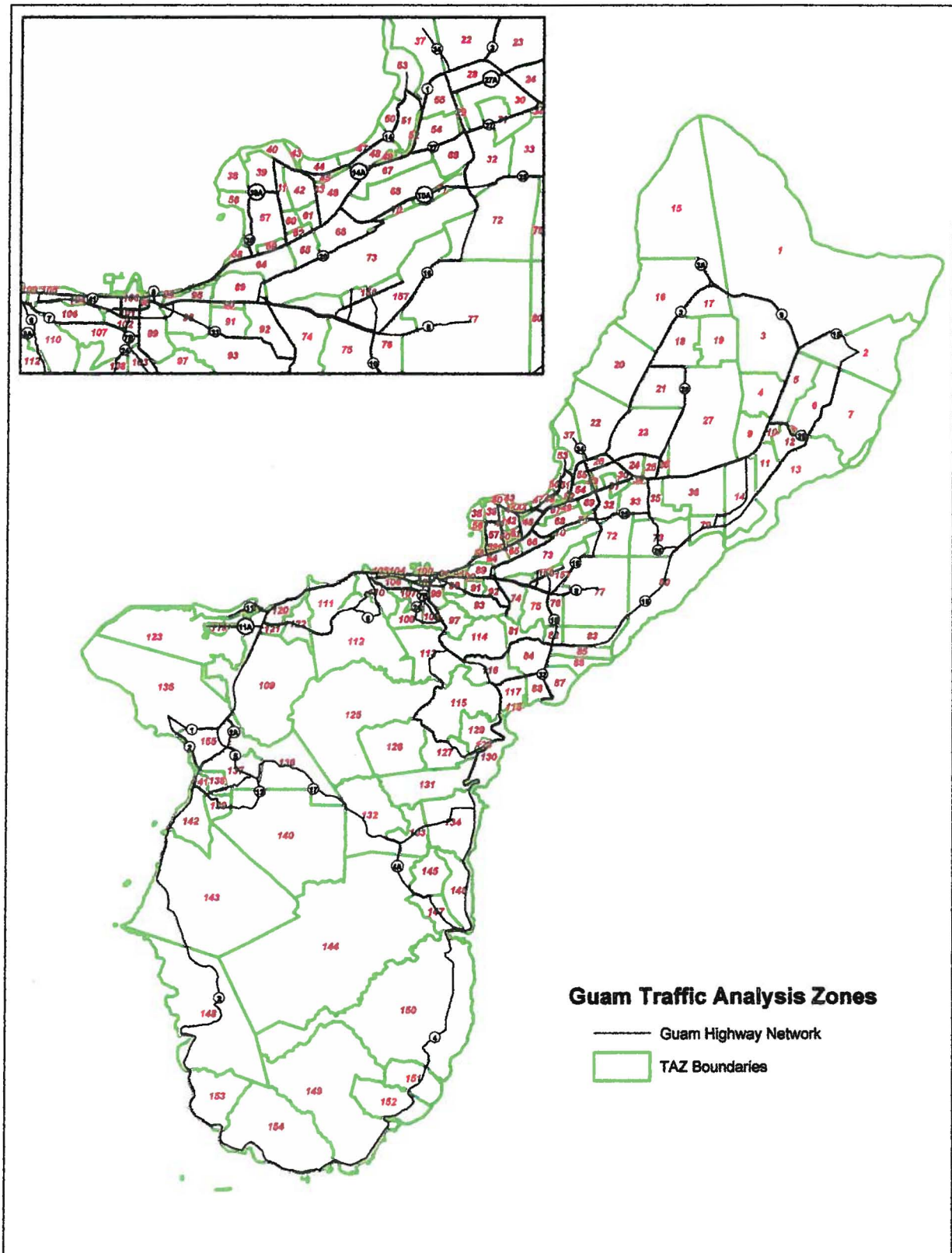


Exhibit 4.2
Guam Base Year Highway Network

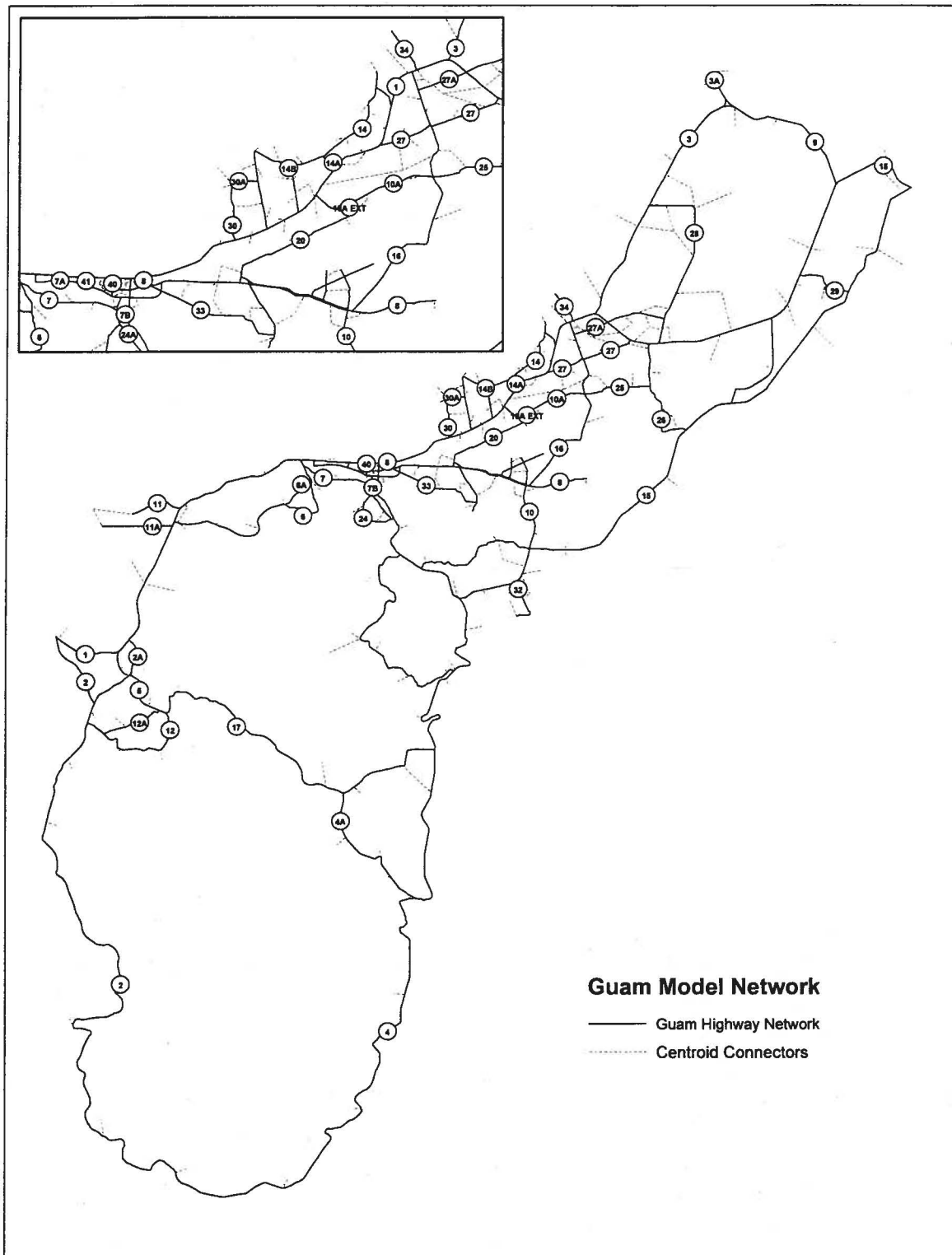


Exhibit 4.3
Model Network Link Capacities

Link Code	Number of Lanes	Traffic Control at End of Link (at B-Node for A to B direction)	1-Way Link Capacity
0	N/A	All centroid connectors	N/A
1	1	None - Substandard geometry / surface conditions	850
2	2	None - Substandard geometry / surface conditions	2,150
3	3	None - Substandard geometry / surface conditions	3,700
6	2 +	None - Substandard geometry / surface conditions	2,800
7	3 +	None - Substandard geometry / surface conditions	4,200
11	1	None - Standard geometry / surface conditions	1,200
12	2	None - Standard geometry / surface conditions	2,500
13	3	None - Standard geometry / surface conditions	4,300
16	2 +	None - Standard geometry / surface conditions	3,200
17	3 +	None - Standard geometry / surface conditions	4,800
21	1	STOP or YIELD Sign Control	350
22	2	STOP or YIELD Sign Control	450
23	3	STOP or YIELD Sign Control	N/A
26	2 +	STOP or YIELD Sign Control	N/A
27	3 +	STOP or YIELD Sign Control	N/A
31	1	Traffic Signal - Link is on Minor Approach	600
32	2	Traffic Signal - Link is on Minor Approach	950
33	3	Traffic Signal - Link is on Minor Approach	N/A
36	2 +	Traffic Signal - Link is on Minor Approach	1,100
37	3 +	Traffic Signal - Link is on Minor Approach	N/A
41	1	Traffic Signal - Link is on Major Approach	950
42	2	Traffic Signal - Link is on Major Approach	1,400
43	3	Traffic Signal - Link is on Major Approach	2,150
46	2 +	Traffic Signal - Link is on Major Approach	1,750
47	3 +	Traffic Signal - Link is on Major Approach	2,500
51	1	Traffic Signal - Approaches of Equal Priority	750
52	2	Traffic Signal - Approaches of Equal Priority	1,100
53	3	Traffic Signal - Approaches of Equal Priority	1,600
56	2 +	Traffic Signal - Approaches of Equal Priority	1,350
57	3 +	Traffic Signal - Approaches of Equal Priority	1,900

2.0 Population and Employment Forecasts

The purpose of this Section is to provide forecasts of Guam's population and employment for the Study's two planning horizon years of 2015 and 2020. These forecasts are used to support projections of future traffic volumes. They are based on the Year 2003 population and employment estimates developed by Duenas & Associates, together with projections of Guam's population, economy and land use development and as summarized in Appendices A through F.

2.1 Historical Perspectives on Forecasting

Guam's historical growth pattern does not conform well to a linear trend. Exhibit 4.4 shows the decennial population from 1970 to 2000. This series of snapshots depicts two relatively stable growth rates for the 1970 – 1980 decade and the 1980 – 1990 decade of 24.7% and 25.6%, respectively. However, population growth for the most recent decade of 1990 – 2000 is far slower, at only 16.3%.

Exhibit 4.4
Change in Population at Decennial Census, 1970 through 2000

Year	Census Population	% Increase Over Previous Census
1970	84,996	n/a
1980	105,979	24.7%
1990	133,152	25.6%
2000	154,805	16.3%

Even more inconsistent, however, are the intervening years, which reflect the roller coaster volatility of Guam's economy and population in response to external forces. Such externalities have included:

- The Island's support role for U.S. military operations, which brought a Department of Defense build-up for the Vietnam War in the early 1970's, the Gulf War in the early 1990's, and the War on Iraq in 2003, as well as significant downsizing as a result of BRACC de-commissionings in the mid 1990's;
- The Asian economy and its collateral effects, which encompassed a building boom in response to Japan's aggressive foreign investments from the late 1980's to the early 1990's, a major economic recession followed by depression starting in the mid 1990's, collapse of the Korean tourist market for several years due to the pull-out by Korean Air Lines after the 1998 KAL crash, and the general downturn in Asian travel since September 2001 in response to terrorism and to the SARS scare;
- Unilateral U.S. foreign policy which permitted unrestricted access to the United States for peoples of Micronesia's Freely Associated States, prompting unprecedented in-migration from Pohnpei and Chuuk States, especially; and
- The unbridled wrath of Mother Nature in the forms of a mega earthquake in 1993 and at least one Super-typhoon every decade.

The net impact of this three-plus decade experience underscores the inherent unpredictability of growth forecasts for Guam. Despite the local and federal government's plans, programs and policies designed to shape the rate and structure of economic growth for the Territory, the likelihood of unanticipated change and adjustment to such forecasts must be expected. Nonetheless, baseline projections of population and employment are necessary to guide the government's plans for future improvements in public services and infrastructure and for highway planning in particular.

2.2 Establishing Overall Growth Rate Projections

Exhibit 4.4 established Guam's historical, decennial population growth rate during the past 30 years as between 16% and 25%. This range sets one base of reference for forecasting the future population estimates required of the Guam Highway Master Plan for the years 2015 and 2020. The other reference is Guam's near-past, present and near-future outlook for growth.

For purposes of projection ranges, therefore, the preceding census data suggest a low, medium and high range of growth as approximately 16%, 20% and 25% per decade, respectively. Applied to the 2010, 2015 and 2020 forecasts, these ranges yield the population estimates presented in Exhibit 4.5.

Exhibit 4.5
Low, Medium and High Range Population Projections
For Years 2010, 2015 and 2020

Year	Population Projections ⁽¹⁾		
	Low Range	Medium Range	High Range
2010	179,574	185,766	193,506
2015	193,940	204,343	217,695
2020	208,306	222,919	241,883

Note: (1) Ranges = 16, 20 and 25 percent per decade.

As of mid-2003, the Territory of Guam has been in an economic depression for approximately three years. The signs of this plight are everywhere: unprecedented foreclosures and bankruptcies, hugely discounted property values, major out-migration of residents, failing governmental services and infrastructure and high unemployment. It is idiomatic that the bottom of an economic cycle can be determined only after it has, in fact, occurred. That being said, a growing consensus of opinion and supportive data now suggest that the Island is at, or near, its economic nadir. Therefore, for the purposes of this Plan, it is assumed that Guam will soon shift into a growth mode, albeit slowly.

The assumption of economic rebound during the remaining years of this decade and into the next is crucial to the population forecasts that follow. There is much empirical evidence to support this assumption:

- Rising discretionary income among East Asia's middle class, who will continue to seek sun, sand, surf and security as tourists in an American venue;
- Forward staging of the country's military personnel, ships and planes in the westernmost soil of the U.S.;
- Multiple industries that are spawned as collateral services to tourism and defense, such as construction, retailing and wholesaling, and professional services; and

- The various secondary, yet important, business sectors that take advantage of Guam's location, as well as its protection under U.S. jurisprudence.

Nonetheless, the possibility of some reversal in economic growth always exists, inasmuch as recent events have dramatically proven this Territory's vulnerability to external forces. Typhoons, earthquakes and international threats to air travel are the most likely calamities to stall growth, at least temporarily. Internal threats to sustained growth include inadequate infrastructure (particularly water and wastewater service) to support development and a labor force that is not equipped with the proper skills to deliver the manpower necessary for economic development.

The best defense against over-reliance on assumptions, no matter how well grounded, about economic growth is to maintain an organized program of economic, social and demographic data collection and analyses. At a minimum, this program should provide for annual reports about the Island's economic activities, as well as mid-decennial updates to the census. Additionally, forward-looking analyses should be provided for purposes of planning land use, infrastructure and human care services. This is an important function of the local government, particularly the Bureau of Statistics and Planning.

2.3 Population Projections for 2015 and 2020

Approximately 12% of Guam's population relocated off-island since the 2000 census. Consequently, a modest growth for the remainder of this decade may be insufficient to even regain the year 2000 population census estimate.

For the purpose of comparison, Guam's 16.3% growth rate for the period 1990 through 1999 reflects a compounded annual growth rate of approximately 1.5% per year. In order to regain the year 2000 census after losing approximately 12% of its population since then, the Island's census must grow by approximately 2% per year for the remaining years 2004 through 2010. That is reasonable, given the assumptions that Guam's most recent down-cycle is now over, and a moderate rebound will occur during most of the remaining years of this decade. Exhibit 4.6 computes the year 2010 population, given these assumptions.

For the year 2015 and 2020 population estimates, the annual growth rate is retained at 2%, which computes to a 10-year increase of 21.9%. Exhibit 4.7 computes the year 2015 and year 2020 population projections, given these assumptions.

Exhibit 4.6
Population Projections, Years 2003 through 2010

Year 2000 Census	12% Net Loss	Year 2003 Estimate	Year	Projections at 2.0% Growth per year	Net Increase by Year
154,805	18,577	136,228			
			2004	138,953	2,725
			2005	141,732	2,779
			2006	144,567	2,835
			2007	147,458	2,891
			2008	150,407	2,949
			2009	153,415	3,008
			2010	156,484	3,068

Exhibit 4.7
Population Projections, Years 2010 through 2020

Year	Projections at 2.0% Growth per year	Net Increase by Year
2010	156,484	n/a
2011	159,614	3,130
2012	162,806	3,192
2013	166,062	3,256
2014	169,383	3,321
2015	172,771	3,388
2016	176,226	3,455
2017	179,751	3,525
2018	183,346	3,595
2019	187,013	3,667
2020	190,753	3,740

2.4 Forecasts for Purposes of Highway Planning

In contrast to the problematic nature of population and economic forecasting on Guam, the Island's relatively small area of developable land and its well defined centroids of development offer a reasonably simple pattern for the purposes of highway master planning. For example, the centers for the island's two major industries, tourism and military, are primarily and permanently sited at Andersen Air Force Base, Naval Station and Tumon.

Further, Guam's major belt of commercial development is firmly concentrated along the Routes 1, 8 and 16 loop. Nearly all development north of Dededo occurs along the Route 1 corridor and nearly all development south of the Agat/Talofofo demarcation

occurs along the Route 4 corridor. Other large, vacant land holdings by the military, the Government of Guam and, more recently, the Chamorro Land Trust and the Ancestral Lands Commission are not expected to play a significant role as traffic generators in the near term future.

This relatively stable development pattern along the highway network offers a basis for projecting the geographical component of average, overall growth rates. Of course, certain areas are reasonably expected to grow faster or slower than the average. Those areas are identified by Traffic Analysis Zones (TAZ) and described later in this section.

Guam's highway planning forecast model relies on an array of data, including population, retail employment, hotel employment and school census, by each of the island's 157 Traffic Analysis Zones (TAZ's). Those forecasts are presented in the following sections.

2.5 Population Projections by TAZ

Having established the islandwide 2003 population estimate, as well as the 2015 and 2020 projections, it is necessary to allocate those total counts among the 157 model TAZ's which encompass the island. This is performed in two stages:

1. Allocating among all TAZ's the initial population decrease of 18,577 to account for Guam's 12% loss of population between 1999 and 2003; and
2. Allocating among all 157 TAZ's the subsequent population increases to account for the projected gain of 36,543 in population from 2003 in order to reach the 2015 population estimate of 172,771 and the further 17,982 population increase in order to reach the 2020 population estimate of 190,753.

2.5.1 Rationale for Allocating Guam's Initial Population Decrease Among TAZ's –

The first step in the process of determining TAZ population increases for the years 2015 and 2020 is to determine where the net loss of population occurred between the Year 2000 census and the 2003 base year estimate. This decrease was established in Technical Report 1 as 12%, or 18,577 people.

In order to understand where on Guam this decrease occurred, it is first necessary to examine why it occurred. The rapidly declining economy and resultant job losses are considered as the primary reasons for out-migration, as local residents moved to the States or to their place of foreign domicile in search of better employment opportunities. Better employment opportunities mean both higher salaries, as well as the likelihood of employment security. Some employees, of course, left Guam through intra-company transfers as multi-national companies reduced Guam operations. Other residents relocated for reasons of retirement, active duty military or schooling.

There are no data to track out-migration from either TAZ's or census tracts on Guam. Nonetheless, some rational assumptions and intuitive reasoning can be applied to explain this occurrence, knowing its strong connection with the employment issues. For example, it can be assumed that out-migration occurred from every municipality; however, certain villages experienced more or less than the average, islandwide decrease in population.

The following villages probably experienced higher than average out-migration for job-related purposes:

- **Agat and Santa Rita** (where a disproportionately large percentage of federal civil service employees resided) due to the thousands of federal civil service jobs lost as a result of military downsizing and the subsequent conversion of nearby Naval Station operations to a private contractor. These two villages are assumed to have lost about 3% more than the islandwide average, or approximately 15% of their population between the Year 2000 Census and the 2003 base year.
- **Dededo** (where a disproportionately large Filipino population resides) due to the thousands of skilled jobs lost in the construction and tourism (hotel) industries. This village is assumed to have lost about 1% more than the island wide average, or approximately 13% of its population between the Year 2000 Census and the 2003 base year.
- **Tamuning** (where Guam's rents and condo prices are the costliest and, therefore, affordable to only higher wage earners) due to the across-the-board reduction of supervisory and middle management jobs. This village is assumed to have lost about 1% more than the island wide average, or approximately 13% of its population between the Year 2000 Census and the 2003 base year.

In contrast to those villages that can be assumed to have lost more than the average population, several villages can be assumed to have experienced lower than average out-migration as a result of job losses, such as:

- **All southern villages** (Umatac, Merizo, Inarajan and Talofofo) due to their relatively small workforce, which is largely committed to public service (particularly education and utilities) or agriculture, both of which are more-or-less recession proof. These four villages are assumed to have lost 2% population between the Year 2000 census and the 2003 base year.

All remaining TAZ's are assumed to have incurred the average population loss of 12%.

2.5.2 Rationale for Allocating Guam's Subsequent Population Increases for 2015 and 2020 Projections Among TAZ's - In order to allocate population projections among the 157 TAZ's for the target years of 2015 and 2020 it is necessary to first study past and current economic trends as well as understand the dynamics for residential development on Guam.

Residential development on Guam has been primarily driven by two forces: the large scale (by Guam standards) developer/contractor and the one-off single family house. Examples of the first category include Latte Heights Subdivision, Ypao-pao Estates, Perez Acres, Marianas Terrace, Barrigada Heights Subdivision, Hyundai Mongmong Subdivision, the Government of Guam's GHURA projects in Sinajana, Agat and Yona,

and the Government of Guam's subsidized housing projects in Dededo as well as large condominium projects such as Alupang Cove, Oka Towers, Agana Bay, Agana Beach, Leo Palace Resort and others. No new housing developments of this category have occurred for more than 10 years.

The one-off single family housing market has generally relied on either land availability through a parental family subdivision or some affordable source of construction financing/mortgaging offered through local private and public financial institutions. This market remains moderately strong, particularly due to historically low interest rates.

From the perspective of highway planning, the primary question is: *where will residential growth occur for the target years of 2015 and 2020?* In the absence of an approved land use plan that is implemented through zoning and other land use controls, forecasting future development must rely on well-founded assumptions. For the purposes of this planning document; therefore, such assumptions include the following:

- Residential growth will first fill-in the majority of those serviceable housing units that were vacated during the period of Guam's out-migration, which started in the latter 1990's and continued to 2003. Those vacant units will likely be offered at attractive prices (sale or rent) and absorb the majority of the initial market demand. Further, potential developers of major housing projects will likely postpone any commitments for new construction until the rebound has proven itself with some longevity, thereby allowing time for the existing, under-utilized housing stock to be occupied;
- The one-off housing market will continue without much disruption in pace, despite the likelihood of upward adjustment to home mortgage rates; and
- The majority of new residential development will re-emerge as large scale projects by developer/contractors, whose location decisions will be based largely on the following criteria:
 - Availability of land (i.e., for sale and adequate in size);
 - Cost of the land is reasonably priced;
 - Economy of development;
 - Proximity to infrastructure;
 - Relatively level terrain;
 - Absence of environmental problems (e.g., wetlands, historical resources, RTE flora and fauna, drainage);
 - Conformity with zoning;
 - Marketability;
 - Near schools, shopping, parks; and
 - Near job centers.

Several TAZ's meet all or most of these location criteria for residential development and, therefore, can be considered as likely to develop **faster than average**. Many more TAZ's exhibit just the opposite characteristics of those cited above for residential development, and those TAZ's can be considered as likely to develop **slower than average**. Still other TAZ's are already developed to capacity or they are simply unsuitable for housing, and the prospects of residential growth in those TAZ's can be considered as **negligible**. The remaining TAZ's, (i.e., those not earmarked as faster, slower or negligible for housing) comprise the category of **average** pace residential development.

The difference between Year 2003 population and Year 2015 population is 36,543. After reallocating the 12% population loss of 18,577 among the TAZ's in accordance with the previous Section, another 17,966 in population growth must be allocated in order to reach the 2015 population estimate of 172,771 and then another 17,982 population increase in order to reach the 2020 population estimate of 190,753. Average population growth per TAZ is determined by dividing the overall growth by 114 TAZ's (all TAZ's except those that are designated as "negligible"). This yields an average TAZ population growth of 158. Faster growth is calculated as 150% of average growth, or 237. Slower growth is calculated as 50% of average growth, or 79.

It must be understood that these population projections reflect increases in residential development only. As such, they cannot be used for utility planning purposes, which must take into account the various infrastructure demand requirements from all of Guam's land uses, not only residential.

2.5.3 TAZ's Likely to Encounter Faster Than Average Residential Development - TAZ's listed in Exhibit 4.8 exhibit strong residential development potential between now and this Plan's target years. Therefore, these TAZ's are expected to have faster than average residential growth by years 2015 and 2020.

Exhibit 4.8
TAZ's with Above Average Residential Development Potential

TAZ	Location and Rationale
2	Yigo: likely military build-up at Andersen Air Force Base
22	Dededo: Available (within 5 years); Reasonable cost (expected); Economy of development (perhaps a zoning issue); Marketable (except for schools)
23	Dededo: Available (within 5 years); Reasonable cost (expected); Economy of development (perhaps a zoning issue); Marketable (except for schools)
37	Tamuning: Available (within 5 years); Reasonable cost (expected); Economy of development (perhaps a zoning issue); Marketable (except for schools)
46	Tamuning: Available; Reasonable cost; Economy of development; Marketable
48	Tamuning: Available; Economy of development; Marketable
56	Tamuning: Available; Reasonable cost; Economy of development; Marketable
72	Barrigada: Available; Reasonable cost; Economy of development; Marketable
85	Mangilao: Barrigada: Available; Reasonable cost; Economy of development; Marketable
86	Mangilao: Barrigada: Available; Reasonable cost; Economy of development; Marketable
89	M-T-M: Available; Reasonable cost; Economy of development (vacant housing already exists); Marketable
112	Asan: Available; Reasonable cost; Economy of development; Marketable (except for schools and shopping)
117	Mangilao: Available; Reasonable cost; Economy of development; Marketable (except for shopping)
135	Santa Rita: likely military build-up at Naval Station

2.5.4 TAZ's Likely to Encounter Slower Than Average Residential Development – TAZ's shown in Exhibit 4.9 do exhibit residential development potential between now and this Plan's target years; however, this potential is considerably less pronounced than that of the TAZ's described in the preceding Section. Therefore, these TAZ's are expected to have slower than average residential growth by years 2015 and 2020.

Exhibit 4.9
TAZ's with Below-Average Residential Development Potential

Election District	Traffic Analysis Zones
Yigo	3, 6, 7, 14, 17 and 19
Tamuning	69
Barrigada	77
Mangilao	81
Sinajana	103
Agana	94, 98, 100, 101, 102 and 104
Agana Heights	106, 107 and 108
Ordot	114
Yona	131 and 132

2.5.3 TAZ's Likely to Encounter Negligible Residential Development – TAZ's listed in Exhibit 4.10 currently exhibit only negligible residential development potential between now and this Plan's target years. Therefore, these TAZ's are expected to have no or very little residential growth by years 2015 and 2020.

Exhibit 4.10
TAZ's with Negligible Residential Development Potential

Election District	Traffic Analysis Zones
Yigo	1, 8 and 13
Dededo	15, 24, 25, 26, 28, 29, 30, 34 and 36
Tamuning	39, 43, 44, 45, 52, 59, 60, 62, 63 and 70
Barrigada	71, 73, 156 and 157
Mangilao	79 and 83
Mongmong Toto Maite	89 (2015 to 2020) and 90
Agana	105
Asan	109
Piti	119, 121 and 123
Yona	125 and 128
Santa Rita	140
Talofofo	144
Umatac	148

2.5.6 TAZ's Likely to Encounter Average Residential Development - Those TAZ's not designated as either faster, slower or negligible in growth rate are determined to be average in residential growth rates through to years 2015 and 2020.

2.6 Establishing Employment Estimates

The Travel Demand Model employed for this Master Plan uses employment, as well as population, data by Traffic Analysis Zone. For the reasons stated above, however, it is a tenuous exercise, at best, to forecast employment for each TAZ in the years 2015 and 2020. Instead, an average rate of growth will be used and adjusted by TAZ, where justified.

Generally speaking, the number of employees, excluding military, can be expected to grow in proportion to population. Exhibit 4.11 estimates the ratio between employees and population for the year 2000 at 1: 2.55; that is, Guam had an average of one employee for every 2.55 residents.

Exhibit 4.11
Employee: Population Ratio for Year 2000

Year 2000 Population	Year 2000 Employees	Employee to Population Ratio
154,805	60,588	1 : 2.55

Further, with reasonable assumptions, average employment forecasts can be adjusted at several single TAZ's, as well as at several multi-TAZ areas, where future growth is expected to occur at a rate faster than Guam's average. Exhibits 4.12 and 4.13 list those areas expected to grow faster between 2003 to 2015 and between 2015 to 2020, respectively.

Exhibit 4.12
Areas with Projected Faster Than Average Employment Growth, 2003 to 2015

Area	Traffic Analysis Zones	Growth above Average
Tourist Destinations		
	Tumon and its nearby environs. (TAZ's 43 through 53)	25 %
	East Agana Bay (TAZ 56)	25 %
	Leo Palace Resort (TAZ 126)	25 %
	Puntan Dos Amantes area (TAZ 37)	10 %
	Oka Point (TAZ 40), which does not currently have employment, is expected to have 250 employees.	n/a
Government Ports of Entry		
	Guam International Air Terminal complex (TAZ 73)	10 %
	Port Authority of Guam complex (TAZ 119)	10 %
Higher Education		
	University of Guam area (TAZ 87)	10 %
Military Installations		
	Andersen Air Force Base (TAZ 1, 2)	10 %
	Naval Station (TAZ 135, 155)	10 %
New Public Facilities		
	New Northern High School site (TAZ 36)	Expected to add 180 employees

Exhibit 4.13
Areas with Projected Faster Than Average Employment Growth, 2015 to 2020

Area	Traffic Analysis Zones	Growth above Average
Economic Development Zones		
	Tiyan/Airport Economic Development Zone (TAZ 73)	25 %
	Harmon / Hilaan / former FAA Housing area (TAZ's 20, 22), which do not currently have employment, are expected to have 100 employees each.	n/a

2.7 Employment Projections By TAZ

The total projected number of employees for years 2015 and 2020, excluding military, was generated by applying the same population: employment ratio as existed in base year 2003 on Guam. This ratio is presented in Exhibit 4.11 as one employee per 2.55 of population and yields the employment projections when applied to the population projections for year 2015 and 2020. Those areas discussed earlier as being expected to grow faster than average by years 2015 and 2020 where included in the projections. In order to maintain the total number of projected employees for years 2015 and 2020, several TAZ's were adjusted for less than average growth.

2.7.1 Retail Employment Projections By TAZ - Retail employment projections were established by determining the proportion of retail to total employees for the base year 2003 for each TAZ. That ratio was then applied to the total employment projections established as described above.

2.7.3 Hotel Employment Projections By TAZ - Hotels and current employee data were presented in Technical Report 1. Inasmuch as those data do not reflect hotel employment at full occupancy, however, data from 1994 were used in order to establish occupancy under a more robust tourism economy. Then hotel employment at full occupancy was estimated for hotels built since 1994. Employment projections were then extended to the target years of 2015 and 2020, taking into account both expansions and new hotels, by TAZ. These data are presented in Exhibit 4.14

2.7.3 School Enrollment Projections By TAZ - School enrollment projections include public schools managed by the GovGuam Department of Education (DOE), Guam Community College, the University of Guam, DODEA schools, and other private, as well as parochial schools. Naturally, the largest system is administered by DOE; however, projections for more than a year or two are not available. Therefore, public school enrollment projections are uniformly generated at a 1.5% increase per annum for each school, based on its year 2003 census. This rate reflects 25% reduction from the overall, projected population growth rate for Guam, established in Section 2.2 as 2% per annum. The only exception to this projection rate is for JFK High School, which is expected to be abandoned in favor of the new Northern High School by year 2015. No other school sites

are expected to be added or abandoned during the plan period, although rehabilitation and expansions are certainly planned.

Exhibit 4.14
Hotel Employees Projections by TAZ for Years 2015 and 2020

TAZ	HOTEL	Year 1994 Hotels	Current Year Hotels	Projected New and Expanded	
		Employees at Full Capacity ⁽¹⁾	Employees at Full Capacity	2015 Hotels	2020 Hotels
				Employees at Full Capacity	Employees at Full Capacity
29	Harmon Loop Hotel		5 ⁽³⁾	5	5
37	Dos Amantes			500	1000
43	Hilton Hotel	538		600	850
44	PIC	595		650	650
	Former Tokyu			0	500
45	Royal Orchid		80 ⁽²⁾	100	100
46	Imperial Suites		5 ⁽²⁾	10	10
47	Holiday Inn		160 ⁽²⁾	175	175
	Fujita	204		500	500
	Tropicana			250	250
	Former Royal Palms			0	300
48	Holiday Plaza	42		50	50
	Garden Villa		5 ⁽³⁾	10	10
	Sherwood			250	250
49	Dai Ichi Hotel	340		350	350
	Marriott Hotel	453		500	500
50	Outrigger		500 ⁽³⁾	550	550
	Hyatt	510		550	550
	Reef Hotel	374		400	400
	Tumon Tanota			600	650
51	Guam Plaza	425		450	450
	Nikko Hotel	518		550	550
	Ohana Bayview			150	150
	Ohana Oceanview	41		50	50
	Okura Hotel	361		400	400
	Tumon Bay Capital		20 ⁽³⁾	20	20
	Westin Hotel		400 ⁽³⁾	450	450
54	Tamuning Plaza		10 ⁽³⁾	10	10
56	Onward	299		400	400
	Santa Fe		60 ⁽³⁾	100	100
	Palace Hotel	367		400	400

64	Alupang Beach Tower		240 ⁽²⁾	250	250
68	Airport Hotel Mai'ana		10 ⁽²⁾	15	15
76	Hotel Palmridge/ Day's Inn		15 ⁽³⁾	15	15
86	Ladera Towers		80 ⁽²⁾	100	100
94	Plumeria		15 ⁽³⁾	15	15
107	Cliff Hotel		10 ⁽³⁾	15	15
126	Leo Palace		540 ⁽²⁾	600	600
141	Aston Inn on the Bay	23	15 ⁽²⁾	20	20

Notes: (1) Per GHRA RECORD FOR November 1994. Hotel may have had a different name.

(2) Per information from hotel management.

(3) Estimate.

School enrollment for DODEA schools is projected to increase by 2.5% per year, in anticipation of the military and collateral services build-up expected to continue during the foreseeable future. As for the Guam Community College and the University of Guam, enrollment is more or less capped by their physical plants and student market; consequently, only a slight overall increase is forecast. Other private and parochial schools are assigned various growth rates depending on their ability to respond to a growing population base or remain relatively stable due to limitations such as campus size and core mission.

2.8 Summary of Population and Employment Forecasts

Population growth projections for 2015 and 2020 are summarized in Exhibit 4.15. The projected average population growth of 2.0 percent per year from the Study's base year of 2003 results in a total increase in population of 40.0 percent by 2020.

Exhibit 4.15
Population Projections

Demographic	Census 2000 (1)	Estimated 2003 (2)	Projected 2015	Projected 2020
Total Population	154,805	136,213	172,771	190,753
Total Households	38,761	34,077	43,489	48,307
Household Size 1 - 2	12,209	10,743	14,127	16,061
Household Size 3 - 4	13,751	12,104	15,297	16,858
Household Size 5 +	12,759	11,230	14,065	15,388
Institutional Total	976	859	1,089	1,203
Total Pop. In Group Quarters	2,901	2,561	3,248	3,585

Notes: (1) 2000 Census, Bureau of the Census, U.S. Department of Commerce.

(2) Appendix C, Technical Report 2, Updating the Travel Demand Model,
Guam 2020 Highway Master Plan, prepared July 2003 by Duenas & Associates
in association with Wilbur Smith Associates.

2.9 School Enrollment and Employment Projections

School enrollment and employment projections are summarized in Exhibit 4.16. Overall school enrollment is projected to increase by 30.4 percent by 2020, while total employment on the Island is expected to increase by 38.7 percent.

Exhibit 4.16
School Enrollment and Employment Projections

Demographic	Estimated 2003 ⁽¹⁾	Projected 2015	Projected 2020
School Enrollment	38,333	45,303	49,493
DODEA Students	2,333	3,137	3,550
Total Students	40,666	48,440	53,043
Retail Employment	11,300	12,944	14,459
Hotel Employment	4,110	10,060	11,660
Other Employment	41,816	47,850	53,857
Military Personnel	5,820	6,892	7,519
DODEA Employees	254	301	328
Total Employment	63,300	78,047	87,823

Note: (1) Appendix D, Technical Report 2, Updating the Travel Demand Model, Guam 2020 Highway Master Plan, prepared July 2003 by Duenas & Associates in association with Wilbur Smith Associates.

Employment projections by Election District, including military, are listed in Exhibit 4.17.

Exhibit 4.17
Total Employment Projections by Election District

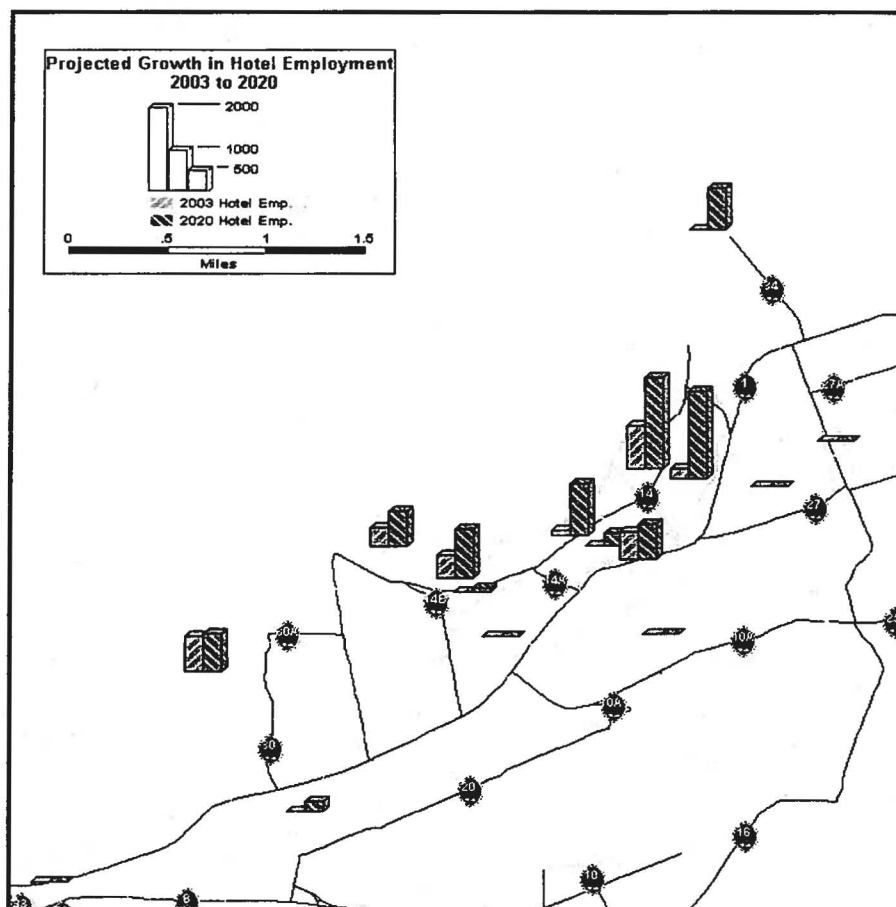
Election District	Estimated		Projected	
	1990 ⁽¹⁾	2003 ⁽²⁾	2015	2020
Agana	9,790	10,104	11,577	13,012
Agana Heights	976	722	1,034	1,150
Agat	460	250	287	321
Asan - Maina	610	596	737	828
Barrigada	4,303	2,777	3,939	4,429
Chalan Pago/Ordot	538	241	286	325
Dededo	4,088	3,340	4,011	4,678
Inarajan	298	156	177	200
Mangilao	2,389	2,896	3,336	3,709

Merizo	69	88	100	114
Mongmong/Toto/Maite	1,167	1,128	1,379	1,551
Piti	2,083	1,251	1,531	1,693
Santa Rita	7,506	6,426	7,320	8,010
Sinajana	340	296	358	402
Talofofo	164	118	134	152
Tamuning	25,068	28,128	35,939	40,807
Umatac	47	50	57	65
Yigo	4,644	4,084	4,818	5,296
Yona	374	649	1,027	1,081
Totals	64,914	63,300	78,047	87,823

Notes: (1) Table 3.3, Guam 2010 Highway Master Plan, prepared July 1992,
by Wilbur Smith Associates in association with Duenas & Associates.
(2) Compiled from data in Appendix B

Hotel employment is projected to grow faster than other employment categories. The growth in this sector between 2003 and 2020 is illustrated in Exhibit 4.18 for the Tumon / Tamuning area – the heart of the island's tourism industry.

Exhibit 4.18
Projected Growth in Hotel Employment



2.10 Population and Employment Forecasts by TAZ

Projected population and employment forecasts by Traffic Analysis Zone are provided in Appendices A through F. For comparison purposes, population and employment estimates for 2003, the study's base year, are also provided. Appendices are as follows:

- Appendix A – Estimated 2003 Demographic Data used in Trip Generation Models;
- Appendix B – Estimated 2003 Land Use Data used in Trip Attraction Models;
- Appendix C – Projected 2015 Demographic Data used in Trip Generation Models;
- Appendix D – Projected 2015 Land Use Data used in Trip Attraction Models;
- Appendix E – Projected 2020 Demographic Data used in Trip Generation Models; and
- Appendix F – Projected 2020 Land Use Data used in Trip Attraction Models.

3.0 Existing Plus Committed (E + C) Network

The Existing Plus Committed (E+C) roadway network is defined as the existing (2003) road network on the Island of Guam, plus any construction and improvement projects that are underway or considered as "committed". Projects programmed for construction under the Statewide Transportation Improvement Program (STIP) are considered as "committed".

This section of the report documents the impact of future year travel demand on the E+C network.

3.1 Future Year Travel Demand

Estimates of future year travel demand between Traffic Analysis Zones (TAZ's) were developed using population and employment forecasts described in Section 2 and the Trip Generation and Trip Distribution components of the Study's Travel Demand Model¹.

Forecasts of population, employment and daily vehicle trips are summarized in Exhibit 4.19.

¹ Guam 2020 Highway Master Plan, Technical Report 2, Updating the Travel Demand Model (Chapter 3 of this Report), Sections 5 and 6, prepared by Duenas & Associates and Wilbur Smith Associates, July 2003.

Exhibit 4.19
Projected Population, Employment and Vehicle Trips

Factor	2003	2015	2020	% Inc. 03-20
Population	136,228	172,771	190,753	40.0%
Total Employment	63,300	78,047	87,823	38.7%
School Enrollment	40,666	48,440	53,043	30.4%
Daily Vehicle Trips	446,022	566,365	627,248	40.1%

3.1.1 Trip Origins by Sector – A comparison of 2003, 2015 and 2020 daily vehicle trip origins is given in Exhibit 4.20. This exhibit lists the number of projected trips by sector of origin. The Island has been divided into seven sectors, with each sector representing one or more municipal districts. Tamuning has the highest number of trip origins, with 31.6 percent of total trips in 2020. This illustrates the dominant role of the Tamuning area as the Island's employment center.

Exhibit 4.20
Comparison of Daily Vehicle Trip Origins by Year

#	Sector	2003		2015		2020		% Inc. 03-20
		Trips	%	Trips	%	Trips	%	
1	Yigo, Dededo	95,104	21.3%	117,674	20.8%	126,199	20.1%	32.7%
2	Tamuning	140,461	31.5%	180,845	31.9%	204,140	32.5%	45.3%
3	Agana, Agana Heights Asan, M-T-M, Sinajana	63,761	14.3%	78,372	13.8%	87,143	13.9%	36.7%
4	Barrigada, Mangilao, Chalan Pago-Ordot	85,629	19.2%	110,785	19.6%	121,980	19.4%	42.5%
5	Yona	9,724	2.2%	14,775	2.6%	16,695	2.7%	71.7%
6	Agat, Piti, Santa Rita	39,276	8.8%	48,295	8.5%	53,545	8.5%	36.3%
7	Inarajan, Merizo, Talofofo, Umatac	12,066	2.7%	15,619	2.8%	17,546	2.8%	45.4%
	Total: All Sectors	446,022		566,365		627,248		40.6%

3.1.2 Projected Trip Patterns – The numbers of projected daily trips between sectors for 2003 and 2020 are shown in Exhibits 4.21 and 4.22, respectively.

Exhibit 4.21
2003 Sector-to-Sector Daily Vehicle Trips

Sector	1	2	3	4	5	6	7	Total
1	39,563 8.9%	30,801 6.9%	7,039 1.6%	14,730 3.3%	551 0.1%	1,845 0.4%	575 0.1%	95,104 21.3%
2	30,801 6.9%	68,849 15.4%	15,108 3.4%	17,930 4.0%	1,664 0.4%	4,601 1.0%	1,508 0.3%	140,461 31.5%
3	7,039 1.6%	15,108 3.4%	21,250 4.8%	12,256 2.7%	1,666 0.4%	5,292 1.2%	1,149 0.3%	63,761 14.3%
4	14,730 3.3%	17,930 4.0%	12,256 2.7%	33,312 7.5%	2,647 0.6%	3,089 0.7%	1,665 0.4%	85,629 19.2%
5	551 0.1%	1,664 0.4%	1,666 0.4%	2,647 0.6%	1,820 0.4%	882 0.2%	494 0.1%	9,724 2.2%
6	1,845 0.4%	4,601 1.0%	5,292 1.2%	3,089 0.7%	882 0.2%	22,066 4.9%	1,500 0.3%	39,276 8.8%
7	575 0.1%	1,508 0.3%	1,149 0.3%	1,665 0.4%	494 0.1%	1,500 0.3%	5,175 1.2%	12,066 2.7%
Total	95,104 21.3%	140,461 31.5%	63,761 14.3%	85,629 19.2%	9,724 2.2%	39,276 8.8%	12,066 2.7%	446,022 100.0%

Exhibit 4.22
2020 Sector-to-Sector Daily Vehicle Trips

Sector	1	2	3	4	5	6	7	Total
1	53,928 8.6%	40,083 6.4%	8,508 1.4%	19,457 3.1%	970 0.2%	2,294 0.4%	959 0.2%	126,199 20.1%
2	40,083 6.4%	104,624 16.7%	20,503 3.3%	27,018 4.3%	3,078 0.5%	6,409 1.0%	2,425 0.4%	204,140 32.5%
3	8,508 1.4%	20,503 3.3%	28,430 4.5%	17,740 2.8%	2,963 0.5%	7,308 1.2%	1,691 0.3%	87,143 13.9%
4	19,457 3.1%	27,018 4.3%	17,740 2.8%	46,619 7.4%	4,312 0.7%	4,454 0.7%	2,379 0.4%	121,980 19.4%
5	970 0.2%	3,078 0.5%	2,963 0.5%	4,312 0.7%	3,168 0.5%	1,425 0.2%	779 0.1%	16,695 2.7%
6	2,294 0.4%	6,409 1.0%	7,308 1.2%	4,454 0.7%	1,425 0.2%	29,677 4.7%	1,978 0.3%	53,545 8.5%
7	959 0.2%	2,425 0.4%	1,691 0.3%	2,379 0.4%	779 0.1%	1,978 0.3%	7,334 1.2%	17,546 2.8%
Total	126,199 20.1%	204,140 32.5%	87,143 13.9%	121,980 19.4%	16,695 2.7%	53,545 8.5%	17,546 2.8%	627,248 100.0%

Note: Sector 1: Yigo, Dededo
Sector 2: Tamuning
Sector 3: Agana, Agana Heights Asan, M-T-M, Sinajana
Sector 4: Barrigada, Mangilao, Chalan Pago-Ordot
Sector 5: Yona
Sector 6: Agat, Piti, Santa Rita
Sector 7: Inarajan, Merizo, Talofofo, Umatac

3.2 E+C Highway Improvement Projects

In addition to existing roads, the E+C network incorporates all projects programmed for construction under the STIP. Those projects resulting in changes to roadway capacity through construction of new or improved infrastructure were reflected in the E+C network model. STIP projects are listed in Exhibit 4.23 and described in detail in Appendix G.

