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**SECTOR 9 — CHART INFORMATION**

## SECTOR 9

### SINGAPORE STRAIT AND APPROACHES, INCLUDING SINGAPORE ISLAND, SINGAPORE ROAD, KEPPEL HARBOR, AND JOHOR STRAIT

**Plan.**—This sector describes Singapore Strait, West Johor Strait, Keppel Harbor, and East Johor Strait. The sector is generally described from W to E, with the exception of East Johor Strait, which is described from E to W.

#### General Remarks

**9.1** This strait is bounded on the N by the Malay Peninsula and Singapore Island, and on the S by **Kepulauan Riau** (Riouw Archipelago) (1°00'N., 105°00'E.), S of which is the **Kepulauan Lingga** (Lingga Archipelago) (3°05'N., 105°00'E.). The entire length of Singapore Strait is about 60 miles; its breadth, at the W entrance, is about 10 miles.

The E entrance is about 20 miles wide, but S of Singapore, between Pulau Sakijang Bendera and Batu Berhanti, it is only about 2.5 miles wide; however, but the fairway is deep throughout.

Because adequate aids to navigation exist, passage through Singapore Strait by day or night is comparatively simple for a prudent navigator.

Heavy rain squalls, during which visibility is moderate or poor, occur frequently in the strait.

IALA Maritime Buoyage System "A" is used for buoys and beacons within the waters under the control of the Port of Singapore Authority.

Radar reflectors are not normally fitted to buoys in waters within the control of the Port of Singapore Authority.

An IMO-adopted routing system has been created for the Strait of Malacca and Singapore. This system is comprised of Traffic Separation Schemes (TSS) and a Deep-Water route, as well as rules for its use.

It has been reported (1994) that numerous small boats loiter in the TSS; these vessels do not exhibit proper lights.

Numerous small vessels and tugs cross the TSS at other than a right angle.

#### Pilotage

**9.2** Pilots are ordered through the VTIS (see paragraph 9.3) at least 6 hours in advance; the vessel's ETA at its pilot boarding area should be confirmed 2 to 3 hours in advance (3 hours in advance if boarding at the East Johor Strait Boarding Ground).

The Pilotage District, within the limits of the port of Singapore, is divided into four areas, named A, B, C, and D, in which differing rules apply for compulsory pilotage. These areas are reported to lie within the port limits, as follows:

1. **Area A.**—West of a line joining the following positions:
  - a. 1°16.3'N, 103°51.4'E.
  - b. 1°15.0'N, 103°51.9'E.
  - c. 1°14.7'N, 103°52.3'E.
  - d. 1°14.7'N, 103°52.8'E.

e. 1°13.3'N, 103°51.9'E.

f. 1°12.7'N, 103°52.1'E.

g. then extending to the N in the W part of Johor Strait to the Causeway (1°27.0'N., 103°46.0'E.).

Pilotage in Area A is compulsory for all vessels of 300 grt or more.

2. **Area B.**—East of the E limit of Area A and the S limit of the Area D, excluding Area C. Pilotage in Area B is compulsory for all vessels of 5,000 grt or more.

3. **Area C.**—The approach to and within Kallang Basin (1°18'N., 103°52'E.). Pilotage in Area C is compulsory for all vessels of 300 grt or more and for all vessels of 45m in length or greater.

4. **Area D.—East Johor Strait.**—North of the N limit of Area B and N of a line joining the following positions:

a. 1°20.5'N, 104°00.7'E.

b. 1°20.0'N, 104°02.7'E.

c. 1°20.0'N, 104°03.1'E.

d. 1°18.8'N, 104°04.3'E.

e. 1°17.5'N, 104°05.2'E.

f. 1°17.8'N, 104°07.3'E.

g. 1°20.8'N, 104°05.1'E.

h. 1°21.5'N, 104°04.8'E.

i. then to the Causeway (1°27.0'N., 103°46.0'E.).

Pilotage in Area D is compulsory for all vessels of 300 grt or more and for all vessels with a height above the waterline of 30m or more.

Vessels are required to use certain pilot boarding grounds, as follows:

1. **Southern Boarding Ground**—For vessels from E or W proceeding directly to Singapore Cruise Center with advanced Health and Immigration clearance or with Immigration boarding at the pilot boarding ground. This boarding ground is to be used only through prior arrangement with the Port Operations Center.

2. **Eastern Boarding Ground A**—For vessels from W proceeding directly to anchorages in the E sector, with advanced Health and Immigration clearance.

3. **Eastern Boarding Ground A, Western Boarding Ground A, or Western Boarding Ground B**—For vessels from W proceeding directly to berths and anchorages, with advanced Health and Immigration clearance.

4. **Eastern Boarding Ground A or B, as arranged with the Pilotage Section**—For vessels from E proceeding directly to berths and anchorages, with advanced Health and Immigration clearance.

5. **Eastern Boarding Ground A**—For vessels from E or W requiring Health and Immigration clearance.

In all areas for all liquefied gas or chemical carriers which are loaded or which have not been certified as gas free, pilotage is required.

The pilot boarding grounds are best seen on the chart.

It is reported that pilots board between the positions of Eastern Boarding Ground A and Eastern Boarding Ground B.

Anchoring is prohibited in Eastern Boarding Ground B due to the presence of submarine cables.

### Vessel Traffic Information Service

**9.3** The Vessel Traffic Information Service (VTIS) will assist vessels within the Singapore Strait TSS, bounded by 103°25'E, and 104°23'E.

The VTIS is divided into VTIS East, VTIS Central, and VTIS West. The boundary between VTIS East and VTIS Central is longitude 104° 02.2'E. The boundary between VTIS Central and VTIS West is longitude 103° 44.6'E. The calling and working frequency of each VTIS sector is, as follows:

1. VTIS East—VHF channel 10.
2. VTIS Central—VHF channel 14.
3. VTIS West—VHF channel 73.

All vessels transiting Singapore Strait must maintain a continuous listening watch on VHF channel 12.

The following vessels are required to report to the VTIS:

1. Vessels of 300 grt and over.
2. Tugs engaged in towing or pushing if combined grt of tug and tow or vessel being pushed is 300 grt or over.
3. Passenger vessels carrying more than 12 passengers intending to call at Singapore.

Vessels transiting Singapore Strait but not calling at Singapore are requested to report to the VTIS.

Vessels arriving at the port of Singapore must report their name, call sign, and position to VTIS East on VHF channel 10 when entering the VTIS operational area and at the following positions:

1. If approaching from the E via the South China Sea, report when abeam of **Horsburgh Light** (1°19.8'N., 104°24.4'E.).
2. If approaching from the S via Selat Riau, report when abeam of **Karang Galang Light** (1°10.0'N., 104°11.5'E.).
3. If approaching from East Johor Strait, report when abeam of **Eastern Lighted Buoy** (1°17.9'N., 104°06.0'E.).

Vessels arriving at the port of Singapore must report their name, call sign, and position to VTIS West on VHF channel 73 when entering the VTIS operational area and at the following positions:

1. If approaching from the S via Selat Duran, report when abeam of **Pulau Jangkat** (0°57.9'N., 103°42.7'E.).
2. If approaching from the W via Strait of Malacca, report when abeam of **Pulau Iyu Kechil** (1°11.5'N., 103°21.2'E.).

A VLCC (greater than 150,000 dwt) or a deep-draft vessel (draft greater than 15m) intending to cross traffic lanes should also report its approximate crossing location and the estimated time of crossing.

