ANTIGUA AND BARBUDA

Sustainable Island Resource Management Zoning Plan for Antigua and Barbuda (including Redonda)

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GENIVAR
Trinidad & Tobago

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Table of Contents

EXECUTIVE SUMMARY **x**

1.1 Mandate **4**

1.2 Planning Approach **4**

2.1 Vision **10**

2.2 Goals **11**

3.1 Background **15**

3.1.1 Context 15

3.1.2 Geology and Soils 15

3.1.3 Topography 17

3.1.4 Climate 21

3.2 Ecosystems **22**

3.2.1 Ecosystem Units 22

3.2.2 Biodiversity and Wildlife 35

3.2.3 Protected Areas 38

3.3 Land use Suitability and Capacity **40**

3.3.1 Environmental Risk and Vulnerability 40

3.3.2 Environmental Resources 43

4.1 Settlement Pattern **52**

4.2 Historic Settlement Pattern **52**

4.3 Current Settlement Pattern **53**

4.3.1 Antigua Settlement Pattern 53

4.3.2 Barbuda Settlement Pattern 61

4.4 Population **64**

4.5 Housing **67**

4.5.1 Housing Demand 67

4.5.2 Land Requirement for Housing 71

4.5.3 Squatting 74

4.6 Economy and Employment **77**

4.7 Social Infrastructure **85**

4.7.1 Health 85

4.7.2 Education 86

4.7.3 Community Facilities 88

4.7.4 Protective Services 88

4.8 Physical Infrastructure **89**

4.8.1 Traffic and Transportation 89

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4.8.2 Water and Wastewater Infrastructure 93
4.8.3 Solid Waste 95
4.8.4 Energy 95
5.1 Purpose 97
5.1.1 Factors Influencing Current Spatial Patterns 97
5.1.2 Development Trends 98
5.1.3 Existing Patterns within Settlements 99
5.1.4 Area Protection Initiatives 99
5.2 Alternative Spatial Development Scenarios 100
5.2.1 Current Trends Scenario 100
5.2.2 Decentralization Scenario 102
5.2.3 Hierarchical Network of Settlements 103
5.3 Evaluation of Alternative Spatial Development Scenarios 105
5.3.1 Maintain and Enhance Ecosystem functions 106
5.3.2 Foster Economic Development and Engaging Livelihoods 106
5.4 Preferred Spatial Development Scenario 108
5.4.1 Suggested Development Scenario 108
5.4.2 Additional Initiatives 108
5.4.3 Requirements to Achieve the Aims of the Selected Development Scenario 109
6.1 Introduction 115
6.2 Environmental Quality 115
6.2.1 Ecological Integrity 115
6.2.2 Environmental Risk 122
6.2.3 Environmental Resources 124
6.3 Economy and Livelihoods 129
6.3.1 Tourism 129
6.3.2 Retail, Services, and Industry 133
6.4 Liveability 138
6.5 Accessibility 142
6.6 Governance 148
6.7 Comprehensive SIRMZP 150
6.8 Redonda 154
7.1 Development Control Administrative Structure and Equipment 156
7.2 Planning and Development Control Process 160
7.2.1 Planning Hierarchy 160
7.2.2 Planning Process 162

7.2.3 Development Control 163

7.3 Development Control Guidelines for Discrete Spatial Units 165

7.3.1 Environmental Protection Areas 172

7.3.2 Environmental Impact Assessments (EIA) 173

7.3.3 Additional Requirements for Specific Areas 173

7.3.4 Agriculture Program on Crown Land 173

7.3.5 Settlement Restructuring 174

7.3.6 Performance Bonds 174

7.3.7 Light Industrial and Service Activities in Residential Areas 175

7.3.8 Acquired Rights 175

7.3.9 Compensation and Acquisition 175

7.4 Concluding Remarks 176

8.1 Short Term Actions 178

8.2 Medium Term Actions 179

List of Tables

Table 3.1 Forest Types of Antigua and their General Location

Table 3.2 Existing Storage Volumes of Major Watersheds in Antigua

Table 3.3 Existing Wells in Antigua

Table 3.4 Historic and Cultural Sites in Antigua and Barbuda

Table 4.1 Number of Parcels With and Without Buildings in Antigua

Table 4.2 Population Estimates and Projections ('000s)

Table 4.3 Population Growth by Parish

Table 4.4 Projected Housing Demand

Table 4.5 Land Requirements for Housing

Table 5.1 Spatial Development Scenario Rating Legend

Table 5.2 Evaluation of Spatial Development Scenarios

Table 5.3 Services/Facilities Suggested for Various Settlement Types

Table 6.1 Land Use Suitability Model: Ecological Integrity

Table 6.2 Land Use Suitability Model: Environmental Risk

Table 6.3 Land Use Suitability Model: Environmental Resources

Table 6.4 Land Use Suitability Model: Tourism

Table 6.5 Land Use Suitability Model: Retail, Services and Industry

Table 6.6 Land Use Suitability Model: Liveability

Table 6.7 Land Use Suitability Model: Accessibility

Table 6.8 Land Use Suitability Model: Governance, Planning Hierarchy

Table 6.9 Detailed Breakdown of Each Area for Each Land Use Category

Table 7.1 General Procedures

Table 7.2 Lotification Guidelines

Table 7.3 SIRZMP Development Guidelines

Table 8.1 Recommended Short Term Actions

Table 8.2 Recommended Medium Term Actions

List of Figures

Figure 1.1 Maps of Antigua and Barbuda

Figure 1.2 Map of the Caribbean

Figure 1.3 Planning Approach

Figure 2.1 The Goals of the SIRMZP

Figure 3.1 Geology Map of Antigua

Figure 3.2 Elevation Map using a TIN (Antigua)

Figure 3.3 Elevation Map using Contours (Barbuda)

Figure 3.4 Topographic Map of Redonda

Figure 3.5 Wooded Areas (Antigua)

Figure 3.6 Vegetation Communities for Codrington Lagoon National Park

Figure 3.7 Wooded Areas /Forest (Barbuda)

Figure 3.8 Major Watersheds (Antigua)

Figure 3.9 Critical Environmental Areas (Antigua)

Figure 3.10 Critical Environmental Areas (Barbuda)

Figure 3.11 Environmental Risk and Vulnerability (Antigua)

Figure 3.12 Archaeological Sites (Barbuda)

Figure 4.1 Built Form (Antigua)

Figure 4.2 Land Use Map (Antigua)

Figure 4.3 Parcels less than 1 ha with buildings in All Saints

Figure 4.4 Built Form and Land Use (Barbuda)

Figure 4.5 UN Population Projections (1950-2050)

Figure 4.6 Persons Per Household (Antigua and Barbuda)

Figure 4.7 St. John's Parcels less than 1Ha with Buildings

Figure 4.8 Squatting Hotspots (Antigua)

Figure 4.9 GDP for selected countries 1969-2009

Figure 4.10 GDP per capita, PPP: Antigua and Barbuda 1980-2008 Constant 2005 International Dollars

Figure 4.11 GDP Annual Growth Rate (%) Antigua and Barbuda 1978-2008

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Figure 4.12 GDP Economic Sector % Share Antigua and Barbuda 1977-2008

Figure 4.13 Composition of GDP, 2001-2009

Figure 4.14 Industrial Sector

Figure 4.15 Agricultural Sector

Figure 4.16 Educational Facilities (Antigua)

Figure 4.17 Travel Mode to Work

Figure 4.18 Transportation Map (Antigua)

Figure 4.19 Transportation Map (Barbuda)

Figure 4.20 Locations of Wells, Reservoirs & Desalination Plants (Antigua)

Figure 5.1 Hierarchical Network of Settlements (Antigua and Barbuda)

Figure 6.1 Natural Features (Antigua)

Figure 6.2 Natural Features (Barbuda)

Figure 6.3 Existing and Proposed Protected Areas (Antigua)

Figure 6.4 Existing and Proposed Protected Areas (Barbuda)

Figure 6.5 Environmental Risk Areas (Antigua)

Figure 6.6 Environmental Resource Areas (Antigua)

Figure 6.7 Environmental Resource Areas (Barbuda)

Figure 6.8 Major Tourism Facility Areas (Antigua)

Figure 6.9 Major Tourism Facility Areas (Barbuda)

Figure 6.10 Retail Services and Industries (Antigua)

Figure 6.11 Retail Services and Industries (Barbuda)

Figure 6.12 Liveability (Antigua)

Figure 6.13 Fire Response Times (Antigua)

Figure 6.14 Police Response Times (Antigua)

Figure 6.15 Accessibility (Antigua)

Figure 6.16 Governance (Antigua)

Figure 6.17 SIRMZP (Antigua)

Figure 6.18 SIRMZP (Barbuda)

Figure 6.19 Access Map of Redonda

Figure7.1 Proposed Organizational Structure for the Development Control Authority

List of Acronyms

ABMA	Antigua and Barbuda Marine Association
ABWREC	Antigua and Barbuda Waste Recycling Corporation
APUA	Antigua Public Utilities Authority
ARG	Antigua Recreation Ground
ASL	Above sea level
AUA	American University of Antigua
BWIA	British West Indies Airways
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CBH	Central Board of Health
CBMR	Cades Bay Marine Reserve
CDB	Caribbean Development Bank
CEHI	Caribbean Environmental Health Institute
CHAPA	Central Housing and Planning Agency
CLNP	Codrington Lagoon National Park
CSO	Central Statistical Office
CZPC	Core Zoning Plan Committee
DCA	Development Control Authority
EAG	Environmental Awareness Group
ECCB	Eastern Caribbean Central Bank
ED	Environment Division
EIA	Environmental Impact Assessment
EMS	Emergency Medical Service
ESAL	Environmental Solutions Antigua Limited
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information Systems
GNI	Gross National Income
HNS	Hierarchical Network of Settlements
IJA	Ivor Jackson and Associates
IMF	International Monetary Fund
ipgd	Imperial Gallons per Day
MoE	Ministry of Education
MONP	Mount Obama National Park
MSJMC	Mount St John's Medical Centre
NDNP	Nelson's Dockyard National Park

NEMMA	North East Marine Management Area
NGO	Non-Governmental Organizations
NPA	National Parks Authority
NPDP	National Physical Development Plan
NSWMA	National Solid Waste Management Authority
OECS	Organisation of Eastern Caribbean States
PAHO	Pan American Health Organization
PPA	Physical Planning Act, 2003
SDA	Special Development Areas
SIDS	Small Island Developing State
SIRMM	Sustainable Island Resource Management Mechanism
SIRMZP	Sustainable Island Resource Management Zoning Plan
SOC	State of the Country Report
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
UWI	The University of the West Indies
WFCA	Wallings Forest Conservation Area

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This Sustainable Island Resource Management Zoning Plan (SIRMZP) has been prepared by GENIVAR Trinidad & Tobago, in association with Ivor Jackson & Associates and Kingdome Consultants Inc., both of whom are based in Antigua and Barbuda. The primary goal of the SIRMZP is to present a forward-looking strategic, national spatial development framework that addresses current development issues, and provides a platform for feasible private and public sector development initiatives, that will reflect local cultural values and aspirations over the next twenty (20) years. Further, it is designed to serve as a revised Draft National Physical Development Plan (NPDP) that meets the criteria of the Physical Planning Act (2003). In so doing, it:

1. Provides for the protection of critical ecosystem functions and habitats, minimizes environmental risks and seeks to optimize the productive use of environment resources;
2. Promotes the development of a network of cohesive mixed-use settlements that offer a range of housing options that respond to different income levels and living preferences while providing ready access to local commerce, public services and facilities;
3. Establishes economic growth and employment centres that focus on tourism, professional services, agriculture and industrial development;
4. Outlines proposals to improve the configuration and efficacy of the road network and public transportation system;
5. Specifies substantive and procedural regulations and administrative frameworks that may be used to guide development in accordance with national policies;
6. Provides a framework for the preparation of detailed local plans that are in accordance with national land use priorities and strategies.

The SIRMZP was prepared under the auspices of the Ministry of the Environment (MoE) and the Development Control Authority (DCA) as a component of an internationally funded project entitled: "*Demonstrating the Development and Implementation of a Sustainable Island Resource Management Mechanism (SIRMM)*".

A Core Zoning Plan Committee (CZPC), which comprised of members from a broad cross-section of government departments and agencies, as well as Non-Governmental Organizations (NGOs) and other stakeholders, was established by the MoE to serve as the steering committee for the project. In addition to regular meetings, the Committee organized two (2) workshops that:

1. Identified key planning issues and opportunities; and
2. Explored alternative futures via a Visioning Exercise.

It should be noted that the SIRMZP focuses on spatial planning issues and that the Government of Antigua and Barbuda has

mandated other government agencies to prepare plans that meet social and economic development objectives. Nonetheless, it is expected that this initiative will provide a spatial framework for the development of robust national social and economic policies and programs. As the zoning plan is GIS-based, it may be integrated with other data sources and modified as required to ensure that it plays an ongoing role in support of shifting social, economic, and environmental objectives.

The SIRMZP is presented in eight (8) Sections:

Section 1	*Introduction;*
Section 2	*Development Orientation;*
Section 3	*Biophysical Environment;*
Section 4	*Built Environment;*
Section 5	*Spatial Development Strategies;*
Section 6	*Physical Development Plan;*
Section 7	*Development Control Policies; and*
Section 8	*Implementation.*

Sections 1 through 6 present the planning context and zoning plan, i.e. the "*Why" and "What"*, while Sections 7 and 8 focus on "*How"* these interventions may be implemented.

Section 1 introduces the mandate as well as the goals, objectives and methodology. Section 2 highlights the vision and goals for the plan. The vision guiding this Plan emerged, largely, from a "Visioning Exercise" that was conducted with representatives from several Antiguan and Barbudan Government agencies and community groups. The main components of the vision highlighted:

1. Development of a strong sense of community and high quality of life;
2. Development of a competitive mix of economic activities, including tourism, agriculture, fishing, manufacturing, and international business services;
3. Implementation of sustainable development processes that seek to make an appropriate balance between social, economic, and biophysical imperatives;
4. Protection of critical ecologically sensitive areas;
5. Promotion of economic activities that rely on the country's extensive environment resources, such as agriculture and fishing;
6. Respect for the natural and built heritage of Antigua and Barbuda;
7. Development of cohesive, mixed-use settlements and tourism areas with effective infrastructure, that provide a range of housing options within walking distance of local commercial and community facilities; and
8. A collaborative 'bottom-up' approach to development that involves individual residents, community groups, as well as private and public stakeholders.

The Vision was expressed in the following five (5) key planning goals that have guided the development of the spatial plan:

Key Planning Goals

The review of the biophysical environment contained within Section 3 initially focused on critical ecosystem components such as forests, hydrology, wetlands, coral reefs, sea grass beds, and wildlife and identified Environmental Protection Areas. Environmental risks due to excessively steep slopes, erosion, flooding and storm surge are then considered. Finally, environmental resources such as agricultural land, beaches, harbours, and historic features are addressed. Collectively, these components are considered to be the "supply" component of the SIRMZP.

The "demand" component of the SIRMZP is covered in Section 4, which focused on the built environment. Consideration is given to historic development patterns, the current spatial pattern of settlements, population growth rates, projected housing demand, economic tendencies, as well as, social and physical infrastructure. The haphazard pattern of newly approved subdivisions with large lots in areas that are difficult to serve with adequate social and physical infrastructure is highlighted. Consequently, the SIRMZP strongly favours the establishment of core mixed-use settlements with expansion areas that are strategically located to improve connections to the road network, reduce the cost of servicing, as well as avoid ecologically sensitive areas and the fragmentation of environmental resources, such as high quality agricultural land.

In Section 5, specific factors that have affected the current spatial patterns and the effectiveness of the planning initiatives that were designed to influence these patterns are highlighted. This is followed by the identification of three (3) spatial development scenarios: (i) current trends, (ii) decentralization, and (iii) a hierarchical network of settlements. Each of these scenarios was evaluated with respect to each of the five (5) primary planning goals, identified above. A preferred option that is based on the hierarchical network was recommended. This option provides a spatial structure for the zoning plan.

The proposed zoning plan that is embedded in this SIRMZP is presented in Section 6 as a series of layers that address each of the primary goals. First consideration is given to the biophysical environment and environmental protection, risk and resource areas are demarcated. Economic development zones for a range of activities, such as tourism and industry, which relate to the Economy and Livelihood goal, are then presented. The Liveability goal is addressed through the identification of core and expansion settlement area, and specific areas where improvements are needed with respect to the configuration of the road network are highlighted in the Accessibility sub-section. Finally, the desirability of a hierarchical approach to spatial planning is presented with due attention to individual settlements, parishes and watersheds and coastal zones, as well as national and regional issues.

Composite SIRMZP maps are presented for Antigua, Barbuda, and Redonda separately. These maps display only the major land use activity zones. However, as they are GIS-based, they may be manipulated to reveal more a detailed classification within each major category as required.

Section 7 provides greater detail concerning development control. Attention is initially given to the administrative structure, resources, and development control protocols of the Development Control Authority, as it is that organization that will be charged with implementing the plan. Specific development control guidelines, some of which are intended to serve as performance standards are then presented in table form.

Finally, Section 8 details recommended immediate and medium term interventions that are designed not only to implement the SIRMZP but address related issues, such as the preparation of enhanced agricultural policies and programs; the formation of a "Ridge to Reef Committee" to provide a technical review of the direct and indirect impacts of development projects within watersheds and adjacent coastal zones; the development of more detailed plans for parishes and individual settlements; and the initiation of specific projects, which include a plan for the port area in Barbuda.

While the plan provides a firm foundation for spatial development decisions in Antigua and Barbuda (including Redonda), it will, of-course have little use unless it is formally adopted by Government and used by all agencies as a reference for day to day decision making. As the implementation process will take place over several years, it is inevitable that there will be a need to modify some of its provisions. In doing so, it is important to look beyond the specific development guidelines for discrete parcels and give careful consideration to the underlying principles that guided the development of the plan.

The application and modification of the plan is facilitated by its presentation in GIS format, a format that allows the zones to be laid over maps depicting a wide range of additional social, economic, and biophysical phenomena to reveal patterns that may then be taken into account in social and economic development plans. Further, the plan is intended to serve as a living document that may be adjusted over time to reflect shifting priorities and opportunities for the well being of the nation.

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Figure 1.1 Maps of Antigua and Barbuda

As a Small Island Developing State (SIDS) in the Eastern Caribbean, Antigua and Barbuda (including Redonda) has very significant resources that may be drawn upon to provide a solid base for development, and yet, also experiences important challenges in managing a sustainable development process. The country's primary resources include a very agreeable climate, outstanding land and seascapes, extensive areas of high ecological value, an engaging history, democratic governance, a well-educated and healthy population, and significant natural resources (beaches, agricultural lands and fish stocks). While the country's natural resources were of primary economic importance throughout much of its history, the other resources listed, coupled with the ease of accessibility to North America and Europe, have led to a thriving tourism industry.

The development challenges that are faced by Antigua and Barbuda are similar to many other SIDS in the region. These include:

- Fragile terrestrial and marine ecosystems such as mangrove wetlands and coral reefs that are endangered by development projects, pollution and misuse;
- A relatively small land mass and population size;
- Vulnerability to external economic and natural environmental events, such as economic recessions, hurricanes, and climate change;
- Urban decay in two of the key historic centres (St. John's and Parham);
- Pockets of poverty;

- Inadequate physical infrastructure;
- Extensive poorly located subdivisions that are underdeveloped;
- Insufficient and unevenly distributed housing and social infrastructure;
- Ribbon development along rural highways which contributes to traffic congestion; an incomplete highway network;
- Conflicting land use activities, especially among housing, tourism and agricultural activities; and
- Land degradation due to uncontrolled grazing; and limited institutional capacity to manage the development process due to the presence of weak and fragmented land use and development control mechanisms.

These problems are exacerbated by the lack of a statutory document that sets out national spatial development policies and provides the context required for the preparation of local development plans.

This combination of development assets and challenges led to the country's selection as a prototype for a major Global Environment Facility (GEF) initiative that was intended to demonstrate the importance and practicality of sustainable resource management in SIDS. Antigua and Barbuda's selection as a prototype is fortuitous as a Draft National Physical Development Plan (NPDP) was prepared for the country in 2001 but was never officially adopted. With this initiative, the GEF effectively provided an opportunity to build on the analysis and provisions of that Plan while taking into account more recent development trends and the results of extensive environmental analyses that were conducted during other phases of GEF's overall initiative.

Figure 1.2: Map of the Caribbean

This Sustainable Island Resource Management Zoning Plan (SIRMZP) presents a forward-looking, strategic national spatial development framework. It addresses current development issues and provides a platform for feasible private and public sector development initiatives that will reflect local cultural values and aspirations over the next twenty (20) years.

The SIRMZP is also designed to serve as a revised Draft NPDP that meets the criteria set out in the Physical Planning Act 2003 (PPA 2003). In this capacity, it:

1. Provides for the protection of critical ecosystem functions and habitats, minimizes environmental risks, and seeks to optimize the productive use of environmental resources;
2. Promotes the development of a network of cohesive mixed-use settlements that offer a range of housing options that respond to different income levels and living preferences while providing ready access to local commerce, public services, and facilities;
3. Establishes economic growth and employment centres that focus on tourism, professional services, agriculture, and industrial development;
4. Presents proposals to improve the configuration and efficacy of the road network and public transportation system;
5. Specifies substantive and procedural regulations and administrative frameworks that may be used to guide development in accordance with national policies; and
6. Provides a framework for the preparation of detailed local plans that are in accordance with national land use priorities and strategies.

This SIRMZP is presented in eight (8) sections:

Section 1 ***Introduction,*** includes a presentation of the mandate and the goals, objectives, and methodology which guided the planning process;

Section 2 ***Development Orientation*** presents the vision and goals of the Plan;

Sections 3 & 4 Examines key planning issues relating to the **Biophysical Environment** and the **Built Environment**;

Section 5 Presents and evaluates alternative **Spatial Development Strategies**;

Section 6 Presents a **Physical Development Plan** that includes a land use zoning map and the rationale for each land use category;

Section 7 Specifies **Land Use and Development Control Policies**, and

Section 8 Offers a phased **Implementation** process.

The SIRMZP is accompanied by a State of the Country (SOC) report that provides a more detailed overview of the planning issues faced by Antigua and Barbuda. The key points of the SOC have been incorporated into Sections 3 and 4 of this document.

1.1 Mandate

This Sustainable Island Resource Management Zoning Plan (SIRMZP) for Antigua and Barbuda (including Redonda) has been prepared under the auspices of the Ministry of Agriculture, Lands, Housing and the Environment and the Development Control Authority (DCA) as a component of an internationally funded project entitled "*Demonstrating the Development and Implementation of a Sustainable Island Resource Management Mechanism (SIRMM)*". The Plan has the dual responsibility of meeting the requirements set out for a development plan in the Physical Planning Act 2003 (PPA 2003) administered by the DCA, as well as serving as a Sustainable Island Resource Zoning Management Plan (SIRMZP), that integrates the recommendations of ecological studies that are designed to ensure the long-term maintenance of ecosystem functions, protection of critical habitats, and the sustainable use of natural resources.

The specific requirements for a development plan in Antigua and Barbuda (including Redonda) as specified in the Physical Planning Act 2003 include, among other elements, the presentation of:

1. A statement of the principal aims and objectives of the Plan.
2. A report on the existing conditions of the area, including the principal physical, social, economic and environmental characteristics.
3. A statement of the policies, proposals and programmes for future development and use of land, including the principles for regulating the use and development of land and measures for the maintenance and improvement of the environment.
4. A reasoned justification of the policies and proposals for the future development and use of land in the area.
5. A schedule guiding the implementation of planning proposals.

Further, in accordance with the guidelines established by SIRMM, the planning process must proceed in an open and transparent manner that involves all stakeholders and the public. For this reason, extensive programmes of public service announcements, meetings and workshops have been completed. Formal public consultations concerning the draft SIRMZP took place in Antigua and Barbuda in September 2011, in keeping with the guidelines outlined in the PPA 2003.

1.2 Planning Approach

The planning approach for this project was designed to produce robust, yet flexible, tools that can be used to channel development processes to ensure that the needs and aspirations of residents of Antigua and Barbuda are met in ways that are consistent with sustainable development.

These tools include a Sustainable Island Resource Management Zoning Plan (SIRMZP) that, in a similar fashion to a National Physical Development Plan (NPDP), may be implemented through development control measures and strategic public investments in both social and physical infrastructure. The use of performance standards for certain projects, as opposed to rigid zoning ordinances, ensures that a clear focus on sustainable development objectives is maintained while allowing flexibility in achieving the objectives.

The overall planning approach may be characterised as a *Learning Ecology* which began with an assessment of the existing relationship between land use activities and the biophysical environment and then proceeded to explore spatial development strategies that may enhance this relationship while, at the same time, meeting the needs and aspirations of residents. Further, a collaborative planning approach is supported through the involvement of stakeholders and the public in the elaboration of a vision, as well as, the development and evaluation of alternative strategies. In this way, a mutual learning process is fostered which in turn contributes to the development of a Plan that is intended to receive wide support.

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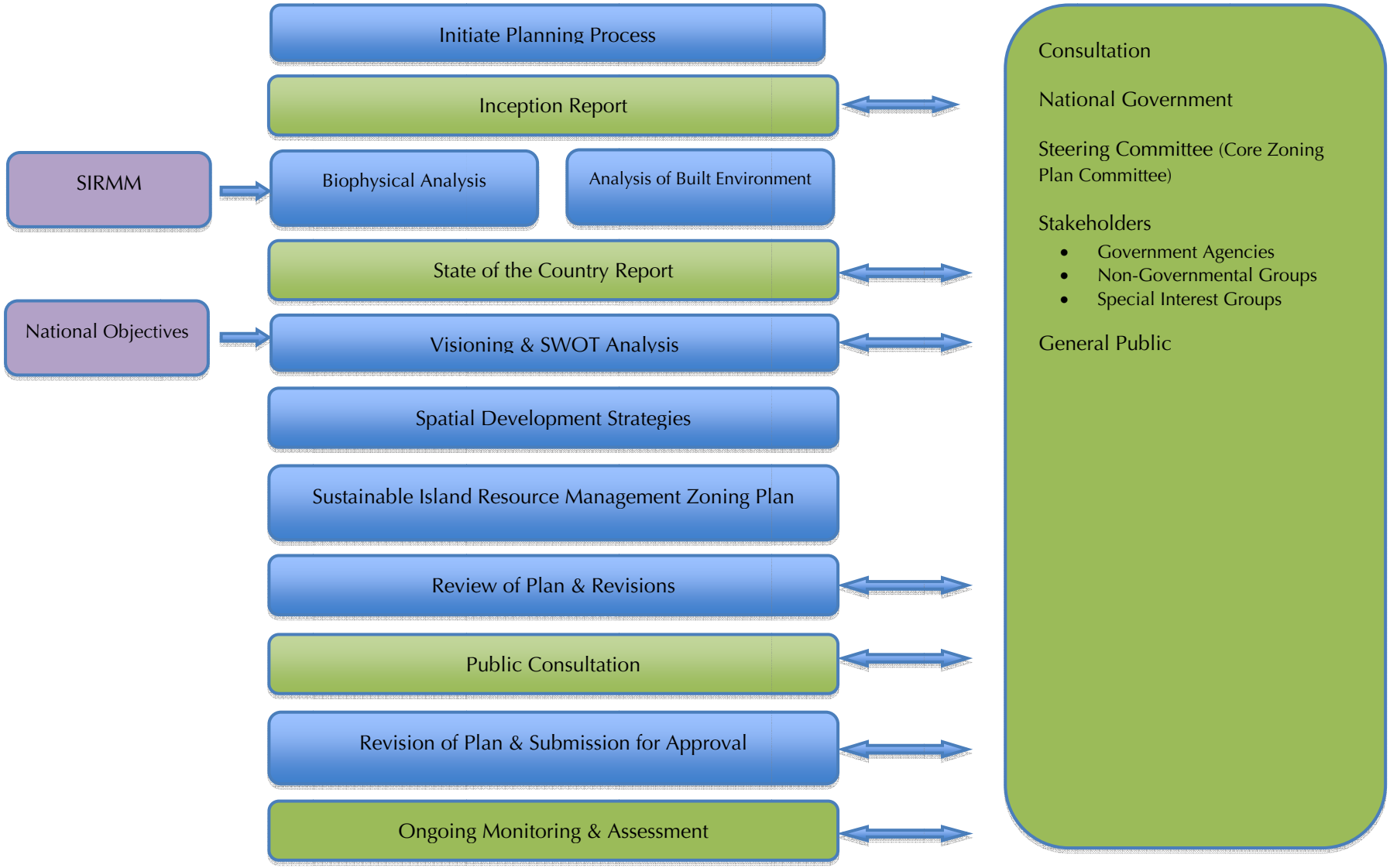


Figure 1.3 Planning Approach

As depicted in Figure 1.3, the planning process began with an Inception Report detailing the consultants' understanding of the planning issues and the planning approach. This document was formally presented to the Core Zoning Plan Committee (CZPC) and a workshop was held with stakeholders in August 2009 to identify the critical planning issues.

The Inception Report led to the commencement of extensive data gathering which focused on specific planning issues relating to the biophysical environment; the built environment (which included consideration of settlement patterns, population and housing, as well as physical and social infrastructure); economy and livelihoods; culture and recreation; and the legislative framework and institutional arrangements. The results of this inquiry were presented in a draft State of the Country Report in January 2010.

During a full-day workshop in February 2010, a Vision Statement for the development of Antigua and Barbuda (including Redonda) and the Strengths, Weaknesses, Opportunities and Threats (SWOT) that may affect the feasibility of reaching the vision were elicited from the stakeholders present. This workshop led to the identification of goals, objectives, and strategies that are designed to move forward to "Where we want to be in 20 years".

The existing balance between land use activities and the capability of the biophysical environment was assessed by overlaying a map of current land use activities with maps depicting environmental planning issues. Three (3) types of environmental zones were identified. These units were then assessed to determine their capabilities to support specific land use activities. These units included:

1. ***Environmental Protection Areas:*** which are critical to the maintenance of ecosystem functions and/or provided critical habitats;
2. ***Environmental Risk Areas:*** where specific measures must be taken to reduce risks such as land slippage; and
3. ***Environmental Resource Areas:*** such as Class II and III agricultural lands that could be used in a sustainable manner to support the local economy and promote food security.

It should be noted that the information pertaining to environmental issues was derived from the work of another consulting agency as part of a separate phase in the overall SIRMM project. As that work is ongoing, the delineation of specific sites for protection should be considered a first approximation and subject to refinement.

An analysis of land use activity patterns was then completed with due consideration to historic patterns, trends, economic opportunities, and housing and settlement requirements. This involved the identification and mapping of existing land use activities, as well as, an assessment of the compatibility between adjacent activities and the degree of interaction between activities. Particular attention was given to the location of activities that generate significant travel demand. In addition, the land use

suitability analysis considered the types of positive and negative impacts that each activity is likely to have on its biophysical environment.

A visual 'development game board' for the exploration of alternative spatial development strategies was created by superimposing the maps of environmental issues with those depicting settlement patterns. Alternative spatial development strategies were then generated and evaluated with respect to their capacity to ensure the resilience of ecological functions, high quality living environments and opportunities for economic growth.

A zoning plan was then prepared to support the preferred spatial development strategy. In addition to the three (3) types of environmental areas noted above, the Plan proposes a network of sustainable communities with accessible physical and social infrastructure that serve all of the country and promote the development of a sustainable economy that includes tourism. Effectively, the Plan presents:

"How we can go from where we are, to where we want to be?"

During the consultation phase that took place in September 2011, stakeholders and the general public had the opportunity to review all aspects of the *Sustainable Island Resource Management Zoning Plan (SIRMZP)*. These sessions included succinct presentations and provided opportunities for individuals and groups to express their opinions concerning the merits and conversely demerits of the SIRMZP. In addition, documentation that illustrated various components of the Plan was made available to members of the public, and the SIRMZP was discussed on radio and television broadcasts and interviews and newspaper articles.

Following the consultation phase in September 2011, the Plan was revised to reflect the feedback received from stakeholders and the public. At the same time, the implementation measures presented in the Plan were reviewed and refined to ensure that it met all statutory requirements.

While the present planning process will conclude with the submission of the SIRMZP in October 2011 for approval, the Geographical Information System (GIS) that has been developed to support the assessment of land use capability will continue to be a useful tool. In particular, the GIS may be used to monitor the effectiveness of the Plan, assess the appropriateness of new project proposals and evaluate future development strategies. In this way, the Plan may keep pace with shifting needs and aspirations and have a lasting contribution on the sustainable development of Antigua and Barbuda.

CHAPTER 2

DEVELOPMENT ORIENTATION

2.0 DEVELOPMENT ORIENTATION

The statements ***"What do we want?"*** and ***"How can we get there?"*** are at the heart of most planning processes. In answering these questions, it is important to develop a clear, realistic *vision* that that reflects the aspirations of the population and may be achieved with existing resources and within the time frame of the Plan. The vision may then be further articulated through a set of *goals* that focus on each of the major facets of the vision; *strategies* that are designed to achieve the goals; and explicit measurable *objectives* that may be used to direct policies, programmes, and projects to assess progress. This section focuses on the two (2) of these planning components, namely, the Vision and Goals. Explicit strategies and objectives with respect to each goal are offered in subsequent sections of the Plan.

2.1 Vision

The vision guiding this Plan emerged, in large part, from a "visioning exercise" that was conducted with representatives of a broad range of Antiguan and Barbudan government agencies and community groups. In addition, it integrates the aspirations and cultural values of residents and stakeholders who participated in numerous formal and informal meetings during the early stages of the Plan preparation process, as well as, the findings reported in a *State of the Country Report*. The main components of the vision are expressed in the following statements that would depict the situation in the country in 2030.

Antigua and Barbuda is a peaceful country where residents have a strong sense of community, maintain healthy lifestyles, and enjoy a high quality of life. The economy has a good, competitive mix of activities including tourism, agriculture, fishing, manufacturing, and international business services. The concept of sustainable development underlies all development activities and ensures that the integrity of environmental systems is maintained. Consequently, sensitive environmental areas, such as wetlands, mangrove forests, sea grass beds, and coral reefs are protected from development; while resource-based activities, such as water extraction, agriculture, fishing, quarrying, and waste management are controlled. Innovative technologies are used to ensure an adequate supply of water for agriculture and other uses. Further, the outstanding natural and built heritage of the country is highly valued and respected. Views of the sea from roadways are maintained and the public has ready access to beaches.

Land use management is a critical, ongoing concern for residents due to the relatively small land mass of the country and the pressures of accommodating increasing numbers of residents, immigrants and tourists. For this reason, cohesive, mixed use settlements and tourism areas have been designated which provide a variety of housing options within walking distance of commercial and community facilities, such as stores, and schools. Each settlement has effective infrastructure that provides water, sewerage, electricity, transportation, and communication services. Solar, wind, and other renewable energy sources meet most of the energy requirements in these settlements. The relatively compact form of the settlements ensures that critical ecological areas are protected and that sufficient agricultural land is available to provide a degree of food security and a good variety of fresh produce for local markets. All settlements form part of a nation-wide hierarchy that collectively provides ready access to government services and employment opportunities throughout the country. The network also facilitates the operation of an efficient public transportation system and reduces traffic congestion.

Effective communication between government agencies and with the public is maintained through regional government offices and web-based services. A collaborative 'bottom-up' approach to development that involves individual residents, community groups, along with private and public stakeholders, is encouraged and is a source of pride for citizens of the country.

2.2 Goals

While the vision expressed above is attainable, it will not be met without a determined and concerted effort on the part of the Government of Antigua and Barbuda, private stakeholders, community groups and the public. The first step in moving forward is to identify goals that express discrete themes or pathways toward the vision. In subsequent Sections of this Plan, the strategies, objectives (or outputs) and activities that are associated with each goal are identified. Five (5) specific goals have been identified for the SIRMZP. These are presented hereafter:

Figure 2.1: The Goals of the SIRMZP

Goal 1: Maintain and Enhance Ecosystem Integrity

The integrity of ecosystems is of great importance in all regions. Policies, programmes, and projects which exert pressures that exceed the capacity of natural systems inevitably increase the vulnerability of natural and human systems. Further, they lead to unintended consequences that ripple throughout the economy – one example of this is the decline in fish stock resulting from mangrove destruction. These concerns are all the more important in SIDS that have extremely limited land mass coupled with competing development priorities.

In Antigua and Barbuda, the key environmental concerns include the freshwater system, fringe mangrove, sea grass beds, coral reefs, sand dunes and forested areas, all of which are essential to sustain flora and fauna and protect against natural disasters such as land slippage, coastal erosion and hurricanes. In addition, it is important to ensure that resource-based industries, such as tourism, fishing, and agriculture do not exceed the resilience of ecological systems.

Goal 2: Foster Economic Development and Engaging Livelihoods

As this SIRMZP is intended to serve as an updated NPDP, in addition to meeting environmental objectives it must set the stage for economic growth by ensuring that land use activities are strategically located; transportation and communication facilities are efficient; and provision is made for catalytic development projects that will have a ripple effect throughout the economy. Equally important are the type of livelihoods that are available. These should reflect the interests and skill-sets of the local population and provide opportunities for advancement.

Over-dependence on one (1) economic sector, tourism, is a main concern in Antigua and Barbuda as it contributes to macroeconomic volatility and vulnerability to externalities. Consequently, it is important to strive for a healthy mix of economic activities both between and within economic sectors. Light manufacturing, professional and technical services, construction, and resource-based industries such as agriculture and fisheries, are among the sectors that may contribute to a more diversified economy. The land requirements of these sectors must therefore be considered in the SIRMZP.

Goal 3: Enhance Liveability

The functionality, feel, and appearance of residential, work and recreational environments is of critical importance to the liveability of a region as these qualities affect the ease and pleasure that people experience as they go about their daily routines. These urban design components are complemented by the availability of affordable housing, basic infrastructure and community services.

While the quality of life in Antigua and Barbuda is superior to that in many other Caribbean islands, significant urban design

improvements are needed in the extent and quality of basic infrastructure such as water and sewerage services, the availability of affordable housing, and access to community and recreational facilities including beaches. Further, it is important to improve the urban design of settlements, especially with respect to the pedestrian environment, and to ensure that foreign investment in property development does not preclude the availability of sufficient land and development opportunities for the local population.

Goal 4: Improve Accessibility

Ease of access to schools, employment opportunities, stores and recreation facilities is critical to the success of any living environment. This is generally best achieved through proximity planning whereby services that are needed on a daily basis are close at hand, while those that are required on a less frequent basis may be reached via an efficient road infrastructure and public transportation system.

Ribbon development along roads and highways, fragmented land uses and dispersed settlements effectively increase transportation demand unnecessarily throughout Antigua and Barbuda. Development controls that favour compact cohesive mixed-use settlements would enhance opportunities for proximity planning and the operation of efficient public transportation services.

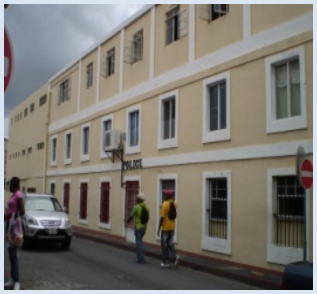
Goal 5: Promote Efficient and Effective Governance

The governance of land management issues affects everyone. Efficient and effective governance approaches are well coordinated, strive to achieve a balance between top-down and bottom-up initiatives, present opportunities for public-private partnerships, and are transparent.

At present, land management decision-making in Antigua and Barbuda is undertaken by several different national agencies with competing mandates and with insufficient coordination. Local planning, development control and maintenance could be enhanced through the devolution of certain responsibilities to local village councils and community groups. These bodies are sensitive to local needs and will be motivated to find solutions that are in line with the development aspirations of residents. Public consultation concerning key projects, as well as, greater use of development control measures such as performance standards and environment impact assessments would be beneficial.

CHAPTER 3

BIOPHYSICAL ENVIRONMENT



3.0 BIOPHYSICAL ENVIRONMENT

3.1 Background

3.1.1 Context

Antigua and Barbuda lie approximately 25 miles (40 km) apart on the relatively shallow Barbuda Bank, which covers an area of about 1,390 sq. miles (3,600 km^2). They sit on the southern and northern edges respectively of the bank, which in turn is located at the outer section of the Lesser Antillean Island Arc. Antigua and Barbuda are 25 miles (40 km) and 62 miles (100 km) east respectively of the centre of volcanic activity associated with late Miocene to Holocene chain of the "Volcanic Caribbees" which stretches from Saba to Montserrat[1]. Redonda lies approximately 35 miles (56 km) from the nearest point in Antigua and is a rugged, uninhabited rock approximately 0.5 sq. miles (1.3 km^2) in area.

3.1.2 Geology and Soils

3.1.2.1 Geology

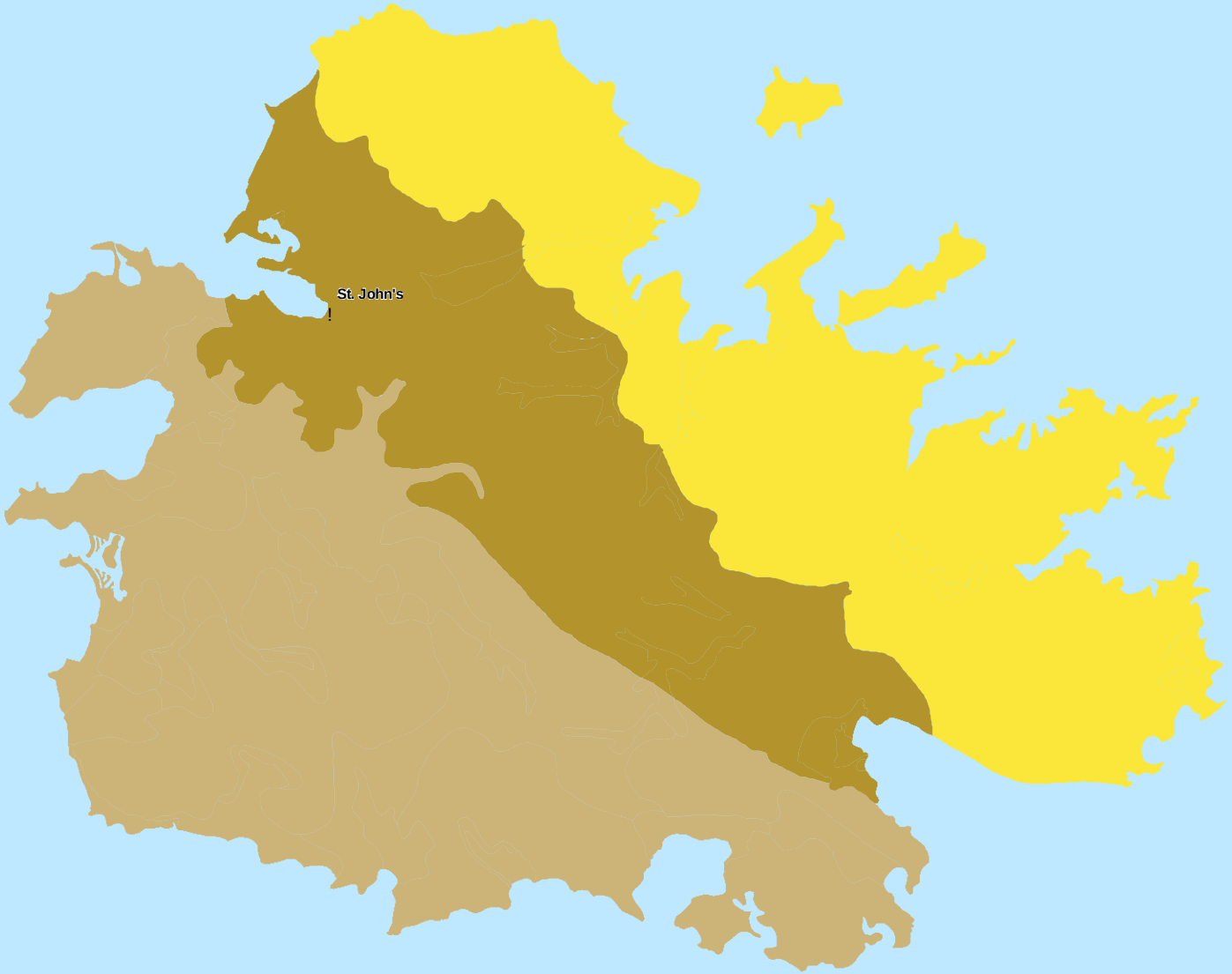
Figure 3.1 shows the three (3) distinct geological regions of Antigua:

a) The **Volcanic Region** of the south and southwest section, where explosive eruptions produced pyroclastic and ashfall that formed the valleys and andesite and basalt flows that shaped the hills of the area. Soils are primarily neutral to slightly acidic and slopes are predominantly 10^0 - 20^0.

b) The **Central Plain**, which separates the volcanic and limestone regions and extends from the capital, St. John's, in the northwest to Willoughby Bay in the southeast. This region consists generally of well-drained soils composed of turfs and agglomerates, with pockets of tough clay. Slopes are less than 10^o.

c) The **Limestone Region**, which includes the northern and eastern third of Antigua as well as many of the islands off the northern coastline. Known as the Antigua Formation, it is comprised of different limestone types of varying toughness. Most of the limestone of the region derives from fine-grained particles of biogenic origin. Elevations in this region range from 50 ft (15 m) to 99 ft (30 m).

[1] Martin Brasier and Jack Donahue, 1985



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

GEOLOGY

FIGURE: 3.1

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CLIENT:

Legend

Geology

- Consolidated Pyroplastic Lava Flow
- Limestone
- Sandstone, Conglomerates & Shale

NOTES:

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SOURCES OF INFORMATION

All base data and satellite imagery were provided by:
The Government of Antigua and Barbuda: SIRMM/Environmental Division, Survey Division, Antigua Public Utilities Authority (APUA) and Caribbean Conservation Association

3.1.2.2 Soils

Comprehensive studies of the soils of Antigua and Barbuda were carried out by Martin-Kaye (1956), Hill (1966) and Ahmad (1984). The major soil types of Antigua can be grouped to reflect the influences of the three (3) main geological regions. The volcanic region consists of igneous rock with soils that are largely clay loams. These soils are neutral to slightly acidic and well drained. The central plain has some heavy, hard to work clay soils, but generally contains well-drained soils laid over tuffs (stratified volcanic detritus) and agglomerates. In the limestone region, light soils exist over calcareous sandstones, heavier soils over calcareous grits, and deeper well-drained clays over calcareous marl. Some of these contain large amounts of almost pure calcium carbonate. Soils are generally alkaline in this region. Barbuda's soils are more homogeneous and are most similar to those of limestone region of Antigua. The limestone-derived soils cover 78% of the island.

These are general descriptions. Details on rates of percolation, permeability, and load bearing capacity of soils required for housing, tourism and other types of projects, (depending on the area and size of the proposed development) must be supplied through soil investigations using boreholes or test pits to obtain samples for laboratory analysis.