Exhibit 4.23
Committed (STIP) Projects

Num.	Location	Municipality	Status in 2003
1	Route 4 Rehabilitation & Widening, improving of left-turn lanes, Phases 1 & 2, Route 1 to Route 10	Agana; Ordod-Chalan Pago	FY 2002 Design - Build Project. DB bid/contract documentation completed and ready for bid solicitation. This is a partial fulfillment of a 2010 HMP Long-Range Improvement Program project No. 19.
2	Route 3 Rehabilitation & Widening Project, Route 28 (y Sengsong Road) to Route 3A/Route 9 (Potts Junction)	Dededo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
3	Route 26 & Route 25 (Alageta Street) Intersection Rehabilitation, Widening & Traffic Signalization	Dededo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4	Island-Wide Highway Hazard Elimination Program - Various Locations	Various	Separate sites/projects as described below, 4(a) to 4(f)
4 (a)	Guardrails at School Bus Shelters along Federal-Aid Highways, Multiple Locations	Various	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (b)	Route 4 Rehabilitation & Widening, Jeff's Pirates Cove to Ipan Beach Park	Talofoto	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (c)	Route 17 Rehabilitation & Resurfacing, Site No. 1: Laguina Circle (west) to Seventh Day Adventist Academy, Site No. 2: Near Camachili Store	Yona	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (d)	Route 29 (Gayinero Road) Rehabilitation & Resurfacing from Country Store to Marianas Terrace (upper entrance)	Yigo	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (e)	Island-wide Guardrails Rehabilitation	Various	FY 2002 Design - Build Project. Under Design-Build contract and bid document preparation
4 (f)	Route 1 & Wusstig Road Traffic Signalization	Dededo	FY 2002 Design-Build, now a FY2005 Construction Project. Under final design and bid documents preparation
5	Route 26 Reconstruction & Widening, Phase II: Route 1 to Route 25 (Alegeta Street)	Dededo; Mangilao	FY 2006 Construction Project. Redesigned to a 3-lane facility.
6	Ylig Bridge	Yona	FY 2002 Design, FY 2007 Construction Project, redesign scope under negotiation.
7	Route 2 Design Modification, Phase I: Namo River to Agat Cemetery, Phase II: Agat Cemetery to Santa Ana Chapel	Santa Rita; Agat	FY 2002 Design & 2007 Construction Project: Design modification (from original design) required.
8	Route 5 Reconstruction & Widening, Route 2A to Route 17 and Portion of Route 12	Santa Rita	FY 2002 Design and FY 2006 Construction Project. This is listed as a 2010 HMP Long-Range Improvement Program project (Project No. 24)

9	Route 15, Rehabilitation & Widening, Phase I: Route 26 to Route 29 (Gayinero Road), Phase II: Route 29 to Andersen Air Force Base Back Gate	Mangilao; Yigo	FY 2005 Design-Build, Phase 1 Project (formerly an FY 2002 Design Phase Project)
10	Route 17 Rehabilitation & Widening, Phase I: Route 5 to Route 4A, Phase 2: Route 4A to Route 4	Santa Rita; Yona	FY 2002 Design, FY 2005 Construction Project.
11	Route 27A (Fatima Road) Rehabilitation & Widening	Dededo	FY 2002 Design Phase, FY 2004 Construction Project. This project is not included in 2010 HMP short or long range project list.
12	Route 25 (Alageta Street) Reconstruction & Widening	Barrigada; Dededo	FY 2002 Design, FY 2005 Construction Project. This was a 2010 short range improvement program project (No. 15)
13	Route 29 (Gayinero Rd) Reconstruction and Widening (Route 1 to Route 15)	Yigo	FY 2007 Construction Project
14	Route 33, Portion of Toto-Canada Road, reconstruction and widening.	MTM	FY 2004 Proposed Project
15	Route 14B Ipao Road Reconstruction and Widening	Tamuning	FY 2007 Construction Project
16	Pigua Bridge Replacement & Road Approaches Improvements	Merizo	FY 2005 Design Phase Project
17	Bile Bridge Replacement & Road Approaches Improvements	Umatac	FY 2005 Design Phase Project
18	ADA Compliance Projects, 2005: Route 1, Route 30 to Route 16, 2006: Route 30 & Route 16	Tamuning	FY 2005 & 2006 Design & Construction Project
19	Route 10A (Airport Road) Rehabilitation	Tamuning	FY 2006 Construction Project
20	Islandwide Highway Hazard Elimination Program – Route 1, Adelup to Asan and Route 4 @ Jeff's Pirates Cove	Tamuning	FY 2006 Design & Construction Projects
21	Route 1, U-Turn Lane Modifications	Tamuning	FY 2006 Design & Construction Project
22	Route 27 (Finegayan Road) Reconstruction & Widening	Dededo	FY 2007 Design Project
23	Route 10/Sabanana Maagas Road & Route 8, Biang Street Intersection Signalization & Improvements	Maite; Barrigada	FY 2007 Design & Construction Projects
24	Traffic Signals Upgrade, Various Locations	Various	FY 2007 Design & Construction Project

3.3 Performance of the E+C Network

Traffic flow quality is measured in terms of the ratio of hourly traffic volume to hourly capacity (V/C ratio) on a highway link. V/C ratios of 1.0 or less indicate reasonably smooth flow. To evaluate the performance of a highway network under a specified level of travel demand, the following two categories of deficiency are used:

- Moderately congested V/C between 1.01 and 1.15; and
- Severely congested V/C 1.16 and greater.

The performance of the E+C network in satisfying travel demands for 2003, 2015 and 2020 is summarized in Exhibit 4.24. It is recognized that all elements of the STIP listed above were not completed in 2003, but the model results for this scenario are shown for comparison purposes. Also shown for comparison purposes is the performance of the existing road network with 2003 travel demands.

As described in Chapter 3, the Guam HMP Travel Demand Model provides separate modeling of A.M. Peak, P.M. Peak and Off-peak traffic conditions. Daily performance measures are derived from two hours of A.M. Peak conditions, two hours of P.M. Peak conditions and twelve hours of Off-peak conditions.

Exhibit 4.24
Performance of the E+C Network

Measure of Effectiveness	2003 Existing Network	2003 E + C Network	2015 E + C Network	2020 E + C Network	% Inc. 03-20
A.M. Peak Hour					
Vehicle-Miles	172,955	172,984	219,214	242,652	140.3%
Vehicle-Hours	5,370	5,354	7,100	8,062	150.6%
Delay (hours)	207	192	528	774	403.1%
Speed (mph)	32.2	32.3	30.9	30.1	93.2%
P.M. Peak Hour					
Vehicle-Miles	181,796	181,561	230,293	255,293	140.6%
Vehicle-Hours	5,650	5,641	7,466	8,499	150.7%
Delay (hours)	207	206	547	824	400.0%
Speed (mph)	32.2	32.2	30.8	30.0	93.3%
Off-Peak Hour					
Vehicle-Miles	115,038	114,836	145,447	160,811	140.0%
Vehicle-Hours	3,470	3,462	4,433	4,941	142.7%
Delay (hours)	26	25	73	114	454.0%
Speed (mph)	33.2	33.2	32.8	32.5	98.1%
Daily Totals (1)					
Vehicle-Miles	2,089,955	2,087,116	2,644,378	2,925,622	140.2%
Vehicle-Hours	63,678	63,531	82,327	92,415	145.5%
Delay (hours)	1,140	1,096	3,030	4,558	415.9%
Speed (mph)	32.8	32.9	32.8	31.7	96.4%

Note: (1) Daily values calculated as:

2 A.M. Peak Hour + 2 P.M. Peak Hour + 12 Off-Peak Hour

Based on projected traffic volumes, locations where moderate or severe congestion is projected to occur on the E+C network during 2020 are shown in Exhibits 4.25, 4.26 and 4.27 for A.M. Peak Hour, P.M. Peak Hour and Off-Peak periods, respectively.

In subsequent sections of this report various packages of improvements will be evaluated to determine the extent to which they are successful in alleviating the projected levels of congestion in the E+C network. These levels of congestion represent the worst case scenario of no future investments being made in the Guam roadway network beyond the current STIP and essential routine maintenance of existing infrastructure.

Exhibit 4.25
Projected 2020 A.M. Peak Hour Congested Locations with the E+C Network

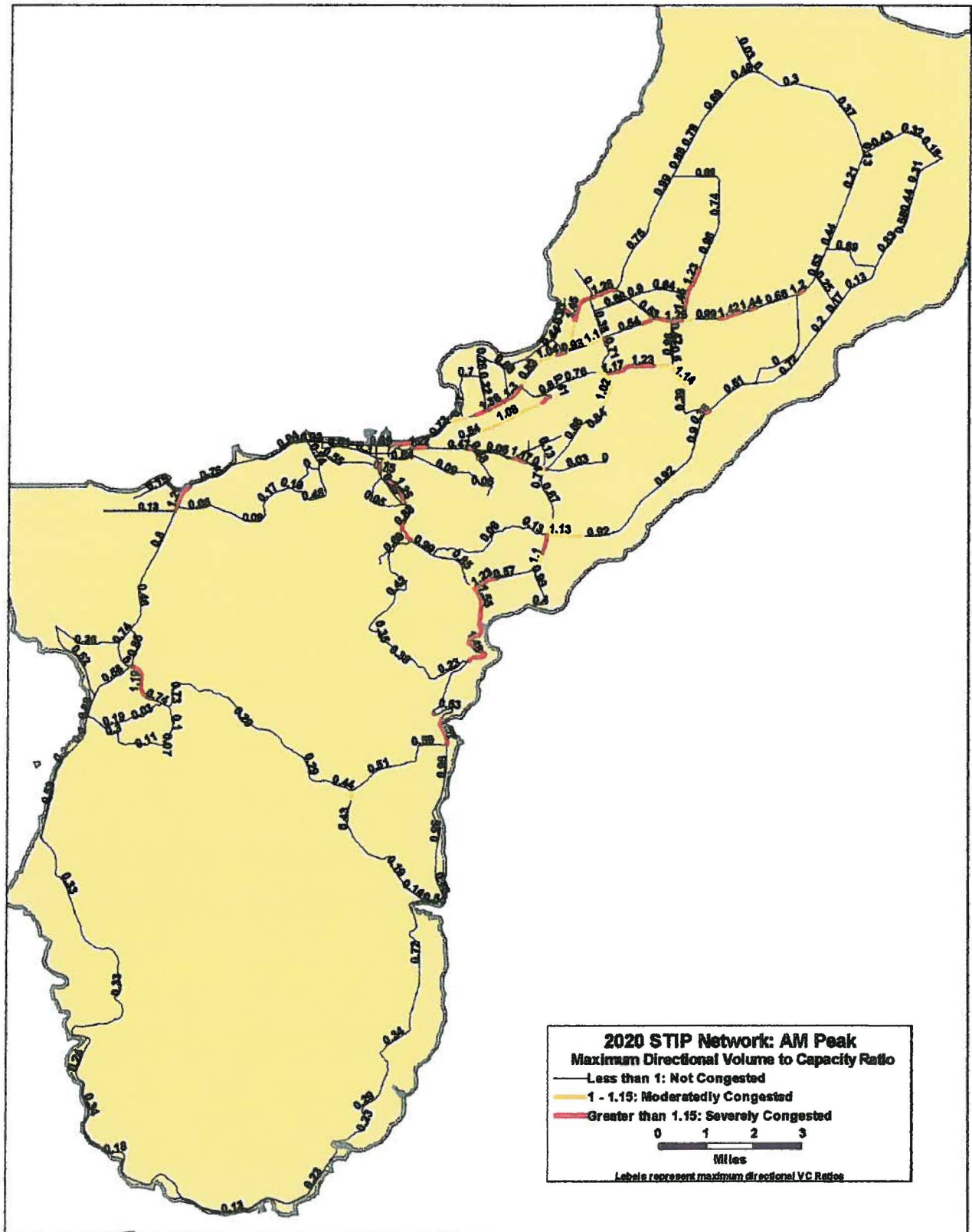


Exhibit 4.26
Projected 2020 P.M. Peak Hour Congested Locations with the E+C Network

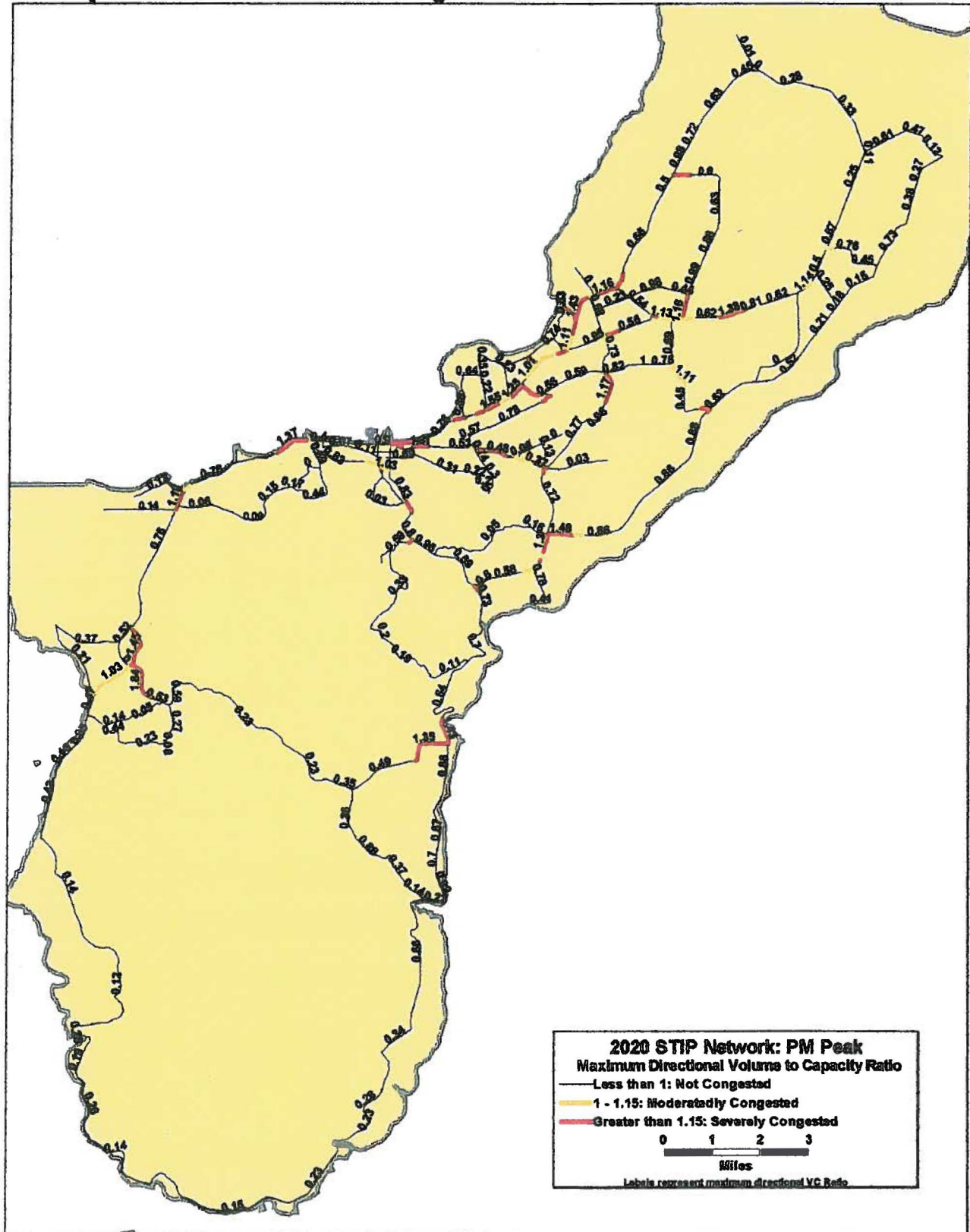
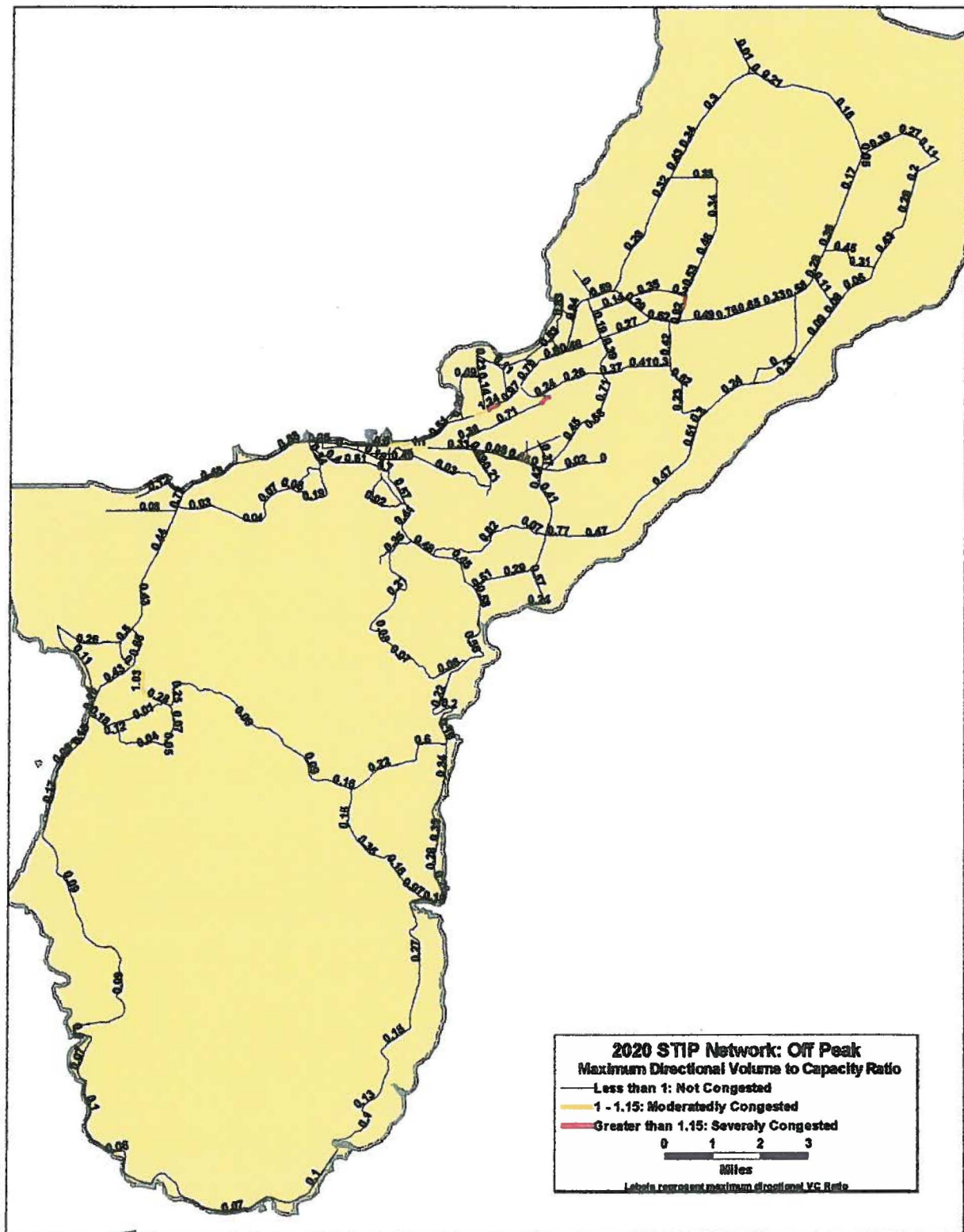


Exhibit 4.27
Projected 2020 Off-Peak Period Congested Locations with the E+C Network



Chapter 5

SHORT RANGE PROGRAM RECOMMENDATIONS

1.0 Formulation of Short-Range Program Highway Improvement Projects

Short Range Program (SRP) highway improvement projects are those that are intended to be funded and implemented within a window of 10 years. These projects do not include those programmed for construction under the Statewide Transportation Improvement Plan (STIP) Program. As discussed in Chapters 2 and 4 of this Report, it is assumed that STIP projects are committed projects and, as such, were included as part of the Existing plus Committed (E+C) highway network.

The E+C network was edited to incorporate highway improvements in the proposed Short-Range Program to create the Short-Range Program (SRP) network. Short-Range Program projects are derived primarily from those formulated under the 2010 Highway Master Plan that have been analyzed and determined to be valid under current planning goals and objectives. Additional projects have been added to the proposed SRP network based on their anticipated significant contribution to satisfying the updated Highway Master Plan goals and objectives. This chapter identifies and describes the highway improvement projects recommended for inclusion in the SRP network and documents the impact of the proposed SRP network on future year travel demand.

2.0 Short-Range Highway Improvement Projects

Those projects in the Short-Range Program resulting in changes to roadway capacity through construction of new or improved infrastructure were reflected in the SRP network model. Recommended SRP projects are identified and described below, and graphically depicted in Exhibit 5.1a placed at the rear of this Chapter. Exhibit 5.1b lists the recommended SRP projects along with "order of magnitude" construction cost estimates which include a factor of 15% for engineering design costs and contingencies. Exhibit 5.1c lists the breakdown of order of magnitude implementation costs for the recommended SRP projects, including costs for acquisition of new and/or additional rights of way.

Recommended SRP Projects:

Project SRP-1: Cold Storage Road Extension. Construct a two-lane roadway, dual configuration through the existing road alignment at Harmon.

Project SRP-2: Harmon Connector and Reconstruction of Harmon Strip and Harmon Access Roads. Construct a two-lane roadway, dual configuration, based on existing right of way corridors within the Harmon area.

Project SRP-3: Macheche/Carnation Avenue. Reconstruct and expand this existing roadway to a four-lane highway, dual configuration, from Route 1 to Route 15 along the existing right of way corridor.

Project SRP-4: Jalaguac Road Connector. Construct a new two-lane, dual configuration connector, initially from Route 8 @ Biang Street along the Laderan Tiyan Parkway corridor to Route 1 @ Camp Watkins Road. (The Laderan Tiyan Parkway will be a Long-Range Project which will supersede and include the Jalaguac Connector, from Route 8 to the Laderan Tiyan Parkway.)

(Note applicable to Projects SRP-4 and LRP-A8.1 and LRP-A8.2: The Government of Guam has enacted into law the return of properties in and around the Laderan Tiyan Parkway right of way corridor to original landowners, i.e., persons who owned Tiyan properties prior to acquisition of such properties by the federal government following World War II. A portion of the proposed Jalaguac Connector corridor, i.e., the section within Tiyan and the Laderan Tiyan Parkway 120-foot wide right of way corridor, had been conveyed to the Department of Public Works by the Federal Highway Administration through the approval of a public conveyance application initiated by DPW after having justified the use of the proposed corridor as a future critical component of the islandwide highway system. While this law does not eliminate the use of the corridor as a future part of the highway system, it does place the difficult and formidable cost and procedural burden of re-acquisition of the corridor on the Government.)

Project SRP-5: Route 3, Marine Drive to Potts Junction. Expand Route 3 from a 3-lane highway (to be reconstructed as such under the STIP program) to a four-lane highway, dual configuration.

Project SRP-6: Alegeta Street, Route 25. Reconstruct two-lane roadway, dual configuration along a portion of the existing Alegeta Street right of way. The actual design of this project must be preceded by a route study

Project SRP-7: Route 15, Route 10 to Carnation Avenue. Reconstruct and widen Route 15 to a two-lane highway, dual configuration with 8-foot paved shoulders, and 4-lane, dual configuration to approach to Route 26 (Carnation Avenue), then transition to a 4-lane highway (See SRP-3).

Project SRP-8: Route 15, Route 26 (Carnation Avenue) to Andersen Air Force Base. Reconstruct and widen Route 15 from Route 26 to the Andersen AFB back gate to a two-lane highway, dual configuration with 8-foot paved shoulders, then transitioning to a 4-lane, dual configuration upon approach to the Guam Raceway Park in Yigo and continuing the 4-lane section to Gayinero Road, Route 29 then returning to a 2-lane dual configuration to Andersen AFB, with signals at Route 26, Guam Raceway Park, Marbo Connector and Gayinero Road (Route 29) intersections.

Project SRP-9: West O'Brien Drive, Aspinall Avenue to Chalan Obispo. Reconstruct and widen West O'Brien Dr. from Route 4 to Aspinall to a 4-lane configuration, including signalization improvements at Chalan Obispo (Route 27).

Project SRP-10: Peter Nelson Dr., Chalan Obispo to Route 4. Reconstruct Peter Nelson Drive to correct alignment and intersection problems and install signals at Route 4 and Chalan Obispo intersections.

Project SRP-11: Route 4, Cross Island Road to Talofofo River Bridge. Reconstruct and widen Route 4, from Route 17 to Talofofo River Bridge to modern design standards using a 2-lane dual configuration. *(Note: The Government of Guam has recently selected a site at Dandan near Malojloj village as the location of the new sanitary landfill and has scheduled the opening of landfill operations in 2007. Route 4, particularly the segment from Route 1 to Malojloj, will be the primary access route for landfill-bound traffic and should be upgraded to address traffic flow and safety issues. Therefore, the Route 4 reconstruction and widening projects, namely SRP-11, 12 and 15, have acquired a greater degree of importance and, thus, a higher priority for implementation in the time frame needed to support the opening of the new landfill.)*

Project SRP-12: Route 4, From and Including Ylig Bridge to Cross Island Road. Reconstruct and widen Ylig Bridge (to accommodate at least 3 lanes) as well as the section of Route 4, from the bridge to Cross-Island Road (Route 17), using 4-lane dual configuration.

Project SRP-13: Route 2, Namo River to Agat Cemetery. Reconstruct and widen Route 2, from Namo River to western edge of Agat Village, using a 5-lane configuration, with paved shoulders.

Project SRP-14: Route 2, Agat Cemetery to Santa Ana Chapel. Reconstruct and widen Route 2, from western edge of Agat Village to the Santa Ana Chapel using a 2 lane dual configuration.

Project SRP-15: Route 4, Talofofo River Bridge to Inarajan Village. Reconstruct and widen Route 4 using 2-lane configuration, adding climbing lanes where appropriate and 8-foot paved shoulders and incorporate section of Route 4 to be reconstructed under the As-Alonso earthquake repair project. Right of way acquisition will be involved.

Project SRP-16: Route 4, Merizo Village to Umatac Village. Reconstruct and widen Route 4 to modern design standards using a 2-lane dual configuration. Right of way acquisition will be involved.

Project SRP-17: Route 15 to Route 1 Connector (Chalan Lujuna Extension). Reconstruct and widen Route 15 to modern design standards using a 2-lane dual configuration.

Project SRP-18: Route 5 and Route 12, Naval Magazine (Santa Rita) Area. Reconstruct Routes 5 and 12 to modern design standards, Cross-Island Road to a point east of Santa Rita Village using 2-lane configuration with climbing lanes where needed. This project will build and improve on the reconstruction of Route 17 which is currently a STIP project.

Exhibit 5.1b
Short-Range Improvement Projects

Project No.	Location	Municipality	Type of Proposed Improvements	Estimated Order of Magnitude Cost
SRP-1	Cold Storage Road Extension	Tamuning	Two-lane roadway, dual configuration.	\$ 1,814,000
SRP-2	Harmon Connector and Reconstruction of Harmon Strip and Harmon Access Roads	Tamuning	Two-lane roadway, dual configuration.	\$ 2,102,000
SRP-3	Macheche/Carnation Avenue	Dededo	Four-Lane highway, dual configuration.	\$ 4,051,000
SRP-4	Jalaguac Road Connector	Tamuning; MTM	Two-lane, dual configuration connector, initially from Route 8 @ Biang Street along the Laderan Tiyan Parkway corridor to Route 1 @ Camp Watkins Road. (The Laderan Tiyan Parkway will be a Long-Range Project which will supersede and include the Jalaguac Connector, from Route 8 to the Laderan Tiyan Parkway.	\$ 3,121,000.00
SRP-5	Route 3, Marine Drive to Potts Junction	Dededo	Four-lane highway, dual configuration.	\$ 20,330,000.00
SRP-6	Alegeta Street, Route 25	Dededo	Two-lane roadway, dual configuration.	\$ 3,604,000.00
SRP-7 DAHF	Route 15, Route 10 to Carnation Avenue	Mangilao	Two-lane highway, dual configuration with 8-foot paved shoulders, and 4-lane, dual configuration to approach to Route 26 (Carnation Avenue, then transition to a 4-lane highway, dual configuration (see SRP-3).	\$ 18,295,000.00
SRP-8 DAHF	Route 15, Route 26 (Carnation Avenue) to Andersen Air Force Base	Mangilao; Yigo	Two-lane highway, dual configuration with 8-foot paved shoulders, then transitioning to a 4-lane, dual configuration upon approach to the Guam Raceway Park in Yigo and continuing the 4-lane section to Gayinero Road, Route 29 then returning to a 2-lane dual configuration to Andersen AFB, with signals at Route 26, Guam Raceway Park, Marbo Connector and Gayinero Road (Route 29) intersections..	\$ 30,523,000.00
SRP-9	West O'Brien Drive, Aspinall Avenue to Chalan Obispo	Agana	Reconstruct West O'Brien Dr. from Route 4 to Aspinall with 4-lane configuration, and signalization at Chalan Obispo (Route 27).	\$ 1,691,000.00
SRP-10	Peter Nelson Dr., Chalan Obispo to Route 4	Agana; Agana Heights	Reconstruct Peter Nelson Drive to correct alignment and intersection problems and install signals at Route 4 and Chalan Obispo intersections.	\$ 2,067,000.00
SRP-11 MSWLF Access Route	Route 4, Cross Island Road to Taloforo River Bridge	Yona	Reconstruct to modern design standards using 2-lane dual configuration.	\$ 12,095,000.00
SRP-12 MSWLF Access Route	Route 4, Yona Village to Cross Island Road	Yona; Taloforo	Reconstruct Ylig Bridge (at least 3 lanes wide) and section from Bridge to Cross-Island Road (Route 17), using 4-lane dual configuration.	\$ 2,904,000.00

Exhibit 5.1b
Short-Range Improvement Projects

Project No.	Location	Municipality	Type of Proposed Improvements	Estimated Order of Magnitude Cost
SRP-13	Route 2, Namo River to Agat Cemetery	Agat	Reconstruct Route 2, from Namo River to western edge of Agat Village, using 5-lane configuration, with paved shoulders.	\$ 11,203,000.00
SRP-14	Route 2, Agat Cemetery to Santa Ana Chapel	Agat	Reconstruct Route 2, from western edge of Agat Village using 2 lane dual configuration.	\$ 3,586,000.00
SRP-15 MSWLF Access Route	Route 4, Talofoto River Bridge to Inarajan Village	Talofoto; Inarajan	Reconstruction Route 4 using 2-lane configuration, adding climbing lanes where appropriate and 8-foot paved shoulders and incorporate section of Route 4 to be reconstructed under the As-Alonso earthquake repair project.	\$ 14,504,000.00
SRP-16	Route 4, Merizo Village to Umatac Village	Merizo; Umatac	Reconstruct to modern design standards using 2-lane dual configuration.	\$ 10,704,000.00
SRP-17	Route 15 to Route 1 Connector (Chalan Lujuna Extension)	Yigo	Reconstruct to modern design standards using 2-lane dual configuration.	\$ 4,582,000.00
SRP-18	Route 5 and Route 12, Naval Magazine Area	Santa Rita	Reconstruct Routes 5 and 12 to modern design standards, Cross-Island Road to a point east of Santa Rita Village using 2-lane configuration with climbing lanes where needed.	\$3,513,250.00

TOTAL ORDER OF MAGNITUDE COST OF SHORT RANGE PROGRAM**\$ 150,689,250**

1. All estimates include a factor of 15% for engineering design costs and contingencies
2. Projects that are related to improving direct primary route access to the Municipal Solid Waste Landfill at Dandan are annotated with "MSWLF Access Route."
3. Costs associated with ROW acquisition are not included
4. Projects which may qualify for Defense Access Highway Funds are annotated with "DAHF."

EXHIBIT 5.1c
SUMMARY OF COST ESTIMATES FOR RECOMMENDED PLAN
SUMMARY OF COST ESTIMATES - SHORT RANGE PROGRAM PROJECTS

Project No.	Reference Name & Description	Length (Miles)	Conceptual Cost Estimate (million \$)			
			Construction Cost (million \$)	Engineering & Contingencies	R.O.W. Cost	Total Cost
SRP-1	Cold Storage Road Extension	0.40	\$ 1.58	\$ 0.24	\$ 1.00	\$ 2.81
SRP-2	Harmon Connector and Reconstruction of Harmon Strip and Harmon Access Roads	0.51	\$ 1.83	\$ 0.27	\$ 1.50	\$ 3.60
SRP-3	Macheche/Carnation Avenue	0.97	\$ 3.52	\$ 0.53	\$ -	\$ 4.05
SRP-4	Jalaguac Road Connector (See Note 3)	1.10	\$ 2.71	\$ 0.41	\$ 1.45	\$ 4.57
SRP-5	Route 3, Marine Drive to Potts Junction	5.34	\$ 17.68	\$ 2.65	\$ -	\$ 20.33
SRP-6	Alegeta Street, Route 25	1.06	\$ 3.13	\$ 0.47	\$ 1.25	\$ 4.85
SRP-7 DAHF	Route 15, Route 10 to Carnation Avenue	4.85	\$ 15.91	\$ 2.39	See Note 1	\$ 18.30
SRP-8 DAHF	Route 15, Route 26 (Carnation Avenue) to Andersen Air Force Base	7.61	\$ 26.54	\$ 3.98	See Note 1	\$ 30.52
SRP-9	West O'Brien Drive, Aspinall Avenue to Chalan Obispo	0.27	\$ 1.47	\$ 0.22	See Note 1	\$ 1.69
SRP-10	Peter Nelson Dr., Chalan Obispo to Route 4	0.25	\$ 1.80	\$ 0.27	\$ 0.12	\$ 2.19
SRP-11 MSWLF Access	Route 4, Cross Island Road to Talofoto River Bridge	3.69	\$ 10.52	\$ 1.58	\$ 1.50	\$ 13.60
SRP-12 MSWLF Access	Route 4, Ylig Bridge to Cross Island Road	0.57	\$ 2.53	\$ 0.38	\$ 0.50	\$ 3.40
SRP-13	Route 2, Namo River to Agat Cemetery	2.44	\$ 9.74	\$ 1.46	\$ -	\$ 11.20
SRP-14	Route 2, Agat Cemetery to Santa Ana Chapel	0.95	\$ 3.12	\$ 0.47	\$ 0.90	\$ 4.49
SRP-15 MSWLF Access	Route 4, Talofoto River Bridge to Inarajan Village	4.26	\$ 12.61	\$ 1.89	\$ 4.00	\$ 18.50
SRP-16	Route 4, Merizo Village to Umatac Village	3.22	\$ 9.31	\$ 1.40	\$ 3.00	\$ 13.70
SRP-17	Route 15 to Route 1 Connector (Chalan Lujuna Extension)	1.17	\$ 3.98	\$ 0.60	See Note 2	\$ 4.58
SRP-18	Route 5 and Route 12, Naval Magazine Area	1.2	\$ 3.06	\$ 0.46	See Note 2	\$ 3.51
	TOTALS	39.86	\$ 131.03	\$ 19.65	\$ 15.22	\$ 165.91

Notes:

- 1 No additional right-of-way required.
- 2 Land/additional right-of way required is in government ownership.
- 3 Right-of-way previously under government ownership has been returned to original land owners. Reversionary clause in conveyance to the Government of Guam by FHWA may void the return of the right of way to original land owners.
- 4 Projects which may qualify for Defense Access Highway Funds are annotated with "DAHF."
- 5 Projects designated as primary access to the proposed Landfill at Dandan are annotated with "MSWLF Access."

3.0 Performance of the SRP Network

Since SRP projects are anticipated to be implemented generally during the next 10 years, the performance of the SRP network is evaluated by estimating the extent to which it satisfies travel demand for the year 2015. Exhibit 5.2 shows measures of effectiveness for the SRP network, together with similar measures for the E+C network.

Based on projected traffic volumes, locations where moderate or severe congestion is projected to occur on the SRP network during 2015 are shown in Exhibits 5.3, 5.4 and 5.5 for A.M. Peak Hour, P.M. Peak Hour and Off-Peak periods, respectively.

Exhibit 5.2
**Performance of the SRP Network/
Impact on Forecasted Traffic Demand**

Measure of Effectiveness	2015 E+C Network	2015 SRP Network	Percent Change
A.M. Peak Hour			
Vehicle-Miles	219,214	216,473	-1.3%
Vehicle-Hours	7,100	6,936	-2.3%
Delay (hours)	528	451	-14.6%
Speed (mph)	30.9	31.2	1.1%
P.M. Peak Hour			
Vehicle-Miles	230,293	227,279	-1.3%
Vehicle-Hours	7,466	7,245	-3.0%
Delay (hours)	547	420	-23.2%
Speed (mph)	30.8	31.4	1.7%
Off-Peak Hour			
Vehicle-Miles	145,447	143,107	-1.6%
Vehicle-Hours	4,433	4,370	-1.4%
Delay (hours)	73	71	-2.7%
Speed (mph)	32.8	32.7	-0.2%
Daily Totals (1)			
Vehicle-Miles	2,644,378	2,604,793	-1.5%
Vehicle-Hours	82,327	80,803	-1.9%
Delay (hours)	3,030	2,598	-14.3%
Speed (mph)	32.8	32.2	-1.8%

Note: (1) Daily values calculated as:

2 A.M. Peak Hour + 2 P.M. Peak Hour + 12 Off-Peak Hour

Exhibit 5.3
Projected 2015 A.M. Peak Hour Congested Locations with the SRP Network

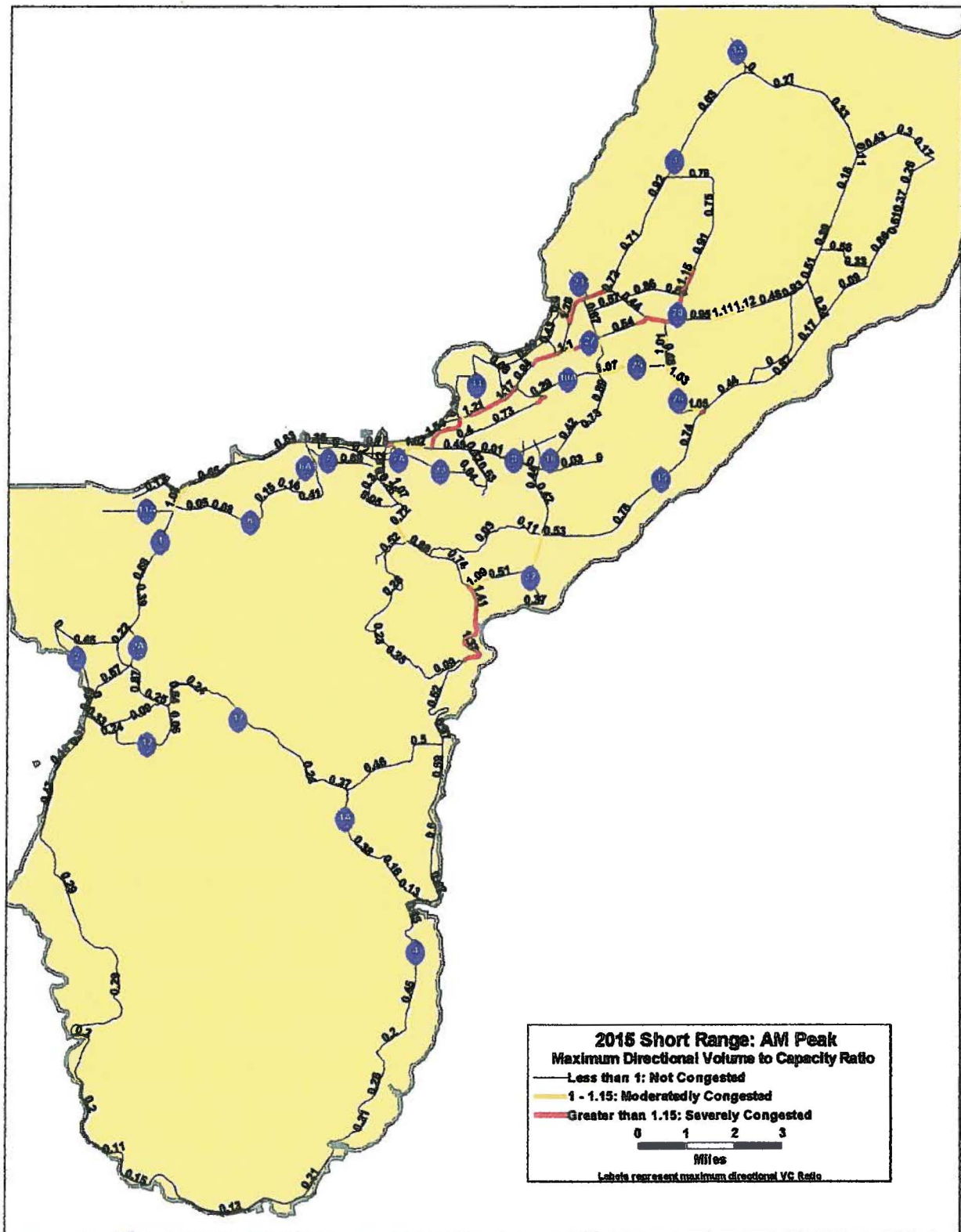


Exhibit 5.4
Projected 2015 P.M. Peak Hour Congested Locations with the SRP Network

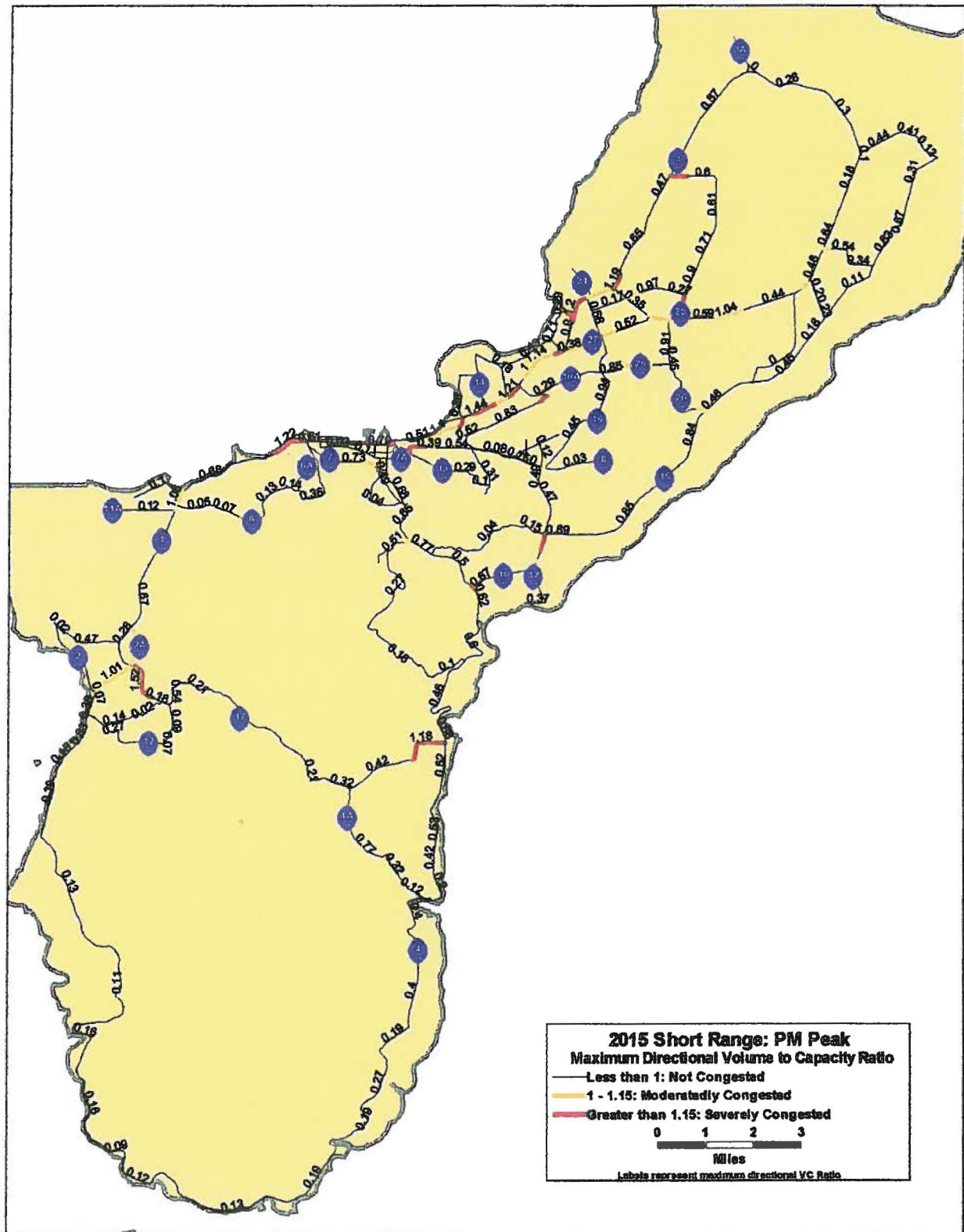
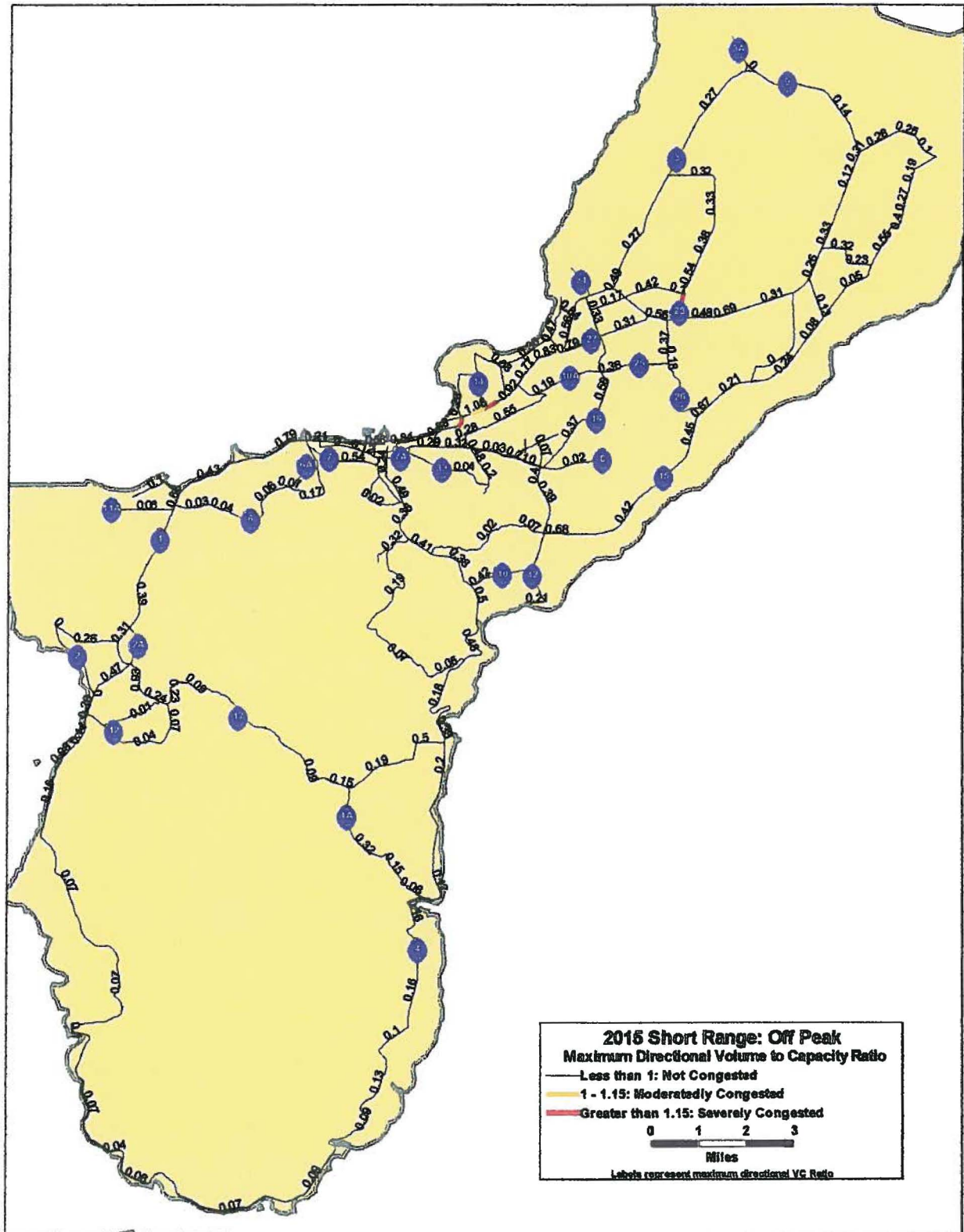


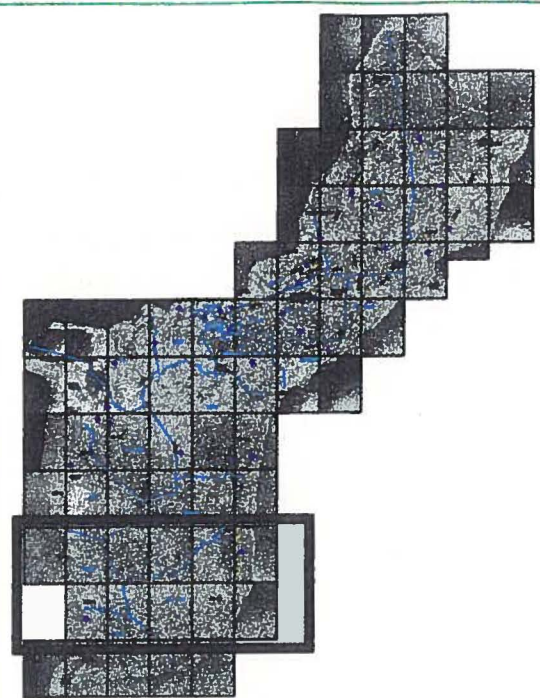
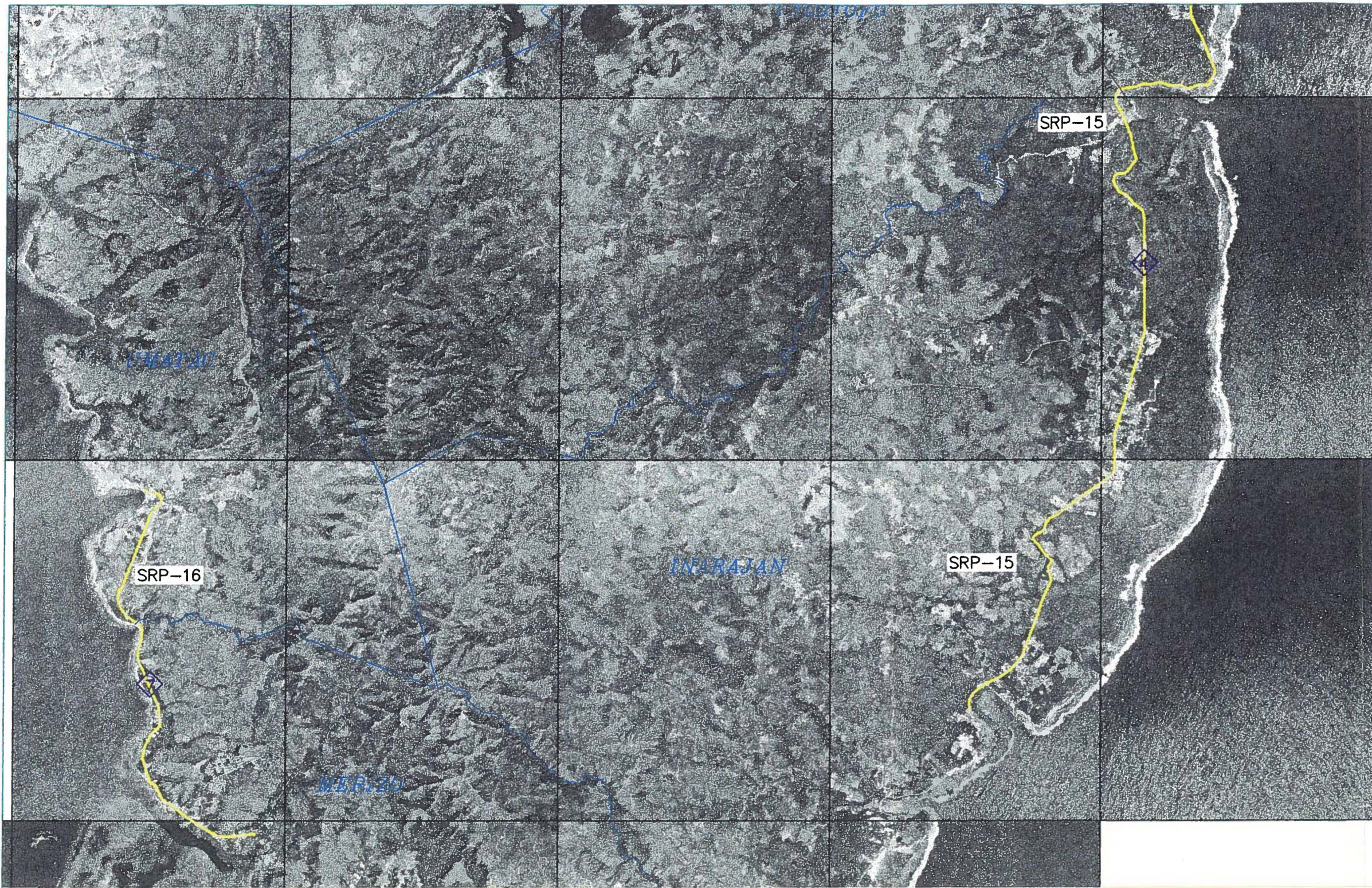
Exhibit 5.5
Projected 2015 Off-Peak Period Congested Locations with the SRP Network



4.0 Recommended Short Range Program Project Funding Requirements

The recommended 2020 Highway Master Plan Short Range Program consists of 17 highway reconstruction and widening projects totaling about 38.76 miles, and 1 new route, namely SRP-4, the Jalaguac Road Connector (1.10 miles in length). Exhibit 5.1c summarizes the conceptual costs estimates for the short range program projects, including construction, engineering and contingency and right of way acquisition costs. The estimated cost for the short range highway improvement program is **\$165.91 million**.

