

Chapter 4: GEOLOGY

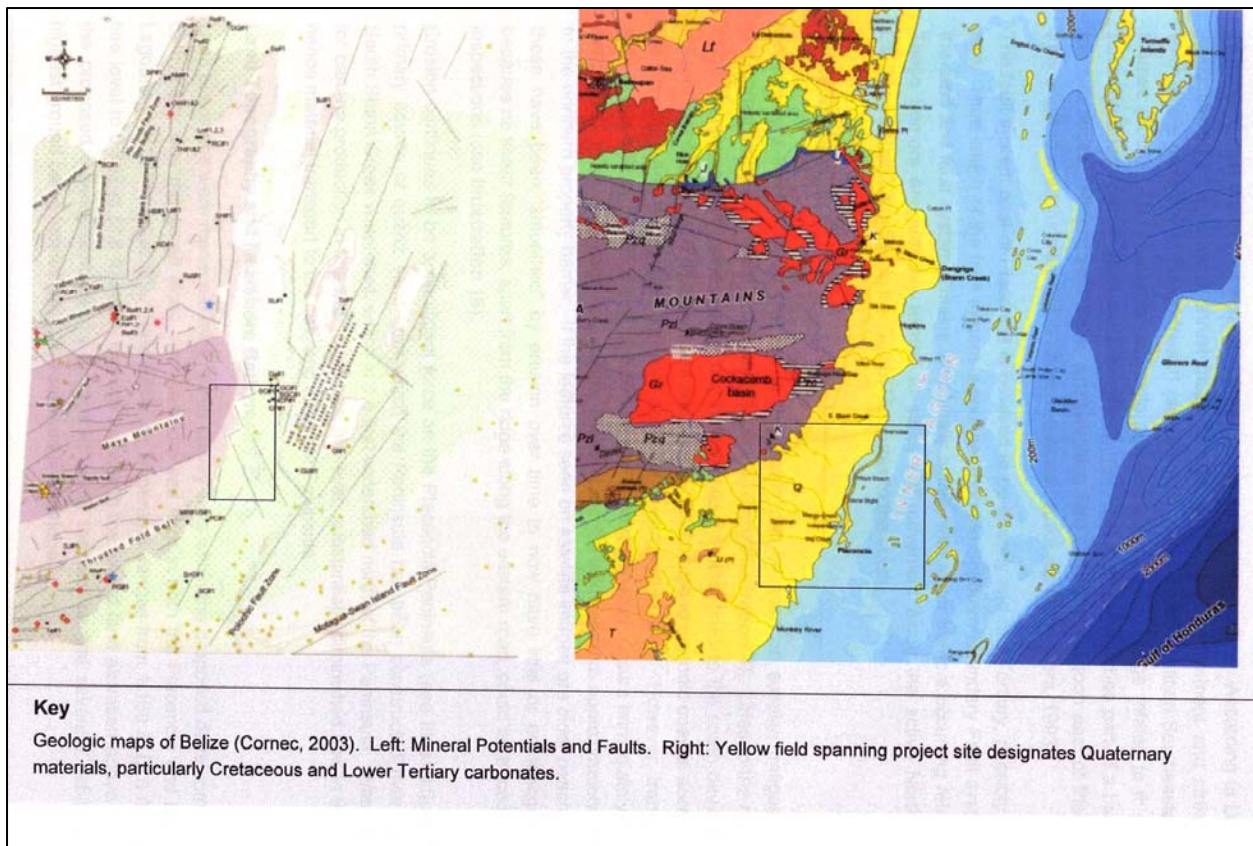
4.1 Geological Setting

The project site is situated within the South Water Caye Marine Reserve, but does form part of the Pelican Cayes Range. The depth around the island extending some 60 feet has depth ranging from four (4) feet to 30 plus feet and deeper, indicating a steep drop.

Project site comprises chiefly of organic un-decomposed fibrous roots some three feet in depth and then changes to a sandy coralline mud.

4.2 Tectonic Setting

Visits to the site and examination of aerial photographs and satellite imagery indicate that there is no tectonic feature within the project site itself, however examination of the Tectonic Map of Belize (Purdy 2000 & Cornec 2003) shows a series of strike slip faults to the west of Early to Mid Tertiary age (Cornec 2003) (Fig. 9). These faults are relatively young in age but are viewed to be inactive.



4.4 Stratigraphy

The organic material that constitutes the first 3 feet of the property are as a result of organic material which over the years have increased and resulting in the cayes over several hundreds of years to have increase in size. The sandy coralline mud to the bottom is as a result of the one area that was entirely covered with water that gradually formed a sand bar from accretion and subsequently gave rise to a vegetation cover.

