

BIBLIOGRAPHY
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BIBLIOGRAPHY

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ANNEXES
(OCTOBER 2020)

ANNEX 1. LIMITS OF THE COASTAL ZONE MANAGEMENT AREA

Geographic coordinates of the updated Coastal Zone Management Area (CZMA) are provided in this annex. CZMA is defined by two boundaries, inland boundary and offshore boundary defined by (longitude (LON) and latitude (LAT) coordinates each 50m. A total of 2185 points delineate the inland boundary and a total of 2171 points delineate the offshore boundary.

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
0	33129,503482	60518,520431	0	32864,620164	57899,926814
1	33175,481689	60500,283748	1	32910,702853	57880,770010
2	33207,016813	60462,165900	2	32949,327379	57849,018696
3	33216,996867	60414,073641	3	32987,951905	57817,267381
4	33265,000648	60400,585712	4	33031,081557	57792,742066
5	33309,059459	60377,662765	5	33076,593404	57772,037674
6	33358,739843	60372,707805	6	33122,105250	57751,333282
7	33406,749291	60359,147353	7	33167,617096	57730,628890
8	33453,621097	60371,489339	8	33211,423965	57707,778422
9	33501,788711	60384,806880	9	33241,882941	57668,126805
10	33550,887472	60393,535126	10	33272,341918	57628,475188
11	33600,066243	60400,840846	11	33316,243303	57605,577115
12	33648,592275	60412,495938	12	33361,589284	57584,542159
13	33692,851431	60435,496806	13	33410,496698	57574,146733
14	33737,127479	60458,668604	14	33459,404112	57563,751308
15	33784,024583	60475,815860	15	33508,311526	57553,355883
16	33832,772498	60486,299483	16	33555,579324	57537,358287
17	33880,844948	60498,616056	17	33602,373986	57519,744101
18	33928,331845	60514,024567	18	33650,958798	57509,142894
19	33977,825750	60520,867731	19	33700,470711	57502,173644
20	34027,766270	60520,704260	20	33749,982624	57495,204393
21	34077,407497	60523,395850	21	33799,494538	57488,235142
22	34127,273442	60525,571097	22	33848,468902	57494,314261
23	34177,168156	60523,507852	23	33897,239794	57505,332431
24	34226,706915	60517,593309	24	33946,010686	57516,350602
25	34264,834194	60520,626893	25	33994,784214	57527,354964
26	34255,546436	60567,661047	26	34044,184152	57535,078057
27	34252,621091	60616,394240	27	34093,584090	57542,801150
28	34254,605799	60665,784066	28	34142,641319	57552,437580
29	34269,416665	60712,071036	29	34191,650708	57562,341106
30	34315,221770	60727,422554	30	34240,660096	57572,244632
31	34362,605574	60717,561653	31	34288,857260	57585,178647
32	34409,778081	60733,197030	32	34336,250356	57601,112711
33	34452,454386	60752,452078	33	34381,345210	57621,730521
34	34498,084909	60768,697896	34	34422,947863	57649,465323
35	34546,818201	60769,622903	35	34464,550516	57677,200126
36	34596,323438	60766,219959	36	34506,153169	57704,934928

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
37	34646,222748	60764,813245	37	34551,789312	57724,596400
38	34696,163911	60764,235231	38	34598,949209	57741,207966
39	34738,071628	60789,005128	39	34646,109106	57757,819531
40	34777,898464	60819,155989	40	34692,621089	57776,104159
41	34816,105716	60851,317892	41	34739,322123	57793,857325
42	34860,493938	60874,027406	42	34786,756001	57809,669574
43	34908,875231	60886,340856	43	34834,536977	57824,148917
44	34953,817651	60907,387859	44	34883,658494	57833,480403
45	34994,598151	60935,602599	45	34932,780010	57842,811889
46	35036,783568	60962,367915	46	34981,901526	57852,143375
47	35082,535267	60982,240234	47	35030,394117	57863,314847
48	35131,492561	60991,773257	48	35074,950100	57886,003267
49	35178,722866	61000,785809	49	35119,506083	57908,691686
50	35223,131617	61023,457505	50	35164,062066	57931,380106
51	35266,209976	61048,511324	51	35211,922602	57945,490330
52	35311,485933	61069,637268	52	35260,184769	57958,557971
53	35356,753322	61090,481318	53	35308,446935	57971,625613
54	35401,511525	61111,632802	54	35356,357078	57985,406011
55	35441,845235	61141,048824	55	35396,068100	58015,787498
56	35483,424550	61168,801362	56	35435,779121	58046,168986
57	35523,843668	61198,168844	57	35475,490142	58076,550474
58	35569,041631	61219,207783	58	35515,201163	58106,931961
59	35618,044836	61228,437112	59	35554,912184	58137,313449
60	35656,900213	61253,991231	60	35594,623206	58167,694937
61	35704,934422	61251,837441	61	35637,224539	58193,477035
62	35733,498324	61290,491270	62	35683,092016	58213,347632
63	35755,213537	61334,378441	63	35729,146049	58232,816222
64	35793,630008	61364,584561	64	35775,200082	58252,284813
65	35839,466800	61356,896273	65	35821,254115	58271,753404
66	35848,898620	61405,515581	66	35867,308148	58291,221995
67	35878,116268	61444,623009	67	35913,362181	58310,690586
68	35890,255590	61489,616053	68	35956,128007	58336,038163
69	35922,584749	61526,659628	69	35996,822377	58365,089294
70	35925,254510	61567,075618	70	36037,516747	58394,140426
71	35876,119913	61576,337982	71	36078,600843	58422,578869
72	35826,985316	61585,600345	72	36122,162514	58447,122318
73	35782,460143	61596,455315	73	36165,724184	58471,665767
74	35812,166138	61633,645631	74	36209,215398	58496,304884
75	35770,560668	61661,376207	75	36245,578410	58530,622975
76	35790,017586	61700,480170	76	36281,941422	58564,941066
77	35831,534323	61697,027553	77	36318,304433	58599,259157
78	35871,261087	61721,416980	78	36354,667445	58633,577248
79	35909,036345	61754,043154	79	36397,717709	58658,905965
80	35920,280631	61798,821013	80	36441,041311	58683,867245
81	35935,470807	61845,198176	81	36482,708368	58711,325481
82	35919,239366	61892,102984	82	36522,548655	58741,537259

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
83	35900,550165	61938,176332	83	36565,066018	58767,825816
84	35881,415814	61982,370882	84	36607,724088	58793,908167
85	35865,420345	62028,481236	85	36650,382158	58819,990518
86	35868,360253	62076,472228	86	36693,040228	58846,072870
87	35900,248911	62114,291584	87	36735,698298	58872,155221
88	35921,846756	62157,934816	88	36772,527271	58905,786864
89	35952,680760	62196,626835	89	36808,552756	58940,459107
90	35997,298723	62217,147226	90	36844,578241	58975,131349
91	36047,154322	62218,808347	91	36880,603726	59009,803593
92	36095,606451	62219,276363	92	36916,629211	59044,475835
93	36137,171241	62235,982420	93	36952,654696	59079,148078
94	36156,991139	62266,159556	94	36990,997922	59110,962935
95	36176,811037	62296,336626	95	37034,024949	59136,432033
96	36204,933621	62318,215935	96	37077,051976	59161,901131
97	36216,450633	62356,691091	97	37120,079003	59187,370229
98	36236,288031	62326,525423	98	37163,106030	59212,839327
99	36286,288028	62326,540130	99	37206,133057	59238,308425
100	36306,125526	62296,374614	100	37249,160084	59263,777523
101	36352,548337	62312,596105	101	37285,684496	59297,474600
102	36390,423937	62341,713270	102	37320,407160	59333,451490
103	36436,486643	62358,294173	103	37355,129824	59369,428380
104	36459,124893	62394,304478	104	37389,852488	59405,405269
105	36475,620284	62441,362207	105	37424,575152	59441,382159
106	36502,182504	62483,558704	106	37469,603225	59462,196644
107	36525,098386	62527,924437	107	37515,718680	59481,510574
108	36556,340383	62566,698074	108	37561,380741	59501,881538
109	36580,257210	62610,563971	109	37607,042802	59522,252502
110	36606,817344	62652,606131	110	37652,704864	59542,623466
111	36635,907364	62693,090784	111	37698,741330	59562,068275
112	36674,095088	62725,141235	112	37745,731943	59579,152838
113	36718,981033	62746,891261	113	37792,722555	59596,237401
114	36766,578685	62762,001675	114	37839,401921	59614,089994
115	36815,714009	62771,253430	115	37884,953725	59634,700038
116	36865,244064	62777,457915	116	37929,886932	59656,631907
117	36913,246973	62785,164914	117	37974,820140	59678,563776
118	36961,531304	62797,632736	118	38019,753347	59700,495645
119	37011,263134	62802,799932	119	38065,467993	59720,746000
120	37061,192267	62802,546020	120	38111,204067	59740,950245
121	37111,122906	62799,961818	121	38155,994362	59763,010780
122	37161,065240	62797,650239	122	38199,223936	59788,134551
123	37210,966296	62795,017778	123	38242,453511	59813,258322
124	37260,956702	62795,997213	124	38285,683085	59838,382094
125	37310,932488	62795,536814	125	38328,912659	59863,505865
126	37359,744856	62785,342628	126	38372,882633	59887,306475
127	37400,795080	62799,213363	127	38416,908136	59911,007847
128	37443,341128	62825,198469	128	38459,685233	59936,843238

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
129	37490,984758	62839,873666	129	38501,920583	59963,604689
130	37540,786872	62842,373211	130	38544,155933	59990,366139
131	37589,721556	62843,841211	131	38586,391283	60017,127589
132	37638,334191	62854,992224	132	38629,464925	60042,514945
133	37678,214668	62881,164692	133	38672,584977	60067,826231
134	37718,503794	62910,527558	134	38715,016052	60093,990496
135	37764,803607	62929,036650	135	38748,830992	60130,821866
136	37809,701562	62947,311274	136	38782,645933	60167,653236
137	37849,131846	62978,032787	137	38824,520485	60194,879004
138	37890,473739	63006,154804	138	38866,665668	60221,782229
139	37929,357770	63037,534954	139	38908,810851	60248,685455
140	37969,383564	63067,412279	140	38950,956034	60275,588681
141	38011,005870	63095,111791	141	38992,225350	60303,777715
142	38051,926385	63123,843507	142	39032,690645	60333,147086
143	38090,764503	63155,287957	143	39073,155940	60362,516456
144	38129,321840	63187,120278	144	39113,621234	60391,885827
145	38164,837337	63222,221897	145	39154,086529	60421,255198
146	38198,659990	63259,022552	146	39194,551823	60450,624568
147	38231,262916	63296,929410	147	39235,017118	60479,993939
148	38264,615253	63334,180202	148	39278,057829	60505,433844
149	38297,967591	63371,430995	149	39321,134529	60530,818838
150	38331,031384	63408,937937	150	39364,211229	60556,203831
151	38364,505098	63446,067740	151	39407,287929	60581,588824
152	38399,689522	63481,593172	152	39450,364630	60606,973818
153	38437,165067	63514,549141	153	39493,441330	60632,358811
154	38480,695791	63539,047002	154	39534,710888	60660,263221
155	38525,334829	63561,558857	155	39572,565226	60692,928939
156	38570,540508	63582,923467	156	39610,419563	60725,594656
157	38616,311741	63603,028062	157	39648,273901	60758,260374
158	38661,965931	63623,239838	158	39686,128239	60790,926092
159	38701,092253	63654,122908	159	39727,990052	60818,241126
160	38739,635445	63685,970287	160	39769,984358	60845,379259
161	38774,858328	63721,417737	161	39811,412096	60873,371085
162	38815,573121	63750,240335	162	39852,731763	60901,525749
163	38859,521569	63773,997916	163	39894,051431	60929,680412
164	38900,213817	63802,186477	164	39935,352825	60957,861862
165	38938,021829	63834,901591	165	39976,641995	60986,061232
166	38975,710095	63867,756511	166	40017,931164	61014,260603
167	39016,588213	63896,158595	167	40057,049803	61044,953317
168	39049,773030	63933,531826	168	40090,668728	61081,963693
169	39086,835719	63967,089439	169	40124,287653	61118,974068
170	39124,783050	63999,639935	170	40160,955378	61152,735394
171	39163,094712	64031,766608	171	40200,026761	61183,935185
172	39203,750837	64060,853184	172	40239,098144	61215,134977
173	39244,898848	64089,253955	173	40278,169528	61246,334769
174	39286,523925	64116,955091	174	40312,384541	61282,629995

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
175	39326,437599	64146,837309	175	40345,424422	61320,158201
176	39363,244722	64180,678640	176	40378,464303	61357,686407
177	39399,956219	64214,623535	177	40411,504185	61395,214613
178	39436,795841	64248,423326	178	40451,585144	61424,668794
179	39457,960753	64293,265779	179	40493,259267	61452,296089
180	39488,292477	64332,852781	180	40533,564268	61481,683462
181	39527,493376	64363,668667	181	40570,595607	61515,279294
182	39573,081025	64383,847543	182	40607,144081	61549,390977
183	39622,237652	64392,156633	183	40643,110201	61584,124796
184	39671,770195	64393,175912	184	40679,076322	61618,858615
185	39711,861051	64422,949045	185	40715,042442	61653,592434
186	39748,867783	64456,506367	186	40751,008563	61688,326253
187	39788,758013	64486,650702	187	40785,203189	61724,789318
188	39832,200500	64511,137723	188	40819,058917	61761,583199
189	39880,342211	64524,199147	189	40852,914646	61798,377080
190	39929,738716	64531,857165	190	40886,770374	61835,170961
191	39970,606655	64552,779044	191	40921,832447	61870,674430
192	40008,991684	64584,589274	192	40960,820266	61901,978583
193	40052,228559	64609,685615	193	40999,966629	61933,082462
194	40098,658469	64627,883084	194	41039,382689	61963,845658
195	40146,786319	64640,670123	195	41082,973366	61988,233970
196	40179,237950	64678,639631	196	41126,928046	62012,066429
197	40216,525523	64711,945711	197	41170,882726	62035,898889
198	40256,976577	64741,121570	198	41214,837406	62059,731348
199	40295,454836	64771,570516	199	41258,792085	62083,563808
200	40333,575150	64803,875219	200	41299,587067	62112,368107
201	40373,331028	64834,140734	201	41339,828300	62142,043739
202	40416,364980	64859,502045	202	41380,069533	62171,719372
203	40456,203835	64889,707646	203	41420,310766	62201,395004
204	40499,913495	64913,882708	204	41460,551999	62231,070637
205	40546,176354	64932,572087	205	41501,798930	62258,933672
206	40573,872416	64971,419397	206	41547,965805	62278,031095
207	40601,921216	65012,688146	207	41591,852255	62301,988964
208	40633,551939	65051,411484	208	41635,832363	62325,758734
209	40668,693987	65086,922521	209	41681,399311	62346,341573
210	40700,524144	65125,372664	210	41726,966259	62366,924412
211	40731,792036	65164,389555	211	41772,533207	62387,507250
212	40763,290739	65203,220051	212	41818,100155	62408,090089
213	40795,833714	65241,142187	213	41861,655752	62431,925962
214	40831,379809	65276,294477	214	41900,431618	62463,492277
215	40872,746808	65304,150286	215	41939,207483	62495,058592
216	40908,097995	65336,150887	216	41979,229233	62525,014687
217	40936,197631	65377,506599	217	42019,519064	62554,624307
218	40969,569615	65414,563857	218	42059,808894	62584,233926
219	41008,735712	65445,594651	219	42100,098725	62613,843546
220	41053,448826	65467,682718	220	42134,232807	62650,082125

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
221	41098,589008	65485,658886	221	42166,739889	62688,072777
222	41132,925878	65521,987538	222	42199,246970	62726,063429
223	41163,342063	65561,671990	223	42231,754052	62764,054081
224	41189,204526	65604,353497	224	42264,616102	62801,734122
225	41213,437417	65648,088472	225	42297,957085	62838,995078
226	41232,958852	65694,071105	226	42326,788525	62879,087806
227	41250,198920	65741,004889	227	42345,867490	62925,304612
228	41270,240346	65786,739829	228	42364,946455	62971,521417
229	41286,366472	65833,899044	229	42384,025419	63017,738222
230	41301,949085	65881,397860	230	42405,632135	63062,598433
231	41321,470188	65927,332493	231	42433,600216	63104,044620
232	41347,076290	65970,276294	232	42461,568297	63145,490807
233	41373,242398	66012,882673	233	42487,989644	63187,897825
234	41392,507674	66058,866221	234	42512,751531	63231,335700
235	41400,536784	66108,003960	235	42546,899932	63266,652717
236	41412,719030	66156,426960	236	42586,324536	63297,404963
237	41427,778715	66204,099594	237	42625,749140	63328,157208
238	41444,143508	66251,345690	238	42665,173744	63358,909453
239	41461,949976	66298,063761	239	42704,598348	63389,661698
240	41485,161148	66342,231446	240	42734,410568	63429,631047
241	41500,376224	66388,110255	241	42763,481193	63470,311493
242	41536,183244	66420,487614	242	42792,551818	63510,991940
243	41565,861264	66460,707591	243	42821,622443	63551,672387
244	41597,839058	66499,118453	244	42851,174265	63591,898958
245	41631,007504	66536,530030	245	42890,087995	63623,295162
246	41666,069211	66572,173521	246	42927,472918	63656,376409
247	41703,828082	66604,797119	247	42962,495592	63692,061311
248	41748,335719	66627,283227	248	42999,241511	63725,891293
249	41796,456493	66640,785404	249	43037,404072	63758,196384
250	41845,941194	66646,986434	250	43075,566634	63790,501475
251	41895,753493	66642,914884	251	43113,729196	63822,806566
252	41944,401542	66631,956300	252	43151,891757	63855,111656
253	41968,166409	66665,073477	253	43180,205831	63896,154866
254	41995,705452	66706,658299	254	43207,737686	63937,892103
255	42028,037574	66744,762955	255	43235,269542	63979,629340
256	42062,398031	66780,905032	256	43262,801397	64021,366577
257	42075,365029	66827,821123	257	43290,333252	64063,103814
258	42095,831663	66873,278382	258	43315,509138	64106,248929
259	42124,311114	66914,358781	259	43337,940040	64150,880975
260	42132,861718	66963,226415	260	43362,388531	64194,240453
261	42151,909596	67009,316793	261	43390,225319	64235,774936
262	42181,793713	67049,232403	262	43418,062107	64277,309418
263	42220,601223	67080,527638	263	43446,070372	64318,724057
264	42264,473251	67104,448978	264	43475,507949	64359,139760
265	42304,895750	67133,211615	265	43504,945526	64399,555463
266	42331,905610	67174,927808	266	43528,490438	64443,417317

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
267	42353,827699	67219,769743	267	43549,281834	64488,889482
268	42381,301714	67261,354056	268	43570,073230	64534,361648
269	42404,946214	67305,363934	269	43590,864626	64579,833814
270	42429,006550	67349,044537	270	43611,656022	64625,305980
271	42444,997316	67396,188197	271	43642,734565	64664,232745
272	42460,541690	67443,704974	272	43675,116136	64702,330433
273	42466,306877	67493,170758	273	43701,871181	64744,507905
274	42472,815976	67542,620675	274	43728,017188	64787,126989
275	42491,324225	67588,920810	275	43754,427203	64829,567231
276	42520,686384	67629,210451	276	43784,308273	64869,656153
277	42557,444050	67663,065746	277	43814,189343	64909,745075
278	42574,452669	67707,062988	278	43844,070413	64949,833997
279	42591,968162	67753,740159	279	43871,923019	64991,209880
280	42611,453965	67799,648147	280	43895,463243	65035,321759
281	42637,129917	67842,395753	281	43919,003466	65079,433638
282	42668,307686	67881,482306	282	43943,938618	65122,761094
283	42704,855073	67915,454602	283	43969,401943	65165,791539
284	42744,086754	67946,445043	284	43994,865267	65208,821982
285	42784,175615	67975,493831	285	44020,328591	65251,852427
286	42805,250740	68020,341154	286	44043,309165	65296,201100
287	42832,658547	68062,117170	287	44064,690946	65341,398659
288	42866,172466	68099,043814	288	44086,072728	65386,596219
289	42907,739198	68126,600701	289	44107,454509	65431,793779
290	42954,592194	68143,883468	290	44128,903361	65476,957870
291	42997,757627	68168,426432	291	44152,162480	65521,218613
292	43033,450138	68202,887331	292	44175,417863	65565,481314
293	43062,944648	68241,991980	293	44198,575402	65609,795289
294	43071,765524	68291,207752	294	44227,453388	65650,451747
295	43080,586400	68340,423523	295	44257,958678	65690,067744
296	43085,027564	68390,090464	296	44288,463969	65729,683741
297	43086,816001	68440,058469	297	44318,969260	65769,299739
298	43088,267435	68489,697965	298	44349,474551	65808,915736
299	43124,547152	68521,149293	299	44378,836120	65849,297941
300	43163,197685	68552,868944	300	44403,867200	65892,581252
301	43203,537373	68581,434984	301	44428,898281	65935,864563
302	43251,012219	68596,915022	302	44453,929361	65979,147874
303	43295,413278	68610,760852	303	44481,340082	66020,515930
304	43318,700574	68584,010199	304	44518,272631	66054,220333
305	43346,434279	68580,266557	305	44555,205181	66087,924736
306	43382,750949	68614,627606	306	44589,928464	66123,814418
307	43420,285282	68647,631318	307	44623,227683	66161,112703
308	43443,069314	68690,820653	308	44656,582071	66198,359833
309	43468,322334	68733,821943	309	44691,262064	66234,377858
310	43496,219451	68774,990317	310	44725,942057	66270,395883
311	43527,028838	68814,196635	311	44760,622050	66306,413907
312	43563,315723	68848,212550	312	44794,242743	66343,278799

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
313	43584,428865	68893,488839	313	44821,742087	66385,037464
314	43614,307420	68933,482083	314	44849,241431	66426,796129
315	43647,031455	68970,514352	315	44876,740775	66468,554793
316	43661,731702	69018,158158	316	44896,893911	66514,176421
317	43675,485514	69065,597845	317	44915,712135	66560,500006
318	43692,633703	69112,409876	318	44934,530358	66606,823590
319	43716,343862	69155,082570	319	44959,113395	66649,212023
320	43716,223729	69205,017799	320	44995,398589	66683,612383
321	43725,326966	69254,151442	321	45031,683782	66718,012742
322	43741,083014	69301,468739	322	45067,968976	66752,413102
323	43742,248938	69350,701743	323	45104,254169	66786,813461
324	43738,586551	69400,520077	324	45133,608902	66827,215564
325	43744,619949	69450,091506	325	45162,471404	66868,043936
326	43756,484027	69498,555562	326	45186,026675	66912,066443
327	43775,800624	69544,667193	327	45209,071220	66956,435409
328	43800,133169	69588,199615	328	45232,678353	67000,511517
329	43834,371954	69624,434754	329	45256,285486	67044,587625
330	43875,962539	69652,066180	330	45279,892619	67088,663733
331	43919,154471	69676,328234	331	45303,499751	67132,739840
332	43945,707820	69718,619376	332	45327,164077	67176,785110
333	43981,082986	69753,774031	333	45350,489541	67221,010925
334	44019,849978	69785,292299	334	45373,815006	67265,236740
335	44049,573417	69824,987925	335	45397,140470	67309,462555
336	44070,835494	69869,160850	336	45420,465935	67353,688370
337	44075,477172	69918,943670	337	45443,888830	67397,853079
338	44087,890355	69967,240407	338	45473,546493	67438,107558
339	44092,387538	70016,715339	339	45506,884339	67474,715859
340	44099,402857	70066,151228	340	45546,861777	67504,745918
341	44113,811892	70114,021932	341	45586,734267	67534,914988
342	44134,112338	70159,569416	342	45626,566118	67565,137887
343	44164,940852	70198,759956	343	45666,397969	67595,360786
344	44204,535323	70229,081937	344	45706,229820	67625,583686
345	44232,037867	70263,752119	345	45746,061671	67655,806585
346	44241,470138	70312,849278	346	45781,889815	67690,589442
347	44252,981631	70361,500031	347	45817,011555	67726,176847
348	44271,691663	70407,726252	348	45852,133294	67761,764252
349	44301,128333	70447,980259	349	45887,255034	67797,351658
350	44322,624126	70489,994673	350	45922,376774	67832,939063
351	44334,669711	70538,375352	351	45956,729401	67869,231192
352	44358,200759	70582,338740	352	45989,441056	67907,042097
353	44387,780946	70622,630414	353	46022,190333	67944,816605
354	44423,809310	70657,180442	354	46054,229697	67983,202529
355	44465,201430	70685,001615	355	46086,269062	68021,588453
356	44487,801417	70727,209970	356	46118,308426	68059,974376
357	44503,647112	70774,618873	357	46150,347791	68098,360300
358	44514,406550	70820,562490	358	46182,387155	68136,746223

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
359	44509,424835	70870,165147	359	46209,756919	68178,550341
360	44516,845526	70919,466951	360	46236,664906	68220,692485
361	44534,152715	70966,333966	361	46263,572894	68262,834627
362	44542,020368	71013,638157	362	46290,480881	68304,976770
363	44546,988319	71063,242169	363	46322,996308	68342,591465
364	44561,013941	71111,219618	364	46358,521777	68377,775852
365	44577,054376	71157,670359	365	46394,296451	68412,703388
366	44580,449840	71207,426081	366	46430,537963	68447,149764
367	44596,139490	71254,761994	367	46466,466899	68481,907315
368	44613,012036	71299,795263	368	46500,750126	68518,303198
369	44609,255742	71349,643579	369	46535,033354	68554,699081
370	44612,193649	71399,528940	370	46569,316582	68591,094964
371	44620,458749	71448,723276	371	46603,599810	68627,490847
372	44640,302956	71494,465434	372	46631,717722	68668,744514
373	44667,759076	71536,233590	373	46659,083303	68710,590959
374	44692,580252	71579,125343	374	46686,448883	68752,437405
375	44712,967883	71624,779617	375	46713,757886	68794,320679
376	44734,998336	71667,600097	376	46740,946260	68836,282475
377	44694,259626	71696,554597	377	46768,134634	68878,244271
378	44655,144480	71727,662391	378	46799,165208	68916,520266
379	44618,067109	71761,202811	379	46839,961571	68945,427994
380	44583,594590	71797,416635	380	46880,757934	68974,335723
381	44553,126935	71836,907679	381	46921,809116	69002,867905
382	44532,935401	71882,534104	382	46963,744911	69030,096367
383	44514,082450	71928,819601	383	47005,680705	69057,324829
384	44500,809769	71976,925590	384	47047,616500	69084,553291
385	44493,798853	72026,352879	385	47086,703443	69115,592439
386	44498,281074	72076,010145	386	47124,685173	69148,109945
387	44510,071108	72124,599150	387	47162,666904	69180,627450
388	44523,972103	72172,624590	388	47200,648635	69213,144955
389	44528,378421	72210,351959	389	47238,331519	69245,983408
390	44478,432441	72212,651503	390	47273,471859	69281,552447
391	44429,055932	72220,332512	391	47309,281134	69316,408221
392	44380,180080	72230,690677	392	47347,028775	69349,197176
393	44334,409942	72250,565270	393	47382,171044	69384,607806
394	44290,503768	72274,444603	394	47415,194821	69422,150184
395	44250,651427	72304,592650	395	47448,218599	69459,692562
396	44212,920177	72337,330760	396	47481,242376	69497,234940
397	44182,901670	72377,165917	397	47514,266154	69534,777317
398	44158,390640	72420,683737	398	47543,079665	69575,547305
399	44143,298865	72468,265073	399	47570,757773	69617,187698
400	44125,959899	72514,037542	400	47598,435880	69658,828091
401	44101,559397	72557,656097	401	47626,113988	69700,468485
402	44075,774601	72600,025905	402	47645,666716	69746,415299
403	44051,141041	72643,478941	403	47664,587122	69792,697242
404	44036,516813	72691,138040	404	47683,546259	69838,961941

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
405	44034,059533	72740,942788	405	47705,279501	69883,991556
406	44015,854459	72787,186585	406	47727,012743	69929,021170
407	44008,585289	72836,513409	407	47748,745986	69974,050784
408	43999,766886	72882,518966	408	47770,479228	70019,080399
409	43969,669545	72922,062825	409	47792,212470	70064,110013
410	43928,657503	72934,295075	410	47813,945713	70109,139628
411	43881,338523	72918,548714	411	47836,986745	70153,512817
412	43831,746832	72912,609526	412	47855,305660	70200,025909
413	43782,151621	72917,666840	413	47875,225713	70245,876623
414	43735,299208	72934,736884	414	47895,581684	70291,545369
415	43686,899011	72945,358746	415	47915,937655	70337,214116
416	43640,200717	72963,059289	416	47936,293626	70382,882863
417	43597,670130	72989,075482	417	47956,649597	70428,551610
418	43562,858114	73024,773734	418	47975,942110	70474,626767
419	43535,871251	73066,840395	419	47991,231524	70522,231744
420	43515,557151	73112,378164	420	48006,520938	70569,836721
421	43490,903790	73152,153614	421	48021,810352	70617,441698
422	43446,842211	73154,945266	422	48027,274500	70666,931315
423	43397,858294	73144,979025	423	48030,684919	70716,814870
424	43348,085366	73140,886031	424	48034,095338	70766,698425
425	43298,133137	73141,135089	425	48037,505757	70816,581979
426	43248,822997	73141,169164	426	48040,895685	70866,466915
427	43200,260924	73130,186060	427	48044,207170	70916,357135
428	43150,775828	73124,530829	428	48047,518655	70966,247355
429	43101,274214	73118,006652	429	48050,830141	71016,137575
430	43053,631438	73106,738495	430	48054,141626	71066,027795
431	43009,402888	73084,137588	431	48052,606141	71115,838268
432	42960,569427	73076,315680	432	48047,655206	71165,592547
433	42911,129249	73079,254249	433	48042,704270	71215,346825
434	42861,729076	73086,079187	434	48037,753335	71265,101104
435	42815,547921	73104,929704	435	48032,802399	71314,855383
436	42773,709889	73132,103270	436	48027,850444	71364,609560
437	42730,363521	73155,905245	437	48022,898421	71414,363730
438	42689,354276	73184,391056	438	48017,946398	71464,117901
439	42644,162091	73203,109998	439	48012,994376	71513,872071
440	42598,806084	73213,101735	440	48004,906942	71562,995566
441	42550,804280	73199,607270	441	47990,236482	71610,794914
442	42500,965563	73198,383019	442	47975,566021	71658,594261
443	42452,368850	73209,502132	443	47960,829819	71706,373085
444	42407,450052	73230,695283	444	47945,701498	71754,029500
445	42358,543592	73240,457620	445	47930,573177	71801,685915
446	42313,605324	73262,069711	446	47915,444856	71849,342330
447	42275,402654	73294,101949	447	47900,316535	71896,998745
448	42243,126188	73331,535483	448	47885,254585	71944,676047
449	42204,513413	73363,068006	449	47870,364843	71992,407542
450	42174,878771	73403,162385	450	47851,518669	72038,621735

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
451	42155,637038	73449,210394	451	47828,418783	72082,955705
452	42143,945248	73497,703878	452	47804,497176	72126,855657
453	42128,143763	73542,137616	453	47779,734466	72170,293063
454	42102,033147	73584,605624	454	47754,971756	72213,730468
455	42071,045448	73621,544120	455	47730,209046	72257,167874
456	42024,713809	73614,592301	456	47705,446336	72300,605279
457	41974,917724	73612,065604	457	47680,965934	72344,195799
458	41925,087582	73613,828621	458	47658,063356	72388,642081
459	41876,108993	73623,207090	459	47635,160778	72433,088362
460	41829,847548	73642,057488	460	47610,592234	72476,437303
461	41788,612837	73670,100792	461	47578,799883	72515,028058
462	41755,456267	73707,384468	462	47547,007531	72553,618813
463	41726,468830	73748,091935	463	47515,215179	72592,209568
464	41701,924687	73791,624703	464	47479,222646	72626,438981
465	41686,506944	73839,043093	465	47439,462740	72656,756464
466	41680,546669	73888,671540	466	47399,702833	72687,073948
467	41678,483008	73938,607040	467	47359,538396	72716,436952
468	41683,179530	73988,193892	468	47310,101966	72723,922898
469	41650,199921	74023,709005	469	47260,665536	72731,408845
470	41620,526810	74063,775813	470	47211,229106	72738,894791
471	41581,138876	74094,200932	471	47161,917557	72747,103433
472	41546,670460	74130,400241	472	47112,835703	72756,641337
473	41517,843628	74171,200219	473	47063,710648	72765,937359
474	41496,993446	74216,483694	474	47014,361640	72773,979459
475	41487,968515	74265,520637	475	46965,012632	72782,021559
476	41491,085262	74315,319127	476	46915,663623	72790,063659
477	41462,466069	74349,916803	477	46868,255204	72805,691367
478	41425,752065	74383,708502	478	46821,106868	72822,335715
479	41392,440962	74420,960870	479	46778,960187	72848,478594
480	41360,156403	74458,273922	480	46738,558605	72877,935549
481	41327,220168	74495,721909	481	46698,157023	72907,392503
482	41300,462863	74537,956110	482	46656,136648	72933,830512
483	41272,041078	74578,628829	483	46609,243867	72951,181797
484	41236,038470	74613,299425	484	46562,351086	72968,533083
485	41206,053305	74653,252620	485	46515,458305	72985,884368
486	41176,027243	74693,046440	486	46469,252927	73004,987790
487	41143,130517	74730,669130	487	46422,600351	73022,960158
488	41110,279559	74768,074075	488	46375,795413	73040,547021
489	41073,732493	74802,055913	489	46328,963331	73058,059680
490	41033,687965	74831,474738	490	46281,857820	73074,824846
491	40998,867366	74867,169223	491	46234,752308	73091,590012
492	40970,095759	74908,046792	492	46187,646796	73108,355177
493	40931,258622	74936,965047	493	46141,154762	73126,744921
494	40888,431564	74962,612031	494	46094,725398	73145,300627
495	40852,968130	74997,674767	495	46048,296035	73163,856332
496	40825,744724	75039,563764	496	46001,859053	73182,392851

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
497	40805,425056	75085,100558	497	45955,346829	73200,739866
498	40779,531863	75127,281083	498	45908,834605	73219,086882
499	40754,002200	75170,235395	499	45862,322380	73237,433898
500	40733,295553	75215,624879	500	45819,788148	73263,577018
501	40708,089440	75225,963056	501	45777,636966	73290,470844
502	40666,133570	75198,926595	502	45735,485784	73317,364669
503	40619,006842	75182,651392	503	45693,334602	73344,258495
504	40569,325072	75178,199711	504	45651,183420	73371,152320
505	40531,484026	75153,368375	505	45610,349530	73399,816503
506	40490,497835	75125,972068	506	45574,853260	73434,730322
507	40475,165779	75080,252617	507	45546,005343	73475,424231
508	40444,655009	75041,128364	508	45521,200447	73518,837560
509	40407,996861	75007,326988	509	45496,395551	73562,250889
510	40364,749998	74982,325162	510	45471,590655	73605,664218
511	40319,966712	74960,097232	511	45446,785759	73649,077547
512	40274,594437	74939,099765	512	45421,980863	73692,490876
513	40226,458439	74926,106944	513	45400,402037	73737,520654
514	40178,207845	74914,875669	514	45380,476661	73783,378907
515	40128,950716	74907,137426	515	45360,551285	73829,237160
516	40083,499992	74886,634228	516	45340,882715	73875,205405
517	40034,460864	74877,508001	517	45321,437273	73921,269217
518	40000,467494	74849,127336	518	45301,991832	73967,333030
519	39962,654805	74817,246935	519	45282,546390	74013,396842
520	39913,899253	74810,296262	520	45264,598492	74060,051377
521	39867,374441	74826,594133	521	45247,359818	74106,985672
522	39840,039875	74867,339722	522	45230,121143	74153,919968
523	39797,142837	74882,439610	523	45212,801881	74200,823737
524	39751,286741	74902,030860	524	45194,618552	74247,400196
525	39705,792208	74921,960902	525	45176,435224	74293,976655
526	39663,143559	74947,801040	526	45153,385285	74338,147766
527	39624,750322	74979,769908	527	45126,173363	74380,078699
528	39594,253034	75019,222352	528	45097,479420	74420,955059
529	39557,644129	75052,346684	529	45063,952715	74458,048994
530	39514,544950	75077,505353	530	45030,426009	74495,142929
531	39476,267423	75109,446029	531	44996,899304	74532,236864
532	39443,767348	75147,431416	532	44963,372598	74569,330800
533	39410,124822	75182,766625	533	44930,410357	74606,882640
534	39369,913661	75212,271120	534	44901,027421	74647,338085
535	39333,426368	75246,457045	535	44871,644485	74687,793531
536	39296,655504	75280,331956	536	44842,261549	74728,248976
537	39261,132568	75315,518896	537	44812,878613	74768,704422
538	39219,529771	75334,835499	538	44784,244617	74809,692420
539	39174,017922	75354,228463	539	44755,680042	74850,729781
540	39143,453642	75393,116875	540	44724,753277	74889,936339
541	39135,192758	75441,878553	541	44692,138911	74927,834929
542	39138,577233	75485,114277	542	44659,524545	74965,733519

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	Lon (º)	Lat (º)	Nº	Lon (º)	Lat (º)
543	39094,867380	75509,392612	543	44615,946051	74986,377113
544	39054,643759	75538,959230	544	44567,783107	74999,805845
545	39016,468593	75571,229811	545	44519,620163	75013,234577
546	38979,114051	75599,909574	546	44471,457220	75026,663310
547	38929,731881	75604,826972	547	44422,893559	75038,489467
548	38883,531265	75621,837838	548	44374,116378	75049,469134
549	38842,785176	75649,509761	549	44325,669606	75061,834822
550	38816,333142	75691,592487	550	44277,222833	75074,200509
551	38779,868662	75717,959887	551	44228,776060	75086,566196
552	38737,941110	75744,220347	552	44180,286728	75098,761762
553	38708,013515	75783,955630	553	44131,724287	75110,665093
554	38670,507166	75816,624061	554	44083,218547	75122,782304
555	38630,204342	75846,215992	555	44035,137205	75136,500339
556	38590,421086	75876,471563	556	43987,055862	75150,218374
557	38557,471538	75913,900697	557	43938,974519	75163,936409
558	38532,905152	75957,365076	558	43890,893177	75177,654444
559	38486,593757	75966,142774	559	43842,811834	75191,372479
560	38438,980915	75980,905341	560	43794,730491	75205,090514
561	38396,432150	76006,906654	561	43747,097595	75220,180243
562	38356,973590	76037,035270	562	43703,632939	75244,506896
563	38308,230984	76047,694966	563	43661,245565	75271,026898
564	38261,626979	76065,803831	564	43618,858190	75297,546900
565	38217,919739	76089,807484	565	43576,470816	75324,066902
566	38173,996387	76111,586792	566	43534,083442	75350,586903
567	38132,870252	76086,985389	567	43491,696067	75377,106905
568	38086,778116	76067,976433	568	43449,523523	75403,955220
569	38037,408963	76061,035092	569	43408,250426	75432,178108
570	37987,725536	76057,114621	570	43366,977328	75460,400996
571	37937,782542	76056,891809	571	43325,704230	75488,623884
572	37888,365439	76063,641457	572	43283,490180	75515,214468
573	37842,158397	76082,387557	573	43238,382926	75536,786108
574	37796,383326	76101,492393	574	43193,275672	75558,357748
575	37752,597376	76125,327596	575	43148,565513	75580,725467
576	37716,058496	76159,238104	576	43104,199941	75603,784002
577	37685,266034	76198,626511	577	43059,834369	75626,842538
578	37640,756974	76219,391584	578	43015,468798	75649,901073
579	37599,188069	76247,034542	579	42971,103226	75672,959608
580	37560,874423	76279,038200	580	42926,367810	75695,164615
581	37530,953512	76318,917029	581	42879,204543	75711,766610
582	37511,872697	76364,981112	582	42832,839413	75730,345069
583	37504,815100	76414,331753	583	42787,372925	75751,148877
584	37501,140417	76464,101753	584	42741,798592	75771,715239
585	37496,322900	76513,849934	585	42696,216433	75792,264370
586	37496,182706	76563,441995	586	42650,634274	75812,813501
587	37491,252600	76613,063701	587	42605,052115	75833,362632
588	37498,052968	76662,508617	588	42559,469956	75853,911762

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
589	37491,741078	76711,624886	589	42514,881477	75876,514284
590	37481,473247	76760,538559	590	42470,482729	75899,508874
591	37471,218893	76809,452059	591	42426,083981	75922,503464
592	37457,103646	76852,906428	592	42382,213560	75946,403992
593	37418,827684	76884,661932	593	42340,337089	75973,723603
594	37371,350917	76900,294382	594	42298,460618	76001,043214
595	37327,967734	76924,885824	595	42257,263447	76029,266501
596	37288,184299	76899,326271	596	42219,382439	76061,901286
597	37245,834530	76872,749206	597	42181,501431	76094,536072
598	37199,999644	76853,121880	598	42143,620423	76127,170857
599	37151,789006	76839,866663	599	42106,361784	76160,463114
600	37103,150043	76828,464746	600	42071,699695	76196,498369
601	37053,829471	76820,250050	601	42037,037607	76232,533625
602	37004,247919	76814,362010	602	42001,803045	76268,005593
603	36954,707262	76819,890660	603	41966,333124	76303,245977
604	36906,922456	76834,551366	604	41930,240467	76337,807877
605	36859,322263	76849,855666	605	41892,095528	76370,133775
606	36811,451424	76864,287464	606	41853,950589	76402,459673
607	36763,703750	76879,114208	607	41815,805651	76434,785570
608	36716,234133	76894,809559	608	41778,942477	76468,414110
609	36669,661055	76912,972270	609	41746,004562	76506,031842
610	36624,946713	76935,339841	610	41713,066647	76543,649573
611	36578,296047	76952,526615	611	41680,128731	76581,267305
612	36533,738299	76972,174687	612	41646,858352	76618,571549
613	36484,285976	76971,535954	613	41611,239072	76653,660961
614	36440,586101	76994,724072	614	41575,619791	76688,750373
615	36413,409282	77036,046557	615	41541,125423	76724,936686
616	36402,165699	77082,583408	616	41506,945181	76761,429302
617	36368,515630	77119,482216	617	41472,265544	76797,438538
618	36324,241286	77135,799792	618	41436,905933	76832,789604
619	36275,765496	77147,789829	619	41401,546321	76868,140671
620	36231,291164	77170,341414	620	41366,186710	76903,491737
621	36193,787420	77203,208746	621	41333,103159	76940,740039
622	36163,076877	77242,649649	622	41304,696873	76981,887128
623	36136,127149	77284,742266	623	41276,290587	77023,034217
624	36105,506219	77320,390667	624	41247,884301	77064,181305
625	36060,445342	77341,974045	625	41212,697008	77099,288569
626	36018,454551	77368,960450	626	41175,097475	77132,247257
627	35977,464866	77397,535870	627	41137,497941	77165,205944
628	35939,029015	77429,480625	628	41097,767784	77195,516225
629	35902,540145	77463,481534	629	41057,521003	77225,184333
630	35873,436163	77504,096023	630	41015,324495	77251,690114
631	35834,316584	77532,475871	631	40970,740825	77274,324080
632	35792,762716	77560,057594	632	40926,157156	77296,958047
633	35759,334739	77597,058394	633	40881,573487	77319,592013
634	35732,971846	77639,012112	634	40837,294630	77342,762070

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
635	35696,822130	77673,509622	635	40795,044598	77369,500335
636	35668,650089	77714,673724	636	40752,794566	77396,238599
637	35640,562113	77754,937063	637	40710,544534	77422,976864
638	35601,996600	77786,523259	638	40668,294502	77449,715128
639	35571,040788	77825,727000	639	40624,823679	77474,415756
640	35539,242745	77864,030293	640	40581,316815	77499,056226
641	35502,568469	77897,202379	641	40538,684296	77525,162610
642	35462,754052	77927,399159	642	40495,581928	77550,476656
643	35420,788347	77954,479565	643	40451,995990	77574,976984
644	35381,919727	77985,752085	644	40408,410053	77599,477311
645	35340,279203	78013,245005	645	40364,824115	77623,977638
646	35306,476630	78049,888634	646	40321,238178	77648,477966
647	35282,791225	78093,748646	647	40277,652240	77672,978293
648	35261,747858	78137,235571	648	40234,475090	77698,189448
649	35215,910319	78151,142957	649	40191,377826	77723,539514
650	35168,636062	78167,011485	650	40148,280563	77748,889581
651	35125,619828	78192,431854	651	40104,439452	77772,900214
652	35080,534319	78213,030954	652	40060,139966	77796,085457
653	35033,233084	78220,175360	653	40015,840479	77819,270699
654	34983,464833	78217,130078	654	39972,684589	77844,054347
655	34934,509610	78226,604454	655	39936,438753	77878,496173
656	34889,411828	78247,861562	656	39900,192918	77912,937999
657	34844,274696	78267,474048	657	39863,947082	77947,379826
658	34799,623469	78289,693952	658	39827,701247	77981,821652
659	34761,090916	78321,472998	659	39787,535567	78011,084623
660	34723,496322	78354,430797	660	39744,545464	78036,615996
661	34677,353596	78370,334781	661	39700,722812	78060,655392
662	34629,492666	78384,471012	662	39654,530490	78079,217480
663	34583,668528	78404,466031	663	39606,689247	78093,750735
664	34542,091378	78432,011508	664	39558,549473	78107,164621
665	34505,549980	78466,133194	665	39509,824755	78118,385223
666	34464,673052	78493,919802	666	39461,100038	78129,605825
667	34417,470952	78479,116478	667	39412,375320	78140,826427
668	34368,805905	78467,833934	668	39364,204894	78153,892273
669	34318,900417	78465,236609	669	39317,362455	78171,379007
670	34268,989251	78466,389493	670	39270,520015	78188,865742
671	34220,773807	78479,122161	671	39223,590542	78206,098921
672	34173,021845	78493,088702	672	39175,883498	78221,066818
673	34124,024531	78502,996477	673	39128,176454	78236,034716
674	34077,328368	78520,731233	674	39080,469410	78251,002613
675	34031,718394	78541,156691	675	39032,925390	78266,431864
676	33990,477462	78569,310325	676	38986,405691	78284,759921
677	33950,689559	78599,584348	677	38939,885993	78303,087978
678	33910,864239	78629,681728	678	38893,021126	78320,492720
679	33869,752932	78658,050396	679	38845,886571	78337,176058
680	33826,269558	78676,584411	680	38798,752017	78353,859396

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
681	33776,563026	78681,868939	681	38752,640143	78373,025914
682	33727,128582	78689,097464	682	38708,008501	78395,358394
683	33679,961708	78705,477933	683	38667,510655	78424,682862
684	33633,688253	78724,411699	684	38627,012809	78454,007331
685	33588,328869	78745,372356	685	38581,109293	78473,501792
686	33548,550224	78775,452073	686	38534,654549	78491,993866
687	33514,567674	78811,987789	687	38488,199806	78510,485940
688	33475,784905	78843,477315	688	38441,745062	78528,978014
689	33430,645532	78864,593535	689	38394,815139	78546,073191
690	33391,455391	78895,486566	690	38346,720311	78559,743871
691	33351,452536	78925,086753	691	38298,656310	78573,522171
692	33312,568775	78956,491903	692	38250,617701	78587,389111
693	33273,387529	78987,548031	693	38202,579092	78601,256051
694	33237,438017	79022,113717	694	38154,158940	78613,597721
695	33210,974055	79064,370250	695	38105,249196	78623,982179
696	33174,688424	79092,677476	696	38056,339453	78634,366638
697	33126,609059	79105,927940	697	38008,967498	78650,189532
698	33083,317264	79130,687711	698	37961,861970	78666,954652
699	33047,497168	79165,373705	699	37914,756443	78683,719772
700	33021,139000	79207,722179	700	37867,645104	78700,468490
701	32990,238670	79237,267748	701	37820,491354	78717,097497
702	32940,851622	79244,177372	702	37773,337604	78733,726504
703	32894,723400	79263,124625	703	37726,183854	78750,355511
704	32854,709824	79292,874423	704	37681,396459	78772,313421
705	32823,058445	79331,430202	705	37637,440107	78796,142797
706	32791,656953	79370,232296	706	37593,483756	78819,972174
707	32760,471566	79408,925875	707	37549,527405	78843,801550
708	32725,429173	79444,588628	708	37505,571053	78867,630926
709	32695,005194	79484,099440	709	37461,614702	78891,460303
710	32671,218163	79527,708009	710	37418,121267	78915,977573
711	32628,106733	79552,777929	711	37379,492412	78947,723621
712	32592,563776	79587,760591	712	37340,863556	78979,469668
713	32566,802791	79630,454245	713	37302,234701	79011,215716
714	32533,630741	79667,358508	714	37263,605846	79042,961764
715	32503,223323	79707,042893	715	37224,976990	79074,707811
716	32470,269691	79744,598984	716	37186,348135	79106,453859
717	32444,085757	79787,020831	717	37155,501032	79144,742684
718	32427,666674	79834,194317	718	37130,859098	79188,248719
719	32413,237968	79881,680862	719	37106,217164	79231,754754
720	32390,501583	79926,130887	720	37079,801851	79274,174555
721	32357,377708	79962,659615	721	37052,241787	79315,893170
722	32316,347824	79990,656925	722	37024,681723	79357,611786
723	32278,791894	80023,587963	723	36997,631254	79399,658413
724	32236,577077	80050,224026	724	36970,680854	79441,773172
725	32194,514128	80077,114272	725	36935,815515	79477,566423
726	32159,385409	80112,553495	726	36900,698249	79513,158242

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
727	32126,822237	80150,494649	727	36865,580983	79548,750061
728	32100,176627	80192,642102	728	36830,463716	79584,341881
729	32076,872861	80236,577558	729	36795,346450	79619,933700
730	32045,371320	80275,333095	730	36764,032448	79658,508548
731	32018,007529	80317,180709	731	36737,832326	79701,094387
732	31991,679164	80359,651777	732	36711,632204	79743,680225
733	31967,615908	80402,268952	733	36685,432082	79786,266063
734	31927,912274	80432,455202	734	36659,231960	79828,851901
735	31892,687564	80467,939634	735	36621,358481	79860,230810
736	31851,140513	80494,761529	736	36579,875789	79888,144717
737	31808,477745	80520,134702	737	36535,645143	79911,302343
738	31776,930785	80558,218939	738	36488,478498	79927,005897
739	31765,098389	80606,128112	739	36439,858070	79938,670117
740	31738,741881	80648,617327	740	36390,959264	79949,007552
741	31712,621682	80691,245666	741	36341,750835	79957,869299
742	31693,773745	80737,405779	742	36292,542407	79966,731047
743	31648,963346	80756,464093	743	36243,333978	79975,592795
744	31607,254700	80783,799221	744	36194,400852	79985,654624
745	31573,604006	80820,587678	745	36146,250180	79999,127293
746	31550,102158	80864,549817	746	36098,099508	80012,599961
747	31528,235493	80908,542962	747	36049,905987	80025,916656
748	31504,817931	80952,552003	748	36001,630341	80038,934415
749	31483,947754	80997,593163	749	35953,354695	80051,952173
750	31458,278622	81040,347287	750	35905,079050	80064,969932
751	31415,043882	81041,425854	751	35856,803404	80077,987690
752	31366,283103	81044,626249	752	35808,828702	80092,063176
753	31340,050301	81072,339366	753	35760,727904	80105,712837
754	31343,331002	81122,168501	754	35712,627106	80119,362498
755	31340,137505	81172,066413	755	35664,526309	80133,012160
756	31329,374274	81213,438525	756	35616,425511	80146,661821
757	31279,449183	81210,702593	757	35569,905520	80164,966417
758	31240,252915	81220,573624	758	35523,439964	80183,431305
759	31234,969083	81270,293652	759	35481,660842	80210,034479
760	31229,685252	81320,013679	760	35442,367290	80240,954000
761	31251,120849	81357,487922	761	35403,073739	80271,873522
762	31215,708290	81392,602948	762	35365,105794	80303,992717
763	31190,088093	81435,384524	763	35338,248997	80346,167502
764	31166,735834	81479,047973	764	35311,392200	80388,342286
765	31144,683380	81523,766346	765	35285,023465	80430,791651
766	31133,339300	81572,388278	766	35262,921037	80475,641207
767	31126,087020	81621,491074	767	35240,818609	80520,490763
768	31117,422226	81670,711801	768	35218,716181	80565,340319
769	31102,990278	81717,622673	769	35196,613752	80610,189875
770	31061,476764	81745,252798	770	35174,511324	80655,039430
771	31020,826964	81774,154532	771	35149,148787	80697,950513
772	30988,405181	81812,027911	772	35121,851473	80739,754377

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
773	30966,390650	81856,764983	773	35109,242900	80786,858979
774	30949,184378	81903,375382	774	35107,821251	80836,817976
775	30911,665220	81932,931803	775	35108,171233	80886,816751
776	30873,990406	81965,611779	776	35108,521215	80936,815526
777	30845,588997	82006,598173	777	35108,871198	80986,814301
778	30828,210593	82053,328107	778	35109,221180	81036,813076
779	30818,115812	82102,159637	779	35109,571162	81086,811851
780	30795,794790	82146,803868	780	35109,921145	81136,810626
781	30770,561570	82189,969648	781	35108,992714	81186,776178
782	30738,142101	82227,896752	782	35103,787623	81236,386739
783	30704,563151	82264,943400	783	35093,493951	81285,315670
784	30671,002806	82302,006622	784	35082,445214	81334,078303
785	30639,910787	82341,159076	785	35071,230982	81382,804487
786	30609,041958	82380,491491	786	35060,016751	81431,530671
787	30576,342913	82418,317044	787	35048,802519	81480,256855
788	30544,161363	82456,566212	788	35037,588287	81528,983039
789	30514,562692	82496,860859	789	35027,190631	81577,884762
790	30472,839150	82502,577186	790	35017,390224	81626,914876
791	30424,679370	82489,137113	791	35007,589817	81675,944989
792	30376,519590	82475,697040	792	34981,781693	81718,244060
793	30328,359810	82462,256967	793	34953,599153	81759,544719
794	30309,336023	82431,011031	794	34925,416613	81800,845378
795	30300,559144	82382,329923	795	34897,234072	81842,146037
796	30269,590739	82343,772218	796	34871,853160	81885,132227
797	30223,909462	82324,781961	797	34848,568007	81929,379279
798	30174,735175	82330,105187	798	34825,282854	81973,626332
799	30134,088634	82358,280093	799	34801,997702	82017,873384
800	30090,321279	82351,790206	800	34778,712549	82062,120437
801	30047,532764	82326,434596	801	34754,887377	82106,072846
802	30008,195752	82295,578262	802	34728,421068	82148,104599
803	29962,117716	82286,681818	803	34687,431735	82176,418126
804	29919,437135	82271,505386	804	34644,235443	82201,578634
805	29873,677310	82288,080216	805	34600,512973	82225,834473
806	29837,940107	82321,554515	806	34556,790504	82250,090311
807	29801,045172	82354,607821	807	34513,068035	82274,346149
808	29788,821127	82402,179167	808	34469,345565	82298,601987
809	29768,448934	82438,683546	809	34426,215287	82323,762866
810	29754,701240	82486,756417	810	34386,481484	82354,114553
811	29740,953547	82534,829288	811	34346,747682	82384,466240
812	29727,205853	82582,902159	812	34307,013879	82414,817928
813	29701,643606	82621,973886	813	34267,280076	82445,169615
814	29676,505543	82664,109920	814	34225,251062	82472,180224
815	29672,909429	82705,432614	815	34182,664827	82498,379700
816	29641,883732	82668,584881	816	34145,203401	82530,855150
817	29600,281554	82653,779195	817	34111,019494	82567,344333
818	29551,147466	82663,016304	818	34076,835587	82603,833517