A Confirmation of Arrival Report should be made when the vessel is at any of the above reporting points and should include the following information:

1. Vessel name.
2. Call sign.

3. Present location, with reference to any of the above-designated reporting points.

4. Number of passengers and crew (passenger vessels only).

5. ETA at first destination in the port or name of the pilot boarding ground for vessels using the services of a pilot.

6. For vessels requiring a pilot on arrival:

- a. Name of the pilot boarding ground.
- b. ETA at the pilot boarding ground.

7. Height of vessel above waterline, if different from that provided in the Notification of Arrival Report.

Vessels approaching from a location not mentioned above must contact VTIS East or VTIS West, as appropriate, and provide the vessel's position by bearing and distance from one of the following reference points:

Pulau Iyu Kechil	1°11.5'N, 103°21.2'E.
Sultan Shoal Light	1°14.4'N, 103°39.0'E.
Raffles Light	1°09.6'N, 103°44.6'E.
Sakijang Lighted Beacon	1°13.3'N, 103°51.4'E.
Bedok Light	1°18.6'N, 103°56.1'E.
Tanjung Setapa Light	1°20.6'N, 104°08.2'E.
Horsburgh Light	1°19.8'N, 104°24.4'E.

Vessels departing the port of Singapore must report to Port Operations on VHF channel 18.

**Reporting requirements.**—Vessels required to participate in the VTIS are also required to submit the following reports:

1. Notification of Arrival Report.
2. Clearance Report.
3. Arrival Report.
4. Underway Report.

**Notification of Arrival Report.**—Vessels of 500 grt and over should send this report to the Singapore Portmaster 12 hours before arrival, stating:

1. Vessel name.
2. Call sign.
3. Draft (in meters).
4. Height of highest point above waterline (in meters).
5. ETA (date, month, year, and time).
6. Direction from which vessel is approaching (E, W, or S).
7. Track-Chem Indicator (Y or N).
8. Slop/Sludge Indicator (Y or N).
9. Remarks (leave blank if not applicable).

**Clearance Report.**—This report is made by vessels arriving from sea before entering the port, by vessels maneuvering from a berth or anchorage to another location within the port, or by departing vessels. Vessels shall seek clearance from the appropriate Sector Control Station before entering the port or commencing the movement. The report will contain the following information:

1. Vessel name.
2. Call sign.
3. Present location.

4. Destination (location in port or bound for sea).
5. Draft.
6. Height.
7. Remarks, if any.

**Arrival Report.**—When a vessel has arrived at a berth or an anchorage either from sea or from another location in the port, the vessel shall report on VHF, as soon as practicable, to the appropriate Sector Control Station, as follows:

1. Vessels berthing alongside—the report contains the following information:
  - a. Vessel name.
  - b. Call sign.
  - c. Arrival date and time.
  - d. Name of the berth or location.
2. Vessels at anchor—the report contains the following information:
  - a. Vessel name.
  - b. Call sign.
  - c. Arrival date and time.
  - d. Bearing and distance of vessel from one of the listed Position Reference Points, as follows:

Sector	Position Reference Point
Timor	Amber Lighted Beacon
Jurong	Rimau Lighted Beacon Sultan Shoal Light
Sembawang Control	Eastern Lighted Buoy

All vessels at anchor should maintain a continuous listening watch on the VHF channel for the appropriate Sector Control Station, as follows:

Sector	Sector Control Station	VHF channel
Timor	Timor Control	12
Keppel	Keppel Control	18
Cruise Bay	Keppel Control	5
West Jurong	Jurong Control West	22
East Jurong	Jurong Control East	22
East Johor Strait	Sembawang Control	21

**Underway Report.**—After clearance has been granted under the Clearance Report, vessels shall report to Port Operations East or Port Operations West, as appropriate, when underway and entering the fairway. The report shall be made when abeam of any of the Reporting Points listed below, and shall contain the vessels name, call sign, and present location.

Vessels make the report to Port Operations East on VHF channel 12 (back up channel is VHF channel 18) when E of longitude 103° 52.2'E, or to Port Operations West on VHF

channel 68 (back up channel is VHF channel 18) when W of longitude 103° 52.2'E.

All underway vessels must maintain a continuous listening watch on VHF channel 12 or 68, as appropriate.

Reporting Points E of Longitude 103° 51.1'E	
Reporting Point	Position
Airway Lighted Buoy	1° 17.7'N, 104° 01.2'E.
Position	1° 16.6'N, 103° 56.0'E.
Approach Lighted Buoy	1° 17.0'N, 103° 53.9'E.
NE Corridor Lighted Beacon	1° 15.4'N, 103° 53.8'E.
Sirdhana Lighted Buoy	1° 14.7'N, 103° 52.7'E.
Outer Shoal Lighted Buoy	1° 15.0'N, 103° 51.8'E.
Tembakul Lighted Beacon	1° 13.3'N, 103° 51.8'E.

Reporting Points W of Longitude 103° 51.1'E	
Reporting Point	Position
Rimau Lighted Beacon	1° 15.6'N, 103° 48.4'E.
West Panjong Lighted Buoy	1° 16.2'N, 103° 47.1'E.
Selegi Lighted Beacon	1° 13.6'N, 103° 49.6'E.
Sisters Lighted Buoy	1° 13.0'N, 103° 48.3'E.
Sebarok Lighted Buoy	1° 11.8'N, 103° 48.3'E.
East Cyrene Lighted Buoy	1° 15.6'N, 103° 45.9'E.
Pusing Lighted Buoy	1° 17.2'N, 103° 44.2'E.
Sawa Lighted Buoy	1° 15.4'N, 103° 44.0'E.
Serebut Lighted Beacon	1° 14.8'N, 103° 42.1'E.
Ajax Shoal Lighted Buoy	1° 13.7'N, 103° 39.8'E.
Salu Lighted Buoy	1° 12.5'N, 103° 40.6'E.
Triton Lighted Beacon	1° 16.4'N, 103° 39.4'E.
West Jurong Lighted Buoy	1° 14.9'N, 103° 38.7'E.

In the event that the VTIS radar system is inoperable, vessels will also report, as appropriate, at the following reporting points:

Eastbound Vessels		
Reporting Point	Station	VHF Channel
Racon D	VTIS West	73
Sakijiang Light	VTIS Central	14
Tanjung Setapa Light	VTIS East	10
Horsburgh Light	VTIS East	10

Westbound Vessels		
Reporting Point	Station	VHF Channel
Tanjung Setapa Light	VTIS East	10
Sakijiang Light	VTIS Central	14
Raffles Light	VTIS West	73
Pulau Iyu Kechil	VTIS West	73

## Caution

Several hovercraft are operating along the Singapore coast and in Johor Strait.

The Director of Marine, Singapore, advises that ships in Singapore Strait between the area W of **Sultan Shoal** (1°14'N., 103°39'E.) and **Horsburgh Lighthouse** (1°20'N., 104°24'E.) proceed at slow speed consistent with safe navigation standards in view of the traffic likely to be encountered. Engines should be ready to maneuver instantly.

## Singapore Strait—West Part of South Shore

**9.4 Pulau Karimun** (1°06'N., 103°27'E.), on the S side of the W approach to Singapore Strait, has been previously described in paragraph 5.16. They have their northernmost point about 9 miles SW of **Tanjong Piai** (1°15'N., 103°30'E.) and extend about 33 miles S. Eastward of these islands is the N entrance to Elat Durian.

**Pulau Nipa** (Tree Island) (1°09'N., 103°40'E.) is the NW of a chain of islands extending about 5 miles in a NW and SE direction, and forming the S side of Singapore Main Strait.