3.1.3 Topography

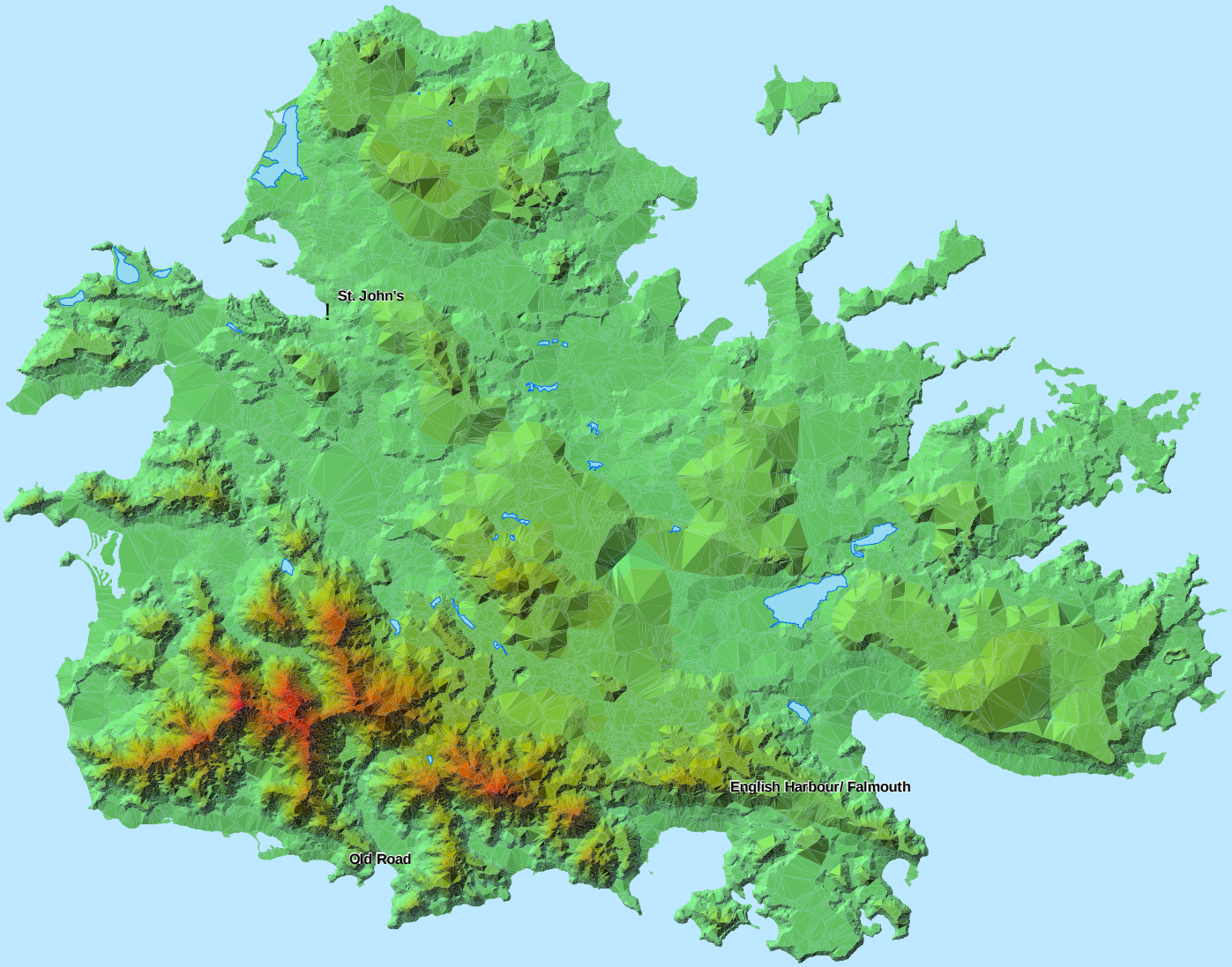
3.1.3.1 Antigua

Topography is a critical variable in the capacity of land to sustain certain uses. About 70% of the land in Antigua is less than 100 ft (30 m) above sea level (ASL); 4% rises 500 ft (152 m) ASL and 1% rises 1000 ft (305 m) ASL[2].

Approximately 65% of Antigua's land area is comprised of moderate slopes between 3^0-10^0, while 5% is flat or less than 2^0. Another 20% of land is between 11^0 and 20^0, and the steeper areas, in excess of 21^0, amounts to about 10% of the land area[3]. A very indented coastline, along with several offshore islands and reefs provide conditions attractive to recreational boating and other forms of marine recreation.

[2] Halcrow *et al* 1963

[3] Land and Water Management, Atkins 1983 and Antigua and Barbuda Environmental Profile, 1991



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

ELEVATION

FIGURE: 3.2

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CLIENT:

Legend

Lakes/Ponds

Elevation (ft)

- 0 - 100
- 100 - 200
- 200 - 300
- 300 - 400
- 400 - 500
- 500 - 600
- 600 - 700
- 700 - 800
- 800 - 900
- 900 - 1000
- 1000 - 1100
- 1100 - 1200
- 1200 - 1300

NOTES:

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The Government of Antigua and Barbuda: SIRMM/Environmental Division, Survey Division, Antigua Public Utilities Authority (APUA) and Caribbean Conservation Association

TITLE:

ELEVATION

FIGURE: **3.3**

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63-65 Independence Square, Port of Spain
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CLIENT:

Legend

- Contours (ft)
- Rivers
- Lagoon
- Inland_Water
- Wetland Forest

SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

NOTES:

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3.1.3.2 Barbuda

Barbuda's topography is relatively uniform. Most of Barbuda is about 10 ft (3 m) above sea level, except in the highlands where heights reach up to 124 ft (38 m). To the north and west is an abrupt escarpment, whereas a gentle slope marks the south and sea cliffs characterize the east. Running along the western side of the island is a lagoon that is less than 0.6 miles (1 km) wide, the mouth of which is to the north. In some areas, the long narrow spit separating the lagoon from the sea is only a few meters wide. The island is surrounded by a well-developed reef system.

3.1.3.3 Redonda

Redonda is a rugged uninhabited rock, 0.5 sq. miles (1.3 km^2) in area and rising to approximately 10,000 ft (305m) above seal level with steep cliffs on all sides. The following illustrates the overall topography of Redonda.

Photo of Redonda (source webecoist.com)1

[4] http://www.britannica.com/EBchecked/topic/494742/Redonda

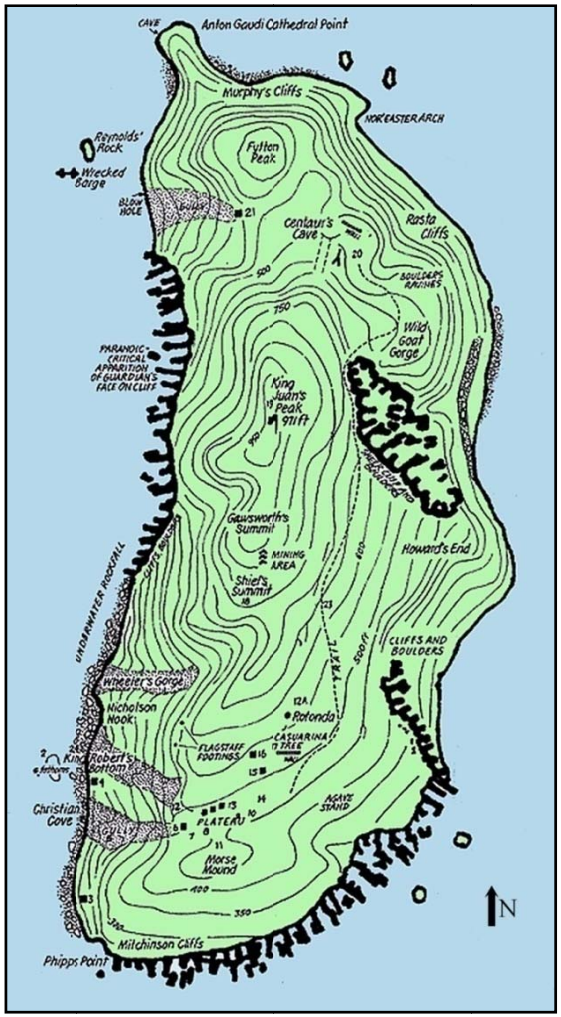


Figure 3.4: Topographic Map of Redonda

Source: Redonda, Fauna & Flora International, 2010

3.1.4 Climate

- **Temperature**

Antigua and Barbuda experience high temperatures year round. The climate is influenced by the steady north-easterly trade winds and has a marked dry and wet season. Daily temperatures average 75^0F (24^0C) in December and January and 84^0F (29^0C) in August and September. Extremes range from a high of 93^0 F (34^0C) recorded in August to lows of 59^0F (15^0C) recorded in January.

- **Rainfall**

Rainfall in Antigua and Barbuda is influenced by seasonal patterns. Typically, there is a dry season that extends from January to March/April, when less than 20% of annual rainfall occurs. The wet season from August through November receives 45% to 50% and intermediate months (May, through July, and December) receive an average of 30% to 35% of the annual total.

Year to year variations can mask normal rainfall distribution. March and April are wet months in some years and August or September are occasionally dry. Over the years, May rainfall levels have been the most variable while February and October rainfall levels have been the least variable. Climatological data shows that the higher elevations in the southern area generally receive the

largest amounts of rainfall, in excess of 50 inches (127 cm) per year, while the least rainfall occurs in the eastern areas of the island, amounting to 40 inches (101 cm) or less, annually. Intermediate values averaging 45 inches (114 cm) per year, are experienced in the central plains and northern limestone areas.

Barbuda is one of the driest islands in the Caribbean and averages between 30 inches (76 cm) and 39 inches (99 cm) of rainfall per year. The island's dry season begins in December and ends in July, while the wet season lasts from August to November.

- **Humidity**

The relative humidity in Antigua is high compared to other islands in the region (mean relative humidity is in the low 80's in the morning and in the low 70's in the afternoon). From January through May the island experiences cooling northeast trade winds.

3.2 Ecosystems

3.2.1 Ecosystem Units

The strategic approach to land and resource use zoning included the identification and mapping of critical ecosystem units, namely terrestrial forests, mangroves, wetlands, beaches, sea grass and coral reefs. These have been mapped in the following sections. Ecosystem units are important banks of biological diversity with stationary flora and fauna with low to high mobility.

3.2.1.1 Forests and Terrestrial Vegetation

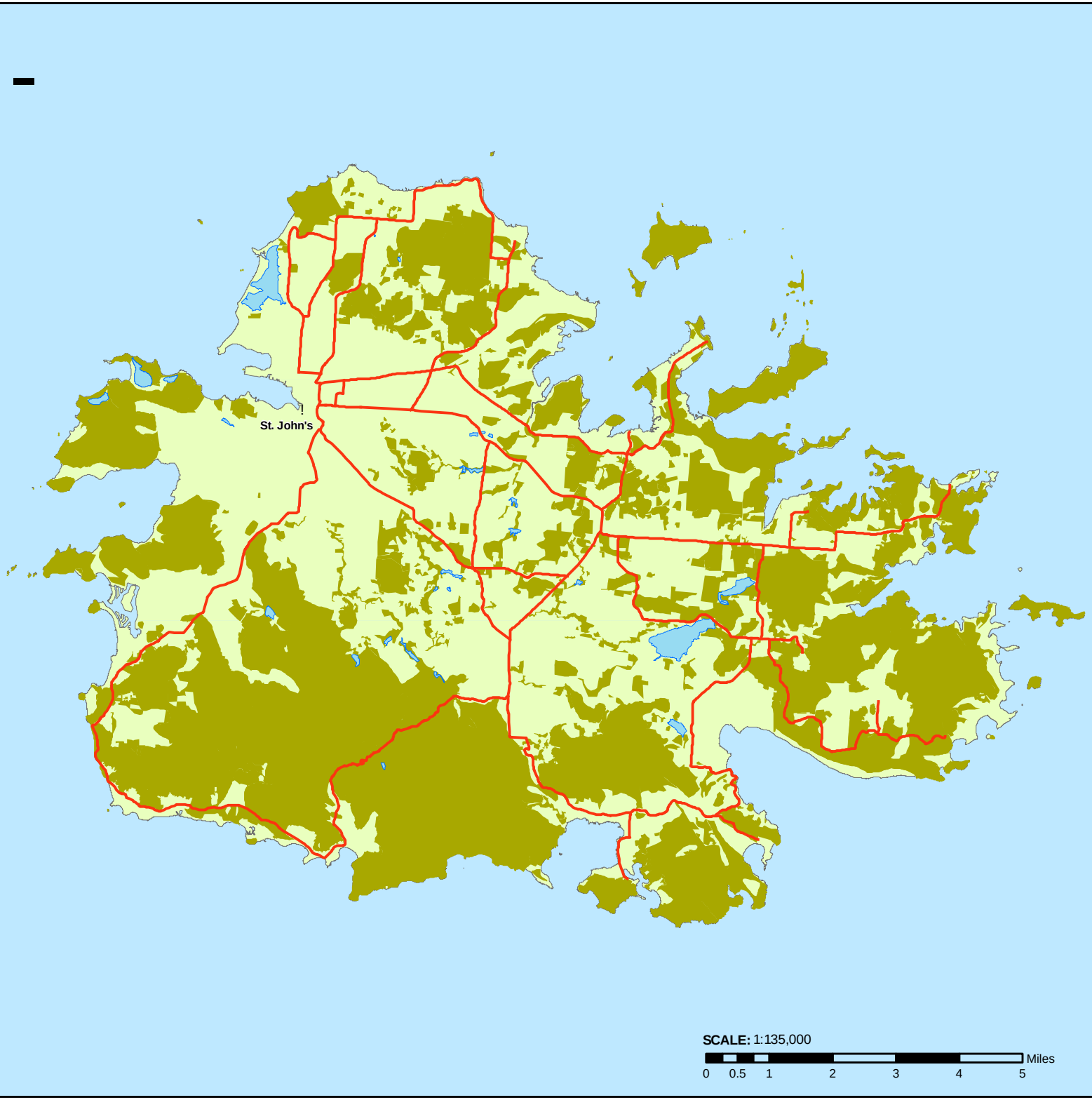
a) Antigua

While not differentiated in the existing mapping, Forest types were identified by Carter in 1944 and placed into seven (7) categories as shown in Table 3.1. The forest cover of Antigua is shown in Figure 3.5.

The table also indicates the general location and canopy characteristics. Forest types are influenced by geology, soils, elevation and rainfall and all have experienced various impacts over time. Protection, preservation and sustainable use of forests will reduce further loss of valuable flora, and for the fauna to which they provide habitat. Such steps will also provide for soil and water conservation, maintenance of landscape scenery and reduction of flood risks associated with down-slope settlements and infrastructure.

Table 3.1 Forest Types of Antigua and their General Location

#	Forest Type	Location	Canopy Cover
1	Cactus Scrub	Volcanic southeast	Open forest; >10 – 40% canopy cover
2	Deciduous Seasonal Forest	Limestone region mainly	Closed forest; > 40% canopy cover
3	Evergreen Seasonal Forest	Volcanic southwest	Closed forest; >40% canopy cover
4	Littoral Woodland	Various areas of exposed shorelines and slopes	
5	Mangrove Woodland	Various coastal areas of Antigua and Barbuda, including offshore islands	Closed forest; > 40% canopy cover
6	Semi-evergreen Seasonal Forest	Volcanic southwest	Closed forest; > 40% canopy cover
7	Thorn Woodland	Limestone region mainly	Open forest



TITLE:
WOODED AREAS

FIGURE: **3.5**

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CLIENT:

Legend

- Primary Roads
- Lakes/Ponds
- Wooded Areas

NOTE:

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b) Barbuda

Barbuda's vegetation types were classified in 2008 by Lindsay into 311 plant species belonging to 84 families. These classifications include:

- Broad-leaved Evergreen Sclerophyllous Closed Tree Canopy Communities characterized by a two-storied forest 16-49 ft (5-15 m) in height and found mainly in the Palmetto Point area in depressions between the sand dunes.
- Mixed Evergreen Drought Resistant Deciduous Communities, found mainly surrounding Codrington Village, adjacent mangroves on thin and saline soils and characterized by stunted vegetation and bare patches of earth interspersed with flashes.
- Dwarf Shrubland Communities, consisting of stunted trees and shrubs that grow on sand dunes or on flat sandy soils; parasitic vines are abundant; a community occurs at Palmetto Point.
- Aquatic Plant Communities; consisting largely of white, black, red, and buttonwood mangroves whose location include the north, east, and south shoreline of Codrington Lagoon, and around the north and west shorelines of the Goat Island Flash.
- Tidally Flooded Mudflats Communities, found around Goat and Rabbit Islands and north-western Codrington Lagoon, this community is made up of shrub-like mangroves, bare ground, and isolated pools.
- Grassland Communities, comprising grasses and forbs with scattered trees and shrubs, produced by the grazing of feral and roaming livestock around; the areas tend to flood after heavy rains.
- Freshwater Ponds and Mudflats, occurring around Codrington Village and are mainly characterized by algae, aquatic ferns, grasses, and sedges.
- Vegetation communities for the Codrington Lagoon National Park (CLNP) were mapped by Putney in 2009 (Figure 3.6).

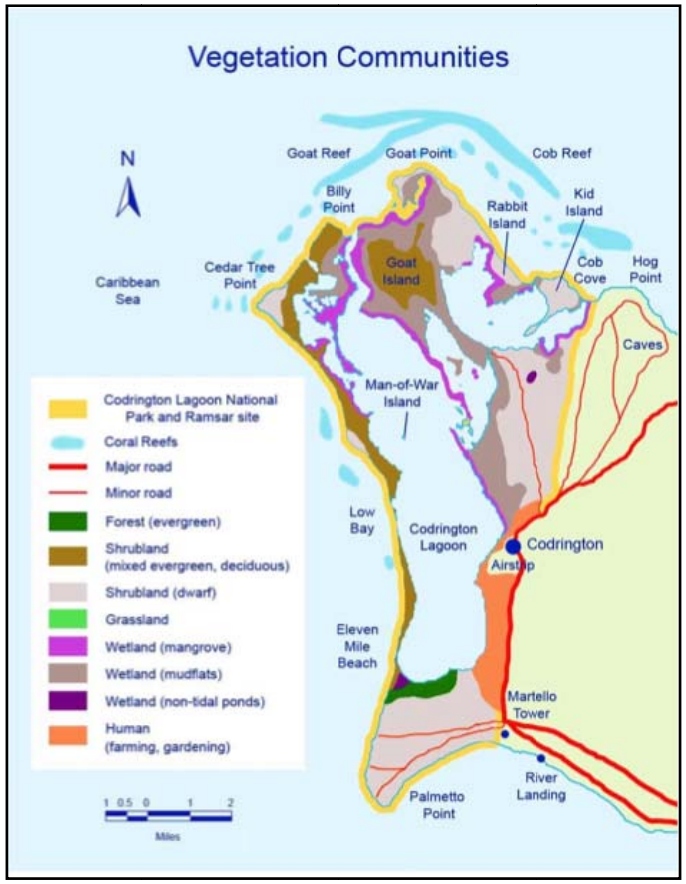

Figure 3.6 Diagram showing Vegetation Communities for Codrington Lagoon National Park

Source: Draft CLNP Barbuda Management Plan 2009 – 2019, map by Allen Putney

TITLE:
WOODED AREAS

FIGURE: **3.7**

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CLIENT:

Legend

- Primary Road
- Lagoon
- Shrubland
- Woodland Reserve
- Woodland

SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

NOTES:

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3.2.1.2 Hydrological Units - Watersheds, Aquifers and Freshwater Reservoirs

a) Antigua

Antigua's drainage areas were consolidated into thirteen (13) watersheds, six (6) of which are considered major because of their socio-economic, agro-ecological and hydrological values. Combined, they constitute 43% of Antigua's land area; sustain 50% of its forests, 90% of its crops and 60% of its livestock production[5]. Further, they contain 90% of Antigua's ground water supply and 90% of its surface water reservoirs. The major watersheds are shown on Figure 3.8 and referenced by numbers in Table 3.2.

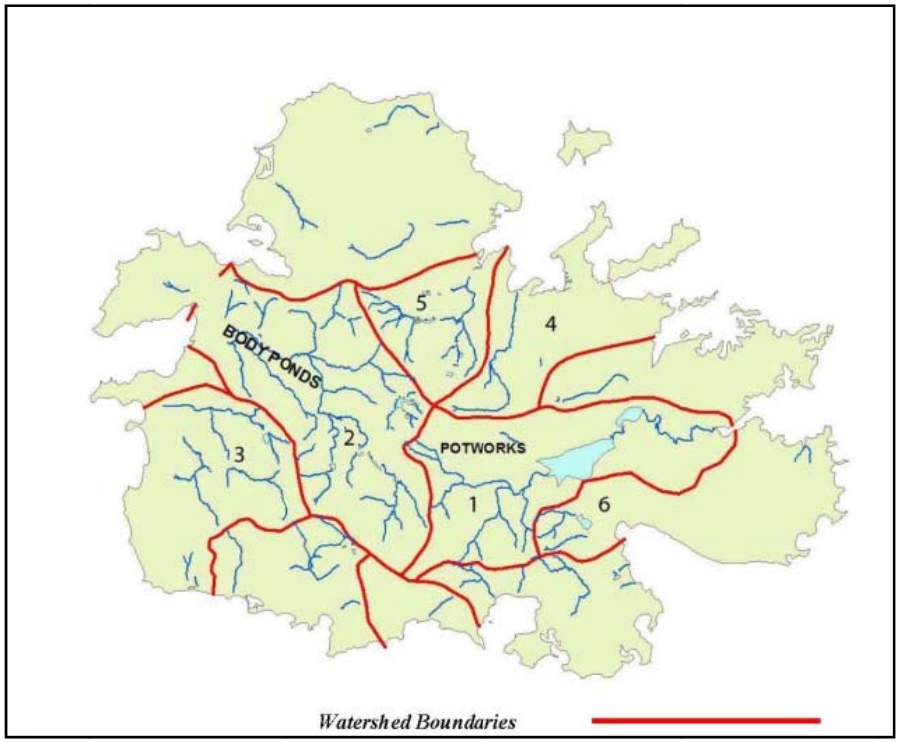

Figure 3.8 Map showing Major Watersheds (Antigua)

Source of map: ESAL, 2008

[5] ESAL, 2008, based on Fernandez, 1990

Table 3.2 Existing Storage Volumes of Major Watersheds in Antigua

Ref #	Watershed	Area (hectares)	Existing Storage (Acre/feet)		Ground Water Yield (cubic metres/yr)
			Agriculture	Municipal	
1	**Potworks**	**3,160**	**30.6**	**4,010**	**220,000**
2	**Body Ponds**	**4,000**	**200.4**	**278**	**340,000**
3	**Christian Valley**	**1,780**	**9.2**	**166**	**610,000**
4	**Parham**	**1,472**	**33.4**	**----**	**----**
5	**Fitches Creek**	**1,040**	**334.5**	**----**	**----**
6	**Bethesda**	**120**	**540**	**----**	**----**

(Source: Environmental Solutions Antigua Limited (ESAL), 2008)

Fresh Water Resources

Water resources of the island are important in sustaining domestic and agricultural uses. Population growth and development have pushed water demands far beyond the capacity of ground and surface water sources. The country is increasingly dependent on desalination, which is much more expensive to produce, to meet its water needs. Ground and surface water resources are however critical to the country's future and requires protection against settlement growth and pollution from occupied facilities and agricultural uses.

Ground Water

Antigua has fifty (50) active wells supplying ground water from a number of well fields:

Table 3.3 Existing Wells in Antigua

#	Area	Wells
1	Bendals Valley	13 wells
2	Blubber, Christian, Roses and Orange Valleys	20 wells
3	Cades Bay & Claremont	5 wells supplying Old Road, Urlings, Johnson's Point and Crabb Hill with approx. 30,000 ipgd
4	Follies	5 wells producing 40,000 igpd
5	Bristol Springs / Collins	7 wells supplying 45,000 igpd to Willikies, New Filed, St. Phillips, Mill Reef and Bethesda

Surface Water

Surface water resources are also important for agriculture and municipal consumption. Potworks Dam is the largest reservoir in Antigua, which has another 9 to 10 medium to small reservoirs, along with 500 ponds and earthen dams. The combined capacity of these facilities is about 6 million cubic meters or 1.6 billion imperial gallons.

b) Barbuda

Barbuda is divided into ten (10) watersheds that are poorly defined and not well studied. The boundaries of the watersheds are delineated in the Highlands, the only area of the island with any appreciable slopes but are not determined for the flat areas of the island, where surface runoff is limited normally but may become significant in flood conditions. Sand mining has impacted the major ground water source for Barbuda at Palmetto Point. Many of the properties in Codrington are able to source ground water using their own wells, but the water is brackish and in some cases there is the risk that it may be contaminated by household sewage.

3.2.1.3 Wetlands

Antigua and Barbuda has numerous wetlands, mostly located in coastal areas. Some are associated with mangrove forests and may

vary in their importance and value as (i) habitats for resident and migratory birds, (ii) sustaining biological diversity, and (iii) the collection and release of storm water which is important in mitigating flood impacts and recreation. Due to their location, wetlands are vulnerable to impacts from coastal tourism and other uses, such that one of the major land use issues facing the country is the balancing of wetland conservation and development.

Most of the wetlands in Antigua are located on the west and southwest section of the island. Many have a physical relationship with beaches hence the reason for coastal tourism impacts on these wetlands. Jolly Pond, one of the major wetlands systems in the island was dredged and land-filled to create Jolly Harbour marina and adjoining lands for real estate development. McKinnon's Pond, the largest existing system in Antigua has been modified and its future remains uncertain. Such uncertainty suggests the need for clarification of policy for the protection, conservation and /or sustainable use of the fifty-three (53) wetlands identified in an Environmental Awareness Group's (EAG) wetland conservation project for Antigua and for the wetlands of Barbuda.

Barbuda's Codrington Lagoon wetland system is the largest in the country and well known as a habitat to one of the world's largest populations of Magnificent Frigate Birds.

3.2.1.4 Mangroves

Mangroves and mangrove wetlands are usually associated with inter-tidal zones of the coastal areas in the country. The red mangroves (*Rhizophora mangle*), black mangroves (*Avicenia nitida*) and white mangroves (*Languncularia racemosa)* are the most commonly occurring species in the country; a fourth species, buttonwood (*Conocarpus erectus L.*) is less common. Mangroves serve several very important environmental functions: they provide habitat for the juveniles of commercially important fish, shrimp, oysters, mussels and various species of resident migratory birds; protect and stabilize coastlines; trap and store sediment from upland runoff and help to gradually extend land seaward. Mangrove-fringed lagoons serve as hurricane shelters for boats during storms and reduce the impact of storm surge on coastal lands and property. Mangroves also provide material for traditional uses such as the construction of fish pots and "wattle & daub" huts and can sustainably be used for charcoal.

The NPDP 2001 mapped the results of a 1991 inventory undertaken by Peter Bacon of thirty-six (36) mangrove sites in Antigua and nine (9) sites in Barbuda. The largest site in Antigua, the 555-acre (225 ha) complex estuarine site at Hanson's Bay, suffered in the past from encroachment by the Cooks solid waste dump and from dumping of spoil dredged from St. John's Harbour.

Given that existing land use policy heavily favours the use of coastal areas for hotel development, developers continue to seek protected harbours and lagoons for marina development. This

places undue pressure on mangrove and wetland systems, which will continue if these policies persist. Future coastal land use policy should therefore seek the protection of environmentally-valued mangrove and wetland systems, while allowing appropriate and sustainable types of coastal development.

TITLE:
CRTICAL ENVIRONMENTAL AREAS

FIGURE: **3.9**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Beaches
- National Parks
- Watersheds
- Lakes/ Ponds
- Coral Reefs
- Mangroves
- Wetlands

Tropical Ecosystems Consulting, 2010

- Existing Protected Areas
- EAG Proposed Protected Areas
- Existing Protected Areas Bounds
- Proposed Protected Areas
- Seagrass

DISCLAIMER:

This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

SOURCES OF INFORMATION

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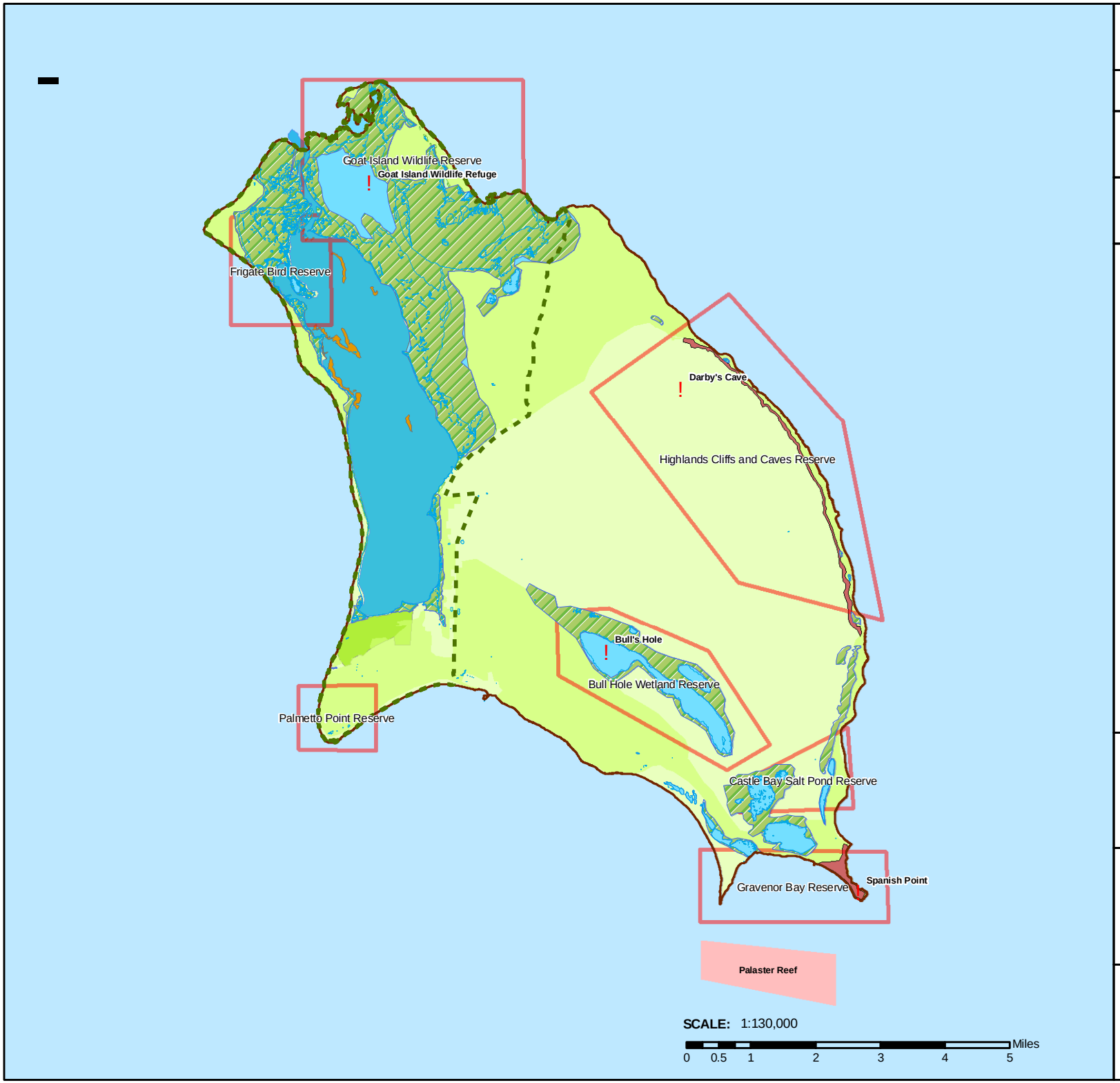
The Government of Antigua and Barbuda: SIRMM/Environmental Division, Survey Division, Antigua Public Utilities Authority (APUA) and Caribbean Conservation Association



TITLE:
CRITICAL ENVIRONMENTAL AREAS

FIGURE: 3.10

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Protected Areas (Prop.)
- Rivers
- CLNP Boundary
- Inland Water
- Proposed Protected Areas
- Algal Comm. (Frigate Bird)
- Escarpment Cliff
- Coral Outcrops
- Mangroves
- Inland Mangroves
- Lagoon
- Existing Protected Areas
- Wetlands
- Coastal Shrubland
- Woodland Reserve

NOTES:

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3.2.1.5 Coral Reefs

Coral reefs are deposits of calcareous material found in clear, shallow water, with enough light for photosynthesis, and ocean water temperatures seldom below 70° F (21°C). They are complex and highly productive reef ecosystems that may include combinations of stony and soft corals, anemones, sea fans and sea whips. Stony corals are the most important for reef building.

Coral reefs provide an important habitat for fish and other marine species; it provides protection of shorelines against storm surge and from wave energy, enjoyed by harbours and anchorages in the country. In addition, they provide the sand and coral fragments found on beaches, and function as a major source of recreation, particularly scuba diving and snorkelling. It is estimated that there are about 9.8 sq. miles (15.8 km^2) of coral reefs around Antigua and Barbuda.

Antigua and Barbuda's reefs are under continuous stress both from natural and human forces. Large percentages of reefs systems of the country are now dead. A natural cause of stress has been the decline of the black urchin population that feeds on algae growing in the reefs, creating algae blooms that smother corals. Since 1989, several hurricanes have damaged the country's reefs, while improper discharge of untreated sewage into the sea has had a major adverse effect on reef health. Sediment loading due to land erosion, fertilizers, plumes from dredging activity, boat and yacht anchors, and careless divers are other sources of impacts on coral reefs, which takes many years to re-grow after destruction.

3.2.1.6 Sea Grass

Sea grass grows in shallow water where the currents are not too swift, wave action is low and the bottom sediment is favourable. They are often found between the reefs and the shore in waters less than 66 ft (20m) deep. Sea grass communities contribute considerable quantities of leaf material to the water column, rivalling mangroves in their leaf production rates. They provide habitats for several herbivorous species of vertebrate and invertebrate organisms such as parrot fish, surgeon fish, conch, sea urchins and turtles. They also produce large quantities of detrital material that is a food source for other animals. In addition, they provide essential nursery habitat for the propagation of numerous organisms. Sea grasses also serve to stabilize the sediments in which they grow. This is a very important role in retarding coastal erosion by stabilizing substrate and by reducing current flow. Extensive sea grass beds are found in Nonsuch Bay, Falmouth Harbour and Willoughby Bay in Antigua and Barbuda's Codrington Lagoon.

3.2.2 Biodiversity and Wildlife

3.2.2.1 Significance of Ecosystems

Forests, wetlands, mangroves, sea grass, coral reefs and other ecosystems are critical reservoirs of genetic material and biological

diversity in Antigua and Barbuda. Conservation, protection, and/or sustainable use of these resources are critical to their health and survival, but their conservation and sustainable use requires better understanding of species abundance, location and habitat requirements. Ongoing studies on plants, birds and other wildlife are helping to build reliable information of the various areas of significant biodiversity value in the country. Some of these areas have been identified for Barbuda within the Codrington Lagoon National Park (CLNP) and in parts of Antigua.

A study done by the EAG identified eleven (11) areas considered to have high priority for conservation of biodiversity in Antigua. The list comprises sections of the areas named here:

1. Nelson's Dockyard National Park
2. Body Ponds
3. Fig Tree Drive / Wallings
4. Sugar Loaf
5. Forest of Stone (east and west of Buckleys Road)
6. Fitches Creek
7. Rendezvous and Doigs
8. Ayers Creek and Black Ghaut
9. Rooms and Seatons Coast
10. Shekerley Mountains (including Mount Obama, Christian Valley and Midway Peak)
11. Sleeping Indian (Saddle Hill and surrounding areas)

3.2.2.2 Wildlife

Existing information indicate that Antigua and Barbuda has the following number of species:

a) ***Mammals:*** Seventeen (17) species native to Antigua and fourteen (14) to Barbuda[6] while Redonda is home to feral populations of goats.

b) ***Reptiles:*** Seventeen (17) reptiles have been recorded in Antigua, twelve (12) for Barbuda[7] and six (6) for Redonda[8]. One (1) native lizard the (*Leiocephalus cuneus*) is extinct, while the large native lizard (*Iguana delicatissima*), is believed to be extinct;

c) ***Birds:*** Birds comprise a significant part of the wildlife in Antigua and Barbuda, which support 106 and 74 species of bird respectively[9]. Barbuda's Codrington Lagoon is home to one (1) of the most important nesting colonies of Magnificent Frigatebirds (*Fregata magnificent*) in the West Indies. Redonda is home to populations of congregatory birds, most notably breeding seabirds such as Magnificent Frigatebird *Fregata magnificens*, Masked Booby *Sula*

[6] Fauborg and Arendt, 1985
[7] *Ibid.*
8 *http://www.birdlife.org/datazone/userfiles/file/IBAs/CaribCntryPDFs/antigua_and_barbuda.pdf*

[9] Fauborg and Arendt, 1985

dactylatra, Red-footed Booby S. sula and Brown Booby S. *leucogaster* as well as over 140 Brown Noddy Anous stolidus. Burrowing Owl Athene cunicularia[10].

3.2.2.3 Endangered Species

A number of wildlife species are endangered and require adequate habitat protection and maintenance to ensure their survival, namely:

a. Marine turtles: Four (4) species are known to occur in Antigua and Barbuda, the loggerhead (*Caretta caretta*) is considered to be vulnerable while the green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*) are endangered, the latter being sighted around the waters of Redonda. Important turtle nesting sites can be found on several of Antigua's beaches, including Jabberwock, Pearns, Rendezvous Bay, Turtle Bay and Devil's Bridge Beach. In addition, turtle nesting sites can be found in Antigua at North Sound Islands of Green Island, Goat Island, Sandy Island, Long Bay and Darkwood Beach and Welcher Bay in Barbuda. The nesting site at Darkwood Beach has been regularly monitored by the Antigua Sea Turtle conservation Programme. The feeding grounds of turtles include the sea grass meadows and the neighbouring coral reefs. Activities such as sand mining and the replenishment of beaches (both of which disturb nesting sites), and lights from tourist resorts on beaches threaten the sea turtles. Turtles, including hatchlings, are attracted to light and are thus disoriented in their journey to the sea after nesting activity.

b. Birds: The West Indian Whistling-Duck, which depends on wetlands in Antigua and Barbuda for foraging and nesting is threatened; so too is the White-crowned Pigeon.

c. Endemic species: Species suspected to be extinct or near extinction; include *Iguana delicatissima* and the Antigua ground snake (*Alsophis antillensis antiguae*) which can be found on Great Bird, Rabbit, Green and York Islands. Three (3) reptile species are endemic to Redonda, namely *Ameiva atrata*, *Anolis nubilus*, and *Sphaerodactylus*.

10 http://www.birdlife.org/datazone/userfiles/file/IBAs/CaribCntryPDFs/antigua_and_barbuda.pdf

3.2.3 Protected Areas

3.2.3.1 Existing

Existing protected areas have been established to achieve a range of management objectives, including resource protection, maintenance of scenic and historic landscapes, recreation, and sustainable development. Major protected areas include:

1. Nelson's Dockyard National Park (NDNP) which was established by the National Parks Act of 1984; comprises 15.94 sq. miles or 41.28 km^2 (about 14.7% of Antigua's land mass) of the south-eastern part of Antigua and is managed by the National Parks Authority (NPA). The Park has been zoned into fourteen (14) categories, representing perhaps the only current zoning regime in the country that can be enforced by law. These zones include conservation, recreation, wilderness conservation, agriculture, habitat, residential, rural residential, tourism, community, residential (intermediate agriculture), yacht working area, heritage, commercial, and institutional.

2. The North East Marine Management Area (NEMMA) comprises approximately 30 sq. miles (78 km^2) of coastal and marine area, including offshore islands and was established as a Marine Reserve under the Fisheries Act, 2006.

3. Cades Bay Marine Reserve (7 sq. miles or 18 km^2) was designated March 1999 in accordance with the Fisheries Act of 1983 and the Fisheries Regulations of 1990.

4. Codrington Lagoon National Park (CLNP) was established in 2005 under the National Parks Act, 1984, (which was amended by the Barbuda Lands Act, 2007); with a total area of 25.8 sq. miles (66.8 km^2). The CLNP was added to the list of Wetlands of International Importance under the RAMSAR Convention[11] in 2006.

5. Diamond Reef Marine Park in Antigua and Palaster Reef Marine Park in Barbuda were both established under the Marine Areas, Preservation and Enhancement Act (No. 5 of 1972). Diamond Reef is approximately 4,942 acres (2,000 ha) and Palaster Reef is approximately 1,236 acres (500 ha). These Parks have never been managed.

6. Three other smaller protected areas were established as National Parks in 2008 under the National Parks Act of 1984. These are the Devils Bridge National Park (244 acres), Green Castle Hill National Park (87 acres) and the Fort Barrington National Park (85 acres). A fourth area, Half Moon Bay National Park, was surveyed to be declared at the same time but is yet to be established for reasons that were not determined.

[11] Convention on Wetlands of International Importance

There are also areas established as public parks and beaches that have been designated to "remain undeveloped" to allow unencumbered public use and enjoyment. These, like the National Parks and Marine Reserves, are not effectively managed and in some cases not widely recognized as protected. They include:

- Two areas that were proclaimed Public Parks under the Public Parks Ordinance (No. 4 of 1965); one (1) of 690 acres (279 ha) in the English Harbour / Falmouth, now part of the NDNP, and the second, a 117 acres park (47 ha) in the Long Bay / Indian Creek area.
- The Botanical Gardens, created by the Botanic Gardens Act 1985.
- Eight (8) beaches, designated by the Antigua and Barbuda Cabinet in 1988 to "remain undeveloped", namely: Pigeon Point, Ffryes Bay, Halfmoon Bay, Fort James, Darkwood, Jabberwock, Long Bay and Morris Bay. With the exception of Fort James, the boundaries of these public beaches have never been established, surveyed, or gazetted.

3.2.3.2 Proposed

Areas proposed for protection include:

a. Mount Obama National Park (MONP), approximately 2,500 acres (1011.72ha).
b. Wallings Forest Conservation Area (WFCA), 1,680 acres or 680 ha.
c. East Coast of Barbuda, an area suggested as an extension to the Codrington Lagoon National Park (CLNP).
d. Half Moon Bay National Park, comprised of lands adjacent to a section of the Half Moon Bay Beach; one of the beaches designated by government to "remain undeveloped" in the public's interest
e. The eleven (11) areas identified by EAG for protection based mainly on bio-quality value.

The MONP is contiguous with the WFCA, with some overlap that requires adjustment. The WFCA is contiguous with the Nelson's Dockyard National Park (NDNP); so that the south and southwest volcanic area of Antigua would be afforded comprehensive legal protected area status through three (3) contiguous sites operated under separate management regimes that must be effectively coordinated.

Of the areas proposed by EAG, three (3) areas are already part of the NDNP (namely, Shirley Heights / Middle Ground, Rendezvous / Doigs, Sugar Loaf) and should be considered for strict zoning within

the existing National Park, rather than be established as a new protected area. Two (2) other areas, the Shekerley Mountains and the Fig Tree Drive / Wallings fall within the proposed MONP and WFCA protected areas and would similarly require strict zoning to achieve management objectives rather than be established as separate protected areas. In fact, management objectives for the large protected areas (existing or proposed) cannot be effectively achieved if these areas are not zoned. This requires a comprehensive initiative, which should be supported by additional data gathering, which was not possible in the preparation of this SIRMZP.

Redonda, uninhabited and unprotected is a very important environmental resource, it is home to numerous nesting birds and reptilian species, some of which are endemic and have been identified by the EAG as warranting further study. The EAG has indicated that recommendations for conservation would be made to protect this environmental area.

3.3 Land use Suitability and Capacity

3.3.1 Environmental Risk and Vulnerability

Environmental risks and vulnerability are associated with natural occurrences such as hurricanes, earthquakes, and sea level rise; and human practices which can lead to fires, land and beach erosion, and flooding. Risks and vulnerabilities are briefly reviewed in relation to development suitability and capacity issues as the basis for recommended solutions.

3.3.1.1 Slopes and Erosion

A natural resources assessment completed for the agricultural sector identified slope and the risk of erosion as limiting factors to the suitability of lands for agriculture. As a result, the hills of the central region of the Antigua and those to the southwest are generally better suited to be retained in forest cover or used for tree crops. The risk of soil erosion intensifies where such lands are used for grazing by goats, road construction and building. Steep slopes >20 % possess a high risk to erosion and are particularly vulnerable when vegetation cover is lost.

3.3.1.2 Flooding

Wetlands of Antigua and Barbuda are generally depressions in the coastal landscape existing close to sea level. Excess water or moisture in wetland soils make them unsuitable for agriculture, and as wetland systems generally function to retain and discharge flood waters, they should not be targeted for building structures in their present state or even when modified through land filling. Numerous other non-wetland areas in Antigua and Barbuda located adjacent to watercourses or surface water discharge points are like wetlands, periodically flooded.

The cost for building in flood-prone areas is high to property owners but also to government, which is quite often, expected to

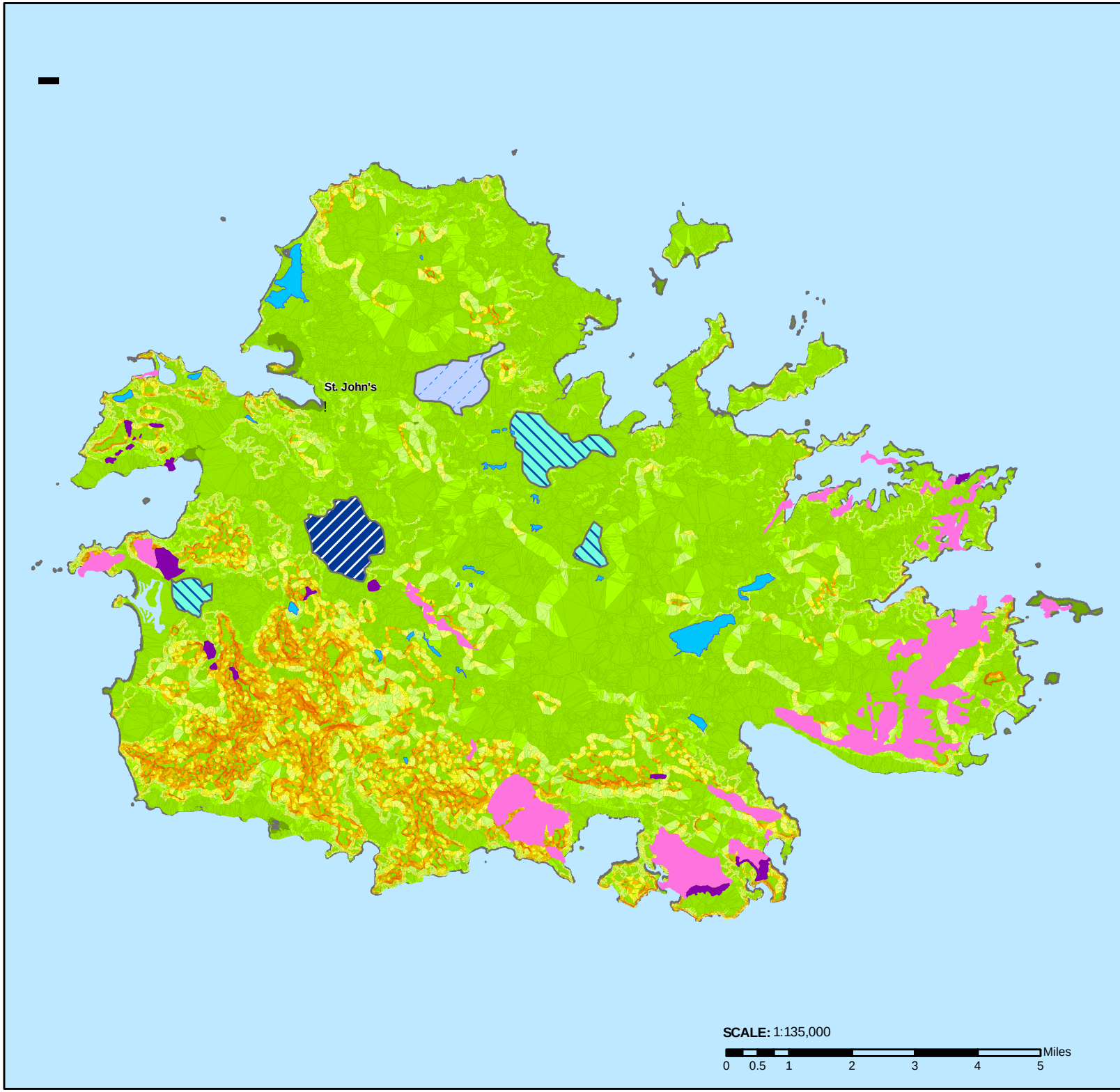
undertake remedial actions for roadwork and storm water drainage. Disincentives for building in flood prone areas are not reflected in property insurance premiums and subdivision applications for residential and other developments in such areas are sometimes approved without conditions imposed to resist flood impacts. Another but related issue is the absence of strict standards to reduce storm water runoff impacts on properties located down-slope from those properties located on higher ground.