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
819	29504,159487	82679,812151	819	34033,916603	82629,469270
820	29458,371285	82699,892740	820	33990,963014	82655,062027
821	29414,183325	82723,135825	821	33948,009426	82680,654784
822	29370,867017	82748,109582	822	33905,426113	82706,715036
823	29331,743509	82779,227126	823	33870,676892	82742,666276
824	29296,655014	82814,771001	824	33835,927671	82778,617516
825	29265,820502	82854,056889	825	33800,108170	82813,343556
826	29234,469610	82888,101900	826	33759,813832	82842,947041
827	29213,499458	82931,951728	827	33719,519494	82872,550526
828	29197,548349	82978,990132	828	33679,225156	82902,154011
829	29184,747216	83026,734394	829	33645,460456	82938,121621
830	29160,576108	83070,486838	830	33616,901046	82979,162577
831	29142,434044	83117,015447	831	33588,341636	83020,203534
832	29130,121840	83165,454502	832	33559,782226	83061,244490
833	29125,059599	83215,179505	833	33557,723655	83110,460040
834	29123,452600	83265,134896	834	33558,200776	83160,457764
835	29094,865754	83277,443423	835	33558,677897	83210,455487
836	29076,514327	83309,721805	836	33559,155019	83260,453211
837	29059,515559	83356,455577	837	33557,251834	83310,399779
838	29038,410385	83401,369572	838	33557,113184	83360,382607
839	29026,701124	83449,979172	839	33557,657155	83410,379647
840	29014,991862	83498,588772	840	33558,201127	83460,376688
841	29003,282601	83547,198372	841	33558,745098	83510,373729
842	28991,573339	83595,807972	842	33562,498231	83560,186466
843	28979,864077	83644,417572	843	33567,681675	83609,917059
844	28968,154816	83693,027171	844	33572,865118	83659,647653
845	28956,445554	83741,636771	845	33578,048562	83709,378246
846	28944,736293	83790,246371	846	33583,294753	83759,101531
847	28933,027031	83838,855971	847	33589,679234	83808,692240
848	28921,317770	83887,465571	848	33596,063715	83858,282949
849	28909,608508	83936,075170	849	33602,448196	83907,873658
850	28897,899247	83984,684770	850	33608,832677	83957,464366
851	28886,189985	84033,294370	851	33597,551323	84000,622864
852	28874,480724	84081,903970	852	33560,776195	84034,498961
853	28862,771462	84130,513570	853	33524,001067	84068,375058
854	28851,062201	84179,123170	854	33487,225939	84102,251156
855	28839,352939	84227,732769	855	33454,522873	84139,930948
856	28827,643678	84276,342369	856	33423,228681	84178,926762
857	28815,934416	84324,951969	857	33391,934489	84217,922576
858	28804,225155	84373,561569	858	33360,640296	84256,918390
859	28792,515893	84422,171169	859	33325,962511	84292,889433
860	28780,806632	84470,780769	860	33290,703990	84328,341326
861	28769,097370	84519,390368	861	33258,477917	84366,045850
862	28757,388109	84567,999968	862	33234,719925	84410,040825
863	28745,678847	84616,609568	863	33211,317974	84454,215631
864	28733,969586	84665,219168	864	33190,008782	84499,447460

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
865	28723,369886	84714,042132	865	33168,699589	84544,679288
866	28716,215794	84763,527675	866	33147,390397	84589,911117
867	28709,061703	84813,013219	867	33126,081204	84635,142946
868	28701,907611	84862,498762	868	33109,126300	84681,870580
869	28700,181646	84912,368878	869	33095,566989	84729,930395
870	28700,287366	84962,368766	870	33079,701036	84777,346337
871	28700,393086	85012,368655	871	33063,835082	84824,762278
872	28700,498805	85062,368543	872	33047,969129	84872,178220
873	28700,604525	85112,368431	873	33030,865256	84919,099361
874	28700,710245	85162,368319	874	33009,676921	84964,387930
875	28700,815964	85212,368208	875	32987,198368	85008,968046
876	28700,921684	85262,368096	876	32960,355947	85051,151982
877	28701,027404	85312,367984	877	32933,513525	85093,335917
878	28701,133123	85362,367872	878	32906,671104	85135,519853
879	28701,238843	85412,367760	879	32868,527579	85167,510615
880	28701,344563	85462,367649	880	32829,327081	85198,548027
881	28701,450283	85512,367537	881	32790,126583	85229,585440
882	28701,556002	85562,367425	882	32753,503446	85263,518133
883	28701,661722	85612,367313	883	32718,135602	85298,860963
884	28701,767442	85662,367202	884	32682,767758	85334,203793
885	28701,873161	85712,367090	885	32647,387180	85369,531692
886	28701,978881	85762,366978	886	32606,906103	85398,879305
887	28701,016953	85812,343796	887	32566,425026	85428,226919
888	28701,390439	85862,320647	888	32526,667767	85458,456577
889	28690,678085	85910,892573	889	32489,983944	85492,431525
890	28688,478705	85960,787338	890	32453,300121	85526,406473
891	28692,573197	86010,566664	891	32414,196403	85557,562672
892	28689,554381	86059,905335	892	32380,722535	85592,991277
893	28677,518296	86108,287889	893	32361,145678	85638,999392
894	28663,001977	86155,945710	894	32341,568821	85685,007507
895	28652,919806	86204,799750	895	32321,991964	85731,015622
896	28652,670563	86254,753717	896	32302,415107	85777,023737
897	28662,592588	86303,615127	897	32282,838250	85823,031853
898	28678,053245	86350,876819	898	32263,261393	85869,039968
899	28696,481123	86397,194768	899	32243,684536	85915,048083
900	28721,109671	86439,179044	900	32224,107678	85961,056198
901	28719,932039	86489,153940	901	32204,530821	86007,064313
902	28716,365110	86537,740867	902	32184,953964	86053,072429
903	28682,662910	86574,487242	903	32165,377107	86099,080544
904	28658,527474	86618,164307	904	32145,800250	86145,088659
905	28622,314155	86651,020635	905	32126,223393	86191,096774
906	28587,170021	86686,403919	906	32106,646536	86237,104890
907	28553,019834	86722,741198	907	32087,069679	86283,113005
908	28528,763901	86766,291210	908	32067,492822	86329,121120
909	28516,025714	86814,495437	909	32047,915965	86375,129235
910	28507,534347	86863,551340	910	32028,339107	86421,137350

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
911	28494,498325	86911,205080	911	32008,762250	86467,145466
912	28473,937629	86956,682405	912	31989,185393	86513,153581
913	28446,489084	86998,168665	913	31969,608536	86559,161696
914	28415,551954	87034,933331	914	31950,031679	86605,169811
915	28375,876941	87065,161598	915	31930,454822	86651,177927
916	28344,886276	87104,226113	916	31910,877965	86697,186042
917	28313,121092	87141,903803	917	31891,301108	86743,194157
918	28293,588544	87187,340742	918	31871,724251	86789,202272
919	28289,979919	87236,805061	919	31852,147394	86835,210388
920	28287,384816	87286,672915	920	31832,570536	86881,218503
921	28292,488546	87336,277376	921	31812,993679	86927,226618
922	28268,429877	87379,635508	922	31793,416822	86973,234733
923	28255,041175	87427,659705	923	31773,839965	87019,242848
924	28253,902412	87477,499649	924	31754,263108	87065,250964
925	28212,040098	87501,518084	925	31734,686251	87111,259079
926	28170,248120	87528,847969	926	31715,109394	87157,267194
927	28134,681639	87563,827967	927	31695,532537	87203,275309
928	28107,167800	87605,420125	928	31675,955680	87249,283424
929	28089,975564	87652,293990	929	31656,378823	87295,291540
930	28078,581529	87700,326517	930	31636,801965	87341,299655
931	28035,358972	87725,212771	931	31617,225108	87387,307770
932	27989,808723	87741,852207	932	31597,648251	87433,315885
933	27943,582592	87760,547659	933	31578,071394	87479,324001
934	27903,215075	87789,766698	934	31558,494537	87525,332116
935	27856,840636	87808,090610	935	31538,917680	87571,340231
936	27816,186957	87837,000220	936	31519,340823	87617,348346
937	27782,169062	87873,489540	937	31499,763966	87663,356461
938	27753,930891	87914,642321	938	31480,187109	87709,364577
939	27727,768671	87957,128359	939	31460,610252	87755,372692
940	27711,743602	88004,341956	940	31441,033394	87801,380807
941	27702,977152	88053,411518	941	31421,456537	87847,388922
942	27690,317928	88101,736644	942	31401,879680	87893,397038
943	27687,430387	88151,507543	943	31382,302823	87939,405153
944	27695,068748	88200,884133	944	31362,725966	87985,413268
945	27712,008557	88247,789750	945	31343,149109	88031,421383
946	27736,238940	88291,478810	946	31323,572252	88077,429498
947	27764,983721	88332,284206	947	31303,995395	88123,437614
948	27802,535243	88365,099956	948	31284,418538	88169,445729
949	27845,925515	88389,906813	949	31264,841681	88215,453844
950	27892,424529	88407,904077	950	31245,264824	88261,461959
951	27941,708570	88416,144152	951	31225,687967	88307,470075
952	27948,838478	88441,012897	952	31206,111109	88353,478190
953	27928,197977	88486,388589	953	31186,534252	88399,486305
954	27917,740900	88535,233954	954	31166,957395	88445,494420
955	27883,923408	88548,495873	955	31147,380538	88491,502535
956	27833,939814	88547,696936	956	31127,803681	88537,510651

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
957	27784,496524	88554,170313	957	31108,226824	88583,518766
958	27738,149105	88572,584409	958	31088,649967	88629,526881
959	27695,035895	88597,837271	959	31069,073110	88675,534996
960	27657,793147	88631,017073	960	31049,496253	88721,543111
961	27626,504828	88669,878157	961	31029,919396	88767,551227
962	27603,038062	88714,000548	962	31010,342538	88813,559342
963	27586,644925	88761,088564	963	30983,046705	88855,277539
964	27582,310939	88810,757301	964	30954,312753	88896,196483
965	27585,046870	88860,682171	965	30925,578801	88937,115428
966	27592,475433	88909,998808	966	30896,844850	88978,034372
967	27608,936974	88957,194797	967	30868,110898	89018,953316
968	27626,659537	89003,947586	968	30839,376946	89059,872261
969	27648,107747	89049,011025	969	30810,642994	89100,791205
970	27675,151400	89090,986726	970	30781,909042	89141,710150
971	27710,942738	89125,703821	971	30753,175090	89182,629094
972	27712,136699	89155,374174	972	30724,441138	89223,548038
973	27679,567391	89193,176925	973	30695,707187	89264,466983
974	27655,196605	89212,445877	974	30666,973235	89305,385927
975	27611,843054	89237,158176	975	30638,239283	89346,304872
976	27573,758444	89269,508993	976	30609,505331	89387,223816
977	27527,589355	89282,898426	977	30580,771379	89428,142761
978	27480,896989	89300,359646	978	30552,037427	89469,061705
979	27438,111339	89326,205908	979	30523,303475	89509,980649
980	27396,091003	89353,286737	980	30494,569524	89550,899594
981	27355,213244	89382,068162	981	30465,835572	89591,818538
982	27314,292106	89410,775042	982	30437,101620	89632,737483
983	27268,265580	89419,878699	983	30408,367668	89673,656427
984	27219,569888	89410,741360	984	30379,633716	89714,575371
985	27171,048697	89398,910508	985	30350,899764	89755,494316
986	27121,203401	89398,200188	986	30322,165812	89796,413260
987	27072,725840	89409,807830	987	30293,431861	89837,332204
988	27028,076760	89432,154595	988	30264,697909	89878,251149
989	26988,253571	89462,175226	989	30235,963957	89919,170093
990	26957,088253	89501,093183	990	30207,230005	89960,089038
991	26918,882390	89533,087446	991	30178,496053	90001,007982
992	26889,578583	89573,410664	992	30149,762101	90041,926927
993	26855,870457	89607,821974	993	30121,028150	90082,845871
994	26818,873877	89641,240489	994	30092,294198	90123,764815
995	26790,992836	89682,469412	995	30063,560246	90164,683760
996	26748,342139	89708,341402	996	30034,826294	90205,602704
997	26712,300233	89742,917574	997	30006,092342	90246,521649
998	26679,217858	89780,388210	998	29977,358390	90287,440593
999	26645,350759	89817,158941	999	29948,624438	90328,359537
1000	26614,892485	89856,807569	1000	29919,890487	90369,278482
1001	26583,807298	89895,963179	1001	29891,156535	90410,197426
1002	26548,267361	89931,105592	1002	29862,422583	90451,116371

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1003	26510,668815	89964,023440	1003	29833,688631	90492,035315
1004	26476,661451	90000,485882	1004	29804,954679	90532,954259
1005	26448,764673	90040,681981	1005	29776,220727	90573,873204
1006	26406,650196	90067,588371	1006	29747,486776	90614,792148
1007	26369,395271	90100,757758	1007	29718,752824	90655,711093
1008	26335,631124	90137,615702	1008	29690,018872	90696,630037
1009	26299,766241	90169,771078	1009	29661,284920	90737,548981
1010	26257,250133	90195,823553	1010	29632,550968	90778,467926
1011	26221,641254	90230,825667	1011	29603,817016	90819,386870
1012	26185,299961	90265,139396	1012	29575,083064	90860,305815
1013	26152,706713	90303,021382	1013	29546,349113	90901,224759
1014	26121,161677	90341,806919	1014	29517,615161	90942,143703
1015	26092,477872	90382,708866	1015	29488,881209	90983,062648
1016	26055,836629	90416,724027	1016	29460,147257	91023,981592
1017	26019,120449	90450,663384	1017	29431,413305	91064,900537
1018	25974,284511	90469,922108	1018	29402,679353	91105,819481
1019	25927,006570	90485,951730	1019	29373,945401	91146,738425
1020	25882,104209	90507,849023	1020	29345,211450	91187,657370
1021	25842,956076	90538,724165	1021	29316,477498	91228,576314
1022	25812,673373	90578,338058	1022	29287,743546	91269,495259
1023	25793,178807	90624,228075	1023	29258,294478	91309,729212
1024	25775,489168	90670,622459	1024	29218,649293	91340,196559
1025	25777,719496	90720,037538	1025	29179,004107	91370,663907
1026	25757,536629	90737,538212	1026	29139,358922	91401,131254
1027	25727,422517	90747,220747	1027	29099,713736	91431,598601
1028	25705,707922	90718,999498	1028	29060,068550	91462,065949
1029	25691,038385	90683,878370	1029	29020,423365	91492,533296
1030	25680,491793	90644,718768	1030	28980,778179	91523,000644
1031	25660,712453	90614,602135	1031	28941,132994	91553,467991
1032	25631,918442	90593,315418	1032	28901,487808	91583,935339
1033	25599,209197	90579,820621	1033	28861,842623	91614,402686
1034	25580,542922	90548,614406	1034	28822,197437	91644,870034
1035	25564,638991	90518,659089	1035	28782,552251	91675,337381
1036	25526,509472	90530,257476	1036	28742,907066	91705,804728
1037	25488,873525	90521,588252	1037	28703,261880	91736,272076
1038	25456,764038	90503,549348	1038	28663,616695	91766,739423
1039	25424,941422	90485,229588	1039	28623,971509	91797,206771
1040	25423,599596	90491,212403	1040	28584,326323	91827,674118
1041	25452,993617	90511,911210	1041	28544,681138	91858,141466
1042	25483,206530	90531,807846	1042	28505,035952	91888,608813
1043	25520,098549	90543,183935	1043	28465,390767	91919,076161
1044	25557,218168	90532,574560	1044	28425,745581	91949,543508
1045	25569,325301	90570,205789	1045	28386,100396	91980,010855
1046	25587,585210	90597,853332	1046	28346,455210	92010,478203
1047	25612,339625	90623,096038	1047	28307,509720	92041,789401
1048	25639,501256	90645,980946	1048	28270,228211	92075,107399

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1049	25649,121637	90682,090964	1049	28232,946701	92108,425398
1050	25654,703271	90722,156578	1050	28203,072033	92148,183919
1051	25667,055399	90755,590367	1051	28175,255024	92189,731651
1052	25684,763718	90785,757333	1052	28147,438015	92231,279382
1053	25678,130461	90798,681511	1053	28119,621005	92272,827114
1054	25671,855343	90822,603262	1054	28088,057323	92311,505729
1055	25637,669579	90848,860639	1055	28055,198384	92349,192465
1056	25608,090363	90870,115782	1056	28023,778536	92387,954941
1057	25572,786063	90905,425302	1057	27996,934105	92430,137597
1058	25539,413873	90942,605214	1058	27970,089674	92472,320254
1059	25493,243276	90960,517359	1059	27943,245244	92514,502911
1060	25449,708165	90984,823545	1060	27909,622112	92551,248799
1061	25411,632297	91017,162011	1061	27874,273115	92586,610480
1062	25377,320423	91053,399470	1062	27838,924119	92621,972161
1063	25341,144021	91087,787362	1063	27811,077112	92663,036458
1064	25310,050938	91126,765924	1064	27786,463040	92706,558262
1065	25277,788101	91159,817324	1065	27762,204489	92750,266773
1066	25231,254449	91178,065016	1066	27740,346472	92795,235952
1067	25189,020038	91204,582473	1067	27718,488455	92840,205132
1068	25149,555580	91235,280763	1068	27696,630437	92885,174311
1069	25110,059701	91265,928055	1069	27674,772420	92930,143490
1070	25068,207100	91293,278251	1070	27655,139055	92976,120373
1071	25026,148111	91320,311467	1071	27635,750804	93022,208286
1072	24984,595135	91348,117986	1072	27616,362553	93068,296199
1073	24941,608637	91373,655429	1073	27596,208685	93114,052951
1074	24900,014402	91401,272123	1074	27575,899393	93159,742476
1075	24865,233999	91436,980770	1075	27547,118584	93221,724765
1076	24827,831854	91469,579023	1076	27523,747837	93265,923896
1077	24778,864879	91479,322291	1077	27499,750939	93309,789017
1078	24732,986726	91498,865278	1078	27470,481324	93349,645560
1079	24692,076100	91527,547731	1079	27434,631895	93384,499806
1080	24654,208845	91560,109030	1080	27398,782467	93419,354053
1081	24624,439849	91600,103652	1081	27362,933039	93454,208299
1082	24597,680859	91642,200978	1082	27327,083611	93489,062546
1083	24568,455065	91681,791227	1083	27290,156502	93522,763418
1084	24540,890911	91723,341753	1084	27252,952624	93556,168080
1085	24507,486771	91750,003540	1085	27215,748747	93589,572742
1086	24458,347364	91758,456734	1086	27178,544869	93622,977405
1087	24412,788023	91778,697794	1087	27141,340991	93656,382067
1088	24370,628914	91805,333171	1088	27102,141817	93687,352646
1089	24323,800416	91822,131420	1089	27063,148617	93718,559681
1090	24276,670167	91838,443010	1090	27023,607991	93747,453882
1091	24234,568244	91865,286290	1091	26975,347124	93760,526322
1092	24193,081931	91841,172755	1092	26927,174335	93773,884036
1093	24143,816485	91836,877115	1093	26879,944115	93790,294590
1094	24098,469851	91856,662786	1094	26832,713894	93806,705145

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1095	24068,299831	91895,873831	1095	26785,483674	93823,115699
1096	24043,497207	91932,581969	1096	26737,876894	93838,195895
1097	23999,409728	91955,947254	1097	26689,052341	93848,973792
1098	23954,897194	91969,649927	1098	26640,227788	93859,751688
1099	23910,264583	91943,712780	1099	26591,403236	93870,529584
1100	23864,885372	91923,048059	1100	26544,281245	93887,046648
1101	23817,633635	91907,527285	1101	26497,477781	93904,637435
1102	23769,261687	91895,450855	1102	26450,674318	93922,228222
1103	23719,399459	91895,655420	1103	26403,870854	93939,819009
1104	23670,122049	91891,680774	1104	26356,708991	93956,422872
1105	23621,488130	91886,250571	1105	26309,524238	93972,963704
1106	23577,198294	91863,177658	1106	26262,368477	93989,585855
1107	23529,432099	91848,611899	1107	26215,361516	94006,625387
1108	23479,919191	91842,711980	1108	26168,354556	94023,664920
1109	23430,482590	91849,217147	1109	26121,363325	94040,747581
1110	23384,084442	91867,547436	1110	26074,423546	94057,971319
1111	23337,598438	91882,796002	1111	26029,792837	94080,377874
1112	23293,017798	91879,383552	1112	25985,595787	94103,757796
1113	23254,974430	91847,060242	1113	25941,398736	94127,137718
1114	23210,746731	91823,940495	1114	25898,907799	94153,488509
1115	23167,419351	91800,047036	1115	25856,439546	94179,878800
1116	23127,419415	91771,380018	1116	25813,971293	94206,269092
1117	23091,517569	91736,800239	1117	25770,766053	94231,195496
1118	23049,451580	91709,851295	1118	25724,273430	94249,592126
1119	23003,692766	91689,758872	1119	25677,622865	94267,477592
1120	22956,185609	91674,267391	1120	25628,856251	94278,514682
1121	22907,602481	91662,647042	1121	25580,089636	94289,551771
1122	22858,657910	91653,063988	1122	25531,323022	94300,588860
1123	22808,863005	91655,729413	1123	25482,574352	94311,704619
1124	22768,537725	91636,421722	1124	25433,845271	94322,906253
1125	22739,073748	91596,171495	1125	25385,070590	94333,907110
1126	22708,386991	91556,796771	1126	25336,283404	94344,852907
1127	22673,171775	91521,371129	1127	25287,496217	94355,798703
1128	22631,281994	91494,349782	1128	25238,709031	94366,744500
1129	22584,604787	91476,519933	1129	25189,661661	94376,439010
1130	22535,960855	91465,582273	1130	25140,555044	94385,848586
1131	22486,077801	91466,546926	1131	25091,448426	94395,258163
1132	22436,775709	91474,672723	1132	25042,368866	94404,801112
1133	22389,363541	91490,127454	1133	24993,477658	94415,272489
1134	22349,071489	91487,134984	1134	24944,586450	94425,743867
1135	22319,627158	91448,784324	1135	24895,573497	94435,625752
1136	22296,409424	91404,675775	1136	24846,534065	94445,379426
1137	22263,180626	91367,482839	1137	24797,494634	94455,133100
1138	22223,547689	91337,212532	1138	24748,408117	94464,644927
1139	22177,696601	91317,647133	1139	24699,291348	94474,001372
1140	22128,627867	91308,468460	1140	24650,155269	94483,255093

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1141	22078,823497	91310,510315	1141	24600,993739	94492,373421
1142	22029,259799	91307,077045	1142	24551,832208	94501,491750
1143	21979,789736	91313,318586	1143	24502,670678	94510,610078
1144	21933,997672	91328,892774	1144	24453,509147	94519,728407
1145	21903,218204	91289,627724	1145	24404,347617	94528,846735
1146	21864,739465	91257,766086	1146	24355,202361	94538,052003
1147	21827,056857	91225,103091	1147	24305,872856	94546,077800
1148	21783,962366	91199,904498	1148	24256,226802	94552,008750
1149	21737,820396	91180,782252	1149	24206,552722	94557,708381
1150	21690,294782	91165,386686	1150	24156,878643	94563,408013
1151	21646,362675	91144,125650	1151	24107,204563	94569,107644
1152	21601,611269	91122,115266	1152	24057,530483	94574,807276
1153	21563,940160	91096,379865	1153	24007,856403	94580,506907
1154	21558,540163	91046,816413	1154	23958,182324	94586,206538
1155	21561,906825	90998,033708	1155	23908,826455	94593,994123
1156	21562,025768	90948,162449	1156	23859,619144	94602,824861
1157	21549,847226	90899,805306	1157	23810,202276	94610,438872
1158	21527,725692	90855,086556	1158	23760,785408	94618,052883
1159	21504,434571	90811,803011	1159	23711,368540	94625,666894
1160	21482,736586	90766,903471	1160	23661,951672	94633,280905
1161	21451,121226	90728,282086	1161	23612,534804	94640,894917
1162	21412,372491	90696,905956	1162	23563,117936	94648,508928
1163	21367,760620	90674,715539	1163	23513,701068	94656,122939
1164	21337,439606	90635,120317	1164	23464,075786	94662,068507
1165	21305,864688	90599,442985	1165	23414,407599	94664,166833
1166	21305,125648	90549,556098	1166	23365,151287	94655,575226
1167	21296,540102	90500,412407	1167	23316,391170	94644,543935
1168	21276,433236	90454,792136	1168	23267,692028	94633,212846
1169	21247,596624	90413,993860	1169	23218,992886	94621,881758
1170	21216,835088	90374,661460	1170	23170,293744	94610,550670
1171	21182,054783	90338,860391	1171	23121,594602	94599,219581
1172	21143,683873	90306,850837	1172	23072,833675	94588,214098
1173	21104,110007	90276,334832	1173	23023,368831	94580,918264
1174	21064,395316	90245,995979	1174	22973,903781	94573,623830
1175	21027,786967	90211,972187	1175	22924,471384	94566,113402
1176	20992,408312	90176,777455	1176	22875,059559	94558,466731
1177	20954,034117	90144,805618	1177	22825,647734	94550,820060
1178	20916,431242	90113,220310	1178	22776,235910	94543,173389
1179	20887,507242	90073,393826	1179	22726,824085	94535,526718
1180	20875,309414	90025,000718	1180	22677,412260	94527,880048
1181	20854,051058	89979,892392	1181	22628,000435	94520,233377
1182	20823,827169	89940,111453	1182	22578,616078	94512,415546
1183	20787,690610	89905,692410	1183	22529,292713	94504,217637
1184	20753,224937	89870,185662	1184	22479,881055	94496,573736
1185	20725,828952	89828,531821	1185	22430,452906	94489,033304
1186	20705,438475	89782,917536	1186	22380,798177	94483,216988

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1187	20677,012907	89741,859027	1187	22331,100113	94477,730417
1188	20644,546587	89703,868267	1188	22281,402049	94472,243845
1189	20609,747540	89668,097345	1189	22231,703986	94466,757273
1190	20585,543811	89624,518619	1190	22182,099500	94460,598216
1191	20563,987057	89579,572208	1191	22132,791573	94452,307960
1192	20538,779502	89536,496234	1192	22083,483646	94444,017704
1193	20509,609086	89495,910167	1193	22034,610954	94433,547279
1194	20480,793754	89455,087880	1194	21985,899431	94422,269536
1195	20450,167403	89415,691761	1195	21937,187907	94410,991793
1196	20416,067319	89379,583165	1196	21888,476384	94399,714050
1197	20384,655875	89340,725176	1197	21840,025750	94387,368869
1198	20360,862474	89302,250746	1198	21791,334343	94376,043310
1199	20367,419083	89253,222571	1199	21742,469514	94365,449516
1200	20349,558797	89207,087047	1200	21693,604685	94354,855722
1201	20311,791684	89175,161052	1201	21644,739856	94344,261927
1202	20263,342644	89165,164013	1202	21596,941725	94330,126049
1203	20219,452482	89171,427105	1203	21550,353058	94311,974021
1204	20206,991530	89123,010720	1204	21503,764391	94293,821994
1205	20193,639817	89074,829492	1205	21457,717284	94274,461088
1206	20174,991650	89028,571624	1206	21413,157583	94251,779971
1207	20187,967607	88986,213073	1207	21368,597883	94229,098854
1208	20215,452409	88944,444836	1208	21324,038182	94206,417736
1209	20242,937211	88902,676598	1209	21279,478481	94183,736619
1210	20257,634987	88859,219768	1210	21234,918781	94161,055502
1211	20237,402300	88816,774391	1211	21190,359080	94138,374385
1212	20209,751173	88776,346726	1212	21147,560815	94112,773229
1213	20215,677474	88726,857815	1213	21106,714846	94083,935636
1214	20209,234690	88677,404425	1214	21065,868877	94055,098043
1215	20194,704771	88630,841321	1215	21025,022907	94026,260449
1216	20212,122233	88584,031714	1216	20984,176938	93997,422856
1217	20223,902198	88535,476605	1217	20943,330969	93968,585262
1218	20233,823581	88486,491681	1218	20902,485000	93939,747669
1219	20240,284215	88436,925658	1219	20865,951916	93905,629677
1220	20244,363698	88387,390461	1220	20829,539120	93871,364414
1221	20250,660310	88337,812453	1221	20793,126324	93837,099150
1222	20248,246910	88287,932341	1222	20756,713528	93802,833886
1223	20242,128219	88238,488078	1223	20720,300732	93768,568623
1224	20254,403707	88190,090618	1224	20684,039963	93734,142617
1225	20265,335919	88141,318962	1225	20649,864784	93697,746613
1226	20271,228607	88091,680850	1226	20618,005247	93659,225896
1227	20271,156467	88041,787433	1227	20587,766286	93619,406238
1228	20277,565935	87992,224856	1228	20557,527324	93579,586579
1229	20284,531986	87942,715608	1229	20527,288363	93539,766920
1230	20287,839240	87892,872556	1230	20497,049402	93499,947262
1231	20290,789458	87843,042505	1231	20466,862296	93460,093132
1232	20298,543366	87794,111704	1232	20441,850927	93416,798428

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1233	20302,024536	87744,272234	1233	20416,839558	93373,503724
1234	20314,311139	87696,349945	1234	20391,388372	93330,471387
1235	20317,861206	87646,914709	1235	20365,173892	93287,894386
1236	20319,954005	87596,965258	1236	20338,959412	93245,317385
1237	20321,732961	87546,996915	1237	20313,593751	93202,333025
1238	20323,256064	87497,020145	1238	20294,491419	93156,299344
1239	20324,174610	87447,041542	1239	20265,988632	93119,630174
1240	20320,322211	87397,195938	1240	20216,168822	93116,712548
1241	20316,384756	87347,352509	1241	20167,943949	93103,824916
1242	20312,418218	87297,517238	1242	20122,970756	93082,127217
1243	20307,136586	87247,797151	1243	20082,151668	93053,341822
1244	20298,944454	87198,477572	1244	20045,816791	93019,050293
1245	20293,030215	87168,966263	1245	20013,949968	92980,557416
1246	20280,975768	87120,458639	1246	19986,371168	92938,877506
1247	20259,860446	87075,295288	1247	19962,824305	92894,789359
1248	20228,249856	87036,746582	1248	19943,061719	92848,876920
1249	20188,096603	87007,194099	1249	19926,879746	92801,581262
1250	20149,699414	86980,419637	1250	19914,100523	92753,253478
1251	20128,882626	86935,702167	1251	19904,580556	92704,178379
1252	20119,082023	86886,785791	1252	19898,212788	92654,594441
1253	20116,378997	86837,389431	1253	19894,949664	92604,709020
1254	20116,930260	86790,074754	1254	19894,759790	92554,717729
1255	20132,503217	86743,115425	1255	19878,817048	92508,380744
1256	20129,313207	86694,122401	1256	19857,505466	92463,150042
1257	20138,258454	86645,023652	1257	19836,193884	92417,919339
1258	20140,056301	86595,067214	1258	19814,882302	92372,688636
1259	20146,471157	86545,696311	1259	19789,206323	92329,817195
1260	20150,297129	86496,032297	1260	19766,591566	92285,303184
1261	20165,705519	86448,787183	1261	19746,530558	92239,504243
1262	20175,186053	86399,936099	1262	19726,259574	92193,802292
1263	20162,246577	86352,192136	1263	19704,423178	92148,822610
1264	20166,401678	86311,131262	1264	19682,586782	92103,842928
1265	20204,333049	86279,696925	1265	19660,750386	92058,863246
1266	20222,728151	86240,971610	1266	19638,913990	92013,883564
1267	20268,871116	86258,816676	1267	19620,822019	91967,312503
1268	20317,911057	86252,441258	1268	19603,593462	91920,374493
1269	20357,930434	86223,354959	1269	19586,364906	91873,436482
1270	20378,981092	86178,589634	1270	19569,136349	91826,498472
1271	20376,078183	86129,221137	1271	19550,871845	91779,954549
1272	20349,857038	86087,270075	1272	19532,547353	91733,433446
1273	20308,090980	86062,378916	1273	19514,222860	91686,912344
1274	20321,611514	86016,905527	1274	19499,450542	91639,206243
1275	20348,856856	85988,054449	1275	19486,174495	91591,000988
1276	20381,849308	85980,171091	1276	19472,898448	91542,795733
1277	20384,617026	85957,459920	1277	19459,622401	91494,590479
1278	20404,325217	85911,903366	1278	19446,080980	91446,465684

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1279	20406,911838	85875,927899	1279	19430,351590	91399,004265
1280	20422,166966	85850,371366	1280	19413,637417	91351,917602
1281	20446,785967	85829,018951	1281	19390,293492	91308,046202
1282	20432,000696	85822,869748	1282	19360,427076	91267,956394
1283	20406,653811	85804,142059	1283	19325,077764	91232,595030
1284	20408,035240	85767,146026	1284	19289,728451	91197,233665
1285	20409,889708	85736,691835	1285	19254,379139	91161,872301
1286	20409,304243	85699,707459	1286	19219,029826	91126,510936
1287	20418,711576	85662,826289	1287	19183,680514	91091,149572
1288	20447,318286	85652,920992	1288	19157,450345	91048,779966
1289	20483,701442	85623,280118	1289	19132,378030	91005,520528
1290	20518,368499	85595,717861	1290	19107,305714	90962,261090
1291	20564,365272	85578,967536	1291	19082,233398	90919,001652
1292	20610,159511	85588,969058	1292	19057,739002	90875,415600
1293	20657,316166	85582,120758	1293	19033,612703	90831,621517
1294	20704,306976	85582,447452	1294	19011,331314	90787,067193
1295	20722,432605	85539,197167	1295	18997,599656	90738,989739
1296	20692,334654	85500,907573	1296	18952,784335	90729,911656
1297	20646,127101	85488,728015	1297	18919,210565	90692,860314
1298	20599,049365	85486,286856	1298	18885,636794	90655,808971
1299	20552,507703	85481,600672	1299	18852,063024	90618,757629
1300	20565,973102	85451,840483	1300	18818,489254	90581,706287
1301	20570,766680	85402,616472	1301	18784,915484	90544,654945
1302	20551,450194	85357,082951	1302	18751,341714	90507,603603
1303	20540,056846	85316,873535	1303	18717,767943	90470,552261
1304	20554,762774	85272,038568	1304	18684,194173	90433,500919
1305	20552,374671	85225,377631	1305	18650,620403	90396,449577
1306	20570,984453	85179,394728	1306	18617,046633	90359,398234
1307	20609,832182	85158,669044	1307	18583,472862	90322,346892
1308	20646,721457	85125,714264	1308	18549,899092	90285,295550
1309	20663,184637	85079,061687	1309	18516,325322	90248,244208
1310	20655,291892	85030,242551	1310	18482,751552	90211,192866
1311	20625,016018	84991,118142	1311	18449,179695	90174,140315
1312	20625,079834	84961,669829	1312	18430,144945	90127,905282
1313	20658,978220	84925,621626	1313	18411,110195	90081,670249
1314	20670,892005	84879,999571	1314	18392,075445	90035,435215
1315	20706,994721	84847,527364	1315	18373,040696	89989,200182
1316	20729,166909	84803,384926	1316	18354,005946	89942,965149
1317	20760,230919	84765,078166	1317	18334,971196	89896,730116
1318	20785,223602	84724,708740	1318	18315,936446	89850,495082
1319	20818,872860	84693,995179	1319	18296,901697	89804,260049
1320	20864,003333	84710,267229	1320	18277,866947	89758,025016
1321	20909,399027	84729,747085	1321	18258,832197	89711,789983
1322	20954,872391	84749,305202	1322	18239,797447	89665,554950
1323	20998,160812	84773,579604	1323	18220,762697	89619,319916
1324	21040,028339	84798,973172	1324	18201,727948	89573,084883

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1325	21089,158351	84796,338735	1325	18182,693198	89526,849850
1326	21138,103258	84795,181784	1326	18163,658448	89480,614817
1327	21164,985169	84761,338877	1327	18144,623698	89434,379783
1328	21157,611390	84740,070907	1328	18125,588948	89388,144750
1329	21134,379330	84698,096009	1329	18106,554199	89341,909717
1330	21118,936061	84651,890018	1330	18087,519449	89295,674683
1331	21122,756015	84606,998751	1331	18068,484699	89249,439650
1332	21087,566705	84575,363357	1332	18049,449949	89203,204617
1333	21043,568757	84553,137074	1333	18030,415199	89156,969584
1334	20996,324874	84539,591208	1334	18011,380449	89110,734550
1335	20947,046307	84534,300714	1335	17992,345700	89064,499517
1336	20899,014842	84528,805161	1336	17973,310950	89018,264484
1337	20890,124077	84488,090822	1337	17956,996098	88971,313403
1338	20896,216644	84441,419056	1338	17950,797312	88921,699141
1339	20921,798536	84406,798564	1339	17944,598526	88872,084878
1340	20941,174942	84366,072290	1340	17938,399741	88822,470616
1341	20985,089489	84363,606690	1341	17932,200955	88772,856353
1342	21032,672136	84359,394705	1342	17926,002169	88723,242090
1343	21058,005709	84317,709578	1343	17911,494371	88675,943312
1344	21067,669861	84269,617418	1344	17893,340605	88629,355323
1345	21043,517083	84227,040334	1345	17877,152601	88582,142910
1346	21064,736879	84207,534542	1346	17865,094041	88533,618780
1347	21108,610674	84184,595661	1347	17853,035482	88485,094651
1348	21129,710692	84141,411907	1348	17840,976923	88436,570521
1349	21104,386242	84102,045567	1349	17829,757231	88387,847389
1350	21056,571423	84107,702108	1350	17818,734980	88339,077419
1351	21027,044047	84096,828362	1351	17806,292497	88290,655496
1352	21017,237929	84048,013980	1352	17793,516588	88242,315283
1353	21009,415963	84001,795189	1353	17780,740680	88193,975071
1354	21013,311843	83953,066997	1354	17767,964771	88145,634858
1355	21008,843960	83903,494945	1355	17775,264669	88097,080658
1356	20999,896466	83855,340450	1356	17787,007276	88048,479103
1357	21007,968083	83809,243406	1357	17798,749884	87999,877547
1358	21006,242607	83761,266181	1358	17810,492492	87951,275992
1359	21004,817202	83711,832760	1359	17822,530774	87902,747102
1360	20988,239837	83666,672950	1360	17834,653741	87854,239023
1361	20975,515518	83620,073190	1361	17846,573565	87805,680684
1362	20930,121453	83606,741315	1362	17858,468204	87757,116112
1363	20902,068083	83633,196137	1363	17870,362842	87708,551541
1364	20896,661848	83585,552324	1364	17884,687342	87660,788156
1365	20918,537022	83551,506371	1365	17904,010963	87614,673108
1366	20954,163936	83522,017207	1366	17923,157633	87568,485022
1367	20951,751071	83475,014336	1367	17941,987147	87522,166026
1368	20914,352707	83448,514249	1368	17960,816660	87475,847029
1369	20920,633394	83402,066108	1369	17979,646174	87429,528033
1370	20914,622139	83353,472104	1370	17998,475687	87383,209036

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1371	20904,714698	83305,988279	1371	18011,291024	87335,108402
1372	20929,231840	83265,795690	1372	18020,728773	87286,007191
1373	20909,777637	83222,719844	1373	18030,166522	87236,905980
1374	20868,021216	83200,039595	1374	18039,167983	87187,723419
1375	20834,456236	83173,853314	1375	18045,930666	87138,193780
1376	20863,184976	83138,595452	1376	18052,197390	87088,588052
1377	20892,916098	83171,448825	1377	18058,464113	87038,982325
1378	20940,180992	83164,832887	1378	18064,730837	86989,376598
1379	20962,502040	83122,144448	1379	18070,997561	86939,770871
1380	21003,474382	83098,706793	1380	18077,264285	86890,165144
1381	21021,059851	83053,704115	1381	18083,531008	86840,559416
1382	21033,009445	83016,204693	1382	18091,867195	86791,265123
1383	21080,149345	83027,858354	1383	18099,921128	86741,928175
1384	21122,035524	83006,127005	1384	18106,219040	86692,326398
1385	21171,631796	83002,662246	1385	18112,455631	86642,718071
1386	21197,691508	83040,133147	1386	18116,775644	86592,905046
1387	21234,194484	83069,363510	1387	18121,095657	86543,092021
1388	21274,072283	83044,975740	1388	18125,415670	86493,278995
1389	21272,860777	82996,514284	1389	18129,735683	86443,465970
1390	21246,636679	82954,983629	1390	18135,544981	86393,821397
1391	21208,622858	82923,836955	1391	18142,460396	86344,301935
1392	21159,664831	82917,548412	1392	18149,375810	86294,782474
1393	21130,306424	82889,980519	1393	18161,942366	86246,401082
1394	21099,971344	82851,633356	1394	18174,733831	86198,064983
1395	21065,693693	82816,650628	1395	18187,525295	86149,728884
1396	21046,877139	82771,383403	1396	18200,316759	86101,392785
1397	21012,306086	82736,558845	1397	18207,413718	86052,001333
1398	21003,525567	82691,539739	1398	18223,232030	86004,954892
1399	20989,656125	82649,290324	1399	18242,325331	85958,744007
1400	21006,777189	82603,420615	1400	18261,418631	85912,533122
1401	20997,913238	82555,404405	1401	18280,511931	85866,322237
1402	20988,075735	82515,463486	1402	18297,741066	85819,504504
1403	21010,580107	82476,244088	1403	18309,510285	85770,909386
1404	21021,785386	82428,269863	1404	18321,279504	85722,314268
1405	20997,822861	82386,746205	1405	18335,786523	85674,538988
1406	20949,002690	82381,734481	1406	18352,663074	85627,473268
1407	20914,317758	82372,187134	1407	18369,539625	85580,407548
1408	20883,867543	82335,396243	1408	18386,416176	85533,341828
1409	20910,187452	82295,746130	1409	18403,292728	85486,276107
1410	20912,019517	82246,803557	1410	18420,169279	85439,210387
1411	20905,239343	82199,133742	1411	18437,045830	85392,144667
1412	20884,154366	82154,341859	1412	18444,964204	85343,002362
1413	20912,075150	82141,029654	1413	18447,804293	85293,083088
1414	20943,634290	82104,120249	1414	18450,644382	85243,163814
1415	20939,268131	82055,159119	1415	18453,484471	85193,244540
1416	20981,007350	82047,214479	1416	18456,567177	85143,343284

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1417	21026,024590	82031,330445	1417	18461,131793	85093,552077
1418	21030,003853	81984,606056	1418	18465,696410	85043,760870
1419	20987,218017	81964,829022	1419	18470,261027	84993,969663
1420	20945,547077	81977,703607	1420	18474,825643	84944,178457
1421	20898,505283	81966,768319	1421	18482,015638	84894,766661
1422	20888,575533	81924,559530	1422	18488,921551	84845,280461
1423	20896,902373	81877,661570	1423	18494,639216	84795,608454
1424	20865,202685	81842,552865	1424	18500,356881	84745,936447
1425	20838,593780	81802,400084	1425	18506,074546	84696,264439
1426	20790,041188	81802,348040	1426	18511,792211	84646,592432
1427	20782,218598	81791,307145	1427	18517,509876	84596,920425
1428	20830,410325	81782,829783	1428	18523,227541	84547,248418
1429	20870,053824	81759,109163	1429	18531,937954	84498,118863
1430	20901,030826	81724,218055	1430	18544,017948	84449,600065
1431	20882,070912	81681,830576	1431	18567,051311	84405,243975
1432	20878,383463	81632,847287	1432	18590,244334	84360,948561
1433	20865,444435	81585,454572	1433	18613,437356	84316,653147
1434	20873,684291	81539,507409	1434	18636,630379	84272,357733
1435	20884,291265	81493,168865	1435	18659,960971	84228,134807
1436	20864,130416	81452,692200	1436	18682,975806	84183,748615
1437	20868,433326	81403,591862	1437	18705,637048	84139,178803
1438	20869,202250	81354,474334	1438	18728,298289	84094,608992
1439	20875,621241	81305,383482	1439	18750,959530	84050,039180
1440	20890,838858	81264,378277	1440	18773,620772	84005,469368
1441	20908,580263	81218,215727	1441	18790,991798	83958,809811
1442	20949,735748	81209,399201	1442	18804,907263	83910,785235
1443	20998,164876	81208,687958	1443	18817,635616	83862,444571
1444	21044,974552	81194,020116	1444	18829,444287	83813,859025
1445	21057,270808	81148,729845	1445	18841,252959	83765,273479
1446	21028,703374	81115,406139	1446	18853,061631	83716,687933
1447	21055,580680	81075,693020	1447	18864,870302	83668,102387
1448	21069,459672	81029,181561	1448	18876,678974	83619,516841
1449	21074,507940	80981,783874	1449	18888,487645	83570,931295
1450	21097,101207	80938,407598	1450	18898,971466	83522,182850
1451	21144,492440	80926,902452	1451	18899,284406	83472,183829
1452	21189,619662	80907,945557	1452	18899,597347	83422,184809
1453	21218,637911	80870,196572	1453	18899,910288	83372,185788
1454	21195,932795	80829,197961	1454	18900,223229	83322,186767
1455	21149,060444	80835,916267	1455	18900,536170	83272,187747
1456	21112,171492	80815,509048	1456	18900,849111	83222,188726
1457	21064,630176	80811,548760	1457	18901,162052	83172,189705
1458	21020,240336	80826,691792	1458	18901,474993	83122,190685
1459	20983,566429	80802,034062	1459	18901,787934	83072,191664
1460	20976,527534	80754,476822	1460	18909,297834	83022,892006
1461	20994,061613	80718,109365	1461	18915,143509	82973,234901
1462	20996,652792	80671,191520	1462	18920,989184	82923,577796

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1463	20953,247781	80652,999212	1463	18926,834858	82873,920691
1464	20941,529039	80622,837580	1464	18932,680533	82824,263586
1465	20925,871967	80577,268739	1465	18938,526207	82774,606481
1466	20929,111489	80528,526906	1466	18944,371882	82724,949376
1467	20932,062743	80478,795765	1467	18950,217556	82675,292270
1468	20938,381588	80430,864095	1468	18955,454319	82625,570531
1469	20941,490371	80381,806892	1469	18961,769898	82575,989724
1470	20956,181994	80334,582242	1470	18969,088984	82526,528676
1471	20958,870913	80285,366647	1471	18976,149777	82477,029735
1472	20964,937400	80239,089659	1472	18983,210571	82427,530794
1473	21005,551995	80251,956214	1473	18990,271364	82378,031852
1474	21050,644070	80238,560900	1474	18997,332158	82328,532911
1475	21057,489519	80190,787964	1475	19004,392951	82279,033970
1476	21029,919083	80152,249886	1476	19011,658574	82229,565383
1477	21028,451984	80136,204309	1477	19019,256960	82180,146110
1478	21066,835965	80107,126173	1478	19026,937598	82130,739746
1479	21062,673863	80059,841658	1479	19034,843635	82081,368757
1480	21017,466464	80046,276320	1480	19042,749672	82031,997767
1481	20976,594691	80039,076159	1481	19050,421438	81982,590941
1482	20977,298132	79991,226956	1482	19057,636607	81933,114266
1483	20980,742418	79941,515005	1483	19064,851776	81883,637591
1484	20994,543386	79898,208254	1484	19072,372939	81834,208598
1485	21016,251222	79853,772279	1485	19080,553756	81784,882396
1486	21032,937143	79806,857634	1486	19088,734572	81735,556193
1487	21058,508634	79765,553835	1487	19096,915388	81686,229991
1488	21071,691191	79717,754990	1488	19103,812318	81636,709162
1489	21076,786253	79668,564462	1489	19110,617970	81587,174497
1490	21071,721109	79619,076836	1490	19117,423623	81537,639831
1491	21089,187947	79582,965949	1491	19124,229275	81488,105166
1492	21128,247359	79553,309611	1492	19131,095912	81438,579012
1493	21152,693666	79513,883035	1493	19138,113234	81389,073889
1494	21179,008768	79472,688919	1494	19145,130555	81339,568766
1495	21172,746895	79426,223369	1495	19152,147876	81290,063642
1496	21194,834090	79382,482283	1496	19159,165197	81240,558520
1497	21187,343350	79334,383171	1497	19161,117406	81190,751727
1498	21161,191353	79293,032122	1498	19160,025726	81140,763646
1499	21139,685318	79249,049820	1499	19158,934046	81090,775565
1500	21117,869903	79205,128361	1500	19157,842366	81040,787485
1501	21103,426667	79158,300625	1501	19156,388258	80990,809776
1502	21139,397578	79131,055091	1502	19154,991878	80940,830518
1503	21134,673058	79083,655022	1503	19153,927944	80890,841839
1504	21115,338558	79041,245053	1504	19152,864011	80840,853160
1505	21099,916796	78994,925763	1505	19151,800078	80790,864481
1506	21093,624240	78945,878314	1506	19150,831498	80740,873998
1507	21086,571286	78897,357338	1507	19150,004181	80690,880843
1508	21085,950905	78850,140030	1508	19149,176863	80640,887688

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1509	21092,969127	78800,800951	1509	19148,349545	80590,894533
1510	21090,713998	78751,359110	1510	19148,059350	80540,916800
1511	21136,811207	78750,114547	1511	19149,823908	80491,001347
1512	21174,293983	78722,112862	1512	19148,826735	80441,011292
1513	21162,430891	78675,889251	1513	19147,829561	80391,021236
1514	21119,210114	78655,037798	1514	19146,832388	80341,031181
1515	21131,776831	78610,553660	1515	19146,817893	80291,075098
1516	21169,126206	78582,383254	1516	19151,265061	80241,273264
1517	21164,852916	78533,651265	1517	19155,712229	80191,471430
1518	21149,262257	78487,935857	1518	19160,159397	80141,669596
1519	21137,858411	78456,965136	1519	19165,072853	80091,919845
1520	21153,136258	78410,419740	1520	19171,723785	80042,364168
1521	21164,500612	78364,856755	1521	19177,146954	79992,666519
1522	21182,726857	78320,599565	1522	19181,981097	79942,900757
1523	21213,028232	78285,151382	1523	19186,815240	79893,134995
1524	21198,025366	78240,203591	1524	19191,649383	79843,369233
1525	21211,998824	78192,788395	1525	19201,995066	79794,481228
1526	21204,472648	78143,912023	1526	19212,859180	79745,675787
1527	21196,514095	78097,682815	1527	19224,169894	79696,991682
1528	21213,276398	78059,782702	1528	19239,495983	79649,398500
1529	21232,940734	78014,384400	1529	19254,822072	79601,805318
1530	21228,272919	77965,133230	1530	19270,148162	79554,212135
1531	21216,446020	77917,410929	1531	19285,474251	79506,618953
1532	21206,567369	77868,784465	1532	19300,800340	79459,025771
1533	21197,572366	77820,228347	1533	19315,433275	79411,230053
1534	21190,079730	77771,346744	1534	19326,613070	79362,550640
1535	21163,776690	77730,488930	1535	19336,705297	79313,599584
1536	21165,656351	77681,372758	1536	19347,631410	79264,807985
1537	21164,766860	77632,721985	1537	19357,787956	79215,888342
1538	21167,130640	77583,886467	1538	19363,249552	79166,187528
1539	21166,173458	77534,539980	1539	19368,711148	79116,486713
1540	21157,744218	77485,778882	1540	19374,172744	79066,785899
1541	21129,628309	77446,782779	1541	19379,634340	79017,085084
1542	21122,661297	77400,255423	1542	19385,095936	78967,384270
1543	21103,167266	77361,604484	1543	19391,080281	78917,745465
1544	21125,801400	77317,685538	1544	19396,073185	78867,995615
1545	21138,443530	77274,375343	1545	19401,017244	78818,240653
1546	21160,265447	77231,470102	1546	19405,961303	78768,485691
1547	21175,292358	77186,427164	1547	19410,905362	78718,730728
1548	21202,858316	77149,750799	1548	19415,849421	78668,975766
1549	21220,827718	77104,276247	1549	19420,793480	78619,220804
1550	21260,032172	77086,599189	1550	19425,737539	78569,465841
1551	21309,235149	77085,297431	1551	19430,694211	78519,712140
1552	21350,687820	77092,701406	1552	19435,696634	78469,963012
1553	21399,439549	77092,475489	1553	19439,440273	78420,109515
1554	21420,899813	77050,807192	1554	19442,699426	78370,215849

