
TABLE OF CONTENTS

<i>List of Annexes</i>	<i>viii</i>
<i>List of Figures</i>	<i>ix</i>
<i>List of Table</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>xx</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	1-5
1.2.1	Existing Development	1-5
1.2.2	Project Rationale	1-6
1.2.3	Developmental Options	1-6
1.3	Overview of the Proposed Project	1-11
1.3.1	Residential Subdivision Lots and Units	1-11
1.3.2	Development Phases	1-15
1.3.3	Support Services	1-17
1.3.4	Amenities	1-28
1.3.4.1	Commercial Areas	1-28
1.3.4.2	Parks and Flex Event Center	1-28
1.3.4.3	Green Areas and Open Space	1-28
1.3.4.4	Swimming Areas	1-28
1.3.4.5	Recreational Center/ Clubs	1-29
1.3.4.6	Destination Spa	1-29
1.3.4.7	Parking Lots	1-29
1.3.4.8	Piers and Associated Infrastructure	1-29
1.3.4.9	Roadways and Associated Infrastructure	1-30
1.3.4.10	Transportation	1-30
1.3.5	Projected Occupancy	1-30
1.3.6	Carrying Capacity	1-32
1.3.7	Restrictive Code of Covenants	1-34
1.4	Dredging and Land Reclamation	1-35
1.4.1	Extraction of Materials	1-35
1.4.2	Types of Dredging Equipment	1-35

1.4.3	Dredging Volumes	1-36
1.4.4	Project Fill Requirements	1-40
1.4.5	Spoil Disposal	1-44
1.4.6	Maintenance Dredging	1-44
1.4.7	Sedimentation Control	1-44
1.4.8	Proposed Drainage System	1-47
1.5	Golf Course Component	1-49
1.5.1	Layout of Proposed Golf Course	1-49
1.5.2	Golf Course Components	1-49
1.5.3	Golfing Equipment	1-52
1.5.4	General Description of Construction of Golf Course	1-52
1.5.5	Irrigation Needs of Golf Course	1-55
1.5.6	Grass Specie Used On Golf Course	1-55
1.5.6.1	Bermuda Grass	1-56
1.5.6.2	Grassing Of Golf Course	1-57
1.5.7	Chemicals Employed In Golf Course	1-57
1.6	Land Use	1-60
1.6.1	Land Use of Project Site	1-60
1.6.2	Land Tenure	1-60
1.6.3	Land Use of Surrounding Areas	1-60
1.7	Zone of Influence	1-61
1.8	Project Development	1-61
1.8.1	Project Implementation	1-61
1.8.2	Construction Phases and Timelines	1-62
1.8.2.1	Sourcing of Construction Materials	1-64
1.8.2.2	Transportation of Material	1-64
1.9	Environmental Planning	1-64
1.9.1	Project Management	1-65
1.9.2	Management Structure	1-65
1.10	Conclusion	1-66

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	2-3
2.1.2	Oceanography	2-3
2.1.2.1	Regional Hydrographic Profile	2-5
2.1.2.2	Localized Bathymetry	2-5
2.1.2.3	Winds and Waves	2-7
2.1.2.4	Tides	2-7
2.1.2.5	Currents	2-8
2.1.2.6	Water Quality	2-10

2.1.3.	Geology	2-16
2.1.3.1	Geological Background	2-16
2.1.3.2	Regional Geological Profile	2-16
2.1.3.3	Seismology	2-19
2.1.4	Soils	2-22
2.1.4.1	Soil Characterization	2-22
2.1.4.2	Soil Investigation	2-22
2.2	Biophysical Environment	2.34
2.2.1	Biological Oceanography	2-34
2.2.2	Flora	2-34
2.2.3	Fauna	2-38
2.2.3.1	Aquatic Fauna	2-38
2.2.3.2	Birds	2-44
2.2.3.3	Mammals	2-49
2.2.3.4	Reptiles and Amphibians	2-52
2.2.4	Conservation Issues	2-54
2.2.4.1	Species Protection	2-54
2.2.4.2	Corozal Bay Wildlife Sanctuary	2-54
2.2.4.3	Adjacent Protected Area	2-56
2.2.4.4	Biological Corridors	2-56
2.3	Social Environment	2-62
2.3.1	Regional Demographics and Population Related Issues	2.62
2.3.2	Social Infrastructure and Services	2-63
2.3.2.1	Education/Health/Water/Electrical/Labour	2-63
2.3.2.2	Disaster Preparedness	2-66
2.3.3	Economic Activities of the Area	2-66
2.3.4	NGO and Public Interest	2-68
2.3.4.1	Social Impacts of Note	2-69
2.3.5	Persons and Institutions Interviewed	2-70
2.4	Archaeological Environment	2-71
2.4.1	Result of Survey and Reconnaissance	2-71
2.4.2	Interpretations	2-80
2.4.3	Recommendation for Mitigation	2-82
2.5	Legal and Policy Environment	2-83
2.5.1	The Environmental Protection Act SI 22/1992 and 328/2003	2-83
2.5.2	Environmental Impact Assessment Regulations SI 107/1995 and 25/2007	2-91
2.5.3	Effluent Limitation Regulations SI 94/1995	2-92
2.5.4	Pollution Regulations SI 56/1996	2-92
2.5.5	Solid Waste Management Authority Act SI 224 of 2003	2-92
2.5.6	Belize Water Industry Act No. 1 of 2001	2-92
2.5.7	Belize Public Health Act Revised Edition SI 40/2000	2-92
2.5.8	National Lands Act (No. 6 of 1992) and SI 191 of 2000	2-93
2.5.9	Crown Land Rules SI 60 of 1939	2-93
2.5.10	Mines and Minerals Act Chap. 226 of 2000	2-93
2.5.11	Belize Tourism Policy 2005	2-93

