North and Central Guam Land Use Plan

Bureau of Statistics and Plans—Government of Guam

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PLAN RITE

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Appendix C. Glossary

Acronyms

AAFB	Andersen Air Force Base
ACP	asbestos cement
Anao	Government of Guam conservation areas
APCs	Areas of Particular Concern
Draft GTP	Draft 2030 Guam Transportation Plan
EHB	East Hagåtña Bay
GCA	Guam Code Annotated
GEDA	Guam Economic Development Authority
GHG	greenhouse gas
GHURA	Guam Housing and Urban Renewal Authority
GIP	Gross Island Product
GPA	Guam Power Authority
GPZ	Groundwater Protection Zone
GRHP	Guam Register of Historic Places
GWA	Guam Waterworks Authority
GWUDI	Groundwater under the Direct Influence of Surface Water
HUD	Department of Housing and Urban Development
IWPS	Island Wide Power System
JGPO	Joint Guam Program Office

LOS	level of service
MARC	Richard F. Taitano Micronesian Area Research Center
MDI	Miyama Development International Co., Ltd
mgd	million gallons per day
MW	megawatts
NAS	Naval Air Station
NCTS	Naval Computer and Telecommunications Station
NR	natural resource
PSI	pounds per square inch
PVC	polyvinyl chloride
RBMP	Recreational Beach Monitoring Program
SGCN	species of greatest conservation need
SHPO	State Historic Preservation Office
STPs	Sewage Treatment Plants
TDM	Transportation Demand Management
TOD	Transit Oriented Development
TSM	Transportation System Management
TWHF	Temporary Workers Housing Facilities
VLD	very low density
WAPA	War in the Pacific National Historical Park
WTP	Water Treatment Plant

Chapter 1. Introduction

1.1. Introduction

The Island of Guam is at a crossroads in planning for its growth and development. The U.S. Department of Defense is planning a major expansion of its facilities and personnel for all military service branches on Guam. An estimated 40,400 active military personnel and dependents are expected by 2014; comprising a 185% increase over the current 14,200 found on the island. Growth in the military sector will, in turn, impact private sector economic and residential growth and development. Much of this future growth is expected to occur in the northern and central part of Guam (see Figure 1 at the end of this section). In order to protect the quality of life and future of the island, growth must take into account Guam's unique environmental, cultural and economic character.

In the face of this unprecedented growth, the Government of Guam seeks to shape its future in ways that will maintain the quality of life that makes North and Central Guam a desirable place to work, live and visit. The Bureau of Statistics and Plans, Government of Guam, in cooperation with an interagency working group, has prepared this North and Central Guam Land Use Plan in order to identify a vision, and establish goals and policies to achieve the vision. Although the initial Plan was limited to North and Central Guam, the vision, goals and policies are intended to have Islandwide application, with the remaining villages included in a later planning phase.

In January and February 2009, comments were received from the public, businesses, and other stakeholders on draft versions of this Plan, which have been used to refine the Plan and to reflect the intent and direction of the citizens and Government of Guam. In September 2009, the final draft Plan was presented to the stakeholders, public, and policymakers again, with review focusing on 1) changes made to the Plan and Land Use Maps since the February meetings, and 2) the implementation actions in Chapter 8. In addition, the Implementation Plan was reviewed by the interagency working group to confirm appropriate lead and partner agencies for each action, and to discuss potential top priority actions.

1.2. Vision

At public meetings conducted in October 2008, Guam residents participated in visioning workshops to contribute their ideas for a vision for North and Central Guam and to identify potential policies and changes needed to address future growth. The Vision Statement that arose from these meetings is described below and the complete summary of comments is provided in Appendix A. The draft Land Use Plan and Vision were presented for review and comment in another round of public and stakeholder meetings in January and February 2009, and was made available for review by all interested parties.

1.2.1. Vision Statement

Guam is a sustainable tropical paradise that is safe, walkable, family- and community-oriented, and protective of natural resources.

The North and Central Guam Land Use Plan envisions a community that is safe for residents in terms of living and mobility, protects residential areas from major commercial developments while improving access to work, shopping, and recreation, puts the focus on the village, and provides adequate public services, transportation choices, and power, sewer, and water utilities for the anticipated growing population. There is also an emphasis on sustainability and conservation, with a desire for more green, recreational spaces and areas that provide protection for both land and marine natural resources. There is a strong desire that the community, stakeholders, and government agencies work together to create a land use plan that incorporates the vision of the people of Guam, along with implementation strategies to deliver that vision.

Land Use Vision

- Future growth has been accommodated through a sustainable pattern of development that provides for commercial, office, industrial and residential development while maintaining the character of Guam.
- Open space is provided through protection of valuable natural resource lands, conservation of sensitive natural features and provision of active open space for recreation and community gatherings.
- New development respects and protects Guam's cultural heritage, following compact, village-scaled patterns and walkable neighborhoods.
- Existing transportation corridors and aging shopping centers have been redeveloped to provide a range of housing choices, workplaces, and community activities, easily accessible via an improved transit system.
- Agricultural lands and activity continues to thrive, with locally produced food readily available.

Environmental Vision

- Guam's natural environment, including air, water and habitat, is clean and well managed.

- The ocean's resources—the coral reefs, the rivers and streams that feed into marine environments, the marine animals—have been protected.
- Irreplaceable resources, such as the Northern Aquifer and limestone forests, have been protected and preserved.
- Alternative energy sources available through sun, wind, waves and water have been explored and are being developed as feasible.

Community Vision

- Guam is a safe, crime-free, clean, organized community.
- Planning on Guam is inclusive and collaborative. All interests are considered, including those of the residents, businesses, military, and other stakeholders.
- Communities are supported through appropriately placed public facilities, including community and civic centers, schools, medical clinics and parks.

Economic Vision

- Guam's economy provides a variety of jobs with livable wages that allow residents to afford a place to live and services.
- The cost of living on Guam is affordable to a diverse range of residents, from those just starting out to those ready to retire.
- Guam's economy has diversified and includes support for military activities, local business growth, enhanced tourism, increased regional trade and other activities.

Infrastructure Vision

- Sewer and water infrastructure provides for adequate, reliable and clean water and wastewater service throughout Guam.
- Transportation infrastructure provides more choices for Guam residents and increases mobility, travel options, safety and efficiency. Expanded opportunities for transit, pedestrian and bicycle mobility have been provided.
- Power and energy are provided through an infrastructure system that is efficient, attractive and uses renewable resources to the extent possible.

What does sustainability mean?

Sustainability and sustainable development are terms that are used frequently in many different contexts and can have different meanings. For the purpose of this Plan, *sustainability* means meeting the needs of the present without depleting resources or harming the environment for future generations. Sustainability also includes the long-term economic health and equity—or social fairness—of a community. *Sustainable development* has been defined as "development without growth beyond environmental carrying capacity, where development means qualitative improvement and growth means quantitative increase" (Herman E. Daly). One of America's founding fathers wrote that "*The earth belongs to the living. No man may by natural right oblige the lands he owns or occupies, or those that succeed him in that occupation, to debts greater than those that may be paid during his own lifetime. Because if he could, then the world would belong*

to the dead and not to the living." (Thomas Jefferson – from the Iroquois Confederacy). *Smart Growth*—often discussed along with sustainability—is economic growth that consciously seeks to avoid wastefulness and damage to the environment, coupled with compact, efficient, and environmentally sensitive patterns of development that provide people with additional travel, housing, and employment choices by focusing future growth away from rural areas and closer to existing and planned job centers and public facilities.

1.3. What is a Land Use Plan?

This Plan, when adopted in its final form by the Government of Guam, is a vehicle to help the northern villages of Guam achieve their vision for future growth and development.

Used as a guide for the future physical, economic and community development of these villages, this Plan establishes goals and policies to be used in evaluating and making land use decisions. By including goals and policies that address topics beyond land use, the Plan also shows how all of the different parts—land use, housing, economic development, natural systems, transportation and infrastructure—must work together to achieve the desired land use pattern.

Although comprehensive in nature, this Land Use Plan differs from a full comprehensive plan in that it addresses the future vision for Guam largely from the perspective of land use patterns and the services needed to support these land use patterns. Future comprehensive planning efforts in Guam will build on the groundwork provided by this Land Use Plan, providing additional guidance for public services, programs and other measures needed to help Guam fully achieve its vision for the future.

This Land Use Plan identifies a range of land use categories for Guam. These land use categories are not zoning designations and are not intended to be used as such. Instead, these categories establish a general land use pattern for Guam that is consistent with the Plan's goals and policies. The Plan provides the basis for and is implemented by future zoning code development. Therefore, the Plan does not specify all uses permitted in each land use category, focusing instead on the purpose of each category and the primary type of use that would be expected in each category.

The government's regulatory and non-regulatory decisions and programs, as well as its budget, should be consistent with this Plan and future comprehensive planning efforts. Used this way, the Plan will help to minimize conflict in decision making, promote coordination among programs and regulations, bring predictability to the development process, and increase effectiveness of Guam's efforts to improve quality of life. Individual landowners, businesses and interest groups are able to use the Plan to evaluate their decisions in light of the community's goals. In addition, consideration should be given to increased use of public-private partnerships, quasi-public organizations, and privatization to augment the Government's ability to deliver essential services. The Government still provides services that are frequently delivered by private enterprise or public-private partnership, such as hospitals, solid waste management, water and waste water

services, and port operations, etc. Implementation of the Plan's goals should consider ways to promote and encourage privatization and public-private partnerships.

The Plan has the following characteristics:

- Long-range. The Plan is based on a 20-year land use vision of North and Central Guam, as articulated by interested citizens, Government of Guam agency representatives, elected officials, and the business and construction community.

- Consistent. The Plan is internally consistent and coordinated with other ongoing planning efforts, such as the 2030 Guam Transportation Plan.

- Comprehensive. The Plan outlines the use of land and resources to organize and coordinate the regulatory and non-regulatory relationships among people, land, resources, natural systems, and public facilities to protect and maximize the future health, safety and welfare of its citizens.

- Flexible. The Plan will continue to evolve after it is officially adopted to reflect North and Central Guam's actual experience with growth and citizen concerns. Through regular review and updates, the Plan can be adjusted to meet changing needs and unforeseen circumstances.

Land Use Map

This Land Use Plan includes a Future Land Use Map that identifies proposed land use categories to achieve the goals of the Plan. Specifically, the Future Land Use Map proposes a balanced growth pattern that protects the Northern Aquifer and other key natural resources while allowing for future growth and development to support projected needs associated with Department of Defense expansion of facilities. The land use categories identified on the Future Land Use Map are generalized; it is anticipated that they will be implemented and further refined through future amendments to the Zoning Code of Guam. Please see Chapter 2, Land Use Element, for the Future Land Use Map and additional discussion of the land use categories.

1.4. Plan Organization

The Plan is divided into chapters dealing with specific issues areas, as follows:

Chapter 1 – Introduction

Chapter 2 – Land Use

Chapter 3 – Housing

Chapter 4 – Economic Development

Chapter 5 – Natural Systems

Chapter 6 – Transportation

Chapter 7 – Infrastructure

Chapter 8 – Implementation

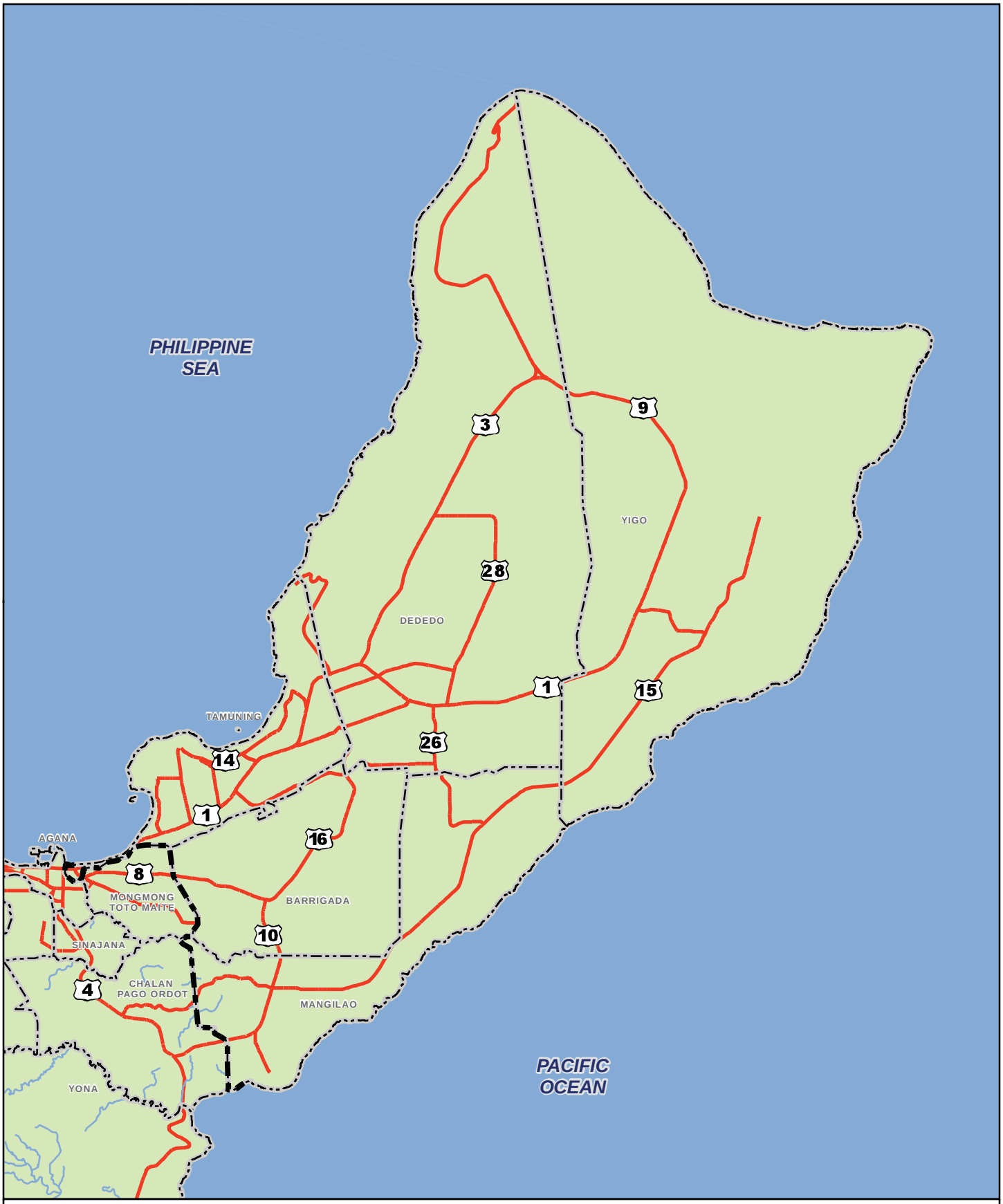
Chapters contain goals and policies that are preceded by brief explanatory text. ***Goals*** describe broad statements of what is to be achieved. ***Policies*** provide direction on decisions and actions needed to achieve the corresponding goal. Following the goals and policies, each chapter has a short summary of existing conditions for the pertinent topic.

Appendices to this Plan include:

Appendix A – Phase I Public Involvement Report

Appendix B – References

Appendix C – Glossary



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Miles

Study Area Boundary
Municipal Boundaries
Rivers
Highways

Figure 1 - Plan Area Boundary
North & Central Guam
Land Use Plan
September 2009

Chapter 2. Land Use

2.1. Introduction

The Land Use chapter plays a central role in guiding land use patterns in the northern and central village districts. Together with the Land Use Designations Map and in coordination with the other chapters of this Plan, this chapter provides policy guidance for the development of these districts. While there are new concepts and designations introduced in this Plan, existing uses and approvals are generally left intact. More detailed parcel-by-parcel zoning will be developed in future efforts as part of the Plan's implementation.

This chapter includes goals and policies that address the following:

- Land Use Categories
- Sustainable Development
- Community Character
- Agricultural Uses
- Cultural Heritage
- Park and Recreation Uses

2.2. Goals and Policies

Goal LU 1. Establish land use categories that provide for a mix of residential, commercial, civic, and industrial development to meet future population and employment needs.