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1555	21404,905121	77004,261453	1555	19446,109461	78320,332277
1556	21451,298535	76997,836716	1556	19449,525617	78270,449115
1557	21486,086057	76965,695940	1557	19452,941773	78220,565953
1558	21477,059170	76918,736426	1558	19456,357930	78170,682790
1559	21444,089022	76882,476852	1559	19459,774086	78120,799628
1560	21409,346620	76847,970003	1560	19463,078804	78070,909036
1561	21364,615665	76829,079364	1561	19466,314687	78021,013856
1562	21348,699415	76794,364785	1562	19468,879243	77971,084531
1563	21366,505386	76767,888273	1563	19470,722399	77921,118514
1564	21379,650559	76722,718137	1564	19472,510837	77871,150736
1565	21414,747776	76710,515570	1565	19473,887197	77821,169683
1566	21433,964882	76667,426719	1566	19475,263557	77771,188630
1567	21433,034029	76618,604716	1567	19476,639918	77721,207577
1568	21401,414029	76583,722456	1568	19478,016278	77671,226525
1569	21407,166816	76539,763457	1569	19479,769137	77621,257740
1570	21419,631625	76494,182871	1570	19481,649560	77571,293113
1571	21417,531370	76447,340847	1571	19483,635384	77521,332884
1572	21428,782066	76402,648794	1572	19485,924728	77471,385323
1573	21439,824094	76363,605006	1573	19488,214072	77421,437761
1574	21474,606718	76329,811243	1574	19492,224072	77371,623937
1575	21477,592409	76281,191130	1575	19497,679915	77321,922490
1576	21518,727445	76264,861694	1576	19503,135757	77272,221044
1577	21540,150645	76223,152061	1577	19508,210538	77222,491116
1578	21575,792045	76192,595182	1578	19510,203662	77172,530857
1579	21613,074198	76160,583963	1579	19512,196787	77122,570598
1580	21629,747862	76114,440162	1580	19514,183276	77072,610110
1581	21647,786474	76068,567019	1581	19515,649725	77022,631619
1582	21655,361680	76019,862203	1582	19517,116174	76972,653129
1583	21631,082054	75977,579438	1583	19518,582623	76922,674638
1584	21643,575282	75946,669007	1584	19519,647798	76872,686714
1585	21680,521457	75915,184343	1585	19520,531494	76822,694524
1586	21723,636806	75891,388551	1586	19521,514999	76772,704719
1587	21762,651489	75861,630368	1587	19523,020308	76722,727383
1588	21809,183732	75854,234817	1588	19524,525616	76672,750048
1589	21857,841624	75860,226257	1589	19526,030925	76622,772713
1590	21898,012965	75887,656649	1590	19527,835414	76572,805524
1591	21942,685311	75870,568626	1591	19529,719419	76522,841031
1592	21962,198569	75826,110568	1592	19531,603423	76472,876538
1593	21941,837237	75783,630417	1593	19533,034057	76422,906805
1594	21895,032260	75783,710128	1594	19532,305397	76372,912115
1595	21848,114482	75768,982244	1595	19532,009593	76322,923401
1596	21798,517461	75763,956428	1596	19534,118254	76272,967886
1597	21749,296941	75767,311680	1597	19536,226916	76223,012370
1598	21706,306942	75791,192552	1598	19538,335577	76173,056854
1599	21666,492325	75809,691095	1599	19539,088269	76123,076694
1600	21628,274762	75778,473896	1600	19538,796268	76073,077547

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1601	21582,091977	75762,706107	1601	19538,504267	76023,078399
1602	21608,021182	75726,756128	1602	19538,212266	75973,079252
1603	21585,040727	75685,664920	1603	19536,641263	75923,106927
1604	21567,425407	75643,906990	1604	19534,836843	75873,139497
1605	21542,556124	75601,803574	1605	19534,520575	75823,140585
1606	21500,325393	75576,876318	1606	19534,210223	75773,141548
1607	21463,499307	75544,786204	1607	19533,899870	75723,142512
1608	21438,929700	75503,457412	1608	19532,065884	75673,220513
1609	21441,371114	75457,000176	1609	19527,331423	75623,445169
1610	21463,698528	75414,601996	1610	19522,596962	75573,669825
1611	21469,228641	75365,614295	1611	19517,930613	75523,890331
1612	21465,709467	75318,061223	1612	19516,587099	75473,908384
1613	21430,754503	75283,687866	1613	19515,243585	75423,926438
1614	21444,907901	75252,699099	1614	19512,919112	75373,998726
1615	21449,835810	75205,901680	1615	19508,744558	75324,173300
1616	21445,455741	75157,129324	1616	19504,570004	75274,347873
1617	21448,439327	75107,656906	1617	19500,700026	75224,506432
1618	21438,750908	75059,098238	1618	19499,626234	75174,517964
1619	21427,291155	75011,359756	1619	19498,552443	75124,529495
1620	21433,524212	74969,833265	1620	19497,304926	75074,546278
1621	21426,829867	74923,208467	1621	19495,357588	75024,584214
1622	21394,023731	74893,301679	1622	19493,410249	74974,622150
1623	21410,942515	74847,896775	1623	19491,462910	74924,660085
1624	21440,943669	74858,547675	1624	19490,043101	74874,681857
1625	21484,333510	74881,754217	1625	19488,927885	74824,694295
1626	21532,223722	74885,482399	1626	19487,812668	74774,706734
1627	21554,331549	74844,147768	1627	19491,147066	74724,846388
1628	21536,687614	74799,072969	1628	19495,116424	74675,004195
1629	21509,180216	74768,741497	1629	19499,085783	74625,162002
1630	21527,947088	74725,838881	1630	19498,950608	74575,174900
1631	21493,852910	74693,827149	1631	19498,506056	74525,176877
1632	21476,867097	74673,824139	1632	19498,061505	74475,178853
1633	21481,914043	74624,572659	1633	19500,532652	74425,308995
1634	21489,280873	74577,860835	1634	19505,362546	74375,542820
1635	21498,436440	74530,538916	1635	19510,192439	74325,776646
1636	21515,557068	74484,230711	1636	19516,266592	74276,156148
1637	21508,478789	74435,284426	1637	19523,062906	74226,620200
1638	21493,560832	74389,499581	1638	19529,859219	74177,084253
1639	21490,133914	74340,165920	1639	19536,655533	74127,548305
1640	21490,302095	74294,432474	1640	19541,503929	74077,789144
1641	21530,772274	74285,594622	1641	19546,808020	74028,087762
1642	21555,767880	74245,250092	1642	19554,359420	73978,661287
1643	21530,782719	74204,731309	1643	19561,910819	73929,234813
1644	21489,331614	74179,245868	1644	19569,462219	73879,808339
1645	21465,636387	74138,743412	1645	19576,939850	73830,370766
1646	21456,552885	74091,626089	1646	19584,265377	73780,910311

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1647	21471,625279	74046,138602	1647	19591,590903	73731,449855
1648	21466,452406	73998,566408	1648	19598,916430	73681,989400
1649	21457,504974	73951,164414	1649	19606,457398	73632,563831
1650	21455,033303	73912,152330	1650	19615,115145	73583,319101
1651	21468,218073	73873,515121	1651	19622,852092	73533,921805
1652	21489,734832	73830,771468	1652	19630,539576	73484,516313
1653	21516,492517	73790,688838	1653	19638,227061	73435,110822
1654	21561,167923	73780,737459	1654	19645,914546	73385,705331
1655	21603,924748	73757,270094	1655	19651,508672	73336,019404
1656	21644,297395	73734,492238	1656	19657,096008	73286,332568
1657	21688,646014	73715,595827	1657	19662,887864	73236,681778
1658	21691,305471	73668,682853	1658	19674,623999	73188,078660
1659	21647,985958	73650,862856	1659	19686,360134	73139,475541
1660	21602,118538	73664,332418	1660	19698,096269	73090,872423
1661	21557,463817	73682,294611	1661	19709,832405	73042,269304
1662	21534,852050	73670,846988	1662	19719,297345	72993,231005
1663	21537,905621	73621,630347	1663	19726,358420	72943,732104
1664	21546,495321	73572,982675	1664	19733,303150	72894,216833
1665	21557,953483	73525,239440	1665	19741,328474	72844,917041
1666	21558,521406	73476,762640	1666	19753,630369	72796,454030
1667	21565,033670	73428,530137	1667	19765,932265	72747,991020
1668	21551,948641	73388,200328	1668	19778,234160	72699,528010
1669	21564,580267	73341,179634	1669	19790,536056	72651,065000
1670	21549,382401	73295,335298	1670	19802,837951	72602,601989
1671	21509,951667	73266,875717	1671	19813,181842	72553,701686
1672	21461,812936	73261,368292	1672	19822,667494	72504,609707
1673	21463,696539	73216,323874	1673	19832,606744	72455,611432
1674	21465,097891	73167,333742	1674	19842,680484	72406,641375
1675	21473,681209	73118,616685	1675	19852,105124	72357,537646
1676	21501,635737	73094,861403	1676	19861,529764	72308,433917
1677	21529,455785	73054,915007	1677	19870,954404	72259,330189
1678	21537,316682	73007,341886	1678	19880,379044	72210,226460
1679	21571,296739	72983,913361	1679	19889,803684	72161,122732
1680	21576,403486	72937,218938	1680	19899,228324	72112,019003
1681	21535,404355	72914,333666	1681	19908,238231	72062,838092
1682	21508,918394	72894,309041	1682	19917,109226	72013,631330
1683	21515,712317	72845,830641	1683	19920,436294	71963,832316
1684	21511,329887	72796,560506	1684	19922,160280	71913,862046
1685	21508,297186	72748,106196	1685	19924,890934	71863,952620
1686	21491,523129	72701,580350	1686	19929,198003	71814,138474
1687	21487,048096	72653,322999	1687	19933,505071	71764,324328
1688	21491,116670	72605,903067	1688	19937,812139	71714,510181
1689	21530,364887	72577,488344	1689	19941,328548	71664,649667
1690	21532,025127	72530,677812	1690	19942,873733	71614,673548
1691	21495,127660	72506,670151	1691	19944,418918	71564,697430
1692	21511,544874	72460,001751	1692	19942,247098	71514,863477

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1693	21503,594865	72411,191558	1693	19936,889113	71465,151386
1694	21473,274112	72372,103857	1694	19931,531127	71415,439295
1695	21427,864265	72352,468451	1695	19927,790141	71365,580263
1696	21405,337153	72310,480924	1696	19924,099449	71315,716662
1697	21409,183166	72261,630338	1697	19920,408758	71265,853060
1698	21430,533098	72219,221472	1698	19916,718067	71215,989458
1699	21436,974553	72170,180490	1699	19912,335149	71166,186546
1700	21420,888563	72123,438054	1700	19907,292732	71116,441455
1701	21420,934007	72073,855150	1701	19902,179787	71066,703694
1702	21424,284207	72024,540123	1702	19896,886617	71016,984660
1703	21427,672133	71975,094588	1703	19891,632648	70967,261485
1704	21436,261508	71929,977246	1704	19886,421995	70917,533735
1705	21448,725617	71882,099022	1705	19881,211341	70867,805986
1706	21444,073293	71832,736955	1706	19876,000688	70818,078236
1707	21429,622943	71785,421611	1707	19870,790035	70768,350486
1708	21423,070925	71737,357203	1708	19865,579381	70718,622736
1709	21418,837760	71690,438837	1709	19860,359530	70668,895957
1710	21406,783612	71645,435500	1710	19855,151573	70619,171835
1711	21415,110165	71597,109098	1711	19855,713378	70569,174991
1712	21412,707027	71547,531446	1712	19852,128874	70519,304298
1713	21401,876090	71500,358022	1713	19848,528646	70469,434082
1714	21396,029564	71452,273715	1714	19844,928418	70419,563867
1715	21370,564115	71413,038573	1715	19841,328190	70369,693652
1716	21370,237509	71364,545386	1716	19837,727962	70319,823437
1717	21374,520982	71315,578999	1717	19834,127735	70269,953222
1718	21373,409412	71266,557023	1718	19830,527507	70220,083007
1719	21374,475184	71217,595919	1719	19826,927279	70170,212792
1720	21374,141848	71171,440375	1720	19830,924011	70120,383635
1721	21372,352155	71121,878582	1721	19835,721899	70070,614364
1722	21400,631106	71083,569111	1722	19840,519786	70020,845094
1723	21422,791787	71039,652928	1723	19845,317673	69971,075823
1724	21446,808390	70996,402772	1724	19850,115560	69921,306553
1725	21447,082403	70946,944407	1725	19854,913447	69871,537282
1726	21423,685776	70903,369604	1726	19859,711334	69821,768012
1727	21430,542316	70856,206692	1727	19864,509222	69771,998742
1728	21426,954761	70807,026919	1728	19869,691293	69722,268530
1729	21433,274196	70758,268448	1729	19865,650113	69673,294085
1730	21440,205663	70709,927710	1730	19854,708252	69624,578386
1731	21452,073641	70662,609919	1731	19846,913347	69575,189729
1732	21468,555570	70618,624092	1732	19839,118441	69525,801072
1733	21492,486573	70575,326199	1733	19831,323535	69476,412415
1734	21492,643307	70525,865245	1734	19823,528630	69427,023758
1735	21498,474770	70479,857178	1735	19815,733724	69377,635101
1736	21522,768421	70438,837131	1736	19807,938818	69328,246444
1737	21556,942221	70404,332579	1737	19799,785178	69278,916322
1738	21586,528259	70365,813537	1738	19788,193645	69230,607130

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1739	21613,008845	70324,044431	1739	19764,038064	69187,001287
1740	21616,194073	70274,676147	1740	19736,731280	69145,116450
1741	21623,642855	70230,624490	1741	19709,424496	69103,231614
1742	21635,037181	70182,480663	1742	19682,117712	69061,346777
1743	21621,806998	70134,811750	1743	19654,810928	69019,461941
1744	21635,346094	70090,825446	1744	19627,504143	68977,577104
1745	21644,759783	70054,325063	1745	19608,486231	68931,704210
1746	21685,778097	70030,672271	1746	19592,798824	68884,228899
1747	21678,161050	69984,338750	1747	19577,111416	68836,753587
1748	21631,823581	69969,424513	1748	19561,424008	68789,278275
1749	21623,186081	69932,218231	1749	19549,084741	68740,873063
1750	21629,102837	69885,098922	1750	19538,042606	68692,107591
1751	21608,367797	69847,542462	1751	19527,000472	68643,342119
1752	21639,296336	69811,167821	1752	19516,276195	68594,508794
1753	21676,451109	69781,324043	1753	19506,443233	68545,485199
1754	21726,418385	69783,132719	1754	19496,610272	68496,461604
1755	21776,378839	69782,877299	1755	19486,706333	68447,452825
1756	21825,667496	69774,848133	1756	19476,105569	68398,589508
1757	21872,945095	69758,747999	1757	19465,504805	68349,726190
1758	21916,888693	69735,005671	1758	19458,525709	68300,541485
1759	21956,256184	69704,269728	1759	19460,356286	68250,575006
1760	21989,983627	69667,439772	1760	19461,590471	68200,635085
1761	22021,394006	69628,686813	1761	19455,325899	68151,029086
1762	22061,150337	69598,527027	1762	19449,061327	68101,423087
1763	22096,698356	69563,445396	1763	19442,796755	68051,817088
1764	22126,818718	69523,592892	1764	19436,532183	68002,211089
1765	22158,329486	69485,321078	1765	19430,267611	67952,605090
1766	22199,286557	69457,226327	1766	19428,768830	67902,823662
1767	22244,377483	69435,815740	1767	19431,199973	67852,893894
1768	22286,902031	69409,626752	1768	19427,093496	67803,062811
1769	22324,737381	69377,034111	1769	19411,913335	67756,575345
1770	22356,667858	69338,631387	1770	19387,755615	67712,798586
1771	22386,518662	69298,579158	1771	19363,597896	67669,021828
1772	22420,687260	69263,926507	1772	19332,141851	67630,995276
1773	22458,498015	69231,308990	1773	19295,233134	67597,264775
1774	22492,307350	69194,494320	1774	19258,324418	67563,534275
1775	22522,878456	69154,957649	1775	19221,415701	67529,803775
1776	22554,993461	69118,037366	1776	19174,163875	67513,843539
1777	22599,167111	69094,729294	1777	19126,605354	67498,410228
1778	22638,865241	69064,428892	1778	19079,046833	67482,976917
1779	22672,973519	69027,957157	1779	19031,488312	67467,543606
1780	22700,592637	68986,357717	1780	18983,929791	67452,110294
1781	22720,952512	68940,759081	1781	18937,128461	67434,878533
1782	22751,329349	68903,810651	1782	18893,106997	67411,275179
1783	22787,148627	68868,968251	1783	18867,041920	67371,355938
1784	22819,543548	68830,912405	1784	18858,541148	67322,153845

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1785	22846,563029	68788,917991	1785	18851,963406	67272,588400
1786	22866,276622	68743,041035	1786	18845,385664	67223,022956
1787	22878,369786	68694,598628	1787	18838,807922	67173,457511
1788	22895,207057	68647,565158	1788	18832,230180	67123,892066
1789	22904,173464	68598,429058	1789	18825,652438	67074,326622
1790	22919,361312	68551,197496	1790	18819,074696	67024,761177
1791	22934,700826	68503,823843	1791	18804,547447	66977,041738
1792	22953,288075	68457,445857	1792	18791,062234	66929,907894
1793	22964,497960	68408,787255	1793	18816,519034	66886,873590
1794	22967,575406	68358,941405	1794	18839,263976	66842,495632
1795	22962,603042	68309,244740	1795	18858,081709	66796,171849
1796	22988,961174	68267,204681	1796	18876,899441	66749,848065
1797	23009,125800	68221,521288	1797	18895,717174	66703,524281
1798	23021,421006	68173,117680	1798	18927,970704	66666,788872
1799	23025,542846	68123,341965	1799	18965,659528	66633,932328
1800	23021,425370	68073,565373	1800	19003,348353	66601,075783
1801	23009,124073	68025,163263	1801	19032,916680	66561,520343
1802	22996,625800	67977,596607	1802	19058,009102	66518,272565
1803	22999,558337	67927,694331	1803	19083,101525	66475,024786
1804	23035,856031	67918,176889	1804	19123,878445	66446,846629
1805	23085,831773	67917,527021	1805	19166,088701	66420,045615
1806	23135,425269	67911,622314	1806	19208,298957	66393,244602
1807	23183,345572	67897,572485	1807	19250,500464	66366,430468
1808	23228,278369	67875,792465	1808	19291,472890	66337,772828
1809	23269,001438	67846,892671	1809	19332,445315	66309,115187
1810	23304,360132	67811,624824	1810	19370,082781	66276,593993
1811	23333,390963	67770,982549	1811	19404,418052	66240,247202
1812	23355,225278	67726,060703	1812	19438,753322	66203,900411
1813	23369,198598	67678,108214	1813	19473,088592	66167,553620
1814	23375,209176	67628,532592	1814	19508,649597	66132,445595
1815	23372,992118	67578,646883	1815	19545,357434	66098,496593
1816	23362,585220	67529,806520	1816	19582,065270	66064,547591
1817	23344,206035	67483,369395	1817	19618,773107	66030,598590
1818	23318,380016	67440,617568	1818	19651,266861	65993,185413
1819	23285,768695	67402,786995	1819	19677,471830	65950,602557
1820	23270,848754	67357,501465	1820	19703,676798	65908,019700
1821	23257,125377	67309,478452	1821	19726,024119	65863,293778
1822	23259,662742	67264,539556	1822	19748,333983	65818,547046
1823	23291,891934	67226,389482	1823	19770,643846	65773,800315
1824	23321,552462	67187,645436	1824	19792,953710	65729,053583
1825	23368,027433	67169,586546	1825	19816,047059	65684,715530
1826	23413,153978	67148,208840	1826	19839,977495	65640,814115
1827	23454,972793	67120,857781	1827	19865,902591	65598,364256
1828	23499,183944	67097,713617	1828	19900,316368	65562,091787
1829	23539,486943	67068,234728	1829	19914,491192	65517,018367
1830	23574,373606	67032,507013	1830	19917,552396	65467,112164

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1831	23602,842100	66991,475509	1831	19918,568381	65417,226158
1832	23624,122153	66946,290154	1832	19914,522273	65367,390136
1833	23637,559447	66898,184484	1833	19910,476164	65317,554115
1834	23642,841535	66848,520644	1834	19906,430055	65267,718094
1835	23661,463727	66802,754895	1835	19902,383946	65217,882073
1836	23692,784618	66790,756372	1836	19901,247197	65168,050152
1837	23737,028118	66814,048273	1837	19905,433757	65118,225733
1838	23781,271619	66837,340174	1838	19905,444005	65068,489241
1839	23825,515119	66860,632075	1839	19899,164115	65018,885179
1840	23869,758620	66883,923976	1840	19895,721869	64969,081637
1841	23915,883962	66903,067575	1841	19895,000205	64919,086845
1842	23965,208890	66910,217257	1842	19894,278541	64869,092054
1843	24014,929292	66906,355830	1843	19893,556877	64819,097262
1844	24063,400279	66894,089535	1844	19892,835213	64769,102470
1845	24111,621079	66880,901154	1845	19892,113549	64719,107678
1846	24159,153285	66865,507775	1846	19887,159658	64669,361597
1847	24201,501487	66841,292958	1847	19881,474728	64619,702501
1848	24231,148003	66806,219152	1848	19872,814483	64570,458210
1849	24280,850964	66811,439070	1849	19861,894074	64521,681374
1850	24303,125481	66845,841884	1850	19850,309678	64473,041866
1851	24340,020691	66863,243410	1851	19838,725281	64424,402357
1852	24388,580374	66857,466827	1852	19827,140885	64375,762849
1853	24435,773195	66853,258850	1853	19815,556488	64327,123341
1854	24475,320889	66833,005000	1854	19804,011090	64278,477221
1855	24470,210778	66783,266818	1855	19798,916957	64228,737400
1856	24465,100667	66733,528636	1856	19793,822823	64178,997579
1857	24455,815236	66684,931407	1857	19805,704796	64131,651891
1858	24451,123048	66637,190775	1858	19841,674955	64096,922255
1859	24450,252505	66587,508628	1859	19877,645114	64062,192618
1860	24465,052368	66553,297685	1860	19913,615273	64027,462982
1861	24515,011322	66552,413803	1861	19949,585432	63992,733345
1862	24564,115917	66544,181243	1862	19985,555591	63958,003709
1863	24612,182166	66531,501237	1863	20021,887263	63923,734882
1864	24655,654234	66546,892343	1864	20064,180777	63897,065448
1865	24697,704580	66520,253430	1865	20105,642247	63869,132189
1866	24697,297379	66477,022050	1866	20146,856777	63840,823843
1867	24739,112855	66458,617006	1867	20188,071308	63812,515496
1868	24784,545464	66437,800690	1868	20229,285839	63784,207150
1869	24826,355066	66410,475573	1869	20271,056177	63756,759863
1870	24863,051076	66376,599031	1870	20315,300323	63733,705193
1871	24893,605074	66337,100259	1871	20361,114313	63713,678253
1872	24917,207371	66293,097472	1872	20400,653103	63684,549216
1873	24933,491561	66245,878605	1873	20435,664486	63648,853236
1874	24941,948369	66196,655076	1874	20470,675870	63613,157255
1875	24944,112153	66146,735752	1875	20505,687253	63577,461274
1876	24939,358162	66097,002768	1876	20540,698636	63541,765294

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1877	24936,040663	66047,841217	1877	20568,589654	63500,371794
1878	24956,761418	66002,592814	1878	20595,738396	63458,384346
1879	24972,933859	65955,346735	1879	20622,887138	63416,396898
1880	24981,035119	65906,065316	1880	20650,035880	63374,409449
1881	24981,245937	65856,107134	1881	20677,184622	63332,422001
1882	24973,543891	65806,765450	1882	20704,333364	63290,434553
1883	24958,337293	65759,175234	1883	20736,459834	63252,852536
1884	24938,610125	65713,273530	1884	20717,162081	63227,147568
1885	24913,689243	65669,965886	1885	20683,268098	63190,516124
1886	24961,281503	65666,840222	1886	20649,736809	63153,426332
1887	25010,862961	65660,930204	1887	20616,205521	63116,336540
1888	25060,771388	65657,905489	1888	20582,674232	63079,246748
1889	25066,657716	65614,925082	1889	20549,142943	63042,156955
1890	25064,846214	65564,957908	1890	20515,611655	63005,067163
1891	25063,034712	65514,990734	1891	20489,410340	62963,015729
1892	25061,223209	65465,023560	1892	20467,434873	62918,103828
1893	25031,902741	65445,922880	1893	20445,459406	62873,191927
1894	24983,081871	65456,717443	1894	20423,483939	62828,280026
1895	24934,248680	65467,452035	1895	20401,516508	62783,370482
1896	24885,107850	65476,673203	1896	20444,272020	62757,448171
1897	24835,728842	65484,529005	1897	20487,027532	62731,525861
1898	24830,302018	65436,832835	1898	20529,783044	62705,603550
1899	24827,900752	65387,036908	1899	20572,538556	62679,681239
1900	24828,303970	65337,038534	1900	20616,490819	62655,970470
1901	24792,000753	65321,206386	1901	20661,578297	62634,357528
1902	24806,511903	65281,378583	1902	20706,665776	62612,744585
1903	24831,081155	65237,910363	1903	20756,592755	62612,975417
1904	24848,006803	65190,921617	1904	20806,589764	62613,522336
1905	24856,873295	65141,767401	1905	20856,586773	62614,069254
1906	24857,501341	65091,824590	1906	20906,528710	62616,206433
1907	24849,923906	65042,464600	1907	20956,443776	62619,119530
1908	24842,136514	64993,680586	1908	21006,367772	62621,778850
1909	24844,900569	64944,320273	1909	21056,364144	62622,381185
1910	24851,984277	64894,888685	1910	21106,360516	62622,983520
1911	24894,198255	64886,077483	1911	21156,356887	62623,585855
1912	24944,181543	64884,784828	1912	21206,026417	62629,191422
1913	24994,158265	64883,263974	1913	21255,676244	62635,098592
1914	25044,133203	64881,681048	1914	21305,265260	62641,404459
1915	25094,108140	64880,098122	1915	21354,418479	62650,567483
1916	25144,088605	64878,797329	1916	21403,571698	62659,730508
1917	25194,087192	64878,421404	1917	21452,724918	62668,893532
1918	25243,985449	64877,100437	1918	21501,878137	62678,056557
1919	25292,994163	64867,211496	1919	21551,372399	62685,089228
1920	25342,314115	64859,042626	1920	21600,929640	62691,728491
1921	25391,090048	64848,891185	1921	21650,811636	62694,559016
1922	25440,910883	64846,350732	1922	21700,759024	62696,681060

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1923	25490,881557	64845,107126	1923	21750,523050	62701,533047
1924	25540,801044	64842,407023	1924	21800,287075	62706,385034
1925	25587,622037	64836,239046	1925	21850,051101	62711,237021
1926	25595,592796	64786,878561	1926	21899,815126	62716,089008
1927	25597,807973	64737,410317	1927	21949,579151	62720,940995
1928	25583,011639	64689,704868	1928	21999,343177	62725,792982
1929	25585,421779	64640,510748	1929	22049,267503	62728,337293
1930	25610,118781	64597,541301	1930	22099,176300	62726,509930
1931	25630,380730	64553,319049	1931	22148,767238	62720,533644
1932	25620,307466	64504,479349	1932	22198,149679	62712,699452
1933	25611,687343	64455,661655	1933	22247,532119	62704,865259
1934	25600,553474	64406,917045	1934	22296,914560	62697,031066
1935	25589,419604	64358,172436	1935	22346,297000	62689,196874
1936	25578,285735	64309,427827	1936	22395,679441	62681,362681
1937	25567,151866	64260,683217	1937	22445,417795	62676,875588
1938	25556,170983	64211,909848	1938	22495,343444	62674,149864
1939	25549,119930	64162,442170	1939	22544,708908	62667,042464
1940	25512,244456	64135,274229	1940	22593,714488	62657,120112
1941	25465,285236	64118,772435	1941	22642,720069	62647,197760
1942	25418,624247	64105,531653	1942	22690,934006	62634,016920
1943	25381,757252	64073,113448	1943	22739,029540	62620,348723
1944	25338,391645	64085,948824	1944	22787,125074	62606,680526
1945	25315,098998	64041,706235	1945	22836,313380	62597,887149
1946	25293,117302	63996,797383	1946	22885,641229	62589,716264
1947	25271,135607	63951,888530	1947	22934,969077	62581,545378
1948	25249,153911	63906,979677	1948	22982,815543	62568,648552
1949	25267,498514	63868,399614	1949	23027,981307	62547,199688
1950	25296,699021	63827,877531	1950	23073,147071	62525,750824
1951	25318,905610	63783,132569	1951	23118,312835	62504,301960
1952	25342,912309	63743,557829	1952	23165,171205	62487,325507
1953	25390,328133	63727,701456	1953	23213,220769	62473,496576
1954	25437,940736	63712,496388	1954	23261,270334	62459,667645
1955	25479,444938	63719,860257	1955	23308,909514	62444,587734
1956	25528,208034	63716,046084	1956	23355,813616	62427,267075
1957	25576,343550	63710,524670	1957	23402,717718	62409,946415
1958	25626,041055	63705,461711	1958	23447,431122	62387,884094
1959	25619,355585	63658,312826	1959	23492,762388	62367,283812
1960	25609,690434	63609,256328	1960	23540,077593	62351,119920
1961	25650,423341	63599,766625	1961	23587,392798	62334,956027
1962	25682,167648	63578,180240	1962	23633,830106	62316,943197
1963	25678,076920	63528,347862	1963	23676,261837	62290,494225
1964	25673,986192	63478,515483	1964	23718,693569	62264,045252
1965	25677,167992	63438,407494	1965	23761,125301	62237,596280
1966	25726,466394	63442,706149	1966	23806,125920	62216,303051
1967	25756,082382	63471,850443	1967	23852,794385	62198,357176
1968	25795,595497	63501,013501	1968	23900,314962	62182,948285

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
1969	25838,129498	63524,572858	1969	23948,354356	62169,084064
1970	25880,789315	63548,389397	1970	23996,393749	62155,219843
1971	25924,920413	63568,709588	1971	24044,433143	62141,355622
1972	25972,342613	63561,208352	1972	24091,514928	62124,548619
1973	26005,575376	63525,474824	1973	24139,198435	62109,783801
1974	26028,620519	63504,960033	1974	24187,868966	62098,330441
1975	26076,564412	63498,850077	1975	24236,539496	62086,877081
1976	26115,526801	63471,932871	1976	24285,210027	62075,423721
1977	26160,377506	63474,703963	1977	24333,951016	62064,289414
1978	26206,631441	63460,788287	1978	24382,918501	62054,180734
1979	26254,304938	63449,119174	1979	24431,885986	62044,072056
1980	26293,620698	63438,642611	1980	24480,853472	62033,963377
1981	26288,901783	63467,041510	1981	24530,622447	62030,427245
1982	26317,542426	63450,879443	1982	24580,584202	62028,471984
1983	26330,139224	63441,490858	1983	24630,322389	62024,227836
1984	26343,382461	63471,131319	1984	24679,718184	62016,478296
1985	26362,974320	63455,921271	1985	24729,113980	62008,728757
1986	26368,384816	63453,395604	1986	24778,497519	62000,905266
1987	26334,499504	63441,057418	1987	24827,752151	61992,304032
1988	26300,613886	63428,719241	1988	24877,006783	61983,702799
1989	26341,865722	63406,122301	1989	24926,404646	61975,990095
1990	26386,370630	63425,139139	1990	24975,867106	61968,678110
1991	26393,035261	63471,604080	1991	25025,329565	61961,366125
1992	26424,748159	63507,504923	1992	25074,792024	61954,054139
1993	26466,748790	63530,921952	1993	25124,254483	61946,742154
1994	26510,950447	63550,550973	1994	25173,631362	61938,886379
1995	26559,019737	63559,262269	1995	25222,948744	61930,652557
1996	26604,714335	63543,843726	1996	25272,174473	61921,888556
1997	26653,086716	63549,501112	1997	25321,255103	61912,353790
1998	26687,510405	63515,906842	1998	25370,291003	61902,582376
1999	26721,068988	63503,829100	1999	25419,326903	61892,810962
2000	26768,782659	63495,864400	2000	25468,362803	61883,039548
2001	26804,187465	63463,103301	2001	25517,398702	61873,268134
2002	26834,596901	63424,535737	2002	25566,434602	61863,496720
2003	26851,667996	63378,757520	2003	25614,172874	61848,992819
2004	26865,525012	63332,211822	2004	25661,334856	61832,387175
2005	26905,044000	63307,171750	2005	25703,454538	61805,688317
2006	26952,259242	63296,553665	2006	25745,055191	61777,950515
2007	26998,952930	63285,708697	2007	25786,584697	61750,112885
2008	27024,953729	63245,497911	2008	25826,379134	61719,840740
2009	27015,619612	63196,937742	2009	25866,173572	61689,568595
2010	27035,491269	63184,461879	2010	25905,968009	61659,296450
2011	27053,376522	63230,056274	2011	25949,051097	61634,418100
2012	27089,768379	63261,502662	2012	25994,187331	61612,907164
2013	27106,330991	63306,929246	2013	26039,323565	61591,396228
2014	27152,328509	63320,621508	2014	26084,459799	61569,885292

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INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
2015	27195,623836	63338,556208	2015	26129,596033	61548,374356
2016	27243,643548	63347,518881	2016	26173,057400	61523,655395
2017	27273,399766	63384,201772	2017	26216,508200	61498,916197
2018	27315,762871	63406,988399	2018	26264,608381	61486,543619
2019	27360,771704	63425,790443	2019	26313,595338	61476,529723
2020	27400,924687	63453,437458	2020	26362,582294	61466,515828
2021	27448,286544	63463,663037	2021	26411,569251	61456,501932
2022	27486,518679	63489,619291	2022	26460,556207	61446,488037
2023	27533,542505	63505,483375	2023	26509,543163	61436,474141
2024	27580,158305	63518,389553	2024	26558,420179	61426,038073
2025	27607,359248	63559,723263	2025	26606,739184	61413,873678
2026	27648,498200	63586,908239	2026	26656,294985	61407,223669
2027	27696,001077	63598,631093	2027	26705,850785	61400,573661
2028	27745,674315	63597,639835	2028	26753,216232	61385,088722
2029	27795,148910	63596,858964	2029	26800,139368	61367,819693
2030	27841,393380	63581,816463	2030	26847,062503	61350,550665
2031	27890,124455	63583,787072	2031	26893,985639	61333,281637
2032	27939,398639	63578,869462	2032	26940,908774	61316,012608
2033	27985,941813	63565,623976	2033	26987,438875	61297,717818
2034	28032,118857	63547,532767	2034	27033,879517	61279,192563
2035	28075,821303	63524,280162	2035	27078,585050	61256,800258
2036	28120,334739	63503,651081	2036	27123,290583	61234,407954
2037	28160,428947	63474,886516	2037	27167,996116	61212,015649
2038	28201,890604	63447,846576	2038	27212,701650	61189,623345
2039	28241,961188	63418,475150	2039	27257,407183	61167,231040
2040	28274,345619	63382,408344	2040	27300,883136	61142,551577
2041	28315,994232	63358,321495	2041	27344,219478	61117,612423
2042	28350,237170	63322,707810	2042	27387,555821	61092,673269
2043	28389,610355	63293,035780	2043	27430,892164	61067,734115
2044	28426,394359	63260,445274	2044	27474,228507	61042,794961
2045	28459,854935	63224,439321	2045	27511,848436	61010,343262
2046	28488,297135	63184,555339	2046	27550,589819	60979,509443
2047	28536,114250	63179,539026	2047	27594,720959	60956,005348
2048	28560,843073	63138,324272	2048	27639,041408	60932,871160
2049	28569,479909	63092,176643	2049	27683,917836	60910,823344
2050	28594,141971	63054,242596	2050	27728,794264	60888,775528
2051	28634,354523	63025,795695	2051	27773,670693	60866,727712
2052	28670,538488	62992,205277	2052	27818,547121	60844,679895
2053	28707,678127	62959,867615	2053	27865,418203	60827,905647
2054	28737,941637	62920,910044	2054	27913,652527	60814,735607
2055	28766,475404	62880,486317	2055	27960,818134	60798,460786
2056	28805,139989	62851,719259	2056	28006,939414	60779,152043
2057	28846,741759	62831,483424	2057	28053,060693	60759,843300
2058	28888,477350	62805,642833	2058	28099,181973	60740,534557
2059	28932,934134	62787,344638	2059	28145,303253	60721,225814
2060	28977,810294	62766,602740	2060	28192,741397	60705,655502

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
2061	29016,265162	62736,481845	2061	28240,782053	60691,795655
2062	29060,283509	62738,189060	2062	28288,822709	60677,935808
2063	29106,663898	62721,562432	2063	28336,863365	60664,075960
2064	29154,979838	62711,595554	2064	28384,904021	60650,216113
2065	29203,331472	62699,706627	2065	28433,182920	60637,213577
2066	29251,828148	62689,631409	2066	28481,486475	60624,299762
2067	29297,750555	62675,291150	2067	28529,819026	60611,497862
2068	29343,397837	62691,403094	2068	28578,316113	60599,330997
2069	29372,308454	62706,665873	2069	28626,813199	60587,164131
2070	29362,874042	62754,207942	2070	28675,310285	60574,997266
2071	29368,442885	62802,426778	2071	28723,807372	60562,830401
2072	29389,790343	62846,869985	2072	28772,296215	60550,631299
2073	29432,311539	62869,680937	2073	28820,680951	60538,025056
2074	29475,561849	62848,914851	2074	28869,318325	60526,469248
2075	29498,922943	62825,883811	2075	28917,587053	60513,524055
2076	29543,576997	62843,400715	2076	28965,573074	60499,476214
2077	29583,467251	62816,797164	2077	29013,559095	60485,428374
2078	29632,630722	62810,028791	2078	29057,055036	60463,168023
2079	29674,953423	62829,537046	2079	29094,780916	60430,354033
2080	29723,745514	62826,515287	2080	29132,506796	60397,540042
2081	29772,716527	62821,267096	2081	29170,232676	60364,726052
2082	29821,888211	62815,112555	2082	29206,836135	60330,673410
2083	29870,927034	62816,069875	2083	29243,196825	60296,352859
2084	29915,377751	62834,586599	2084	29279,557515	60262,032308
2085	29964,291671	62825,464015	2085	29313,238093	60225,189100
2086	30005,404658	62799,432776	2086	29345,297025	60186,819517
2087	30046,709158	62773,233000	2087	29377,355958	60148,449935
2088	30089,713778	62750,094943	2088	29410,615453	60111,181902
2089	30131,868169	62737,839725	2089	29446,090751	60075,946931
2090	30179,610376	62725,738191	2090	29481,566050	60040,711960
2091	30221,602514	62700,837801	2091	29516,828867	60005,267070
2092	30270,141641	62694,485623	2092	29551,630812	59969,366867
2093	30313,354834	62670,786015	2093	29586,432757	59933,466663
2094	30343,579004	62632,619317	2094	29621,234702	59897,566459
2095	30388,554910	62612,844634	2095	29658,214012	59863,930360
2096	30437,460402	62608,431213	2096	29695,445661	59830,556654
2097	30485,436302	62598,407292	2097	29732,677311	59797,182948
2098	30533,127584	62593,396428	2098	29764,824826	59759,201025
2099	30581,733284	62583,838174	2099	29794,390451	59718,878900
2100	30629,681889	62571,585629	2100	29823,956076	59678,556774
2101	30677,080361	62558,591235	2101	29857,377453	59641,963493
2102	30724,292881	62543,872263	2102	29896,687886	59611,065438
2103	30759,562527	62552,519995	2103	29935,998320	59580,167382
2104	30803,586491	62575,056068	2104	29974,683462	59548,545279
2105	30853,032153	62573,811393	2105	30010,975798	59514,152454
2106	30895,792689	62548,932881	2106	30047,268133	59479,759630

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
2107	30928,457813	62516,820142	2107	30083,560468	59445,366805
2108	30950,388553	62559,592728	2108	30123,464711	59415,283970
2109	30997,805051	62566,718220	2109	30163,674437	59385,565661
2110	31037,492237	62537,450233	2110	30203,663151	59355,561493
2111	31077,370038	62508,361322	2111	30242,546987	59324,128274
2112	31113,855911	62476,209266	2112	30281,430824	59292,695055
2113	31159,387724	62486,012456	2113	30320,314660	59261,261835
2114	31208,583862	62486,469078	2114	30361,140356	59232,676246
2115	31253,657804	62470,143745	2115	30404,602092	59207,956264
2116	31286,469148	62433,120781	2116	30448,063827	59183,236281
2117	31324,723494	62404,051139	2117	30491,525563	59158,516299
2118	31367,212933	62426,698767	2118	30534,987299	59133,796317
2119	31405,079799	62455,349254	2119	30578,449035	59109,076335
2120	31453,038093	62454,674763	2120	30619,839153	59081,353260
2121	31496,579729	62431,889525	2121	30656,402437	59047,372241
2122	31545,015260	62430,117119	2122	30690,996670	59011,271839
2123	31594,304030	62423,097645	2123	30725,590904	58975,171437
2124	31643,359832	62419,116289	2124	30760,185138	58939,071035
2125	31689,490393	62402,038575	2125	30794,779371	58902,970634
2126	31722,443127	62370,083423	2126	30829,373605	58866,870232
2127	31770,131478	62357,718882	2127	30867,284359	58835,393091
2128	31817,928656	62344,856082	2128	30912,567453	58814,193058
2129	31853,548667	62313,745336	2129	30956,699227	58790,809588
2130	31891,786352	62284,650334	2130	30999,772844	58765,419363
2131	31934,605707	62261,675201	2131	31042,846461	58740,029139
2132	31972,423987	62230,881659	2132	31085,920078	58714,638914
2133	32002,309136	62192,856218	2133	31121,260115	58680,356880
2134	32039,954230	62170,339452	2134	31155,992546	58644,586026
2135	32087,605315	62164,743153	2135	31191,286807	58609,200931
2136	32127,392548	62136,581607	2136	31225,872893	58573,092724
2137	32169,303461	62110,405238	2137	31260,458980	58536,984517
2138	32209,559304	62081,827969	2138	31295,045066	58500,876310
2139	32230,619190	62038,826499	2139	31329,631153	58464,768102
2140	32206,524743	61997,420860	2140	31365,821727	58430,738763
2141	32166,397193	61969,649620	2141	31409,514965	58406,430309
2142	32208,696875	61947,334788	2142	31453,208203	58382,121854
2143	32246,659835	61914,966458	2143	31496,901441	58357,813400
2144	32278,212183	61876,228986	2144	31540,594679	58333,504946
2145	32303,275876	61833,113139	2145	31583,359300	58307,623582
2146	32326,658746	61789,369124	2146	31625,750322	58281,109412
2147	32354,753692	61748,146861	2147	31671,201810	58261,688780
2148	32372,581170	61701,580938	2148	31719,576164	58249,042759
2149	32387,693845	61654,126734	2149	31767,950519	58236,396739
2150	32402,901736	61606,565193	2150	31816,324873	58223,750719
2151	32409,097709	61557,081637	2151	31864,699228	58211,104698
2152	32413,960939	61508,051233	2152	31913,073582	58198,458678

COORDINATE SYSTEM:	Barbados_1938_Barbados_Grid
WKID:	21292

INLAND BOUNDARY			OFFSHORE BOUNDARY		
Nº	LON (º)	LAT (º)	Nº	LON (º)	LAT (º)
2153	32442,355016	61467,573764	2153	31961,447937	58185,812658
2154	32479,181299	61433,786626	2154	32009,839013	58173,233484
2155	32509,457904	61394,088058	2155	32058,470040	58161,613534
2156	32536,224197	61351,910027	2156	32107,101066	58149,993585
2157	32553,080163	61304,988022	2157	32155,732093	58138,373635
2158	32557,828228	61255,362359	2158	32204,363120	58126,753685
2159	32550,175737	61206,098819	2159	32252,994147	58115,133736
2160	32530,592684	61160,241213	2160	32301,625174	58103,513786
2161	32500,229057	61120,678693	2161	32350,256201	58091,893836
2162	32518,880755	61079,227890	2162	32398,859974	58080,160894
2163	32534,462245	61031,961771	2163	32447,441130	58068,334174
2164	32547,863013	60985,076956	2164	32494,166146	58050,789355
2165	32548,886369	60936,537894	2165	32540,431403	58031,828183
2166	32545,010420	60887,973271	2166	32586,696660	58012,867012
2167	32533,852685	60839,528241	2167	32632,961350	57993,904470
2168	32526,188652	60790,285785	2168	32679,117978	57974,680379
2169	32507,474900	60745,055809	2169	32725,390145	57955,739013
2170	32520,821593	60698,181375	2170	32771,800151	57937,134947
2171	32551,340593	60660,102386	2171	32818,210158	57918,530880
2172	32587,100794	60626,422299			
2173	32620,709040	60591,303451			
2174	32666,021112	60595,688526			
2175	32714,900751	60588,112681			
2176	32754,209911	60558,101769			
2177	32774,300047	60512,893796			
2178	32813,128695	60485,537510			
2179	32850,096265	60452,803063			
2180	32892,440211	60429,718044			
2181	32937,975073	60411,358224			
2182	32978,996918	60412,158712			
2183	33018,751184	60439,194066			
2184	33040,181652	60483,769045			
2185	33080,407326	60512,566061			

ANNEX 2. BASELINE STUDIES AND RISK ASSESSMENTS DEVELOPED BY THE CZMU

REPORT	CONTENTS
Circulation Water Quality & Sedimentation Study. Phase 1 Report	A review of previous works completed concerning water quality, terrestrial loads, and circulation in Holetown, Bridgetown and Conset Bay
Circulation Water Quality and Sedimentation Study. Phase 3. Model Calibration, Verification and Clean-up Scenarios	Model calibration/validation and potential clean-up scenarios to reduce contaminant loadings to the receiving coastal waters
Circulation Water Quality and Sedimentation Study. Phase 4. Summary Report	Summary of the work completed during the CWQS study, including data assembly and review, field monitoring programs, groundwater assessment, numerical modelling activities, and the assessment of clean-up scenarios
CRMP Ecosystem-Based Adaptation Pilot Project. Water Quality and Reef Information Report	Summary of the initial findings from the first campaign for the EBA and analysis of the results and the historical quality measurements
Ecosystem-Based Adaptation Pilot Project. Phase 1. Report	Summary of the technical studies completed during the first year of the EBA pilot project, which analyses the feasibility of reef restoration as an NbS to mitigate the impacts of Climate Change
Ecosystem-Based Adaptation Pilot Project. Coral Nursery – Final Report	Description of the Coral Nursery Pilot project carried out within the EBA project
Geotechnical surveys Investigation. Field Study Report	Results of the data collection and field investigations completed in this part of the CRMP study, which include: geological maps, cliff undercut surveys, downhole camera and optical televiewer surveys, instrumentation installation and monitoring records, and laboratory testing results.
Geotechnical surveys Investigation. Assessment Report	Results of the data interpretation, analysis and geotechnical modelling carried out to assess the stability of the slopes and cliffs within the coastal zone
CRMP Nearshore Wave Study. Phase 1. Report	Review of previously recorded wave data and past hindcasts in the vicinity of the Barbados coastline
CRMP Nearshore Wave Study. Phase 3a. Report	Review of past data, collection of new data, and development of a long-term data collection program as well as the development of a numerical model to produce wave climates for different locations around the island
CRMP Nearshore Wave Study. Phase 3b. Report	
CRMP Shoreline Change Study. Phase 1. Data Preparation Progress Memorandum	Summary of the ongoing data preparation for the shoreline change analysis, including the sources of historical imagery, steps involved in generating ortho-photographs for the coast of Barbados
CRMP Shoreline Change Study. Phase 2. Report on Expansion and Improvements to the Beach Profile Monitoring Program	A review of the existing beach monitoring program and new recommendations for future improvements

REPORT	CONTENTS
CRMP Shoreline Change Study. Phase 3. Report on the QA/QC Process	Analysis of the shoreline changes for different time periods of historic aerial imagery, classification of the coastal zones based on shoreline trends and providing information for decisions about future monitoring
RMP Shoreline Change Study. Phase 4. Report on Training	Final recommendations on coastal monitoring
Sediment Transport Study. Final Report	Literature review about the sediment budget along the Barbados coastline, Data about sediment samples from beaches around Barbados and results of an encapsulated sediment budget model that formulates the balance between supply and loss of sediment for individual beaches under different SLR scenarios
Update of the System of Indicators of Disaster Risk and Risk Management to Barbados	Results for Barbados for the indicators DDI (Disaster Deficit Index), LDI (Local Disaster Index), PVI (Prevalent Vulnerability Index) and RMI (Risk Management Index)
National Hazard Mapping Risk Atlas	Maps to illustrate the areas that are exposed to the different hazards identified in Barbados, at specific return period levels
National Coastal Risk Information and Planning Platform. Final Hazard Report	Development of hazard data (wind, earthquakes, landslides, storm surge, coastal erosion, flooding due to rainfall, tsunami and oil spills) for Barbados
National Coastal Risk Information and Planning Platform. Final Vulnerability Report	Analysis of the exposure and susceptibility of socioeconomic and environmental items to the identified hazards in Barbados
National Coastal Risk Information and Planning Platform. Revised Revised Draft Risk Report	Calculating financial damage (referred to as risk) resulting from the assessed hazards in previous reports. Risk is computed for multiple hazards at various return periods for a range of assets

Table Annex 2.1. Baselines studies and risk assessments developed by the CZMU during last years.

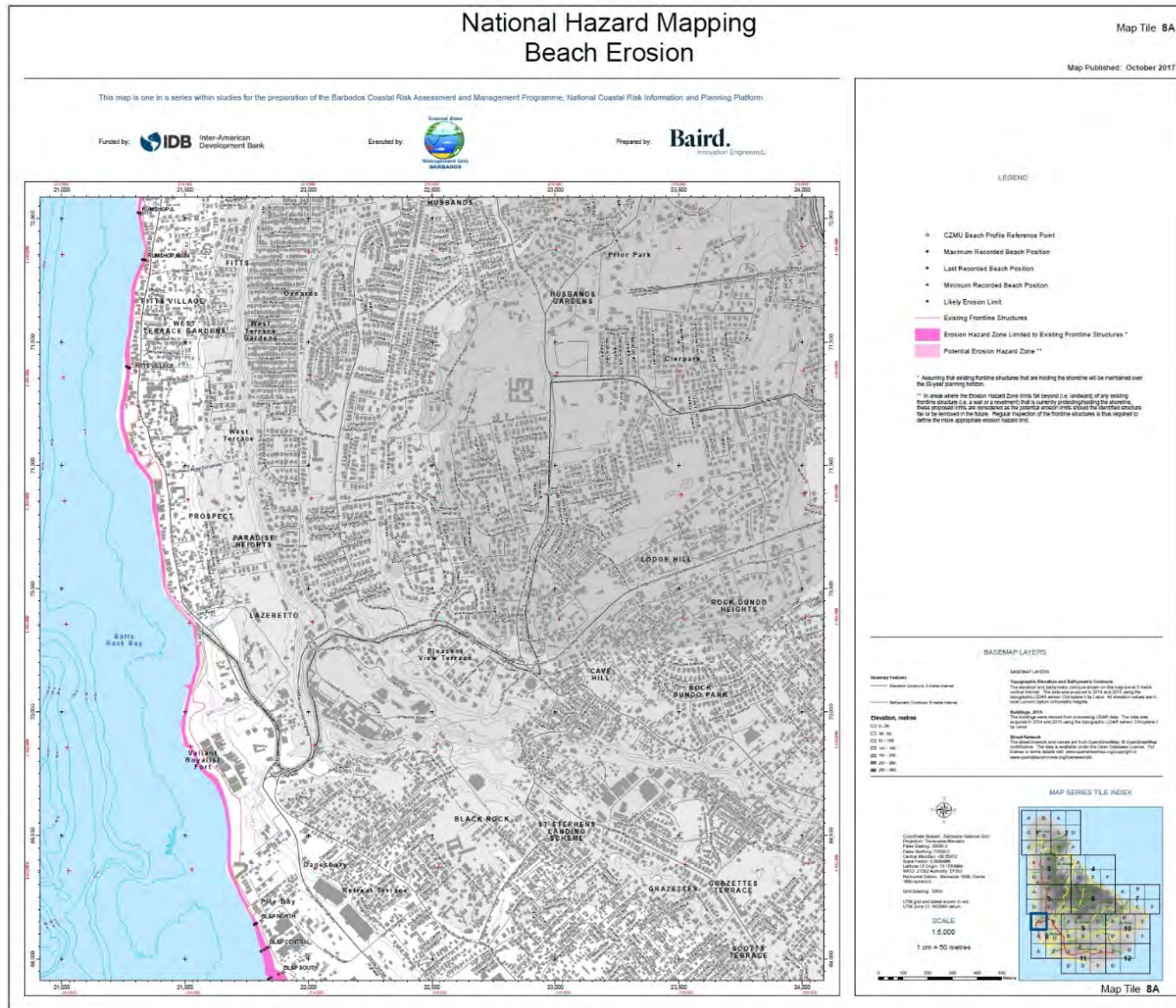
ANNEX 3. CLIMATE CHANGE TRENDS AND PROJECTIONS

HISTORICAL TREND	FUTURE PROJECTION
<p>Temperatures</p> <ul style="list-style-type: none"> • Mean temperature has increased at 0.1°C/decade • Maximum and minimum temperatures show an upward (linear) trend. Reanalysed records (1901-2015) suggest +0.094°C/decade for maximum temperatures and +0.10°C/decade for minimum temperatures. • Daily temperature range has decreased slightly. • Maximum and minimum temperature extremes near Barbados have increased at 0.1-0.3 °C/decade over 1961-2010. • Frequency of warm days and warm nights have shown statistically significant increases. • Frequency of cool days and nights have declined across the Caribbean by approximately 1.8% and 2.6% respectively over the 1961-2010 period. 	<p>Temperatures</p> <ul style="list-style-type: none"> • Minimum, maximum and mean temperatures increase irrespective of the climatic scenario through the end of the century. These temperature increases occur across all seasons of the year. • The projected mean temperature increase from selected RCP climatic scenarios in the GCMs are: <ul style="list-style-type: none"> • 0.56-0.68°C for the 2020s; • 0.71-0.96°C for the 2030s, • 0.85 – 1.59°C for the 2050s and • 0.78-2.82°C for 2081-2100. • RCMs suggest increases in mean temperature of up to 0.89°C by the 2050s
<p>Rainfall</p> <ul style="list-style-type: none"> • Significant year-to-year variability due to the influence of phenomena like the El Nino Southern Oscillation (ENSO). • An upward trend in mean is observed at 0.197 mm/year over Barbados though a strong decadal signal is also evident. • Two long-term stations in Barbados suggest no discernible change in consecutive dry days and frequency of days above 10 mm rainfall in recent past but slightly increase in very wet days (R95p). Trends diverge for max 1-day and max 5-day rainfall. • A 2014 study suggests that for 1986-2010, Barbados shows an increase in total precipitation as well as an increase in the daily rainfall intensity index although both are not considered statistically significant. 	<p>Rainfall</p> <ul style="list-style-type: none"> • Rainfall shows a slight decrease across all scenarios through to the end of the century. • The mean annual precipitation is projected from GCMs to have decreases of 3 – 5% for 2020s, 3– 6% for 2030s, 2 – 14% for 2050s and 4 – 25% for the end of century. • This drying is projected to occur in both the wet season (August to November) by up to 11% and the dry seasons (Dec. to Mar.) up to 18% by mid-century (2046-2065) from GCM data. • One RCM projects modest declines of up to 4% by the 2050s which overlaps with projections from GCMs. • Two RCMs predict little discernible change in consecutive dry days and frequency of days above 10 mm rainfall. These RCMs also predict small increases in the number of very wet days, the maximum 1-day precipitation and maximum 5-day precipitation. • A detailed analysis of rainfall intensity (Acclimatise, 2016) for Barbados showed significant uncertainty with respect to future trends with changes of -70% to +45% possible in the next 50 years.

