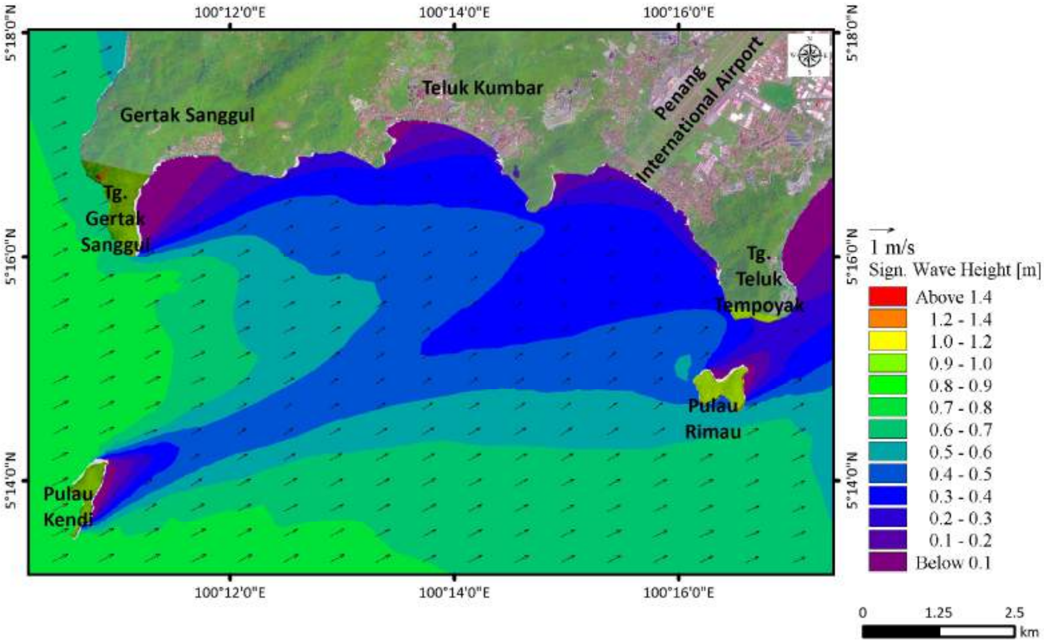
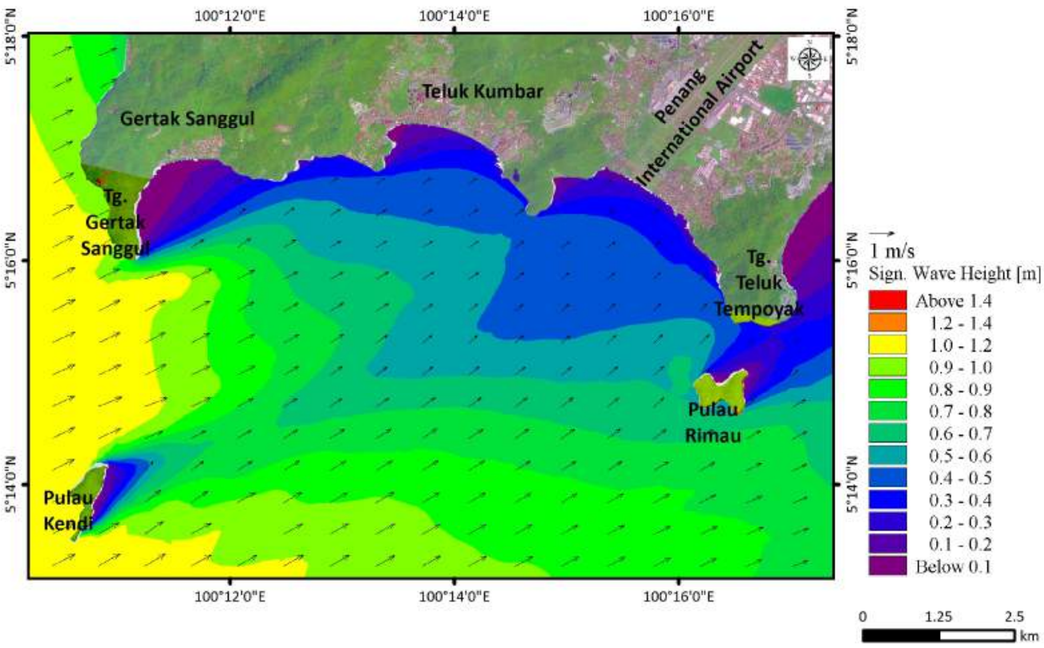
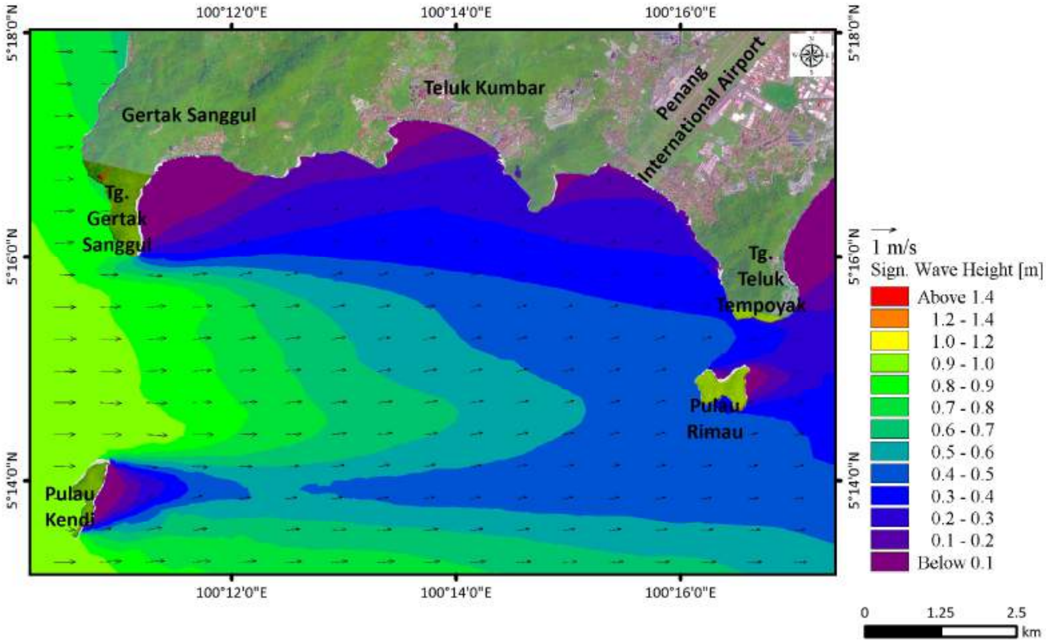


a) 1 in 1 year return period event: H_{m0} = 0.8 m, T_p = 5.0 s

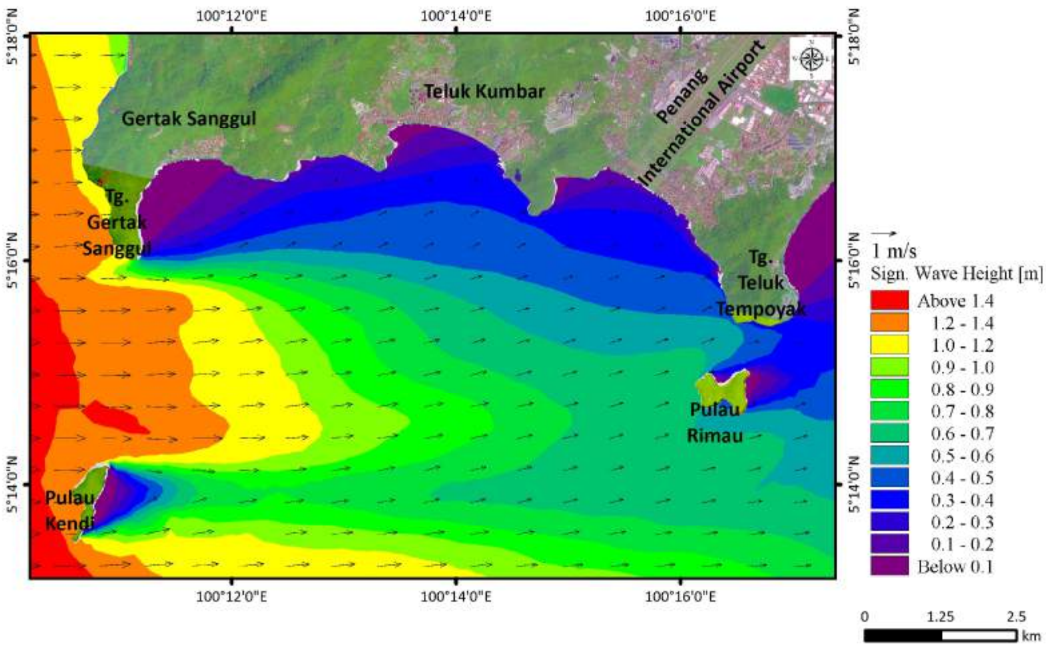


b) 1 in 60 year return period event: H_{m0} = 1.2 m, T_p = 6.5 s

F6.16 Significant wave heights (H_{m0}); baseline condition; Mean Wave Direction = 240°N



a) 1 in 1 year return period event: H_{m0} = 1.0 m, T_p = 5.5 s



b) 1 in 60 year return period event: H_{m0} = 1.5 m, T_p = 6.0 s

F6.17 Significant wave heights (H_{m0}); baseline condition; Mean Wave Direction = 270°N

6.2.3 Climate and Meteorology

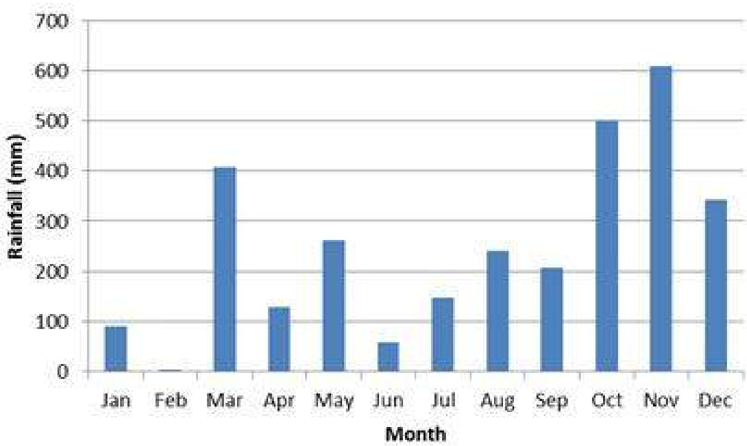
The climate of the Project study area reflects an equatorial climate, which is generally hot and wet throughout the year with little variation. Four rainfall regimes are inherent here, which are:

a) Northeast Monsoon from December to March;
b) Inter-monsoon period from April to May;
c) Southwest Monsoon from June to September; and
d) Inter-monsoon period from October to November.