Policy LU-1 Establish the following land use categories and allow for future development as established in Figure 2, Future Land Use Map. Note that Figure 2 consists of an overall map of the Plan area (Figure 2), followed by three larger-scale satellite images that break the Plan area into subareas (Figures 2a, 2b, and 2c). The larger-scale satellite images are intended to provide a more detailed view of the Plan area; land use categories on the overview map and subarea images are the same.

a. Very Low Density Residential. This residential designation provides for very low density (VLD) residential development in the area over the sole source Northern Aquifer. The purpose of this designation is to provide for residential development while protecting the long-term viability and health of the Northern Aquifer. VLD Residential densities should generally be no more than one unit per acre. Non-residential development such as continued agricultural uses should be subject to specific criteria and standards to ensure protection of the Northern Aquifer.

b. General Residential. The Residential category provides for a range of residential densities, ranging from low density single family residences to multiple family structures. Nonresidential uses are generally discouraged except for public facilities, schools, and institutions, provided their nature and location are not detrimental to the residential environment. Where neighborhood-scaled commercial and retail is desired in a residential zone, a special design review process should be established to ensure compatibility with surrounding residential neighborhoods.

c. Commercial. Commercial lands are those designated primarily for retail businesses and services located near arterials or major transportation centers. Examples of such uses may include major retail uses, large office developments, medical and other service uses, and a mix of other commercial uses that serve the island. Non-commercial uses should be discouraged except for public facilities that are compatible with the surrounding area. Commercial areas may include mixed use development, including residential where appropriate,

d. Mixed Use. The Mixed Use category primarily focuses on larger commercial centers and corridors, including commercial uses that require large sites and draw customers from throughout the Island. Examples of commercial uses appropriate to this category include but are not limited to department stores, malls, office buildings, medical and other service uses, hotels/motels and restaurants. Mixed use developments incorporating a variety of types and densities of residential units are also appropriate in this designation. Mixed Use development along corridors should be developed in a manner that focuses density in specific areas or ‘transit targets’ to support high-quality transit service, and should be developed at a walkable neighborhood scale. Along undeveloped corridors, the

mixed use development should be interspersed with development that is lower density to maintain natural character and open space.

e. Village Center. The Village Center category is intended to provide flexibility for a compatible mix of residential, commercial, public facility, medical and other service uses, and open space uses at a scale and pattern that is consistent with traditional Chamorro villages and neighborhoods (similar to the urban neighborhoods proposed by the Hagatna Redevelopment Masterplan). Uses may be mixed vertically, such as retail street level, with residential above, or horizontally, with a mixed of uses next to each other in separate buildings. This designation applies to the existing Dededo and Yigo villages, on a smaller scale to Mangilao and Barrigada, along with two new areas in the northern part of the Island. Flexibility is encouraged in this category, recognizing that the exact mix and configuration of uses must be responsive to community needs and history. Future implementation may include development standards to ensure preservation of existing historic structures. Development should occur in a manner that creates a central focal point and supports bicycle and pedestrian linkages to the surrounding area. Although the areas designated as Village Centers may be quite large, they should be developed as a series of individual neighborhoods (0.25-mile radius).

f. Tourist Resort. The Tourist/Resort land use category applies to areas needed for commercial uses to serve the traveling public, including hotels/motels, condominium-hotels, single family and multiple family residential uses, golf courses and other typical resort services and retail uses. These categories are located primarily along the shoreline and include existing and future tourist and resort areas.

g. Industrial. Industrial lands are those lands designated for a variety of industrial uses and agricultural, commercial and non-residential uses compatible with industrial uses. Typical uses include manufacturing and processing, wholesaling, large storage and transportation facilities, light industrial and industrial-commercial uses. The Industrial area also includes the Guam International Airport, which serves as the international transportation hub for both passenger and freight service. A separate Airport Plan ensures compatibility with aviation facilities, for the protection of runway safety and clear zones, and the protection of public safety. Mineral extraction is also permitted in the industrial designation. Prior to development, mineral resource uses must demonstrate the quality, type, available quantity, development and environmental constraints, and other quantitative assessment considerations. Residential development is limited to uses such as caretaker facilities and accessory dwelling units.

h. Agriculture. The Agriculture category provides for general agricultural uses and is intended to maintain the long-term viability of agricultural activities. This land

use category may be located in proximity to residential and transportation corridors to facilitate farm-to-home sale of agricultural products. Residences would be permitted in this designation, but should be associated with the agricultural use or, if not associated, should not conflict with nearby agricultural uses. The vast majority of available agricultural land in northern and central Guam is publicly owned. Chamorro Land Trust Lands are designated agricultural in recognition of current and historic uses; however, special area plans would likely result in a mix of residential and agricultural uses.

i. Dos Amantes Planning Area. Land uses in this area are designated pursuant to the interim zoning adopted by the Guam Land Use Commission. Potential uses would be comparable to those described as Residential, Commercial, Industrial and Tourist Resort in this Plan.

j. Park, Open Space, and Conservation Lands. The Park, Open Space, and Conservation Lands category is intended to encompass existing and future park, recreation, conservation and natural open space and cultural resource areas. The Future Land Use Map indicates the general configuration of proposed park and open space lands, but is not intended to indicate the specific size or extent of this category of land use. All major development should incorporate usable parks and open space. New residential subdivisions and planned unit developments must meet the Department of Parks and Recreation requirements for parks and recreation functions. Specific plans for development in the Mixed Use and Village Center categories should provide well-located community parks connected to greenway and trail systems where possible.

k. Federal Land. The Federal Land category includes all properties owned and managed by the federal government for military and other uses.

Policy LU-2 Develop corresponding zoning designations and other measures to implement the land use categories. Explore use of Form-Based Zoning, especially in Mixed-Use areas, Corridors, and Village Centers, to help guide how buildings, streets and open space shape the form and character of the community. Use a Special Area Plan process to design specific neighborhoods and develop community consensus on appropriate overlay zoning, street standards, and other tools that could be applied to individual villages. Temporary Workers Housing Facilities (TWHF) should be encouraged in Mixed Use and Village Center areas, if designed as real neighborhoods for later use as affordable workforce housing.

Policy LU-3 Implement Figure 2, Future Land Use Map, through a Zoning Map that identifies zoning categories by land parcel or other fixed boundaries. Figure 2 (including 2a, 2b and 2c), Future Land Use Map, provides a conceptual depiction of the overall land use pattern in North and Central Guam. Future effort to identify

parcel specific boundaries and to fully list all uses allowed in each land use category is needed in order to implement this Future Land Use Map.

Policy LU-4 Establish a future land use monitoring process to evaluate effectiveness of the Plan and implementing measures.

Goal LU 2. Promote sustainable community development.

Policy LU-5 Promote environmental sustainability through a variety of measures. Examples of possible measures include green building design, green spaces in urban areas, green infrastructure, greenway and conservation lands networks, transit-oriented and transit-ready development, improved networks for walking and wheeling, site design to promote renewable energy use, and other measures.

Policy LU-6 Enhance social sustainability by providing community gathering places and diverse opportunities for arts, recreation, entertainment, and culture, easily accessible to nearby residents.

Policy LU-7 Promote economic sustainability through incentives for local business opportunities in mixed use urban areas, increased infill along existing transportation corridors and design standards to allow flexible building use.

Policy LU-8 Consider innovative measures, such as transfer of development rights, to preserve significant environmental and built features. A transfer of development rights program allows landowners in designated areas to sell the development rights to their property to buyers in designated areas. This tool allows for the preservation of important areas, such as agricultural lands, while compensating owners for the development restrictions on their land. It also focuses growth in desired areas and provides for continued growth and development in a community. For implementation, specific criteria to determine sending and receiving areas, the amount of development capacity that may be transferred, the value of the development capacity to be transferred and other information must be developed.

Goal LU 3. Promote and protect the long-term health, character and identity of the village communities.

Policy LU-9 Create development standards and practices that recognize and promote existing and desired community character of villages, while allowing for innovation and design excellence.

Policy LU-10 Provide for incremental growth in already developed areas to take advantage of existing investments in transportation and utility systems and to reduce impacts on the Northern Aquifer. In providing for infill growth, assure the adequacy of water, roads and other public services.

Policy LU-11 Prioritize infill and incremental expansion of existing villages and corridors over new communities or freestanding new development.

Policy LU-12 Establish opportunities for localized services and recreation close to residential neighborhoods.

Goal LU 4. Preserve agricultural lands and encourage expansion of market opportunities for local crops and products.

Policy LU-13 Consider measures to preserve agricultural lands through land use categories, zoning, restrictions on non-agricultural uses in farming areas, agricultural easements, right-to-farm ordinances, incentives for active farming activities, and other measures.

Policy LU-14 In designating agricultural areas, ensure that there is adequate water supply to support agricultural activity.

Policy LU-15 Encourage organic production and chemicals best management practices over the Northern Aquifer.

Policy LU-16 Provide for farm markets in locations close to customers in established and new villages.

Goal LU 5. Ensure that Guam's cultural heritage is preserved as part of planning for new growth and development.

Policy LU-17 Identify, preserve and protect historic properties.

Policy LU-18 Invigorate the public and empower communities to preserve cultural resources.

Policy LU-19 Establish strong partnerships in preservation of Guam's cultural heritage.

Policy LU-20 Encourage building construction and design guidelines that help create 'people places' based on architectural designs from pre-war era Guam and other Pacific nations, while encouraging innovation and design excellence.

Goal LU 6. Provide a park and recreation system that enhances the quality of life for residents and visitors to Guam.

Policy LU-21 Identify desired park and recreation facilities, including senior and/or teen centers, playground, ball fields, community swimming pool and other facilities.

Policy LU-22 Identify key trails and greenways needed to link residential, community and employment centers.

Policy LU-23 Identify highest priority park improvements.

Policy LU-24 Identify existing Government of Guam properties that may be utilized for new parks and recreational facilities.

Policy LU-25 Continue to implement the Department of Parks and Recreation guidelines for park and recreation functions in new subdivisions and planned unit developments.

Policy LU-26 Consider master planning processes for specific significant areas, such as the buffer along Marine Drive between Micronesia Mall and Y Sengsong Road, to create functional and attractive public areas.

2.3. Summary of Existing Conditions

Land Use

The island of Guam is approximately 212 square miles in size, most of which is in an undeveloped state. The northern/central portion of the island is far more populous than the south, with the municipalities of Barrigada, Dededo, Mangilao, Tamuning, and Yigo making up 66% of the entire population. While the southern villages often retain a more traditional culture and lifestyle, the northern and central portions of the island have adopted a more western style of development and more urban character. These areas have seen the greatest residential growth in recent years and are predicted to absorb much of Guam's future growth.

Land Ownership

The federal government owns approximately 32% of the land on Guam, primarily for military uses. (It is estimated that the Government of Guam owns an additional 20%, though data on the exact location and extent of GovGuam land is incomplete.) Less than half of the island is currently available for private development. The largest concentrations of federal land ownership are at the northern tip of the island (Andersen AFB) and on the southwest coast (U.S. Naval Base Guam and Ordinance Annex). The current distribution of federal lands in the study area is illustrated on Figure 2 at the end of this section.

Land Use Patterns

Most of the island remains in a relatively rural state, with commercial and industrial uses, including tourist-oriented development, concentrated in the area surrounding districts of Tamuning and Hagåtña. Most of the island's agricultural land is located in the south, with small pockets scattered across the north and central plains. Outside these areas, the remainder of the island is either in use for low-density residential development, designated open space, or undeveloped.

Hagåtña, as the capital city, serves as a base of industry, commerce, and government. Many of the island's public sector jobs are located here, and land uses consist of a commercial core surrounded by residential development, as well as some federally-owned land.

Tumon Bay, located within the municipality of Tamuning, is the center of Guam's tourist industry. Tumon features large numbers of hotels and condominiums, as well as tourist-oriented businesses, such as restaurants and entertainment. This area is the most densely developed and urban portion of the island.

The north/central communities of Barrigada, Dededo, Mangilao, Tamuning, and Yigo are characterized primarily by the large proportion of land owned by the federal government, as well as the presence of a large concentration of residential development. As previously discussed, these communities represent a large portion of the island's population, and the local villages serve as bedroom communities for residents who work in Hagåtña, or in the more urban areas of Tamuning. Mangilao is the "education district" and is home to the University of Guam and the Guam Community College.

The southern portion of the island contains large expanses of undeveloped land. Development here experiences challenges from the presence of steep slopes and unstable soils. Most villages occur along the coast, with little development in the interior. The south holds the largest concentration of agricultural lands on Guam, as well as large areas of designated recreational/open space.

Applicable Plans, Policies and Regulations

Land Use Plan

A Land Use Plan for Guam was developed in 1977 for a planning period extending from 1977–2000. The Land Use Plan assigns land in Guam to one of four districts: Urban, Rural, Agricultural, and Conservation.

Urban District

This district includes lands characterized by high-intensity development, including high-density residential, commercial, and industrial uses. Urban district lands also represent areas where the government anticipates future growth and where expansion of existing infrastructure has been planned. Growth within these urban areas is encouraged to develop in a clustered manner, rather than in a sprawling suburban pattern, but no specific regulations to implement this philosophy are offered.

Rural District

Rural district lands are areas of probably future development and are characterized by a mixture of low-density residential lots and agricultural uses. In areas where urban levels of services are

absent, residential density should not exceed 1 dwelling unit per half-acre. These rural areas are also often where residents pursue traditional lifestyles, including backyard farming and households containing extended families. The Land Use Plan states that, in these areas, the government is not committed to providing urban services, such as sewer, roads, and water and power, beyond essential needs.

Agricultural District

Agricultural lands are defined as those areas whose physical characteristics make them well-suited for agricultural uses. These lands are relatively level and are located on suitable agricultural soils. Primary uses on agricultural land include field farming, livestock production, aquaculture, or forestry. Other compatible uses include farm residences, storage facilities, animal shelters, roadside agricultural product markets, open space, and small-scale recreation areas. While some infrastructure improvements are necessary in these areas to support agricultural activities, intensive development is discouraged.

Conservation District

Conservation district lands are intended for the preservation of unique natural and cultural features, protection of watersheds and water resources, and conservation of indigenous wildlife and their habitat. While often adjacent to areas of existing development, preferred uses in Conservation districts include low-intensity residential development, agriculture, parks, and other uses determined not to be environmentally damaging.

In addition to the above districts, the Land Use Plan defines Areas of Particular Concern (APCs). These are areas where geographic conditions, hazards, or natural resources directly influence the suitability of the land for particular uses. APCs may exist in any land use district and provide an additional method of management.

I Tano'-Ta Land Use Plan

This Plan was prepared in the early 1990s, after the passage of Public Law 20-147, which mandated the creation of a Comprehensive Development Plan. The Plan was to be an element of this larger Master Plan, but it was repealed shortly after its adoption.

Zoning Code

The current zoning code for Guam contains regulations on land uses, heights, yards and building area, parking, signage, and administration of the code. Various sections of the Zoning Code have been adopted at different times, ranging back to 1952 and extending through the 1980s. The zoning code establishes the following zoning districts (21 GCA § 61201):

- "A" Rural Zone - This zone allows agricultural uses, single-family dwellings, duplexes, and uses considered accessory to these.

- "R1" One-Family Dwelling Zone – Primarily for single-family dwellings, this zone allows schools, churches, parks, and health services as conditional uses.
- "R2" Multiple Dwelling Zone – This zone allows duplexes and multi-family residential uses, as well as single-family dwellings and hotels.
- "C" Commercial Zone – In addition to typical commercial uses, this zone also provides for residential uses, if approved as a conditional use.
- "P" Automobile Parking Zone – This zone is intended for commercial and public parking and garages, as well as service vehicle storage.
- "M1" Light Industrial Zone – This zone allows light manufacturing (drugs, cosmetics, food products), as well as auto repair facilities, warehouses and other similar uses. Packaging of fish or meat products, including fat rendering, is not allowed.
- "M2" Heavy Industrial Zone – The Heavy Industrial Zone allows all uses not specifically prohibited by law.
- "LC" Limited Commercial Zone – While the LC zone is listed in § 61201 as an established zone, the code does not contain regulations enumerating specifically allowed uses in this zone.
- "H" Hotel-Resort Zone – The Hotel-Resort Zone is geared toward tourism-related activities, and all associated uses are conditional in nature.
- "S-1" School Zone – Established for public schools and related facilities.
- "PF" Public Facility Zone – The Public Facility zone is intended for schools, police and fire stations, community centers, and other public or government facilities.

Subdivision Law

Codified as Chapter 62 of Title 21 of the Guam Code Annotated (GCA), the Subdivision Law regulates the development and subdivision of land on Guam, regardless of purpose. The Law establishes regulations that govern parcel access, availability of utilities and drainage, and dedication of public rights-of-way. The Law also establishes regulations for Agricultural Subdivisions and specifies legal procedures for filing applications for subdivision.

Guam Territorial Seashore Protection Act

Enacted in 1974, the Guam Territorial Seashore Protection Act (21GCA63) is designed to prevent the deterioration and destruction of Guam's natural shoreline areas and sole source Northern Aquifer, and to protect the natural resources present there. The Act establishes the Guam Territorial Seashore Protection Commission, whose responsibility is to formulate a seashore reserve plan that applies to development within 10 meters of shoreline. The Bureau of Statistics and Plans is currently preparing the Guam Seashore Reserve Plan to implement the requirements of the Act.

Population and Demographics

Guam's 2007 population was estimated at 173,456, with an average annual growth rate of 1.6% since 1988. While population growth accelerated during the early 1990's and then slowed near the end of that decade, growth in recent years has been relatively stable and mirrored the average for the period. Population growth on the island is closely tied to the U.S. military installations, and the total population fluctuates as military personnel are transferred onto or off the island. The 2007 military population (including active duty personnel and their dependents) was estimated by the Department of Defense at 14,110. This represents approximately 8.1% of the total population.

Residents claiming Chamorro ancestry make up the largest ethnic group on Guam, comprising approximately 37% of the population. Filipinos account for 26% of the population, followed by Caucasians at 7%. The remaining 30% is composed of a variety of ethnic groups, primarily Korean, Japanese, Chinese, and other Pacific Islanders.

The median age on Guam as of the 2000 Census was 27.4 years. Seniors (those aged 65 years and older) made up 5.3% of the total population. Children under the age of 15 made up 30% of the population and adults aged 25-39 made up approximately 25%.

Population forecasts for the island anticipate a 23% increase in civilian population over the next 20 years. The Department of Defense's proposed military buildup on the island is expected to result in military population growth of 157% by 2016, but remaining relatively stable beyond that point. Total population growth over the next 20 years is forecast at 34%. While it has not yet been determined where on Guam this growth will primarily occur, current land use plans indicate that the northern portion of the island is likely to absorb a greater proportion of this growth than the south, given the less mountainous terrain and more widespread availability of public services.

Cultural Resources

Cultural and historic resources in Guam are under the jurisdiction of the Guam State Historic Preservation Office (SHPO) and the Historic Resources Division of the Guam Department of Parks and Recreation. The SHPO published a Comprehensive Historic Preservation Plan in October 2007, outlining the office's vision that historic preservation will become a basic feature of daily life on Guam, carried out by the entire community.

Historic Context and Existing Resources

Local Chamorro culture is believed to have originated when settlers from Southeast Asia arrived on Guam around 1,500 B.C. The history of the island from this point until approximately 1700 A.D. is divided into the Pre-*Latte* and *Latte* periods (including several sub-periods). Archaeological resources from these periods consist primarily of burials, rock shelters, tool, habitation debris, and *latte* sets, which are collections of upright stone pillars with round

capstones. *Lattes* were often used as house foundations and represent one of the most commonly found cultural resources on the island.

Prior to European settlement of Guam, the local Chamorros lived in a subsistence economy in small villages scattered across the island, though under the rule of a single chieftain known as *I maga'lahi* (the Governor). As Spanish colonization increased, conflicts arose between the Europeans and the native islanders, resulting in several decades of warfare at the end of the seventeenth Century. The resulting depopulation combined with the conversion of many Chamorros to Roman Catholicism, resulted in a cultural shift that saw the end of many traditional cultural practices, such as *latte* construction and ancestor worship. Local village layout and construction also changed to reflect Spanish influences, and cultural resources from this period typically include monuments and Spanish public works projects (missions, bridges, fortifications).

When the United States took control of Guam after the Spanish-American War of 1898, it began a period of reform that included widespread public works projects, including military installations, school, roads, and bridges. U.S. administration of the island was interrupted during World War II, when Japanese military forces occupied Guam from1941-1944. The conflict produced large numbers of artifacts and sites now considered historic, including mass graves, sunken vessels, coastal fortifications, and man-made tunnels and trenches. Unfortunately, many historic resources from the pre-war era were damaged or destroyed during the American effort to retake the island in 1944.

