
TABLE OF CONTENTS

| | |
|-----------------------------|-------------|
| <i>List of Index</i> | <i>i</i> |
| <i>List of Annexes</i> | <i>viii</i> |
| <i>List of Figures</i> | <i>ix</i> |
| <i>List of Tables</i> | <i>xi</i> |
| <i>List of Plates</i> | <i>xiii</i> |
| <i>Glossary of Terms</i> | <i>xv</i> |
| <i>Glossary of Acronyms</i> | <i>xix</i> |
| <i>Placement Notes</i> | <i>xxii</i> |
| <i>Executive Summary</i> | <i>xxiv</i> |

Section 1 Project Description

| | | |
|---------|---------------------------------------|-------|
| 1.1 | Project Location | 1- 1 |
| 1.2 | Physical Development Plans | 1- 2 |
| 1.2.1 | Existing Development | 1- 5 |
| 1.2.2 | Project Rationale | 1- 5 |
| 1.3 | Overview of the Proposed Project | 1- 5 |
| 1.3.1 | Detailed Development Plans and Layout | 1- 9 |
| 1.3.2 | Utilities Plan Layout | 1- 10 |
| 1.3.3 | Amenities | 1- 12 |
| 1.3.3.1 | Helipad | 1- 12 |
| 1.3.3.2 | Sunset Amphitheatre | 1- 12 |
| 1.3.3.3 | Beach Club/Restaurant/Bar/Restroom | 1- 12 |
| 1.3.3.4 | Spa & Fitness Center | 1- 12 |
| 1.3.3.5 | Massage Pavilion | 1- 13 |
| 1.3.3.6 | Library and Observation Deck | 1- 13 |
| 1.3.3.7 | Arrival Pier and Delivery Dock | 1- 13 |
| 1.3.3.8 | Recreation Amenity Area | 1- 16 |
| 1.3.4 | Other Areas | 1- 16 |
| 1.3.4.1 | Buffer Zones and Green Areas | 1- 16 |
| 1.3.4.2 | Beach | 1- 16 |
| 1.3.4.3 | Future Controlled Entrance | 1- 17 |
| 1.3.4.4 | Staffing | 1- 17 |
| 1.4 | Project Development | 1- 18 |
| 1.4.1 | Forecast of Activity Clusters | 1- 18 |
| 1.4.2 | Construction Timeframe | 1- 18 |
| 1.4.2.1 | Construction Components and Timeline | 1- 19 |
| 1.4.2.2 | Sourcing of Construction Materials | 1- 20 |

| | | |
|---------|----------------------------|-------|
| 1.4.2.3 | Transportation of Material | 1- 21 |
| 1.5 | Project Administration | 1- 22 |
| 1.5.1 | Project Management | 1- 22 |
| 1.5.2 | Management Structure | 1- 23 |
| 1.6 | Conclusions | 1- 23 |

Section 2 Project Environment

| | | |
|-----------|--------------------------------|------|
| 2.1 | Physical Environment | 2-1 |
| 2.1.1 | Physical Description | 2-1 |
| 2.1.1.1 | Climatology | 2-1 |
| 2.1.1.2 | Topography and Surface Runoffs | 2-3 |
| 2.1.1.3 | Ambient Noise | 2-7 |
| 2.1.2 | Oceanography | 2-7 |
| 2.1.2.1 | Regional Hydrographic Profile | 2-7 |
| 2.1.2.2 | Bathymetry | 2-10 |
| 2.1.2.3 | Winds and Waves | 2-13 |
| 2.1.2.4 | Tides | 2-14 |
| 2.1.2.5 | Currents | 2-15 |
| 2.1.2.6 | Water Quality | 2-17 |
| 2.1.3. | Geology | 2-23 |
| 2.1.3.1 | Geological History | 2-23 |
| 2.1.3.2 | Geomorphology | 2-23 |
| 2.1.3.3 | Seismology | 2-24 |
| 2.1.4 | Soils | 2-28 |
| 2.1.4.1 | Soil Classification | 2-28 |
| 2.1.4.2 | Soil Investigation and Profile | 2-29 |
| 2.1.4.3 | Extraction of Materials | 2-37 |
| 2.1.5 | Ecosystem Profile | 2-39 |
| 2.1.6 | Land Use | 2-39 |
| 2.1.6.1 | Land Use of Project Site | 2-39 |
| 2.1.6.2 | Land Tenure | 2-40 |
| 2.1.6.3 | Land Use of Surrounding Areas | 2-40 |
| 2.1.6.4 | Zone of Influence | 2-40 |
| 2.2 | Biophysical Environment | 2-41 |
| 2.2.1 | Flora and Fauna | 2-41 |
| 2.2.2 | Flora | 2-41 |
| 2.2.3 | Fauna | 2-62 |
| 2.2.3.1 | Invertebrates | 2-63 |
| 2.2.3.2 | Vertebrates | 2-73 |
| 2.2.3.2.1 | Fish | 2-73 |
| 2.2.3.2.2 | Reptiles and Amphibians | 2-84 |
| 2.2.3.2.3 | Mammals | 2-86 |
| 2.2.3.2.4 | Avi-fauna or Birds | 2-87 |

| | | |
|----------|--|-------|
| 2.3 | Conservation Issues | 2-98 |
| 2.3.1 | Endangered Species of Special Significance | 2-98 |
| 2.3.2 | Conservation Areas | 2-100 |
| 2.4 | Social Assessment | 2-101 |
| 2.4.1 | Background | 2-101 |
| 2.4.2 | Introduction | 2-102 |
| 2.4.3 | Core Concerns of the Social Assessment | 2-103 |
| 2.4.4 | Demographics | 2-103 |
| 2.4.4.1 | Regional Demographics and Population Related Issues | 2-103 |
| 2.4.4.2 | Population and Housing | 2-104 |
| 2.4.5 | Employment | 2-105 |
| 2.4.6 | Social Infrastructure | 2-106 |
| 2.4.7 | Communication and Services | 2-107 |
| 2.4.8 | Cultural | 2-108 |
| 2.4.8.1 | Traditional Activities | 2-109 |
| 2.4.8.2 | Development Strategies | 2-109 |
| 2.4.9 | Transportation/Access | 2-112 |
| 2.4.9.1 | Sea Access | 2-112 |
| 2.4.9.2 | Road Access | 2-112 |
| 2.4.9.3 | Air Access | 2-113 |
| 2.4.10 | Tourism Activities | 2-114 |
| 2.4.11 | NGO and Public Interest | 2-117 |
| 2.4.12 | NGO and Public Consultations | 2-121 |
| 2.5 | Archeological Environment | 2-122 |
| 2.6 | Legislative Environment | 2-124 |
| 2.6.1 | The Environmental Protection Act SI 22/1992 and 328/2003 | 2-124 |
| 2.6.2 | Environmental Impact Assessment Regulations SI 107/1995 | 2-125 |
| 2.6.3 | Effluent Limitation Regulations SI 94/1995 | 2-125 |
| 2.6.4 | Pollution Regulations SI 56/1996 | 2-125 |
| 2.6.5 | Solid Waste Management Authority Act SI 224 of 2000 | 2-126 |
| 2.6.6 | Belize Water Industry Act No. 1 of 2001 | 2-126 |
| 2.6.7 | Belize Public Health Act Revised Edition SI 40/2000 | 2-126 |
| 2.6.8 | National Lands Act (No. 6 of 1992) and SI 191 of 2000 | 2-126 |
| 2.6.9 | Crown Land Rules SI 60 of 1939 | 2-126 |
| 2.6.10 | Mines and Minerals Act Chap. 226 of 2000 | 2-127 |
| 2.6.11 | The Ambergris Caye Master Plan | 2-127 |
| 2.6.11.1 | The Ambergris Caye Planning Authority | 2-127 |
| 2.6.11.2 | Ambergris Caye Local Building Authority | 2-127 |
| 2.6.11.3 | The San Pedro Town Council | 2-128 |
| 2.6.12 | Belize Tourism Policy 2005 | 2-128 |
| 2.6.12.1 | Tourism Master Plan | 2-128 |
| 2.6.12.2 | Belize Tourism Board | 2-129 |
| 2.6.12.3 | Belize Tourism Industry Association | 2-129 |
| 2.6.13 | The Coastal Zone Management (CZM) Act | 2-129 |
| 2.6.13.1 | Cayes Development Policy and the Coastal Zone Management | 2-129 |