The islet is 0.9m high and lies near the SE end of a coral reef which dries from 0.3 to 2.4m. A sandbank extends from the N side of the islet along the NE edge of the reef. There are a few trees on the reef. A light is shown from the NE side of the reef.

To keep in the fairway N of this shoal and S of the shoals lying SW of **Pulau Pawai** (1°11'N., 103°44'E.) keep Raffles Lighthouse on **Pulau Satumu** (1°10'N., 103°45'E.) between the bearings of 100° and 104°.

About 8 miles NW of the NW extremity of Pulau Nipa is an area where the tidal currents from the various straits and channels in the vicinity converge. It is impossible to give the exact limits of the area; therefore, it must be treated with caution. The W entrance to Singapore Strait must be approached very carefully as a relatively small difference in position may mean a great difference in the direction and strength of the tidal current.

**Kent Rocks** (1°09'N., 103°41'E.), about 1.2 miles ESE of the light on Pulau Nipa, lie in a NW and SE direction from each other, about 0.5 mile apart. They are steep-to, and their positions are usually marked by tidal rips. From the S rock, which is the larger of the two and has a depth of 2.3m, the center of Pulau Pelamburg is in range with the E extremity of Pulau Takong Besar, bearing 125°, the former island distant 1 mile. The N rock has a depth of 1.2m.

**Pulau Pelamburg** (Red Islet) (1°07'N., 103°42'E.), a sandy 12.5m high islet situated about 3 miles SE of Pulau Nipa, is about 119m long and 64m wide; it is a peculiar red color, with a few trees.

The reef surrounding Pulau Pelamburg extends about 0.5 mile NW, with a breadth of about 0.2 mile.

Five small reefs, which uncover 0.6 to 0.9m, lie from 0.5 to 1.5 miles SW of Pulau Pelamburg. A wreck, with a depth of 21.5m, lies in Main Strait 1.25 miles NE of Pulau Pelamburg.

**Pulau Takong Besar** (1°07'N., 103°43'E.) is 26m high to the tops of the trees. The rock off the N end is 1.2m high, and a small detached reef lies about 183m SW of the SW edge of the surrounding reef.

Between Pulau Pelamburg and Pulau Takong Besar is a channel used by local vessels.

**Pulau Takong Kecil** (1°06'N., 103°43'E.), 25m high to the tops of the trees, is small, thickly overgrown, and lies about 0.5 mile SSE of Pulau Takong Besar.

There is a red cliff, about 12m high, that rises at its S extremity. A light is shown from Pulau Takong Kecil.

The reef surrounding this islet is narrow on the E side, but is about 0.2 mile wide on the W and S sides.

A small detached reef is located about 183m from the shore reef on the S side; a lighted beacon stands on the reef. Two detached reefs lie N and NE from the islet at 0.2 mile distant; the E of these reefs is about 0.2 mile in extent.

**9.5 Phillip Channel** (1°05'N., 103°45'E.) lies between Pulau Takong Besar and Pulau Takong Kecil to the NW, and the numerous islands fronting Pulau Batam and Pulau Bulan to the SE. The channel is about 3 miles wide and lies within the deep water and general E traffic lane of the Singapore Strait Traffic Separation Scheme.

**Tanjong Jernih** (Steep Cape) (Tanjong Djernih) (1°02'N., 103°45'E.), the NW point of Pulau Kapalajernih, is 64m high, precipitous, and conspicuous; it forms the SE side of Phillip Channel.

Islets and rocks extend SW of Tanjong Jernih to **Pulau Jangkat** (Djangkat) (0°58'N., 103°43'E.), encumbering the N entrance to **Selat Combol** (0°54'N., 103°52'E.).

**Pulau Cula** (Tjupla) (1°02'N., 103°43'E.), in the S approach to Phillip Channel, about 3 miles WNW of Tanjong Jernih, is a bare rock of yellowish color, 11m high, with a flat top and perpendicular sides; it is surrounded by a reef to a distance of about 0.15 mile, with depths of 7.3 to 9.1m lying 0.3 mile off the islet. Vessels should not pass between it and Tanjong Jernih. A dangerous wreck lies about 0.5 mile E of the above islet. The islet is marked by a light.

**Karang Tengah** (1°02'N., 103°44'E.), located in the fairway between Pulau Cula and Tanjong Jernih, is 0.6 mile long in a N and S direction, about 0.1 mile wide, and dries.

The channel between Karang Tengah and Pulau Cula is deep but is not recommended; a dangerous wreck lies 0.5 mile E of Pulau Cula. A drying reef lies between Karang Tengah and Tanjong Jernih. An obstruction lies about 2 miles NE of Karang Tengah.

**Pulau Pemping Besar** (1°06'N., 103°48'E.), the largest of the NW islands of the **Bulan Archipelago** (1°04'N., 103°48'E.), and forming the E side of Phillip Channel, is about 2 miles long and fully 1 mile wide. It is composed of a number of moderately elevated hills, the greatest elevation being 60m high.

Several rocks above-water lie on the reef which encircles the island to a distance of 0.2 to 0.3 mile; a wooded rock lies close to its N extremity.

**Pulau Labon** (1°06'N., 103°47'E.), two small islets lying about 0.5 mile W of Pulau Pemping Besar, are connected to it by reefs; a detached reef about 0.5 mile long lies W of the islets. The larger N islet is fringed with mangroves, above which is a bare conical hill, 29m high.

A dangerous wreck is reported to lie about 0.7 mile W of the N islet.

A reef, about 0.2 mile in extent, which dries, lies almost 1.5 miles S of Pulau Labon, with another reef midway between;

another reef lies about 0.5 mile off the NE extremity of Pulau Kapalajernih.

Eastward of these reefs lies **Pulau Ampar** (1°03'N., 103°49'E.), 27m high, with **Pulau Kera** (1°04'N., 103°48'E.) on the W extremity of the former island's reef. A rock, which dries, lies about 0.5 mile farther W. A great number of islets and rocks lie NE of the above, and can best be seen on the chart.

**9.6 Helen Mar Reef** (1°07'N., 103°46'E.), marked by a light, is the outer and NW of the dangers which lie off the NW end of Pulau Batam, and the turning point from Phillip Channel into Singapore Main Strait for eastbound vessels. The reef consists of two drying patches; both are steep-to and lie within the 20m curve.

A coral patch with a depth of 1.3m lies about 0.3 mile SSE of Helen Mar Reef; drying reefs lie between the 1.3m coral patch and Pulau Pemping Besar to the SE. A rock, with a depth of 0.9m, lies about 1.2 miles E of Helen Mar Reef.

**Djantan** (Jantan) (1°06'N., 103°22'E.), the 437m high S peak on Pulau Karimunbesar, in range with Pulau Pelamburg bearing 266°, leads about 0.4 mile N of Helen Mar Reef; Tanjong Jernih, bearing 190°, leads the same distance W.

**Pulau Nirup** (1°08'N., 103°50'E.), with a flat hill 47m high, lies about 2 miles NE of Pulau Pemping Besar.

**Kapal Islets** (1°08'N., 103°50'E.), from 13.1 to 36m high, lie about 0.7 mile NE of Pulau Nirup; farther NE is Pulau Belakangpadang.

A flat with depths of less than 5.5m extends about 0.7 mile W of Pulau Nirup. The drying reef N of Pulau Nirup extends to a distance of about 0.2 mile.

**Pulau Subar** (1°09'N., 103°50'E.), a rock 18.3m high, lies just N of the Kapal Islets, within the 20m curve fronting the above islands.