The distribution of annual rainfall for the Bayan Lepas main drain, Sungai Bayan Lepas, Sungai Batu, Sungai Teluk Kumbar, Sungai Gemuruh and Sungai Gertak Sanggul basin does not vary much throughout the year. The study area experiences an average of 3,000 mm of rainfall annually. Temperature throughout the year is quite constant with an average of 28°C. The temperature usually peaks in the afternoon with an average of 32°C and falling to its lowest during the evening with an average of 24°C. The relative humidity similarly shows very little variation throughout the year with an average of 80%.

6.2.3.1 Monthly Rainfall

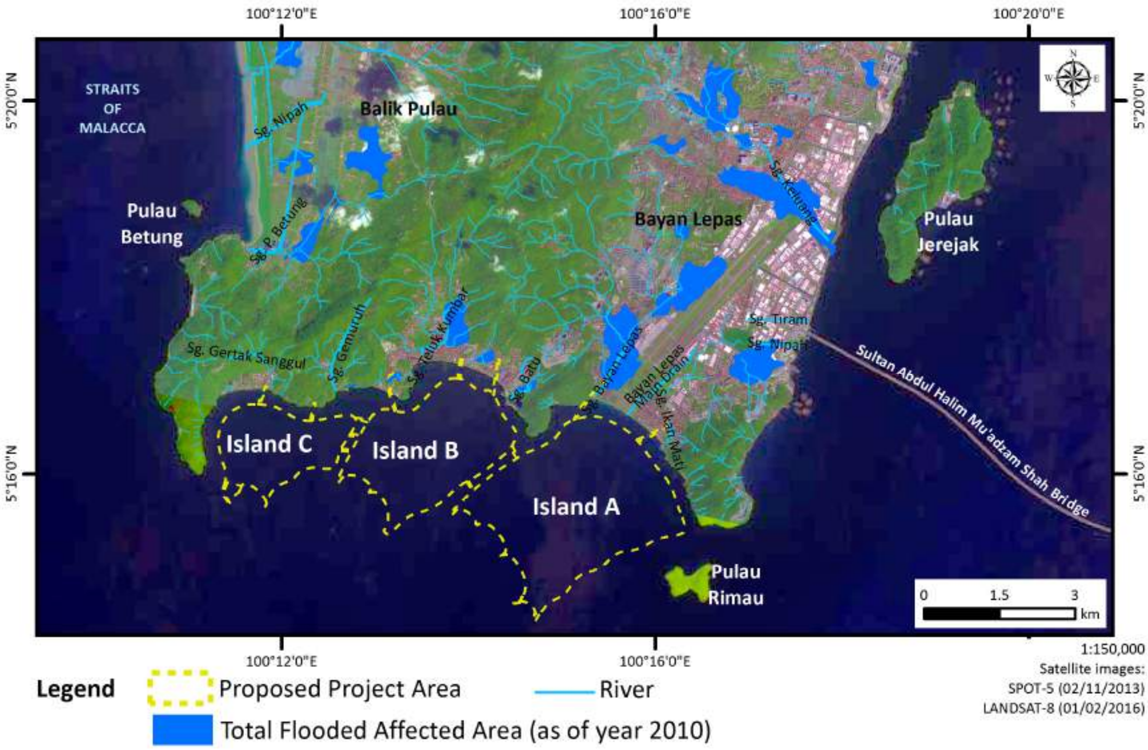
In general, the highest and lowest mean rainfall normally occurs in November and February respectively. Based on observations from the nearest rainfall station, the maximum minimum and rainfall recorded in November and February are about 610 and 3 mm respectively (F6.18).



F6.18
Monthly rainfall recorded at station Pintu Air Bagan, Air Itam, Penang

6.2.3.2 Flooding Condition

It is very likely that the larger river catchments have been subjected to flooding on various occasions. This is possibly true for Sungai Teluk Kumbar where a tidal gate and storm pump have been installed. River flooding is caused by incidence of heavy rainfall (monsoon or convective) and the resultant large concentration of runoff that exceeded river capacity. This is further compounded by the low-lying and flat terrain at the lower catchment where the Project site is situated. The flood events are also aggravated by high tide levels that can increase the downstream boundary levels which result in higher flood levels. From the flood event map as shown in F6.19, Sungai Bayan Lepas and Sungai Teluk Kumbar were recorded to be prone to flooding.



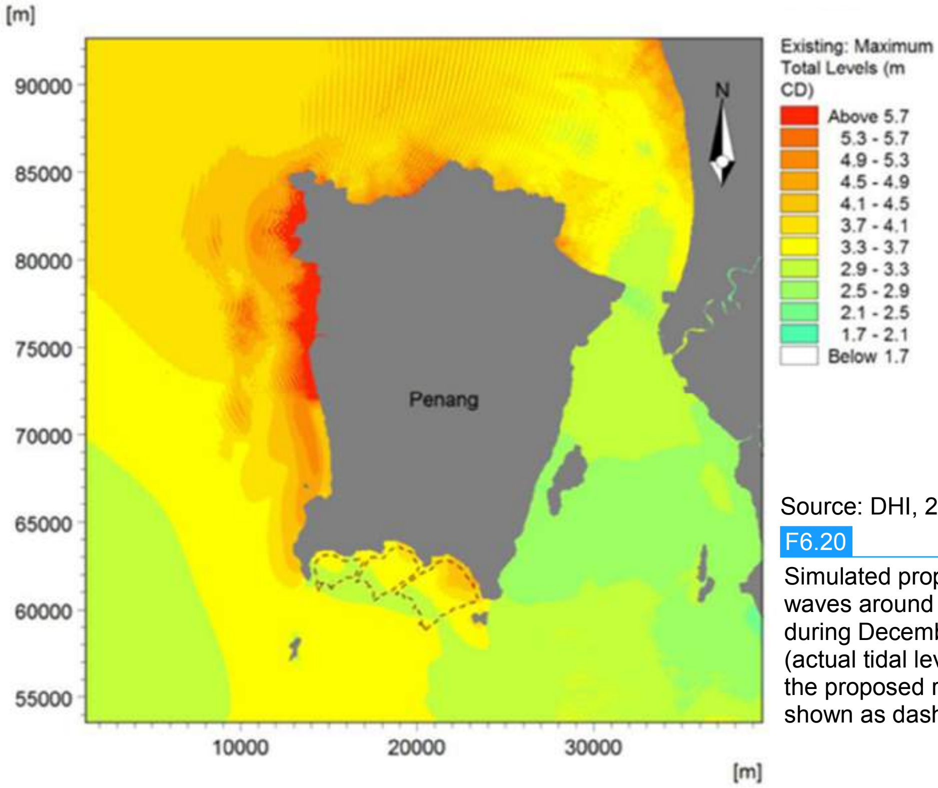
F6.19 Recorded flood extent of the rivers at south of Penang Island (as of year 2010)

It is envisaged that in circumstances where no rainfall occurs, tidal intrusion may inundate the low-lying areas up to about 2.69 m deep during Mean High Water Spring (MHWS) condition. It might reach up to 3.09 m deep during Highest Astronomical Tide (HAT) condition.

6.2.4 Tsunami

Tsunami can generally occur anytime and anywhere subject to the factors of tsunami generation. Earthquakes are the most common contributors to a tsunami. However, accurate prediction of earthquakes is extremely difficult. Predicting when and where the next tsunami will strike is currently not feasible. Once a tsunami is generated, forecasting tsunami arrival and impact is possible via modelling and measurement techniques.

An assessment of combined tidal and tsunami-induced water levels has been carried out using a detailed two-dimensional hydraulic model (MIKE 21 HD model) to assess the impact of the tsunami waves in the waters of southern Penang Island. The proposed development phases were evaluated separately. The simulation results show that the southern and eastern coasts of Penang Island have limited exposure to tsunami effects from the Indian Ocean compared to the western and northern coasts of Penang Island (F6.20) due to the relatively-sheltered location of this coastal stretch.



Source: DHI, 2016

F6.20 Simulated propagation of tsunami waves around Penang Island during December 2004 event (actual tidal level); the outlines of the proposed reclamations are shown as dashed red lines

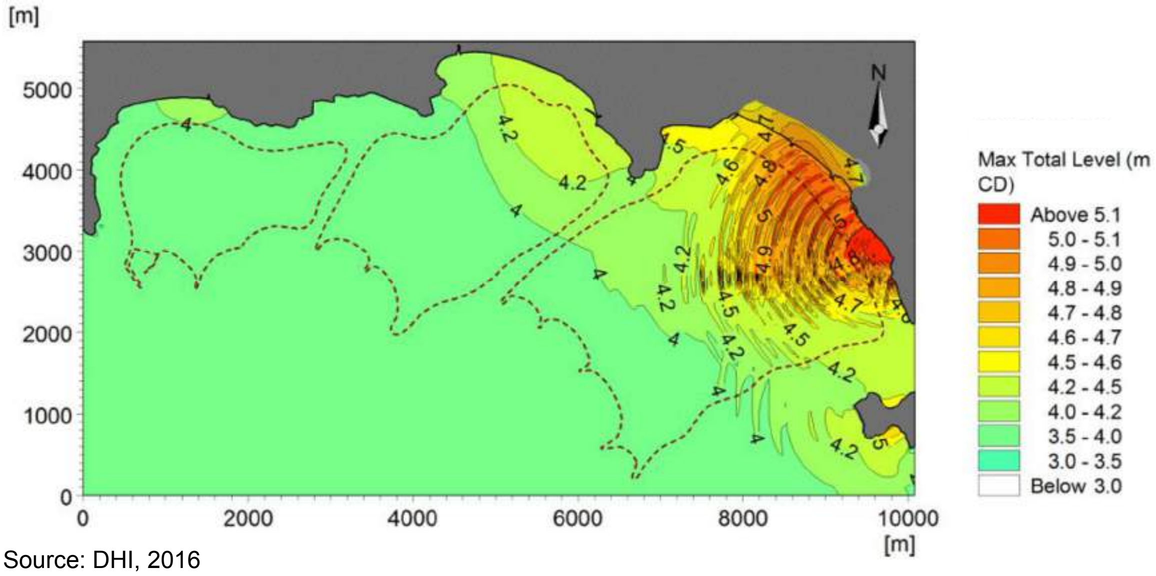
The simulations were conducted based on the December 2004 tsunami event at four tidal levels. The tidal levels are important for the water level assessment as the water depth, which the tsunami propagates influences the propagation speed, wave attenuation and shoaling of tsunami wave transformation. For design purpose, a relatively conservative tidal datum could be selected based on the tidal characteristics of the nearest tidal station, i.e. Kedah Pier, Penang. As earthquake events and tidal conditions are uncorrelated, the tsunami event of 2004 has been simulated for tidal levels as elaborated in T6.3.