| | | |
|----------|--|-------|
| | Strategy | |
| 2.6.14 | The Belize Port Authority | 2-129 |
| 2.6.14.1 | Mooring Buoy Program | 2-130 |
| 2.6.15 | Pier Guidelines and Seawall Development | 2-130 |
| 2.6.16 | The National Protected Areas Policy and System Plan | 2-130 |
| 2.6.17 | National Park System Act SI 215/2000 | 2-131 |
| 2.6.18 | Protected Areas in the Region | 2-132 |
| 2.6.19 | Bacalar Chico National Park and Marine Reserve Regulations | 2-132 |
| 2.6.19.1 | Bacalar Chico Advisory Committee | 2-138 |
| 2.6.19.2 | Little Guana & Los Salones Caye Bird Sanctuaries | 2-138 |
| 2.6.19.3 | UNESCO World Heritage Sites | 2-138 |
| 2.6.20 | Hol Chan Marine Reserve | 2-140 |
| 2.6.21 | The Corozal Bay Wildlife Sanctuary | 2-140 |
| 2.6.22 | Forests (Mangrove Protection) Regulations, SI No. 52 of 1989 | 2-140 |
| 2.6.23 | The Forest Act SI 213/2000 | 2-140 |
| 2.6.24 | Fisheries Act SI 210/2000 | 2-141 |
| 2.6.25 | The Wildlife Protection Act SI 220/2000 | 2-141 |
| 2.6.26 | National Institute of Culture and History 330/2000 | 2-142 |
| 2.6.27 | The Ministry of Housing and the Central Housing Planning Committee | 2-142 |
| 2.6.28 | Housing and Town Planning Act SI 182/2000 | 2-142 |
| 2.6.29 | Hotels and Tourist Accommodation Act 285/2000 | 2-142 |
| 2.6.30 | International Conventions and Agreements | 2-143 |

Section 3 Details of Supporting Services

| | | |
|---------|--|------|
| 3.1 | Introduction | 3-1 |
| 3.2 | Water Resources Management | 3-1 |
| 3.2.1 | Projected Occupancy | 3-1 |
| 3.2.2 | Projected Residential Potable Water Demand | 3-2 |
| 3.2.3 | Water Source Selection | 3-3 |
| 3.2.4 | Water Management | 3-4 |
| 3.2.4.1 | Climatology | 3-4 |
| 3.2.4.2 | Distribution and Storage | 3-5 |
| 3.2.4.3 | Water Treatment Methods | 3-7 |
| 3.2.4.4 | Water Management Strategies | 3-10 |
| 3.3 | Wastewater Management | 3-10 |
| 3.3.1 | Projected Wastewater Composition | 3-11 |
| 3.3.2 | Wastewater Production | 3-12 |
| 3.3.3 | Environmental Wastewater Load | 3-13 |
| 3.3.4 | National Effluent Standards | 3-14 |
| 3.3.5 | Wastewater Treatment and Collection | 3-14 |
| 3.3.6 | Wastewater Disposal | 3-17 |
| 3.4 | Solid Waste Management | 3-18 |

| | | |
|---------|-----------------------------------|------|
| 3.4.1 | Waste Types | 3-18 |
| 3.4.1.1 | Construction and Field Waste | 3-18 |
| 3.4.1.2 | Domestic Solid Waste Generation | 3-19 |
| 3.4.1.3 | Commercial Waste | 3-21 |
| 3.4.2 | Solid Waste Disposal Alternatives | 3-21 |
| 3.4.3 | Waste Minimization | 3-22 |
| 3.4.4 | Waste Collection and Education | 3-23 |
| 3.5 | Energy Generation Management | 3-24 |
| 3.5.1 | Energy Demand | 3-24 |
| 3.5.2 | Energy Supply Sources | 3-25 |
| 3.5.3 | Power Transmission Lines | 3-27 |
| 3.5.4 | Fuel Management | 3-27 |
| 3.6 | Transportation | 3-29 |
| 3.6.1 | Road and Walkways Circulation | 3-29 |
| 3.6.2 | Air Transportation | 3-30 |
| 3.6.3 | Water Transportation | 3-32 |
| 3.7 | Shoreline Protection | 3-34 |

Section 4 Development Alternatives

| | | |
|-------|--|------|
| 4.1 | Introduction | 4-1 |
| 4.2 | The ‘No Action Alternative’ | 4-1 |
| 4.3 | Technical and Economic Analysis | 4-2 |
| 4.4 | Conceptual Strategy for Alternative Analysis | 4-2 |
| 4.4.1 | Potable Water Alternatives | 4-2 |
| 4.4.2 | Wastewater Treatment Alternatives | 4-5 |
| 4.4.3 | Disposal of Treated Wastewater | 4-6 |
| 4.4.4 | Solid Waste Disposal Alternatives | 4-7 |
| 4.4.5 | Energy Generation Alternatives | 4-8 |
| 4.4.6 | Excavation and Land Reclamation | 4-9 |
| 4.4.7 | Ecological Development Alternatives | 4-10 |
| 4.4.8 | Siting and Placement | 4-11 |
| 4.5 | Conclusion | 4-18 |

Section 5 Environmental Impact Analysis

| | | |
|-------|---|-----|
| 5.1 | Introduction | 5-1 |
| 5.1.1 | Conceptual Approach | 5-1 |
| 5.1.2 | Environmental Principles in Impact Analysis | 5-1 |
| 5.2 | Overview of Proposed Cumulative Impacts | 5-2 |
| 5.2.1 | Impact Rating Matrix | 5-3 |
| 5.3 | Details of Potential Environmental Impacts | 5-5 |
| 5.3.1 | Excavation Impacts | 5-6 |
| 5.3.2 | Land Reclamation Impacts | 5-6 |
| 5.3.3 | Domestic Effluent Impacts | 5-7 |
| 5.3.4 | Potable Water Impacts | 5-8 |

| | | |
|-----------|--|------|
| 5.3.5 | Solid Waste Impacts | 5-8 |
| 5.3.6 | Energy Generation Impacts | 5-9 |
| 5.3.7 | Boating and Dockside Impacts | 5-10 |
| 5.3.8 | Impacts from the Building Construction | 5-10 |
| 5.3.9 | Walkway Impacts | 5-11 |
| 5.3.10 | Roadway Impacts | 5-11 |
| 5.3.11 | Heliport | 5-12 |
| 5.3.12 | Overview of Social Impacts | 5-12 |
| 5.3.12.1 | Details of Social Impacts | 5-13 |
| 5.3.12.2 | Existing and Proposed Activities | 5-14 |
| 5.3.12.3 | Marine Traffic | 5-15 |
| 5.3.12.4 | Road Access | 5-15 |
| 5.3.12.5 | Disturbances (Noise, Air Quality) | 5-16 |
| 5.3.12.6 | Population Housing | 5-16 |
| 5.3.12.7 | Socio-Cultural | 5-17 |
| 5.3.12.8 | Education/Health Services | 5-17 |
| 5.3.12.9 | Employment/Safety | 5-18 |
| 5.3.12.10 | Emergency Services | 5-18 |
| 5.3.12.11 | Tourism Activities | 5-18 |
| 5.3.12.12 | Economic Impact | 5-19 |
| 5.4 | Indirect Impacts | 5-24 |
| 5.4.1 | Impact on Fishing Activities | 5-24 |
| 5.4.2 | Impacts on Tourism Activities | 5-24 |
| 5.5 | Conclusion | 5-25 |