2.5.12	Belize Tourism Industry Association	2-94
2.5.13	Belize Tourist Board Act SI 275 of 2000	2-94
2.5.14	Hotels and Tourist Accommodation Act SI 285/2000	2-94
2.5.15	Coastal Zone Management Strategy	2-94
2.5.16	Cayes Development Policy	2-95
2.5.17	Piers Guidelines and Seewall Development	2-95
2.5.18	Forests (Mangrove Protection) Regulations, SI No. 52 of 1989	2-96
2.5.19	National Protected Areas Policy and System Plan	2-96
2.5.20	Corozal Bay Wildlife Sanctuary	2-96
2.5.21	National Institute of Culture and History	2-97
2.5.22	International Conventions and Agreement	2-97
2.5.23	Permits and Licences	2-98

Section 3 Details of Supporting Services

3.1	Introduction	3-1
3.2	Water Resources	3-1
3.2.1	Projected Occupancy	3-1
3.2.2	Projected Residential Potable Water Demand	3-1
3.2.3	Water Resources Management	3-3
3.2.3.1	Source Supply Description	3-3
3.2.3.2	Water Treatment	3-4
3.2.3.3	Water Storage and Distribution	3-6
3.2.3.4	Water Minimization and Conservation Strategies	3-7
3.3	Wastewater Management	3-9
3.3.1	Projected Wastewater Composition	3-9
3.3.2	Wastewater Production	3-10
3.3.2.1	Domestic Wastewater Production	3-10
3.3.2.2	Service Wastewater Production	3-11
3.3.2.3	Environmental Wastewater Load	3-12
3.3.2.4	National Effluent Standards	3-12
3.3.3	Wastewater Collection and Treatment	3-13
3.3.3.1	Preferred Option	3-13
3.3.3.2	Wastewater Piping	3-14
3.3.4	Wastewater Disposal	3-15
3.4	Solid Waste Management	3-17
3.4.1	Waste Types	3-17
3.4.1.1	Construction and Field Waste	3-17
3.4.1.2	Domestic Solid Waste Generation	3-18
3.4.1.3	Commercial Waste	3-20
3.4.2	Waste Minimization Strategies	3-20
3.4.3	Solid Waste Disposal Mechanism	3-21
3.4.4	Solid Waste Collection	3-24
3.5	Energy Generation	3-25
3.5.1	Energy Demand	3-25

3.5.2	Energy Supply Sources	3-27
3.5.3	Power Transmission Lines	3-28
3.5.4	Fuel Management	3-28
3.6	Transportation	3-31
3.6.1	Road Transportation	3-31
3.6.1.1	Roads (Public Access)	3-31
3.6.1.2	Internal Access Network	3-31
3.6.1.3	Road Provision	3-32
3.6.2	Water Transportation	3-34
3.6.2.1	Marina Component	3-34
3.6.2.2	Marina Construction	3-36
3.6.2.3	Marina Flushing	3-40
3.6.2.4	Shoreline Protection	3-41
3.6.2.5	Marina Management Plan	3-50

Section 4 Development Alternative

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	4-6
4.4.2.1	Disposal of Treated Wastewater	4-7
4.4.3	Solid Waste Disposal Alternatives	4-8
4.4.4	Energy Generation Alternatives	4-10
4.4.5	Dredging and Land Reclamation	4-11
4.4.6	Marina Design Alternatives	4-12
4.4.7	Golf Course Alternatives	4-13
4.4.8	Ecological Development Alternatives	4-14
4.4.9	Siting and Placement	4-15
4.5	Conclusion	4-20

Section 5 Environmental Impact Analysis

5.1	Introduction	5-1
5.2	Conceptual Approach Towards Development	5-1
5.2.1	Impact Assessment	5-2
5.3	Details of the Potential Environmental Impacts	5-3
5.3.1	Ecological Impacts	5-3
5.3.1.1	Dredging and Land Reclamation	5-3
5.3.1.2	Land Clearing	5-4
5.3.1.3	Sewage and Golf Course	5-5
5.3.1.4	Transportation	5-19

5.3.1.5	Solid Waste	5-21
5.3.1.6	Potable Water	5-22
5.3.1.7	Loss of Livelihood	5-22
5.3.2	Social Impacts	5-23
5.3.3	Other Related Impacts	5-26
5.4	Conclusion	5-29

Section 6 Environmental Management System

6.1	Introduction	6-1
6.2	EMS Outline	6-1
6.2.1	Required Key EMS Elements	6-1
6.2.2	Benefits	6-2
6.2.2.1	Financial	6-2
6.2.2.2	Operational and Internal	6-2
6.2.2.3	External	6-2
6.2.2.4	Benefits of third party verification	6-2
6.3	Impact Mitigation Measures	6-3
6.3.1	Mitigation Measures In Relation To Dredging Activities	6-3
6.3.2	Mitigation Measures in Relation to Land Reclamation Activities	6-7
6.3.3	Mitigation Measures in Relation to Domestic Effluent Impacts	6-8
6.3.4	Mitigation Measures in Relation to Solid Waste Management	6-11
6.3.5	Mitigation Measures in Relation to Energy Generation	6-13
6.3.6	Mitigation Measures in Relation to Marina and Sea Based Transportation	6-16
6.3.7	Mitigation Measures in Relation to Socio-Economic Concerns	6-20
6.4	Environmental Monitoring Plan	6-24
6.4.1	Purpose of Environmental Monitoring	6-24
6.4.2	Principles of Environmental Monitoring	6-25
6.4.3	Specific Monitoring Plan	6-25
6.4.3.1	Water Quality Monitoring Program	6-25
6.4.3.2	Energy Monitoring Program	6-30
6.4.3.3	Wastewater Monitoring Program	6-30
6.4.3.4	Solid Waste Monitoring Plan	6-31
6.4.3.5	Biodiversity Monitoring Program	6-32
6.4.3.6	Social Monitoring	6-34
6.4.3.7	Sediment Transport	6-34
6.4.4	Performance Indicators	6-35
6.5	Conclusion	6-36