Guam SHPO Responsibilities

The Guam State Historic Preservation Office oversees the nomination of properties for listing on the State and National Historic Registers and maintains the Guam Historic Properties Inventory,

Historic Register Nominations

All nominations for the State or National Register are processed by the State Historic Preservation Office. The process is time-consuming, and it can require up to 3 years for an application to reach the National Register office in Washington, DC. In the last 10 years, eight properties have been listed on the National Register, including the following:

- Francisco Q. Sanchez Elementary School,
- Sunken Japanese WWII submarine,
- Sumay Cemetery
- Umatac Outdoor Library,
- Guam Legislature Building
- Marine Drive Monument

- Asan Patriots of World War II Memorial Monument
- Talagi Pictograph Cave – Andersen Air Force Base

Survey and Inventory

In addition to processing Historic Register nominations, the SHPO is responsible for maintaining the Guam Historic Properties Inventory, which consists of over 1,900 properties, including archaeological sites, pottery scatters, World War II sites and artifacts, and historic districts. 150 of these properties are on the Guam Register of Historic Places (GRHP), and 121 have been listed on the National Register. Hundreds more have been identified as being eligible for register listing. One of the responsibilities of the SHPO is to conduct site inspections and review permit applications for the potential to impact these inventoried properties.

The SHPO also maintains a library of survey reports, historic property inventory forms, nomination documents, maps, and photographs that is available for planning, research, and educational purposes.

Archives and Collections

In addition to the SHPO's library and inventory, the Richard F. Taitano Micronesian Area Research Center (MARC), based at the University of Guam, maintains several collections of historic documents and artifacts, including the Guam, Micronesian, and Spanish Documents and Manuscripts collections. These collections are kept in trust for the people of Guam and are available to researchers worldwide.

The Guam Museum, under the jurisdiction of the Department of Chamorro Affairs, is the official depository for Guam's cultural artifacts. The collection includes archival documents, grave goods, and even human skeletal remains. Following damage by a typhoon, the Museum has passed several temporary locations. Though the Governor of Guam established a task force in 2005 for the purpose of finding a permanent home for the museum, much of the Museum's inventory remains in substandard storage or in private stewardship until a new museum can be constructed.

The T. Stell Newman Visitor Center at the War in the Pacific National Historic Park served as a museum and park headquarters until damaged by super typhoon Pongsona, and the facility closed in early 2003. The archives and collections contained here are currently in temporary storage, and planned to be co-located with the Navy Museum at a new facility near Naval Base Guam in Santa Rita.

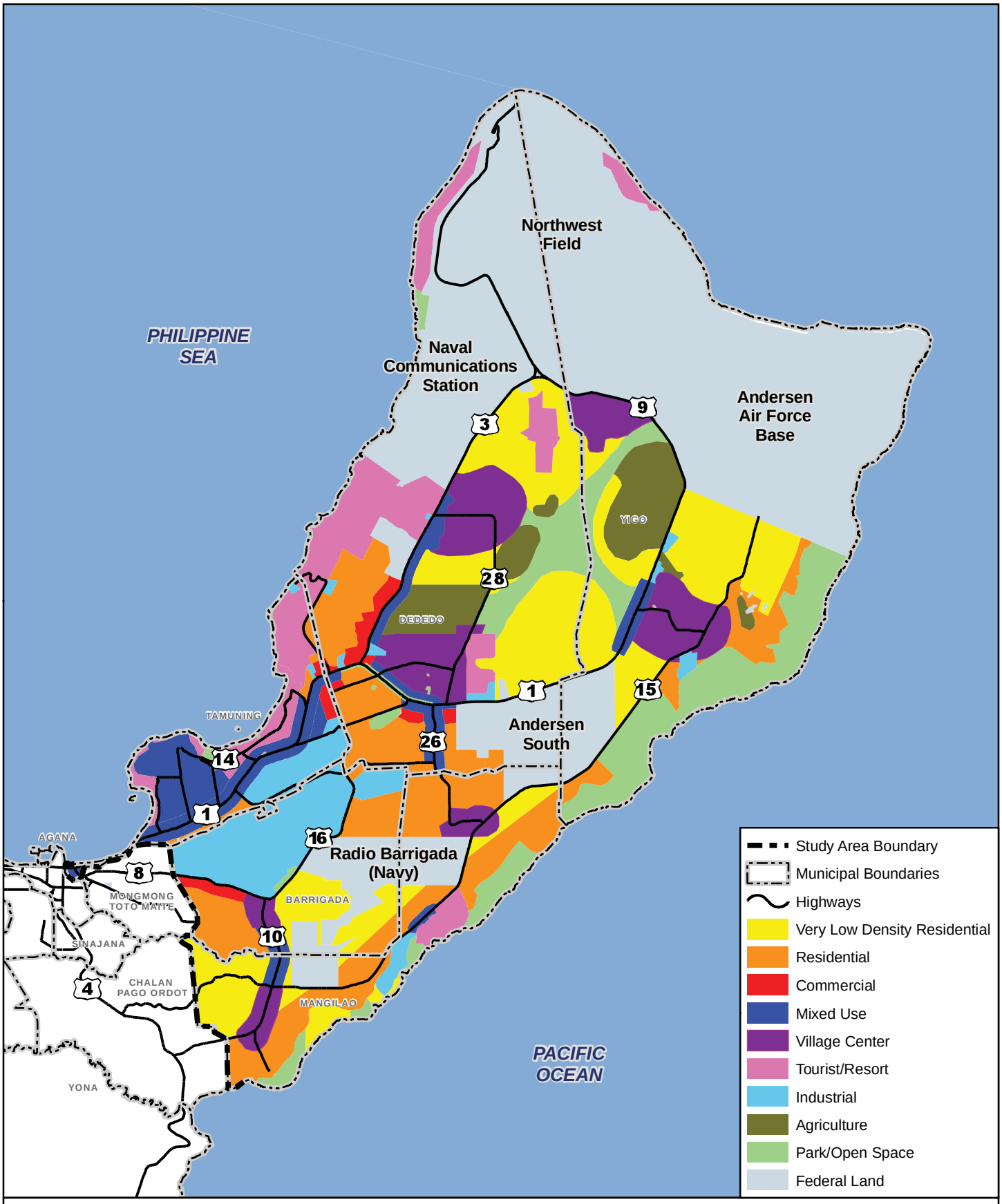

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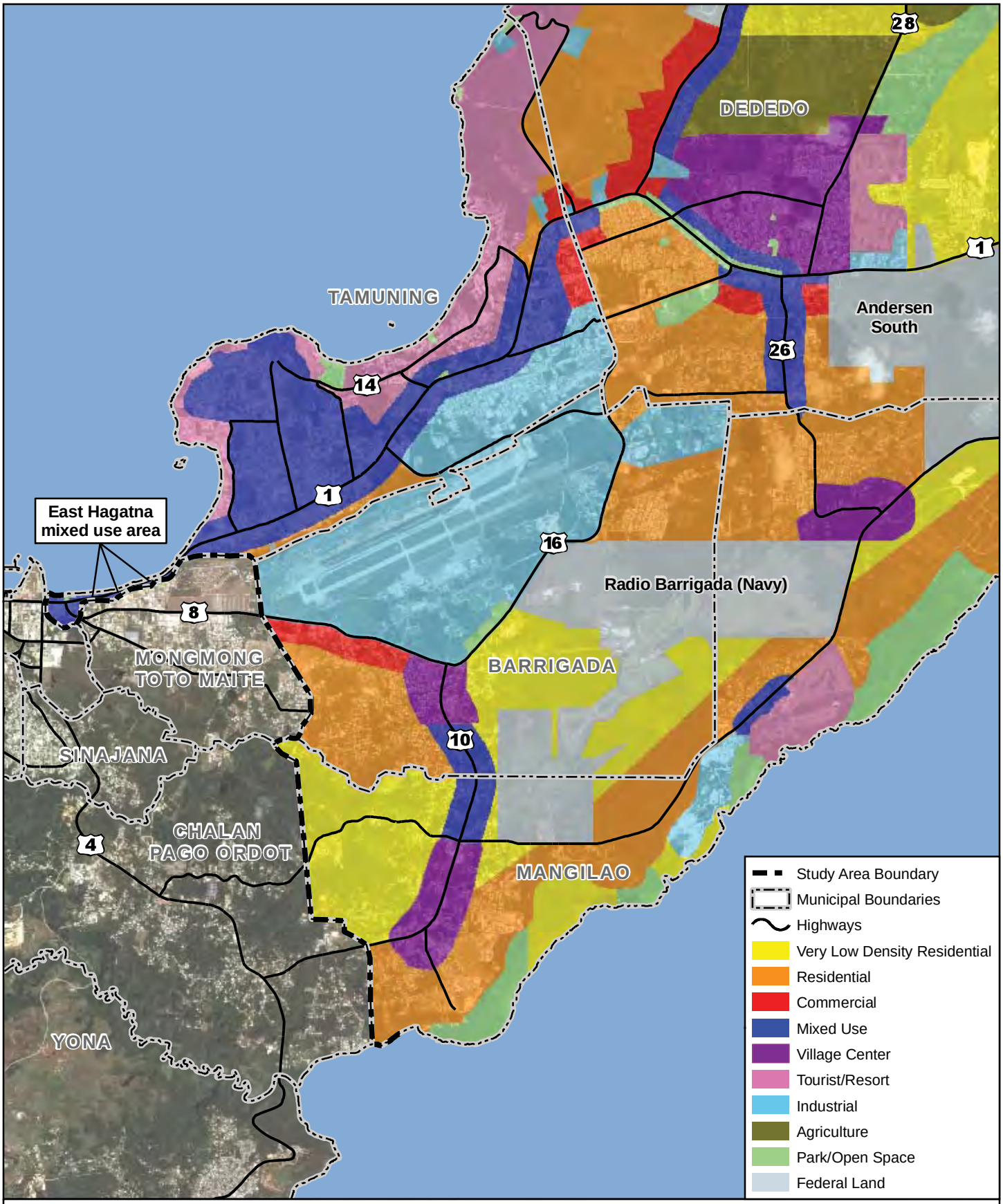
Figure 2 - Future Land Use Map
North & Central Guam
Land Use Plan
September 2009



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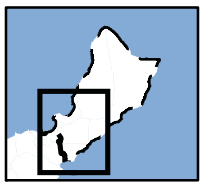

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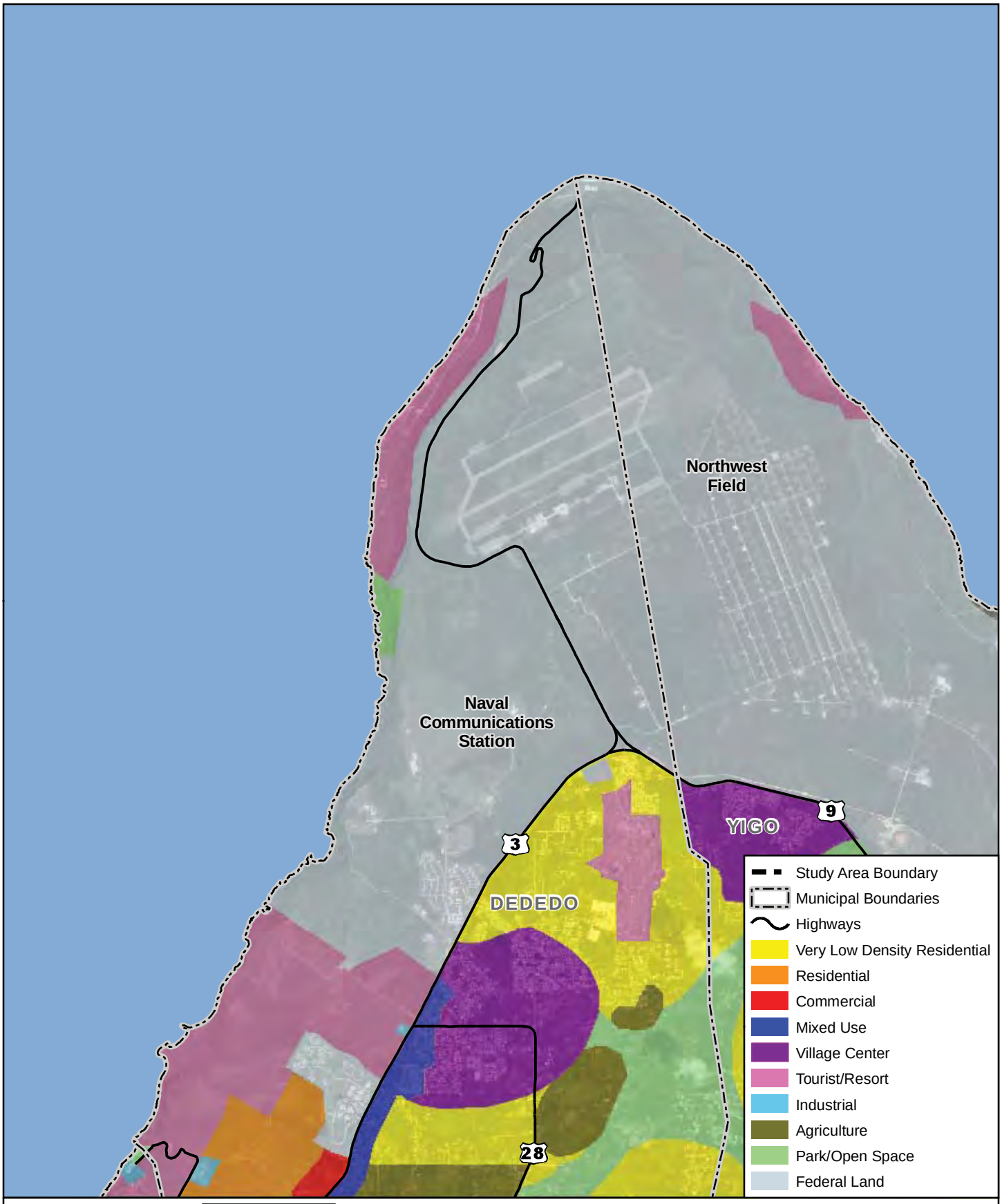
Figure 2a - Future Land Use Map (West Sheet)
North & Central Guam
Land Use Plan
September 2009



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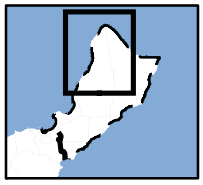


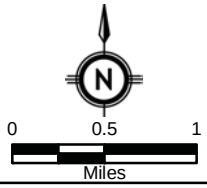
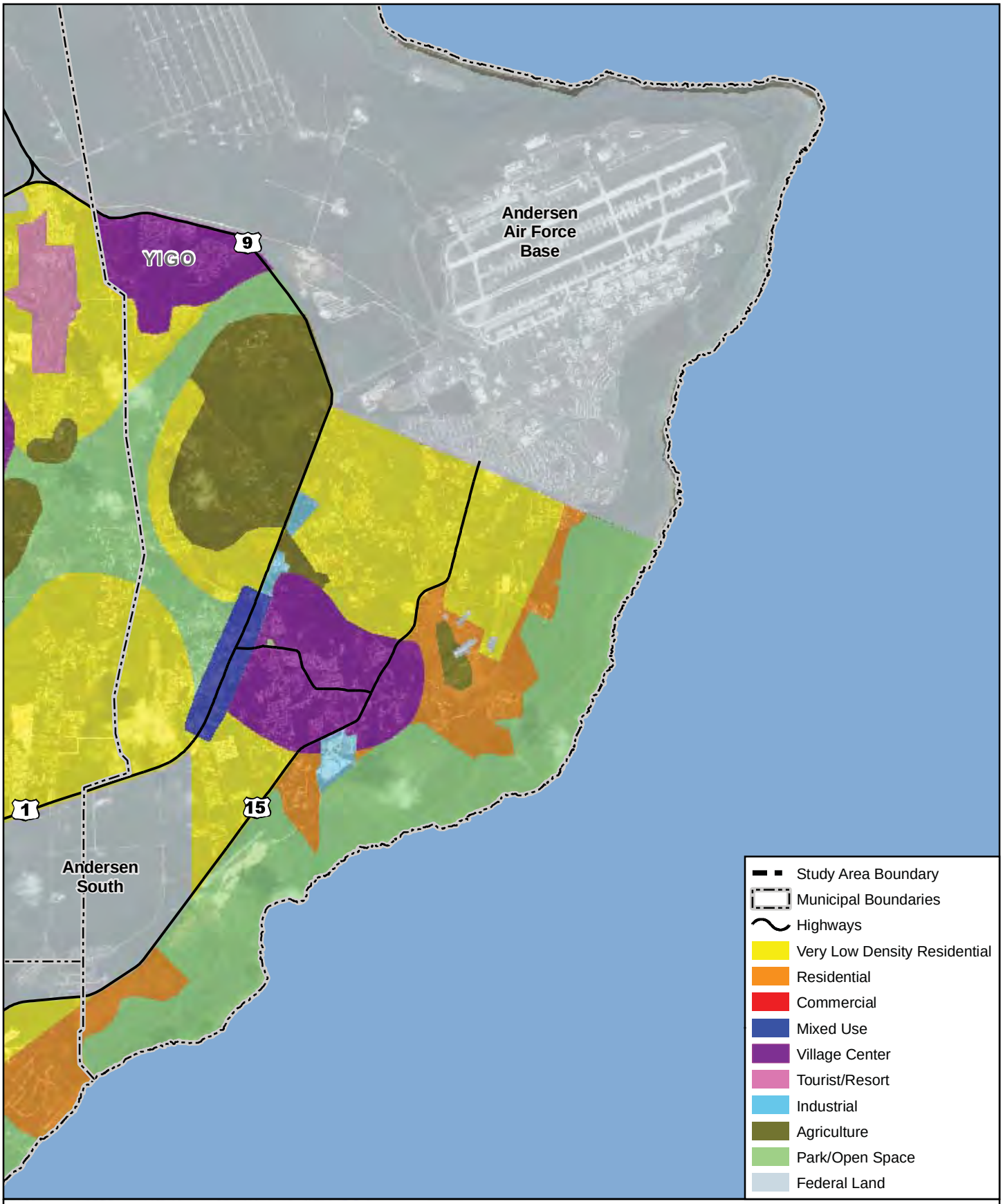


Figure 2b - Future Land Use Map (North Sheet)
North & Central Guam
Land Use Plan
September 2009



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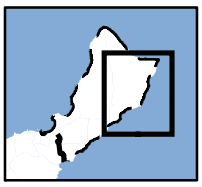

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Figure 2c - Future Land Use Map (East Sheet)
North & Central Guam
Land Use Plan
September 2009

Chapter 3. Housing

3.1. Introduction

Guam has experienced a steady growth in population of approximately 1.6% annually over the past two decades. Population growth on the island is closely tied to the U.S. military installations, and the total population fluctuates as military personnel are transferred onto or off the island. In general, the housing stock has kept pace with this population increase. However, homeownership is not affordable to many households. Guam's overall rate of home ownership is approximately 48%, compared to 66% in the United States as a whole.