Section 6 Environmental Management System

| | | |
|---------|--|------|
| 6.1 | Introduction | 6-1 |
| 6.2 | EMS Outline | 6-1 |
| 6.2.1 | Benefits | 6-2 |
| 6.3 | Impact Mitigation Measures | 6-2 |
| 6.3.1 | Mitigation Measures In Relation To Excavation Activities | 6-3 |
| 6.3.2 | Mitigation Measures in Relation to Land Reclamation Activities | 6-4 |
| 6.3.3 | Mitigation Measures in Relation to Domestic Effluent Impacts | 6-5 |
| 6.3.4 | Mitigation Measures in Relation to Solid Waste Management | 6-8 |
| 6.3.5 | Mitigation Measures in Relation to Energy Generation | 6-10 |
| 6.3.6 | Mitigation Measures In Relation To Socio-Economic Concerns | 6-13 |
| 6.3.7 | Other related Impacts | 6-18 |
| 6.4 | Environmental Monitoring Plan | 6-20 |
| 6.4.1 | Principle of Environmental Monitoring | 6-20 |
| 6.4.2 | Specific Monitoring Plan | 6-21 |
| 6.4.2.1 | Water Quality Monitoring Program | 6-21 |
| 6.4.2.2 | Energy Monitoring Program | 6-24 |
| 6.4.2.3 | Wastewater Monitoring Program | 6-24 |
| 6.4.2.4 | Solid Waste Monitoring Plan | 6-25 |
| 6.4.2.5 | Biodiversity Monitoring Program | 6-27 |

| | | |
|---------|---|------|
| 6.4.2.6 | Social Monitoring | 6-28 |
| 6.4.2.7 | Other Monitoring Plans | 6-29 |
| 6.4.3 | Performance Indicators | 6-30 |
| 6.5 | Disaster and Contingency Management Framework | 6-30 |
| 6.5.1 | Administrative Framework | 6-30 |
| 6.5.2 | Disaster Classification | 6-31 |
| 6.5.3 | Hurricane Preparedness Plan | 6-31 |
| 6.5.3.1 | Purpose of Plan | 6-32 |
| 6.5.3.2 | Strom Information System | 6-32 |
| 6.5.3.3 | Action Plan | 6-32 |
| 6.5.3.4 | Safety Precautions | 6-34 |
| 6.5.4 | Fire Prevention and Response Plan | 6-35 |
| 6.5.4.1 | Purpose of Plan | 6-35 |
| 6.5.4.2 | Fire Prevention | 6-35 |
| 6.5.4.3 | Fire Protection Equipment/Systems | 6-36 |
| 6.5.4.4 | Fire Response | 6-36 |
| 6.5.4.5 | Response Mechanisms | 6-36 |
| 6.5.5 | Spill Contingency Plan | 6-37 |
| 6.5.5.1 | Purpose of Plan | 6-37 |
| 6.5.5.2 | Response Policy | 6-38 |
| 6.5.5.3 | Fuel Management | 6-38 |
| 6.5.5.4 | Waste Oil Management | 6-39 |
| 6.5.5.5 | Contingency Equipment | 6-39 |
| 6.5.6 | Tidal Rise Contingency Plan | 6-39 |
| 6.5.6.1 | Purpose of the Plan | 6-40 |
| 6.5.6.2 | Adapting to Sea Level Rise | 6-40 |
| 6.5.6.3 | Climate Change Effects | 6-40 |
| 6.5.7 | Medical Emergency Plan | 6-41 |
| 6.5.7.1 | Purpose of the Plan | 6-41 |
| 6.5.7.2 | Basic First Aid | 6-41 |
| 6.5.7.3 | Transportation (Evacuation) of Patient | 6-42 |
| 6.5.7.4 | Contact Information | 6-42 |
| 6.5.8 | Environmental Safety | 6-43 |
| 6.6 | Conclusion | 6-44 |

LIST OF REFERENCES

LIST OF ANNEXES

- Annex I - Terms of Reference
- Annex II - EIA Preparers
- Annex III - Legal Document
- Annex IV - Water Quality Results
- Annex V - Wind Code Evaluations
- Annex VI - Seismic Code Evaluation
- Annex VII - Archeology
- Annex VIII - Sewage Plant Specification
- Annex IX - Earth Tub Composting Technology

LIST OF FIGURES

| | | |
|-----------|--|-------|
| Fig. 1.1 | General Project Location | 1- 1 |
| Fig. 1.2a | Option 1 of Development Concept for Bellcan Eco-Resort w/Areas | 1-6 |
| Fig. 1.2b | Option 2 of Development Concept for Bellcan Eco-Resort w/ Areas | 1-7 |
| Fig. 1.2c | Artistic Rendition of Chosen Option 2 | 1-8 |
| Fig. 1.3 | Schematic Representation of Back of House Zone | 1- 11 |
| Fig. 1.4 | Arrival Pier, Overwater Cabañas and Delivery Dock | 1- 14 |
| Fig. 1.5 | Typical Overwater Structure Pile Brace and Pier Section | 1- 15 |
| Fig. 1.6 | Typical Development Factors of a Project | 1- 22 |
| Fig. 1.7 | Proposed Management Structure for Bellcan Eco Resort | 1- 23 |
| | | |
| Fig. 2.1 | Isopleth Map of Belize-Note Project Site | 2-2 |
| Fig. 2.2 | Topography Map of Project Site (Profile's L1-L4) | 2-4 |
| Fig. 2.3 | Topography Map of Project Site (Profile's L5-L7) | 2-5 |
| Fig. 2.4 | Surface Runoff Patterns for the Project Site | 2-6 |
| Fig. 2.5 | Hydrographic Map of the Project Site | 2-9 |
| Fig. 2.6 | Bathymetric Profile of Proposed Project Site | 2-11 |
| Fig. 2.7 | Seabed Depths for the Placement of the Overwater Structures | 2-12 |
| Fig. 2.8 | Wind Speed Graph | 2-13 |
| Fig. 2.9 | Tide Graph Data | 2-14 |
| Fig. 2.10 | Float Data for the Proposed Development | 2-16 |
| Fig. 2.11 | Water Sample locations and Results | 2-20 |
| Fig. 2.12 | In-situ Water Sample Locations and Results | 2-21 |
| Fig. 2.13 | Comparative Water Sample Locations and Results | 2-22 |
| Fig. 2.14 | Typical cross section of the geological formations underlying Ambergris Caye and associated areas. | 2-24 |
| Fig. 2.15 | Seismicity of Central America, 1990 - 2006 | 2-25 |
| Fig. 2.16 | Seismic Intensity Map of Belize and project site | 2-26 |
| Fig. 2.17 | Geological Fault Map of Belize | 2-27 |
| Fig. 2.18 | Field Data of Bedrock Probing | 2-30 |
| Fig. 2.19 | Land Survey Transects - Borehole Location & Sections | 2-33 |
| Fig. 2.20 | Soil Sample Locations | 2-36 |
| Fig. 2.21 | Proposed Extraction and Fill Requirement for the Project | 2-38 |
| Fig. 2.22 | Vegetation Classification of Greater BCNP/MR. | 2-43 |
| Fig. 2.23 | Vegetation Map of Project Site | 2-44 |
| Fig. 2.24 | Dive Map of Project Site | 2-45 |
| Fig. 2.25 | Archaeological Map of Ambergris Caye | 2-123 |
| Fig. 2.26 | Management Zones within the BCNP/MR | 2-137 |
| Fig. 2.27 | Protected Areas in the Region of the Proposed Development | 2-139 |