T6.3 Tidal characteristics at Kedah Pier tidal station, Penang

Level	Simulation Case	Value (m CD)	Exceedence in Percentage of Time (%)
Mean Sea Level (MSL)	1	1.71	50
Actual water level (1300 hrs, 26th December 2004)	2	2.16	22
Mean High Water Spring (MHWS)	3	2.69	4
Highest Astronomical Tide (HAT)	4	3.09	*

Note: The probability of a tsunami coinciding with HAT is extremely low, as the return period is about 18.3 years

The predicted maximum water level map for a simulation carried out for the existing condition is shown in F6.21. The maximum water level is higher at the frontage of Permatang Damar Laut but reduces progressively westwards towards Gertak Sanggul.



Source: DHI, 2016

F6.21 Maximum water levels during the impact of tsunami waves with a tidal level corresponding to MHWS level for the existing condition

6.2.5 Hydrology and Drainage

The river catchments within the Project study area are shown in F6.22. There are eight rivers present along the south of Penang Island's coastline. However, only five main catchments were studied namely Sungai Gertak Sanggul, Sungai Teluk Kumbar, Sungai Batu, Sungai Bayan Lepas and Bayan Lepas Main Drain. The other three rivers (Sungai Mati, Sungai Gemuruh and Sungai Ikan Mati) contribute insignificant pollutants downstream, making them negligible. All river catchments are mapped out as shown in F6.22 while the area and dimensions for the five main rivers are tabulated in T6.4 and T6.5 respectively.

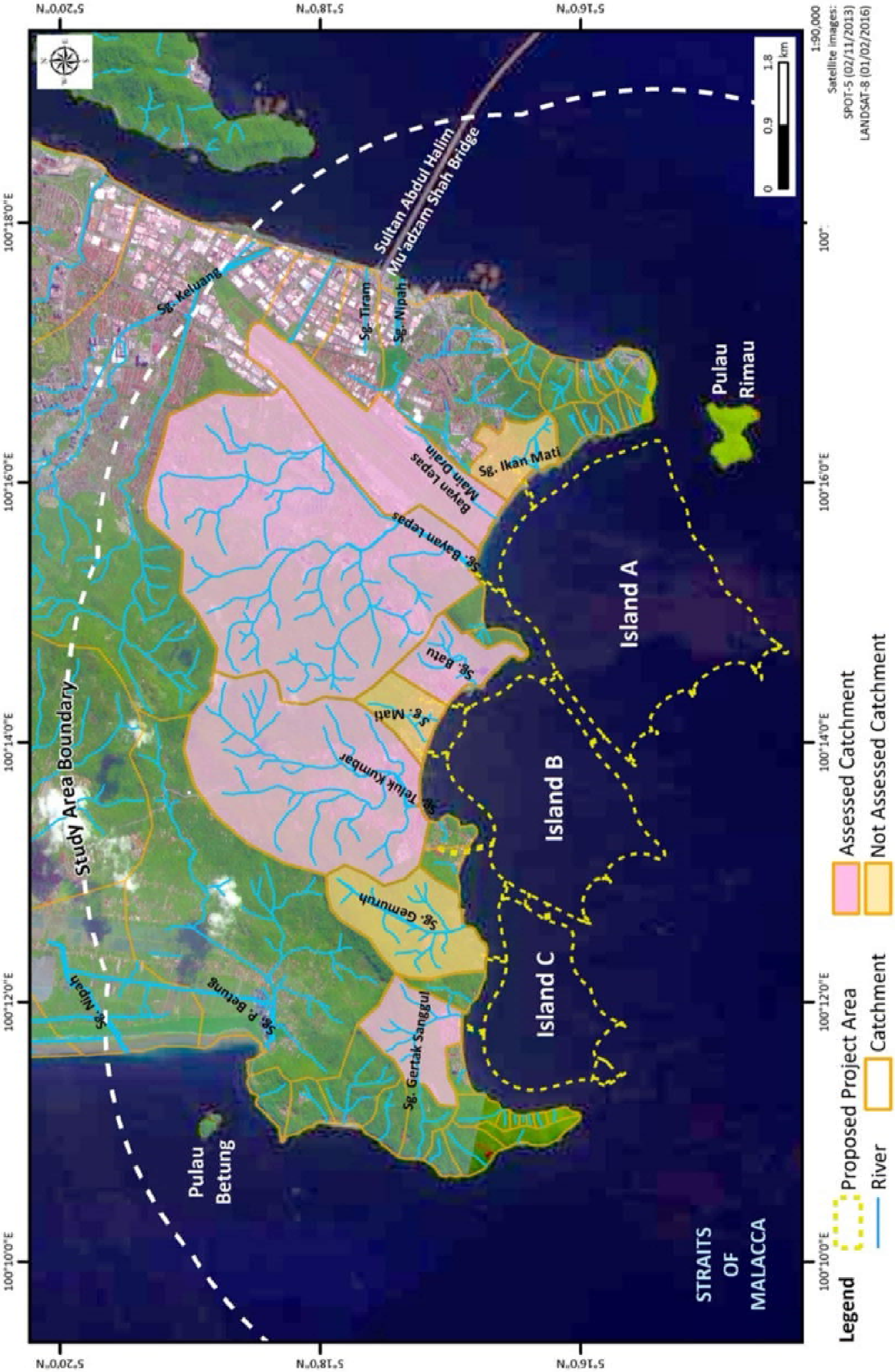
T6.4 Area of main river catchment

Rivers	Catchment Area (km^2)
Bayan Lepas Main Drain	2.98
Sungai Bayan Lepas	7.43
Sungai Batu	1.22
Sungai Teluk Kumbar	7.05
Sungai Gertak Sanggul	1.34

Source: Southern Penang Rivers - Water Quality Study (2016)

T6.5 Dimensions of the rivers along the south coast of Penang Island

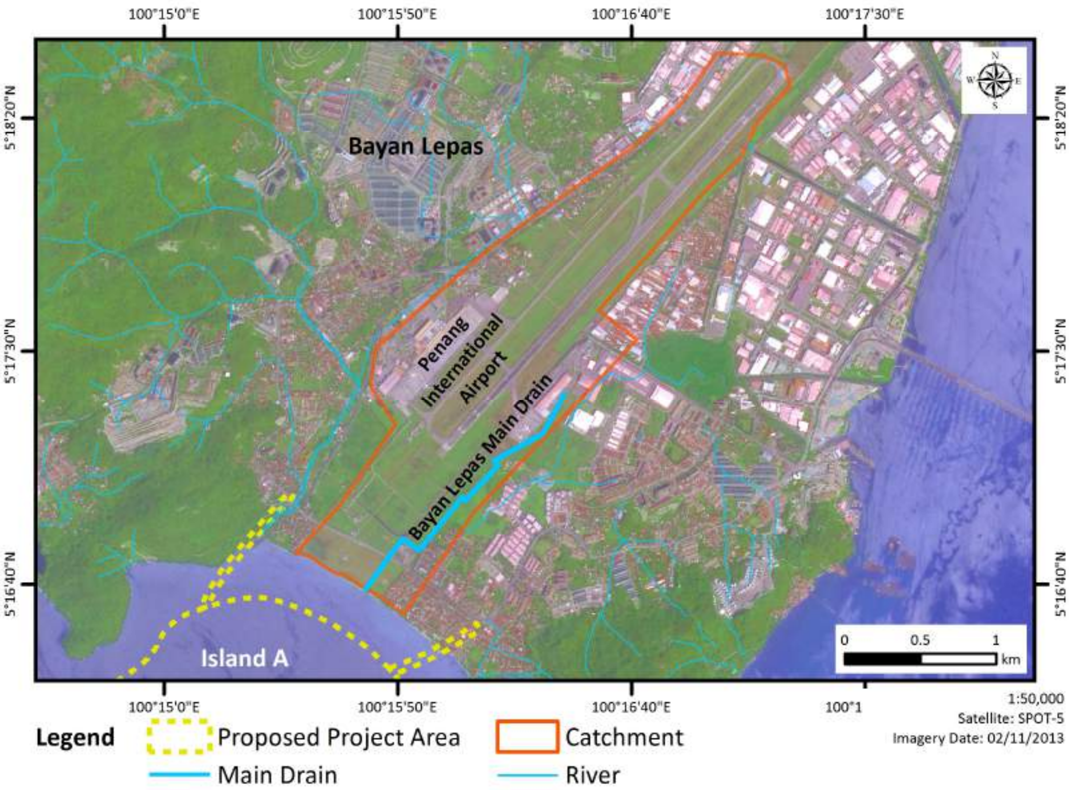
River Name	River Width (m)	River depth (m)	Base Flow (m^3/s)
Bayan Lepas Main Drain	2.0	2.0	0.028
Sungai Bayan Lepas	2.0	3.6	0.16
Sungai Batu	2.5	2.1	0.07
Sungai Teluk Kumbar	5.0	0.25	0.37
Sungai Gertak Sanggul	2.0	2.7	0.04



F6.22 River catchments within the Project study area

6.2.5.1 Bayan Lepas Main Drain

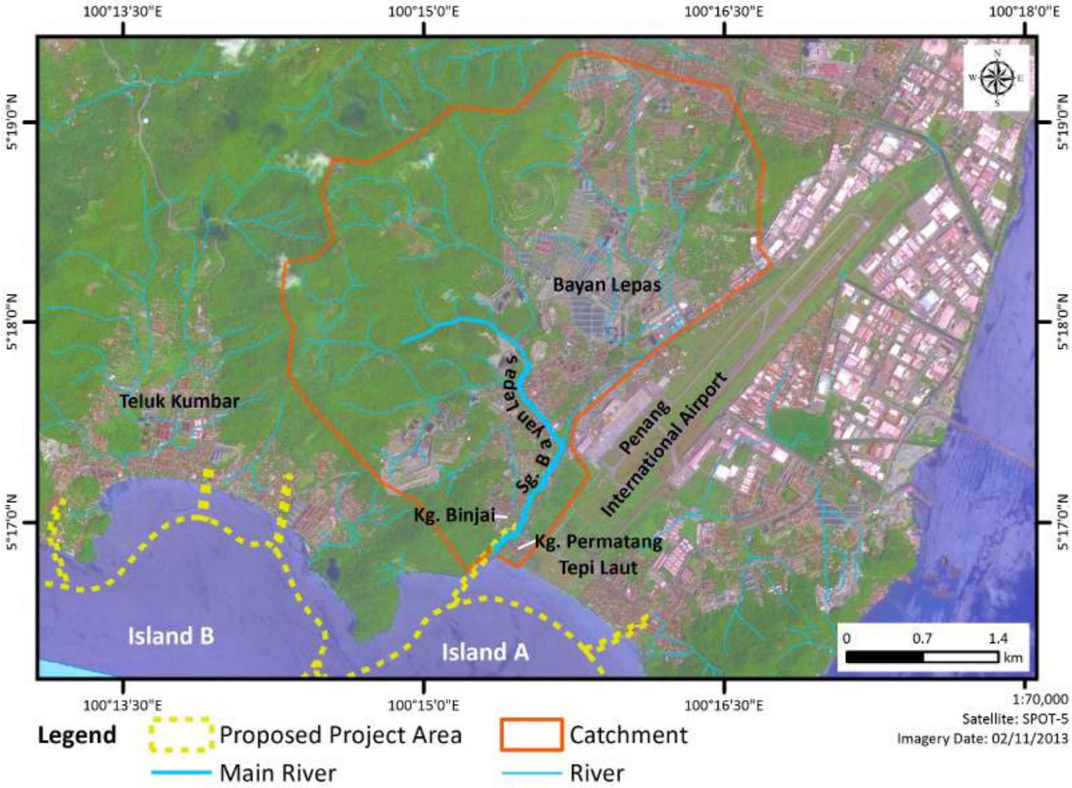
The Bayan Lepas Main Drain has a width and depth of 2.0 m with a catchment area of 2.98 km^2. It caters for flows from Penang International Airport and the surrounding development area in Bayan Lepas. It discharges into the sea at the southern part of the airport runway. F6.23 indicates the location of the Bayan Lepas Main Drain catchment. The Bayan Lepas Main Drain's primary purpose is to facilitate transfer flow from the urban discharges away from the development area. It is not a river but it does contribute a significant amount of flow to the coastal area during a storm event.