**Buffalo Rock** (1°09'N., 103°49'E.), is marked by a lighted beacon, 1.5m high, with a patch which dries 0.6m about 91m S of it, lies about 1.3 miles NW of Pulau Subar, well out toward the fairway of Main Strait. There is a depth of 17m about 2 miles NW of Buffalo Rock.

**Pulau Tolop** (Pulau Telup) (1°10'N., 103°52'E.), and Pulau Senang, encircled by the same common reef, lie about 0.5 mile off the W coast of Pulau Belakangpadang.

**Caution.**—Submerged dangers lie up to 0.5 mile NW of the islands. A dangerous reef, extending about 0.2 mile in a NE and SW direction, lies about 0.5 mile W of Pulau Telup.

Depths of 10.5m lie close to the reef on its W and SE sides, but near the N and S ends of the reef are depths of 0.7 to 4.1m.

**9.7 Pulau Belakangpadang** (1°09'N., 103°53'E.), 30m high and about 2 miles in diameter, is the largest of the islands on the S side of Main Strait and fronts the entrance of **Selat Bulan** (1°09'N., 103°55'E.).

The island is generally low, covered with jungle, and is encircled by a reef which projects nearly 0.5 mile in places.

It is separated from **Pulau Sambu** (1°10'N., 103°54'E.) to the E by Sambu Road, a channel about .5 mile wide, which has depths of 13.7 to 29m and is described in paragraph 9.8.

The N entrance of Selat Bulan lies between Pulau Miriam and Tanjung Pinggir. The fairway lies on the W side of the entrance and is clear of the dangers off Tanjung Pinggir.

There is a pier on the E side of Pulau Belakangpadang, about 183m long, with a T-head about 33m long.

A detached reef, marked at its N end by a light, lies close N of the encircling reef that contains Pulau Belakangpadang. A depth of 11.4m lies about 0.2 mile NE of the detached reef.

Indonesian quarantine and immigration stations are located on Pulau Belakangpadang. Vessels requiring inspection for entry into Indonesian ports in the area may receive such inspection here.

**Tanjong Pinggir** (1°08'N., 103°55'E.), the NW extremity of Pulau Batam, is the E side of the N entrance of Selat Bulan.

The point is easily identified by a 47m high bare conical hill.

Detached drying reefs and foul ground extend up to 0.6 mile NW of Tanjung Pinggir and encumbers the E side of the N entrance of Selat Bulan.

A small reef, with a least depth of 1.8m, lies about 0.5 mile N of Tanjung Pinggir.

**9.8 Sambu Road** (1°10'N., 103°53'E.) lies between the islands of Anaksambu, Sambu and Mariam on the NE and Pulau Belakangpadang and the island N of it on the SW.

The road has a least width of about 0.2 mile between Pulau Sambu and Pulau Belakangpadang, and extends in a NW and SE direction for about 2 miles.

**Anchorage.**—Vessels arriving at night should anchor off the NE side of Pulau Sambu in 20 to 35m. Large vessels awaiting a berth should anchor about 0.8 mile WSW of the light on Batu Berhanti in depths of about 42m.

Except for Government and small local vessels, all navigation and fishing within the limits of the roadstead is prohibited at night between 2100 and 0600 hours local time.

A prohibited anchorage area, best seen on the chart, lies S of Batu Berhanti.

Vessels should not enter or leave at night, as the current is strong and full of eddies.

**Batu Berhanti** (1°11'N., 103°53'E.) are two rocky ledges about 0.2 mile apart, the centers of which are above-water. A light, shown from a conspicuous structure, stands on the W rocky ledge of Batu Berhanti.

A depth of 2.5m lies about 0.2 mile NE of the W rock of Batu Berhanti. Within about 0.2 mile NW and SE of the same rock are depths of 5.5 to 8.8m.

A bank, about 4 miles long, lies E of Batu Berhanti with depths varying from 8.2 to 18.3m.

A shoal bank, as defined by the 30m curve, extends about 1 mile NNW of Batu Berhanti. Least depths of 13.7 to 14.9m are found on the outer part of the shoal.

**9.9 Pulau Anaksambu** (1°10'N., 103°54'E.), about 0.3 mile long, lies about 0.7 mile SSE of Batu Berhanti. Karang Sambu extends about 0.5 mile NW of Pulau Anaksambu; about 0.2 mile further NW is a 6.5m shoal with a dangerous wreck at its SE end.

**Pulau Sambu** (1°10'N., 103°54'E.), about 0.25 mile SE of Pulau Anaksambu, is fringed by a reef, except on its SW side. The port of Sambu is described in paragraph 9.10.

**Pulau Mariam** (1°09'N., 103°54'E.), an islet marked by a light, lies about 0.2 mile S of Pulau Sambu.

Foul ground and three drying patches lie in the fairway between Pulau Mariam and Tanjung Pinggir. A reef extends from the N and NE sides of Pulau Mariam. A depth of 6.5m lies close S of the island.

Depths of 3.2 to 7.5m lie 0.75 mile SW and 0.6 mile SSW, respectively, of the island.

**Caution.**—Owing to the strong tidal currents which prevail in this part of the strait, and the rocky and uneven nature of the bottom, violent eddies and overfalls are usually encountered, it is therefore advisable to keep on the N side of the strait.

### Sambu (1°10'N., 103°54'E.)

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**9.10** The terminal and its facilities are situated on the SW side of Pulau Sambu. Vessel movements are limited to daylight hours.

The terminal usually takes one tanker at a time and therefore it is unlikely tankers will meet outbound vessels with this arrangement.

**Winds—Weather.**—The terminal may be affected by sudden heavy squalls, usually occurring during the night.

**Tides—Currents.**—Tidal currents generally parallel the wharves. The flood current sets NW while the ebb current sets SE; velocities may reach 2 to 3 knots.

An eddy extends along the SW side of Pulau Sambu, occasionally being felt as far as the SE extremity of the island.

**Depths—Limitations.**—Pier facilities, which are described below, are located on the SW side of Pulau Sambu.

The Dolce Berth has a depth alongside of 40m and has a maximum vessel length of 270m. It is used for oil and can accommodate a maximum vessel size of 120,000 dwt.

Berth No. 1 has a depth alongside of 10.5m, maximum vessel length of 175m, and accommodates a maximum vessel size of 29,000 dwt. It is an oil facility.

Berth No. 2 has a depth alongside of 11.3m, maximum vessel length of 56m, and accommodates a 400 dwt vessel. It is utilized for fresh water.

Berth No. 3 has a depth alongside of 10.6m, maximum vessel length of 125m, and is able to accommodate a 6,500 dwt vessel. It is reported to be an oil facility.

Berth No. 4 is 5.6m, length 60m, and is an oil facility accommodating vessels up to 400 dwt.

Berth No. 5 has a depth alongside of 3m, a maximum vessel length of 31m, and accommodates up to 200 dwt. The facility is used for general cargo and fresh water.

**Aspect.**—Numerous petroleum storage tanks are conspicuous from various directions. A flagstaff stands on a hill about 0.2 mile from the SE end of Pulau Sambu. A beacon stands on a reef at the SE end of the island.

Radar ranges obtained from Pulau Sambu and surrounding islands should be regarded with caution since all the islands are surrounded by drying reefs.

**Pilotage.**—Pilotage is compulsory. Pilots require 6 hours notice of arrival and 3 hours notice of departure.

The pilot vessel flies a blue flag with a white star and meets vessels about 0.8 mile WSW of Batu Berhanti.