Through 2025, the civilian population Guam is projected to increase by approximately 50,000 people. Assuming that North and Central Guam absorb 80% of this growth, a total of approximately 10,800 new housing units will be needed to absorb this growth. This chapter, in conjunction with the Land Use chapter and other chapters of this Land Use Plan, contains goals and policies that provide guidance for the development of these new housing units.

This chapter contains housing goals and policies that address:

- Residential Land Use Categories
- Affordable Housing
- Housing Choices
- Housing Maintenance

3.2. Goals and Policies

Goal H 1. Through the land use categories, designate sufficient land area and appropriate locations to allow for choice of housing types and

prices to meet a diversity of household needs and incomes based on the most recent Guam Housing Study.

Policy H-1 Establish a range of residential land use categories that allow for a variety of housing types and styles. Refer to Policy LU 1 in the Land Use chapter for the description of the land use categories that include residential uses.

Policy H-2 Implement the residential land use categories through refined zoning categories that establish appropriate densities for single and multi-family residential and mixed-use development.

Policy H-3 Develop and administer land use plans and policies that will effectively ensure sufficient land is available for housing development including government-assisted housing, housing for low-income families, senior housing, multifamily housing, group homes, and foster care facilities. Ensure that regularly-updated housing data is available for planning and development needs.

Goal H 2. Increase the homeownership rate and increase the availability of affordable permanent housing.

Policy H-4 Provide new opportunities for low and moderate first time homeowners, such as sweat equity loans, low/no interest loans to first time homeowners, and education and counseling for first time homebuyers.

Policy H-5 Implement affordable housing measures to expand the availability of affordable permanent housing. Examples of measures that should be considered include accessory dwelling units, cottage style development, small lot provisions, multi-family development capacity, density bonuses, location on transit lines, and other measures.

Policy H-6 Take advantage of the influx of construction workers related to military expansion by encouraging temporary worker housing to be located near existing or planned transit, follow Transit Ready Development principles, and be built for eventual conversion to permanent housing.

Goal H 3. Encourage a variety of housing choices throughout North and Central Guam.

Policy H-7 Provide for a variety of densities, based on compact traditional patterns, with highest densities located near village centers, public facilities and services, commercial services, major transportation corridors, and within easy walking distance of employment centers and transit stops. Lower densities should be located in areas with environmental constraints, such as the Northern Aquifer, adjacent wetlands, and other sensitive natural features.

Policy H-8 Adopt development standards that promote innovation in housing, such as small lot development, flexible setbacks, attached single family residential development, mid-rise development, mixed-use buildings, clustering and other measures that support design creativity.

Policy H-9 Provide a requirement or incentives for inclusion of affordable housing in larger residential developments. For example, consider a requirement or incentives to provide at least 15% of housing units built at a price affordable to households earning 80% to 120% of local income adjusted for family size. Incentives could include density increases, flexibility in development standards or other measures.

Policy H-10 Increase the supply of supportive housing for persons with disabilities, such as supportive group homes, enhanced single room occupancy and affordable rental assistance.

Policy H-11 Increase opportunities for supportive and transitional housing for homeless individuals and families.

Policy H-12 Increase the supply of senior housing, retirement homes, and assisted living facilities, co-located where possible with senior centers, parks, schools, and community facilities.

3.3. Summary of Existing Conditions

Housing Conditions

The majority of Guam's housing units are located in the northern villages. In 2000, the villages of Dededo, Tamuning, Yigo, Barrigada, and Mangilao accounted for 67% of the island's housing stock. Compared to the island as a whole, housing in these districts exhibited the following characteristics. (As this Land Use Plan was being developed, a new housing survey was also initiated, so new data may be available).

Table 3-1. Guam Housing Characteristics

	Guam	Barrigada	Dededo	Mangilao	Tamuning	Yigo
Average household size	3.89	4.04	4.26	3.91	2.96	4.09
Average family size	4.27	4.32	4.51	4.27	3.62	4.28
Percent of population below poverty level	22.95%	17.80%	22.83%	26.30%	25.96%	21.64%
Housing occupancy rate	81.32%	90.90%	82.65%	81.25%	73.42%	84.42%
Building material						
Poured concrete	27.26%	20.81%	31.35%	20.45%	37.37%	28.06%

	Guam	Barrigada	Dededo	Mangilao	Tamuning	Yigo
Concrete block	62.21%	71.04%	54.52%	66.66%	59.42%	59.61%
Metal	5.33%	2.51%	7.75%	6.98%	1.20%	5.70%
Wood	4.05%	4.77%	5.27%	4.66%	1.78%	5.41%
Other	1.15%	0.87%	1.11%	1.25%	0.23%	1.22%
Lacking complete plumbing facilities	7.83%	9.15%	9.46%	8.38%	2.49%	6.70%
Outdoor cooking or no cooking facilities	5.99%	5.20%	7.88%	5.73%	1.89%	5.59%

Source: US Census Bureau 2000.

Housing Affordability

Since the 1960s Guam has experienced significant population growth. In general, the housing stock has kept pace with this population increase, but many families find themselves unable to afford to buy homes. The influx of tourism-based development over the same period has raised land prices, which also drives up housing costs. These housing costs often rise much more quickly than the incomes of local residents. As a result, Guam's overall rate of home ownership is approximately 48.36%, below the United States average of 66%. Much of the study area, however, shows a greater degree of home ownership than the island as a whole. Housing tenure for the study area is shown below.

Table 3-2. Home Ownership by District

District	Home Ownership Rate (%)
Guam	48.36
Barrigada	62.18
Dededo	55.41
Mangilao	50.19
Tamuning	25.43
Yigo	43.46

Source: U.S. Census Bureau 2000

Guam Housing and Urban Renewal Authority

The mission of the Guam Housing and Urban Renewal Authority (GHURA) is to promote the health and welfare of the people of Guam through community planning and the provision of decent, safe housing to low- and moderate-income families. Funded entirely by the U.S. Department of Housing and Urban Development (HUD), GHURA is also the local contact

agency regarding issues pertaining to the Fair Housing Act and Section 504 of the American's with Disabilities Act. Some of GHURA's key programs are described below.

Public Housing

GHURA offers affordable rental housing to families who meet HUD's criteria for being considered either low-income or very low-income. Affordable housing units are available in a variety of types and sizes (one-bedroom apartments up to single-family houses). GHURA currently operates 751 public housing units across the island.

Section 8 Voucher Program

GHURA is responsible for administering HUD's Section 8 housing voucher program on Guam. The vouchers are designed to provide low-income families with monetary assistance to help them rent affordable housing of their choice from private landlords. The waiting list for Section 8 vouchers from GHURA is currently closed.

Guma' Trankilidat

Guma' Trankilidat is GHURA's program to provide housing for the elderly and those with disabilities. In order to qualify to live in one of the 49 one-bedroom units, a family must qualify as very low-income under HUD's income limits, and the head of household or their spouse must be elderly or disabled. As a result of the increased demand for similar type units, GHURA has embarked on a development plan to increase the number of dwelling units at Guma' Trankilidat. This project is projected to be completed in 2010.

Emergency Service Grants

GHURA administers Emergency Service Grants on behalf of HUD. The purpose of these grants is to increase the number and quality of emergency homeless shelters. Grants are reserved to organizations operating homeless shelters and provide financing conversion or rehabilitation of buildings for use as shelters, operating expenses, essential supportive services (job placement, health care, drug abuse, and education), and homelessness prevention. Homelessness on the island was estimated at 6.9% in March 2006. This rate is higher than most of the mainland United States, but it compares favorably with other islands in the western Pacific.

Chapter 4. Economic Development

4.1. Introduction

The economy of Guam is primarily supported by tourism and the presence of the United States military. After experiencing a slump during the 1990s and early 2000s, Guam's economy is beginning to strengthen once again. Primary civilian factors in Guam's economic development include tourism, construction and real estate.

This Chapter of the North and Central Guam Land Use Plan includes goals and policies that address land use categories that provide for healthy economic development and a diverse economic base.

4.2. Goals and Policies

Goal ED 1. Through the land use categories, provide sufficient land area and appropriate locations to accommodate new and expanded opportunities for employment.

Policy ED-1 Provide commercial and industrial land use categories and capacity needed to meet future employment projections. Refer to Policy LU 1 in the Land Use chapter for the range of land use categories that provide for economic development and employment opportunities.

Policy ED-2 Provide for mixed-use commercial, retail, and workplace development that is compatible with residential neighborhoods, to provide easy access to jobs, shopping, and activities.

Policy ED-3 Identify and prioritize specific areas and transportation corridors designated for future expansion of the economic base, such as the Upper Tumon area, Route 3 and north Marine Drive. Provide public investment and infrastructure support to encourage development in these areas.

Policy ED-4 Provide a diverse mix and appropriate range of commercial, industrial and business land uses that will encourage economic activity capable of providing living-wage jobs and reasonably scaled to the needs of the community.

Goal ED 2. Provide for a diverse economic base, through expansion of wealth generating businesses and educational opportunities.

Policy ED-5 Implement measures to encourage a diversified economic base, including an expanded land supply, improved infrastructure, business recruitment, and other measures.

Policy ED-6 Provide opportunities for entrepreneurs to establish or expand micro-enterprises. Encourage development of pedestrian-oriented retail markets in Village Centers to connect local food and craft vendors to customers and tourists.

Policy ED-7 Establish, maintain, expand and support higher educational opportunities to ensure an educated and technically trained work force. Expand opportunities in both new and existing institutions, including vocational, post-secondary and professional training opportunities. Ensure availability of adequate public lands to support educational system growth.

Policy ED-8 Recognize a wide variety of cultural, tourism, and active recreational programs with regional and neighborhood facilities, providing well-rounded recreational and tourism opportunities.

4.3. Summary of Existing Conditions

Guam's economy relies heavily on its tourism industry and the presence of large U.S. military bases. After experiencing a slump during the 1990s and early 2000s, Guam's economy is beginning to strengthen once again. Primary indicators and factors in Guam's economic development include the following:

Tourism

While tourism continues to lag behind the boom years of the mid-1990s, it has been estimated that this sector accounts for 21% of the Gross Island Product (GIP) and 25% of the local jobs. (The GIP of Guam was last estimated in 2002 at $3.4 billion.) The Guam Visitor's Bureau anticipates that tourism on Guam will continue to grow at 3-7%. The Visitor's Bureau also

indicates that the capacity of the island is approximately 1.7 million tourists before infrastructure systems become overtaxed.

Traditionally, the bulk of Guam's tourist trade has come from Japan. Japanese tourists currently make up approximately 80% of visitors to Guam. As the population of Japan ages, and as other destinations in Southeast Asia and the Pacific develop, this proportion is anticipated to drop. Visitors from Korea are expected to form a larger percentage of the tourist trade, as are other visitors from East Asia. The Visitor's Bureau indicates that China holds a large market of easily accessible potential tourists.

Construction

In recent years, construction activity on Guam has averaged approximately $250 million per year, reaching a record high of $1 billion in 1992 (adjusted to 2006 dollars). In recent years, private construction has accounted for approximately $153 million in annual sales, leaving around $97 million as government contracts (Government of Guam agencies or Department of Defense).

Construction employment on Guam averaged 4,800 employees over the period 2003-2006. Projections of labor required for the upcoming military buildup indicate that as many as five times this number could be necessary for completion of the project.

Real Estate

Real estate values have seen dramatic increases in recent years. The median price of a single-family home has nearly doubled since 2003, and the total dollar volume of single-family transactions rose 21% in 2007 alone. Sales of commercial properties have also soared, indicating a high level of confidence in the business community.

Chapter 5. Natural Systems

5.1. Introduction

The natural systems of Northern Guam provide functionally viable and valuable forest, coastal and marine ecosystems. These natural systems provide wildlife habitat, multiple recreational opportunities, significant cultural resources and amenities as well as an abundant source of fresh water. However, the development trend over the past 30 years has been to clear vegetation for homes, agriculture, commercial and industrial, including military land uses activities. The main factors driving the significant concentration of growth in the central-north half of the island is its relatively flat and easily developed terrain, long-term military base operations at Andersen Air Force Base (AAFB), and Naval Computer and Telecommunications Station (NCTS), and the former Naval Air Station (NAS).

The Guam Northern Aquifer provides approximately 80% of the island's potable water supply and the surrounding marine waters are of very good to excellent quality. The coastal areas of Northern Guam are mostly vegetated and developed to low densities or are remote and largely inaccessible from Tanguisson point clockwise around the island to just east of Pago Bay. Likewise, the inland cliffs support some of the highest quality limestone forests and wildlife habitat, including large tracts on military property at AAFB, Northwest Field, NCTS, and Government of Guam conservation areas (Anao) and other undeveloped lands. The land use management challenge facing the island today is to balance military and civilian development while protecting water quality, preserving remaining viable wildlife habitat, open space, clean air, and other quality of life assets, which are substantially dependent on natural systems.

The following goals and polices represent essential provisions for maintaining and enhancing natural systems.

5.2. Goals and Policies

Goal NS 1. Use land use categories to protect the natural environment and guide future development.

Policy NS-1 Protect the Northern Aquifer watershed and recharge areas through appropriate land use categories and development standards including requirements for public sewer infrastructure for all residential subdivisions, low development density for unsewered areas, on-site storm water disposal, and limiting heavy industrial activities.

Policy NS-2 Protect marine water quality through appropriate shoreline area land use designations and development standards such as discouraging construction below the mean high tide mark, including sea or retaining walls, allowing natural beach development processes to prevail, controlling erosion from shoreline development and ensuring that wastewater infrastructure is appropriately set back from marine waters.

Policy NS-3 Require that development be planned to take into account natural constraints such as flood prone areas, steep terrain, unstable areas, faults, highly erodible soils, storm surge zones, and similar constraints. Developing around constraints minimizes design, construction costs, and risks while preserving capacity of natural systems to provide resource functions and services.

Goal NS 2. Preserve significant open space areas.

Policy NS-4 Identify existing and preserve new open space and conservation lands that preserve, maintain or improve land or water areas that:

a. Are of significant public value for scenic or recreational uses;

b. Perform essential physical or habitat functions important to the welfare of surrounding lands, water or biological resources; or

c. Contain cultural, historic or archaeological resources.

Policy NS-5 Provide and improve public access to significant open space areas for low impact recreation and cultural/traditional practices, eco-tourism, and similar uses.

Goal NS 3. Integrate future development with open space and natural amenities, including public views of significant natural features and water.

Policy NS-6 Ensure that development in designated open space areas is consistent with and accessory to the open space character.

Policy NS-7 Identify and preserve existing scenic views from public places, such as parks, highways and shoreline areas.

Goal NS 4. Ensure that new development protects the shoreline character and coastal environment consistent with the Guam Coastal Zone Management program.

Policy NS-8 Preserve the marine environment and coastal area as a first priority in new development. If development is proposed in marine waters it should be for public facilities or for uses that provide regional community and economic benefit. Community benefits must be "direct" in nature and include cultural and traditional community practices.

Policy NS-9 Provide for additional and improved public access to beaches as part of new development and retain traditional access wherever possible.

Policy NS-10 Provide an open vegetated buffer between the shoreline and buildings.

Policy NS-11 Site buildings to preserve view corridors from roads or public places.

Goal NS 5. Protect habitat areas of significant native species.

Policy NS-12 Protect and re-establish native species through active management of established conservation areas, continued partnership with military land owners on refuge overlay lands, and provide guidance to private property owners on best management and "green" and sustainable development standards. Incorporate development practices called for under local conservation plans and guidance through the Department of Agriculture Division of Aquatic and Wildlife Resources.

Policy NS-13 Provide for wetland protection and conservation through:

a. Update the Wetlands Conservation Plan and consider establishing a comprehensive regulatory program which better complements federal programs and provides protection for isolated wetlands; consider applying for delegated authority to administer the regulatory program under Section 404 of the federal Clean Water Act;

b. Expand public information efforts to raise awareness and assist developers to incorporate wetland resource avoidance approaches to site development plans;

c. Provide Watershed Management Plans for priority watersheds that are the focus of major development in order to provide a basis for resource protection and to guide compensatory mitigation; and

d. Development of system of reference wetlands as a baseline for future classification of wetlands and to establish a basis for ecological function when formulating the scope and extent of compensatory mitigation proposals.

Goal NS 6. Protect natural resources through incentives and regulatory processes.

Policy NS-14 Review, update and strengthen local regulatory processes where needed for enhanced protection of critical natural features particularly the Guam Water Quality Standards, fishing regulations, rules for the management of conservation areas including Marine Preserves and focus on areas under Chamorro Land Trust Commission administration.

Policy NS-15 Develop tax and fee incentives to encourage sustainable design for site planning, structural design, and energy efficiency. Start by setting targets for and requiring public facilities, especially schools, housing and government spaces to incorporate green design and energy efficiency and the integration of alternative energy sources.

Policy NS-16 Identify locations and opportunities for compensatory mitigation programs in Northern Guam, especially for limestone forest conservation, watershed protection, and high value/ecological function habitat through agreements and acquisition or conversion to conservation of critical areas. The preferred approach should be to enhance or expand existing conservation and protection areas to consolidate systems and habitat, as opposed to continued fragmentation of valuable natural systems.

Goal NS 7. Manage groundwater as a valuable and limited resource.

Policy NS-17 Protect groundwater recharge areas and stream conservation areas from urban and saltwater contamination using the following approaches:

a. Focus development on existing transportation corridors and centers to maximize re-use of existing paved areas and infrastructure investments (‘greyfield’ redevelopment).

b. Focus new ‘greenfield’ development in compact, traditional village patterns to minimize developed area; preserve and enhance village “centers” where residents, shop, gather socially, and worship, and protect conservation lands;

c. Develop criteria and standards for development of industrial and light industrial uses over the Northern Aquifer, particularly activities that involve bulk manufacturing, large quantity storage, and transport of petroleum products, chemicals, and other substances that could migrate to groundwater

and near-shore marine waters, especially the down gradient Tumon and Hagåtña Bays;

d. Restrictions on impervious surfaces; increased use of pervious materials and apply best management practices from existing storm water management in new as well as major property renovations.

e. Use of 'green streets' design principles, which emphasize low maintenance, stormwater management, aquifer recharge, beautification, and neighborhood collaboration and pride;

f. Limit building and parking footprints and use alternative surface/paving designs to reduce thermal pollution, promote groundwater recharge, and preserve space for landscaping;

g. Use of percolation ponds and other low maintenance systems on large-scale development sites overlying recharge areas. Require that large scale and regional storm water management plans and designs do not result in the transfer or movement of water from immediate area recharge to sub-basins. There should be no new point or surface designed discharges as part of new development and major redevelopment project should be required to retrofit or redirect, remediate and correct historic surface discharges to marine waters.

Goal NS 8. Protect Guam from the impacts of climate change.