F6.23 Bayan Lepas Main Drain catchment

6.2.5.2 Sungai Bayan Lepas

Sungai Bayan Lepas has a width of 2.0 m and depth of 3.6 m. The catchment area is the biggest among all rivers at south Penang Island at 7.43 km^2. It originates from the area of Bukit Gambir, flowing through the village of Bayan Lepas and joins the sea just south of Penang International Airport. The river flows through a residential (high-rise) as well as some shophouses area before flowing into the sea. F6.24 indicates the location of the Sungai Bayan Lepas catchment.



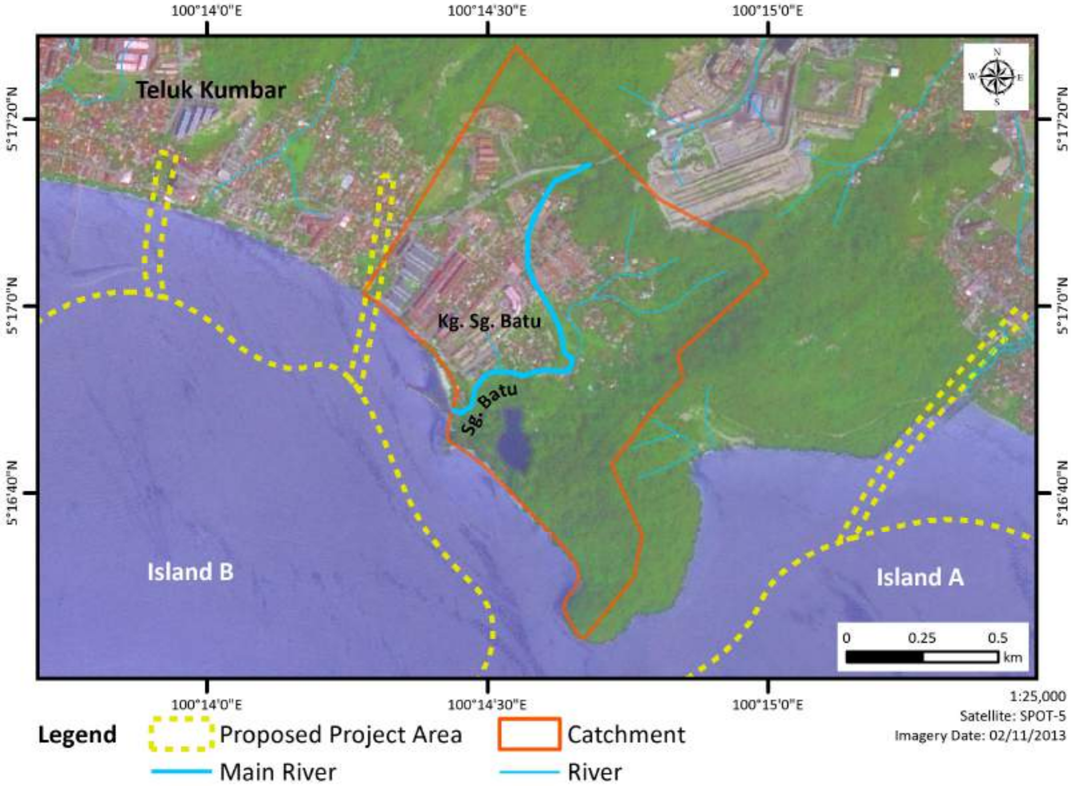
F6.24 Sungai Bayan Lepas catchment

6.2.5.3 Sungai Batu

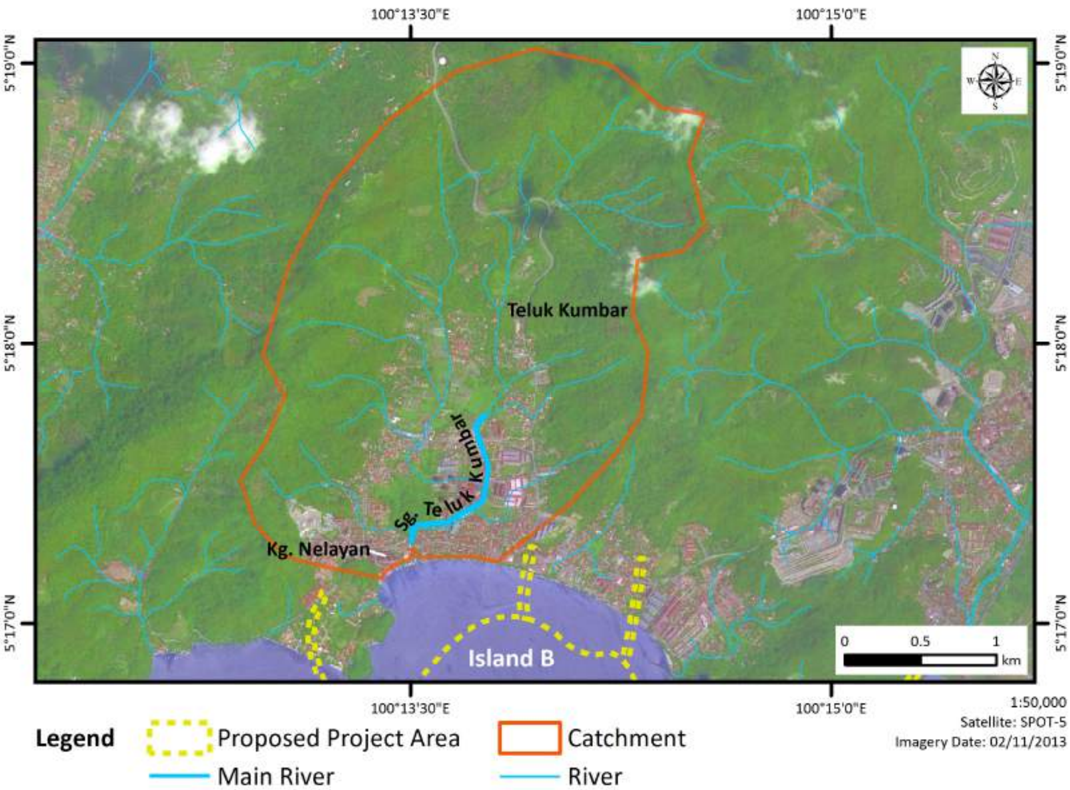
The width and depth of Sungai Batu are 2.5 and 2.1 m respectively. The catchment area is also the smallest at 1.22 km^2 in size. Sungai Batu originates from Kampung Sungai Batu, flowing through the residential area and joins the coast after flowing through a lake at a public beach area. Water flow is relatively slow with numerous locations where stagnant water can accumulate. F6.25 below indicates the location of the Sungai Batu catchment.

6.2.5.4 Sungai Teluk Kumbar

Sungai Teluk Kumbar is the widest at 5 m in width, but the shallowest at only 0.25 m in depth. The catchment area is the second largest after Sungai Bayan Lepas at 7.05 km^2. Sungai Teluk Kumbar originates from Bukit Papan, flowing through Kampung Tengah and joins the river at Kampung Teluk Kumbar. Sungai Teluk Kumbar passes through a relatively dense residential area, areas of mixed development and some small fishing villages. A tidal gate and pump operated by the Department of Irrigation and Drainage Malaysia (DID) is present at this river. F6.26 indicates the location of the Sungai Teluk Kumbar catchment.



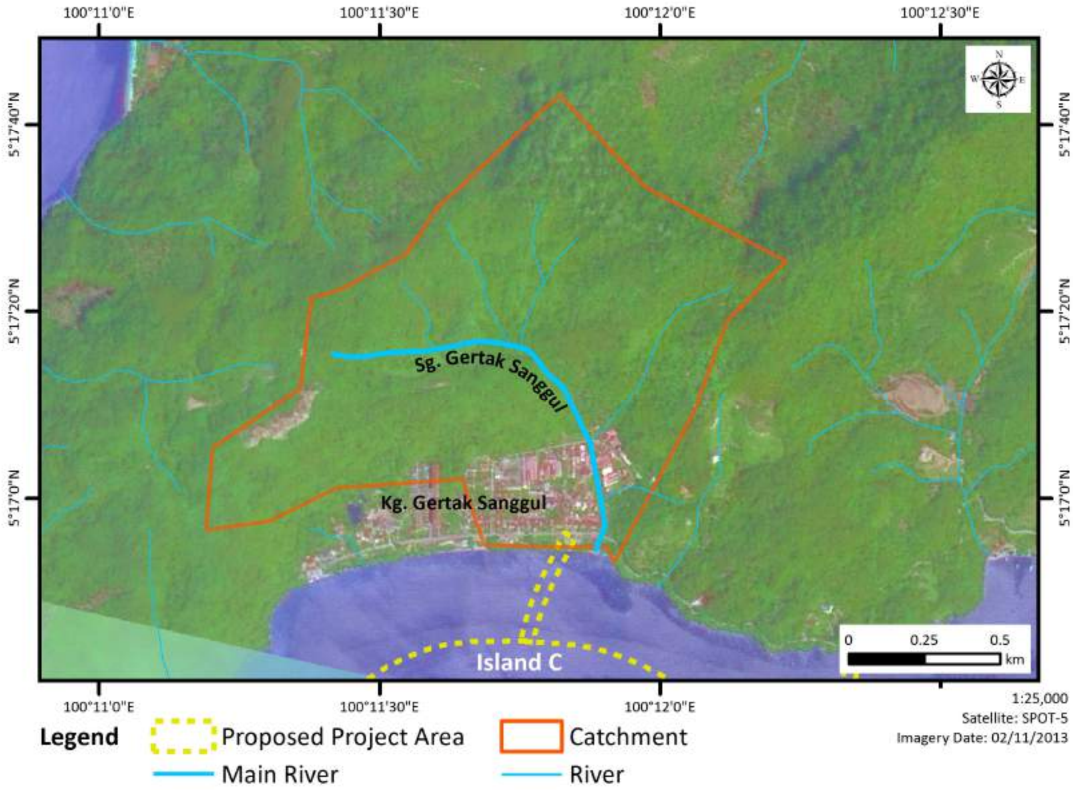
F6.25 Sungai Batu catchment



F6.26 Sungai Teluk Kumbar catchment

6.2.5.5 Sungai Gertak Sanggul

Sungai Gertak Sanggul has a width of 2.0 m and depth of 2.7 m. The catchment area is 1.34 km^2. Sungai Gertak Sanggul flows through Kampung Gertak Sanggul. The upstream area can be characterised as a combination of mainly residential area and undeveloped upstream areas. The river also flows through a cottage industry facility (pig farm). F6.27 shows the location of the Sungai Gertak Sanggul catchment.



