ALTERNATIVE ANALYSIS

2 Alternative Analysis

2.1 Outline

2.1.1 Landing Site Alternatives

The proponent also considered a number of alternate landing sites along the South-east and Northern coasts of the island. The landing sites were selected based on a number of factors. Of primary concern was the type and degree of impact the cable installation would have on the coastal and marine ecology. The sites that are proposed in this report represent the best selections from exhaustive considerations of a number of sites. Some of which were disqualified on the basis of:

- Estimated coastal and marine ecological impacts
- Impacts to and on cable laying installation, and
- Through consultations (such as the Montego Bay Marine Park).

The Bull Bay landing site is an existing cable landing site with the necessary infrastructure already in place (manhole and cable housing building). Other sites would have represented "green" sites which would have higher potential for impacts.

The alternative to the Tower Isle landing site was in the Port Antonio area. However, this area proved to be within a protected area and as such was not used.

The alternative to the Montego Bay landing site and cable routing would have taken the cable through large areas of sea grass in the Reading area, west of Montego Bay. In consultation with members of the Montego Bay Marine Park the Great River site was accepted. This site is on the edge of the marine park in an area with the least possible potential for impacts.

2.1.2 Technological Alternatives

The proponent evaluated a number of technological alternatives that either did not fulfill the purpose of the project or did not meet agreed criteria. The major factors that affected the acceptability of those options were potentially adverse environmental effects and problems related to technical feasibility. The following details the advantages of incorporating a high speed data fiber-optic cable in Jamaica, when compared with other technologies outlined below:

- **SPEED:** Fiber optic networks operate at high speeds - up into the gigabits
- **BANDWIDTH:** large carrying capacity
- **DISTANCE:** Signals can be transmitted further without needing to be "refreshed" or strengthened.
- **RESISTANCE:** Greater resistance to electromagnetic noise such as radios, motors or other nearby cables.
- **MAINTENANCE:** Fiber optic cables costs much less to maintain.

2.2 No-Action Alternative

The proposed submarine fiber-optic cable would not be installed. No operations and maintenance activities would occur. This alternative would not fulfill the purpose of the project or meet the identified needs for high-speed data transmission. The enormous economic and social development opportunities for Information Communication Technology (ICT) as well as the investment will be lost, including the potential for job creation. It therefore would be necessary to consider alternative methods of meeting data transmission requirements.

2.3 Radio

Other high-speed wireless providers, such as those using 24 GHz, 28 GHz and 38 GHz spectrum, have concentrated on the more densely populated urban areas because of transmission distance limitations. Signals using these radio frequencies are generally limited to a one to three-mile radius, or three to 28 square miles, which makes application in less densely populated areas less economical. These frequencies are inherently more susceptible to weather and environmental interference.

2.4 Telephony

The telephone industry predominantly uses copper twisted-pair for the delivery of communications services to commercial and residential customers. Plain old telephone systems have been the primary means of communicating both locally and long distance. The problem is that it was designed for the transmission of voice communications. It's a mature technology, but inadequate by design, the amount of bandwidth that can be delivered is restricted by the characteristics of the copper twisted-pairs installed between the customer and central office.

Fiber-optics span the long distances between local phone systems as well as providing the backbone for many network systems (such as cable television services, university campuses, office buildings, industrial plants, and electric utility companies).

The main difference is that fiber-optics use light pulses to transmit information down fiber lines instead of using electronic pulses to transmit information down copper lines.

Services such as DSL delivered across a local exchange carrier’s existing copper wire system are capable of delivering very high speeds. However, DSL suffers performance limitations based on the distance from the customer premises to the serving central office. Distances are limited to about four to five miles from a central office for the lowest speed solutions and 10,000 feet or less for the fastest. Additionally, much of the plant is physically incapable of providing broadband service.

2.5 Satellite Data Transmission

The proponent evaluated a non-cable option of replacing the proposed telecommunication and data transmission services with satellite communications. The use of communications satellites to provide the services identified as necessary would require no construction in the marine environment, but would not provide the capacity or quality of service proposed under the project.