HISTORICAL TREND	FUTURE PROJECTION
<p>Sea Levels*</p> <ul style="list-style-type: none"> • Historical trends show a regional rate of increase of 0.18 ± 0.01 mm/year between 1950 and 2010. • Higher rate of increase in later years: up to 3.2 mm/year between 1993 and 2010. • Caribbean Sea level changes are similar to the overall global mean. 	<p>Sea Levels*</p> <ul style="list-style-type: none"> • The combined range for a projected rise over all GCM scenarios spans 0.26 to 0.82 m by 2100 relative to 1986-2005 levels. The range is 0.17 to 0.38 m for 2046 – 2065. • It is suggested that gravitational and geophysical factors will lead to the region experiencing a greater rise in sea levels than most global areas. • Sea-level rise over the northern Caribbean may exceed the global average by 25%. • Other recent studies suggest an upper limit for the Caribbean of up to 1.5 m for the most pessimistic future climatic scenario (RCP8.5).
<p>Hurricanes</p> <ul style="list-style-type: none"> • Increase in frequency and duration of Atlantic hurricanes since 1995. • Increase in Category 4 and 5 hurricanes and in rainfall intensity, associated peak wind intensities, and mean rainfall for the same period. 	<p>Hurricanes</p> <ul style="list-style-type: none"> • No change or slight decrease in the frequency of hurricanes. • An 80% increase in the frequency of Saffir-Simpson category 4 and 5 Atlantic hurricanes over the next 80 years using a future compromise or average climatic scenario (A1B). • Shift toward stronger storms by the end of the century as measured by maximum wind speed increases of +2 to +11%. • +20% to +30% increase in rainfall rates for the model hurricane’s inner core, with a smaller increase (~10%) at radii of 200 km or larger.

Table Annex 3.1. Climate change and projections for Barbados at a glance. (Source: Baird, 2017)

ANNEX 4. SAMPLE HAZARD MAPS



National Hazard Mapping Seismic - Estimated Site Classes

Map Title 4E

Map Published: October 2017

This map is one in a series within studies for the preparation of the Barbados Coastal Risk Assessment and Management Programme, National Coastal Risk Information and Planning Platform.

Funded by:  Inter-American Development Bank

Executed by:  Coastal Zone Management Unit BARBADOS

Prepared by:  Baird.
Innovation Engineered.

Geotechnical Analysis by:

 Golder Associates

LEGEND

Soil Site Class	Horizontal Peak Ground Acceleration PGA _h (g)	0.2 second Spectral Accelerations S _w (g)	1 second Spectral Accelerations S ₁ (g)
B - Rock	0.69	1.50	0.64
C - Very dense soil and soft rock	0.69	1.50	0.83
D - Stiff soil	0.69	1.50	0.96
E - Soft clay soil	0.62	1.35	1.54

NOTE
1. SW CLASS BASED ON ASCE 7-10 (2011) with Golder interpretation of geologic units from Rowe et al. (1978/1980) and Igwe (1997, 2012).

REFERENCES
1. ASCE 7-10 (2011)
2. ROWE, D.C., BARNER, L.H. AND RYMER, B. (1981)
3. IGWE, C.C., BARNER, L.H. AND RYMER, B. (1981)
4. DALZAR, V.A., BROWN, L. AND MANNETTE, G. (2013)
5. SPRELL, R.C. (1997, 2012)

BASEMAP LAYERS

Basemap Features

— Elevation Contours, 5 metre interval
— Bathymetry Contours, 5 metre interval

Elevation, metres

0 - 0.9
10 - 9.9
20 - 19.9
30 - 29.9
40 - 39.9
50 - 49.9

BASEMAP LAYERS

Topographic Elevation and Bathymetry Contours

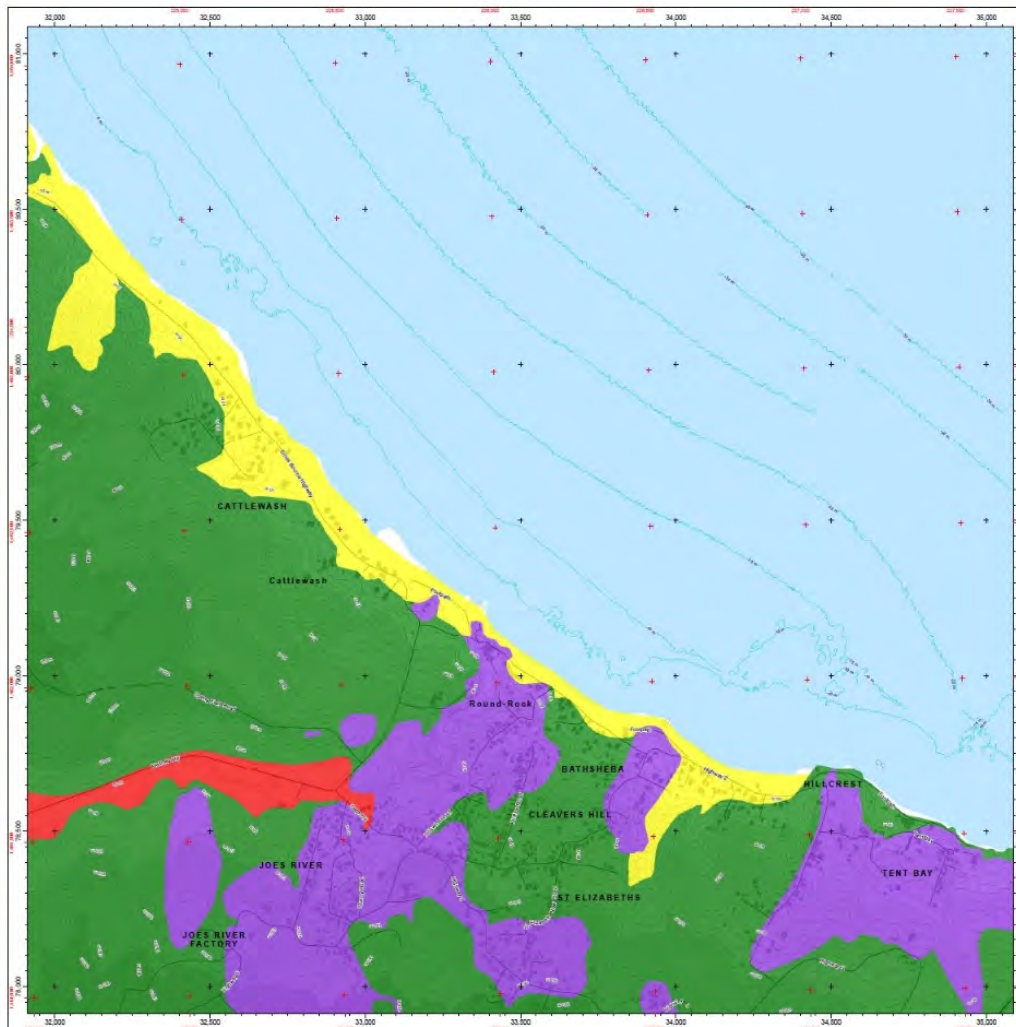
The elevation and bathymetry contours shown on this map are at 5 metre interval intervals. The data was acquired in 2014 and 2015 using the topographic (LiDAR sensor Chiroptera) 1 to 10m.

Buildings, 2015

The buildings were derived from processing LiDAR data. The data was acquired in 2014 and 2015 using the topographic (LiDAR sensor Chiroptera) 1 to 10m.

Street Network

The street network and names are from OpenStreetMap, a OpenStreetMap contribution. The data is available under the Open Database License. For details of this license visit: www.openstreetmap.org/licenses/



BASEMAP LAYERS

Basemap Features

— Elevation Contours, 5 metre interval
— Bathymetry Contours, 5 metre interval

Elevation, metres

0 - 0.9
10 - 9.9
20 - 19.9
30 - 29.9
40 - 39.9
50 - 49.9

Buildings, 2015

The buildings were derived from processing LiDAR data. The data was acquired in 2014 and 2015 using the topographic (LiDAR sensor Chiroptera) 1 to 10m.

Street Network

The street network and names are from OpenStreetMap, a OpenStreetMap contribution. The data is available under the Open Database License. For details of this license visit: www.openstreetmap.org/licenses/

Coordinate System

Coordinate System: Barbados National Grid
Projection: Transverse Mercator
False Easting: 70000.0
False Northing: 70000.0
Scale Factor: 0.999997
Semi-Major Axis: 6378137.0
Semi-Minor Axis: 6378137.0
Units: Meter
Horizontal Datum: Barbados 1984 Datum
Vertical Datum: Barbados 1984 Datum
Ellipsoid: Spheroid
Grid Spheroid: Spheroid
UTM grid and labels shown in red.
UTM Zone: 18N
Datum: Barbados 1984 Datum

SCALE

1:5,000

1 cm = 50 metres

0 100 200 300 400 500

MAP SERIES TILE INDEX



Map Title 4E

National Hazard Mapping Slope Risk Classification - Fully Saturated Condition

Map Tile 4A

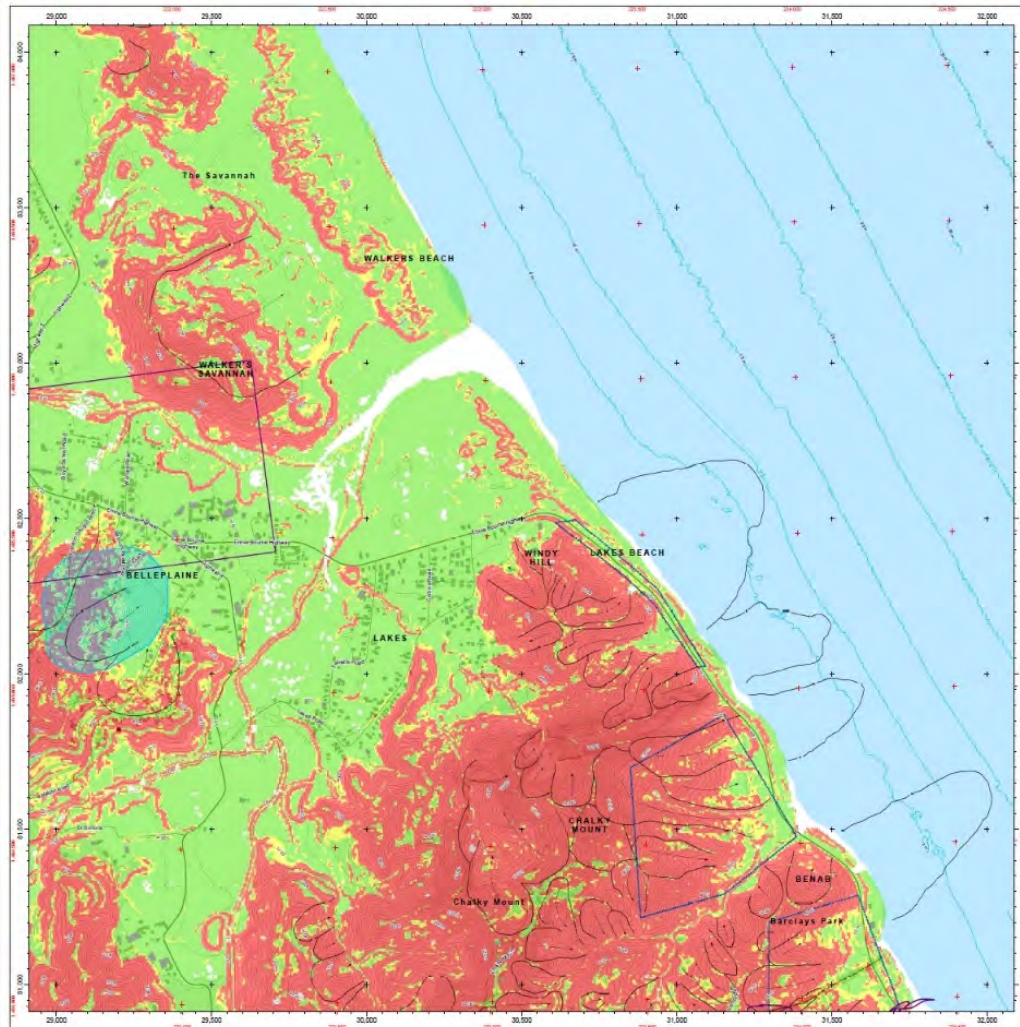
Map Published: October 2017

This map is one in a series within studies for the preparation of the Barbados Coastal Risk Assessment and Management Programme, National Coastal Risk Information and Planning Platform.

Funded by  Inter-American Development Bank

Executed by  Geomatics Barbados

Prepared by  Baird.
Innovation Engineered.



Geotechnical Analyses by:  Golder Associates

LEGEND

- CORE RECORD FAILURE LOCATIONS
- ROAD DAMAGE LOCATIONS
- Road Damage Location: Minor, Damage, Location, Status
- Road Damage Location: GOLFER (2012)
- Road Check - Unimproved
- Road Check - Minor
- Road Check - Moderate
- Road Check - Major
- Shovel/Failure Approximate Locations
- Alley
- Canal
- Drain
- Embankment / Embankment
- APPROXIMATE LOCAL DRAIN
- ECLIPSEMENT LIMESTONE BOUNDARY

- Discontinuity
- ECLIPSE
- Approximate Location of Precipitation
- SETTLEMENT OF FILL OR LANDSLIDES
- UNSTABLE AREAS

FIELD INTERPRETATIONS - GOLDER (2012)
SHENT LINE, DEEP DRIFTCONE, BACK SCARP

RISK CLASS	FACTOR OF SAFETY	PROBABILITY OF FAILURE	STABILITY STATE	ANTICIPATED BEHAVIOUR
High	< 1.0	> 50%	MARGINALLY UNSTABLE TO UNSTABLE	LONG TERM CREEP OR EXCESSIVE MOVEMENT / FAILURE
Medium	1.0 - 1.5	15% - 50%	MARGINALLY STABLE TO STABLE	LONG TERM CREEP MOVEMENT
Low	> 1.5	< 15%	GENERALLY STABLE TO STABLE	MINOR TRENDS

REFERENCES AND NOTES
 1. FROM COMBINED GEOTECHNICAL SURVEYS INVESTIGATION & FIELD STUDY REPORT DATED 14/11/2012. SURVEYS CARRIED OUT IN LESS DETAIL OUTSIDE OF THE 1 KM BUFFER AROUND THE COASTLINE ENVIRONMENTAL HAZARD SURVEILLANCE, PRECIPITATION RECORDS IN THE ISLAND DISTRICT AND THE WEST COAST CARIBBEAN GEOGRAPHIC VOL. 7 (2012)

BASEMAP LAYERS

Basemap Features
 - Elevation Contours, 5 metre Interval
 - Bathymetry Contours, 5 metre Interval

Elevation, metres
 □ 0 - 50
 □ 50 - 100
 □ 100 - 150
 □ 150 - 200
 □ 200 - 250
 □ 250 - 300

BASEMAP LAYERS

Topographic Elevation and Bathymetry Contours
 The elevation and bathymetry contours shown on this map are at 5 metre vertical intervals. The data was derived in 2014 and 2015 using the Topographic (DART) sensor (Chibret et al. 2014). All elevation values are in local average datum orthometric height.

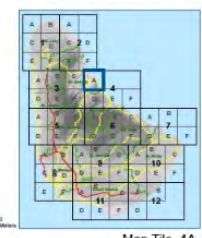
Buildings, 2016
 The buildings were derived from the Copernicus DEM. The data was acquired in 2014 and 2015 using the Topographic (DART) sensor (Chibret et al. 2014).

Street Networks
 The street networks and names are from CopernicusDEM. © Copernicus Data Contributors. The data is available under the Copernicus License. For further details visit www.copernicus.eu/copernicus



MAP SERIES TILE INDEX

Coordinate System: Barbados National Grid
 Projection: Transverse Mercator
 False Easting: 50000.0
 False Northing: 7000.0
 Units: Meter
 Scale Factor: 0.999997
 Latitude of Origin: 13° 00' 00.0000
 WGS 84 Zone: 18N
 National datum: Barbados 1958, Clarke
 National datum: Barbados 1958, Clarke
 Datum: 1958
 UTM grid and scale shown in red
 UTM Zone: 18N
 SCALE
 1:5,000
 1 cm = 50 metres



Map Tile 4A

National Hazard Mapping Inland Flooding

Map Tile 5A

Map Published: October 2017

This map is one in a series within studies for the preparation of the Barbados Coastal Risk Assessment and Management Programme, National Coastal Risk Information and Planning Platform.

Funded by  Inter-American Development Bank



Prepared by  Baird.
Innovation Engineered.



LEGEND

Rainfall Induced Flooding
Inland flooding may occur throughout Barbados, but is common near the coast and in flatter low-lying regions. Flooding risk assessment based on an island-wide hydrologic model developed with SWAT and 2-D sub-cellular model using SWEET11 flexible levee. This flood assessment focused on regional flooding, rather than event scale ponding and waves. The dimensional modeling was undertaken with grid cells in the range of 10 to 100 m in size, and local drainage infrastructure was not included in the broad-scale modeling effort. Slugged flood depths were derived from assessing the difference between water surface elevations from the SWEET11 model, and topography from the 1 m DEM from the LIDAR data set (Baird, 2015). The flooding depicted in these maps is representative of regions with significant flood potential; however, local variability due to on-site storage potential will exist.

Limitations: The island-wide scale of the modeling exercise did not allow for simulation of detailed smaller scale flow paths. Calibration and validation data are extremely limited or completely absent in many regions. The model was primarily calibrated through assessing model performance on the west coast, and using similar morphologies elsewhere with local topography, rainfall and soil data. Simulators were based on over-simplified topography, which did not include buildings and soils, and represent topography from 2015.

Inland Drainage Hazard - Major Drainage Pathways
Gullies in Barbados present flood hazards as well as slip hazards. Gullies were included in the SWAT model but were not modeled to represent flow depths. Instead, gullies have been assigned an 'Inland Drainage report' classification, and a 10 m buffer has been delineated to delineate these regions. The hazard due to being at the top of a gully may extend beyond 10 m and needs to be assessed on a case by case basis.

Annual Exceedance Probability
Annual Exceedance Probability (AEP) is the annual probability that a specific hazard level will be exceeded in any given year. For return periods near 10 years, the AEP is well approximated by the reciprocal of the return period. E.g. AEP of 0.1 is close to a 10 year return period.

- Area inundated by a 1:10 annual exceedance probability (AEP) flood
- Additional area inundated by a 1:25 AEP flood
- Additional area inundated by a 1:50 AEP flood
- Additional area inundated by a 1:100 AEP flood
- Major Drainage Pathways

BASEMAP LAYERS

Boundary Features

- Building Footprints (Vector/DEM/DEM)
- Elevation Contours, 5 metres Interval
- Bathymetry Contours, 5 metres Interval

Elevation, metres

- 0 - 20
- 20 - 100
- 100 - 150
- 150 - 200
- 200 - 250
- 250 - 300
- 300 - 400

BASEMAP LAYERS
Topographic Elevation and Bathymetric Contours
 The elevation and bathymetry contours shown on this map are at 5 metre intervals. The data were derived from the 2014 and 2015 using the SWEET11 LIDAR dataset. Contours of 1 by 1 metre resolution are to be used for detailed planning purposes.

Buildings, 2015
 The buildings were derived from processing LIDAR data. The data was acquired in 2014 and 2015 using the SWEET11 LIDAR dataset. Contours of 1 by 1 metre.

Shaded Relief
 The shaded relief and terrain are from the SWEET11 LIDAR dataset. The contours are a 5 metre resolution. The data is available under the Open Data License. For more information visit www.gov.bm/open-data.

MAP SERIES TILE INDEX

Coordinate System: Barbados National Grid
 Projection: Transverse Mercator
 False Easting: 5000.0
 False Northing: 7000.0
 Central Meridian: 057.500
 Scale Factor: 0.9999999999999999
 WGS 1984 Authority: EPSG
 Produced Under: Barbados 2014, 2015
 2016

Contour Interval: 5m
 UTM grid and labels shown in red
 UTM Zone 21, WGS84 datum.

SCALE
 1:5,000
 1 cm = 50 metres

Map Tile 5A

National Hazard Mapping Storm Surge Induced Runup and Overtopping

Map Title 8F

Map Published: October 2017

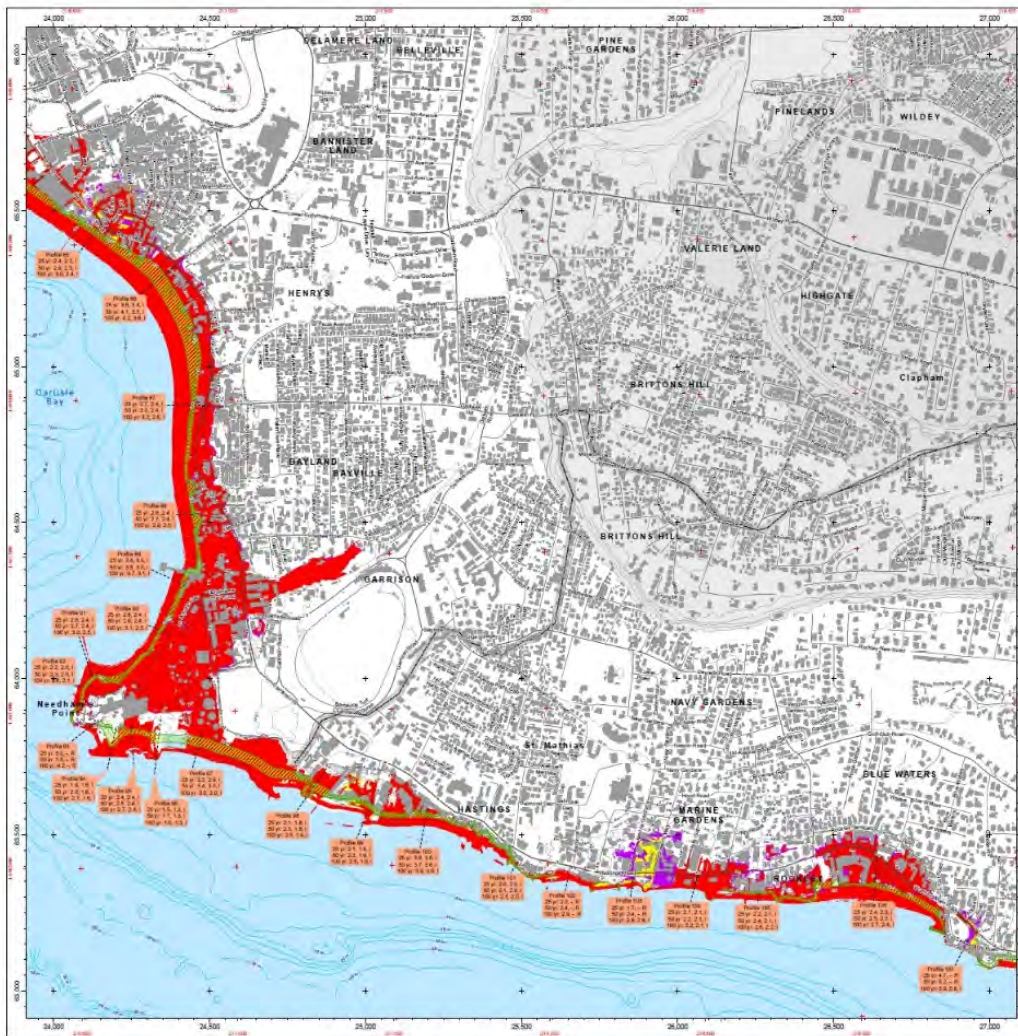
This map is one in a series within studies for the preparation of the Barbados Coastal Risk Assessment and Management Programme, National Coastal Risk Information and Planning Platform.

Funded by  Inter-American Development Bank



Executed by

Prepared by  Baird
PROFESSIONAL ENGINEERS



LEGEND

Coastal Flooding due to Storm Surge

Coastal flooding is a complex process that is influenced by the nearshore wave conditions, water depth, beach slope, and position of beach berms, coastal structures, (small) man-made structures, and walls, buildings, etc. The wave setup and wave overtopping elevations depicted on the maps represent the estimated water surface elevation on the beach crest for a particular return period storm event. The distance of overtopping waves will travel inland all depend on the volume of the water, local topographic variations, obstructions, and fragrances elements. Wave setup and flood elevations may vary by $\pm 0.31\text{m}$ or more locally.

Return Period is a term used to define the maximum condition that would be expected to occur, on average, every T years. For example a 10 year return period could be exceeded in Barbados (data by extending the maximum level from each decade for an appropriate long period of time.

ADP or Annual Exceedance Probability is the annual probability that a specific hazard level will be exceeded in any given year. For return periods over 10 years, the ADP is also approximated by the reciprocal of the return period. E.g. ADP 0.1 is equal to a 10 year return period.

Data boxes are associated with each profile location along the coast and provide two elevation values (m LGD) and an indicator of the flooding type for three return periods. The first elevation value is either: (a) the maximum surge level on the shore, or (b) the 2% higher value, crest passing over the beach crest. If the surge does not exceed the beach crest, the data box contains an "N" for setup. If there are waves over the beach crest, the data box contains an "H" for inundation. If inundation is taking place, the second elevation value is the depicted period water surface elevation. If only (runup is occurring) (marked "R"), then a second value is not provided.

Simulations were undertaken to depict the 25, 50, 100 and the 100 year events. The 100 and 100 year events were similar in runup and overtopping magnitudes such that the values were often close to equal and occasionally reversed. The highest of the two values are applied to represent the 100 year event; the 100 year event (based on conventional) to be similar, yet slightly higher.

Limitations: Wave runup and overtopping were computed based on data from the 2014 LIDAR survey and represent conditions at that time. Changes from these profiles will impact wave runup and overtopping. Wave runup elevations are based on a 2% exceedance; therefore waves could exceed these elevations. Wave runup and overtopping elevations may vary substantially between profiles due to differences in wave and shoreline conditions.

Severe Spray Hazard

A severe spray hazard exists on sections of the east coast, where deep water allows large waves to impact cliffs. Very high spray, sometimes mixed with rubble or boulders can result in localized regions where setbacks of 100 to 200 m may be required. Only specific assessments should be undertaken for development in these regions.

Maximum Ponding
 At the Beach Point
 2% Annual Exceedance
 100 Year Return Period

Hazard Mapping Features
 Potential Storm Impact Zone
 Storm Surge Profile

BASEMAP LAYERS

Basemap Features

— Parcel Boundary, Easement Feature

--- Easement Corridor, Transmission Line

Elevation, metres

0-20

20-40

40-60

60-80

80-100

100-120

120-140

140-160

160-180

180-200

200-220

220-240

240-260

260-280

280-300

300-320

320-340

340-360

360-380

380-400

400-420

420-440

440-460

460-480

480-500

500-520

520-540

540-560

560-580

580-600

600-620

620-640

640-660

660-680

680-700

700-720

720-740

740-760

760-780

780-800

Buildings, 2015
 The data was derived from processing LIDAR data. The data was acquired in 2014 and 2015 using the topographic LIDAR sensor (Chiroptera) of the plane.

Topographic Elevation and Bathymetric Contours
 The bathymetric and topographic contours shown on this map are at 1 metre vertical intervals. The data was acquired in 2014 and 2015 using the topographic LIDAR sensor (Chiroptera) of the plane. The elevation was in the form of a Digital Elevation Model (DEM).

Beach Network
 The beach network and names are from (GeoBridging), © GeoBridging/Mapbox. The data is available under the Open Database License. For further information please visit www.geobridging.com/geobridging/

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National Hazard Mapping Tsunami Flood Hazard for Maximum Runup for 2017

Map Title: 8C

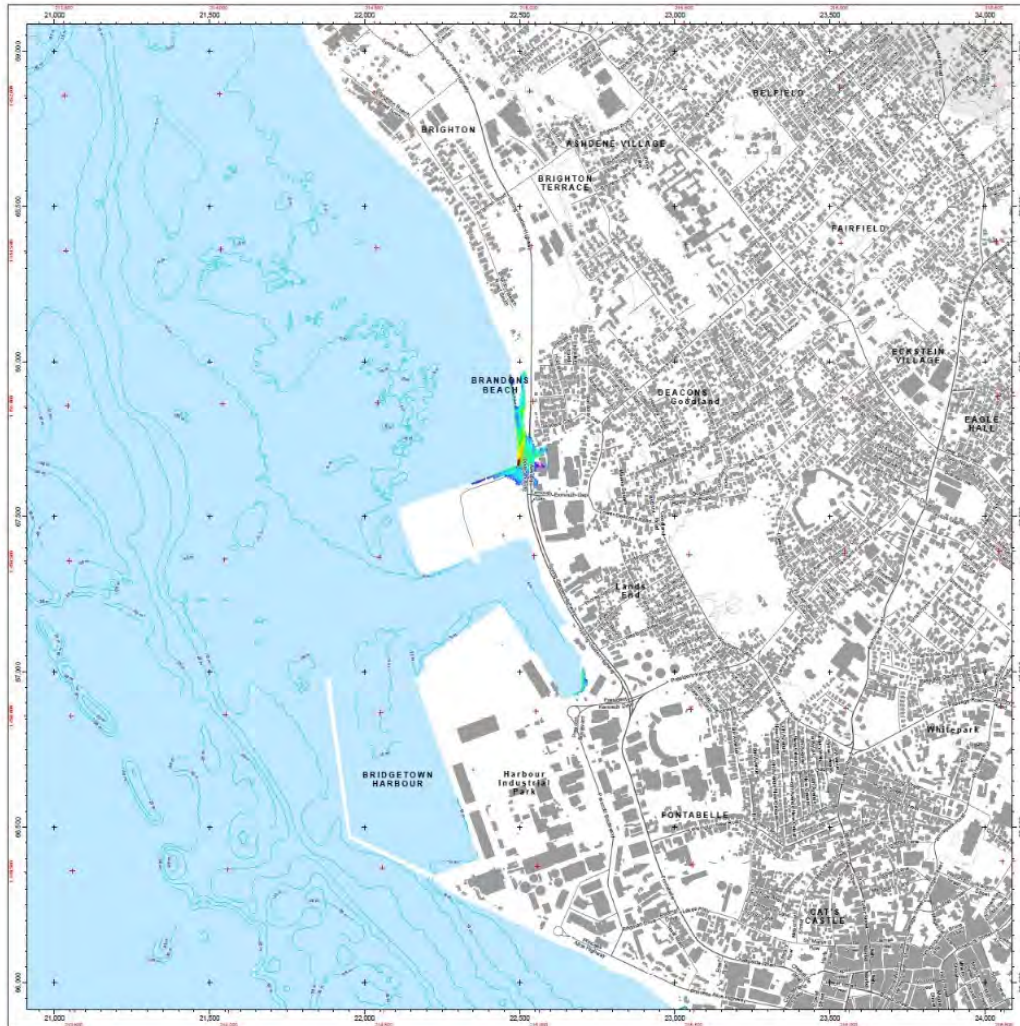
Map Published: October 2017

This map is one in a series within studies for the preparation of the Barbados Coastal Risk Assessment and Management Programme, National Coastal Risk Information and Planning Platform.

Funded by **IDB** Inter-American Development Bank



Prepared by **Baird.** Inc. Houston, Texas



LEGEND

Source: Information was compiled with the 480221 Profile Map, Hydrographic Model. The profile shown is bathymetric and hydrographic data from the 2015 USAT study. The source also included the nearest ocean ridge to the east and west of Barbados.

The 100 year maximum runup is determined by the maximum runup of 1000 and 1000. These results were integrated with the coastal profile of Barbados to the east of the inner harbor. An estimate of the total inundation was prepared for each of these events. The results of these events were integrated with the bathymetric data and the profile of Barbados to the east of the inner harbor.

These results were then integrated with the bathymetric data and the profile of Barbados to the east of the inner harbor. The results were then integrated with the bathymetric data and the profile of Barbados to the east of the inner harbor.



BASEMAP LAYERS

Basemap Features

- Coastline, Contour, 5 meter interval
- Naturalistic Contour, 5 meter interval

Elevation, meters

- 0 to 10
- 10 to 20
- 20 to 30
- 30 to 40
- 40 to 50
- 50 to 60
- 60 to 70
- 70 to 80
- 80 to 90
- 90 to 100

BASEMAP LAYERS

Topographic Elevation and Bathymetric Contours

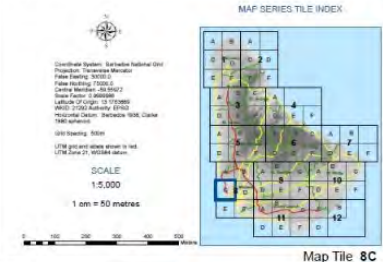
The elevation and bathymetric contours shown on this map are at 1 meter interval.

Buildings, 2016

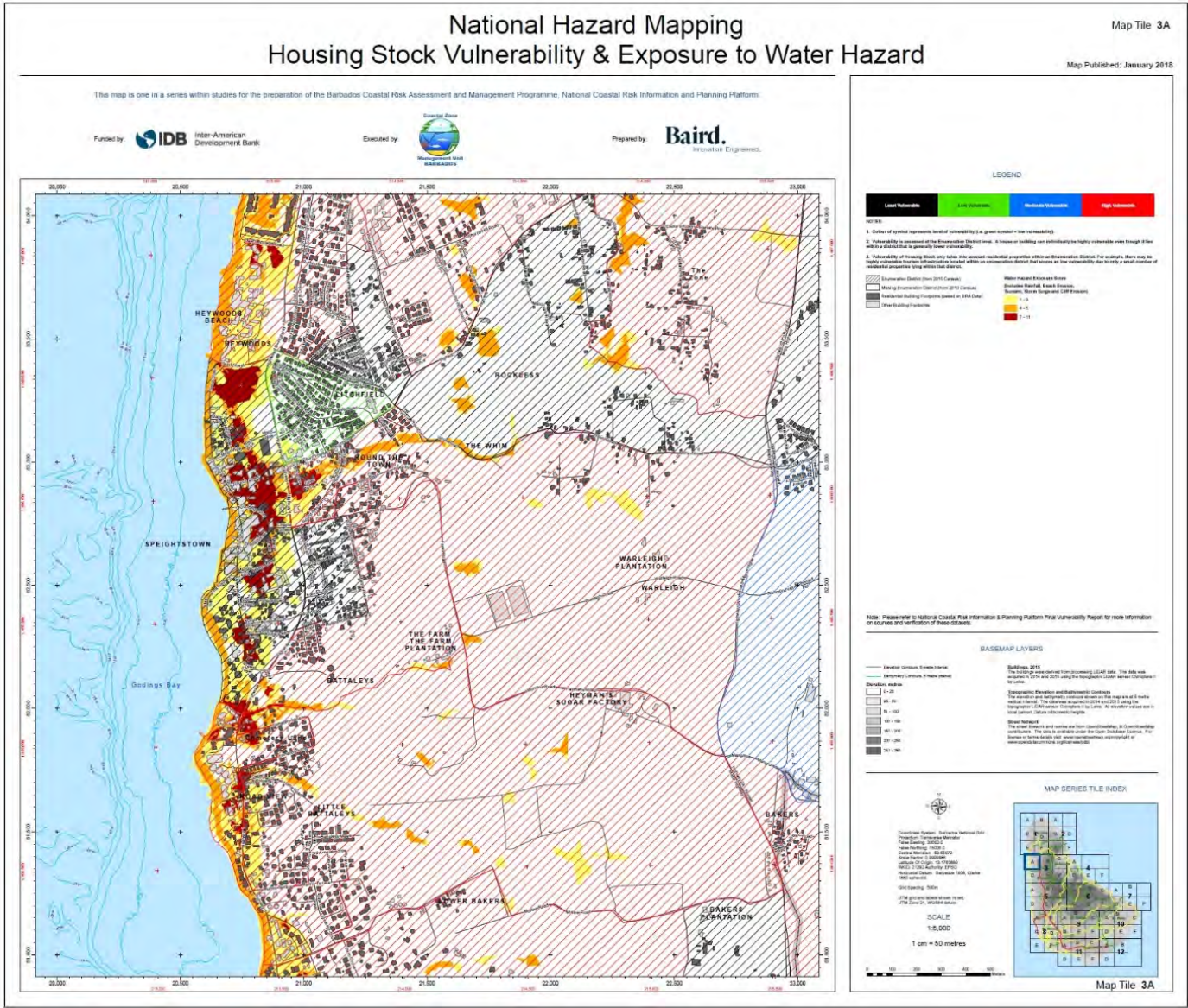
The buildings were derived from the 2016 USAT study. The data was collected in 2017 and 2018 using the topographic USAT sensor (Chibrikov) 100m.

Street Network

The street network and names are from OpenStreetMap, US Coastline and contributors. The data is available under the Open Database License. For further information, see www.openstreetmap.org/contributors.



ANNEX 5. SAMPLE VULNERABILITY MAP



ANNEX 6. SOCIAL IMPACT ASSESSMENT AND GENDER ANALYSIS

1. The SIA will investigate socio-economic developmental opportunities and risks related to the execution of the project; and inform possible mitigation measures to safeguard against any risks identified, as well as other measures to support positive social impacts. It will be conducted in a highly participatory, gender-inclusive manner engaging the communities, particularly with representatives of women and men and vulnerable groups such as children, youth, elderly, persons with disabilities (PWDs) etc.

2. The methodology for the SIA shall include, but is not be limited to, the following:

(a) Review of secondary data including reports, studies, gender assessments, poverty assessments, census reports, labour force surveys, and relevant policy documents such as legislation, regulations, standards and policies in the areas of gender and social development including vulnerable groups of women, youth, PWDs and human trafficking victims.

(b) Collection of primary data through participatory consultations with all categories of stakeholders in order to introduce the project, facilitate feedback, and gauge perception of the project in order to gain and/or strengthen buy-in. Interviews, focus groups and other appropriate differential participatory methodologies may be employed for state and non-state stakeholders directly impacted by the works such as Community-Based Organisations, Non-Governmental Organisations, vulnerable groups (to include elderly, children, youth, men, women, PWDs, and indigenous peoples), private sector entities and relevant public agencies. Where applicable, focus groups may be convened for youth, PWDs, males and females, respectively. Facilitation of participation through the provision of transportation and child care as well as appropriate timing should be ensured. Data should be disaggregated by sex, age groups, disability status and race/ethnicity where feasible.

(c) Execution of site visit exercises to verify, update and fill gaps using community maps, transect walks, snowballing, as well as photographic documentation, and other appropriate participatory approaches.

3. The scope of work shall examine and report on the following, and related developmental issues:

(a) Describe the project areas including demographic, economic, topographical and sociocultural data which should be disaggregated by sex, age groups, minority or special needs groups (such as PWDs, youth, immigrants, and informal settlers):

(i) total population of the project areas (Parish communities/villages);

(ii) population density of the project areas (Parish communities/villages);

(iii) number of households by sex of household head;

(iv) labour force participation, employment and occupation;

(v) crime and violence; and

(vi) prevalence of poverty.

(b) Investigate the governance and management structure in the appropriate sector (institution) of Government in Barbados, including staff ratios by occupation and sex), equality in recruitment, workplace policies conducive for women, occupational health and safety.

(c) Assess the different social as well as household activities of men and women, and vulnerable youth, PWDs in project areas.

(d) Assess economic activities or potential future economic activity by sex for the project areas and need for areas for vendors, sanitation facilities, parking, illumination needs and other basic facilities necessary to be covered in the design of the project infrastructure. This assessment should address competing users of the proposed infrastructure including social service providers, commercial sector operators; and private citizens.

(e) Analyse the local labour force and the potential of engaging communities, especially abovementioned vulnerable groups, in the construction and maintenance and resilience building phases of the project. Give recommendations on training needs and legal requirements from a procurement perspective. Identify the number of men, women and other vulnerable groups identified who will benefit from employment during project implementation and subsequent operation.

(f) Propose project components (initiatives) necessary to facilitate the access and participation of youth, women and PWDs in the economic and social benefits of the proposed project. The institutional partners necessary for the success of the project components (initiatives) and the budget to implement them must be clearly identified.

(g) Assess accessibility of the project areas in keeping with universal design standards required for use by PWDs, and seek direct feedback from PWDs regarding the requirements, to inform the design of the proposed infrastructure.

(h) Identify the effects of the project on time use in the household disaggregated by sex; and how men and women would use the time savings differently. Differentiate the time use benefits for public and private sectors as well as for householders.

(i) Identify any deficiencies in transport arrangements that hinder men, women, indigenous peoples and relevant vulnerable groups from fully accessing services and markets. The assessment should examine:

(i) different travel patterns of women and men;

(ii) who pays for the commercial, household and other transportation, disaggregated by sex;

(iii) how the travel pricing structure would change due to the project, i.e. cost implications for consumers (if possible, disaggregated by sex); and

(iv) expected performance/service of existing transport networks, and the potential needs of the population in beneficiary communities and/or the project areas during works and post-completion of works, disaggregated by sex and vulnerable groups identified.

(j) Identify any activities related to transactional and commercial sex in the project areas and analyse both the potential effects of the construction and operational phases of the project.

(k) Evaluate public illumination needs and the potential for preventing crime, including gender-based violence and sexual assault. Identify “hot spots” together with the police and the communities engaging women, men, youth and PWDs as they have different perspectives and advice on the placement of street lights and necessary preventative measures.

(l) Determine potential social and economic dislocation in the project areas and whether resettlement/replacement is necessary. Identify any possible effects of this on the livelihoods and culture of people in the project areas. Identify possible social and gender concerns taking into account the distribution of male and female-headed households, distribution of land titles by sex, and any other

vulnerable group. Identify any possible options to avoid resettlement as well as appropriate gender-responsive resettlement (possible distribution of land titles to women) and mitigation measures.

(m) Describe the potential impacts of the project at its various stages (preparation, construction, and operation) on the social and economic contexts in the immediate surrounding communities. Identify any issues pertaining to the design of the project which may have social impacts including gender, livelihood or other dimensions.

(n) Make specific recommendations with regard to the project design options and identify measures required not only to mitigate any significant negative impacts, and enhance the potential social and gender benefits in the project areas. This process shall:

(i) Discuss the adequacy of proposed mitigation measures overall, and specific measures to enhance gender equality and equitable inclusion of vulnerable groups and any other relevant social benefits; as well as the adequacy of project design to meet the needs of the relevant stakeholders.

(ii) Consider measures such as public education and, training opportunities for vulnerable groups to take part in project activities, workers code of conduct and grievance mechanisms; and reform of workplace, human resources and customer service policies.

(iii) Define Community Participatory Mechanisms (CPMs) by identifying appropriate mechanisms to engage women, men and vulnerable groups in the decision-making of the project in a gender-balanced way; and appropriate gender-sensitive public education communication strategies for providing information on project activities to stakeholders and for receiving timely feedback (pre-project, during implementation and post-implementation). The CPM design must ensure conducive meeting times and facilitate participation through the provision of transportation, child care, and other supportive measures.

(iv) Estimate the cost of the measures and justify their suitability.

(v) Prepare a detailed monitoring and evaluation plan for tracking the key relevant project results and the implementation of the mitigating and benefit-supporting measures. Identify gender-responsive outputs and outcomes of the project activities to facilitate gender-responsive results monitoring and evaluation.

(vi) Develop a Gender Action Plan containing relevant gender and social inclusion actions, indicators, timelines and budget. (o) Analyse and outline the key SIA findings regarding: (i) social and gender benefits arising from the project and measures to maximise the benefits; and (ii) social and gender risks and measures to mitigate the risks for beneficiaries including the sub-groups requiring focussed attention. The key SIA findings including measures such as universal design standards required for use by PWDs, areas for vendors, sanitation facilities, parking, public illumination, and other basic facilities must be discussed with the engineers on the team for consideration in the design of the proposed project infrastructure.

(p) Convene a stakeholders' validation workshop, including community groups, representatives of vulnerable population groups (women, elderly, youth, indigenous people and persons with disabilities), and relevant Barbados government agencies, to discuss the findings of the consultancy and to seek consensus and clarification on issues from participants for incorporation in the Draft Final and Final Reports. As part of the stakeholders' validation workshop conduct gender sensitisation training to report on the findings of the gender analysis.

ANNEX 7. DRAFT TERMS OF REFERENCE CLIMATE RISK AND VULNERABILITY ASSESSMENTS

1. BACKGROUND

1.01. A Climate Risk and Vulnerability Assessment (CRVA) will be conducted on the project components as part of the design process to ensure that they are strengthened against climate risks (to develop depending on the exact project details and requirements).

2. OBJECTIVES

2.01 The objectives of the CRVA are to (i) identify and evaluate the potential effects of climate change on the project on the project area and (ii) recommend resilience measures to address the identified risks and vulnerabilities and minimise impacts. This should include consultation with stakeholders to get a better understanding of the nature of the climate risk and adaptation issues, especially the historical experience of climate related hazards, the response and to agree on the scope.

3. METHODOLOGY

3.01 The consultants are expected to develop a database, if one does not already exist, that would include, inter-alia, the following data and information:

- (a) Background information on the project; and
- (b) Locational characteristics of the project area geographic scope.

4. SCOPE OF SERVICES

4.01 The consultants will be required to perform the following tasks:

- (a) Identification and description of project components
- (b) Hazard Identification and Characterisation
 - (i) Summarise the key current and expected future climate hazards relevant in the context of the project, and of the associated potential climate-related risks/implications for the Project, that should be addressed in the CRVA, during the construction and operational phases; and
 - (ii) Establish a climate baseline for the relevant climate variables and establish a climate baseline;
 - (iii) Undertake an in-depth assessment, combining an analysis of historical events and present day conditions in order to establish a climate baseline, with an analysis of future conditions (mid-century as well as the design life of the investment) using scenario-based methodologies. Climate variables could include the following: (aa) sea level and wave action; (bb) storm surges (cc) peak rainfall events; (dd) temperatures; (ee) profiles of past extreme weather events; and (ff) wind speed.
- (c) Assessment of Exposure

4.02 The consultant will (i) assess the exposure of project components that could be exposed to the hazards identified above and the extent of this exposure. This should include preparation of hazard maps showing the spatially distributed expected exposure levels for different frequencies (i.e. 50-yr, 100-yr and 150-yr return periods) and for different hazard types (extreme precipitation, flooding, landslides, sea level rise, etc).

(d) Vulnerability Assessment

4.03 The consultant will establish climate change scenarios and assess the relationship between the changes in the climate parameters agreed on in (b) and the impacts on project components. The assessment of vulnerabilities considers in detail how the project components, and communities would be vulnerable to the identified hazards according to different climate scenarios, as well as non-climate factors.

(e) Risk assessment

4.04 The consultant will conduct a risk assessment (a quantitative expression of the vulnerability assessment: the consequences of the hazards, in economic and social impact terms, on project components.

(f) Adaptation Assessment

4.05 The consultant shall identify the most appropriate adaptation measures that could be incorporated into the Project in order to address the vulnerabilities and risks identified. This may include structural, technological and behavioural measures.

5. REPORTING REQUIREMENTS

5.01 The consultants will report to the CZMU's Project Manager. The Technical Proposal of the selected consultant shall outline a work plan and approach to the assignment, the scope and methodology, the tasks and responsibilities and a time schedule for the completion of the assignment. The following reports, one hard copy each, along with an electronic copy either by electronic mail, on CD ROM or flash drive, shall be submitted to the CZMU at the times indicated below.

(a) Inception Report within three weeks of commencement of the assignment;

(b) Draft report on completion of the risk assessment;

(c) Final report on the CRVA specifying the recommended design changes to take account of climate risks, including an analysis of structural and non-structural measures.

6. TIMING AND QUALIFICATIONS

6.01 Duration: circa 30-40 working days.

6.02 The consultancy shall be conducted by a team of three experts, who shall have the following competencies:

(a) Climate Change Specialist: Responsible for identifying the climate change parameters to be assessed; collection of relevant local historical climate data and climate change projections; identify the probabilities of specific climate change occurrences; conduct field investigations with local stakeholders to identify existing vulnerabilities. In consultation with other team members, contribute to the identification of adaptation options, including their costs and benefits and prioritisation. The consultant is expected to have at least five years' work experience in the area of climate change impacts adaptation and mitigation. Knowledge of the Climate Change Adaptation context in the Caribbean region would be a plus.

(b) Engineer: Civil Engineer will lead the characterisation and technical assessment of project infrastructure and operations in the energy sector; conduct interviews with relevant organisations and stakeholders; and undertake site visits to determine the existing infrastructure conditions and proposals for rehabilitation. The specialist will assist in the preparation of cost estimates for capital and recurrent costs for the recommended resilience measures.

(c) Economist: The Economist should have at least 10 years of experience and a graduate degree or equivalent. Experience should include economic analysis of development projects and sector strategies based on economic analyses. Experience with incorporating climate change concerns into economic analysis as well as multi criteria analysis will also be required.

ANNEX 8. STANDARD FORMS FOR COASTAL RESEARCH

- Draft standard form A: Application for consent to conduct marine scientific research

Application for consent to conduct Marine scientific research

Date: _____

1. General Information

1.1 Cruise name and/or number:	
1.2 Sponsoring institution(s):	
Name:	
Address:	
Name of Director:	
1.3 Scientist in charge of the project:	
Name:	
Country:	
Affiliation:	
Address:	
Telephone:	
Fax:	
Email:	
Website (for CV and photo):	
1.4 Entity(ies)/Participant(s) from coastal State involved in the planning of the project:	
Name:	
Affiliation:	
Address:	
Telephone:	
Fax:	
Email:	
Website (for CV and photo):	

2. Description of Project

2.1 Nature and objectives of the project:

--

2.2 If designated as part of a larger scale project, then provide the name of the project and the organization responsible for coordinating the project:

--

2.3 Relevant previous or future research projects:

--

2.4 Previous publications relating to the project:

--

3. Geographical Areas

3.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude, including coordinates of cruise track/way points)

--

3.2 Attach chart(s) at an appropriate scale (1 page, high-resolution) showing the geographical areas of the intended work and, as far as practicable, the location and depth of sampling stations, the tracks of survey lines, and the locations of installations and equipment.

--

4. Methods and means to be used

4.1 Particulars of vessel:	
Name:	
Type/Class:	
Nationality (Flag State):	
Identification Number (IMO/Lloyds No.):	
Website for diagram & specifications:	
Owner:	
Operator:	
Overall length (meters):	
Maximum draught (meters):	
Displacement/Gross tonnage:	
Propulsion:	
Cruising & maximum speed:	
Call sign:	
INMARSAT number and method and capability of communication (including emergency frequencies):	
Name of master:	
Number of crew:	
Number of scientists on board:	
Relevant documents required by international conventions and regulations:	
Other relevant information:	
4.2 Particulars of aircraft:	
Name:	
Make/model:	
Nationality (Flag state):	
Website for diagram & specifications:	

Owner:	
Operator:	
Overall length (meters):	
Propulsion:	
Cruising & Maximum speed:	
Registration No.:	
Call sign:	
Method and capability of communication (including emergency frequencies):	
Name of pilot:	
Number of crew:	
Number of scientists on board:	
Details of sensor packages:	
Other relevant information:	

4.3 Particulars of Autonomous Underwater Vehicle (AUV):	
Name:	
Manufacturer and make/model:	
Nationality (Flag state):	
Website for diagram & specifications:	
Owner:	
Operator:	
Overall length (meters):	
Displacement/Gross tonnage:	
Cruising & Maximum speed:	
Range/Endurance:	
Method and capability of communication (including emergency frequencies):	
Details of sensor packages:	
Other relevant information:	

4.4 Other craft in the project, including its use:

4.5 Particulars of methods and scientific instruments		
Types of samples and measurements:	Methods to be used:	Instruments to be used:

4.6 Indicate nature and quantity of substances to be released into the marine environment:

4.7 Indicate whether drilling will be carried out. If yes, please specify:

4.8 Indicate whether explosives will be used. If yes, please specify type and trade name, chemical content, depth of trade class and stowage, size, depth of detonation, frequency of detonation, and position in latitude and longitude:

5. Installations and Equipment

Details of installations and equipment (including dates of laying, servicing, method and anticipated timeframe for recovery, as far as possible exact locations and depth, and measurements):

6. Dates

6.1 Expected dates of first entry into and final departure from the research area by the research vessel and/or other platforms:

6.2 Indicate if multiple entries are expected:

7. Port calls

7.1 Dates and names of intended ports of call:

7.2 Any special logistical requirements at ports of call:

7.3 Name/address/telephone of shipping agent (if available):

8. Participation of the representative of the coastal State

8.1 Modalities of the participation of the representative of the coastal State in the research project:

8.2 Proposed dates and ports for embarkation/disembarkation:

9. Access to data, samples and research results

9.1 Expected dates of submission to coastal State of preliminary report, which should include the expected dates of submission of the data and research results:

9.2 Anticipated dates of submission to the coastal State of the final report:

9.3 Proposed means for access by coastal State to data (including format) and samples:

9.4 Proposed means to provide coastal State with assessment of data, samples and research results:

9.5 Proposed means to provide assistance in assessment or interpretation of data, samples and research results:

9.6 Proposed means of making results internationally available:

10. Other permits submitted

10.1 Indicate other types of coastal state permits anticipated for this research (received or pending):

11. List of supporting documentation

11.1 List of attachments, such as additional forms required by the coastal State, etc.:

Signature:

Contact information of the focal point:

Name:

Country:

Affiliation:

Address:

Telephone:

Fax:

Email:

- Draft standard form B: Consent to conduct marine scientific research

Consent to conduct marine scientific research

(Complimentary opening)

....and has the honour to refer to (request document from Embassy) dated _____ regarding the proposed marine scientific research of (chief scientist). The Ministry is pleased to advise that approval has been given for the marine scientific research project (reference number of project) proposed in the (Territorial Sea/ Exclusive Economic Zone/Continental Shelf) of (coastal State) from (dates) to (dates) inclusive, subject to the conditions being met as specified below.

- Participation of (name and details of coastal State participant(s)).
- Notifications regarding entry into and departure from the (Territorial Sea/ Exclusive Economic Zone/Continental Shelf), port arrivals and departures, and daily position reports, should be transmitted to (provide channels through which such notifications are to be transmitted).
- Provision of preliminary report(s) within the time frame provided on application _____
- Access to all data and samples derived from the marine scientific research project, including provision of data to participant(s).
- Provision of data which may be copied and samples which may be divided and copies of reports prepared, or alternatively details of where such data and reports can be obtained will be submitted to _____ in a form acceptable to (coastal State) as soon as possible but preferably no later than a 12-month period after the conclusion of the proposed research programme. The information will be treated as public information and may be made available via the internet unless another arrangement is reached with the (coastal State) government.
- Assessment of data, samples and research results /or provision of assistance in such assessment or interpretation.
- Compliance with the attached guidelines (safety, acoustics, map of protected areas, list of relevant endangered species under CITES, etc.).
- Changes to the authorized research programme shall be directed to _____ (name, phone, email of Marine Scientific Research Office or focal point).
- Removal of the scientific research installations or equipment once the research is completed.
- Final report will be provided within a reasonable time-frame.

(Complimentary close)

Date

Diplomatic Seal

ANNEX 9. BASIC SOCIOECONOMIC ASSESSMENTS TO SUPPORT COASTAL DEVELOPMENT PLANNING

A9.1. Introduction

A9.1.1. Socio-economic Conditions

Islands, such as Barbados, which include both land and sea interfaces, influence the fabric and design of the economies and welfare of the communities which depend, directly or indirectly, on the exploitation of the natural resources present on the island. This means that there are interrelationships between environmental and socioeconomic conditions prevailing in the both land and sea space. On one hand, socioeconomic conditions are usually affected by the natural environment with its various ecosystems which provide a continuous supply of goods including fish, oil, gas, minerals, salt, construction materials, and services including shoreline protection, sustaining bio-diversity, water quality maintenance, transportation, recreation and tourism. The socioeconomic structures on islands may affect, positively or negatively, the environment and its ecosystems by various human activities being conducted. This, in return, means that the stability of both the natural environment and the community welfare on islands are highly associated.