| | | |
|----------|---|------|
| Fig. 3.1 | Proposed Potable Water Supply Schematic | 3-6 |
| Fig. 3.2 | Cross Section of a Typical Abstraction Well | 3-8 |
| Fig. 3.3 | Cross Section of a Typical Deep Injection Well | 3-9 |
| Fig. 3.4 | Schematic Chlorination System | 3-10 |
| Fig. 3.5 | Wastewater Collection Schematic | 3-16 |
| Fig. 3.6 | Typical above ground storage tanks | 3-28 |
| Fig. 3.7 | Typical Road Cross-Section. | 3-30 |
| Fig. 3.8 | Schematic Representation of the Project Road and Pathways | 3-31 |

LIST OF TABLES

| | | |
|------------|---|-------|
| Table 1.1 | Summary Breakdown of Residential Areas | 1- 10 |
| Table 1.2 | Proposed Construction Schedule for Belcan Luxury Eco Resort | 1- 20 |
| | | |
| Table 2.1 | Terrestrial and Inter-tidal Plants of the Project Area | 2-46 |
| Table 2.2 | Sub-tidal plants of the project area | 2-58 |
| Table 2.3 | Invertebrates including corals found in and around the project site | 2-64 |
| Table 2.4 | Fish Species Found in Project Area | 2-74 |
| Table 2.5 | Reptiles and Amphibians | 2-84 |
| Table 2.6 | Mammals | 2-86 |
| Table 2.7 | Birds Found in and Around the Project Area | 2-88 |
| Table 2.8 | Summary of methodologies employed in characterization of bio-physical environment | 2-96 |
| Table 2.9 | 2008 Mid- Year Population Estimates by Region and Sex | 2-103 |
| Table 2.10 | Populations of 2 Communities Directly Impacted by the Development | 2-104 |
| Table 2.11 | National Population by District, Mid-year Estimates 2007 | 2-105 |
| Table 2.12 | Employment Data in the Belize District during 2005-2007 | 2-105 |
| Table 2.13 | Statistics on Number of beds from 1988 to present (Courtesy BTB) | 2-114 |
| Table 2.14 | Statistics on Number of Hotels from 1988 to present (Courtesy BTB) | 2-115 |
| Table 2.15 | Statistics on Number of rooms from 1988 to present (Courtesy BTB) | 2-115 |
| Table 2.16 | Comparative Tourism Industry Statistics in Ambergris Caye | 2-115 |
| Table 2.17 | Recorded Visitations at Hol Chan Marine Reserve. | 2-116 |
| Table 2.18 | Licenses and Permits required by the Development | 2-144 |
| | | |
| Table 3.1 | Projected Occupancy for the Proposed Project | 3-2 |
| Table 3.2 | Potable Water Demand for Belcan Eco Resort | 3-3 |
| Table 3.3 | Rainfall Storage Capacity for the buildings at Belcan Eco Resort | 3-5 |
| Table 3.4 | Typical Composition of Untreated Domestic Wastewater | 3-11 |
| Table 3.5 | Projected Wastewater Productions for Belcan Luxury Eco Resort | 3-12 |
| Table 3.6 | Volume of Recycled Wastewater required for flushing of Toilets | 3-13 |
| Table 3.7 | Environmental Wastewater Loading Profile | 3-14 |
| Table 3.8 | Effluent Limitation Standards for Commercial Activities | 3-14 |
| Table 3.9 | Projected Performance of BESST Treatment Plant and its equivalent | 3-17 |
| Table 3.10 | Projected Solid Waste Production volumes by Zones for Belcan Eco Resort | 3-20 |
| Table 3.11 | Waste Separation Yield for Belcan Eco Resort | 3-23 |
| Table 3.12 | Projected Energy Demand for Belcan Eco Resort | 3-24 |
| Table 3.13 | Selection of Sources for Belcan Eco Resort | 3-26 |

| | | |
|------------|---|-------|
| Table 4.1 | Summary of Alternative Potable Water Sources | 4-4 |
| Table 4.2 | Generic Evaluation of Wastewater Disposal Alternatives | 4-5 |
| Table 4.3 | Evaluation of Treated Wastewater Disposal | 4-6 |
| Table 4.4 | Domestic Waste Disposal Option | 4-8 |
| Table 4.5 | Alternative Analysis for Energy Generation | 4-9 |
| Table 4.6 | Land Reclamation Activities | 4-10 |
| Table 4.7: | Ecological Alternatives | 4-11 |
| Table 4.8 | Options for Development | 4-12 |
| | | |
| Table 5.1 | Impact Rating Matrix for Belcan Luxury Eco Resort | 5-4 |
| Table 5.2 | Social Impact Summary for Belcan Eco Resort | 5-20 |
| | | |
| Table 6.1 | Mitigation Responses in relation to Excavation Impacts | 6- 3 |
| Table 6.2 | Mitigation Responses in relation to Land Reclamation Activities | 6- 5 |
| Table 6.3 | Summary of Impacts Associated with Human Waste and Domestic Effluents | 6- 6 |
| Table 6.4 | Mitigation Measures in Relation to Solid Wastes | 6- 9 |
| Table 6.5 | Mitigation Measures in relation to Energy Generation | 6- 11 |
| Table 6.6 | Mitigations In Relation to Socio-Economic Concerns | 6- 14 |
| Table 6.7 | Mitigation Measures in Relation to Other Impacts | 6- 18 |
| Table 6.8: | Monitoring Plan for Surface Waters | 6- 22 |
| Table 6.9 | Wastewater Monitoring Template | 6- 25 |
| Table 6.10 | Parameters for Solid Waste Monitoring | 6- 25 |
| Table 6.11 | Proposed Biodiversity Monitoring Plan | 6- 27 |
| Table 6.12 | Social Monitoring Issues | 6- 29 |
| Table 6.13 | Complementary Plans for Belcan Eco Resort | 6- 30 |
| Table 6.14 | Preparedness Plan for Belcan Eco Resort | 6- 31 |
| Table 6.15 | Marine Spills Levels | 6- 38 |
| Table 6.16 | Inland Spill Levels | 6- 38 |
| Table 6.17 | Contact Numbers for Emergency Services | 6- 42 |