3.3.1.3 Storm Surge and Sea Level Rise

The frequency and severity of storm surges will increase as sea levels continue to rise. Coastal impacts from severe weather events in recent years are manifested in severe beach erosion and land loss particularly along the west coast and west coast beaches, such as Runaway, Dickenson, Darkwood and Crab Hill beaches. Problems caused by natural events are intensified where properties are constructed in active beach zones or where ill advised attempts to build sea defence structures like groins and seawalls fail.

Building setback limits, proposed by Dr. Gillian Cambers in 1998[12] are being used as standards for coastal development by the DCA. Setback limits are intended to help reduce risk and vulnerability and are prescribed for beaches (from the zone of permanent vegetation, ranging from (11-114 m or 36-374 ft), cliffs (15 m or 50 ft from cliff edge), low rocky shores (30 m or 100 ft from line of natural vegetation) and mangroves/ wetlands (to be determined with the use of relevant data). Risks can also be reduced by applying minimum floor level heights consistently as area specific standards for different parts of the shoreline in the country. Such standards should be based on adequate storm surge analysis.

[12] Coastal Development Setback Guidelines in Antigua and Barbuda



TITLE: ENVIRONMENTAL RISK & AREAS

FIGURE: 3.11

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Lakes/Ponds

Flood Risk (Hazard Rank)

- Moderate
- High
- Very high

Risk of Erosion

- High
- Very High

Slope (%)

- 0.00 - 10.00
- 10.00 - 20.00
- 20.02 - 30.00
- 30.02 - 40.00
- 40.03 - 50.00
- 50.00 - 60.00
- 60.15 - 70.00
- 70.08 - 80.00
- 90.00 - 100.00

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3.3.2 Environmental Resources

3.3.2.1 Beaches

Antigua and Barbuda are known for the quantity and quality of its beaches which were used to frame and sustain the country's policy for beach and seaside tourism. Several factors have caused moderate review of this policy, one being the realization that other attractions, such as cultural and yacht racing events, are vital to a competitive tourism product.

Also critical to reflections on the beach development strategy is the rate of erosion and shoreline land loss, degradation due to sand mining, inadequacy of public access and use at some beaches, actual or perceived wastewater contamination of bathing areas and diminished visual or aesthetic value in others. Antigua claims to have 365 beaches but an inventory conducted in November 1994 lists only 156 beaches. Of these, 114 are sandy beaches, 28 are comprised of sand and rock and 14 are rocky. At the time, 24 beaches experienced erosion and sand mining was observed to be taking place at 26 beaches, 12 of which were being mined extensively. The survey showed that there are 14 beaches that are over 328 ft (100 m) in length, while over 70% of the beaches are 18 ft (60 m) or less in length[13].

Monitoring data from 20 beaches indicated a general pattern of high erosion rates on the northwest coast from Dickenson Bay to Fort James and on the east coast from Half Moon Bay to Jabberwock. During the period 1992 - 1993 the average erosion rate was -10.8 ft/year (-3.3 m/year) on the northwest coast and -12.1 ft/year (-3.7 m/year) on the east coast[14].

Thus for environmental, social and economic reasons, the beach although it remains attractive to hotel development, is no longer the only viable option for placing accommodation and in fact requires some adjustment to how it is developed and used if its value as an ecological, real estate and recreational assert is to be sustained.

3.3.2.2 Agricultural Lands

- **Antigua**

When the natural resources assessment for the agricultural sector was done in 1992, 27,497 acres or 11,127.66ha (41.9% of lands on Antigua) were classified as Class II and Class III lands. Limiting factors considered in these lands were climate, excessive moisture, and soil condition (shallow depth, infertility, salinity or mechanical impediment due to compaction).

Soils were classified II if only one (1) limited factor applied and III where no more than two (2) limiting factors existed. Another 5,734 acres or 2,320.47ha (8.7% of the area) was classified as class IV lands with three (3) limiting factors allowed. Class IV

[13] NPDP, 2001

[14] *Ibid.*

lands can be cultivated using intensive conservation and management practices. Classes V, VI and VII were considered marginal or unsuitable to cultivation with erosion or excess water being major limiting factors. The classification system allows for Class I and Class VIII soils but these do not exist in Antigua.

A fairly large amount of Class II and III lands have been lost by agriculture to competing uses, such as housing, light industry and recreational facilities. Like agriculture, flat adequately drained lands are quite often preferred building sites due to the ease and cost of construction and because poorly drained soils are unsuited for wastewater disposal using traditional septic tanks and drain-fields. While slopes are attractive to housing because of views and natural ventilation, steep and highly elevated areas are better retained in forested or vegetated cover for environmental reasons.

In order to meet existing and future demands for local agricultural produce, exports and requirements for national food security and reduction of the food import bill, an agreed minimum acreage of Class II, III and IV lands should be set aside for agricultural use under a zoning mechanism. For practical reasons, and in order to provide adequate supplies of water, feeder roads and other appropriate infrastructure, large contiguous portions of crown owned lands should be earmarked for this purpose.

- **Barbuda**

No Class II lands were identified for Barbuda in the resource assessment. Class III and IV lands identified totalled 6,640 acres or 2,687.12ha (18%) and 12,048 acres or 4,875.66ha (32.8%) respectively of the land area. The remaining lands were classified as Class V and VI. As in Antigua, agriculture competes with other land uses but the small population size of the island and common ownership of land provides an opportunity to earmark and zone selected areas of land to help meet food requirements.

3.3.2.3 Harbours and Anchorages

Historically, Willoughby Bay, English Harbour, Parham Harbour and St. John's Harbour have all served as significant shipping ports. Settlements evolved around each of these harbours and these still exist, except at Willoughby Bay. There were five (5) official ports of entry into Antigua, namely, St. John's Harbour, Crabbs, Mamora Bay, English Harbour and Lignumvitae Bay (Jolly Harbour).

Barbuda has recently been added as a port of entry with the proposed development of a facility at River[15] and the status of Mamora Bay and Crabbs needs to be confirmed. Recently, following recommendations by the Antigua and Barbuda Marine Association (ABMA) the government has agreed that Falmouth

[15] http://www.port.gov.ag/PortExpansion5.pdf

should become another Port of Entry to reduce the long lines of yachtsmen waiting clearance in English Harbour. This is now in process.

In addition to ensuring there are an adequate number of ports of entry, attention should be given to improving the ease of access and convenience of using the numerous anchorages around Antigua for marine recreational purposes. While Antigua is recognized as a globally significant centre for yachting, cruising opportunities within the country are restricted due to the lack of adequate navigational markers at the approaches and entrances of anchorages that could be used more for yacht charter vacations in the country.

3.3.2.4 Historic and Archaeological Resources

a. Built Heritage Conservation

Antigua has an abundance of historic buildings, sites and military installations which have mostly remained abandoned, rundown and underdeveloped. In recent years, many of these historic buildings, especially in St. John's City, have been demolished, or are under threat of being demolished to facilitate construction of new structures. Other historic buildings have been refurbished / repaired with little attention given to preserving their heritage value.

Antigua's heritage resources present opportunities for development of heritage-based tourism. The resources include historic buildings, about 114 sugar mill towers, and numerous historic forts and military installations, some of which were built when the country served as regional headquarters for the English naval force in the Caribbean. Approximately forty-three (43) forts were constructed in Antigua between the 17th and 18th centuries. While many of these fortifications survive today, in various states of ruin, only the Nelson's Dockyard, Dow's Hill Fort and the Lookout at Shirley's Heights have been significantly restored and / or preserved.

There are fewer heritage sites in Barbuda. However, some heritage sites are considered important enough to be preserved / conserved. The most important of these is the River Fort with its imposing Martello Tower.

b. Archaeological Sites

The Historical and Archaeological Society, in collaboration with the Museum of Antigua and Barbuda maintains a comprehensive inventory of historical and cultural heritage sites around the country. The Heritage Division of the National Parks Authority is in the process updating and mapping these sites. Figure 3.12 highlights several cultural heritage/ archaeological sites in Barbuda.

SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

TITLE:
ARCHAEOLOGICAL SITES

FIGURE: **3.12**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Historic Sites
- Pre-Colonial Sites
- Primary Roads
- Secondary Roads
- Inland Water
- Lagoon
- Wetland Forest

NOTES:

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Table: 3.4 Showing the Historical and Cultural Sites in Antigua and Barbuda

SITE	LOCATION	TYPE	OWNER	PERIOD
Court House	Antigua	Civic	Government	1747 – 1974
St. John's Cathedral	Antigua	Ecclesiastical	Anglican Church	1845
Roman Catholic Church	Antigua	Ecclesiastical	Catholic Church	1909
Warner Graves	Antigua	Plantation Building	NPA	1650 – 1730
Blockhouse Officers' Quarters	Antigua	Military Building	Government	1790 – 1854
Fort George, Monk's Hill	Antigua	Military Defence	Government	1689 – 1923
Fort Charles, Blake Island	Antigua	Military Defence	Private	1672 – 1780
Horseshoe Battery	Antigua	Military Defence	Private	1700 – 1830
Indian Creek	Antigua	Ceramic Amerindian	Various Private	35 – 1100
Bat's Cave	Antigua	Natural Area	Government	1800 – 1900
Middle Ground	Antigua	Military Building	NPA	1790 – 1850
Fort Cuyler	Antigua	Military Defence	NPA	1790 – 1850
Dow's Hill Fort	Antigua	Military Defence	Government	1790 – 1843
Fort Berkeley	Antigua	Military Defence	Government	1700 – 1820
Canteen Annex	Antigua	Military Building	Government	1795 – 1850
Highland House	Antigua	Residence	Government	1730 – 1800
Devil's Bridge	Antigua	Natural Area	Government	

SITE	LOCATION	TYPE	OWNER	PERIOD
Fort James	Antigua	Military Defence	Government	1680 – 1880
Jolly Beach	Antigua	Aceramic Amerindian	Private	2000 BC
Bridgetown Ghost Town	Antigua	Civic	Various Private	1675 – 1850
Nonsuch Amerindian	Antigua	Ceramic Amerindian	Emerald Cove	500 - 1000
Betty's Hope	Antigua	Plantation Building/Mill	Government	1660 – 1945
Long Island, High Point	Antigua	Aceramic Amerindian	Jumby Bay Resort	5000 BC
South Pier Amerindian	Antigua	Aceramic Amerindian	Government	1000 BC
Nelson's Dockyard	Antigua	Naval Building	Government	1825 – 1889
Martello Tower, River Fort	Barbuda	Military Defence	Government	18th Century
Spanish Point Tower	Barbuda	Military Defence	Government	18th Century
Muddy Bay	Antigua	Ceramic Amerindian		
Green Island, Rickett's Valley	Antigua	Ceramic Amerindian	Mill Reef	9 – 1000 AD
Cobb's Cross Egret Colony	Antigua	Natural Area		
Montpelier Sugar Factory	Antigua	Industrial	Ant. Distillery Ltd.	1890 – 1953
Gunthorpe's Sugar Factory	Antigua	Industrial	Government	1905 – 1976
Copper and Lumber Store	Antigua	Ceramic Amerindian	NPA	600
Union Mill	Antigua	Plantation Building/Mill		1800
Will Blizard's Mill	Antigua	Plantation Building/Mill		1738

SITE	LOCATION	TYPE	OWNER	PERIOD
Indian Cave	Barbuda	Petroglyph		500
Redonda Mining Camp		Industrial	Government	1910
Greencastle Hill Amerindian	Antigua	Ceramic Amerindian		400

CHAPTER 4

BUILT DEVELOPMENT

4.0 BUILT ENVIRONMENT

While the previous section on the Biophysical Environment essentially presented the "supply" for a Sustainable Island Resource Management Zoning Plan, this section presents the "demand". Consideration is given to current trends, projections, and planning issues relating to settlements; population and housing; economy and employment; social infrastructure; and physical infrastructure. As noted earlier, the discussion is in summary form. Further details are available in the *State of the Country Report.*

4.1 Settlement Pattern

4.2 Historic Settlement Pattern

Antigua and Barbuda's settlement pattern has been influenced by various historic events. These include:

The Amerindian Period

During the Amerindian period, Arawak Indian settlements were established at numerous locations including Jolly Harbour, Indian Creek, Mill Reef, Coconut Hall, Mamora and Blackman's Point, where the prospects for fishing and agriculture were promising. As is the case for many islands in the region, Carib Indians displaced the Arawak around 1200 AD. While relatively few sites remain in evidence, it is essential that development projects take this history into account with a view to conserving important sites and artefacts.

The Colonial Period

The Colonial period began in 1493 when Christopher Columbus sighted Antigua and gave it the name Santa Maria la Antigua. Although the Spanish attempted an early settlement in 1520, it was only when the English took control in 1625 that colonization commenced in earnest. It is understood that the first town was established at Falmouth in 1632. Nonetheless, port facilities in the northeast proved to be more attractive due to their proximity to the sugar plantations that soon became central to the economy. Consequently, Parham, which was established in 1663 on a site with a natural harbour, quickly became the dominant sea trading centre and national capital. While Parham has experienced significant decline in recent years, its historic significance coupled with its proximity to the outstanding marine resources in the Northeast Marine Management Area (NEMMA) coast offer significant possibilities for redevelopment.

In Barbuda, the Codrington family leased the island from the British Crown until 1870; ten (10) years after the island became a dependency of Antigua. The first and only settlement in Barbuda was established in 1667 and aptly named Codrington. The present communal land ownership

system, which presents many opportunities and challenges for development, is a legacy of the historic community-based leasehold arrangement

Emancipation

Following emancipation, freed men and women began to inhabit and cultivate lands surrounding old sugar estates. Relatively compact settlements emerged in locations such as Freetown, Freemans Village, Jennings, Bendals and New Fields due in part, to the limited amount of land that was available. Many of these early settlements offer a nucleus for the development of a network of sustainable communities.

Over time, another early trading settlement and defence position in the northeast, St. John's, proved to have greater growth potential than Parham. Designated the national capital in 1842, St. John's overtook Parham in size and importance and is now indisputably the nation's major settlement and centre for governmental, commerce and service functions.

Post Colonial

When the government purchased the sugar estates, substantial relatively flat land was made available for residential expansion. At the same time, there was increased interest in upscale residential development on hillsides with a view of the sea and the beginnings of what was to become a major interest in tourism development. Barbuda, which has a much smaller population base than Antigua, has only one settlement at Codrington.

4.3 Current Settlement Pattern

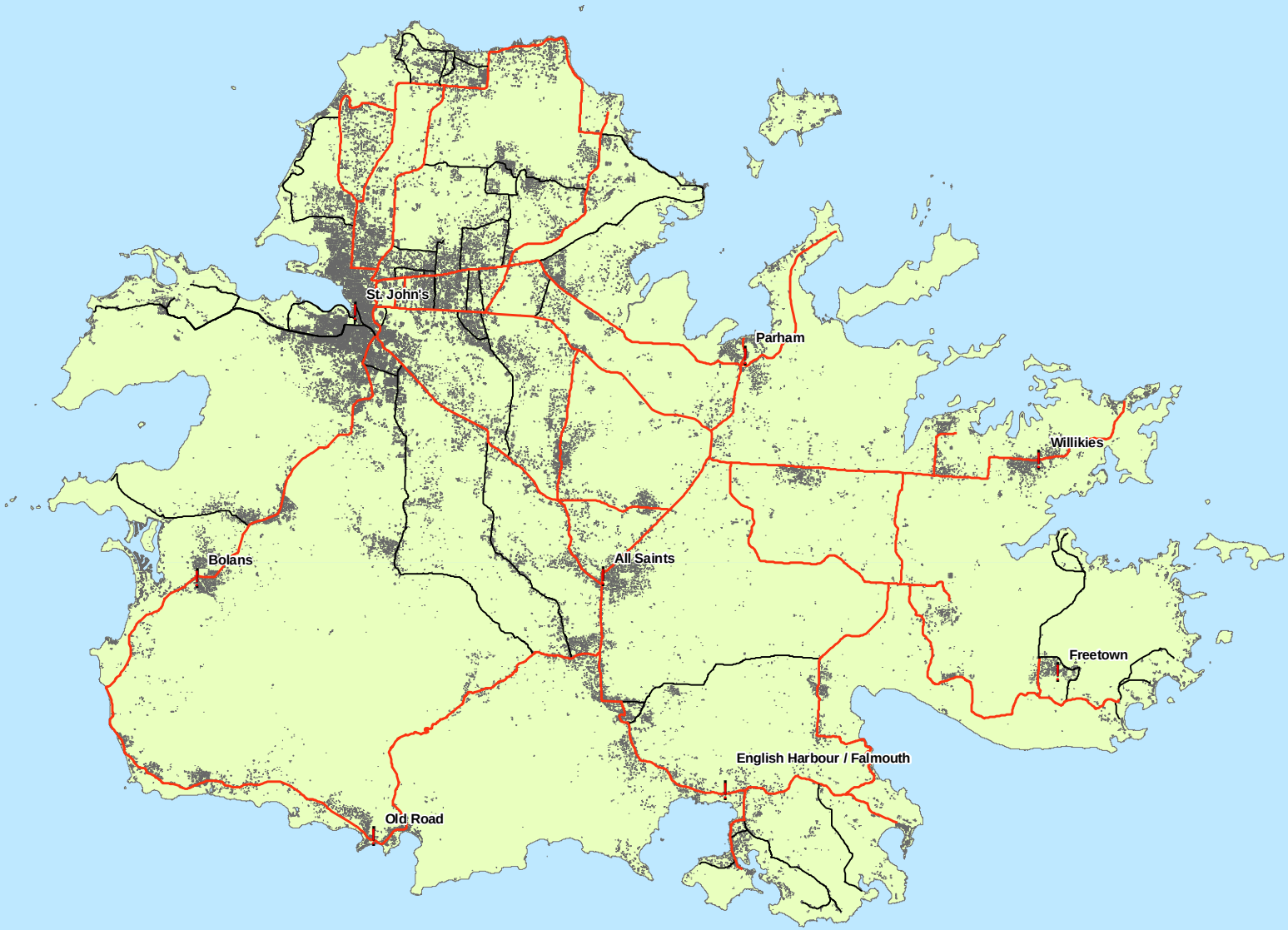
4.3.1 Antigua Settlement Pattern

The current settlement pattern in Antigua is illustrated in Figure 4.1, clearly illustrates the dominance of the settlement in St. John's. This area, which has only 1.6% of Antigua's landmass, was reported in the 2001 census to be home to 24,451 people or 32% of the country's population. An additional 20,895 people live in the area designated as St. John's Rural. The main concentration of settlement outside of the St. John's area is along the All Saints Road corridor, which links St. John's with Falmouth.

Interior Lot Subdivision in the Point

The downtown area of St. John's is vibrant and exciting due to the daily activities of residents, employees, students and tourists. However, it is also very congested and does not offer an attractive pedestrian environment. In addition, most of the dwelling units and businesses in the City rely on septic tanks, a practice that is questionable for small lots, collectively expensive and difficult to regulate. These problems are further exacerbated in locations, such as the Point, where small lots have been further sub-divided; formally or informally, and now have rows of dwelling units stretching back from the public roadway.

Streetscape in the Point



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

BUILT FORM

FIGURE: 4.1

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

Roads

- Primary Roads
- Secondary Roads
- Buildings

NOTE:

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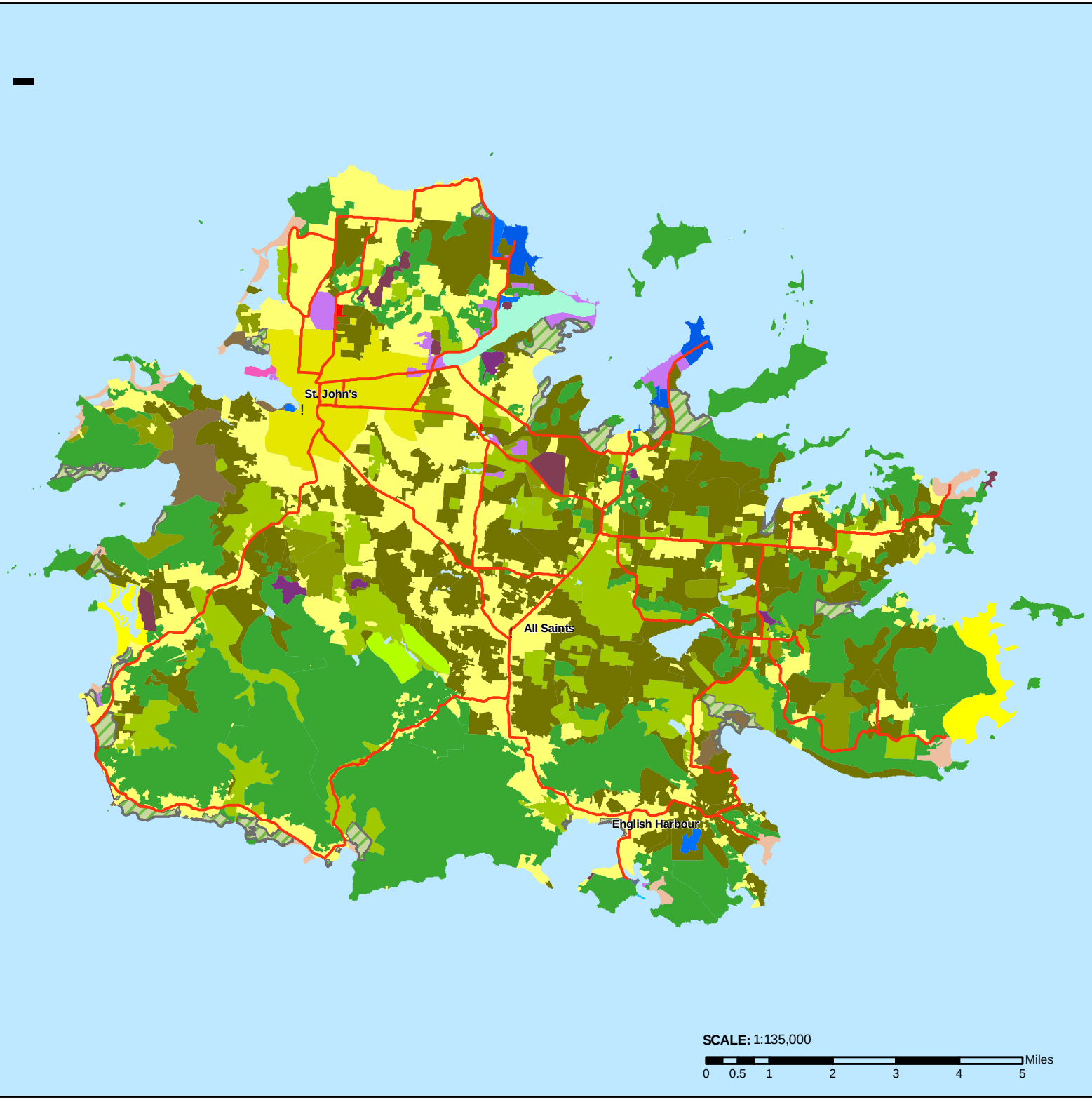
SOURCES OF INFORMATION

All base data and satellite imagery were provided by:
The Government of Antigua and Barbuda: SIRMM/Environmental Division, Survey Division, Antigua Public Utilities Authority (APUA) and Caribbean Conservation Association

A Plan prepared by the Development Control Authority (DCA) for St. John's City proposed:

1. To consolidate commercial and administrative functions within a clearly defined CBD.
2. Facilitate opportunities for economic activity and employment
3. Reduce congestion.
4. Establish a transition zone around the CBD that would lead to distinctive future expansion areas.
5. Redevelop the waterfront.
6. Maintain distinctive neighbourhoods.
7. Preserve cultural heritage.
8. Enhance social and physical infrastructure.
9. Provide for safe and efficient movement of vehicular and pedestrian traffic.

Specific land use proposals and development projects are presented within that plan that include the creation of a network of public parks and plazas, careful attention to the pedestrian environment and the development of the waterfront as an interactive public space within the hustle and bustle of downtown. These and other urban development and design schemes are intended to encourage tourists to filter through from the port throughout the downtown area. Responsibility for implementation rests with the St. John's Development Corporation, which was established through legislation in 1986. Although the St. John's City Plan has not been formally adopted, its provisions are considered in the SIRMZP.



TITLE:

LAND USE

FIGURE: 4.2

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20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

Primary Roads

Land Use

- Agriculture - citronella grass
- Agriculture - crops
- Agriculture - improved grazing
- Agriculture - rough grazing
- Barren
- Commercial
- Forest
- Historic
- Industrial
- Industrial - Quarry
- Institutional
- Institutional - Military
- National Park
- Recreational
- Settlement - Rural
- Settlement - Tourism/Resident*
- Settlement - Urban
- Tourism
- Transportation - Pt of Entry
- Transportation - airport
- Water bodies
- Wetland

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Figure 4.2 depicts the major land uses throughout the island of Antigua that are described hereafter. The most intense area of tourism activity is located northeast of St. John's along Dickenson and Runaway Bays. While hotels predominate the beachfront, substantial settlements have developed inland which include a mix of villas, cottages and medium to upscale residential housing. As noted in the previous section, the presence of a number of sensitive environmental areas, such as McKinnon's Pond and the beach-fronts that are subject to erosion, coupled with weak control over building locations and effluent has resulted in significant environmental damage. A local development plan is needed for this area that incorporates environmental rehabilitation and gives careful attention to the road network and land use pattern to improve access to commercial and community facilities.

Tourist resorts may be found along most of the coastal areas. Some of these are located virtually on a beach with the result that they negatively affect the beach ecology and are vulnerable to storm surges that will likely become still more problematic should the sea level rise as expected due to global warming. Greater attention to the location of these facilities and the relationship between the activities that they generate on fragile beach ecologies is needed.

Jolly Harbour/Jolly Beach on the west coast and Falmouth/English Harbour on the south coast have emerged as intensive tourism activity areas. The former includes an all-inclusive resort, as well as, high-density tourist/non-resident-oriented apartments and villas, along with a marina, golf course, and shopping centre. This development model has proved to be economically successful. However, Jolly Harbour has limited area for expansion and is essentially an "island within an island" which separates tourist and regular residential areas. While this model is attractive to a certain class of tourists and benefits the macro economy, it is not a development model that should be widely emulated due to the social and economic distortions it generates. Local development plans that consider both tourism projects and their surrounding community in an integral manner should be developed prior to approving similar projects.

The Falmouth/English Harbour area benefits from its location within the Nelson Dockyard National Park (NDNP), which includes some of the most impressive historic and natural landscapes in the country. Tourism activity is largely related to yachting, an activity that draws very significant international attention during "Sail Week". While significant development potential exists in this area, the current development pattern is sporadic, proceeding along tracks that wind up steep slopes and most frequently reach a dead-end. Linkages between these roads are poor to non-existent. Further, some major residential and villa developments obscure ridgelines that are a vital historic landscape component. A local plan that reflects the intent of the SIRMZP is urgently needed in this area. The Plan must be accompanied by strict development guidelines and enforcement procedures.

Some of the tourist resort areas are very large. This is especially the case of the Mill Reef Club, which effectively alienates some 692

acres (280 ha) of land along the southeast coast. As large gated properties restrict public access to beaches and present obstacles to the development of an efficient road network, they should be avoided. Moreover, any opportunities to provide public access through these properties should be seized.

Industrial activities are largely concentrated in estates near Tomlinson and Coolidge and on the Crabbs Peninsula. As recommended in the 2001 NPDP, the Tomlinson and Coolidge estates are located on relatively flat land with good vehicular access and have additional lands that may be used to accommodate industrial expansion. The establishments on Crabbs Peninsula, however, are located in a very sensitive marine and terrestrial environment. Again, in accordance with the 2001 Plan, these establishments should be carefully monitored and further expansion curtailed.

Specialized light industrial and warehousing activities are located in discrete locations throughout Antigua, but most notably in the port, airport and Falmouth harbour areas. While the general distribution of these activities is appropriate, consideration should be given to developing small light industrial estates in Jolly Harbour, Falmouth / English Harbour and Parham. This would allow these activities to share common infrastructure and minimize environmental impacts.

The expansion of the City of St. John's into St. John's Rural over the past twenty (20) years is largely in the form of low-density residential development that now encircles many older villages, such as Piggotts and Potters Village. Nonetheless, a significant band that is for the most part occupied by institutional and industrial activities separates the City of St. John's from St. John's Rural and serves to some extent as an open space buffer due to the large size of the lots. The concentration of large institutional properties in this area presents an opportunity to establish an environmental corridor that provides a welcome break from the surrounding higher density settlement patterns.

Ribbon development along primary and secondary roadways predominates outside of the St. John's area, and is especially pronounced along All Saints Road. This type of development greatly exacerbates traffic congestion due to the number of vehicles entering, exiting, and parking along the road; increases the distances that have to be travelled to basic functions such as schools, local commerce, and community facilities; is very difficult and costly to service with water and sewerage infrastructure and unnecessarily interferes with ecological systems and farmland. Further development of this type should be curtailed in favour of compact settlements

Despite the tendency toward ribbon development, some of the older villages have managed to maintain a node that is relatively compact and multi-functional. These include Parham, All Saints, Liberta, English Harbour, Five Island Village, Jennings, Bolans, Old Road, Freetown and Willikies. These, and other traditional nodes, offer opportunities to develop more compact settlements where local functions are readily accessible on foot or bike; community

spirit and sense of place is enhanced; and water and sewer facilities may be efficiently provided.

Ribbon Development along All Saints Road

Following the decline of the sugar and cotton industries, large areas of agricultural lands have been converted and used for built development. The vast majority (79.5%) over the period 2005 to 2009 were designated for residential use, with the remainder intended for commercial, industrial and agricultural uses. Collectively, the new subdivisions currently contain something in the order of 4,653 undeveloped lots of conventional urban and suburban size (Table 4.1), between 2,000 sq. ft. (186 m^2) and 7,000 sq. ft. (650 m^2) and a further 9,261 larger lots between 7,000 sq.ft. (650 m^2) and 107,639 sq.ft. (10,000m^2) in size. If the 2,156 undeveloped lots that are smaller than 2,000 sq. ft. (186 m^2) were consolidated, the total area of subdivided undeveloped lots that are less than one hectare in size would be 3,426 hectares[16], an example of this is shown in Table 4.1 below.

Table 4.1 Showing Number of Parcels with and without Buildings in Antigua

Plot Size (m^2)	Building		Total
	No	Yes	
0 - 186	2,156	1,612	3,768
186 - 278	794	2,368	3,162
278 - 371	879	2,513	3,392
371 - 465	1,358	3,194	4,552
465 - 557	1,622	2,673	4,295
557 - 650	1,975	1,924	3,899
650 - 1,000	7,286	4,872	12,158
1,000 +	11,231	7,649	18,880
Total	**27,301**	**26,805**	**54,106**

Source: Survey Division, 2010

[16] The number of developed and un-developed lots was calculated by distinguishing between parcels that contained one or more structures from those that had none using a GIS-based Point-in-Polygon procedure. Both the parcel and built form maps were obtained from the Lands Department in May 2010 and are believed to be up to date. Nonetheless, the figures should be considered approximate.

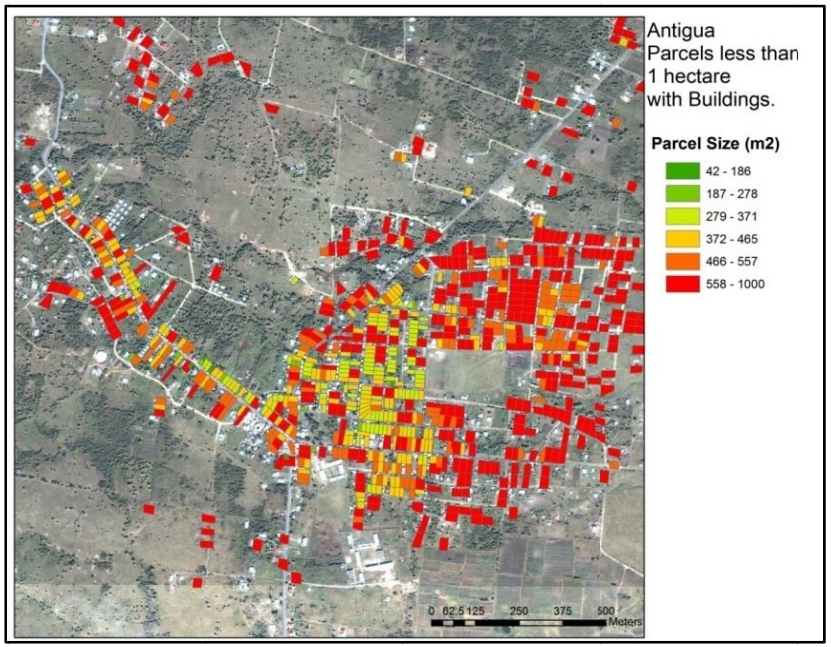


Figure 4.3 Illustration of Parcels Less than 1Hectare with Buildings in All Saints

These lots should be sufficient to accommodate the residential population years into the future. However, they are often poorly located relative to the existing settlements, have lot sizes that are beyond the means of targeted residents, are in environmentally vulnerable areas, and lack infrastructure and services that in any event would be costly to provide given their location.

A review of subdivisions that have yet to be occupied should be undertaken. In some cases, these should be decommissioned in favour of more centrally located development parcels that may be more readily provided with social and physical infrastructure and offer easier access to community facilities. In other areas, it may be appropriate to further subdivide large lots and allocate space for settlement amenities.

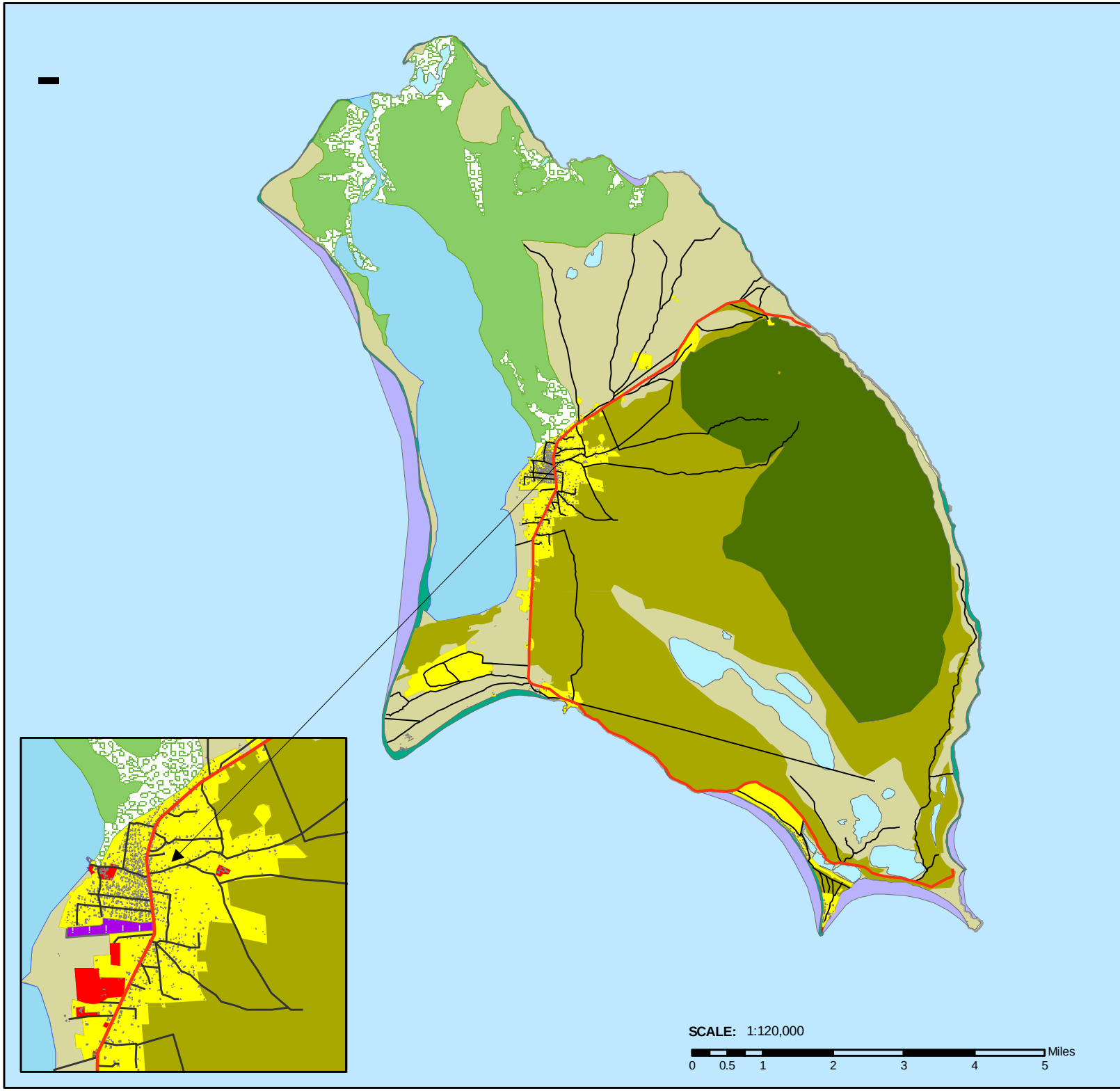
4.3.2 Barbuda Settlement Pattern

The settlement pattern in Barbuda differs dramatically from that of Antigua due to the small population and the fact that the entire island is communally owned with control over land distribution and development resting with the Barbadian Council (Figure 4.4). Virtually all of the residents on the island live in a single settlement, Codrington, which was established next to a large lagoon. This settlement is relatively compact with lots ranging between 4,306 sq. ft. (400 m^2) and 6,548 sq. ft. (600 m^2) in size. Residential, commercial, and institutional functions are interspersed throughout much of the town.

While development outside of Codrington predominately consists of isolated high-end tourist resorts, some Barbudans have acquired leases to large, semi-rural lots in the interior and there are plans to expand the village to the east and south. There is also a plan to build a larger airfield in the interior, east of Codrington.

The south coast has very high development potential for tourism and related commerce. However, two exclusive tourist resorts, one of which closed some years ago, occupy some 4 miles (7 km) of prime beachfront. Further, the port area, which also serves as a

passenger terminal for ferries between Antigua and Barbuda, is in very poor condition. A comprehensive development plan is needed for this area.



TITLE:
LAND USE & BUILT FORM

FIGURE: 4.4

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63-65 Independence Square, Port of Spain
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CLIENT:

Legend

- Primary Roads
- Secondary Roads
- Forest Woodland
- Highlands Woodland
- Buildings
- Development

Land Use

- Bare Exposed Rock
- Bays
- Beaches
- Commercial/Services
- Croplands
- Inland Water
- Lagoon
- Mangrove
- Marl
- Mixed Rangeland
- Partially Forested Wetland
- Residential
- Strip Mines Quarries, Gravel Pits
- Transport, Communications & Utilities

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4.4 Population

The latest national census, in 2001, reported a total population of 76,886 people of which 1,325 or 1.7% were located in Barbuda. Based on estimates published by the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (Table 4.2) the current population is 89,000 and is projected to rise steadily until at least 2050 when it will reach between 97,000 and 130,000; depending on fertility and immigration trends. The medium variant projection for the SIRMZP planning horizon would see the population reach 105,000 in 2030, the time frame for this Plan.

The volatility of population growth is evident in the decline from 1980 to 1990 (Figure 4.5), a period of economic transition from agriculture to tourism. A significant portion of the increase in population over the past 20 years may be attributed to returning residents and migrants from neighbouring CARICOM countries that have been drawn by the relatively good economic performance of the country over this time frame as tourism projects began to take hold and international business services expanded significantly. It may be expected that the UN projections, which are based on fertility and mortality estimates, will also be subject to variances due to migration patterns in response to changing economic and other living conditions over the next twenty years.

Table 4.2 Population Estimates and Projections ('000s)

Year	Low	Medium	High	Constant Fertility
1950	46	46	46	46
1955	53	53	53	53
1960	55	55	55	55
1965	62	62	62	62
1970	69	69	69	69
1975	76	76	76	76
1980	72	72	72	72
1985	68	68	68	68
1990	62	62	62	62
1995	68	68	68	68
2000	77	77	77	77
2005	84	84	84	84
2010	89	89	89	89
2015	92	93	94	93
2020	95	97	100	98
2025	97	101	106	103
2030	99	105	111	108
2035	99	108	116	112
2040	99	110	121	116
2045	98	111	125	119
2050	97	112	130	122

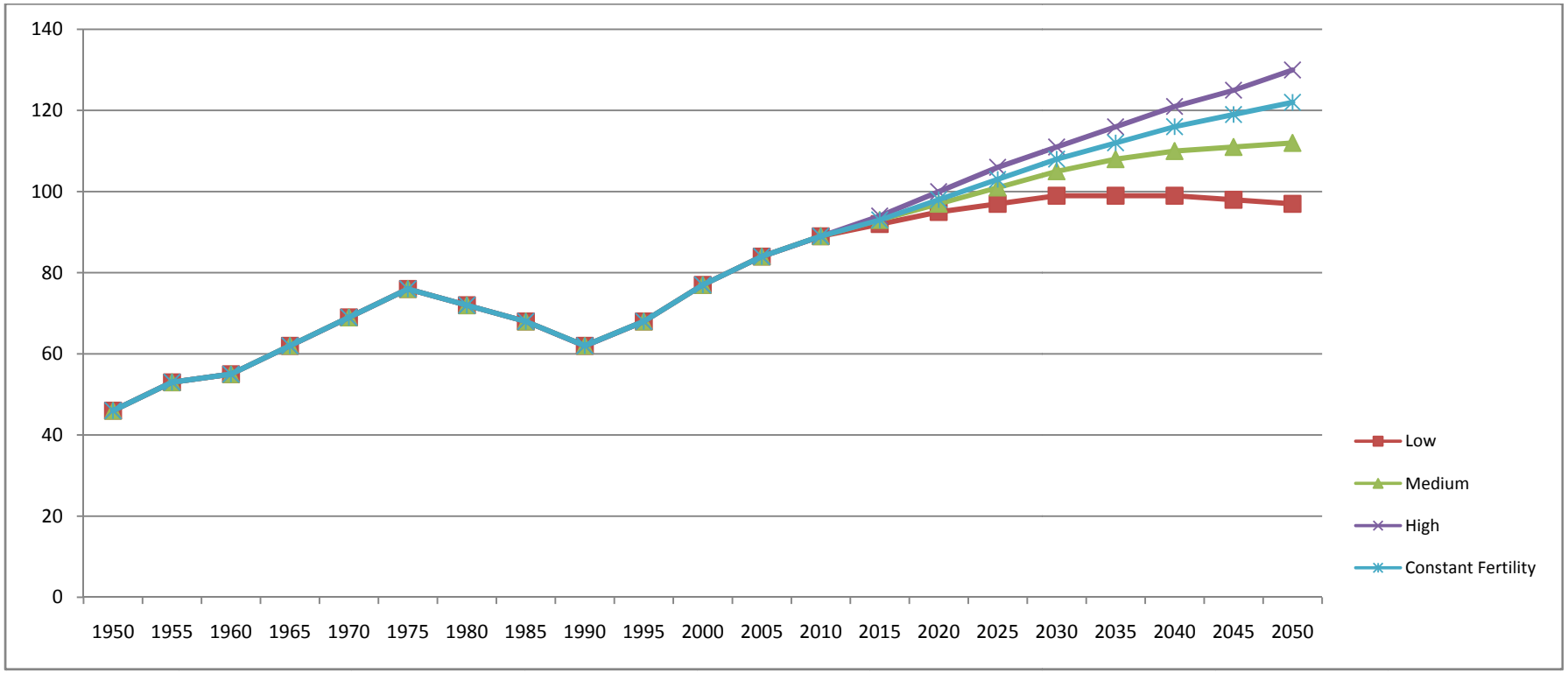


Figure 4.5 Graph Showing UN Population Projections (1950-2050)

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects[17]

[17] The 2008 Revision: http://esa.un.org/unpp

While the overall growth rate is healthy and manageable, there are substantial differences in the population base and growth rates between parishes. The parish of St. John's, which consists of the St. John's City and St. John's Rural, accounted for 60% of Antigua's population in 2001. This relatively high concentration of population reflects the concentration of employment opportunities in and around St. John's and the number of residential plots that were made available within the parish over the past 20 years. An additional 'pull factor' is the high concentration of administrative functions and social services within the capital region. Decentralization of selected basic government services would increase overall accessibility to these services and reduce traffic demand. However, it should be noted that the prominent role of the City of St. John's as the nation's primary centre of government, commerce, industry, and culture should be maintained.

Table 4.3 provides the breakdown of population grown by Parish between 1991 and 2001, however the figures from the 2010 National Census was unavailable and could not be utilised in this analysis. The percentage share of growth between 1991 and 2001 for each of the parishes indicates that St. John's Rural (38.6%) and St. John's City (16.8%) accounted for a very substantial proportion of total growth. Nonetheless, it is important to note the high growth rates for St. George's (49.2%) and St Peter's (50.2%). It is likely that the 2011 Census will report further significant growth in these areas and a somewhat slower rate of growth for St. John's Rural due to the residential plots that have become available in St George's and St. Peter's over the past 9 years, improvements in public transportation, and the congestion that many experience in St. John's parish.