However, current growth and consumption patterns as well as unplanned development activities are placing increasing pressure on island ecosystems, causing a wide range of problems. Globally, it was estimated that, about two-thirds of the world's population live in coastal areas, and within three decades, 75 per cent of the world population will reside in coastal areas. These problems range between environmental degradation, biodiversity loss and deforestation, leading ultimately to the breakdown of socioeconomic systems. Such a pressure on coastal areas poses increasing threats to coastal ecosystems as they exceed the carrying capacity of these areas and leads usually to degradation of their resources and environmental quality in general (UNEP). This accordingly, emphasizes the need for sustainable development on islands. According to sustainable development, economic growth and environmental protection are viewed as mutually comparable activities and not conflicting ones. This in turn requires that various human activities must be integrated within a coherent setting of land-use planning policies, addressing problems of environmental carrying capacity. They also should be planned and developed within the limits of the local socioeconomic and natural carrying capacities.

A9.1.2. Objective of the Guide

Basically, the underlying purpose of this Guide is to provide conceptual and practical guidelines on how to conduct a reliable assessment of prevailing socioeconomic conditions for developmental proposal applications, in consistent format. It should be noted that the proposed consistent data collection and presentation format is intended to enable clear monitoring and evaluation to support State of the Coast reporting in the coming years and for improved data on socio-economic factors to be easily updated which in turn, may help the update of land use policies in the future.

A9.2. What is a Socio-economic Assessment?

A9.2.1. Definition and Purpose

The socio-economic environment refers to a wide range of diverse aspects and variables relating to or involving a combination of social and economic factors. These in general, can be categorized into several categories including, economic, demographic, public services, fiscal and social. The social aspects may, for instance, involve community island life as well as social and cultural attitude and values. Community services may meanwhile be concerned with housing and requirements for public services such as water, sanitation, communications, police and fire protection facilities, solid waste disposal as well as health and educational services. Demographic aspects may include population growth structures, distribution and density. Similarly, economic factors may include general characteristics, structures and changes various economic activities and employment.

A socioeconomic assessment is a way to learn about the social, cultural, economic and political conditions of stakeholders including individuals, groups, communities and organizations. The socioeconomic “situational analysis” is intended to:

- Assess the prevailing socioeconomic conditions. This includes provision of a baseline study and characterizing the existing state. This will assist in identifying the main areas of concern.
- Analyze the impacts of the prevailing environmental conditions on the socioeconomic structure of the proposed development area.
- Develop a set of guidelines for establishing viable communities.

Accordingly, the following section is concerned with listing all possible socioeconomic impacts and the indicators used to estimate their magnitude. This is followed by a general discussion of the methodology usually employed in conducting a socioeconomic analysis. Based on this methodology, an operational work plan is provided for the actual implementation of such socioeconomic analysis to be then used for insertion within future State of the Coast reports.

A9.2.2. Possible Socioeconomic Impacts

Generally, it should be stated that socioeconomic conditions are usually hard to identify and assess, as they are related to the human beings and their characteristics, which usually differ widely within the same community and from one community to another. Furthermore, as socioeconomic assessment deals with dynamic variables, no comprehensive list of areas of concern could be developed to fit socioeconomic assessment in all cases. However, there is a number of broad sets of socioeconomic impacts could be developed including economic impacts, demography; employment, health, and community resources including political, social, economic and cultural conditions (See Table 2.1).

Impact area	Indicators
Economic conditions	<ul style="list-style-type: none"> • Economic structure • Income levels • Job opportunities
Community structure, institution and infrastructure	<ul style="list-style-type: none"> • Health and social services in study area, including health, workforce, law enforcement, fire protection, water supply, wastewater treatment facilities, solidwaste collection and disposal, and utilities. • Transportation systems in study area, including highway, rail, air, and motorway • Tourism and recreational opportunities in the study site • Tax levels and patterns in the study area, including land, sales, and income taxes • Institutional structure • Community cohesion, including organized community groups • Social orders including community attitudes, lifestyle and history of the community • Distinct settlements of ethnic groups
Demographic conditions	<ul style="list-style-type: none"> • General trends in population size for study site • Migration trends in the study area • Population characteristics in the study area including distribution by age, gender, ethnic groups, educational level and family size • poverty and wealth distribution
Employment	<ul style="list-style-type: none"> • Employment composition • Unemployment rate • Availability of job opportunities and their nature

Gender	<ul style="list-style-type: none"> • Gender distribution • Employment structure • Role of women
Community resources	<ul style="list-style-type: none"> • Land use patterns and controls for study site • Land values in the study area • Housing characteristics in the study area, including types of housing and occupancy levels and age and condition of housing • Areas of unique significance

Table Annex 9.1: Indicators for socioeconomic impacts

A9.2.3. The Questions to Answer

The following questions may be used to help support CZMU to help coordinate the collection of information by other agencies. The questions refer to a “location” which is a loose term that may be used to relate to a specific geographic location (ICZM Plan Sub-Area), a sector or a new policy, plan or development proposal.

Economic Impacts:

- What are the main characteristics of the locations economic structure and how does it contribute to Barbados’ overall economic income?
- How does such an economic structure affect or be affected by the environmental quality of the location?
- How would local business be affected by rapid growth resulting from the development of the location?

Community structure, institutions, and infrastructure

- How are the locations communities organized, both formally and informally?
- What are the employment and economic dimensions of each social grouping?
- What are the existing economic, social, or cultural inequities among groups, if any, and what are their causes?
- What experience do various groups have with induced change?
- What changes in these variables may be caused by alternative scenarios for socio-economic development?
- What factors influence the daily lives of potentially affected members of the community?
- How stable is the pattern of residence?
- Do people in different groups feel that they currently have a satisfying way of life?
- What attitudes do people have toward risk, health, safety, and toward alternative scenarios for socio-economic development?
- How available are community services and infrastructure? And how will their provision and availability be affected in the future (i.e.: by climate change?).

Demography

- What are the demographic characteristics of the community? And to what extent are they affected by the prevailing environmental conditions?
- What is the current structure and organization of the population? Is it stable or changing?
- Are there ethnic, economic, or social group distinctions within this population?
- What are the patterns of poverty and wealth, and income distribution among the population?

Employment

- What is the existing employment composition?

- What is the magnitude and composition of the unemployed?
- What are the types and characteristics of primary and secondary job opportunities that are expected to be created?
- Are there seasonal changes, or other kinds of influx and outflow?

Gender

- What is the existing gender distribution of the population?
- What is the existing gender structure of employment and unemployment?
- What are the social and economic roles played by women in the community?
- What is the role of women, if any, in the existing decision making system?
- How are power and authority distributed in the community, both formally and informally?
- Who are the relevant stakeholders? What are their interests?
- How do they organize and exercise power within the community and at the regional and national levels?

Community Resources

- How do people use the land, whether urban or rural? Are there conflicts between these different land uses?
- How do they use the natural environment (land and reef area)?
- Are there culturally valued neighbourhoods, shopping areas, recreational areas, or gathering places?
- Are there culturally valued patterns of social formal and/or informal groups?
- Are there valued historic places, archaeological sites, or historical artifacts?

A9.3. Recommended Approach

For a socioeconomic “profile” to be organized and conducted properly, it should be systematic, and have minimum bias, and allow for consistent comparison and reasoned judgment. For all this to be accomplished, carefully planned, very precise and logical work methodologies are usually developed. The approach consists of three main sections as shown in Figure 3.1.

A9.3.1. Location Profiling

The first section aims to provide a comprehensive profile for the location and develop criteria for socioeconomic assessment. This could be attained through develop a thorough background about both coastal areas considerations and socioeconomic assessment.

A9.3.2. Conducting New Assessments

The second section deals with conducting the island socioeconomic assessment, which begins with the identification of main issues at the location and followed by identification by of main positive and negative socioeconomic aspects.

Listing Impacts

Criteria for socioeconomic assessment should be firstly developed. The development of such criteria should be based on the list of socioeconomic impacts and indicators. However, the specific features of each location should be carefully taken into account in listing all possible impacts areas. The socioeconomic assessment should identify all possible impacts. In order to take account of all possible impacts, there is a number of “Impact identification” approaches (methods) including:

- Checklists.
- Matrices
- Networks
- Overlays and geographical information systems (GIS)

Each of the above-mentioned methods has their own advantages and disadvantages. However, the suitable method should be carefully selected. The choice of impact identification methods depends upon the type of impacts being considered, the nature of the likely impacts and the experience of the staff.

Scoping of Impacts

As the number of potential impacts on any location is usually large, socioeconomic impacts should be scoped to focus on the most important impacts, both direct, and indirect. Scoping is carried out by identifying and assigning priority to socioeconomic impacts that might be examined within the context of the socioeconomic assessment.

Scoping must be carried out in consultation with the affected groups and through the public participation process, should be based on discussions of an agreed policy, goal, vision or scenario for the future. Parameters to consider may include:

- Number of people potentially affected;
- Duration of potential impacts;
- Values of benefits and costs to affected groups;
- Potential for reversibility or mitigation;
- Likelihood of subsequent impacts;
- Relevance to decisions;
- Uncertainties over probable effects;
- Controversy.

A9.3.3. Provide Guidelines

Field Surveys

It should be borne in mind that the implementation of the socioeconomic study involves a number of field work activities, which include field surveys to acquire data and information from primary sources. This data and information is mainly concerned with personal opinions, which cannot be obtained from secondary sources such as perceptions and opinions of the individuals about their concerns and future perspectives of the island. They will also be utilized in the verification of data and information obtained from secondary sources.

Depending upon the objective of the field survey, the techniques of data collection should be determined. Generally, there is a wide range of techniques for data and information collection from primary sources including personal interview, telephone interview and mailed questionnaire. This means that the procedures and output of these techniques should be reliable and well-adopted to the case in hand.

Considerable amounts of fieldwork with different population groups would require careful consideration of the right approaches; which include for example, social surveys, questionnaires, interviews, use of available statistics, the Delphi technique. This would require recognition and understanding of the relationships of peoples' perceptions, their realities and the structures within which they exist. The ultimate objective is not only to obtain the required data and information but also to get them involved in the assessment process. This means that the objectives of the field survey should be clearly identified, which is the first step of conducting a successful field survey.

Questionnaires

Concerning the questionnaire forms to be employed in such field surveys, they should be developed carefully taking into account a number of considerations which may include the following:

- The questions should be easily understood by the all individuals of the sample whatever their educational and cultural levels.
- The questions should be formulated to be accurately and clearly answered. This can be done through minimizing the open answer questions.
- The questions should be ordered so that the difficult and sensitive questions come later.
- The sensitive questions should be asked indirectly and their answers should be verified.

In order to ensure that the questionnaire is properly designed a pilot survey should be conducted with a feedback on the quality of questions, especially the difficult ones to understand ones. The pilot survey will include a number of questions, at the end of the primarily questionnaire to assess the reaction of those interviewed.

The outcome of this pilot survey will assist to review the questionnaire, and make adjustments, where needed. At this stage, the final questionnaire form will be ready and can be used to collect data and information. The form of survey to be conducted will depend upon direct interviews with the people in order to ensure high rate of response. It also helps to ensure the seriousness of the answers given by the interviewees. Moreover, the sensitivity of some questions and the need for clear, sharp and explicit answers to some questions compel the need for personal interview approach.

Also, as a result of the impossibility of investigating all the islands population, sampling methods will be useful to acquire data and information to save time, effort and fund. To ensure the representative of the sample, the sampling should be random. This will ensure that different socioeconomic groups are included in the sample. The best representativeness of the sample for the population can be considered as a function of sample size and sampling method. This means that the pre-determination of the sample size is meaningless. So the decision of the sample size should be taken during the carrying out of the survey, taking into account time, effort and fund limitations.

Involving Community Leaders

It should be noted that the involvement of communities' leader is of great importance to ensure the contacts with the target sample. Since the most socioeconomic aspects of the environment, and their magnitudes, exist largely in people's minds, interaction with affected communities and groups is essential. There are many methods of interacting with people and groups to learn about their society. A systematic interview program, working with group leaders and participant observation (in which the analyst lives as part of the community while studying how it works) are among the methods that can be employed. Still, the choice of methods will necessarily reflect not only available time and funds, but also reflect the kind of community affected.

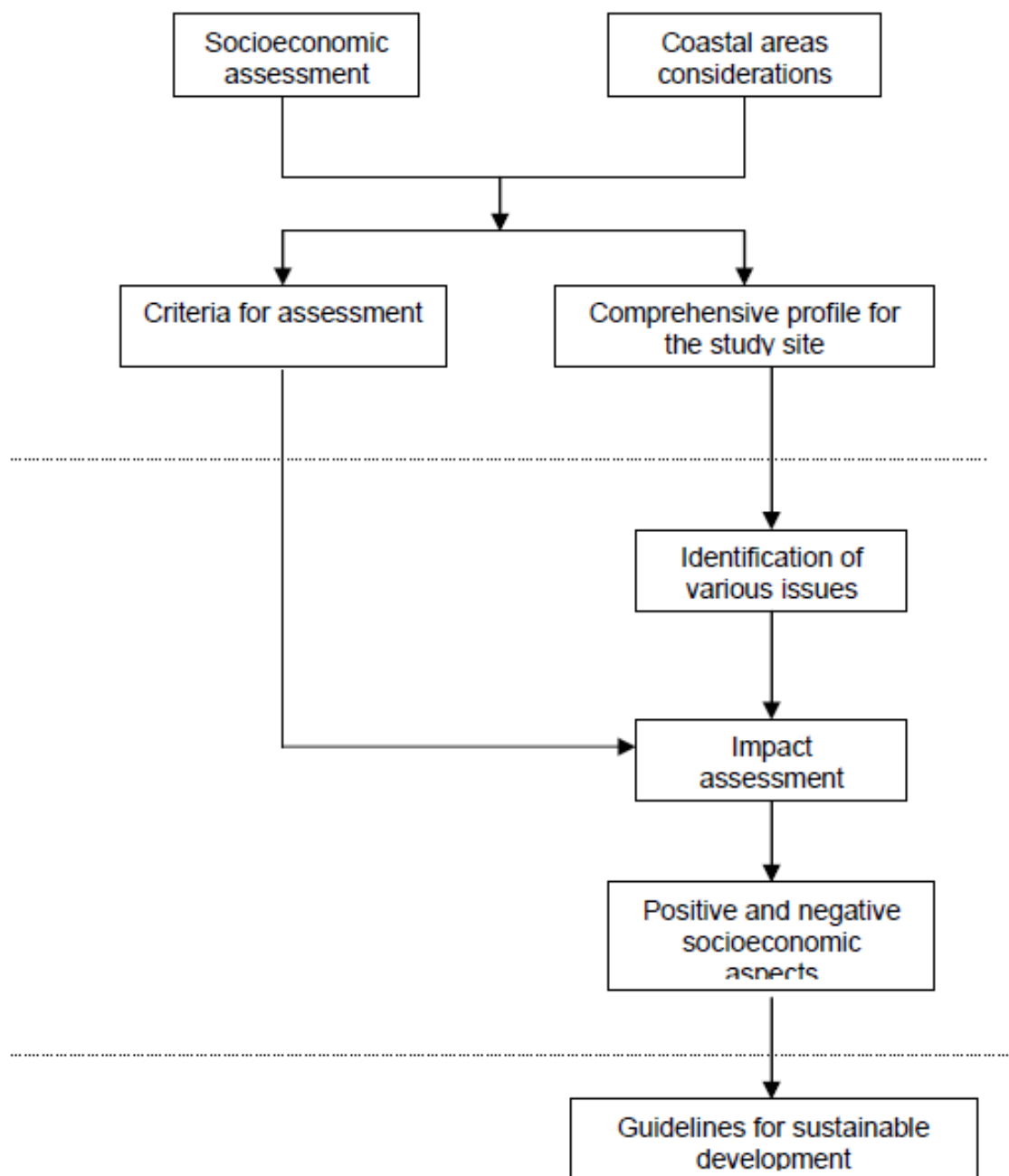


Figure Annex 9.1: Methodology for a Socioeconomic Study

A9.4. Work plan:

Based on the methodology presented above, a work plan for the socioeconomic study of any location should be developed to support future State of the Coast reporting. This work plan needs to include the following tasks and activities (Figure 4.1):

A9.4.1. Develop baseline conditions

This section can be considered as a preparatory work which includes the following steps:

Data and information collection from secondary sources

Materials; including statistics, research work, study reports, that may provide data and information about conditions in the island, have to be reviewed. This includes available data and information about various socioeconomic aspects, environmental quality and previous as well as current development schemes. It should be noted that various socioeconomic aspects of the location, have to be considered comprehensively without any bias towards any of the aspect.

As Census data is relatively inexpensive and highly reliable, Census represents one of the main secondary sources of data and information. Nevertheless, there should be certain problems that are generally associated with the use of data collected from secondary sources in general and census data in particular. These problems generally are related to:

- Changes in classification way of data and definitions of variables.
- Changes in boundaries of administrative units.

Therefore, these two issues should be taken into account in dealing with data from secondary sources

Develop a comprehensive profile

Depending upon the data and information that are collected from secondary sources, a comprehensive profile could be developed. The comprehensive profile should cover the following items:

- Boundaries of the island
- Past and present :
 1. Demographic structure.
 2. The economic structure.
 3. Social structure.
 4. Infrastructure provision.
- Development schemes in the island, past, present and future.

Usually, such a comprehensive profile is of great importance for the following steps of the study as it highlights the character and the main features of the island.

Develop a set of criteria for assessment

A comprehensive list of all possible socioeconomic impacts and indicators should be developed, based on the provisional list described before in the Guide. Thereafter, these impacts should be scoped to focus on the most important impacts to be dealt with within the context of the socioeconomic assessment.

A9.4.2. Field work

The field work (if required or deemed necessary) would involve the following steps:

Identify required data and information

After scoping, the data and information from secondary sources about the location and the previous development schemes should be reviewed to identify the gap of information to be collected from primary sources.

Conducting field surveys

After the identification of gaps in the required data and information, field surveys would be planned. This would require also the identification of the target population and sampling techniques.

A9.4.1.1. Designing a questionnaire form

Such a questionnaire will have to be designed in such a way that takes into account the type of people to be covered by the survey, in terms of educational status, culture, and attitude. This aspect is very important in order to end up with the right answers needed for this research work and avoid any possible biases.

A9.4.1.2. Pilot survey and feedback

In order to ensure the effectiveness and adequacy of the designed questionnaire forms, pilot survey would be conducted. The main objectives of conducting these pilot surveys is to fine tune them to attain their objectives most effectively.

A9.4.3. Data analysis and socioeconomic assessment

This section of the socioeconomic study will include the socioeconomic assessment of the island depending upon the analysis of the data and information collected from primary and secondary sources.

Data entry and verification

Dealing with large amount of data requires a systematic approach for data coding, tabulating and entry. It should be noted that, before data entry, the collected data should be verified. Such verification could be carried out for all collected data or for the random sample of the data. This depends usually on the quality of the procedures of data collection.

Data analysis

Analysis will involve standard statistical analysis of the data and information collected. The analysis should be based upon the criteria developed before.

Socioeconomic impacts assessment and identification of main areas of concern

One of the main objectives of socioeconomic assessment is to identify various socioeconomic positive and negative impacts. The socioeconomic impacts assessment should highlights possible relationships between assessed socioeconomic variables and the environmental quality in the island. Such an assessment could guide the following step of the work. Also, the areas of concern (issues and opportunities) of socioeconomic structure of the location have to be identified.



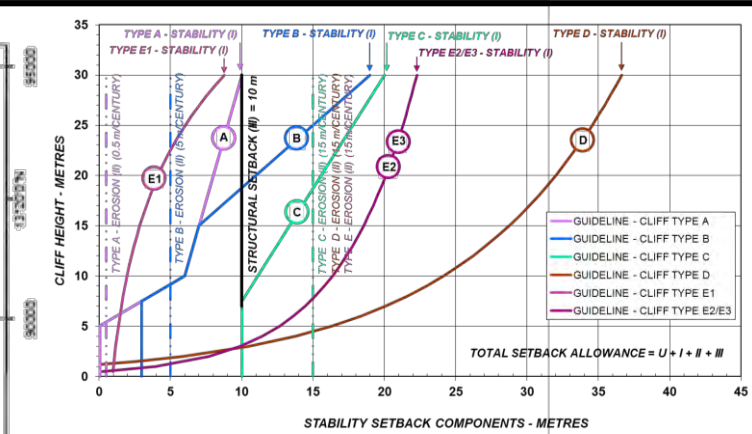
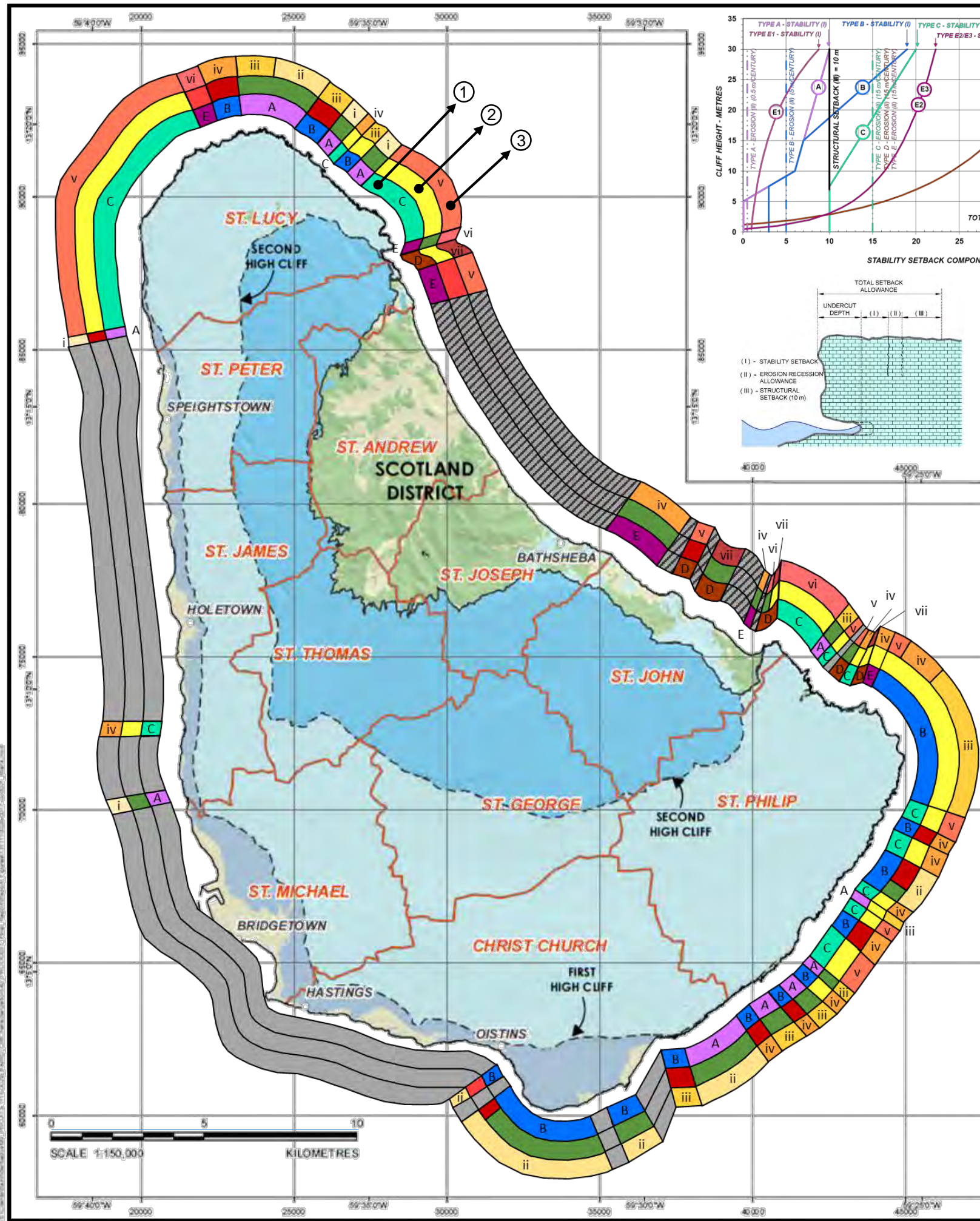
Figure Annex 9.2: Proposed WorkPlan of a Socioeconomic study

ANNEX 10. COASTAL CLIFF CLASSIFICATION, SETBACK AND RISK FROM GSI STUDY

This Annex provides information extracted from the Geotechnical Survey Investigation (GSI) study (Golder Associates 2017), including:

- First, a set of maps including (i) a national map that represents the coastal cliff classification, setback and risk along the coast of Barbados; and (ii) the Coastal Cliff Classification Map Series 003 (extracted from Appendix R of GSI report) with local scale maps showing the extent of cliff setbacks.
- Finally, the guidelines for development in cliff areas around the island (extracted from section 6.9 of the GSI report).

A10.1. Maps: coastal cliff classification, setback and risk.



SETBACK CATEGORY	TOTAL SETBACK (m) (I + II + III)
i	18.0
ii	20.0
iii	25.0
iv	35.0
v	45.0
vi	55.0
vii	65.0

TYPE A CLIFFS		
UNDERCUT DEPTH	HIGH STRENGTH	LOW STRENGTH
<1 m	A0a	A0b
1 to 2 m	A1a	A1b
2 to 4 m	A2a	A2b
4 to 7 m	A3a	A3b

TYPE B CLIFFS		
UNDERCUT DEPTH	HIGH STRENGTH	LOW STRENGTH
<1 m	B0a	B0b
1 to 2 m	B1a	B1b
2 to 4 m	B2a	B2b
4 to 7 m	B3a	B3b

TYPE C CLIFFS		
CLIFF HEIGHT	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE D CLIFFS	
CLIFF TYPE	CLIFF DESCRIPTION
D1	TRANSLATED LIMESTONE BLOCK(S)
D2	D1 CLIFFS OVER OCEANICS OR OTHER SCOTLAND DISTRICT "ROCKS"
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT "ROCKS" (BOULDER BLOCKS)

TYPE E CLIFFS	
CLIFF TYPE	CLIFF DESCRIPTION
E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT "ROCKS"
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT "ROCKS" (BOULDER BLOCKS)

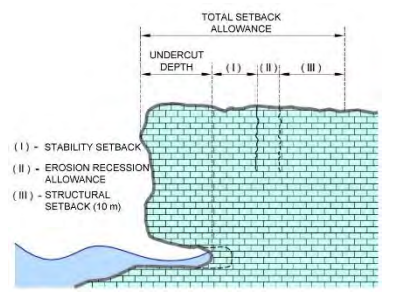
RISK CLASS	PROBABILITY OF FAILURE	MIN FoS
Very High	>50%	<1.0
High	30-50%	1.1
Medium	8-30%	1.3
Low	<8%	>1.5

STABILITY SETBACK (I): UDEC ANALYSES RESULTS

EROSION RATES (II): TYPE A: 0.5 m in 100 years
TYPE B: 5 m in 100 years
TYPE C: 15 m in 100 years
TYPE D: 15 m in 100 years
TYPE E: 15 m in 100 years

STRUCTURAL SETBACK (III): 10 m FOR ALL CLIFFS

TOTAL SETBACK = U + I + II + III

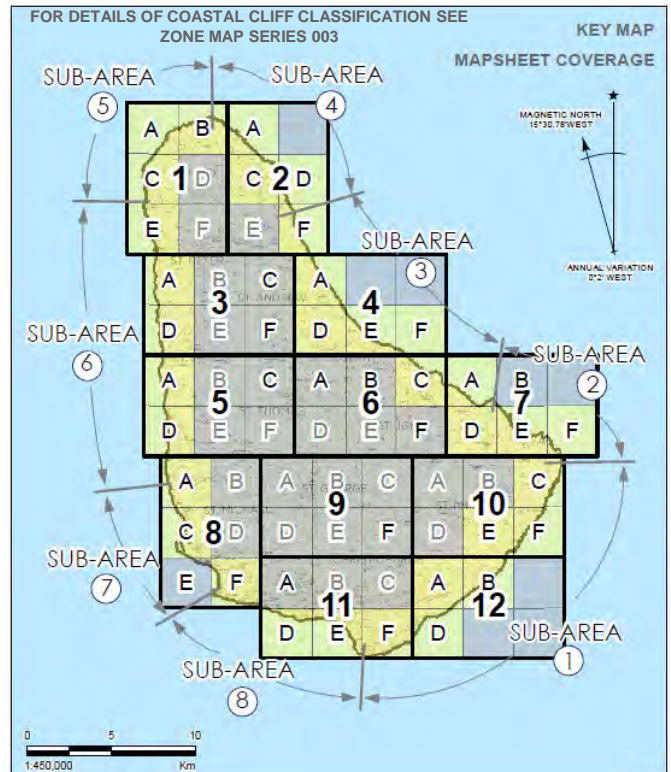


- LEGEND**
- PARISH BOUNDARY
 - GEOLOGY**
 - FIRST AND SECOND HIGH CLIFF
 - QUATERNARY SEDIMENTS
 - PLEISTOCENE LIMESTONE**
 - CORAL ROCK - UPPER REEF TERRACES
 - CORAL ROCK - MIDDLE REEF TERRACES
 - CORAL ROCK - LOWER REEF TERRACES
 - TERTIARY FORMATIONS**
 - MUDSTONES, SHALES, SANDSTONES, CHALK

NOT CLASSIFIED
NO CLIFFS IN THIS AREA; SEE NOTE 8.

- ① Morphology
- ② Risk
- ③ Total Setback

- REFERENCE(S) AND NOTE(S)**
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS).
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 - CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m AND 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELVDREN, SEPTEMBER 2014 TO JANUARY 2015.
 - LIDAR IMAGERY COLLECTED/PROCESSED BY PELVDREN SEPTEMBER 2014 TO JANUARY 2015.
 - NO CLIFFS IN THIS AREA; GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAIRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURE(S).
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BEACH.
 - WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 150 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAP PROJECTION: BARBADOS NATIONAL GRID 1938.



CLIENT

Coastal Zone Management Unit
8th Floor Warrens Tower
Warrens, St. Michael
Barbados
www.coastal.gov.bb

PROJECT
GEOTECHNICAL SURVEYS INVESTIGATION (GSI) ASSESSMENT REPORT
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE
CLIFF AREAS - GENERAL COASTAL CLIFF CLASSIFICATION, SETBACK AND RISK

CONSULTANT

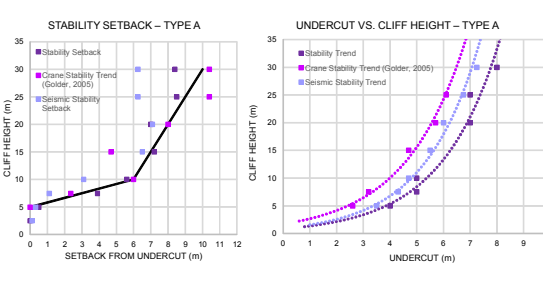
YYYY-MM-DD	MARCH 2017
DESIGNED	CGE/PR
PREPARED	AB
REVIEWED	TGC
APPROVED	TGC

PROJECT NO. 1311110029 **CONTROL** **REV.** **FIGURE** 34

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM...

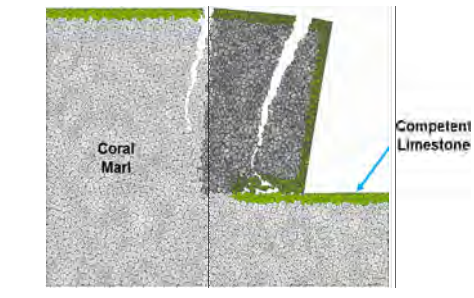
TYPE A

TYPE A STABILITY SETBACK AND RISK ASSESSMENT



CLIFF HEIGHT	UNDERCUT DEPTH (m)			
	A0 <1 m	A1 1-2 m	A2 2-4 m	A3 4-7 m >7 m
2.5 m	<1%	>50%	>90%	>90%
5 m	<1%	10%	>90%	>90%
7.5 m	<1%	<1%	>90%	>90%
10 m	<1%	<1%	21%	>90%
15 m	<1%	<1%	3%	>90%
20 m	<1%	<1%	<1%	27%
25 m	<1%	<1%	<1%	7%
30 m	<1%	<1%	<1%	2%

CLIFF HEIGHT	RISK CLASS RANKING			
	A0 <1 m	A1 1-2 m	A2 2-4 m	A3 4-7 m >7 m
2.5 m	HIGH	VERY HIGH	VERY HIGH	VERY HIGH
5 m	LOW	MEDIUM	VERY HIGH	VERY HIGH
7.5 m	LOW	LOW	VERY HIGH	VERY HIGH
10 m	LOW	LOW	MEDIUM	VERY HIGH
15 m	LOW	LOW	LOW	VERY HIGH
20 m	LOW	LOW	LOW	MEDIUM
25 m	LOW	LOW	LOW	LOW
30 m	LOW	LOW	LOW	VERY HIGH

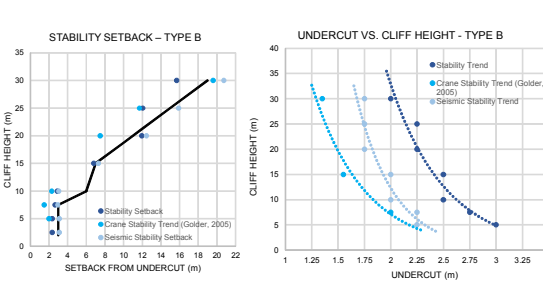


Competent Limestone	$M_t = \sigma_v / \sigma_c$	40.8
	Friction Angle	29.9°
	Cohesion (MPa)	4.12

Coral Mari	$M_t = \sigma_v / \sigma_c$	24.5
	Friction Angle	22.2°
	Cohesion (MPa)	2.06

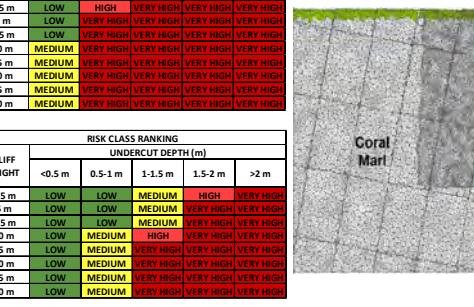
TYPE B

TYPE B STABILITY SETBACK AND RISK ASSESSMENT



CLIFF HEIGHT	UNDERCUT DEPTH (m)		
	B0 <1 m	B1 1-2 m	B3 2-4 m >7 m
2.5 m	3%	41%	>90%
5 m	4%	59%	>90%
7.5 m	6%	81%	>90%
10 m	9%	>90%	>90%
15 m	15%	>90%	>90%
20 m	22%	>90%	>90%
25 m	27%	>90%	>90%
30 m	26%	>90%	>90%

CLIFF HEIGHT	RISK CLASS RANKING		
	B0 <1 m	B1 1-2 m	B3 2-4 m >7 m
2.5 m	LOW	HIGH	VERY HIGH
5 m	LOW	VERY HIGH	VERY HIGH
7.5 m	LOW	MEDIUM	VERY HIGH
10 m	LOW	MEDIUM	VERY HIGH
15 m	MEDIUM	VERY HIGH	VERY HIGH
20 m	MEDIUM	VERY HIGH	VERY HIGH
25 m	MEDIUM	VERY HIGH	VERY HIGH
30 m	MEDIUM	VERY HIGH	VERY HIGH



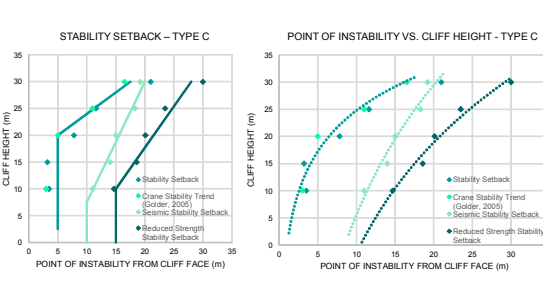
Competent Limestone	$M_t = \sigma_v / \sigma_c$	40.8
	Friction Angle	29.9°
	Cohesion (MPa)	4.12

Coral Mari	$M_t = \sigma_v / \sigma_c$	24.5
	Friction Angle	22.2°
	Cohesion (MPa)	2.06

Joint Sets:
1. 80° ~ 5 m spacing
2. 10° ~ 8 m spacing

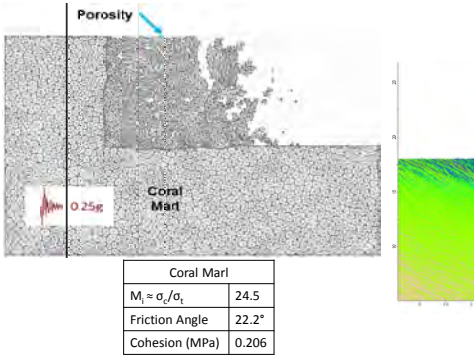
TYPE C

TYPE C STABILITY SETBACK AND RISK ASSESSMENT



CLIFF HEIGHT	POINT OF INSTABILITY FROM CLIFF FACE (m)				
	<5 m	5-10 m	10-15 m	15-20 m	20-25 m
2.5 m	21%	14%	9%	6%	5%
5 m	18%	12%	8%	6%	4%
7.5 m	17%	12%	7%	5%	4%
10 m	17%	12%	7%	5%	4%
15 m	27%	17%	9%	6%	4%
20 m	66%	55%	15%	8%	5%
25 m	>90%	>90%	36%	13%	7%
30 m	>90%	>90%	60%	25%	10%

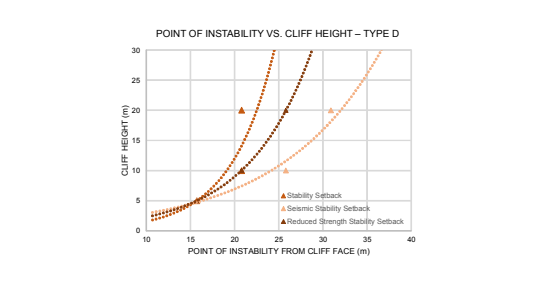
CLIFF HEIGHT	RISK CLASS RANKING				
	<5 m	5-10 m	10-15 m	15-20 m	20-25 m
2.5 m	MEDIUM	MEDIUM	MEDIUM	LOW	LOW
5 m	MEDIUM	MEDIUM	MEDIUM	LOW	LOW
7.5 m	MEDIUM	MEDIUM	MEDIUM	LOW	LOW
10 m	MEDIUM	MEDIUM	LOW	LOW	LOW
15 m	MEDIUM	MEDIUM	LOW	LOW	LOW
20 m	VERY HIGH	HIGH	MEDIUM	LOW	LOW
25 m	VERY HIGH	VERY HIGH	HIGH	MEDIUM	LOW
30 m	VERY HIGH	VERY HIGH	VERY HIGH	MEDIUM	MEDIUM



Coral Mari	$M_t = \sigma_v / \sigma_c$	24.5
	Friction Angle	22.2°
	Cohesion (MPa)	0.206

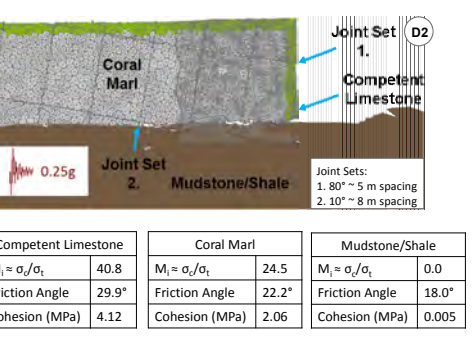
TYPE D

TYPE D STABILITY SETBACK AND RISK ASSESSMENT



CLIFF HEIGHT	POINT OF INSTABILITY FROM CLIFF FACE (m)			
	<15 m	15-20 m	20-25 m	>30 m
2.5 m	<1%	<1%	<1%	<1%
5 m	33%	<1%	<1%	<1%
7.5 m	>90%	12%	<1%	<1%
10 m	>90%	43%	2%	<1%
15 m	>90%	13%	2%	1%
20 m	>90%	>90%	32%	9%
25 m	>90%	>90%	51%	19%
30 m	>90%	>90%	67%	29%

CLIFF HEIGHT	RISK CLASS RANKING				
	<15 m	15-20 m	20-25 m	25-30 m	>30 m
2.5 m	LOW	LOW	LOW	LOW	LOW
5 m	HIGH	LOW	LOW	LOW	LOW
7.5 m	VERY HIGH	MEDIUM	LOW	LOW	LOW
10 m	VERY HIGH	HIGH	LOW	LOW	LOW
15 m	VERY HIGH	VERY HIGH	MEDIUM	LOW	LOW
20 m	VERY HIGH	VERY HIGH	HIGH	MEDIUM	LOW
25 m	VERY HIGH	VERY HIGH	VERY HIGH	MEDIUM	MEDIUM
30 m	VERY HIGH	VERY HIGH	VERY HIGH	MEDIUM	MEDIUM



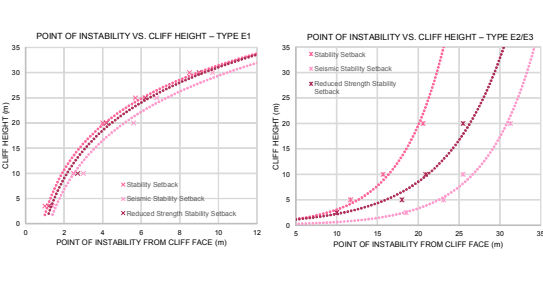
Competent Limestone	$M_t = \sigma_v / \sigma_c$	40.8
	Friction Angle	29.9°
	Cohesion (MPa)	4.12

Coral Mari	$M_t = \sigma_v / \sigma_c$	24.5
	Friction Angle	22.2°
	Cohesion (MPa)	2.06

Mudstone/Shale	$M_t = \sigma_v / \sigma_c$	0.0
	Friction Angle	18.0°
	Cohesion (MPa)	0.005

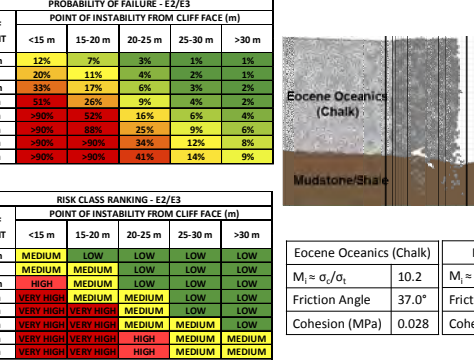
TYPE E

TYPE E STABILITY SETBACK AND RISK ASSESSMENT



CLIFF HEIGHT	POINT OF INSTABILITY FROM CLIFF FACE (m)				
	<1 m	1-3 m	3-5 m	5-7 m	>7 m
3.5 m	1%	<1%	<1%	<1%	<1%
5 m	2%	<1%	<1%	<1%	<1%
7.5 m	7%	<1%	<1%	<1%	<1%
10 m	26%	<1%	<1%	<1%	<1%
15 m	>90%	22%	<1%	<1%	<1%
20 m	>90%	>90%	7%	<1%	<1%
25 m	>90%	>90%	>90%	9%	<1%
30 m	>90%	>90%	>90%	>90%	16%

CLIFF HEIGHT	RISK CLASS RANKING - E1				
	<1 m	1-3 m	3-5 m	5-7 m	>7 m
3.5 m	LOW	LOW	LOW	LOW	LOW
5 m	LOW	LOW	LOW	LOW	LOW
7.5 m	LOW	LOW	LOW	LOW	LOW
10 m	MEDIUM	LOW	LOW	LOW	LOW
15 m	VERY HIGH	VERY HIGH	LOW	LOW	LOW
20 m	VERY HIGH	VERY HIGH	LOW	LOW	LOW
25 m	VERY HIGH	VERY HIGH	VERY HIGH	LOW	LOW
30 m	VERY HIGH	VERY HIGH	VERY HIGH	VERY HIGH	MEDIUM



Ecocene Oceanics (Chalk)	$M_t = \sigma_v / \sigma_c$	10.2
	Friction Angle	37.0°
	Cohesion (MPa)	0.028

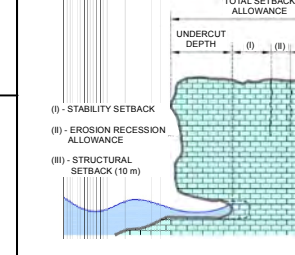
Mudstone/Shale	$M_t = \sigma_v / \sigma_c$	0.0
	Friction Angle	18.0°
	Cohesion (MPa)	0.005

2 COASTAL CLIFF RISK CLASSIFICATION

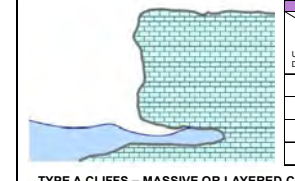
RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

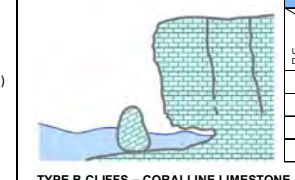
SETBACK GUIDELINE SCHEMATIC



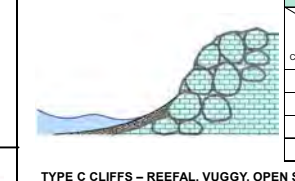
1 TYPICAL MORPHOLOGY



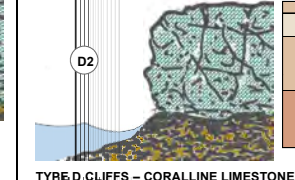
TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)



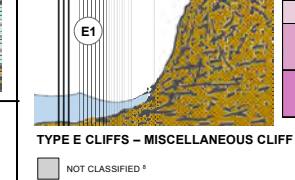
TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)



TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)



TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)



TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS



3 MINIMUM SETBACK LIMITS AND CATEGORY

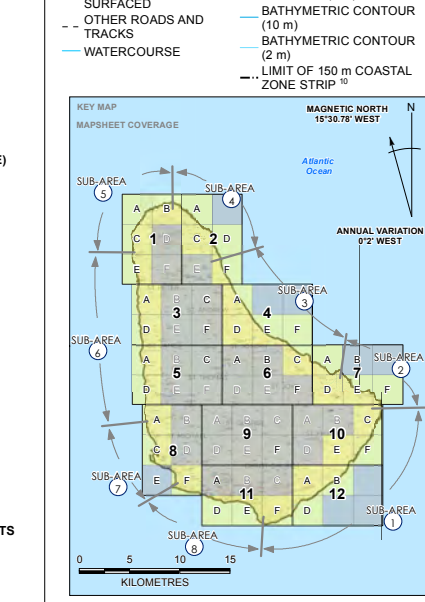
COMMON CLIFFS	SUBSETBACK CATEGORY			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIANS	ARCUTE OVERHANGS	CLIFF TYPE	
i	II	III	IV	18.0
ii	II	III	IV	20.0
iii	III	IV	V	25.0
iv	III	IV	V	35.0
v	IV	V	VI	45.0
vi	IV	V	VI	55.0
vii	IV	V	VI	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

TOPOGRAPHY

- SECONDARY ROAD, SURFACED
- OTHER ROADS AND TRACKS
- WATERCOURSE
- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP ¹⁰

KEY MAP



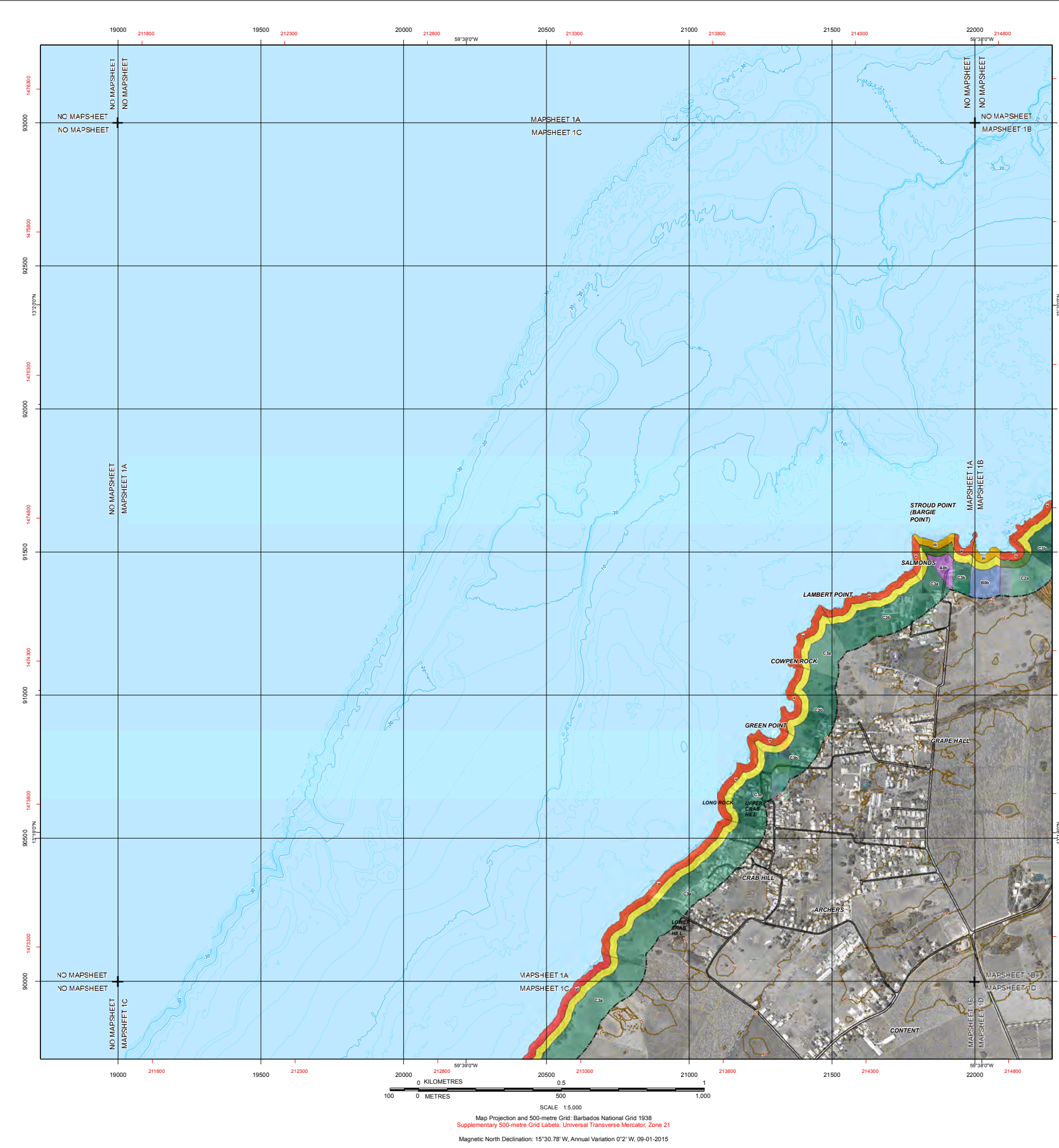
GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM CLIFF AREAS - COMPOSITE RISK CLASSIFICATION REFERENCE SHEET

REFERENCE(S) AND NOTES:
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELYDRIN, SEPTEMBER 2014 TO JANUARY 2015.
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELYDRIN SEPTEMBER 2014 TO JANUARY 2015.
 8. NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAND 1 MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAR.
 10. WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8 FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES	MAPSHEET	DATE
003	01	MARCH, 2017

Coastal Zone Management Unit
8th Floor Warrens Tower
Warrens, St. Michael
Barbados
www.coastal.gov.bb

Baird
Golder Associates

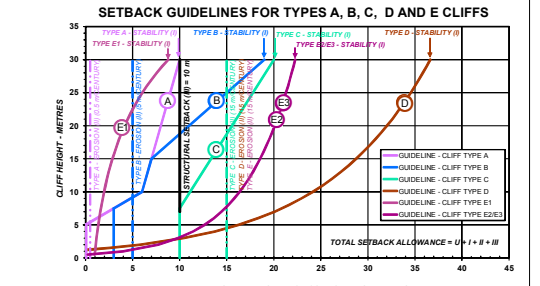
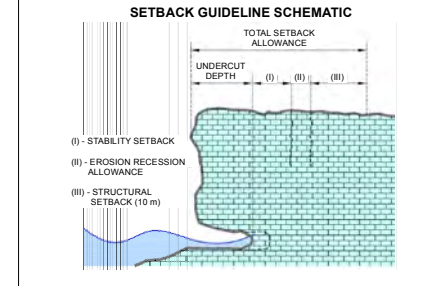


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS	
D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

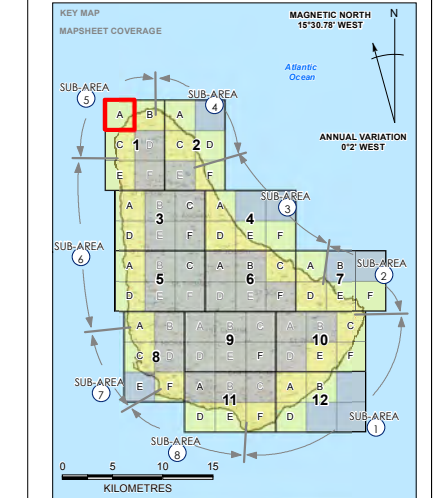
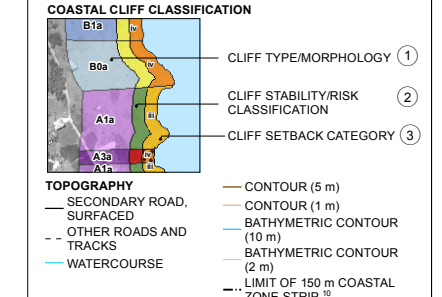
TYPE E - CLIFFS	
E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	CLIFF TYPE	
I	I	I	A	18.0
II	II	II	B	20.0
III	III	III	C	25.0
IV	IV	IV	D	35.0
V	V	V	E	45.0
VI	VI	VI		55.0
VII	VII	VII		65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