Section 7 Environmental Management System

7.1	Introduction	7-1
7.1.1	Management Structure	7-1

7.1.2	Disaster Classification	7-1
7.1.3	Management Programs and Plans	7-2
7.2	Hurricane Preparedness Plan (Evacuation Plan)	7-3
7.2.1	Purpose of Plan	7-3
7.2.2	Information System	7-3
7.2.3	Pre-Season Preparation	7-4
7.2.4	Implementation Plan during Threats	7-4
7.2.5	Marina Hurricane Preparedness Plan	7-6
7.3	Fire Prevention and Response Plan	7-7
7.3.1	Purpose of Plan	7-8
7.3.2	Fire Protection Equipment/Systems	7-8
7.3.3	Fire Prevention	7-9
7.3.4	Fire Response	7-9
7.4	Spill Contingency Plan	7-11
7.4.1	Purpose of Plan	7-12
7.4.2	Mechanism	7-12
7.4.3	Response Policy	7-12
7.4.4	Fuel Management	7-13
7.4.5	Waste Oil Management	7-13
7.4.6	Contingency Equipment and Safety Priorities	7-13
7.4.7	Marina Spill Contingency Response Plan	7-14
7.5	Sea Level Rise Contingency Plan	7-15
7.5.1	Purpose of the Plan	7-15
7.5.2	Sea Level Rise and Erosion	7-15
7.5.3	Adapting to Sea Level Rise	7-15
7.5.4	Climate Change Effects	7-16
7.6	Medical Emergency Plan	7-17
7.6.1	Purpose of the Plan	7-17
7.6.2	Basic First Aid	7-17
7.6.3	Transportation (Evacuation) of Patient	7-18
7.6.4	Contact Information	7-18
7.7.	Environmental Safety and Health	7-19
7.8	Conclusion	7-21

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 - Soil Investigation Report
- Annex VII - Archaeological Report
- Annex IX - Well Pumping Test Report
- Annex X - Sewage Plant Specification
- Annex XI - Earth Tub Composting Technology
- Annex XII - Sheet Pile Specification
- Annex XIII - Covenants ,Conditions and Restriction
- Annex XIV - Social Impact Assessment

LIST OF FIGURES

Fig. 1.1 General Project Location	1-2
Fig. 1.2 Yakuna Bay Development Blocks	1-5
Fig. 1.3 Development Concept	1-9
Fig. 1.4 Breakdown of Conceptual Development	1-10
Fig. 1.5 Development Phasing – Phase 1,1x and 2x	1-18
Fig. 1.6 Development Phasing – Phase 2	1-19
Fig. 1.7 Development Phasing – Phase 3 and 4	1-20
Fig. 1.8 Green Areas and Open Space	1-21
Fig. 1.9 Conceptual Development by Phase	1-22
Fig. 1.10 Beachfront Lots	1-23
Fig. 1.11 Typical Praking Lot Schematic	1-24
Fig. 1.12 Sea-Front Lots with Building Footprint	1-25
Fig. 1.13 Back of House Area	1-26
Fig. 1.13b Conceptual Destination Resort Hotel Exhibit	1-27
Fig. 1.14 Dredge Volume Material	1-38
Fig. 1.15 Pre and Post Development Profile	1-39
Fig. 1.16 Project Fill Requirement	1-41
Fig. 1.17 Pre and Post Development	1-42
Fig. 1.18 Pre and Post Development Cont'd	1-43
Fig. 1.19 Typical Fill Section	1-45
Fig. 1.20 Cross Section of Proposed Drainage Canal	1-47
Fig. 1.21 Conceptual Grading Exhibit	1-48
Fig. 1.22 Golf Course Design	1-59
Fig. 2.1 Rainfall Isopleths Map of Project Site	2-2
Fig. 2.2 Existing Topography and Surface flow	2-4
Fig. 2.3 Bathymetric Profile of Project Site	2-6
Fig. 2.4 Current Flow Patterns	2-9
Fig. 2.5 Water Quality Laboratory Sample Results	2-13
Fig. 2.6 Insitu Water Quality Results	2-14
Fig. 2.7 Insitu Water Quality Results Cont'd	2-15
Fig. 2.8 Geological Map of Belize	2-18
Fig. 2.9 Seismic Intensity Map of Belize and project site	2-20
Fig. 2.10 Geological Fault Map	2-21
Fig. 2.11 Probe Location Plan	2-30
Fig. 2.12 Sea-Floor Sediment Profile	2-31
Fig. 2.13 Sea-Floor Sediment Profile Cont'd	2-32
Fig. 2.14 Sea-Floor Sediment Characterization	2-33

Fig. 2.15 Forest Type Classification Map	2-35
Fig. 2.16 Vegetation Types within the Project Site	2-36
Fig. 2.17 Location and Route of Transects	2-49
Fig. 2.18 Map of Manatee Sightings	2-57
Fig. 2.19 Location of Other Protected Areas	2-58
Fig. 2.20 Biological Corridors within Project Area	2-59
Fig. 2.21 Map with Transect Lines and Mound Locations	2-78
Fig. 2.22 Map with Boreholes Locations and Coordinates	2-79
Fig. 3.1 Well Cross Section	3-5
Fig. 3.2 Potable Water Disinfection Scheme	3-6
Fig. 3.3 Schematic Representation of the Potable Water Distribution Line	3-8
Fig. 3.4 Schematic Representation of the Water Usages	3-15
Fig. 3.5 Proposed Sewage Zones and Collection Schematics	3-16
Fig. 3.6 Solid Waste Disposal Site	3-23
Fig. 3.7 Typical above ground storage tanks	3-29
Fig. 3.8 Fuelling Dock for the Servicing of Boats	3-30
Fig. 3.9 Typical Road Cross Section.	3-32
Fig. 3.10 Proposed Road Transportation Network	3-33
Fig. 3.11 Conceptual Marina Plan	3-35
Fig. 3.12 Conceptual Marina Berthing Plan	3-37
Fig. 3.13 Detail Marina Perpendicular Slips	3-38
Fig. 3.14 Typical Double Berth Layout	3-39
Fig. 3.15 Typical Marina Sheet Pile Section	3-41
Fig. 3.16 Profile of Belcan Jetty to Beach Section	3-44
Fig. 3.17 Cross Section of Breakwater/Jetty Section	3-45
Fig. 3.18 Schematic Representation of Entrance Channel Breakwater	3-46
Fig. 3.19 Schematic Representation of Breakwater Swim Area and Shoreline	3-47
Fig. 3.20 Schematic Breakwater Representation and Lengths	3-48
Fig. 3.21 Shoreline Concept Layout	3-49
Fig. 5.1 CEQ's Impact Structure	5-2
Fig. 5.2 Cumulative Potential Impacts	5-2
Fig. 6.1 Monitoring Wells	6-28
Fig. 6.2 Cross Section of Monitoring Wells	6-29
Fig. 6.3 Methodology Used By Excavator to Dredge Shallow Nearshore Areas	6-37