While the very low population growth in Barbuda over the 1990s has likely continued over the past 9 years, there are significant development opportunities on that island that may result in more substantial growth if the Barbadian Council so wishes.

Table 4.3 Population Growth by Parish

	Population		Absolute	Growth	Share of
Parish	1991	2001	Growth	Rate (%)	Growth (%)
St. John's City	21,514	24,451	2,937	13.7	16.8
St. John's Rural	14,121	20,895	6,774	48.0	38.6
St. George's	4,473	6,673	2,200	49.2	12.5
St. Peter's	3,622	5,439	1,817	50.2	10.4
St. Phillip's	2,964	3,462	498	16.8	2.8
St. Paul's	6,117	7,848	1,731	28.3	9.9
St. Mary's	5,303	6,793	1,490	28.1	8.5
Barbuda	1,241	1,325	84	6.8	0.5
Totals	**59,355**	**76,886**	**17,531**	**29.5**	**100**

Source: Calculations based on National Censuses data for 2001 and 1991.

The national population projection and the distribution of that population within parishes should be revisited as soon as the latest census data become available. At that time it will also be possible to obtain reliable indications of age profiles, household characteristics, and employment, factors that are important in social and economic development and influence many trends, such as the household formation rate.

This SIRMZP presents an opportunity to influence the choices that people make about where to live in Antigua and Barbuda. If the Plan is successful, the tendency will be toward a network of sustainable communities that respect environmental integrity, support local economic development, and provide a convivial environment in which to live, work, and play.

4.5 Housing

4.5.1 Housing Demand

Housing demand is a function of the growth in the number of independent households; the need to replace dwellings that are substandard, overcrowded or damaged due to natural causes, such as hurricanes; and shifts in income and/or dwelling preferences with

respect to location and features. Housing supply by the private sector is related to market forces that include the price of land in desirable locations, the cost of construction, and expected profits. Governments may influence both housing demand and supply through measures such as subdivision control, building regulations, tariffs, taxation policy, public information programmes, and direct incentives that encourage households to choose sustainable housing units.

The average household size has decreased in recent years in most countries that have experienced rising educational and income levels due the preference of couples for smaller families and the increasing tendency for young people to establish households independently of their parents in their early twenties. This tendency is in evident in Antigua and Barbuda where the average household size fell from 4.23 in 1970 to 3.71 in 2001 for non-institutionalized individuals.

Recent census data, however, is inconsistent with the overall trend as the average household size reported in the 1991 census, 3.2 persons per household, is substantially lower than the 3.7 reported in 2001. During this ten-year period, the population increased by 29.5% while the number of housing units increased by only 10.9% due in part to limitations on the availability of land for development. Over the past ten years, numerous residential subdivisions have sprung up in the interior and some intensification of residential densities has occurred in the St. John's area. Consequently, it is likely that the long-term decline in household size has resumed and may reach 2.5 by 2030; a figure that the 2001 NPDP estimated would be the case in 2016 and is the current norm in North America and Europe. This is reflected in Figure 4.6, which shows that smaller household sizes constitute a greater portion in the country.

The combination of the expected increase in population and the decrease in household size suggests that between 38,000 and 52,000 dwelling units will be required by 2030. Using the medium population projection variant some 42,000 dwelling units would be required; 21,563 more than the 20,437 units reported in the 2001 census.

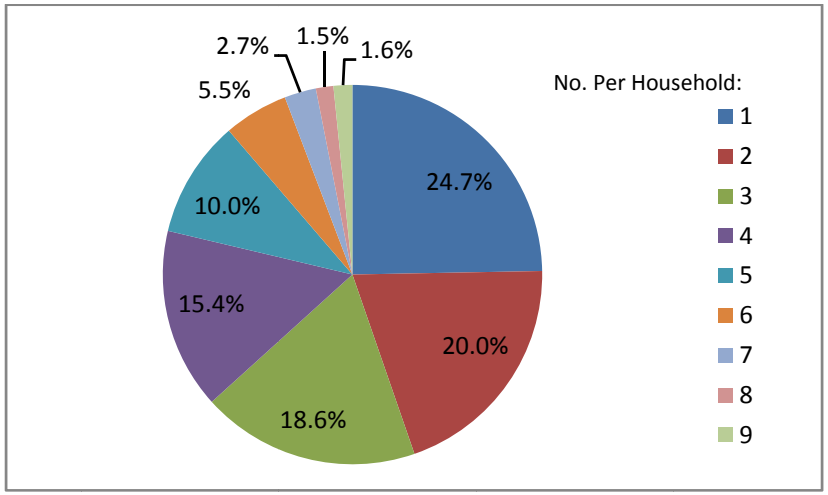


Figure 4.6 Persons per Household: Antigua and Barbuda

Source: CSO census 2001

In addition to accommodating new households, it is necessary to add replacement units for substandard housing stock and provide relief from overcrowding. The most recent estimate of substandard housing is 8,000 units or approximately 39% of all units, an estimate that was made in 1994[18]. The projection assumes that this deficit will be vigorous tackled in the short term before reaching a more normal 5%. While the data indicates that many households are currently overcrowded, the gradual decrease in household size that is built into the model incorporates this requirement.

Overall, the model suggests that approximately 35,547 new or replacement units will be required from over the period 2001 to 2030. This works out to about 1,184 units per year.

[18] McHardy, 1994

Table 4.4 Projected Housing Demand

Housing Demand Projection						Cumulative	
				Replacement	Replacement	Replacement	Cumulative
Year	Population	Hld Size	Hlds	Rate (%)	Units	Units	New Units
2001	75828	3.71	20,437	0	0	0	0
2005	84000	3.50	24,000	10	2,400	2,400	5,963
2010	89000	3.20	27,813	10	2,781	5,181	12,557
2015	93000	3.00	31,000	10	3,100	8,281	18,844
2020	97000	2.80	34,643	5	1,732	10,013	24,219
2025	101000	2.70	37,407	5	1,870	11,884	28,854
2030	105000	2.50	42,000	5	2,100	13,984	35,547
Census Data							
2001 data does not include institutionalized population & households							
Data for 2005 to 2030 are from Population Division,							
Department of Economic and Social Affairs of the United Nations Secretariat,							
World Population Prospects							
Assumptions:							
Household Size will decrease with rising educational and income levels							
providing adequate housing stock is available.							
Replacement units will decline once the backlog is dealt with.							
Overcrowding is taken into account by the decline in household size.							

The development and implementation of these policies will require attention to:

1. *Fragmented Institutional Structure*: the housing sector is fragmented and responsibilities are ambiguous which results in duplication and conflict. Further there remains no formal mechanism for ensuring systematic co-ordination between agencies and departments involved in housing.
2. *Inadequate Infrastructure Provision*: many housing developments completed in partnership between CHAPA and private developers lack the necessary basic infrastructure. Furthermore, several subdivisions remain

un/ under-developed as beneficiaries are unable to access credit to finance construction.

3. *Housing Finance and Affordability*: Low and moderate-income earners are often unable to meet the loan criteria and pay the high lending rates charged by local commercial banks. Consequently, in accord with the 2001 NPDP, the Government may need to offer soft loans for dwelling purchase or renovations, subsidies for building materials, and guaranteed loans or long-term leases to residents without title or with communal title in order that they may access credit.
4. *Land Availability*: Population growth, the changing structure of the economy and the processes of urbanization and commercialization, all combine to exert severe pressure on available land resources. Designated residential expansion areas that respect environmental integrity and foster the development of sustainable communities are required.

4.5.2 Land Requirement for Housing

The amount of land that will be required to accommodate housing demand depends on the density of the new developments. This calculation excludes replacement units, as these would typically be provided within the existing urban fabric. However, there is a need for de-densification in areas where single-family lots are less than 2,000 sq. ft. (186 m^2) in size, as occurs in various parts of St. John's. A rough estimate of this requirement may be gleaned from Figure 4.7, which indicates that structures are located on 1,612 lots of less than 2,000 sq. ft. (186 m^2).

The residential density standards currently used by the DCA are 5, 10, and 17 dwelling units per acre for low, medium, and high-density developments respectively, which are similar to those recommended by the 2001 NPDP (low: 2-4; medium: 5-9; high: 10-20 dwelling units per acre) and to those published in the international literature. These figures should be considered neighbourhood density standards in that they take into account land that is occupied by individual residences, as well as, commercial, community, recreation, and circulation activities. For example, the land area in a typical low-density neighbourhood might be allocated in the following way: 60% residential and the remaining 40% for commercial, community functions, recreation, circulation, and open space.

As the sizes of single-family parcels in recent subdivisions in Antigua and Barbuda have tended to be similar to conventional suburban developments in North America (6,000 sq.ft. or 557 m^2) low-density developments are the norm. However, the international trend is toward smaller lots and/or a greater variety of higher density housing typologies that have the advantage of consuming less land; as well as, being more affordable for individuals; less costly for government to provide and maintain proper infrastructure and utilities; less dependent on cars for transportation; and more likely to enhance the sense of community. These characteristics, together with mixed use, and housing variety, are captured in the "New

Urbanism Movement" which is seen by many as offering a much more sustainable development pattern than that provided by conventional suburban development.

In SIDS, such as Antigua and Barbuda, it is especially important to ensure that land is used efficiently to create high-quality residential environments that meet sustainable development criteria. Here it is useful to look back to traditional villages such as Bolans, All Saints, and Willikies where individual lots are 3,000 to 4,000 sq.ft. (278 to 371 m^2). These villages, which provide a strong sense of place and housing choice, offer nodes that may be built upon to create a network of sustainable communities.

Medium and high-density residential developments are more appropriate in St. John's City and St. John's Rural. These developments may be particularly attractive to the 25% and 20% of one (1) - and two (2) -person households (respectively) as reported in the 2001 census who seek affordable housing in an accessible area. Consequently, it is important to determine a mix of low, medium, and high-density residential environments that will meet the needs of the population in 2030.

The density standards guiding this Plan and the corresponding land requirements are presented in Table 4.5.

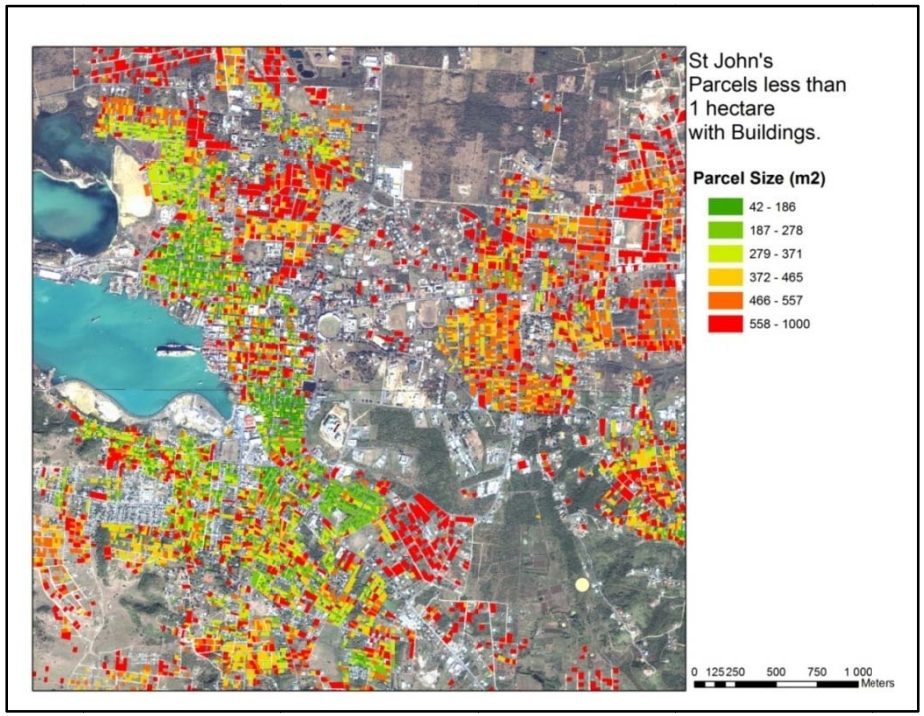


Figure 4.7 Showing St. John's Parcels less than 1Ha with Buildings

Table 4.5 Land Requirements for Housing

	Distribution (%)	Units	Neighbourhood Density (Acres)	Neighbourhood Density (Hectares)	Land Required (Hectares)
Single detached	40	9,270	5	12	773
Semi-detached	20	4,635	7	18	258
Row houses	20	4,635	12	30	155
Low-rise apartments	20	4,635	20	50	93
	100				1,277
Assumptions					
New Dwelling Units	21,563				
De-densification	1,612				
Total	23,175				
Alternative Scenarios	**Hectares**				
All Single detached	1,931				
Even distribution	891				
All apartments	464				

The model indicates that, using the medium population projection variant; the land requirements for housing over the plan period would range from 1,147 to 4,772 acres (464 to 1,931 hectares) depending on the density of development. While recommended densities for different residential areas in Antigua and Barbuda will vary significantly, it is apparent that something in the order of 1,300 hectares would be more than sufficient to meet the housing demand over the period 2001 to 2030. Some of this requirement has already been met in the subdivisions that were completed over the past 10 years. For example, the number of lots in new registered subdivisions totalled 580 and 552 in 2007 and 2008 respectively[19]. Of these 70% were intended for the local residential market and the remainder for the tourism residential market; 22% of the new lots were in government-initiated subdivisions.

[19] DCA, 2010

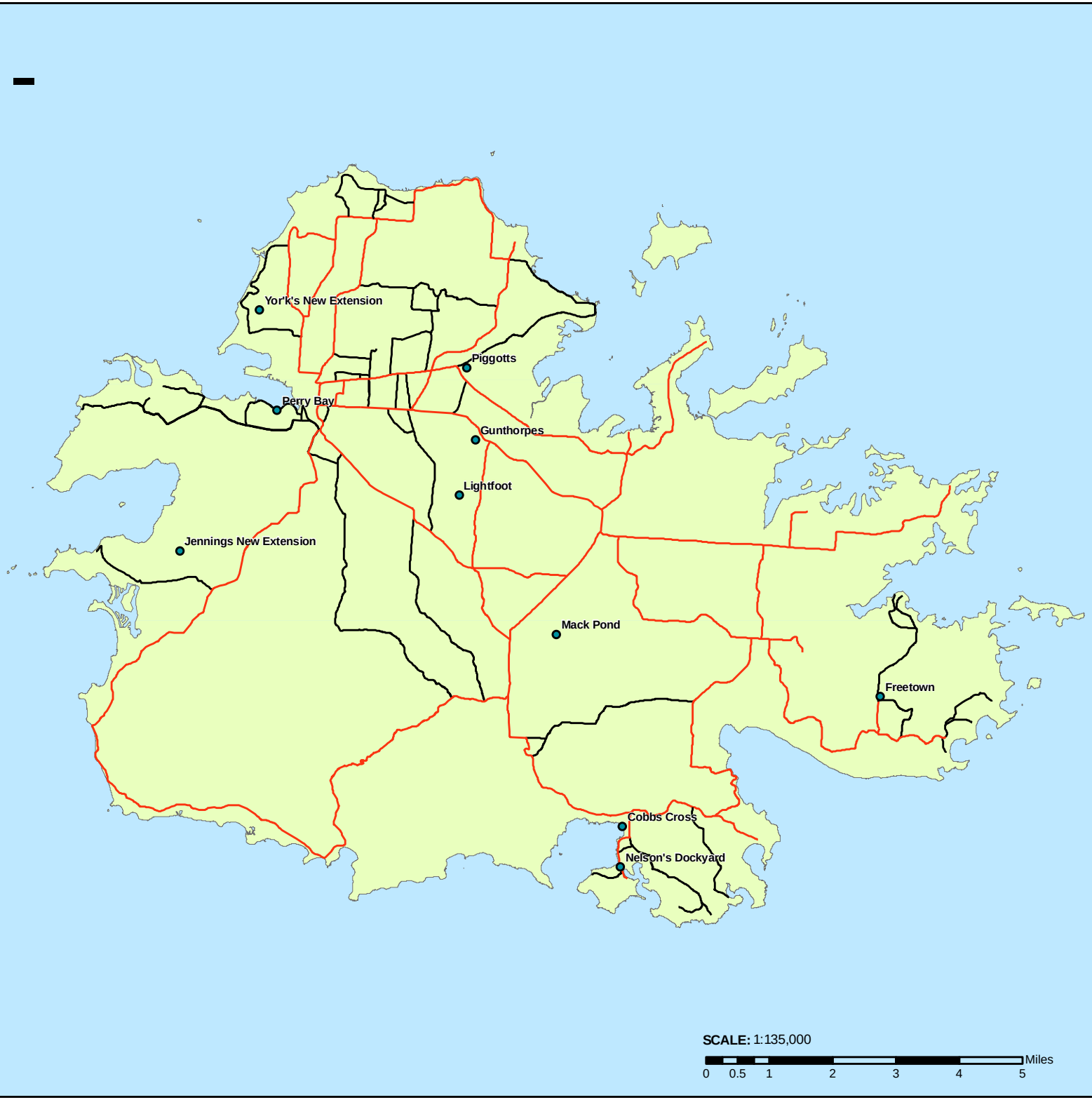
As the census data is now 10 years old, it will be important to review the housing requirement as soon as the results of the next census are made available.

4.5.3 Squatting

Within recent times, squatting has become a major problem throughout Antigua & Barbuda in the following key areas and as depicted in Figure 4.8

1. Perry Bay
2. York's New Extension
3. Piggotts
4. Gunthorpes
5. Lightfoot
6. Mack Pond area
7. Freetown
8. Cobbs Cross
9. Nelson's Dockyard
10. Jennings New Extension

The recent increase in the number of informal settlements can be attributed to a number of reasons. Due to the escalating land prices, some low and middle income earners resort to squatting on available vacant lands. Furthermore, traditional cheaper Crown lands are still out of reach for most and the huge influx of Caribbean immigrants over the past few decades has resulted in much of the cheaper lands being bought off and therefore raising the demand and price of these lands. Many landowners also do not live in Antigua and are unable to monitor and take enforcement against possible encroachers. More importantly, Government agencies that have responsibility for monitoring and evicting squatters from lands are severely under-staffed and under-equipped to deal effectively with this growing problem.



TITLE:
EXISTING SQUATTER HOTSPOTS

FIGURE: 4.8

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CLIENT:

Legend

- Squatter Sites
- Primary Roads
- Secondary Roads

NOTE:

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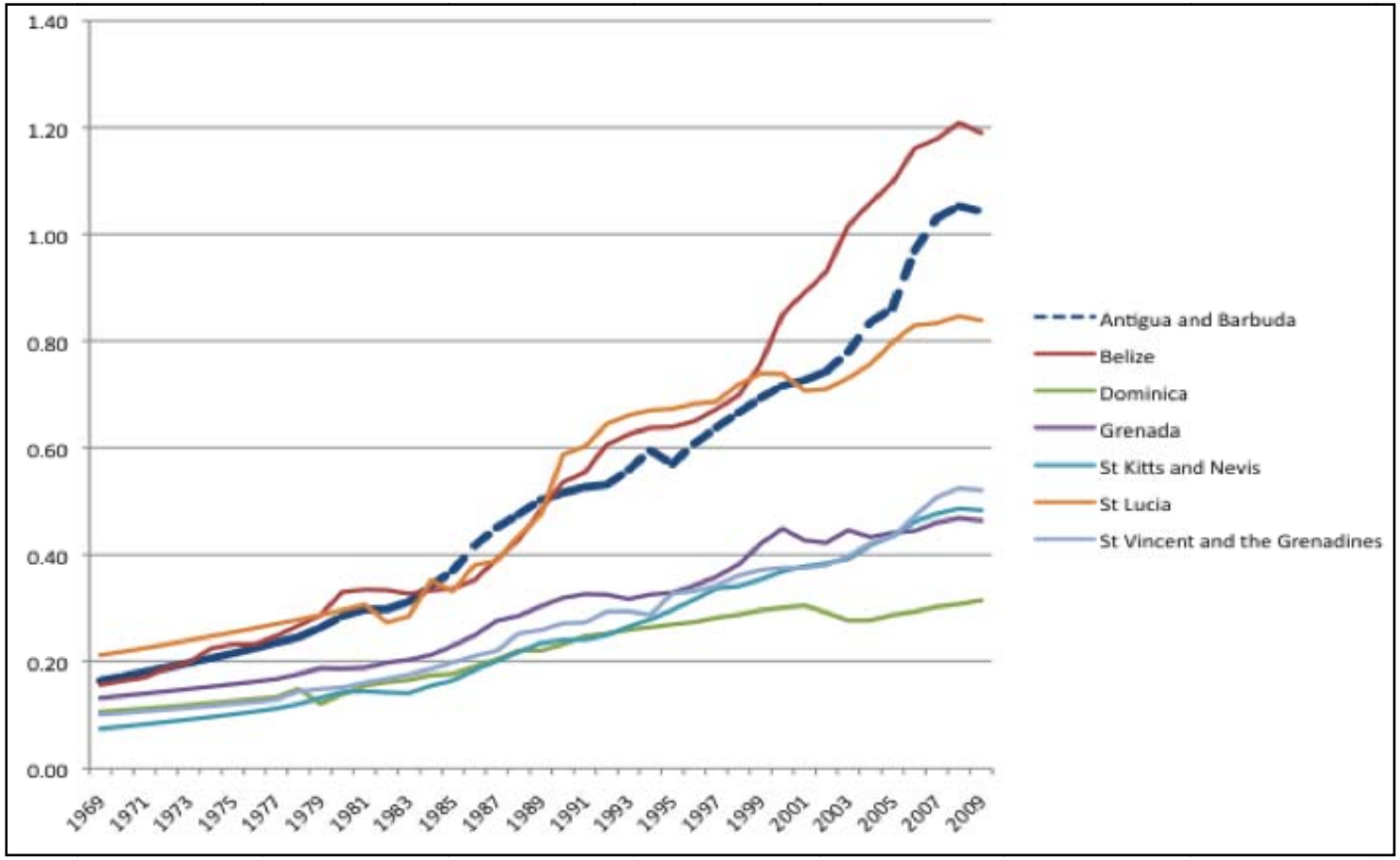


Figure 4.9 Gross Domestic Product (GDP) Selected Countries (in billions of 2005 dollars) 1969-2009

Source: World Bank World Development Indicators, International Financial Statistics of the IMF, Global Insight, and Oxford Economic Forecasting, as well as estimated and projected values developed by the Economic Research Service all converted to a 2005 base year.

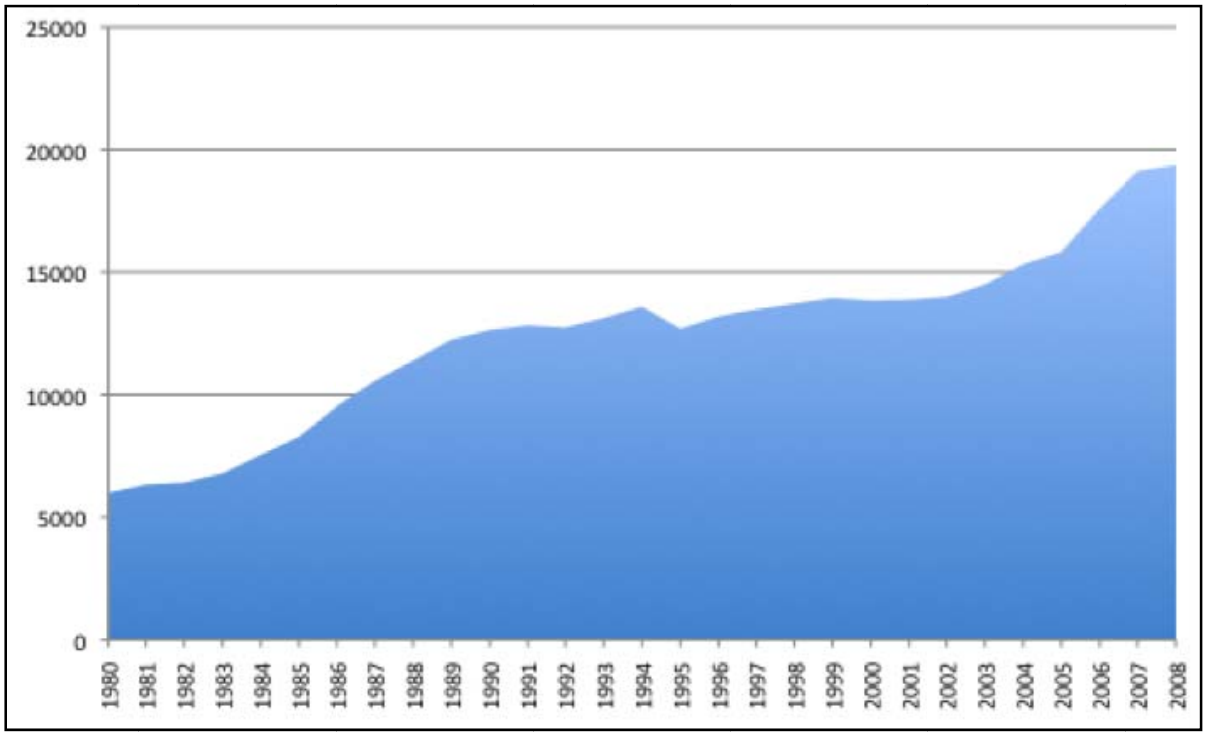


Figure 4.10 GDP per capita, PPP: Antigua and Barbuda 1980-2008
Constant 2005 International Dollars
Source: The World Bank Group: World Development Indicators, April 19, 2010

4.6 Economy and Employment

Relative to other countries with economies of similar size in the region, Antigua and Barbuda has performed very well over the past forty (40) years during which its Gross Domestic Product (GDP) rose from $US0.16 B in 1969 to $US1.04 B in 2009 (Figure 4.10). This status is further borne out by its ranking of 47th on the UNDP's Human Development Index (2009), which is second only to Barbados in the Caribbean, and is fourth place (after Aruba, The Bahamas and Barbados) in GDP per capita over at least the past 15

years[20]. The Gross National Income (GNI) per capita of $US13,200 in 2008 qualifies Antigua and Barbuda as a High Income country according to World Bank criteria.

The growth in the economy is also reflected in the impressive shift in purchasing power parity in constant international values based on 2005 that rose from 5,997 in 1980 to 19,368 in 2008 (Figure 4.9). As indicated in Figure 4.11, growth in the economy of Antigua and Barbuda tends to occur in spurts. Vigorous growth occurred between 1978 and 1981; 1983 and 1989; 1993 and 1999 (with the notable exception of 1995); as well as 2003 and 2007.

The periods of growth tend to be driven by increased investment in the tourism industry and related activities with the most recent spurt corresponding with a change in government and the build up in hotel and residential construction prior to the World Cricket Championship in 2007.

[20] The World Bank Group: World Development Indicators, April 19, 2010

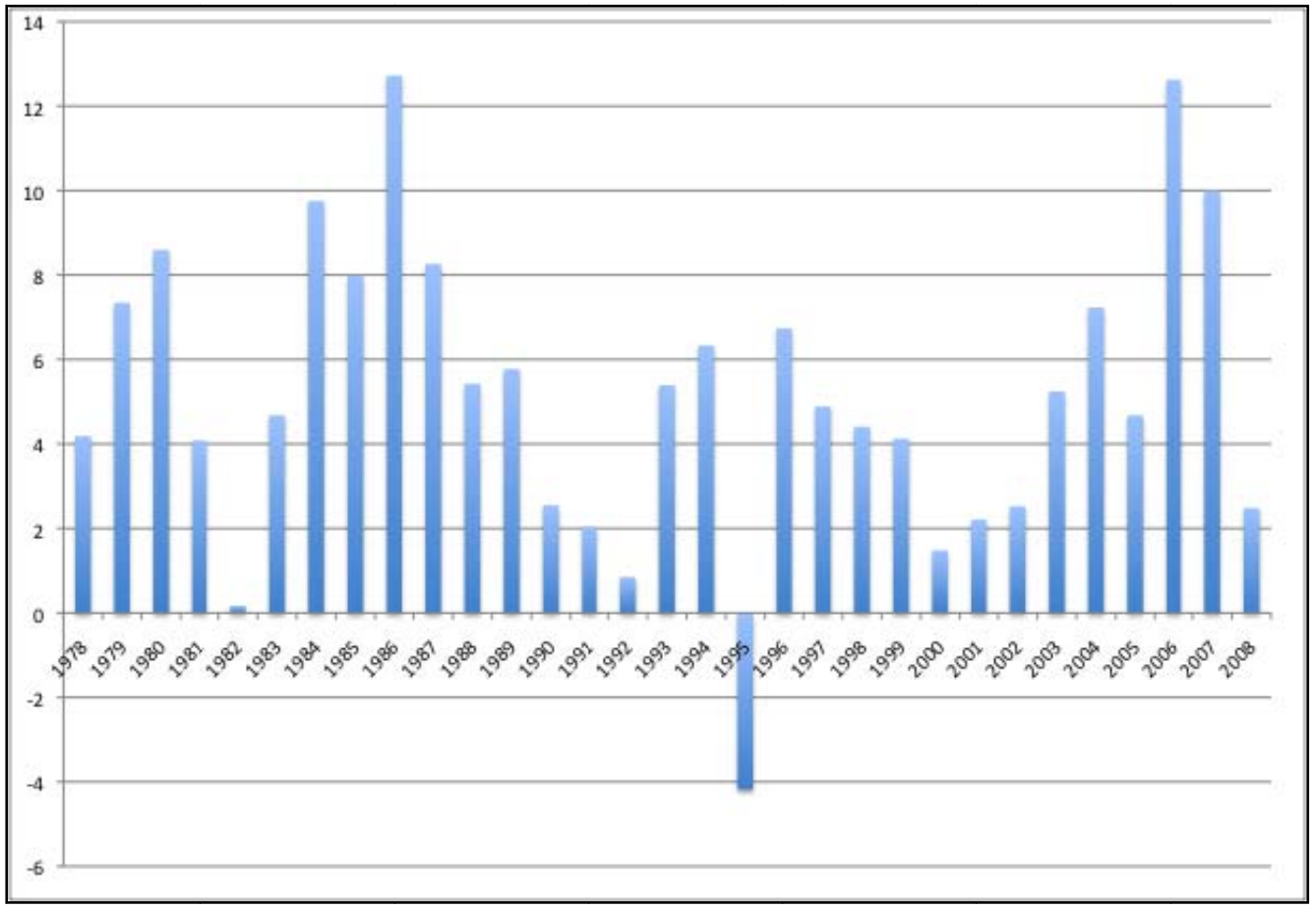


Figure 4.11 GDP Annual Growth Rate (%) Antigua and Barbuda 1978-2008

Source: The World Bank Group: World Development Indicators, April 19, 2010

The negative growth that occurred in 1995 was due to the effect of Hurricane Luis on tourism, a coincidence that underlines the vulnerability of the economy to natural disasters. As the country was also hard hit by the international financial crisis and the rising price of commodities in 2008, the economy is expected to decline over 2009 and 2010. While growth is projected to resume in 2011, it is only in 2014 that the country's GDP is expected to surpass its 2008 level[21]. This situation is exasperated by significant accumulated government debt. In this context, the government recently signed a three (3) year 117.8 million ($US) loan agreement with the International Monetary Fund (IMF) in order to finance a Fiscal Consolidation Programme that is expected to reduce government expenditures, increase revenues, and strengthen public institutions[22].

Given the current fiscal situation it is evident that the Government of Antigua and Barbuda is not in a position to invest in speculative projects (Figure 4.12). Consequently, it is all the more important that the recommendations presented in this SIRMZP are practical and in accordance with the Government's commitment to improve its financial position while positioning the country for sustained growth in future years. This may be accomplished through the appropriate designation of land use zones, protection of environmental resources and sensitive areas, improvements to social and physical infrastructure that provide better service at a lower unit cost, and a fair and transparent development process – all components of this SIRMZP.

[21] International Monetary Fund (IMF) forecast July 7 2010
[22] Press Release: Minister of Finance, Antigua and Barbuda, June 10, 2010

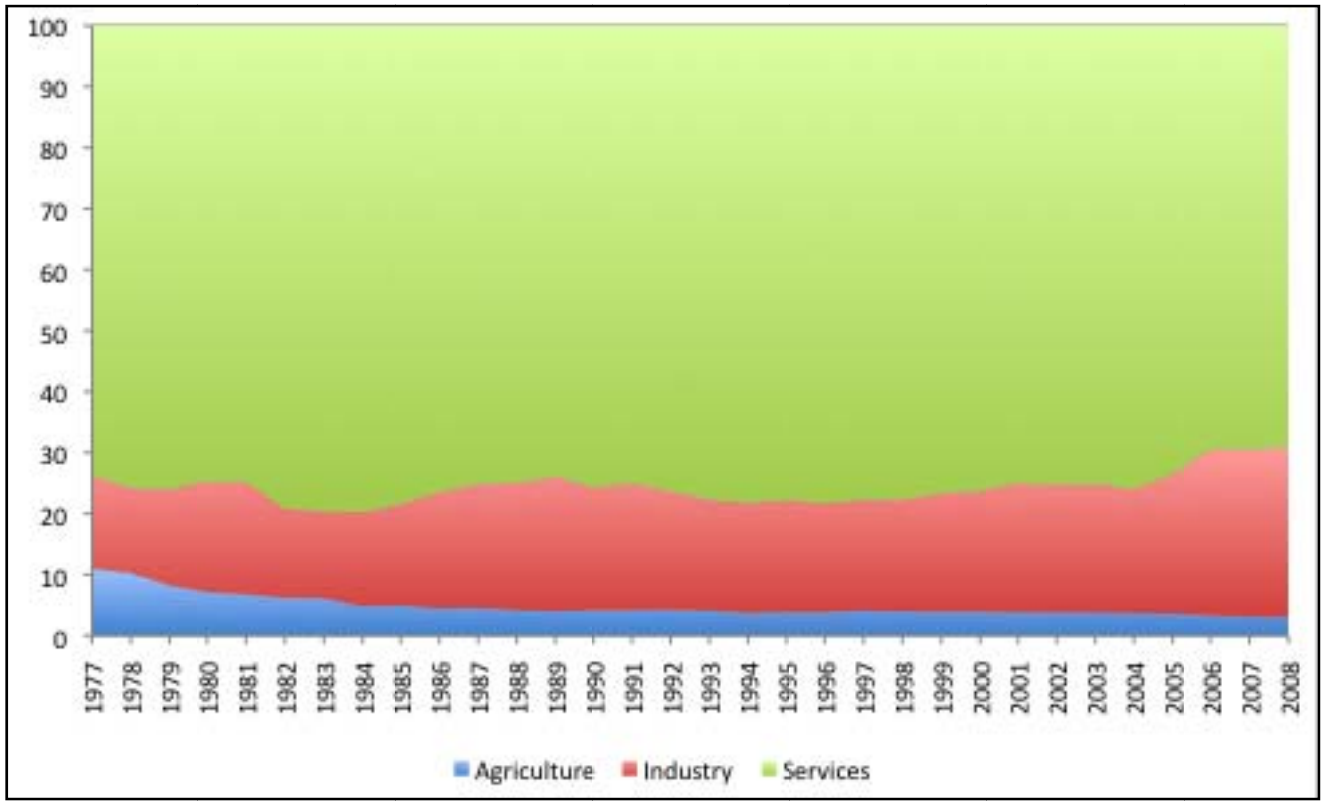


Figure 4.12 GDP % Share: Antigua and Barbuda 1977-2008

Currently, Antigua and Barbuda's economy is fuelled by the service sector, which has accounted for 69 to 77% of the country's GDP over the past 30 years. Over the same time period, industry has increased in importance while agriculture has declined from 11% in 1977 to 3% in 2008 (World Bank: World Development Indicators, 2010). These data correspond closely with the distribution of employment among economic sectors, which were 2.6%, 14.6%, and 75.6% for the agricultural, industrial, and service sectors respectively in 2001.

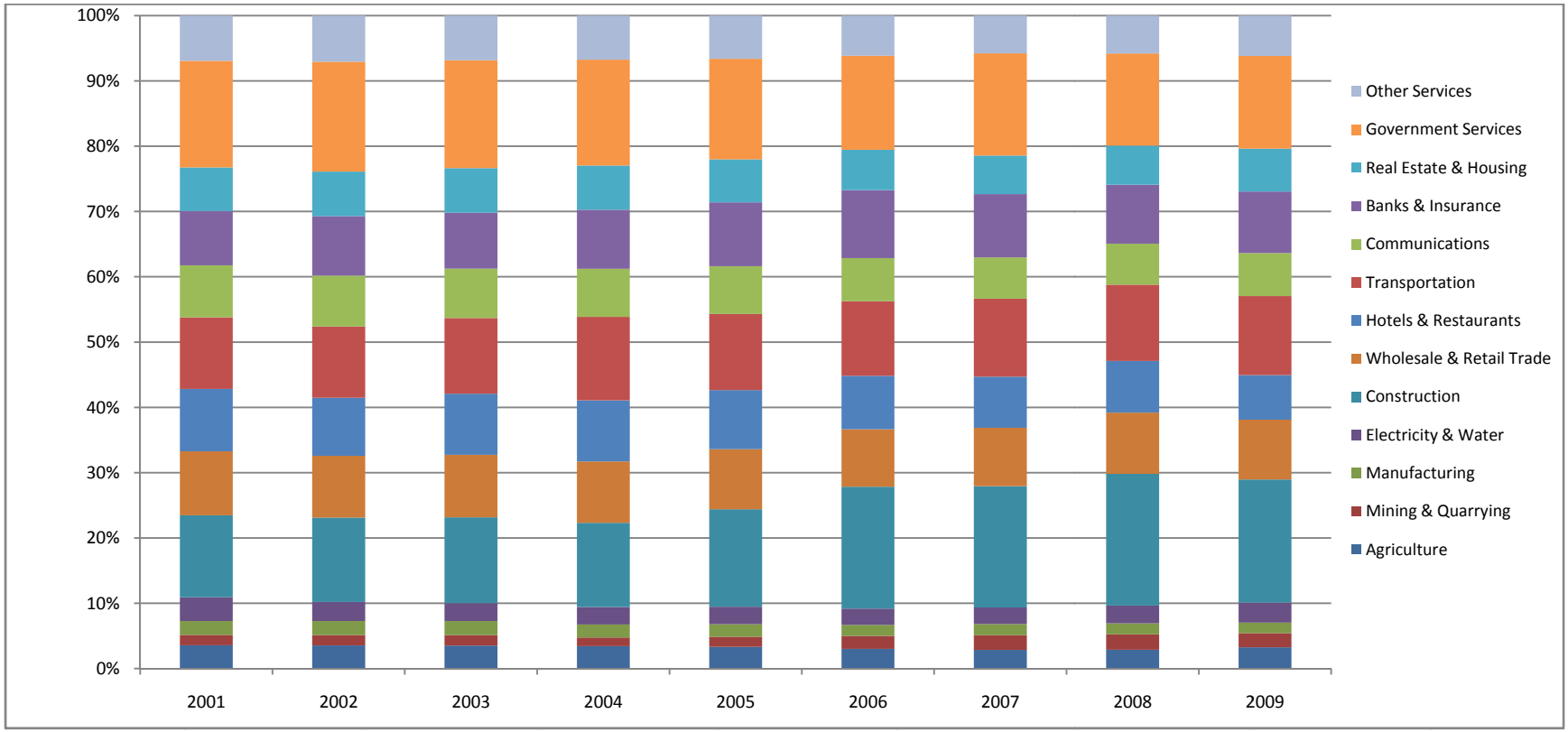


Figure 4.13 Composition of GDP, 2001 to 2009

Source: CSO, ECCB, 2010

Currently, Antigua and Barbuda's economy is fuelled by the service sector, which has accounted for 69 to 77% of the country's GDP over the past thirty (30) years. Over the same time period, industry has increased in importance while agriculture has declined from 11% in 1977 to 3% in 2008 (World Bank: World Development Indicators, 2010). These data correspond closely with the distribution of employment among economic sectors, which were 2.6%, 14.6%, and 75.6% for the agricultural, industrial, and service sectors respectively in 2001.

Further, the service sector itself is overwhelming driven by tourism, which is estimated to directly employ 22.6% of all workers in 2010 and 84.5% when indirect employment is included. While the real GDP growth for the Travel and Tourism Economy is expected to be -2% in 2010, it is projected that a growth rate of 3.9% per annum will be achieved over the next 10 years[23]. The same projection indicates that tourism's importance will substantially increase to the point where it represents 84.8% of GDP, 86.9% of employment, 74.3% of exports (via export earnings from international visitors), and 55.2% of total investment by 2020.

These are both optimistic and worrisome figures. While it is certainly encouraging to note that tourism has solid growth potential in the eyes of industry observers, an increase in the dominance of a single sector of the economy increases its vulnerability. Further, the growth rates for personal and business travel in the report prepared by the World Travel and Tourism Council are slightly below those for the Caribbean and the World.

Figure 4.13 presents a further breakdown of the composition of the GDP for each of the three primary economic sectors. Here it is evident that Government Services (14.2%) and Transportation (12.1%) dominated the service sector in 2009 and, indeed, throughout the entire period from 2001-2009. Nonetheless, it is encouraging that Government Services declined from 16.3% to 14.2% of GDP over the same time period.

Financial services (Banks and Insurance) contributed 9.4% of the GDP in 2009. While this industry was recently affected by offshore banking irregularities that garnered international attention, it may well represent a growth area in the future. There are also important gains that may be achieved in Trade, which represented 9.2% of the 2009 GDP.

The industrial sector is dominated by construction activity (Figure 4.14), which is cyclical in nature and in particular was recently greatly affected by the build up to the 2007 World Cricket Championship. Relatively modest but steady output is generated by Mining and Quarrying, Manufacturing, and Electricity and Water. However, the quarrying and mining industry is heavily dependent on sand mining, an activity that is environmentally disruptive and must be restrained.

[23] World Travel and Tourism Council, Travel and Tourism Economic Impact: Antigua and Barbuda, 2010

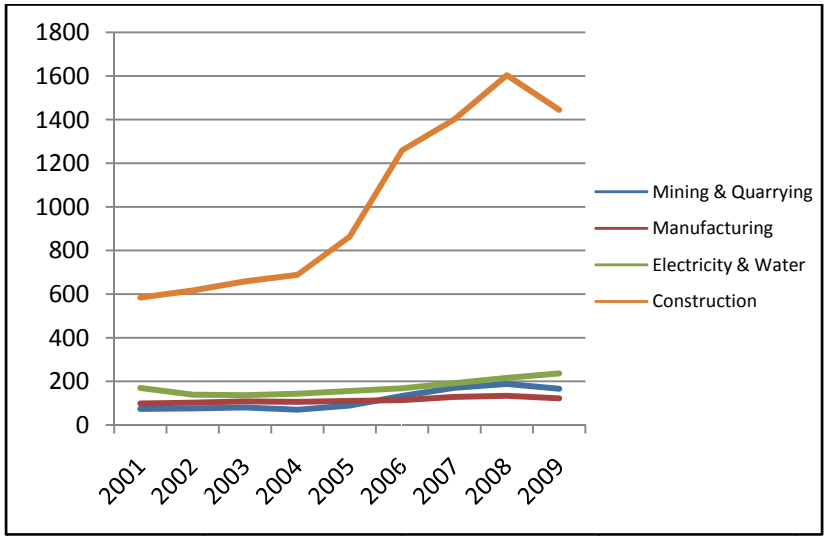


Figure 4.14 Industrial Sector

Source: CSO, ECCB, 2010

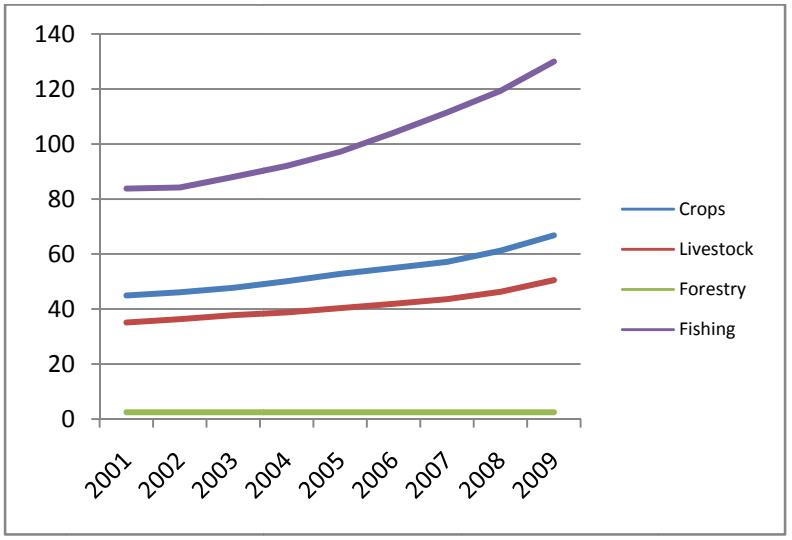


Figure 4.15 Agricultural Sector

Source: CSO, ECCB, 2010

In contrast, manufacturing, which currently focuses on textiles and apparel, distilled liquor, bedding, handicrafts, and electronic components, has growth potential despite the competitive disadvantages of relatively high labour, energy and communication costs for the region[24]. Planned industrial estates and the encouragement of small niche industries focusing on activities such as the yachting sector in the Falmouth area are part of the SIRMZP. As suggested by representatives of the Antigua and Barbuda Investment Authority, this approach would be attractive to investors as it allows companies to share utilities and infrastructure, minimize problems due to incompatible adjacent land uses, and safe guard environmental integrity.

The agricultural sector, which includes crops, livestock, forestry, and fishing, represents a significant opportunity for development (Figure 4.15). While this sector declined dramatically with the collapse of the sugar industry decades ago, significant class II and III land is available, much of which is owned by the government. A coordinated public-private initiative might be used to greatly increase the production of ornamental plans, salt resistant grass,

[24] United States Agency for International Development (USAID), 2006

and specialty vegetables and fruits for the domestic and tourism sectors[25]. These and other crops would increase food security and lower what is presently a substantial negative trade balance on food goods. Consequently, a comprehensive agriculture development programme, which includes setting aside large tracks of land in order to achieve economies of scale, is recommended in this SIRMZP. Further, there is a need to provide institutional and physical support for the fishing industry to enable fisherfolk to provide products of sufficient quality and quantity for the domestic and international markets.

Another area for economic diversification and growth is the tourism sector itself. While Antigua and Barbuda's market share of "sun, sand, and sea tourism" is declining due to the country's relatively high wages and stagnation in the growth of this market, there are significant opportunities to develop ecological, medical, sports, and heritage tourism products[26]. Indeed, Antigua and Barbuda has already developed a very strong foundation in sports tourism, especially the yachting sector. Unspoiled beaches, protected marine areas, attractive town centres and vistas, nature parks and heritage sites that are well served with social and physical infrastructure are therefore important elements of the SIRMZP.