LIST OF PLATES

| | | |
|-------------|--|------|
| Plate 1.1 | Satellite Imagery of Project Site(Courtesy of Google Earth) | 1- 3 |
| Plate 1.2 | Aerial Views of the Project Site. | 1- 4 |
| | | |
| Plate 2.1 | Soil Samples and Classification | 2-34 |
| Plate 2.2 | Soil Samples and Classification Cont'd | 2-35 |
| Plate 2.3 | Mixture of manatee and turtle grass | 2-60 |
| Plate 2.4 | Transect line through Seagrass Bed | 2-60 |
| Plate 2.5 | Dead sargassum weed on sea bed | 2-60 |
| Plate:2.6 | Three finger leaf algae mixed with manatee grass | 2-60 |
| Plate 2.7 | Sparse seagrass near reef crest | 2-60 |
| Plate 2.8 | Mixture of turtle and manatee grass near reef patch | 2-60 |
| Plate: 2.9 | Eastern approach to property | 2-61 |
| Plate 2.10 | Beach environment looking West. | 2-61 |
| Plate: 2.11 | Low tide at project site showing semi-exposed algae with red mangrove saplings | 2-61 |
| Plate 2.12 | Nearshore environment on Laguna seagrass and Cantena | 2-61 |
| Plate 2.13 | Nearshore environment of Laguna Cantena Red Mangrove | 2-61 |
| Plate 2.14 | Littoral forest (Buttonwood) on property | 2-61 |
| Plate 2.15 | Area described as 'Littoral Forest Mid-Latitude Berm' | 2-62 |
| Plate 2.16 | Area described as Littoral Forest Lagunal Berm | 2-62 |
| Plate 2.17 | Stakes or 'brush sticks' harvested from area of Mid-latitude Berm | 2-62 |
| Plate 2.18 | Northern Portion of Property at low tide | 2-62 |
| Plate 2.19 | Soldier Crabs found in Littoral Forest | 2-71 |
| Plate 2.20 | Tellin found in the Laguna de Cantena | 2-71 |
| Plate 2.21 | Periwinkle found in near shore Laguna de Cantena | 2-72 |
| Plate 2.22 | Unknown mussel found in lagoon; also found during the ABR survey | 2-72 |
| Plate 2.23 | Blade fire coral and sea fan | 2-72 |
| Plate 2.24 | Porous sea rod providing cover for many Species of fishes | 2-72 |
| Plate 2.25 | Smooth star coral | 2-72 |
| Plate 2.26 | Mixture of hard and soft corals, note parrot fish feeding on coral | 2-72 |
| Plate 2.27 | Smooth star coral with algae growing on dead areas | 2-73 |
| Plate 2.28 | Note the dead coral at the top of a patch reef in the back reef | 2-73 |
| Plate 2.29 | Two diff. species of star coral starting to grow, in Back reef area amongst dead coral | 2-73 |
| Plate 2.30 | Doughnut Sea Rod found in pavement area | 2-73 |
| Plate 2.31 | Juvenile School Master Snapper | 2-83 |
| Plate 2.32 | Juvenile jack | 2-83 |

| | | |
|------------|---|-------|
| Plate 2.33 | Black Snapper | 2-83 |
| Plate 2.34 | Blue stripped Grunt | 2-83 |
| Plate 2.35 | Silverside | 2-83 |
| Plate 2.36 | Google Earth Picture showing the White Hole where the head of the pier will be situated | 2-101 |
| Plate 3.1 | Water Transportation Routes Bellcan Luxury Eco Resort | 3-33 |

Glossary of Terms

Algae: one celled or many celled plants that have no root, stem, or leaf system.

Bathymetry: depth profile of the ocean bottom or seafloor.

ABR: Ambergris Caye Resort

Beach: sediment seaward of the coastline through the surf zone that is in transport along the shore and within the surf zone.

BCNP: Bacalar Chico National Park

BCMR: Bacalar Chico Marine Reserve

Benthic: pertaining to the ocean bottom or seafloor.

Benthos: the forms of marine life that live on the ocean bottom or seafloor.

Biogenic Sediments: sediments containing materials produced by plants or animals such as corals, shell fragments and tests housing diatoms and radiolarians.

Biomass: total weight of the organisms in a particular habitat, species, or group of species.

Biota: the total plants and animals of a given area.

Coast: a strip of land that extends inland from the coastline as far as marine influence is evidenced in the landforms.

Coastline: landward limit of the highest storm waves' effect on the shore.

Coliform: Type of bacterial found in feces.

Construction: excavation, movement of earth, erection of forms or structures, or similar activities at a development or project site.

Disposal: the discharge, deposit, injection, dumping, spilling, leaking, or placing of any waste into or on any land, water so that it may enter the wider environment, including ground water sources.

Effluent: water discharged from a development into receiving water body or the environment otherwise.

Euryhaline: pertaining to the ability of a marine organism to tolerate a wide range of salinity.

Eutrophication: elevation of nutrient content of water through input of fertilizers, fecal materials and domestic effluents

Fauna: animals.

Fecal: of or related to feces.

Flora: plants.

Finfish: collective terms for aquatic vertebrates with scales which uses fins for propulsion.

Groundwater: water below the land surface in a zone of saturation.

Habitat: a place where a particular plant or animal lives: Generally refers to a smaller area than environment.

Intertidal Zone: lies between the high and low tide extremes and can be divided into a high tide zone which is mostly dry and covered by the highest high tide but not the lowest high tide, the middle tide zone exposed and covered equally by all high tides and exposed during all low tides, and the low tide zone which is mostly wet and covered during the highest low tides and exposed during the lowest low tides.

Lagoon: a body of water separated from the sea by a bank or coral reef: Also the region between a shore and a barrier reef or inside a ring of islands composing an atoll.

Littoral Zone: also known as the foreshore or intertidal zone, lies between the high and low tide extremes.

Lagoonal: of or pertaining to lagoon.

Macroalgae: algae that project more than 1 cm above the substrate, such as *Dictyota* spp., and *Halimeda* spp.

Mangal: a swamp dominated by mangroves.

Mangroves: collective term used for range of salt-tolerated inter-tidal plants found throughout the tropics and within latitude of 20° north and south of the equator.

Neap Tide: tide of minimal range occurring when the moon in quadrature, or its 1st Quarter and 3rd Quarter Phases.

Nearshore Zone: the seaward zone from the shoreline to the line of breakers.

Pelagic Environment: the open ocean environment which is divided into a neretic province with water depths 0 to 200 m and the oceanic province with depths greater than 200 m.

Pelagic Organism: free-swimming or floating biota that live exclusively in the water column, not on the sea floor or ocean bottom.

Permitting Agency: a Government Agency responsible for issuing permits to allow various aspects of a development to proceed within the context of the Laws of Belize.

Permit: authorization, license, or equivalent control document issued by an Agency of the Government of Belize to implement various aspects of a development.

Pollutant: any dredged spoil, solid waste, incinerator residue, sewage, garbage, chemical waste, heat, industrial, domestic, municipal or agriculture waste discharged into the environment.

Primary Productivity: the amount of organic matter organisms synthesize from inorganic substances within a given volume of water or habitat in a unit of time.

Project Proponent: developer proposing a particular project.

Red List: Catalogue of Threatened Species compiled by IUCN.

Salinity: a measure of the quantity of dissolved solids in ocean water: it is expressed in part per thousand by weight after all carbonates have been converted to oxide, the bromide and iodide to chloride, and all the organic matter oxidized.

Sessile: attached to the bottom or to rocks, pilings, etc. and unable to move.

Sewage: any human body waste and the waste from toilets and other receptacles intended to receive or retain body wastes that are discharged into the environment.

Sand: particle size ranging from 1/16 to 2 mm: It pertains to particles that lie between silt and granules on the Wentworth Scale of grain size.

Sanitary Landfill Site: a facility at which municipal, industrial wastes and hazardous wastes are applied onto or incorporated into the soil surface.

Shore: the section of land seaward of the coast: This extends from the highest level of wave action during storms to the low water line.

Shoreline: the line marking the intersection of the water surface with the shore: It migrates up and down as the tide rises and falls.

Silt: a particle size ranging from 1/128 to 1/16 mm: It is intermediate between sand and clay.

Spring Tide: tide of maximum range occurring every fortnight and coincides with when the moon is new and full respectively.

Sub littoral: seabed below the low tide mark.

Tide: periodic rise and fall of the ocean surface and connected bodies of water resulting from the unequal gravitational attraction of the moon and sun on different parts of the earth.

Tidal Range or Amplitude: the difference in height between consecutive high and low

Water: The comparison may also be a day, month, or year.