The segments of Route 4 beginning at Ylig Bridge and continuing to Inarajan Village are designated as the Municipal Solid Waste Landfill Facility access route and are noted as "MSWLF Access" in the Exhibits. The reconstruction and widening of these segments of Route 4 will cost about \$36.0 and must be programmed for implementation within the next 3 years to coincide with the opening of the new solid waste landfill facility at Dandan in late 2007.



LEGEND

SRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



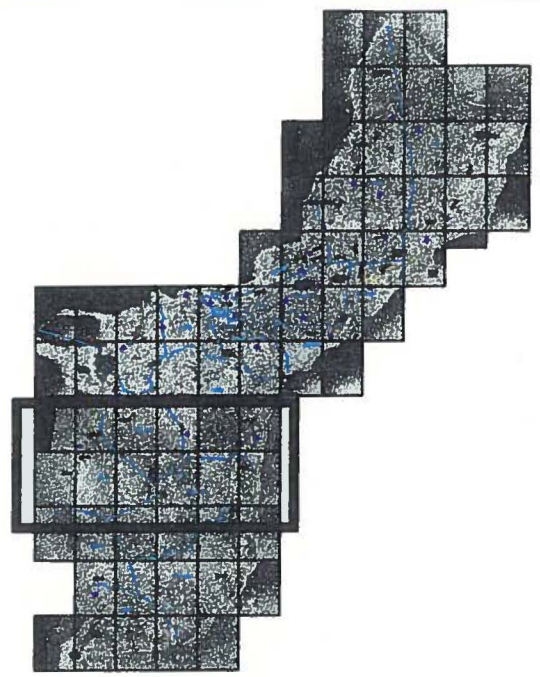
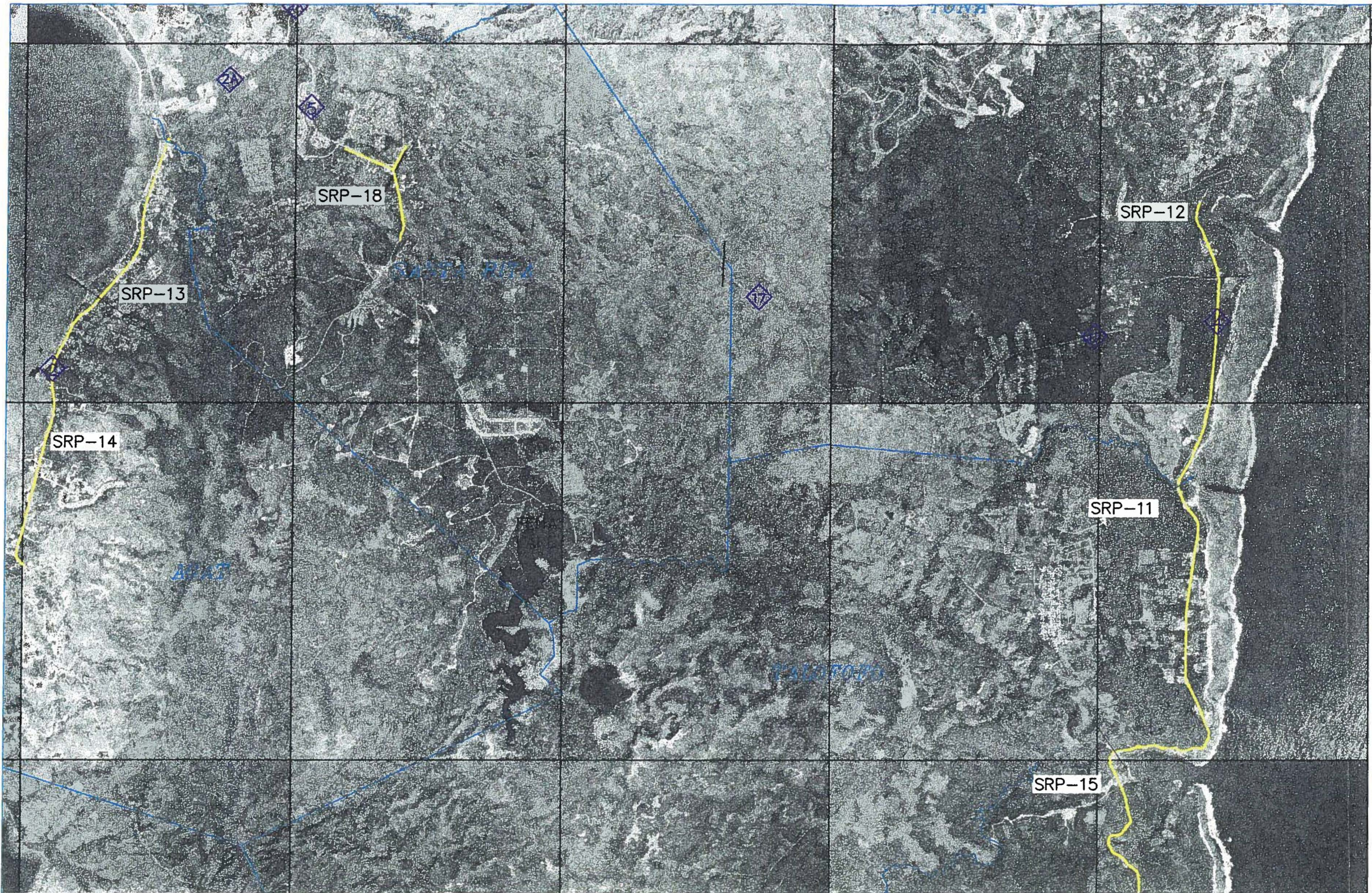
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GRAPHIC SCALE

4000 2000 0' 4000 8000

SCALE: 1 INCH = 4000 FEET

GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 5.1a
SHORT RANGE
HIGHWAY IMPROVEMENT PROGRAM



LEGEND

SRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT

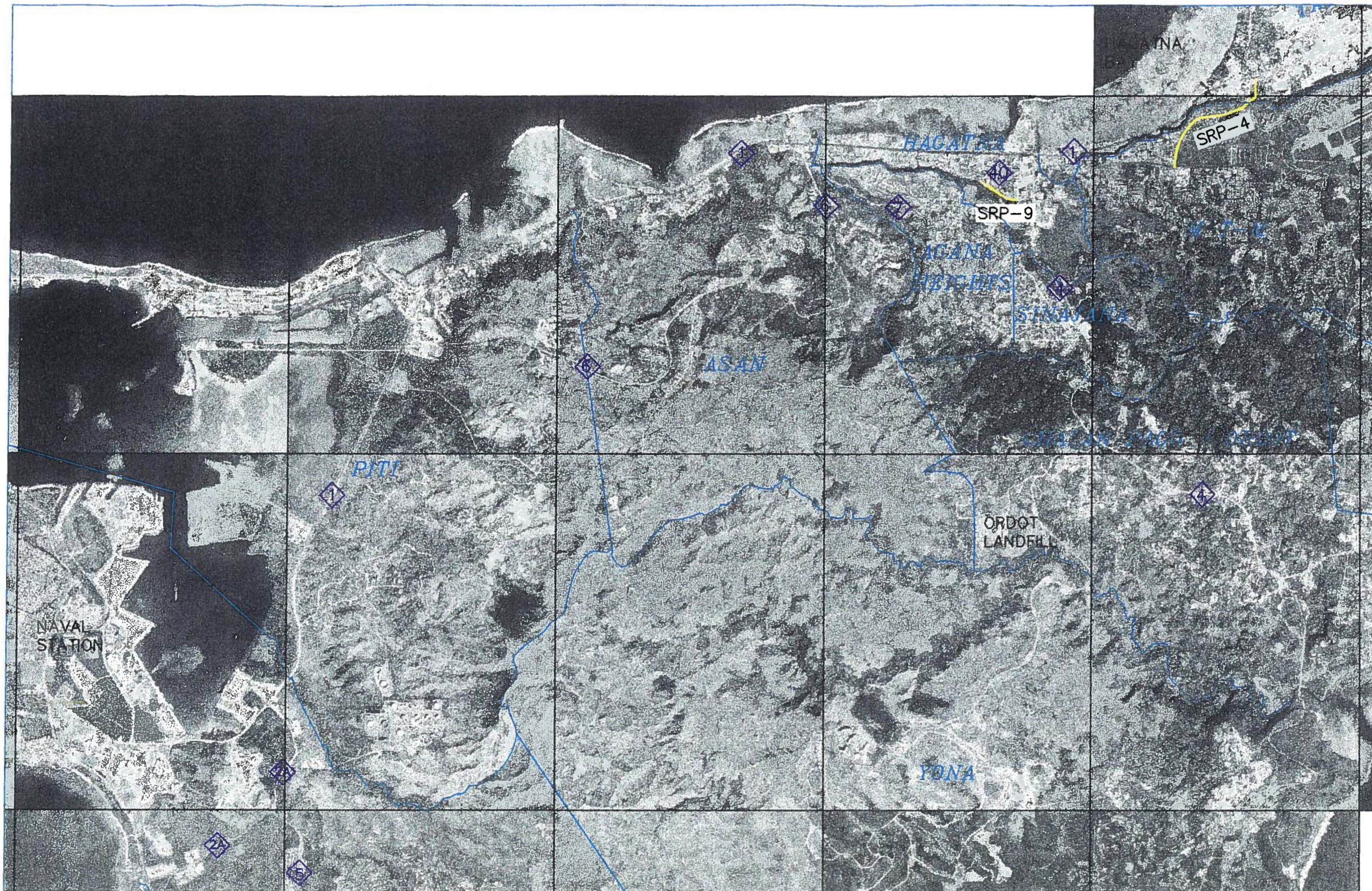


1963 GRID
GRAPHIC SCALE



GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 5.1a
SHORT RANGE
HIGHWAY IMPROVEMENT PROGRAM



LEGEND

SRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



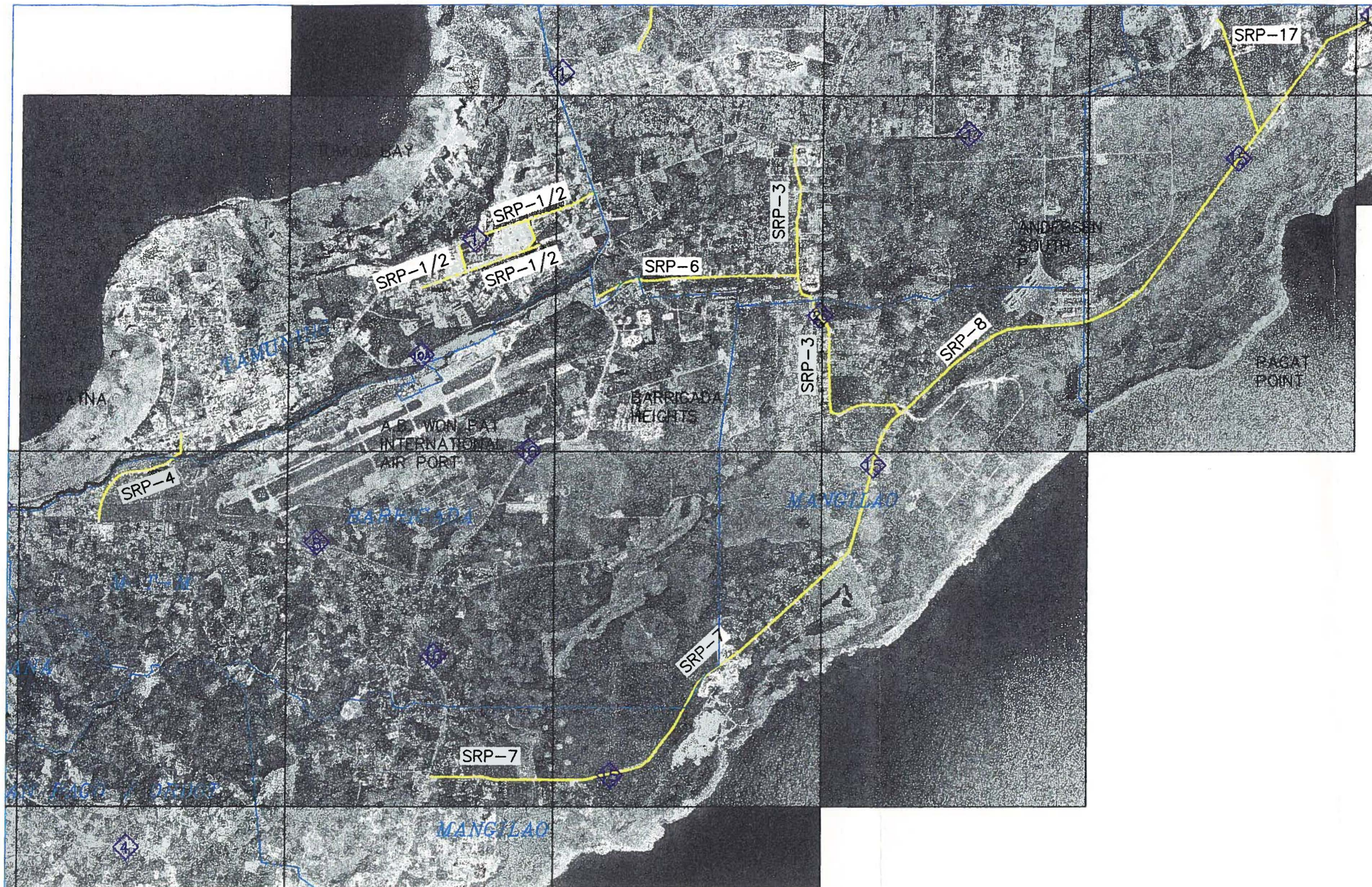
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4000 2000 0' 4000 8000

SCALE: 1 INCH = 4000 FEET

GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 5.1a
SHORT RANGE
HIGHWAY IMPROVEMENT PROGRAM



LEGEND

SRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



1963 GRID
GRAPHIC SCALE

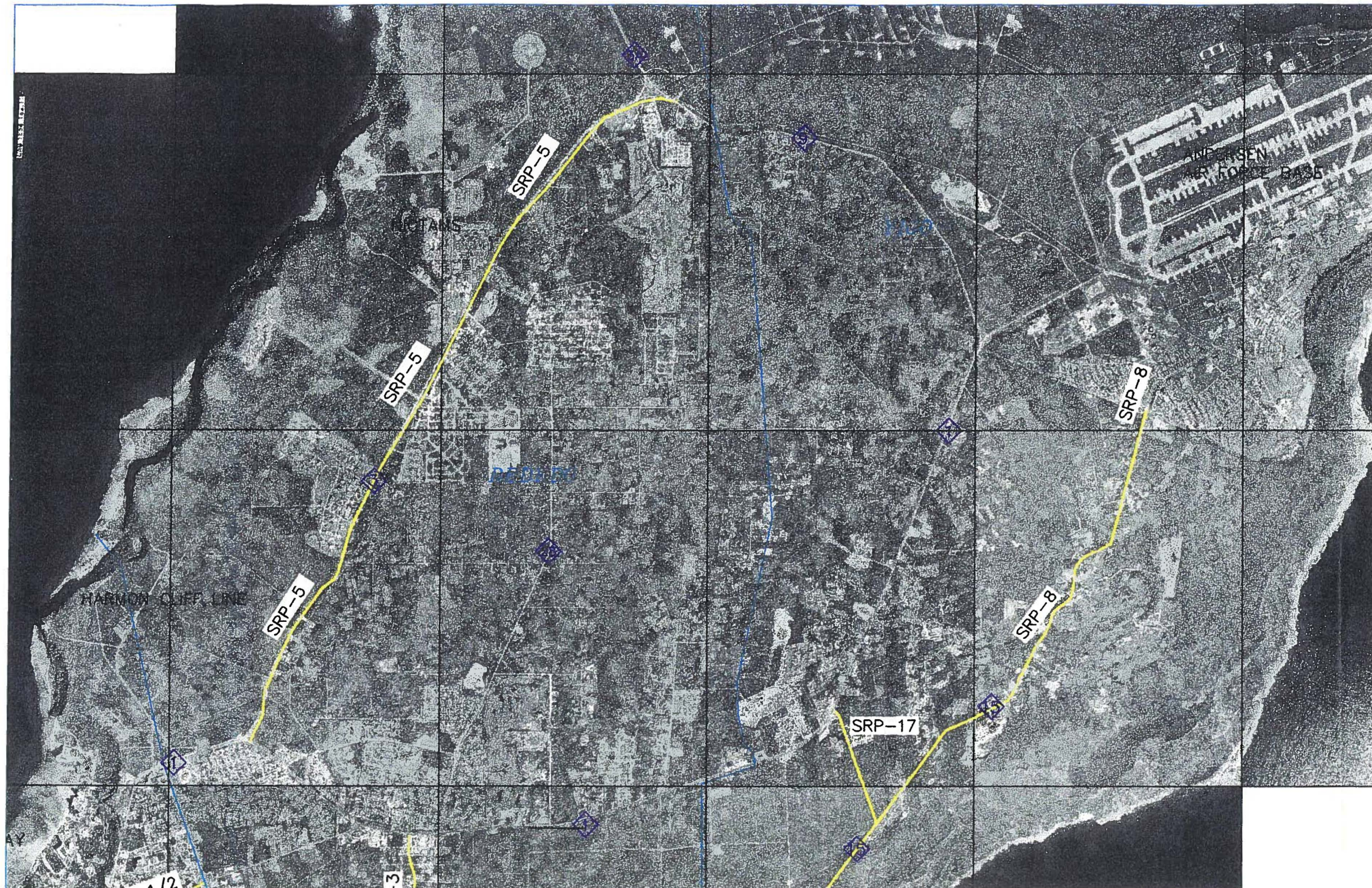
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GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 5.1a SHORT RANGE

HIGHWAY IMPROVEMENT PROGRAM



LEGEND

SRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



1963 GRID
GRAPHIC SCALE

4000 2000 0' 4000 8000



SCALE: 1 INCH = 4000 FEET

GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 5.1a
SHORT RANGE
HIGHWAY IMPROVEMENT PROGRAM

Chapter 6

LONG RANGE PROGRAM RECOMMENDATIONS

1.0 Formulation of Long Range Program Highway Improvement Projects

Long-Range Program (LRP) highway improvement projects go beyond those projects identified in the Short Range Program to further improve highway capacity by the widening of existing roads and increasing route choices by the addition of connectors along new alignments. A large number of potential LRP projects were considered, such projects being derived primarily from the 2010 Highway Master Plan list of Long-Range Program projects. Two LRP concepts are defined as follows:

- Long-Range Highway Improvement Projects – Concept A: *Minimal highway improvement program required to satisfy updated 2020 Highway Master Plan goals and objectives; and*
- Long-Range Highway Improvement Projects – Concept B: *Minimal highway improvement program required to satisfy updated 2020 Highway Master Plan goals and objectives, plus highway projects which establish a Defense Access Highway System linking Guam's two major Department of Defense base facilities: Andersen Air Force Base and Naval Station.*

The Short-Range Program (SRP) network was edited to incorporate highway improvements to the proposed Long-Range Program to create the LRP Concept A and LRP Concept B networks. These networks, therefore, include all STIP and Short-Range Program projects, as well as the appropriate LRP projects. This chapter identifies and describes recommended long-range program projects as well as documents the impact of future year travel demand on the recommended LRP networks.

2.0 Long-Range Highway Improvement Projects – Concept A

Although it includes 16 projects, the Long-Range Program Concept A may be considered as reflecting a minimalist approach to improving Guam's highway network. Those projects resulting in changes to roadway capacity through construction of new or improved infrastructure are reflected in the LRP Concept A network model.

Recommended LRP Concept A projects are identified and described below, and graphically depicted in Exhibit 6.1a placed at the rear of this Chapter. Exhibit 6.1b lists the recommended LRP Concept A projects along with "order of magnitude" construction cost estimates which include a factor of 15% for engineering design costs and contingencies. Exhibit 6.1c lists the breakdown of order of magnitude implementation costs for the recommended Concept A projects, including costs for acquisition of new and/or additional rights of way.

LRP Concept A Projects:

Project LRP-A1: Marine Drive, Marbo to Yigo Area. Widen Marine Drive, from Y-Sengsong Road in Dededo to Chalan Lujuna in Yigo to a 6-lane dual configuration.

Project LRP-A2: Ukudu Connector. Construct connector between Route 3 and Marine Drive, with an alignment along Binadu St., Rydilla St. and Batulo Street using a 2-lane dual configuration.

Project LRP-A3: Mogfog Connector. Construct connector between Route 15 and Marine Drive, with an alignment near west of Marbo Annex to an intersection coinciding with Batulo Road/**Ukudu Connector** using a 4-lane dual configuration, with signals at the Routes 1 & 15 intersections.

Project LRP-A4: Macheche Connector. Construct connector between Alageta St. and Mogfog Connector with an alignment along Nandez St using a 4-lane dual configuration, with traffic signals at the Alageta Street and Mogfog Connector intersections.

Project LRP-A5: Adacao Connector. Construct connector between Route 16 and Route 15 with an alignment near the north boundary of NAVCAMS/Radio Barrigada and along a portion of Carnation Avenue using a 2-lane dual configuration, with signals at the Routes 1 & 15 intersections.

Project LRP-A6: Route 15 - Adacao Area. Widen Route 15, Mogfog Connector to Adacao Connector using a 4-lane, dual configuration, with a signal at its intersection with the Mogfog Connector.

Project LRP-A7: Airport Access Road. Widen Route 10 A (Airport Access Road), from Route 1 (Marine Drive) to Route 10A Bypass.

Project LRP-A8.1: Laderan Tiyan Parkway, Tiyan Corridor. Construct bypass to Route 1, between Rte 8 and Airport Access Rd., using an alignment along upper Tiyan cliff line using a 5-lane configuration.

Project LRP-A8.2: Laderan Tiyan Parkway, Route 10A Bypass. Construct bypass to Route 10A (Airport Access Rd) using an alignment parallel to Route 10A as a continuation of the Laderan Tiyan Parkway from its intersection with Route 10A to Route 16. Bypass alignment and capacity is expected to be a 4-lane dual configuration.

(Note applicable to Projects LRP-A8.1 and LRP-A8.2: At the time of the preparation of this draft report, the Government of Guam had just enacted into law the return of properties in and around the Laderan Tiyan Parkway right of way corridor to original landowners, i.e., persons who owned Tiyan properties prior to acquisition of such properties by the federal government following World War II. The Laderan Tiyan Parkway 120-foot wide right of way corridor had been conveyed to the Department of Public Works by the Federal Highway Administration through the approval of a public conveyance application initiated by DPW after having justified the use of the proposed corridor as a future critical component of the islandwide highway system. While this law does not eliminate the use of the corridor as a future part of the highway system, it does place the difficult and formidable cost and procedural burden of re-acquisition of the corridor on the Government.)

Project LRP-A9: Route 16, Barrigada. Widen Route 16 from Route 10 to the Adacao Connector just south of Barrigada Heights to a 6-lane dual configuration.

Project LRP-A10: Route 8, Barrigada. Widen Route 8, from the Laderan Tiyan Parkway/Jalaguac Connector to Route 10 using a 6-lane configuration, with traffic signals at the Laderan Tiyan and Route 10 intersections.

Project LRP-A11: Route 7 Extension, Agana and Mongmong-Toto-Maite. Construct extension of Route 7 across Agana Swamp using a 2-lane configuration, from Route 4 to Route 8 along Biang Street using a 2-lane configuration with traffic signals at the Route 4 and Route 8 intersections.

Project LRP-A12: Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7. Reconstruct Spruance Drive/Halsey Road, Route 1 to Route 7 using 4-lane dual configuration, with a traffic signal at the Route 7 intersection.

Project LRP-A13: Route 10 - Mangilao to Barrigada. Widen Route 10, through the developed urban areas using a 7-lane configuration complete with curb & gutter and sidewalk improvements, specifically University Drive to Corten Torres Road and portions of Route 10 through Barrigada Village.

Project LRP-A14: Route 15 - Mangilao Area. Widen Route 15, Route 10 to Fadian Point Road using an urban street section, i.e., a 5-lane configuration complete with curb, gutter and sidewalk improvements.

Project LRP-A15: Route 5 - Apra Heights to Camp Covington. Widen Route 5, Cross-Island Road to Route 2A using a 5-lane configuration, with a modification of affected traffic signal systems.

Project LRP-A16: Route 1, Marine Drive, Piti Area. Widen Route 1, Marine Drive, Spruance Drive (Route 6) in Piti to Route 2A, Santa Rita, using 6-lane dual configuration. Modification of the existing signal systems will be required.

2.1 Performance of the LRP Network - Concept A

Exhibit 6.2 shows measures of effectiveness for the LRP Concept A network under 2015 and 2020 travel demands. For comparison purposes, similar measures for the SRP network for 2015 are also shown.

Based on projected traffic volumes, locations where moderate or severe congestion is projected to occur on the LRP Concept A network during 2020 are shown in Exhibits 6.3, 6.4 and 6.5 for A.M. Peak Hour, P.M. Peak Hour and Off-Peak periods, respectively. Comparable maps showing projected congested locations with LRP Concept A in 2020 are provided in Exhibits 6.6, 6.7 and 6.8.

Exhibit 6.1b
LONG RANGE PROGRAM "CONCEPT A" HIGHWAY IMPROVEMENT PROJECTS

Project No.	Reference Name & Description	Municipality	Type of Proposed Improvements	Estimated Order of Magnitude Cost
LRP-A1	Marine Drive, Marbo to Yigo Area	Dededo; Yigo	Widen Marine Drive, Y-Sengsong Road to Chalan Lujuna to a 6-lane dual configuration.	\$14,999,450
LRP-A2	Ukudu Connector	Dededo	Construct connector between Rte 3 and Marine Dr. with an alignment along Binadu St., Rydilla St. and Batulo Sreet using a 2-lane dual configuration.	\$12,160,100
LRP-A3	Mogfog Connector	Mangilao; Dededo	Construct connector between Rt. 15 and Marine Dr. with an alignment near the west boundary of Marbo Annex to an intersection coinciding with Wusstig Road using a 4-lane dual configuration, with signals at the Routes 1 & 15 intersections.	\$13,764,350
LRP-A4	Macheche Connector	Dededo	Construct connector between Alageta St. and Mogfog Connector with an alignment along Nandez St using a 4-lane dual configuration.	\$7,878,650
LRP-A5	Adacao Connector	Barrigada; Mangilao	Construct connector between Route 16 and Route 15 with an alignment near the north boundary of NAVCAMS/Rado Barrigada and along a portion of Camation Avenue using a 2-lane dual configuration, with signals at the Routes 1 & 15 intersections.	\$9,549,600
LRP-A6	Route 15 - Adacao Area	Mangilao	Widen Route 15, Mogfog Connector to Adacao Connector using a 4-lane, dual configuration, with a signat at the Mogfog Connector.	\$2,018,250
LRP-A7	Airport Access Road	Tamuning; Barrigada	Widen Route 10 A (Airport Access Road), from Route 1 (Marine Dr.) to Route 10A Bypass.	\$2,086,100
LRP-A8.1	Laderan Tiyan Parkway, Tiyan Corridor	MTM; Tamuning	Construct bypass to Route 1, between Rte 8 and Airport Access Rd., using an alignment along upper Tiyan cliff line using a 5-lane configuration.	\$5,134,750
LRP-A8.2	Laderan Tiyan Parkway, Route 10A Bypass	MTM; Tamuning	Construct bypass to Route 10A (Airport Access Rd) using an alignment parallel to Route 10A as a continuation of the Laderan Tiyan Parkway from its intersection with Route 10A to Route 16. Bypass alignment and capacity is expected to be a 4-lane dual configuration.	\$10,706,500

Exhibit 6.1b
LONG RANGE PROGRAM "CONCEPT A" HIGHWAY IMPROVEMENT PROJECTS

Project No.	Reference Name & Description	Municipality	Type of Proposed Improvements	Estimated Order of Magnitude Cost
LRP-A9	Route 16, Barrigada	Barrigada	Widen Route 16 from Route 10 to the Adacao Connector to a 6-lane dual configuration.	\$8,416,850
LRP-A10	Route 8, Barrigada	Barrigada	Widen Route 8, from the Laderan Tiyan Parkway to Route 10 using a 6-lane configuration, with a signal at the Laderan Tiyan and Route 10 Intersections.	\$11,385,000
LRP-A11	Route 7 Extension	Agana; MTM	Construct extension of Route 7, from Route 4 to Ordot-Mongmong Connector across Agana Swamp using a 2-lane configuration.	\$3,864,000
LRP-A12	Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7	Asan	Reconstruct Spruance Drive/Halsey Road, Route 1 to Route 7 using 4-lane dual configuration.	\$2,639,250
LRP-A13	Route 10 - Mangilao to Barrigada	Mangilao; Barrigada	Widen Route 10, through developed urban areas using a 7-lane configuration complete with curb & gutter and sidewalk improvements. (University Drive to Corten Torres Road and portions of Route 10 through Barrigada.)	\$6,054,750
LRP-A14	Route 15 - Mangilao Area	Mangilao	Widen Route 15, Route 10 to Fadian Point Road using a 5-lane configuration complete with curb, gutter and sidewalk improvements.	\$3,064,750
LRP-A15	Route 5 - Apra Heights to Camp Covington	Santa Rita	Widen Route 5, Cross-Island Road to Route 2A using a 5-lane configuration.	\$6,296,250
LRP-A17	Marine Drive, Piti Area	Piti; Santa Rita	Widen Marine Drive, Spruance Drive to Route 2A using 6-lane dual configuration..	\$11,586,250

TOTAL ORDER OF MAGNITUDE COST OF LONG RANGE PROGRAM CONCEPT "A"

\$131,604,850

1. All estimates include a factor of 15% for engineering design costs and contingencies
2. Projects that are related to improving direct primary route access to the Municipal Solid Waste Landfill at Dandan are annotated with "MSWLF Access Route."
3. Costs associated with ROW acquisition are not included
4. Projects which may qualify for Defense Access Highway Funds are annotated with "DAHF."

EXHIBIT 6.1c
SUMMARY OF COST ESTIMATES - LONG RANGE PROGRAM "CONCEPT A" PROJECTS

Project No.	Reference Name & Description	Length (Miles)	Conceptual Cost Estimate (million \$)			
			Construction Cost (million \$)	Engineering & Contingencies	R.O.W. Cost	Total Cost
LRP-A1	Marine Drive, Marbo to Yigo Area	2.6	\$ 13.04	\$ 1.96	See Note 2	\$ 15.00
LRP-A2	Ukudu Connector	3.2	\$ 10.57	\$ 1.59	See Note 2	\$ 12.16
LRP-A3	Mogfog Connector	1.6	\$ 11.97	\$ 1.80	See Note 2	\$ 13.76
LRP-A4	Macheche Connector	1.9	\$ 6.85	\$ 1.03	\$ 1.34	\$ 9.22
LRP-A5	Adacao Connector	2.5	\$ 8.30	\$ 1.25	See Note 2	\$ 9.55
LRP-A6	Route 15 - Adacao Area	0.5	\$ 1.76	\$ 0.26	See Note 1	\$ 2.02
LRP-A7	Airport Access Road	1.9	\$ 1.81	\$ 0.27	See Note 2	\$ 2.09
LRP-A8.1	Laderan Tiyan Parkway, Tiyan Corridor	2.81	\$ 4.47	\$ 0.67	See Note 3	\$ 5.13
LRP-A8.2	Laderan Tiyan Parkway, Route 10A Bypass	1.43	\$ 9.31	\$ 1.40	See Note 3	\$ 10.71
LRP-A9	Route 16, Barrigada	1.6	\$ 7.32	\$ 1.10	See Note 1	\$ 8.42
LRP-A10	Route 8, Barrigada	2.16	\$ 9.90	\$ 1.49	See Note 1	\$ 11.39
LRP-A11	Route 7 Extension	1.0	\$ 3.36	\$ 0.50	\$ 1.23	\$ 5.09
LRP-A12	Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7	0.2	\$ 2.30	\$ 0.34	See Note 1	\$ 2.64
LRP-A13	Route 10 - Mangilao to Barrigada	2.2	\$ 5.27	\$ 0.79	See Note 1	\$ 6.05
LRP-A14	Route 15 - Mangilao Area	0.8	\$ 2.67	\$ 0.40	See Note 1	\$ 3.06
LRP-A15	Route 5 - Apra Heights to Camp Covington	1.3	\$ 5.48	\$ 0.82	See Note 1	\$ 6.30
LRP-A16	Marine Drive, Piti Area	2.8	\$ 10.08	\$ 1.51	See Note 1	\$ 11.59
Totals		30.5	\$ 114.44	\$ 17.17	\$ 2.56	\$ 134.17

Notes:

- 1 No additional right-of-way required.
- 2 Land/additional right-of way required is in government ownership.
- 3 Right-of-way previously under government ownership has been returned to original land owners. Reversionary clause in conveyance to the Government of Guam by FHWA may void the return of the right of way to original land owners.
- 4 Projects which may qualify for Defense Access Highway Funds are annotated with "DAHf."

Exhibit 6.2
Performance of the LRP Concept A Network

Measure of Effectiveness		2015 SRP Network	2015 LRP A Network	Percent Change	2020 LRP A Network
A.M. Peak Hour					
	Vehicle-Miles	216,473	217,063	0.3%	241,185
	Vehicle-Hours	6,936	6,760	-2.5%	7,669
	Delay (hours)	451	337	-25.3%	514
	Speed (mph)	31.2	32.1	2.9%	31.4
P.M. Peak Hour					
	Vehicle-Miles	227,279	228,270	0.4%	253,626
	Vehicle-Hours	7,245	7,081	-2.3%	8,017
	Delay (hours)	420	305	-27.4%	478
	Speed (mph)	31.4	32.2	2.8%	31.6
Off-Peak Hour					
	Vehicle-Miles	143,107	144,208	0.8%	159,487
	Vehicle-Hours	4,370	4,321	-1.1%	4,801
	Delay (hours)	71	43	-40.2%	68
	Speed (mph)	32.7	33.4	1.9%	33.2
Daily Totals (1)					
	Vehicle-Miles	2,604,793	2,621,158	0.6%	2,903,464
	Vehicle-Hours	80,803	79,529	-1.6%	88,980
	Delay (hours)	2,598	1,796	-30.9%	2,794
	Speed (mph)	32.2	33.0	2.2%	32.6

Note: (1) Daily values calculated as:

2 A.M. Peak Hour + 2 P.M. Peak Hour + 12 Off-Peak Hour

Exhibit 6.3
Projected 2015 A.M. Peak Hour Congested Locations
with the LRP Concept A Network

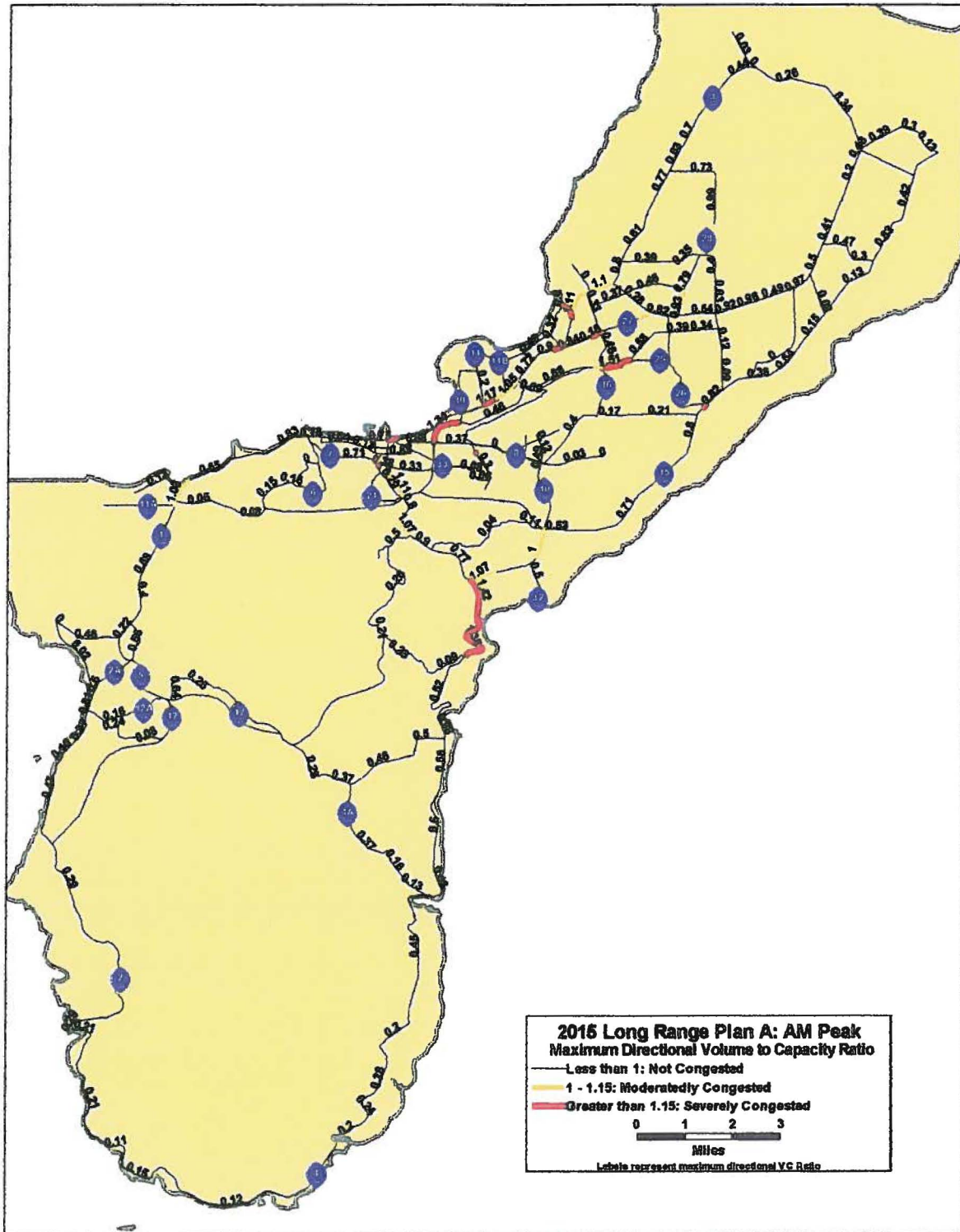


Exhibit 6.4
Projected 2015 P.M. Peak Hour Congested Locations
with the LRP Concept A Network

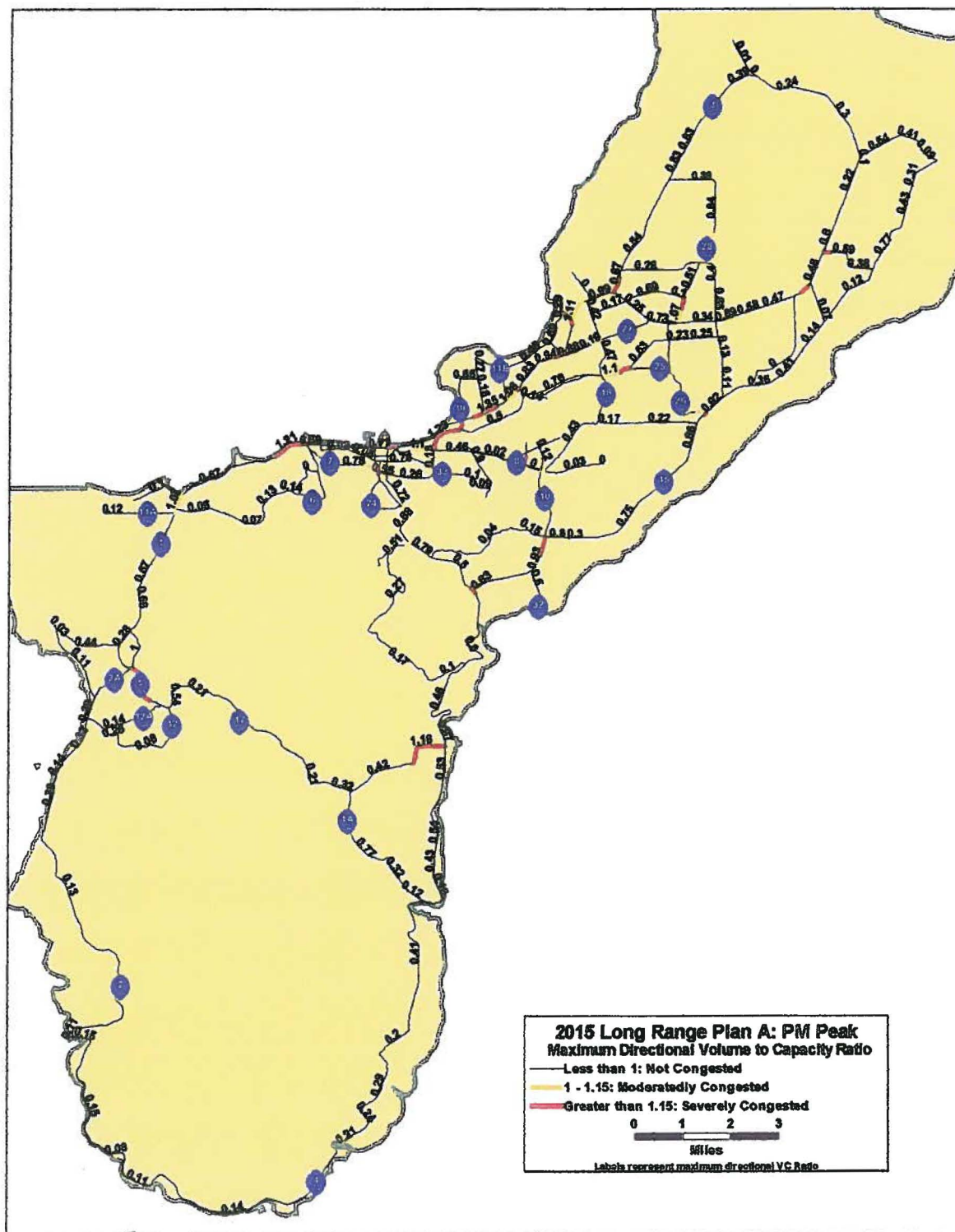


Exhibit 6.5
Projected 2015 Off-Peak Period Congested Locations
with the LRP Concept A Network

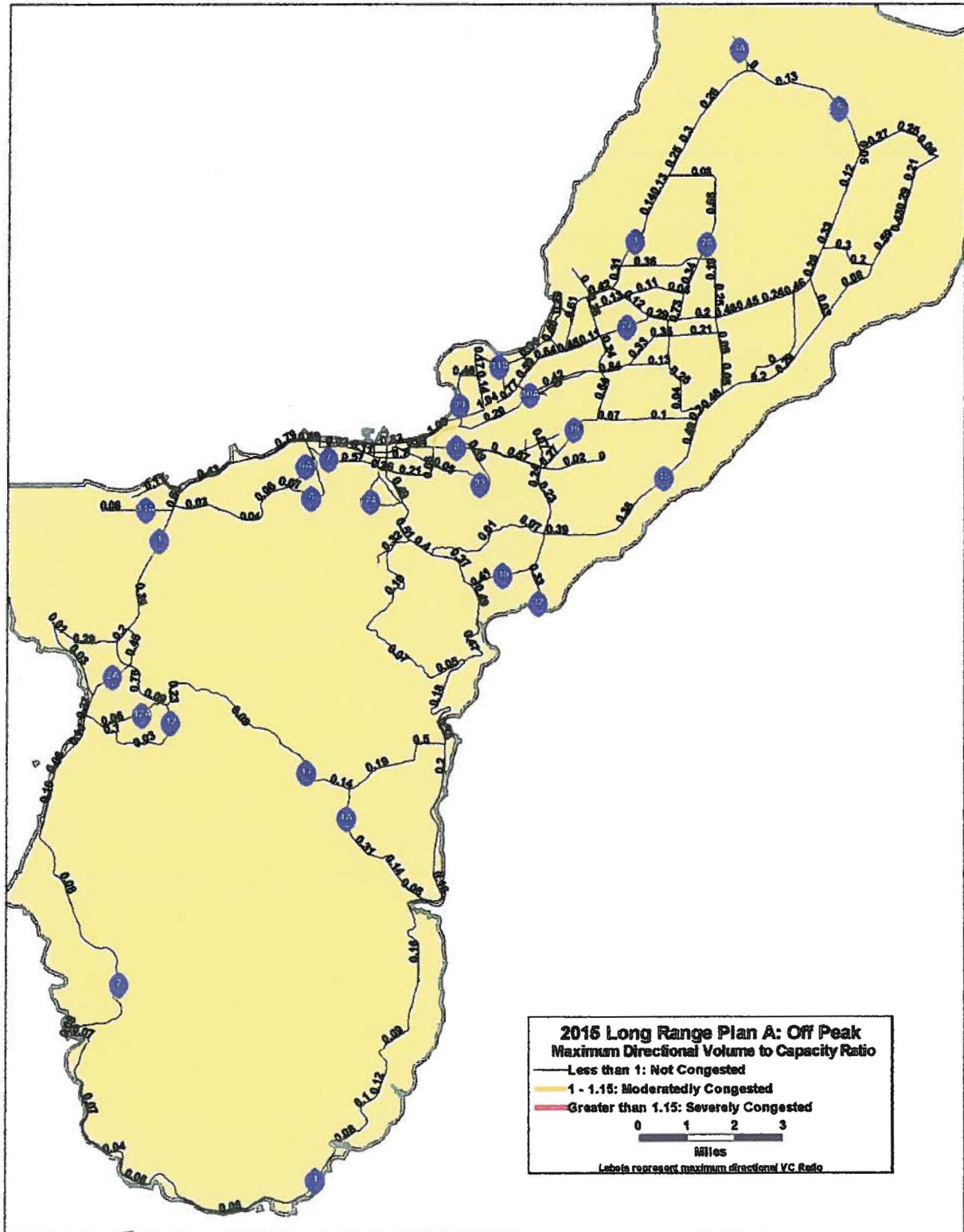


Exhibit 6.6
Projected 2020 A.M. Peak Hour Congested Locations
with the LRP Concept A Network