[25] USAID, 2006
[26] USAID, 2006

4.7 Social Infrastructure

4.7.1 Health

Antigua and Barbuda is divided into six (6) health districts, each of which is served by designated clinics while more specialized medical services are provided by the new 185 bed Mount St. John's Medical Centre (MSJMC) and several private clinics. The affiliation of the American University of Antigua (AUA) with MSJMC effectively makes this facility a teaching hospital that further augments its range of services. One notable deficiency is the lack of a hyperbaric chamber with the result that divers suffering from decompression illness must be evacuated to a neighbouring island.

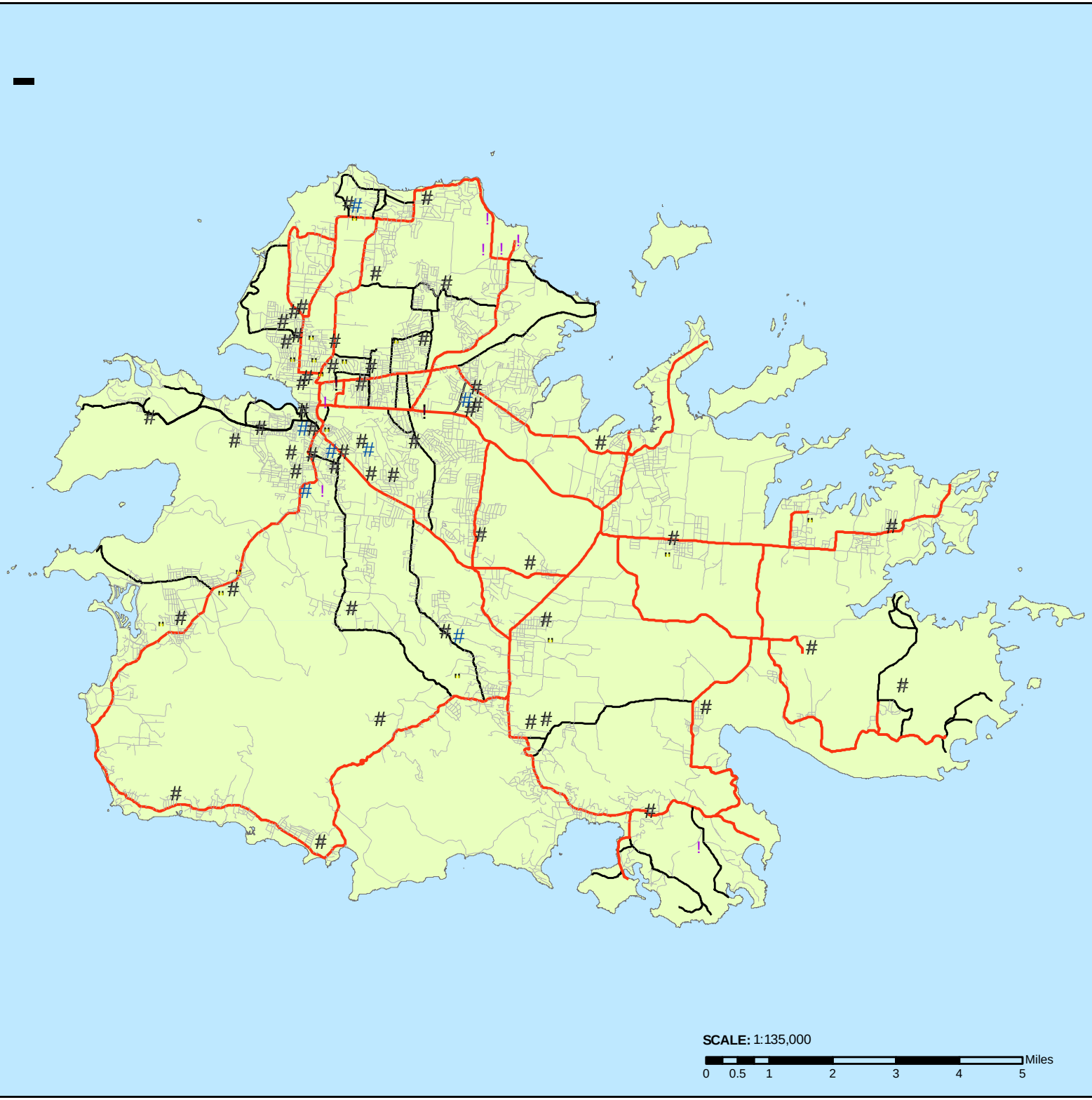
Despite some deficiencies in community clinics and ambulatory services, the system works relatively well as the distances that must be travelled are short. Nonetheless, ensuring that basic X-ray, laboratory, and drug services were available in regional centres would improve the level of service. The situation is especially critical in Barbuda where the Hannah Thomas Hospital lacks laboratory facilities and can only deal with minor to moderate surgeries. Consequently, patients with more serious conditions are airlifted to Antigua. In addition to dealing with health problems, the Government operates preventive medicine programmes and promotes healthy lifestyles.

4.7.2 Education

Education facilities are widely available in Antigua and Barbuda at the pre-primary, primary, and secondary by both the public and private sectors. In addition, the Antigua State College, the University Centre in St. John's that is administrated by the School of Continuing Studies of the University of the West Indies (UWI), the American University of Antigua (AUA), as well as, numerous institutions that provide specialized vocational training are available for post-secondary studies.

While the distribution of schools throughout the country appears to be adequate as indicated in Figure 4.16, there are problems with overcrowding in urban facilities. Further, many buildings have structural deficiencies, some of which were caused by recent hurricanes.

A further concern is the number of students who do not complete secondary school. Data from the 2001 census indicates that among residents 15 years of age and over, 96% have completed primary standard (4-6 year), while 67.3% completed secondary school, 24.2% pre-university, and 9% university (CSO, 2001). Greater attention to providing the facilities and programmes that will encourage students to continue to the secondary and tertiary education levels is needed if the country is to compete in the knowledge economy. There is a need to reconsider the distribution of both primary and secondary education facilities in light of the SIRMZP, which proposes a hierarchy of communities.



TITLE:
EDUCATION FACILITIES

FIGURE: 4.16

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CLIENT:

Legend

Schools

- # Primary
- " Secondary
- ! Tertiary
- ! Technical Vocational
- # Primary/ Secondary

Roads

- Primary
- Secondary
- Tertiary

NOTE:

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4.7.3 Community Facilities

Antigua and Barbuda are served by a network of community services that include post offices, community centres, libraries, churches, cemeteries, sports and cultural facilities. Most of these facilities are concentrated in St. John's or in Codrington where they are intended to serve Antigua and Barbuda respectively. The primary exception is community centres, which are distributed to a large extent to reflect the distribution of population. With funding and project management from the Government of China, a community centre with a library facility is being constructed in Barbuda.

Sports and recreation facilities and playgrounds are provided throughout the country. Many villages have hard courts that are used for basketball, netball or volleyball and the larger settlements are provided with cricket and/or football fields. Additionally, there are six (6) national sporting grounds with basketball, netball, volleyball, golfing and track and field facilities. However, many existing sports and recreational facilities do not adequately serve their intended clientele as they are too small, in poor condition, or lack basic facilities such as washrooms. Several settlements, including many new residential developments, do not have public recreation facilities and there is a noticeable lack of children's playgrounds in communities throughout the country.

Recently, the Government of Antigua and Barbuda has indicated that it intends to establish Administrative and Cultural Centres in each parish that will be used for administrative, local government, and cultural activities. This is a welcome proposal that is taken into account in the SIRMZP.

4.7.4 Protective Services

Protective services in Antigua and Barbuda include the Royal Antigua and Barbuda Defence Force, as well as Police and Fire Services. All headquarters for these services are located in St. George.

In addition to St. John's, police stations are located in a good number of communities, including All Saints; American Road; Bolans; Coolidge; Dockyard; Freetown; Grays Farm; Liberta; Parham; Willikies; and Codrington (Barbuda). New police facilities are in the planning stage for Longford, Cedar Grove, Mt. Pleasant, and Blue Waters. Further, a new penitentiary is under consideration which is to be located in the general vicinity of Potsworks Dam.

There are three fire stations located in St. John's, Coolidge and All Saints. Five additional stations have been proposed with the goal of ensuring a maximum of eight (8) minutes response time, regardless of traffic. It has also been proposed that the Emergency Medical Service (EMS) be merged with the Fire Services Division to improve coverage and efficiency.

Emergency shelters, which have a crucial rule to play during hurricanes and other events, are distributed throughout the country. The location of all protective services and emergency shelters are a consideration in the SIRMZP.

4.8 Physical Infrastructure

4.8.1 Traffic and Transportation

Antigua has approximately 443 miles (713 km) of primary main roads and 120 miles (193 km) of secondary roads which is illustrated in Figure 4.18. Road infrastructure in Barbuda amounts to approximately 7 miles (11 km) of paved (major) roads. Secondary roads and other tracks in Barbuda are mainly made of dirt, gravel or crushed corals as illustrated in Figure 4.19.

The network in Antigua provides reasonable coverage throughout the island, with the exception of the southwest and southeast regions. In the former, steep mountain slopes impede road construction, while the presence of a very large resort estate limits public accessibility in the latter. Throughout, the roadways are narrow, and often congested during peak travel periods. These problems are compounded by the presence or ribbon development along many arterials.

Extensive road construction and rehabilitation projects are underway including the construction of a multi-modal hub with parking in St. John's, resurfacing, new signalization, and the construction and maintenance of drains.

The Ministry of Tourism, Civil Aviation and Culture are preparing to upgrade and expand the V.C. Bird International Airport at Coolidge. The proposed site is located immediately to the right of the existing terminal building and construction should commence in 2011. Current safety and efficiency concerns include the close proximity of an arterial to the runway, insufficient taxing and apron space. Further, development projects that are unrelated to air transport are encroaching on space that may be needed to accommodate further expansion. For these reasons, an airport expansion area and buffer zone are provided in the SIRMZP.

The Codrington airport in Barbuda is presently excessively close to the town. There are plans to relocate it east of Codrington and expand its capacity. A grass field is also in operation at Cocoa's Point.

Deep Water Harbour, St. John's provides the infrastructure and services to support passenger and cargo sea transportation. Sufficient capacity is available for up to four (4) cruise ships to dock along Heritage Quay, and Radcliffe Quay. A major private-public waterfront redevelopment initiative that extends to Market Street is expected to commence shortly. Consideration must also be given to the efficiency of road linkages between the V.C. Bird Airport and the port facility as Antigua serves as a freight transhipment point for the Leeward Islands and many cruise ship passengers must transfer between modes. Industrial and

warehousing areas will ideally be located along the route as is the case to some extent presently.

An inter-island ferry system connects Antigua with Barbuda. The Barbuda Council has a project to construct a new ferry jetty and upgrade its seaport facility. Currently, customs and immigration services for private yachts are available in St. John's, Jolly Harbour, English Harbour, the St. James Club, and Crabbs Marina. Additional services should be considered for Barbuda.

Antigua has two (2) public transportation hubs known as the East and West Bus Stations. Collectively these hubs serve 26 routes that are used by 351 privately owned 14 and 30 seat buses. In addition, there are 30 school buses with a seating capacity of 22. The public transportation system provides reasonably good coverage of the island with the exception on the southeast. Data from the 2001 census indicates that these services were used by 23% of the population to go to work. Further rationalization of these services is addressed in the SIRMZP. Figure 4.17 illustrates the type of transportation used by residents to travel to work.

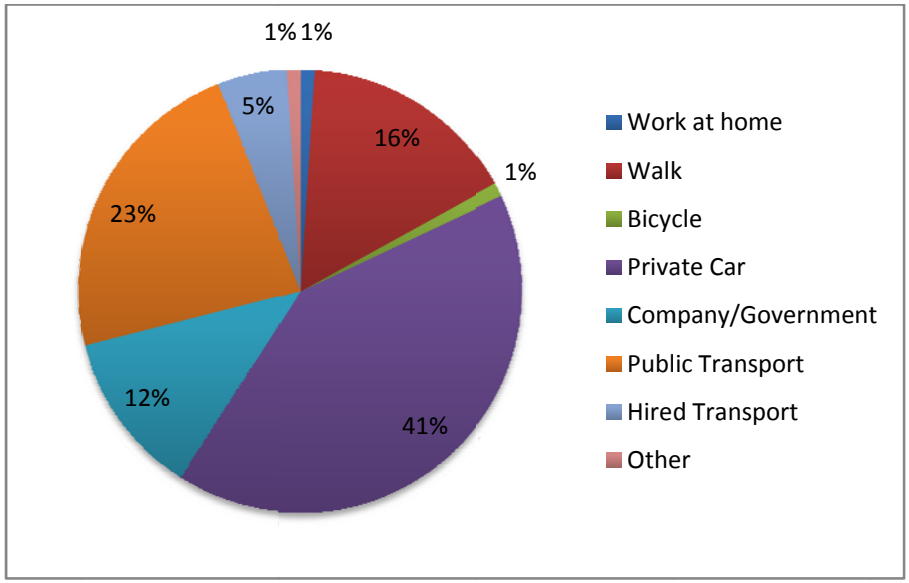
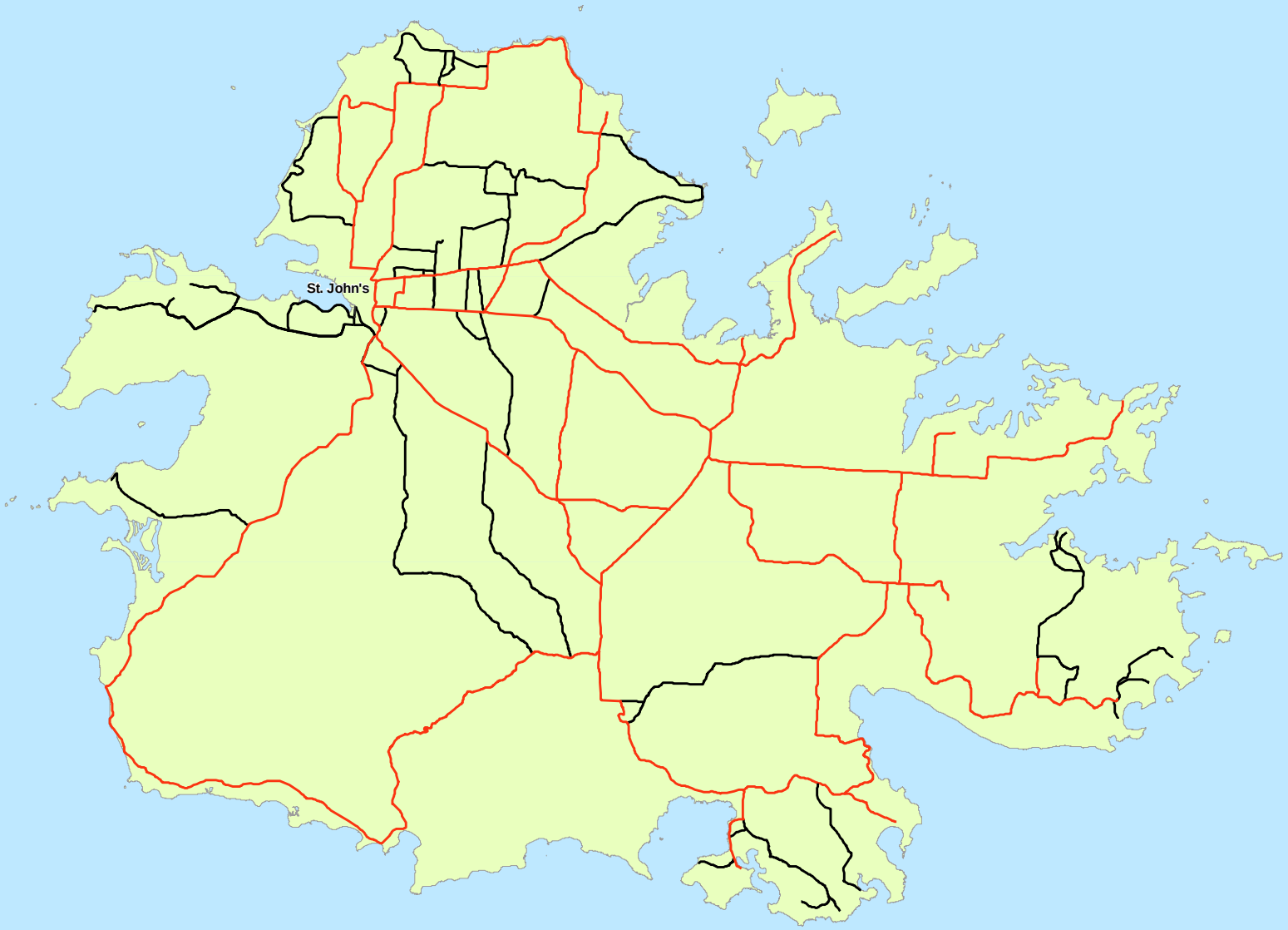


Figure 4.17 Pie Chart showing Travel Mode to Work

Source: CSO census 2001



TITLE:
TRANSPORTATION NETWORK

FIGURE: **4.18**

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Legend

- Primary Roads
- Secondary Roads

SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

NOTE:

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TITLE:
TRANSPORTATION NETWORK

FIGURE: **4.19**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Primary Road
- Secondary Roads
- Inland Water
- Wetland Forest
- Lagoon

SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

NOTES:

DISCLAIMER:

This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

SOURCES OF INFORMATION

All base data and satellite imagery were provided by:
The Government of Antigua and Barbuda: SIRMM/Environmental Division, Survey Division, Antigua Public Utilities Authority (APUA) and Caribbean Conservation Association

4.8.2 Water and Wastewater Infrastructure

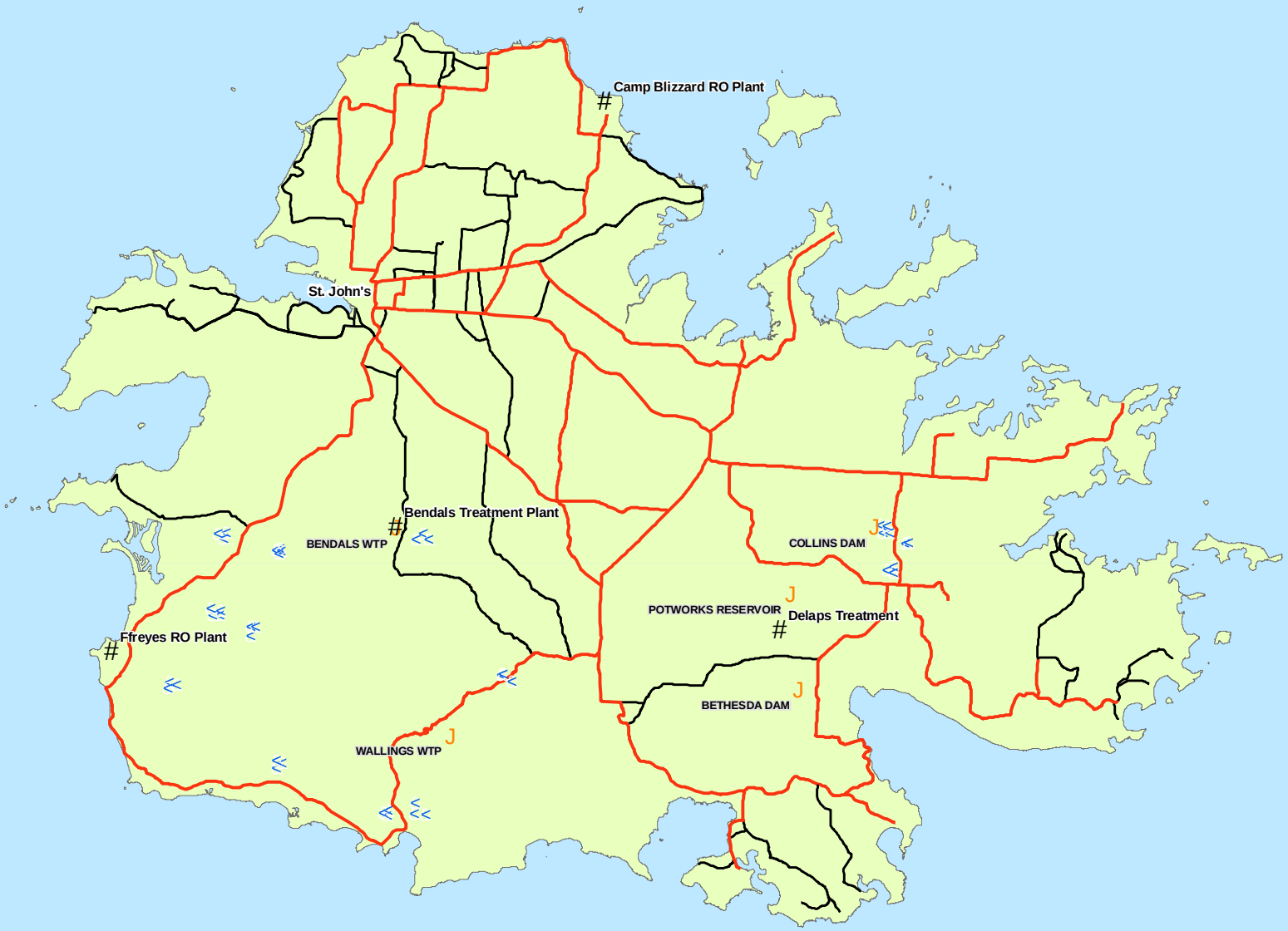
Antigua and Barbuda are among the driest of the Caribbean Islands with the former receiving an average of 3.4 ft (1,050 mm) rainfall per annum and the later only 2.5 to 3 ft (750 to 900 mm). Further, the rainfall is seasonal with significant peaks in April and October-November and prolonged dry periods often occur between January and March. While surface and ground water resources are replenished following periods of heavy rains, and several reservoirs are available, natural rainfall is insufficient to meet all of the country's water demand for domestic, tourist, and agricultural activities throughout the year. Consequently, two (2) desalination plants are in operation in Antigua and a third is nearing completion. These plants produce about two thirds of the island's water supply and serve a critical function despite the high operational costs and potential for negative environmental effects on marine resources.

In addition to the desalination plants, the Antigua Public Utilities Authority (APUA) operates two (2) surface water treatment facilities: Delaps and Bendals, which have treatment capacities of 2 million and 600 thousand imperial gallons per day respectively. Four (4) well fields and some ten (10) reservoirs serve these facilities. These facilities require protection from pollutants arising from ongoing hillside residential developments, pesticide use, and ineffective wastewater treatment in some areas. Ideally, consideration in the SIRMZP should be given to measures that protect the entire watershed within which the wells and reservoirs are located.

Septic tanks are the primary means of domestic wastewater treatment; although a significant number of pit latrines are also in operation and the major hotels operate private sewerage treatment facilities. These facilities would be sufficient if they are properly designed and located. However, an evaluation by the Caribbean Environmental Health Institute (CEHI) and the Pan American Health Organization (PAHO) found that only 12% of the seventeen (17) private sewage treatment facilities were fully operational and nearly 50% of these were in poor condition (1998) Further, the lack of rigorous building regulations and design standards for septic tanks results in many facilities that contaminate surface and ground water due to inappropriate siting or poor construction practices. These problems are especially present in St. John's where many lots are too small for septic tank use and effluents seep into open drains that drain in the harbour.

Plans to install a sewage system for St. John's area have been discussed and should be carried through. These new facilities however must be complemented with other activities such as regular checks by relevant government agencies to ensure privately installed sewage treatment systems are adequately maintained and kept in good working condition[27].

[27] Preliminary Environmental Analysis for SIRMM: Part I Situation Analysis



TITLE: WELLS, RESERVOIRS & DESALINATION PLANTS

FIGURE: 4.20

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CLIENT:

Legend

- # Water Treatment Plants
- J Catchments
- < Wells

Roads

- Primary
- Secondary

NOTE:

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4.8.3 Solid Waste

Solid waste is disposed of at two (2) sites in Antigua: Burma and Cooks. The facility at Cooks is properly constructed, efficient and fully operational. The Burma facility receives both solid and liquid wastes (sludge from septic tanks) as well as hazardous waste. As the facility is not lined with a geo-membrane, there are concerns that leachate is percolating into the soil and groundwater. Both facilities require buffer zones, something that is already in the planning stage for the Cooks site. Barbuda also has its own sanitary landfill located at Plantation. This state-of-the-art landfill was recently funded through an Organization of Eastern Caribbean States (OECS) project.

The Antigua and Barbuda Waste Recycling Corporation (ABWREC), a non-profit project of the Rotary Club of Antigua Sundown, operates a recycling facility in collaboration with the National Solid Waste Management Authority (NSWMA), the Environment Division (ED) and Central Board of Health (CBH). This facility processes plastics, aluminium cans, car batteries and some electronic waste. These programmes should be extended and made more readily available throughout the country.

4.8.4 Energy

Antigua and Barbuda is almost completely dependent on imported petroleum products to generate electricity and provide transportation fuel. The Antigua Public Utilities Authority (APUA) generates most of the electricity at four (4) sites in Antigua -Crabbs, Cassada Gardens, Friars Hill Road and the West Indies Oil Company compound - and one (1) in Barbuda. Their total capacity is approximately 36.1 MW. Recently, the transmission and distribution system has been upgraded to provide a 69Kv distribution ring with 69 / 11Kv[28] transformer sub-stations. The public grid reaches over 95% of Antigua's population, with similar coverage in Barbuda[29]. The residential sector is estimated to be the largest consumer of electricity, accounting for approximately 40% of sales[30]. Many commercial enterprises, hotels, apartment complexes and private homes have generators to supply their own electricity during outages. APUA estimates a load increase of 10% per annum for the foreseeable future.

As Antigua and Barbuda have on average 268 hours of sunlight per month, solar energy has considerable potential and, in fact, is currently widely used to heat water. In addition, wind energy, which was extensively used in colonial times as evidenced with remnants of windmills throughout the country, may also be harassed. The feasibility of both forms of energy should be further explored in the interest of lowering GHG[31] emissions and reducing foreign exchange flows.

[28] Kilovolt (Kv)
[29] NPDP, 2001
[30] GENIVAR'S Interview with the APUA (2010)
[31] Greenhouse gases (GHG)

CHAPTER 5

SPATIAL DEVELOPMENT SCENARIOS

5.0 SPATIAL DEVELOPMENT SCENARIOS

5.1 Purpose

This section of the report identifies and evaluates alternative spatial development scenarios to be considered in meeting the goals and objectives of the Plan. The five (5) specific goals that have been identified for the SIRMZP are:

1. **To maintain and enhance ecosystem integrity;**
2. **To foster economic development and engaging livelihoods;**
3. **To enhance liveability;**
4. **To improve accessibility; and**
5. **To promote efficient and effective governance.**

The scenarios seek to provide guideposts that in the future, the country can most effectively provide both shelter for households and services (public and private, economic, social and regulatory) in organized settlements efficiently linked by roads, transport, utilities and communications. It is important that the chosen future spatial development option incorporates the most desirable and the best features of existing spatial patterns while deploying measures to correct physical development practices that have undesirable effects.

5.1.1 Factors Influencing Current Spatial Patterns

The Spatial patterns of settlement in Antigua and Barbuda have been influenced by geographic, topographic, environmental, social and economic circumstances, including:

a. The multi-island nature of the state, with its requirement for intra-island movement of passengers and goods via planes, passenger ferries and cargo boats; the dominant intra-island transport nodes are located in the three main islands, Antigua, Barbuda and Long Island.

b. The forested areas of the southwest volcanic region, which have steep slopes and very significant environmental resources, are not considered suitable for development of settlements.

c. The land distribution: in Antigua government's ownership of a large acreage of former sugar estate lands resulted in a policy that allowed relatively large lot residential subdivisions, which in some instances were randomly located and quite often inadequately provided with basic infrastructure. For Barbuda, common ownership of lands created a flexible policy that until recently allowed Barbudans to select the location and size of land they

wanted for home building or farming; in both islands, the land distribution policies encouraged sprawl, discouraged unified and compact settlements and resulted in undesirable environmental impacts in some cases.

d. Concentration of services, commerce and events in the capital, St. John's. It is understandable that St. John's is the seat of government, centre of commerce and services (public and private), events and shipping. However, in a visioning exercise, participants raised questions about the undesirable effects of this level of concentration, and the inconvenience to residents of some rural settlements who must travel to the capital for even basic services and the impact that related vehicular trips are having on traffic movement.

e. A well developed road system in Antigua which nonetheless has general inadequacies in physical infrastructure. Antigua has a fairly extensive road network that allows convenience in movement of goods and people, widens the choice of places to live, but inadvertently contributes to sprawl given the land distribution policy and residential subdivision practices. Sprawl and large lot subdivisions in both islands increase the cost for installing and maintaining roads, water, electricity and communications infrastructure.

f. Activities at major Ports of Entry: Development in and around St. John's continues to be influenced by the presence of the major shipping and cruise ship port in Antigua (St. John's Harbour). Falmouth Harbour/English Harbours, along with Jolly Harbour, provide the central locations for yachting activities in the country, which has impacted growth in commercial and residential development in these areas. Parham Harbour with a dredged entrance channel and relatively good depth is underused as a port of entry but has the potential for growth in shipping and yachting activity. So far such activities have had no major impact on settlement development in Parham. Similarly, Barbuda's seaport has had no real impact on the growth of settlements, partly because it is undeveloped.

5.1.2 Development Trends

In the past two decades, the major growth area for commercial development, residential and expansions and new residential subdivisions has been to the north of the country from St. John's, northward to the coastal areas of Crosbies, Cedar Grove, and Hodges Bay and from St. John's eastward to Coolidge (including V C Bird Airport) and Fitches Creek. A large percentage of residential parcels in the north have yet to be developed, but the divided lots

shown on recent 2010 aerial imagery are evidence of intent to develop.

There are other areas of the country where appreciable growth in residential development is occurring including:

- Outward expansion of St. Johns City from its fringes and the evolution of satellite neighbourhoods of varying densities and villages;
- Ribbon development and sprawl, spurred by the relative ease in obtaining planning permits for subdivisions in undeveloped areas or outside the boundaries of existing settlements;
- Village expansions and new subdivisions being built on average with larger lot sizes than the older sections of villages;
- Emerging corridors of commercial and / or residential activities within and outside of St. Johns, (Old Parham Road, Friar's Hill Road, Valley Road and All Saints Road);
- Emerging Special Centres (Poles) such as English Harbour / Falmouth and Jolly Harbour with appreciable job generation.

5.1.3 Existing Patterns within Settlements

Housing and commerce are key factors in how space is allocated within settlements. Downtown St. John's is a core of predominantly commercial uses mixed with some residential, institutional and small pockets of light industrial activity. In most other parts of St. John's and the majority of rural settlements in the country, residences comprise the dominant use among building footprints.

In such areas, there are no distinct commercial cores but rather individual commercial or institutional buildings (churches, schools, health centres and other government facilities) interspersed among residential uses. There is evidence in places like English Harbour of commercial activity replacing residential use. This occurs in response to the demand for commercial space, yet there have been no significant attempts to prescribe distinct commercial or mixed use zones in new residential subdivisions.

5.1.4 Area Protection Initiatives

Progress has been made in declaring a number of areas protected with the aim to conserve or sustainably use the natural and historic resources therein. Examples include the Nelson's Dockyard National Park (NDNP), Northeast Marine Management Area (NEMMA), Codrington Lagoon National Park (CLNP) and the Cades Bay Marine Reserve (CBMR). Current efforts seek to provide protection to the southwest volcanic region by seeking to establish

the Mount Obama National Park (MONP), and the Wallings Forest Reserve to conserve biodiversity, protect the structure of key natural forests, and to sustain soil and water conservation. Information received from EAG indicated that a recommendation has been made to propose Redonda as a protected area. These efforts are unlikely to achieve long-term goals unless effective management resources and infrastructure are deployed on the ground.

One of the benefits of protected areas is to contain settlement development and prevent sprawl in areas that would be best left natural or used for other purposes than housing and industry. Since the decline of the sugar industry, residential subdivisions have spread rapidly across the country's landscape. So despite the achievements made in area protection, the country has failed to:

- Provide legal protection for agricultural lands, most of which remain in government ownership
- Provide effective legal protection to critical areas of watersheds that are important to sustain yields of ground and surface water
- Provide effective management arrangements for sustaining the quality and recreation value of some of the country's most important beaches
- Provide for an adequate system of public parks within villages and urban areas, where the primary aim of management is the use and enjoyment of public open spaces as places for relaxation, leisure, contemplation and community interface beneficial to all age groups
- Provide for legal protection for wetlands of hydrological, ecosystem and habitat importance
- Provide legally binding regulations to reduce storm water impacts associated with improperly drained areas

5.2 Alternative Spatial Development Scenarios

5.2.1 Current Trends Scenario

The current trend scenario would essentially allow existing policies and practices inherent to land and resource use to continue as is. This means that planning policies favouring large lot low density development will continue; a situation that many stakeholders at the visioning exercise felt to be unsustainable. Government would continue to absorb the relatively higher costs of providing infrastructure to homes in subdivisions planned and executed by CHAPA and the Lands Division in the Ministry of Lands and Housing. Further, the remaining large blocks of good quality agricultural land would be fragmented and reduced in size, thereby jeopardizing food

security initiatives and what could be a major revitalization of the agricultural sector.

Maintaining these policies leads to excessive centralization and concentration of government services in St. Johns, and denies residents in other parts of Antigua and Barbuda convenient access to services that could be selectively and efficiently provided at the Parish or village level. Some success has been achieved in the decentralization of public primary and secondary schools to other parts of the country. Customs and immigration services are available at ports of entry but extension or renewal of work permits must be done in St. John's. Fire stations located in St. Johns, All Saints, and V.C Bird International Airport cannot effectively service most parts of the country within acceptable response time. The Fire Department believes that ideally, Antigua should have six (6) fire stations serving six (6) catchment areas, each serving an area within a five (5) mile (8 km) radius and allowing for a response time to reach a fire within the catchment of 7.5 minutes at road speeds of 40 mph (64 kmph).

Notable shifts in the location of commercial activities from downtown St. Johns to areas on Friar's Hill and Old Parham roads has helped relieve the congestion in the town while providing shoppers with convenient and hassle free parking. Commercial corridors on the fringe of the capital are useful but are best achieved with some degree of planned intervention to avoid long-term problems. In this case, numerous entrance and exit points on both roads, which are major arteries in and out of St. John's, will eventually lead to slower traffic and major inconveniences to motorists. A service road which is often considered to reduce entrance and exit points may not be possible in either case. Use of additional lanes for vehicles turning to exit the main roads, without slowing through traffic, would also be extremely challenging and would not necessarily solve the problem caused by vehicles entering the main roads.

The current trends scenario will reinforce practices whereby residential subdivisions continue to emerge as "bedroom communities" in which there is insufficient effort made to ensure that such communities are adequately provided with social services and amenities (recreation facilities, parks, public spaces, adequate sidewalks). Additionally, the lack of proper sewerage treatment in St. John's and village cores is a serious pollution concern, especially in McKinnon's Pond and Dickenson Bay. Throughout the country poor septic treatment affects the ground water and coral reefs etc. This scenario would also maintain the current high dependence on private cars in most residential subdivisions, which often lack the people/ acre density required to sustain profitable public transportation.

A review of the parcel map for Antigua overlaid on the 2010 aerial photograph of existing buildings show a vast number of vacant lots

waiting to be built on. The data suggest that as these lots develop within the next 1 or 2 decades, St. John's will merge with settlements such as All Saints, with major implications for traffic on the All Saints Road and loss of natural areas. Current policies would also reinforce ribbon development practices along major and secondary roads where efficiency in land use would be better served through the consolidation of residential and commercial buildings into compact settlements.

The current trends scenario also exemplifies a laisser-faire approach to land use management that fails to protect sensitive natural areas and agricultural lands. It also fails to provide planning and urban design intervention to areas given protected status or showing signs of emerging further as centres of job and business opportunities. Although many square miles of land in Antigua and Barbuda have been declared protected, the planning and management for realistic attainment of environmental and socio-economic goals and objectives is lacking.

5.2.2 Decentralization Scenario

Decentralization is essentially the opposite of centralization. Under this scenario, land use and economic policy would foster a development strategy that would radically change the direction of land use and the economic and social relationships between settlements. Major emphasis would be placed on distributing government services and structures that house them around the country for maximum convenience to persons living outside of St. John's. The policy would also seek to encourage investment in commercial activities in villages and subdivisions as options to St. John's.

A major disadvantage of this scenario is the high cost to government for wholesale decentralization of services. The cost to government for providing social services must be balanced against the benefits to persons. It is important that St. John's does not lose its vibrancy as the National Centre for government, commerce, culture, night-life and major events such as carnival.

This scenario would serve to reduce vehicular trips to St. John's, which is a major cause of existing and potential traffic and parking difficulties in the country's capital. It would also help to relieve congestion in some parts of the capital that seem to be linked directly and indirectly to existing negative visual and aesthetic images in some of the economically depressed parts of the town. However, each country, no matter how small, requires at least one city (and in particular, a capital city) that function as the centre of government, shopping, retail and other commercial services, nightlife, dining, entertainment and culture. A potential danger of the scenario would be to strip St. John's of some of the vibrancy that is a major plank in its attraction to residents and visitors.

5.2.3 Hierarchical Network of Settlements

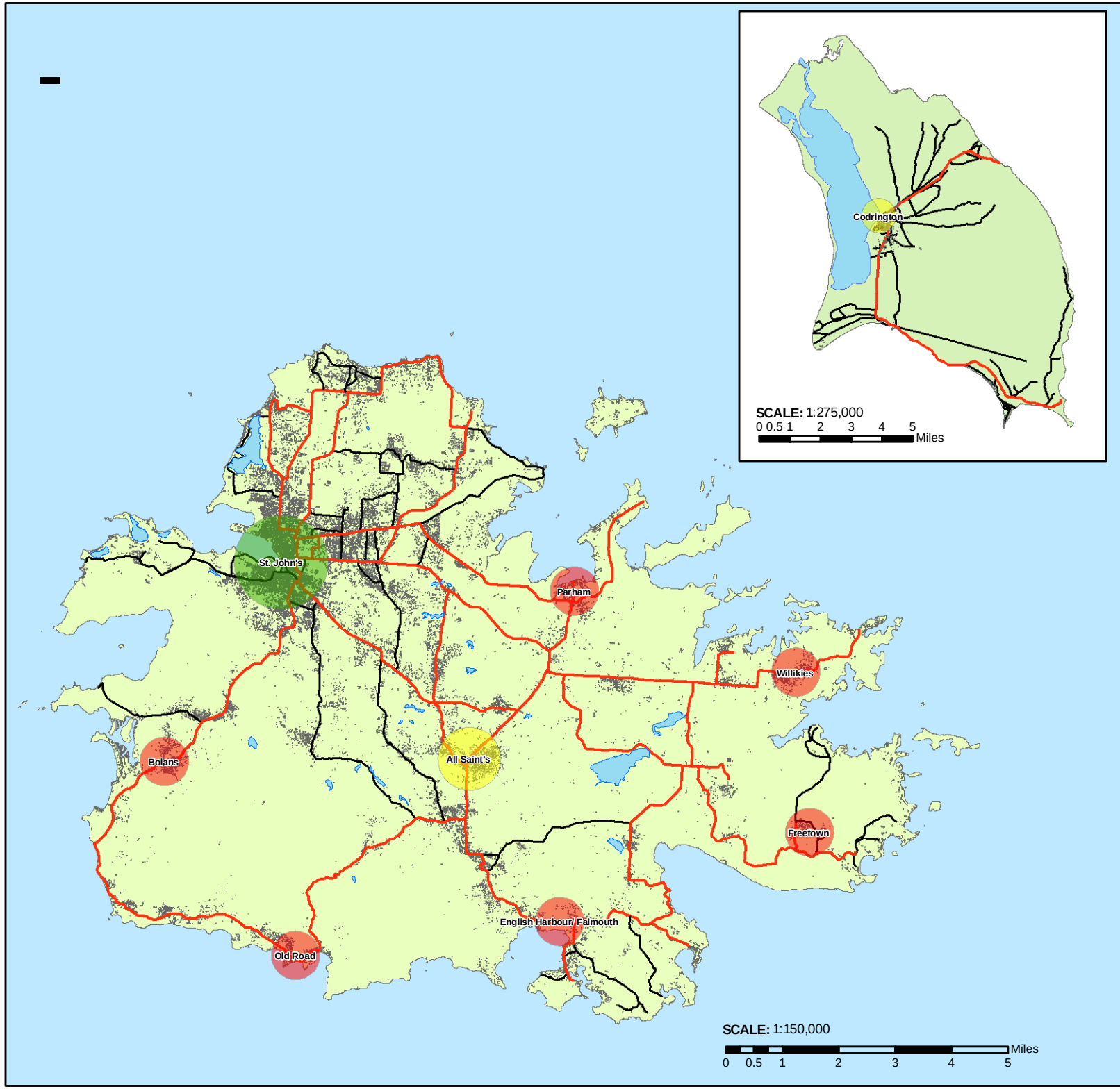
This scenario represents a spatial development option that is modified from the proposed spatial development strategy outlined in the NPDP 2001. Under this proposal future planning and management of settlements would be geared to produce and maintain a hierarchy of settlements, based on their capacity to provide social and economic services to communities within their sphere of influence and their strategic location throughout the country. Called the Hierarchical Network of Settlements (HNS) scenario, it would result in the country having:

- One (1) National Centre (St. John's); the highest level in the hierarchy, with the sphere of interest being the entire country.
- Two (2) Secondary Centres, i.e. Codrington, Barbuda and All Saints (Antigua). Codrington's range of influence would be the entire island of Barbuda, while All Saints would provide services to the neighbouring communities.
- Six (6) District Centres, (i.e.Falmouth/English Harbour, Freetown, Willkie's, Parham, Bolans and Old Road), providing district level services to all communities within an agreed radius.
- Villages, operating as the lowest the hierarchy with the minimum amount of services available.
- Special Development Areas (SDA); these include Nelson's Dockyard National Park (NDNP), with the emerging commercial centre at English Harbour/Falmouth Harbour, Codrington Lagoon National Park (CLNP), Cades Bay Marine Reserve (CBMR) and the North East Marine Management Area (NEMMA), Jolly Harbour, St. John's Waterfront, McKinnon's Pond and the Barbuda Seaport area.

This scenario (Figure 5.1) recognizes that some areas because of natural or man-made attributes, for example, seaports and airports, have inherent values that could be exploited for social and economic benefits beyond what they confer at present.

Two operating forces are operating here, government and private enterprise; government mainly through the provision of key services in education (schools and computer access centres), health, fire fighting, security, recreation facilities, other amenities and beautification and maintenance of the public spaces and facilities, promotion of public architecture, provision of space for the arts and maintenance of beaches.

Government's role will be in the development of public policy that is favourable to private sector investment and to assist in sustaining competitiveness against regional and international competitors in tourism and other industries. Private sector responsibility should include capitalizing on investment and business opportunities singly or as members of private sector organizations, such as the Antigua



TITLE:
SETTLEMENT HIERARCHY

FIGURE: 5.1

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CLIENT:

Legend

Roads

- Primary Roads
- Secondary Roads
- Buildings
- Lakes/Ponds

Settlement Hierarchy Scenarios

- National Centre
- Secondary Centre
- District Centre

NOTE:

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5.3 Evaluation of Alternative Spatial Development Scenarios

This Section evaluates the three scenarios against the goals set for the Plan. The legend is shown in Table 5.1, while the ratings are shown in Table 5.1.

Table 5.1 Spatial Development Scenario Rating Legend

Excellent	Good	Moderate	Fair	Poor

Table 5.2 Evaluation of Spatial Development Scenarios

#	Goals	Scenarios		
		Current Trends	Decentralization	Hierarchy of Settlements
1	Maintain/Enhance Ecosystem Integrity			
2	Foster Economic Development & Engaging Livelihoods			
3	Enhance Liveability			
4	Improve Accessibility			
5	Promote Efficient & Effective Governance			

5.3.1 Maintain and Enhance Ecosystem functions

a) Current Trends Scenario

There are two (2) major issues inherent to the current situation of ribbon development and sprawl. One (1) is the encouragement of the large lot subdivision in Antigua and Barbuda with a preference shown by regulatory agencies for low density over compact settlements. The other is the absence of legal or administrative designated boundaries that define the spatial limit of settlements. Containment of settlement growth within designated boundaries would not eliminate sprawl but is nevertheless essential to the protection of agricultural lands, as well as sensitive environmental areas and ecosystems contained therein. The Current Scenario not only encourages large lot residential subdivisions but single units in preference to multiple unit dwellings. During the consultations leading to the preparation of the Plan, various stakeholders agreed that the current land use policies and patterns of land use are not sustainable and do not provide a viable option for accommodating future population growth while at the same time preserving the vital ecosystems of the country.

b) Decentralization Scenario

By virtue of seeking to improve the organization of land use, decentralization would be expected to provide better protection of ecosystem functions than the Current Trends. Its ability to accommodate future population growth would depend on measures put in place to contain settlement expansion within preferred areas, reduce residential lot size and encourage homeowners to view multiple unit dwellings as attractive options to single family homes.

c) Hierarchy of Settlements

Similar to Decentralization, the Hierarchy of Settlements will only be effective in conserving ecosystems and Classes II and III agricultural lands if measures are taken to halt the unbridled spread of settlements in areas best suited for maintenance as natural areas, landscape, scenery, flood mitigation and biodiversity.

5.3.2 Foster Economic Development and Engaging Livelihoods

a) Current Trends

One of the failures of current development policy has been the failure of established settlements to fully capitalize on economic opportunities presented by their proximity to

hotels and other tourism establishments. For example, there has been no significant growth in commercial activity in Bolans, despite its location less than a mile from Jolly Beach Hotel, Jolly Harbour, and other resort activity. This is unlikely to change under a Current Trends scenario. The experience of English Harbour/Falmouth is different. In this case, the economic life of the community is fully integrated with and dependent on the yachting sector, numerous holiday villas and cottages in the area. The shopping centre at Jolly Harbour was developed as part of the Jolly Resort community and is to a large extent sustained by patronage of residents living in its villas, providing perhaps the best example of an integrated mixed use development having the potential to have a profound economic impact on future commercial development in the area.

b) Decentralization

What is happening at English Harbour/Falmouth and Jolly Harbour occurs mainly as private enterprise initiatives, with some development concessions. The attraction to investors has been the two natural harbours in the former and the manmade marina basin in the latter, the historic and heritage value of Nelson's Dockyard, real estate opportunities for investment and more recently the staging of yachting related events. The economic benefits from these two areas for the country are appreciated and are likely to continue without significant change (current trend) or in a decentralized option.

c) Hierarchy of Settlements

Under the Hierarchy of Settlements, government policy would provide the basis for creative investment by private enterprise for special development areas needing to balance heritage conservation (built and natural) with economic development in ways that can be sustained to the benefit of communities. Special planning, with creative policy guidance would be employed in having Bolans emerge as a district centre for St. Mary's Parish and using Jolly Harbour, Jolly Beach, Sugar Ridge and other resort establishments to a commercial advantage and job creation. A Master Plan for the English Harbour Village Centre will be updated to advance commercial activity, and improve public amenities, waterfront access, etc. Special attention will be paid to the NEMMA to maximize its potential for livelihoods and job creation.