Topography: the physical shape of the land surface.

Transect: a line or narrow belt used to survey the distribution of organisms or substrate across a given area.

Vertebrates: animals belonging to the Subphylum Chordata, also known as the Chordates that include those animals with a well-developed brain and a skeleton of bone or cartilage: Includes fishes, amphibians, reptiles, birds and mammals.

Wave: a disturbance that moves over or through a medium with a speed determined by the properties of the medium.

Wave Height: vertical distance between a crest and the preceding trough.

Wave Length: horizontal distance between two corresponding points on successive waves such as from crest to crest.

GLOSSARY OF ACRONYMS

ABR: Ambergris Caye Belize Resort

ACBLA: Ambergris Caye Local Building Authority

AST: Above ground Storage Tank.

BAS: Belize Audubon Society.

BCNP/MR: Bacalar Chico National Park and Marine Reserve

BEL: Belize Electricity Limited.

BESST: Biological Engineered Single Sludge Treatment.

BOD₅: 5 days Biological Oxygen Demand test.

BSWMP: Belize Solid Waste Management Program.

BTB: Belize Tourism Board

BWSL: Belize Water Services Limited.

CBA: Central Building Authority

CBWS: Corozal Bay Wildlife Sanctuary

CEQ: Council of Environmental Quality.

CITES: Convention on the International Trade in Endangered Species of wild flora and fauna.

CSO: Central Statistical Office, *See SIB*

CZMAI: Coastal Zone Management Authority and Institute.

DoE: Department of the Environment.

ECP: Environmental Compliance Plan

EIA: Environmental Impact Assessment

GoB: Government of Belize.

GPS: Global Positioning System.

IMO: International Marine Organization.

IUCN: International Union for the Conservation of Nature.

MoH: Ministry of Health

MBRS: Mesoamerican Barrier Reef System

MOU: Memorandum of Understanding

MPA: Marine Protected Areas.

MSL: Mean Sea Level.

NEAC: National Environmental Appraisal Committee.

NEMO: National Emergency Management Organization.

NFS: National Fire Service

NGO: Non-Government Organization.

NICH: National Institute of Culture and History

REA: Rapid Environmental Assessment.

RTE: Rare Threatened or Endangered.

SPBA: San Pedro Business Association

SIB: Statistical Institute of Belize

SPT: Standard Penetration Test

SWMA: Solid Waste Management Authority

TBFIM: To Be Filled In later by Management

TNCE: Tunich Nah Consultants and Engineering

TOR: Terms of Reference.

TSS: Total Suspended Solids.

WTS: Waste Transfer Site

PLACEMENT NOTES

The intended Belcan Eco Resort project aims to develop a low density residential tourism venture in the Bacacal Chico National Park and Marine Reserve. The endeavor will be accompanied by several amenities that will attract potential guests and nature lovers to the site. This document is aimed at describing the proposed project, its setting and supporting services and its impact and mitigation measures that will be employed. The description of the project, its setting and supporting services and amenities are in the form of an expansive narrative (Sections 1,2 and 3) with its impacts described in its outcome (Sections 4,5, and 6).

Narrative

The location and background of the project are identified in an expansive narrative which consists of a description of the overall project, its immediate surroundings and the supporting services required for operation. These components are also supported by a number of annexes that in principle provide further details to the narration. The main narrative is further broken down into two subcomponents as summarized in the following:

- The main narrative begins with Section 1 with the description of the overall project and Section 2 which gives a picture of the physical environment of the project. These Sections an important component in any EIA as it allows the reader to get an understanding of the overall project development along with a description of the environmental setting in which the project will be located.
- The other component or Section 3 relates to the infrastructural supporting services that will be derived from the operations component that will make the project viable. Such support services include identifying the water and energy demands as well as the calculating the wastewater and solid waste production. In addition, other components in this narrative give a broad view of the infrastructural components that will be developed in conjunction with the site's carrying capacity.

Outcome

Every action must have an equal and opposite reaction. The resulting outcomes of the project's development are captured in the potential impacts. These impacts can be measured in terms of its magnitude, scope and duration. Prior to these impacts, a set of development alternatives are provided to broaden the reader's perspective in employing alternative measures. These components are described in Sections 4 and 5 of the document and entail a detailed description of the development alternatives and potential impacts that could arise as a result of developing the intended project.

Management

The mitigational measures to the potential impacts are manifested in the management aspect of the proposed project (Section 6). Section 6 deals with the implementation of an environmental management system (EMS) plan to address the different environmental impacts, its mitigational measures and proposed monitoring plans. In addition, this section further documents the project's response mechanisms towards natural disasters. The term 'disaster' is loosely used in this section and is referred to as any incident, accident, or natural occurrence that could affect the operation of the project in whatever way.

Conclusion

The overall document was prepared with the fundamental view of understanding the project, its development concept and anticipated impacts on the receiving environment (water, soil, air and social components). This EIA submission is supported by data collected in the field (physical, biological and social) as well as from references and citations from reliable sources. Care was taken in obtaining the necessary information to satisfy the project's TOR and the overall intentions of the developer which is to develop the land or project site in an environmentally sustainable manner.

EXECUTIVE SUMMARY

Project Location

The proposed Belcan Luxury Eco Resort is to be located on northern Ambergris Caye just or about 18.5 miles north of San Pedro Town as the crow flies. The proposed project is on the windward or eastern side of Ambergris Caye and is bordered on its leeward or western side by the Laguna de Cantena.

The property is part of the larger area of northern Ambergris Caye known as the Bacalar Chico National Park and Marine Reserve (BCNP/MR) which runs to the northern border with Mexico and comprises 28,169 acres of land and coastal waters. Currently the site can only be accessed by boat either 'through the back' or around Rocky Point which would involve going through one of the 'splits'. Road access is limited to trails along the upper north eastern portion of Ambergris Caye and there is no current intention of constructing a road.

Project Setting

The proposed project lies on some 74.25 acres of which 33.11 acres or 44.6 % of the property is land and 41.14 acres or 55.4 % is lagoonal waters (See Plate 1.1). These parcels of land are a part of a larger subdivision plan for the area.

The project is located on a moderately thick strip of land with the Caribbean Sea. The windward side of the property is relatively shallow, with maximum depths within 20 feet and this shallow area proceeds from the beaches of the property, to the reef crest of the Belize Barrier Reef. The land portion entails a very well developed beach berm with herbaceous vegetation and littoral forest extending inwards towards the lower portion of leeward side of the project site which is characterized by a strand of lowland mangrove forest. Thus the land mass portion can be subdivided into two categories. The littoral forest and beach environment (sand dune) comprises of 18.81 acres or 56.8 %, while the lowland mangrove forest is comprised of 14.3 acres or 43.2 % of the land mass.

The coastal waters off the eastern shoreline of the property is dominated by intermittent tufts of sea grass beds mainly Turtle Grass (*Thalassia testudinum*) in the near shore areas and by coral formations such as the Staghorn Coral (*Acropora cervicornis*) and the Elkhorn Coral (*Acropora palmata*) in the more distal areas. Apart from corals, the near shore and offshore waters off the eastern side of the property are inhabited by a number of invertebrate and vertebrate species such as the Spiny Lobster (*Panulirus argus*) along with several fish species such as the Bonefish (*Albula vulpes*) and Red Hind Grouper (*Epinephalus gattatus*). As for the Laguna de Cantena, no fish activity was recorded for this area, especially around the project site.

In terms of its wildlife, the area is characterized by a number of small mammals such as the Four-Eyed Opossum (*Philander opossum*) and Gibnut (*Agouti paca*) to name a few.