Pilots are forbidden to proceed during thick or foggy weather or when navigational marks are not visible. Daylight berthing and unberthing only.

**Signals.**—The following signals are shown for vessels requiring a pilot.

1. By day—Flags "UC", International Code, pilot jack, or the vessel's national flag at the fore.

2. By night—A blue light every 15 minutes or a white light shown over the stern at short frequent intervals for about 1 minute at a time.

The above signal should be made only until the pilot is onboard.

**Anchorage.**—See Sambu Road, paragraph 9.8.

**Directions.**—When approaching from the W, steer for the middle of the entrance to Sambu Road bearing 141°. If approaching from the E, steer to pass N of Batu Berhanti, and then for the entrance as directed for a vessel approaching from the W.

The channel between Pulau Anaksambu and Pulau Sambu is suitable only for small craft.

### Selat Jurong

**9.11 Selat Jurong** (Sembilan) (1°18'N., 103°43'E.) is approached from the W via West Jurong Fairway and from the E via East Jurong Fairway. West Jurong Fairway is maintained at a depth of 12.7m while East Jurong Fairway is maintained at a depth of 12.6m.

**Caution.**—Jurong Causeway, under construction in 1997, connects Pulau Merlimau with Pulau Damar Laut. The use of Selat Jurong as a through transit passage from East Jurong Fairway to West Jurong Fairway or Pesek Fairway and vice-versa is prohibited to all vessels except government vessels.

West Jurong Fairway and Pesek Fairway are controlled fairways for all vessels intending to enter, maneuver within, or leave the area. The following vessels must not enter, maneuver within, or leave the West Jurong Sector without notifying Jurong Control West Station of their intention and obtaining permission to do so:

1. All vessels of 300 gross tons and over.
2. All vessels engaged in pushing or towing, the combined tonnage of which is 300 gross tons and over.
3. All vessels greater than 30m in length.

Clearance is not required for vessels proceeding to or from facilities located E of Jurong Causeway, except for Sungai Jurong and Pulau Damar Laut.

**Tanjong Gul** (1°17.7'N., 103°39.9'E.) is a fairly high bluff, steep-to from seaward, and generally sloping gradually toward the interior. It is covered with timber, though there has been some attempt at clearing on the E slope. Two radio towers stand about 4 miles N of the point.

**Long Shoal** (1°17'N., 103°39'E.) lies on the N side of West Jurong Fairway about 0.4 mile SW of Tanjong Gul. A least depth of 1m lies over an obstruction located on the shoal. The shoal is marked close NE by a lighted buoy.

From Tanjong Gul, the coast extending E to **Sungi Pandan** (1°18'N., 103°45'E.), a distance of about 6 miles, consists of mangrove swamps, backed by hills 30 to 61m high and fronted

by reefs, on which lies Pulau Samulun and Pulau Damar Laut, both of which are described later.

**Gul Channel** (1°18'N., 103°40'E.), a basin with general depths of 4.3 to 6m, lies close ENE of Tanjung Gul. Repair berths, with alongside depths of 7 to 10m, occupy the NE side of the basin. There are also two drydocks, the largest of which can accommodate vessels up to 300,000 dwt.

**Benoi Basin** (1°18'N., 103°41'E.), whose depths are best seen on the chart, lies close E of Gul Channel.

The Mobil Oil Singapore oil depot is close E of Benoi Basin. The tidal rise at the oil depot is 3.4m at springs and 0.6m at neaps. The currents parallel the pier faces with the ebb flowing E and the flood flowing W.

**Depths—Limitations.**—The T-head pier provides four berths, and an L-head pier with two berths, the locations of which can best be seen on the chart, as follows:

1. Berth No. 1 is about 305m long with an alongside depth of 14.2m and it can accommodate vessels up to 120,000 dwt.
2. Berth No. 2 is 250m long with an alongside depth of about 13.1m. It can accommodate vessels up to 50,000 dwt.
3. Berth No. 3 is 200m long with an alongside 14.6m and can accommodate vessels up to 50,000 to 30,000 dwt.
4. Berth No. 4 is 150m long with an alongside depth of 9.4m, although caution is necessary as an obstruction, with a charted depth of 7.4m, lies close N of the berth. The berth can accommodate vessels up to 5,000 dwt.
5. Berth No. 5 is located on the NE extremity of Pulau Pesak, on the S side of Selat Jurong. The berth is 250m long; it has an alongside depth of 14.8m and can accommodate vessels up to 50,000 dwt.
6. Berth No. 6 is 116m long with an alongside depth of 7.8m.
7. Berth No. 7 is located about 0.4 mile W of Berth No. 6, with an alongside depth of 14.7m.

**9.12 Pulau Samulum** (1°18'N., 103°42'E.), 21m high, lies E of the Mobil Oil Singapore oil depot. A shipyard is located at the S end of Pulau Samulun. The facilities include a drydock 270m long and 40m wide that will accommodate vessels up to 90,000 dwt, and a newer drydock that will accommodate vessels up to 300,000 dwt. There is also a floating drydock of 2,000 tons lifting capacity.

**Pulau Damar Laut** (1°18'N., 103°43'E.), 17m high and undergoing massive reclamation of its shoreline, lies about 1 mile E of Pulau Samulun. A prominent chimney, which sometimes shows a flare, stands about 2 miles WNW of Pulau Damar Laut; another chimney, marked by obstruction lights, stands 0.75 mile NNW of the same island.

The S side of Pulau Damar Laut is composed of a continuous quay, consisting of six berths, each with a depth of 18m alongside. A directional light stands close to the E of the E most berth.

**9.13 Port Jurong** (1°18'N., 103°44'E.), abreast the NE side of Pulau Damar Laut, has a total berthing length of 1,517m, with alongside depths of 9.2 to 13m.

**Sungai Jurong** (1°18'N., 103°44'E.), entered close E of Port Jurong, is the designated fishing harbor, and has a least depth of about 3.4m in the fairway. Many oil pipelines, best seen on the chart, lie in Selat Jurong.

The GATX Terminal, a T-head wharf, lies SE of the entrance to Sungai Jurong. Berth 1, with an alongside depth of 14m, can accommodate a vessel up to 85,000 dwt, with a maximum length of 320m. Berth 2, with an alongside depth of 13.2m, can accommodate a vessel up to 5,000 dwt, with a maximum length of 116m.

The Caltex Asia Terminal, which consists of five sets of breasting dolphins, with a total of seven berths, is close SE of the GATX Terminal. Berth 1, with an alongside depth of 13.6m, can accommodate vessels up to 100,000 dwt, with a maximum length of 335m. Berth 2, with an alongside depth of 13.3m can accommodate vessels up to 32,000 dwt, with a maximum length of 183m. The remaining berths are best seen on the chart.

**Sungai Pandan** (1°18'N., 103°45'E.) is entered close E of Tanjung Penura. The coast for 2 miles S and E of Sungai Pandan is fronted by drying sandbanks, and sometimes marked by pile beacons, extending up to 1 mile offshore.

Eastward of these sandbanks, the coast trends 2 miles SE to **Tanjong Berlayar** (1°16'N., 103°48'E.).

**9.14 Pasir Paluang Terminal** (1°17'N., 103°47'E.) has 1,321m of berthing space, with alongside depths of 7 to 10.6m. The controlling depth of the fairway approaching the berths is 11.5m.

A tower stands about 0.2 mile NW of **Tanjong Berlayar** (1°15'48"N., 103°48'24"E.).