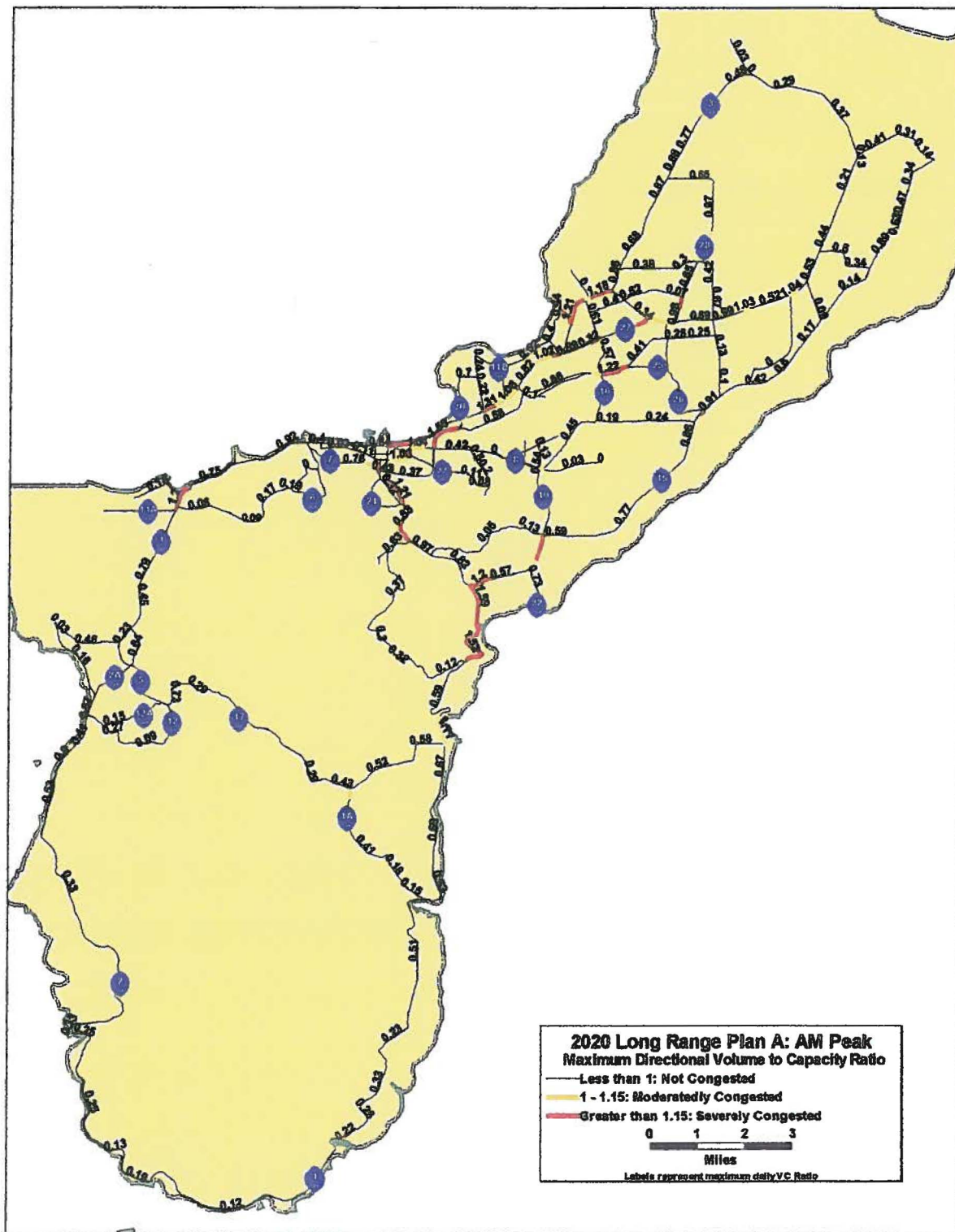


Exhibit 6.7
Projected 2020 P.M. Peak Hour Congested Locations
with the LRP Concept A Network

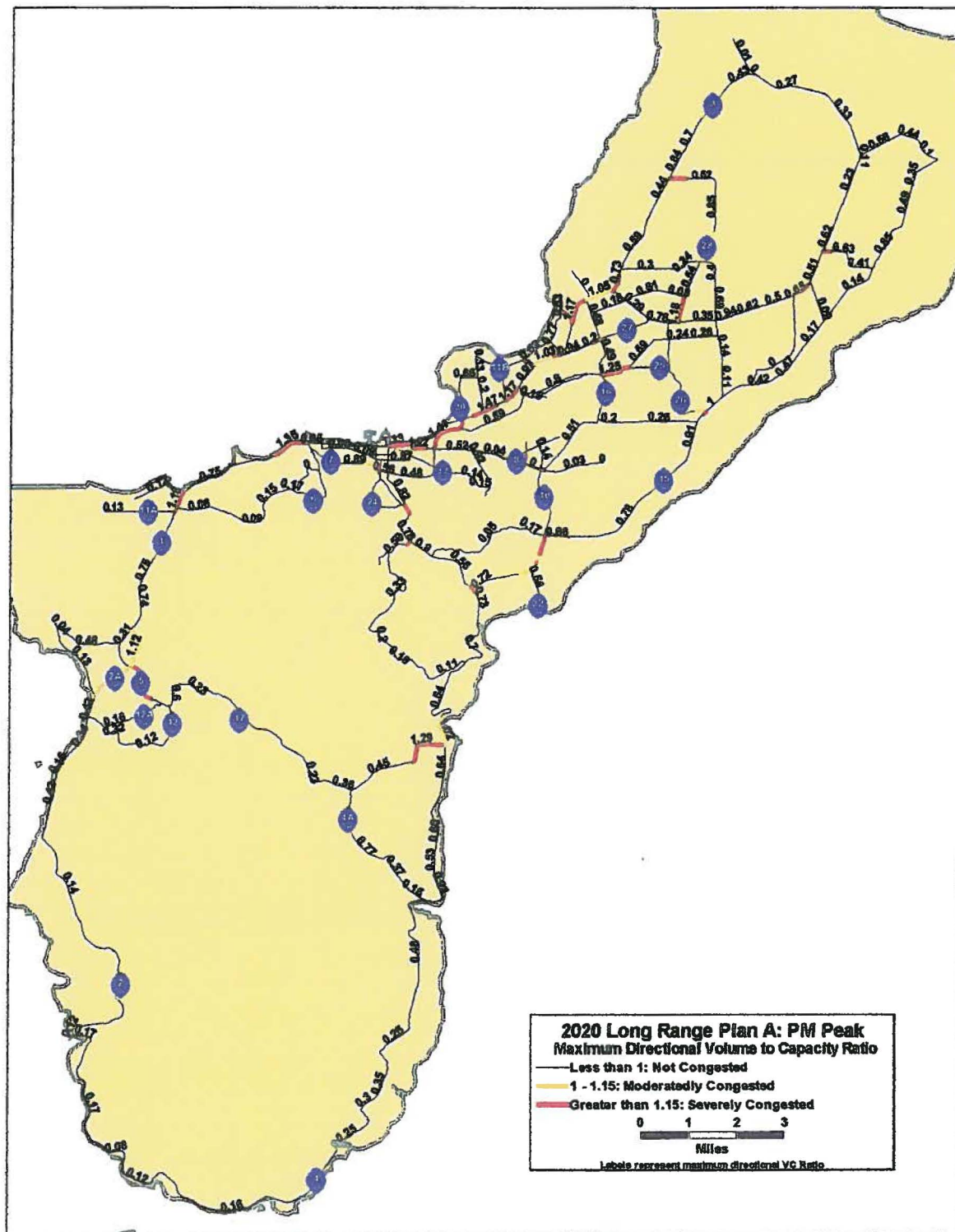
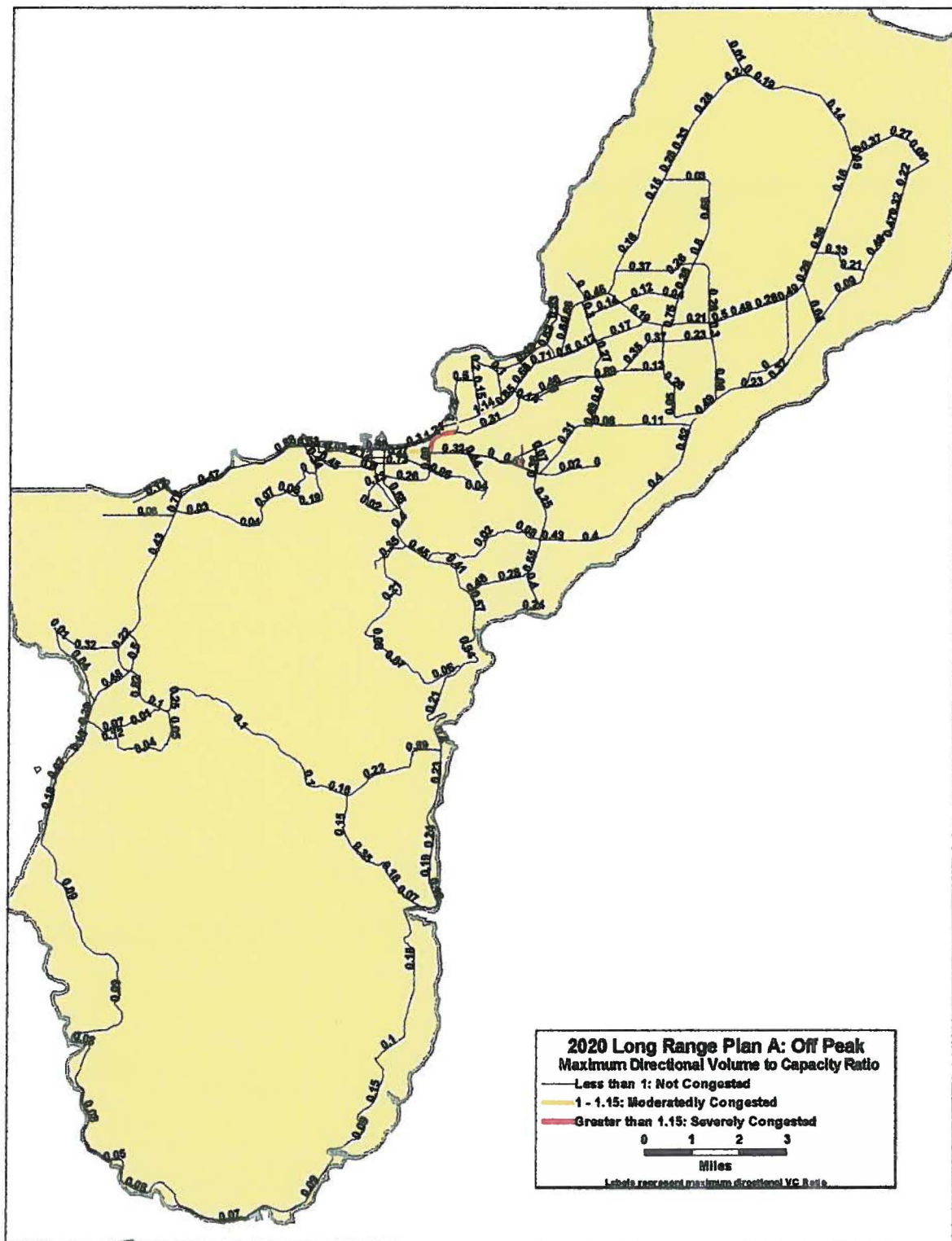


Exhibit 6.8
Projected 2020 Off-Peak Period Congested Locations
with the LRP Concept A Network



3.0 Long-Range Highway Improvement Projects – Concept B

The projects in the Long-Range Program Concept B include all those in Concept A, plus seven additional projects. Concept B more or less includes all projects considered in the Long-Range Plan developed in the previous 2010 Highway Master Plan Study. It also includes projects that would contribute to the establishment of a Defense Access Highway linking Guam's two major Department of Defense base facilities at Andersen Air Force Base and the Naval Base. A Defense Access Highway would provide an alternative to Route 1 for travel between these bases.

Those projects resulting in changes to roadway capacity through construction of new or improved infrastructure were reflected in the LRP Concept B network model. Recommended LRP Concept B projects are identified and described below, and graphically depicted in Exhibit 6.9a placed at the rear of this Chapter. Exhibit 6.9b lists the recommended LRP Concept B projects along with "order of magnitude" construction cost estimates which include a factor of 15% for engineering design costs and contingencies. Exhibit 6.9c lists the breakdown of order of magnitude implementation costs for the recommended Concept B projects, including costs for acquisition of new and/or additional rights of way.

LRP Concept B Projects:

Project LRP-B1: Upi Connector. Construct connector between Route 1, Marine Drive and Route 15 in a 2-lane configuration with an alignment adjacent to AAFB Boundary using a two (2) lane, dual configuration and traffic signals at the affected intersections as warranted.

Project LRP-B2: Marine Drive, Marbo to Yigo Area. Widen Marine Drive, from Y-Sengsong Road in Dededo to Chalan Lujuna in Yigo to a 6-lane dual configuration.

Project LRP-B3: Ukudu Connector. Construct connector between Route 3 and Marine Drive, with an alignment along Binadu St., Rydilla St. and Batulo Street using a 2-lane dual configuration.

Project LRP-B4: Mogfog Connector. Construct connector between Route 15 and Marine Drive, with an alignment west of Marbo Annex to an intersection coinciding with Batulo Road/**Ukudu Connector** using a 4-lane dual configuration, with signals at the Routes 1 & 15 intersections.

Project LRP-B5: Macheche Connector. Construct connector between Alageta St. and Mogfog Connector with an alignment along Nandez St using a 4-lane dual configuration, with traffic signals at the Alageta Street and Mogfog Connector intersections.

Project LRP-B6: Adacao Connector. Construct connector between Route 16 and Route 15 with an alignment near the north boundary of NAVCAMS/Radio Barrigada and along a portion of Carnation Avenue using a 2-lane dual configuration, with signals at the Routes 1 & 15 intersections.

Project LRP-B7: Route 15 - Adacao Area. Widen Route 15, Mogfog Connector to Adacao Connector using a 4-lane, dual configuration, with a signal at its intersection with the Mogfog Connector. *This is a segment which may qualify for Defense Highway Funding.*

Project LRP-B8: Airport Access Road. Widen Route 10 A (Airport Access Road), from Route 1 (Marine Drive) to Route 10A Bypass.

Project LRP-B9.1: Laderan Tiyan Parkway, Tiyan Corridor. Construct bypass to Route 1, between Rte 8 and Airport Access Rd., using an alignment along upper Tiyan cliff line using a 5-lane configuration.

Project LRP-B9.2: Laderan Tiyan Parkway, Route 10A Bypass. Construct bypass to Route 10A (Airport Access Rd) using an alignment parallel to Route 10A as a continuation of the Laderan Tiyan Parkway from its intersection with Route 10A to Route 16. Bypass alignment and capacity is expected to be a 4-lane dual configuration.

(Note applicable to Projects LRP-A8.1 and LRP-A8.2: At the time of the preparation of this draft report, the Government of Guam had just enacted into law the return of properties in and around the Laderan Tiyan Parkway right of way corridor to original landowners, i.e., persons who owned Tiyan properties prior to acquisition of such properties by the federal government following World War II. The Laderan Tiyan Parkway 120-foot wide right of way corridor had been conveyed to the Department of Public Works by the Federal Highway Administration through the approval of a public conveyance application initiated by DPW after having justified the use of the proposed corridor as a future critical component of the islandwide highway system. While this law does not eliminate the use of the corridor as a future part of the highway system, it does place the difficult and formidable cost and procedural burden of re-acquisition of the corridor on the Government.)

Project LRP-B10: Marine Drive (Route 1) Lower Tiyan Cliffline Bypass/Service Road. Construct bypass to Route 1, from the Jalaguac Connector (a 2020 GHMP short range project) to Route 10A along lower Tiyan cliff line using a 2-lane dual configuration.

Project LRP-B11: Route 16, Barrigada. Widen Route 16 from Route 10 to the Adacao Connector just south of Barrigada Heights to a 6-lane dual configuration.

Project LRP-B12: Route 8, Barrigada. Widen Route 8, from the Laderan Tiyan Parkway to Route 10 using a 6-lane configuration, with traffic signals at the Laderan Tiyan and Route 10 intersections.

Project LRP-B13: Route 7 Extension, Agana and Mongmong-Toto-Maite. Construct extension of Route 7, from Route 4 to intersect with the Ordot-Mongmong Connector across Agana Swamp using a 2-lane configuration, with traffic signals at the Route 4 and O-M Connector intersections.

Project LRP-B14: Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7. Reconstruct Spruance Drive/Halsey Road, Route 1 to Route 7 using 4-lane dual configuration, with a traffic signal at the Route 7 intersection.

Project LRP-B15: Ordot-Mongmong Connector. Construct a connector between Route 4 and Route 8 with an alignment along Chaot River, east of Agana Swamp and along Biang Street using a 2-lane configuration dual configuration from Route 4 to Route 7 Extension and a 6-lane configuration from the terminus of the Route 7 Extension to Route 8. Traffic signals will be provided where warranted.

Project LRP-B16: Conga - Mangilao Connector. Construct a connector between the Ordot-Mongmong Connector and Route 15 with an alignment north of Conga and along portion of Dairy Road using a 2-lane dual configuration with traffic signals where warranted. *This is a segment which may qualify for Defense Highway Funding.*

Project LRP-B17: Route 10 - Mangilao to Barrigada. Widen Route 10, through the developed urban areas using a 7-lane configuration complete with curb & gutter and sidewalk improvements, specifically University Drive to Corten Torres Road and portions of Route 10 through Barrigada Village.

Project LRP-B18: Route 15 - Mangilao Area. Widen Route 15, Route 10 to Fadian Point Road using an urban street section, i.e., a 5-lane configuration complete with curb, gutter and sidewalk improvements. *This is a segment which may qualify for Defense Highway Funding.*

Project LRP-B19: Spruance Drive (Route 6) - Route 4 Connector through Lonfit Region to Link with Ordot-Mongmong Connector. Construct a connector between Route 6 and Route 4 through Larson Road at Turner Road along an alignment parallel and adjacent to the POL road, through the Lonfit and Ordot regions to an intersection with the Ordot-Mongmong connector using a 2-lane dual configuration. Traffic signals will be provided where warranted.

Project LRP-B20: Cotal Connector. Construct a connector between Manengon Hills Access Road and Cross-Island Road (Route 17) with an alignment along the north and west boundaries of Manengon Hills development, thence southwesterly across Ylig River to a connection with Cross-Island Road at the crest of the hill east of Apra Heights using a 2-lane dual configuration. Traffic signals will be provided where warranted. *This is a segment which may qualify for Defense Highway Funding.*

Project LRP-B21: Cross-Island Road (Route 17) Realignment. Realign and reconstruct Cross-Island Road (Route 17) between the Sinifa area and Route 5 at Apra Heights using a 2-lane configuration with climbing lanes where needed. Traffic signals will be provided where warranted.

Project LRP-B22: Route 5 - Apra Heights to Camp Covington. Widen Route 5, Cross-Island Road to Route 2A using a 5-lane configuration, with a modification of affected traffic signal systems.

Project LRP-B23: Route 1, Marine Drive, Piti Area. Widen Route 1, Marine Drive, Spruance Drive (Route 6) in Piti to Route 2A, Santa Rita, using 6-lane dual configuration. Modification of the existing signal systems will be required.

Exhibit 6.9b
LONG RANGE PROGRAM "CONCEPT B" HIGHWAY IMPROVEMENT PROJECTS

Project No.	Reference Name	Municipality	Type of Proposed Improvements	Estimated Order of Magnitude Cost
LRP-B1	Upl Connector	Yigo	Construct connector between Marine Drive and Route 15 in a 2-lane configuration with alignment adjacent to AAFB Boundary using a two (2) lane, dual configuration.	\$ 5,293,450
LRP-B2	Marine Drive, Marbo to Yigo Area	Dededo; Yigo	Widen Marine Drive, Y-Sengsong Road to Chalan Lujuna to a 6-lane dual configuration.	\$ 14,999,450
LRP-B3	Ukudu Connector	Dededo	Construct connector between Rte 3 and Marine Dr. with an alignment along Binadu St., Rydilla St. and Batulo Sreet using a 2-lane dual configuration.	\$ 12,160,100
LRP-B4	Mogfog Connector	Mangilao; Dededo	Construct connector between Rt. 15 and Marine Dr. with an alignment near the west boundary of Marbo Annex to an intersection coinciding with Wusstig Road using a 4-lane dual configuration, with signals at the Routes 1 & 15 intersections.	\$ 13,764,350
LRP-B5	Macheche Connector	Dededo	Construct connector between Alageta St. and Mogfog Connector with an alignment along Nandez St using a 4-lane dual configuration.	\$ 7,878,650
LRP-B6	Adacao Connector	Barrigada; Mangilao	Construct connector between Route 16 and Route 15 with an alignment near the north boundary of NAVCAMS/Rado Barrigada and along a portion of Carnation Avenue using a 2-lane dual configuration, with signals at the Routes 1 & 15 intersections.	\$ 9,549,600
LRP-B7 DAHf	Route 15 - Adacao Area	Mangilao	Widen Route 15, Mogfog Connector to Adacao Connector using a 4-lane, dual configuration, with a signal at the Mogfog Connector.	\$ 2,018,250
LRP-B8	Airport Access Road	Tamuning; Barrigada	Widen Route 10 A (Airport Access Road), from Route 1 (Marine Dr.) to Route 10A Bypass.	\$ 2,086,100
LRP-B9.1	Laderan Tiyan Parkway, Tiyan Corridor	MTM; Tamuning	Construct bypass to Route 1, between Rte 8 and Airport Access Rd., using an alignment along upper Tiyan cliff line using a 5-lane configuration.	\$ 5,134,750
LRP-B9.2	Laderan Tiyan Parkway, Route 10A Bypass	MTM; Tamuning	Construct bypass to Route 10A (Airport Access Rd) using an alignment parallel to Route 10A as a continuation of the Laderan Tiyan Parkway from its intersection with Route 10A to Route 16. Bypass alignment and capacity is expected to be a 4-lane dual configuration.	\$ 10,706,500

Exhibit 6.9b
LONG RANGE PROGRAM "CONCEPT B" HIGHWAY IMPROVEMENT PROJECTS

Project No.	Reference Name	Municipality	Type of Proposed Improvements	Estimated Order of Magnitude Cost
LRP-B10	Marine Drive (Route 1) Lower Tiyan Cliffline Bypass/Service Road	MTM; Tamuning	Construct bypass to Route 1, from the Jalaguac Connector (a 2020 GHMP short range project) to Route 10A along lower Tiyan cliff line using a 2-lane dual configuration.	\$ 8,021,250
LRP-B11	Route 16, Barrigada	Barrigada	Widen Route 16 from Route 10 to the Adacao Connector to a 6-lane dual configuration.	\$ 8,416,850
LRP-B12	Route 8, Barrigada	Barrigada	Widen Route 8, from the Laderan Tiyan Parkway to Route 10 using a 6-lane configuration, with a signal at the Laderan Tiyan and Route 10 intersections.	\$ 11,385,000
LRP-B13	Route 7 Extension	Agana; MTM	Construct extension of Route 7, from Route 4 to Ordot-Mongmong Connector across Agana Swamp using a 2-lane configuration.	\$ 3,864,000
LRP-B14	Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7	Asan	Reconstruct Spruance Drive/Halsey Road, Route 1 to Route 7 using 4-lane dual configuration.	\$ 3,363,750
LRP-B15	Ordot-Mongmong Connector	Chalan Pago-Ordot; MTM	Construct connector between Route 4 and Route 8 with an alignment along Chaot River, east of Agana Swamp and along Biang Street using a 2-lane configuration dual configuration from Route 4 to Route 7 Extension and a 6-lane configuration from Route 7 to Route 8.	\$ 5,002,500
LRP-B16 DAHf	Conga - Mangilao Connector	Chalan Pago-Ordot; Mangilao	Construct connector between Ordot-Mongmong Connector and Route 15 with an alignment north of Conga and along portion of Dairy Road using a 2-lane dual configuration.	\$ 14,260,000
LRP-B17	Route 10 - Mangilao to Barrigada	Mangilao; Barrigada	Widen Route 10, through developed urban areas using a 7-lane configuration complete with curb & gutter and sidewalk improvements. (University Drive to Corten Torres Road and portions of Route 10 through Barrigada.)	\$ 6,054,750
LRP-B18 DAHf	Route 15 - Mangilao Area	Mangilao	Widen Route 15, Route 10 to Fadian Point Road using a 5-lane configuration complete with curb, gutter and sidewalk improvements.	\$ 3,064,750
LRP-B19	Spruance Drive (Route 6) - Route 4 Connector through Lonfit Region to Link with Ordot-Mongmong Connector	Asan; Chalan Pago-Ordot	Construct a connector between Route 6 and Route 4 through Larson Road (@Turner Road), along an alignment parallel and adjacent to the POL road, through the Lonfit and Ordot regions to an intersection with the Ordot-Mongmong Connector using a 2-lane dual	\$ 14,812,000
LRP-B20 DAHf	Cotal Connector	Yona; Santa Rita	Construct connector between Manengon Hills Access Road and Cross-Island Road with an alignment along the north and west boundaries of Manengon Hills development, thence southwesterly across Ylig River to a connection with Cross-Island Road at the crest of	\$ 17,112,000

Exhibit 6.9b
LONG RANGE PROGRAM "CONCEPT B" HIGHWAY IMPROVEMENT PROJECTS

Project No.	Reference Name	Municipality	Type of Proposed Improvements	Estimated Order of Magnitude Cost
LRP-B21	Cross-Island Road	Santa Rita	Realign and reconstruction Cross-Island Road between Sinifa area and Route 5 at Apra Heights using a 2-lane configuration with climbing lanes where needed.	\$ 11,511,500
LRP-B22	Route 5 - Apra Heights to Camp Covington	Santa Rita	Widen Route 5, Cross-Island Road to Route 2A using a 5-lane configuration.	\$ 6,296,250
LRP-B23	Marine Drive, Piti Area	Piti; Santa Rita	Widen Marine Drive, Spruance Drive to Route 2A using 6-lane dual configuration..	\$ 11,586,250

TOTAL ORDER OF MAGNITUDE COST OF LONG RANGE PROGRAM CONCEPT "B" \$ 208,342,050

1. All estimates include a factor of 15% for engineering design costs and contingencies
2. Projects that are related to improving direct primary route access to the Municipal Solid Waste Landfill at Dandan are
3. Costs associated with ROW acquisition are not included
4. Projects which may qualify for Defense Access Highway Funds are annotated with "DAHf."

EXHIBIT 6.9c
SUMMARY OF COST ESTIMATES - LONG RANGE PROGRAM "CONCEPT B" PROJECTS

Concept B Project No.	Concept A Project No.	Reference Name & Description	Length (Miles)	Conceptual Cost Estimate (million \$)			
				Construction Cost (million \$)	Engineering & Contingencies	R.O.W. Cost	Total Cost
LRP-B1	-	Upi Connector	1.3	\$ 4.60	\$ 0.69	See Note 2	\$ 5.29
LRP-B2	LRP-A1	Marine Drive, Marbo to Yigo Area	2.6	\$ 13.04	\$ 1.96	See Note 2	\$ 15.00
LRP-B3	LRP-A2	Ukudu Connector	3.2	\$ 10.57	\$ 1.59	See Note 2	\$ 12.16
LRP-B4	LRP-A3	Mogfog Connector	1.6	\$ 11.97	\$ 1.80	See Note 2	\$ 13.76
LRP-B5	LRP-A4	Macheche Connector	1.9	\$ 6.85	\$ 1.03	\$ 1.34	\$ 9.22
LRP-B6	LRP-A5	Adacao Connector	2.5	\$ 8.30	\$ 1.25	See Note 2	\$ 9.55
LRP-B7 DAHF	LRP-A6	Route 15 - Adacao Area	0.5	\$ 1.76	\$ 0.26	See Note 1	\$ 2.02
LRP-B8	LRP-A7	Airport Access Road	1.9	\$ 1.81	\$ 0.27	See Note 2	\$ 2.09
LRP-B9.1	LRP-A8.1	Laderan Tiyan Parkway, Tiyan Corridor	2.81	\$ 4.47	\$ 0.67	See Note 3	\$ 5.13
LRP-B9.2	LRP-A8.2	Laderan Tiyan Parkway, Route 10A Bypass	1.43	\$ 9.31	\$ 1.40	See Note 2	\$ 10.71
LRP-B10	-	Marine Drive (Route 1) Lower Tiyan Cliffline, Bypass/Service Road	3.4	\$ 6.98	\$ 1.05	\$ 4.16	\$ 12.18
LRP-B11	LRP-A9	Route 16, Barrigada	1.6	\$ 7.32	\$ 1.10	See Note 1	\$ 8.42
LRP-B12	LRP-A10	Route 8, Barrigada	2.16	\$ 9.90	\$ 1.49	See Note 1	\$ 11.39
LRP-B13	LRP-A11	Route 7 Extension	1.0	\$ 3.36	\$ 0.50	\$ 1.23	\$ 5.09
LRP-B14	LRP-A12	Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7	0.2	\$ 2.30	\$ 0.34	See Note 1	\$ 2.64
LRP-B15	-	Ordot-Mongmong Connector	2.7	\$ 4.35	\$ 0.65	\$ 3.31	\$ 8.31
LRP-B16 DAHF	-	Conga-Mangilao Connector	2.2	\$ 3.70	\$ 0.56	\$ 2.20	\$ 6.46
LRP-B17	LRP-A13	Route 10 - Mangilao to Barrigada	2.2	\$ 5.27	\$ 0.79	See Note 1	\$ 6.05
LRP-B18 DAHF	LRP-A14	Route 15 - Mangilao Area	0.8	\$ 2.67	\$ 0.40	See Note 1	\$ 3.06
LRP-B19	-	Spruance Drive (Route 6) - Route 4 Connector through Lonfit Region to Ordot-Mongmong Connector (LRP-B15)	3.53	\$ 12.88	\$ 1.93	\$ 2.60	\$ 17.41
LRP-B20 DAHF	-	Cotal Connector	3.5	\$ 14.88	\$ 2.23	\$ 1.72	\$ 18.83

EXHIBIT 6.9c
SUMMARY OF COST ESTIMATES - LONG RANGE PROGRAM "CONCEPT B" PROJECTS

Concept B Project No.	Concept A Project No.	Reference Name & Description	Length (Miles)	Conceptual Cost Estimate (million \$)			
				Construction Cost (million \$)	Engineering & Contingencies	R.O.W. Cost	Total Cost
LRP-B21 DAHF	-	Cross-Island Road (Route 17) Realignment	2.2	\$ 10.01	\$ 1.50	\$ 1.08	\$ 12.59
LRP-B22 DAHF	LRP-A15	Route 5 - Apra Heights to Camp Covington	1.3	\$ 5.48	\$ 0.82	See Note 1	\$ 6.30
LRP-B23	LRP-A16	Marine Drive, Piti Area	2.8	\$ 10.08	\$ 1.51	See Note 1	\$ 11.59

Totals

49.33 \$ 171.84 \$ 25.78 \$ 17.65 \$ 215.26

DAHF Subtotals

\$ 49.26

Notes:

- 1 No additional right-of-way required.
- 2 Land/additional right-of way required is in government ownership.
- 3 Right-of-way previously under government ownership has been returned to original land owners. Reversionary clause in conveyance to the Government of Guam by FHWA may void the return of the right of way to original land owners.
- 4 Projects which may qualify for Defense Access Highway Funds are annotated with "DAHF."

3.1 Performance of the LRP Network - Concept B

Exhibit 6.10 shows measures of effectiveness for the LRP Concept B network under 2015 and 2020 travel demands. For comparison purposes, similar measures for the SRP network for 2015 are also shown.

Based on projected traffic volumes, locations where moderate or severe congestion is projected to occur on the LRP Concept B network during 2020 are shown in Exhibits 6.11, 6.12 and 6.13 for A.M. Peak Hour, P.M. Peak Hour and Off-Peak periods, respectively.

Comparable maps showing projected congested locations with LRP Concept B in 2020 are provided in Exhibits 6.14, 6.15 and 6.16

Exhibit 6.10
Performance of the LRP Concept B Network

Measure of Effectiveness	2015 SRP Network	2015 LRP B Network	% Change	2020 LRP A Network	2020 LRP B Network	% Change
A.M. Peak Hour						
Vehicle-Miles	216,473	216,822	0.2%	241,185	240,397	-0.3%
Vehicle-Hours	6,936	6,726	-3.0%	7,669	7,587	-1.1%
Delay (hours)	451	304	-32.6%	514	461	-10.3%
Speed (mph)	31.2	32.2	3.3%	31.4	31.7	0.8%
P.M. Peak Hour						
Vehicle-Miles	227,279	228,023	0.3%	253,626	252,615	-0.4%
Vehicle-Hours	7,245	7,073	-2.4%	8,017	7,963	-0.7%
Delay (hours)	420	302	-28.1%	478	451	-5.6%
Speed (mph)	31.4	32.2	2.8%	31.6	31.7	0.3%
Off-Peak Hour						
Vehicle-Miles	143,107	143,738.8	0.4%	159,487	159,182.3	-0.2%
Vehicle-Hours	4,370	4,306	-1.5%	4,801	4,785.083	-0.3%
Delay (hours)	71	40.08333	-43.8%	68	58.25	-13.7%
Speed (mph)	32.7	33.4	1.9%	33.2	33.3	0.1%
Daily Totals (1)						
Vehicle-Miles	2,604,793	2,614,555	0.4%	2,903,464	2,896,212	-0.2%
Vehicle-Hours	80,803	79,270	-1.9%	88,980	88,521	-0.5%
Delay (hours)	2,598	1,693	-34.8%	2,794	2,523	-9.7%
Speed (mph)	32.2	33.0	2.3%	32.6	32.7	0.3%

Note: (1) Daily values calculated as:

$$2 * \text{A.M. Peak Hour} + 2 * \text{P.M. Peak Hour} + 12 \text{ Off-Peak Hour}$$

Exhibit 6.11
Projected 2015 A.M. Peak Hour Congested Locations with the
LRP Concept B Network

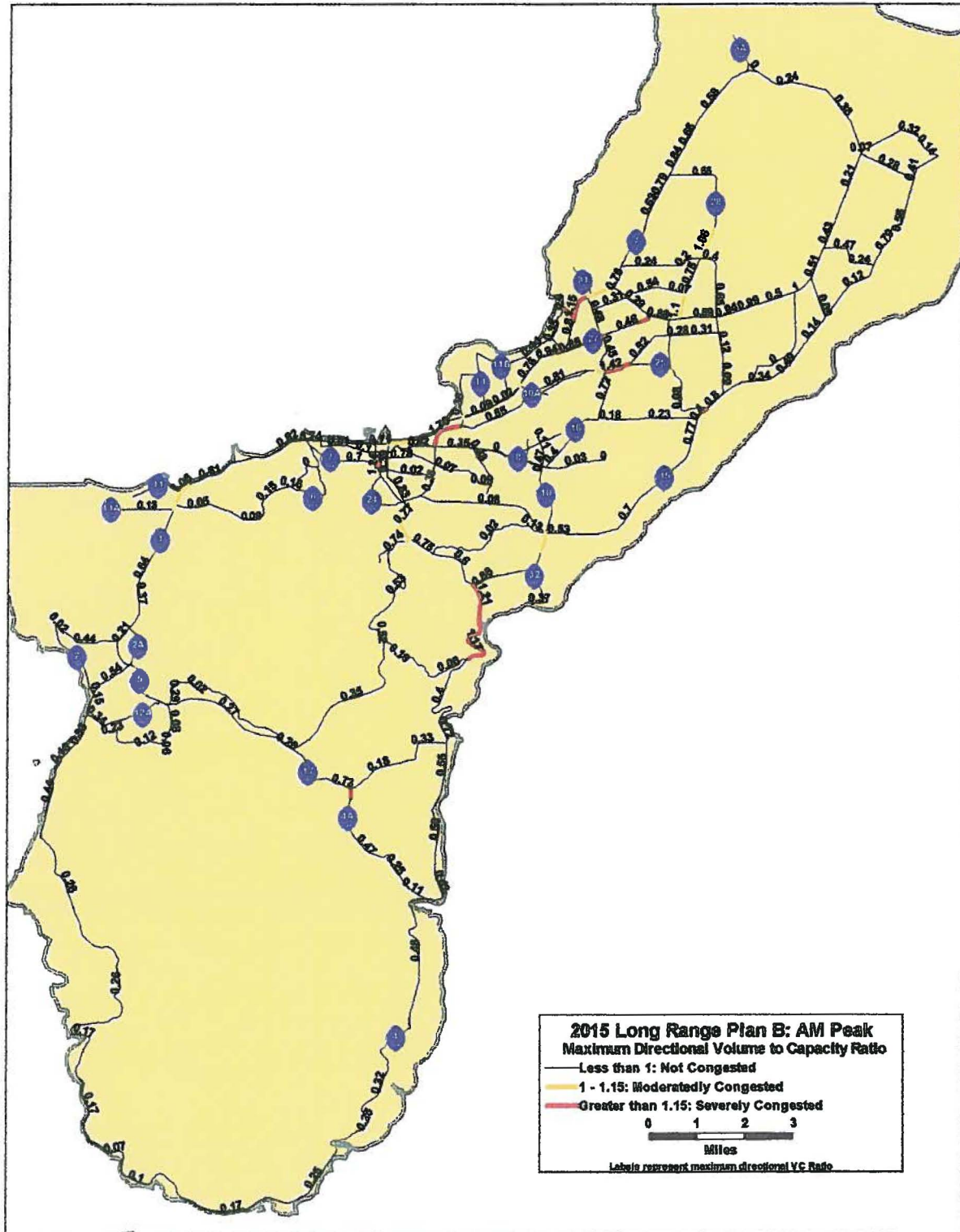


Exhibit 6.12
Projected 2015 P.M. Peak Hour Congested Locations with the
LRP Concept B Network

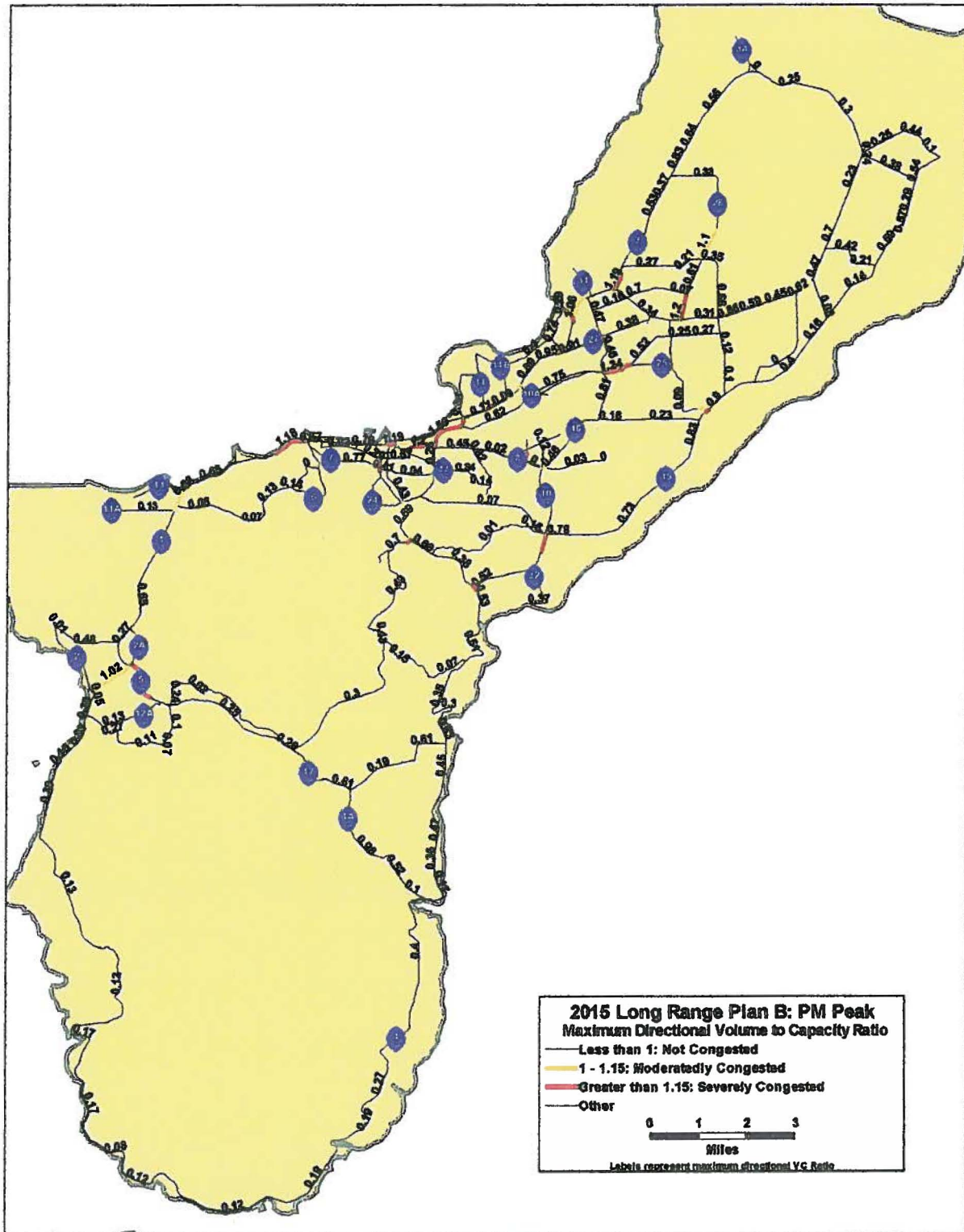


Exhibit 6.13
Projected 2015 Off-Peak Period Congested Locations with the
LRP Concept B Network

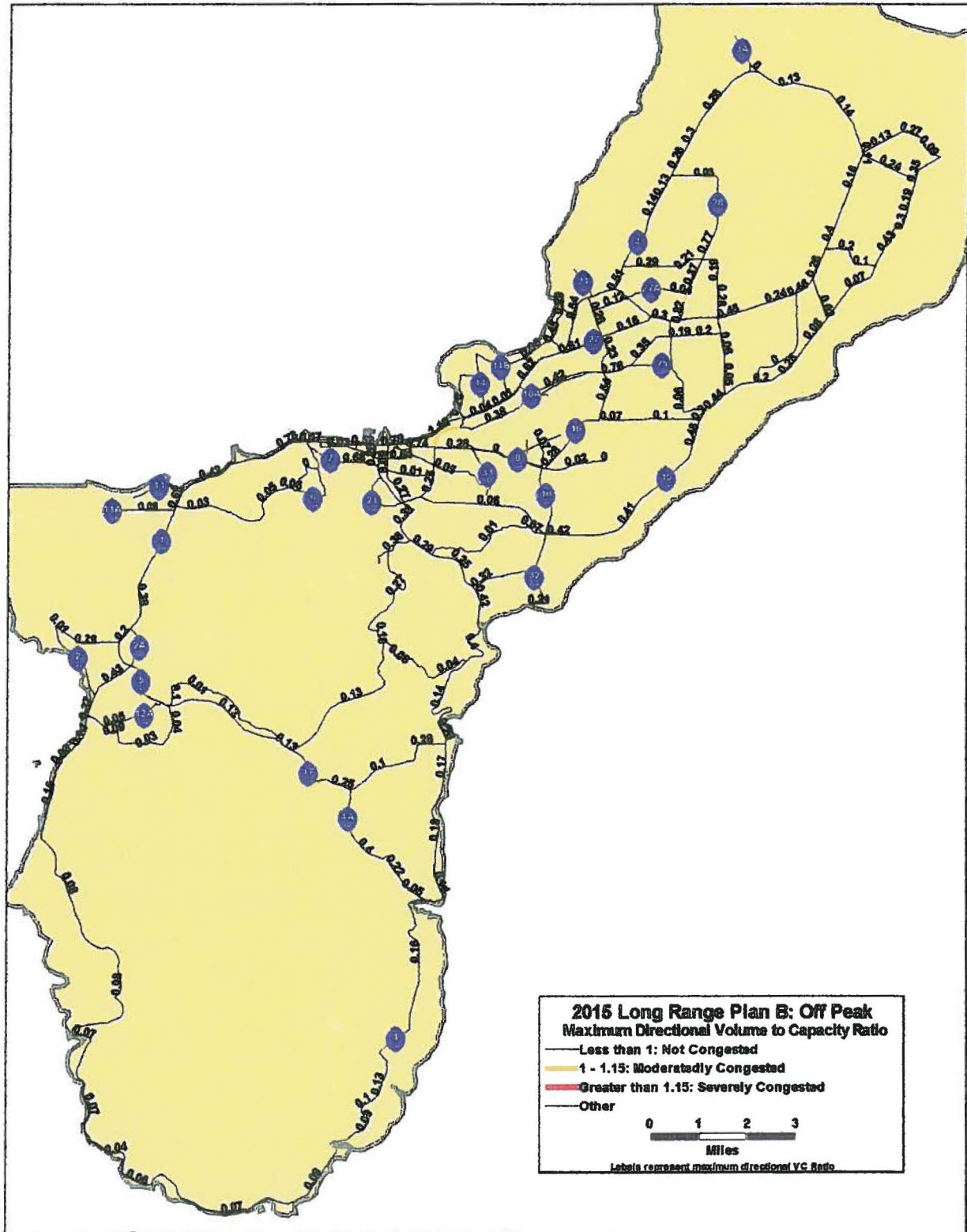


Exhibit 6.14
Projected 2020 A.M. Peak Hour Congested Locations with the
LRP Concept B Network

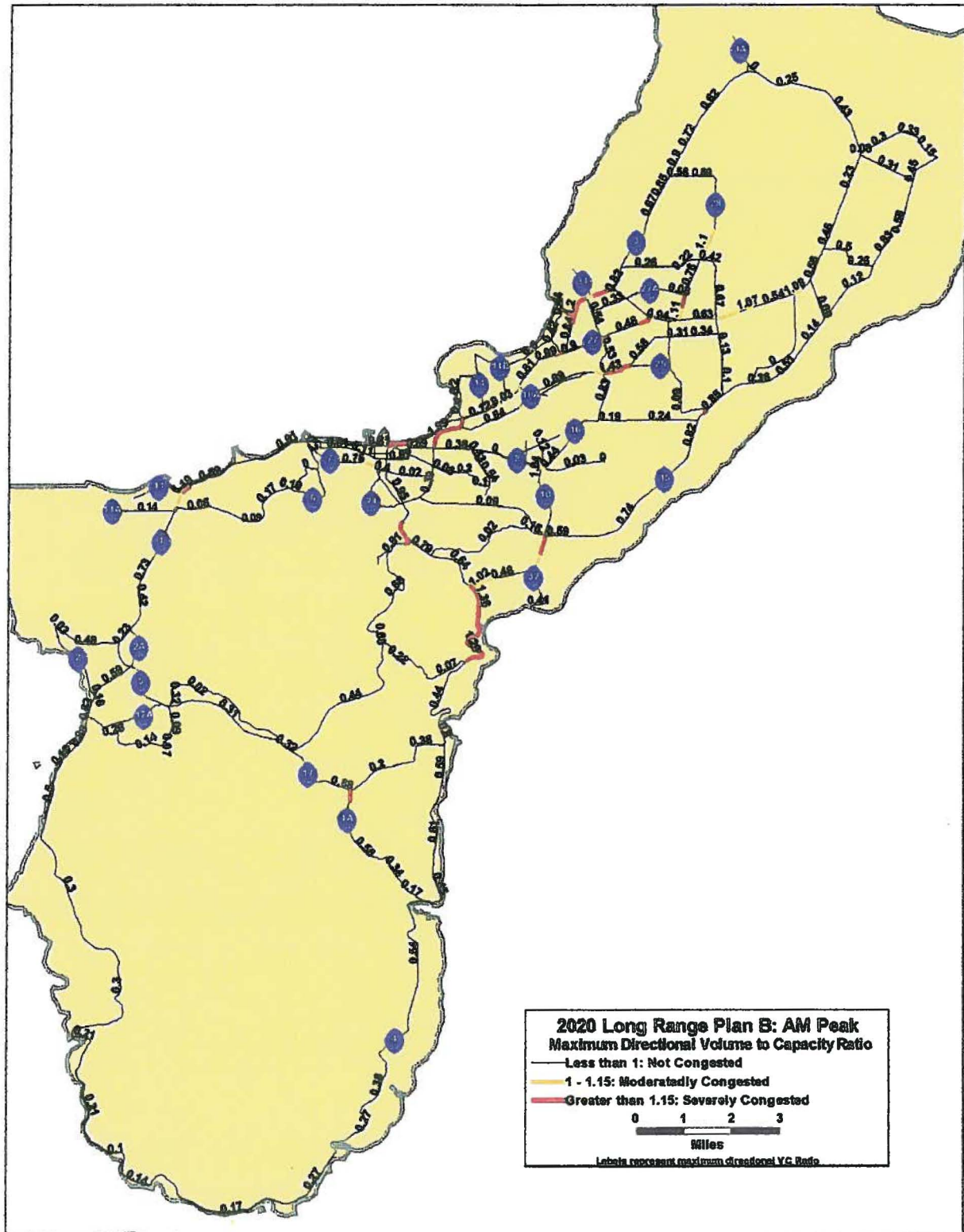


Exhibit 6.15
Projected 2020 P.M. Peak Hour Congested Locations with the
LRP Concept B Network