Satellite networks, such as direct broadcast satellite, currently offer only one-way Internet access. Upstream access is limited to existing copper telephone lines. Other alternatives like Low Earth Orbit (LEO) Satellite Systems are not scheduled to be completed for years and have not proven capable of providing "carrier-class" voice or data services. Fibre optic cables transmit voice and data traffic with higher reliability and security at a cheaper rate than satellite. While a satellite call must travel 27,000 miles (35,780 km) from the earth to the satellite and then another 27,000 miles back, a Jamaica to Florida fibre optic call need only travel about 200 miles point-to-point. At the speed of light this helps to eliminate the delays suffered during a satellite telephone call.

The option does not meet the purpose of the project.

ENVIRONMENT SETTING & BASELINE

3 Environment Setting & Baseline

3.1 Physical Environment

3.1.1 Segment 1 – Bahamas to Bull Bay, St. Thomas

3.1.1.1 Bull Bay

3.1.1.1.1 Topography and Geology

3.1.1.1.1.1 General Topography and Geology

Elevations at the site increase gently from sea level along the shoreline to a maximum of 1.5 metres above sea level along the boundary with the Bull Bay to Kingston main road, in the vicinity of Seven Miles. The soil at the shoreline is dark silty-sand overlaid by coarse and smooth pebbles. The potential for erosion of soil materials during periods of moderate to heavy rainfall at the site is minimal as the area continuously undergoes strong wave action and is fairly stable.

3.1.1.1.1.2 Beach Topography and Geology

Along the beach, the substrate depth ranged from 0 cm to 10 cm, and consists of coarse, angular, highly sorted carbonate sand grains with large pieces of coralline material along with the numerous varied sized pebbles. This suggests recent (less than 50 years) storm surge deposits (possibly from Hurricane Ivan in September 2004). Sediments on the sandy shore are composed of typical dark sand grains as seen on Jamaica’s south coast.

The site is in a major earthquake zone. Between 8 and 15 earthquake events of intensity greater than six (VI; Modified Mercalli Scale) have been reported in this fault area between 1874 and 1978.