LIST OF TABLES

Table 1.1 Density Options 1	1-7
Table 1.2 Density Options 2	1-7
Table 1.3 Breakdown of Residential Lots and Units	1-14
Table 1.4 Projected Occupancy Limit for Belcan Golf Resort & Marina	1-31
Table 1.5 Derived or Calculated Dredging Volumes for the Project	1-40
Table 1.6 List of Registered Pesticides for Use in Belize	1-58
Table 1.7 Construction Time Frame for Belcan Golf Resort & Marina	1-63
Table 2.1 Aquatic and Terrestrial Vegetation of the Project Area	2-37
Table 2.2 Results of Seine Net Sampling – Consejo Shores, Corozal Bay	2-40
Table 2.3a Transect Locations	2-45
Table 2.3b List of Birds of Project Site	2-45
Table 2.4 List of Mammals of Project Site	2-50
Table 2.5 List of Reptiles of Project Site	2-52
Table 2.6 List of Amphibians of Project Site	2-53
Table 2.7 Summary of Biological Methodologies Employed	2-60
Table 2.8 Current and Projected Population of 2 Communities	2-62
Table 2.9 National Population By District, 2007	2-62
Table 2.10 Social Infrastructure/ Amenities of Communities Impacted	2-64
Table 2.11 Employment Data in the Corozal District During 2005-2007	2-65
Table 2.12 Tourism Industry Statistics in Corozal District	2-67
Table 2.13 Recorded Visitations at Cerros Archaeological Site	2-67
Table 2.14 Summary of Legislative and Policy Framework	2-84
Table 2.15 Licenses and Permits required by the Development	2-98
Table 3.1 Projected Residential Water Demand for the Belcan Golf Resort	3-2
Table 3.2 Typical Composition of Untreated Domestic Sewage	3-9
Table 3.3 Projected Wastewater Productions for Belcan Golf Resort	3-10
Table 3.4 Proposed Wastewater Generation by Marine Vessels	3-11
Table 3.5 Projected Domestic Wastewater Loading Profile	3-12
Table 3.6 Effluent Limitation Standards for Commercial Activities	3-12
Table 3.7 Projected BESST Performance	3-14
Table 3.8 Projected Solid Waste Production Volumes for Belcan Golf Resort	3-19
Table 3.9 Waste Reduction Yield for Belcan Golf Resort	3-21
Table 3.10 Projected Energy Demand for Belcan Golf Resort	3-26

Table 4.1 Summary of Alternative Potable Water Sources	4-5
Table 4.2 Generic Evaluation of Wastewater Disposal Alternatives	4-6
Table 4.3 Evaluation of Treated Wastewater Disposal	4-7
Table 4.4 Domestic Waste Disposal Option	4-8
Table 4.5 Alternative Analysis for Energy Generation	4-10
Table 4.6 Dredging Alternative Options	4-11
Table 4.7: Marina Design	4-12
Table 4.8 Golf Course Alternatives	4-13
Table 4.9 Ecological Alternatives	4-14
Table 4.10 Options for Development	4-15
Table 5.1 Impact Matrix –With Mitigation Measures	5-6
Table 5.2 Potential Social and Residual Impacts Rating	5-27
Table 6.1: Mitigation Responses in relation to Dredging Impacts	6-4
Table 6.2: Mitigation Responses in relation to Land Reclamation Activities	6-7
Table 6.3: Mitigation Responses in Relation to Human Wastes and Domestic Effluents	6-9
Table 6.4: Mitigation Measures in Relation to Solid Wastes	6-12
Table 6.5: Mitigation Measures in relation to Energy Generation	6-14
Table 6.6: Mitigation Measures in Relation to Marina and Sea Based Traffic	6-17
Table 6.7: Mitigations In Relation to Socio-Economic Concerns	6-21
Table 6.8: Monitoring Plan for Surface Waters	6-27
Table 6.9 Wastewater Monitoring Template	6-30
Table 6.10 Parameters for Solid Waste Monitoring	6-31
Table 6.11 Proposed Biodiversity Monitoring Plan	6-33
Table 6.12: Possible Social Monitoring Issues	6-34
Table 6.13 Sediment Entrapment and Dredging Activities	6-35
Table 7.1 Summary of the Potential Disasters and Response Plan	7-2
Table 7.2 Marine Spills Levels	7-10
Table 7.3 Inland Spill Level	7-10
Table 7.4 Bellcan Golf Resort & Marina Emergency Services	7-15