F6.27 Sungai Gertak Sanggul catchment

6.2.6 Geology and Geotechnical

A geology and geotechnical study was conducted to assess the subsurface condition at the Project area. The reclamation site is located within the tidal range of about 2 m and water depth of –0.3 to –4.0 m CD.

6.2.6.1 Methodology

The methodology in conducting the studies comprises the following:

a) Geological assessment;
b) Geotechnical assessment study; and
c) Reclamation embankment stability analyses.

a) Geological Assessment

The geological assessment is carried out by reviewing available secondary data which are previous works and geological maps. The maps referred to are the Geological Map of Pulau Pinang from New Series L7010, Part of Sheet 28 published in 1994 by the Director-General of Geological Survey, Malaysia and the map published in 2012 by the Director-General of Minerals and Geoscience Malaysia.

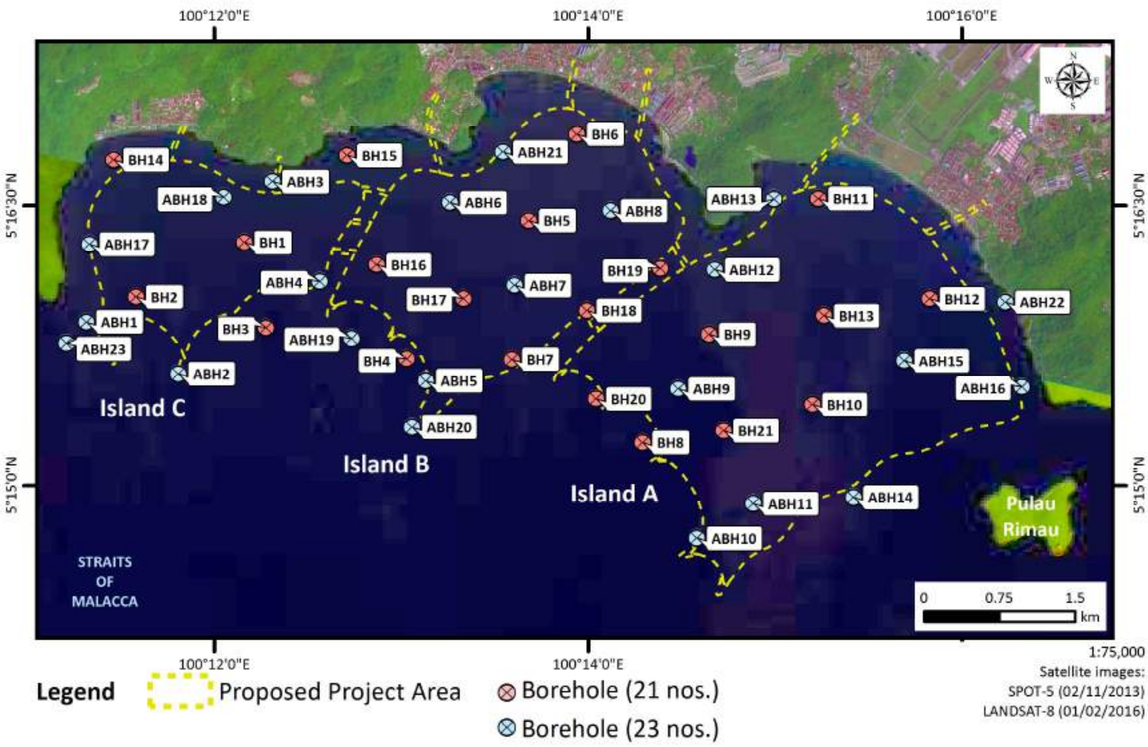
b) Geotechnical Assessment Study

The geotechnical assessment study is based on the Preliminary Geotechnical Design Report produced by G&P Professionals Sdn. Bhd. The report interprets the soil investigation (SI) works done at the proposed Project site. The SI works were first conducted by Geolab (M) Sdn. Bhd. and Strata Drill Sdn. Bhd. in July 2014 followed by a second round of SI works by Geolab (M) Sdn. Bhd. and Test Sdn. Bhd. in September 2015. A total number of 44 boreholes were sunk to obtain the subsoil information (F6.28).

c) Reclamation Embankment Stability Analyses

The stability of the reclamation embankment was analysed to determine the safe fill slopes and the required ground treatment during construction. The embankment stability is assessed using a limit equilibrium analysis by Slope/W. The external stability is checked against circular slip surface by Modified Bishop method and non-circular (wedge) slip surface by Spencer's method. The following stages were taken into consideration in the stability analyses:

i) Construction stage; and
ii) Serviceability stage.

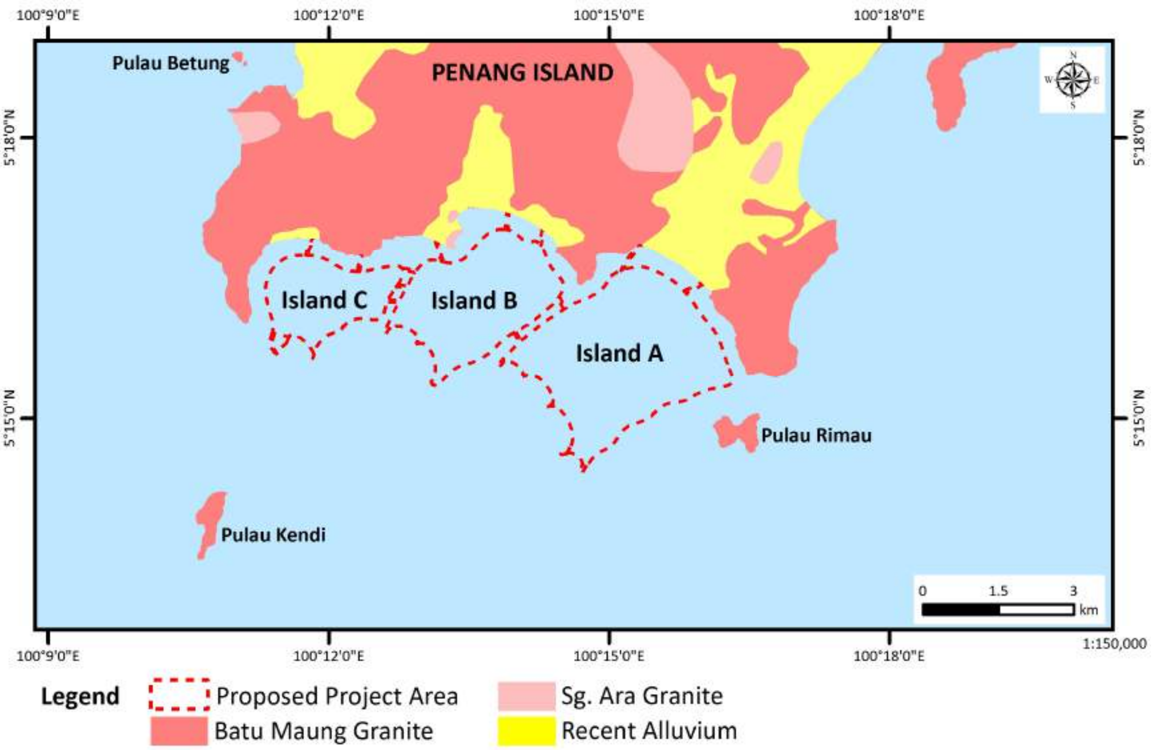


F6.28 Locations of boreholes

6.2.6.2 Geological Formation

The existing geological features of Penang Island mostly comprise igneous rocks which are intrusive rocks. It consists mainly of granite with minor granodiorite. The geological formation of south Penang Island is shown in F6.29. The south of Penang Island is underlain by Recent Alluvium over Batu Maung Granite, the latter generally consisting of medium to coarse grained biotite-muscovite granite with microcline predominates. The age of Batu Maung Granite is Early Permian to late Carboniferous. The overburden material of Batu Maung Granite generally consists of silty sand which is derived from the weathering of granite bedrock.

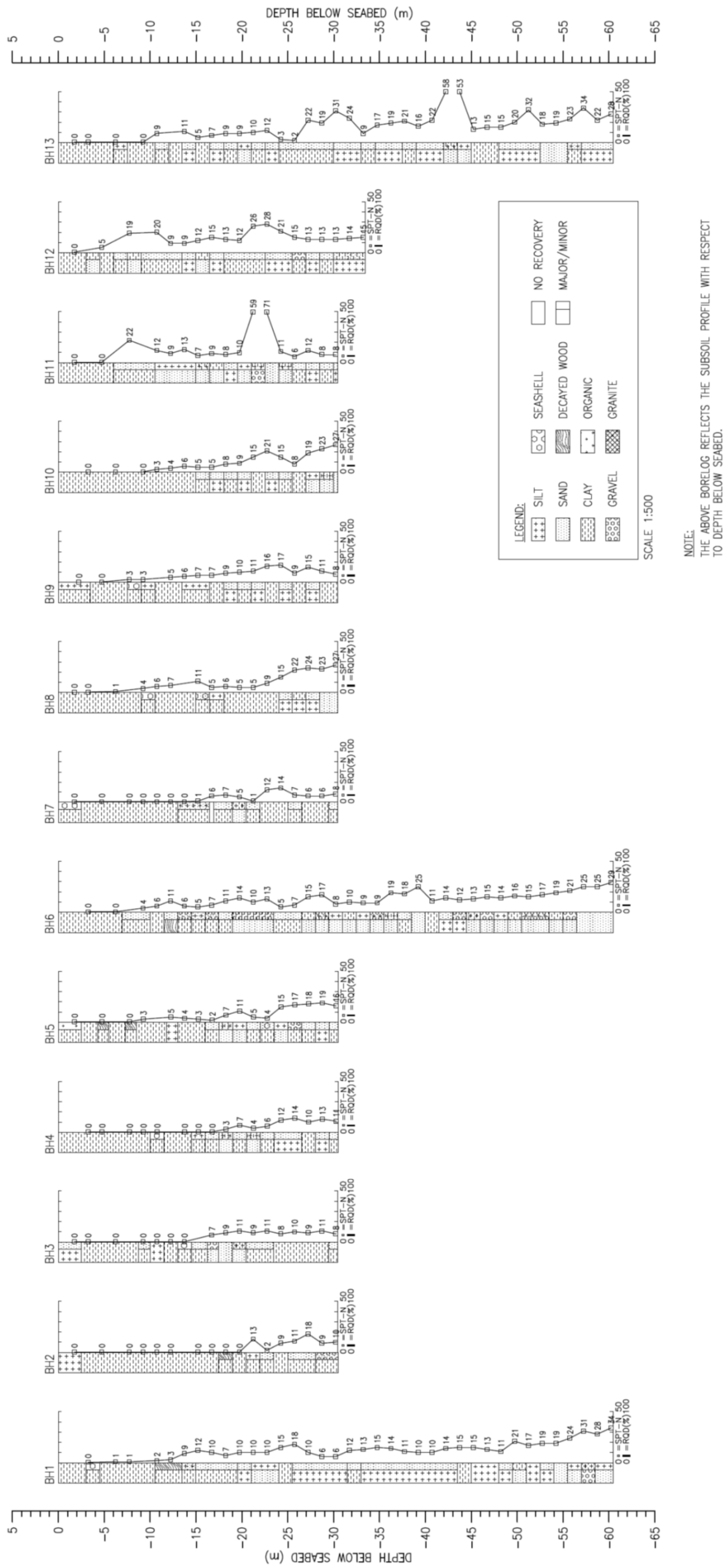
Meanwhile the Recent Alluvium is Quaternary in age, which is much younger than Batu Maung Granite and generally consists of coastal and fluviatile clay, sand and gravel and is usually a soft ground. However, geology underneath this alluvium may encounter granitic bedrock with variety of depth.