Policy NS-18 Establish a climate change planning process to address measures to minimize and adapt to the effects of climate change.

Policy NS-19 Consider measures to reduce greenhouse gas emissions through building standards, land use and transportation patterns, agricultural practices, and vegetation planting and retention.

Policy NS-20 Prepare strategies for adaptation to climate change that address coastal areas, water resources, biological resource impacts and public health needs.

5.3. Summary of Existing Conditions

Recent natural resource planning efforts for the Guam buildup identify nine natural resource (NR) issues that should be addressed in the context of the anticipated economic growth over the next 5 to 10 years. Guam's biodiversity has been severely impacted by invasive species, development, over-harvesting, and other human activities on land and in coastal areas since the mid-1940s. Seven of the nine NR issues are briefly described below.

Invasive and Exotic Species. The constant threat of exotic species introduction and the ongoing impact of species that have successfully invaded the island remain a major resource protection challenge. High on the list of destructive species is the brown tree snake, which has devastated Guam's native bird population to the extent that most bird species are extinct or endanger of extinction.

Coral Reef Ecosystem Protection. Coral reef protection remains a very high management priority. Guam's reef systems function in a variety of important ways that provide economic, cultural, and enhanced quality of life benefits. Local resource mangers consistently highlight the need to accurately account for potential impacts associated with shoreline facilities, military training areas, tourism expansion, and greater reliance on near shore waters to support development. The island's coastal zone is vital to sustaining economic develop.

Species of Greatest Conservation Need. The 2005 Guam Comprehensive Wildlife Conservation Strategy identified 63 species including 31 terrestrial, 7 freshwater, and 25 marine organisms as species of greatest conservation need (SGCN). In addition to identifying actions necessary for each species, other conservation actions that affect general groups of species were identified and included key management actions, which are the development of memoranda of understanding, rehabilitation of habitats, public education, and law enforcement.

Terrestrial and Inland Aquatic Resources. Forests, wetlands, inland surface waters, soil, and other physical and geologic resources are subject to increased development impact and use. One of the main concerns is that development may significantly impact largely rural, open, and previously undeveloped areas to accommodate new residential, commercial, industrial, and related military land uses. A greater emphasis on redevelopment and maximizing existing infrastructure should be part of any growth management approach.

Marine Preserves and Fisheries Management. Marine preserves and their current management approach are under pressure to be modified to satisfy special interests. The original purpose for having marine preserves continues to be challenged openly and from unauthorized activities. Fisheries management, including addressing unsustainable fishing methods, decreasing access to shorelines, historically disproportionate impacts, cultural identity concerns, and direction and emphasis of local and federal management efforts, is at a critical juncture. It is entirely possible that the island's fisheries carrying capacity will, if it hasn't already, be exceeded at all accessible shorelines and that more restrictive fishing regulations will be necessary to ensure viable populations.

Compensatory Mitigation. Resource managers believe that a compensatory mitigation policy is needed to guide mitigation planning, design, implementation, and long-term development project management. The policy, practices, and the legal framework for mitigation requirements could be strengthened at the local level, which will in turn better guide federal mitigation (Bureau of Statistics and Plans 2008).

Coral Resources

Guam coral reef types include fringing reefs, patch reefs, submerged reefs, offshore banks and barrier reefs. Of these four reefs, fringing reefs are the predominant reef type, extending around much of the island. Shallow (0-2m) reef flat platform formations vary in width from less than 10 meters along some windward areas, to over 700 m in Pago Bay. The combined area of coral reefs and lagoons is approximately 108 km2 in near shore waters less than 5.5 m and approximately 110 km2 in waters greater than 3 nmi offshore (Burdick et al. 2007).

More than 5,100 marine species have been identified from Guam's coastal waters, including over 300 species of scleractinian (stony) coral. Guam's reef resources are important economic and cultural components of the local community providing many goods and services for the residents of Guam recently valued at over $127 million per year (van Beukering et al. 2007). Major coral reef system values stem from cultural and traditional use, tourism, recreation, fisheries, and shoreline protection. Coral reef and related marine resources make Guam's natural environment a significant part the island's tropical destination appeal for over one million Asian tourists annually. The contribution of tourism to Guam's overall economy is 20% of Guam's GDP providing over 15,000 jobs directly or indirectly (Burdick et al., 2007). Coral reef resources in Tumon Bay and the northern half of East Hagåtña Bay (EHB), which are located in the northern Guam Planning area, contribute significantly to the economy. Tumon Bay businesses anchor the islands tourism industry.

Within the northern Guam planning area the types and health of coral resources can be linked largely to land based stressors and management efforts or the lack thereof. The northern half of EHB and Tumon Bay are flanked by some of Guam's densest development. Significant volumes of urban storm water discharge from these developed areas into shallow and broad reef platforms. EHB in particular is the receiving water from much of Tamuning, one of the largest urban areas on Guam. By contrast the vast majority northern Guam's reef and marine systems receive minimal or no direct surface runoff. Much of the coastal areas of northern and northeastern Guam are not publicly accessible due to rugged and undeveloped terrain, secured military lands. With the exception of certain fish species, which are pursued by boat limited accessibility is the main reason coral and many other marine resources are remain in fairly good condition. Fringing reefs in northern Guam range from approximately 800 meters at EHB to just a few meters along the northeastern windward coastal areas.

Recent benthic surveys of Guam's coastal areas have yielded a wealth of information about coral and marine ecosystem structure. Three representative northern Guam coastal areas Tumon Bay in Tumon, Urunao in Dededo, and Janum in Yigo are generally described here.

Tumon Bay coral reef resources are distributed from shore to the shallow (less than 50m) for reef (seaward of the wave zone) over distances up to 600 m at the widest points. The beaches are sandy and the reef flat, which makes up as much as 90% of the bay's structure is aggregate reef, pavement, and rubble. Coral cover on the Tumon reef flat can be as high as 50% in some areas.

The reef crest and fore reef ranges from 100–200m and comprised primarily of two types of aggregate reef with coral cover from 10% to 90%.

Urunao reef resources are distributed from shore to the shallow fore reef over distances of approximately 100–200m at the widest points. The beaches are sandy and the reef flat is mainly aggregate reef and pavement. Coral cover on the Urunao reef flat can be as high as 50% on pavement and spur and groove formations.

Janum reef resources are typical of most windward reef areas in northeastern Guam. Coral resources are distributed from shore to deeper habitat over much narrow high platforms or "tables" which are flanked by shallow pools with few if any sand beaches. Seaward the coral reefs are characterized fairly uniformly by aggregate, pavement and spur and groove formations with up to 50% coral cover.

The health of Guam's coral reefs varies significantly based on a number of factors, which are often compounded. These major factors include geology, human population density, level of coastal development, level and types of uses of marine resources, oceanic circulation patterns, coral predator and disease outbreaks and disasters such as typhoons and earthquakes. The vitality of many of Guam's coral reef systems has declined over the past 40 years as evidenced by the fact that average live coral cover on the fore reef slopes went from approximately 50% in the 1960s to less than 25% in the 1990s. Coral reefs having over 50% live cover are few (Burdick et al. 2007).

Fishery Resources

Assessments over the past 40 years identify that reef fish stocks have been declining due to a number of human pressures and as a result Guam set aside, approximately 15.5% (36.1 km2) of Guam's near shore (less than 183 m) waters in five Marine Preserves in 1997. The preserves are the Tumon Bay, Piti Bomb Holes, Sasa Bay, Achang Reef Flat and Pati Point Marine Preserves. Two of these preserves, the Tumon bay and Pati Point preserve are with the northern Guam planning area. Guam's preserves make up 11% of Guam's coastline. Active management including enforcement of rules that limit the take of fish and other marine resources commenced in 2001 (Agriculture 2005).

In addition to the preserves four federal and one local conservation area have been established, which are the War in the Pacific National Historical Park (WAPA), the Ritidian National Wildlife Refuge, the Orote and Haputo Ecological Reserve Areas and the Guam Territorial Seashore Park. The refuge and Haputo area are also within the northern Guam planning area. Active management of these areas is limited.

Coral reef fishery resources have traditionally formed a substantial part of the indigenous Chamorro community's diet and included finfish, invertebrates, and sea turtles Coral reef resources continue to be both economically and culturally important. Reef fish, a variety of crustaceans, mollusks, and marine algae are all eaten locally. Family and group fishing is a

common activity in Guam's coastal waters (Agriculture 2005). An important fishing tradition involves sharing the fish catch with extended family and other in the village, including elders and those who are not able to fish.

Marine Water Quality

According to the Guam Environmental Protection Agency Guam's marine waters are generally of "good" quality (Guam EPA 2006). The Agency assesses coastal/recreational water quality with the goal of protecting and enhancing public health and related uses involving primary contact/swimming and secondary contact.

Under a recently redesigned monitoring program Guam EPA monitored 8.68 shoreline miles of the total 43.65 shoreline miles of Guam waters in 2004. The total of 0.46 mile fully supported and attained water quality standards for the designated uses; 8.22 miles did not support WQS. In 2005, Guam EPA also monitored 9.60 shoreline miles and found that 0.23 mile fully supported and attained water quality standards for the designated uses; and 9.37 miles did not support WQS.

Guam EPA's Recreational Beach Monitoring Program (RBMP) issued 864 and 535 swimming advisories in 2004 and 2005, respectively. Under the RBMP the causes or stressors that necessitate advisories are pathogen indicators. Although advisory totals for monitoring stations in the northern Guam planning area are not readily available only 8 of 39 RBMP stations are located in the area and more specifically they are located in EHB and Tumon Bay (Guam EPA 2006). Guam's list of Impaired/Threatened Waters, which meet Federal Clean Water Act Section 303d criteria, includes 12 beaches from EHB to Tanguisson Beach which are not fully attaining or supporting applicable marine water quality standards.

A few applicable source categories that may contribute to pathogenic and other impairments include municipal point sources, combined sewer overflows, agriculture, urban runoff/storm sewers, contaminated sediments, and groundwater seeps/springs. Tumon Bay, a marine water body on Guam's list 303d list, is non-attaining due to nutrient pollution (Guam EPA 2006).

Marine waters from Haputo Point (Sharks Hole) north and then east around Ritidian and Pati Points then south to Fadian Point are designated M-1 "Excellent" Marine water quality. Key factors such a lack of coastal development, no rivers or streams, and the filtering function of the northern limestone plateau support the assumption that northern marine waters (other than EHB and Tumon Bay) along approximately 39 coastal miles likely have water quality better than "good." These waters are more likely to consistently support or attain water quality standards.

Terrestrial Wildlife

Historically, Guam hosted a rich diversity of terrestrial and aquatic species, including over 100 species of birds including migrant, wetland, seabird, grassland, and forest birds. Three native mammals were also known to occur on Guam, the Marianas fruit bat (*Pteropus mariannus*

mariannus), little Marianas fruit bat (*Pteropus tokudae*) and Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*), although the Marianas fruit bat is the only extant species. There are six native reptiles, five skink species, and one gecko species that are still found in the wild. Several native tree snail species still exist in low numbers on Guam. Two species of snails, *Samoana fragilis* and *Partula radiolata*, have been on the candidate list of the Endangered Species Act (ESA; 1973) for more than 13 years. All of the birds mammals, and reptiles are or were present in the forests, grasslands and coastal areas of the northern Guam, including 28 of the 33 terrestrial SOGCN identified by the Guam Department of Agriculture (Agriculture 2005).

Guam's native flora and fauna have been impacted by various threats, such as the introduction of invasive species, poor land management practices, and overexploitation. These human threats are exacerbated by the frequency with which the island is impacted by typhoons. Since 1990 Guam has been hit directly by four storms with sustained winds greater than 150 miles per hour (Category 4 and 5 storms) in addition to the affects of high wave and winds from large systems passing near Guam.

Introduced and Invasive Species

Guam's increasing population, growing economy, and strategic location has contributed to an increasing rate of intentional and accidental introductions of alien species. Introductions have greatly affected Guam's native ecology. Guam's native terrestrial fauna have evolved in the absence of predators making native wildlife vulnerable to introduced predators such as brown treesnakes (*Boiga irregularis*), rats (*Rattus sp*.), and feral cats (*Felis catus*). For example, feral cats in the Munitions Storage Area, Andersen Air Force Base (AAFB) have hampered reintroduction efforts of the Guam rail (*Gallirallus owstoni*). The following excerpt was taken for the GCWCS regarding the accidental introduction of the brown treesnake to Guam after World War II.

"The ecological damage caused by this snake to the island environment is well documented (Savidge 1987; Jaffe 1994; Conry 1988; Engbring and Fritts 1988; Wiles 1987; Rodda and Fritts 1992; Rodda et al. 1992a, 1997). The snake is largely responsible for the extirpation or decline of the island's resident bird species (Savidge 1987) (see Table10). This nocturnal and arboreal snake is capable of taking advantage of a variety of habitats and prey species (Rodda et al. 1992b, 1999b). Only three of 12 native forest bird species continue to persist in the wild on Guam, they include the Mariana crow (*Corvus kubaryi*), Micronesian starling (*Aplonis opaca guami*) and the Island swiftlet (*Aerodramus vanikorensis bartschi*). Additionally, two wetland species of birds: the Mariana common moorhen and the yellow bittern also continue to persist in the wild. Historically, the resident species were found throughout the forests of Guam (Seale 1901; Baker 1947; Marshall 1949; Jenkins 1983). The Micronesian megapode, Mariana mallard (*Anas platyrhyncos*), and White-browed rail (*Poliomnas cenereus*) were extirpated prior to the introduction of the brown treesnake (Engbring and Fritts 1988)."

Terrestrial Habitats

Guam has more than 320 native plant species of which six deserve greater attention, but unfortunately only one, *Serianthes nelsonii*, is eligible for funding under the ESA. Prior to their demise, many of Guam's terrestrial native species were found throughout the island and in a variety of habitats. Much habitat remains available in eight general terrestrial habitat types, which are limestone forest, scrub forest, ravine forests, freshwater habitats, freshwater swamps, freshwater marshes, reservoirs, and mangrove areas. Three of the eight habitat types are found in northern Guam, limestone and scrub forests and freshwater habitats, including emergent wetlands.

Limestone forests, and scrub (secondary forest) are important for all of Guam's native avian, invertebrate, reptilian, and mammalian species. Beach strand and other habitats likely function as habitat to native species, to some lesser degree. The following are descriptions of key habitat types, location, and current status important to the management and conservation of Guam's SOGCN in northern Guam.

Limestone forest is composed principally of a mature growth of native trees and plants, with a moderately dense canopy of 10–30 m high including the tree species Banyan (*Ficus sp.)*, Ifil (*Intsia bijuga)*, Breadfruit (*Artocarpus marianensis)* and Blue Marbled Tree (*Elaeocarpus joga).* Limestone forests are found on the northern limestone plateau and on several limestone outcroppings in southern Guam. Limestone and scrub forests comprise 34% of total forested areas of over 80% of forested areas in northern Guam. The structure of limestone forests is undergoing slow but very distinct change to due to the presence of Philippine deer (*Cervus mariannus*) and feral pigs (*Sus scrofra*) as they browse on seeds and seedlings retarding any regeneration of forest plants. Typhoons, loss of pollinators and habitat due to development, as well as the introduction of invasive plant species exacerbate this condition. Without intervention and restoration this habitat type will be altered so severely that it may not sustain reintroduction of SOGCN with substantial restoration effort. Since the majority of terrestrial fauna species inhabit lime stone forests this habitat is critically important for almost all of Guam's native forest birds, snails, insects, lizards, and two fruit bat species (Agriculture 2005).

Scrub forest is a degraded, yet diverse, brush-type forest, generally with an open canopy under 10 m high and a dense understory, is often considered a "secondary" forest type. The distribution of scrub forests on Guam is primarily through the interior northern limestone plateau where historical land uses included large-scale clearing for agricultural, ranching and other development. The plant species are similar to those in limestone forests, but are at an earlier stage of development, which explains the secondary forest characterization. In northern Guam, this scrub forests are now dominated by *Vitex parviflora,* an introduced tree.

Much of the Tarague Plateau, Northwest Field region and large areas interior to routes 1, 3, and 9 in northern Guam is scrub forest. Tarague and Northwest Field were cleared for military purposes. Repeated destruction by typhoons has also played a major role in creating these forests. This forest type, although degraded and having a larger mix of nonnative species, it is

also vital to the overall health of the ecosystem. Like limestone forests, scrub forests are important for many native terrestrial species. Feral deer and pigs, invasive plant species, and typhoons are the ongoing primary factors that threaten to change scrub forests.

Freshwater Habitats and Water Quality

The northern limestone plateau allows rapid water seepage, as a result only a few marshy areas and ephemeral streams exist in the vicinity of Mt. Santa Rosa. The main stream in the Mt. Santa Rosa area is both surface and spring fed and eventually disappears into a sink hole which seems to have a relatively direct connection to groundwater that discharges at Hamun Spring along the eastern coast line. During the rainy season (August to January) sediment plumes can be observed along the coastline from the Gayinero valley sink-hole and possibly several other caves. The water quality of the few ephemeral streams and springs surrounding Mt. Santa Rosa are not classified; however, during storm events water is highly turbid but quickly clears up in a few days.

The northern half of Guam is comprised of a high limestone plateau bounded on the west, north and east by near-vertical cliffs and fringing reefs and on the south by the Adelup Fault that stretches from Adelup to Pago Bay. Groundwater in northern Guam is contained within the aquifer termed the “Northern Guam Lens” (NGL) and was designated a “principle source aquifer” in 1978 by the U.S. Environmental Protection Agency (Guam EPA 2006). The NGL has the capacity to provide a sustainable yield of 60 million gallons per day and currently supplies more than 70% of the island’s potable water.

Guam’s northern limestone plateau was deposited subaqueously as a result of down faulting along the Adelup fault and is underlain by nearly impermeable volcanic rock. Fresh groundwater is contained in a modified Ghyben-Herzberg lens underlying most of northern Guam, which is formed by infiltrating rainfall that collects on top of the more dense saltwater. The Northern Guam Lens Study (Camp Dresser and McKee 1982) divides the aquifer into six sub-basins, containing 47 management zones.

Groundwater that occurs in the manner described above is called *“basal”* groundwater, which is the most common formation in the NGL. In other parts of the lens infiltrating precipitation encounters the volcanic basement at elevations greater than approximately 10 feet, the resulting groundwater resting upon the impermeable volcanic rock under *parabasal”* conditions. Parabasal groundwater can be produced without significant threat of saltwater intrusion.