4.5 Material Volume Requirements and Supply Options

Approximately 24,000 cu. yds. of additional material will be required to fill the property. The property, as mentioned before had previously been filled but still requires more filling. The access channel to the main lagoon will produce a mere 500 cubic yards of material, which will have a required amount of 23,500 cu. yds. balancing.

As can be noted from the marine survey, the coral system along the entrance to the lagoon appears to have been significantly impacted and some areas only exhibit some 10% live cover. However, areas east and south of the cayes exhibited healthier coral formations. Based on the marine survey, it is safe to say that the area near the lagoon entrance is a viable option to obtain material for the filling of the property. In addition, Cat Caye is not a part of the Pelican Cayes Range, the area of most marine biodiversity in the South Water Caye Marine Reserve.

Another option for supplying the required fill material is to import quartz sand from the mainland. This option is very costly, but viable at the least. However, this option also poses significantly less impacts to the environment. If this is the chosen method for filling, material will have to be purchase and truck to Riversdale and subsequently barge out to the project site. The existing material already on site would have to scrape off and stockpile and used as topping material as it is of better quality material.

4.6 Preferred Burrow Site

The main area of the property to be comprise most of the proposed development facilities has been previously filled, but will require and additional 24,000 cubic yards of material. It is proposed, to reduce any additional impacts, that the site of material be the same site

from which material had previously been obtained. This is south of the project area. Material will be suction dredged and pumped into a contained area on Cat Caye to allow for dewatering and subsequently spread to areas where required.

This option will result in little siltation as the bottom is relatively exposed sand with no or little abundance of benthic life as compared to the surrounding areas. Notwithstanding, silt curtains would be deployed, including when dredging the access channel area for the sports fishing marina and transient marina.

4.7 Extraction Impacts and Mitigation Measures

The potential impacts of dredging at locations near the project site can be subdivided into three categories; physical impacts, biological impacts and water resource impacts.

Physical Impacts:

- Direct Physical Impacts; the direct negative physical impacts of the project are related to the alteration of the existing seafloor. This impact is unavoidable and can only be mitigated through the non-development approach.
- Indirect Physical Impacts; the potential negative indirect physical impacts are related to the release, increase and entry of erosion products in the form of sediments and the slumping of excavated materials. These impacts are avoidable.
- Residual Physical Impacts; the potential negative residual physical impacts are related the long term degradation of the area due to changes in the geomorphological profile. These impacts are avoidable.

Measure available to mitigate against avoidable physical impacts include:

- Operational Measures; use of sedimentation curtains or geotextile materials in order to limit or eliminate sediment travel, phasing of the extraction ie extract from in enclosed and confined areas.

- Dredge from only identified burrow sites approved by the Fisheries Department and the Geology and Petroleum Department.

Biological Impacts:

- Direct Biological Impacts; the direct negative biological impacts are related to the loss or reduction of *Rhizophora mangle* Dominated Forest, Dwarf Mangrove Forest and *Eleocharis* Marsh and select plant species, these are unavoidable impacts and can only be partially mitigated by select avoidance and replanting of specialized plants and native species. ***However, no further mangrove and/or vegetation clearance is required only selective trimming.***
- Indirect Biological Impacts; the potential negative indirect biological impacts are related to the displacement of mobile wildlife during material extraction and movement, which is an unavoidable impact that can only be mitigated by the non-development alternative.
- Residual Biological Impacts; the potential negative residual biological impacts are related to the long term removal of habitat for select mobile wildlife species, this is an unavoidable impacts and can only be partially mitigated by select avoidance of vegetated areas and water bodies which should allow for re-colonization and interior movement of displaced species.

Water Resource Impacts:

- Direct Water Resource Impact; the direct negative water resource impacts are related to the material extraction and movement and the potential for short term disturbance of surrounding water quality and sediment loading from runoff and slumping, these are avoidable impacts.

Measure available to mitigate against avoidable water resource impacts include:

- Design and Construction Measures; use of berms or other containment structures around fill sites to prevent or limit runoff from materials or spoils.

- Operational Measures;
 - direct impacts: use of sedimentation curtains or geotextile materials in order to limit or eliminate sediment travel
 - Indirect and residual impacts: these can be partially mitigated by (a) infusions of treated effluent water. (b) routine rainfall runoff. (c) tidal influence, average tidal ranges of approximately 10” per tide (two tides per day accounting for tidal exchange of 20” per day).