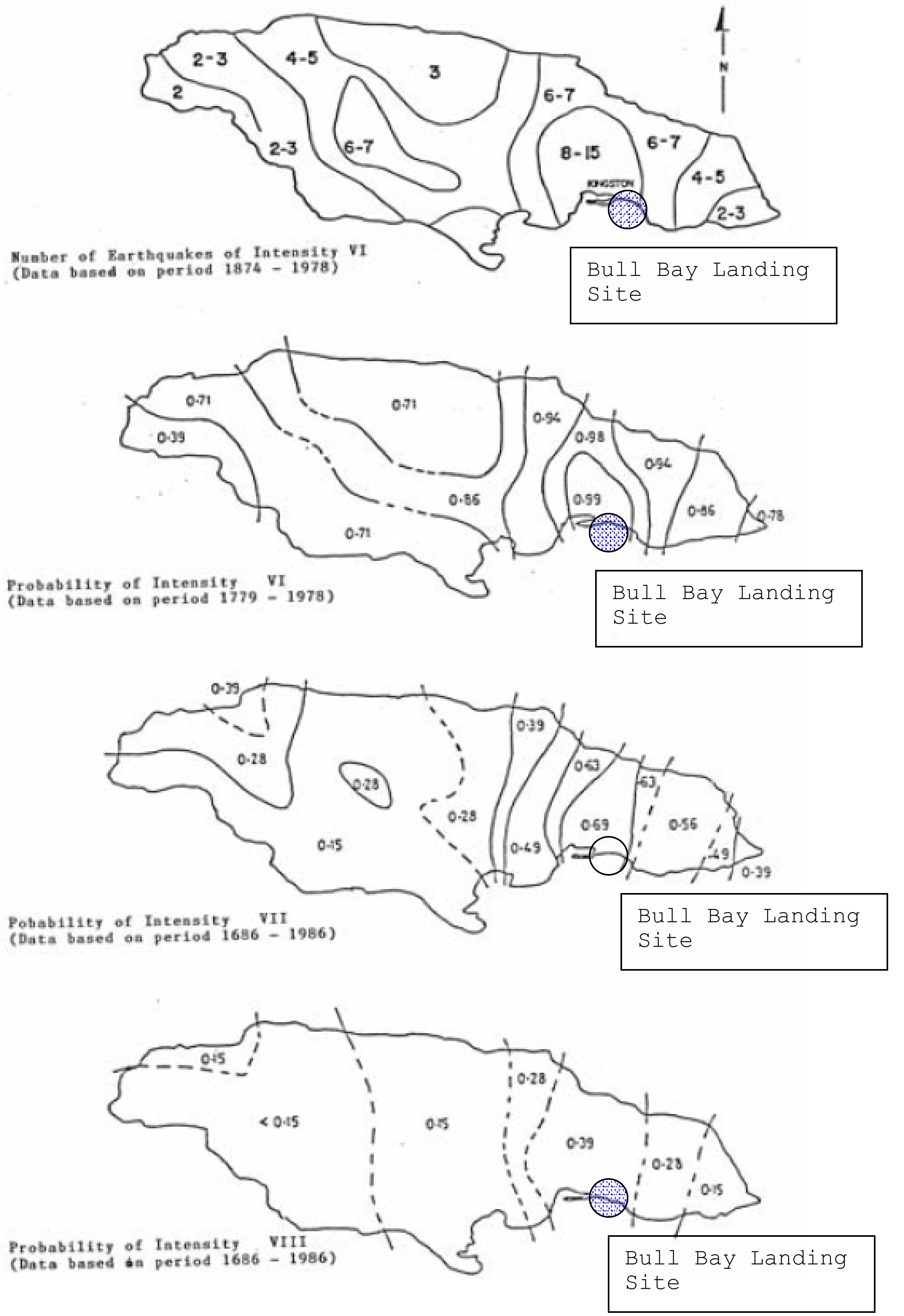


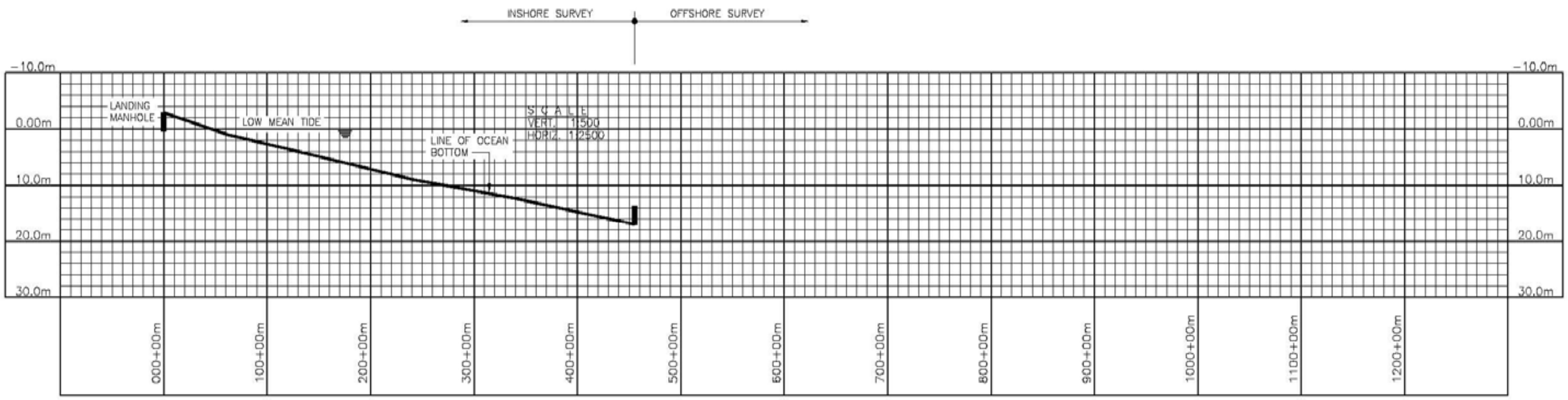
FIGURE 3-1: EARTHQUAKE HAZARD ZONATION OF JAMAICA WITH BULL BAY LANDING SITE AREA HIGHLIGHTED

It is not perceived that the present topography and geology of the site requires any special considerations prior to a development such as the one proposed being implemented.

3.1.1.1.1.3 Inshore Topography

The inshore has a relatively, consistent declining slope substrate of white calcareous sand from near shoreline to about 460m where offshore distinction is made (Figure 4-6 below). This represents a depth of no more than 18m. Based on video-photography taken during the marine survey, the area is made-up of soft sandy substrate.

There is no coral reef substrate along the survey path or rocky outcroppings.