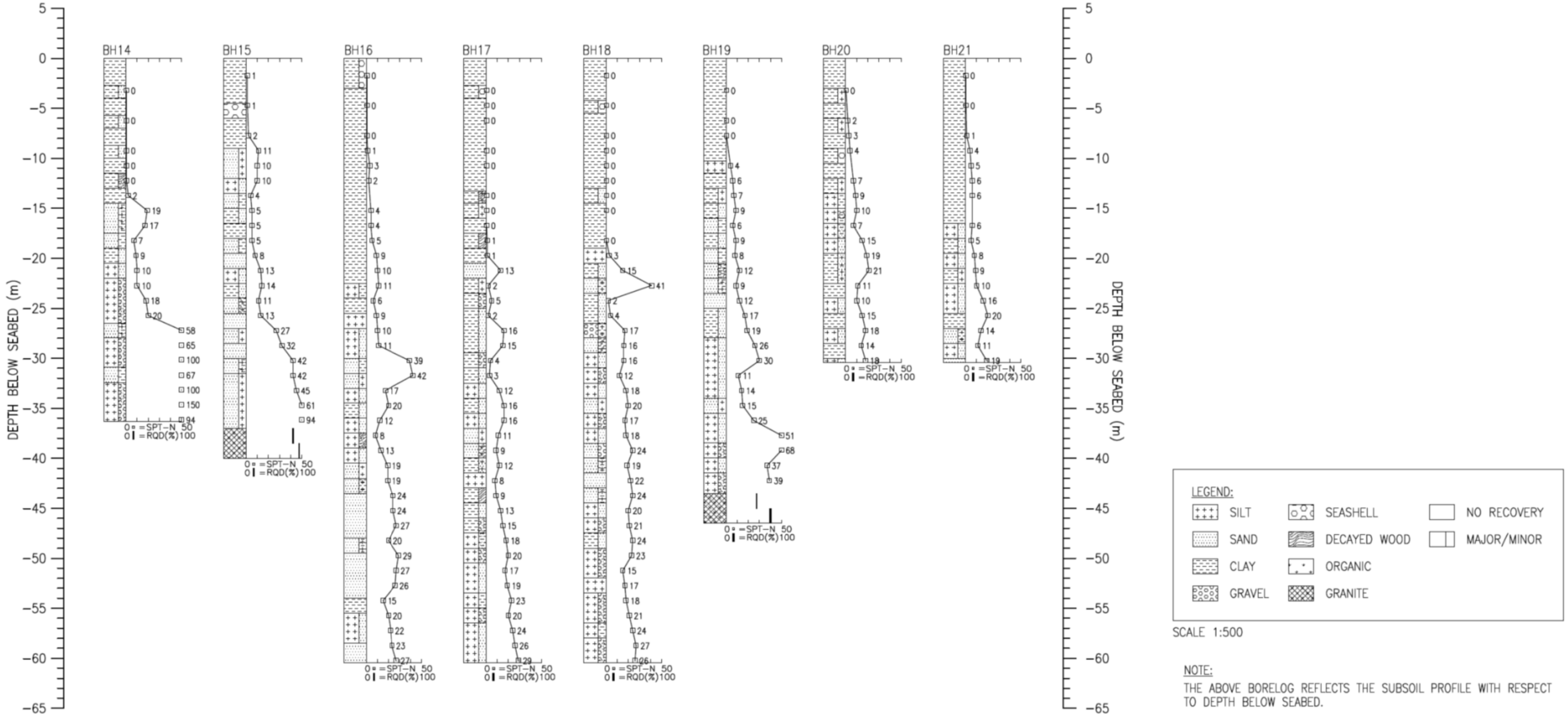
F6.29 Geological map of south Penang

6.2.6.3 Geotechnical Properties

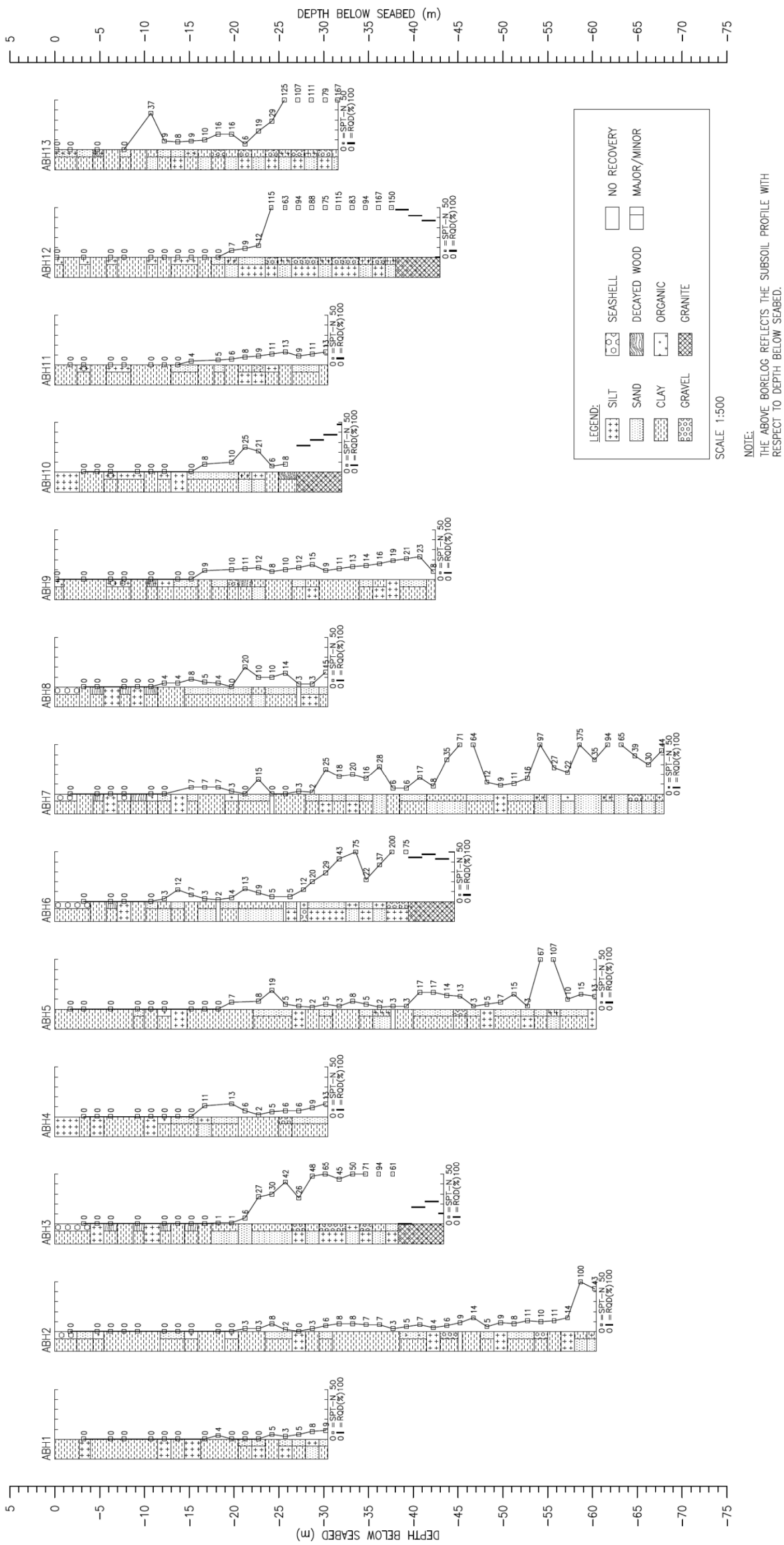
The borelog profiles (F6.30 to F6.33) show that the seabed subsoil stratum mainly consists of clay and sandy clay. BH15 and BH19 encountered granite at 37 and 43 m below the seabed respectively. ABH3, 6, 10, 16, 18 and 22 also encountered granite during the second study stage SI works at 38, 40, 27, 28, 29 and 2 m respectively. This further confirmed the geological formation of Batu Maung Granite at the proposed site.