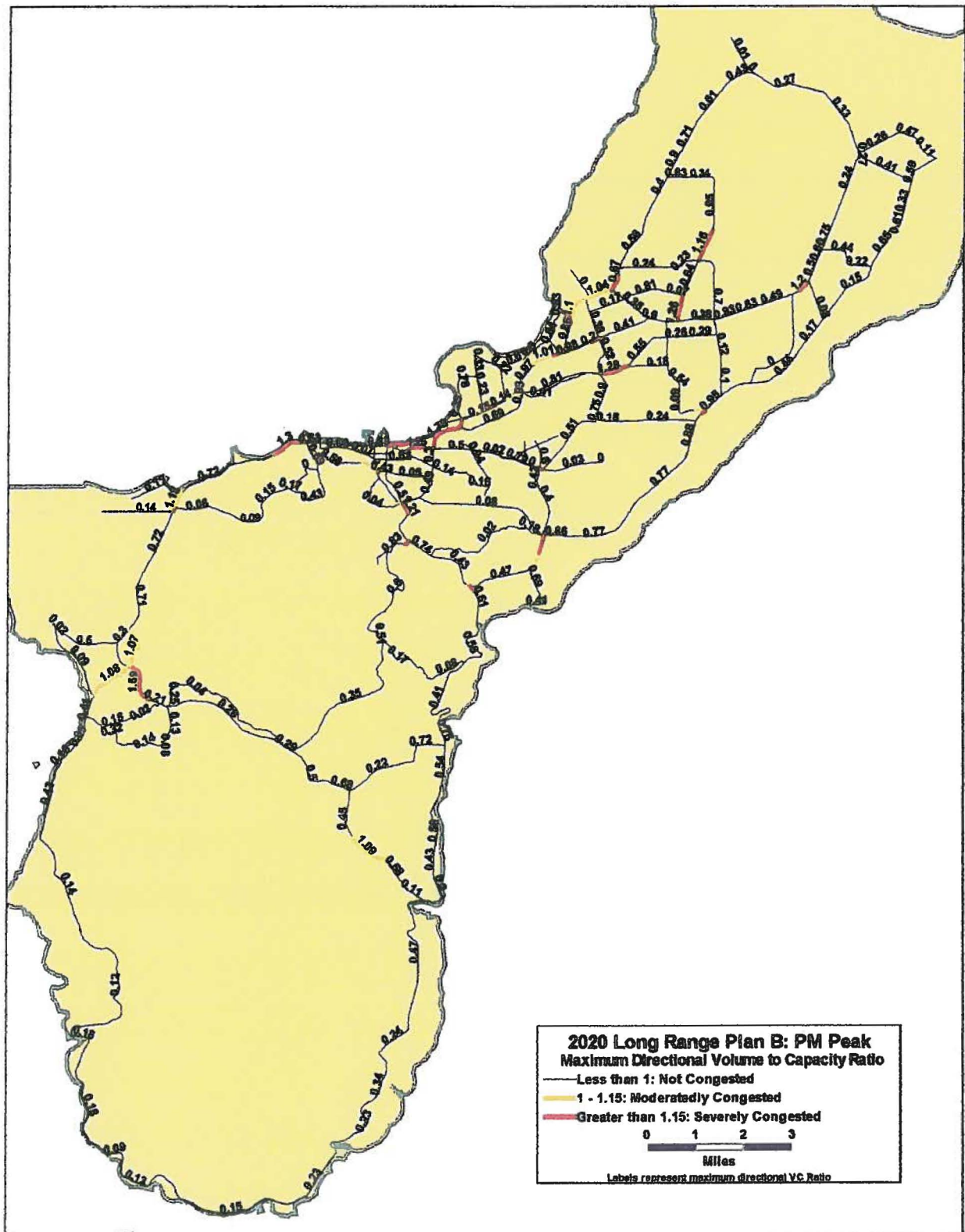
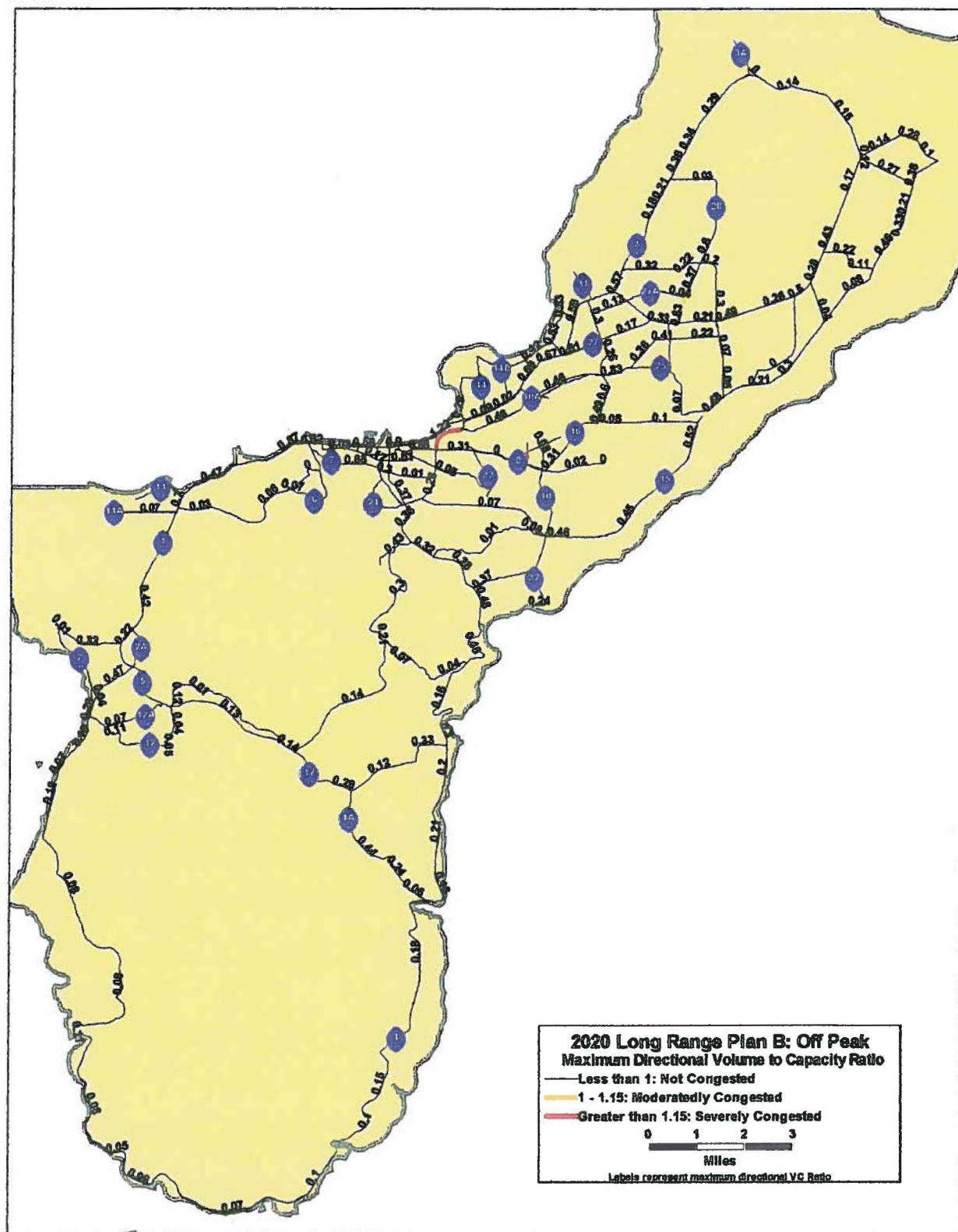


Exhibit 6.16
Projected 2020 Off-Peak Period Congested Locations with the
LRP Concept B Network



4.0 Evaluation

The Recommended minimum level master plan (Short Range Program and Long Range Program Concept A projects) was evaluated on the basis of five goals and supporting objectives as described in Chapter 1. Exhibit 6.17 contains summary results of the analysis associated with the objectives. Exhibit 6.18 presents a summary list of projects under the Recommended Plan.

Goal 1: Highway Transportation Quality – The first goal, “Highway Transportation Quality” is supported by 5 objectives. Section 3.3 of Chapter 4 presents the projected performance of the highway network consisting of “existing” highway improvements plus “committed” projects. Section 2.1 of Chapter 6 presents the projected performance of the Short plus the Long Range Concept A network. Results of the evaluation show significant achievements in all of the objectives.

Goal 2: Highway Transportation Efficiency – The Recommended Plan provides significant positive results for 2 out of the 4 objectives under this goal.

Goal 3: Highway Cost Effectiveness – The total capital cost of the Recommended Plan, short plus long range programs, is \$300 million, of which nearly \$18 million is for right of way acquisition. The net annual savings – value of time saved by highway users less the annualized cost – is substantial and indicates that the Plan's economic benefits far exceed its costs.

Goal 4: Comprehensive Planning – The Recommended Plan features projects previously proposed by the 2010 Guam Highway Master Plan and is generally supportive of the objectives listed under this goal. If Concept B is adopted, the alternative Plan will define a defense access highway route other than Marine Drive.

Goal 5: Environmental Quality – Reconstruction and widening of existing highways and construction of new highways have the potential for negative environmental impacts. However, mitigation measures will be employed to counteract these effects.

Exhibit 6.17

**EVALUATION OF RECOMMENDED HIGHWAY IMPROVEMENT PLAN
ON PLAN GOALS & OBJECTIVES
Guam 2020 Highway Master Plan**

GOAL NUMBER 1: HIGHWAY TRANSPORTATION QUALITY

The Plan shall meet accepted standards of highway transportation safety and service.

OBJECTIVES	MEASURE	RESULTS
1.1 Good Traffic Flow Quality	Total highway-miles below Level of Service (LOS) Standard	Significant increase in Level of Service for both Short and Long Range Plans (Exhibits 5.2 & 6.2)
1.2 Adherence to Highway Design Standards	Total highway-miles upgraded to design standards	70 miles of highways upgraded and constructed to current design standards.
1.3 Mobility	Average Speed	Increase in average speed is negligible due to development of alternate routes.
1.4 Accessibility to the Highway Network	Average travel time for trips with trip ends in selected zones	Significant reduction in traffic delays during peak hours (Exhibits 5.2 & 6.2)
1.5 Elimination of Traffic Hazards	Number of hazardous conditions/locations addressed by improvement projects	STIP and Short Range Projects address hazardous locations.

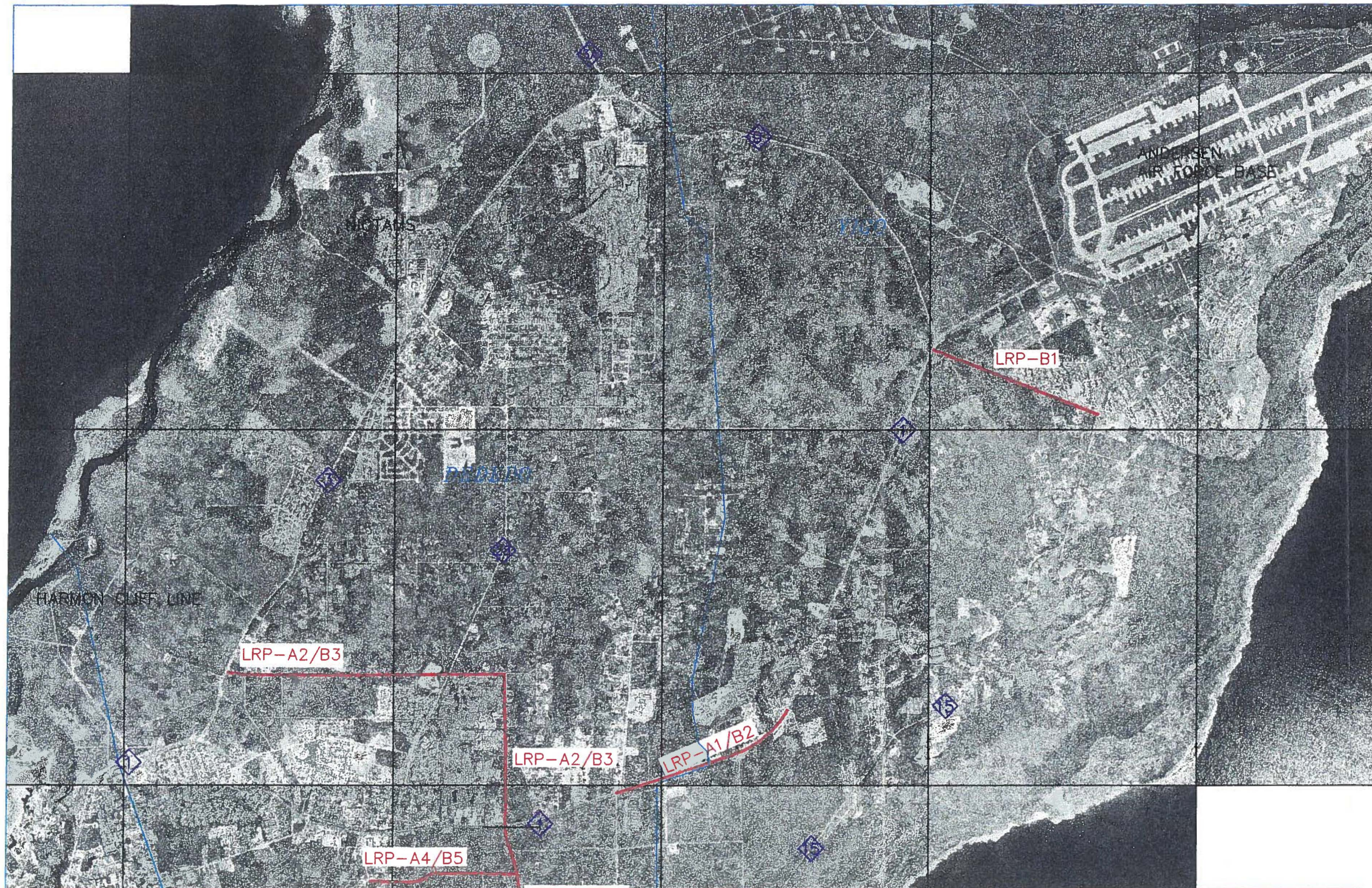
GOAL NUMBER 2: HIGHWAY TRANSPORTATION EFFICIENCY

The Plan shall provide a high level of efficiency in the number of vehicular trips that are made.

OBJECTIVES	MEASURE	RESULTS
2.1 Vehicle-miles and vehicle hours	Number of vehicle-miles and vehicle-hours	PM Peak vehicle-miles and vehicle-hours show significant positive change (Exhibits 5.2 & 6.2)
2.2 Vehicle-miles on congested sections of highway	Total number of vehicle-miles on highway sections with substandard LOS	Significant reduction in highway sections with substandard LOS (See Exhibits 5.2 & 6.2)
2.3 Public Transit Services	Improvements to segments which are served by existing or potential transit routes	Significant improvements to segments of the existing and potential transit routes.
2.4 Transportation Systems Management (TSM)	Inclusion of TSM strategies in improvement program	Opportunities for implementation of TSM strategies can be addressed in both short and long range highway improvements.

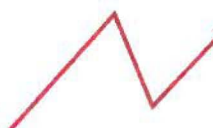
GOAL NUMBER 3: HIGHWAY COST EFFECTIVENESS		
<i>The Plan shall achieve a high level of cost effectiveness in the use of available financial and material resources.</i>		
OBJECTIVES	MEASUREMENT	RESULTS
3.1 Capital Cost	Total capital cost of all highway improvements	Total capital cost is \$300 million
3.2 Annual Cost	Amortized capital costs, plus annual maintenance costs, less savings in travel time costs	Significant net savings in annual cost
3.3 Private Sector Involvement	Potential for private sector involvement	Partial private sector financing may be possible for certain long range program projects. Defense access highway funds may also be available for designated Concept B projects.
GOAL NUMBER 4: COMPREHENSIVE PLANNING		
<i>The Plan shall support a coordinated and mutually supportive relationship with other planning efforts, with due recognition of highway transportation's key role in the social and cultural life in Guam, in the development of the local economy and in the provision of emergency and homeland security services.</i>		
OBJECTIVES	CRITERIA	MEASUREMENT STRATEGIES
4.1 Other Planning Efforts	Extent of coordination and consistency with other planning efforts	The Recommended Plan appears to be consistent with other planning efforts, but that will be determined when the Plan is submitted through the government plan review process.
4.2 Economic Development	Extent of support for each major sector of the local economy	The Recommended Plan provides and supports opportunities for economic development. New highways open up areas that have no access infrastructure and reconstruction and widening of existing highways will support the development of approved land use.
4.3 Disaster and Homeland Security Planning	a) Number of corridor-miles in major travel corridors where alternate routes are available; b) Accessibility to alternate routes	The Recommended Plan provides new alternate routes for use in disaster response. Concept B provides designated defense access highway.
4.4 Relocations and Disruptions	Number of homes and establishments required to relocate	It is uncertain how many homes will be relocated or business disrupted.

GOAL NUMBER 5: ENVIRONMENTAL QUALITY AND HISTORIC PRESERVATION		
The Plan shall support the maintenance and enhancement of the quality of the Island's natural environment and the preservation of historic resources		
OBJECTIVES	MEASUREMENT	RESULTS
5.1 Maintenance and enhancement of the quality of the Island's natural environment	a) Amount of land taken from environmentally significant areas; b) Other impacts which could adversely affect these areas, e.g. visual intrusion, accessibility	Reconstruction and widening of existing highways and construction of new highways have the potential for negative environmental impacts. However, mitigation measures will be employed to counteract these effects.
5.2 Disruption of Social and Cultural Characteristics	Extent of adverse impacts of proposed highway facilities on the cohesiveness of existing communities and neighborhoods, either by cutting through or passing near such areas	New roads in the Recommended Plan should have negligible impacts on communities as new and improved highway routes will provide for safe traffic flow.
5.3 Visual Impact of New Highways	Extent of visual intrusion, caused by a proposed highway structure or embankment, in areas having scenic or architectural value	Visual intrusiveness cannot be fully evaluated until the design stage of the various projects. Visual impacts can be mitigated through landscaping and road geometry.
5.4 Preservation of Water Quality	a) Extent of potential runoff from highway sources being directed into critical watershed areas, reservoirs and groundwater recharge areas; b) Compliance with non-point source pollution management standards and program objectives	The Recommended Plan has some potential for diminished water quality, but potential adverse impacts can be mitigated through the use of best management practices for drainage control works.
5.5 Air and Noise Pollution	a) Air Quality: Extent to which congestion and high peak hour traffic volumes are reduced along arterial roads; b) Noise: Extent of increased noise levels in residential districts caused by highway improvements.	The Recommended reduces congestion levels significantly, and disperses traffic. The Recommended Plan will introduce higher noise levels in areas where new roads are constructed. However, noise levels will be lower on roads where traffic volumes are reduced as a consequence of the implementation of the Plan.



LEGEND

LRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



1963 GRID
GRAPHIC SCALE

4000 2000 0' 4000 8000



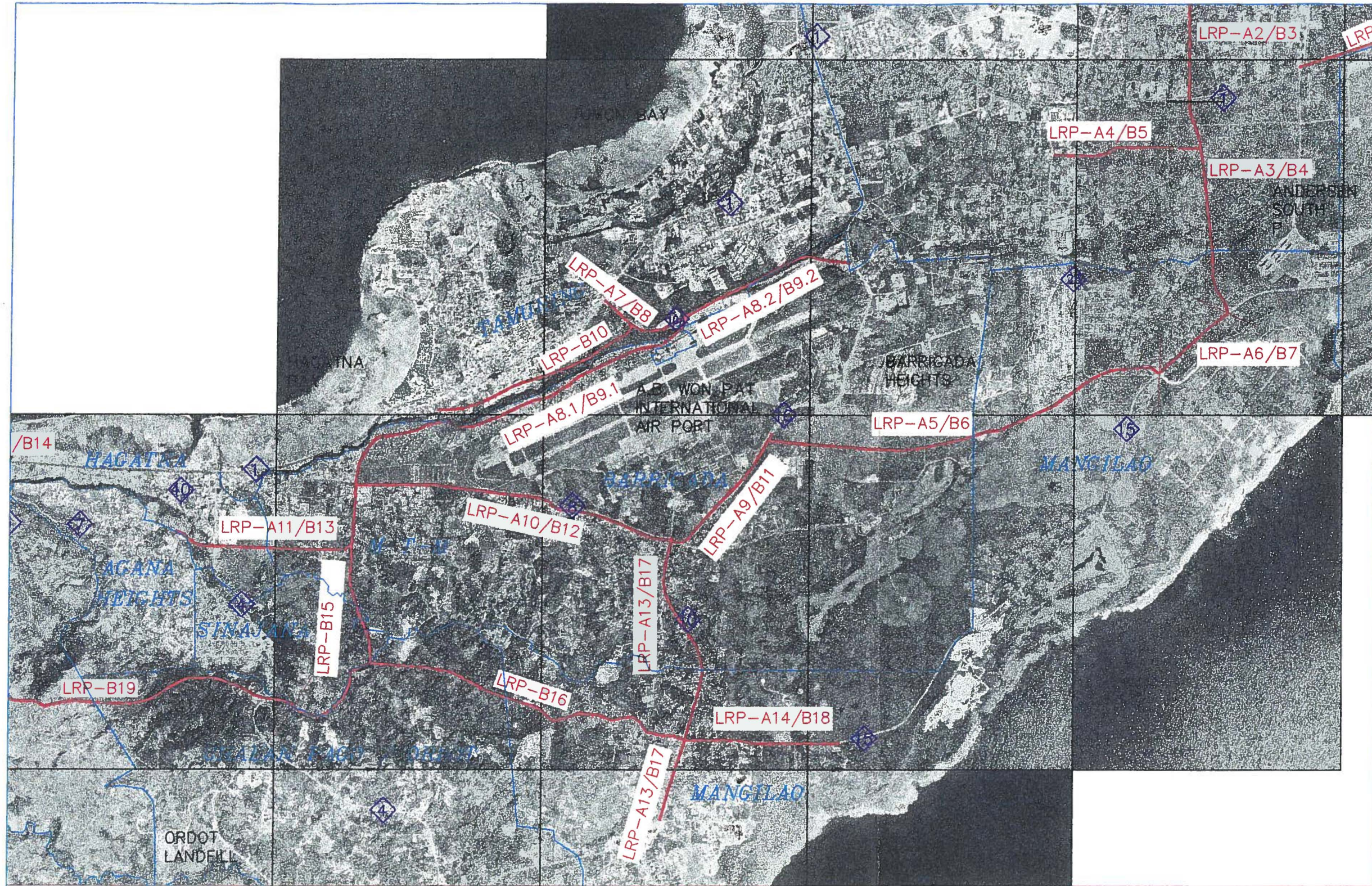
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GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 6.1a & 6.9a

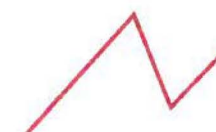
LONG RANGE

HIGHWAY IMPROVEMENT PROGRAM



LEGEND

LRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



1963 GRID
GRAPHIC SCALE

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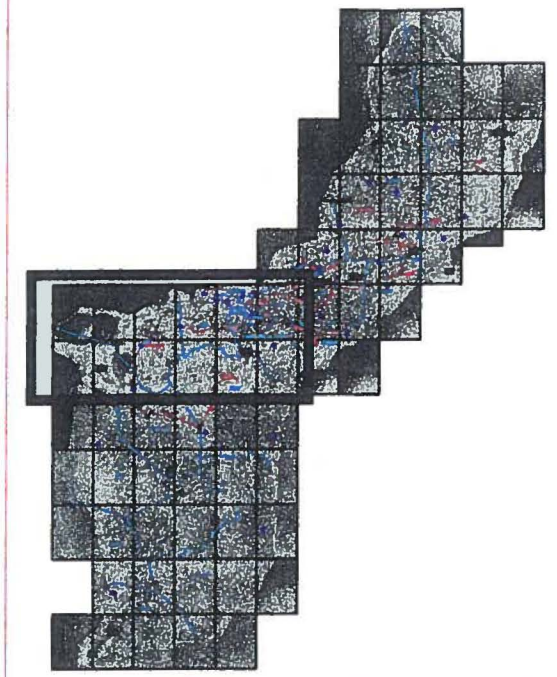
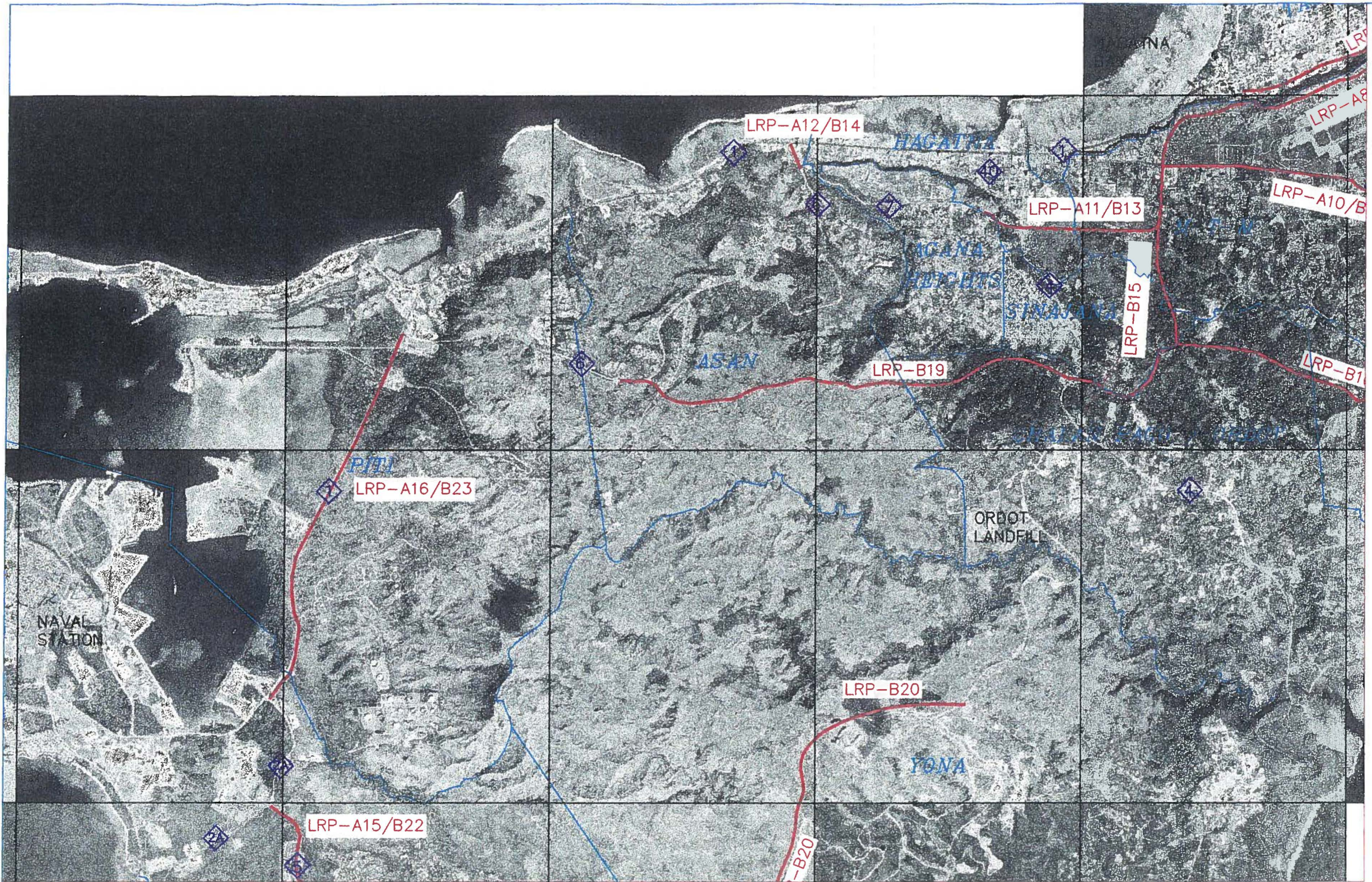
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GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 6.1a & 6.9a

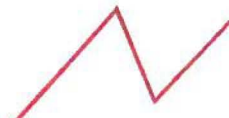
LONG RANGE

HIGHWAY IMPROVEMENT PROGRAM



LEGEND

LRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



1963 GRID
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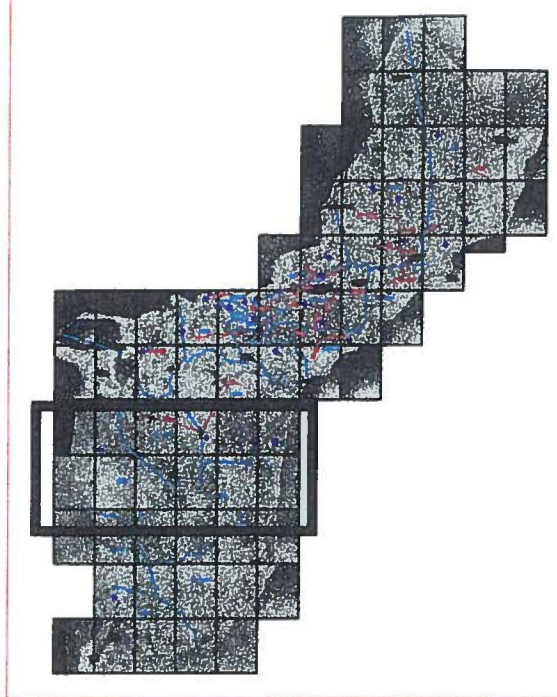
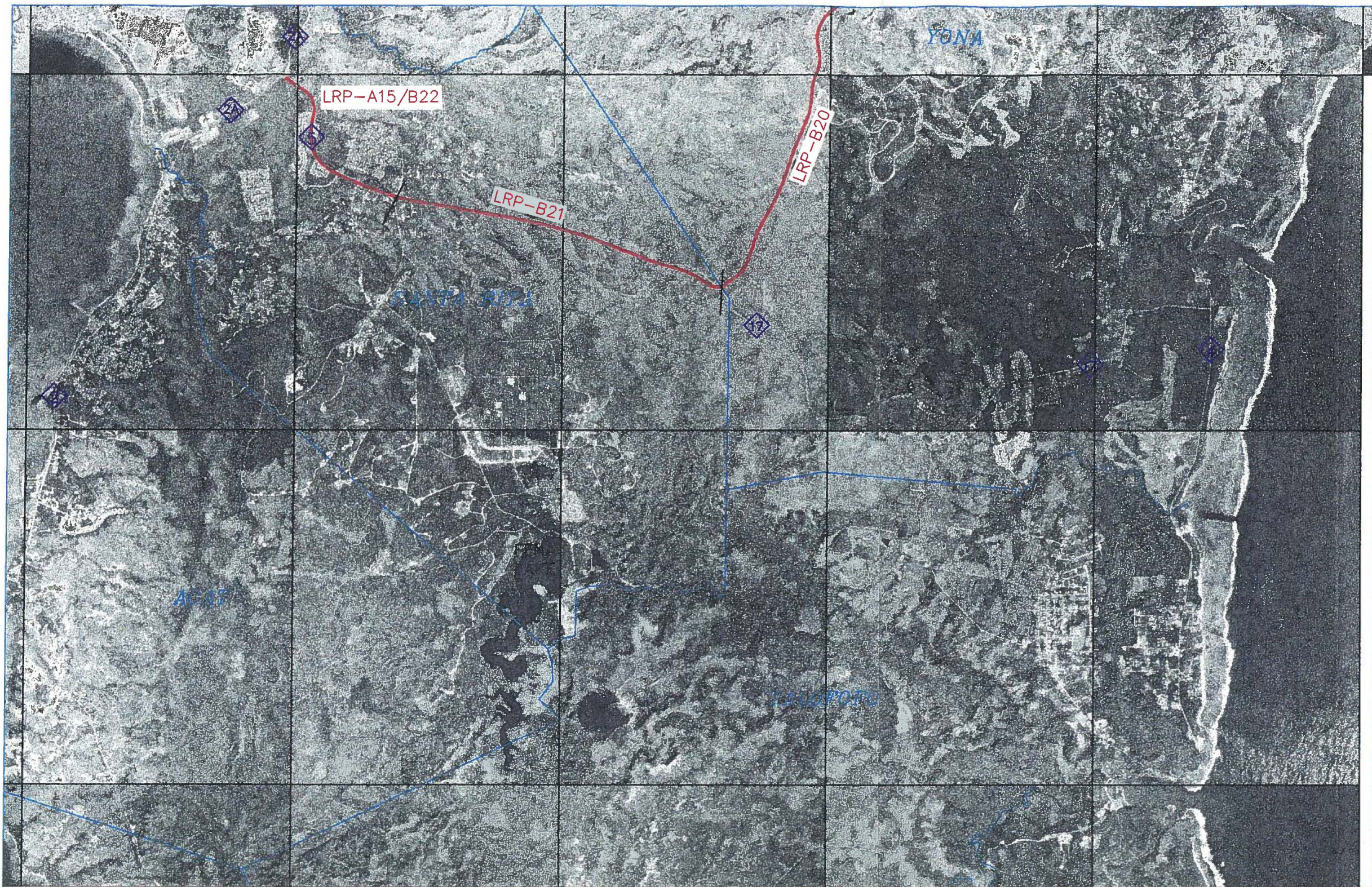


GUAM 2020 HIGHWAY MASTER PLAN

EXHIBIT 6.1a & 6.9a

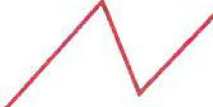
LONG RANGE

HIGHWAY IMPROVEMENT PROGRAM



LEGEND

LRP-11 PROJECT NUMBER

 LIMITS OF IMPROVEMENT



1963 GRID
GRAPHIC SCALE



GUAM 2020 HIGHWAY MASTER PLAN
EXHIBIT 6.1a & 6.9a
LONG RANGE
HIGHWAY IMPROVEMENT PROGRAM

Chapter 7

IMPLEMENTATION AND FUNDING OPTIONS

This chapter presents recommendations and options for funding the 2020 Guam Highway Master Plan. The previous chapters describe the analytical process used to identify future highway network needs and the recommended program for highway improvement projects that should be pursued through the plan target year of 2020.

1.0 Current Funding Sources

There are four (4) principal sources of public funds earmarked for the highway program as follows:

- Fuel Tax
- Annual Vehicle Registration (based on a sliding scale of vehicle weight)
- Federal Highway Administration (FHWA) funds
- Highway Bond Issues (Bond issues may not be a true source of funds if repayment is to be made from the Territorial Highway Fund. Rather, such bond issues are a means of financing the highway program with long term payback provisions)

Exhibit 7.1a summarizes the historical highway program-related funding sources. Not all of the funds are used for highway capital improvement projects. The Department of Public Works estimates that it receives approximately \$8.94 million annually from fuel tax and registrations. These sources are also used to fund highway operations, maintenance, and debt service (retirement) of current bond issues. Federal highway funding is part of a recurring authorization by the U.S. Congress and is assumed to continue into the future through Year 2020 with the current funding level as a minimum benchmark projection.

Exhibit 7.1a HISTORICAL HIGHWAY FUNDING SOURCES Guam 2020 Highway Master Plan		
SOURCE	Funding Sources	
	Category/Specification	Rate
Fuel Tax	Automotive Diesel Fuel	\$0.14 per gallon
	Gasoline (Automotive)	\$0.15 per gallon
	Aviation Fuel	\$0.04 per gallon
Vehicle Registrations	Estimated Average	\$30 per vehicle
Federal Highway Administration	Per Annum	\$14 Million

2.0 Funding Levels

Exhibit 7.1b summarizes historic annual revenue levels for highway-related programs. Local sources of these revenues are earmarked for deposit into the Territorial Highway Fund.

Exhibit 7.1b HISTORICAL HIGHWAY FUNDING LEVELS Guam 2020 Highway Master Plan			
	FUNDING BY FISCAL YEAR (in \$ Million)		
SOURCE	2002	2003	2004
Fuel Tax (not including aviation fuel taxes)	\$5.35	\$6.04	\$4.62
Vehicle Registrations	-	\$2.78	\$2.77
Federal Highway Administration	\$13.90	\$14.47	\$12.06

Sources: Department of Public Works and Department of Revenue and Taxation

3.0 Analysis of Funding Sources

The three traditional/historical public funding sources were analyzed to determine current and future trends and whether they, individually or collectively, could be used as potential sources of new funds. A potential additional source is the Defense Access Roads (DAR) Program as discussed below.

3.1 Federal Highway Administration (FHWA) – Based on the recently enacted Safe Accountable Flexible and Efficient Transportation Equity Act, Guam is expected to receive \$14 million in 2005, \$16 million in 2006 and \$20 per year in 2007 and thereafter. This new level of FHWA funding will be used to establish funds available for use in the implementation of this plan. If these funds continue at this minimum level through Year 2020, then Guam will have \$290 million of the total required (\$300 million) funding for the Recommended Plan. Approximately \$10 million will be required from other sources. If Long Range Plan Concept B is implemented, approximately \$91 million will be required from other sources.

3.2 Annual Vehicle Registration and Fuel Tax Collections

Vehicle registration and liquid fuels tax collections on Guam for the Target Plan Years of 2015 and 2020 must be projected to establish a basis for estimating revenues that can be dedicated to support street and highway improvements. The Department of Revenue and Taxation compiles data regarding vehicle registration and liquid fuels tax collection.

3.2.1 Vehicle Registration Projections

Vehicle registration data are compiled by fiscal year for the following vehicle categories.

- Automobile
- Bus
- Cargo

Handicapped
 Motorcycle
 Special Equipment
 Taxi
 Trailer
 Veteran (starting FY 98)
 Dealer
 Personalized
 Total for All Vehicles

The most relevant profiles for projection purposes are the "Automobile" category and the "Total for All Vehicles." By comparing vehicle registrations for Automobiles and All Vehicles with the Year 2000 Census and the Year 2003 Population Estimate, an average number of vehicles per population was determined as .655 vehicles per person and .408 automobiles per person, respectively. See Exhibit 7.2.

Exhibit 7.2
Comparison of 2000 Census and 2003 Population Estimate with
Vehicle Registration on Guam to Determine Vehicle / Population Ratios

Population Data Source	Population	All (Regis.) Vehicles	All (Regis.) Vehicles/Pop.	Registered Autos	Registered Autos/Pop
Year 2000 Census	154,805	97,763	0.632	60,545	0.391
GHMP Year 2003 Estimate	136,228	92,320	0.678	57,999	0.426
Avg. Vehicles/Population			0.655		0.408

In order to project the number of all vehicles and automobiles on Guam for target years 2015 and 2020 and intervening years, the average number of all vehicles and automobiles per population (0.655 and 0.408, respectively) determined in Exhibit 7.2 was applied to the projected population established previously by this Plan. Those projections are presented in Exhibit 7.3.

Exhibit 7.3
Projected Number of All Vehicles and Automobiles

Year	Population Data Source	Population	Projected # of All Vehicles	Projected # of Automobiles
2003	GMHP Projection	136,228	92,320	57,999
2004	GMHP Projection	138,953	92,549	57,999
2005	GMHP Projection	141,732	92,778	57,883
2006	GMHP Projection	144,567	94,634	59,041
2007	GMHP Projection	147,458	96,526	60,222
2008	GMHP Projection	150,407	98,456	61,426
2009	GMHP Projection	153,415	100,425	62,655
2010	GMHP Projection	156,484	102,434	63,908
2011	GMHP Projection	159,614	104,483	65,186
2012	GMHP Projection	162,806	106,573	66,490
2013	GMHP Projection	166,062	108,704	67,820

2014	GMHP Projection	169,383	110,878	69,176
2015	GMHP Projection	172,771	113,096	70,564
2016	GMHP Projection	176,226	115,358	71,971
2017	GMHP Projection	179,751	117,665	73,410
2018	GMHP Projection	183,346	120,018	74,879
2019	GMHP Projection	187,013	122,419	76,376
2020	GMHP Projection	190,753	124,867	77,904

3.2.2 Liquid Fuels Tax Collections

The Department of Revenue and Taxations compiles five categories of liquid fuels tax collections:

- Gasoline Tax and Gasoline Tax Surcharge
- Diesel Fuel Tax and Diesel Fuel Tax Surcharge
- Aviation Fuel

Exhibit 7.4a presents liquid fuels tax collections for FY 2000 through FY 2004.

Exhibit 7.4a
Liquid Fuels Tax Collections, FY 2000 through FY 2004

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Gasoline Tax	\$1,274,775	\$1,530,197	\$908,866	\$1,229,651	\$990,809
Gasoline Tax Surcharge	\$303,693	\$368,698	\$303,437	\$395,727	\$258,047
Diesel Fuel Tax	\$4,137,044	\$4,789,161	\$3,143,096	\$3,426,962	\$2,726,965
Diesel Fuel Surcharge	\$759,233	\$923,634	\$655,173	\$989,808	\$645,394
Aviation Fuel Tax	\$3,879,782	\$2,724,879	\$4,349,680	\$2,881,990	\$4,246,226

The variance between years for fuels tax collections is substantial and for all categories except aviation fuels, reflects an overall negative trend between FY 2000 and FY 2004. Exhibit 7.4b compares these variances for FY 2000, FY 2001 and FY 2002. Table 10.2 - 3 compares FY 2003 and FY 2004 as well as overall between FY 2000 and FY 2004.

Exhibit 7.4b
Liquid Fuels Tax Collection Variances, FY 2000, FY 2001 and FY 2002

	FY 2000	FY 2001	% variance From previous FY	FY 2002	% variance from previous FY
Gasoline Tax	\$1,274,775	\$1,530,197	20.0%	\$908,866	-40.6%
Gasoline Tax Surcharge	\$303,693	\$368,698	21.4%	\$303,437	-17.7%
Diesel Fuel Tax	\$4,137,044	\$4,789,161	15.8%	\$3,143,096	-34.4%
Diesel Fuel Surcharge	\$759,233	\$923,634	21.7%	\$655,173	-29.1%
Aviation Fuel Tax	\$3,879,782	\$2,724,879	-29.8%	\$4,349,680	59.6%

Exhibit 7.4c
Liquid Fuels Tax Collection Variances, FY 2003 and FY 2004
and FY 2000 vs. FY 2004

	FY 2003	% variance From previous FY	FY 2004	% variance from previous FY	% variance between FY00 & FY04
Gasoline Tax	\$1,229,651	35.3%	\$990,809	-19.4%	-22.3%
Gasoline Tax Surcharge	\$395,727	30.4%	\$258,047	-34.8%	-15.0%
Diesel Fuel Tax	\$3,426,962	9.0%	\$2,726,965	-20.4%	-34.1%
Diesel Fuel Surcharge	\$989,808	51.1%	\$645,394	-34.8%	-15.0%
Aviation Fuel Tax	\$2,881,990	-33.7%	\$4,246,226	47.3%	9.4%

3.2.3 Liquid Fuels Tax Collection Projections

By comparing vehicle registrations with liquid fuels tax collections for Year 2000 and Year 2003, the average amount of liquid fuels taxes collected per vehicle is determined. Those calculations are presented in Exhibit 7.5a for all categories of liquid fuels taxes except aviation.

Exhibit 7.5a
Average Liquid Fuels Taxes Collected Per Vehicle for Period FY 2000 through FY 2003

	2000	Year 2000 Taxes per Vehicle	2003	Year 2003 Taxes per Vehicle	Average Taxes per Vehicle
Vehicle Registrations	97,763		92,320		
Gasoline Tax	\$1,274,775		\$1,229,651		
Gasoline Tax Surcharge	\$303,693		\$395,727		
Diesel Fuel Tax	\$4,137,044		\$3,426,962		
Diesel Fuel Surcharge	\$759,233		\$989,808		
Total	\$6,574,508	\$67.25	\$6,042,148	\$65.44	\$66.35

The average annual liquid fuels taxes collected was \$67.25 per vehicle in FY 2000 and \$65.44 per vehicle in FY 2003, yielding an average for the period of \$66.35 collected per vehicle per year. By comparing the average number of all vehicles per population (0.655), as established in Exhibit 7.5a and the population projections for Years 2015 and 2020 as previously established for this Plan, Exhibit 7.5b calculates the projected number of all vehicles in Year 2015 and 2020.

Exhibit 7.5b
Projected Number of All Vehicles for Year 2015 and Year 2020

	Actual for Census Year 2000	Base Year 2003		Projection for 2015	Ratio of Vehicles per Person	Projection for 2020	Ratio of Vehicles per Person
Population	154,805	136,228	(Est)	172,771		190,753	
Vehicles	97,763	92,320	(Actual)	113,096	@ .655 Veh/Per	124,867	@ .655 Veh/Per

Then, by comparing the number of vehicles in Year 2015 and Year 2020 with the average amount of liquid fuels taxes collected per vehicle, as established in Exhibit 7.5a, Exhibit 7.5c calculates the amount of projected liquid fuels taxes to be collected in Year 2015 and Year 2020 as \$7,503,913 and \$8,284,920, respectively. These projections assume no change in the amount of tax per gallon that is currently being assessed.

Exhibit 7.5c

**Projected Amount of Liquid Fuels Taxes and Registration Fees to be
Collected for Year 2015 and 2020**

Guam 2020 Highway Master Plan

YEAR	Projected Revenues			
	Registered Vehicles	Fuel Taxes @ \$66.35/Vehicle	Registration Fees @ \$30/ Vehicle	Total
2005	92,778	\$ 6,155,805	\$ 2,783,333	\$ 8,939,138
2006	94,634	\$ 6,278,937	\$ 2,839,007	\$ 9,117,943
2007	96,526	\$ 6,404,501	\$ 2,895,780	\$ 9,300,281
2008	98,456	\$ 6,532,584	\$ 2,953,693	\$ 9,486,276
2009	100,425	\$ 6,663,229	\$ 3,012,764	\$ 9,675,993
2010	102,434	\$ 6,796,524	\$ 3,073,033	\$ 9,869,557
2011	104,483	\$ 6,932,469	\$ 3,134,500	\$ 10,066,968
2012	106,573	\$ 7,071,106	\$ 3,197,184	\$ 10,268,290
2013	108,704	\$ 7,212,523	\$ 3,261,126	\$ 10,473,648
2014	110,878	\$ 7,356,763	\$ 3,326,343	\$ 10,683,106
2015	113,096	\$ 7,503,913	\$ 3,392,877	\$ 10,896,790
2016	115,358	\$ 7,653,973	\$ 3,460,726	\$ 11,114,699
2017	117,665	\$ 7,807,073	\$ 3,529,950	\$ 11,337,023
2018	120,018	\$ 7,963,214	\$ 3,600,549	\$ 11,563,762
2019	122,419	\$ 8,122,481	\$ 3,672,561	\$ 11,795,043
2020	124,867	\$ 8,284,920	\$ 3,746,007	\$ 12,030,927

Of the total revenues projected to be collected from vehicle registration fees and fuel taxes, it is assumed that 50% has been and will be dedicated to the repayment of past highway bond issues, highway maintenance and improvement of local/village streets. Based on this assumption, the remaining 50% can be dedicated the funding/financing highway capital improvement projects.