The S side of Selat Jurong is formed, from W to E, by Pulau Pesek Kecil, Pulau Pesek, Pulau Merlimau, and Pulau Seraya.

**Pulau Pesek** (1°17'N., 103°40'E.) is 18m high.

The oil wharf located on the NE extremity is part of the Mobil complex and has been previously described in Benoi Basin. Another T-headed pier, with an alongside depth of 14.7m, extends NW from reclaimed land on the N side of Pulau Pesek close W of the Mobil piers.

A reef extends about 0.1 mile ENE from the NE extremity of Pulau Pesak. A rock, with a least depth of 0.7m, lies about 0.4 mile ENE of the same point; the rock is marked close N by a lighted buoy.

Drying reefs surround Pulau Pesek and extend up to 0.4 mile offshore. A drying rock lies close ESE of Pulau Pesek Kecil.

**Triton Shoal** (1°16'N., 103°40'E.) extends up to 1.25 miles ESE of Pulau Pesek Kecil. It has general depths of 6.4 to 11m and is marked on its W end by a lighted buoy.

Triton Petroleum Anchorage, best seen on the chart, is located SW of the shoal.

**9.15 Tanjong Pidara** (1°17'N., 103°42'E.), the NW extremity of Pulau Merlimau, lies about 0.6 mile E of the NE extremity of Pulau Pesek; a T-headed jetty, with 11m alongside its outer face and 9.4m alongside its inner face, is located here.

Another T-head jetty, with 11.4m alongside its outer face and marked at each end by a light, stands about 0.2 mile NE of Tanjong Pidara.

The Singapore Petroleum Company Pier is a T-headed pier extending about 0.3 mile N from the E extremity of Pulau Merlimau. Berth 1 and Berth 2 have alongside depths of 15.7 and 15.4m, respectively and can each accommodate a vessel with a maximum length of 290m.

Berth 5 has a depth of 10.7m alongside and can accommodate a vessel with a maximum length of 115m.

**Pulau Seraya** (1°17'N., 103°44'E.) lies close SE of Pulau Merlimau. A T-headed oil pier extends about 0.2 mile NE from the N extremity of Pulau Seraya. Berth 1 and Berth 2 have an alongside depth of 13.1 and 13m, respectively and can each accommodate a vessel with a maximum length of 250m. Another T-headed pier, with a length of about 0.35 mile, can best be seen on the chart about 0.5 mile further SE.

**Selat Pesek** (1°17'N., 103°41'E.) lies with Pulau Pesek Kecil and Pulau Pesek on its NW side and Pulau Merlimau and Pulau Ayer Chawan on its SE side.

**Pulau Ayer Chawan** (1°16'N., 103°42'E.) is reported to be 27m high. The Esso Refinery, a bunkering terminal, is located on the NW side of Pulau Ayer Chawan. The tidal range at the terminal is 2.1m at springs and 0.9m at neaps.

A jetty provides five berths at T-head projections. Each berth is capable of stern loading to conventional service.

The berths are numbered from S to N; limiting dimensions are given below:

1. Berth No. 1 has a vessel length of 91m, depth alongside of 9.4m, and accommodates vessels up to 35,000 dwt.
2. Berth No. 2 has a vessel length of 198m, depth alongside of 12.7m, and accommodates vessels up to 25,000 dwt.
3. Berth No. 3 has a vessel length of 244m, depth alongside of 12.4m, and accommodates a vessel size of 48,000 dwt.
4. Berth No. 4 has a vessel length of 305m, depth alongside of 15.8m, and accommodates a vessel size of 80,000 dwt.
5. Berth No. 5 has a vessel length of 305m, depth alongside of 15.8m, and accommodates a vessel size of 90,000 dwt.

## Selat Sinki

**9.16 Selat Sinki** (1°15'N., 103°44'E.) is the deep channel by which **Keppel Harbor** (1°16'N., 103°51'E.) is approached from the Strait of Malacca; it is bounded on either side by islands and reefs.

Between Sultan Shoal and Cryene Reef the channel is about 7 miles long, at its E and narrowest part, it is about 0.5 mile wide, with irregular depths of 12.8 to 29.3m.

Vessels going both to and from Europe now use Selat Sinki as the direct route. The channel is available at all times but night navigation requires local knowledge.

The maximum velocity of the current is 3 knots; the flood current sets W and the ebb current sets E.

Pilotage is compulsory; see paragraph 9.2 for further information.

**Sultan Shoal** (1°14'N., 103°39'E.), circular and about 0.7 mile in diameter, lies on the N side of the W entrance to Selat Sinki, about 3 miles SW of the SW end of Pulau Ayer Chawan; a short pier extends NE from the lighthouse that stands on the shoal. Close W of the shoal are depths of 5.5 to 7.3m, but the E side of the shoal is steep-to.

A light, which is equipped with a racon, is shown from a tower rising from a small dwelling. A wreck, with a depth of 9.3m, lies about 0.3 mile SE of Sultan Shoal.

**Ajax Shoal** (1°14'N., 103°40'E.), with a least depth of 4.4m, lies about 1 mile SE of Sultan Shoal; it is about 183m in extent and composed of coral with sharp pinnacles. The water deepens gradually NW of the shoal but is steep-to to the SE. A lighted buoy is located close S of the reef.

Sultan Shoal Petroleum Anchorage B, best seen on the chart, is located NE of a line joining Sultan Shoal and Ajax Shoal.

The N shore of Selat Sinki is formed by the S islands of the group which lie between it and Selat Jurong.

**Pulau Sakra** (1°16'N., 103°42'E.), the westernmost, is 27m high and about 0.5 mile wide; all of these islands are surrounded by mangroves, and there are shoals and channels between them.

Van Ommeran Terminal, on the SE side of Pulau Sakra, has depths of 12.6m alongside its outer berth and 12.2m alongside its inner berth.

Sempec Terminal, WSW of Van Ommeran Terminal, has a T-head pier with an alongside depth of 13.6m.

Terumbu Mait, a drying reef, lies about 1 mile WSW of the W side of Pulau Sakra. Fishing stakes extend about 0.3 mile ESE of the reef.

Depths of less than 10m, marked W by a buoy, extend up to 0.5 mile E of the reef. Mongkok Tengelim.

A rock with a depth of 2.1m, lies 0.5 mile NE of Terumbu Mait.

**Terumbu Serebut** (1°15'N., 103°42'E.), a drying reef, lies about 0.6 mile S of the S side of Pulau Sakra. The S side of the reef is marked by a lighted beacon.

**9.17 Pulau Ayer Merbau** (1°16'N., 103°43'E.), 31m high to the tops of the trees, lies NE of Pulau Bakau; it is mostly low mangrove with higher land in places.

The S extremity of the island is a red bluff, 12m high and conspicuous. At the NW side of the island, a service bridge, with a vertical clearance of 9m, it links the island with the S shore of Pulau Merlimau.

Two drying reefs lie 0.3 and 0.45 mile E, respectively, of the red earth cliffs of the island; the S reef is marked by a lighted beacon.

A terminal has been established on the SW coast of the island; berthing facilities are described below:

1. Berth No. 1 has a depth alongside of 2.5m and is used by barges.
2. Berth No. 2 has a maximum vessel length of 165m and a depth alongside of 9.5m.
3. Berth No. 3 is used by tankers and accommodates a maximum vessel length of 130m, depth alongside 8.6m.
4. Berth No. 4 and Berth No. 5 are used by tankers. They each have a maximum vessel length of 140m and each have a depth alongside of 11.8m.