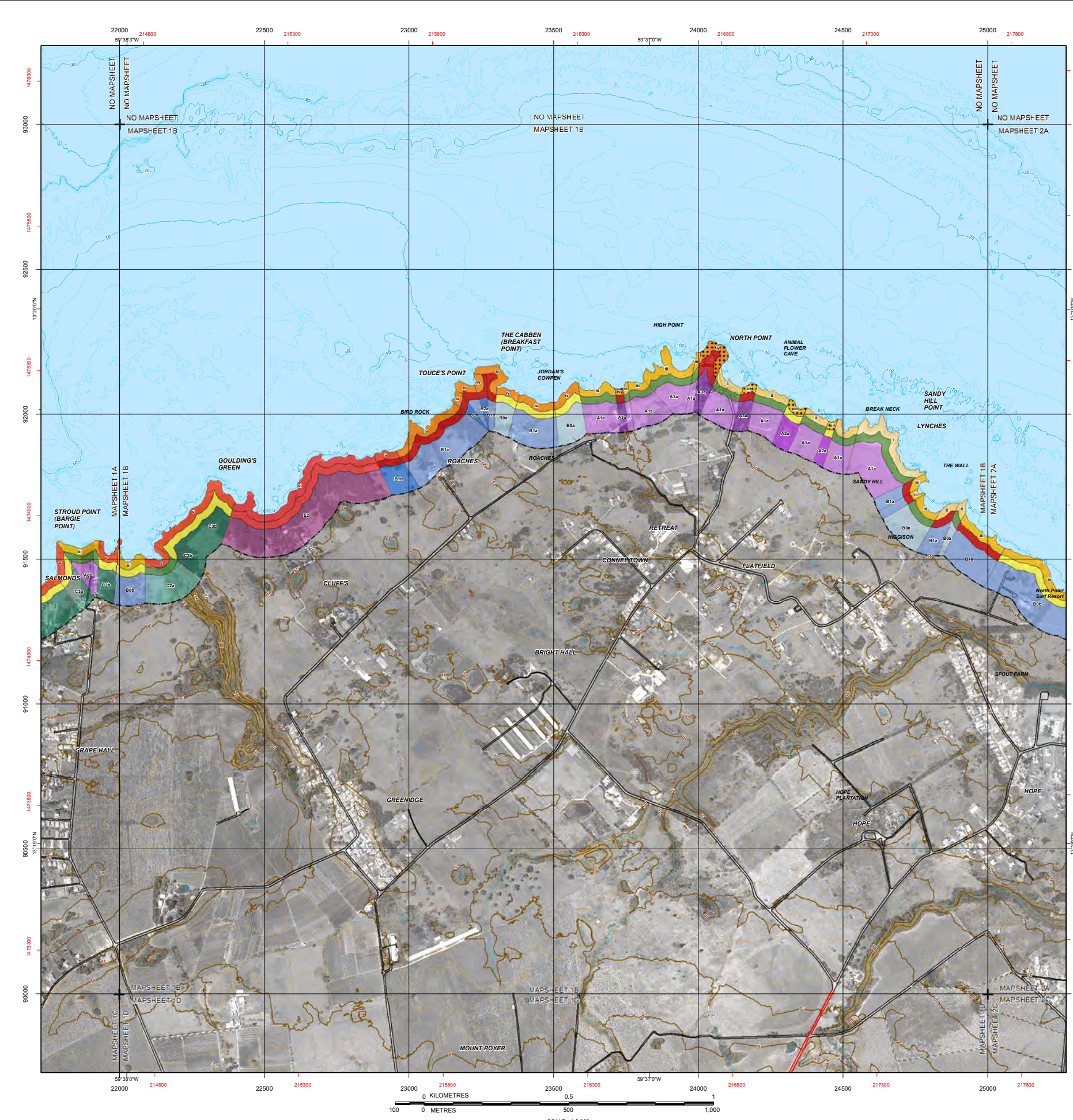
TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 5 - SHEET 1A

- REFERENCE(S) AND NOTE(S)
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
 - CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015
 - LIAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. (SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES).
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 1A DATE MARCH, 2017

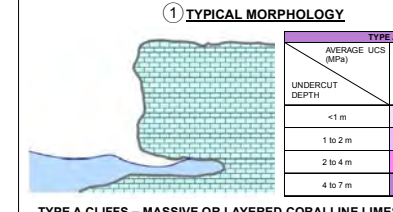
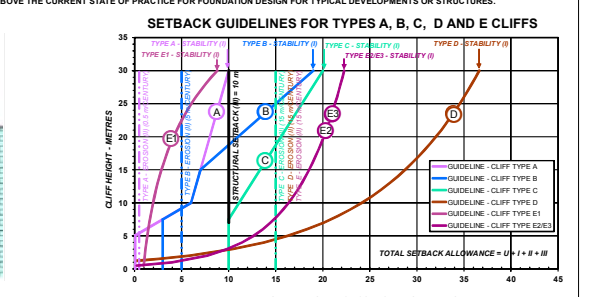
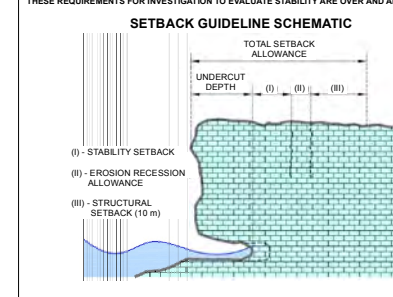
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Map Projection and 500-metre Grid: Barbados National Grid 1938
 Supplementary 500-metre Grid Labels: Universal Transverse Mercator, Zone 21
 Magnetic North Declination: 15°30.78' W, Annual Variation 0°2' W, 09-01-2015



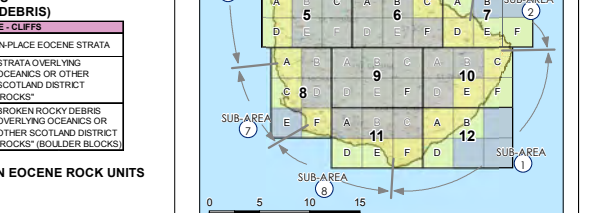
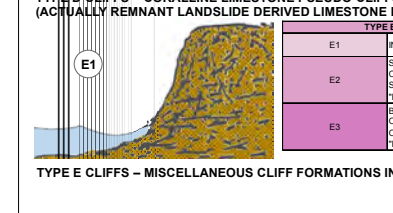
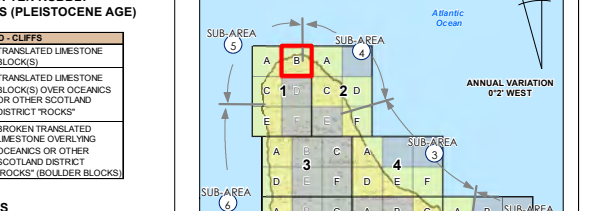
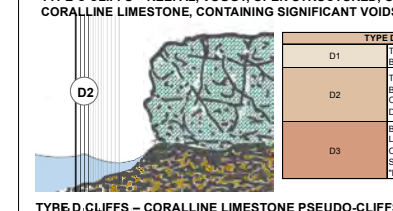
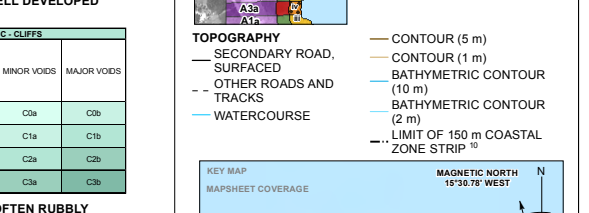
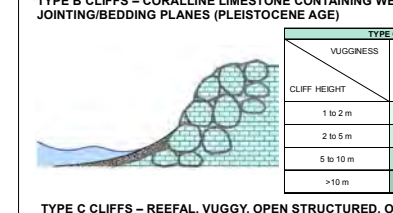
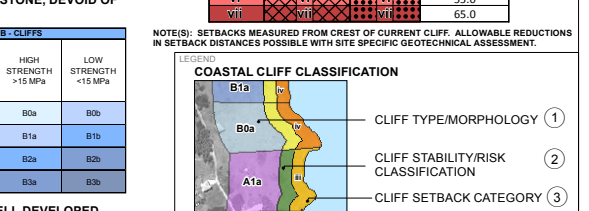
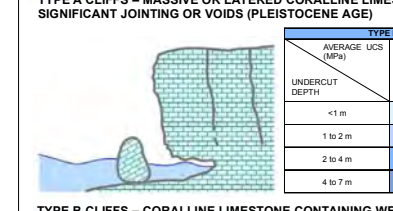
2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIANS	ARCuate OVERHANGS	OTHER	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 4 / 5 - SHEET 1B

REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDNER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYDRYN, SEPTEMBER 2014 TO JANUARY 2015
- LIAR IMAGERY COLLECTED/PROCESSED BY PELDYDRYN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAIROD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES: 003, MAPSHEET: 1B, DATE: MARCH, 2017

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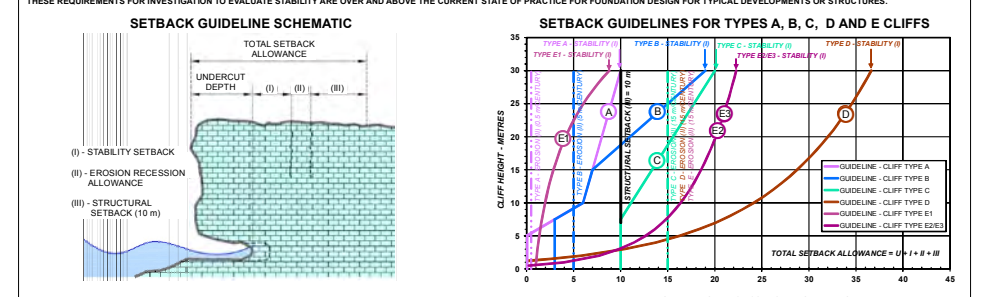
Baird **Goldner Associates**

Map Projection and 500-metre Grid: Barbados National Grid 1938
 Supplementary 500-metre Grid Labels: Universal Transverse Mercator, Zone 21
 Magnetic North Declination: 15°30.78' W, Annual Variation 0°2' W, 09-01-2015



2 COASTAL CLIFF RISK CLASSIFICATION

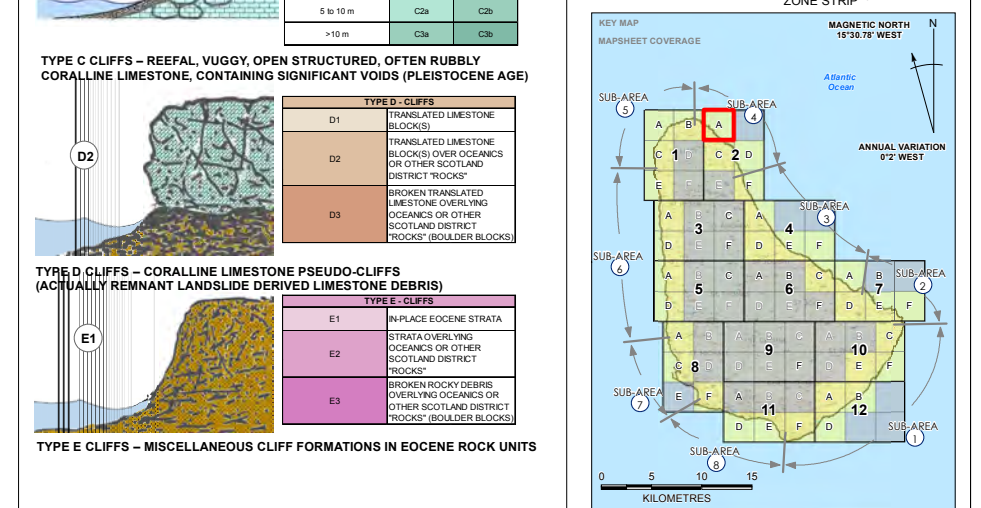
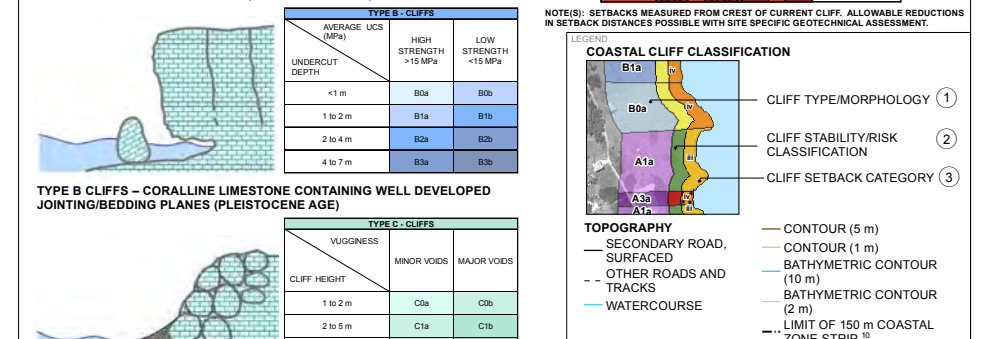
RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III)
	PROLETARIES	ARCuate OVERHANGS	CLIFF TYPE/MORPHOLOGY	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTES: SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 4 - SHEET 2A

- REFERENCE(S) AND NOTES:**
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 - CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDNER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015
 - LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. (SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES).
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 2A DATE MARCH, 2017

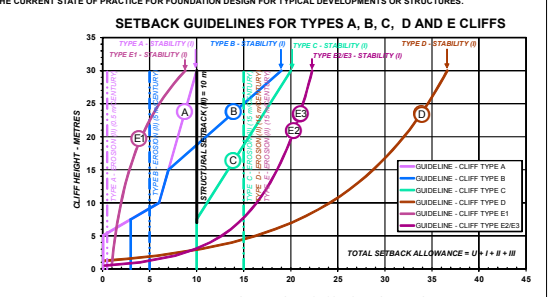
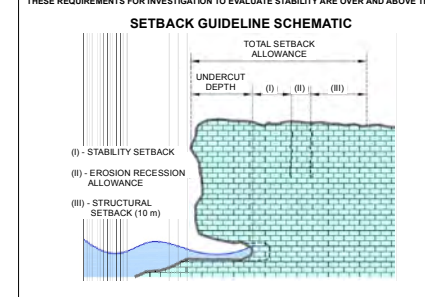
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2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

CLIFF HEIGHT	TYPE C - CLIFFS	
	WUGGNESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

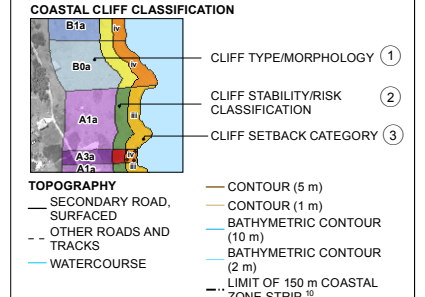
TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUBSETBACK CATEGORY			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM: GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

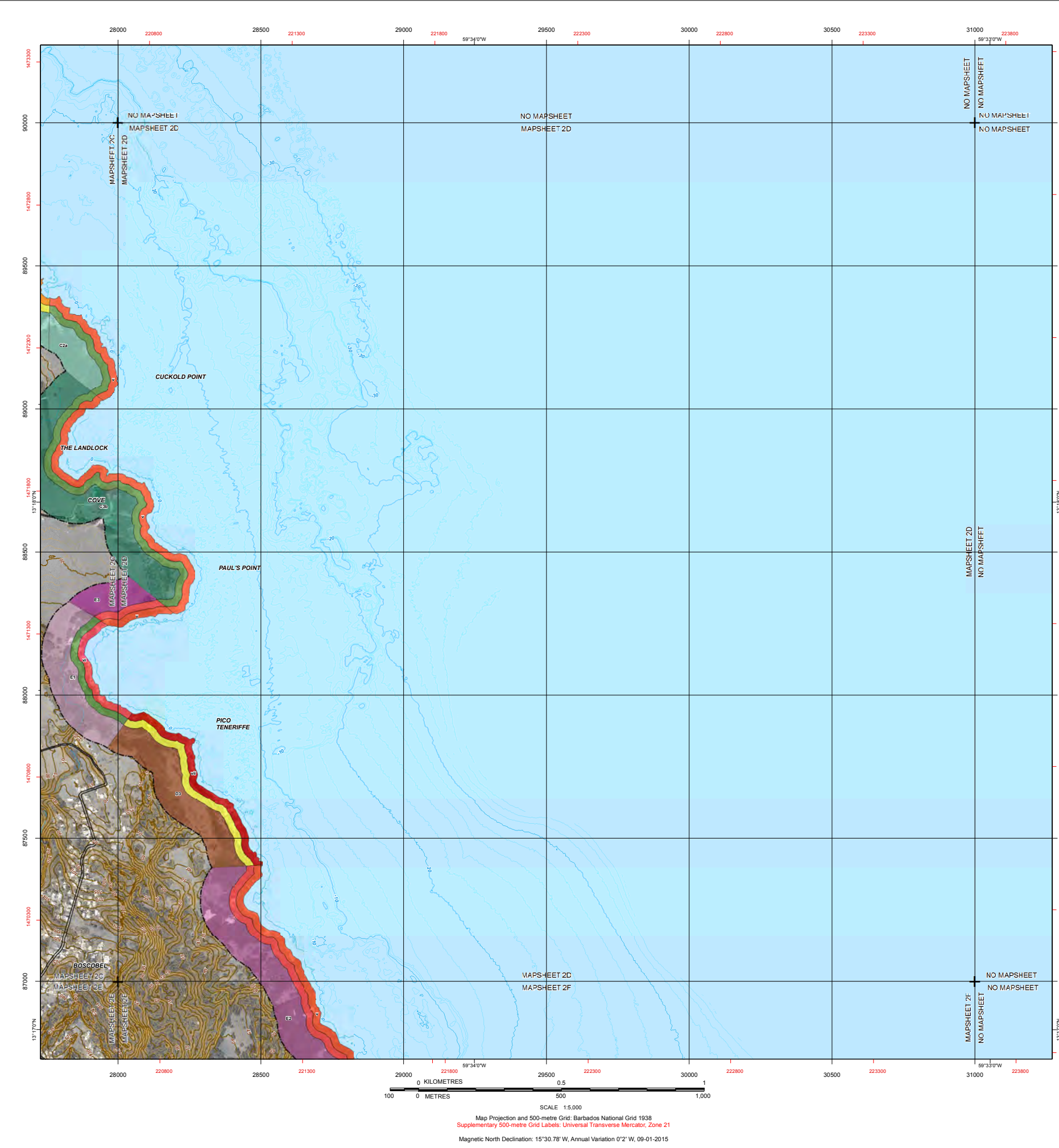
TITLE: COASTAL CLIFF CLASSIFICATION - SUB-AREA 4 - SHEET 2C

REFERENCE(S) AND NOTES:
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDNER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
 8. NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAYARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 10. WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES: 003 MAPSHEET: 2C DATE: MARCH, 2017

Coastal Zone Management Unit
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Barbados
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Baird **Golder Associates**

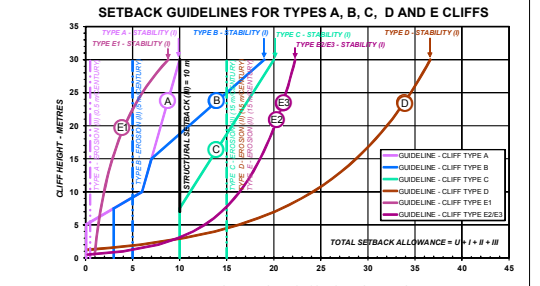
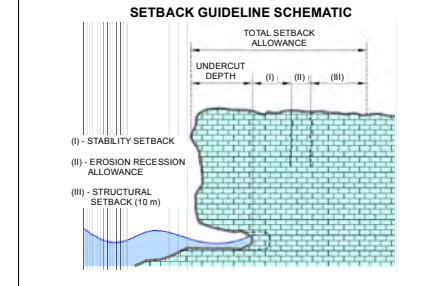


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS	
	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b
1 to 2 m	A1a	A1b
2 to 4 m	A2a	A2b
4 to 7 m	A3a	A3b

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS	
	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b
1 to 2 m	B1a	B1b
2 to 4 m	B2a	B2b
4 to 7 m	B3a	B3b

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

D1	TYPE D - CLIFFS	
	TRANSLATED LIMESTONE (BLOCKS)	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)
D1	D1	D1
D2	D2	D2
D3	D3	D3

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

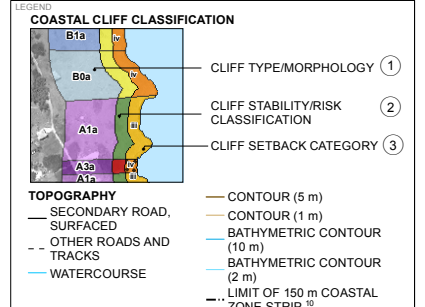
E1	TYPE E - CLIFFS	
	IN-PLACE EOCENE STRATA	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)
E1	E1	E1
E2	E2	E2
E3	E3	E3

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III)
	PROLETARIAN	ARCULATE OVERHANGS	ARCULATE OVERHANGS	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 4 - SHEET 2D

REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDYN, SEPTEMBER 2014 TO JANUARY 2015
- LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDYN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. (SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARDI MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES).
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES I AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8. FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 2D DATE MARCH, 2017

Coastal Zone Management Unit
 8th Floor Warrens Tower
 Warrens, St. Michael
 Barbados
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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS		
	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b	
2 to 5 m	C1a	C1b	
5 to 10 m	C2a	C2b	
>10 m	C3a	C3b	

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

D1	TYPE D - CLIFFS	
	TRANSLATED LIMESTONE (BLOCKS)	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	
D2		
D3		

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

E1	TYPE E - CLIFFS	
	IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	
E2		
E3		

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

REFER TO SCOTLAND DISTRICT MAP SERIES

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROMENTARIES	ARCuate OVERHANGS	TOTAL SETBACK	
I	I	I	18.0	
II	II	II	20.0	
III	III	III	25.0	
IV	IV	IV	35.0	
V	V	V	45.0	
VI	VI	VI	55.0	
VII	VII	VII	65.0	

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

LEGEND

COASTAL CLIFF CLASSIFICATION

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- - OTHER ROADS AND TRACKS
- BATHYMETRIC CONTOUR (2 m)
- WATERCOURSE
- LIMIT OF 150 m COASTAL ZONE STRIP¹⁰

KEY MAP

MAPSHEET COVERAGE

PROGRAM

GEOTECHNICAL SURVEYS INVESTIGATION (GSI)

COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE

COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 2F

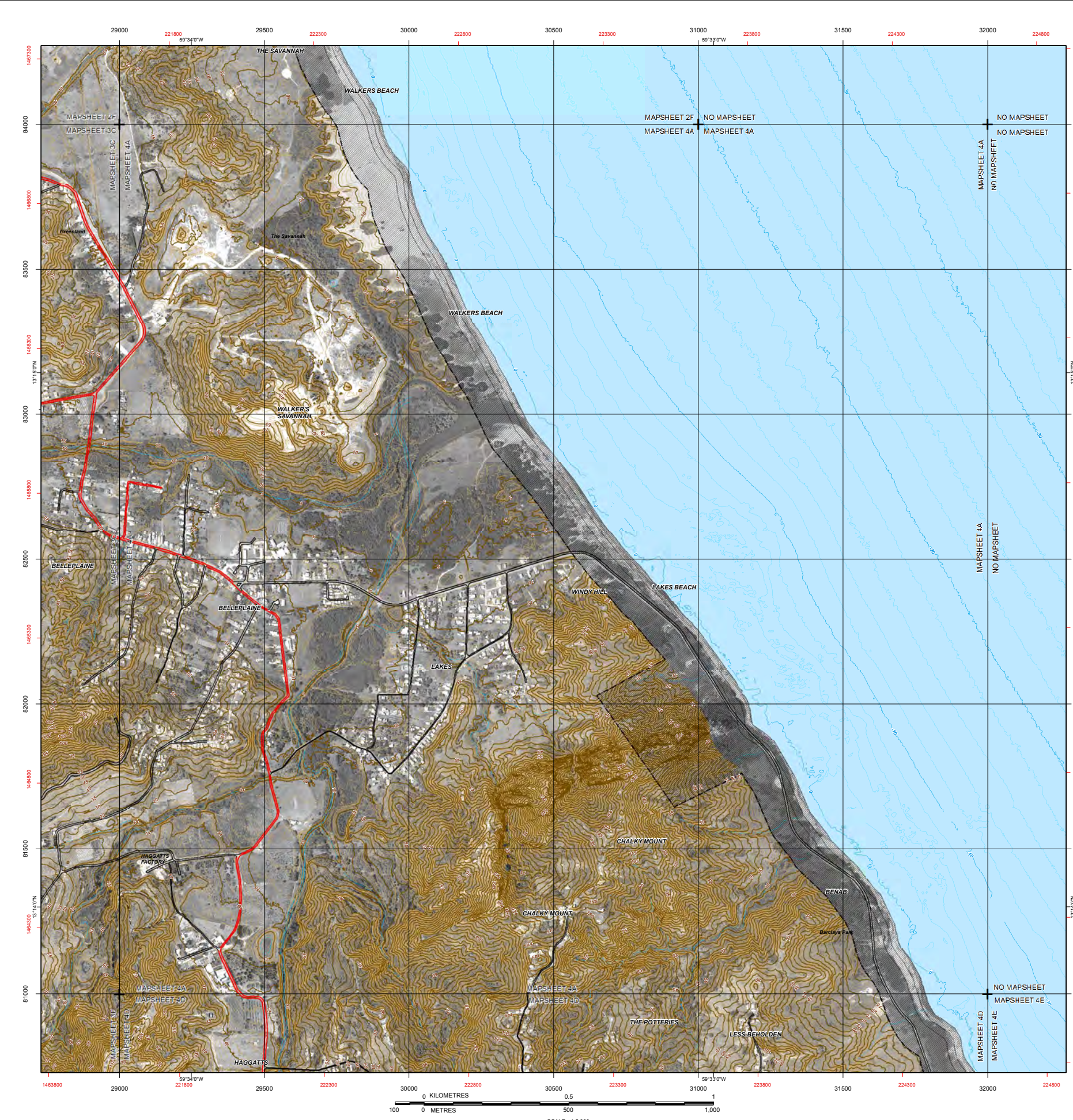
REFERENCE(S) AND NOTE(S)

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
- LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAIIRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES(S).
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 2F DATE MARCH, 2017

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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

TYPE A - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m		A0a	A0b
1 to 2 m		A1a	A1b
2 to 4 m		A2a	A2b
4 to 7 m		A3a	A3b

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

TYPE B - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m		B0a	B0b
1 to 2 m		B1a	B1b
2 to 4 m		B2a	B2b
4 to 7 m		B3a	B3b

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

TYPE C - CLIFFS

CLIFF HEIGHT	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m		C0a	C0b
2 to 5 m		C1a	C1b
5 to 10 m		C2a	C2b
>10 m		C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

REFER TO SCOTLAND DISTRICT MAP SERIES

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIES	ARCULATE OVERHANGS	SETBACK CATEGORY	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

LEGEND

COASTAL CLIFF CLASSIFICATION

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP

KEY MAP

MAPSHEET COVERAGE

PROGRAM **GEOTECHNICAL SURVEYS INVESTIGATION (GSI)**
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE **COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 4A**

REFERENCE(S) AND NOTE(S):

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
- LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARDI MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAR.
- WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 4A DATE MARCH, 2017

COASTAL ZONE MANAGEMENT UNIT
Coastal Zone Management Unit
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Barbados
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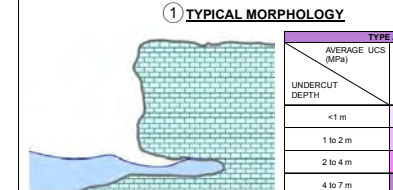
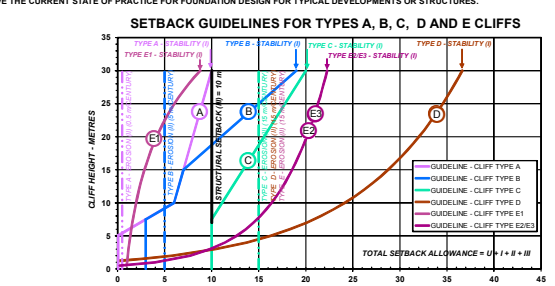
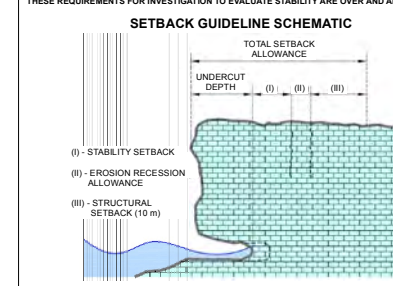
Baird **Golder Associates**



LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCuate	OVERHANGS	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

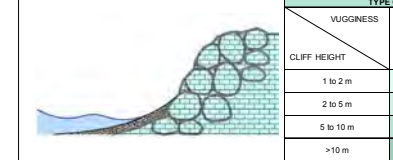
TYPE A CLIFFS – MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)



TYPE B - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m		B0a	B0b
1 to 2 m		B1a	B1b
2 to 4 m		B2a	B2b
4 to 7 m		B3a	B3b

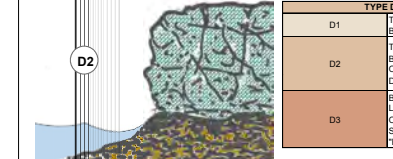
TYPE B CLIFFS – CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)



TYPE C - CLIFFS

CLIFF HEIGHT	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m		C0a	C0b
2 to 5 m		C1a	C1b
5 to 10 m		C2a	C2b
>10 m		C3a	C3b

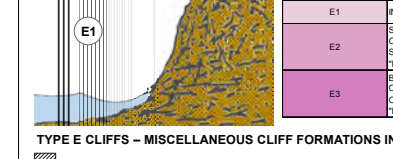
TYPE C CLIFFS – REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)



TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS – CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)



TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS – MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

PROGRAM: GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE: COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 4D

REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m AND 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDIER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
- LIAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPS FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
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- WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES: 003 | MAPSHEET: 4D | DATE: MARCH, 2017

Coastal Zone Management Unit
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Warrens, St. Michael
Barbados
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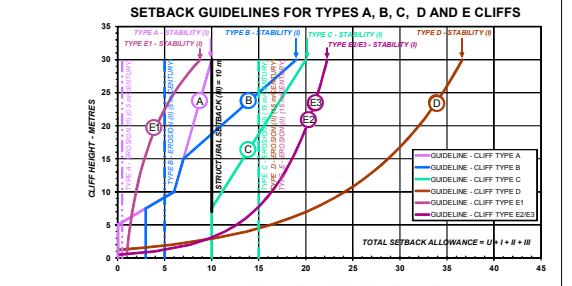
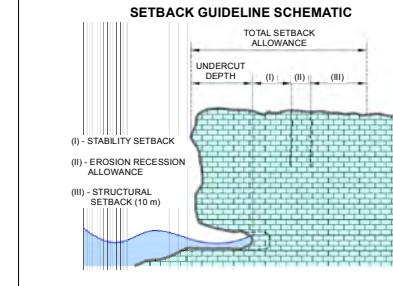


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	VUGGINESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

D	TYPE D - CLIFFS	
	D1	D2
	D3	D4
D1	TRANSLATED LIMESTONE (BLOCKS)	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D2	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	
D3		
D4		

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

E	TYPE E - CLIFFS	
	E1	E2
	E3	E4
E1	IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E2		
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	
E4		

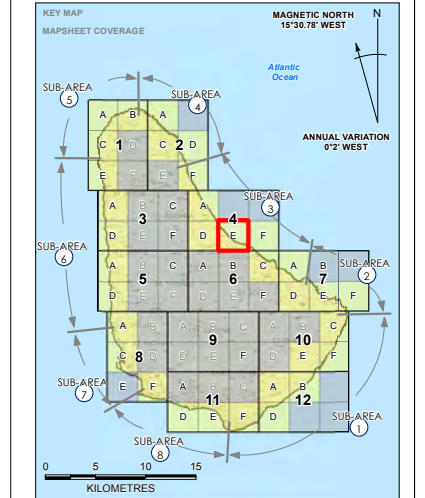
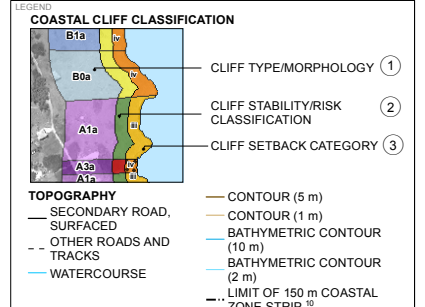
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

REFER TO SCOTLAND DISTRICT MAP SERIES

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIANS	ARCULATE OVERHANGS	OTHER	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

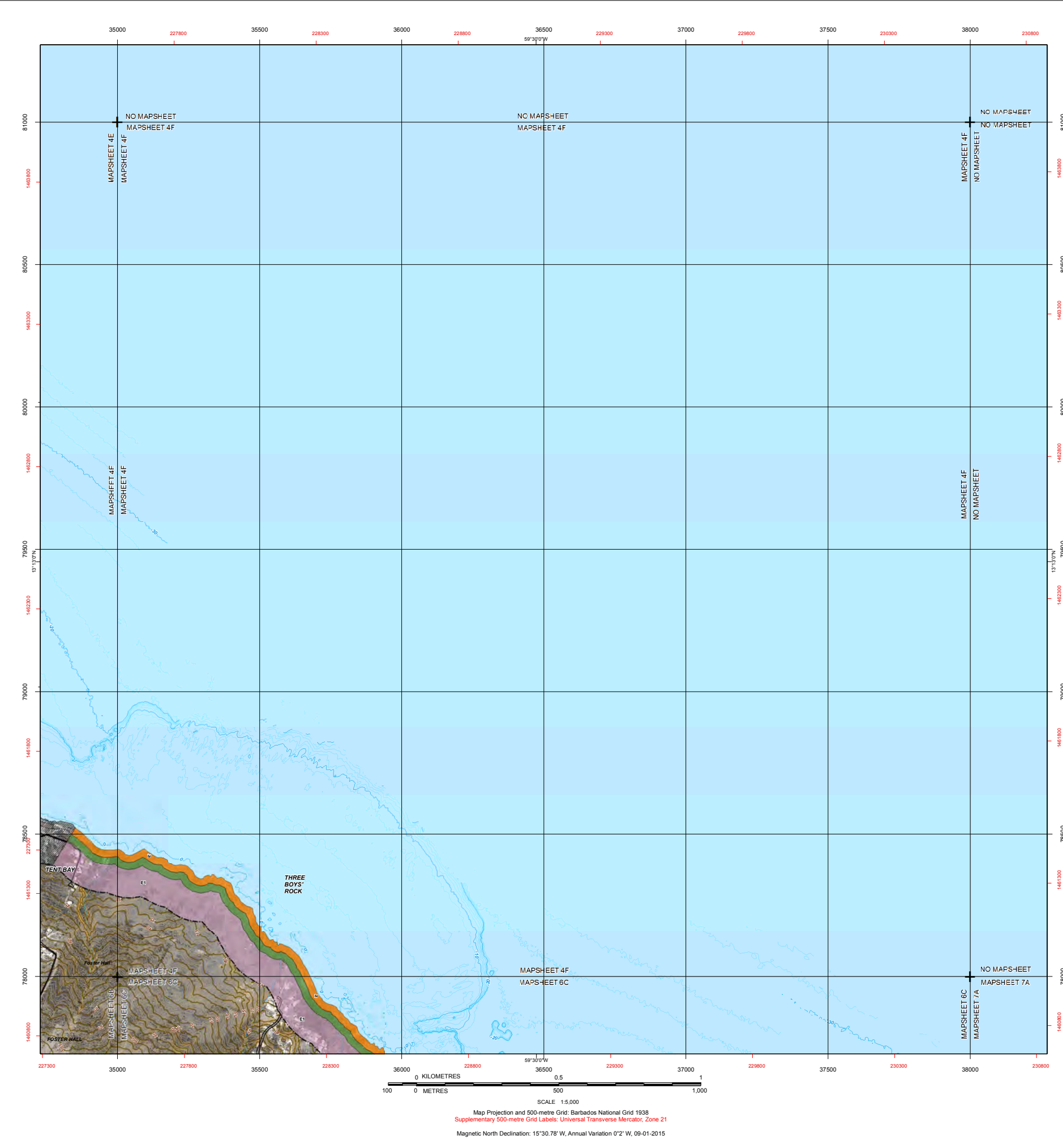
TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 4E

REFERENCE(S) AND NOTES:
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m AND 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015
 8. NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAIIRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 10. WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 4E DATE MARCH, 2017

Coastal Zone Management Unit
8th Floor Warrens Tower
Warrens, St. Michael
Barbados
www.coastal.gov.bb

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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

TYPE A - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE B - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE C - CLIFFS

CLIFF HEIGHT	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b	
2 to 5 m	C1a	C1b	
5 to 10 m	C2a	C2b	
>10 m	C3a	C3b	

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

REFER TO SCOTLAND DISTRICT MAP SERIES

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	TOTAL SETBACK	
I	I	I	18.0	
II	II	II	20.0	
III	III	III	25.0	
IV	IV	IV	35.0	
V	V	V	45.0	
VI	VI	VI	55.0	
VII	VII	VII	65.0	

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

COASTAL CLIFF CLASSIFICATION

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP

PROGRAM
GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE
COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 4F

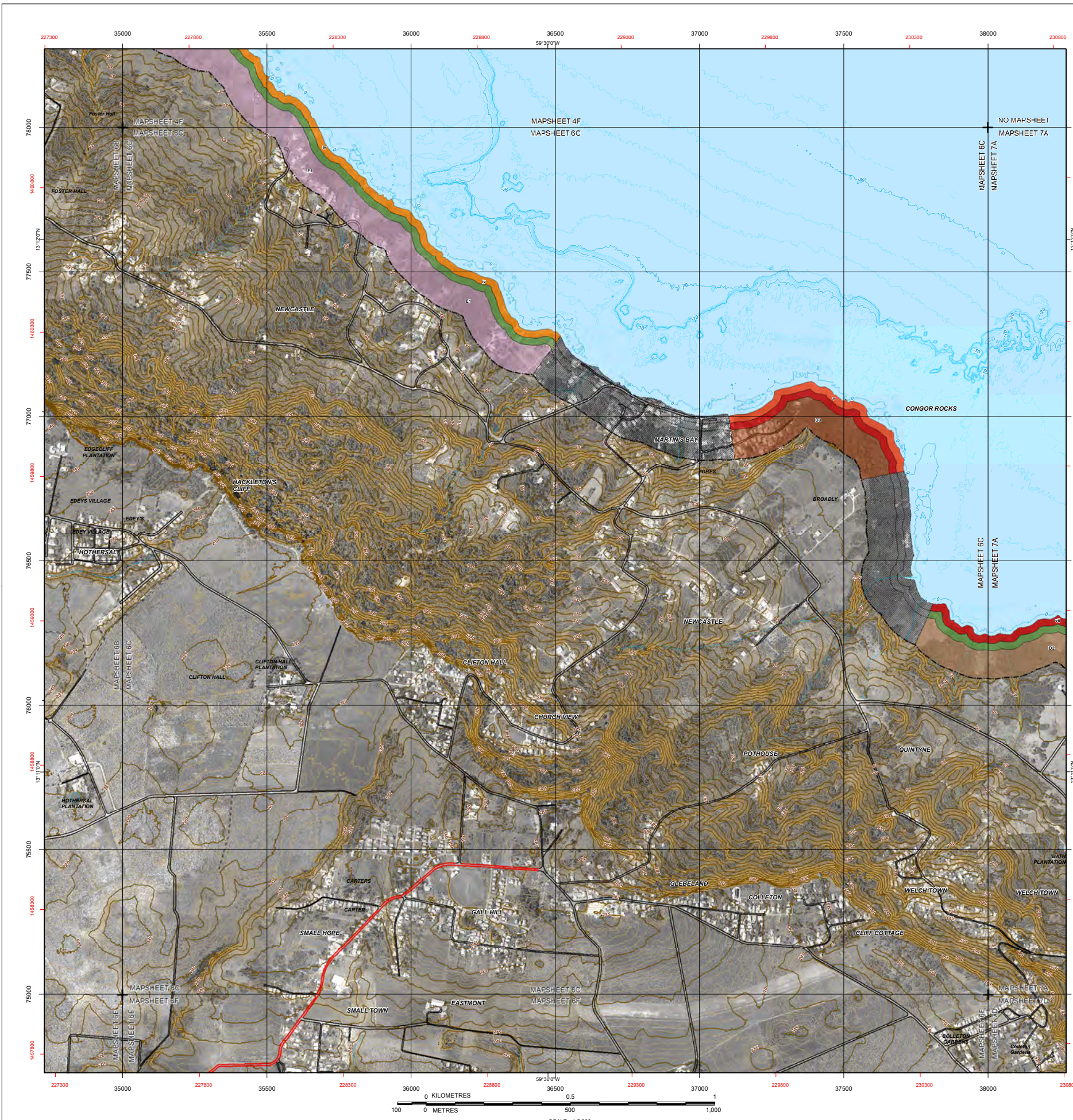
REFERENCE(S) AND NOTES:
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015.
 7. LIAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015.
 8. NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPS FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 10. WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8 FINAL ASSESSMENT REPORT DATED MARCH 2017.

MAP SERIES: 003 | MAPSHEET: 4F | DATE: MARCH, 2017

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 8th Floor Warrens Tower
 Warrens, St. Michael
 Barbados
 www.coastal.gov.bb

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Map Projection and 500-metre Grid: Barbados National Grid 1938
 Supplementary 500-metre Grid Labels: Universal Transverse Mercator, Zone 21
 Magnetic North Declination: 15°30.78' W, Annual Variation 0°2' W, 09-01-2015



LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTES: 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

TYPE A - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m		A0a	A0b
1 to 2 m		A1a	A1b
2 to 4 m		A2a	A2b
4 to 7 m		A3a	A3b

TYPE B - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m		B0a	B0b
1 to 2 m		B1a	B1b
2 to 4 m		B2a	B2b
4 to 7 m		B3a	B3b

TYPE C - CLIFFS

CLIFF HEIGHT	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m		C0a	C0b
2 to 5 m		C1a	C1b
5 to 10 m		C2a	C2b
>10 m		C3a	C3b

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUBSETBACK CATEGORY			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIES	ARCuate	OVERHANGS	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP¹⁰

KEY MAP

MAPSHEET COVERAGE

ANNUAL VARIATION 0'2" WEST

0 5 10 15 KILOMETRES

PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 6C

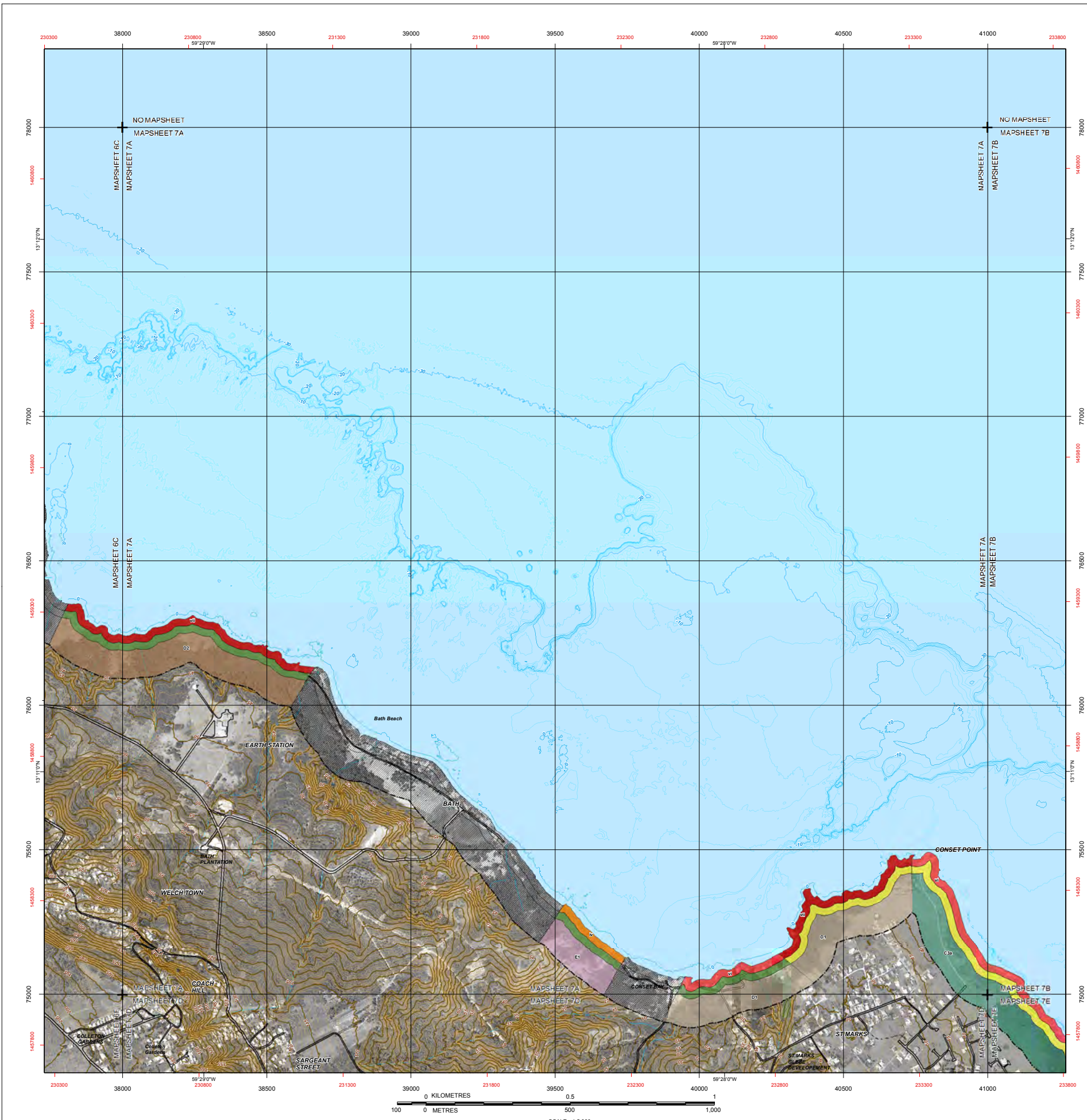
REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m AND 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
- LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAYRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 6C DATE MARCH, 2017

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Warrens, St. Michael
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2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

SETBACK GUIDELINES FOR TYPES A, B, C, D AND E CLIFFS

NOTE(S): SETBACK GUIDELINES CHART FOR TWO DIMENSIONAL GEOMETRY ONLY. FOR THREE DIMENSIONAL STRUCTURES, SITE SPECIFIC EVALUATION MANDATORY.

1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS – MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS – CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	VUGGINESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS – REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS	DESCRIPTION	
	D1	TRANSLATED LIMESTONE (BLOCKS)
D2	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	
D3		

TYPE D CLIFFS – CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

TYPE E - CLIFFS	DESCRIPTION	
	E1	IN-PLACE EOCENE STRATA
E2		
E3		

TYPE E CLIFFS – MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

REFER TO SCOTLAND DISTRICT MAP SERIES

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCuate OVERHANGS		
I	I	I		18.0
II	II	II		20.0
III	III	III		25.0
IV	IV	IV		35.0
V	V	V		45.0
VI	VI	VI		55.0
VII	VII	VII		65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

LEGEND

COASTAL CLIFF CLASSIFICATION

- CLIFF TYPE/MORPHOLOGY ①
- CLIFF STABILITY/RISK CLASSIFICATION ②
- CLIFF SETBACK CATEGORY ③

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP 10

KEY MAP

MAPSHEET COVERAGE

ANNUAL VARIATION 9'2" WEST

0 5 10 15 KILOMETRES

PROGRAM **GEOTECHNICAL SURVEYS INVESTIGATION (GSI)**

COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE **COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 7A**

REFERENCE(S) AND NOTES:

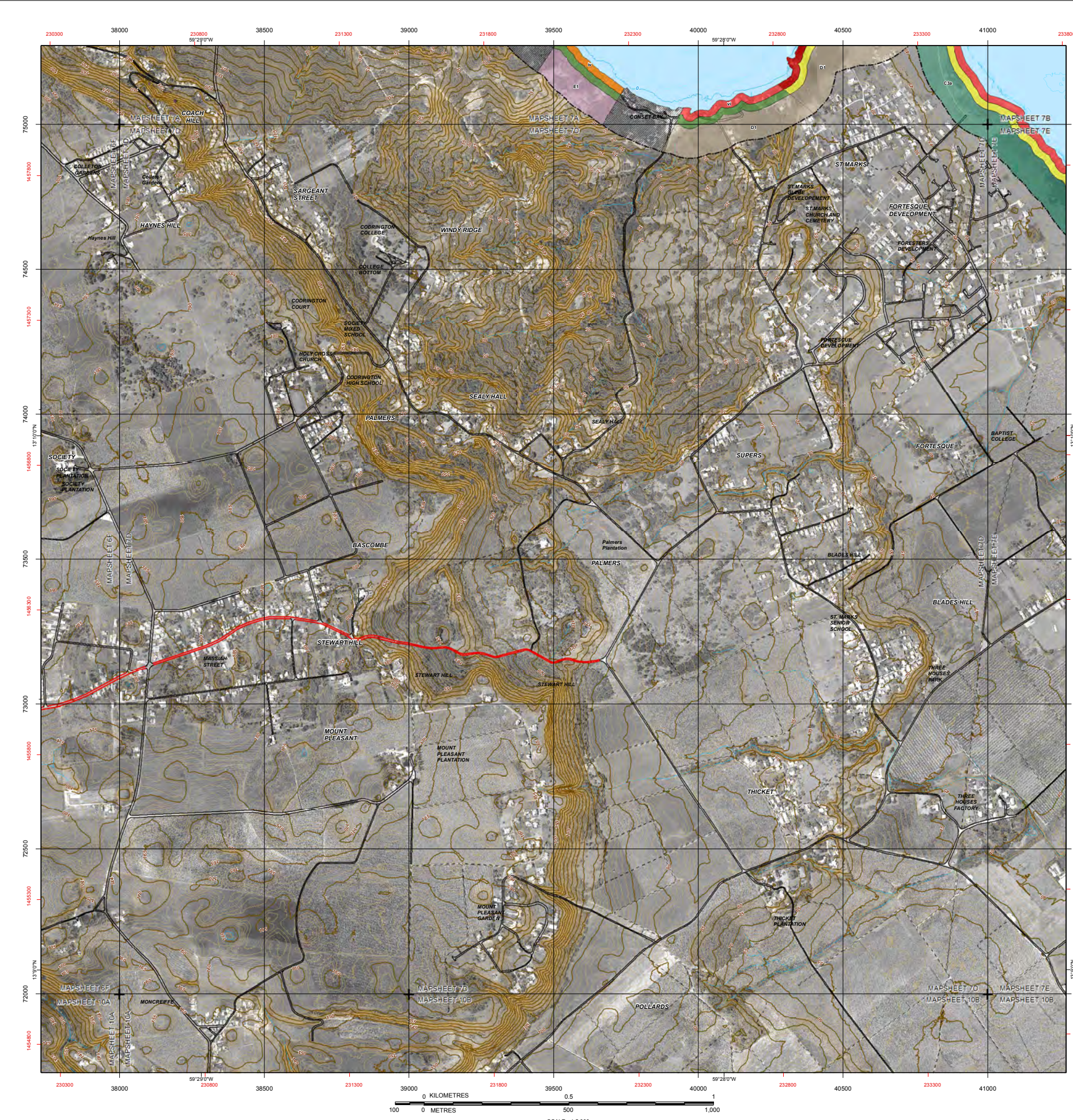
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
- LIAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. (SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAIRO MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES).
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003

MAPSHEET 7A

DATE MARCH, 2017

Coastal Zone Management Unit
8th Floor Warrens Tower
Warrens, St. Michael
Barbados
www.coastal.gov.bb

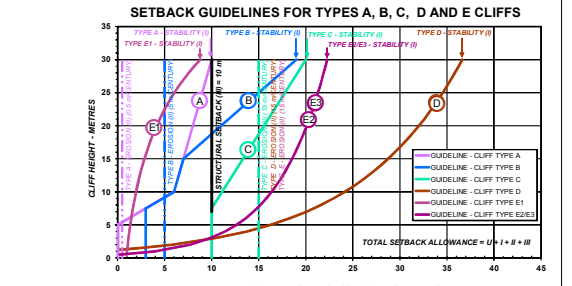
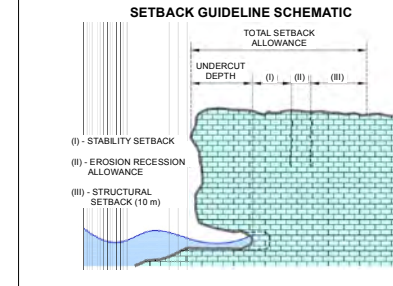


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	WUGGNESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE D - CLIFFS		
	D1	D2	D3
		TRANSLATED LIMESTONE (BLOCKS)	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

UNDERCUT DEPTH	TYPE E - CLIFFS		
	E1	E2	E3
		IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'

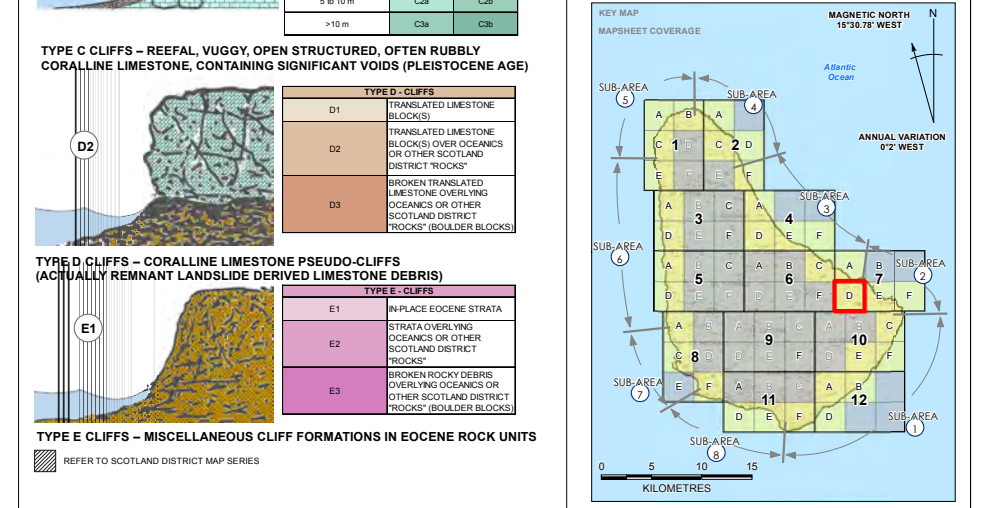
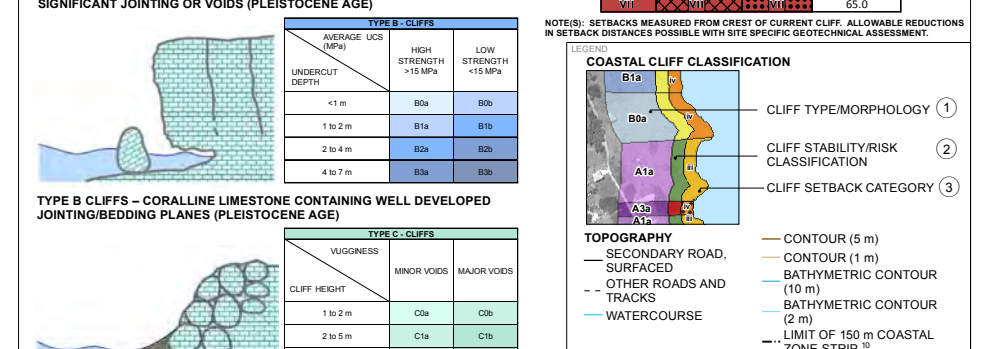
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

REFER TO SCOTLAND DISTRICT MAP SERIES

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCuate	OVERHANGS	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