There are approximately 180 deep wells in northern Guam of which the Guam Water Works Authority operates 120 for general public consumption. The Air Force also operates 10 wells dedicated to Air Force operations and the remaining wells are either Navy, privately owned (golf courses). At any given time a number of wells may be out of service for a variety of operation and maintenance reasons. It is estimated that 35 million gallons per day is produced from the NGL, roughly half of its sustainable yield (Gingerich 2003).

According to Guam EPA ten contaminant sources pose the greatest threat to Guam's groundwater quality. The 10 potential sources are *animal feedlots, fertilizer applications, pesticide applications; underground storage tanks, landfills, septic systems/cesspools, hazardous waste generators, pipelines and sewer lines salt water intrusion, and urban runoff*. Common factors considered in the selection of these contaminant sources were human health and/or environmental risk (toxicity) and location of the sources relative to drinking water sources. The contaminant "nitrate" is found in six of the 10 sources.

Overall, groundwater quality of the NGL is good. However, the results of water quality monitoring over the past 18 years indicate that the NGL is significantly vulnerable to contaminants, including chloride contamination induced from over pumping of water supply wells, chemical contaminants, and pathogen introduction from waste water infrastructure, including residential septic disposal systems (Guam EPA 2006).

In 2005, Guam EPA initiated an investigation to determine if the NGL is subject to contaminant conditions know as "Groundwater under the Direct Influence of Surface Water" (GWUDI) because of the contamination of several GWA groundwater wells and possibly U.S. Navy wells. These wells were potentially influenced by surface water or raw sewage from leaking sewer pumps or sewer pipes. The investigation is ongoing and if GWUDI is determined the implications are that water system purveyors will be required to provide additional treatment of the potable water supply.

The preservation of the Northern Guam Lens Aquifer is a priority because of its designation a Sole Source Aquifer and because of the extent and magnitude of pollutants observed over many years, which exceeded Guam Water Quality Standards. Public interest in or concern about the water body is very high.

Groundwater resources are vulnerable to contamination from a wide range of land uses/activities as well as poor water production practices. Guam is using approximately half of the sustainable yield of groundwater. The public water system operated by GWA is losing water at a rate greater than 20% of the water pumped because of system leaks and unauthorized taps. Regulatory and utility agencies recognize both the opportunities and challenges to improvement the protection and sustainable use of groundwater as Guam's primary drinking water resource.

5.3.1. Parks and Open Space

The Bureau of Statistics and Plans GIS department reports that Guam currently has an inventory of more than 1,200 acres of parkland. However, the vast majority of this is located in the southern portion of the island. The northern/central municipalities of Barrigada, Dededo, Mangilao, Tamuning, and Yigo currently possess approximately 103 acres of inventoried parkland. The bulk of this parkland is located in the tourist/commercial area of Tamuning and near the town center of Dededo. Barrigada, Mangilao, and Yigo have several small parks, though Yigo's largest park is actually located on Andersen Air Force Base and not accessible to the general public.

Chapter 6. Transportation

6.1. Introduction

The *Draft 2030 Guam Transportation Plan* (October 13, 2008), hereafter referred to as the *Draft GTP*, preceded the planning process for North and Central Guam. Many of the issues addressed in the *Draft GTP* are directly relevant to the North and Central Guam Land Use Plan process. In particular, the *Draft GTP* focuses on the impacts associated with the potential U.S. Department of Defense multiple services build up expected to occur over the next 20 years, especially as it relates to transportation needs in North and Central Guam.

In order to provide for consistency, this Transportation Chapter has incorporated many the goals and policies and recommended transportation projects presented the *Draft GTP*, particularly as they related to North and Central Guam. In the text below, goals and policies that are taken directly from the *Draft GTP* are shown in *italics*.

This chapter includes goals and policies that address the following:

- Transportation facilities to support future growth
- Financially balanced transportation system
- Interconnected multimodal street network
- Local circulation and emergency access
- Public transportation
- Safety for all modes of travel
- Natural systems, historic and cultural sustainability
- Efficient movement of goods, people and services

- Coordination among transportation service providers
- Transportation funding
- Transportation maintenance
- Security of transportation systems
- Environmental justice

6.2. Goals and Policies

Goal T 1. Ensure that multimodal transportation facilities necessary for future growth are provided, concurrent with growth and coordinated with land use plans and development patterns.

Policy T-1 Identify multimodal transportation improvements and strategies needed to fulfill the Land Use Vision and to improve mobility and transportation choice for all users.

Policy T-2 Ensure that multimodal transportation infrastructure will be developed to adequately support planned land use growth.

Goal T 2. Establish a financially balanced transportation improvement plan that addresses identified needs and maximizes the value of both public and private investment in the system.

Policy T-3 *Work with the Department of Defense and other agencies to prioritize needs and funding sources associated with future military-induced growth.*

Policy T-4 Identify appropriate funding sources needed to implement recommended transportation improvements.

Policy T-5 Ensure that as development occurs, it provides an interconnected multimodal network of choices for local travel, to minimize impacts on existing major corridors and minimize public funds required. Ensure that all new streets in developed areas provide sidewalks and bike lanes or multi-use paths.

Goal T 3. Establish an interconnected multimodal street network that adequately addresses the travel needs of the community, consistent with community vision.

Policy T-6 *Plan and develop each mode of transportation in coordination with other modes to promote convenience, efficiency and cost effectiveness.*

Policy T-7 Establish performance standards, including operational level of service (LOS) standards for all modes of travel.

Policy T-8 *Consider congestion management strategies, such as Transportation System Management (TSM) and Transportation Demand Management (TDM) as part of the planning and programming of transportation improvements.*

Policy T-9 *Enhance the connectivity of key destinations on Guam.*

Policy T-10 *Increase mode choice and access for persons with disabilities, low-income residents, non-English-speaking citizens and elderly populations as well as military personnel and their dependents and off-Guam workers who may not own autos.*

Policy T-11 Identify specific locations that are high priority for multimodal capacity/mobility improvement. For example, Marine Drive, between the village districts of Hagatna, Tamuning, Yigo and Dededo.

Policy T-12 Establish requirements for streetscape design standards that reflect the community character and provide for balanced multimodal access and safe travel for all users. Encourage provision of appropriately scaled alleys in Mixed Use and Village Center areas.

Goal T 4. Improve local circulation and emergency access throughout the community while addressing the importance of neighborhood quality and safety.

Policy T-13 Establish traffic calming policies and implementation programs, where desired, especially in neighborhoods impacted by adjacent development.

Policy T-14 Establish importance of local circulation system for emergency access.

Policy T-15 *Minimize emergency response times.*

Policy T-16 Identify gaps in the roadway network that hinder access or circulation.

Policy T-17 *Provide efficient emergency evacuation routes.*

Policy T-18 *Improve accessibility to typhoon evacuation shelters.*

Policy T-19 *Provide transportation options during emergency evacuation for all system users.*

Goal T 5. Encourage development of improved public transportation to provide fast, frequent, dependable transit service for all users.

Policy T-20 Establish strategies to encourage Transit Oriented Development (TOD) and Transit Ready Development along corridors and in centers.

Policy T-21 Identify potential innovative local transit routes, such as a local transit shuttle.

Policy T-22 Identify high priority corridors for regional transit service, such as Bus Rapid Transit, to serve Hagatna, Tamuning, Dededo, Yigo, Mangilao, Barrigada and major bases and employment centers.

Policy T-23 *Improve transit access, choices, and services for the transportation disadvantaged*.

Goal T 6. Improve safety, circulation, and travel choice for all system users, including automobiles, bicyclists and pedestrians of all ages and abilities.

Policy T-24 *Reduce the overall crash rate on Guam roadways*.

Policy T-25 *Reduce the overall fatality rate in all transportation modes, including automobiles, bicycles, and pedestrians*.

Policy T-26 *Promote the benefits of walking and bicycling as practical modes of transportation*.

Policy T-27 *Provide an integrated network of pedestrian and bicycle facilities*. Establish implementation priorities for completion of sidewalks, pathways, bikeways and trails

Policy T-28 Require installation of well-connected walking and wheeling facilities in all redevelopment and new development

Policy T-29 Develop and implement policies and designs for improved intersections, roundabouts, and pedestrian crossings of local streets and major corridors. Ensure that the pedestrian signal system is operational and functions for the safety of pedestrians.

Policy T-30 *Improve safety for all modes through enforcement and education programs*.

Goal T 7. Plan, construct and operate the transportation system to support the sustainability and preservation of natural, historic and cultural resources.

Policy T-31 *Avoid, minimize and mitigate potential adverse effects of transportation on the natural, historic and cultural resources of Guam*.

Policy T-32 *Reduce energy requirements of the transportation system*.

Policy T-33 *Promote healthy lifestyles by providing pedestrian and bicycle facilities.*

Policy T-34 *Develop a transportation system that improves air quality and reduces greenhouse gas (GHG) emissions.*

Goal T 8. Support the expansion and diversification of Guam's economy through the efficient and effective movement of people and goods, services and information.

Policy T-35 Identify key routes for freight movement and *provide for safe and efficient intermodal freight transport. Explore enhanced connections for freight and passenger movements with Rota and Saipan.*

Policy T-36 *Identify transportation programs and projects that support tourism.*

Policy T-37 *Provide efficient access to existing and planned activity centers.*

Goal T 9. Improve coordination, communication and cooperation among transportation users, providers, and those affected by transportation activities.

Policy T-38 *Coordinate transportation planning among the Department of Public Works, the Guam Power Authority, the Guam Waterworks Authority, the Port Authority of Guam, the Guam International Airport Authority, the Guam Mass Transit Authority, the Bureau of Statistics and Plans, the Federal Highway Administration and the U.S. Department of Defense.*

Policy T-39 *Implement an effective and ongoing community outreach program.*

Policy T-40 *Include local and native stakeholder groups and typically under-represented groups, populations and areas into the transportation decision making process.*

Policy T-41 *Support informed decision-making through improved communications and responsive planning and programming methods and techniques.*

Policy T-42 *Support collaborative working relationships among federal, territorial and village interests with the objective of removing barriers so the transportation system can function seamlessly.*

Policy T-43 *Consult with other federal agencies and Guam departments to achieve transportation goals.*

Goal T 10. Create a transportation funding structure that is stable and reliable and supports a viable transportation system to achieve territorial and local goals now and into the future.

Policy T-44 *Develop a financially responsible implementation plan that allocates and maximizes the use of all available financial resources.*

Policy T-45 *Include existing and anticipated funds and life cycle costs in the planning making process.*

Policy T-46 *Reduce transportation costs by promoting energy efficient modes and developing intermodal transportation facilities that promote the efficient and seamless transfer of people and goods – especially between ports and the associated civilian and military facilities throughout Guam.*

Policy T-47 *Seek out and promote public private partnerships for innovative delivery of services. These partnerships may include design build methods, competitive contracting mechanisms for transit services, pursuit of joint development opportunities with the tourist sector, and coordinated planning and funding of new privately developed road networks with public investment in existing corridors and transit systems.*

Goal T 11. Preserve existing transportation facilities and services through an ongoing maintenance program.

Policy T-48 *Develop standards for maintaining transportation facilities, services and equipment for all modes of transportation.*

Policy T-49 *Bring all existing transportation infrastructure into a state of good repair,* while improving its multimodal capacity and connections, to maximize value of existing investments.

Policy T-50 *Plan and program improvements to keep the transportation infrastructure in a state of good repair.*

Goal T 12. Improve the security of general travel, public transit and goods movement.

Policy T-51 *Identify the standards and policies necessary to enhance the security of transportation facilities and services and incorporate them into the planning, design, construction and operation of transportation facilities and services.*

Policy T-52 *Facilitate the development of transportation projects that enhance island-wide security.*

Policy T-53 *Work with freight operators to enhance the security of freight transportation systems that move goods to and from Guam.*

Goal T 13. Comply with Title VI of the Civil Rights Act of 1964 and environmental justice requirements of Executive Order 12898.

Policy T-54 *Develop a process to identify and evaluate potential environmental justice impacts of transportation projects during the planning and programming processes.*

Policy T-55 *Provide equal access to public information and decision-making about transportation planning, financing, construction, operations, and maintenance activities.*

6.3. Transportation Improvement Projects

The *Draft GTP* identifies a wide range of transportation infrastructure needs to improve the future transportation system in terms of mobility, safety, operations, and increased mode choice. The goal of the planned transportation improvement projects is to maximize usage of the existing system, providing additional capacity where needed. Chapter 5 of the *Draft GTP* describes the specific performance measures and evaluation criteria used to develop the list of improvement projects.

The transportation projects that are identified below are for the North and Central Guam planning area. This is a comprehensive list that has not been evaluated based on financial constraints. Chapter 7 of the *Draft GTP* provides a fiscally constrained plan that reflects the highest priority projects, given the likely availability of future funding.

Transportation improvement project categories described below include:

- Intersection Improvements. Intersection improvement projects address existing peak hour congestion and safety problems.
- Tier I Congestion-Related Projects. These projects are intended to address the most highly congested roads now and in the future.
- Tier II Congestion-Related Projects. These projects are intended to address roads that are projected to be moderately congested in the future.
- Reconstruction Improvements. These projects are intended to address the remainder of Guam's federal road system that are not addressed in the Tier I and Tier II projects.

The table shown below focuses primarily on capital facility improvements to address the vehicular transportation network. It should be noted that the *Draft GTP* also addresses mass transit and bicycle and pedestrian improvements. For mass transit, improvements are discussed from a system-wide perspective and are not identified below as specific capital improvement projects for North and Central Guam. For bicycle and pedestrian improvements, please see the

description of roadway improvements below, which include sidewalk and widened shoulder lanes for bicycles where feasible and planned as part of the future bicycle and pedestrian network. For a complete discussion of improvements to support alternative modes of transportation, please see the *Draft GTP*.

Several of the policies and development types described in this Land Use Plan—redeveloping existing corridors, Transit Ready Development, Mixed Use and Village Center Development—may have an influence on the character and focus of transportation investments and priorities. Since both this Plan and the *Draft GTP* are in draft form for comment at the same time, it would be appropriate to review the desired development vision in this plan before finalizing the transportation investment priorities. In particular, investment in re-paving and/or widening existing corridors should include proactive planning for transit system improvements (stops, customer access, safe crossings, queue jumping and other signal preferences). Any of the projects calling for intersection improvements, signal modification, or added turn lanes (and possibly specific two to four lane widenings) should be re-evaluated as potential roundabout locations. This strategy could greatly increase safety of all modes, while saving capital investment and operating costs, improving traffic flow, and reducing energy use and emissions (including greenhouse gases).

Table 6-1. North and Central Guam Transportation System Improvement Projects

Project	Project Description
INTERSECTION IMPROVEMENTS	
Rte 1/Rte 28	Traffic signal modifications, signing, striping
Rte 1/Rt3 26	Traffic signal modifications, signing, striping, and median
Rte 1/Rte 27/Salisbury	Additional southbound left turn lane
Rte 1/Rte 27A	Eastbound right turn lane
Rte 1/Rte 3	Additional northbound left turn lane
Rte 1/Rte 16	Traffic signal modifications, signing, striping
Rte 1/Rte 14 (N San Vitoris)	Additional northbound left-turn lane
Rte 1/Rte 14a	Northbound/southbound right turn lanes
Rte 1/St John's Church	Minor street approach widening
Rte 1/Mansana	Signing/striping
Rte 1/Rte 10A	Northbound right turn lane
Rte 1/Rte 10B	Extend eastbound right turn lane
Rte 1/Rte 14 (ITC)	Additional turn lanes and development access
Rte 1/Rte 30	Additional turn lanes
Rte 1/Rte 4	Southbound left turn lanes
Rte 14/Rte 14 (Westin)	Reconfigure northbound right-turn lanes

Project	Project Description
Rte 14/Rte 14B	Eastbound right turn lane, extend northbound left turn storage
Rte 14 traffic circle	Traffic circle signing, striping
Rte 14/Tun Jose Salas	Signing, striping
Rte 16/Rte 27A	Traffic signal modification, signing, striping
Rte 16/Rte 27	Additional turn lanes
Rte 16/Rte 10A	Restriping, signage for additional turn lanes
Rte 7/Rte 7A/Rte 24	Reconfigure Y intersection
TIER I CONGESTION IMPROVEMENTS	
Tijan Parkway – Rte 10A to Rte 8	Widen from 2 to 4 lanes/sidewalks
Route 14 Extension – Rte 1 to Tijan Parkway	New 4 lane connection
Rte 28 – Rte 3 to Rte 1	Widen from 2 to 4 lanes
Rte 8 – Rte 1 to Rte 10	Safety/operational improvements
Rte 27 Ext (Hamburger Hwy) – Rte 16 to Rte 1	Widen from 2 to 4 lanes/sidewalks
Rte 27A – Rte 1 to Rte 28	Safety/operational improvements
Rte 25 – Rte 16 to Rte 26	Widen from 2 to 4 lanes/sidewalks
Rte 26 – Rte 1 to Rte 15	Widen from 2 to 4 lanes/sidewalks
Adacao Connection – Rte 16 to Rte 15	New 2 lane connection/turn lane/shoulders
TIER II CONGESTION IMPROVEMENTS	
Rte 8 – Rte 1 to Rte 10	Widen from 4/6 to 6 lanes
Rte 16 – Rte 10A to Rte 10	Widen from 4 to 6 lanes
Finegayan Connection – Rte 1 to Rte 3	New 2 lane connection/turn lane/shoulders
Okkodo Connection – Finegayan to Rte 28	New 2 lane connection/shoulders
Okkodo Connection – Rte 28 to Rte 1	New 2 lane connection/turn lane/sw
MogFog Connection – Rte 1 to Rte 15	New 2 lane connection/turn lanes/shoulders
Koda/Nijok/Mataguac – Rte 28 to Rte 1	Safety/operational improvements
Rte 15 – Adacao to MogFog	Widen from 2 to 4 lanes/shoulders
RECONSTRUCTION IMPROVEMENTS	
Rte 1 – Rte 3 to Rte 8	Reconstruct 6 lanes
Rte 3A – Rte 3 to End	Reconstruct 2 lanes/shoulders
Rte 34 – Rte 1 to Two Lovers Pt	Reconstruct 2 lanes/shoulders
Rte 29 – Rte 1 to Rte 15	Reconstruct 2 lanes/shoulders
Rte 15 – AAFB to Rte 10	Reconstruct 2 lanes/shoulders
Rte 14 – Rte 1 to Rte 1 (ITC)	Reconstruct 4 lanes

Project	Project Description
Rte 14A – Rte 14 to Rte 1	Reconstruct 4 lanes
Rte 14B – Rte 14 to Rte 1	Reconstruct 2 lanes/sidewalks
Rte 30 – Rte 1 to End	Reconstruct 2 lanes/sidewalks
Rte 30A – Rte 14 to End	Reconstruct 4 lanes
Rte 8 – Rte 16 to End	Reconstruct two lanes/shoulders

Source: Draft 2030 Guam Transportation Plan

6.4. Summary of Existing Conditions

Existing Infrastructure

Guam is served by a network of highways and local roads of varying capacities and conditions. Local streets are especially variable, ranging from paved boulevards to dirt roads. Guam's highway system provides for circulation around the island, as well as connecting major industrial centers. Guam's two major industries, the military and tourism, are sited at Andersen Air Force Base/Naval Base Guam and Tumon Bay, respectively. The primary belt of commercial development is concentrated along Routes 1, 8, and 16. Almost 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 2 and Route 4 corridors.