5.4 Preferred Spatial Development Scenario

5.4.1 Suggested Development Scenario

The suggested scenario is Hierarchy of Settlements, based on its determined capacity to realize the goals of the Plan. It would be expected, with the relevant government support policies, to:

- Integrate and build on the positive aspects of existing spatial arrangements and therefore should be considered a realistic and practical component of the strategy for physical development.
- Network urban, suburban and rural settlements, using an improved and efficient public transport system.
- Promote realistic and sustainable development densities that reduce negative ecological impacts.
- Promote aesthetic and functional quality in all communities.
- Maintain the vital aspects of St. John's as a vibrant centre of government, commerce, culture and nightlife, while resulting in decentralizing selected key services to District Centres and Special Development areas.
- Promote varying degrees of self-sufficiency in commerce, services, recreation and cultural events in other settlements.
- Sustain and increase job generating capacities in Special Development Areas and District Centres.

5.4.2 Additional Initiatives

Success in implementing this spatial development scenario will require additional initiatives, involving public, private sector and in some cases non-government organizations (NGOs), to:

- Streamline development of commercial zones within selected parts of satellite settlements existing or emerging around St. John's City, within what is defined in the Census as Rural St. John's.
- Devise and implement a ports and harbours development strategy by establishing capacity limits for growth at the Shipping and Cruise Ship ports in St. John's, while seeking to improve port facilities and/or services in Barbuda, Falmouth/English Harbour, Jolly Harbour and Parham for yachts, ferries and appropriately sized cruise ships.
- Provide the legislative and management capacity for area protection and sustainable use of agricultural lands,

watersheds, wetlands, representative samples of biological diversity and other valued heritage resources.

5.4.3 Requirements to Achieve the Aims of the Selected Development Scenario

a) Background

Based on stakeholder comments, it was decided that Liberta would not be considered a District Centre as proposed in the Draft SIRMZP. The promotion of Falmouth/English Harbour and Parham as Secondary Centres was not done for reasons given below. Rather, Falmouth/ English Harbour, Parham and Bolans/Jolly Harbour should remain as District Centres, with designated Special Development Area status. In the past decade, development of Falmouth/English Harbour has been tied substantially to growth in the yachting sector, which in turn benefits villa tourism.

Socio-economic benefits to the proposed District Centre of Bolans from the yachting industry seems negligible to date but could be improved through strategic and creative investments that provide better linkages, job and income opportunities. The proposed District Centre of Parham has untapped potential to capitalize on yachting, recreational boating and numerous hotel, condominium and villa properties within close distance. A common feature of all three is the existence of reasonably well-sheltered harbours favourable to boating activities.

b) Policy Initiatives Needed

There are three initiatives required:

- Government's policy to decentralize selected government services, including general offices
- Tax and other fiscal policies to encourage investment by private enterprise in facilities, services and housing for targeted areas
- Land use policy and standards that encourage higher or urban level densities better suited to returns on investment made to house services in Secondary, Special Development and District Centres

i. Decentralization of Selected Services

Table 5.3 provides a summary of the type of services and facilities that should be considered for various settlements to facilitate growth according to the hierarchy of settlements scenario. These are public and private sector services, for which minimum requirements should be established at the level of villages and residential subdivisions. The type of services and options available to consumers or users of public and private services and amenities increases up the settlement hierarchy of Districts (particularly those designated Special Development Areas), and Secondary Centres, culminating with the National Centre (St. Johns) where population

density, consumer demand and mix of services will remain significantly greater than in all other settlements.

In Antigua, the population size and current economic development dynamics do not appear to favour the growth of more than one Secondary Centre to St. John's, namely All Saints. The second of the two Secondary Centres is Codrington in Barbuda. All Saints is positioned to grow into a Secondary Centre because of its central position, connection with major roads, relatively good access to public transportation, available governance, health and educational services, and room to infill or expand.

= at least 1 service/facility is the minimum require.

****= 2 or more options desirable***

***** = several options desirable/ available***

Table 5.3 Services/Facilities Suggested for Various Settlement Type

Services/Facilities	National Center	Secondary Center	District Center	Special Development Area	Village/ Subdivision
Education					
Secondary School	***	*	*		
Primary School	***	*	*	*	*
Computer Center	***	*	*	*	*
Learning Institute	***	***		*	
Day Care Center	***	***	*		*
Health					
Hospital	***	*			
Clinic	***	*	*	*	
Medical Center	***	*			

Services/Facilities	National Center	Secondary Center	District Center	Special Development Area	Village/ Subdivision
Doctor Office	***	***		*	*
Pharmacy/Drugstore	***	*		*	
Legal & Governance Services					
Court House	**	*			
Law Offices	****	*		*	
Police Station	**	*	*	*	
Fire Station	**	*	*	*	
Government office	****	***		*	
Emergency /Disaster	*				
Recreation /Amenities					
Cricket/Football Field	****	***	*	*	*
Tennis	****		*	*	
Basketball	****	***	*	*	*
Netball/Volley Ball	****	***	*	*	*
Playgrounds	****	***	*	*	*
Public Park	****	***	***	***	*
Key/Major Commercial					
Banks	****	***		*	
Shopping Center/Mall	****	*		*	

Services/Facilities	National Center	Secondary Center	District Center	Special Development Area	Village/ Subdivision
Restaurant/Bar/Club	****	***		****	*
Supermarket	****	***	*	****	
Grocery Store	****	***	*	****	*
Building Supply	****	***	*	***	
Large Store	****	***			
Professional	****	***	*	****	*
Other Small Commercial	****	****	****	****	***
Transport					
Bus Terminal	***	*	*	*	
Seaport	*			*	

Future development of this settlement should also benefit by the location of the villages of Sea View Farm, Freemans Village, Swetes, Liberta, and Buckleys within a 2.5 mile radius from its center. Codrington, on the other hand, is an automatic choice as the sole centre of government and commerce in Barbuda.

ii. Tax Concessions

Initially, government may need to provide incentives for investment in housing and commercial activities in All Saints in the form of discounts on taxes for developed properties, waivers on import duty taxes on construction material, and on taxes from corporate income. This policy could also be applied to incentivize investment in commercial and housing enterprises in Codrington, and District Centres, including those labelled as Special Development Areas. Such incentives would be granted in seeking to improve accessibility to services and housing for residents or potential residents of such areas.

iii. Land Use Policy and Standards

The right policy interventions will be required to assist Secondary Centres and District Centres with Special Development Area status in the development of emerging or planned commercial and/or mixed use zones within their boundaries. Such policies should be outlined in area plans, in which specific minimum standards to achieve agreed urban level densities will be determined for lot size, floor levels and building height, plot and site coverage, floor area ratio, building to sidewalk setback, and parking. A draft Plan for the development of the English Harbour Village Centre is currently under consideration by the National Parks Authority. Plans for other areas will be important in achieving the aims of the suggested development scenario. The scope of work for each plan should be designed to include identification and costing of physical and social infrastructure projects.

CHAPTER 6

PHYSICAL DEVELOPMENT PLAN

6.0 PHYSICAL DEVELOPMENT PLAN

6.1 Introduction

The spatial dimensions of this SIRMZP, which are formally presented in this section of the report, strive to provide a solid base for the socio-economic and physical development of Antigua and Barbuda. To this end, attention is given to each of the primary goals presented in Chapter 2: Environmental Quality, Economy and Livelihoods, Liveability, Accessibility, and Governance.

6.2 Environmental Quality

6.2.1 Ecological Integrity

The integrity of ecological systems must be given priority in all regional and national plans as all life depends on ecological services and these are most efficiently provided in well-functioning ecosystems. This is especially the case for Small Island Developing States (SIDS) where the effects of even small scale activities that inhibit the effectiveness of natural systems may lead to very costly remedial measures. Issues such as storm surges, the decline in fish stocks, ground water contamination, loss of coral reefs, fluctuations in the tourism industry and a myriad of other issues have to be dealt with by the government and in turn the residents of Antigua and Barbuda. By ensuring that ecological systems are maintained or enhanced, Antigua and Barbuda will have a solid base on which to develop its economy and liveability.

Particular attention must be given to the health of coral reefs, sea grass beds, mangrove areas, forest cover, wetlands, rivers, and other water bodies. All of these ecological components are interrelated and therefore must be treated in a comprehensive manner. As a general principle, these areas should be preserved in their natural state and not used for agriculture, intensive fishing, resource extraction, or human settlement. At the same time, many of these areas offer outstanding settings for educational and managed recreational activity such as skin diving, scuba diving, hiking, and zip lines. In this way, preserving the ecological integrity of these areas not only provides ecological services but also contributes to the economy, livelihoods, and liveability of the country.

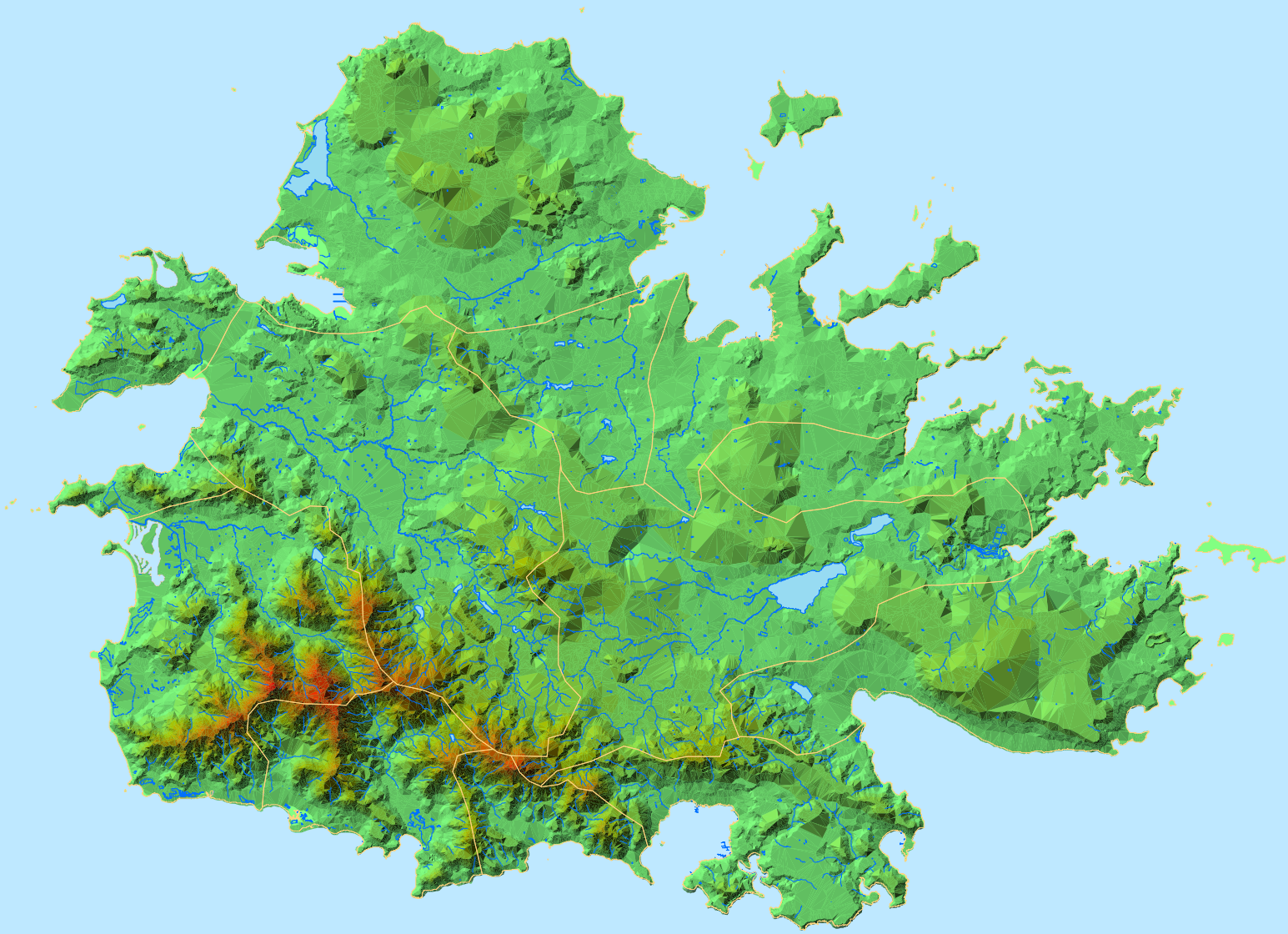
One effective way to ensure that natural systems are well managed is to use the boundaries of natural watersheds and adjacent coastal zones to serve as planning and development control units, known as “Ridge to Reef Planning Units”, as further elaborated in Section 7.2.1 of Chapter 7: Land Use Policies and Development Control Policies. This is similar to the “SIRMM Ridge to Reef Demonstration Project” strategy that the Ministry of Agriculture, Lands, Housing and Environment have put forward. Further, a “Ridge to Reef” planning approach facilitates the analysis of the downstream effects

of development projects and provides an excellent spatial framework for the installation of gravity-based infrastructure that is designed to manage drainage and provide water and sewerage services.

Figures 6.1 and 6.2 illustrate the topography, watercourses, and watersheds for Antigua and Barbuda. Unfortunately, a reliable map of the watersheds could not be produced for Barbuda as its very complex hydrological system which includes extensive low-lying flat areas with salt water intrusion, has not been sufficiently studied to clearly identify water courses and watersheds. In the case of Antigua, it is recommended that each of the watersheds be identified as a planning unit.

Existing protected areas are shown in Figures 6.3 and 6.4. As these areas have already been recognized as important biophysical and cultural environments, they have been incorporated into this Plan. Plans are also underway to declare Mount Obama National Park (MONP) and create a Wallings Forest Conservation Area (WFCA).

Another area which due to its environmental importance and should be protected is the entire island of Redonda.



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

NATURAL FEATURES

FIGURE: 6.1

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Watersheds
- Lakes/ Ponds
- Rivers

Elevation (ft)

- 0 - 100
- 100 - 200
- 200 - 300
- 300 - 400
- 400 - 500
- 500 - 600
- 600 - 700
- 700 - 800
- 800 - 900
- 900 - 1000
- 1000 - 1100
- 1100 - 1200
- 1200 - 1300

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SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

TITLE:
NATURAL FEATURES

FIGURE: **6.2**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

Contour

- Contours (ft)
- Rivers
- Inland Water
- Wetland Forest
- Lagoon

NOTES:

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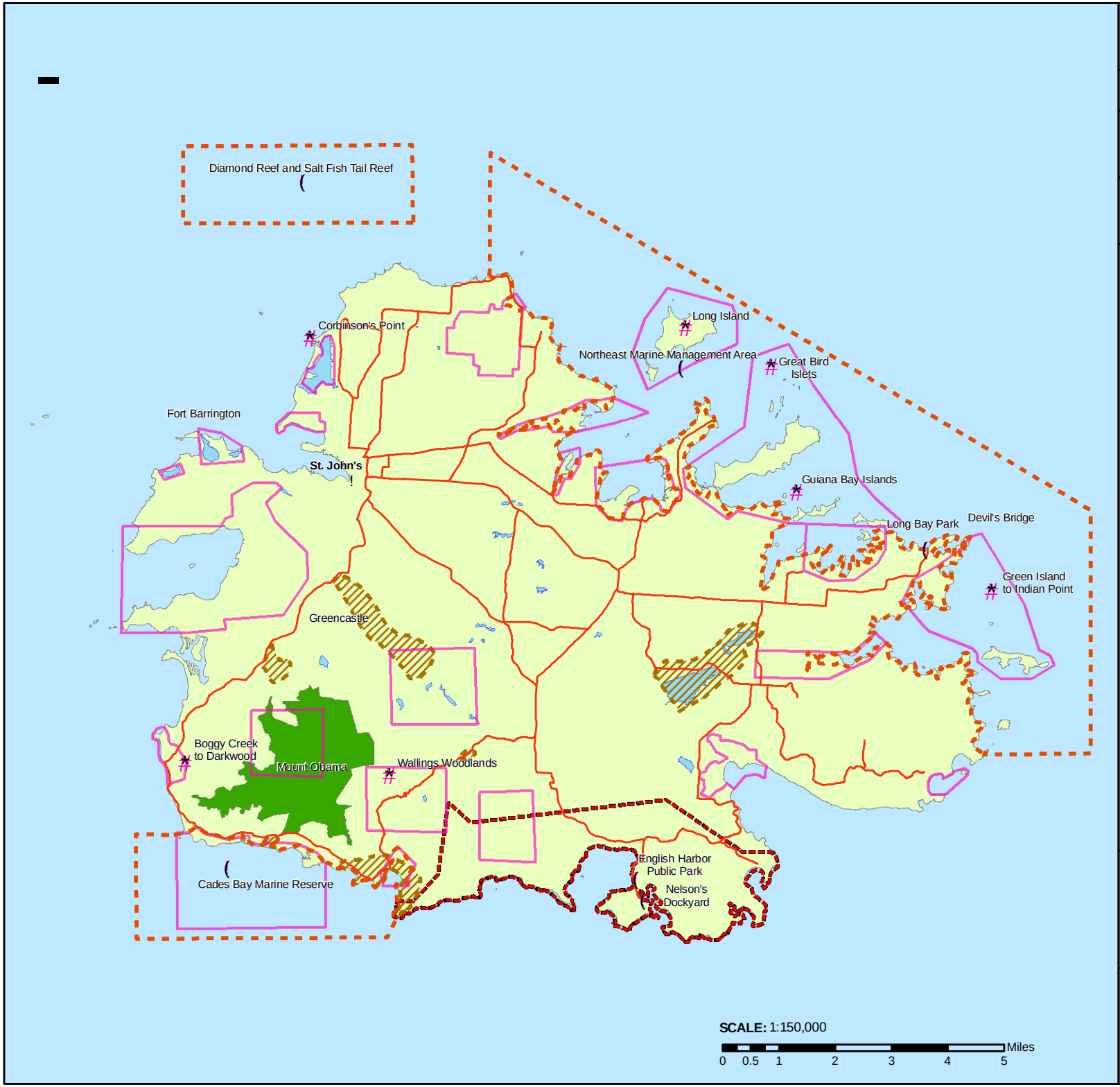

TITLE: EXISTING & PROPOSED PROTECTED AREAS

FIGURE: 6.3

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Major Roads

Proposed Protected Areas

- Proposed Protected Areas
- National Parks
- Mount Obama (Prop.)
- Lakes/ Ponds

Tropical Ecosystems Consulting, 2010

- Antigua Existing Protected Areas
- EAG Prop. Protected Areas
- Existing Protected Areas Bounds
- APUA Proposed

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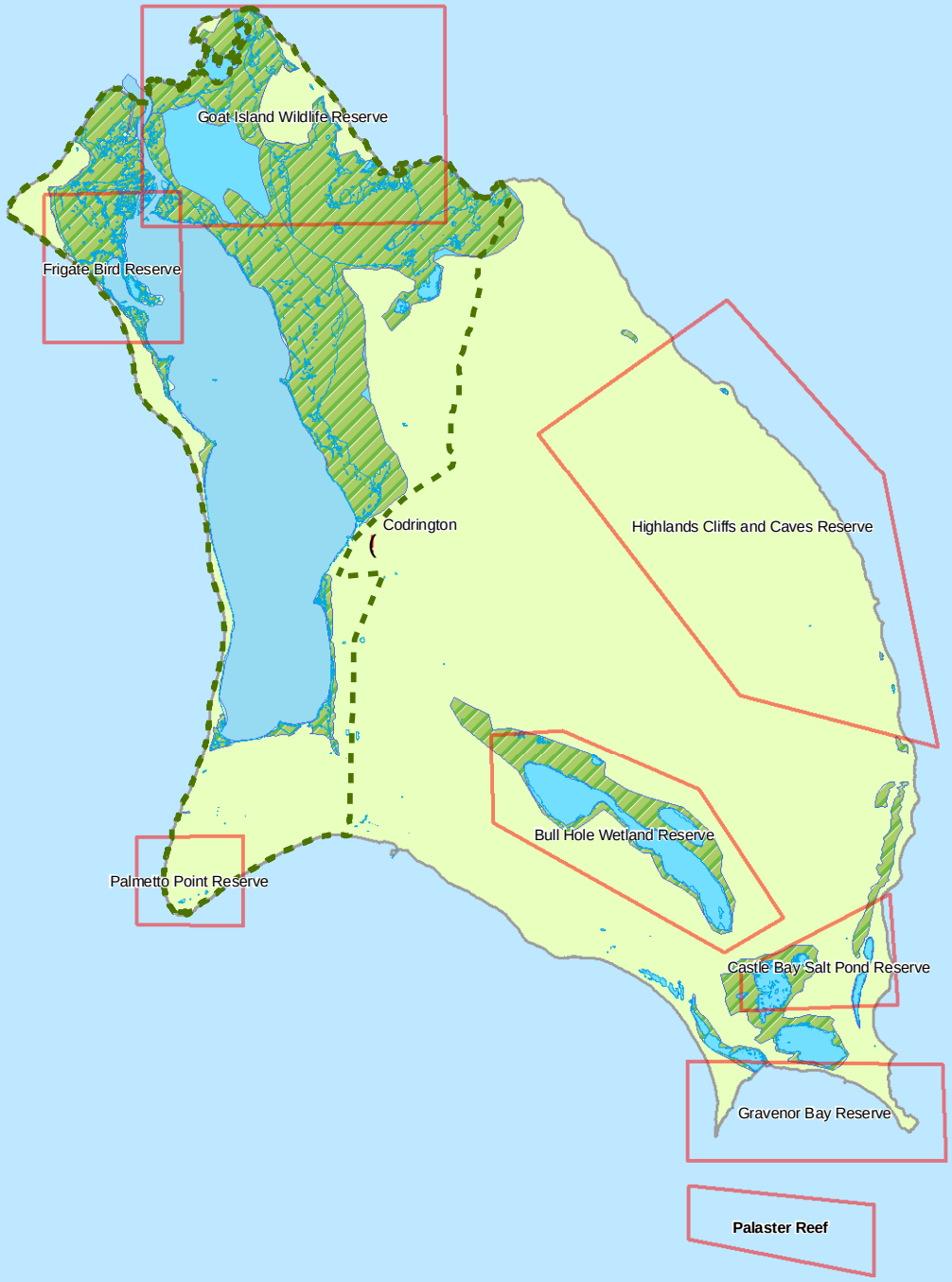

SCALE: 1:130,000

0 0.5 1 2 3 4 5 Miles

TITLE:
EXISTING PROTECTED AREAS & ENVIRONMENTAL RESERVES

FIGURE: 6.4

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- CLNP Boundary
- Proposed Protected Areas
- Rivers
- Inland Water
- Wetland Forest
- Lagoon

NOTES:

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A recent study of critical ecological areas completed by Tropical Ecosystems Consulting for the Environment Division, plus consultations with local stakeholders has resulted in the identification of areas of high bioquality that should be protected, some of which are within already designated areas, such as Nelson's Dockyard National Park. In addition, environmentally sensitive development standards are required along river courses and in mangrove, wetland, beach, sea grass and coral reef areas. The planning objectives and the decision rules used in the land use suitability are presented in Table 6.1, while the spatial limits of each component are illustrated in Figures 6.3 and 6.4.

Table 6.1 Land Use Suitability Model: Ecological Integrity

Component		Physical Planning Objective	Planning Principles
Existing protected areas.		Maintain integrity of existing protected areas.	Maintain designated natural and historic areas in accordance with the law.
Critical Environmental Areas			
1	Bioquality	Preserve ecosystem functions in areas with high bioquality.	Prohibit development in designated areas.
2	Mangrove	Conserve fringe mangrove (fisheries, sea surge protection).	Restrict development in existing mangrove areas. Require an EIA for all mangrove clearance.
3	Wetlands	Conserve wetlands.	Restrict development of wetlands. Require an EIA for all wetland development.
4	Surface fresh water bodies	Maintain quality of surface fresh water.	Restrict development within 65.6 ft (20m) of water courses and ponds to maintain natural filtration. Require submission of filtration plans prior to development approval.
5	Watersheds	Soil and water conservation.	Restrict development in higher elevations of major watersheds. Require submission of clearance and drainage plans.
6	Sea grass	Conserve sea grass beds.	Restrict marine activities in sea grass areas. Require an EIA for all marine related development projects.
7	Beaches	Maintain beach ecosystem, including turtle habitat.	Prohibit development on beaches and in adjacent marine and terrestrial areas that may affect beach ecology.
8	Reefs	Conserve coastal reefs.	Prohibit development on coastal reefs, maintain surveillance of diving activities.

6.2.2 Environmental Risk

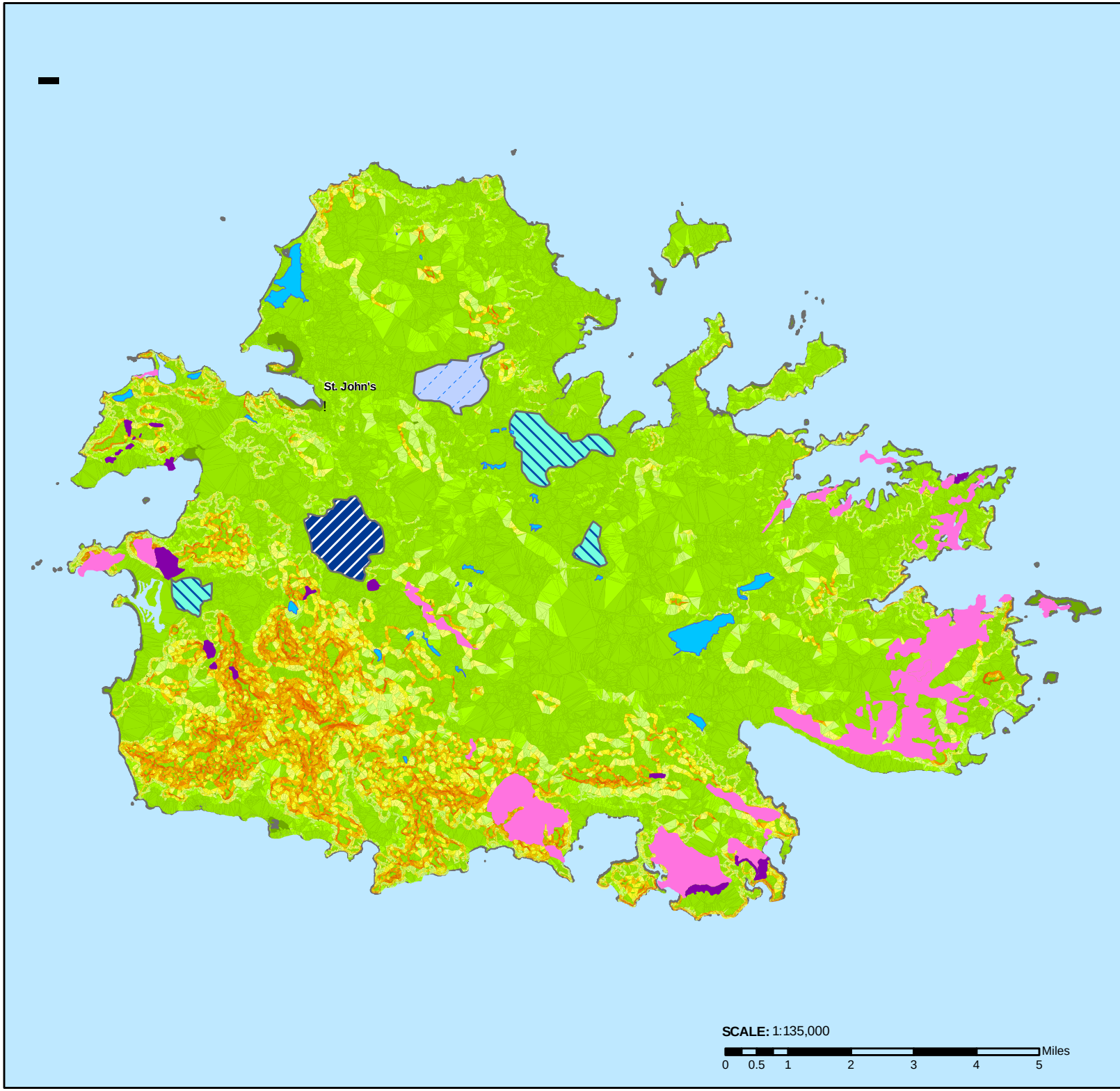
The degree of risk associated with development projects depends on several factors including excessive slopes, erosion propensity, flooding, exposure to hurricanes and low elevations which may be subject to storm surges or rising sea level. These conditions are presented in Table 6.2 and illustrated in Figure 6.5.

In general, development should be prohibited on low-lying areas, excessive slopes, and areas prone to a high degree or risk of erosion or flooding. However, in some cases development in these areas may be acceptable providing proper design measures are implemented. Consequently, some flexibility in the development approval process that takes into consideration the specific plans submitted for approval is required.

With the exception of the prohibition of development on areas that are less than 9.8 ft (3m) above sea level, the environmental risk areas illustrated in Figure 6.5 are not exclusive zones within the SIRMZP. Rather, they pose additional constraints regardless of the zone within which they fall and these risks must be addressed in the plans prepared.

Table 6.2 Land Use Suitability Model: Environmental Risk

Component		Physical Planning Objective	Planning Principles
1	Slope	Minimize risk of land slippage.	Restrict development on slopes greater than 20%.
2	Elevation	Minimize risk of damage due to sea surge over next 100 years.	Prohibit development on lands less than 9.8ft (3m) elevation.
3	Erosion risk	Minimize risk of erosion.	Restrict development in areas with erosion risk greater than 3 on soil map.
4	Flooding	Minimize risk of flooding.	Restrict development within areas subject to frequent flooding. Require comprehensive drainage plan that is fully consistent with drainage plan for the local watershed.
5	Hurricane risk (buildings)	Minimize damage from hurricanes.	Hurricane resistant building guidelines should be applied throughout country. Special attention to sea front properties on the east coast.
6	Hurricane risk (natural area)	Minimize damage from hurricanes.	Restrict development in natural areas prone to hurricanes.
7	Climate change	Climate change adaptation.	Building setback from beaches, coastlines, minimum ground floor elevation.



TITLE: ENVIRONMENTAL RISK & AREAS

FIGURE: 6.5

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Lakes/Ponds

Flood Risk (Hazard Rank)

- Moderate
- High
- Very high

Risk of Erosion

- High
- Very High

Slope (%)

- 0.00 - 10.00
- 10.00 - 20.00
- 20.02 - 30.00
- 30.02 - 40.00
- 40.03 - 50.00
- 50.00 - 60.00
- 60.15 - 70.00
- 70.08 - 80.00
- 90.00 - 100.00

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6.2.3 Environmental Resources

Antigua and Barbuda have very significant marine and terrestrial environmental resources that sustained the early settlements of indigenous peoples and played a central role in the economy during the colonial period. These resources include: beaches, agricultural and grazing lands, fishing grounds, and quarries. In addition, there are many historical buildings and sites that offer a cultural resource that is vital to the local community and are of great interest to tourists. However, many terrestrial environmental resources are currently under threat from haphazard, low-density development projects that have created sprawl and fragmented good quality agricultural lands, rendered beaches vulnerable to storm surges, and degraded the landscape. Similarly, pollution and over-fishing have affected the viability of the fishing industry and the quality of the coral reefs.

While all of these issues require attention, this SIRMZP gives special consideration to the protection agricultural lands as this sector is critical to the food self-sufficiency of the country and, with appropriate management and production policies, may greatly contribute to the local economy, provide employment, and reduce the substantial trade imbalance concerning food stocks. As the government owns a substantial amount of the Class II and III agricultural lands it is possible to achieve remarkable progress over a relatively short course of time. It is proposed that virtually all large plots of contiguous government land that are located within a Class II or III zone be dedicated to agriculture. Similarly, large tracts of government land that are located within Class IV or V zones should be dedicated to grazing. In addition, private land holdings that are currently cultivated or are within Class II or III zones should be earmarked for agriculture.

Agricultural and grazing land that is presently owned by the Government may be effectively used to ensure that:

1. Sufficient food is produced for the local population.
2. Fresh fruits, vegetables, and speciality foods that are in demand by the tourism industry are produced in sufficient quality and quantity to serve a large proportion of that market.
3. Niche agricultural products that are targeted to the international market are developed.

All of this will require a ramping up of the capacity of experimental farms and careful attention to all phases of the food cycle including production, processing, marketing, delivering, and composting. All participants in the food cycle process should be encouraged to consider their activity as an integral part of the overall process. This integrated approach to agriculture should be reinforced in public schools.

The policy may be implemented by directly employing farmers and developing state production facilities. Alternatively, land could be leased to individual farmers who agree to participate in farming cooperatives that target particular food objectives. To ensure that the land continues to serve the country's agricultural needs over the

long term, it is important that no privately-owned structures are erected on the land, whether or not it is leased.

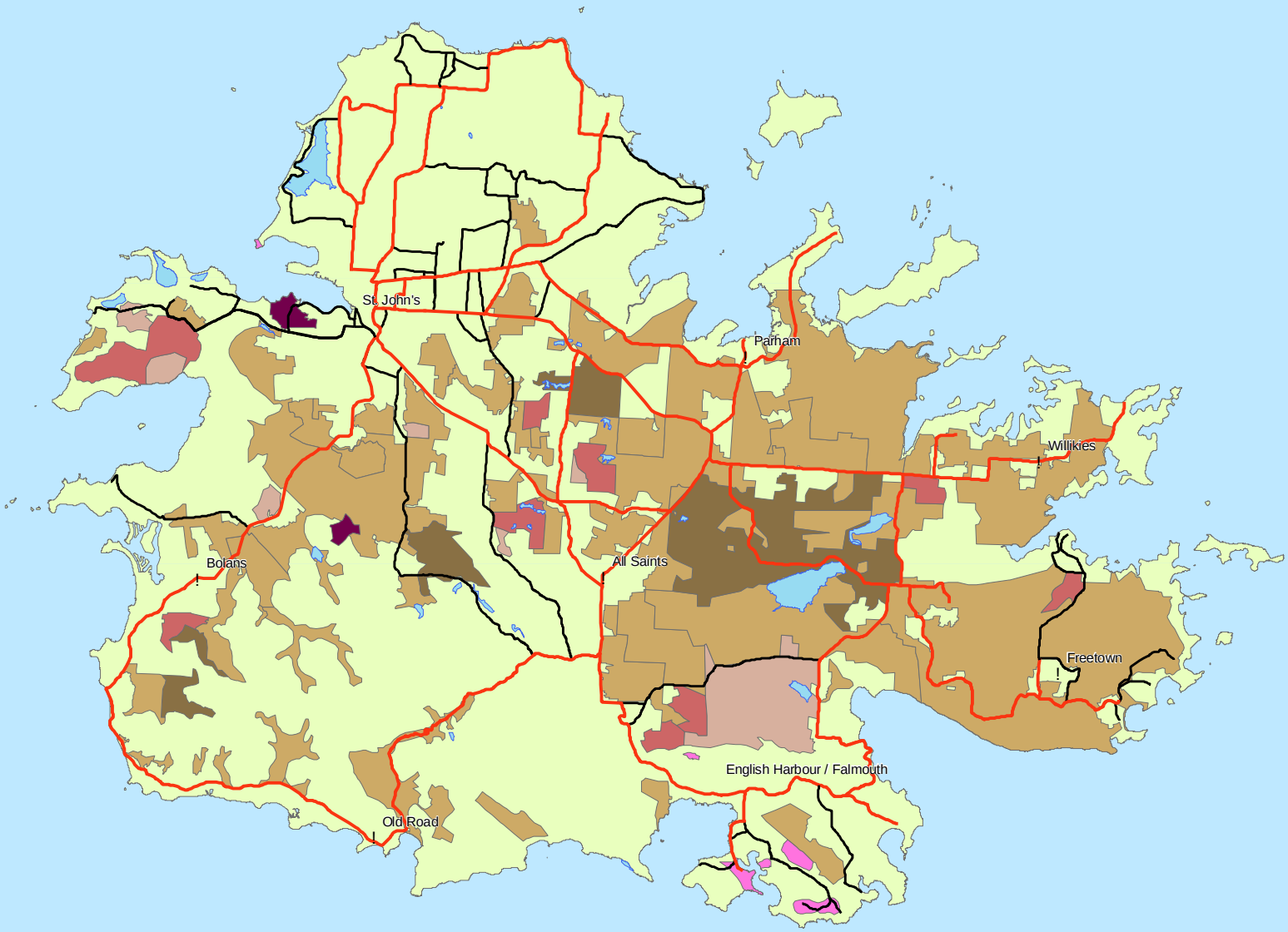
The limited amount of cultivable land in Barbuda coupled with salt water intrusion in many areas renders a similar agricultural policy impractical. However, fishing is a key component of the local economy and provides a livelihood to many residents. The recent construction of a fish processing and packing plant is indicative of the resolve that should be maintained to ensure that fish stocks are considered a critical environmental resource. Further, the relatively small population, which is largely concentrated in Codrington, coupled with the public ownership of the entire island, offers significant opportunities to capitalize on ecological resources that are of great interest to the tourism industry. These need to be carefully managed to ensure their long-term viability.

The physical planning implications of a comprehensive environmental resource policy are outlined in Table 6.3 while the spatial extent of the lands to be dedicated to these purposes is represented in Figures 6.6 and 6.7.

Table 6.3 Land Use Suitability Model: Environmental Resources

Component		Physical Planning Objective	Planning Principles
1	Beaches	Maintain ecological function, aesthetics, comfort, public access.	Prohibit development in beach areas, maintain public access, and provide facilities.
2	Agriculture (private)	Encourage agriculture on high quality lands.	Restrict use on Class II and III lands.
3	Agriculture (public)	Promote food security and competitive food production and processing.	Initiate national farm programmes on Class II or III agricultural lands that are Crown Lands.
4	Grazing	Encourage grazing in suitable areas, minimize environmental damage.	Restrict grazing to class 4&5 lands, require fencing. Provide grazing areas in designated and managed areas of Crown Land.
5	Fishing	Maintain productive fishing industry.	Restrict use of fishing grounds. The EAG also recommended that fishing sites that exist within protected areas should be zoned with areas clearly demarcated where fishing is allowed as well as the identification of specific fishing seasons

Component		Physical Planning Objective	Planning Principles
6	Quarrying	Minimize disruption (noise, dust) & damage to views.	Locate quarries and other resource extractive industries away from settlements, scenic areas, require management plan. If all these principles cannot be met, a requirement must be to ensure any resulting potential health effects are minimised.
7	Sand mining	Minimize environmental damage.	Regulate sand mining; require EIAs and a management plan.
8	Historical, cultural landmarks, sites	Maintain significant historical & cultural landmarks and sites.	Restrict development of designated buildings and sites, maintain views of the sea (obtain map of designated building, areas).



TITLE:
ENVIRONMETAL RESOURCE AREAS

FIGURE: 6.6

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Major Roads
- Secondary Roads

Environment Resources

- Agriculture
- Agriculture Crown
- Grazing
- Grazing Crown
- Heritage
- Resource Extraction
- Water

NOTES:

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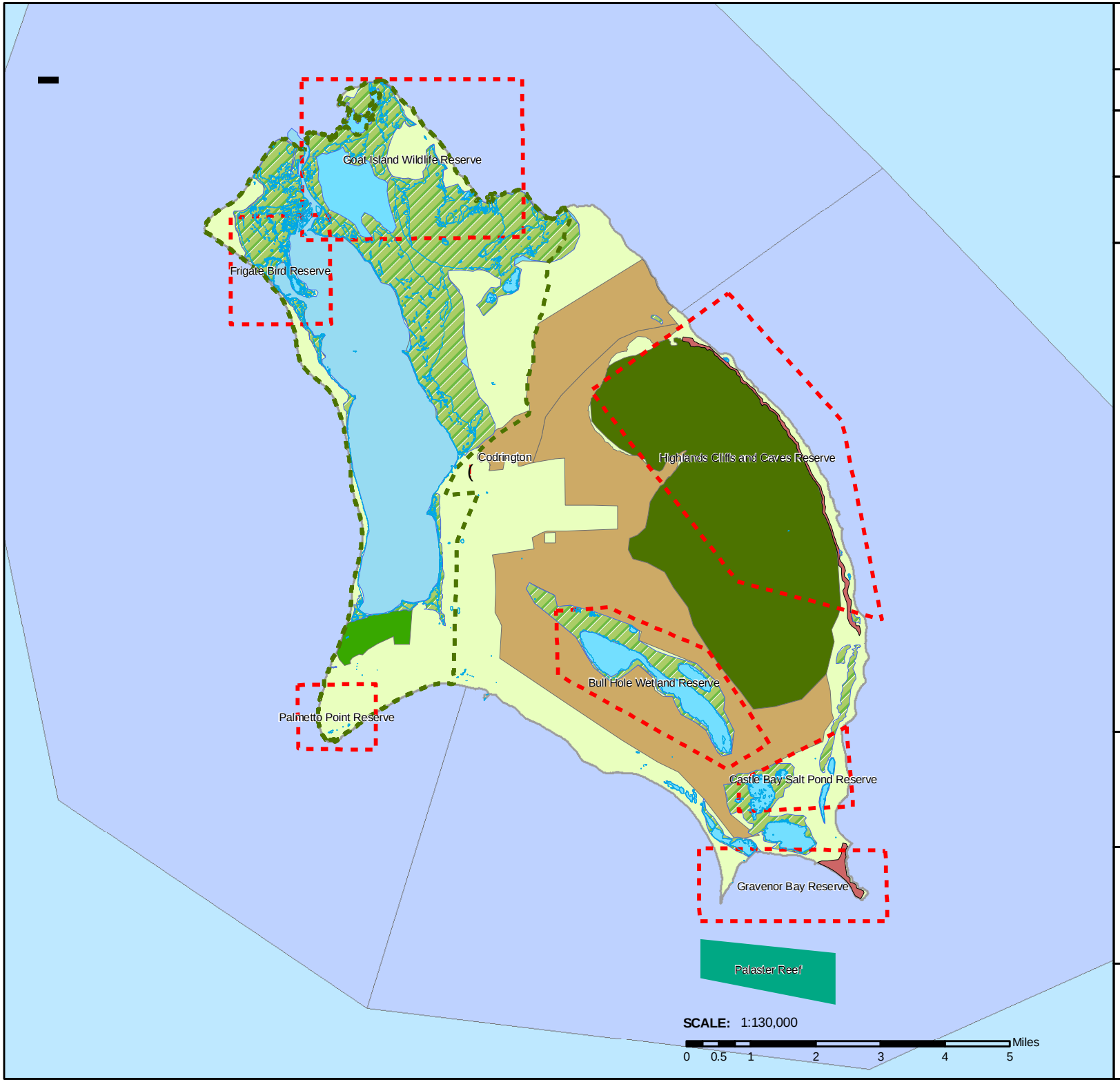
SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles



TITLE:
ENVIRONMENTAL RESOURCE AREAS

FIGURE: 6.7

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Rivers
- CLNP Boundary
- Protected Area Reserves
- Inland_Water
- Wetland Forest
- Lagoon
- Agriculture
- Algal Community (Frigate Bird)
- Coral Outcrops
- Escarpment Cliff
- Woodland Reserve
- Highlands Woodland
- Palaster Reef
- Inland Mangroves
- Marine Protected Areas

NOTES:

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6.3 Economy and Livelihoods

6.3.1 Tourism

In recent years, tourism has become the primary economic motor for Antigua and Barbuda. Consequently, it is important that the country be positioned to respond to international tourism market opportunities as they evolve over time. This has been accomplished in the SIRMZP by designating tourism zones that are especially attractive for different tourism-related activities. While tourism in one form or another essentially takes place over most of the islands, it is advantageous for the industry if there are discrete zones that are specifically targeted.

All-inclusive resort hotels essentially privatize a tract of land that most often is contiguous with a beach, outstanding sea views or a recreational facility such as a private golf course. In Antigua, these resorts are very prominent along Dickenson's Bay and Jolly Harbour, although there are many individual resorts on the west and southwest coasts. Barbuda has only three (3) such resorts, Coco Point Lodge, Lighthouse Bay Resort and North Beach.

The maximum area of land that is effectively privatized by a resort hotel should be limited to less than 50 acres (20 ha), or approximately the area occupied by the Jolly Beach Resort. Further, public access to the beach should be provided at intervals not exceeding 0.6 mile (1 km). These guidelines should be used for all future projects and to evaluate any redevelopment proposals for existing projects, such as the K-Club in Barbuda or the Mill Reef Club in Antigua.

Provision has been made to continue the cruise ship facility in its present location as it is ideally situated with respect to the shopping and tourism opportunities in St. John's. An urban design plan for the adjacent shopping area of St. John's, however, should be developed to improve its integration within the Central Business District and most especially the pedestrian environment. It is critical that "Universal design", which ensures that all people, including those with mobility restrictions or wheeling baby carriages have full access to public space, should be used throughout.

Ecotourism, which promotes a form of tourism that is respectful of the local biophysical, social, cultural environment, may be conducted throughout both islands. Nonetheless, it must be carefully managed in ecologically sensitive areas.

Villas and cottages may also occur in any designated tourist or settlement zone. Groups of villas or cottages that are located in an exclusive "gated community" should be located in designated areas and their total contiguous land area that is not available to the public should not exceed 50 acres (20 ha).

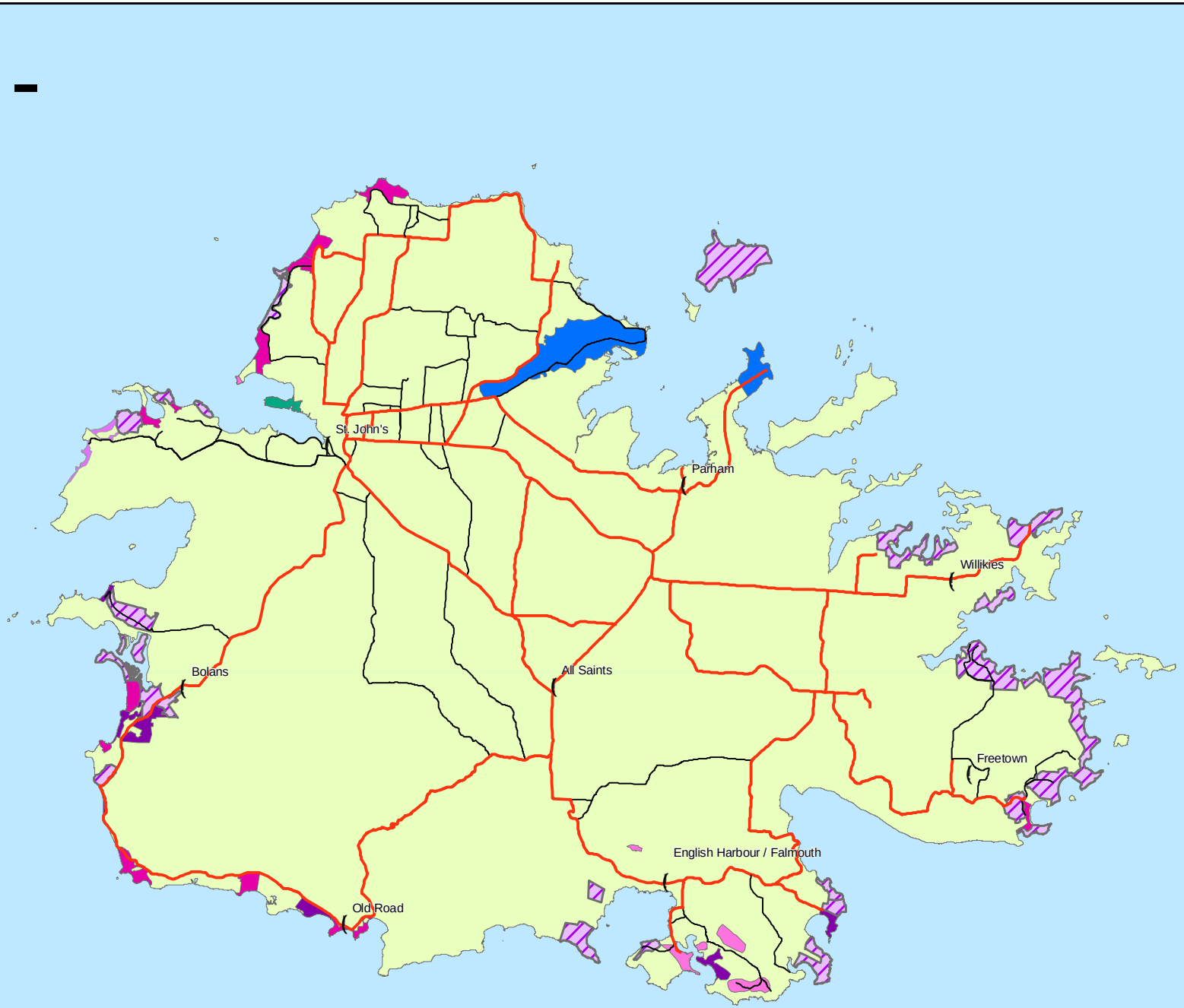
Falmouth and English Harbour have emerged as a major international yachting destination. This area should be officially designated as a yachting centre with provision made for supporting services and industries. The Plan also proposes the creation of an

attractive yachting facility in Barbuda near to the present seaport with appropriate commercial and tourist facilities along the shore.