3.3 Defense Access Roads (DAR) Program - The following is a brief description of the Defense Access Roads Program as taken from the Federal Highway Administration website <http://www.fhwa.dot.gov/flh/defense.htm>:

The Defense Access Road (DAR) Program provides a means for the military to pay their fair share of the cost of public highway improvements necessary to mitigate an unusual impact of a defense activity. An unusual impact could be a significant increase in personnel at a military installation, relocation of an access gate, or the deployment of an oversized or overweight military vehicle or transporter unit.

To initiate a DAR project, the local military base identifies the access or mobility needs and brings these deficiencies to the attention of the Military Traffic Management Command (MTMC). The MTMC will either prepare a needs evaluation or request the FHWA to make an evaluation, in accordance with 23 CFR, Part 660E, of improvements that are necessary, develop a cost estimate, and determine the scope of work.

An onsite meeting is usually held before the evaluation begins to explain the DAR program, the process for performing the needs evaluation, identify possible alternates, and the assignment of work. The FHWA will forward the needs evaluation to the MTMC for their review and the review of the appropriate military service.

The MTMC will determine if the proposed work/project/improvements are eligible for DAR funds and certify the road as important to the national defense. Then military service requests funding for the project through their normal budgeting process. Once the funds are provided by Congress they are transferred to FHWA and allocated to the agency administering the project. Title 23 Federal-aid procedures are followed in the design and construction of the project.

Appendix H contains eligibility criteria for DAR funding. Exhibits 5.1a through 5.1c and 6.9a through 6.9c identify the Short and Long Range Program projects, respectively, which may be eligible for DAR funding.

3.4 Private Funding Sources - Private financing of public road infrastructure can be a viable source of highway funds under special circumstances. In the past, Guam has required large land use developments to provide access as a requirement for issuance of a development permit. Thus, private sources can be classified into the following distinct groups:

- Development agreements
- Traffic impact fees
- Special assessment districts

- Joint ventures
- Toll (road) assessments
- Tax increment financing

4.0 Implementation of Short and Long Range Programs

We recommend the implementation of the Short and Long Programs in phases to address highway improvements in accordance with a rational set of rules of establishing priority as follows:

1. Reconstruction of roadways to address serious highway traffic safety problems;
2. Reconstruction and widening of roadways to address significant highway traffic safety problems and to improve a poor level of highway service;
3. Reconstruction and/or widening of roadways to serve a development which will serve the general public in a significant way (*such as developing a safe access route to the new Landfill at Dandan*);
4. Creation and/or development of alternate access routes to heavily congested highway corridors (either existing or projected by traffic modeling) such as Route 1;
5. Development of a Defense Access Highway System;
6. Development of access infrastructure to serve a private development land use which will generate a significant traffic demand;
7. Reconstruction and widening of a highway corridor to enhance traffic flow and pedestrian travel.
8. The implementation of projects must begin with preliminary engineering and engineering design prior to construction. Accordingly, route feasibility studies must precede engineering design which, in turn, must precede the solicitation of bids for construction of improvements. Ample lead time must be set aside for preliminary studies and engineering design work.

The application of these rules to identify and schedule the design and construction of short and long range program projects may involve multiple rules which may affect the level of priority of a single or group of projects.

Exhibits 7.6a, 7.6b and 7.6c present phasing recommendations for Short and Long Range Program projects in order of priority. The recommended yearly funding schemes along with estimates for recommended Short and Long Range highway program projects are shown in Exhibit 7.7. Both the Short Range Program plan and Long Range Program, Concept A plan can be implemented within expected levels of funding. However, the implementation of the Long Range Program Concept B will experience a shortfall of funds of \$53.93 million.

EXHIBIT 7.6a
RECOMMENDED PROJECT PROGRAM AND FUNDING LEVELS NEEDED
SHORT RANGE PROGRAM
Guam 2020 Highway Master Plan

Program/Project			Recommendations	
Number	Name/Description	Concept Cost (\$ million)	Recommended Phase	Notes
	Short Range			
SRP-12	Route 4, Ylig Bridge to Cross Island Road	\$ 3.40	Phase 1	Necessary to improve traffic flow and highway safety along the primary access route to the new MSWL facility
SRP-11	Route 4, Cross Island Road to Talofofo River Bridge	\$ 13.60	Phase 1	Necessary to improve traffic flow and highway safety along the primary access route to the new MSWL facility
SRP-15	Route 4, Talofofo River Bridge to Inarajan Village	\$ 18.50	Phase 1	Necessary to improve traffic flow and highway safety along the primary access route to the new MSWL facility
	Total Funding Requirement for Phase 1	\$ 35.50		
SRP-7	Route 15, Route 10 to Carnation Avenue (Route 26)	\$ 18.30	Phase 2	Will improve traffic safety and flow over an important bypass to Route 1 and a potential Defense Access Road.
SRP-8	Route 15, Carnation Avenue (Route 26) to Andersen Air Force Base	\$ 30.52	Phase 2	Will improve traffic safety and flow over an important bypass to Route 1 and a potential Defense Access Road.
	Total Funding Requirement for Phase 2	\$ 48.82		
SRP-1	Cold Storage Road Extension	\$ 2.81	Phase 3	The continuing development of the Harmon industrial park and areas to the north will require the construction of this collector road.
SRP-2	Harmon Connector and Reconstruction of Harmon Strip and Harmon Access Roads	\$ 3.60	Phase 3	The continuing development of the Harmon industrial park and areas to the north will require the construction of this collector road.
SRP-3	Macheche/Carnation Avenue (Route 26), Route 1 to Route 15	\$ 4.05	Phase 3	Reconstruction and widening of this east-west connector (Route 15 to Route 1) will be important once the reconstruction and widening of Route 15 is complete.
SRP-6	Alegeta Street (Route 25), Airport Road to Route 26 (Carnation Avenue)	\$ 4.85	Phase 3	This undersized collector road must be realigned and widened following a corridor study to determine routing.
SRP-9	West O'Brien Drive, Aspinall Avenue to Chalan Obispo	\$ 1.69	Phase 3	This importance of the reconstruction of this collector road will depend on the status of the revitalization of Hagatna.
SRP-10	Peter Nelson Dr., Chalan Obispo to Route 4	\$ 2.19	Phase 3	The reconstruction of this road will correct alignment and improve its intersection with Route 4 and Chalan Obispo.

EXHIBIT 7.6a
RECOMMENDED PROJECT PROGRAM AND FUNDING LEVELS NEEDED
SHORT RANGE PROGRAM
Guam 2020 Highway Master Plan

Program/Project			Recommendations	
Number	Name/Description	Concept Cost (\$ million)	Recommended Phase	Notes
SRP-17	Route 15 to Route 1 Connector (Chalan Lujuna Extension)	\$ 4.58	Phase 3	Reconstruction and widening of this east-west connector (Route 15 to Route 1) will be important once the reconstruction and widening of Route 15 is complete and the Guam Raceway Park events begin to achieve significant attendance.
	Total Funding Requirement for Phase 3	\$ 23.77		
SRP-4	Jalaguac Road Connector, Route 1 to Route 8 Through Tiyan	\$ 4.57	Phase 4	This roadway is vital to the improvement of traffic flow in central and northern Guam. However, real estate issues created by a recent law will require a corridor study and ample time for land acquisition.
SRP-13	Route 2, Namo River to Agat Cemetery	\$ 11.20	Phase 4	The reconstruction and widening of Route 2 through the village area will improve traffic and pedestrian flow.
SRP-14	Route 2, Agat Cemetery to Santa Ana Chapel	\$ 4.49	Phase 4	The reconstruction and widening of Route 2 from Agat village will improve traffic flow to southern Guam.
SRP-16	Route 4, Merizo Village to Umatac Village	\$ 13.70	Phase 4	The reconstruction of this segment of Route 4 will improve road geometrics.
	Total Funding Requirement for Phase 4	\$ 33.96		
SRP-5	Route 3, Marine Corps Drive to Potts Junction	\$ 20.33	Phase 5	Route 3 reconstruction and widening is prompted by the potential development of returned ancestral lands between northwest field and Harmon Cliffline.
SRP-18	Route 5 and Route 12, Naval Magazine Area	\$ 3.51	Phase 5	This project will improve traffic flow to Route 17 and areas surrounding the Route 12 & 5 corridors.
	Total Funding Requirement for Phase 5	\$ 23.84		
	Total Short Range Funding Requirement	\$ 165.89	Phases 1 - 5	

EXHIBIT 7.6b
RECOMMENDED PROJECT PROGRAM AND FUNDING LEVELS NEEDED
LONG RANGE PROGRAM - CONCEPT A
Guam 2020 Highway Master Plan

Program/Project			Recommendations	
Number	Name/Description	Concept Cost (\$ million)	Recommended Phase	Notes
	Long Range Program - Concept A			
LRP-A7	Airport Access Road	\$ 2.09	Phase 1	This is an essential companion project to LRP-A8.1 and A8.2 and facilitates the effectiveness of an important bypass to Route 1 through central Tamuning.
LRP-A8.1	Laderan Tiyan Parkway, Tiyan Corridor	\$ 5.13	Phase 1	Phase 1 projects create an important bypass to Route 1 through central Tamuning and, with the Jalaguac Connector, will relieve traffic congestion in East Agana and Tamuning, but will require return of the Laderan Tiyan Parkway Corridor by DPW.
LRP-A8.2	Laderan Tiyan Parkway, Route 10A Bypass	\$ 10.71	Phase 1	In addition to creating a bypass to Route 1, this project will separate airport access from the public thoroughfare function of Route 10A.
	Total Funding Requirement for Phase 1	\$ 17.93		
LRP-A11	Route 7 Extension	\$ 5.09	Phase 2	This project provides another Route 1 bypass link and will connect to the Laderan Tiyan Parkway at Route 8.
LRP-A12	Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7	\$ 2.64	Phase 2	This project enhances the function of Route 7 Extension.
LRP-A10	Route 8, Barrigada	\$ 11.39	Phase 2	This project will complement the Route 7 Extension Route 1 bypass function. This is a potential Defense Access Road.
	Total Funding Requirement for Phase 2	\$ 19.12		
LRP-A2	Ukudu Connector	\$ 12.16	Phase 3	This will provide an important link to a large area of Dededo that is expected to experience extensive residential development within the next 15 years.
LRP-A3	Mogfog Connector	\$ 13.76	Phase 3	In combination with Route 15, this project will provide a critical link in the development of a free flowing alternate access to Mangilao, Dededo and Yigo.
LRP-A5	Adacao Connector	\$ 9.55	Phase 3	This project will link a reconstructed and widened Route 15 with Route 16.
LRP-A6	Route 15 - Adacao Area	\$ 2.02	Phase 3	This project will complement the function of the Mogfog and Adacao Connectors.
	Total Funding Requirement for Phase 3	\$ 37.49		
LRP-A4	Macheche Connector	\$ 9.22	Phase 4	This critical link between Alegata Street and the Mogfog Connector will serve to relieve traffic on Route 1.

EXHIBIT 7.6b
RECOMMENDED PROJECT PROGRAM AND FUNDING LEVELS NEEDED
LONG RANGE PROGRAM - CONCEPT A
Guam 2020 Highway Master Plan

Program/Project			Recommendations	
Number	Name/Description	Concept Cost (\$ million)	Recommended Phase	Notes
LRP-A9	Route 16, Barrigada	\$ 8.42	Phase 4	The project will complement the function of the Adacao Connector, and Route 8.
LRP-A1	Marine Drive, Marbo to Yigo Area	\$ 15.00	Phase 4	This project will widen Route 1 to its ultimate section.
LRP-A16	Marine Drive, Piti Area	\$ 11.59	Phase 4	This project will widen Route 1 to its ultimate section.
	Total Funding Requirement for Phase 4	\$ 44.23		
LRP-A13	Route 10 - Mangilao to Barrigada	\$ 6.05	Phase 5	The reconstruction and widening of Route 10 through the village area will improve traffic and pedestrian flow.
LRP-A14	Route 15 - Mangilao Area	\$ 3.06	Phase 5	The reconstruction and widening of Route 15 through the developed area along the corridor will improve traffic and pedestrian flow as well as enhance this Defense Access Road.
LRP-A15	Route 5 - Apra Heights to Camp Covington	\$ 6.30	Phase 5	This project will improve traffic flow to Route 17 and areas surrounding the Route 5 corridor.
	Total Funding Requirement for Phase 5	\$ 15.41		
	Total Long Range Program Funding Requirement	\$ 134.18	Phases 1 - 5	

EXHIBIT 7.6c
RECOMMENDED PROJECT PROGRAM AND FUNDING LEVELS NEEDED
LONG RANGE PROGRAM - CONCEPT B
Guam 2020 Highway Master Plan

Program/Project			Recommendations	
Number	Name/Description	Concept Cost (\$ million)	Recommended Phase	Notes
	Long Range Program - Concept B			
LRP-B8	Airport Access Road	\$ 2.09	Phase 1	This is an essential companion project to LRP-A9.1 and A9.2 and facilitates the effectiveness of an important bypass to Route 1 through central Tamuning.
LRP-B9.1	Laderan Tiyan Parkway, Tiyan Corridor	\$ 5.13	Phase 1	Phase 1 projects create an important bypass to Route 1 through central Tamuning and, with the Jalaguac Connector, will relieve traffic congestion in East Agana and Tamuning, but will require return of the Laderan Tiyan Parkway Corridor by DPW.
LRP-B9.2	Laderan Tiyan Parkway, Route 10A Bypass	\$ 10.71	Phase 1	In addition to creating a bypass to Route 1, this project will separate airport access from the public thoroughfare function of Route 10A.
	Total Funding Requirement for Phase 1	\$ 17.93		
LRP-B13	Route 7 Extension	\$ 5.09	Phase 2	This project provides another Route 1 bypass link and will connect to the Laderan Tiyan Parkway at Route 8.
LRP-B14	Spruance Drive/Halsey Road (Route 6) Reconstruction, Route 1 to Route 7	\$ 2.64	Phase 2	This project enhances the function of Route 7 Extension.
LRP-B12	Route 8, Barrigada	\$ 11.39	Phase 2	This project will complement the Route 7 Extension Route 1 bypass function. This is a potential Defense Access Road.
	Total Funding Requirement for Phase 2	\$ 19.12		
LRP-B3	Ukudu Connector	\$ 12.16	Phase 3	This will provide an important link to a large area of Dededo that is expected to experience extensive residential development within the next 15 years.
LRP-B4	Mogfog Connector	\$ 13.76	Phase 3	In combination with Route 15, this project will provide a critical link in the development of a free flowing alternate access to Mangilao, Dededo and Yigo
LRP-B6	Adacao Connector	\$ 9.55	Phase 3	This project will link a reconstructed and widened Route 15 with Route 16.
LRP-B7	Route 15 - Adacao Area	\$ 2.02	Phase 3	This project will complement the function of the Mogfog and Adacao Connectors.
	Total Funding Requirement for Phase 3	\$ 37.49		
LRP-B5	Macheche Connector	\$ 9.22	Phase 4	This critical link between Alegata Street and the Mogfog Connector will serve to relieve traffic on Route 1.

EXHIBIT 7.6c
RECOMMENDED PROJECT PROGRAM AND FUNDING LEVELS NEEDED
LONG RANGE PROGRAM - CONCEPT B
Guam 2020 Highway Master Plan

Program/Project			Recommendations	
Number	Name/Description	Concept Cost (\$ million)	Recommended Phase	Notes
LRP-B11	Route 16, Barrigada	\$ 8.42	Phase 4	The project will complement the function of the Adacao Connector and Route 8.
LRP-B2	Marine Drive, Marbo to Yigo Area	\$ 15.00	Phase 4	This project will widen Route 1 to its ultimate section.
LRP-B23	Marine Drive, Piti Area	\$ 11.59	Phase 4	This project will widen Route 1 to its ultimate section.
	Total Funding Requirement for Phase 4	\$ 44.23		
LRP-B17	Route 10 - Mangilao to Barrigada	\$ 6.05	Phase 5	The reconstruction and widening of Route 10 through the village area will improve traffic and pedestrian flow.
LRP-B18	Route 15 - Mangilao Area	\$ 3.06	Phase 5	The reconstruction and widening of Route 15 through the developed area along the corridor will improve traffic and pedestrian flow as well as enhance this Defense Access Road.
LRP-B22	Route 5 - Apra Heights to Camp Covington	\$ 6.30	Phase 5	This project will improve traffic flow to Route 17 and areas surrounding the Route 5 corridor.
LRP-B1	Upi Connector	\$ 5.29	Phase 5	This project will provide a critical link between Route 1 and Route 15 to serve the development of northeastern Guam.
	Total Funding Requirement for Phase 5	\$ 20.70		
LRP-B10	Marine Corps Drive Lower tiyan Cliffline Bypass/Service Road	\$ 12.19	Phase 6	This project will be critical if the commercial and industrial properties at the base of the Tiyan cliffline develop.
LRP-B19	Spruance Drive (Route 6) - Route 4 Connector through Lonfit Region to Ordot-Mongmong Connector (LRP-B15)	\$ 17.41	Phase 6	This project provides an alternate access through central Guam in conjunction with LRP-B15 and will connect to the Laderan Tiyan Parkway at Route 8.
LRP-B16	Conga-Mangilao Connector	\$ 6.46	Phase 6	This potential DAR will link the Ordot-Mongmong Connector to Route 15.
LRP-B15	Ordot-Mongmong Connector	\$ 8.31	Phase 6	This project provides a critical segment in the Route 6 to Route 8 alternate access corridor.
LRP-B20	Cotal Connector	\$ 18.83	Phase 6	This potential DAR links Route 17 with the Leo Palace Access Road, then to LRP-B19 & B15 connectors.
LRP-B21	Cross-Island Road (Route 17) Realignment	\$ 12.59	Phase 6	This potential DAR will improve the function of Cross-Island Road by realignment.
	Total Funding Requirement for Phase 6	\$ 75.79		
	Total Long Range Program Funding Requirement	\$ 215.26	Phases 1 - 5	

EXHIBIT 7.7
RECOMMENDED PROJECT PROGRAM
AND FUNDING LEVELS NEEDED
Expressed in Constant 2005 Dollars

Guam 2020 Highway Master Plan

Year	Program	Phase	Funds (Millions)		
			Needed	Available from FHWA & Local Sources ¹	Shortfall/Excess ²
2005	Short Range	Phases 1&2	\$ 16.86	\$ 18.47	\$ 1.61
2006	FHWA funding level to \$16 Million FHWA funding level to \$20 Million	Phases 1&2	\$ 20.87	\$ 22.17	\$ 1.30
2007		Phases 1&2	\$ 19.02	\$ 25.95	\$ 6.93
2008		Phase 1&2	\$ 19.11	\$ 24.74	\$ 5.63
2009		Phases 2,3&4	\$ 19.22	\$ 30.47	\$ 11.25
2010		Phase 3&4	\$ 15.65	\$ 24.93	\$ 9.28
2011		Phase 3&4	\$ 23.10	\$ 34.32	\$ 11.22
2012		Phase 3&4	\$ 8.22	\$ 25.13	\$ 16.91
2013		Phase 5	\$ 23.84	\$ 36.15	\$ 12.31
2014	Begin Long Range Projects (see below)			\$ 33.65	\$ 33.65
			\$ 165.89		\$ 33.65
2014	Long Range Concept A	Phases 1 &2	\$ 29.32	\$ 33.65	\$ 4.33
2015		Phases 2&3	\$ 19.89	\$ 29.78	\$ 9.89
2016		Phase 3	\$ 25.33	\$ 35.45	\$ 10.12
2017		Phase 4	\$ 17.64	\$ 35.68	\$ 18.04
2018		Phase 4	\$ 15.00	\$ 43.59	\$ 28.59
2019		Phase 4&5	\$ 27.00	\$ 54.15	\$ 27.15
			\$ 134.18		\$ 27.15
2014	Long Range Concept B	Phases 1 &2	\$ 29.32	\$ 33.65	\$ 4.33
2015		Phase 2	\$ 19.89	\$ 29.78	\$ 9.89
2016		Phase 3	\$ 25.33	\$ 35.45	\$ 10.12
2017		Phase 4	\$ 17.64	\$ 35.68	\$ 18.04
2018		Phase 4	\$ 26.59	\$ 43.59	\$ 17.00
2019		Phase 5&6	\$ 96.49	\$ 42.56	\$ (53.93)
			\$ 215.26		\$ (53.93)

¹ Only 50% of local funding sources (fuel taxes and vehicle registration fees) are used in these projections. The remaining 50% is assumed to be dedicated to highway-related operations and maintenance and to fund improvements to village streets.

² A shortfall or excess in funds available in any year is carried over to the following year.

5.0 Funding Conclusions and Options

5.1 Conclusions Based on Existing Funding Levels

A review of Exhibits 7.6a through 7.6c and 7.7 which collectively recommend short and long range program projects based on existing funding levels yield the following conclusions:

Assumptions

- FHWA funding level will remain at \$16 million for 2006 and increasing to a peak of \$20 million per year beginning in 2007, with this fixed amount available for funding future highway capital improvement projects.
- Liquid fuel taxes will increase in proportion to an increase in the number of registered vehicles in general accord with the methodology set forth in Section 3 of this Chapter.
- Vehicle registration fees will remain at the same rate, but will increase in proportion to an increase in the number of registered vehicles in general accord with the methodology set forth in Section 3 of this Chapter.
- Total projected increase in fuel tax and vehicle registration revenues will increase to \$8.94 million in 2005 and \$12.03 million in 2020 as shown in Exhibit 7.5c.
- One-half or 50% of the combined fuel tax and vehicle registration revenues can be made available to fund future highway capital improvement projects. The remaining 50% is assumed to be dedicated to funding the debt service for existing highway bond issues, yearly highway-related operations and maintenance budgets and improvements to village streets.
- Funding levels and estimates are expressed in 2005 dollars with no allowances made for inflation.

Conclusions

1. The Short Range Program highway improvement projects can be funded by proper management of revenues coupled with timely phasing of program implementation. (See Exhibit 7.7)
2. The funding of Long Range Program Concept A highway improvement projects will experience an excess of \$27.15 million, some of which is expected to be offset by inflationary increases in the cost of labor and pricing of materials and equipment.
3. The funding of Long Range Program Concept B highway improvement projects will experience a large shortfall of \$53.93 million.
4. DPW has to create or find sources of additional funds to make up this projected shortfall.

There are a multitude of options to increase highway program funding levels, including:

1. Raise the liquid fuel tax rate for vehicles for diesel and gasoline powered vehicles 29% per gallon which will result in an approximate average annual tax burden per vehicle of a nominal amount of \$85;
2. Raise the Vehicle Registration Fee from an average of \$30 per vehicle to \$45 per

- vehicle or a 50% increase.
3. Hold the minimum FHWA funding level at \$20 million.
 4. Obtain Defense Highway Access Funding to underwrite the cost of DAHF projects under Concept B.

Exhibits 7.8a and 7.8b show the results of the implementation of these funding options.

Exhibit 7.8a HISTORICAL HIGHWAY FUNDING SOURCES		
Guam 2020 Highway Master Plan		
SOURCE	Funding Sources	
	Category/Specification	Proposed Rate
Fuel Tax	Automotive Diesel Fuel Gasoline (Automotive) Aviation Fuel	\$0.20 per gallon \$0.20 per gallon \$0.04 per gallon
Vehicle Registrations	Estimated Average	\$45 per vehicle
Federal Highway Administration	Per Annum (from 2007)	\$20 Million

Exhibit 7.8b

**Projected Amount of Liquid Fuels Taxes and Registration Fees to be Collected
for Year 2015 and 2020**

(Based on a 29% increase in taxes and a 50% increase in registration fees)

Guam 2020 Highway Master Plan

YEAR	Projected Revenues			
	Registered Vehicles	Fuel Taxes @ \$85/Vehicle	Registration Fees @ \$45/ Vehicle	Total
Factors-->	0.6546	\$ 85	\$ 45	
2005	92,778	\$ 7,886,110	\$ 4,175,000	\$ 12,061,110
2006	94,634	\$ 8,043,852	\$ 4,258,510	\$ 12,302,363
2007	96,526	\$ 8,204,711	\$ 4,343,670	\$ 12,548,381
2008	98,456	\$ 8,368,796	\$ 4,430,539	\$ 12,799,335
2009	100,425	\$ 8,536,164	\$ 4,519,146	\$ 13,055,310

2010	102,434	\$ 8,706,926	\$ 4,609,549	\$ 13,316,475
2011	104,483	\$ 8,881,083	\$ 4,701,750	\$ 13,582,832
2012	106,573	\$ 9,058,689	\$ 4,795,776	\$ 13,854,465
2013	108,704	\$ 9,239,856	\$ 4,891,688	\$ 14,131,544
2014	110,878	\$ 9,424,640	\$ 4,989,515	\$ 14,414,155
2015	113,096	\$ 9,613,151	\$ 5,089,315	\$ 14,702,467
2016	115,358	\$ 9,805,391	\$ 5,191,089	\$ 14,996,480
2017	117,665	\$ 10,001,525	\$ 5,294,925	\$ 15,296,451
2018	120,018	\$ 10,201,555	\$ 5,400,823	\$ 15,602,378
2019	122,419	\$ 10,405,590	\$ 5,508,842	\$ 15,914,432
2020	124,867	\$ 10,613,688	\$ 5,619,011	\$ 16,232,699

Exhibit 7.8c presents recommended yearly funding schemes along with estimates for recommended Short and Long Range Program projects based on increased funding levels and the availability of Defense Access Highway Funding. Both Short Range Program and Long Range Program Concept "A" Plans can be implemented based on recommended increases in fuel tax rates and vehicle registration fees, coupled with minimum annual FHWA funding of \$20 million. The Long Range Program Concept "B" plan will experience a shortfall of about \$40.2 million. This shortfall can be offset to a large extent by acquiring Defense Access Highway funding in the amount of \$49.3 million for "DAHf"-designated projects, with a projected excess of over \$9 million.

It is, therefore, strongly recommended that DPW seek the following highway-related revenue funding adjustments:

- Raise the liquid fuel tax rate for vehicles for diesel and gasoline powered vehicles 29¢ per gallon which will result in an average annual tax burden per vehicle of \$85;
- Raise the Vehicle Registration Fee from an average of \$30 per vehicle to \$45 per vehicle (or an average 50% increase in fees).
- Hold the annual FHWA funding level to a minimum of \$20 million.
- Obtain Defense Highway Access Funding to underwrite the cost of DAHF projects under Concept B of about \$49.26 million.

EXHIBIT 7.8c
RECOMMENDED PROJECT PROGRAM
WITH INCREASED FUNDING LEVELS AND DAHF FUNDING
Expressed in Constant 2005 Dollars

Guam 2020 Highway Master Plan

Year	Program	Phase	Funds (Millions)		
			Needed	Available from FHWA & Local Sources ¹	Shortfall/Excess ²
2005	Short Range FHWA funding level to \$16 Million FHWA funding level to \$20 Million	Phases 1&2	\$ 22.88	\$ 20.03	\$ (2.85)
2006		Phases 1&2	\$ 20.87	\$ 19.30	\$ (1.57)
2007		Phases 1&2	\$ 25.30	\$ 24.71	\$ (0.59)
2008		Phase 1,2&3	\$ 21.68	\$ 26.40	\$ 4.72
2009		Phases 3&4	\$ 21.93	\$ 31.25	\$ 9.32
2010		Phase 3&4	\$ 22.54	\$ 26.66	\$ 4.12
2011		Phase 4&5	\$ 24.35	\$ 30.91	\$ 6.56
2012		Phase 5	\$ 6.34	\$ 22.93	\$ 16.59
2013	Begin Long Range Projects (see below)			\$ 39.65	\$ 39.65
			\$ 165.89		\$ 39.65
2013	Long Range Concept A	Phases 1 & 2	\$ 45.05	\$ 39.65	\$ (5.40)
2014		Phases 2&3	\$ 19.94	\$ 21.95	\$ 2.01
2015		Phase 3&4	\$ 27.19	\$ 29.51	\$ 2.32
2016		Phase 4	\$ 26.59	\$ 29.82	\$ 3.23
2017		Phase 5	\$ 15.41	\$ 30.73	\$ 15.32
			\$ 134.18		\$ 15.32
2014	Long Range Concept B	Phases 1 & 2	\$ 39.07	\$ 39.65	\$ 0.58
2015		Phase 2	\$ 25.92	\$ 27.93	\$ 2.01
2016		Phase 3&4	\$ 27.19	\$ 29.51	\$ 2.32
2017		Phase 4	\$ 26.59	\$ 29.82	\$ 3.23
2018		Phase 5	\$ 20.70	\$ 30.73	\$ 10.03
2019		Phase 6	\$ 75.79	\$ 35.59	\$ (40.20)
			\$ 215.26		\$ (40.20)
	Proposed Defense Access Highways Funded (DAHF) Projects (Exhibit 6.9a)				\$ 49.26
	Projected Excess/Shortfall in Concept B Implementation				\$ 9.06

¹ Only 50% of local funding sources (fuel taxes and vehicle registration fees) are used in these projections. The remaining 50% is assumed to be dedicated to highway-related operations and maintenance and to fund improvements to village streets.

² A shortfall or excess in funds available in any year is carried over to the following year.

GUAM 2020 HIGHWAY MASTER PLAN REPORT FINAL

APPENDICES

Appendix A	Estimated 2003 Demographic Data
Appendix B	Estimated 2003 Land Use Data
Appendix C	Projected 2015 Demographic Data
Appendix D	Projected 2015 Land Use Data
Appendix E	Projected 2020 Demographic Data
Appendix F	Projected 2020 Land Use Data
Appendix G	Guam Statewide Transportation Improvement Plan, FY 2005 - 2007
Appendix H	DAR Funding Eligibility Criteria

APPENDIX A

GUAM 2020 HIGHWAY MASTER PLAN

ESTIMATED 2003 DEMOGRAPHIC DATA

Appendix A
Estimated 2003 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total		Households by Size Group			Instit. Total	Population in Group Quarters			
	Population	Households	1 - 2 People	3 - 4 People	5 or more		Total	Dorms	Military	Other
1	855	214	64	123	27	0	156	0	156	0
2	3,085	825	234	453	138	0	304	0	304	0
3	1,654	357	69	121	167	0	0	0	0	0
4	1,111	250	63	83	104	0	0	0	0	0
5	1,871	414	91	141	182	0	0	0	0	0
6	1,116	256	65	84	107	0	0	0	0	0
7	897	204	39	83	82	0	0	0	0	0
8	146	43	15	16	12	0	0	0	0	0
9	3,382	765	158	284	323	0	4	0	0	4
10	376	84	20	31	33	0	0	0	0	0
11	532	177	76	66	35	0	0	0	0	0
12	1,584	356	69	137	150	0	0	0	0	0
13	529	131	40	51	40	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	9	0	0	0	0	0	9	0	9	0
16	405	99	41	55	3	0	121	0	121	0
17	1,307	282	53	94	135	0	0	0	0	0
18	5,204	1,202	276	420	506	0	26	0	0	26
19	1,479	321	55	112	154	0	2	0	0	2
20	1,088	309	72	174	63	0	0	0	0	0
21	2,871	607	128	188	291	0	0	0	0	0
22	47	8	2	1	5	0	0	0	0	0
23	3,191	709	153	251	305	0	0	0	0	0
24	2,404	579	163	195	221	0	3	0	0	3
25	1,121	254	44	110	100	0	4	0	0	4
26	2,079	451	99	163	189	24	15	0	0	15
27	5,503	1,217	284	409	524	0	48	0	0	48
28	1,409	340	99	118	123	0	23	0	0	23
29	141	36	10	15	11	0	0	0	0	0
30	3,283	777	183	299	295	0	26	0	0	26
31	788	193	55	77	61	0	0	0	0	0
32	891	247	84	94	69	0	0	0	0	0
33	2,123	515	129	192	194	0	1	0	0	1
34	109	28	8	11	9	0	0	0	0	0
35	2,621	701	215	277	209	0	3	0	0	3
36	0	0	0	0	0	0	0	0	0	0
37	60	12	4	2	6	0	1	0	0	1
38	818	267	128	84	55	0	0	0	0	0
39	724	225	98	79	48	0	25	0	0	25
40	26	8	2	4	2	0	0	0	0	0
41	345	107	49	36	22	0	0	0	0	0
42	742	241	114	84	43	0	0	0	0	0
43	12	6	4	2	0	0	0	0	0	0
44	69	39	31	8	0	0	2	0	0	2
45	92	31	15	12	4	0	0	0	0	0
46	664	249	132	91	26	0	0	0	0	0
47	192	115	100	12	3	0	3	0	0	3
48	540	251	175	67	9	0	0	0	0	0

Appendix A
Estimated 2003 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Dorms	Military	Other
49	246	79	39	28	12	0	0	0	0	0
50	7	5	5	0	0	0	0	0	0	0
51	609	275	195	62	18	0	0	0	0	0
52	26	10	5	3	2	0	0	0	0	0
53	50	25	18	5	2	0	0	0	0	0
54	2,055	599	260	196	143	0	42	0	0	42
55	1,363	454	212	158	84	0	0	0	0	0
56	807	373	275	62	36	0	0	0	0	0
57	3,304	990	410	337	243	0	0	0	0	0
58	122	54	36	14	4	0	0	0	0	0
59	114	37	25	5	7	0	15	0	0	15
60	189	50	17	18	15	0	2	0	0	2
61	160	40	11	13	16	0	3	0	0	3
62	166	42	17	7	18	0	0	0	0	0
63	14	4	0	3	1	0	0	0	0	0
64	455	131	53	48	30	0	9	0	0	9
65	522	205	113	73	19	0	0	0	0	0
66	275	66	22	26	18	0	37	0	0	37
67	95	8	3	4	1	0	74	0	0	74
68	591	139	60	52	27	0	130	0	0	130
69	401	98	31	29	38	0	11	0	0	11
70	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0
72	1,703	440	140	172	128	53	24	0	0	24
73	11	5	3	2	0	0	0	0	0	0
74	1,397	347	103	136	108	0	50	0	0	50
75	2,812	641	150	237	254	0	10	0	0	10
76	1,275	303	84	98	121	0	8	0	0	8
77	0	0	0	0	0	0	0	0	0	0
78	3,473	844	225	300	319	0	16	0	0	16
79	13	4	1	1	2	0	0	0	0	0
80	1,360	300	64	112	124	0	4	4	0	0
81	499	115	24	45	46	0	0	0	0	0
82	845	197	50	63	84	0	0	0	0	0
83	7	1	0	0	1	0	0	0	0	0
84	1,445	199	52	70	77	592	0	0	0	0
85	553	144	61	40	43	0	31	0	0	31
86	1,042	307	136	95	76	0	0	0	0	0
87	1,482	459	205	161	93	0	33	0	0	33
88	1,157	271	85	82	104	0	63	54	0	9
89	0	0	0	0	0	0	0	0	0	0
90	188	55	23	17	15	0	0	0	0	0
91	1,038	304	125	95	84	0	7	0	0	7
92	1,272	309	83	99	127	0	0	0	0	0
93	946	230	62	78	90	0	0	0	0	0
94	47	16	10	5	1	0	10	0	0	10
95	435	150	79	42	29	0	4	0	0	4
96	1,265	386	162	136	88	0	0	0	0	0

Appendix A
Estimated 2003 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Dorms	Military	Other
97	662	197	85	62	50	0	1	0	0	1
98	11	2	2	0	0	0	9	0	0	9
99	68	17	7	3	7	0	3	0	0	3
100	11	2	0	2	0	0	4	0	0	4
101	194	0	0	0	0	184	10	0	0	10
102	90	39	31	4	4	0	1	0	0	1
103	1,849	456	138	163	155	0	2	0	0	2
104	460	132	58	47	27	0	17	0	0	17
105	88	26	14	6	6	0	9	0	0	9
106	183	56	36	18	2	6	46	0	46	0
107	1,345	412	177	139	96	0	7	0	0	7
108	1,940	463	129	162	172	0	10	0	0	10
109	0	0	0	0	0	0	0	0	0	0
110	716	182	49	73	60	0	0	0	0	0
111	895	242	84	86	72	0	1	0	0	1
112	209	51	17	18	16	0	0	0	0	0
113	966	236	83	71	82	0	49	0	0	49
114	1,900	535	210	178	147	0	0	0	0	0
115	163	44	15	11	18	0	0	0	0	0
116	1,337	339	113	107	119	0	18	0	0	18
117	720	188	58	68	62	0	0	0	0	0
118	127	43	24	12	7	0	1	0	0	1
119	16	1	1	0	0	0	47	0	0	47
120	621	163	55	48	60	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0
122	723	231	101	90	40	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0
124	106	20	11	4	5	0	0	0	0	0
125	4	1	0	1	0	0	0	0	0	0
126	95	38	21	15	2	0	0	0	0	0
127	862	181	40	56	85	0	18	0	0	18
128	759	144	18	48	78	0	0	0	0	0
129	933	192	29	64	99	0	0	0	0	0
130	599	142	33	54	55	0	2	0	0	2
131	671	152	41	46	65	0	24	0	0	24
132	112	41	19	19	3	0	0	0	0	0
133	1,287	314	90	107	117	0	0	0	0	0
134	383	95	26	36	33	0	0	0	0	0
135	2,144	526	197	281	48	0	578	0	578	0
136	1,140	297	100	101	96	0	0	0	0	0
137	1,360	352	73	165	114	0	0	0	0	0
138	605	147	36	58	53	0	0	0	0	0
139	1,060	246	64	84	98	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
141	365	91	26	32	33	0	1	0	0	1
142	3,509	798	216	242	340	0	19	0	0	19
143	1,103	256	69	98	89	0	0	0	0	0
144	26	9	4	3	2	0	0	0	0	0

Appendix A
Estimated 2003 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Non-Institutional Dorms	Military	Other
145	1,221	260	55	84	121	0	0	0	0	0
146	744	204	72	70	62	0	0	0	0	0
147	838	178	33	67	78	0	20	0	0	20
148	781	142	22	36	84	0	0	0	0	0
149	275	67	20	20	27	0	0	0	0	0
150	1,808	381	73	133	175	0	14	0	0	14
151	411	80	15	29	36	0	0	0	0	0
152	193	38	8	9	21	0	0	0	0	0
153	887	191	48	60	83	0	0	0	0	0
154	1,016	224	55	76	93	0	0	0	0	0
155	291	0	0	0	0	0	291	0	291	0
156	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0	0	0
Totals	136,213	34,077	10,743	12,104	11,230	859	2,561	58	1,505	998

APPENDIX B

GUAM 2020 HIGHWAY MASTER PLAN

ESTIMATED 2003 LAND USE DATA

Appendix B
Estimated 2003 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA Students	School System Employees
1	0	1,153	30	0	121	1,002	0	0
2	0	2,180	266	0	1,092	698	1,147	124
3	351	50	10	0	40	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	651	105	21	0	84	0	0	0
8	0	35	7	0	28	0	0	0
9	3,423	316	62	0	254	0	0	0
10	0	105	71	0	34	0	0	0
11	0	35	7	0	28	0	0	0
12	683	105	21	0	84	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	193	0	0	0	193	0	0
17	0	63	12	0	51	0	0	0
18	1,091	126	25	0	101	0	0	0
19	0	63	12	0	51	0	0	0
20	0	0	0	0	0	0	0	0
21	634	126	25	0	101	0	0	0
22	0	0	0	0	0	0	0	0
23	754	126	25	0	101	0	0	0
24	0	252	49	0	203	0	0	0
25	2,624	315	62	0	253	0	0	0
26	0	63	12	0	51	0	0	0
27	0	63	12	0	51	0	0	0
28	0	944	785	0	159	0	0	0
29	0	63	12	0	51	0	0	0
30	0	31	6	0	25	0	0	0
31	0	31	6	0	25	0	0	0
32	699	252	49	0	203	0	0	0
33	0	252	49	0	203	0	0	0
34	0	157	81	0	76	0	0	0
35	0	157	31	0	126	0	0	0
36	0	63	12	0	51	0	0	0
37	0	123	24	0	99	0	0	0
38	0	123	24	0	99	0	0	0
39	550	1,234	424	0	810	0	0	0
40	0	0	0	0	0	0	0	0
41	1,152	617	121	0	496	0	0	0
42	0	123	24	0	99	0	0	0
43	0	624	122	475	27	0	0	0
44	0	702	122	537	43	0	0	0
45	0	312	76	0	236	0	0	0
46	0	445	121	7	317	0	0	0
47	0	624	122	140	362	0	0	0
48	0	546	122	0	424	0	0	0

Appendix B
Estimated 2003 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA Students	School System Employees
49	0	858	153	690	15	0	0	0
50	0	1,325	229	1,042	54	0	0	0
51	0	780	353	261	166	0	0	0
52	500	624	153	0	471	0	0	0
53	0	1,403	275	0	1,128	0	0	0
54	0	378	74	0	304	0	0	0
55	0	1,234	242	0	992	0	0	0
56	0	1,234	42	853	339	0	0	0
57	0	1,234	542	0	692	0	0	0
58	0	617	121	0	496	0	0	0
59	0	617	121	0	496	0	0	0
60	0	617	121	0	496	0	0	0
61	0	617	121	0	496	0	0	0
62	0	617	271	0	346	0	0	0
63	0	0	0	0	0	0	0	0
64	0	1,234	242	0	992	0	0	0
65	0	1,234	242	0	992	0	0	0
66	0	247	48	0	199	0	0	0
67	0	2,269	594	0	1,675	0	0	0
68	0	3,025	93	0	2,932	0	0	0
69	0	1,891	170	0	1,721	0	0	0
70	0	600	295	0	305	0	0	0
71	0	16	3	0	13	0	0	0
72	0	647	177	0	470	0	0	0
73	0	308	0	0	308	0	0	0
74	950	307	60	0	247	0	0	0
75	797	100	20	0	80	0	0	0
76	1,602	647	127	0	520	0	0	0
77	0	152	0	0	0	152	0	0
78	0	136	27	0	109	0	0	0
79	0	0	0	0	0	0	0	0
80	0	272	53	0	219	0	0	0
81	0	27	5	0	22	0	0	0
82	0	109	21	0	88	0	0	0
83	0	0	0	0	0	0	0	0
84	655	679	133	0	546	0	0	0
85	0	54	11	0	43	0	0	0
86	0	217	43	68	106	0	0	0
87	10,309	1,402	139	0	1,255	8	0	0
88	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0
90	0	537	105	0	432	0	0	0
91	0	30	6	0	24	0	0	0
92	0	45	9	0	36	0	0	0
93	635	75	15	0	60	0	0	0
94	0	283	105	0	178	0	0	0
95	0	358	70	0	288	0	0	0
96	0	83	16	0	67	0	0	0

Appendix B
Estimated 2003 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA School System Students	Employees
97	0	0	0	0	0	0	0	0
98	0	1,399	174	0	1,225	0	0	0
99	0	2,331	457	0	1,874	0	0	0
100	0	1,399	274	0	1,125	0	0	0
101	400	1,865	115	0	1,750	0	0	0
102	0	1,399	174	19	1,206	0	0	0
103	592	296	58	0	238	0	0	0
104	0	721	138	0	569	14	0	0
105	0	707	188	0	519	0	0	0
106	0	549	4	0	15	530	0	0
107	493	115	23	0	92	0	0	0
108	0	58	11	0	47	0	0	0
109	0	413	81	0	332	0	0	0
110	0	42	8	0	34	0	0	0
111	0	82	16	0	66	0	0	0
112	0	59	2	0	7	0	417	50
113	1,421	104	20	0	84	0	0	0
114	0	35	7	0	28	0	0	0
115	0	25	5	0	20	0	0	0
116	400	51	10	0	41	0	0	0
117	0	51	10	0	41	0	0	0
118	0	0	0	0	0	0	0	0
119	0	880	72	0	808	0	0	0
120	844	352	69	0	283	0	0	0
121	0	19	4	0	15	0	0	0
122	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0
126	0	290	14	0	276	0	0	0
127	0	0	0	0	0	0	0	0
128	0	142	28	0	114	0	0	0
129	0	0	0	0	0	0	0	0
130	799	106	21	0	85	0	0	0
131	0	0	0	0	0	0	0	0
132	164	50	10	0	40	0	0	0
133	0	18	3	0	15	0	0	0
134	0	18	3	0	15	0	0	0
135	0	4,888	436	0	2,301	2,151	0	0
136	0	15	3	0	12	0	0	0
137	1,860	335	0	0	255	0	769	80
138	0	15	3	0	12	0	0	0
139	118	30	6	0	24	0	0	0
140	0	15	3	0	12	0	0	0
141	0	25	5	18	2	0	0	0
142	1,166	200	39	0	161	0	0	0
143	0	25	5	0	20	0	0	0
144	0	0	0	0	0	0	0	0

Appendix B
Estimated 2003 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA Students	School System Employees
145	352	59	11	0	48	0	0	0
146	0	0	0	0	0	0	0	0
147	235	59	11	0	48	0	0	0
148	97	50	10	0	40	0	0	0
149	0	8	2	0	6	0	0	0
150	0	0	0	0	0	0	0	0
151	716	101	20	0	81	0	0	0
152	333	47	9	0	38	0	0	0
153	283	44	9	0	35	0	0	0
154	0	44	9	0	35	0	0	0
155	0	1,128	11	0	45	1,072	0	0
156	0	300	0	0	300	0	0	0
157	0	300	0	0	300	0	0	0
Totals	38,333	63,300	11,300	4,110	41,816	5,820	2,333	254

APPENDIX C

GUAM 2020 HIGHWAY MASTER PLAN

PROJECTED 2015 DEMOGRAPHIC DATA

Appendix C
Projected 2015 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Non-Institutional Dorms	Military	Other
1	972	244	73	140	31	0	198	0	198	0
2	3,743	1,002	284	550	168	0	386	0	386	0
3	2,038	440	85	149	206	0	0	0	0	0
4	1,421	320	81	106	133	0	0	0	0	0
5	2,284	505	111	172	222	0	0	0	0	0
6	1,347	310	79	101	130	0	0	0	0	0
7	1,098	248	47	101	100	0	0	0	0	0
8	166	49	17	18	14	0	0	0	0	0
9	4,001	904	186	336	382	0	5	0	0	5
10	585	132	32	48	52	0	0	0	0	0
11	763	253	108	95	50	0	0	0	0	0
12	1,958	441	85	170	186	0	0	0	0	0
13	601	148	45	58	45	0	0	0	0	0
14	79	0	0	0	0	0	0	0	0	0
15	10	0	0	0	0	0	11	0	11	0
16	618	150	63	83	4	0	153	0	153	0
17	1,643	353	66	118	169	0	0	0	0	0
18	6,072	1,402	322	490	590	0	33	0	0	33
19	1,839	399	69	139	191	0	3	0	0	3
20	1,394	396	92	223	81	0	0	0	0	0
21	3,421	724	153	224	347	0	0	0	0	0
22	290	49	11	5	33	0	0	0	0	0
23	3,863	859	185	304	370	0	0	0	0	0
24	2,742	661	186	223	252	0	4	0	0	4
25	1,274	289	50	125	114	0	5	0	0	5
26	2,373	515	113	186	216	30	19	0	0	19
27	6,412	1,418	331	477	610	0	61	0	0	61
28	1,601	387	113	134	140	0	29	0	0	29
29	160	40	11	17	12	0	0	0	0	0
30	3,744	886	209	341	336	0	33	0	0	33
31	1,053	259	74	104	81	0	0	0	0	0
32	1,171	324	110	124	90	0	0	0	0	0
33	2,571	624	157	232	235	0	1	0	0	1
34	124	31	9	12	10	0	0	0	0	0
35	3,137	839	257	332	250	0	4	0	0	4
36	0	0	0	0	0	0	0	0	0	0
37	305	62	22	9	31	0	1	0	0	1
38	1,088	356	170	112	74	0	0	0	0	0
39	823	255	111	90	54	0	32	0	0	32
40	188	51	13	25	13	0	0	0	0	0
41	550	172	79	58	35	0	0	0	0	0
42	1,001	326	154	114	58	0	0	0	0	0
43	14	7	5	2	0	0	0	0	0	0
44	78	44	35	9	0	0	3	0	0	3
45	105	35	17	14	4	0	0	0	0	0
46	992	370	197	135	38	0	0	0	0	0
47	376	226	197	24	5	0	4	0	0	4
48	851	395	276	105	14	0	0	0	0	0