STATION	NORTH COORDINATE	WEST COORDINATE	DEPTH		SOIL	ROCK	BRITISH UNIFIED SOILS CLASIFICATION	NOTES
			FEET	METRES				
Landing Manhole 000+00	N17°56.888'	W76°42.138'						
000+62	N17°56.857"	W76°42.125"	5'-0"	1.524	SAND / BOLDERS	MED-STRONG LIMESTONE	SMI	APPROX. 300mm SAND OVER LIMESTONE
100+43	N17°56.813"	W76°42.119"	15'-0"	4.572	SILTY SAND	MED-STRONG LIMESTONE	SMI	APPROX. 300mm SAND OVER LIMESTONE
200+42	N17°56.761"	W76°42.106"	30'-0"	9.144	SILTY SAND	MED-STRONG LIMESTONE	SMI	APPROX. 300mm SAND OVER LIMESTONE
300+38	N17°56.712"	W76°42.088"	40'-0"	12.192	SILTY SAND	MED-STRONG LIMESTONE		APPROX. 300mm SAND OVER LIMESTONE
End of Inshore Survey 400+55	N17°56.650"	W76°42.072"	60'-0"	18.288	SILTY SAND	MED-STRONG LIMESTONE		APPROX. 300mm SAND OVER LIMESTONE

FIGURE 3-2: INSHORE TOPOGRAPHY OF CABLE ROUTE IN BULL BAY WITH COORDINATES

3.1.2 Segment 2 – Bahamas to Tower Isle, St. Mary

3.1.2.1 Tower Isle

3.1.2.1.1 Topography and Geology

3.1.2.1.1.1 General Topography and Geology

Elevations at the site increase gently from sea level along the shoreline to a maximum of 1.5 metres above sea level along the boundary with the Tower Isle to Ocho Rios main road. The site is approximately 5km east of Ocho Rios and 10km west of Oracabessa. The soil at the shoreline consists of soft sand with intermittent silty-clay deposits. There is a minimal potential for erosion of soil materials at the site. The topsoil is on strong bedrock of limestone, possibly from the Hopgate Formation.

3.1.2.1.1.2 Beach Topography and Geology

Along the beach, the soil type at the site is typically dark-brown to black, sandy, organic and typically less than 0.3 m thick in most areas. Below the soil layer is a sequence of limestone sands mixed with silt and minor clay fraction.

The site is in a moderate earthquake zone in terms of frequency. Between 4 and 5 earthquake events of intensity greater than six (VI; Modified Mercalli Scale) have been reported in this fault area between 1874 and 1978. It is also in close proximity to a region that experienced 6 – 7 earthquakes during the same period. The probability of intensity VII was 0.39 for the period 1686 – 1986. However, cable landings have been in this area for many years without any adverse impacts due to the effect of earthquakes or other natural disasters.