Sailing Week and Carnival are two (2) examples of very successful, special annual events that attract great interest from international visitors and locals alike. Plans that take into consideration meeting venues, routes, guest accommodation, and special service requirements are required to ensure that these events run smoothly.

Table 6.4 Land Use Suitability Model: Tourism

Component		Physical Planning Objective	Planning Principles
1	Resort hotels (sea, sand, sun)	Provide competitive opportunities for resort hotels.	Designate intensive tourism zones (max 20h). Ensure adequate public access to facilities and beaches (min 1km interval).
2	Cruise ships	Maximize return from cruise ship visitors.	Provide agreeable walking environment with shops in harbour, day trips to sites. Improve integration between St. John's CBD and the cruise ship terminal.
3	Ecotourism	Ensure that tourism throughout most of islands is sustainable.	Enhance walking trails, marine tours, enlist community support in maintaining trails and providing explanations.
4	Villas, cottages	Encourage development of resident owned villas and cottages.	Facilitate property inspection, rating, and listing.
5	Activity based: Yachting	Encourage activities and industries relating to yachting.	Designate Falmouth region as a yachting centre, encourage related services and industries.
6	Special event based: Carnival, Sailing Week	Encourage special events.	Identify key special events; prepare event regulations that allow appropriate use of space.



TITLE:
MAJOR TOURISM FACILITIES

FIGURE: **6.8**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Major Roads
- Secondary Roads

Environment Resources

Land Use

- Airport
- Cruise Ship Facility
- Heritage/ Historic
- Ports & Marinas
- Resort Hotel
- Shopping Multiplex
- Tourism Activity Area
- Villas & Cottages

NOTES:

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TITLE:
MAJOR TOURISM FACILITIES

FIGURE: 6.9

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Primary Road
- Secondary Roads
- Inland_Water
- Wetland Forest
- Lagoon
- Airport
- Ports and Marinas
- Resort Hotels
- Tourism Activity Area

NOTES:

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SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

6.3.2 Retail, Services, and Industry

The spatial requirements for retail, service, and industrial land use activities are presented in Table 6.5 and illustrated in Figures 6.10 and 6.11.

Convenience goods and services should be readily accessible in towns and villages throughout the country. Consequently, small stores that sell convenience items and do not generate excessive traffic or parking requirements should be permitted within residential areas. Major or specialized purchases and services should be made available at stores located within the core areas of settlements or shopping centres. Major tourist centres should have convenience goods, as well as, local arts and crafts nearby.

Specialized trades, such as those relating to yachting, should be permitted to operate in designated zones in close proximity to the clientele they serve. In particular, such areas should be designated in the Jolly Harbour and Falmouth Harbour areas. The development of such services within residential areas should be discouraged.

Government services should be available in the core areas of settlements. The range of services made available should depend on the level of that settlement within the overall settlement hierarchy identified in Section 5.

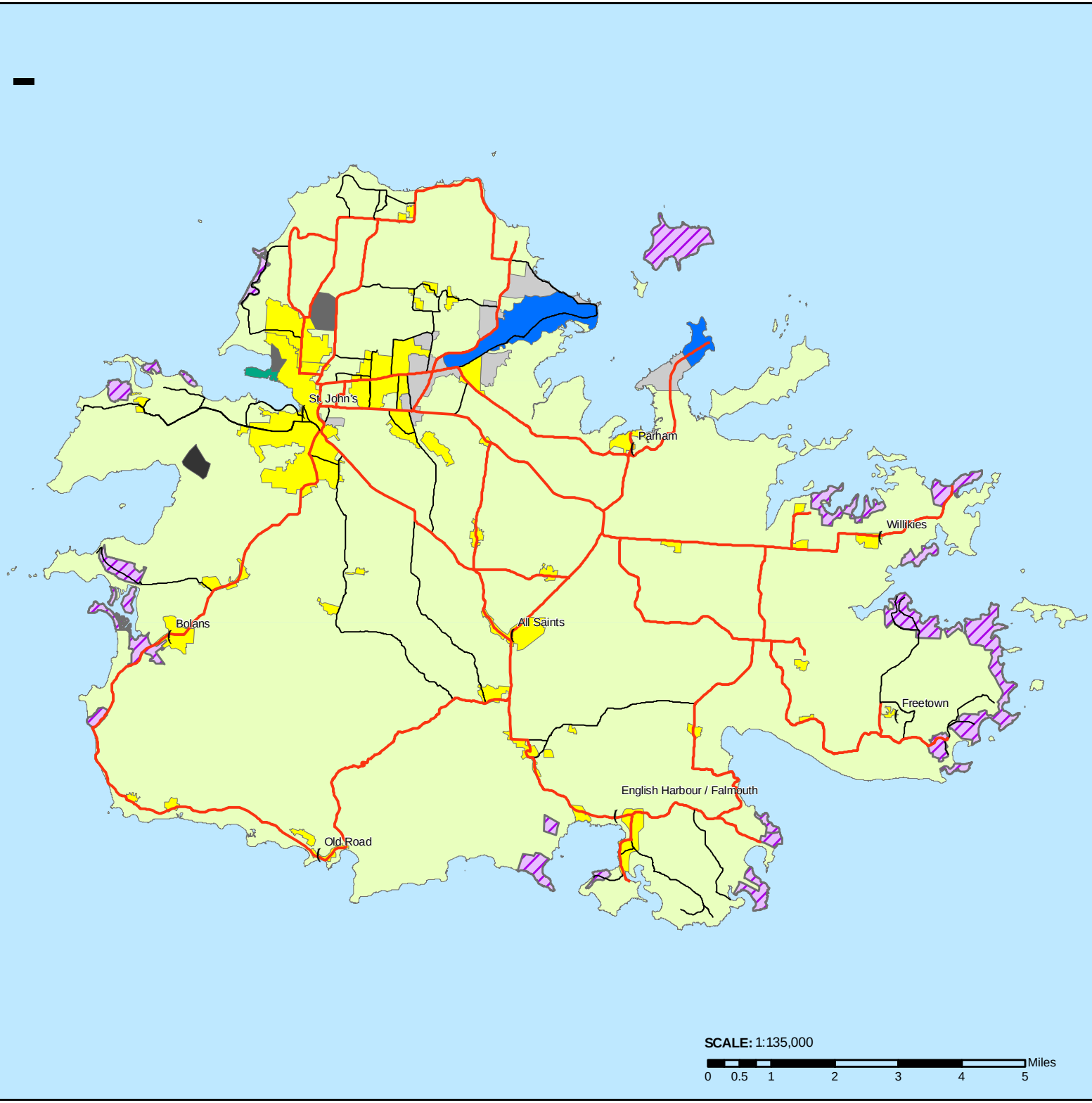
Resource-based industries generally require facilities in close proximity to key nodes such as fishing ports, quarries and agricultural fields. These needs should be accommodated to the extent that the activities associated with the facilities do not have adverse impacts on settlement areas.

Proximity to the airport, port, and road network should be a key consideration in the designation of sites for warehousing and manufacturing activities.

Table 6.5 Land Use Suitability Model: Retail, Services and Industry

Component		Physical Planning Objective	Planning Principles
Retail			
1	Tourist related	Promote international retail at convenient locations for tourists.	Designate tourist shopping areas in St. John's and Jolly Harbour.
2	Convenience goods	Minimize transportation demand, maximize convenience.	Designate convenience shopping areas within or near all communities.
3	Major purchases	Promote shopping streets and areas.	Designate shopping centre locations.
Services			
1	Personal	Minimize transportation demand, maximize convenience.	Permit personal services in individual dwellings providing the nature, and intensity of the services do not conflict with residential uses. Locate larger scale services in commercial areas.
2	Trade (e.g. yachting)	Ensure associated services are available in proximity to special activity areas	Permit trade services in individual dwellings providing the nature, and intensity of the services do not conflict with residential uses. Locate larger scale services in commercial areas.
3	Professional	Ensure professional services are located in appropriate areas.	Permit professional services in individual dwellings providing the nature, and intensity of the services do not conflict with residential uses. Locate larger scale services in commercial areas.
4	Government	Ensure that regular administrative services are readily accessible.	Decentralize government services to regional centres.

Component		Physical Planning Objective	Planning Principles
Industry, Warehousing			
1	Warehousing	Minimize transportation demand and land use conflicts.	Designate warehousing areas around the airport, port, Jolly Harbour and Falmouth Harbour. Ensure good access to road network and minimal visual, sound, or contamination in non industrial areas.
2	Resource-based (agriculture, fisheries)	Ensure adequate processing facilities are in close proximity to resource-based industries.	Permit storage and processing facilities associated with resource-based industries to be located in close proximity to related activities providing the nature and intensity of these activities does not create land use conflicts.
3	Manufacturing	Minimize land use conflicts; maximize proximity to related industries and services.	Restrict manufacturing activities to industrial parks near the port, airport, and highway system.



TITLE:
RETAIL SERVICES & INDUSTRIES

FIGURE: **6.10**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Major Roads
- Secondary Roads

Retail Services & Industries

- Airport
- Compact Settlement
- Heavy Industrial
- Landfill
- Light Industrial
- Ports & Marinas
- Villas & Cottages

NOTES:

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SOURCES OF INFORMATION

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TITLE:
RETAIL SERVICES & INDUSTRIES

FIGURE: **6.11**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Primary Road
- Secondary Roads

Retail Services & Industries

- Airport
- Core Mixed Use
- Landfill
- Light Industrial
- Ports and Marinas
- Inland Water
- Wetland Forest
- Lagoon

NOTES:

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SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

6.4 Liveability

The liveability of an environment is clearly a key consideration in any development plan. Settlements should provide a healthy, safe, and convenient environment for all of society. In addition, functional and aesthetic considerations such as the landscape settings and urban design affect the convenience, pleasure and sense of belonging of individual residents.

This SIRMZP encourages the designation of core and expansion settlement areas. While taken into consideration in both cases, mixed use and density would be greater in core settlement areas. The intent is to offer choice in housing type and density while ensuring that residents have the services they need within an attractive environment.

All settlement areas should be located in areas that may be readily supplied with water, sewerage, sanitary and electrical and communication services. Further, larger settlements with the greatest expansion areas should be strategically located to facilitate access to government and commercial services throughout the country.

Recent subdivisions that are not well located with respect to service provision should be relocated if possible. This is relatively straightforward in instances where buildings have not been erected. No new subdivisions should be approved outside of the settlement expansion areas. Within these areas, development should be staged to ensure that services can be efficiently and economically provided.

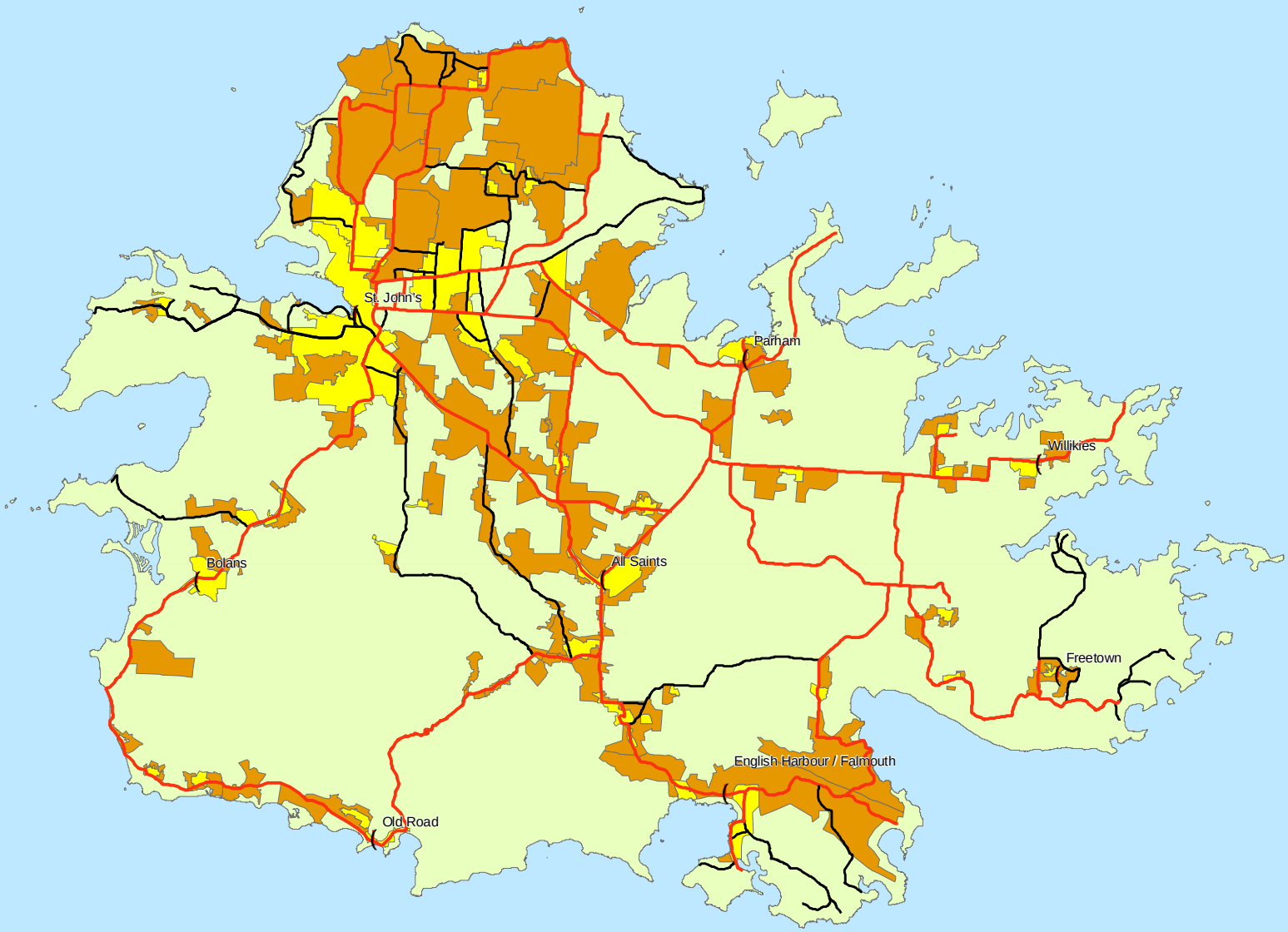
Table 6.6 indicates some of the key planning principles that should be applied when locating and building cohesive settlements. Some of these principles are embedded in the zoning guidelines prepared for this SIRMZP. Others are intended to guide the preparation of local plans and the review of development applications. The areas designated as core and expansion settlement zones are illustrated in Figure 6.12.

Table 6.6 Land Use Suitability Model: Liveability

Component		Physical Planning Objective	Planning Principles
Vitality			
1	Water supply	Ensure adequate water supply.	Piped in-house drinking water should be available within all designated settlements. In rural areas, wells may be used. Rainwater should be collected for purposes other than drinking.
2	Sewerage	Ensure proper sewerage treatment.	All core settlement areas should be serviced with a sewerage system. Septic tanks and composting toilets may be used in settlement expansion, rural, and resort areas.
3	Sanitation	Ensure adequate treatment of solid, liquid, and toxic wastes.	All wastes should be directed toward an appropriate disposal site. Recycling and composting should be encouraged.
4	Safety	Ensure adequate safety with respect to transportation and buildings.	Sidewalks should be provided in core settlement areas. Signage and signalization along the road network should be clear and appropriate. Building codes must be followed for new and renovated construction.
5	Crime	Minimize risk of crime.	Urban design measures should ensure that there are "eyes on the road", visual clarity, and adequate lighting in settlements. Neighbourhood watch programmes should be encouraged.
Function			
1	Walking environment	Encourage pedestrian and other active transportation modes.	Provide sidewalks in core settlement areas no less than 5'0" wide[32]. Encourage mixed use development.
2	Community services	Ensure that community services are accessible.	Ensure that local plans include provision for the full range of community services.

[32] OECS Building Code – Antigua and Barbuda

Component		Physical Planning Objective	Planning Principles
3	Public space	Encourage a sense of community.	Provide well maintained public spaces within core settlement areas.
4	Accessibility	Minimize the transportation demand.	Promote proximity planning with mixed use and different density levels within settlements.
Attractiveness			
1	Landscape setting	Preserve and enhance quality of the landscape	Consider view corridors in designating settlement areas and individual land use activities.
2	Entrances	Ensure entrances to settlements are attractive	Review signage. Encourage distinctive signs for each settlement and parish.
3	City and village centres	Attract residents to core settlement areas.	Provide public space with street furniture.
4	Distinctive	Encourage a sense of community.	Ensure distinctive signage, architecture, and urban form that relates to the surrounding landscape and cultural history of the settlement.



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

LIVEABILITY

FIGURE: 6.12

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Major Roads
- Secondary Roads
- Compact Settlement
- Settlement Expansion Area

NOTES:

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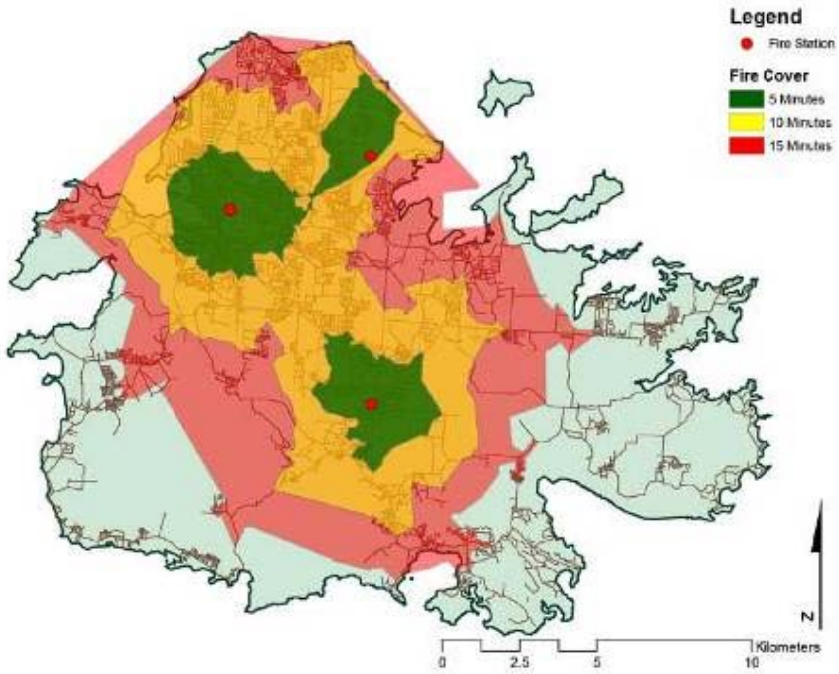
6.5 Accessibility

Accessibility refers to the relative ease of linking trips between origins and destinations. It differs from mobility in that it focuses on the feasibility of completing these links in terms of time or some other measure, rather than the fluidity of traffic along a roadway. With proximity planning, for example, it is possible to provide children an easy and pleasant walk to school rather than relying on transport via bus or car. In this way, accessibility is also an important component of liveability. In addition, accessibility planning reduces congestion and minimizes pollution, thereby having beneficial effects for both the economy and the environment.

As both Antigua and Barbuda are relatively small islands, travel times between most origins and destinations are not excessive under normal conditions. While the condition of most roads are good in Antigua, the fact that the main roads go through large settlements and the presence of ribbon development along the roadways greatly increase travel times. Further, the road network is incomplete in the southeast and southwest. The construction of bypasses for major settlements with ribbon development and the construction of additional key links would resolve this situation.

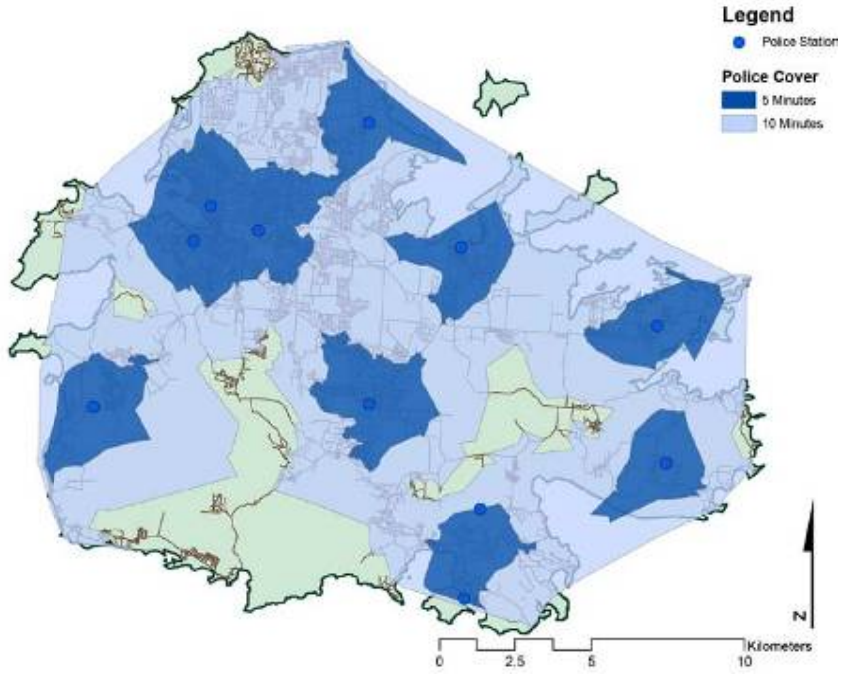
Figures 6.13 and 6.14, for example, illustrate the theoretical 5, 10 and 15 minute response times for fire and police vehicles respectively with the assumption that the average speeds on main, secondary, and tertiary roads are 25, 19 and 16 mph (40, 30 and 25 km/h) respectively. This simulation does not take into consideration delays due to traffic lights or village centres.

Figure 6.13 Fire Response Times for Antigua



Source: Shah, Yousaf, Course Assignment, School of Urban Planning, McGill University, 2011

Figure 6.14 Police Response Times for Antigua



Source: Shah, Yousaf, Course Assignment, School of Urban Planning, McGill University, 2011

The above figures clearly indicate the need for one or more additional fire stations, as well as improvements to the effectiveness of the road network to ensure the entire island is adequately covered.

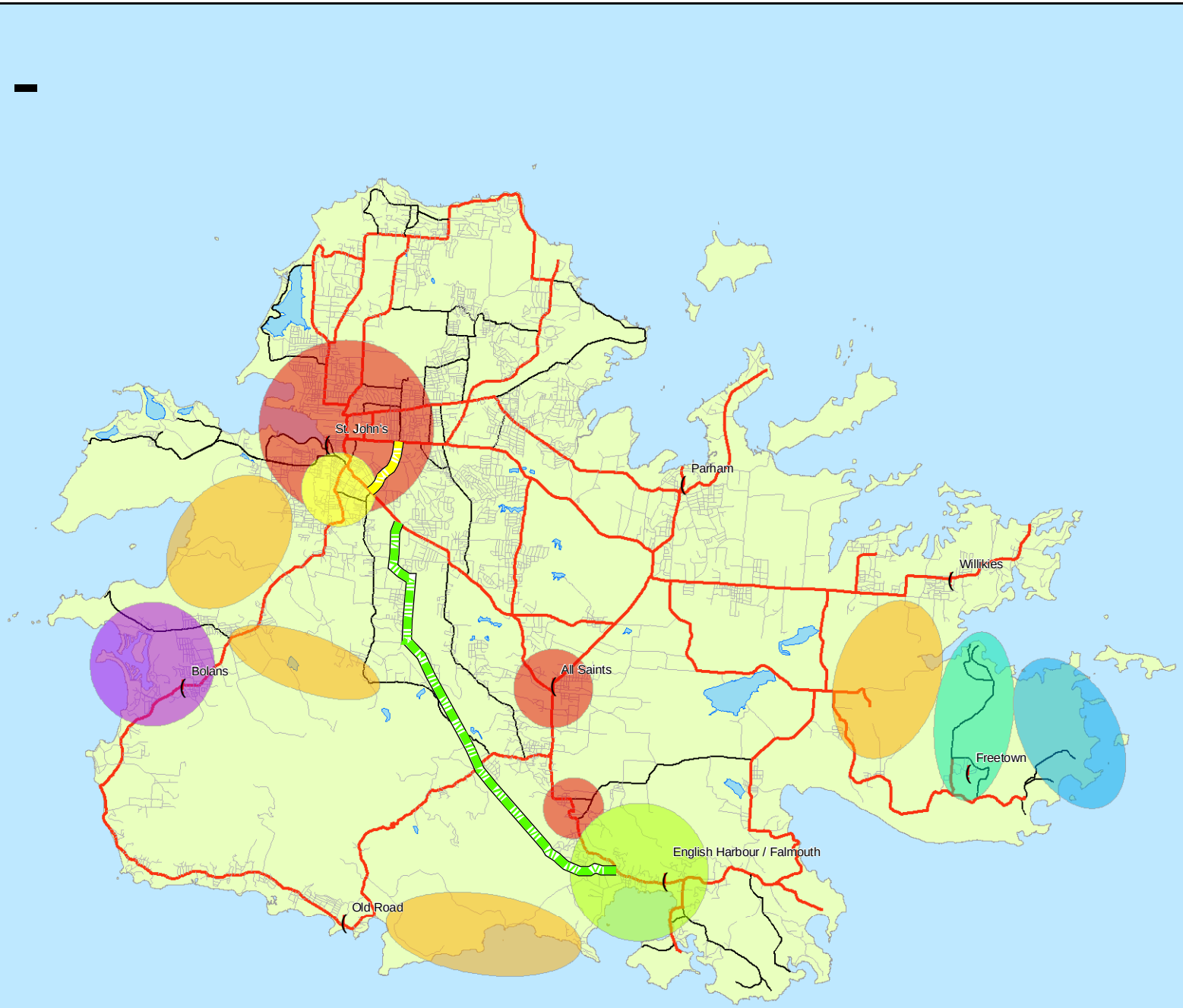
As the vast majority of Barbudan residents live in Codrington and most are in close proximity to the services they require. Here the problem is more to do with the condition of roads in the countryside and the absence of proper infrastructure at the ferry and cargo port.

Table 6.7 presents accessibility planning principles while Figure 6.15 illustrates specific areas in the road network that should be improved. The SIRMZP takes into consideration the spatial aspects of these issues via proximity planning. It however, needs to be accompanied by a review of the effectiveness of the public transportation system.

Table 6.7 Land Use Suitability Model: Accessibility

Component		Physical Planning Objective	Planning Principles
Proximity Planning			
1	Housing	Enhance accessibility within and between communities.	Provide a range of housing types and densities within settlements.
2	Shops	Enhance accessibility to shops.	Encourage mixed use developments.
3	Community facilities	Enhance accessibility to community facilities.	Encourage mixed use developments.
Public Transportation			
1	Bus stops	Ensure ready access to public transportation.	Provide bus stops along arterial roadways in settlements every 400 meters.
2	Routing	Ensure that public transportation routes are effectively used.	Ensure that major origin and destination points may be reached efficiently.
3	Taxi service	Ensure that taxi service is available.	Provide taxi stand areas within settlements.
Private Automobile			
1	Mobility	Minimize congestion.	Reduce ribbon development. Enhance the functionality of the road network and signalization. Provide bypasses to major settlements.
2	Parking	Ensure adequate parking	Provide off-street parking in residential areas along arterials and in proximity to major destinations. Prohibit parking along highways. Meter parking in urban areas.
Goods Transport			
1	Airport	Ensure efficient shipment of goods.	Provide warehousing facilities in close proximity to air and sea ports and with easy accessibility to the roadway network.

Component		Physical Planning Objective	Planning Principles
2	Cargo port	Ensure efficient shipment of goods.	Provide warehousing facilities in close proximity to air and sea ports and with easy accessibility to the roadway network.
3	Industrial production	Ensure efficient shipment of goods.	Provide warehousing facilities in close proximity to air and sea ports and with easy accessibility to the roadway network.
4	Warehousing	Ensure efficient shipment of goods.	Provide warehousing facilities in close proximity to air and sea ports and with easy accessibility to the roadway network.



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

ACCESSIBILITY

FIGURE: 6.15

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Primary Roads
- Secondary Roads
- Tertiary Roads

ByPass

- By Pass 1
- By Pass 2

Accessibility

- Congestion
- Incomplete Network
- Inefficient Network
- Unstructured Hillside Roads
- Poor Road Condition
- No Public Access
- Poor Fire Service
- Lakes/Ponds

NOTE:

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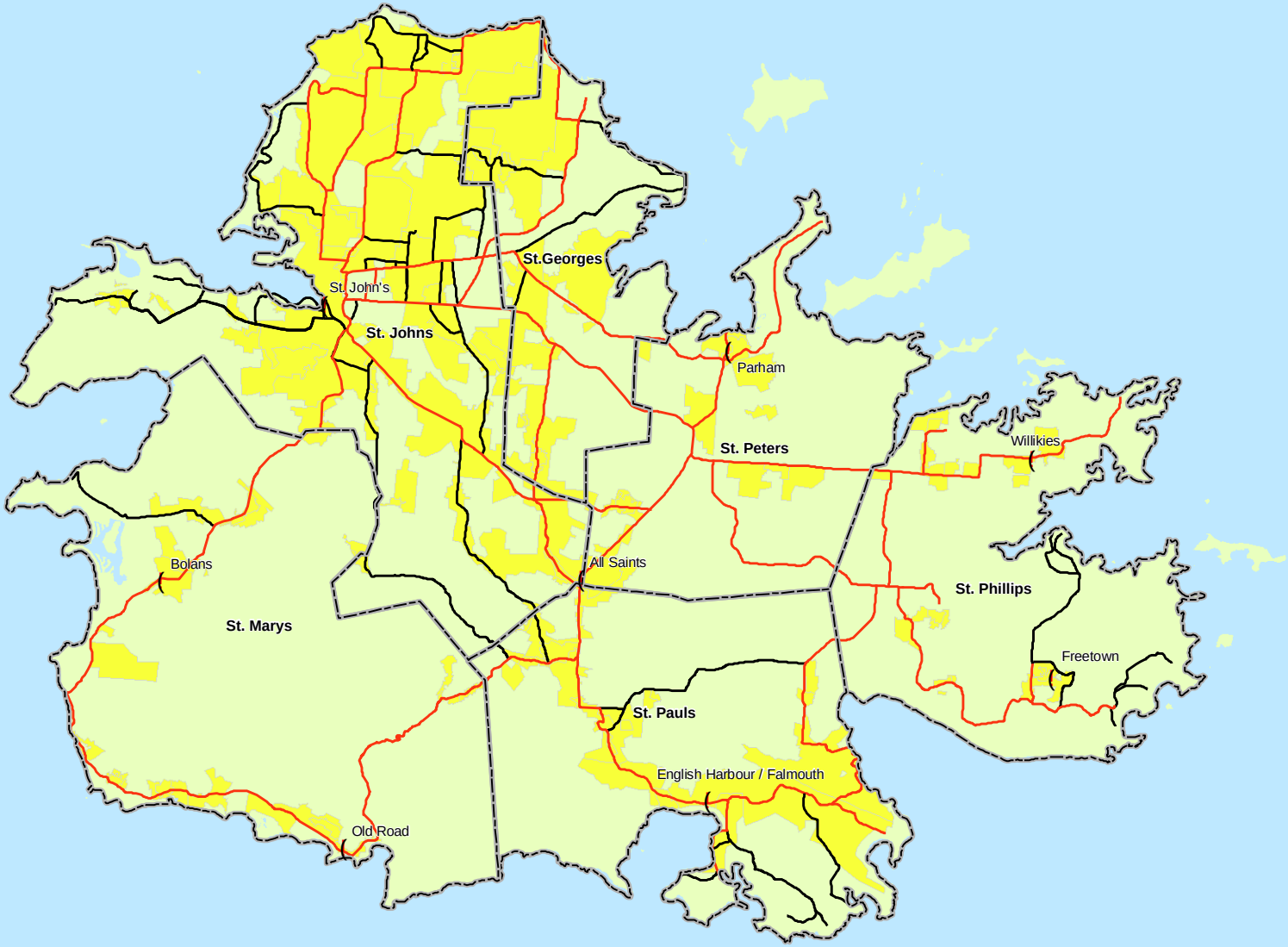
6.6 Governance

As most governance issues are related to institutional structure and management rather than spatial configurations, governance is primarily dealt within the following section, which discusses Land Use and Development Control Policies. This Section deals exclusively with the spatial components of SIRMZP governance.

It is recommended that four (4) distinct hierarchical planning entities be recognized: community, parish, nation and region. This SIRMZP evidentially is at the national level. It should be complemented by plans at the parish level and community levels that are consistent with the overall national thrust yet go into much more detail concerning local planning issues. In addition, the major watersheds should be used for planning and review purposes by the DCA. Figure 6.16 shows the existing parish boundaries in Antigua.

A single planning unit is recommended for Barbuda due to its relatively small population and the communal land ownership system in Barbuda that is in place.



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

GOVERNANCE

FIGURE: 6.16

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Major Roads
- Secondary Roads
- Parish Boundary
- Settlement

NOTES:

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6.7 Comprehensive SIRMZP

Figures 6.17 and 6.18 present comprehensive SIRMZPs for Antigua and Barbuda respectively. These maps are accompanied by Table 6.8, which presents the major development guidelines and the area occupied by each land use category. Further details are provided concerning recommended control guidelines in Section 7.3 of this Report.

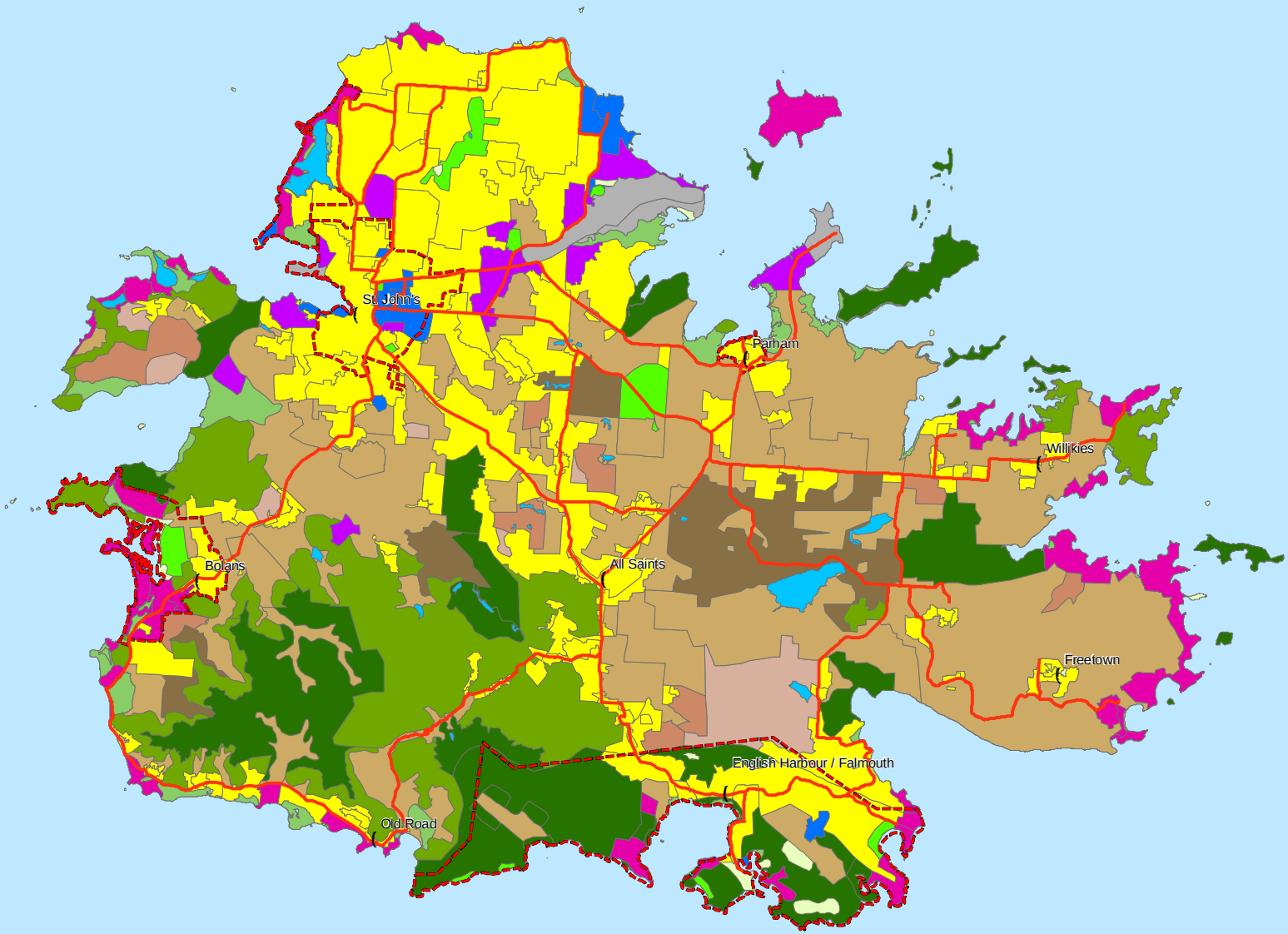
Consistent with the objectives of this exercise, sufficient land has been allocated to each land use activity to meet the national goals and requirements up to 2030. Nonetheless, it may be necessary to amend the Plan to reflect changing economic or other conditions.

Table 6.8 Land Use Suitability Model: Governance, Planning Hierarchy

Component		Physical Planning Objective	Planning Principles
1	Community	Resolve local planning issues, encourage sense of community.	Prepare local village plans, support village councils, sports teams, social events.
2	Parish	Ensure reasonable equity in servicing & distinctive parishes.	Prepare parish plans that address socio-economic development issues and servicing.
3	Nation	Promote national identity and pride.	Prepare national physical development plan, complete visioning exercises with stakeholders.
4	Region	Promote collaborative approach to planning within region.	Promote collaborative planning with respect to regional socio-economic and biophysical issues.

Table 6.9 Breakdown of Each Area for Each Land Use Category

Major Land Use Type	Antigua	Barbuda
Commerce	0.1%	0%
Environment Protection	29.3%	66.7%
Environment Resource	38.9%	24.2%
Industrial	2.1%	0.1%
Institutional	1.7%	0.1%
Settlement	21.9%	3.9%
Tourism	4.7%	2.9%
Transportation	1.2%	0.4%
Unknown	0.2%	1.7%



SCALE: 1:135,000

0 0.5 1 2 3 4 5 Miles

TITLE:

SIRMZP

FIGURE: **6.17**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

- Major Roads
- Special Devlepoment Areas
- Water bodies

Land Use

- Settlement
- Recreation
- Tourism
- Heritage
- Institutional
- Industrial
- Transportation
- Agriculture
- Agriculture Crown
- Grazing
- Grazing Crown
- Mangrove Wetlands
- Forest
- Environmental Protection

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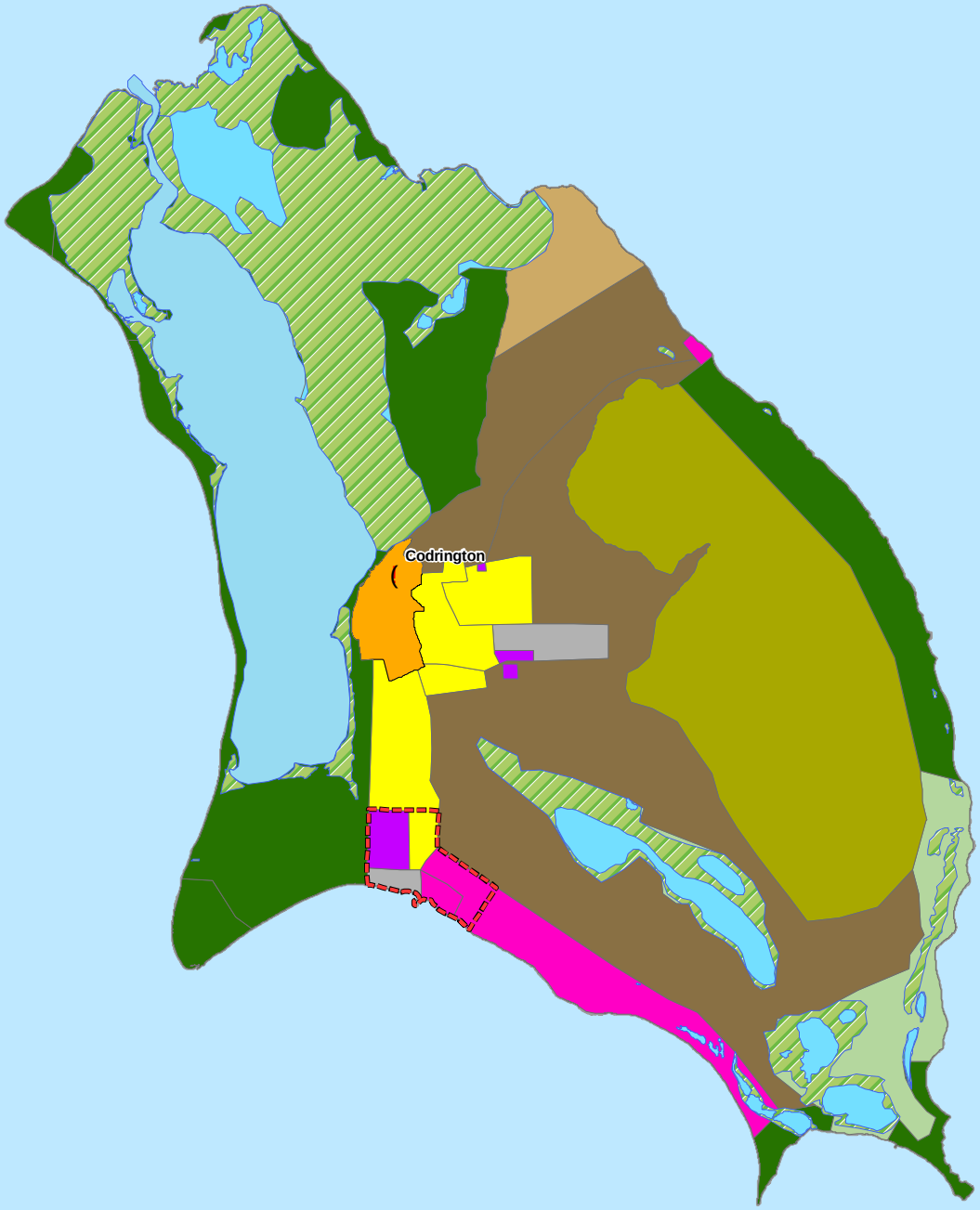

TITLE:

SIRMZP

FIGURE: **6.18**

GENIVAR
Trinidad & Tobago
20th Fl., Nicholas Tower,
63-65 Independence Square, Port of Spain
Tel: 868-624-8039 | Fax: 868-623-7170

CLIENT:

Legend

Special Development Area

Land Use

- Settlement
- Codrington
- Tourism
- Industrial
- Transportation
- Agriculture
- Grazing
- Mangrove Wetlands
- Forest
- Environmental Protection
- Inland Water
- Wetland Forest
- Lagoon

NOTES:

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SCALE: 1:120,000

0 0.5 1 2 3 4 5 Miles

6.8 Redonda

The island of Redonda is of-course, a special case as it is relatively small, very rugged, and not inhabited. Nonetheless, it has great potential for education and limited tourism due to the presence of outstanding physical features and unique flora and fauna, which include an extensive variety and quantity of birds.

It is recommended that the entire island be declared an environmental protection area with public access at designated areas and along well-managed pathways. Signage describing various natural features and the history of the island may be placed in strategic locations. In addition, some shelters and public convenience facilities should be constructed.

Sea access to the island could be arranged in the location of "Landing Rock" (Figure 6.19). Access to the summit could then be possible via one of the ravines along the coast and trails could branch out from there.

As the island has already attracted the interest of a number of international nature organizations, such as Flora and Fauna International, the additional research that is needed to complete a thorough ecological study, as well as the costs associated with preparing and implementing a plan may well be covered by international agencies. In any event, the costs should be relatively modest in comparison to the value of the island for education and tourism. Moreover, it is essential that Antigua and Barbuda invest in the island to ensure that it and the surrounding marine resources, continue to be recognized as part of the nation.