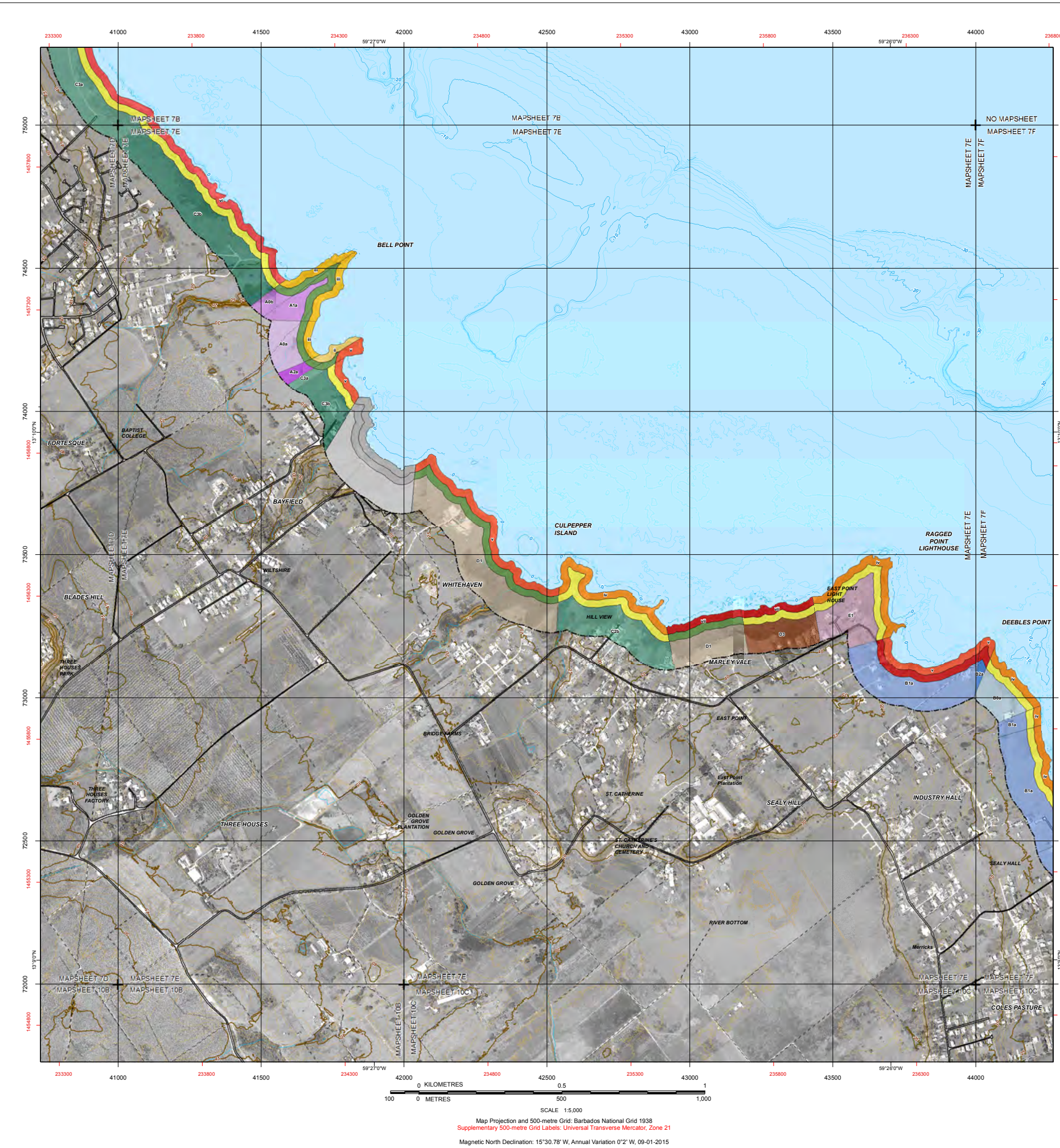
PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 3 - SHEET 7D

- REFERENCE(S) AND NOTE(S)
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
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 - LIAR IMAGERY COLLECTED/PROCESSED BY PELDYRN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARDI MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES(S).
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
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MAP SERIES 003 MAPSHEET 7D DATE MARCH, 2017

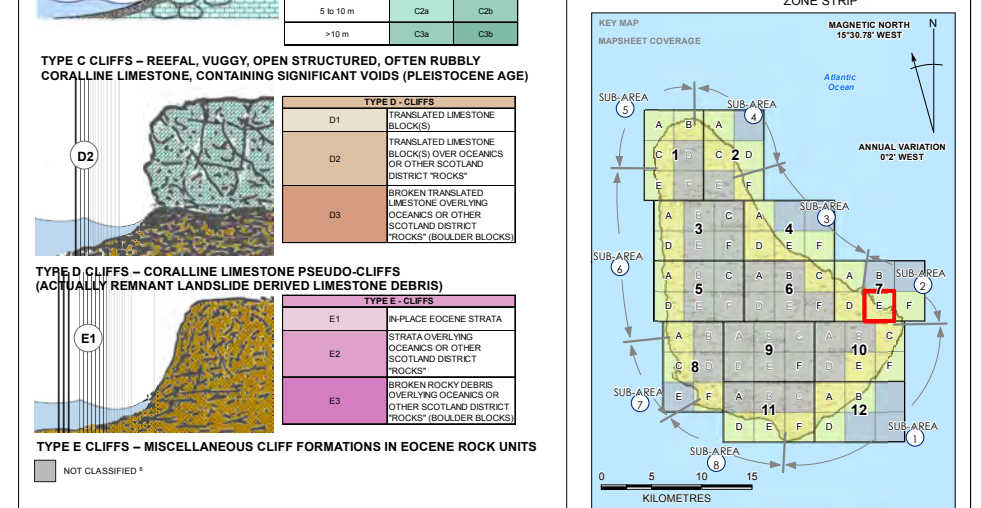
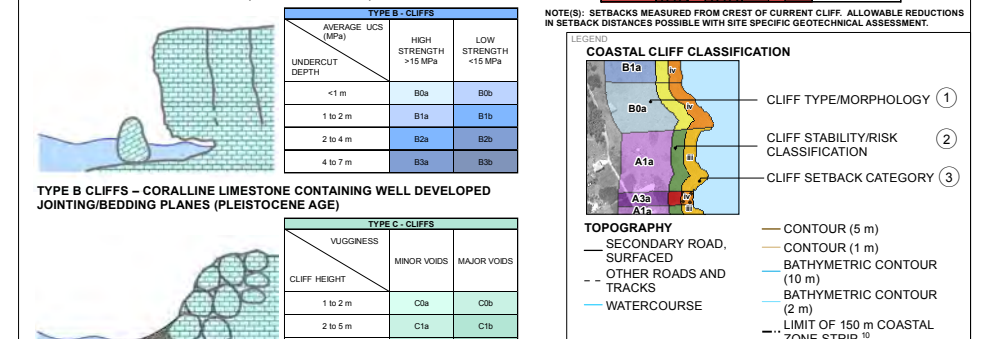
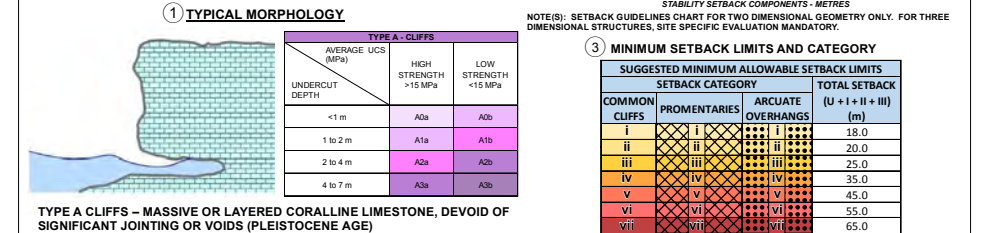
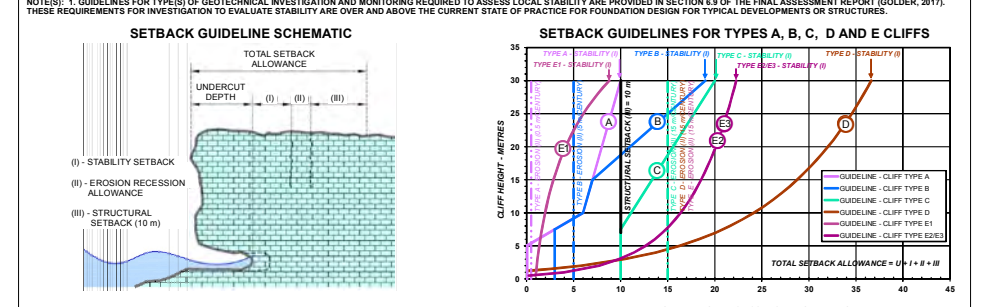
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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 2 - SHEET 7E

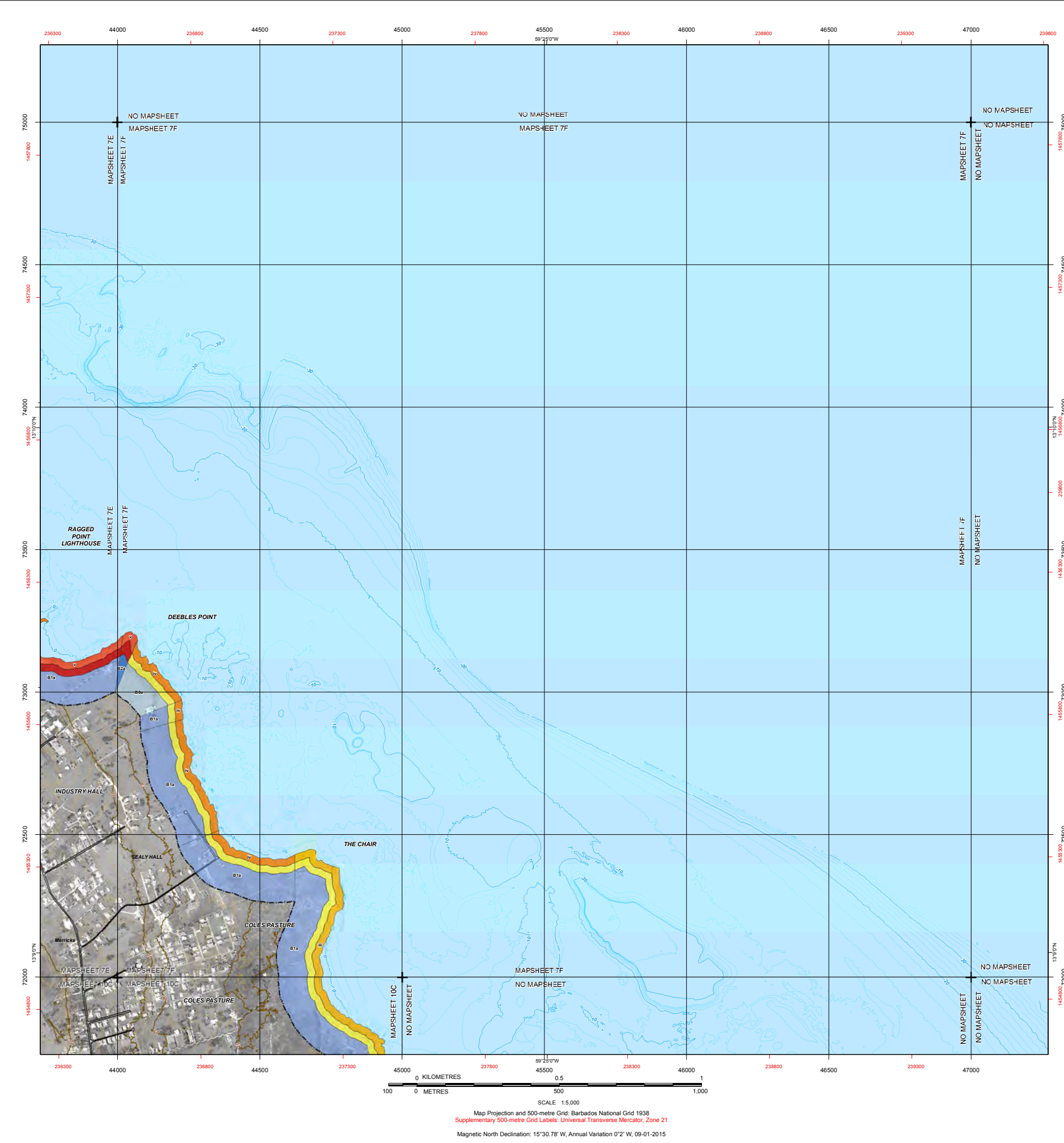
REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
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MAP SERIES 003 MAPSHEET 7E DATE MARCH, 2017

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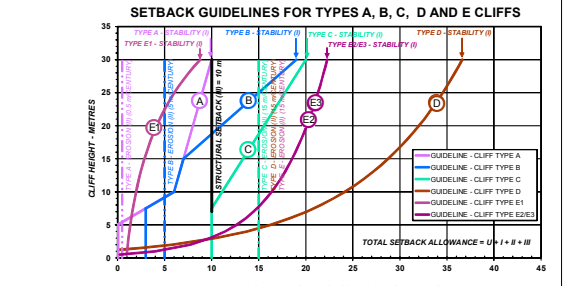
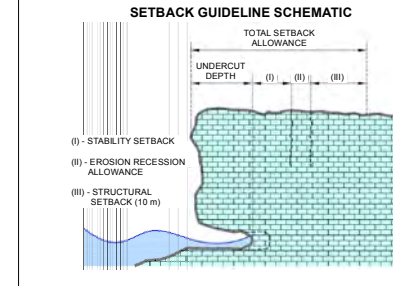


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
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1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS		
	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b	
2 to 5 m	C1a	C1b	
5 to 10 m	C2a	C2b	
>10 m	C3a	C3b	

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS	TRANSLATED LIMESTONE (BLOCKS)	
	D1	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	D2	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

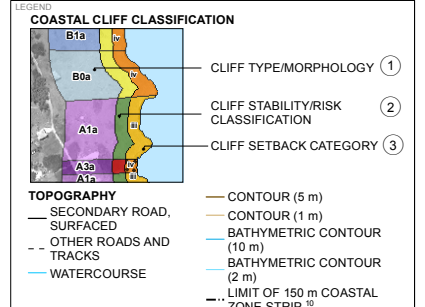
TYPE E - CLIFFS	IN-PLACE EOCENE STRATA	
	E1	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	E2	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 2 - SHEET 7F

REFERENCE(S) AND NOTE(S):

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
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MAP SERIES 003 MAPSHEET 7F DATE MARCH, 2017

COASTAL ZONE MANAGEMENT UNIT
 Coastal Zone Management Unit
 8th Floor Warrens Tower
 Warrens, St. Michael
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 www.coastal.gov.bb

Baird **Golder Associates**

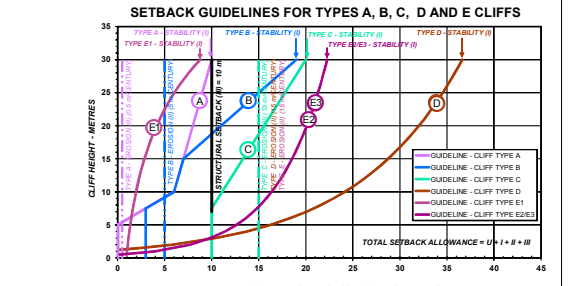
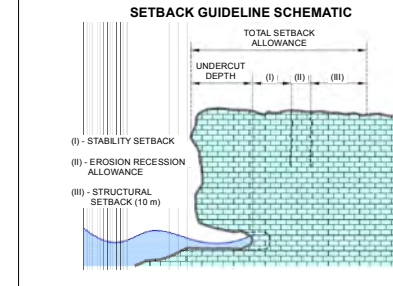


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
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UNDERCUT DEPTH	TYPE B - CLIFFS		
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TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

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5 to 10 m	C2a	C2b	
>10 m	C3a	C3b	

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS	
D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

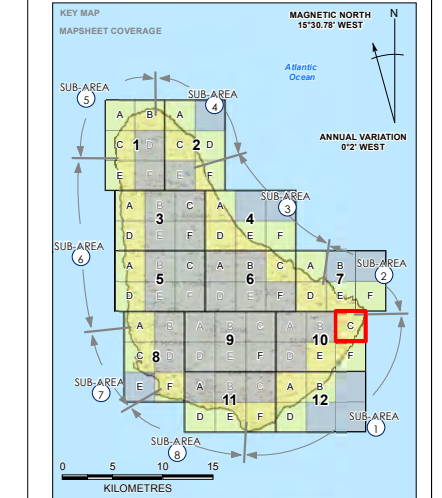
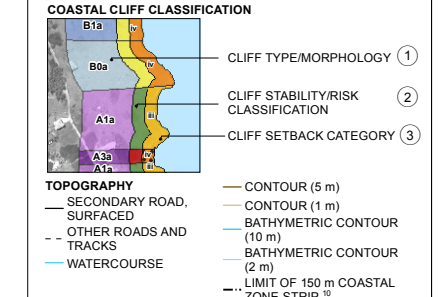
TYPE E - CLIFFS	
E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	NO OVERHANGS	
I	18.0	18.0	18.0	18.0
II	20.0	20.0	20.0	20.0
III	25.0	25.0	25.0	25.0
IV	35.0	35.0	35.0	35.0
V	45.0	45.0	45.0	45.0
VI	55.0	55.0	55.0	55.0
VII	65.0	65.0	65.0	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 1 - SHEET 10C

REFERENCE(S) AND NOTE(S):
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015.
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015.
 8. NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. (SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAYRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES).
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 10. WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017.

MAP SERIES 003 MAPSHEET 10C DATE MARCH, 2017

Coastal Zone Management Unit
 8th Floor Warrens Tower
 Warrens, St. Michael
 Barbados
 www.coastal.gov.bb

Baird **Golder Associates**



LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

TYPE A - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	
	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b
1 to 2 m	A1a	A1b
2 to 4 m	A2a	A2b
4 to 7 m	A3a	A3b

TYPE B - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	
	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b
1 to 2 m	B1a	B1b
2 to 4 m	B2a	B2b
4 to 7 m	B3a	B3b

TYPE C - CLIFFS

CLIFF HEIGHT	VUGGINESS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	SETBACK CATEGORY	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

COASTAL CLIFF CLASSIFICATION

CLIFF TYPE/MORPHOLOGY ①
CLIFF STABILITY/RISK CLASSIFICATION ②
CLIFF SETBACK CATEGORY ③

TOPOGRAPHY

- CONTOUR (5 m)
- SECONDARY ROAD, SURFACED
- OTHER ROADS AND TRACKS
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP 10

KEY MAP

MAPSHEET COVERAGE

MAGNETIC NORTH 15°38'76" WEST

ANNUAL VARIATION 0'2" WEST

0 5 10 15 KILOMETRES

PROGRAM
GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE
COASTAL CLIFF CLASSIFICATION - SUB-AREA 1 - SHEET 10F

REFERENCE(S) AND NOTES:

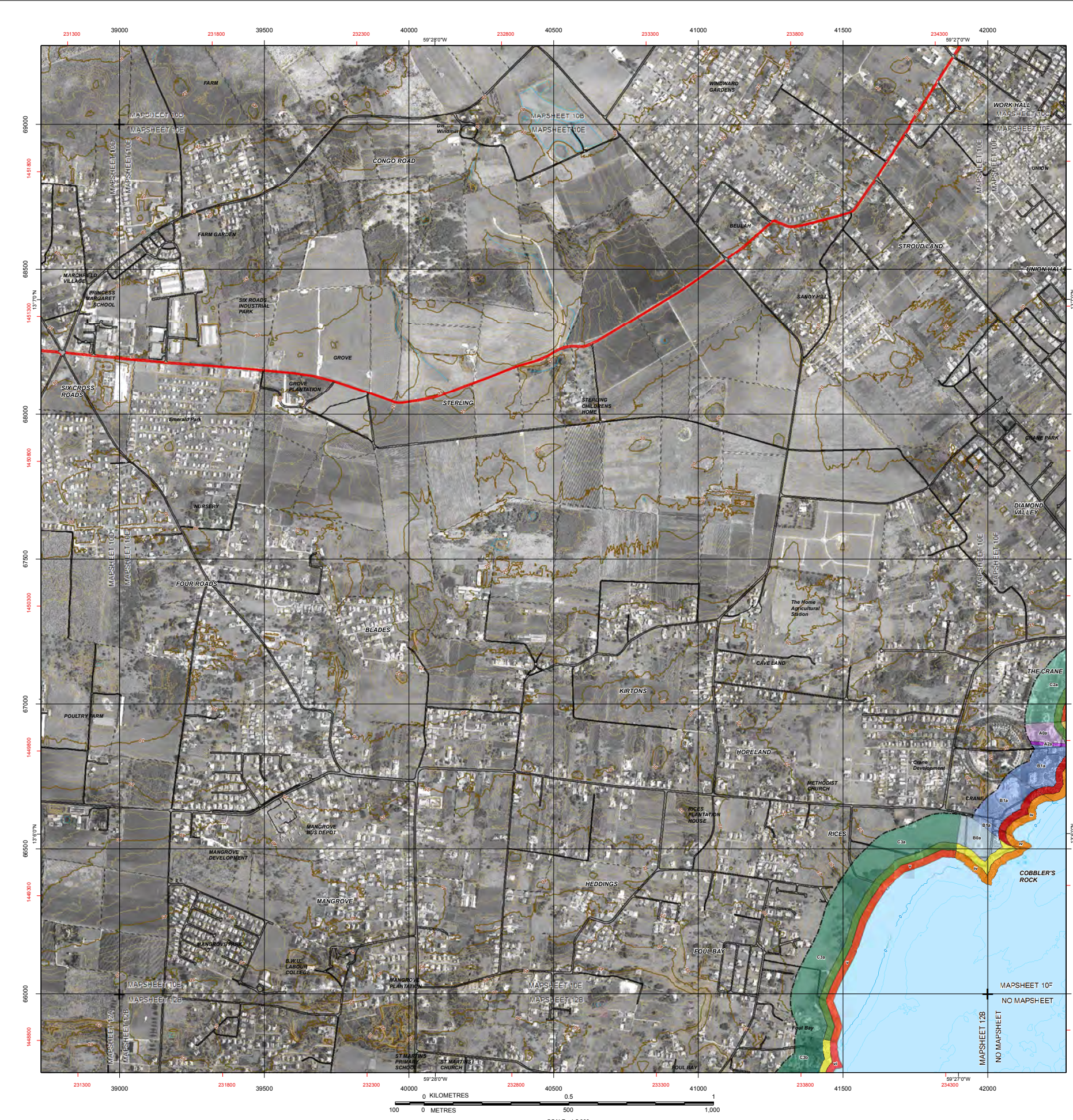
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD. FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015
- LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES(S).
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8. FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 10F DATE MARCH, 2017

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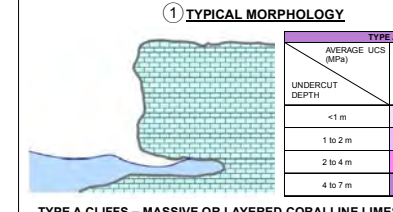
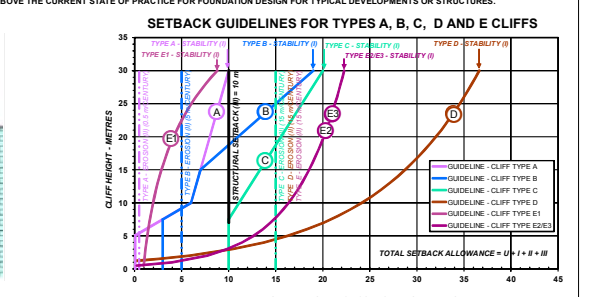
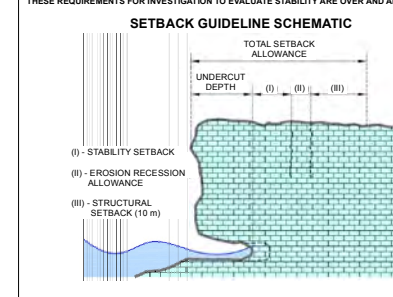
Baird **Golder Associates**

Map Projection and 500-metre Grid: Barbados National Grid 1938
Supplementary 500-metre Grid Labels: Universal Transverse Mercator, Zone 21
Magnetic North Declination: 15°30'78" W, Annual Variation 0'2" W, 09-01-2015



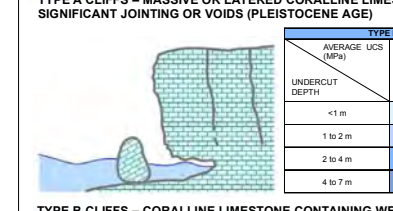
2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



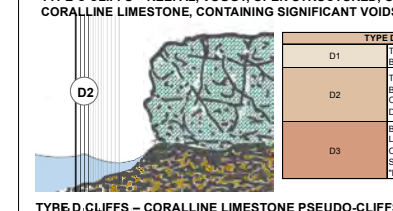
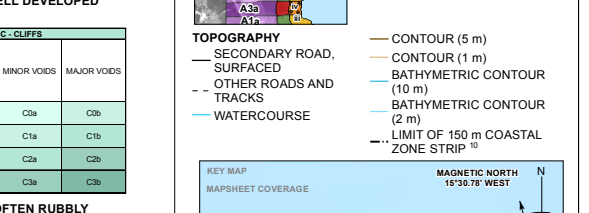
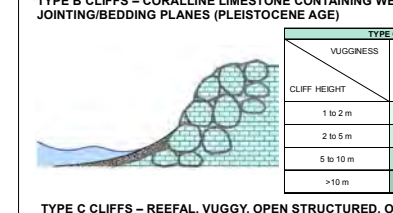
3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIANS	ARCULATE OVERHANGS	CLIFF TYPE	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0



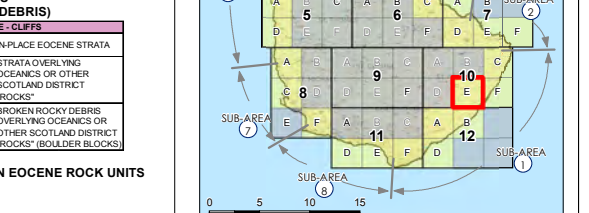
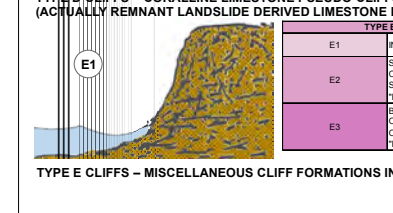
TYPE B - CLIFFS

AVERAGE UCS (MPa)	HIGH STRENGTH (>15 MPa)	LOW STRENGTH (<15 MPa)
<1 m	B0a	B0b
1 to 2 m	B1a	B1b
2 to 4 m	B2a	B2b
4 to 7 m	B3a	B3b



TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)



PROGRAM: GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

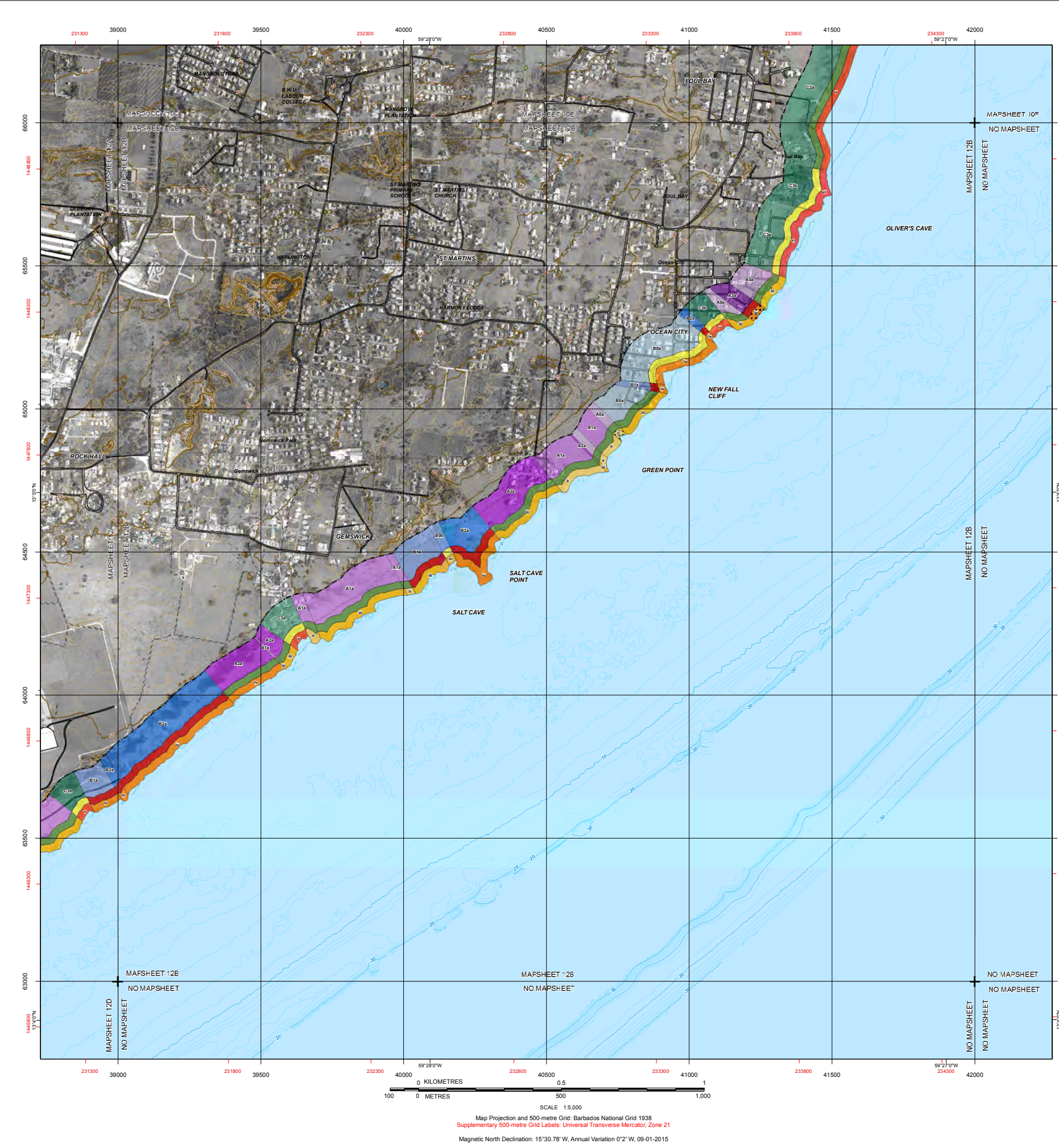
TITLE: COASTAL CLIFF CLASSIFICATION - SUB-AREA 1 - SHEET 10E

REFERENCE(S) AND NOTES:
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDNER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDRYN, SEPTEMBER 2014 TO JANUARY 2015
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDRYN SEPTEMBER 2014 TO JANUARY 2015
 8. NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAYRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAB.
 10. WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES: 003, MAPSHEET: 10E, DATE: MARCH, 2017

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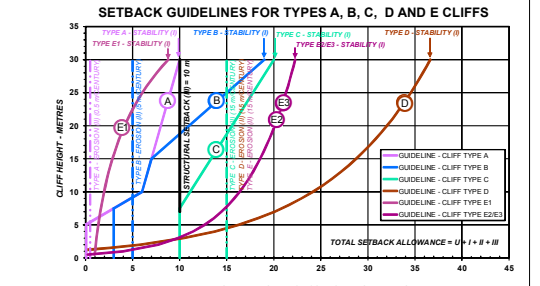
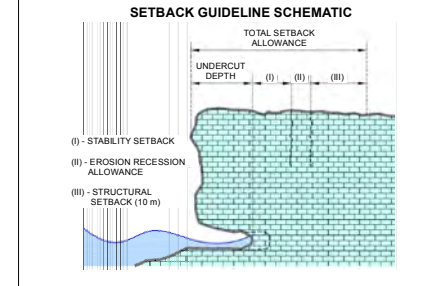


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS		
	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b	
2 to 5 m	C1a	C1b	
5 to 10 m	C2a	C2b	
>10 m	C3a	C3b	

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

D2	TYPE D - CLIFFS		
	D1	TRANSLATED LIMESTONE (BLOCKS)	
	D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'	
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)		

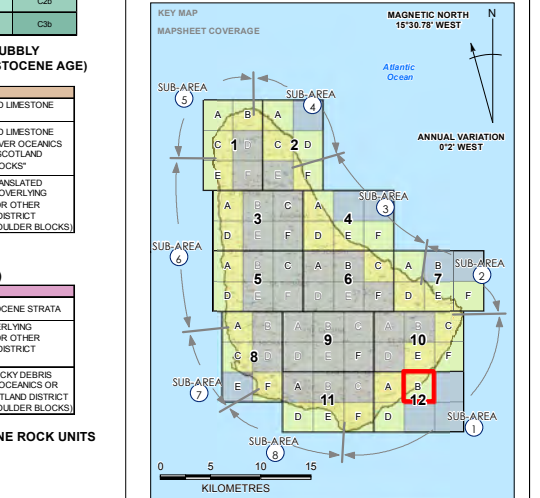
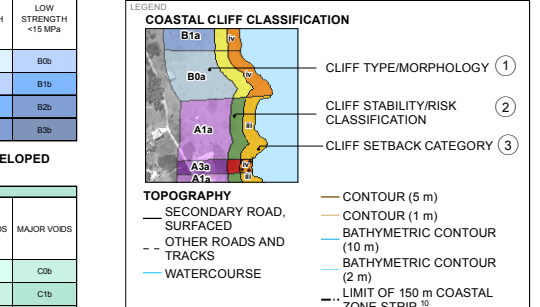
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

E1	TYPE E - CLIFFS		
	E1	IN-PLACE EOCENE STRATA	
	E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'	
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)		

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III)
	PROLETARIAN	ARCULATE OVERHANGS	TOTAL SETBACK	
I	I	I	18.0	
II	II	II	20.0	
III	III	III	25.0	
IV	IV	IV	35.0	
V	V	V	45.0	
VI	VI	VI	55.0	
VII	VII	VII	65.0	

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 1 - SHEET 12B

REFERENCE(S) AND NOTE(S)
1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
5. COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015.
7. LIAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015.
8. NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAIIRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
10. WHERE TYPES I AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017.

MAP SERIES 003 MAPSHEET 12B DATE MARCH, 2017

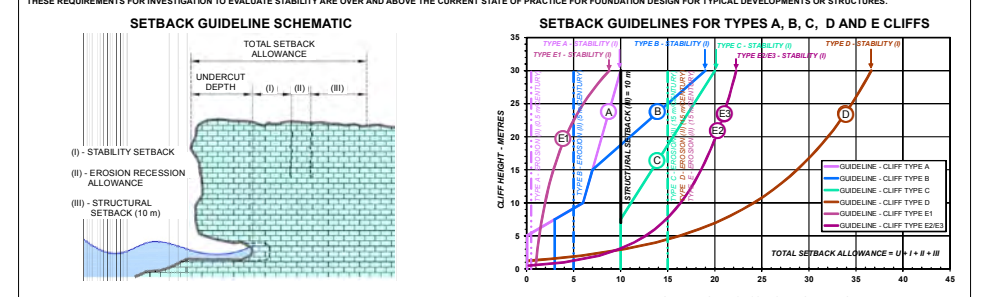
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Warrens, St. Michael
Barbados
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Baird **Golder Associates**



2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	Average UCS (MPa)	High Strength >15 MPa	Low Strength <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	Average UCS (MPa)	High Strength >15 MPa	Low Strength <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	Wuggness	Minor Voids / Major Voids
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS	D1	
	Translated Limestone (Blocks)	Translated Limestone (Blocks) over Oceans or other Scotland District 'Rocks'
	Broken Translated Limestone overlying Oceans or other Scotland District 'Rocks' (Boulder Blocks)	

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

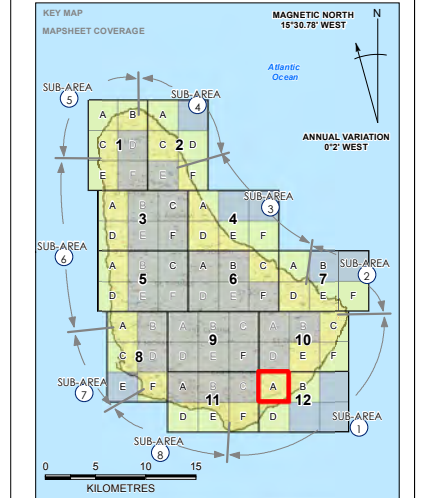
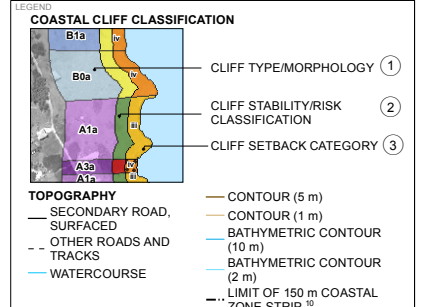
TYPE E - CLIFFS	E1	
	In-Place Eocene Strata	Strata overlying Oceans or other Scotland District 'Rocks'
	Broken Rocky Debris overlying Oceans or other Scotland District 'Rocks' (Boulder Blocks)	

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	18.0	18.0	18.0	18.0
II	20.0	20.0	20.0	20.0
III	25.0	25.0	25.0	25.0
IV	35.0	35.0	35.0	35.0
V	45.0	45.0	45.0	45.0
VI	55.0	55.0	55.0	55.0
VII	65.0	65.0	65.0	65.0

NOTES: SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



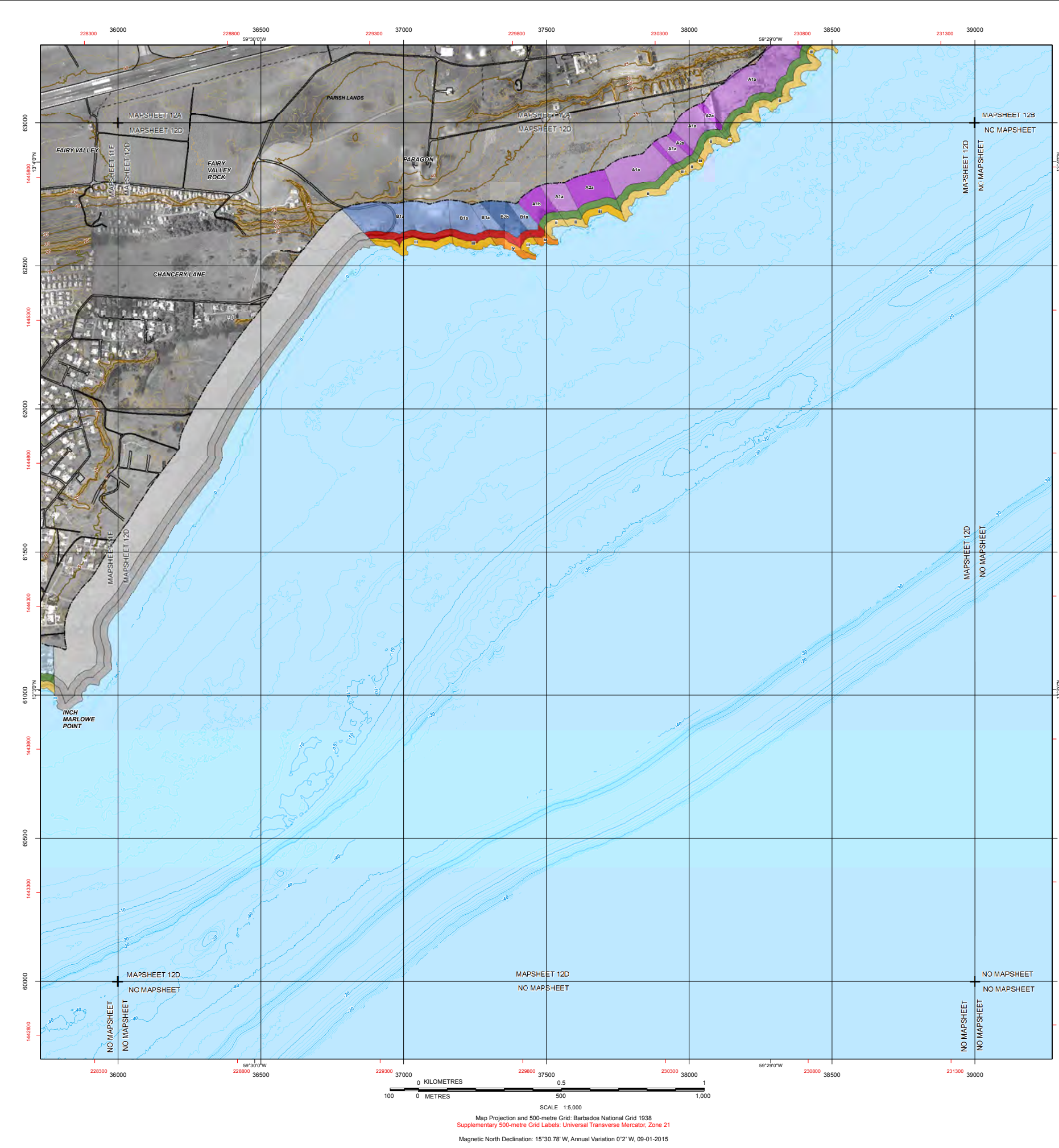
PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 1 - SHEET 12A

- REFERENCE(S) AND NOTES:**
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
 - CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYDRN, SEPTEMBER 2014 TO JANUARY 2015
 - LIAR IMAGERY COLLECTED/PROCESSED BY PELDYDRN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPS FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

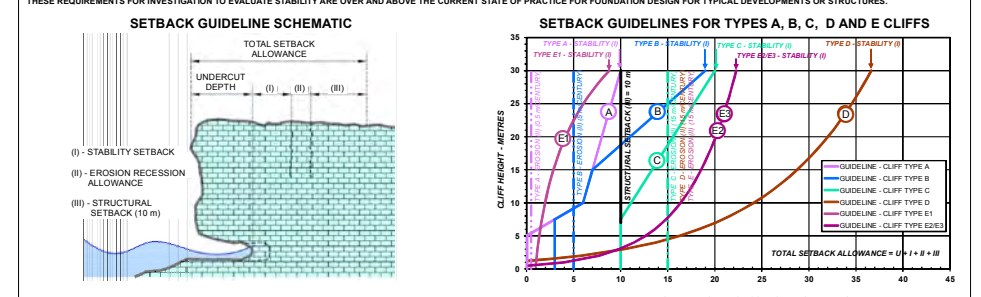
MAP SERIES 003 MAPSHEET 12A DATE MARCH, 2017

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2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS	
	AVERAGE UCS (MPa)	LOW STRENGTH (<15 MPa)
<1 m	A0a	A0b
1 to 2 m	A1a	A1b
2 to 4 m	A2a	A2b
4 to 7 m	A3a	A3b

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS	
	AVERAGE UCS (MPa)	LOW STRENGTH (<15 MPa)
<1 m	B0a	B0b
1 to 2 m	B1a	B1b
2 to 4 m	B2a	B2b
4 to 7 m	B3a	B3b

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

D1	TYPE D - CLIFFS	
	TRANSLATED LIMESTONE (BLOCKS)	OTHER SCOTLAND DISTRICT 'ROCKS'
D1	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

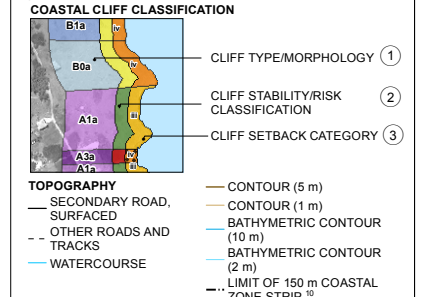
E1	TYPE E - CLIFFS	
	IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E1	IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	1	1	1	18.0
II	2	2	2	20.0
III	3	3	3	25.0
IV	4	4	4	35.0
V	5	5	5	45.0
VI	6	6	6	55.0
VII	7	7	7	65.0

NOTES: SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM: GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE: COASTAL CLIFF CLASSIFICATION - SUB-AREA 1 - SHEET 12D

- REFERENCE(S) AND NOTES:
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 - CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDNER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
 - LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. (SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES).
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES: 003 | MAPSHEET: 12D | DATE: MARCH, 2017

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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXCLUDED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

TYPE A - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE B - CLIFFS

UNDERCUT DEPTH	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE C - CLIFFS

CLIFF HEIGHT	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b	
2 to 5 m	C1a	C1b	
5 to 10 m	C2a	C2b	
>10 m	C3a	C3b	

TYPE D - CLIFFS

TYPE	DESCRIPTION
D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E - CLIFFS

TYPE	DESCRIPTION
E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	18.0			18.0
II	20.0			20.0
III	25.0			25.0
IV	35.0			35.0
V	45.0			45.0
VI	55.0			55.0
VII	65.0			65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

COASTAL CLIFF CLASSIFICATION

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP

KEY MAP

PROGRAM **GEOTECHNICAL SURVEYS INVESTIGATION (GSI)**
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE **COASTAL CLIFF CLASSIFICATION - SUB-AREA 1 - SHEET 11F**

REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015
- LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES: 003, MAPSHEET: 11F, DATE: MARCH, 2017

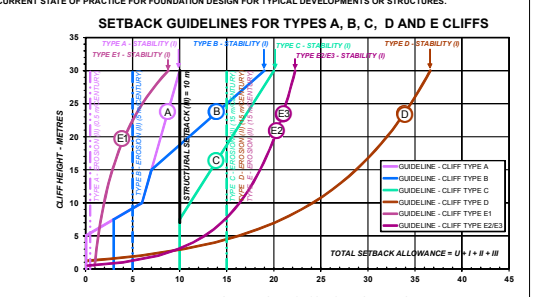
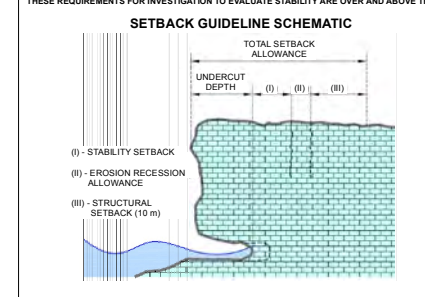
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Warrens, St. Michael
Barbados
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Baird **Golder Associates**



2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

CLIFF HEIGHT	TYPE C - CLIFFS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

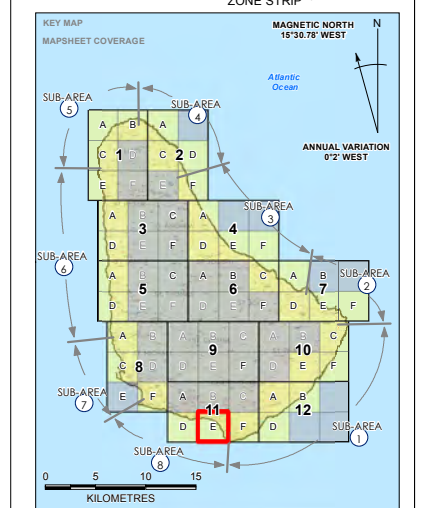
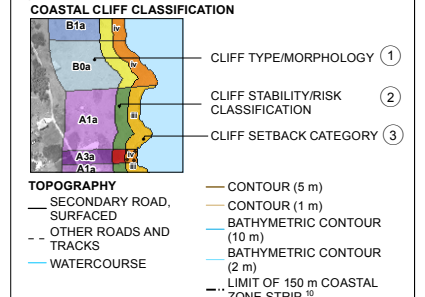
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS		TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCuate OVERHANGS	
I	18.0	18.0	18.0
II	20.0	20.0	20.0
III	25.0	25.0	25.0
IV	35.0	35.0	35.0
V	45.0	45.0	45.0
VI	55.0	55.0	55.0
VII	65.0	65.0	65.0

NOTES: SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



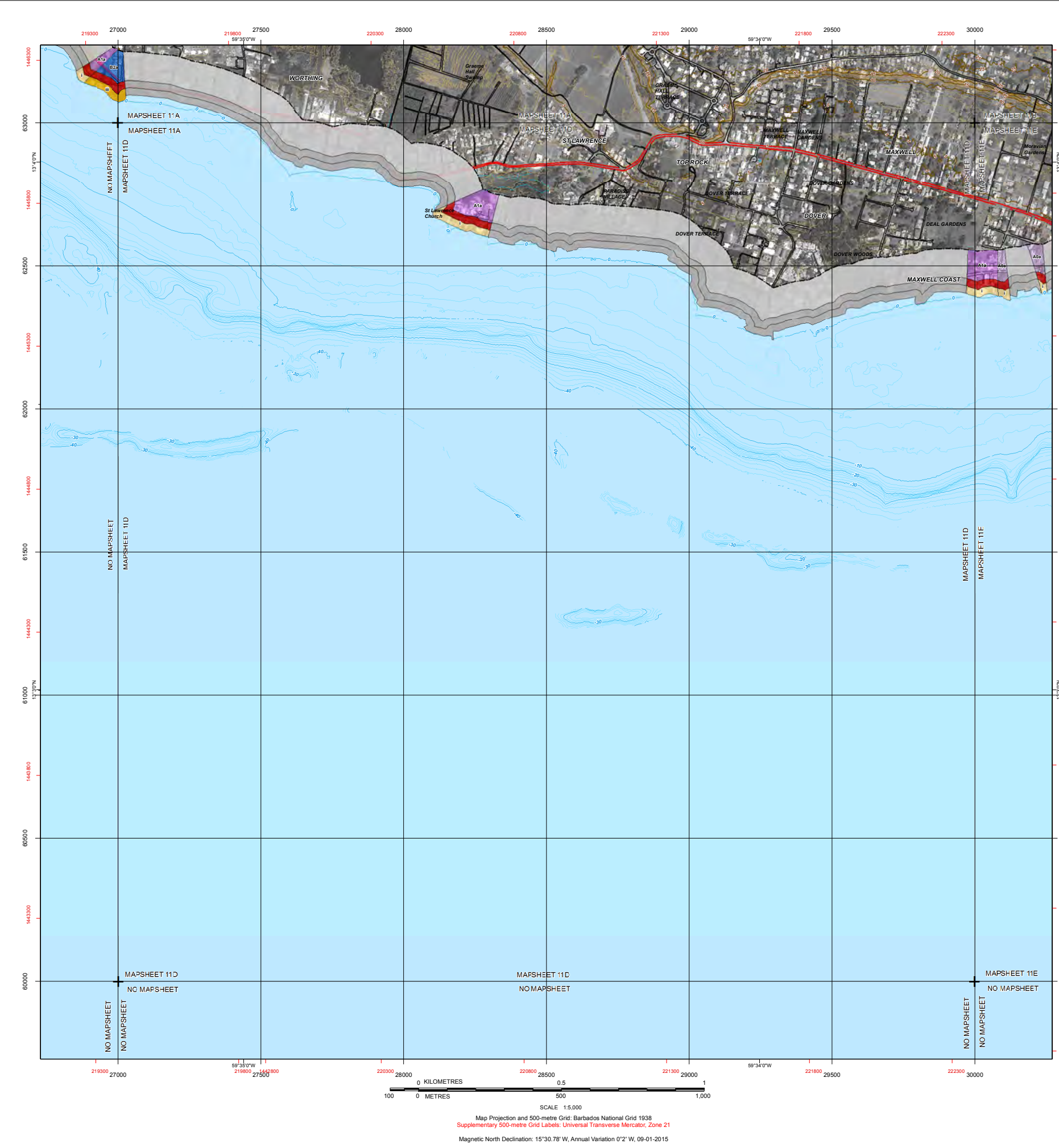
PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 8 - SHEET 11E

- REFERENCE(S) AND NOTES:
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
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 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDNER ASSOCIATES FROM LIAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
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 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 11E DATE MARCH, 2017

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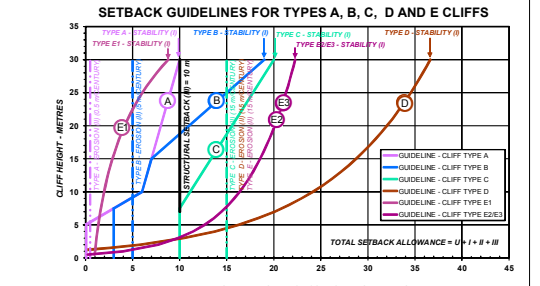
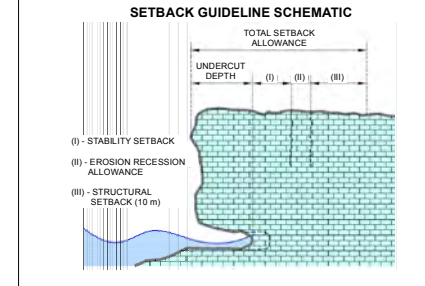


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTES: 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

CLIFF HEIGHT	TYPE C - CLIFFS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

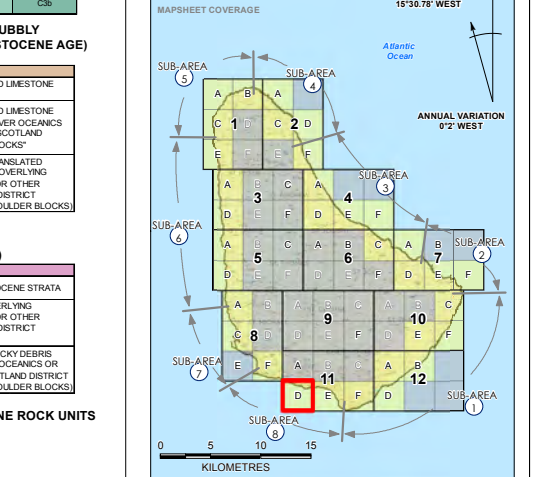
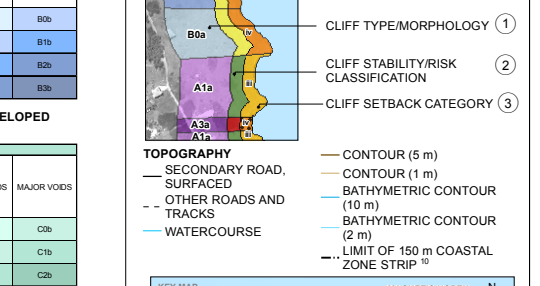
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTES: SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 8 - SHEET 11D

REFERENCE(S) AND NOTES:
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD SURVEY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYRN, SEPTEMBER 2014 TO JANUARY 2015
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYRN SEPTEMBER 2014 TO JANUARY 2015
 8. NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 10. WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES: 003, MAPSHEET: 11D, DATE: MARCH, 2017

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 Warrens, St. Michael
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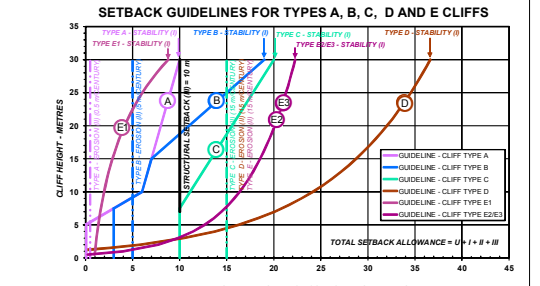
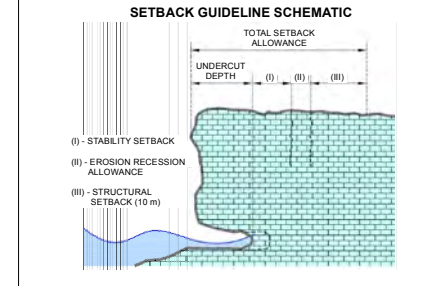