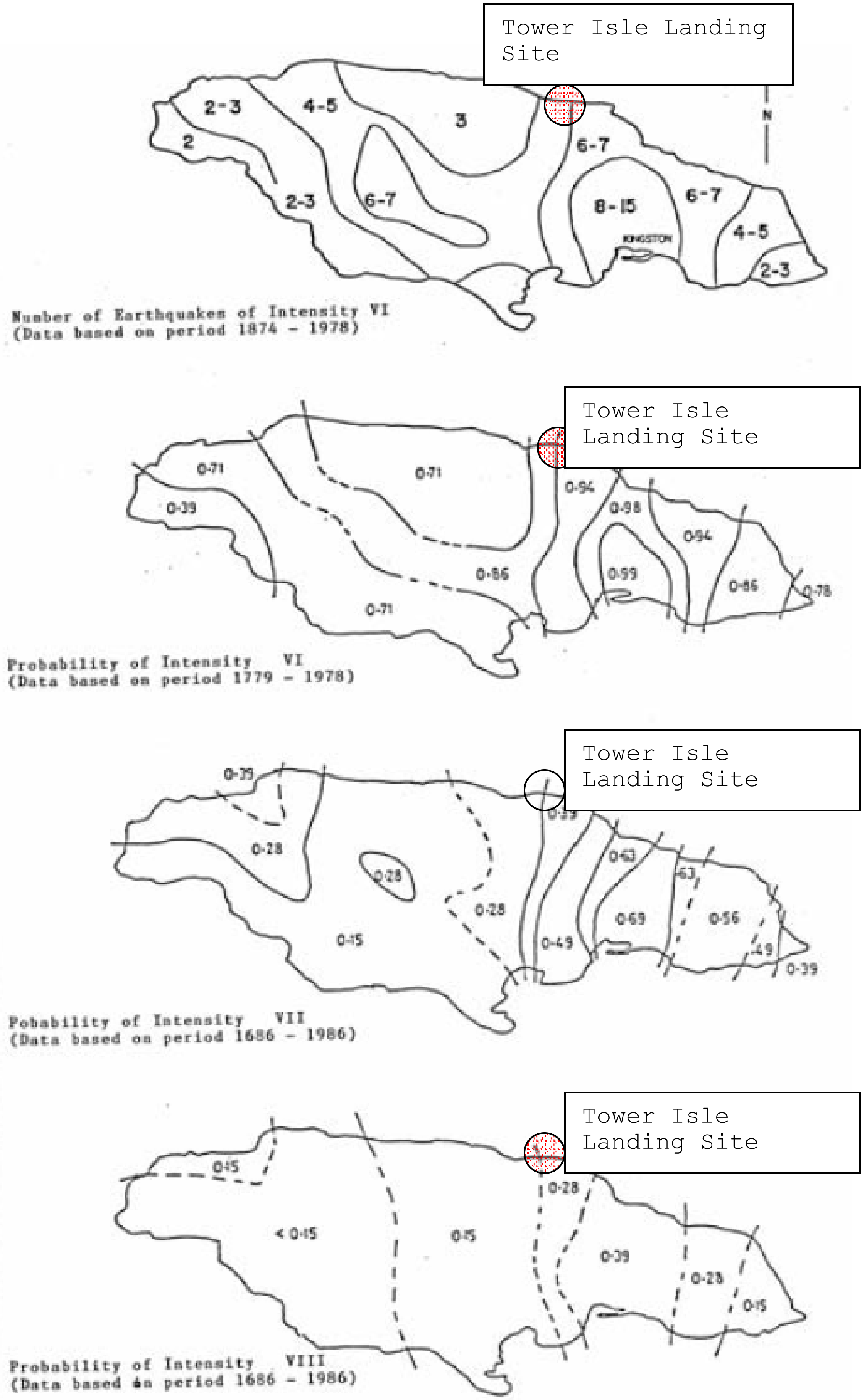


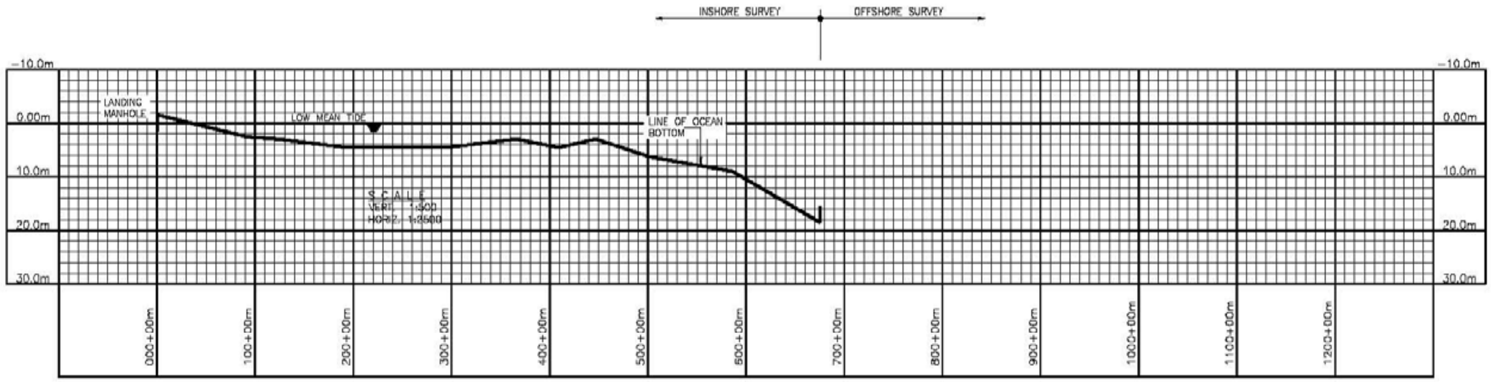
FIGURE 3-3: EARTHQUAKE HAZARD ZONATION OF JAMAICA WITH TOWER ISLE LANDING SITE AREA HIGHLIGHTED

It is not perceived that the present topography and geology of the site requires any special considerations prior to a development such as the one proposed being implemented.