LIST OF PLATES

Plate 1.1 Aerial view of proposed project site	1-3
Plate 1.2 Aerial views of the proposed project sites	1-4
Plate 1.3 Examples of Dredging Equipment	1-36
Plate 1.4 Geotextile material supported by stakes	1-45
Plate 1.5 Example of a geotextile containment structure	1-46
Plate 1.6 Project Management Phases	1-65
Plate 1.7 Proposed Management Structure for Bellcan Consejo Belize	1-66
Plate 2.1 Seismicity of Central America:1990-2000,Courtesy of NEIC/USGS 2007	2-19
Plate 2.2 Cast Nets Being Deployed for Fin-Fish	2-41
Plate 2.3 Passive Sampling Gear Retrieved	2-41
Plate 2.4 Small Skiff at nearshore end of Seine Net	2-41
Plate 2.5 Cast net being deployed from boat in pocket bay	2-41
Plate 2.6 Carpenter's Tape being deployed as measuring device	2-41
Plate 2.7 Machete Handle being use as relative size comparison of fish	2-41
Plate 2.8 Apple Snails	2-42
Plate 2.9 Common Atlantic Vase	2-42
Plate 2.10 Southern Moon Snail	2-42
Plate 2.11 White Semele	2-42
Plate 2.12 Ribbed Mussel	2-42
Plate 2.13 Blue Crabs	2-42
Plate 2.14 Harvest of Blue Crab	2-43
Plate 2.15 Ground Croaker	2-43
Plate 2.16 Gray Mullet	2-43
Plate 2.17 Stripped Mojarra	2-43
Plate 2.18 Gaff Topsail Catfish	2-43
Plate 2.19 Undescribed species of Catfish	2-43
Plate 2.20: Leatherjacket	2-44
Plate 2.21: Collection of Blackfin Snappers	2-44
Plate 2.22: Redhead Cichlid	2-44
Plate 2.23: Collection of Redhead Cichlid	2-44
Plate 2.24: Fallen Tree after Hurricane Dean	2-50
Plate 2.25: Gumbo Limbo Tree	2-50
Plate 2.26: Typical Understory (Transect A.)	2-50
Plate 2.27: Black Poison Wood Tree (abundant)	2-50
Plate 2.28 Shallow Ponds on Property (Transect B)	2-51
Plate 2.29 Red Mangrove Coastal area (Transect C)	2-51

Plate 2.30 Boa Constrictor Skeleton	2-51
Plate 2.31 White Tail Deer skull and leg bones	2-51
Plate 2.32 Bird nest on electrical wire southern property line	2-51
Plate 2.33 View of property from southern end	2-51
Plate 2.34 Riparian perches commonly used by birds	2-52
Plate 2.35 Grey Breasted Martins on Power line	2-52
Plate 2.37 M 3 One of the highest mounds along with M 4 - Block B	2-73
Plate 2.36 Bulldozed M23 and M24	2-73
Plate 2.39 Looted Coastal mound with limestone slab to the right	2-74
Plate 2.38 M 4 showing bio-turbation on the right	2-74
Plate 2.41 Western edge of Sacbe (stone road)	2-77
Plate 2.42 Top: Small depression with waterlogged tree on line	2-81

GLOSSARY OF TERMS

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

Avifaunal: Pertaining or relating to birds

Bathymetry: depth profile of the ocean bottom or seafloor.

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

Bedrock: the solid rock that underlies loose material, such as soil, sand, clay, or gravel.

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.

Canal: a strip of watercourse that is used by the residents to access their lots via a marine vessel

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 bacteria found in faeces

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

Developer: see Proponent

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.

Estuary: the mouth of a river valley, or a bay or lagoon receiving freshwater, where marine influence is manifested as tidal effects and increased salinity of the freshwater.

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 faeces.

Fetch: area of the open ocean over which the wind blows with constant speed and direction thereby creating a wave system.

Flora: Pertaining or relating plants.

Geogenic Sediments: sediments derived from non-living or inorganic sources such as silicate sand.

Geology: The scientific study of the origin, history, and structure of the earth.

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.

Incineration: 1. Burning of certain types of solid, liquid, or gaseous materials. 2. A treatment technology involving destruction of waste by controlled burning at high temperatures, e.g., burning sludge to remove the water and reduce the remaining residues to a safe, nonburnable ash that can be disposed of safely on land, in some waters, or in underground locations.

Incinerator: A furnace for burning wastes under controlled conditions.

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.

Irrigation: Technique for applying water or wastewater to land areas to supply the water and nutrient needs of plants.

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.

Land reclamation: dredging to mine sand, clay or rock from the seabed and using it to construct new land elsewhere. This is typically performed by a cutter-suction dredge or trailing suction hopper dredge. The material may also be used for flood or erosion control

Littoral Forest: low-lying coastal forest impacted by tidal influence.

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

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.

Marina: A boat basin that has docks, moorings, supplies, and other facilities for small boats, yachts and cabin cruisers.

Marina Slips: A docking place for a ship between two piers.

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

Near shore 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 is responsible for issuing permits that 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.

Point Source of Pollution: any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft from which pollutants are or may be discharged.

Pollutant: any dredged spoil, solid waste, incinerator residue, sewage, garbage, chemical waste, heat, and 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.

Proponent: developer proposing a particular project.

Red List: Catalogue of Threatened Species compiled by IUCN.

Residents: Locals or community members of a development, housing project etc.

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.

Sublittoral: seabed below the low tide mark.

Suction Dredges: These operate by sucking through a long tube, like some vacuum cleaners. A plain suction dredger has no tool at the end of the suction pipe to disturb the material.

Supralittoral Zone: this is the backshore environment above the spring high tide line and is only covered by water during storms and heavy sea states.

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: the difference in height between consecutive high and low water: The comparison may also be a day, month or year.

Tidal Period: elapsed time between successive high or low water.

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.

Wastewater Treatment: Removal of organic solids and materials through aerobic or anaerobic conditions via the three known treatment methods of Primary, Secondary and Tertiary treatment.

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

Wave Height: is a 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.

Watershed: The region draining into a river, river system, or other body of water.

GLOSSARY OF ACRONYMS

AST: Above ground Storage Tank.

BAS: Belize Audubon Society.

BWSL: Belize Water Services Limited.

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

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*

CTW: Corozal Town Board

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

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.

REA: Rapid Environmental Assessment.

RTE: Rare Threatened or Endangered.

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 Bellcan Golf Resort & Marina project aims to develop a private residential subdivision just north of Corozal Town on the Consejo Road. The endeavor will be accompanied by golf course and a marina component that will complement the site as well as attract foreigners to Belize. 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 4,5,6 and 7).

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 utilities and amenities components in order to 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

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 two 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 (Sections 6 and 7). 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. On the other hand, Section 7 of the

EIA document accounts for the disaster preparedness and contingency plans. These plans are in response to the natural and anthropogenic influences that affect coastal development projects.