Functional Classification

Guam's streets and highways are divided into four functional classifications: trunk highways, major highways, minor highways, and collector roads. A map of Guam's highway network is shown in Figure 3 at the end of this section. Each of these classifications is described in more detail below:

Trunk Highways connect major population centers and traffic generators. They are designed to carry large volumes of traffic long distances. Roads assigned to this type include:

- Route 1 (Santa Rita to Hagåtña)
- Route 1 (Hagåtña to Dededo)

Major Highways connect major population centers and traffic generators to smaller ones. They are designed to carry moderately high volumes of traffic over long distances. Roads assigned to this type include:

- Route 1 (Dededo to Yigo)

- Route 2A
- Route 2 (through Agat)
- Route 4 (through Yona)
- Route 4 (Yona to Route 10)
- Route 4 (Route 10 to Route 7A)
- Route 4 (Route 7A to Route 1)
- Route 5
- Route 10 (Chalan Pago to Barrigada)
- Route 11
- Route 16
- Route 7
- Route 8 (Route 1 to Route 7A)
- Route 8 (Route 7A to Bunny Hardware)
- Route 8 (Bunny Hardware to Route 10)
- Route 7A

Minor Highways connects smaller communities and traffic generators to larger highways. These roads carry moderate volumes of traffic over comparatively short distances. Roads assigned to this type include:

- Route 2
- Route 4 (Umatac to Yona)
- Route 3
- Route 9
- Route 12
- Route 4A
- Route 17

- Route 6 (Route 1 to Nimitz Hill)
- Route 6 (Nimitz Hill to Route 1)
- Route 15
- Route 27

Collector Roads link residential, industrial, hotel, and institutional areas to larger highways. These roads carry light to moderate traffic volumes over short distances. Roads assigned to this type include:

- Route 10A
- Route 14
- Route 14A
- Route 14B
- Route 30
- Route 30A
- Route 29
- Route 32
- Route 33
- Route 34
- Route 28
- Route 26

Unknown Classifications

The following routes are documented to exist, but no data is currently available to verify their functional classification. They are marked on Figure 3 at the end of this section as belonging to the "Unknown" classification.

- Route 11A
- Route 12A
- Route 24

- Route 24A
- Route 25
- Route 27A
- Route 3A
- Route 40
- Route 41
- Route 6A
- Route 7B

Traffic Count Trends

Between 1991 and 1998, traffic volumes grew an average of 1.7% per year, for a total of 12.5%. From 1998 to 2003, overall traffic volumes declined by 15.5%. Overall volumes have declined by 3.6% between 1991 and the first half of 2003 and have essentially returned to 1990 levels.

These five road sections have seen traffic growth of 35% or more between1991 and 2003:

- Route 28, Chalan I'Bang to Route 3–110% increase
- Bello Road, Route 16 to Route 26–50%
- Route 2A, Route 1 to Route 5–40%
- Route 29, Route 1 to Route 15–39%
- Route 27, Route 1 to Route 16–36%

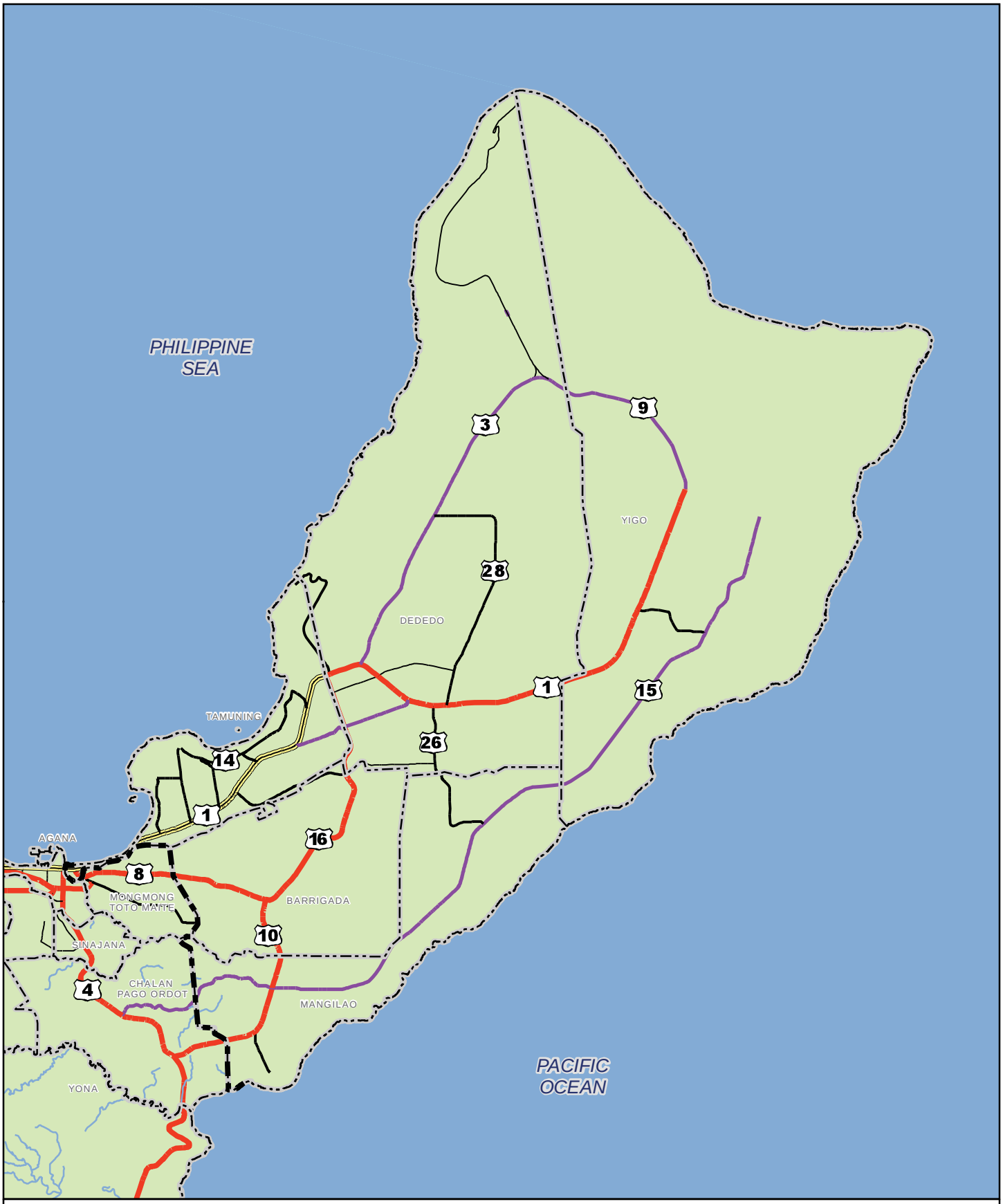
Daily vehicle trips in 2003 were 446,022 and are projected to increase 40.1% by 2020. Tamuning is responsible for 31.6% of the daily vehicle trip originations (140,461 trips out of 446,022 total trips). The city with the least amount of trip originations is Yona, with 9,724 trips originating there.

The 2003 existing network had 2,089,955 total daily vehicle-miles, 63,378 total daily vehicle-hours, 1,140 hours of total daily delay, and 32.8 mph speed. The 2003 E+C network had 2,087,116 total daily vehicle-miles, 63,531 total daily vehicle-hours, 1,096 hours of total daily delay, and 32.9 mph speed.

Based on 2003 modeling of traffic volumes, there are several locations in northern/central Guam where moderate or severe congestion is projected to occur on the highway network, mostly along Route 1 in Tamuning, Route 28 in Dededo, and Route 3 in Dededo/Yigo.

Transit Service

Public transportation on Guam is provided by the Guam Mass Transit Authority. The GMTA currently operates nine bus routes that connect most of the villages on the island. Service frequency varies by route, from approximately 30 minutes up to 2 hours. Buses run 6 days per week.



ICF INTERNATIONAL
PLAN RITE
SEi Sablan Environmental, Inc.

N

0 1 2
Miles

Study Area Boundary
Municipal Boundaries
Rivers

Road Network
Trunk Highway
Major Highway
Minor Highway
Collector Road
Unknown Type

Figure 3 - Functional Classifications
North & Central Guam
Land Use Plan
September 2009

Chapter 7. Infrastructure

7.1. Introduction

Infrastructure discussed in this chapter includes water supply, wastewater service, stormwater drainage, and electrical power. Public water service in Guam is provided by the Guam Waterworks Authority (GWA), which was established in Public law 23-119 to deliver water and wastewater service to the residents of Guam. Stormwater facilities are provided by the Department of Public Works and monitored by the Guam Environmental Protection Agency. Electrical service on Guam is provided by the Guam Power Authority (GPA), which is a public corporation of the Government of Guam. Coordination between these agencies is essential for the provision of adequate public services and protection of key natural systems, such as the Northern Aquifer.

This chapter includes goals and policies that address the following:

- Provision of infrastructure concurrent with future growth
- Level of service standards
- Efficient, reliable and sustainable water supply
- Protection of public and environmental health sanitary sewer service
- Stormwater facilities that minimize flooding and enhance water quality

7.2. Goals and Policies

Goal I 1. Contribute to the quality of life in Guam through the planned provision of infrastructure.

Policy I-1 Recognize that new development must occur in conjunction with adequate infrastructure to provide the services required by the development.

Policy I-2 Facilitate efficient planning for infrastructure improvements by providing districts and agencies population and employment projections on a regular basis.

Policy I-3 Encourage the designation and development of infrastructure corridors and facilities in a manner consistent with Guam's needs and resources.

Policy I-4 Coordinate provision of infrastructure with future development by designating appropriate sites for infrastructure facilities and ensuring their availability.

Policy I-5 Coordinate provision of public services with planned development by improving coordination with the development permit review and approval process.

Policy I-6 Ensure that development regulations allow timely development of infrastructure facility additions and improvements.

Policy I-7 Identify and implement specific criteria for siting of telecommunication towers and antennas. Criteria could include neighborhood compatibility, impacts on local views and ability to buffer facilities, among others.

Policy I-8 Consider use of impact fees on new development to help pay for the additional demand on infrastructure and services required by the development. An impact fee is a charge on new development to pay for the construction or expansion of public improvements and services that are required by and benefit the new development. Impact fees could apply to transportation, power, water, schools, policy and fire protection, park and other public services and facilities. The use of impact fees must show that the fee is clearly connected to the benefitting development and is based on a proportionate fair share estimate of the impact.

Goal I 2. Identify level of service standards that ensure adequate public facilities to serve current and future development.

Policy I-9 Establish level of service standards based on the criteria of public health, environmental protection, economic development, community character and consistency with the adopted Land Use Plan.

Policy I-10 Identify measures to make service provision as efficient and cost effective as possible. For example, consider joint use of existing facilities and maximize use of existing facilities prior to expansion.

Policy I-11 To minimize installation and ongoing maintenance and replacement costs, encourage redevelopment near existing infrastructure prior to new development

in unserved areas. In new development, encourage compact development patterns to minimize capital investment and operating costs.

Goal I 3. Manage water resources efficiently.

Policy I-12 Create a unified water and wastewater system that serves both the military and civilian populations.

Policy I-13 Continue to support the development and implementation of public-private partnerships to enhance water and wastewater system improvements.

Goal I 4. Assure a reliable, sustainable water supply for existing and future development while protecting the natural environment.

Policy I-14 Ensure adequate water supply, storage and conveyance systems are available to serve planned growth:

a. Provide new wells for source redundancy and to ensure adequate service for future growth.

b. Provide collector wells to improve the efficiency and security of the drinking water supply system.

c. Continue to support projects that account for and stop water system losses from leaks and unauthorized taps as a major element of supply and conveyance management.

Policy I-15 Ensure that future development does not lead to contamination of the aquifer

a. Provide line replacements to reduce leakage, provide additional water and reduce demand on the Northern Aquifer.

b. Support water conservation programs

c. Implement wellhead protection standards with special emphasis on areas where high-density development is planned, such as village centers, mixed use and industrial areas.

d. Encourage use of sustainable “green streets” designs to minimize runoff and increase aquifer recharge.

e. Institute new density requirements for land uses that utilize on-site wastewater disposal systems that are more protective than current standards.

f. Revisit and clarify land use planning and development policies that exist to protect drinking water resources such as the Groundwater Protection Zone (GPZ) management framework.

Goal I 5. Protect public health and environmental quality through the appropriate design, installation, and maintenance of sanitary sewer facilities.

Policy I-16 Provide for sanitary sewer connections and collection in unsewered areas in the Northern Aquifer watershed.

Policy I-17 Support and prioritize aggressive environmental compliance initiatives aimed at correcting longstanding sanitary sewer infrastructure problems.

Policy I-18 Combine with the Department of Defense to provide for expansion of the Northern District Wastewater Treatment Plant, including a new deep ocean outfall.

Policy I-19 Provide for monitoring of the water system to minimize impacts, maximize efficiency and protect the water system.

Policy I-20 Identify measures to minimize public health and environmental impacts association with location and construction of sanitary sewer facilities. Measures could include timing of construction, coordination with other utility improvements, access management and other measures.

Goal I 6. Ensure that stormwater facilities provide adequate drainage and minimize flooding while protecting and enhancing water quality and habitat.

Policy I-21 Support coordination of land use designations and development regulations to protect water quality and habitat and to minimize potential for flooding.

Policy I-22 Identify areas that are highly sensitive to changes in hydrologic conditions, such as the Northern Aquifer, and establish standards to minimize impacts to these areas.

Policy I-23 Support development regulations that minimize flooding, including low impact development

Policy I-24 Support development regulations for stormwater facilities to ensure that design compatibility with the surrounding area, public safety, habitat value, and recreational value are considered.

Policy I-25 Support increased monitoring and maintenance of stormwater facilities.

Goal I 7. Assure long-term reliability of power supply and distribution

Policy I-26 Encourage and support research, pilot projects, and investment in alternative power sources, such as solar power, solar hot water panels, wind power, wave power, geothermal power and other sources.

Policy I-27 Develop and apply improved energy conservation standards for new construction and retrofits. Work with utilities and agencies to expand existing residential and commercial energy conservation programs to lower overall energy usage.

Policy I-28 Develop and maintain a vegetation planting and maintenance plan that prevents aerial encroachment on power lines, especially on private property adjacent to public easements.

Policy I-29 Encourage all new development to locate utilities underground.

7.3. Summary of Existing Conditions

Water

Public water service in Guam is provided by the GWA, which was established in Public law 23-119 to deliver water and wastewater service to the residents of Guam. In the year 2003, GWA had more than 38,000 customers for water service and more than 24,000 for wastewater service. Since then, the population served by the GWA has grown to 157,000 in 2005.

Supply

Guam's water resources include fresh water, wetlands, near coastal, and marine waters. The northern half of Guam consists of calcareous rock formations, which are very porous and permeable, so there are no perennial streams in this area. Any rainfall quickly seeps into the aquifer and provides approximately 75% of the public drinking water supply. This aquifer, known as the Northern Aquifer, is estimated to have a total average daily recharge of 111.9 million gallons and a sustainable yield of up to 60 million gallons per day (mgd). GWA currently supplies approximately 42 mgd to the residents of Guam. Capacity is adequate for current development, but additional studies will need to be completed to determine if the existing water supply is adequate for future growth.

Treatment and Distribution

The GWA operates and maintains more than 200 water facilities, including wells, springs, reservoirs, booster stations, and one treatment plant. This public water system is divided in three parts: The Northern, Central, and Southern Public Water Systems. The Northern System serves

the majority of the population living in Guam. The Central System is mostly served by the U.S. Navy's FENA Water Treatment Plant (WTP). The Southern System is mostly served by GWA's Ugum WTP.

GWA's water supply sources include deep wells, FENA, Ugum, Santa Rita Spring, and former Earth Tech Wells. Table 1 shows the number of facilities in each of the three systems. About 42 million gallons per day (mgd) of water is supplied to the residents of Guam. Deep wells contribute over 75% of that 42 mgd. However, about 50% of the 42 mgd is "unaccounted for" water that leaves the system through illegal connections or pipeline leads, or is associated with unreadable meters.

Table 7-1. Count of Guam Waterworks Authority Facilities

System	Wells	Springs	Reservoirs	Booster Stations	Treatment Plants
Northern	119	0	14	10	0
Central	0	1	8	9	0
Southern	2	4	14	16	1
Total	121	5	36	35	1

Source: GWA 2007 Water Resources Master Plan.

The GWA water distribution system includes over 400 miles of pipe constructed of a variety of pipe materials and sizes. The system was built principally by the Navy and then turned over to the Government of Guam to operate for the civilian population.

System Conditions

The legal code (Guam Administrative Rules and Regulations, Title 28, Chapter 2, Clause 2109) states that "GWA shall maintain a standard water delivery pressure range of a minimum 20 pounds per square inch (PSI) to a maximum 90 PSI at the customer's meter." The existing water system infrastructure is insufficient to meet basic flow and pressure requirements for all of GWA customers. About 10% of GWA's customers are affected by intermittent or ongoing water supply outages and poor pressure. GWA reports that there is significant corrosion evident for all water infrastructure.

Sewer

Collection and Treatment

In addition to water service, GWA also provides wastewater services for Guam's general population and Andersen Air Force Base. The wastewater system consists of six wastewater basins and includes over 300 miles of collection system and force main, 77 sewage pump

stations, and seven sewage treatment plants. Collection pipes are typically constructed of polyvinyl chloride (PVC) or asbestos cement. Construction of the sewer system was undertaken in the mid-1960s and many of these pipes are still in service.

The population served by the GWA wastewater system is expected to grow from 111,000 in 2005 to 134,000 in 2025. The two largest treatment plans are the Hagåtña and the Northern District Sewage Treatment Plants (STPs). The Northern District plant was commissioned in 1979 with a design flow capacity of 12 mgd. 2005 estimates for average daily flow indicated that the Northern district sewer treatment plant handled approximately 7.8 mgd. By 2025, this is anticipated to increase to 9.5 mgd. While these numbers would indicate that the plant has excess capacity, GWA reports that the plant is currently over capacity and in need of upgrades and expansion. This issue will require clarification moving forward.