3.1.2.1.1.3 Inshore Topography

The inshore has a relatively flat substrate of white calcareous sand from near shoreline to about 700m where offshore distinction is made (Figure 4-4 below). This represents a depth of no more than 20m. Based on video-photography taken during the marine survey, the area is made of soft sandy substrate.

There is no coral reef substrate along the survey path or rocky outcroppings.



STATION	NORTH COORDINATE	WEST COORDINATE	DEPTH		SOIL	ROCK	BRITISH UNIFIED SOILS CLASIFICATION	NOTES
			FEET	METRES				
LANDING MANHOLE 000+00	N18°25.296'	W77°02.524'						
000+92	N18°25.329'	W77°02.504'	8'-0"	2.438		STRONG LIMESTONE		
100+25	N18°25.345'	W77°02.496'	10'-0"	3.048	SILTY SAND		SMI	APPROX. 300mm SAND OVER LIMESTONE
100+94	N18°25.378'	W77°02.477'	15'-0"	4.572	SILTY SAND		SMI	APPROX. 300mm SAND OVER LIMESTONE
200+51	N18°25.404'	W77°02.460'	15'-0"	4.572	SILTY SAND		SMI	APPROX. 300mm SAND OVER LIMESTONE
200+95	N18°25.425'	W77°02.448'	15'-0"	4.572	SILTY SAND		SMI	APPROX. 450mm SAND OVER LIMESTONE
300+68	N18°25.462'	W77°02.436'	10'-0"	3.048	SILTY SAND		SMI	APPROX. 300mm SAND OVER LIMESTONE
400+09	N18°25.483'	W77°02.425'	15'-0"	4.572		MED-STRONG LIMESTONE		MINIMAL CORAL LIFE EVIDENT. LIMESTONE/CORAL OUTCROPS SCATTERED BUT ELEVATED. PASSAGEWAYS AROUND LIMESTONE/CORAL OUTCROPS TO BE UTILIZED AS CABLE ROUTE.
400+47	N18°25.501'	W77°02.415'	10'-0"	3.048		MED-STRONG LIMESTONE		
500+02	N18°25.528'	W77°02.401'	20'-0"	6.096		MED-STRONG LIMESTONE		
500+68	N18°25.569'	W77°02.381'	30'-0"	9.144		MED-STRONG LIMESTONE		
End of Inshore Survey 600+76	N18°25.609'	W77°02.352'	60'-0"	18.288		MED-STRONG LIMESTONE		

Figure 3-4 Inshore Topography of Cable Route in Tower Isle with Coordinates

3.1.3 Segment 3 – Ocho Rios to Montego Bay

3.1.3.1 Montego Bay

3.1.3.1.1 Topography and Geology

3.1.3.1.1.1 General Topography and Geology

Elevations at the landing site increase from sea level along the shoreline to a maximum of 3 metres above sea level along the boundary with the Great River to Montego Bay main road. The soil at the shoreline consists of coarse, poorly sorted, calcareous sand with numerous smooth pebbles. Care will be taken in the designs to guarantee structural stability of manhole particularly on the slopes. There is a minimal potential for erosion of soil materials during periods of light to moderate rainfall. During the assessment of the site, no obvious sources or existing pollution or contamination was observed across the project area.

3.1.3.1.1.2 Beach Topography and Geology

Along the beach, the substrate depth ranged from 0 cm to 10 cm, and consists of coarse, angular, highly sorted carbonate sand grains with large pieces of coral and marine tests. This suggests recent (less than 50 years) storm surge deposits. Sediments on the sandy shore are composed of large, poorly sorted, angular sand grains, 50% of which were larger then 125 mm.

The site is in a moderate earthquake zone in terms of frequency (Figure 3-5: Earthquake hazard Zonation of Jamaica with Montego Bay Landing Site Area Highlighted). Between 4 and 5 earthquake events of intensity greater than six (VI; Modified Mercalli Scale) have been reported in this fault area between 1874 and 1978. The probability of an intensity VII earthquake was 0.39 for the period 1686 – 1986.