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 anticipated Belcan Golf Resort & Marina project is to be located at Mile 4 on the Corozal – Consejo Road in the Corozal District. This also places the development on the northern coastal portion of the Corozal Bay. The project can be accessed by road, sea and air from the airstrip in Ranchito Village. The development can also be accessed from neighboring Chetumal, Quintana Roo, Mexico by sea. The intended project currently lies on some 969.86 acres of what were originally agricultural lands (Blocks B and C). The property is owned by Casa Bay Incorporated and its subsidiaries and has several other established resorts throughout the world including the Belcan Luxury Eco-Resort in northern Ambergris.

Project Setting

The Corozal District is distinguished by the dominant limestone soil that extends from the north towards the central portion shoreline of the Belize District where the coast is characterized particularly by red clay. This geological setting is characteristic of the northern Districts of Belize. The project site slopes gently from the Consejo Road towards the coast. This slope is characterized by undulating zones of low lying areas that are flooded as a result of the heavy seasonal rains. The coastal portion of the project is comprised of a ridge of mangrove forest that is subjected regularly to low salinity values as a result of the two rivers which dominate the area. These rivers are the Rio Hondo and Belize New River which is further south of the project site.

Ecologically, the project site is bordered by the Corozal Bay Wildlife Sanctuary which extends from the Rio Hondo River southwards towards the Belize New River and upwards close to Sarteneja. This sanctuary presently has no management scheme or structure in place. Therefore its fate is unknown, especially considering that this sanctuary also includes the shorelines of Corozal Town. In terms of its natural resources, the area is characterized by a number of mammals, birds and reptiles. The remaining vegetation of the area is predominantly classified as agricultural lands that are described by lowland and seasonal broadleaf swamp forest with mixed mangrove forest.

In terms of the environmental influences, the project site is relatively nestled in an undeveloped area that is bordered by smaller residential subdivision project both to the north and south. The most detrimental influence to the project is the location of the municipal dumpsite which is about only a mile away from the project's entrance. Measures will be put in place by the developer to upgrade the dumpsite. Other influences include agricultural practices such as sugar cane, corn, vegetable and fruit farming in addition to only illegal 'cash crop' which is famous for this area.

Historical Background

The project site was once a part of a larger residential subdivision called Yakuna Bay Development and comprised of four blocks of land namely Blocks A,B,C and D. Historically, the only inhabitants were located on Block B up until 1985 when there was a decrease of world

cane prices. Sugar cane farming was the main agricultural activity of the area when the blocks of land were purchased by Yakuna Bay (Shanta Bay Resort, 2003). Both Blocks A and B had sugar cane and were eventually abandoned around 1991. Eventually, Blocks B and C were bought by the Belcan Properties in 2007 (See Fig. 1.2). The landscape has been partially subdivided with Block C in its natural state and Block B with regrowth forest (Shanta Bay Resort, 2003).

Structurally, the project site has an old dilapidated building with a strewn thatch roof along with several abandoned fresh water wells and a man made pond and marina basin. In addition, there is a rock breakwater measuring about 1,500 feet that is in front of the property as well as a small rock base groin on the northern extremes of the property. There is also a small mangrove island on the northern coastal area that serves as a temporary stopover for birds primarily the cormorant.

Project Background

Belcan Golf Resort & Marina will be privately owned residential subdivision project designed to complement the approved Belcan Eco Luxury Resort which is to be located on northern Ambergris Caye. Both companies will be under the same environmental criteria and objective and thus up to international hospitality standards. The proposed project will be comprised of residential/commercial subdivision lots and units along with a 18 Hole Championship Golf Course and Marina component.

In order to better appreciate the development concept and to facilitate the engineering calculations, the proposed project was divided into several development phases as oppose to construction zones. Thus the proposed development was divided into four (4) phases each characterized by an overlapping continuous set of residential lots/units and surrounded by a host of supporting amenities and infrastructure.

The project is to be developed in a single continuous phase over a three (3) to four (4) year time-frame. With this in mind, the project profile will consist of several components including residential dwellings, amenities and its supporting services.

Use	Residential Description	No. of Lots/Units
Lots	Eco Buffer (18), Private Large Residential/Beachfront (21), Golf Course Residential (58), Golf Course/Beachfront (13), Canal (99), Beachfront (15) Waterways (13)	237
Units	Waterway Condos (68), 'Island' Marina Condos (94), Seaport Village Townhomes (95), Seaport Village Condos (119), Marina Condos (67), Resort Residential/Retail Mixed Use (81), Commercial Retail/Marina Condos (54), Destination Resort Hotel (1), Overwater Bungalows (10), Boutique Hotel (1), Golf Resort Timeshare Townhouse (95) and Golf Resort Villas (117)	802
Total		1,039

It is expected that the Destination Resort Hotel will be a 150 to 200 room facility and the Boutique Hotel a 25-50 room venture. Collectively, it is anticipated that when completed and operational, the residential subdivision would be able to accommodate about 3,651 patrons at maximum capacity. This occupancy translates to persons being 3,526 residents, 75 persons as permanent staff and commercial workers along with 50 transient visitors that would visit the development and utilize the various amenities and marina services. It is anticipated that the majority of guests and transient visitors will be foreigners who are now practicing the sport of golf.

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:

- ▶ 18 Hole Championship Golf Course
- ▶ Marina Docking Facilities
- ▶ Beach and Swimming Area
- ▶ Parks and Flex Event Center
- ▶ Destination Spa
- ▶ Recreational Centers and Clubs
- ▶ Commercial and Retail Areas
- ▶ Helipad (future)

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. The following sections briefly summarize the supporting services for the proposed project:

- ▶ *Water Resources* – Several potential water sources were analyzed as part of the alternatives to development. Due to the location and availability of groundwater, the primary source of water is to be from ground water abstraction. The property has several wells that were excavated due to past activities. Thus the proponents plan to capitalize in this endeavor. It is expected that water demand will be about 180,050 gallon/day at full capacity. It is expected that this source will be supplemented by rainwater harvesting, a practice that the proponents will encourage for the lot owners.
- ▶ *Wastewater Management* – Similarly, due to the volume of water required for the project, the sewage and grey water associated with the proposed development will be treated by a package plant capable of tertiary treatment. The particular Package Plant to be deployed is known by its trade name "BESST", a package plant that is widely used in Belize. This technology, of which the acronym stands for **B** Biologically **E** Engineered **S** Single **S** Sludge **T** Treatment. This plant reduces the major pollutants to levels where they do not pose a

threat to the integrity of the environment, or human health. The post chlorinated and treated water from the BESST Treatment Plant, will be stored and used for irrigation (golf course, ornamental plants, hedgerows etc.) and for fire-fighting purposes where applicable.