**Cyrene Reefs** (1°15'30"N., 103°45'00"E.) lie in the fairway, but the direct channel is S of them. The reefs are about 1 mile in extent, consisting of four patches partly drying at LW, with deep water around them. Shoal depths within and in the vicinity of the reef may best be seen on the chart.

Causeways are reported to connect the islands, as follows:

1. Pulau Sakra—Pulau Ayer Merbau.
2. Pulau Ayer Merbau—Pulau Merlimau.
3. Pulau Ayer Merbau—Pulau Seraya.

**Esso/Mobil** (1°14'N., 103°41'E.), an SBM spherical lighted buoy, 12m in diameter, is connected to the SW side of Pulau

Ayer Chawan by a pipeline extending about 3.2 miles SSW from the island. The controlling depth in the approach is 21m. Vessels up to 285,000 dwt can be accommodated.

**PSA** (1°13'N., 103°40'E.) SPM lies about 2 miles SW of Esso/Mobil SBM. The controlling depth in the approach is 22.8m. Vessels up to 320,000 dwt can be accommodated.

Mariners are advised to give a wide berth when passing this area at slow speed consistent with safe navigation.

**Directions.**—Raffles Light, standing on Pulau Satumu, both of which are described in paragraph 9.21, bearing 248°, leads S of all dangers off the N shore of Main Strait located E of Raffles Light.

Raffles Light bearing 101° leads in the best water W of the light, between the 8.5m and 10.5m patches on either side.

**Caution.**—The narrowest part of Main Strait is S of Raffles Light, where it is 1 mile wide. Vessels with a draft of up to about 19.8m can navigate in this area.

**9.18 Pulau Salu** (1°13'00"N., 103°42'30"E.), a small islet on a reef about 0.5 mile in extent, forms the SW side of the W entrance, and is steep-to.

**Pulau Busing** (1°14'N., 103°45'E.), about 10.4m high, lies nearly 2.5 miles NE of Pulau Salu; it is a small islet covered with mangroves and surrounded by a reef. The oil piers on the N side of the island can accommodate a vessel up to 352m long.

Drying reefs lie up to about 0.1 mile NW and about 0.2 mile WSW of the island.

**Pulau Hantu** (1°13'30"N., 103°45'03"E.), 18.9m high, lies about 0.5 mile SSE of Pulau Busing. Drying reefs extend up to 1.75 miles WNW of the island.

**9.19 Pulau Bukum** (1°14'N., 103°46'E.) (World Port Index No. 50010) bounds the S side of the E entrance to Selat Singkeh; its N extremity, which borders the channel, lies about 1 mile ENE of Pulau Busing. The island, about 1.2 miles long, is 40m high near its S end and fringed by a reef.

**Tides—Currents.**—During the E current in Selat Sinki, an eddy forms along the NE side of Pulau Bukum. The inshore current sets NE for most of the time, and sets SE only from 1 hour after the main current in Selat Sinki turns E until about the time of maximum E current. Tidal ranges are 2.4m at springs and 1m at neaps.

**Depths—Limitations.**—The NE side of the island is almost entirely fronted by deep water oil berths. There are 10 berths numbered from N to S. Included is information on maximum length, maximum draft and maximum displacement expressed in dwt. Information on the berths are given below.

The berths are easy to approach at slack water but currents are often experienced at other times and care is necessary when berthing.

Pulau Bukum Berthing Limitations			
Berth	Length	Draft	Vessel size
1	173m	10.4m	33,000 dwt
2	91m	10.1m	33,500 dwt
3	82m	11.1m	33,500 dwt
4	189m	11.5m	43,600 dwt

Pulau Bukum Berthing Limitations			
Berth	Length	Draft	Vessel size
5	193m	12.9m	45,700 dwt
6	243m	14.6m	35,000 dwt
7	183m	12.8m	66,000 dwt
8	243m	13.1m	83,300 dwt
9	186m	13.0m	33,500 dwt
10	265m	15.7m	85,300 dwt

**Aspect.**—A water tower stands about 0.5 mile NW of the SE end of the island. Range lights stand on the NW end of the island.

A conspicuous house, with a cupola and a red roof, stands on the SE peak of the island. A conspicuous flare stands close S of Berth No. 7. A prominent 83m high chimney stands near the center of the island. A number of conspicuous tanks stand on the N part of the island.

Drying rocks and reefs, best seen on the chart, lie NE of the berths. Drying rocks and reefs also lie from 0.2 mile SE to 0.2 mile SSW of the SE point of Pulau Bukum.

**Caution.**—Heavy cross traffic may be encountered NE of Pulau Bukum, at the intersection of Selat Sinki, Jong Fairway, and West Keppel Fairway.

**9.20 Pulau Ular** (1°13'04"N., 103°45'27"E.) and **Pulau Bukum Kechil** (1°13'45"N., 103°46'00"E.) lie between Pulau Bukum and Pulau Busing to the W, but are of no importance to navigation.

A group of islands, described below, lies to the S of Selat Sinki; those bordering the strait have been described with it.

They are separated by deep water, but so encumbered with reefs as to render them unavailable for anything but small craft.

**Pulau Sudong** (1°12'24"N., 103°43'48"E.), with a treetop height of about 32m, lies about 2 miles ESE of Pulau Salu, on the E end of an extensive drying reef.

A wreck, with a depth of 1.1m and marked by a buoy, lies about 0.6 mile N of the E end of the island. A drying reef, marked at its W end by a buoy, lies 0.3 mile SE of the wreck.

Mongkok Gerita, a rock with 1.8m and marked by a lighted beacon, lies about 0.5 mile NW of the wreck.

**Caution.**—A military maneuver area is located in the W part of Selat Pauh, close NNE of Pulau Sudong. The area is closed to vessel traffic during military maneuvers.

**9.21 Pulau Pawai** (1°11'18"N., 103°43'36"E.), 0.75 mile in extent and fringed by reefs, lies about 1 mile S of Pulau Sudong. The summit is conspicuous, being bare, except for a clump of trees, the tops of which are about 62m high on the W side of the islet.

Several detached reefs lie in the channels around the islet, the largest being a drying reef midway between Pulau Sudong and Pulau Pawai.

**Pulau Senang** (1°10'18"N., 103°44'18"E.), about 0.5 mile SE of Pulau Pawai, is about 1 mile in extent, 48m high at its S extremity, and covered with trees. A 6.4m shoal lies about 0.4 mile WNW of the W end of the islet.

**Pulau Biola** (1°09'54"N., 103°44'37"E.) lies about 0.2 mile SE of the SE end of Pulau Senang and is fringed by a reef

extending as much as 0.2 mile to the NE. It is about 137m long in a general N to S direction and about 21m high.

**Pulau Satumu** (1°09'36"N., 103°44'33"E.) is the S most islet of the group and borders the Main Strait; it lies about 0.2 mile SSW of Pulau Biola. There is a small pier for the use of the lighthouse staff on its E side.

Raffles Light is shown from a lighthouse on Pulau Satumu; prominent clumps of trees cover the island, but the lighthouse is visible above the trees.

**Caution.**—A steep-to reef, with a sunken rock close off its S end, extends about 183m offshore from the lighthouse.

**9.22 Pulau Semakau** (1°12'30"N., 103°45'45"E.), 27m high to the tops of the trees and about 1 mile in extent, lies near the center of the islands.

The island is separated from the adjacent islands by narrow channels of deep water, encumbered with shoals. The vegetation is mangroves and coconut palms. A village, which is the best landing place, is on the SW point of the island.