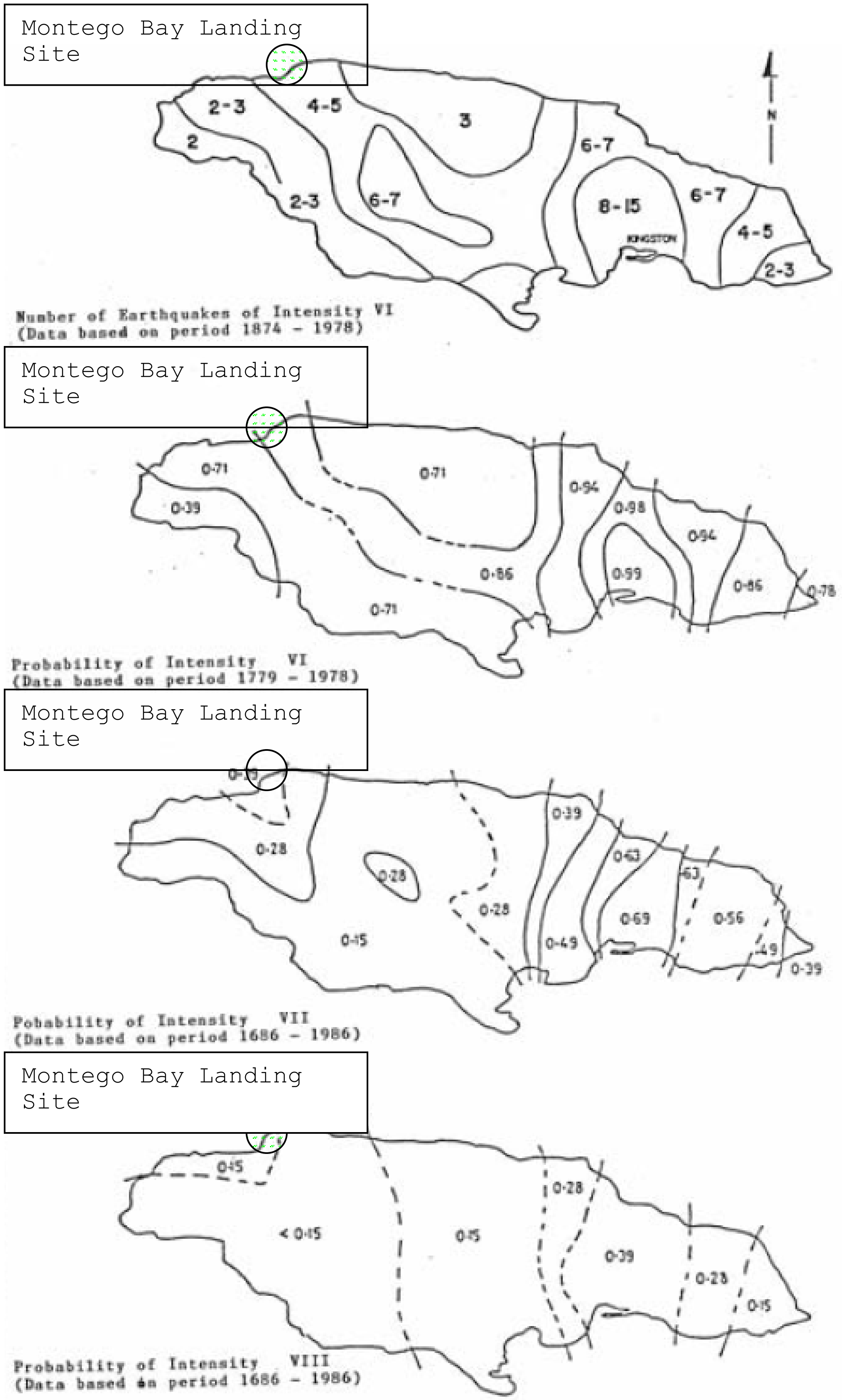


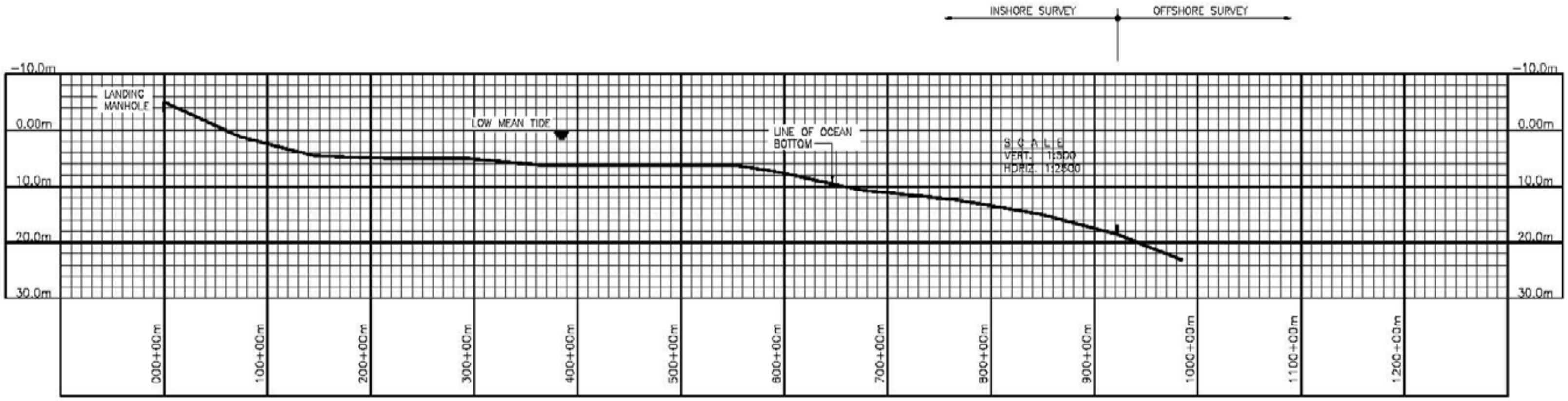
FIGURE 3-5: EARTHQUAKE HAZARD ZONATION OF JAMAICA WITH MONTEGO BAY LANDING SITE AREA HIGHLIGHTED

It is not perceived that the present topography and geology of the site requires any special considerations prior to a development such as the one proposed being implemented.

3.1.3.1.1.3 Inshore Topography

The inshore has a relatively flat undulating substrate from near shoreline to about 1000m where offshore distinction is made (Figure 4-2 below). This represents a depth of no more than 28m. Based on video-photography taken during the marine survey, the area is made of soft silty-sand substrate.

There is no coral reef substrate along the survey path or rocky outcroppings.



STATION	NORTH COORDINATE	WEST COORDINATE	DEPTH		SOIL	ROCK	BRITISH UNIFIED SOILS CLASIFICATION	NOTES
			FEET	METRES				
Landing Manhole 000+00	N18°26.932'	W77°59.330'						
000+74	N18°26.972'	W77°59.332'	6'-0"	1.524	SILTY SAND (MIN. 3'-0")		MS	