Appendix C
Projected 2015 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Dorms	Military	Other
49	438	141	69	50	22	0	0	0	0	0
50	166	125	125	0	0	0	0	0	0	0
51	850	385	273	86	26	0	0	0	0	0
52	30	11	6	3	2	0	0	0	0	0
53	215	110	79	23	8	0	0	0	0	0
54	2,493	727	315	238	174	0	53	0	0	53
55	1,707	568	266	197	105	0	0	0	0	0
56	1,154	534	394	88	52	0	0	0	0	0
57	3,913	1,173	486	399	288	0	0	0	0	0
58	297	133	88	34	11	0	0	0	0	0
59	130	42	28	6	8	0	19	0	0	19
60	215	57	19	21	17	0	3	0	0	3
61	340	84	22	28	34	0	4	0	0	4
62	189	47	19	8	20	0	0	0	0	0
63	16	4	0	3	1	0	0	0	0	0
64	675	193	78	71	44	0	11	0	0	11
65	751	295	162	105	28	0	0	0	0	0
66	471	115	38	45	32	0	47	0	0	47
67	266	19	7	10	2	0	94	0	0	94
68	830	195	84	73	38	0	165	0	0	165
69	535	130	41	39	50	0	14	0	0	14
70	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0
72	2,172	560	178	219	163	67	30	0	0	30
73	13	5	3	2	0	0	0	0	0	0
74	1,746	434	129	170	135	0	63	0	0	63
75	3,354	764	179	282	303	0	13	0	0	13
76	1,607	381	105	123	153	0	10	0	0	10
77	79	0	0	0	0	0	0	0	0	0
78	4,105	999	266	355	378	0	20	0	0	20
79	15	4	1	1	2	0	0	0	0	0
80	1,704	375	80	140	155	0	5	5	0	0
81	646	148	31	58	59	0	0	0	0	0
82	1,118	261	66	84	111	0	0	0	0	0
83	8	1	0	0	1	0	0	0	0	0
84	1,800	249	65	88	96	751	0	0	0	0
85	865	225	95	63	67	0	39	0	0	39
86	1,421	419	186	130	103	0	0	0	0	0
87	1,842	571	255	200	116	0	42	0	0	42
88	1,473	345	109	104	132	0	80	69	0	11
89	237	0	0	0	0	0	0	0	0	0
90	214	62	26	19	17	0	0	0	0	0
91	1,338	392	161	122	109	0	9	0	0	9
92	1,604	389	104	125	160	0	0	0	0	0
93	1,233	299	80	102	117	0	0	0	0	0
94	53	18	11	6	1	0	13	0	0	13
95	652	226	119	63	44	0	5	0	0	5
96	1,596	487	204	172	111	0	0	0	0	0

Appendix C
Projected 2015 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Non-Institutional Dorms	Military	Other
97	910	271	117	85	69	0	1	0	0	1
98	13	2	2	0	0	0	11	0	0	11
99	235	57	24	9	24	0	4	0	0	4
100	13	2	0	2	0	0	5	0	0	5
101	220	0	0	0	0	233	13	0	0	13
102	181	78	62	9	7	0	1	0	0	1
103	2,180	538	163	192	183	0	3	0	0	3
104	602	173	76	61	36	0	22	0	0	22
105	100	30	16	7	7	0	11	0	0	11
106	287	88	57	28	3	8	58	0	58	0
107	1,607	492	211	166	115	0	9	0	0	9
108	2,284	546	152	191	203	0	13	0	0	13
109	0	0	0	0	0	0	0	0	0	0
110	972	247	67	99	81	0	0	0	0	0
111	1,175	319	111	113	95	0	1	0	0	1
112	475	116	38	42	36	0	0	0	0	0
113	1,256	307	108	93	106	0	62	0	0	62
114	2,238	630	248	209	173	0	0	0	0	0
115	343	93	32	24	37	0	0	0	0	0
116	1,677	425	141	135	149	0	23	0	0	23
117	1,055	274	85	99	90	0	0	0	0	0
118	302	103	57	29	17	0	1	0	0	1
119	18	1	1	0	0	0	60	0	0	60
120	864	226	77	66	83	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0
122	980	314	137	122	55	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0
124	278	51	28	9	14	0	0	0	0	0
125	5	1	0	1	0	0	0	0	0	0
126	266	106	59	42	5	0	0	0	0	0
127	1,138	239	52	74	113	0	23	0	0	23
128	863	164	21	54	89	0	0	0	0	0
129	1,218	252	38	84	130	0	0	0	0	0
130	839	198	47	75	76	0	3	0	0	3
131	842	191	52	57	82	0	30	0	0	30
132	206	77	36	36	5	0	0	0	0	0
133	1,621	395	113	135	147	0	0	0	0	0
134	593	147	41	56	50	0	0	0	0	0
135	2,673	655	246	350	59	0	733	0	733	0
136	1,453	379	128	129	122	0	0	0	0	0
137	1,704	439	91	206	142	0	0	0	0	0
138	846	205	50	81	74	0	0	0	0	0
139	1,363	316	83	107	126	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
141	573	141	40	50	51	0	1	0	0	1
142	4,146	942	255	286	401	0	24	0	0	24
143	1,411	327	88	125	114	0	0	0	0	0
144	30	10	5	3	2	0	0	0	0	0

Appendix C
Projected 2015 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Non-Institutional Total	Dorms	Military	Other
145	1,546	329	69	107	153	0	0	0	0	0
146	1,003	274	97	94	83	0	0	0	0	0
147	1,110	236	43	89	104	0	25	0	0	25
148	888	162	25	41	96	0	0	0	0	0
149	471	117	35	35	47	0	0	0	0	0
150	2,213	466	89	163	214	0	18	0	0	18
151	625	122	23	44	55	0	0	0	0	0
152	377	73	15	17	41	0	0	0	0	0
153	1,166	250	62	79	109	0	0	0	0	0
154	1,313	291	72	98	121	0	0	0	0	0
155	489	0	0	0	0	0	369	0	369	0
156	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0	0	0
Totals	172,771	43,489	14,127	15,297	14,065	1,089	3,248	74	1,908	1,266

APPENDIX D

GUAM 2020 HIGHWAY MASTER PLAN

PROJECTED 2015 LAND USE DATA

Appendix D
2015 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA Students	School System Employees
1	0	1,368	35	0	144	1,189	0	0
2	0	2,588	316	0	1,296	829	2,103	147
3	420	57	11	0	46	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	778	121	24	0	97	0	0	0
8	0	40	8	0	32	0	0	0
9	4,093	362	71	0	291	0	0	0
10	0	121	81	0	40	0	0	0
11	0	40	8	0	32	0	0	0
12	817	121	24	0	97	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	226	0	0	0	226	0	0
17	0	72	14	0	58	0	0	0
18	1,304	144	28	0	116	0	0	0
19	0	72	14	0	58	0	0	0
20	0	0	0	0	0	0	0	0
21	758	144	28	0	116	0	0	0
22	0	0	0	0	0	0	0	0
23	901	144	28	0	116	0	0	0
24	0	288	56	0	232	0	0	0
25	3,137	361	71	0	290	0	0	0
26	0	72	14	0	58	0	0	0
27	0	72	14	0	58	0	0	0
28	0	1,082	900	0	182	0	0	0
29	0	72	14	5	53	0	0	0
30	0	36	7	0	29	0	0	0
31	0	36	7	0	29	0	0	0
32	836	288	56	0	232	0	0	0
33	0	288	56	0	232	0	0	0
34	0	180	93	0	87	0	0	0
35	0	180	35	0	145	0	0	0
36	2,803	254	50	0	204	0	0	0
37	0	529	29	500	0	0	0	0
38	0	141	28	0	113	0	0	0
39	658	1,414	277	0	1,137	0	0	0
40	0	250	0	0	250	0	0	0
41	1,377	707	139	0	568	0	0	0
42	0	141	28	0	113	0	0	0
43	0	756	148	600	8	0	0	0
44	0	798	148	650	0	0	0	0
45	0	473	93	100	280	0	0	0
46	695	707	139	10	558	0	0	0
47	0	1,073	148	925	0	0	0	0
48	0	756	148	310	298	0	0	0

Appendix D
2015 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA School Students	System Employees
49	0	1,035	185	850	0	0	0	0
50	0	2,378	278	2,100	0	0	0	0
51	0	2,497	427	2,070	0	0	0	0
52	600	945	185	0	760	0	0	0
53	0	1,701	333	0	1,368	0	0	0
54	0	433	85	10	338	0	0	0
55	0	1,414	277	0	1,137	0	0	0
56	0	1,496	51	900	545	0	0	0
57	0	1,414	621	0	793	0	0	0
58	0	707	139	0	568	0	0	0
59	0	707	139	0	568	0	0	0
60	0	707	139	0	568	0	0	0
61	0	707	139	0	568	0	0	0
62	0	707	310	0	397	0	0	0
63	0	0	0	0	0	0	0	0
64	0	1,415	277	250	888	0	0	0
65	0	1,415	277	0	1,138	0	0	0
66	0	283	55	0	228	0	0	0
67	0	2,600	681	0	1,919	0	0	0
68	0	3,466	106	15	3,345	0	0	0
69	0	2,167	138	0	2,029	0	0	0
70	0	0	0	0	0	0	0	0
71	0	19	4	0	15	0	0	0
72	0	742	203	0	539	0	0	0
73	0	591	351	0	240	0	0	0
74	1,136	352	69	0	283	0	0	0
75	953	115	22	0	93	0	0	0
76	1,915	742	145	15	582	0	0	0
77	0	178	0	0	0	178	0	0
78	0	156	30	0	126	0	0	0
79	0	0	0	0	0	0	0	0
80	0	311	61	0	250	0	0	0
81	0	31	6	0	25	0	0	0
82	0	124	24	0	100	0	0	0
83	0	0	0	0	0	0	0	0
84	783	778	152	0	626	0	0	0
85	0	62	0	0	62	0	0	0
86	0	249	12	100	137	0	0	0
87	8,351	1,460	49	0	1,402	9	0	0
88	0	165	165	0	0	0	0	0
89	0	0	0	0	0	0	0	0
90	0	615	0	0	615	0	0	0
91	0	121	121	0	0	0	0	0
92	0	52	7	0	45	0	0	0
93	759	86	10	0	76	0	0	0
94	0	324	17	15	292	0	0	0
95	0	410	178	0	232	0	0	0
96	0	95	80	0	15	0	0	0

Appendix D
2015 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA School System Students	School System Employees
97	0	19	19	0	0	0	0	0
98	0	1,603	0	0	1,603	0	0	0
99	0	2,671	199	0	2,472	0	0	0
100	0	1,603	523	0	1,080	0	0	0
101	425	2,137	314	0	1,823	0	0	0
102	0	1,603	132	0	1,471	0	0	0
103	708	339	199	0	140	0	0	0
104	0	826	66	0	744	16	0	0
105	0	810	159	0	651	0	0	0
106	0	836	216	0	0	620	0	0
107	589	132	4	15	113	0	0	0
108	0	66	26	0	40	0	0	0
109	0	473	13	0	460	0	0	0
110	0	93	93	0	0	0	0	0
111	0	94	9	0	85	0	0	0
112	0	77	18	0	0	0	0	59
113	1,699	119	2	0	117	0	0	0
114	0	40	23	0	17	0	0	0
115	0	29	8	0	21	0	0	0
116	478	58	6	0	52	0	0	0
117	0	58	11	0	47	0	0	0
118	0	11	11	0	0	0	0	0
119	0	1,045	0	0	1,045	0	0	0
120	1,009	403	86	0	317	0	0	0
121	0	79	79	0	0	0	0	0
122	0	4	4	0	0	0	0	0
123	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0
126	0	617	17	600	0	0	0	0
127	0	0	0	0	0	0	0	0
128	0	162	32	0	130	0	0	0
129	0	0	0	0	0	0	0	0
130	955	122	24	0	98	0	0	0
131	0	0	0	0	0	0	0	0
132	196	57	11	0	46	0	0	0
133	0	20	4	0	16	0	0	0
134	0	20	4	0	16	0	0	0
135	0	5,802	518	0	2,731	2,553	0	0
136	0	17	3	0	14	0	0	0
137	2,224	95	0	0	0	0	1,034	95
138	0	17	3	0	14	0	0	0
139	141	34	7	0	27	0	0	0
140	0	17	3	0	14	0	0	0
141	0	29	6	20	3	0	0	0
142	1,394	229	45	0	184	0	0	0
143	0	29	6	0	23	0	0	0
144	0	0	0	0	0	0	0	0

Appendix D
2015 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA School System Students	School System Employees
145	421	67	13	0	54	0	0	0
146	0	0	0	0	0	0	0	0
147	281	67	13	0	54	0	0	0
148	116	57	11	0	46	0	0	0
149	0	9	2	0	7	0	0	0
150	0	0	0	0	0	0	0	0
151	856	115	23	0	92	0	0	0
152	398	53	10	0	43	0	0	0
153	338	50	10	0	40	0	0	0
154	0	50	10	0	40	0	0	0
155	0	1,338	13	0	53	1,272	0	0
156	0	609	0	0	609	0	0	0
157	0	591	0	0	591	0	0	0
Totals	45,303	78,047	12,944	10,060	47,850	6,892	3,137	301

APPENDIX E

GUAM 2020 HIGHWAY MASTER PLAN

PROJECTED 2020 DEMOGRAPHIC DATA

Appendix E
Projected 2020 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Non-Institutional Dorms	Military	Other
1	972	244	73	140	31	0	218	0	218	0
2	3,980	1,065	302	585	178	0	426	0	426	0
3	2,196	473	91	160	222	0	0	0	0	0
4	1,579	356	90	118	148	0	0	0	0	0
5	2,442	540	118	184	238	0	0	0	0	0
6	1,426	327	83	107	137	0	0	0	0	0
7	1,177	267	51	109	107	0	0	0	0	0
8	166	49	17	18	14	0	0	0	0	0
9	4,159	941	194	350	397	0	6	0	0	6
10	743	167	40	61	66	0	0	0	0	0
11	921	306	131	114	61	0	0	0	0	0
12	2,116	476	92	183	201	0	0	0	0	0
13	611	151	46	59	46	0	0	0	0	0
14	158	0	0	0	0	0	0	0	0	0
15	10	0	0	0	0	0	13	0	13	0
16	776	189	79	105	5	0	169	0	169	0
17	1,801	389	73	130	186	0	0	0	0	0
18	6,230	1,439	331	502	606	0	36	0	0	36
19	1,997	434	75	151	208	0	3	0	0	3
20	1,552	442	103	249	90	0	0	0	0	0
21	3,579	758	160	235	363	0	0	0	0	0
22	527	90	20	10	60	0	0	0	0	0
23	4,100	911	197	322	392	0	0	0	0	0
24	2,752	663	186	224	253	0	4	0	0	4
25	1,274	289	50	125	114	0	6	0	0	6
26	2,383	518	114	187	217	34	21	0	0	21
27	6,649	1,470	343	494	633	0	67	0	0	67
28	1,601	387	113	134	140	0	32	0	0	32
29	160	40	11	17	12	0	0	0	0	0
30	3,754	888	209	342	337	0	36	0	0	36
31	1,211	297	85	119	93	0	0	0	0	0
32	1,329	367	125	140	102	0	0	0	0	0
33	2,729	663	166	247	250	0	1	0	0	1
34	124	31	9	12	10	0	0	0	0	0
35	3,295	880	270	348	262	0	4	0	0	4
36	9	0	0	0	0	0	0	0	0	0
37	542	112	40	16	56	0	1	0	0	1
38	1,246	407	194	129	84	0	0	0	0	0
39	823	255	111	90	54	0	35	0	0	35
40	346	92	23	46	23	0	0	0	0	0
41	708	220	101	74	45	0	0	0	0	0
42	1,159	378	179	132	67	0	0	0	0	0
43	14	7	5	2	0	0	0	0	0	0
44	78	44	35	9	0	0	3	0	0	3
45	105	35	17	14	4	0	0	0	0	0
46	1,229	459	244	168	47	0	0	0	0	0
47	534	320	279	34	7	0	4	0	0	4
48	1,088	506	353	135	18	0	0	0	0	0

Appendix E
Projected 2020 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Non-Institutional Dorms	Military	Other
49	596	192	94	68	30	0	0	0	0	0
50	324	243	243	0	0	0	0	0	0	0
51	1,008	456	323	102	31	0	0	0	0	0
52	30	11	6	3	2	0	0	0	0	0
53	373	189	137	39	13	0	0	0	0	0
54	2,651	773	335	253	185	0	59	0	0	59
55	1,865	620	290	216	114	0	0	0	0	0
56	1,391	643	475	106	62	0	0	0	0	0
57	4,071	1,219	505	415	299	0	0	0	0	0
58	455	202	134	52	16	0	0	0	0	0
59	130	42	28	6	8	0	21	0	0	21
60	215	57	19	21	17	0	3	0	0	3
61	498	123	33	41	49	0	4	0	0	4
62	189	47	19	8	20	0	0	0	0	0
63	16	4	0	3	1	0	0	0	0	0
64	833	239	97	87	55	0	13	0	0	13
65	909	357	196	127	34	0	0	0	0	0
66	629	152	50	60	42	0	52	0	0	52
67	424	32	12	16	4	0	104	0	0	104
68	988	233	100	87	46	0	182	0	0	182
69	614	149	47	44	58	0	15	0	0	15
70	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0
72	2,409	622	198	243	181	74	34	0	0	34
73	13	5	3	2	0	0	0	0	0	0
74	1,904	473	140	186	147	0	70	0	0	70
75	3,512	802	188	296	318	0	14	0	0	14
76	1,765	419	116	135	168	0	11	0	0	11
77	158	0	0	0	0	0	0	0	0	0
78	4,263	1,036	276	368	392	0	22	0	0	22
79	15	4	1	1	2	0	0	0	0	0
80	1,862	411	88	153	170	0	6	6	0	0
81	725	166	35	65	66	0	0	0	0	0
82	1,276	298	76	96	126	0	0	0	0	0
83	8	1	0	0	1	0	0	0	0	0
84	2,037	281	73	99	109	829	0	0	0	0
85	1,102	288	121	81	86	0	43	0	0	43
86	1,658	488	217	151	120	0	0	0	0	0
87	2,000	620	277	217	126	0	46	0	0	46
88	1,631	381	120	115	146	0	88	75	0	13
89	237	0	0	0	0	0	0	0	0	0
90	214	62	26	19	17	0	0	0	0	0
91	1,496	439	180	137	122	0	10	0	0	10
92	1,762	428	115	138	175	0	0	0	0	0
93	1,391	338	91	115	132	0	0	0	0	0
94	53	18	11	6	1	0	14	0	0	14
95	810	281	148	79	54	0	6	0	0	6
96	1,754	535	224	189	122	0	0	0	0	0

Appendix E
Projected 2020 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Non-Institutional Dorms	Military	Other
97	1,068	318	138	99	81	0	1	0	0	1
98	13	2	2	0	0	0	13	0	0	13
99	393	97	41	15	41	0	4	0	0	4
100	13	2	0	2	0	0	6	0	0	6
101	220	0	0	0	0	258	14	0	0	14
102	260	112	89	13	10	0	1	0	0	1
103	2,259	557	169	199	189	0	3	0	0	3
104	681	195	86	69	40	0	24	0	0	24
105	100	30	16	7	7	0	13	0	0	13
106	366	111	72	35	4	8	64	0	64	0
107	1,686	516	222	174	120	0	10	0	0	10
108	2,363	565	158	197	210	0	14	0	0	14
109	0	0	0	0	0	0	0	0	0	0
110	1,130	287	78	115	94	0	0	0	0	0
111	1,333	361	126	128	107	0	1	0	0	1
112	712	174	57	63	54	0	0	0	0	0
113	1,414	345	121	104	120	0	69	0	0	69
114	2,317	652	256	217	179	0	0	0	0	0
115	501	135	46	35	54	0	0	0	0	0
116	1,835	465	155	147	163	0	25	0	0	25
117	1,292	337	104	122	111	0	0	0	0	0
118	460	157	86	45	26	0	1	0	0	1
119	18	1	1	0	0	0	66	0	0	66
120	1,022	267	91	78	98	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0
122	1,138	364	159	141	64	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0
124	436	81	44	15	22	0	0	0	0	0
125	5	1	0	1	0	0	0	0	0	0
126	424	169	94	67	8	0	0	0	0	0
127	1,296	273	60	85	128	0	25	0	0	25
128	863	164	21	54	89	0	0	0	0	0
129	1,376	285	43	95	147	0	0	0	0	0
130	997	236	56	89	91	0	3	0	0	3
131	921	209	57	63	89	0	34	0	0	34
132	285	105	49	49	7	0	0	0	0	0
133	1,858	454	130	155	169	0	0	0	0	0
134	751	187	52	71	64	0	0	0	0	0
135	2,910	714	268	381	65	0	809	0	809	0
136	1,611	421	142	143	136	0	0	0	0	0
137	1,862	480	100	225	155	0	0	0	0	0
138	1,004	244	60	96	88	0	0	0	0	0
139	1,521	352	92	120	140	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
141	731	179	51	63	65	0	1	0	0	1
142	4,304	978	264	297	417	0	27	0	0	27
143	1,569	363	98	139	126	0	0	0	0	0
144	30	10	5	3	2	0	0	0	0	0

Appendix E
Projected 2020 Demographic Data Used in Trip Generation Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone (TAZ)	Total Population	Total Households	Households by Size Group			Instit. Total	Population in Group Quarters			
			1 - 2 People	3 - 4 People	5 or more		Total	Non-Institutional Dorms	Military	Other
145	1,704	362	76	118	168	0	0	0	0	0
146	1,161	318	113	109	96	0	0	0	0	0
147	1,268	269	49	101	119	0	28	0	0	28
148	888	162	25	41	96	0	0	0	0	0
149	629	154	46	46	62	0	0	0	0	0
150	2,371	500	96	174	230	0	20	0	0	20
151	783	153	29	55	69	0	0	0	0	0
152	535	105	22	24	59	0	0	0	0	0
153	1,324	283	71	89	123	0	0	0	0	0
154	1,471	325	80	110	135	0	0	0	0	0
155	647	0	0	0	0	0	407	0	407	0
156	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0	0	0
Totals	190,753	48,307	16,061	16,858	15,388	1,203	3,585	81	2,106	1,398

APPENDIX F

GUAM 2020 HIGHWAY MASTER PLAN

PROJECTED 2020 LAND USE DATA

Appendix F
2020 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA School System Students	School System Employees
1	0	1,492	39	0	158	1,295	0	0
2	0	2,833	347	0	1,424	902	2,380	160
3	452	65	13	0	52	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	839	136	27	0	109	0	0	0
8	0	45	9	0	36	0	0	0
9	4,409	408	80	0	328	0	0	0
10	0	136	91	0	45	0	0	0
11	0	45	9	0	36	0	0	0
12	880	136	27	0	109	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	249	0	0	0	249	0	0
17	0	81	16	0	65	0	0	0
18	1,405	162	32	0	130	0	0	0
19	0	81	16	0	65	0	0	0
20	0	100	0	0	100	0	0	0
21	817	162	32	0	130	0	0	0
22	0	100	0	0	100	0	0	0
23	971	162	32	0	130	0	0	0
24	0	324	63	0	261	0	0	0
25	3,380	406	79	0	327	0	0	0
26	0	81	16	0	65	0	0	0
27	0	81	16	0	65	0	0	0
28	0	1,216	1,011	0	205	0	0	0
29	0	81	16	5	60	0	0	0
30	0	41	8	0	33	0	0	0
31	0	41	8	0	33	0	0	0
32	900	324	63	0	261	0	0	0
33	0	324	63	0	261	0	0	0
34	0	202	104	0	98	0	0	0
35	0	202	40	0	162	0	0	0
36	3,019	258	51	0	207	0	0	0
37	0	1,032	32	1,000	0	0	0	0
38	0	158	31	0	127	0	0	0
39	708	1,589	311	0	1,278	0	0	0
40	0	246	0	0	246	0	0	0
41	1,484	794	156	0	638	0	0	0
42	0	158	31	0	127	0	0	0
43	0	1,012	162	850	0	0	0	0
44	0	1,312	162	1,150	0	0	0	0
45	0	518	101	100	317	0	0	0
46	748	794	156	10	628	0	0	0
47	0	1,387	162	1,225	0	0	0	0
48	0	829	162	310	357	0	0	0

Appendix F
2020 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA Students	School System Employees
49	0	1,053	203	850	0	0	0	0
50	0	2,455	305	2,150	0	0	0	0
51	0	2,539	469	2,070	0	0	0	0
52	600	1,036	203	0	833	0	0	0
53	0	1,866	366	0	1,500	0	0	0
54	0	487	95	10	382	0	0	0
55	0	1,589	311	0	1,278	0	0	0
56	0	1,641	55	900	686	0	0	0
57	0	1,589	698	0	891	0	0	0
58	0	794	156	0	638	0	0	0
59	0	794	156	0	638	0	0	0
60	0	794	156	0	638	0	0	0
61	0	794	156	0	638	0	0	0
62	0	794	349	0	445	0	0	0
63	0	0	0	0	0	0	0	0
64	0	1,589	311	250	1,028	0	0	0
65	0	1,589	311	0	1,278	0	0	0
66	0	318	62	0	256	0	0	0
67	0	2,922	766	0	2,156	0	0	0
68	0	3,900	119	15	3,766	0	0	0
69	0	2,435	155	0	2,280	0	0	0
70	0	0	0	0	0	0	0	0
71	0	21	4	0	17	0	0	0
72	0	833	228	0	605	0	0	0
73	0	667	396	0	271	0	0	0
74	1,224	396	78	0	318	0	0	0
75	1,027	129	25	0	104	0	0	0
76	2,063	833	163	15	655	0	0	0
77	0	196	0	0	0	196	0	0
78	0	174	34	0	140	0	0	0
79	0	0	0	0	0	0	0	0
80	0	350	68	0	282	0	0	0
81	0	35	7	0	28	0	0	0
82	0	140	27	0	113	0	0	0
83	0	0	0	0	0	0	0	0
84	844	874	171	0	703	0	0	0
85	0	70	0	0	70	0	0	0
86	0	280	14	100	166	0	0	0
87	8,995	1,604	55	0	1,539	10	0	0
88	0	182	182	0	0	0	0	0
89	0	0	0	0	0	0	0	0
90	0	692	0	0	692	0	0	0
91	0	136	136	0	0	0	0	0
92	0	58	8	0	50	0	0	0
93	818	97	11	0	86	0	0	0
94	0	365	19	15	331	0	0	0
95	0	461	200	0	261	0	0	0
96	0	107	90	0	17	0	0	0

Appendix F
2020 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA Students	School System Employees
97	0	21	21	0	0	0	0	0
98	0	1,801	0	0	1,801	0	0	0
99	0	3,003	224	0	2,779	0	0	0
100	0	1,801	588	0	1,213	0	0	0
101	450	2,401	353	0	2,048	0	0	0
102	0	1,801	148	0	1,653	0	0	0
103	763	381	224	0	157	0	0	0
104	0	929	75	0	836	18	0	0
105	0	911	178	0	733	0	0	0
106	0	928	243	0	0	685	0	0
107	635	148	5	15	128	0	0	0
108	0	74	29	0	45	0	0	0
109	0	532	14	0	518	0	0	0
110	0	104	104	0	0	0	0	0
111	0	106	11	0	95	0	0	0
112	0	86	21	0	0	0	0	65
113	1,830	135	2	0	133	0	0	0
114	0	45	27	0	18	0	0	0
115	0	33	9	0	24	0	0	0
116	515	66	7	0	59	0	0	0
117	0	66	13	0	53	0	0	0
118	0	13	13	0	0	0	0	0
119	0	1,148	0	0	1,148	0	0	0
120	1,830	452	94	0	358	0	0	0
121	0	88	88	0	0	0	0	0
122	0	5	5	0	0	0	0	0
123	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0
126	0	618	18	600	0	0	0	0
127	0	0	0	0	0	0	0	0
128	0	182	36	0	146	0	0	0
129	0	0	0	0	0	0	0	0
130	1,029	137	27	0	110	0	0	0
131	0	0	0	0	0	0	0	0
132	211	65	13	0	52	0	0	0
133	0	23	4	0	19	0	0	0
134	0	23	4	0	19	0	0	0
135	0	6,353	569	0	3,005	2,779	0	0
136	0	19	4	0	15	0	0	0
137	2,396	103	0	0	0	0	1,170	103
138	0	19	4	0	15	0	0	0
139	152	39	8	0	31	0	0	0
140	0	19	4	0	15	0	0	0
141	0	32	6	20	6	0	0	0
142	1,502	257	50	0	207	0	0	0
143	0	32	6	0	26	0	0	0
144	0	0	0	0	0	0	0	0

Appendix F
2020 Land Use Data Used in Trip Attraction Models
Guam Highway Master Plan Update Study

Traffic Analysis Zone	School Enrollment	Total Employment	Retail Employment	Hotel Employment	Other Employment	Military Personnel	DODEA School System Students	School System Employees
145	453	76	15	0	61	0	0	0
146	0	0	0	0	0	0	0	0
147	303	76	15	0	61	0	0	0
148	125	65	13	0	52	0	0	0
149	0	10	2	0	8	0	0	0
150	0	0	0	0	0	0	0	0
151	922	130	25	0	105	0	0	0
152	429	60	12	0	48	0	0	0
153	365	57	11	0	46	0	0	0
154	0	57	11	0	46	0	0	0
155	0	1,458	14	0	59	1,385	0	0
156	0	687	0	0	687	0	0	0
157	0	667	0	0	667	0	0	0
Totals	49,493	87,823	14,459	11,660	53,857	7,519	3,550	328

APPENDIX G

GUAM 2020 HIGHWAY MASTER PLAN

**GUAM STATEWIDE TRANSPORTATION IMPROVEMENT PLAN
FY 2005 - 2007**



Governor
Felix P. Camacho
Lt. Governor
Kaleo S. Moylan



Acting Director
Lawrence P. Perez
Deputy Director
Michael C. James

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN

FY 2005 – FY 2007

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN

FY 2005

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN

FY 2005 PROPOSED PROJECTS

	<u>TOTALS</u>
CATEGORY I <i>Roadways Upgrade & Modernization Program</i>	\$ 14,100,000.00
CATEGORY II <i>New Traffic Signalized Intersections and Upgrade & Modernization of Existing Traffic Signalized Intersection Program</i>	\$ 300,000.00
CATEGORY III <i>Bridge Replacement, Rehabilitation & Repair Program</i>	\$ 800,000.00
CATEGORY IV <i>Highway Hazard Elimination Program</i>	\$ 474,000.00
CATEGORY V <i>Engineering Personnel for the Federal-Aid Highway Program</i>	\$ 1,300,000.00
CATEGORY VI <i>Completion of TMC Building</i>	\$ 450,000.00

FY 2005 PROJECTS BUDGET TOTALS → \$ 17,424,000.00

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2005 PROPOSED PROJECTS

***CATEGORY I:* ROADWAYS UPGRADE & MODERNIZATION PROGRAM**

PROJECT NAME

PROJECT BUDGET

- | | |
|--|-----------------|
| 1) Route 15 Reconstruction, Phase I
<i>Design & Construction Elements</i> | \$ 6,900,000.00 |
| 2) Route 17 Reconstruction, Widening & Traffic Signal Upgrade
<i>Construction Element</i> | \$ 6,000,000.00 |
| 3) Route 25 Reconstruction & Widening
<i>Construction Element</i> | \$ 1,200,000.00 |

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECT

Category I, Project No.1

Route 15 Reconstruction, Phase 1 – Design & Construction Elements

Limits: From Route 26 to Route 29

This road is a minor arterial in the Guam Highway System. It is the alternate access roadway to Andersen Air Force Base from Route 10, in Mangilao and serves also as the arterial highway for the municipality of Yigo.

Development: 90% Rural - 10% Urban

A. Project Scope of Work:

This is a modernization project which includes the reconstruction of the existing two lane facility. Provide left turn lanes @ the intersection with Route 29. Widening of existing pavement from 11 ft. to 12 ft. travel lanes & for a 2 ft. lane separation flush median, removal of existing asphalt concrete (AC), install base & sub-base courses, 3" thick A.C. wearing course, ¾" thick friction course, and construction of the roadway appurtenances for a complete and useable safe facility. Design speed will be 55 mph and speed limit will be posted @ 45 mph and portions @ 35 mph.

B. Project Data:	Existing	Proposed
Length	5.08 mi.	5.08 mi.
Travel Lanes	2 lane facility	2 lane facility + 2 Ft. Lane Separation
Travel Lane Width	11'	12'
Right-of-Way	100'	100'
Sidewalk	None	None
Roadside Drainage	Surface flow	Surface flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Sign	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Unpaved	Unpaved
Guardrail System	None	Per 2002 Roadside Design Guide Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing lighting system & Upgrade with modern intersection luminaries
C. Project Budget:	FY 2005 STIP Funding	Other Funding Source
Design/Build	\$ 6,900,000.00	
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost		
ROW Acquisition Cost		
TOTAL	\$ 6,900,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECTS, MODIFIED

Category I, Project 2

Route 17 Reconstruction, Widening & Traffic Signal Upgrade

Limits: Route 5 to Route 4

This road is a minor arterial in the Guam Highway System. It connects Route 4, Yona and Route 5, Santa Rita. This roadway serves the Windward Hills area and it is an alternate route to the village of Talofofu. It also serves as a bypass to two naval base facilities and to the villages of Santa Rita and Agat.

Development Type: 60% Rural - 40% Urban

A. Project Scope of Work:

This is a modernization project which includes the reconstruction of the existing two lane facility. Widening of existing pavement from 11 ft. to 12 ft. travel lanes & 2 ft. flush median lane separation on 2 lane segments, provide climbing lanes, left turn lanes @ major intersections, removal of existing asphalt concrete (AC), install base & sub-base courses, 3" thick A.C. wearing course, 3/4" thick friction course, improve superelevation @ horizontal curve locations, install new base, 3" thick A.C. wearing course, 3/4" thick friction course, upgrade traffic signal system @ its intersection w/ Route 4 and construction of the roadway appurtenances for a complete and useable facility.

B. Project Data:	Existing	Proposed
Length	7.20 mi.	7.20 mi.
Travel Lanes	2 lane facility	2 lane facility + 2' flush median separation, left turn lanes & climbing lanes
Travel Lane Width	11'	12'
Right-of-Way	100'	100'
Sidewalk	None	None
Roadside Drainage	Surface flow	Surface flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	6' paved
Guardrail System	None	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing lighting system
C. Project Budget:	FY 2005 STIP FUNDING	Other Funding Source
PE @ 15% of ECC		FY-2002 \$424,625.00
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 6,000,000.00	
ROW Acquisition Cost		
TOTAL	\$ 6,000,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECT

Category I, Project No. 3

Route 25 (Alageta Road) Reconstruction & Widening – Construction Element

Limits: From Bello Road to Route 26

This road is a major arterial in the Guam Highway System. It connects Route 16 and Route 26 serving as a by-pass for northbound traffic from Route 16 and also a by-pass for westbound traffic from Route 26. Travel miles saved is approximately 3.0 miles.

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

This is a modernization project which includes rehabilitation and widening of the existing 2-lane roadway facility. Widening of the existing pavement from 10 ft. to 12 ft. travel lanes & for a 2 ft. lane separation flush median, milling/removal of existing asphalt concrete (AC) & portion of existing base course, where localized base failure occurs, install new base, 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be @ 40 mph and speed limit will be posted @ 25 mph.

B. Project Data:	Existing	Proposed
Length	1.04 mi.	1.04 mi.
Travel Lanes	2 lane facility	2 lane + 2 ft. flush median lane separation
Travel Lane Width	10'	12'
Right-of-Way	40'	40'
Sidewalk	None	None
Roadside Drainage	Surface flow	Surface flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	4'-6' A.C. wearing course
Guardrail System	Does not meet current standards	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	@ un-signalized intersections & maintain existing in other areas.
C. Project Budget:	FY 2005STIP Funding	Other Funding Source
PE @ 15% of ECC		\$ 110,000.00 – FY 2002 STIP
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 1,200,000.00	
ROW Acquisition Cost		
TOTAL	\$ 1,200,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2005 PROPOSED PROJECTS

***CATEGORY II:* NEW TRAFFIC SIGNALIZED INTERSECTIONS AND UPGRADE
& MODERNIZATION OF EXISTING TRAFFIC SIGNALIZED
INTERSECTIONS PROGRAM**

PROJECT NAME

PROJECT BUDGET

1 Route 1/Wusstig Road Intersection Improvements &
New Traffic Signalization
Construction Element

\$ 300,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECT

Category II, Project No. 1

Route 1/Wusttig Road Intersection Improvements & New Traffic Signalization

Construction Element

Limits: From 150 ft. out on Route 1 and 100 ft. out on Wusstig Rd. all 3 to intersection

Route 1 is a major arterial in the Guam Highway System and Wusstig Road is a minor collector road that serves several housing subdivisions totaling over 800 dwellings.

Development Type: 50% Rural - 50% Urban

A. Project Scope of Work:

This is a modernization project which includes the rehabilitation of the existing intersection and Installation of a new traffic signal system, full channelization, milling/removal of existing asphalt concrete (AC) & portion of existing base course, where localized base failure occurs, install 8" thick P.C.C. wearing course on approaches, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility.

B. Project Data:	Existing	Proposed
Length	100 ft. - Route 1 100 ft. - Wusstig Rd.	100 ft. - Route 1 100 ft. - Wusstig Rd.
Travel Lanes	Route 1 - 5 lanes Wusstig Road - 3 lanes	Route 1 - 5 lanes Wusstig Road - 3 lanes
Travel Lane Width	12' & 14' left turning lane	12' & 14' left turning lane
Right-of-Way	Route 1 - 100' Wusstig Road - 60'	Route 1 - 100' Wusstig Road - 60'
Sidewalk	None	None
Roadside Drainage	Surface flow	Surface flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Sign	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	6' AC wearing course	6' AC wearing course @ Wusttig Road leg
Guardrail System	None	Per Roadside Design Guide - 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Upgrade with modern intersection luminaries
C. Project Budget:	FY 2005 STIP Funding	Other Funding Source
PE @ 15% of ECC		FY 2002 STIP FUNDING
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 300,000.00	
ROW Acquisition Cost		
TOTAL	\$ 300,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2005 PROPOSED PROJECTS

***CATEGORY III:* BRIDGE REPLACEMENT, REHABILITATION & REPAIR
PROGRAM**

PROJECT NAME

PROJECT BUDGET

- | | |
|---|---------------|
| 1) Pigua Bridge Replacement & Road Approaches Improvements
<i>Design Element</i> | \$ 400,000.00 |
| 2) Bile Bridge Replacement & Road Approaches Improvements
<i>Design Element</i> | \$ 400,000.00 |

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECT

Category III, Project No. 1

Pigua Bridge Full Replacement & Road Approaches Improvements – Design Element

Pigua Bridge is located in Merizo and carries Route 4 over the Pigua River. Route 4 is a major arterial in the Guam Highway System. A bridge safety inspection team from the Federal Highway Administration recently inspected and determined Pigua Bridge to be in poor to critical condition due to severe spalling of the concrete members with section loss on the exposed reinforcing steel; severe section loss on the steel beams, up to 100% in some locations; severe decay with some crushing timber elements; and undermining at the abutments. Steel plates have been placed in the southbound travel lane of the roadway to help distribute the load.

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

This is a modernization project which includes design work for the construction of a new single span, 2 lane bridge with a 2 ft. flush median separation. Install $\frac{3}{4}$ " thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 35 mph and speed limit will be posted @ 25 mph.

B. Project Data:	Existing	Proposed
Length	28 ft.	28 ft.
Spans in Main Unit	1	1
Width – Out to Out	16.5 ft.	30 ft.
Travel Lanes	2 lane facility	2 lane + 2ft. flush median lane separation + 4 ft. bike lanes
Right-of-Way	60'	60'
Sidewalk	None	4' Flush to accommodate bike lanes
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Approach Shoulders	Un-paved	4'-6' A.C. wearing course
Guardrail System	Does Not Meet Current Standards	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing street lighting system.
C. Project Budget:	FY 2005 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$400,000.00	
CE @ 5% of ECC		
Estimated Construction Cost		
ROW Acquisition Cost		
TOTAL	\$ 400,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECT

Category III, Project No. 2

Bile Bridge Full Replacement & Road Approaches Improvements – Design Element

Bile Bridge is located in Merizo and carries Route 4 over the Bile River. Route 4 is major arterial in the Guam Highway System. A bridge safety inspection team from the Federal Highway Administration recently inspected and determined Bile Bridge to be in poor to critical condition due to severe spalling of the concrete members with section loss on the exposed reinforcing steel; severe section loss on the steel beams, up to 100% in some locations; severe decay with some crushing timber elements; and undermining at the abutments.

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

This is a modernization project which includes design work for the construction of a new single span, 2 lane bridge with a 2 ft. flush median separation. Install $\frac{3}{4}$ " thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 35 mph and speed limit will be posted @ 25 mph.

B. Project Data:	Existing	Proposed
Length	28 ft.	28 ft.
Spans in Main Unit	1	1
Width – Out to Out	16.5 ft.	30 ft.
Travel Lanes	2 lane facility	2 lane + 2 Ft. flush median lane separation + 4 ft. bike lanes
Right-of-Way	60'	60'
Sidewalk	None	4' Flush to accommodate bike lanes
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Approach Shoulders	Un-paved	4'-6' A.C. wearing course
Guardrail System	Does Not Meet Current Standards	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing street lighting system.
C. Project Budget:	FY 2005 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 400,000.00	
CE @ 5% of ECC		
Estimated Construction Cost		
ROW Acquisition Cost		
TOTAL	\$ 400,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2005 PROPOSED PROJECTS

CATEGORY IV: HIGHWAY HAZARD ELIMINATION PROGRAM

PROJECT NAME

PROJECT BUDGET

- 1) ADA Compliance Project
Route 1 (Route 30 to Route 16),
Design & Construction Elements

\$ 474,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECT

Category IV, Project No. 1

Roadside ADA Compliance Project *Design & Construction Elements*

Limits: Route 1 (Route 30 to Route 16)

Plan to correct the ADA Violation - Civil Case No. CV01-00047

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

Correct all sidewalk ramps and curb cuts that are not in compliance with the ADA.

B. Project Data:

Proposed

Site designation used in the April 19, 2004 status report

D-4, D-10, D-11, D-12, D-13, D-15,
D-16, D-17, D-20, D-21, D-24, D-25,
D-27, D-35, D-39, D-40, D-43, D-44
& D-45

C. Project Budget:

FY 2005 STIP Funding

Other Funding Source

PE @ 15% of ECC

\$ 74,000.00

CE @ 5% of ECC

DPW Resources

Estimated Construction Cost

\$ 400,000.00

ROW Acquisition Cost

TOTAL

\$ 474,000.00

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2005 PROPOSED PROJECTS

***CATEGORY V:* ENGINEERING PERSONNEL FOR
FEDERAL-AID HIGHWAY PROGRAM**

PROJECT NAME

PROJECT BUDGET

1) Engineering Personnel
for Federal-Aid Highway Program
Personnel Element

\$ 1,300,000.00

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN (STIP)

FY 2005 PROPOSED PROJECT

CATEGORY V: ENGINEERING PERSONNEL FOR FEDERAL-AID HIGHWAY PROGRAM

**DEPARTMENT OF PUBLIC
WORKS
FHWA RECRUITMENT FOR HIGHWAY CONSTRUCTION PROJECTS
Annual Costs**

ITEM	POSITION TITLE	Section	POSITION NO.	GRADE	STEP	SALARY	BENEFITS	SAL + BEN
MANAGEMENT								
1	Chief of Engineer, PE		4132	R	10	\$ 66,364	\$ 23,227	\$ 89,591
2	Engineer Supervisor	CQC	4548	P	8	\$ 51,589	\$ 18,056	\$ 69,645
3	Engineer Supervisor	Contracts	4159	P	8	\$ 51,589	\$ 18,056	\$ 69,645
4	Engineer Supervisor	Traffic	4545	P	8	\$ 51,589	\$ 18,056	\$ 69,645
STAFF								
5	Engineer III	Projects	4118	O	6	\$ 43,955	\$ 15,384	\$ 59,339
6	Engineer III	Projects	4135	O	6	\$ 43,955	\$ 15,384	\$ 59,339
7	Engineer III	Projects	4140	O	6	\$ 43,955	\$ 15,384	\$ 59,339
8	Engineer III	Projects	4564	O	6	\$ 43,955	\$ 15,384	\$ 59,339
9	Engineer II	Projects	4520	N	5	\$ 38,830	\$ 13,591	\$ 52,421
10	Engineer II	Projects	4539	N	5	\$ 38,830	\$ 13,591	\$ 52,421
11	Engineer II	Projects	4139	N	5	\$ 38,830	\$ 13,591	\$ 52,421
12	Engineer II	Projects	4143	N	5	\$ 38,830	\$ 13,591	\$ 52,421
13	Construction Inspector III	Projects	4528	L	3	\$ 29,835	\$ 10,442	\$ 40,277
14	Construction Inspector III	Projects	4091	L	3	\$ 29,835	\$ 10,442	\$ 40,277
15	Construction Inspector III	Projects	4087	L	3	\$ 29,835	\$ 10,442	\$ 40,277
16	Construction Inspector III	Projects	4130	L	3	\$ 29,835	\$ 10,442	\$ 40,277
17	Construction Inspector II	Projects	4145	J	1	\$ 22,942	\$ 8,030	\$ 30,972
18	Construction Inspector II	Projects	4736	J	1	\$ 22,942	\$ 8,030	\$ 30,972
19	Construction Inspector II	Projects	4125	J	1	\$ 22,942	\$ 8,030	\$ 30,972
20	Construction Inspector II	Projects	4565	J	1	\$ 22,942	\$ 8,030	\$ 30,972
						\$763,379	\$ 267,183	\$1,030,562
						Overtime	Budget	\$ 260,438
						Total:	Total:	\$1,291,000
							say	\$1,300,000

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2005 PROPOSED PROJECTS

CATEGORY VI: COMPLETION OF TMC BUILDING

PROJECT NAME

PROJECT BUDGET

- | | |
|---|---------------|
| 1) Completion of the Traffic Management Center Building for
Division of Engineering Offices
<i>Design & Construction Elements</i> | \$ 450,000.00 |
|---|---------------|

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2005 PROPOSED PROJECT

Category VI, Project No. 1

Completion of TMC Building for Division of Engineering Offices – Design & Construction Elements

The existing Division of Engineering offices are located @ Building "B". Building "B" is in poor condition and hazardous for the engineering personnel. Damaged by 3 devastating typhoons within the past 5 years and roof was severely damaged by all 3 typhoons. Roof has major leaks during rain periods and water soaked ceiling tiles, has fallen periodically and once nearly missing an engineering personnel. Electrical circuit does not meet building code standards and experienced several power outages due to electrical shortages. Plumbing fixtures and drain pipes are old and not fully functional, does causing unsanitary conditions. Cracks and small openings throughout building, does causing rat infestation.

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

Construction for finishing work of a two-story concrete structure partially occupied by the Office of Highway Safety. The completion work for the 2,500 sq. ft. per floor office space will include the following:

- Floor finish (tile work)
- Acoustical drop ceiling
- Portable partitions
- A.C. Unit System
- Electrical lighting & power
- Plumbing fixtures & toilet accessories
- Smoke alarm
- Painting (interior)

B. Project Data:	Existing	Proposed
Ground Floor Sq. Ft.	2,500 sq. ft.	2,500 sq. ft.
Second Floor Sq. Ft.	2,500 sq. ft.	2,500 sq. ft.
Total Sq. Ft.	5,000 sq. ft.	5,000 sq. ft.
Ground Floor Offices	Unfinished	Highway Planning & Rights-of-Way/Survey
Second Floor Offices	Unfinished	COE, Admin. Support & Contract Administration
C. Project Budget:	FY 2005 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 66,000.00	
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 384,000.00	
TOTAL	\$ 450,000.00	

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN

FY 2006

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN

FY 2006 PROPOSED PROJECTS

	<u>TOTALS</u>
CATEGORY I <i>Roadways Upgrade & Modernization Program</i>	\$ 15,259,000.00
CATEGORY II <i>New Traffic Signalized Intersections and Upgrade & Modernization of Existing Traffic Signalized Intersection Program</i>	00.00
CATEGORY III <i>Bridge Replacement, Rehabilitation & Repair Program</i>	\$ 7,600,000.00
CATEGORY IV <i>Highway Hazard Elimination Program</i>	\$ 1,753,000.00
CATEGORY V <i>Engineering Personnel for the Federal-Aid Highway Program</i>	\$ 1,300,000.00

FY 2006 PROJECTS BUDGET TOTALS → \$ 25,912,000.00

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2006 PROPOSED PROJECTS

CATEGORY I: ROADWAYS UPGRADE & MODERNIZATION PROGRAM

<u>PROJECT NAME</u>	<u>PROJECT BUDGET</u>
1) Route 5 & Portion of Route 12, Reconstruction & Widening <i>Construction Element</i>	\$ 2,600,000.00
2) Route 10A (Airport Road) Portion Rehabilitation <i>Construction Element</i>	\$ 2,000,000.00
3) Route 26 Reconstruction & Widening (Phase II) (Route 1 to Route 25) <i>Construction Element</i>	\$ 2,700,000.00
4) Route 4 Rehabilitation & Widening <i>Design & Construction Elements</i>	\$ 7,710,000.00
5) Route 29 Reconstruction & Widening <i>Design Element</i>	\$ 249,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category I, Project No. 1

Route 5 & Portion of Route 12 Reconstruction & Widening – Construction Element

Limits: Route 5 – Route 2A to Route 17

Route 12 – Route 17 to East Entrance to the Village of Santa Rita

Routes 5 & 12 are minor arterials in the Guam Highway System. Both routes connecting are the primary roadway access for the Naval Magazine Base and the Municipality of Santa Rita. Route 5 is also the major connecting road to Route 17.