Reptiles on the other hand were few and mainly consisted of snakes and lizards such as the Boa (*Boa constrictor*) and the Gray Vine Snake (*Oxybelis aeneus*). The birds were the most abundant and diverse wildlife found in and around the project site. These consisted mainly of the Brown Pelican (*Pelicanus occidentalis*), the Herring Gull (*Larus argentatus*), the Golden-fronted Woodpecker (*Melanerpes aurifrons*), and the Tropical Kingbird (*Tyrannous melancholicus*). The amphibians were the least present of the vertebrates.

In terms of existing development, there is no development on the property, nor is there a history of any development that may have been pre-existing. There is, however, a small wooden structure and pier just south of the development. Further north, the area has several wooden structures that serve as weekend getaways. Socially, the area is visited mostly by tourists and traditional fishermen of the area. The reserve is actively managed by the Bacalar Chico staff with support from the Fisheries Department.

Development Concept

In considering the development concept, the developers wanted to develop the entire property but they were convinced to protect the lagoon, mangroves and littoral forest as much as possible (See 'Option 1' in Fig. 1.2a). Thus most of the mangrove forest will be left in its natural form. In visualizing the importance, the developers decided to scale down the project as well as to give up the lagoon portion of the property to further spare the mangroves in exchange for permission to construct an Arrival Pier and Overwater Cabañas that are within the marine reserve (See 'Option 2' in Fig. 1.2b). Therefore, the developers will surrender the lagoon portion or about 55.4 % of the property. The lagoon property will be given to government where agreement will be signed with the Fisheries Department and Department of the Environment. This agreement will guarantee that this portion of the property will remain as a reserve and that the authorities will be responsible for managing the reserve.

Project Profile

Therefore in retrospect to the above development concept, the proposed eco resort development will be a recreational tourism venture that will be complemented by an upscale accommodation component. This development is termed as a low density, low impact and high end project that aims to provide a complete and wonderful relaxing experience. With this in mind, the project profile will consist of several components including residential dwellings, amenities and its supporting services.

At full completion, the anticipated project is expected to have an occupancy of 118 persons which includes guests, visitors and staff. It is expected that 25 of these persons will be full time staff. In addition, the overall development will occupy about 5.5 acres which represents about 16.6 % of the property. The project is to be developed in a single continuous phase over a three (3) to four (4) year time-frame. It is anticipated the development will utilize native materials for its construction purposes which will be

bought locally. In considering the overall project and revised development concept, the residential or guest accommodations will consist of:

- ▶ Four Beachfront Casita Units
 - ▶ Eight Eco Luxury Villa Units
 - ▶ Twenty Four Stilted Casita Units
 - ▶ Six Overwater Cabaña Units
- } Total amount 42 units

Collectively, it is anticipated that when operational, the residential guest units will be able to accommodate about 68 patrons at maximum occupancy (See Table 3.1). It is anticipated that these residential guest units will be constructed out of wooden materials except for the foundations which will be concrete where applicable. It is expected that native materials will be used as much as possible to enhance the residential settings.

Similarly, the development will have its share of amenities to complement the residential guest accommodation. Some of the amenities that will be constructed on site as part of the project outline and setting will include the following:

- ▶ Sunset Amphitheatre
- ▶ Beach Club/Restaurant and Bar
- ▶ Beach and Bathing Area
- ▶ Spa and Fitness Center
- ▶ Massage Pavilion
- ▶ Library and Observation Deck
- ▶ Arrival and Delivery Dock
- ▶ Helipad

These amenities are further discussed in Section 1.3.3 of this document.

In addition, the development will also have its supporting services to keep the project in operation. These supporting services will be housed in an area known as the 'Back of House' area or Utility Zone as is sometimes referred. These services include potable water and its distribution, wastewater treatment and recycling facility, solid waste storage facility, energy generation and electrical distribution, and communication services. This section is further expounded in Section 3. These services will be located on the northeastern portion of the project site. The following sections briefly summarize the supporting services for the proposed project:

- ▶ *Potable Water* – The primary source of water is to be from rain water sequestration supplemented by water desalinization – Reverse Osmosis (See Section 3.2.3 and 'IW' in Fig. 1.3). It is anticipated that the water demand will further be supplemented by wastewater recycling that will exclusively be used for flushing of toilets, irrigation, and fire fighting. At full occupancy, it is estimated

that a total of 7,100 gallons of potable water will be required for project operation, notwithstanding the pre-construction phase. For this purpose, it is expected that water for the construction will be gotten from Reverse Osmosis. Furthermore, it is anticipated that the water desalinization plant will be operational from time to time, especially during the peak of the dry season.

- ▶ *Wastewater Treatment and Disposal* – Sewage and waste water associated with the proposed development is to be treated to tertiary levels using a ‘Package Plant’. This package plant is to be located on the upper northwestern portion of the project site (See ‘TP’ in Fig. 1.3). This package plant must reduce the major pollutants such as the macro-nutrients (nitrates and phosphates), ammonia, as well as Total Suspended Solids, Biological Oxygen Demand and microbes to levels where they do not pose a threat to the integrity of the environment or human health (See Tables 3.7 and 3.8).

Such package plant can either be the BESST Plant which is an acronym for **B**io**E**ngineered **S**ingle **S**ludge **T**reatment or its equivalent. It is anticipated that at full occupancy, the volume of wastewater generated by the eco resort will be around 4,970 gallons a day. The post-treated effluent from the package plant is to be stored and recycled and used for flushing of toilets, irrigation, and fire-fighting. The management of wastewater has been comprehensively dealt with in Section 3.3.

- ▶ *Solid Waste Management* – The solid waste management strategy is to entail a sequence of activities. This is to begin with the initial separation of the waste into its organic and inorganic components. The organic component is then to be composted using composter. The mulch is then to be used as fertilizer in gardening operations to ‘fertilize’ lawns and hedgerows. After the initial separation, the inorganic component is to be further separated into combustible and non-combustible components. For the time being, both these components will be compacted, tagged, bagged, and transported to the San Pedro dump site for disposal (See Section 3.4). If feasible, the combustible portion of the inorganic waste can be incinerated in the near future, especially considering other similar developments in the area.
- ▶ *Energy Generation* – As the nature of the proposed development implies, the primary energy sources for the project will be derived from alternative energy, mainly solar and wind sources. It is anticipated that the overall development will require about 568.5 kWh/day of energy a day (See Table 3.12). The relative power required to sustain the development will primarily be generated by the wind turbine that will be supplemented by the solar panels.

The final placement of the wind turbine will be on the southwestern corner of the project site (See ‘WA’ in Fig. 1.4). It is anticipated that since these sources depend entirely on the natural environment, the proposed development will invest

in having a standby diesel generator capable of sustaining about 40 % to 50 % of the development at full occupancy.

- ▶ *Fuel Storage* - Fuel services will be limited to emergency and operational use only and will include diesel fuel for the standby generator and gasoline fuel for the development's water craft. It is envisioned that the proposed project will store a minimum quantity of these fuels not exceeding 500 gallons. These fuels will be stored at the Back of House area and the tanks will be enclosed in a reinforced concrete containment walls capable of holding 110 % of the biggest tank (See Section 3.5.4 and Fig. 3.5).
- ▶ *Communications* – As part of the telecommunications era, the anticipated development will employ satellite communications mainly telephone, internet and cable services along with the standard radio based communications. Presently in Belize, there is a telephone service provider that has coverage in the project area. It is envisioned that as development of the area commences, these services will eventually be provided by land lines which can include fiber optics etc. This supporting service is important especially considering the remoteness of the project site and the recent spate of illegal activities around Rocky Point.

These supporting services are further discussed in Section 3.0 of this document. It is important to note that these services are also accompanied by their respective development alternatives as discussed in Section 4.0.