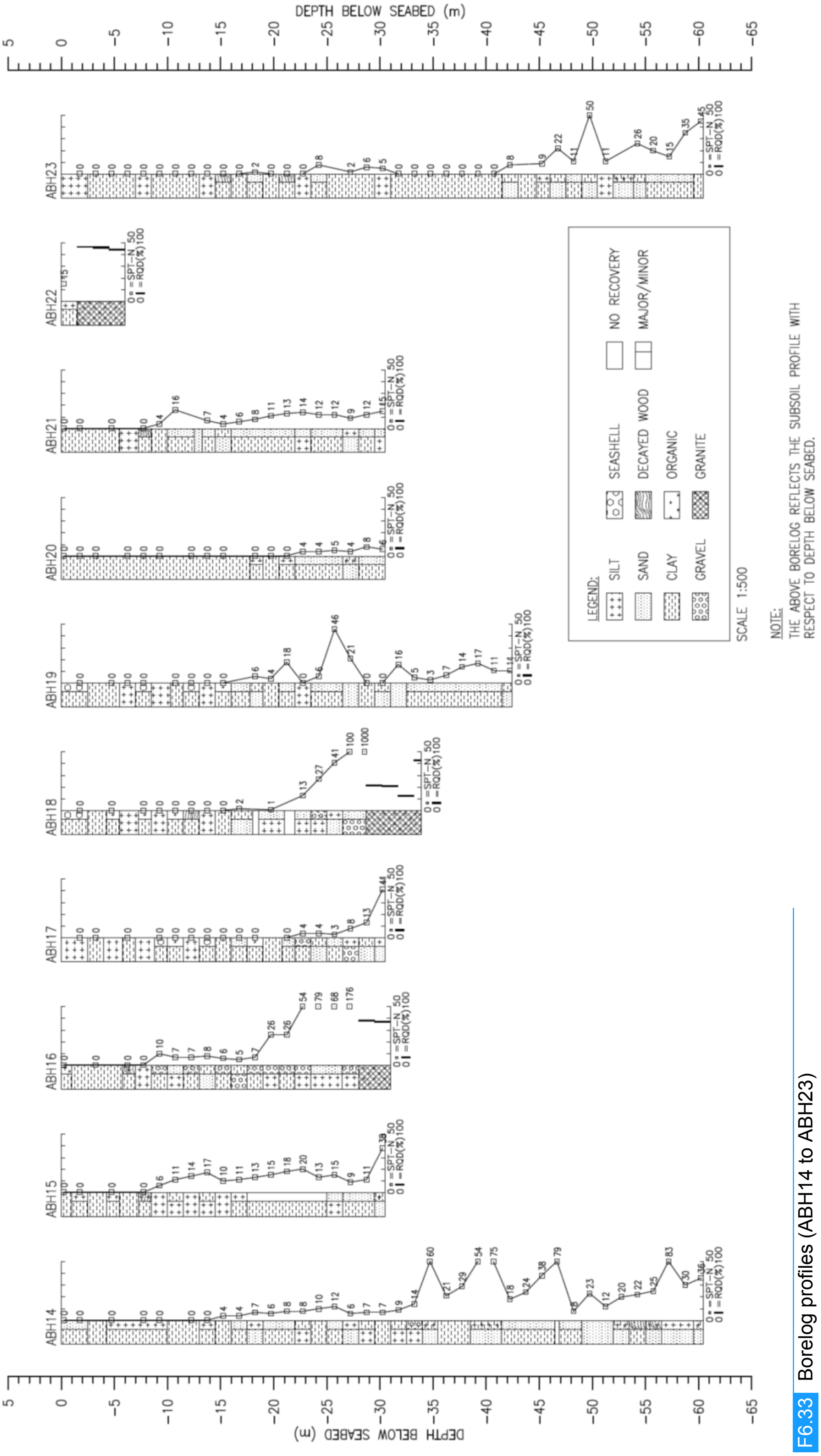
F6.30 Borelog profiles (BH1 to BH13)



F6.31 Borelog profiles (BH14 to BH21)



F6.32 Borelog profiles (ABH1 to ABH13)



F6.33 Borelog profiles (ABH14 to ABH23)

6.2.6.4 Reclamation Embankment Stability Analyses

Reclamation embankment stability analyses were conducted based on conditions as stipulated in T6.6. The result shows that the embankment is stable as shown in T6.7 and T6.8.

T6.6 Factors of Safety (FoS) for each stage

Stage	Condition	Sea Water Condition	FOS
Construction Stage	Undrained (Total Stress Parameters)	Normal – MLWS	1.2
	Undrained (Total Stress Parameters)	Rapid - MHWS[a] - MSL[b]	1.1
Serviceability Stage	Drained (Effective Stress Parameters)	Normal – MLHW	1.4
	Drained (Effective Stress Parameters)	Rapid - MHWS[a] - MSL[b]	1.2

Notes: i) Normal – Groundwater level and sea level are at the same level
ii) Rapid - Groundwater level and sea level are not at the same level
iii) [a] – Groundwater level
iv) [b] – Sea level

T6.7 Stability analyses summary for sand bund

Filling Stage	Factor of Safety (Fos)						Remark
	Normal			Rapid Drawdown			
	Circular	Wedge	Min FoS	Circular	Wedge	Min FoS	
Construction							
Sand containment bund	1.4	1.8	1.2	1.6	1.7	1.1	Achieved minimum safety factor
Fill 0.5 m above MHWS with PVD installation and 0.5 m thick surcharge	1.2	1.3	1.2	1.2	1.3	1.1	Achieved minimum safety factor
Fill to designed surcharge level	1.3	1.5	1.2	1.4	1.5	1.1	Achieved minimum safety factor
Serviceability							
Trim to final platform level	1.5	1.6	1.4	1.5	1.5	1.2	Achieved minimum safety factor

T6.8 Stability analyses summary for rock bund

Filling Stage	Factor of Safety (Fos)				Remark
	Normal		Rapid Drawdown		
	Circular	Min FoS	Circular	Min FoS	
Construction					
Rock containment bund	1.33 (R to L) 1.20 (L to R)	1.20	-	1.10	Achieved minimum safety factor
Fill 0.5 m above MHWS with PVD installation and 0.5 m thick surcharge	1.22	1.20	-	1.10	Achieved minimum safety factor
Fill to designed surcharge level	1.23	1.20	1.20	1.10	Achieved minimum safety factor
Serviceability					
Trim to final platform level	2.07	1.40	1.95	1.20	Achieved minimum safety factor

6.2.7 Water Quality

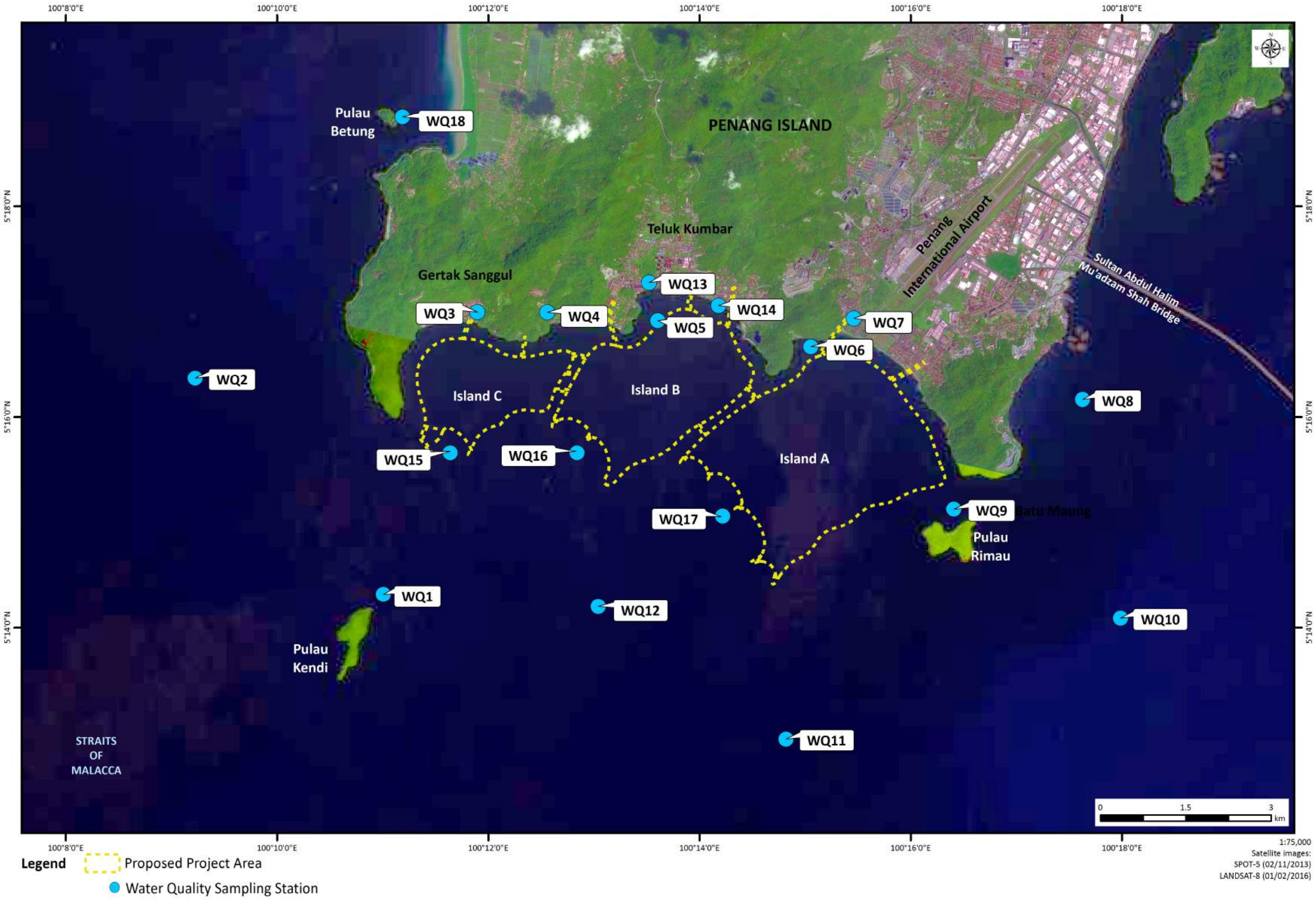
18 water quality sampling stations were identified within the Project area as shown in T6.9 and F6.34. Water samples at stations WQ1 to WQ13 were taken on 9th January 2016 for spring tide, both during flooding and ebbing; and on 5th February 2016 for neap tide. Additional sampling stations WQ14 to WQ17 were selected later on to include an additional discharge outlet from Penang Island as well as consideration of beaches on the man-made islands. The samplings for stations WQ14 to WQ17 were conducted on 4th March 2016 for flooding and ebbing. The last sampling exercise at Pulau Betung (WQ18) was the final addition as per TOR review panel's comments. It was completed on 25th May 2016 and 2nd June 2016 for neap and spring tides, respectively. It is to be noted that the weather was fine during all sampling sessions.