100+46	N18°27.011'	W77°59.331'	15'-0"	4.572	SILTY SAND (MIN. 3'-0")		MS	
200+18	N18°27.050'	W77°59.332'	17'-0"	5.182	SILTY SAND (MIN. 3'-0")		MS	
200+93	N18°27.091'	W77°59.328'	17'-0"	5.182	SILTY SAND (MIN. 3'-0")		MS	
300+64	N18°27.129'	W77°59.326'	20'-0"	6.096	SILTY SAND (MIN. 3'-0")		MS	
400+52	N18°27.177'	W77°59.323'	20'-0"	6.096	SILTY SAND (MIN. 3'-0")		MS	
500+52	N18°27.231'	W77°59.320'	20'-0"	6.096	SILTY SAND (MIN. 3'-0")		MS	
500+93	N18°27.253'	W77°59.317'	25'-0"	7.620	SILTY SAND (MIN. 3'-0")		MS	
600+76	N18°27.298'	W77°59.317'	35'-0"	10.668	SILTY SAND (MIN. 3'-0")		MS	
700+66	N18°27.347'	W77°59.314'	40'-0"	12.192	SILTY SAND (MIN. 3'-0")		MS	
800+49	N18°27.392'	W77°59.314'	50'-0"	15.240	SILTY SAND (MIN. 3'-0")	MED. TO STRONG LIMESTONE	MS	APPROX. 300mm SAND OVER LIMESTONE
End of Inshore Survey 900+23	N18°27.432'	W77°59.313'	60'-0"	18.288	SILTY SAND (MIN. 3'-0")		MS	

FIGURE 3-6 INSHORE TOPOGRAPHY OF CABLE ROUTE IN MONTEGO BAY WITH COORDINATES