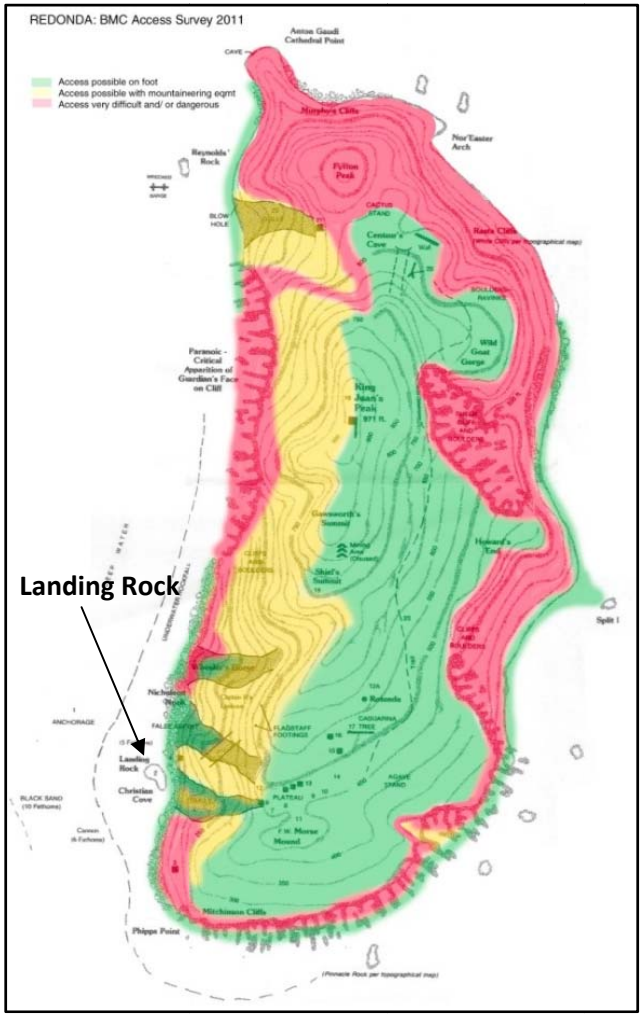

Figure 6.19 Access Map of Redonda

CHAPTER 7

LAND USE AND DEVELOPMENT CONTROL POLICIES

7.0 LAND USE AND DEVELOPMENT CONTROL POLICIES (DRAFT FOR DISCSUSSION)

7.1 Development Control Administrative Structure and Equipment

As detailed in the State of the Country (2010) report, there are many statutory provisions and regulatory guidelines that govern land tenure, land use activities, and the development process in Antigua and Barbuda. These include the following key documents:

1. The Registered Land Act, Cap. 374 (1975)
2. The Barbuda Land Act (2007)
3. The Physical Planning Act (2003)
4. The Land Acquisition Act (1958)
5. The National Parks Act (1985)
6. The St. John's Development Corporation Act (1986)
7. The Disaster Management Act (2002)
8. General Procedures for Processing of Development Applications and For Inspection of Construction in Antigua and Barbuda (1995)
9. The Building Code (1995)
10. Antigua and Barbuda Building Guidelines (1994)
11. OECS Planning and Infrastructure Standards Draft (1992)

With respect to the natural environment, the Physical Planning Act (2003) includes provisions for environmental impact assessments for specific projects, preservation of designated plants, designation of environmental protection areas, and the regulation of activities and/or conditions that pose a threat to environmental quality. These provisions are strengthened by the Disaster Management Act (2002) which authorizes the National Office of Disaster Services to designate areas vulnerable to hazards and prepare special area precautionary plans. Further, a comprehensive environmental act is now under consideration.

While land tenure regulations in Antigua provide for the usual designation of crown, lease, and private title (with or without mineral rights), all land in Barbuda is held in common by Barbudans who are defined as persons born in Barbuda and who have at least one grandparent who was also born in Barbuda or the child of a person who meets the above conditions, wherever born. The Barbudan Council has the authority to designate land for specific purposes, as well as grant exclusive rights to Barbudans to occupy and use individual plots of land for specific purposes. In addition, the Council may, with the approval of Cabinet, grant leases to non-Barbudans for major developments up to a maximum of 50 years.

Primary responsibility for planning, development control, and designation of permitted land uses rests with the Development Control Authority (DCA) with the exception that permission from this authority is not required for agricultural or forestry activities. Special exceptions are also provided in the St. John's Development

Corporation Act (1986) that gives the Corporation the authority required to exercise planning and development control over its own territory.

With the approval of the Minister, the DCA may appoint a Town and Country Planner who may then assume responsibility for monitoring land use and development, as well as the preparation of development plans, the approval of development permits and the execution of enforcement notices. Development plans may allocate land uses; designate areas that may not be developed due to environmental protection or risk considerations; propose buildings and districts that should be preserved for architectural, cultural or historical reasons; and designate comprehensive planning areas. Final approval of development plans rests with Parliament.

The DCA Board under the Development Control Act of 1977 is to comprise the following members, The Chairman, the Director Public Works Department, the Chief Health Inspector, a Lands Officer, a Town and Country Planner, an appointed member of the Public Service and two (2) appointees from the private sector.

In meeting its responsibilities, the DCA must interact with other government agencies including but not limited to:

1. The Land Registry
2. Public Works Department
3. National Office of Disaster Services
4. Central Board of Health of the Ministry of Health, Social Transformation and Consumer Affairs
5. Antigua Public Utilities Authority
6. Ministry of Agriculture, Lands, Housing and the Environment
    a. Department of Agriculture
    b. Lands and Surveys Division
    c. Environment Division
    d. Fisheries Department
7. Ministry of Legal Affairs
8. Ministry of Tourism, Civil Aviation and Culture
9. Ministry of Finance, The Economy and Public Administration
10. Royal Police Force of Antigua and Barbuda

Consequently, it is imperative that direct, efficient lines of communication are maintained between these entities. In particular, DCA, Land Registry, and Lands and Surveys Division require close interaction on a daily basis.

The DCA currently has positions for one (1) Chief Town and Country Planner, one (1) Deputy Chief Town and Country Planner, one (1) Civil/Structural Engineer, one (1) Senior Building Inspector, two (2) Building Inspectors, one (1) Draughtsman, one (1) Physical Planner, two (2) Planning Assistants, one (1) GIS Technician, one (1) GIS Assistant and three (3) Support Staff.

It is recommended that the administrative structure of the DCA be reconfigured as illustrated in Figure 7.1. The new arrangement would allow for three (3) distinct lines of authority for planning, building inspection, and administration. In addition, the staff complement would increase to twenty-five (25) full time personnel.

The full-time services of a Civil/Structural Engineer are needed (however if this is not possible, then such a person could be seconded to the DCA on a part-time basis as required).

The separation of the Development Planning and Development Control Units, as depicted in Figure 7.1, is appropriate, as it would greatly strengthen the DCA's capacity to undertake foreword-planning functions. The addition of a Physical Planner and two (2) Planning Assistant positions that are to be occupied by specialists in physical planning, environment, economics, and social-geographical disciplines adds considerable breadth and depth to the Unit. Similarly, the addition of a Building Inspector, to bring the total number of inspectors to six (6) (one (1) for each of the five (5) Inspection Zones across Antigua, and an additional Inspector to assist wherever need arises) augments the capacity of the whole Authority to fulfil its functions.

In recognition of the efficiencies that may be gained through the use of information technology, it is recommended that GIS and Computer-Aided-Drawing Specialists be engaged for the Development Planning and Development Control Units respectively.

The proposed administrative structure is well thought out and appropriate for the range and intensity of activities that the DCA must perform. It is, therefore, recommended.

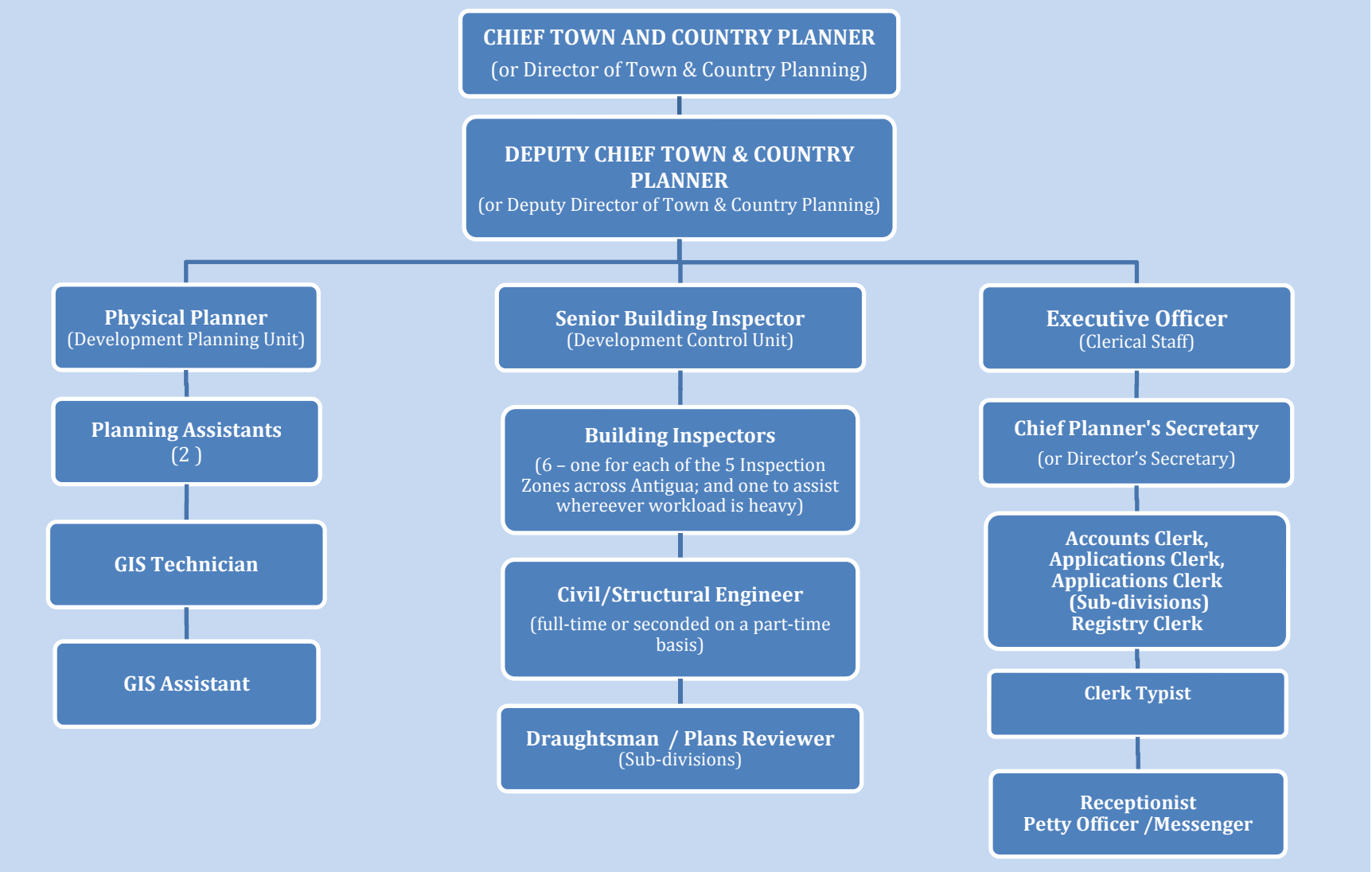

Figure 7.1 Proposed Organizational Structure for the Development Control Authority

(prepared by the DCA, July 2011)

The DCA currently is equipped with computers, printers, as well as, a plotter, scanner, digitizing board, and a photocopy machine. However, the majority of the computers are 4 years old and should be replaced. Further, the DCA has recommended that the following additional equipment be acquired to enable the full complement of projected staff to perform their functions:

- One (1) Medium format printer (13 x 19 inch).
- Two (2) Regular printers.
- One (1) Server with Xeon processor (1) coupled with associated wiring for the establishment of a Local Area Network.
- One (1) Graphics computer with large monitor (19 or 21 inches).
- Ten (10) Desktop computer systems.
- Broad-band Internet service that would integrate the Land Management System and GIS between the various agencies that deal with land management (DCA, Lands and Surveys, Land Registry, Agriculture Department and Inland Revenue Department).
- Five (5) Uninterruptable power supply units.
- One (1) AutoCAD network version.

It is recommended that a priority listing of equipment be determined and acquired in the immediate term (i.e. within six (6) months) as a matter of urgency. In the longer term, it would be advantageous to consider the equipment needs of the Land Registry, Lands and Surveys, Agriculture Department, Inland Revenue Department and the Development Control Unit simultaneously with a view to ensuring that these agencies have complimentary hardware and software so as to facilitate close collaboration. This will require a comprehensive review of the functions of these organizations and the development of an information management plan that is accompanied by recommendations for hardware and software purchases, tasks that could be completed over a six (6) month period.

7.2 Planning and Development Control Process

7.2.1 Planning Hierarchy

In many jurisdictions it is common practice for plans to be nested within a planning hierarchy, which in the case of Antigua and Barbuda would be national, regional (parish), and local community plans. In this way, it is possible to ensure that all plans support the national planning objectives, while allowing for variances that reflect the particular socio-economic and physical characteristics of the different regions.

National Plans

National plans are intended to set the direction for all other planning units. They take into account the resource base of the nation, strategic opportunities for socio-economic development, and the values and aspirations of citizens. Successful national plans enhance a sense of national identity and pride while ensuring that development is strategic, equitable, and sustainable.

This SIRMZP seeks to provide a solid spatial foundation for the development of other national plans and policies that focus more closely on social and economic issues. At the same time, it identifies the need for policies such as the protection of coral reefs, the promotion of food security, and the development of accessible, liveable communities. The level of detail and spatial resolution, however, is generalized as it deals with large categories such as compact settlements and settlement expansion areas and does not designate more precise land use activity categories, such as high, medium and low density areas, or the location of schools and other community facilities.

Regional Plans

Each of the six (6) parishes of Antigua and the island of Barbuda has distinct landscapes, resources, and settlement histories that, in many cases, foster a sense of identity and belonging among parish residents. Further, they have long served as spatial units for the purposes of the national census.

Consequently, it is recommended that parishes of Antigua and the island of Barbuda be recognized as administrative and planning units. The preparation of plans at parish level and for Barbuda would offer local residents the chance to articulate their goals for their territory and work together to achieve them. These goals and associated planning measures, however, must be consistent with the national plan. The plans may address issues relating to the road network, land use activities, socio-economic development, environmental considerations, and public services. Two (2) specific planning issues that were highlighted during the public consultation with respect to this plan were the need for additional public cemeteries and new aggregate extraction sites – may be most effectively addressed in these regional plans.

Community Plans

Local community plans are also needed to enhance the liveability of individual settlements. At this level, the plans are much more spatially detailed, for example, explicit road right of ways, precisely located community facilities, and proposals for convenient access to and use of commercial areas would be addressed. Further, urban design measures that are intended to improve the "*look, function, and feel*" of central areas in villages and towns through signage, sidewalk design, street furniture, and vegetation should be planned and implemented. Here it should be added that universal design, which ensures that everyone, including those with restricted mobility, will have access to all public spaces, should be applied throughout.

Ridge to Reef Planning Units

Finally, it is recommended that the boundaries of the major watersheds and adjacent coastal zones serve as technical planning and development control units. In this way, development projects may be readily evaluated in terms of their implications for drainage and the feasibility of providing water and sewerage services. Further, the direct and indirect effects of effluents and

sedimentation on riparian vegetation, coastal water quality, and other critical biophysical resources, such as sea grass beds, and coral reefs may be assessed.

Building inspectors, in particular, may be assigned to different watershed areas. This will allow them to be in a position to monitor the effects of development on the biophysical environment and suggest development alternatives that promote environmental quality and minimize the cost of services. The establishment of a Watershed and Coastal Zone Management Committee that includes members from the DCA, the Ministry of Works and Transport, APUA, Forestry, Fisheries, and Soil and Water Conservation Divisions (Ministry of Agriculture, Lands, Housing & The Environment), as well as other government agencies that have expertise and responsibility for water related issues, would enhance collaboration between these units and provide solid expertise to support the technical reviews of development proposals. Consideration may also be given to including representatives from non-governmental organizations on the Watershed and Coastal Zone Management Committee.

7.2.2 Planning Process

While the planning process for each of the levels in the Planning Hierarchy will vary in some respects, all will be guided by the Physical Planning Act 2003 and have the following main components.

1. Preparation of a proposal to prepare a development plan (PPA 2003, s9.1 – 9.2).
2. Decision of Minister to accept or refuse a development plan proposal (PPA 2003, s9.3).
3. Preparation of a draft development plan (PPA s10). This would normally involve:
    a. Survey and analysis of all relevant information.
    b. Consultation with all relevant government agencies.
    c. Consultation with the Barbuda Council in the event that the plan address development issues within the jurisdiction of the Council.
    d. Consultation with representatives of non-governmental organizations and the community at large.
4. Review of draft development plan (PPA 2003, s11). This would normally involve:
    a. Submission of draft to Minister, members of the House of Representatives, and the Barbuda Council (for planning areas within their jurisdiction).
    b. Notification of the existence of the plan to persons residing, working or owning land in affected areas and provision for the public to review the plan.
    c. Completion of one or more public hearings.
5. Approval of draft development plan (PPA 2003, s12, 13, 14). This would normal involve:
    a. Formal submission of draft development plan to the Minister.
    b. Subject to the approval of the Minister; formal submission of draft development plan to Parliament.

c. Subject to the approval of Parliament; notice of approval in the Gazette.

As planning is inevitably an interdisciplinary activity that involves many different specialties and interest groups, the process of preparing a plan should be as transparent and inclusive as possible. For this reason, an integrated process that involves all relevant government agencies should be followed.

7.2.3 Development Control

Development control is currently administered with reference to two (2) documents entitled "General Procedures for Processing of Development Applications and for Inspection of Construction in Antigua and Barbuda" (1995) and "OECS Draft Planning and Infrastructure Standards" (1992).

Section 1 of the "General Procedures" document outlines the process to be followed upon receipt of an application for development, including filing requirements, consultation with other departments, preparation for planning authority meetings, preparation of planning authority minutes, and conveying the decisions of the planning authority. Section 2 specifies inspection procedures including the examination of plans, as well as special considerations with respect to complex or large projects, illegal developments, site visits, advisory services, and reporting.

While the "General Procedures" document provides useful detailed guidance for processing applications, it should be revised to reflect the 2003 Physical Planning Act and the introduction of information technology in many government agencies. A common geodatabase that is shared by Lands and Surveys Division, Land Registry, and the DCA, as recommended above, would help streamline the review of applications.

The revised general procedures should include the steps outlined in Table 7.1.

Table 7.1 General Procedures

Activity	Responsibility
Receipt of application for a plan, subdivision, building construction, reconstruction, or change in land use activity.	Applications Clerk
Link to relational geodatabase to establish parcel numbers and property ownership of property of interest and neighbouring properties.	Automated function developed by GIS specialist

Activity	Responsibility
Establish application number and code corresponding to type of application.	Automated function developed by GIS specialist
Store dossier in database that is accessible to DCA, Lands and Surveys, and Land Registry.	Automated function developed by GIS specialist
Review of planning and zoning controls for property.	Planning Assistant
Determine need for site visit. If yes, site visit.	Physical Planning Officer / Senior Building Inspector
Prepare preliminary report.	Planning Assistant / Building Inspector
Determine consultation requirements. If yes, save dossier on drive that is accessible by the relevant authorities.	Physical Planning Officer / Senior Building Inspector
Submit comments from agencies consulted.	Applications Clerk
Determine need for EIA. If yes, complete EIA.	Physical Planning Officer / Senior Building Inspector
Determine need for public consultation. If yes, public consultation.	Chief Town and Country Planner
Prepare final report for review by Planning Authority.	Planning Assistant / Building Inspector
Review by Planning Authority.	Chief Planning Officer
Notification of results of review.	Applications Clerk

The development approval process must ensure that existing plans and policies are taken into effect in an equitable manner. For this to happen, it is essential that the process be as transparent as possible. While some aspects of development permit applications may be considered confidential, the fact that an application has been made for a particular project in a particular location should be public knowledge.

During the public consultation period for this plan, it was suggested that the DCA establish a committee consisting of individuals both in the public and private sector who had expert knowledge with respect to land use planning. This committee would have the mandate to meet once a month to review development applications prior to their approval. This is something that the DCA may wish to consider, especially for some controversial decisions. In any case, it is imperative, as noted above, that the process be transparent and incorporate opportunities for public intervention.

Table 7.2 Lotification Guidelines

Gross Residential Density	Lots per Acre (Max)		Lots Sizes (Min sq ft)	
	OECS	SIRMZP	OECS	SIRMZP
Low	5	8	8,000	5,000
Medium	10	12	4,000 to 7,000	3,000
High	17	20	2,500 to 4,000 internal 3,000 to 4,500 corner	2,500 internal 3,000 corner

The Draft Planning and Infrastructure Standards (1992) set out development standards that are specific for the OECS region. These include consideration of standards for development intensity; subdivisions; roads and parking; storm water drainage; liquid and solid waste disposal; water, electricity and telephones; retaining walls and reclamation; and accessibility guidelines. This very useful compilation of standards is intended to serve as guidelines for good practice rather than definitive regulations. Indeed, the authors indicate that the emphasis should be placed on performance criteria rather than the numbers themselves.

In general, the standards provide excellent guidelines with the exception that the recommended residential densities are relatively low. Table 7.2 lists the standards in the guide and those recommended in this SIRMZP for residential areas.

7.3 Development Control Guidelines for Discrete Spatial Units

The following table provides guidelines that may be used to assess the appropriateness of development proposals for Antigua and Barbuda. The land use activity zones correspond with those identified in Chapter 6. As noted in that chapter, however, the discrete zones shown on the zoning plan (Fig 6.17) are those that occupy significant contiguous land areas. The electronic GIS-based map that accompanies this document offers greater detail with respect to smaller spatial units. Further some additional planning restrictions apply, for example, to areas subject to erosion or flooding. These are also identified in the electronic version of the SIRMZP and effectively overlay the land use zone in which they are located.

A legal reference for each of the development guidelines is included in the table. For greater clarity, some of the critical provisions are discussed at greater length immediately following the table.

Table 7.3 SIRMZP Development Guidelines

Code 1	Code 2	Land Use Category	Permitted Uses	Intensity		Performance Criteria	Physical Planning Act Legal Reference
				Density	FAR		
1	**Environmental Protection**						
	1	Conservation areas	Education, where private: comprehensive plan	NA	NA	Designated environmental features protected	PPA 2003 Part II 54.1/PPA Part II s4e
	2	Water courses and bodies	Education, Light Recreation	NA	NA	Quality of water maintained or enhanced	PPA Part II s56
	3	Mangroves and wetlands	Education, Light Recreation	NA	NA	Ecosystem functions maintained	PPA Part II s56
	4	Sea grass	Education, Light Recreation	NA	NA	Ecosystem functions maintained	PPA Part II s56
	5	Coral reefs	Education, Light Recreation	NA	NA	Ecosystem functions maintained	PPA Part II s56
	6	Forests	Education, Light Recreation	NA	NA	Ecosystem functions maintained	PPA Part II s56
	7	Rehabilitation	None	NA	NA	Ecosystem functions enhanced	PPA Part II s56
2	**Environmental Risk**						
	1	Flooding	Recreation, education, no structures	NA	NA	Minimal flooding damage	PPA s4b/PPA s56
	2	Land erosion and slippage	Recreation, education, no structures	NA	NA	Minimal land erosion and slippage	PPA s4b/PPA s56
	3	Beach erosion	Recreation, education, no structures	NA	NA	Minimal erosion	PPA s4b/PPA s56

Code 1	Code 2	Land Use Category	Permitted Uses	Intensity		Performance Criteria	Physical Planning Act Legal Reference
3	4	Storm surge	Recreation, education, no structures	NA	NA	Minimal storm surge damage	PPA s4b/PPA s56
	5	Climate change	Recreation, education, no structures	NA	NA	Minimal elevation of 3 meters	PPA s4b/PPA s56
	Environmental Resource						
	1	Agriculture (Government)	Crops, agricultural buildings owned by Crown	NA	NA	Food production yields, food security, value	PPA s4a
	2	Agriculture	Crops, agricultural buildings, residence			Food production yields, food security, value	PPA s4a
	3	Grazing (Government)	Grazing, agricultural buildings owned by Crown	NA	NA	Grazing yields, food security, value	PPA s4a
	4	Grazing	Grazing, agricultural buildings, residence			Grazing yields, food security, value	PPA s4a
	5	Fishing grounds	Licensed fishing	NA	NA	Maintenance of fish stocks	PPA SSII Part IV 6
	6	Resource extraction	Quarrying, material processing, plant, office			Aggregate value, minimal disruption of neighbors	PPA s10.4a/Third Schedule
	7	Natural heritage	Existing, other compatible with existing	NA	NA	Retained value of natural heritage, views	PPA SSII Part IV 4
4	**Settlement**						
	1	Designated service area within hierarchy	Institutional, commercial, residential, community, recreation, industrial	NA	NA	Access to services/community facilities throughout country	PPA SSII Part III

Code 1	Code 2	Land Use Category	Permitted Uses	Intensity		Performance Criteria	Physical Planning Act Legal Reference
	2	Compact Settlement	Commercial, residential, light industry	20 lots/acre	3	Function, appearance, pedestrian focus	PPA SSII Part III // OECS Standards 1.2.2
	3	Low density	Residential, neighbourhood commercial	8 lots/acre	0.5	Low traffic, noise levels, well maintained lots	PPA SSII Part III // OECS Standards 1.2.3
	4	Medium density	Residential, commercial, community facilities	12 lots/acre	0.75	Accessibility, mixed use	PPA SSII Part III // OECS Standards 1.2.4
	5	High density	Residential, commercial, services, community facilities	20lots/acre	1	Accessibility, mixed use	PPA SSII Part III // OECS Standards 1.2.5
	6	Settlement expansion area	Residential, commercial, community facilities	12 lots/acre	0.5	Low traffic, noise levels, well maintained lots	PPA SSII Part VII 2
5	**Commerce: retail and service**						
	1	Core commercial	Commercial, residential	20 lots/acre	3	Accessibility, mixed use, pedestrian environment	PPA SSII Part III
	2	Shopping and multiplex centre	Commercial	NA	2	Accessibility, drainage, infrastructure	PPA SSII Part III
	3	Village mixed use	Commercial, residential, community facilities	12 lots/acre	2	Accessibility, mixed use, pedestrian environment	PPA SSII Part III
6	**Tourism**						
	1	Cruise ship facility	Commercial	NA	3	Pedestrian environment	PPA SSII Part III
	2	Resort hotels	Hotels, residential, commercial	NA	1.5	Max 20 h contiguous, max 1 km access to beaches	PPA SSII Part III

Code 1	Code 2	Land Use Category	Permitted Uses	Intensity		Performance Criteria	Physical Planning Act Legal Reference
7	3	Villas and cottages	Residential, commercial, community facilities	12 lots/acre	0.75	Max 20 h contiguous, max 1 km access to beaches	PPA SSII Part III
	4	Activity area	Recreational, educational	NA	0.25	Max 20 h contiguous, max 1 km access to beaches	PPA SSII Part III
	Institutional						
	1	Educational facilities	Schools, training centres	1 lot/3 acres	1	Service area, number, ease of access	PPA SSII Part III
	2	Health facilities	Clinics, hospitals	NA	2	Service area, number, ease of access	PPA SSII Part III
	3	Churches	Religious centres	NA	1.5	Service area, number, ease of access	PPA SSII Part III
	4	Government offices	Institutional	NA	3	Service area, number, ease of access	PPA SSII Part III
	5	Police and fire stations	Institutional	NA	3	Service area, number, ease of access	PPA SSII Part III
	6	Recreational facilities	Recreational facilities	NA	0.25	Service area, number, ease of access	PPA SSII Part IV
	7	Historical buildings and sites	Existing, other compatible with existing, education, tourism	NA	NA	Retained value of historic building and sites	PPA s4c
	8	Cemeteries	Cemetery, graves, memorial structures, management facility	NA	0.25	Low noise level, minimal pollution from site, maintenance	PPA SSII Part IV 2
	9	Military	Military	NA	NA	Minimal disruption on adjacent uses	

Code 1	Code 2	Land Use Category	Permitted Uses	Intensity		Performance Criteria	Physical Planning Act Legal Reference
8	**Industrial**						
	1	Light	Light industry	NA	0.75	Minimal disruption (noise, traffic, fumes, smell)	PPA s10.4a/Third Schedule
	2	Heavy	Heavy industry	NA	0.75	Minimal disruption, pollution	PPA s10.4a/Third Schedule
	3	Landfill	Landfill operations	NA	NA	Minimal disruption, pollution	PPA s10.4a/Third Schedule
9	**Transportation**						
	1	Airports	Transportation, light industrial, commercial	NA	NA	Efficiency	PPA SII Part VI
	2	Ports and marinas	Transportation, light industrial, commercial, residential	NA	NA	Efficiency	PPA SII Part VI
	3	Road network	Transportation	NA	NA	Accessibility	PPA SSII Part I
	4	Public transportation facility	Transportation	NA	0.75	Accessibility	PPA SII Part VI
10	**Special Development Areas**						
	1	St John's waterfront	Commercial, residential, light industrial, recreational	SDA	SDA	Tourist activity	PPA Part II s4e
	2	Nelson' s Dockyard National Park	Conservation, residential, villas, resort hotels,	SDA	SDA	Maintenance of natural landscape, tourist activity	PPA Part II s4e

Code 1	Code 2	Land Use Category	Permitted Uses	Intensity		Performance Criteria	Physical Planning Act Legal Reference
			tourism				
	3	Mount Obama	Conservation	SDA	SDA	Ecosystem functions maintained	PPA Part II s4e
	4	Jolly Harbour	Commercial, residential, light industrial, recreational	SDA	SDA	Tourist activity, integration with neighbourhoods	PPA Part II s4e
	5	Cades Bay	Fishing, tourism activity	SDA	SDA	Maintenance of fish stocks, marine ecosystem	PPA Part II s4e
	6	Parham	Commercial, residential, light industrial, recreational	SDA	SDA	Tourist activity, yachting activities and maintenance, residential, commercial, institutional	PPA Part II s4e
	6	NEMMA	Fishing, tourism activity	SDA	SDA	Maintenance of fish stocks, marine ecosystem	PPA Part II s4e
	7	Dock and ferry terminal in Barbuda	Commercial, transportation, resort hotels, villas, recreation	SDA	SDA	Minimal disruption, tourist activity	PPA Part II s4e

7.3.1 Environmental Protection Areas

As specified in Section 54.2 of the Physical Planning Act, 2003, the Minister may declare an area to be an "environmental protection area" and in so doing restrict the classes of development that are permitted or, indeed, prohibit all development (s54.3). Further, the Minister may require that an environmental impact assessment be completed with respect to any proposal. Such a declaration is generally preceded by a formal report prepared by the Town and Country Planner that specifies the features of the site that merit protection. These features may include not only flora and fauna but also landscape quality, outstanding physical, ecological, architectural or historic elements, features of scientific interest, natural hazards, and the unique characteristics or circumstances of people living or working in the area (s53.3c). These investigations must take place in a transparent manner. People living or working in the area must be made aware of the intent to designate an environmental protection area and have sufficient opportunity to present their position with respect to the pending declaration, which must then be taken into account by the Town and Country Planner (s53.2).

When delimiting environmental protection areas for biophysical features it is good practice to identify the location of the specific features of interest, as well as, corridors that may be set aside to link these nodes. In this way, flora and fauna that are an integral part of an ecosystem may maintain their role in dynamic ecosystem functions. The development activities and intensities that are permitted in these areas must be restricted to uses and levels that ensure that these critical functions may be maintained. Further, a buffer zone surrounding the nodes and corridors is needed to protect these resources. Appropriately planned ecotourism and educational activities would be permitted in all areas. As these activities may have a monetary value, the protection of critical ecological resources may not only minimize the direct and indirect costs of development but also contribute to the local economy.

While the designation and control of environmental protection areas on crown lands is straightforward, the situation may be more complicated with respect to private lands. Nonetheless, experience has demonstrated that the value of land in close proximity to environmental amenities is substantially greater than land lacking these amenities. For this reason, land owners have an incentive to prepare plans that respect critical ecological areas. The DCA and other agencies may provide further motivation by assisting with the preparation of plans that maximize development potential in adjacent areas and streamline the development approval process. This approach has proven effective in other jurisdictions.

In some instances, however, it may be necessary to acquire the lands in question or compensate the owner for a loss in value (s55 PPA 2003).

Following the designation of an environmental protection area, the Town and Country Planer may prepare (or cause to be prepared) an environmental protection management plan (s56 PPA 2003).

The legislation provides a clear legal context for the designation and management of environmental protection areas. Nonetheless, it should be noted that the designation of an area may only be made following an extensive consultation process. Interim controls are required to ensure that the amenities that are under consideration for protection are not compromised prior to the formal designation.

7.3.2 Environmental Impact Assessments (EIA)

Schedule III of the Physical Planning Act (2003) specifies the projects for which an EIA must be completed. These generally relate to industrial or transportation facilities that may have a direct, negative effect on the environment. Nonetheless, it should be noted that hotel and resort complexes are included in the list. Further, the Minister may require that such a statement be prepared during the evaluation process for any development project (s23.2 PPA 2003).

The content of an EIA and the procedures governing its preparation are dealt with in s23 of the Physical Planning Act (2003). The DCA has the authority to set out specific terms of reference for the preparation of each EIA (s23.4). In this way, the proponent may be directed to respond to issues that are of particular importance with respect to the proposal under consideration.

7.3.3 Additional Requirements for Specific Areas

When a development application is made for lands that are within the jurisdiction of either the Barbuda Council, the St. John's Development Corporation, or the Port Authority or National Parks, the DCA may not issue a development permit prior to consulting with the responsible authority (s24 PPA 2003).

7.3.4 Agriculture Program on Crown Land

A major recommendation of this plan is that an agricultural program be prepared that includes the designation of large contiguous areas of crown land that have Class III or better agricultural capability for crops and grazing. There are many options that the Government may wish to pursue to attain this objective, including the formation of state farms or the provision of restricted leaseholds to individual farmers. What is critical is that these lands are used exclusively for the production and processing of agricultural produce for the foreseeable future. Further, it is desirable to maintain some control over the specific crops that are grown to maximize the overall potential of a national program that is intended to (1) promote food security, (2) serve the local market, including hotels and resorts, and (3) develop niche produce for the international market. For these reasons, it is imperative that the leaseholds that may be granted do not offer the lessor a right to convert the property to non-agricultural purposes over time.

The development of a vigorous national agricultural program will also benefit farmers who are cultivating their own lands as the knowledge and marketing expertise that will be acquired will also be available to them. They may also choose to join cooperatives or other organizations that facilitate collaborative activities. These

measures would help ensure that the agricultural produce that is produced is of sufficient quality and quantity to meet the needs of the local tourism industry as well as the local population.

7.3.5 Settlement Restructuring

The settlement program that is recommended in this plan is intended to support sustainable communities where individuals and families enjoy a high quality of life. Each settlement should have a core area that incorporates commercial, institutional and community functions along with higher density residential areas. In these areas, urban design measures are required to provide functional and pleasant walking environments, convenient parking areas, and public transportation facilities. Settlement expansion areas with medium and low-density residential developments as well as local commercial and community facilities should be planned for adjacent areas. Proximity planning, which ensures that destinations that serve daily needs or contribute to the sense of community are close at hand, should be applied throughout. These facilities include schools, playgrounds, churches, convenience stores, and community centres. Both core and expansion areas should be provided with appropriate infrastructure.

A complement to this plan is the recommendation to decommission the many unoccupied subdivisions that have emerged in inappropriate areas over the years. Many of these areas cannot be serviced efficiently and at reasonable cost with water, sewerage, electricity, roads, and drainage infrastructure. Individual households who have obtained leaseholds to lots in these areas should be encouraged to relocate in a settlement expansion area and the land returned to other uses such as agriculture or grazing. A “carrot and stick” approach that effectively freezes development in inappropriate subdivisions and offers an opportunity for a properly serviced lot in a nearby settlement may have the desired result in the majority of cases.

Development programs should prioritize communities that have been singled out for specific roles within the hierarchy of settlements (Fig 5.1). Separate plans will be required for each of these settlements.

7.3.6 Performance Bonds

The Physical Planning Act provides for the use of performance bonds to ensure that private developers meet the conditions set out in their development permit (s27.j PPA 2003). The use of these bonds should be a standard practice. Further, it should be noted that lapsed development permits may be withdrawn without the payment of compensation (s30.2 PPA 2003).

These provisions should also be applied to ensure that lessors who acquire land for tourism and other projects complete their project as outlined at the time of approval. The leases for properties that have not been developed in accordance with the plan proposed by the developers should be withdrawn without compensation. This is especially the case with respect to several projects in Barbuda.

7.3.7 Light Industrial and Service Activities in Residential Areas

It is customary for most residential areas to include some commercial and industrial functions that have developed as a home-based industry. This flexibility offers individuals households the opportunity to develop micro-enterprises that benefit the overall community.

However, larger enterprises that generate significant traffic, noise, visual pollution, or other negative effects that are not appropriate for a residential neighbourhood, should be redirected to nearby light industrial parks. Performance criteria, which include sound levels, parking space, traffic volumes and the like, should be developed by the DCA to ensure that obnoxious industrial and service activities do not occur in residential areas. As with the case of decommissioning inappropriately located subdivisions, a "carrot and stick" approach may have the best results in persuading existing obnoxious land use activities to relocate.

7.3.8 Acquired Rights

All public officers must take the provisions of a plan that has been approved by Parliament (or has been prepared and pending approval) into account when considering decisions relating to new applications for development permits and/or the preparation of public investment and development projects (s16 PPA 2003). Existing land use activities and buildings are not subject to the provisions of the plan and may continue. Indeed, should these activities or facilities be damaged or destroyed by fire or another cause, they may be restored with the provision that any replacement buildings are erected as close to the previous locations as possible and have the same cubic feet of space and uses (s64 PPA 2003). In effect existing uses may continue as "acquired rights".

However, should the DCA consider that it is in the best interests of the country that an existing use of land be discontinued or restricted, or that an existing building be altered or removed, a "discontinuance notice" may be issued (s42 PPA 2003). In these cases, compensation may be claimed.

Should a landowner wish to develop his or her land in a manner that does not conform to an approved plan or existing uses an application for a zoning change may be made. This measure provides some flexibility while ensuring that the central tenants of the plan are observed.

7.3.9 Compensation and Acquisition

The Land Acquisition Act provides the Government with the legal standing required to ensure that the interests of the overall community are served. This instrument includes the option of acquiring land outright, securing a right of passage for the public (s49.3 PPA 2003), or protecting sensitive environmental resources by restricted land use activities in particular locations (s55 PPA 2003). The Physical Planning Act (2003) specifically states that this measure may be used to secure public access to recreational amenities, such as beaches.

In addition to compulsory acquisition, compensation may be claimed in cases where the value of the land has depreciated due to (a) withdrawal or modification of a development permit, (b) refusal by the DCA to permit an owner to restore a building that has been destroyed by fire, hurricane or other natural disaster, (c) an order to discontinue an existing use, and (d) the declaration of an environmental protection area (s64 PPA 2003). The amount of compensation is assessed with respect to the loss of value in the property.

7.4 Concluding Remarks

The Physical Planning Act (2003) provides the legal instruments that are required to enable all of the measures proposed in this plan. It remains to apply these provisions in the best interests of the country as a whole.

CHAPTER 8

IMPLEMENTATION

8.0 IMPLEMENTATION

8.1 Short Term Actions

The aspects of the projects arising out of the SIRMZP which have been recommended for priority implementation are based on the results of ongoing dialogue with relevant stakeholders. These projects have been divided into a number of short and medium term projects.

In establishing these key projects, the following criteria were considered:

1. The importance of each intervention with respect to the integrity of the SIRMZP;
2. The logical sequence of interventions;
3. The direct and indirect benefits of the interventions;
4. The degree of difficulty in implementing each intervention; and
5. The cost of implementation.

Based on these criteria, it is recommended that priority be given to interventions that curtail negative development tendencies, have high impact, are ready to go at low cost, build institutional capacity, nurture stakeholder interest and involvement and are not dependent upon the completion of other interventions for implementation.

The short term projects outlined in Table 8.1 are of major priority in nature and are identified as those with the largest return for minimum investments. Inclusive of the formal adoption of the SIRMZP, the short term projects are in conformity with the ongoing plan and can be implemented within a 1.5 year timeframe. It is our professional opinion that these new projects will assist greatly in securing the endorsement of stakeholders and the general public. As outlined in Table 8.1 most proposed short-term projects highlighted will take place in areas with high visibility to the public.

Table 8.1 Recommended Short Term Actions

Code	Task	Responsibility
1.1	**Deposit SIRMZP with Minister. Note: this step will have the result that all agencies must take its provisions into account immediately. (PPA 2003 s16.2)**	DCA
1.2	**Adopt SIRMZP**	Parliament
1.3	**Enhance capacity of DCA** • Personnel • Equipment	Minister
1.4	**Develop terms of reference for an integrated GIS that incorporates a permit tracking and development monitoring facility**	DCA, Registry and, Lands Divisions
1.5	**Prepare crown agricultural and grazing plan** • Verify crown land in affected areas • Form a committee with representation from the Ministry of Agriculture, tourism industry, food processors, market analyst, and private farmers • Examine alternative models for state farms, fiscal policy, and government support systems for the agricultural sector • Prepare a report to advance the local agricultural sector	Ministry of Agriculture, DCA, Registry and, Lands Divisions
1.6	**Implement settlement restructuring policy** • Verify status of existing subdivided lands, establish feasibility of providing services and community facilities • Decommission subdivisions that are not substantially occupied and cannot be efficiently supplied with services • Prepare and prioritize plans for settlement expansion areas, including the	DCA, Min of Agriculture, Registry and, Lands Divisions Min. of Public Works, APUA

Code	Task	Responsibility
	provision of services and community facilities • Offer lots in settlement expansion areas to those with tenure in existing, but undeveloped, subdivisions that are to be decommissioned.	
1.7	**Strengthen core settlement areas** • Identify or form village and parish councils for each settlement within the hierarchy • Establish stakeholder committees • Prepare detailed maps of central areas in towns and villages designated in the hierarchy of settlements • Determine level of service for each settlement in the hierarchy, identify additional community facility and locational requirements • Prepare core settlement revitalization plans	DCA, Parishes, Village Councils
1.8	**Develop squatter regularization and slum improvement plans** • Identify zones with spontaneous development and/or slum conditions. • Where feasible, prepare plans to regularize informal settlements and improve living conditions in slum areas • Alternatively, offer lots in designated core or expansion settlement areas with conditions that ensure equity with others in need of housing	DCA, Parish Councils
1.9	**Prepare and implement preliminary plan for Barbuda port area** • Establish location of cargo, ferry passenger, and marina activities • Identify land requirements • Prepare preliminary physical plans • Develop incentive program for development of port area and adjacent tourism activities	DCA, Barbuda Council, Antigua & Barbuda Port Authority

Code	Task	Responsibility
1.10	**Prepare preliminary plans for Special Development Areas in Antigua** • Formalize limits of special development areas with due attention to biophysical features, such as watersheds • Establish stakeholder committees • Complete detailed analysis of existing and proposed land use activities • Establish development objectives and strategies for each SDA in consultation with stakeholder committees • Designate priority development policies, programs, and projects for specific areas within the SDAs • Prepare and implement a management plans • Monitor development to ensure that SDA regulations are respected	DCA, Public Works, APUA, Tourism, Environment, Registry and, Lands Divisions
1.11	**Prepare social and economic development plans** • Review status of current planning efforts • Form interagency review committees • Determine complementarities of planning efforts	DCA, Economic Policy, Min. of Social Transformation

8.2 Medium Term Actions

Upon formal adoption of the short-term projects, medium term projects would then follow as highlighted in Table 8.2, which would implement the major items of the SIRMZP in the future. These projects are ultimately associated with significantly higher costs than the short term projects but will bring significant long term benefits. However, it should be noted that these projects are recommended to tackle the more complex issues and large scale capital projects such as the implementation of major proposed land use, transportation and infrastructural plans over the longer term.

Table 8.2 Recommended Medium Term Actions

Code	Task	Responsibility
2.1	**Prepare drainage plans for each of the major watersheds** • Form Watershed and Coastal Zone Management Committee with representation from DCA, DCA, Min. of Works & Transport, APUA, Forestry, Fisheries, Soil and Water Conservation Divisions. Possible inclusion of NGO representatives. • Prepare drainage plan • Establish monitoring program	DCA, Min. of Works & Transport, APUA, Forestry, Fisheries, Soil and Water Conservation Divisions
2.2	**Prepare water, sewerage, and drainage plans for Antigua and Barbuda** • Review current structure and service levels • Establish alternative infrastructural approaches for settlements with different densities, land use activities, and topographic conditions • Prepare plans for settlement core and expansion areas • Prepare plans to improve sanitation services in St. John's	APUA, Public Works, DCA, Health
2.3	**Prepare roadway improvement plans** • Review sectors with inadequate roadway access • Review congestion hotspots • Prepare roadway and signalization plan for Antigua	Public Works
2.4	**Improve ferry service to Barbuda** • Review current service and explore alternative service structures used in other countries • Construct dock facilities in Barbuda • Acquire new ferry watercraft • Develop and implement enhanced ferry service	DCA, Barbuda Council

Code	Task	Responsibility
2.5	**Prepare energy plan** • Review alternative energy programs • Determine implications of energy programs for settlement and tourism policies • Develop energy guidelines that favour renewal energy and minimize expenditures external to the country	APUA, Energy Desk (PM's Office)
2.6	**Develop environmental conservation and education program and projects** • Assemble committee of environmental stakeholders, including representatives of the school system and tourism • Explore alternative conservation and educational programs currently in Antigua and Barbuda and elsewhere • Elaborate conservation and education policy • Implement conservation and education policy in selected environmental protection areas	DCA, Environment,
2.7	**Prepare environmental and conservation tourism plan for Redonda** • Consult with international environmental agencies that have completed resource inventories concerning Redonda, such as Fauna & Flora International • Establish map base for Redonda • Complete site visit in company of environmentalists and tourism officials • Identify best marine access • Assess landscape quality and environmental features • Identify trail network that offers visitors an opportunity to explore the island without compromising critical biophysical features. • Seek international funding to support project • Construct wharf, landing facility, trail network, and signage	DCA, Tourism, Environment

Code	Task	Responsibility
2.8	**Prepare Parish and community Physical Plans** • Form Parish and Community Councils • Establish stakeholder committees • Establish planning goals, objectives, and strategies. • Prepare plans	DCA, Parish Council

As all who have been involved in the preparation of the SIRMZP will surely attest, the plan-making process is often very intense, sometimes in conflict, and filled with surprises. This is only to be expected as we delve as deeply as we can into issues that have proved difficult to resolve over a very long period of time, issues with respect to which many in the community have taken strong and sometimes opposing positions. What is so critical here is to understand not only the factual base, but also, the values and expectations of the people who will be affected by the Plan.

The GENIVAR planning team would like to express its appreciation to the Government of Antigua and Barbuda and the SIRMM, as well as, the many stakeholders who came forward to offer opinions and provide guidance as the plan unfolded. While this process was often difficult due to the number of issues - regional, inter-regional and national - that needed to be addressed at the same time we very much appreciate the willingness with which so many shared their frustrations and aspirations for a region that is clearly much treasured. We hope that the planning measures that are included in this plan will help the region move forward in directions that reflect the personal and collective aspirations of its residents.

In addition, it must be mentioned that the Client and other stakeholders were most supportive during the planning process, a process that in many respects represents a departure from traditional planning practice in Antigua and Barbuda. The emphasis given to engaging the local population has been particularly encouraging. While there have been (and will be) many challenges along the way, this approach to planning is most welcome and will surely lead to significant benefits in the form of collaborative planning and implementation efforts that truly reflect local interests while still respecting the national development priorities.

A plan, of-course, is never really finished. Rather, it simply offers a road map that may be followed over some years by many stakeholders. What is important is to get started, assess progress and make adjustments as the implementation proceeds.