- ▶ *Solid Waste Management* – Progress brings problems and one of the problems with any new development is waste management. Several alternatives are presented in this document. The methodology of choice to begin with will involve the judicious separation of the waste into its organic and inorganic components. The organic waste will be composed using a composter (Earth Tub or its equivalent) and used as mulch or fertilizer for the lawns and hedgerows etc. The inorganic waste will be compacted, tagged, bagged and transported intermittently to Corozal Town Municipal dump site. As part of the good stewardship in protecting and promoting sound environmental practices, the proponents of the project plan to upgrade or possibly relocate the existing ‘dump site’ to a more plausible site. In any event, any action to the ‘dump site’ will require the input/permission of the relevant authorities such as the Solid Waste Management Authority, the Corozal Town Board and the project proponents.
- ▶ *Energy Generation* – The project will obtain its energy from the national grid provider, BEL which passes in front of the property. As secondary and supplementary sources of energy, the project plans on using generators to power the development during power outages and emergency situations. These generators could be either diesel or LP driven generators. The use of solar energy will be encouraged within the property and the onus will be on the individual lot owner to implement this alternative use. This is especially important considering that the project will consume about 3,274,000 kWh/year.
- ▶ *Fuel Services* – These services form a part of the energy generation mechanism and will mostly be provided for the refueling of the marine vessels, project vehicles and generators as well as for the general domestic use (cooking, heating etc.). This fuel will be stored in the Back of House Area with a subsequent outlet at the marina. It is envisioned that the storage tanks will not exceed 8,000 gallons of each type. The tanks, as required by national standards, will be housed in a concrete containment wall capable of storing 110% of the biggest tank. All the necessary preventive, mitigative and safety measures will be developed and implemented as part of the overall environmental management plan.

Anticipated Potential Impacts and Proposed Mitigation Measures

The environmental impacts arising from the proposed project are environmental and social in nature as well as beneficial and negative in scope and orientation. The aim of the project proponent is to develop Belcan Golf Resort & Marina into an environmentally friendly residential development by planning around and utilizing the existing resources. The impacts associated with the intended development extend to both project construction and operation. The negative impacts of the project are for the most part high to moderate without any mitigation measures.

In the preparation of this environmental impact assessment, the following components of the development were identified as areas likely to create significant negative environmental impacts if not properly addressed during project implementation or mitigated subsequently. It is important that there are also positive impacts.

Flora and Fauna

Despite the developer's stated policy of leaving as much of the property as possible in its natural state, the construction of residential and supporting buildings, roads, marina, golf course and other infrastructure will necessitate the clearing of substantial acreages of littoral broadleaf and mangrove forests. These littoral type forest are nationally threatened and a fast diminishing resource with consequent on the host of migrant and native birds and animals as well as raw exposure of the coastline to storm damage.

Terrestrial fauna will be impacted by loss of habitat, while marine wildlife such as the endangered American Crocodile and the West Indian Manatee will be impacted by increased human presence, especially in the form of boating traffic.

Impacts to flora and fauna will be mitigated by minimizing land clearance along the coastal strip, limiting deforestation of the individual lots (clearing only for the individual footprint), introducing green areas and open spaces and establishing a system of navigational corridors around the marina with clear rules to minimize the effect of boating traffic and other recreational use. Roads will be limited to a single thoroughfare extending from the project lots to the different amenities.

Dredging and Land Reclamation

There will be several dredging and excavation events as a result of the proposed project. Dredging/excavation activities will entail the refurbishment and expansion of the pre-existing marina basin and access channels, nearshore seas, peripheral drainage canal and golf course obstacles. The requisite material will be used for land reclamation purposes, infrastructural support and to facilitate proper drainage of the site.

The pertinent ecological impacts related to the dredging activities are the water quality impacts (sedimentation and turbidity). This activity can result in the raising of sediments that can damage offshore habitats on settling thereby reducing sunlight penetration. In addition, dredging will destroy all habitats over which the activity occurs.

The total volume of materials to be dredged from the seafloor, marina and infrastructural works (golf course obstacles and drainage canals) is roughly about 4,302,279 cubic yards and will consist mainly of limestone, sand and silt. Thus the overall activity has been categorized as 'high' given the volumes to be extracted and 'low' given the 'sparsity of biota' on the seabed and consequently its low productivity. The other issue related to the dredging operation is navigational safety which could be minimal because of the limited boat traffic within the area.

Mitigating responses to the potential impacts include minimizing the area to be dredged by adequately identifying the dredged area, expanding the present ‘marina’ dugout to accommodate the proposed marina design, and to conserve certain areas of the development in order to promote areas of regeneration of impacted areas.

Other mitigating responses include the deployment of navigational aids such as buoys and lights to alert and ward off mariners. This will be pertinent to both the dredge itself and the ‘spoil discharge’ pipes running ashore. Other measures include limiting the suspension of the sediments by utilizing some kind of containment boom and by using a geotextile material to dewater the spoils.

Marine activity will benefit from the dredged seafloor and marina excavation as well as offer protection from predators and fishing.

Water and Wastewater

The potential impacts associated with the extractive process are classified as ‘moderate’ deleterious considering the volumes of water to be extracted. Generally, when perforating a well for the use of extracting the ground water, the impacts can be devastating if not properly mitigated.