Development Type: 50% Rural – 50% Urban

A. Project Scope of Work:

This is a modernization project which includes the reconstruction of the existing two lane facility. Widening of existing pavement from 11 ft. to 12 ft. travel lanes & 2 Ft. Flush Median lane separation on 2 lane segments, removal of existing asphalt concrete (AC), install base & sub-base courses, 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable safe facility. Design speed will be 45 mph and speed limit will be posted @ 35 mph. & portions @ 25 mph.

B. Project Data:	Existing	Proposed
Length	Route 5 - 1.10 miles Route 12 - 1.50 miles	Route 5 - 1.10 miles Route 12 - 1.50 miles
Travel Lanes	2 lane facility	Varies 2 & 3 lane facility + 2 Ft. Flush Median Lane Separation on 2 Lane Segments
Travel Lane Width	11'	12' & 14' center turning lane
Right-of-Way	Route 5 - 100' Route 12 - 60'	Route 5 - 100' Route 12 - 60'
Sidewalk	None	8' - vicinity of school & housing areas
Roadside Drainage	Surface flow	Surface flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Sign	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Unpaved	4' – 6' AC wearing course
Guardrail System	None	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing lighting system
C. Project Budget:	FY 2006 STIP FUNDING	Other Funding Source
PE @ 15% of ECC		FY-2004 \$300,000.00
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 2,600,000.00	
ROW Acquisition Cost		
TOTAL	\$ 2,600,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category I, Project No. 2

Route 10A (Airport Road) Portion Rehabilitation – Construction Element

Limits: From Route 1 to Route 10A Extension

This road is a major arterial in the Guam Highway System. It serves the Guam International Airport & Tiyan (former N.A.S.) It is a by-pass from Route 1 to Route 16, Barrigada and from Route 1 to Route 8, Maite.

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

This is a modernization project which includes the design work for the rehabilitation & widening of the existing roadway facility. Milling & removal of existing asphalt concrete (AC) & portion of existing base course, where localized base failure occurs, install new base, 3" thick A.C. wearing course, 3/4" thick friction course and construction of the roadway appurtenances for a complete and useable safe facility. Design speed will be 45 mph and speed limit will be posted @ 35 mph.

B. Project Data:	Existing	Proposed
Length	0.70 mi.	0.70 mi.
Travel Lanes	Varies 3-4-5 lane facility	Varies 4-5 lane facility
Travel Lane Width	11'	12' & 14' two-way left turn lane
Right-of-Way	100'	100'
Sidewalk	None	None
Roadside Drainage	Surface flow & concrete channel	Surface flow and new concrete swales discharge to existing channel
Off-Site Drainage	Harmon Sink	Harmon Sink improvements
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	4'- 6' A.C. wearing course
Guardrail System	Does not meet current standards	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing lighting system

C. Project Budget:	FY 2006 STIP Funding	Other Funding Source
PE @ 15% of ECC		FY 2004 - \$ 300,000.00
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 2,000,000.00	
ROW Acquisition Cost		
TOTAL	\$ 2,000,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category I, Project No. 3

Route 26 Reconstruction & Widening, Phase II – Construction Element

Limits: From Route 1 to Route 25

This road is a major collector in the Guam Highway System. Initially, the design work was included in the FY 2002 STIP Funding, which was proposed for a 4 lane roadway. The project was cancelled due to lack of funding for land acquisition. Based on the on-going up-date of the Guam Highway Master Plan, the new proposed roadway calls for 3 lanes.

Development Type: 20% Rural - 80% Urban

A. Project Scope of Work:

This is a modernization project which includes the design work for the reconstruction and widening of the existing 2-lane roadway to a 3-lane roadway facility. Removal of existing A.C. pavement, install new base, 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 45 mph and speed limit will be posted @ 35 mph. & portions @ 25 mph.

B. Project Data:	Existing	Proposed
Length	1.10 mi.	1.10 mi.
Travel Lanes	2 lane facility	3 lane facility
Travel Lane Width	11'	12'
Right-of-Way	60'	60'
Sidewalk	None	None
Roadside Drainage	Surface flow	Surface flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	6' A.C. wearing course
Guardrail System	Does not meet current standards	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	@ un-signalized intersections & maintain existing in other areas.
C. Project Budget:	FY 2006 STIP Funding	Other Funding Source
PE @ 15% of ECC		FY 2005 STIP - \$ 320,000.00
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 2,700,000.00	
ROW Acquisition Cost		
TOTAL	\$ 2,700,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category I, Project No. 4

Route 4 Rehabilitation & Widening – Design & Construction Elements

Limits: Site 1- From Route 1 to Route 24 (Tutujan Dr.)

Site 2- From Route 24 to Route 10

This road is a major arterial in the Guam Highway System. This project was programmed in FY 2002 STIP and was cancelled due to a proposed waterline project programmed to be installed after the completion of the roadway project. Route 4 Rehabilitation & Widening and the Waterline projects are programmed and will be constructed simultaneously.

Development Type: Rural – 0% Urban- 100%

A. Project Scope of Work:

Site 1: Milling or removal of the existing asphalt concrete pavement and a portion of the existing base course where localized base failures occur, installation of 3" thick A.C. pavement, ¾" thick A.C. friction course, adjustment s/replacements of existing utility manholes, and installation of permanent traffic markers & signs.

Site 2: Increase the existing 3 foot wide flushed median to accommodate a 14 ft. wide two-way left turn center lane, thereby resulting to a 5-lane roadway and to include the scope of work in Site 1.

Design speed will be @ 50 mph and speed limit will be posted @ 35 mph.

B. Project Data:	Existing	Proposed
Length	Site 1: 1.42 mi. Site 2: 2.35 mi.	Site 1: 1.42 mi. Site 2: 2.35 mi.
Travel Lanes	Site 1: 4-5-7 lane facility Site 2: 4 lane facility	Site 1: 5-7 lane facility Site 2: 5 lane facility
Travel Lane Width	12 + 3' Flush Median	12' + 2-way left turn lane
Right-of-Way	100'	100'
Sidewalk	Site 1 – Rte. 1 to Superior Ct. Both sides	Site 1 – Rte. 1 to Superior Ct. Both sides
Roadside Drainage	Maintain existing & surface flow	Maintain existing & surface flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	4'-6' A.C. wearing course
Guardrail System	Does not meet current standards	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	@ un-signalized intersections & maintain existing in other areas.
C. Project Budget:	FY 2006 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 500,000.00	FY 2002 STIP 35% Complete
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 7,210,000.00	
ROW Acquisition Cost		
TOTAL	\$ 7,710,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category I, Project No. 5

Route 29 (Gayinero Drive) Rehabilitation & Widening – Design Element

Limits: From Route 1 to Route 15

This road is a major collector in the Guam Highway System. It connects Route 1 in Yigo and Route 15, back road to AAFB. This roadway serves the Northern Guam Elementary School & two residential housing subdivisions with approximately 300 dwellings.

A. Project Scope of Work:

This is a modernization project which will include design work for the rehabilitation and widening of the existing 2-lane roadway facility, provide two-way left turn lane along the school area and the Marianas Terrace Housing Subdivision, widening of existing pavement from 11 ft. to 12 ft. travel lanes, milling/removal of existing asphalt concrete (AC) & portion of existing base course, where localized base failure occurs, install new base, 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 40 mph and speed limit will be posted @ 25 mph.

B. Project Data:	Existing	Proposed
Length	1.29 mi.	1.29 mi.
Travel Lanes	2 lane facility	2 lane & portion 14' two-way left turn lane
Travel Lane Width	11'	12'
Right-of-Way	60'	60'
Sidewalk	None	Partial along school & housing areas
Roadside Drainage	Surface flow	Surface flow & enclosed discharge to existing ponding basin
Off-Site Drainage	Existing ponding basin	Utilize existing ponding basin with modification & improvements
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	4'-6' A.C. wearing course
Guardrail System	None	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	@ Marianas Terrace intersections & maintain existing in other areas.
C. Project Budget:	FY 2006 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 249,000.00	
CE @ 5% of ECC		
Estimated Construction Cost		
ROW Acquisition Cost		
TOTAL	\$ 249,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2006 PROPOSED PROJECTS

CATEGORY II: NEW TRAFFIC SIGNALIZED INTERSECTIONS AND UPGRADE
& MODERNIZATION OF EXISTING TRAFFIC SIGNALIZED
INTERSECTIONS PROGRAM

PROJECT NAME

PROJECT BUDGET

None Programmed

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2006 PROPOSED PROJECTS

CATEGORY IV: HIGHWAY HAZARD ELIMINATION PROGRAM

<u>PROJECT NAME</u>	<u>PROJECT BUDGET</u>
1) Island-wide Highway Hazard Elimination Program <i>Design & Construction Elements</i>	\$ 1,047,000.00
2) ADA Compliance Project Route 30, Route 30A & Route 16 (Route 1 to Route 10A) <i>Design Element</i>	\$ 146,000.00
3) ADA Compliance Project Route 30 & Route 30A <i>Construction Element</i>	\$ 400,000.00
4) Route 1 U-Turn Lane Improvements (Route 30 to Route 10A) <i>Design & Construction Elements</i>	\$ 160,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category IV, Project No. 1

Island-wide Highway Hazard Elimination Program *Design & Construction Elements*

Limits: Island-wide

This is an immediate hazard elimination project. It is to improve the roadway facility and to eliminate contributing factors of crashes at high traffic accident locations.

Development Type: Route 1 (Dead Man's Curve) 50% Rural - 50% Urban

Route 4 (Jeff's Pirates Cove) 90% Rural - 10% Urban

A. Project Scope of Work:

Localized improvements, which includes engineering and or construction to improve existing conditions at Route 1, Dead Man's Curve and installation of 3/4" friction course on Route 4 by Jeff's Pirates Cove

B. Project Data:

Existing

Proposed

Length

Rte. 1 (Dead Man's Curve) - 4,000 ft.

Rte. 4 (Jeff's Pirates Cove) - 1,000 ft.

C. Project Budget:

FY 2006 STIP Funding

Other Funding Source

PE @ 15% of ECC

\$ 150,000.00

CE @ 5% of ECC

DPW Resources

Estimated Construction Cost

\$ 897,000.00

ROW Acquisition Cost

00.00

TOTAL

\$ 1,047,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category IV, Project No. 2

Roadside ADA Compliance Project Design Element

Limits: Route 30, Route 30A & Route 16 (Rte. 1 to Rte. 10A)

Plan to correct the ADA Violation - Civil Case No. CV01-00047

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

Correct all sidewalk ramps and curb cuts that are not in compliance with the ADA.

B. Project Data:

Proposed

Site designation used in the April 19, 2004 status report for Route 30 & Route 30A

A-1, A-2, A-6, A-7, A-9, A-10, A-11, A-16, A-17, A-19, A-22, A-23, A-21, A-26, A-32, A-33, A-35, A-36, A-39 and A-40

Site designation used in the April 19, 2004 status report for Route 16 (Rte. 1 to Rte. 10A)

B-2, B-3, B-7, B-11, B-13 B-14, B-17, B-18, B-19, B-21, B-22, B-24, B-26, B-27, B-28, B-29, B-30, B-31, B-32, B-34

C. Project Budget:

FY 2006 STIP Funding

Other Funding Source

PE @ 15% of ECC

\$ 146,000.00

CE @ 5% of ECC

Estimated Construction Cost

ROW Acquisition Cost

TOTAL

\$ 146,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECT

Category IV, Project No. 3

Roadside ADA Compliance Project *Construction Element*

Limits: Route 30, Route 30A

Plan to correct the ADA Violation - Civil Case No. CV01-00047

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

Correct all sidewalk ramps and curb cuts that are not in compliance with the ADA.

B. Project Data:

Proposed

Site designation used in the April 19, 2004 status report for Route 30 & Route 30A

A-1, A-2, A-6, A-7, A-9, A-10, A-11, A-16, A-17, A-19, A-22, A-23, A-21, A-26, A-32, A-33, A-35, A-36, A-39 and A-40

C. Project Budget:

FY 2006 STIP Funding

Other Funding Source

PE @ 15% of ECC

CE @ 5% of ECC

Estimated Construction Cost

\$ 400,000.00

ROW Acquisition Cost

TOTAL

\$ 400,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2006 PROPOSED PROJECTS, MODIFIED

Category IV, Project 4

Route 1, U-Turn Lane Improvements

Limits: From Route 30 to Route 14 (ITC)

This road is a major arterial in the Guam Highway System. This roadway was rehabilitated in 1997 with the first time installation of U-Turn lanes at raised median breaks. Motorists at opposing U-Turn lanes attempting to execute U-Turns are subjected with limited or no sight distance. This has resulted with numerous traffic crashes.

A. Project Scope of Work:

This is a hazard elimination project which includes the separation and relocation of the existing U-Turn Lanes. Cutting of raised median at designated locations, providing U-Turn storage lanes and installation of Thermoplastic pavement markings, raised markers and traffic signs.

B. Project Data:	Existing	Proposed
Length	1.38 mi.	1.38 mi.
Travel Lanes	6 lane facility plus U-Turn & Left Turn Lanes	6 lane facility plus U-Turn & Left Turn Lanes
Travel Lane Width	12' / 11' U-Turn & Left Turn	12' / 11' U-Turn & Left Turn
Right-of-Way	100'	100'
Sidewalk	8'	8'
Roadside Drainage	Enclosed	Enclosed
Off-Site Drainage	Box Culvert, discharge to ocean	Box Culvert, discharge to ocean
Pavement Markings	Thermoplastic pavement markings & raised markers	Thermoplastic pavement markings & raised markers for New U-Turn Lanes
Traffic Sign	Meets existing Roadway MUTCD Requirements	Per MUTCD requirements for New U-Turn Lanes
Shoulders	Curb Lane	Curb Lane
Guardrail System	None	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing lighting system
C. Project Budget:	FY 2006 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 10,000.00	
CE @ 5% of ECC		
Estimated Construction Cost	\$ 150,000.00	
ROW Acquisition Cost		
TOTAL	\$ 160,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2006 PROPOSED PROJECTS

***CATEGORY V:* ENGINEERING PERSONNEL FOR
FEDERAL-AID HIGHWAY PROGRAM**

PROJECT NAME

PROJECT BUDGET

1) Engineering Personnel
for Federal-Aid Highway Program
Personnel Element

\$ 1,300,000.00

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN (STIP)

FY 2006 PROPOSED PROJECT

CATEGORY V: ENGINEERING PERSONNEL FOR FEDERAL-AID HIGHWAY PROGRAM

**DEPARTMENT OF PUBLIC
WORKS
FHWA RECRUITMENT FOR HIGHWAY CONSTRUCTION PROJECTS
Annual Costs**

ITEM	POSITION TITLE	Section	POSITION NO.	GRADE	STEP	SALARY	BENEFITS	SAL + BEN
MANAGEMENT								
1	Chief of Engineer, PE		4132	R	10	\$ 66,364	\$ 23,227	\$ 89,591
2	Engineer Supervisor	CQC	4548	P	8	\$ 51,589	\$ 18,056	\$ 69,645
3	Engineer Supervisor	Contracts	4159	P	8	\$ 51,589	\$ 18,056	\$ 69,645
4	Engineer Supervisor	Traffic	4545	P	8	\$ 51,589	\$ 18,056	\$ 69,645
STAFF								
5	Engineer III	Projects	4118	O	6	\$ 43,955	\$ 15,384	\$ 59,339
6	Engineer III	Projects	4135	O	6	\$ 43,955	\$ 15,384	\$ 59,339
7	Engineer III	Projects	4140	O	6	\$ 43,955	\$ 15,384	\$ 59,339
8	Engineer III	Projects	4564	O	6	\$ 43,955	\$ 15,384	\$ 59,339
9	Engineer II	Projects	4520	N	5	\$ 38,830	\$ 13,591	\$ 52,421
10	Engineer II	Projects	4539	N	5	\$ 38,830	\$ 13,591	\$ 52,421
11	Engineer II	Projects	4139	N	5	\$ 38,830	\$ 13,591	\$ 52,421
12	Engineer II	Projects	4143	N	5	\$ 38,830	\$ 13,591	\$ 52,421
13	Construction Inspector III	Projects	4528	L	3	\$ 29,835	\$ 10,442	\$ 40,277
14	Construction Inspector III	Projects	4091	L	3	\$ 29,835	\$ 10,442	\$ 40,277
15	Construction Inspector III	Projects	4087	L	3	\$ 29,835	\$ 10,442	\$ 40,277
16	Construction Inspector III	Projects	4130	L	3	\$ 29,835	\$ 10,442	\$ 40,277
17	Construction Inspector II	Projects	4145	J	1	\$ 22,942	\$ 8,030	\$ 30,972
18	Construction Inspector II	Projects	4736	J	1	\$ 22,942	\$ 8,030	\$ 30,972
19	Construction Inspector II	Projects	4125	J	1	\$ 22,942	\$ 8,030	\$ 30,972
20	Construction Inspector II	Projects	4565	J	1	\$ 22,942	\$ 8,030	\$ 30,972
						\$763,379	\$ 267,183	\$1,030,562
						Overtime	Budget	\$ 260,438
						Total:	Total: say	\$1,291,000 \$1,300,000

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN

FY 2007 PROPOSED PROJECTS

	<u>TOTALS</u>
CATEGORY I <i>Roadways Upgrade & Modernization Program</i>	\$ 7,230,000.00
CATEGORY II <i>New Traffic Signalized Intersections and Upgrade & Modernization of Existing Traffic Signalized Intersection Program</i>	\$ 2,043,000.00
CATEGORY III <i>Bridge Replacement, Rehabilitation & Repair Program</i>	\$ 6,000,000.00
CATEGORY IV <i>Highway Hazard Elimination Program</i>	\$ 448,000.00
CATEGORY V <i>Engineering Personnel for the Federal-Aid Highway Program</i>	\$ 1,300,000.00

FY 2007 PROJECTS BUDGET TOTALS → \$17,021,000.00

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2007 PROPOSED PROJECTS

***CATEGORY I:* ROADWAYS UPGRADE & MODERNIZATION PROGRAM**

<u>PROJECT NAME</u>	<u>PROJECT BUDGET</u>
1) Route 14B Reconstruction & Widening <i>Construction Element</i>	\$ 2,000,000.00
2) Route 2 Reconstruction & Widening <i>Construction Element</i>	\$ 3,000,000.00
3) Route 27 (Finegayan Road) Reconstruction & Drainage System Improvements <i>Design Element</i>	\$ 230,000.00
4) Route 29 Reconstruction & Widening <i>Construction Element</i>	\$ 2,000,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category I, Project 1

Route 14B Reconstruction & Widening – Construction Element

Limits: From Route 1 to Route 14

This road is a major collector in the Guam Highway System. Initially, the design work was included in the FY 2002 STIP Funding, which was proposed for a 4 lane roadway. The project was cancelled due to lack of funding for land acquisition. Based on the on-going up-date of the Guam Highway Master Plan, the new proposed roadway stipulates for a 3 lane facility.

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

This is a modernization project which includes the design work for the reconstruction and widening of the existing 2-lane roadway to a 3-lane roadway facility. Removal of existing A.C. pavement, install new base, 3" thick A.C. wearing course, 3/4" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 45 mph and speed limit will be posted @ 35 mph. & portions @ 25 mph.

B. Project Data:	Existing	Proposed
Length	1.10 mi.	1.10 mi.
Travel Lanes	2 lane facility	3 lane facility
Travel Lane Width	11'	12'
Right-of-Way	60'	60'
Sidewalk	None	6' Both Sides – Rte.1 to Paseo De Oro 6'
Roadside Drainage	Surface flow	Curb & Gutter - Enclosed
Off-Site Drainage	None	Route 1 & Route 14 (San Vitores Rd.)
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	6' A.C. wearing course
Guardrail System	Does not meet current standards	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	@ un-signalized intersections & maintain existing in other areas.
C. Project Budget:	FY 2007 STIP Funding	Other Funding Source
PE @ 15% of ECC		FY 2004 STIP - \$ 320,000.00
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 2,000,000.00	
ROW Acquisition Cost		
TOTAL	\$ 2,000,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category I, Project 2

Route 2 Reconstruction & Widening, Phase I, Modified – Construction Element

Limits: From Route 2A, Namo Bridge to Santa Ana Chapel

This road is a major arterial in the Guam Highway System. It is the primary route to the municipalities of Agat, Umatac and Merizo. It is also an alternate route to the village of Santa Rita, Hyundai and Bordallo Subdivisions and Harry Truman and Elementary & Southern High schools.

Development Type: 10% Rural - 90% Urban

A. Project Scope of Work:

This is a modernization project which includes the reconstruction and widening of the existing 2-lane roadway to a 3-lane roadway facility. Removal of existing A.C. pavement, relocation/adjustment of existing utilities, install new base, 3" thick A.C. wearing course, 3/4" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 45 mph and speed limit will be posted @ 35 mph. and portions @ 25 mph

B. Project Data:	Existing	Proposed
Length	3.05 mi.	3.05 mi.
Travel Lanes	2 lane facility	2 lane facility plus a continuous 2-way left turn lane
Travel Lane Width	12'	12' & 14' two-way left turn lane
Right-of-Way	100'	100'
Sidewalk	None	8' @ commercial & school areas
Roadside Drainage	Surface flow & existing natural drainage canals	Surface flow/underground discharge to existing canals
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	6' A.C. wearing course
Guardrail System	None	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA poles	@ un-signalized intersections & maintain existing in other areas.
C. Project Budget:	FY 2007 STIP Funding	Other Funding Source
PE @ 15% of ECC		\$ 350,000.00 - FY 2002 STIP
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 3,000,000.00	
ROW Acquisition Cost		
TOTAL	\$ 3,000,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category I, Project No. 3

Route 27, Finegayan Road Reconstruction & Drainage System Improvements – Design Element

Limits: From Route 1 to Route 16

This road is a major arterial in the Guam Highway System. It connects Route 1 in the vicinity of the East-West Business Center in Upper Tumon and Route 16 (McDonalds). This roadway is a heavily traveled facility which serves as a by-pass for northbound traffic to Dededo and Yigo municipalities.

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

This is a modernization project which includes the design work for the reconstruction & widening of the existing two lane facility and providing an adequate roadside drainage system, removal of existing A.C. pavement, install new base, 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 45 mph and speed limit will be posted @ 35 mph. and portions @ 25 mph.

B. Project Data:	Existing	Proposed
Length	1.12 mi.	1.12 mi.
Travel Lanes	2 lane facility	2 lane facility + 2-way left turning lane @ major intersections
Travel Lane Width	10'	12' & 14ft. 2-way left turning lane
Right-of-Way	40'	40'
Sidewalk	None	None
Roadside Drainage	Surface flow	Surface flow & enclosed drainage
Off-Site Drainage	None	Acquisition of property for construction of ponding basins & percolation chambers
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Sign	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Unpaved	6' A.C. wearing course
Guardrail System	None	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	@ un-signalized intersections & maintain existing in other areas.
C. Project Budget:	FY 2007 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 230,000.00	
CE @ 5% of ECC		
Estimated Construction Cost		
ROW Acquisition Cost		
TOTAL	\$ 230,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category I, Project 4

Route 29 (Gayinero Drive) Rehabilitation & Widening – Design Element

Limits: From Route 1 to Route 15

This road is a major collector in the Guam Highway System. It connects Route 1 in Yigo and Route 15, back road to AAFB. This roadway serves the Northern Guam Elementary School & two residential housing subdivisions with approximately 300 dwellings.

A. Project Scope of Work:

This is a modernization project which will include the rehabilitation and widening of the existing 2-lane roadway facility, provide two-way left turn lane along the school area and the Marianas Terrace Housing Subdivision, widening of existing pavement from 11 ft. to 12 ft. travel lanes, milling/removal of existing asphalt concrete (AC) & portion of existing base course, where localized base failure occurs, install new base, 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Design speed will be 40 mph and speed limit will be posted @ 25 mph.

B. Project Data:	Existing	Proposed
Length	1.29 mi.	1.29 mi.
Travel Lanes	2 lane facility	2 lane & portion 14' two-way left turn lane
Travel Lane Width	11'	12'
Right-of-Way	60'	60'
Sidewalk	None	Partial along school & housing areas
Roadside Drainage	Surface flow	Surface flow & enclosed discharge to existing ponding basin
Off-Site Drainage	Existing ponding basin	Utilize existing ponding basin with modification & improvements
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised markers
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Un-paved	4'-6' A.C. wearing course
Guardrail System	None	Per Roadside Design Guide – 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	@ Marianas Terrace intersections & maintain existing in other areas.
C. Project Budget:	FY 2007 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 2,000,000.00	
CE @ 5% of ECC		
Estimated Construction Cost		
ROW Acquisition Cost		
TOTAL	\$ 2,000,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2005 PROPOSED PROJECTS

***CATEGORY II: NEW TRAFFIC SIGNALIZED INTERSECTIONS AND UPGRADE
& MODERNIZATION OF EXISTING TRAFFIC SIGNALIZED
INTERSECTIONS PROGRAM***

<u>PROJECT NAME</u>	<u>PROJECT BUDGET</u>
1) Route 10/Sabanan Magas Road & Route 8/North-South Biang Streets Intersection Improvements & New Traffic Signalization <i>Design & Construction Elements</i>	\$ 760,000.00
2) Traffic Signal System Upgrade <i>Design Element</i>	\$ 360,000.00
3) Route 8/10/16 & Radio Barrigada Intersection Improvements & Traffic Signalization Upgrade <i>Design & Construction Elements</i>	\$ 923,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category II, Project No. 2

Route 10/Sabanán Magas Road Intersection Improvements & New Traffic Signalization

Design & Construction Elements

Limits: From 150 ft. on both Route 10 approaches and 100 ft. on Sabanán Magas Road approach to intersection.

Route 10 is a major arterial in the Guam Highway System and Sabanán Magas Road is a minor collector road that serves Tai Day Care Nursery, Father Duenas High School and residential housing units totaling over 120 dwellings.

Development Type: 50% Rural - 50% Urban

A. Project Scope of Work:

This is a modernization project which includes widening of Sabanán Magas Rd. & rehabilitation of the existing intersection facility. Installation of a new traffic signal system, full channelization, milling/removal of existing asphalt concrete (AC) & portion of existing base course, where localized base failure occurs, install 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility.

B. Project Data:

	Existing	Proposed
Length	100 ft. - Route 10 approaches 100 ft. - Sab. Magas approach	100 ft. on Route 10 approaches 100 ft. - Sab. Magas approach
Travel Lanes	Route 4 - 5 lanes Sabanán Magas Road - 2 lanes	Route 4 - 5 lanes Sabanán Magas Road - 3 lanes
Travel Lane Width	12' & 14' left turning lane	12' & 14' left turning lane
Right-of-Way	Route 10 - 100' Sabanán Magas Road - 40'	Route 10 - 100' Sabanán Magas Road - 40'
Sidewalk	None	None
Roadside Drainage	Surface Flow	Surface Flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Sign	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Route 10 - 6' AC wearing course Sabanán Magas Rd. - Unpaved	Route 10 - 6' AC wearing course Sabanán Magas Rd. - Unpaved
Guardrail System	Does not meet current standards	Per Roadside Design Guide - 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Upgrade with modern intersection luminaries

C. Project Budget:

	FY 2007 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 40,000.00	
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$ 264,000.00	
ROW Acquisition Cost		
TOTAL	\$ 304,000.00	

NOTE: Page 42 & Page 43 are combined projects

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category II, Project No. 2

Route 8/North-South Biang Streets Intersection Improvements & New Traffic Signalization

Design & Construction Elements

Limits: From 150 ft. on both Route 8 approaches & 100 ft. on both North & South Biang Streets approaches to intersection.

Route 8 is a major arterial in the Guam Highway System and North & South Biang Streets is a minor collector road that connects to Route 33 and serves as primary access for the residence in the municipality of Mongmong-Toto-Maite. This signalization project is part of the Jalaquac Connector Short-Range Improvement Project in the Guam 2010 Highway Master Plan.

Development Type: 0 % Rural - 100% Urban

A. Project Scope of Work

This is a modernization project which includes widening of North & South Biang Streets, rehabilitation of the existing intersection facility and Installation of a new traffic signal system, full channelization, milling/removal of existing asphalt concrete (AC) & portion of existing base course, where localized base failure occurs, install 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility.

B. Project Data:	Existing	Proposed
Length	150 ft. - Route 8 approaches 100 ft. - N. & S Biang approach	150 ft. on Route 8 approaches 100 ft. - N. & S Biang approach
Travel Lanes	Route 8 - 5 lanes N. & S. Biang St. - 2 lanes	Route 8 - 5 lanes N. & S. Biang St. - 3 lanes
Travel Lane Width	12' & 14' left turning lane	12' & 14' left turning lane
Right-of-Way	Route 8 - 100' N. & S. Biang St. - 40'	Route 8 - 100' N. & S. Biang St. - 40'
Sidewalk	None	None
Roadside Drainage	Surface Flow	Surface Flow
Off-Site Drainage	None	None
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Sign	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Route 8 - 6' AC wearing course N. & S. Biang St. - Unpaved	Route 8 - 6' AC wearing course N. & S. Biang St. - Unpaved
Guardrail System	Does not meet current standards	Per Roadside Design Guide - 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Upgrade with modern intersection luminaries
C. Project Budget:	FY 2007 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 66,000.00	
CE @ 5% of ECC		
Estimated Construction Cost	\$ 390,000.00	
ROW Acquisition Cost		
TOTAL	\$ 456,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category II, Project No. 3

Traffic Signal System Upgrade

Design Element

Limits: Route 1 & Route 11, Route 1 & Route 6 (Adelup), Route 1 & 5th Street, Route 1 & Route 4, Route 1 & Route 8 and Route 8 & Route 7A (O'Brien Dr.), Route 4 & Dero Rd., Route 4 & Route 15 (Maimai Rd.), Route 4 & Route 10, Route 8 & Route 10, Route 14 & Route 30A (Farenholt Ave.) and Route 16 & Route 27A (Fatima Rd.)

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

This is a modernization project which include the removal of the existing cable hung traffic signal heads, installation of new Mast Arm, new signal heads and all necessary conduits, pull boxes and wires on all approaches at the above intersection locations.

B. Project Data:	Existing	Proposed
Overhead Signal Heads	Cable Hung	New Mast Arms
Traffic Sign	Does not meet MUTCD Req.	As per MUTCD Requirements
C. Project Budget:	FY 2007 STIP FUNDING	Other Funding Source
PE @ 15% of ECC	\$ 360,000.00	
CE @ 5% of ECC		
Estimated Construction Cost		
ROW Acquisition Cost		
TOTAL	\$ 360,000.00	

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECTS, MODIFIED

Category II, Project No. 4

Route 8/10/16/Radio Barrigada Road Intersection Improvements & Traffic Signalization Upgrade

Limits: From 500 ft. out on Route 8/10/Radio Barrigada Road & Route 16 to connect with Route 16 Phase I
Route 8/10/16 is a major arterial in the Guam Highway System and Radio Barrigada Road is a minor collector road that serves P.C. Lujan Elementary School, Navy Admiral Nimitz Golf Course & Club, an Army Reserve Unit and a Military Housing Area.

A. Project Scope of Work:

This is a modernization project which includes the reconstruction of the existing intersection facility and upgrade of the existing cable hung traffic signal system, install new base, 8" thick P.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility.

B. Project Data:	Existing	Proposed
Length	100 ft. on all 3 approaches	1200 ft. on Route 16 100 ft. on other approaches
Travel Lanes	Route 8/10/16 - 5 lanes Radio Barrigada Rd. - 2 lanes	Route 8/10/16 - 5 lanes Radio Barrigada Road - 3 lanes
Travel Lane Width	12' & 14' left turning lane	12' & 14' left turning lane
Right-of-Way	Route 8/10/16 - 100' Radio Barrigada Road - 60'	Route 10 - 100' Radio Barrigada Road - 60'
Sidewalk	Route 10 - 6'	Route 10 - 6'
Roadside Drainage	Surface Flow	Surface flow & enclosed
Off-Site Drainage	Abutting ponding basin	Enclosed; discharge to abutting ponding basin
Pavement Markings	Inadequate and in poor condition	Thermoplastic pavement markings & raised markers
Traffic Sign	Inadequate and in poor condition	Per MUTCD requirements
Shoulders	Rte. 8/10/16 - 6' AC w. course Radio Barrigada Rd. - Unpaved	Route 8/10/16 - 6' AC wearing course Radio Barrigada Rd. - 6' AC w. course
Guardrail System	None	Per Roadside Design Guide - 2002 Requirements
Roadway Lighting	Mounted on GPA power poles	Upgrade with modern intersection luminaries
C. Project Budget:	FY 2007 STIP FUNDING	Other Funding Source
PE @ 15% of ECC	\$ 120,000.00	
CE @ 5% of ECC		
Estimated Construction Cost	\$ 803,000.00	
ROW Acquisition Cost		
TOTAL	\$ 923,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2007 PROPOSED PROJECTS

***CATEGORY III:* BRIDGE REPLACEMENT, REHABILITATION & REPAIR
PROGRAM**

PROJECT NAME

PROJECT BUDGET

1) Ylig Bridge Replacement & Road Approaches Improvements <i>Construction Element</i>	\$ 6,000,000.00
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GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category III, Project No. 1

Ylig Bridge Full Replacement & Approaches Improvements – Construction Element

Ylig Bridge is located in Yona and carries Route 4 over the Ylig River. It is a major arterial in the Guam Highway System and it is reference "Bridge Number 19" in the Guam Bridge Inventory. E.A. Engineers conducted a bridge inspection in 1996 and determined the bridge was in serious condition and be replaced. Initially, the proposed bridge replacement calls for a 5 lane bridge and based on the on-going up-date of the Guam Highway Master Plan, the proposed bridge will be 3 lanes.

Development Type: 80% Rural - 20% Urban

A. Project Scope of Work:

This is a modernization project which includes the construction of a new single span, 3 lane bridge with a 2 ft. flush median separation. This project also includes the reconstruction and widening from 2 to 3 lanes of the north approach from the bridge to connect to the Route 4, Yona project. Reconstruction and widening to 3 lanes from the bridge to its intersection with Route 17, removal of existing A.C. pavement, install new base, 3" thick A.C. wearing course, ¾" thick friction course and construction of the roadway appurtenances for a complete and useable facility. Installation of temporary bridge for bypass during construction. Design speed will be 45 mph and speed limit will be posted @ 35 mph.

B. Project Data:	Existing	Proposed
Length	Bridge -144 ft.	Bridge - 144 ft. Route 4 - .49 mi.
Spans in Main Unit	3	1
Width – Out to Out	33 ft.	42 ft.
Travel Lanes	2 lane facility	3 lane facility + 2 ft. flush median separation (2 SB – 1NB)
Right-of-Way	100'	100'
Sidewalk (Bridge)	3'	4' (Flush-Bike Path) Both Sides
Pavement Markings	Inadequate and in poor condition	Thermoplastic markings & raised marker
Traffic Signs	Inadequate and in poor condition	Per MUTCD requirements
Approach Shoulders	Un-paved	4'-6' A.C. wearing course
Guardrail System	Does Not Meet Current Standards	Per 2002 Roadside Design Guide Requirements
Roadway Lighting	Mounted on GPA power poles	Maintain existing street lighting system.
C. Project Budget:	FY 2007 STIP Funding	Other Funding Source
PE @ 15% of ECC	\$ 70,000.00 – Bridge to Rte. 17	FY 2002 STIP - Bridge
CE @ 5% of ECC		DPW Resources
Estimated Construction Cost	\$5,930,000.00	
ROW Acquisition Cost		
TOTAL	\$6,000,000.00	

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2007 PROPOSED PROJECTS

***CATEGORY IV:* HIGHWAY HAZARD ELIMINATION PROGRAM**

PROJECT NAME

PROJECT BUDGET

- 1) ADA Compliance Project
Route 16 (Route 1 to Route 10A)
Construction Element

\$ 380,000.00

GUAM STATEWIDE (ISLANDWIDE) TRANSPORTATION IMPROVEMENT PLAN

FY2007 PROPOSED PROJECT

Category IV, Project No. 1

Roadside ADA Compliance Project *Construction Element*

Limits: Route 16 (Rte. 1 to Rte. 10A)

Plan to correct the ADA Violation - Civil Case No. CV01-00047

Development Type: 0% Rural - 100% Urban

A. Project Scope of Work:

Correct all sidewalk ramps and curb cuts that are not in compliance with the ADA.

B. Project Data:

Proposed

Site designation used in the April 19, 2004 status report

B-2, B-3, B-7, B-11, B-13 B-14, B-17,
B-18, B-19, B-21, B-22, B-24, B-26, B-27,
B-28, B-29, B-30, B-31, B-32, B-34

C. Project Budget:

FY 2007 STIP Funding

Other Funding Source

PE @ 15% of ECC

CE @ 5% of ECC

Estimated Construction Cost

\$ 380,000.00

ROW Acquisition Cost

TOTAL

\$ 380,000.00

**GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION
IMPROVEMENT PLAN (STIP)**

FY 2007 PROPOSED PROJECTS

***CATEGORY V: ENGINEERING PERSONNEL FOR
FEDERAL-AID HIGHWAY PROGRAM***

PROJECT NAME

PROJECT BUDGET

1) Engineering Personnel
for Federal-Aid Highway Program
Personnel Element

\$ 1,300,000.00

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN (STIP)

FY 2007 PROPOSED PROJECT

CATEGORY V: ENGINEERING PERSONNEL FOR FEDERAL-AID HIGHWAY PROGRAM

**DEPARTMENT OF PUBLIC
WORKS
FHWA RECRUITMENT FOR HIGHWAY CONSTRUCTION PROJECTS
Annual Costs**

ITEM	POSITION TITLE	Section	POSITION NO.	GRADE	STEP	SALARY	BENEFITS	SAL + BEN
MANAGEMENT								
1	Chief of Engineer, PE		4132	R	10	\$ 66,364	\$ 23,227	\$ 89,591
2	Engineer Supervisor	CQC	4548	P	8	\$ 51,589	\$ 18,056	\$ 69,645
3	Engineer Supervisor	Contracts	4159	P	8	\$ 51,589	\$ 18,056	\$ 69,645
4	Engineer Supervisor	Traffic	4545	P	8	\$ 51,589	\$ 18,056	\$ 69,645
STAFF								
5	Engineer III	Projects	4118	O	6	\$ 43,955	\$ 15,384	\$ 59,339
6	Engineer III	Projects	4135	O	6	\$ 43,955	\$ 15,384	\$ 59,339
7	Engineer III	Projects	4140	O	6	\$ 43,955	\$ 15,384	\$ 59,339
8	Engineer III	Projects	4564	O	6	\$ 43,955	\$ 15,384	\$ 59,339
9	Engineer II	Projects	4520	N	5	\$ 38,830	\$ 13,591	\$ 52,421
10	Engineer II	Projects	4539	N	5	\$ 38,830	\$ 13,591	\$ 52,421
11	Engineer II	Projects	4139	N	5	\$ 38,830	\$ 13,591	\$ 52,421
12	Engineer II	Projects	4143	N	5	\$ 38,830	\$ 13,591	\$ 52,421
13	Construction Inspector III	Projects	4528	L	3	\$ 29,835	\$ 10,442	\$ 40,277
14	Construction Inspector III	Projects	4091	L	3	\$ 29,835	\$ 10,442	\$ 40,277
15	Construction Inspector III	Projects	4087	L	3	\$ 29,835	\$ 10,442	\$ 40,277
16	Construction Inspector III	Projects	4130	L	3	\$ 29,835	\$ 10,442	\$ 40,277
17	Construction Inspector II	Projects	4145	J	1	\$ 22,942	\$ 8,030	\$ 30,972
18	Construction Inspector II	Projects	4736	J	1	\$ 22,942	\$ 8,030	\$ 30,972
19	Construction Inspector II	Projects	4125	J	1	\$ 22,942	\$ 8,030	\$ 30,972
20	Construction Inspector II	Projects	4565	J	1	\$ 22,942	\$ 8,030	\$ 30,972
						\$763,379	\$ 267,183	\$1,030,562

Overtime	Budget	\$ 260,438
Total:	Total: say	\$1,291,000 \$1,300,000

GUAM STATEWIDE (ISLAND-WIDE) TRANSPORTATION IMPROVEMENT PLAN
FY 2005 - FY 2007 Proposed Projects



			ESTIMATED PROJECT COSTS						
No	PROJECTS	CAT.	FY 2005		FY 2006		FY 2007		PROJECT BUDGET
			Design	CONST.	Design	CONST.	Design	CONST.	
1	Route 15 Reconstruction, Phase I -Design/Build	I	\$6,900,000						\$6,900,000
2	Route 5 & Portion of Route 12, Reconstruction & Widening	I				\$2,600,000			\$2,600,000
3	Route 10A (Airport Rd.) Portion Rehabilitation	I				\$2,000,000			\$2,000,000
4	Route 17 Reconstruction and Widening and upgrade of traffic signal	I		\$6,000,000					\$6,000,000
5	Route 14B (Ipao Road) Reconstruction and Widening	I						\$2,000,000	\$2,000,000
6	Route 2 Reconstruction and Widening	I						\$3,000,000	\$3,000,000
7	Route 25 Reconstruction & Widening	I		\$1,200,000					\$1,200,000
8	Route 26 Reconstruction & Widening (Phase II) (Route 1 to Route 25)	I				\$2,700,000			\$2,700,000
9	Route 1/Wusstig Rd. Intersection Improvements & New Traffic Signalization	II		\$300,000					\$300,000
10	Route 10/Sabanán Magas Rd. & Route 8/N.-S. Biang Sts. Int. Improvements & New Traffic Sig.	II					\$110,000	\$650,000	\$760,000
11	Traffic Signal System Upgrade	II					\$360,000		\$360,000
12	Route 8/10/16 Radio Barrigada Rd. Intersection Improvements & Traffic Signalization Upgrade	II					\$120,000	\$803,000	\$923,000
13	Pigua Bridge Replacement & Road Approaches Improvements	III	\$400,000			\$3,800,000			\$4,200,000
14	Bile Bridge Replacement & Road Approaches Improvements	III	\$400,000			\$3,800,000			\$4,200,000
15	Island-Wide Highway Hazard Elimination Program	IV			\$150,000	\$897,000			\$1,047,000
16	ADA Compliance Project Route 1 (Route 30 to Route 16)	IV	\$74,000	\$400,000					\$474,000
17	ADA Compliance Project Route 30, Route 30A & Route 16 (Rt.1 to Rt.10A)	IV			\$146,000				\$146,000
18	ADA Compliance Project Route 30 and Route 30A	IV				\$400,000			\$400,000
19	ADA Compliance Project Route 1 6 (Route 1 to Route 10A)	IV						\$380,000	\$380,000
20	Guardrail System Replacement (Island-Wide)	IV					\$68,000		\$68,000
21	Completion of the Traffic Management Center Building for Division of Engineering Offices	VI	\$66,000	\$384,000					\$450,000
22	Route 4 Rehabilitation & Widening Design/Build	I				\$7,710,000			\$7,710,000
23	Route 27 (Finegayan Rd.) Reconstruction & Drainage Improvements	I					\$230,000		\$230,000
24	Route 29 Reconstruction & Widening	I			\$249,000			\$2,000,000	\$2,249,000
25	Ylig Bridge Replacement & Road Approaches Improvements	III						\$6,000,000	\$6,000,000
26	Route 1 U-Turn Lane Improvements (Route 30 to Route 10A)	IV			\$10,000	\$150,000			\$160,000
			\$940,000	\$15,184,000	\$555,000	\$24,057,000	\$888,000	\$14,833,000	\$56,457,000
27	Engineering Personnel for Federal-Aid Highway Program	V	PERSONNEL \$1,300,000		PERSONNEL \$1,300,000		PERSONNEL \$1,300,000		\$3,900,000
FY 2005 -2007 TOTALS			\$17,424,000		\$25,912,000		\$17,021,000		\$60,357,000

GRAND TOTAL \$60,357,000

Projects for FY 2008:

Traffic Signal Upgrade , CON = \$1,100,000.00
Guardrail System Replacement, CON = \$500,000.00
Route 27 (Finegayan Rd), CON = \$3,000,000.00
Agana Bridge , CON = \$4,000,000.00
Ajayan Bridge Reconstruction, PE = \$380,000.00
Engineering Personnel = \$1,300,000.00
Advance Const for FY 07 = \$4,000,000.00
Total Amount = \$14,280,000.00

Cat

I Roadway Upgrade & Modernization
II Traffic Signal Installation and Upgrade
III Bridge Replacement
IV Highway Hazard Elimination Program
V Completion of TMC Building
VI Engineering Personnel

APPENDIX H

GUAM 2020 HIGHWAY MASTER PLAN

DAR FUNDING ELIGIBILITY CRITERIA

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Defense Access Roads

The Defense Access Road (DAR) Program provides a means for the military to pay their fair share of the cost of public highway improvements necessary to mitigate an unusual impact of a defense activity. An unusual impact could be a significant increase in personnel at a military installation, relocation of an access gate, or the deployment of an oversized or overweight military vehicle or transporter unit.

To initiate a DAR project, the local military base identifies the access or mobility needs and brings these deficiencies to the attention of the Military Traffic Management Command (MTMC). The MTMC will either prepare a needs evaluation or request the FHWA to make an evaluation, in accordance with 23 CFR, Part 660E, of improvements that are necessary, develop a cost estimate, and determine the scope of work.

An onsite meeting is usually held before the evaluation begins to explain the DAR program, the process for performing the needs evaluation, identify possible alternates, and the assignment of work. The FHWA will forward the needs evaluation to the MTMC for their review and the review of the appropriate military service.

The MTMC will determine if the proposed work/project/improvements are eligible for DAR funds and certify the road as important to the national defense. Then the military service requests funding for the project through their normal budgeting process. Once the funds are provided by Congress they are transferred to FHWA and allocated to the agency administering the project. Title 23 Federal-aid procedures are followed in the design and construction of the project.

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FEDERAL-AID POLICY GUIDE
December 9, 1991, Transmittal 1

NS 23 CFR 660E

Attachment 2

NON-REGULATORY SUPPLEMENT

ATTACHMENT

OPI: HFL-13

ELIGIBILITY CRITERIA

1. Defense Access Roads

- a. Military Installations. The Department of Defense has the responsibility for determining the eligibility of proposed improvements for financing with defense access road funds. Generally, projects meeting the following requirements will be considered appropriate for such financing.

(1) Access roads providing new connections between either old or new military installations and main highways may be considered eligible for 100 percent financing with defense access road funds, providing that in urban areas where a new entrance is established and access to a main thoroughfare is via existing city streets, the 100 percent defense access financing extends outward from the reservation only so far as the traffic generated by the installation is greater than other traffic.

(2) Urgently needed improvements of existing highways that are neither a part of nor qualified for inclusion in the Federal-aid primary system, but upon which traffic is suddenly doubled (or more than doubled) by reason of the establishment or expansion of a permanent military installation may be considered eligible for financing in whole or in part with defense access road funds. One hundred percent defense access road financing will be considered only on the lightly traveled portion of these highways which are a part of the Federal-aid secondary system, or which are of insufficient importance to qualify for such designation. The more heavily traveled Federal-aid secondary highways (upon which traffic is suddenly doubled or more than doubled), generally regarded as being self-supporting from their earnings of road-user revenues, are eligible for only partial defense access road financing.

(3) Urgent improvements needed to avoid intolerable congestion or critical structural failure of any highway serving a temporary surge of defense-generated traffic (such as that which results from the establishment and operation of a temporary military installation, or from large-scale construction activity) may be considered eligible for financing to the extent necessary to provide the minimum essential facility to accommodate the temporary surge of traffic. A temporary surge of traffic is defined as one of several months duration, at least, but very short in duration as compared to the total life of a normal highway improvement.

(4) Alteration of a public road in the immediate vicinity of a military installation to accommodate regular and frequent movements of special military vehicles such as tank transporters or heavy ammunition carriers may be financed with defense access road funds, provided it is impractical or uneconomical to acquire right-of-way and develop such roads for exclusive military use. However, highway funds from other sources should finance any improvement that may be needed to bring the highway to a stage satisfactory for accommodation of all traffic except the special military vehicles.

(5) Access roads serving State National Guard facilities which are federally owned are eligible under paragraphs 1a(2) and (4). Roads serving federally owned National Guard facilities which are of appreciable non-military local benefit are eligible for only partial defense access road financing. Roads serving State-owned National Guard facilities are ineligible.

(6) No highway located within the boundaries of a military reservation is eligible for financing from defense access road funds. This prohibition does not apply to a highway through a military reservation on public rights-of-way open to free use of the public with no military restrictions nor to a highway located along and partly within the installation boundaries but not subject to closure by military authorities.

(7) Except for some clear exceptions such as cases that qualify under paragraph 1a(5) of this attachment, projects on the Federal-aid primary system are not generally considered eligible for financing with defense access road funds.

(8) Traffic signal installations when justified may be financed as part of a new construction project.

b. Defense Industries. Criteria governing eligibility of access roads for military installations also apply to any defense industry as defined in current joint Army-Navy-Air Force regulations.

2. Replacement Roads (Military). Highways constructed to replace those closed by establishment of new military installations or the expansion of old ones are considered eligible for financing with defense access road funds to the extent of 100 percent of the cost of constructing the replacement road to current standards for current traffic.

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