Potential Environmental Impacts

As mentioned previously, the proposed project will be a low impact and low density venture aimed at merging development with the environment. This direction will thus have minimal potential impacts on the ecological and social nature of the existing environment which can be manifested as either beneficial or negative in orientation.

The potential environmental impacts of the proposed project are related to both the construction and post construction stages. The projected activities that are likely to give rise to some negative environmental impacts are the land reclamation operations, the generation of domestic effluents and solid wastes, as well as energy generation. The impacts of the project are for the most part minor, although some have been categorized as moderate without proper mitigation.

Land Reclamation Impacts and Mitigation

This impact has been classified as minor considering that most of the materials will be excavated from the land portion of the project site - it is important to note that no dredging activities will be carried out by the proposed project. The pertinent ecological impacts related to the land reclamation activities are limited and restricted to land clearing, habitat removal, and some water quality impacts as a result of inappropriate containments, etc.

In order to mitigate the land clearing activities and habitat removal, the developer will practice selective clearing and pruning in order to limit the deforestation, especially in terms of the mangrove forest. In addition, the developer plans to maintain as much littoral forest as possible as the residential guest accommodations and amenities will be nestled within this forest canopy.

The total volume of materials to be obtained from the excavation process is roughly 5,909.9 yd³ and is expected to be mainly sand with minor fractions of silt and humus. The material will be obtained from the excavation of some building foundations and contouring. Once available, the excavated volume of material will be used for land reclamation purposes. It is anticipated that about 5,569.8 yd³ of material will be required for this purpose. The remaining volume will be utilized as required by the project. As for the potential leaching of the contained materials, the developer plans to utilize a Geotextile matting to properly contain the excavated material.

Water Resource Impacts and Mitigation

It is anticipated that the project will require roughly about 7,100 gallons of potable water a day at full occupancy. Thus, it is envisioned that 70 % of this demand will be converted to wastewater which will amount to 4,970 gallons a day. Therefore, the primary impacts in relation to human and domestic waste are evaluated as moderate given the scope of the project location. These relate to nutrient enrichment, increase in BOD compounds and elevation of microbacterial pathogens mainly fecal coliforms and E. Coli.

Apart from the limited dispersal of effluents into the environment, the wastewater and sewage derived from human activities will be treated via a package plant capable of reducing the major pollutants such as the macro-nutrients (nitrates and phosphates), ammonia, as well as Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) to levels where they do not pose a threat to the integrity of the environment.

The storage and chlorination of effluents that are to be reused for flushing toilets and irrigation of lawns and eco-gardens should denature any pathogens that would remain after treatment by the package plant. The collection and treatment system will be centralized and coupled to a vacuum station. This will be able to facilitate growth without having to purchase a big treatment plant from the beginning.

The excess treated and post chlorinated wastewater will be disposed of in a proper manner. This process will be carried out by utilizing a deep injection well that will be perforated for the disposal of the brine from the water desalinization method. It is anticipated that this methodology will not pose any long term impacts to the receiving environment. It is important to note that the treated wastewater will be of excellent quality that will meet and exceed the present DOE standards.

Solid Waste Impacts and Mitigation

The most severe and potential impacts related to the generation of solid waste is the introduction of pathogenic diseases and ground water contamination due to the inappropriate management and containment of the waste. These potential impacts are considered as moderate, especially considering the project location and low density development. Ecologically, the accumulation of waste can attract feral animals such as rats and birds to the area to scavenge. This impact is considered as minor without mitigation, considering the anticipated volumes of solid waste.

In order to address this issue and to ‘minimize’ the potential impacts, the developers plan to judiciously collect and separate the generated solid waste into organic and inorganic components. The organics will be composted and used on site as compost and the inorganics will be compacted and transported to the San Pedro dumpsite for disposal. The management of the proposed project will encourage waste minimization strategies such as recycling and reusing of the inorganics.

Collectively, these measures can drastically reduce the solid waste production from 437.8 lbs/day to 174.62 lbs/day. This volume can further be reduced by implementing reduction and rejection managerial countermeasures to ‘curtail’ the solid waste production.

Energy Impacts and Mitigation

The proposed development will obtain their energy from alternative sources such as wind and solar systems that will be hooked up to a bank of batteries for its eventual distribution to the different project areas. It is estimated that the development will require about 207,500 kWh per annum or roughly 568.5 kWh per day at full capacity (100% occupancy).

The primary impact related to the sourcing of energy from this combination is the wind turbine and its impact on the migratory and roosting bird population. In addition, the improper disposal of the bank of batteries from the system (wind/solar) can have deleterious effects on the environment. Potential impacts can also be derived from the operation of the secondary source or backup system which will involve the use of diesel generators. The primary impacts related to this source include fuel spills, air and noise pollution.

In order to address the potential impacts related to the primary and secondary source of energy, the developer will locate the wind turbine in a non-sensitive area. Batteries and waste oil will be properly disposed of by a certified DOE contractor. The implementation of noise and air abatement measures will also be carried out.

Transportation Impacts and Mitigation

The issue of ‘access to resource’ relates to the need to ensure uninterrupted access to the fishery resources of the area by sports fishers and commercial fishermen, as well as the need to ensure continued access to the area by dive guides and tour operators. The need of guaranteeing access of the BCNP/MR Staff is also of relevance. The developers will

ensure that these measures are implemented with the assistance of the BCNP/MR management.

The threat of injury and trauma relates to potential encounter with guests of the resort with wildlife attracted to the area such as raccoons, as well collision-at-sea events and helicopter disturbances. These transportation impacts have been assessed as moderate to high. In order to address these potential impacts and life threatening scenarios, the developer plans to exercise caution in transporting its guests to and from the project site.

Other impacts associated to the transportation issues relates to the transportation of fuel and materials to the project site. Fuel spills and leaks during transportation can adversely affect the receiving environment. This impact has been assessed as high considering the transportation routes. Therefore, the developer will properly contain the hydrocarbons during transportation and limit their use on the project site.

Social Impact and their Mitigation

The social implications to the regions of the project site are both beneficial and negative. The beneficial impact is employment creation, economic spinoffs and security that would arise from the anticipated project. These impacts would bode well with the development in further developing the area in a sustainable manner. The negative social implication has been discussed previously in the transportation section and mainly deals with access to the fishing grounds, temporary visitation, and community interaction especially in conservation and preservation issues.

Environmental Management System

The anticipated project plans to implement an Environmental Management System (EMS) to manage and address the potential environmental impacts associated with the development. This environmental tool is also essential in increasing the operational efficiency and investment returns by developing sound environmental practices towards the tourism aspect of the development.

The EMS system will devise monitoring plans to manage and document the different environmental issues associated with the construction and operation of the project. Furthermore, the monitoring program has been developed not only in relation to satisfying the statutory requirements of the EIA process, but also as a consequence of the proper implementation of the proposed development and its relationship to the integrity of the environment and the stakeholders in the area.

Conclusion

The proposed project will be located on northern Ambergris Caye, specifically within the Bacalar Chico National Park and Marine Reserve. The majority of the environmental impacts were assessed as low to moderate without proper mitigation measures. In considering the project location, the developer will ensure that the appropriate mitigation

measures are taken into consideration in order to address the potential environmental impacts.

The anticipated project plans to construct a low impact and low density venture aimed at merging development with the environment in a sustainable manner. In view of this, the intended undertaking plans to carry out the development in phases in order to minimize the impact. This approach is important considering the residential and amenities component of the project and the clientele it aims to attract. Overall, the developer hopes this venture will help the area and especially the staff of the marine reserve in order to promote good stewardship and to increase the importance of the area.