The primary impacts relating to the generation of domestic wastewater (gray water and sewage) includes increased nutrients (phosphates, nitrates, minerals etc.) and fecal coliform. The situation of increased nutrients in the water column is generally referred to as eutrophication. These impacts can significantly pollute any receiving water body if not properly mitigated. Therefore the impacts from this activity are rated as ‘high’ without any mitigation measures. This is crucial considering that about 70 % of the water demand will be converted to wastewater that must be treated to meet national standards before being discharged into the environment.

Other sources of macro nutrients include the discharge of bilge and sewage water from the marina. This impact is expected to be mitigated along with the domestic wastewater. Another source of macro nutrients is from fertilizers, pesticides and the general decomposition of organic debris within the property. This significant polluter is carried to the sea/marina by the occasional surface runoffs. Thus if not mitigated, this effect can be rated as ‘moderate’ without the adequate intervention.

Impacts to the water extraction process will be mitigated by minimizing and limiting the extraction volumes by promoting alternative sources such as rainwater harvesting and considering connecting to BWSL when feasible. Other mitigation measures include implementing water conservation measures, public education and wastewater recycling. Likewise, wastewater and derived from human activities are to be treated through the use of a tertiary treatment technology in the form of a ‘BESST’ Treatment Plant. The technology implemented will reduce the major pollutants to levels where they do not pose a threat to the integrity of the environment.

Solid Waste

The issue of solid waste is important, especially considering the magnitude of the development and the present mismanagement of the municipal dump site. One of the potential impacts of solid waste will be the introduction of pathogenic diseases and ground contamination as a result of the inadequacy of the dump site. The attraction of feral animals such as rats, crocodiles and birds to the area to scavenge is also seen as a potential impact to the site and surrounding areas. Therefore considering the volumes to be generated, this impact is considered as ‘moderate’ without any waste minimization strategy.

The mitigating responses to be implemented by the proposed project include the judicious collection and segregation of the wastes into organic and inorganic components. Other mitigation measures include the implementation of several waste minimization strategies such as reduction, reusing and recycling of the solid waste as well as rejecting certain products whose end product poses serious environmental risks. This mitigation measures will be coupled with the fact that the developer intends relocate the existing dumpsite to a more feasible site capable of adequately managing the solid waste. This venture will be consulted with the local stakeholders as well as the respective governmental agencies.

Energy

There will be no deleterious impacts associated with the energy generation process as the development will utilize energy from BEL. The only possible impact related to energy generation is as a result of the supplementary source, which would be the commissioning of the standby generators during emergencies and power outages.

There are however, hydrocarbon related impacts in the form of fuel spills and leaks that occur as a result of generator operation, refueling and product transportation. Thus for this purpose, this secondary impact has been rate as ‘low’ considering the volumes to be stored. Likewise other impacts related to the secondary source relates to the generation of noise and fugitive emissions during generator operation. This localized impact is classified as ‘low’ considering the use of the source.

The energy impacts will be mitigated by minimizing generator use by promoting alternative means of producing energy. In addition, to address the hydrocarbon impact, the developer intends to develop and implement a contingency plan.

Golf Course

The primary impact related to the golf course is irrigation. A golf course requires enormous volumes of fresh water to irrigate and that can lead to fresh water depletion and in this case, salt water intrusion. Other relevant impacts include the overuse of pesticides and organic fertilizers to maintain the turf grass. Secondary impacts associated with chemicals include eutrophication, toxic bioaccumulation (biomagnifications) and pest resistance. Therefore, based on the potential impacts, this activity was rated as ‘high’ without any abatement measures.

Impacts to the irrigation method will be mitigated by minimizing the ground water source and supplementing it with post chlorinated and treated wastewater (recycling/reuse). Furthermore, the proponents plan to use hardy turf grass that requires less water for irrigation and less chemicals for maintenance.

Transportation

Transportation into and away from the development will be by road and water. This involves both road and water transportation mechanisms. The construction and operation of the road can produce significant amounts of dust and noise while the construction of the marina and piers can result in coastal erosion and safety risks for water users. Other secondary impacts relate to spills and leaks as a result of vehicle and boat movements.

Although the construction of road is common practice, mitigating the impacts would include the carryout a work schedule to reduce noise and use of water mist to suppress the dust. Marina mitigation measures include the use of proper embankment or shoreline protection mechanisms as well as 'limiting' boat trafficking in and around the project site.

Social

Potential impacts include job creation and spinoffs which are classified as positive. The few fisher folk in the area are dwindling and is expected to fall further as commercial fishing is further offshore. It is anticipated that the creation of the marina and access channel contribute the fish population of the area by offering a suitable place to hide from predators. Every consideration has been taken on board in regards to the dredging operation to ensure that access to the area, or the loss, or destruction of fishing gear and grounds will not be a problem. Related ecological impacts are only limited to the near shore ecosystem where the dredging will occur. Mitigation measures include the conservation of much of the coastal ecosystem for recreational use.

Environmental Management Plan

It is imperative that the proposed Belcan Golf Resort & Marina project develop and implement an Environmental Management Plan aimed at identifying and addressing the potential negative impacts by means of mitigation measures, monitoring plans and performance indicators. These measures are important considering the size and magnitude of the operation and its influence on the environment. Furthermore, these plans are required to promote best management practices that in turn would translate into economic and social investment returns.

Conclusion

The proposed Belcan Golf Resort & Marina development will be located in the Corozal District and will be a privately owned residential subdivision project that will include a marina and championship golf course. These components are essential in attracting potential home owners and investors to the area. Just like other publicly contentious projects such as Ara Macao and

South Beach, this Belcan project is in the place where the latter two were recommended to be located.

Thus considering the opportunity, the project proponents plan to develop the site without jeopardizing the natural value of the area by utilizing best management practices in conjunction with sound environmental practices. Therefore this venture will help the 'norteños' with meaningful employment and spinoffs that are typical of the hospitality and tourism industry. This is especially important considering that the tourism sector is almost defunct in the Corozal District. There is no doubt that a project of this size and magnitude will be economically beneficial to the area and surrounding communities.