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A1a	A2a
1 to 2 m	A1a	A2a	A3a
2 to 4 m	A2a	A3a	A4a
4 to 7 m	A3a	A4a	A5a

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B1a	B2a
1 to 2 m	B1a	B2a	B3a
2 to 4 m	B2a	B3a	B4a
4 to 7 m	B3a	B4a	B5a

CLIFF HEIGHT	TYPE C - CLIFFS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

UNDERCUT DEPTH	TYPE D - CLIFFS		
	D1	D2	D3
		TRANSLATED LIMESTONE (BLOCKS)	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'

UNDERCUT DEPTH	TYPE E - CLIFFS		
	E1	E2	E3
		IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'

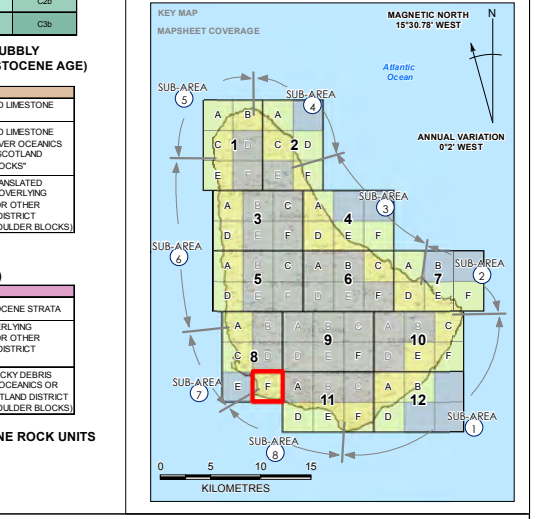
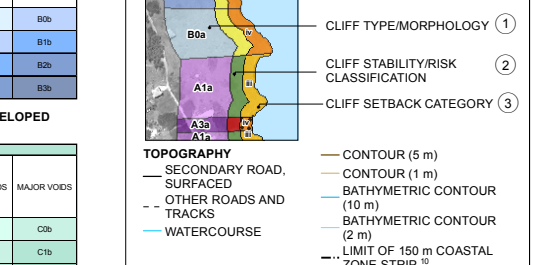
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	10	10	10	18.0
II	10	10	10	20.0
III	10	10	10	25.0
IV	10	10	10	35.0
V	10	10	10	45.0
VI	10	10	10	55.0
VII	10	10	10	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 8 - SHEET 8F

- REFERENCE(S) AND NOTE(S)
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 - CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m AND 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015
 - LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. SHORELINE NOT CLASSIFIED ACCORDING TO ISS DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAYRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 8F DATE MARCH, 2017

Coastal Zone Management Unit
8th Floor Warrens Tower
Warrens, St. Michael
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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	WUGGNESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

D1	TYPE D - CLIFFS	
	TRANSLATED LIMESTONE (BLOCKS)	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	
D2		
D3		

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

E1	TYPE E - CLIFFS	
	IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	
E2		
E3		

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIES	ARCULATE OVERHANGS	TOTAL SETBACK	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

COASTAL CLIFF CLASSIFICATION

KEY MAP

MAPSHEET COVERAGE

ANNUAL VARIATION 9'2" WEST

0 5 10 15 KILOMETRES

PROGRAM
GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

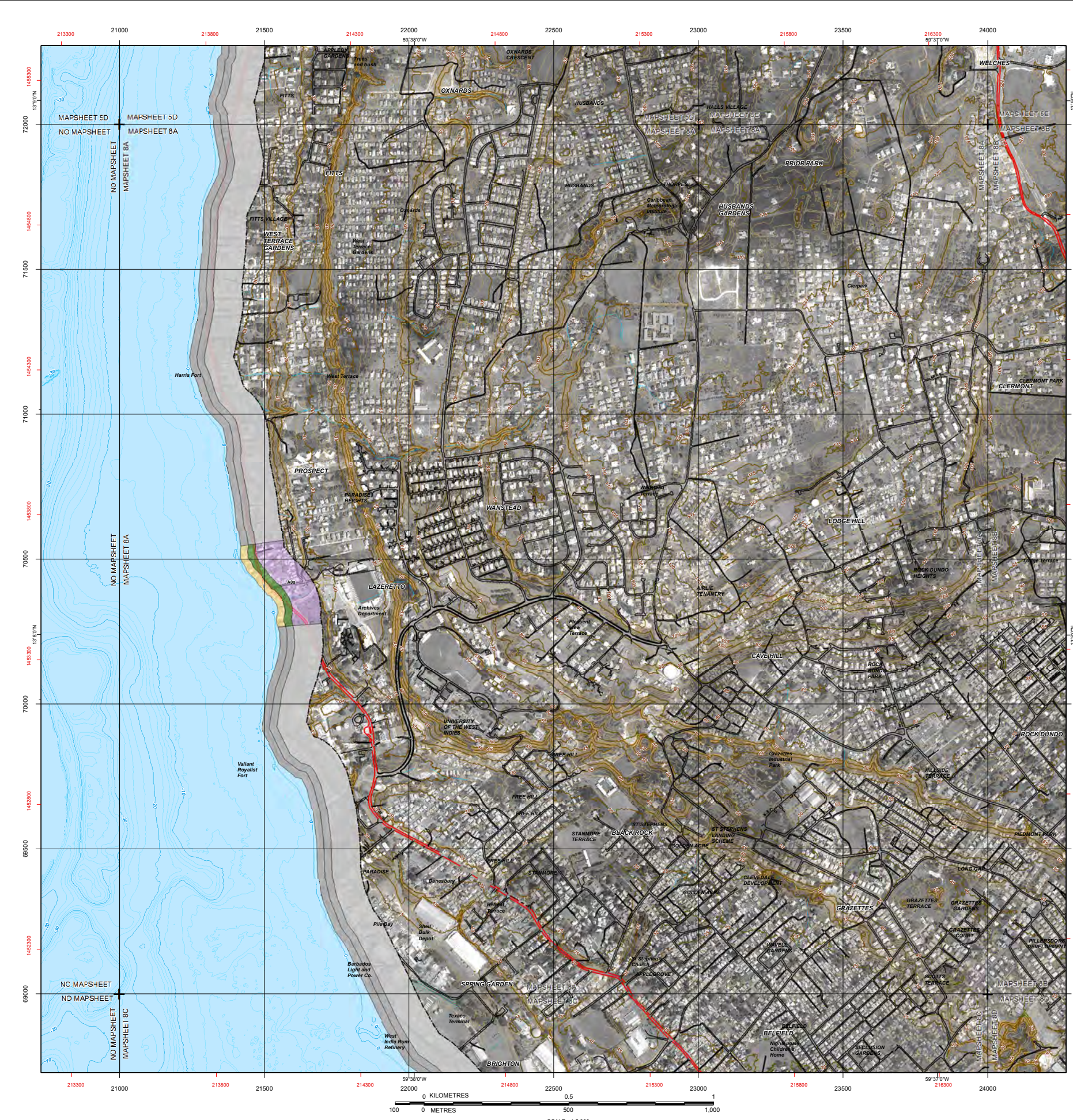
TITLE
COASTAL CLIFF CLASSIFICATION - SUB-AREA 7 - SHEET 8C

REFERENCE(S) AND NOTES:
 1. CLIFF TYPES: GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDREN, SEPTEMBER 2014 TO JANUARY 2015
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDREN SEPTEMBER 2014 TO JANUARY 2015
 8. NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARDI MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAB.
 10. WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 8C DATE MARCH, 2017

Coastal Zone Management Unit
 8th Floor Warrens Tower
 Warrens, St. Michael
 Barbados
 www.coastal.gov.bb

Baird **Golder Associates**

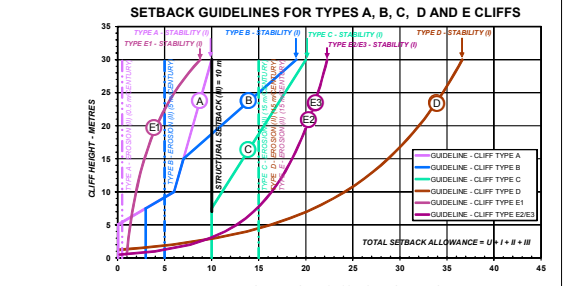
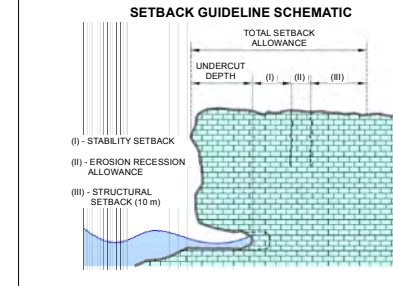


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
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MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS		
	VUGGINESS	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b	
2 to 5 m	C1a	C1b	
5 to 10 m	C2a	C2b	
>10 m	C3a	C3b	

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLBY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS	
D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

TYPE E - CLIFFS	
E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

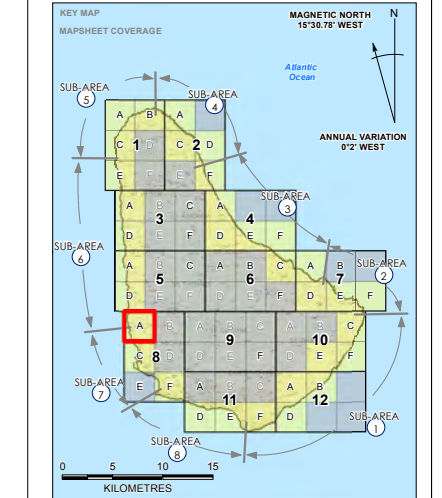
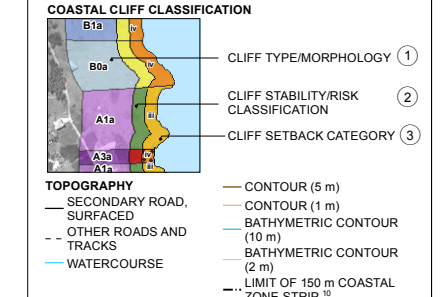
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIANS	ARCULATE OVERHANGS	OTHER	
I	18.0			18.0
II	20.0			20.0
III	25.0			25.0
IV	35.0			35.0
V	45.0			45.0
VI	55.0			55.0
VII	65.0			65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 6 / 7 - SHEET 8A

REFERENCE(S) AND NOTES:
 1. CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 2. CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 3. CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 4. CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 5. COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 6. CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015.
 7. LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015.
 8. NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAYRD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 9. ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAR.
 10. WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 11. MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017.

MAP SERIES: 003, MAPSHEET: 8A, DATE: MARCH, 2017

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 8th Floor Warrens Tower
 Warrens, St. Michael
 Barbados
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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTES: (1) GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	WUGGNESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE D - CLIFFS		
	D1	D2	D3
		TRANSLATED LIMESTONE (BLOCKS)	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

CLIFF HEIGHT	TYPE E - CLIFFS		
	E1	E2	E3
		IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCuate	OVERHANGS	
I	1	1	1	18.0
II	2	2	2	20.0
III	3	3	3	25.0
IV	4	4	4	35.0
V	5	5	5	45.0
VI	6	6	6	55.0
VII	7	7	7	65.0

NOTES: (1) SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.

LEGEND

COASTAL CLIFF CLASSIFICATION

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP

KEY MAP

MAPSHEET COVERAGE

MAGNETIC NORTH 15°38'76" WEST

ANNUAL VARIATION 0'2" WEST

0 5 10 15 KILOMETRES

PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 6 - SHEET 5D

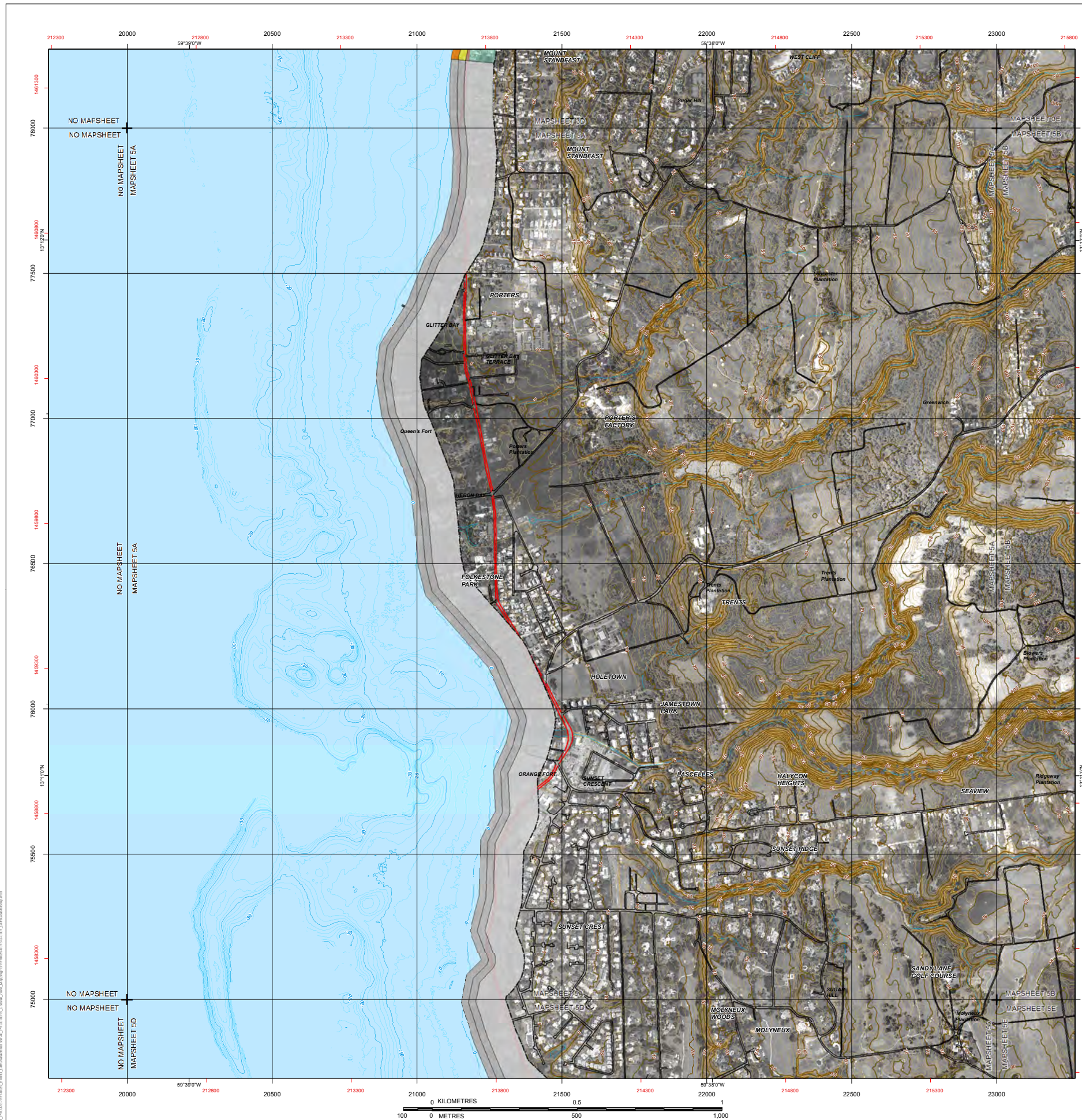
REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
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- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES D AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 5D DATE MARCH, 2017

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8th Floor Warrens Tower
Warrens, St. Michael
Barbados
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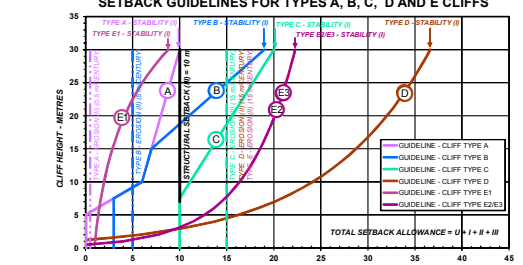
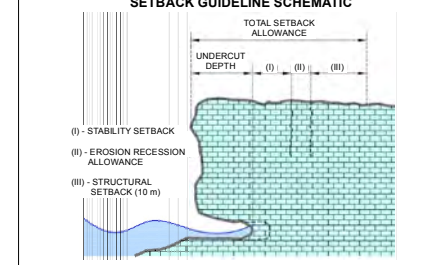
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LEGEND
2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

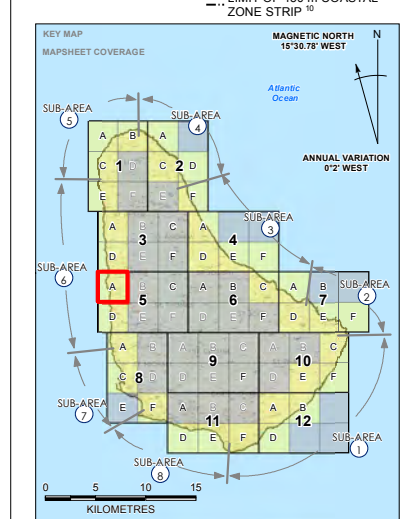
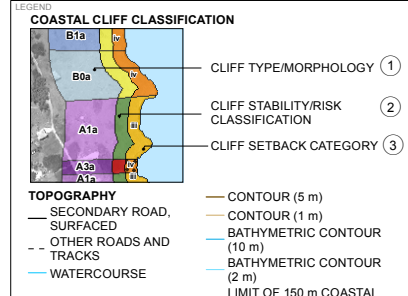
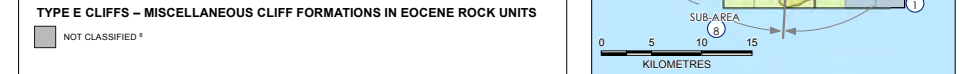
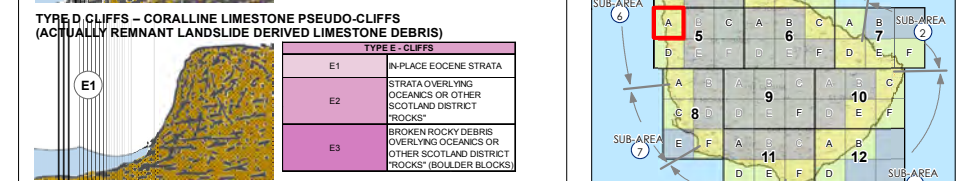
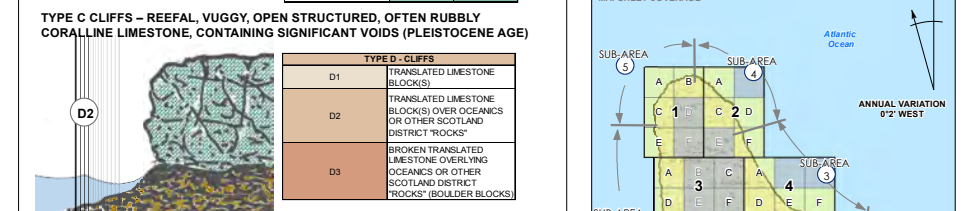
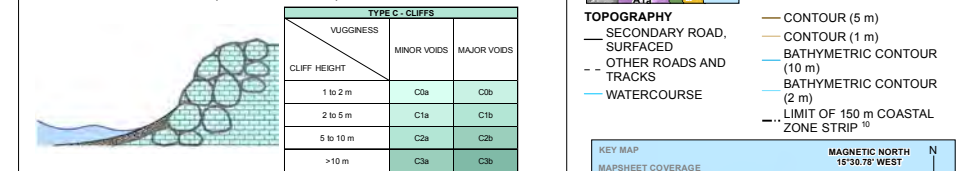
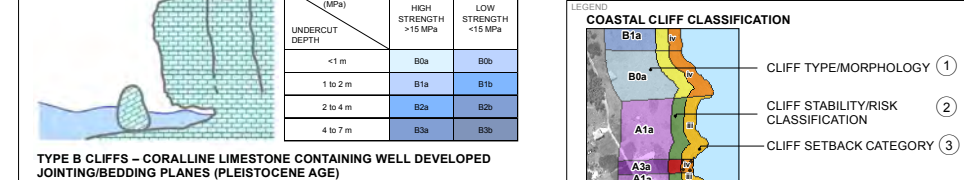


NOTE(S): SETBACK GUIDELINES CHART FOR TWO DIMENSIONAL GEOMETRY ONLY. FOR THREE DIMENSIONAL STRUCTURES, SITE SPECIFIC EVALUATION MANDATORY.

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	SETBACK CATEGORY	PROLETARIAN	ARCuate OVERHANGS	
i	I	I	I	18.0
ii	II	II	II	20.0
iii	III	III	III	25.0
iv	IV	IV	IV	35.0
v	V	V	V	45.0
vi	VI	VI	VI	55.0
vii	VII	VII	VII	65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 6 - SHEET 5A

REFERENCE(S) AND NOTE(S)

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIAR AND DRONE SURVEY INFORMATION.
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- NO CLIFFS IN THIS AREA. GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT. (SHORELINE NOT CLASSIFIED ACCORDING TO SSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BAIRO MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES).
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
- WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 5A DATE MARCH, 2017

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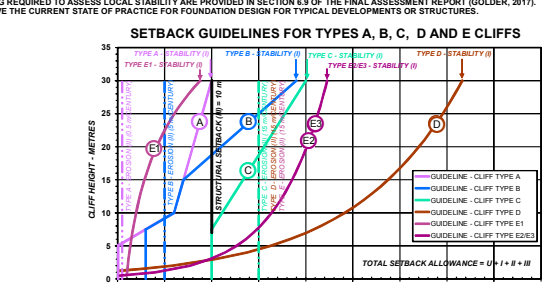
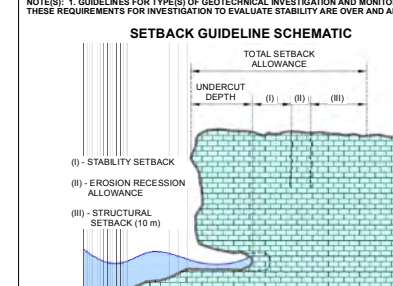


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	WUGGNESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

TYPE D - CLIFFS	
D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

TYPE E - CLIFFS	
E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

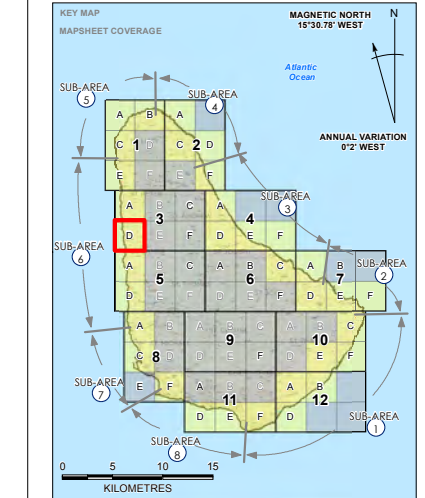
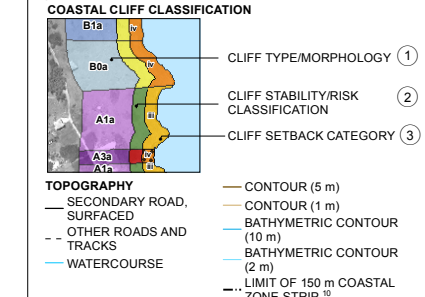
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	CLIFF TYPE	
I	I	I	A	18.0
II	II	II	B	20.0
III	III	III	C	25.0
IV	IV	IV	D	35.0
V	V	V	E	45.0
VI	VI	VI		55.0
VII	VII	VII		65.0

NOTE(S): SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 6 - SHEET 3D

REFERENCE(S) AND NOTES:

- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
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MAP SERIES 003 MAPSHEET 3D DATE MARCH, 2017

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LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

SETBACK GUIDELINE SCHEMATIC

1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
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TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	TYPE B - CLIFFS		
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1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

CLIFF HEIGHT	TYPE C - CLIFFS	
	WUGGNESS	MINOR VOIDS MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

D	TYPE D - CLIFFS	
	D1	D2
	D3	D4
	TRANSLATED LIMESTONE (BLOCKS)	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

E	TYPE E - CLIFFS	
	E1	E2
	E3	E4
	IN-PLACE EOCENE STRATA	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)	

TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCULATE OVERHANGS	OTHER	
I	1	1	1	18.0
II	2	2	2	20.0
III	3	3	3	25.0
IV	4	4	4	35.0
V	5	5	5	45.0
VI	6	6	6	55.0
VII	7	7	7	65.0

NOTE(S): SETBACK GUIDELINES CHART FOR TWO DIMENSIONAL GEOMETRY ONLY. FOR THREE DIMENSIONAL STRUCTURES, SITE SPECIFIC EVALUATION MANDATORY.

COASTAL CLIFF CLASSIFICATION

TOPOGRAPHY

- CONTOUR (5 m)
- CONTOUR (1 m)
- BATHYMETRIC CONTOUR (10 m)
- BATHYMETRIC CONTOUR (2 m)
- LIMIT OF 150 m COASTAL ZONE STRIP

KEY MAP

MAPSHEET COVERAGE

MAGNETIC NORTH 15°38'76" WEST

ANNUAL VARIATION 0°2' WEST

0 5 10 15 KILOMETRES

PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI)
COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 6 - SHEET 3A

REFERENCE(S) AND NOTES:

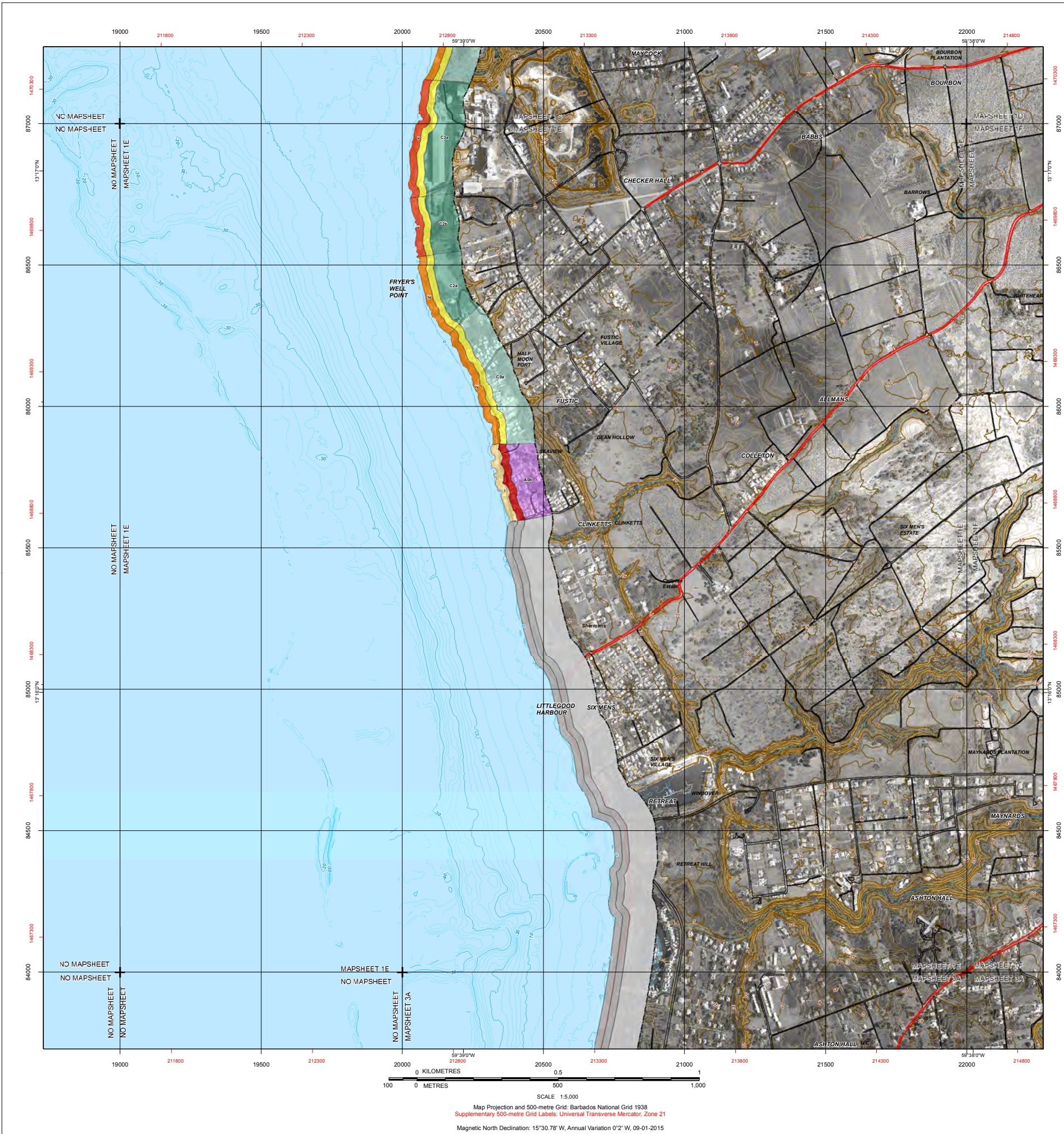
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
- CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
- CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
- CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
- COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
- CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDRN, SEPTEMBER 2014 TO JANUARY 2015
- LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDRN SEPTEMBER 2014 TO JANUARY 2015
- NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO ISS DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
- ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAB.
- WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
- MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 3A DATE MARCH, 2017

Coastal Zone Management Unit
8th Floor Warrens Tower
Warrens, St. Michael
Barbados
www.coastal.gov.bb

Baird **Golder Associates**

Map Projection and 500-metre Grid: Barbados National Grid 1938
Supplementary 500-metre Grid Labels: Universal Transverse Mercator, Zone 21
Magnetic North Declination: 15°30'78" W, Annual Variation 0°2' W, 09-01-2015

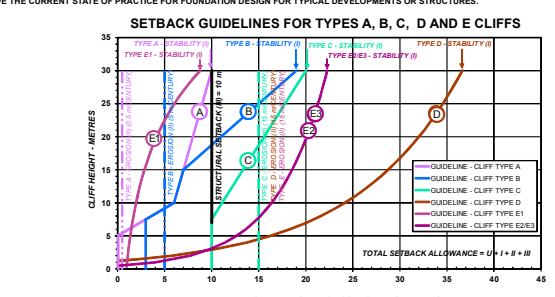
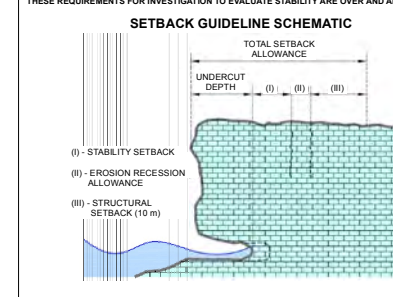


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE
LOW	<8%	>1.5	STABLE		

NOTES: 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



1 TYPICAL MORPHOLOGY

UNDERCUT DEPTH	TYPE A - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b	
1 to 2 m	A1a	A1b	
2 to 4 m	A2a	A2b	
4 to 7 m	A3a	A3b	

UNDERCUT DEPTH	TYPE B - CLIFFS		
	AVERAGE UCS (MPa)	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b	
1 to 2 m	B1a	B1b	
2 to 4 m	B2a	B2b	
4 to 7 m	B3a	B3b	

CLIFF HEIGHT	TYPE C - CLIFFS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE D - CLIFFS

D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

TYPE E - CLIFFS

E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANIC OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

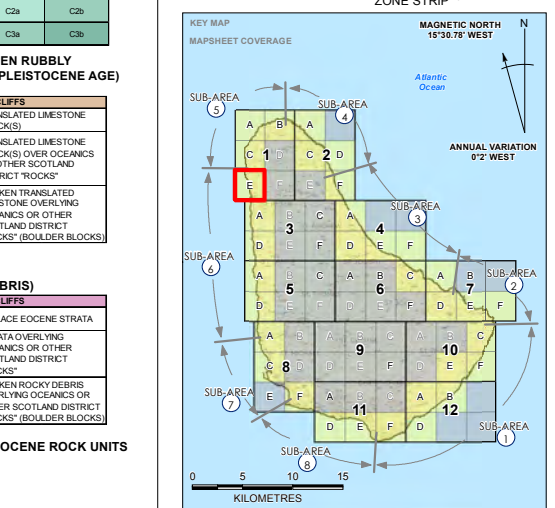
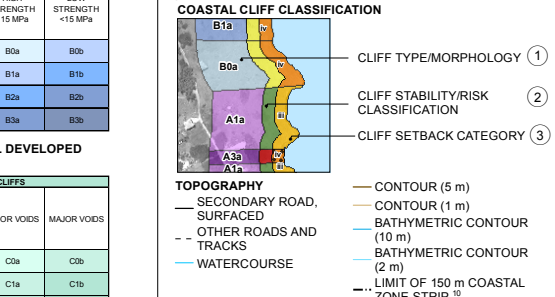
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

NOT CLASSIFIED *

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIAN	ARCuate OVERHANGS	SETBACK CATEGORY	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTES: SETBACKS MEASURED FROM CREST OF CURRENT CLIFF. ALLOWABLE REDUCTIONS IN SETBACK DISTANCES POSSIBLE WITH SITE SPECIFIC GEOTECHNICAL ASSESSMENT.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 6 - SHEET 1E

- REFERENCE(S) AND NOTES:
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
 - CLIFF HEIGHTS MEASURED AT SOME LOCATIONS IN THE FIELD. ALL OTHER LOCATIONS ESTIMATED THEN CHECKED FROM LIDAR AND DRONE SURVEY INFORMATION.
 - CLIFF RISK AND SETBACK CRITERIA APPLY AT THE CLIFF EDGE. LANDSLIDE RISK ZONINGS APPLY FOR FULL 150 M STRIP.
 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD, FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFFS TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m AND 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYDRN, SEPTEMBER 2014 TO JANUARY 2015
 - LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYDRN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARD MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 1E DATE MARCH, 2017

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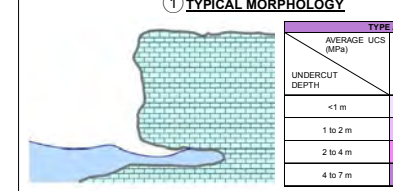
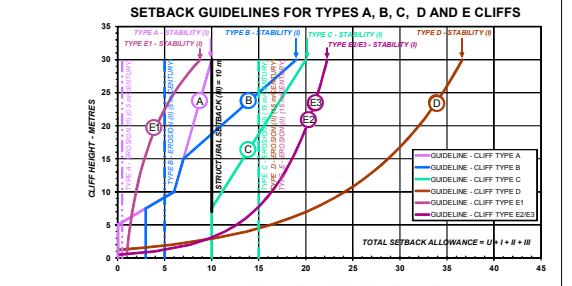
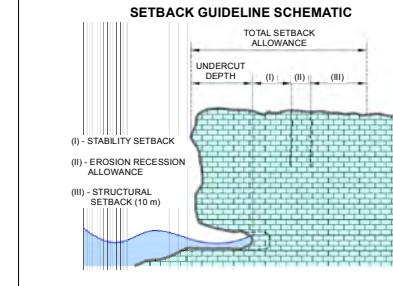


LEGEND

2 COASTAL CLIFF RISK CLASSIFICATION

RISK CLASS	PROBABILITY OF FAILURE	MIN FOS	CLIFF STABILITY	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS	
				FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL
MEDIUM	8-30%	1.3	MINOR CRACKING		
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE

NOTE(S): 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.8 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.



TYPE A CLIFFS - MASSIVE OR LAYERED CORALLINE LIMESTONE, DEVOID OF SIGNIFICANT JOINTING OR VOIDS (PLEISTOCENE AGE)

UNDERCUT DEPTH	AVERAGE UCS (MPa)	
	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	A0a	A0b
1 to 2 m	A1a	A1b
2 to 4 m	A2a	A2b
4 to 7 m	A3a	A3b

TYPE B CLIFFS - CORALLINE LIMESTONE CONTAINING WELL DEVELOPED JOINTING/BEDDING PLANES (PLEISTOCENE AGE)

UNDERCUT DEPTH	AVERAGE UCS (MPa)	
	HIGH STRENGTH >15 MPa	LOW STRENGTH <15 MPa
<1 m	B0a	B0b
1 to 2 m	B1a	B1b
2 to 4 m	B2a	B2b
4 to 7 m	B3a	B3b

TYPE C CLIFFS - REEFAL, VUGGY, OPEN STRUCTURED, OFTEN RUBBLY CORALLINE LIMESTONE, CONTAINING SIGNIFICANT VOIDS (PLEISTOCENE AGE)

CLIFF HEIGHT	VUGGINESS	
	MINOR VOIDS	MAJOR VOIDS
1 to 2 m	C0a	C0b
2 to 5 m	C1a	C1b
5 to 10 m	C2a	C2b
>10 m	C3a	C3b

TYPE D CLIFFS - CORALLINE LIMESTONE PSEUDO-CLIFFS (ACTUALLY REMNANT LANDSLIDE DERIVED LIMESTONE DEBRIS)

TYPE D - CLIFFS	
D1	TRANSLATED LIMESTONE (BLOCKS)
D2	TRANSLATED LIMESTONE (BLOCKS) OVER OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
D3	BROKEN TRANSLATED LIMESTONE OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

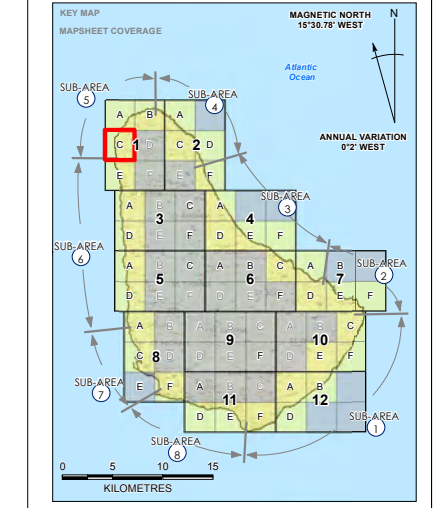
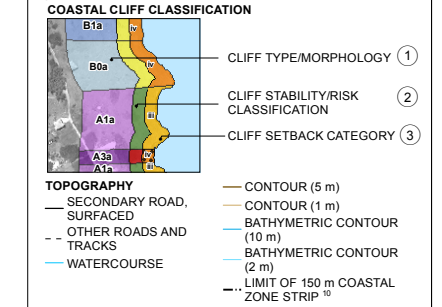
TYPE E CLIFFS - MISCELLANEOUS CLIFF FORMATIONS IN EOCENE ROCK UNITS

TYPE E - CLIFFS	
E1	IN-PLACE EOCENE STRATA
E2	STRATA OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS'
E3	BROKEN ROCKY DEBRIS OVERLYING OCEANICS OR OTHER SCOTLAND DISTRICT 'ROCKS' (BOULDER BLOCKS)

3 MINIMUM SETBACK LIMITS AND CATEGORY

COMMON CLIFFS	SUGGESTED MINIMUM ALLOWABLE SETBACK LIMITS			TOTAL SETBACK (U + I + II + III) (m)
	PROLETARIANS	ARCULATE OVERHANGS	CLIFF TYPE	
I	I	I	I	18.0
II	II	II	II	20.0
III	III	III	III	25.0
IV	IV	IV	IV	35.0
V	V	V	V	45.0
VI	VI	VI	VI	55.0
VII	VII	VII	VII	65.0

NOTE(S): SETBACK GUIDELINES CHART FOR TWO DIMENSIONAL GEOMETRY ONLY. FOR THREE DIMENSIONAL STRUCTURES, SITE SPECIFIC EVALUATION MANDATORY.



PROGRAM GEOTECHNICAL SURVEYS INVESTIGATION (GSI) COASTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

TITLE COASTAL CLIFF CLASSIFICATION - SUB-AREA 5 - SHEET 1C

- REFERENCE(S) AND NOTE(S)
- CLIFF TYPES - GENERAL CHARACTERISTICS (SEE GEOTECHNICAL SURVEYS INVESTIGATION 6.7 FIELD STUDY REPORT DATED SEPTEMBER 2016 FOR DETAILS)
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 - CLIFF UNDERCUT DEPTHS ESTIMATED IN FIELD FROM DRONE SURVEY AND/OR OFFSHORE PHOTOGRAPHS.
 - COASTLINES FEATURING CLIFF TYPES (A, B, C, D, E) ARE OF VARYING ELEVATIONS AND GENERALLY LACK ANY BEACH.
 - CONTOURS - 1 m and 5 m ELEVATION ON LAND AND 2 m BATHYMETRY GENERATED BY GOLDER ASSOCIATES FROM LIDAR DATA COLLECTED AND PROCESSED BY PELDYREN, SEPTEMBER 2014 TO JANUARY 2015
 - LIDAR IMAGERY COLLECTED/PROCESSED BY PELDYREN SEPTEMBER 2014 TO JANUARY 2015
 - NO CLIFFS IN THIS AREA - GEOTECHNICAL SURVEYS AND INVESTIGATION (GSI) MAPPING NOT CARRIED OUT - SHORELINE NOT CLASSIFIED ACCORDING TO GSI DESIGNATIONS. SHORELINE CONSISTS OF EITHER BEACH (REFER TO BARDI MAPPING FOR SHORELINE CLASSIFICATION) OR MAN-MADE STRUCTURES.
 - ASSESSMENT OF COASTAL ZONE STRIP AREA EXTENDED TO 400 m INLAND JUST NORTH OF BENAS.
 - WHERE TYPES A AND E CLIFFS ARE PRESENT IN SCOTLAND DISTRICT, SLOPE RISK CLASSIFICATION FOR SOILS WITHIN THE 100 m COASTAL ZONE STRIP MUST ALSO BE CONSIDERED.
 - MAPS TO BE READ IN CONJUNCTION WITH GEOTECHNICAL SURVEYS INVESTIGATION 6.8, FINAL ASSESSMENT REPORT DATED MARCH 2017

MAP SERIES 003 MAPSHEET 1C DATE MARCH, 2017

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Warrens, St. Michael
Barbados
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A10.2. Guidelines for development

The following is intended to update and enhance the existing recommendations and form a new set of guidelines to be used to help review applications for future development and continued land use within the 150 m coastal zone strip within the Cliff areas around the island. These guidelines are based on the risk zoning presented in detail (at 1:5,000 scale) on the Map Series 003 and as summarized on the first figure of this Annex.

The guidelines for development and use within the coastal strip (summarized in the tables within the legend of these figures and the detailed Map Series 003) are discussed in the following sub-sections. The table of Guidelines for Development and Use shown on the following figure provides a summary of these guidelines and is also included as an inset on figures on each individual map sheet of the Map Series 003.

RISK CLASS	PROBABILITY OF FAILURE AND USAGE GUIDELINES WITHIN TOTAL SETBACK LIMITS					
	PROBABILITY OF FAILURE	MIN FoS	CLIFF STABILITY	FOR CONTINUED USE	FOR NEW OR FUTURE DEVELOPMENT	
VERY HIGH	>50%	<1.0	UNSTABLE AND REGRESSING	NOT PERMITTED (POSSIBLE ONLY AFTER SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING, DESIGN, AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES EXECUTED)	FORBIDDEN	SITE SPECIFIC GEOTECHNICAL INVESTIGATION ¹ , MOVEMENT MONITORING AND DESIGN AND IMPLEMENTATION OF ENGINEERING CONTROL MEASURES REQUIRED. THE SCOPE AND SCALE OF THESE REQUIREMENTS DEPENDS ON THE RISK CLASS, THE TYPE OF PROPOSED DEVELOPMENT AND THE NATURE OF THE SITE CONDITIONS. EVALUATION MUST BE CARRIED OUT BY A QUALIFIED GEOTECHNICAL SPECIALIST WITH RELEVANT EXPERIENCE WHO IS A REGISTERED PROFESSIONAL ENGINEER.
HIGH	30-50%	1.1	SIGNIFICANT CRACKING	CAUTION - SITE SPECIFIC ASSESSMENT, MOVEMENT MONITORING AND POSSIBLY ENGINEERING CONTROL MEASURES REQUIRED	CONDITIONAL	
MEDIUM	8-30%	1.3	MINOR CRACKING			
LOW	<8%	>1.5	STABLE	ALLOWED - AFTER VISUAL INSPECTION	ALLOWABLE	

NOTE(S):
 1. GUIDELINES FOR TYPE(S) OF GEOTECHNICAL INVESTIGATION AND MONITORING REQUIRED TO ASSESS LOCAL STABILITY ARE PROVIDED IN SECTION 6.9 OF THE FINAL ASSESSMENT REPORT (GOLDER, 2017). THESE REQUIREMENTS FOR INVESTIGATION TO EVALUATE STABILITY ARE OVER AND ABOVE THE CURRENT STATE OF PRACTICE FOR FOUNDATION DESIGN FOR TYPICAL DEVELOPMENTS OR STRUCTURES.

In general, all new development should be located behind the minimum recommended total setback limits. Any development or structures (existing or proposed) that may encroach into the total setback limit will require specific evaluation to ensure that the loading from the structure(s) do not adversely affect the stability of the cliffs. All existing structures located within the total setback limits may incur restrictions on future use (including possibly eviction) depending on risk level and outcome of site specific geotechnical investigation and assessment as discussed below.

A10.2.1. Low Risk Areas

From a cliff stability perspective, areas within the coastal strip that are classified as low risk are generally considered to be stable. Future development and continued use of currently occupied properties should not be restricted (subject to adherence to the minimum recommended total setback requirements) and geotechnical investigations and/or monitoring are generally not anticipated to be necessary for locations outside of the total setback limits. For existing structures located within the total setback limits in low risk areas, continued use may be allowable, depending on proximity to cliff face, local conditions and subject to satisfactory inspections. New development within the total

setback limits in low risk areas would generally be allowable subject to geotechnical investigations (i.e. in addition to typical requirements as part of the current state of practice for foundation design for developments or structures) and assessment and monitoring by a qualified geotechnical specialist with proper structural design, if required.

A10.2.2. Medium Risk Areas

Areas within the coastal strip that are classified as medium risk are also generally considered to be stable from an overall stability perspective. New development and continued use of currently occupied properties should not necessarily be restricted (subject to adherence to the minimum recommended total setback requirements) however, caution is advised. Evidence and signs of incipient instability observed in certain parts of medium risk areas suggests that confirming stability and refining risk with respect to the extent and/or location of any existing or proposed development is required. For cases where existing structures are located, or new development is proposed to be located, within the recommended total setback allowance, geotechnical investigations (i.e. additional to typical requirements as part of the current state of practice for foundation design for developments or structures), assessment and monitoring by a qualified geotechnical specialist will be required. The scope of the investigation and assessment required (plus requirements for additional structural and/or remedial design measures) will be dependent on the scale of the existing or proposed development, and in particular on the location relative to the recommended total setback limit.

A10.2.3. High Risk Areas

Areas within the coastal strip that are classified as high risk are generally considered to be only marginally stable.

All existing structures and any proposed new development should be located beyond the recommended total setback limits. In high risk areas, existing buildings and infrastructure that are located within the minimum recommended total setback limits may be at high risk if cliff recession has created marginally stable overhangs or open joints in areas where joint controlled blocks are evident. For these situations and for cases where any new development is proposed to encroach into the recommended total setback limit, inspection, investigation and evaluation by a qualified geotechnical specialist is required. Evaluation should include a detailed assessment of each of the components for calculating/refining the minimum total setback requirement, including:

- Undercut (U) – refinement should be based on detailed survey of actual cliff and notch geometry at the site;
- Stability Component (I) – refinement should be based on detailed site specific investigation, sampling and laboratory testing followed by numerical analysis using actual cliff geometry (3D analysis may be required, depending on site geometry);
- Recession Component (II) – refinement should be based on assessment of actual recession/erosion rates at site, including consideration of shoreline protection, if any, typical wave climate and energy, and available long-term monitoring information (if any); and,
- Structural Component (III) – refinement should be based on actual site and structure conditions including cliff height, cliff type as well as building load(s) and foundation type(s) and depth(s).

Depending on the outcome, new development may not be permitted and, for existing structures, restrictions on continued land use, implementation of remedial measures, monitoring, or possibly eviction, may be mandatory. Ground movement and tension crack monitoring of identified features will be required for any continued use of existing structures and for any proposed new development. Such mandatory monitoring should be carried out to establish ground movement rates on an annual basis. Approval(s) for new development in these areas (within the total setback limits) would be dependent on the outcome of detailed investigation, assessment and monitoring and be subject to review by a qualified geotechnical specialist. However, in general, new development may be limited to only lightly loaded, low-level or single-storey building structures.

As a minimum requirement, all geotechnical investigations should be carried out by a qualified geotechnical specialist and the minimum investigation requirements to assess stability (in addition to that carried out as part of the current state of practice for foundation design for typical developments or structures) should include the following tasks:

- Detailed survey of topography and cliff geometry;
- Detailed cliff mapping followed by drillhole investigation to confirm cliff types and rockmass competence and variability, and presence or absence of unidentified deep undercuts, adverse jointing influence, blowholes, caves or adverse vuggy porosity;
- Laboratory testing of undisturbed samples of cap, face and internal fabric (direct tensile and Brazilian and uniaxial strength tests) to establish rock properties;
- Determination of Building Footprint and Loadings;
- Calculation of appropriate stability, recession and structural setbacks based on regression equations; and,
- Check comparison of results against the 1:5,000 scale setback maps in Appendices J and R and update as required.

Prior to approval for new development, the results of the detailed geotechnical investigation and assessment in the context of the scale of the proposed development should be reviewed by a qualified geotechnical professional.

A10.2.4. Very High Risk Areas

Areas within the coastal strip that are classified as very high risk are generally considered to be unstable within the total setback limits. Future development should therefore not be permitted within the setback zone as defined in these areas. The continued use of existing structures and infrastructure within the setback zone in these areas is also not permitted. The urgency and requirements for abandonment of existing infrastructure, design and implementation of remedial measures, and/or eviction from existing residential developments within the total setback limits however would need to be evaluated on a case-by-case basis. Mandatory evaluation must include a detailed re-assessment of each of the components involved in determining the minimum total setback required (as per the requirements outlined in previous section for the High Risk Areas).

In all areas where existing development is present, and where it is proposed that such development remain in place, a regular program of inspection, crack monitoring and structure movement monitoring should be immediately implemented. The results of such a program would then be used to identify and prioritize the requirements for abandonment, eviction, or implementation of remedial measures.

A10.2.5. Areas behind Total Setback Limit

In terms of the above discussions, the 'setback limit' or 'setback strip' applies to the Total Setback Distance and not just the Stability Setback (I) discussed under stability analysis. The stability setback constitutes just one portion of the Total Setback. The Total Setback is the combined value of the Undercut Depth (U) as well as the setbacks compiled from: (I) the Stability Setback Component calculated from the line of best fit for each cliff type; (II) the Recession Allowance Component; and, (III) the Structural Setback Width.

Ongoing and future use of cliff areas outside of the defined Total Setback distance, as far as the 150 m boundary, is permissible without remediation. However, if new development is proposed to be located close to the Total Setback boundary in any areas designated as high to very high risk (as explained in Section 6.7), it is advisable that the new development be subjected to site specific investigations (over and above that required as part of the current state of practice for typical foundation design). This additional, site specific investigation would be necessary to check that the proposed structure(s), foundation load(s), construction methods, etc. will not destabilize the cliff zone conditions or in any way adversely extend the pre-defined Total Setback distance father inland.

ANNEX 11. TIERED APPROACH TOWARDS ADDRESSING EMERGING ISSUES IN THE CZMA

A tiered approach to identifying and addressing emerging challenges (as directed by members of the Planning and Development Board) may include the following:

Analysing and applying approaches to identify possible emerging challenges

- Scan methods (enhanced by deep-analytics tools) to provide early detection of even weak signals or patterns.
- Undertake trend-analysis methods to better quantify data and review additional analytic tools for assessing unstructured data.
- Consider using future scenarios that use quantitative, qualitative, and unstructured data to fuel real-time and dynamic scenario imaging as data feeds are used to refine and weight potential outcomes.
- Adopt the use of crowdsourcing and analytics to detect and predict emerging challenges, particularly for hazardous natural or human-caused areas of concern.

Organizing and screening emerging challenges for further review

- Apply selected screening-level versions of the mature tools now available for each of the three main sustainability pillars (society/environment/economy)'.

Analyse the sustainability challenges of identified emerging issues

- Screening-level results should be used to help rank/order the importance or significance of emerging challenges taking place on the coast for further analysis. The most likely scenarios from the future methods should be subjected to a more detailed set of assessments for each of the three pillars as more refined data become available.
- Devise a systems-based indicator analysis of likely scenarios from the futures methods which could be used to further clarify which projects would benefit most from more refined sustainability assessments. *(NB: the sustainability-assessment tools and approaches will be informed and guided by emerging related issues that are identified and may include environmental-impact assessments, social impact assessments, benefit-cost analyses (BCAs), risk assessments, resilience and adaptation assessments, segmentation analyses, and collaborative problem-solving already in place for the ESIA process in Barbados).*

Communication of findings and recommendations

Social-media platforms and analytics present new and effective forums to engage and communicate with Barbadian stakeholders, allowing for the use of analytic approaches to provide rapid analysis and categorization of stakeholder input and to provide transparency to stakeholders on how CZMU uses this information in its decision-making. This approach presents an opportunity to derive a substantial increase in value from stakeholder processes that are planned for GoB and CZMU. Additional value could be created in the use of advanced IT capabilities in the following:

- Benchmarking the potential effects of newly identified emerging issues in the regulated community and other stakeholders.
- Mapping the effects of newly identified emerging issues in demographic or stakeholder categories.
- Setting priorities for action on newly identified emerging issues multiple stakeholder categories.
- Identifying the socially influential stakeholders to spearhead the communication of emerging issues to a broader citizenry.
- Assessing stakeholder preferences for sustainable and resilient products and technologies through analysis of social-media data.

In this instance, CZMU should develop its current IT capabilities to assess emerging issues by involving all relevant stakeholders, possibly through the use of a range of social analytic tools (see Section E4 “Information Needs and Data Management”). This could involve the incorporation of insights from a broad array of stakeholders which, upon evaluation, could markedly improve CZMU’s understanding of a new issue’s importance and also, the speed with which it is emerging. The insights could also improve the evidence base for the CZMU’s decision-making process and increase the likelihood of stakeholder acceptance of difficult decisions.

To enhance post-decision assessment of its activities, the GoB (under the leadership of the CZMU) should identify, track, and address unintended consequences of new emerging issues. A searchable database of the lessons learned should be created and possibly linked to NCRIPP to determine the implications of the emerging issue for coastal hazards and risks (see Section E4 “Information Needs and Data Management”).

Not only would that provide additional evidence-based support capabilities for future decision-making, but the data could feed advanced cognitive analytics that could be used to test proposed decisions against known unintended cause–effect scenarios developed from past decisions.

Finally, it is clear that more accurate and earlier prediction of emerging issues related to environmental settings would enhance the ability to incorporate resilience strategies into any new (required) infrastructure design. Incorporation of resilience in the context of sustainability would have implications for the design and planning of projects (particularly urban infrastructure projects) that include and integrate new emerging issues into their design. Currently, this remains a challenge to accomplish as no comprehensive tool for quantifying resilience is available.