Private Septic Systems

About 41% of the island residents are served by individual wastewater disposal systems and not by GWA's collection and treatment systems. High concentrations of these properties are located in Northern and Central Guam above the Northern Guam Lens. Many of these unsewered properties are close to deeps wells and close to existing sewers, which would allow hookups without extensive sewer construction.

System Condition

A review of sewer system infrastructure condition indicates that the collection system has a number of trouble spots where flows exceed capacity, and surcharging occurs. Additionally, Water Resources Master Plan reports that, as of 2006, the Northern District Sewer Treatment Plant had a number of deficiencies and was in acute need of repair in order to function properly.

Power

The Guam Power Authority presently serves approximately 46,000 customers. The Authority is a member of the American Public Power Association, which is comprised of over 2,000 publicly owned member utilities nationwide, including US territories.

The power system for Guam consists of generation, transmission, and distribution facilities separately owned and jointly and separately operated by the Authority and the Navy as the Island Wide Power System (IWPS).

The Authority owns three oil-fired steam generating units, two slow speed diesel units, four combustion turbine units and twelve high speed diesel units. Additionally, Miyama Development International Co., Ltd (MDI), the developer of Leo Palace Resort, has constructed a two-unit diesel plant with a net capacity of 9.8 megawatts (MW) which is being operated and maintained by the Authority for the Authority's use. The Navy owns one combustion turbine unit at Marbo

and one steam generating unit at Tanguisson (units leased and operated by the Authority) with a net capacity of 40 MW.

In 1996, the Authority entered into energy conversion agreements with three independent companies. The Tanguisson Plan is now being managed by Pruvient. TEMES, Inc. constructed, operates and maintains a 40 MG (net) combustion turbine. Marianas Energy Company operates and maintains two slow speed diesel units (baseload) with a total capacity of 87 MW (net). Additional the Authority has performance management contracts with TEMES and Doosan for the Cabras 1 and 2 and the Cabras 3 and 4 plants respectively whereby the plants and its employees are managed by the private companies.

Collectively, all of the units discussed above have a total net capacity of 536.4 MW. In addition to the generating units, the Authority operates 29 substations (including substations jointly used with the Navy), 186 miles of 115 kV and 34.5 kV transmission lines, 494 miles of overhead and 54 miles of underground primary distribution lines, and other buildings equipment, warehouses and other facilities. The Authority continues to make expenditures for renewals, replacements, and expansion of its facilities to meet growing requirements of its customers.

Chapter 8. Implementation

8.1. Introduction

The goals and policies set forth in the North and Central Guam Land Use Plan provide direction for the area's growth over the next 20 years. This chapter compiles implementation strategies from all of the chapters of the Plan, identified by chapter, supporting goal, and government department or other agency most likely to assume lead responsibility for implementation (to be confirmed in the interagency review process). During the course of plan development, many public comments noted a perceived lack of agency capacity—or political will—to effectively control growth and provide and maintain required infrastructure. The following implementation strategies should be used initially as a discussion tool for agencies to determine 'what's possible', and public and policymakers to identify 'what's most important.'

Although the leads in each strategy are identified primarily as public agencies, private business, developers, and landowners will play major roles in many strategies. For instance, creation of a connected network of walkable local streets will largely be implemented by private sector development along corridors and in Village Centers. Forward-thinking developers may propose new street and intersection designs that could be considered for more widespread adoption. Similarly, the Plan calls for an expanded park and open space network, much of which might be provided by developers as an amenity within individual neighborhoods, or as part of a greenway trail system linking their customers to nearby services, shopping, or schools.

Since many of these concepts are relatively new, and require a more detailed, design-oriented level of planning, one key recommendation is to proceed with a Special Area Plan for one of the existing or proposed Village Center areas in Dededo or Yigo. Conducting an 'all-hands-on-deck' public process to develop a more detailed plan for a few neighborhoods would provide a forum for discussing and testing the Plan's concepts while identifying desired development types and realistic design guidelines in specific places.

Implementation actions have been sorted by draft priority level, based on the following categories and criteria. The 'immediate' actions were reviewed by the interagency working group to confirm the appropriate lead agencies and priorities. The consensus at the September 2009 work session was that, in addition to adoption by the Legislature, the group of actions related to 1) zoning, and 2) protection of water quality, are most important for immediate action.

- Immediate. Actions essential for implementation of the North and Central Guam Land Use Plan Vision and protection of the Northern Aquifer. Actions should be implemented within 5 years following Plan adoption;
- Medium-term. Actions that generally support implementation of the North and Central Guam Land Use Plan.
- Long-term. Longer range actions that would enhance quality of life and the public interest and support the North and Central Guam Land Use Plan. These may also include longer term studies and activities needed to determine future actions.
- Ongoing. Includes monitoring, tracking, coordination and management activities of existing or planned programs.

While the list that follows is intended to be complete, other additional tasks may be identified over time. In addition, the Plan should be reviewed every 5 years, especially in the initial phases of military buildup.

8.2. Implementation

Table 8-1. Immediate Actions

Immediate Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
General	Interagency strategy session(s) to review and prioritize plan implementation actions	Bureau of Statistics and Plans; Governor's Chief of Staff	Immediate (*completed for immediate actions*)
General	Adoption of North and Central Guam Land Use Plan by the Guam Legislature	Guam Legislature	Immediate
Goal LU 1; LU 3; H1;ED 1	Conduct Special-Area Plan process for one or more Village Centers to create plan, design standards, zoning overlay, and action plan	Mayors, Guam Land Use Commission, Department of Land Management, Bureau of Statistics and Plans, and landowners	Immediate
Goal LU 1; LU 3; H1;ED 1	Adopt new zoning designations to match land use categories. Consider form-based zoning for Mixed Use and Village Center designations.	Guam Land Use Commission, Department of Land Management, and Application Review Committee	Immediate

Immediate Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal LU 1; H 1	Update zoning map to reflect the Future Land Use Map and new Land Use categories.	Guam Land Use Commission and Department of Land Management	Immediate
Goal LU 2	Evaluate and adopt new incentives for sustainable development, including transfer of development rights, sustainable site design, social, and economic sustainability.	Bureau of Statistics and Plans	Immediate
Goal LU 3	Amend development guidelines to promote desired community character.	Bureau of Statistics and Plans and Department of Land Management	Immediate
Goal LU 3	Prioritize capital facilities and services in existing developed areas.	Bureau of Statistics and Plans, Guam Housing and Urban Renewal Authority, Department of Parks and Recreation	Immediate
Goal LU 4	Identify and set aside land areas for agricultural purposes.	Chamorro Land Trust Commission	Immediate
Goal LU 4	Provide mechanisms for agricultural best management practices to protect water quality over the Northern Aquifer.	University of Guam Soil and Water Conservation Program and Guam Environmental Protection Agency	Immediate
Goal LU 6	Prepare and implement an Island-wide comprehensive greenway and trail system	Department of Parks and Recreation	Immediate
Goal LU 6	Identify and acquire highest priority areas for public parks	Department of Parks and Recreation and Guam Housing and Urban Renewal Authority	Immediate
Goal H2, Goal H 3	Research successful programs and incentives for affordable housing and incorporate into an ordinance that would encourage moderate and low income housing units in future mixed-use housing developments.	Guam Housing and Urban Renewal Authority	Immediate
Goal H2, goal H3	Amend zoning code to allow innovative mixed-use development to increase the amount and density of affordable and accessible housing, such as accessory units, small lot provisions, density bonuses for affordability and others.	Guam Land Use Commission, Department of Land Management and Guam Housing and Urban Renewal Authority	Immediate
Goal ED 1	Identify and prioritize public investment in locations that are priorities for future expansion of the economic base.	Guam Economic Development Authority	Immediate

Immediate Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal NS 1	Adopt development standards to protect water quality along the shoreline area and over the Northern Aquifer.	Guam Environmental Protection Agency	Immediate
Goal NS 2	Amend the Chamorro Land Trust Act to require conservation of prime forest and other valuable habitat types.	Chamorro Land Trust Commission	Immediate
Goal NS 2	Create an inventory of significant potential conservation lands from CLTC and Ancestral Lands inventories.	Chamorro Land Trust Commission and Ancestral Lands Commission	Immediate
Goal NS 5	Develop best management practices for sustainable development standards.	Guam Environmental Protection Agency	Immediate
Goal NS 7	Develop criteria and standards for development of industrial uses over the Northern Aquifer.	Guam Environmental Protection Agency	Immediate
Goal NS 7	Amend zoning code to restrict impervious surfaces and apply best management practices to stormwater management.	Guam Land Use Commission, Department of Land Management, and Guam Environmental Protection Agency	Immediate
Goal NS 7; I 4	Encourage green streets design principles.	Department of Public Works	Immediate
Goal T 1	Identify and prioritize transportation improvements to implement the Land Use Vision.	Department of Public Works	Immediate
Goal T 3	Develop streetscape and design standards.	Department of Public Works	Immediate
Goal T 5	Identify high priority corridors for transit service.	Department of Public Works and Guam Mass Transit	Immediate
Goal I 2	Provide incentives to support new development near existing public services.	Guam Economic Development Authority	Immediate
Goal I 4	Reduce maximum densities for development that uses on-site wastewater treatment.	Guam Environmental Protection Agency	Immediate
Goal I 4	Review and clarify development standards that protect drinking water resources, like the Well Protection Program and groundwater recharge area management.	Guam Environmental Protection Agency	Immediate
Goal I 5	Plan for sanitary sewer connections and collection in the un-sewered developing areas (Village Centers, industrial, etc.) of the Northern Aquifer watershed.	Guam Waterworks Authority	Immediate

Immediate Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal I 5	Identify and prioritize correction to longstanding sanitary sewer infrastructure problems.	Guam Waterworks Authority	Immediate
Goal I 6	Establish higher stormwater and water quality standards for sensitive areas, such as the Northern Aquifer.	Guam Environmental Protection Agency	Immediate
Goal I 6	Develop and implement low impact development standards.	Guam Environmental Protection Agency and Department of Public Works	Immediate
Goal ED 2	Work with the University of Guam to identify training programs that will support worker needs.	Department of Labor	Long-term
Goal ED 2	Develop a program to support the creation and growth of new small businesses.	Guam Economic Development Authority	Long-term

Table 8-2. Medium-Term Actions

Medium-Term Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal LU 5	Amend building standards and design guidelines to support the architectural character of pre-war Guam.	Department of Public Works	Medium-term
Goal LU 6	Identify joint use opportunities with the Government of Guam for public recreational space.	Department of Parks and Recreation	Medium-term
Goal LU 6	Establish master plan process for significant open space areas.	Bureau of Statistics and Plans and Department of Parks and Recreation	Medium-term
Goal H2	Work with the military to locate temporary worker housing near transit routes.	Bureau of Statistics and Plans	Medium-term
Goal H 3	Increase the supply of supportive housing for persons in need.	Guam Housing and Urban Renewal Authority	Medium-term
Goal NS 5	Establish a comprehensive regulatory program to provide protection for wetlands, including possibly applying for delegated authority to administer the regulatory program under Section 404 of the federal Clean Water Act.	Department of Agriculture and Guam Environmental Protection Agency	Medium-term
Goal NS 5	Require comprehensive stormwater management plans for major new developments.	Department of Public Works and Guam Environmental Protection Agency	Medium-term

Medium-Term Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal NS 6	Review and update Guam Water Quality Standards and other regulations to enhance protection of critical areas.	Guam Environmental Protection Agency	Medium-term
Goal NS 7	Require percolation ponds and other low maintenance systems for large developments over the Northern Aquifer and other recharge areas.	Guam Environmental Protection Agency	Medium-term
Goal T1; T 2; T 3	Establish priorities for a multi-modal transportation network.	Department of Public Works and Guam Mass Transit	Medium-term
Goal T 3	Establish a transportation level of service for all modes of travel.	Department of Public Works and Guam Mass Transit	Medium-term
Goal T 4	Identify appropriate areas for traffic calming and implement improvements.	Department of Public Works	Medium-term
Goal T 6	Develop and implement designs for pedestrian crossings on local streets and major corridors.	Department of Public Works	Medium-term
Goal I 1	Study need for impact fees to help pay for additional demand on infrastructure by new development.	Bureau of Statistics and Plans	Medium-term
Goal I 2	Establish levels of service for key public facilities.	Department of Public Works	Medium-term
Goal I 4	Identify the need for additional wells for redundancy, security and efficiency.	Guam Waterworks Authority	Medium-term
Goal I 4	Implement comprehensive wellhead standards.	Guam Environmental Protection Agency	Medium-term
Goal I 5	Adopt development regulations that minimize flooding and consider public benefits such as public safety, habitat and recreational values.	Department of Public Works	Medium-term

Table 8-3. Long-Term Actions

Long-Term Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal LU 4, H 1	Establish a land use monitoring program.	Bureau of Statistics and Plans	Long-term
Goal ED 2	Prepare a comprehensive economic base study that addresses the mix of businesses, land supply needs, infrastructure support and other needs.	Guam Economic Development Authority	Long-term

Long-Term Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal NS 2	Create a program to preserve and provide low-impact public access to significant conservation lands.	Department of Agriculture	Long-term
Goal NS 3, NS 4	Inventory and adopt standards to protect existing scenic views from public places.	Bureau of Statistics and Plans and Department of Land Management	Long-term
Goal NS 5	Partner with the military and private property owners to protect and re-establish native species.	Department of Agriculture	Long-term
Goal NS 5	Develop a system of reference wetlands for use in future wetland classification and as a basis for determining scope and extent of compensatory mitigation.	Department of Agriculture and Guam Environmental Protection Agency	Long-term
Goal NS 6	Develop tax and fee incentives for sustainable design for site planning structural design and energy efficiency.	Guam Economic Development Authority and Guam Energy Office	Long-term
Goal NS 6	Identify locations and opportunities for compensatory mitigation in Northern Guam.	Bureau of Statistics and Plans	Long-term
Goal NS 8	Develop a climate change planning process.	Guam Environmental Protection Agency	Long-term
Goal I 1	Provide infrastructure service agencies regular updates on population and employment.	Bureau of Statistics and Plans and Department of Labor	Long-term
Goal I 1	Identify and implement specific criteria for siting of telecommunications towers and antennae.	Department of Public Works	Long-term
Goal I 2	Identify and implement measures to make service provision more efficient and effective.	Consolidated Commission on Utilities	Long-term
Goal I 3	Create a unified water system to serve military and civilian population.	Guam Waterworks Authority	Long-term
Goal I 3	Support public/private partnerships to enhance water system improvements.	Guam Waterworks Authority	Long-term
Goal I 5	Combine with the Department of Defense to expand the Northern District Wastewater Treatment Plant.	Guam Waterworks Authority	Long-term
Goal I 7	Require improved energy conservation standards for new construction and major remodels.	Guam Environmental Protection Agency and Guam Energy Office	Long-term
Goal I 7	Support research, pilot projects and investment in alternative power sources.	Guam Power Authority and Guam Environmental Protection Agency	Long-term

Long-Term Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal I 7	Provide incentives for locating utilities underground.	Guam Power Authority	Long-term
Goal I 7	Develop and implement vegetation standards and maintenance plan that prevents aerial encroachment on power lines.	Guam Power Authority	Long-term

Table 8-4. Ongoing Actions

Ongoing Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
General	Continue meeting as an interagency working group to monitor and track implementation progress, and coordinate development-related issues	Bureau of Statistics and Plans	Ongoing
Goal LU 5	Continue to support the public to preserve historic and cultural resources	Department of Parks and Recreation	Ongoing
Goal LU 5	Continue to identify, preserve and protect historic properties.	Department of Parks and Recreation	Ongoing
Goal LU 5	Continue to implement guidelines for park and recreation facilities in new development.	Department of Parks and Recreation	Ongoing
Goal NS 4	On an ongoing basis, ensure that new development is consistent with the Guam Coastal Zone Management Program.	Bureau of Statistics and Plans	Ongoing
Goal NS 5	Continue to manage established conservation areas.	Department of Agriculture	Ongoing
Goal NS 5	Expand public information and education efforts on wetland protection and conservation.	Department of Agriculture	Ongoing
Goal I 1	Review and coordinate infrastructure services with land use planning.	Guam Waterworks Authority and Guam Power Authority	Ongoing
Goal I 4	Conduct water system maintenance to protect the Northern Aquifer.	Guam Waterworks Authority	Ongoing
Goal I 4	Support a water conservation program.	Guam Waterworks Authority	Ongoing
Goal I 5	Provide for ongoing monitoring of the water system to protect the environment, the infrastructure and to maximize efficiency.	Guam Environmental Protection Agency	Ongoing

Ongoing Actions			
Goal Number	Implementing Strategy	Lead Agency	Priority Level
Goal I 6	Prioritize and increase monitoring and maintenance of stormwater facilities at high pollution potential industrial, commercial and similar activities.	Guam Environmental Protection Agency	Ongoing

8.3. Draft 2030 Guam Transportation Plan Implementation Measures

Consistent with the Transportation Element of this Plan, the implementation discussion contained in the *Draft 2030 Guam Transportation Plan* (October 13, 2008), has been incorporated into this Implementation Element. The text below is an excerpt from the *Draft GTP* implementation discussion.

> *Implementation of the Guam Transportation Plan project recommendations requires a coordinated planning effort to forward funding priorities in each three to 4-year TTIP review cycle. It is recommended that a Technical Committee is developed to coordinate with the Department of Public Works on the selection of projects for the 2030 GTP for funding in future TTIPs.*
>
> *Best practices for plan implementation include the following:*
>
> *The plan approval process should involve a new advisory group – one at the technical level and one at the policy level. The technical group would include staff from GDPW, FHWA, FTA, FAA, DOA, EPA, Department of Aviation and representatives from Andersen Air Force Base, Navy Bas Guam, and U.S. Marine Corps Finegayan.*
>
> *The plan implementation process should center on selecting projects from the plan and moving them into the TTIP. The TTIP will become the central focus for short-term decision making and priorities. The GTP will be the central focus for policy.*
>
> *The implementation process should focus on using resources from the private sector. The private sector should be relied upon to engage in discrete work elements such as design, operations, and maintenance. The public sector should remain in control of policy and oversight.*
>
> *Coordination needs to occur with the stakeholders. Stakeholders engaged for the GTP include the Department of Administration-Division of Transit, the Joint Guam Program Office (JGPO), the U.S. Marine corps, the U.S. Air Force, and the U.S. Navy (Naval Facilities Command-Pacific and Marianas) and the Territorial Land Use Commission. Each of these groups should be asked to sit on a technical committee to review project proposals, technical studies and NEPA documents, and advise the DPW on matters relating to the long range plan, funding and project administration.*