T6.9 Coordinates of the water quality sampling stations

Station	Coordinates	Type of Water	Description
WQ1	5° 14' 19.01" N, 100° 11' 0.34" E	Marine	North of Pulau Kendi 
WQ2	5° 16' 22.154" N, 100° 9' 13.46" E	Marine	About 3 km to the west of Tanjung Gertak Sanggul 
WQ3	5° 16' 59.78" N, 100° 11' 53.75" E	River	River mouth of Sungai Gertak Sanggul 
WQ4	5° 16' 59.7" N, 100° 12' 33.5" E	River	River mouth of Sungai Gemuruh 
WQ5	5° 16' 54.96" N, 100° 13' 36.24" E	Marine	Proposed flushing channel between Tanjung Bongkok and the proposed Island B
WQ6	5° 16' 40.04" N, 100° 15' 3.19" E	Marine	Proposed flushing channel between Tanjung Chut and the proposed Island A
WQ7	5° 16' 56.26" N, 100° 15' 27.6" E	River	River mouth of Sungai Bayan Lepas 
WQ8	5° 16' 10.062" N, 100° 17' 37.68" E	Marine	About 1.5 km to the east of Kampung Teluk Tempoyak 
WQ9	5° 15' 7.52" N, 100° 16' 24.54" E	Marine	North of Pulau Rimau 
WQ10	5° 14' 5.429" N, 100° 17' 59.24" E	Marine	About 3 km to the south east of Pulau Rimau 

T6.9 Coordinates of the water quality sampling stations

Station	Coordinates	Type of Water	Description
WQ11	5° 12' 56.51" N, 100° 14' 49.159" E	Marine	About 3 km to the south of the proposed Island A 
WQ12	5° 14' 12.098" N, 100° 13' 2.447" E	Marine	About 2 km to the south of the proposed Island B 
WQ13	5° 17' 16.7" N, 100° 13' 31.4" E	River	River mouth of Sungai Teluk Kumbar 
WQ14	5° 17' 3.49" N, 100° 14' 10.87" E	River	In front of two main discharge outlets from Teluk Kumbar 
WQ15	5° 15' 39.6" N, 100° 11' 38.4" E	Marine	In front of the proposed beach at Island C 
WQ16	5° 15' 39.6" N, 100° 12' 50.4" E	Marine	In front of the proposed beach at Island B 
WQ17	5° 15' 3.6" N, 100° 14' 13.2" E	Marine	In front of the proposed beach at Island A 
WQ18	5°18'51.1" N, 100°11'11.3" E	Marine	Near aquaculture at Pulau Betung 



F6.34 Water quality sampling stations

6.2.7.1 Methodology

Marine water samples were taken at three depths (surface, middle and bottom) at stations with water depths of more than 5 m. Two-depth sampling was applied for water depths ranging from 3 to 5 m while only one depth sampling was done at those of less than 3 m. The sampling details are listed in T6.10. The samples were analysed by an accredited laboratory [ALS Technichem (M) Sdn. Bhd.]. *In situ* analyses were also made using portable analytical meters which comply with the standard methods as specified by the APHA procedures.

T6.10
Water quality sampling details

Items	Details
Physical	Temperature, salinity, pH, conductivity, turbidity, dissolved oxygen (DO), total suspended solids (TSS)
Anions	Ammoniacal nitrogen, phosphate, nitrate, sulphate
Cations/Heavy Metals	Cr, Cd, Cu, Ni, Fe, Pb, Mn, As, Hg
Organics	BOD, Total Organic Carbon (TOC), oil and grease
Microbial	Fecal coliform, *E. Coli*
Number of stations	18
Depths	3 depths (surface, middle, bottom)
Tides	Spring and neap (flooding and ebbing)

6.2.7.2 Results

The results for all water quality sampling sessions are tabulated in T6.11 and T6.12. The results obtained for marine water are compared with the Malaysian Marine Water Quality Criteria and Standard (MWQCS) (T6.13).

T6.11 Baseline water quality results (spring tide)

Parameter	Unit	WQ1 (Marine)						WQ2 (Marine)					
		Ebbing (27.0 m)			Flooding (27.2 m)			Ebbing (18.6 m)			Flooding (19.0 m)		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
pH		8.41	8.36	8.3	8.18	8.33	8.28	8.44	8.41	8.34	8.43	8.34	8.39
Temperature	^{o}C	30.3	29.8	29.6	30.2	29.8	29.6	30	29.6	29.4	30	29.4	29.5
DO	mg/L	4.7	3.8	4.4	5.2	4.9	4.5	5.5	4.3	3.8	4.7	4.1	3.9
Salinity	ppt	9.91	9.97	9.92	29.96	9.81	30.58	30.11	30.52	30.59	30.11	30.57	30.53
Conductivity	uS/cm	17,036	16,900	16,932	46,395	16,790	47,190	46,596	47,131	47,228	46,587	47,230	47,152
Turbidity	NTU	7	7	5	7	5	6	5	8	8	8	5	6
TSS	mg/L	15	18	13	15	10	14	17	19	16	17	12	19
COD		16	18	20	10	11	12	19	19	15	15	16	17
BOD		5	6	7	3	3	5	8	9	5	4	5	5
Oil & Grease		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TOC		0.5	0.4	0.5	0.1	0.4	0.3	0.8	0.4	0.4	0.3	0.5	0.4
Chlorophyll-A		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammoniacal Nitrogen (NH_3-N)		0.34	0.04	0.01	0.05	0.35	0.08	0.03	0.01	0.01	0.15	0.06	0.03
Nitrate		0.96	1.35	0.14	0.59	0.16	0.33	1.03	1.40	1.45	0.47	0.39	0.32
Phosphate		0.23	0.35	0.37	0.16	0.36	0.13	0.26	0.32	0.42	0.25	0.08	0.35
Cadmium (Cd)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Arsenic (As*)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead (Pb)		0.003	0.028	0.026	0.003	0.006	0.130	0.003	0.016	0.028	0.009	0.019	<0.001
Copper (Cu)		<0.001	<0.001	0.003	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	0.002	<0.001
Manganese (Mn)		0.002	0.006	0.008	0.002	0.002	0.005	0.002	0.003	0.022	0.003	0.004	<0.001
Nickel (Ni)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe)		0.05	0.14	0.16	0.01	0.03	0.10	0.4	0.06	0.42	0.04	0.18	0.18
E. coli	cfu/100 ml	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Faecal Coliform		660,000	44,000	<1	21,100	71,000	53,000	56,000	5,000	1,000	103,000	11,400	13,300

Note: DO: Dissolved Oxygen COD: Chemical Oxygen Demand BOD: Biochemical Oxygen Demand TOC: Total Organic Carbon

T6.11 Baseline water quality results (spring tide) (cont'd)

Parameter	Unit	WQ5 (Marine)		WQ6 (Marine)		WQ8 (Marine)					
		Ebbing (1.6 m)	Flooding (2.1 m)	Ebbing (1.1 m)	Flooding (1.6 m)	Ebbing (7.1 m)			Flooding (7.0 m)		
		Surface	Surface	Surface	Surface	Surface	Middle	Bottom	Surface	Middle	Bottom
pH		8.21	8.44	8.49	8.52	8.51	8.51	8.48	8.22	8.08	8.16
Temperature	°C	32.4	31.1	32.1	31.3	30.4	30.2	29.9	29.8	29.8	29.5
DO	mg/L	4.6	5.2	7.20	5.2	6.3	5.9	5.2	5.3	4.8	4.6
Salinity	ppt	29.56	29.79	29.46	29.52	29.91	29.49	29.61	29.94	29.85	29.87
Conductivity	uS/cm	46,587	46,198	45,704	45,859	45,915	45,504	45,907	46,203	46,173	46,237
Turbidity	NTU	5	9	8	7	6	8	7	3	5	5
TSS	mg/L	13	18	19	16	12	16	14	15	13	10
COD		16	14	18	19	15	19	15	18	16	9
BOD		5	5	7	6	5	6	5	7	5	6
Oil & Grease		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TOC		1.2	0.6	1.5	0.7	0.7	0.6	0.5	1.0	0.2	0.3
Chlorophyll-A		<0.5	0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammoniacal Nitrogen (NH_3-N)		0.13	0.10	0.07	0.52	0.02	0.07	0.12	0.42	0.04	0.08
Nitrate		0.64	0.21	2.19	0.41	2.30	2.55	2.22	0.08	0.06	0.07
Phosphate		0.23	0.05	0.43	0.27	0.43	0.44	0.43	0.07	0.15	0.37
Cadmium (Cd)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (As*)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead (Pb)		<0.001	<0.001	0.003	<0.001	0.001	0.005	0.019	0.001	0.064	0.024
Copper (Cu)		<0.001	<0.001	0.002	<0.001	0.001	0.002	0.002	<0.001	0.004	0.004
Manganese (Mn)		0.018	0.012	0.011	0.014	0.012	0.004	0.013	0.009	0.014	0.015
Nickel (Ni)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe)		0.10	0.04	0.19	0.08	0.11	0.06	0.16	0.06	0.06	0.03
E. coli	cfu/100 ml	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Faecal Coliform		2,500	700	6,300	2,300	100	2,300	31,000	<1	44,000	<1

Notes: DO: Dissolved Oxygen COD: Chemical Oxygen Demand BOD: Biochemical Oxygen Demand TOC: Total Organic Carbon

T6.11 Baseline water quality results (spring tide)

Parameter	Unit	WQ9 (Marine)						WQ10 (Marine)		
		Ebbing (9.6 m)			Flooding (10.0 m)			Ebbing (3.0 m)	Flooding (4.1 m)	
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Surface	Bottom
pH		8.27	8.42	8.46	8.26	8.32	8.36	8.44	8.41	8.43
Temperature	^{o}C	30.4	30	30.1	28.7	29.6	29.7	31.1	30.1	30.3
DO	mg/L	6.9	5.7	5.5	4.5	4.2	4.8	5.6	4.6	4.8
Salinity	ppt	29.63	29.66	29.64	9.87	9.81	29.92	29.84	29.57	29.6
Conductivity	uS/cm	45,955	45,933	45,977	16,955	17,090	46,321	45,989	45,858	45,876
Turbidity	NTU	7	7	5	5	7	5	8	6	6
TSS	mg/L	14	14	10	10	14	10	12	13	14
COD		20	18	18	12	13	18	16	17	16
BOD		7	6	6	4	6	6	5	6	6
Oil & Grease		<1	<1	<1	<1	<1	<1	<1	<1	<1
TOC		0.8	0.6	0.6	0.3	0.5	0.5	0.6	0.2	0.8
Chlorophyll-A		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ammoniacal Nitrogen (NH_3-N)		0.06	0.01	0.14	0.04	0.20	0.04	0.03	0.36	0.08
Nitrate		3.17	3.67	1.94	0.02	0.07	0.49	3.17	0.04	0.05
Phosphate		0.52	0.56	0.43	0.16	0.35	0.12	0.16	0.44	0.15
Cadmium (Cd)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (Cr)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (As*)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead (Pb)		<0.001	0.023	0.007	0.002	0.022	0.020	0.001	0.002	0.020
Copper (Cu)		0.002	<0.001	0.002	<0.001	0.001	0.004	0.001	0.001	0.002
Manganese (Mn)		0.010	0.010	0.012	0.001	0.004	0.011	0.005	0.016	0.025
Nickel (Ni)		<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe)		0.08	0.12	0.19	0.11	0.19	0.20	0.09	0.30	0.49
E. coli	cfu/100 ml	<1	<1	<1	<1	<1	<1	<1	<1	<1
Faecal Coliform		40,000	1,700	4,000	6,000	<1	900	<1	2,700	1,000

Notes: DO: Dissolved Oxygen COD: Chemical Oxygen Demand BOD: Biochemical Oxygen Demand TOC: Total Organic Carbon