Other houses stand on the W shore of the island. The SE extremity of the island is marked by a lighted beacon.

Pulau Semakau is surrounded by drying reefs. Three drying reefs, each marked by a lighted beacon, lie 0.5 mile SE, about 0.7 mile S, and about 0.6 mile SSW of the SE point of the island. Other drying reefs and submerged dangers lying N of a line joining Pulau Biola and Pulau Sebarok can best be seen on the chart.

**Pulau Sakeng** (1°12'30"N., 103°46'42"E.), 32m high to the tops of the trees, lies between Pulau Semakau and Pulau Sebarok to the E and is surrounded by reefs. The island is almost completely surrounded by mangroves and covered with jungle. The land generally is very low. There are a few coconut palms close to the N end of the island.

**Shell SBM** (1°11'N., 103°47'E.) lies about 1.2 miles SE of Pulau Sakeng. A submarine pipeline extends to Pulau Bukom Kechil. The SBM, which has a controlling depth of 23m, can accommodate tankers up to 350,000 dwt.

**9.23 Pulau Sebarok** (1°12'24"N., 103°47'45"E.), the E most island of the group, is about 0.4 mile long and about 17m high.

The island is fringed by a reef which extends about 0.3 mile from its SE extremity; fish stakes stand on the SE edge of the reef. An obstruction, with 17.8m, lies about 0.5 mile SE of the SE end of the island. A detached reef about 0.2 mile long and drying in places lies parallel to the SE side of Pulau Sebarok and 0.1 mile offshore.

**Tides—Currents.**—The tidal current off Pulau Sebarok sets NW and SE, with a maximum velocity of 2.5 knots at springs.

**Depths—Limitations.**—Van Ommeren Terminal, an oil facility on the NE side of Pulau Sebarok, has five piers. Vessels are berthed during daylight hours only. Berthing limitations are, as follows:

1. Berth No. 3 has a depth of 17m alongside and can accommodate a vessels with a maximum length of 370m.
2. Berth No. 4 has a depth of 13m alongside and can accommodate a vessels with a maximum length of 250m.
3. Berth No. 5 has a depth of 17.6m alongside and can accommodate a vessels with a maximum length of 280m.
4. Berth No. 6 has a depth of 10.4m alongside and can accommodate a vessels with a maximum length of 110m.

5. Berth No. 7 has a depth of 8.2m alongside and can accommodate a vessels with a maximum length of 110m.

Pulau Sebarok Slop Reception Center is a concrete pier located off the NE side of Pulau Sebarok; from its head arms extend NW and SE to form three dolphin berths. Pier 1, with a controlling depth of 12.8m, can accommodate vessels up to 65,000 dwt, with a maximum length of 174m. Pier 2, with a controlling depth of 11m, can accommodate vessels up to 26,000 dwt, with a maximum length of 264m. The barge pier has a controlling depth of 5.2m.

These berths are used for tank cleaning and the admission of slops from oil tankers, no other facilities are available. Ships are berthed during daylight hours only.

Pulau Jong, about 23m high to the tops of the trees, lies about 0.5 mile NW of Pulau Sebarok. A reef, marked at its SE extend by a lighted beacon, extends about 0.4 mile SE from the island.

**The Sisters** (1°13'N., 103°50'E.), lying about 2.2 miles ENE of Pulau Sebarok, is composed of Pulau Subar Darat, the N island, and Pulau Subar Laut, the S island. The islands are surrounded by reefs to a distance of about 183m, and close to the edges are irregular depths of 9.1 to 16.5m.

Pulau Subar Darat, about 27m high to the tops of the trees, is steep-to, cliffy, and covered with rock and small jungle; Pulau Subar Laut is about 21m high to the tops of the trees.

The channel between The Sisters and the islands to the E is deep and free of known dangers.

The use of this channel is not recommended during the flood current and should never be used by low-powered vessels.

A shoal area, with depths under 18.3m, extends about 1.7 miles W of The Sisters; on the S edge is a shoal nearly 1 mile long with a least depth of 3m charted in several places. A shoal, with a depth of 10.7m, lies about 1 mile SE of Pulau Subar Laut.

**Terumbu Selegi** (1°13'36"N., 103°49'36"E.), a coral reef which dries 0.6m, and is about 183m in extent, lies about 0.7 mile NW of Pulau Subar Darat.

Depths of 5.5 to 11m lie within about 0.1 mile N and SE of the reef. A light stands on the E side of the reef.

**Selat Pauh** (1°13'N., 103°44'E.), an anchorage, is located N of Pulau Sudong. Within the anchorage are several dangers best observed on the chart.

**Regulations.**—A Traffic Separation Scheme has been established by the local authorities for Sinki Fairway, which leads through Selat Sinki, and may best be seen on the chart.

Vessels should take note that a Precautionary Area encompasses almost the entire S lane of the scheme.

The regulations governing traffic within the scheme are, as follows:

1. All vessels intending to proceed W to Sultan Shoal area via Sinki Fairway shall as far as practicable, join the outward lane which commences at the E extremity of Selat Pandan.
2. Vessels when using the Precautionary Area are to navigate with caution as there may be vessels berthing or unberthing at Pulau Busing Terminal or deep draft vessels navigating against the recommended direction of traffic flow.
3. Deep draft vessels proceeding W and unable to proceed via the outward lane (Selat Pandan) due to insufficient depth of water may proceed via the Precautionary Area.

In addition, such vessels should inform Jurong Control on VHF channel 22 of their intention before entering the Precautionary Area or immediately before unberthing from the Esso SBM as the case may be. This information would be conveyed to other vessels using the Sinki Fairway.

4. Vessels navigating in the Sinki Fairway are advised to establish communications with Jurong Control and report their intended movements so that other users of the fairway may be kept informed. They are also advised to navigate with caution and avoid impeding the safe passage of a deep draft vessel in the Sinki Fairway.

Selat Sinki is available for all classes of vessels. From S of Sultan Shoal course may be shaped to pass S of Ajax Shoal; then in accordance with traffic system described above to the entrance of Keppel Harbor.

Danger bearings on **Raffles Light** (1°09'36"N., 103°44'33"E.) are useful in avoiding dangers when approaching Selat Sinki from W.

**Pulau Jong** (1°12'54"N., 103°47'18"E.), bearing 304° and open well NE of Pulau Sebarok, leads NE of the small detached reef lying about 0.6 mile SE of Pulau Sebarok, and SW of the 13.5m shoal lying about 0.4 mile NE of the reef.

Vessels are warned not to anchor in the vicinity of the cable area in Selat Singkeh, which extends about 12 miles E from a position about 3 miles W of **Sultan Shoal Light** (1°14'23"N., 103°38'59"E.).

The boundaries of the prohibited anchorage areas in the vicinity of Singapore are charted.

**Signals.**—However, when going against the recommended direction of traffic flow, they are to display the following signals:

1. By day—A black cylinder as prescribed in the International Regulations for Preventing Collisions at Sea.
2. By night—Three red lights in a vertical line as prescribed in the International Regulations for Preventing Collisions at Sea.

Traffic signals are occasionally displayed from a steel framework tower 36m high, standing 91m N of **Raffles Lighthouse** (1°10'N., 103°45'E.). The signals are intended to warn vessels that a VLCC is crossing Main Strait bound for Shell SBM, situated about 4 miles NE of Raffles Lighthouse.

The VLCC may approach either through West Raffles Fairway or through Phillip Channel.

The day signal is a black cone point up over a black cylinder. The night signal is a white isophase light shown in the shape of an X.

Vessels should keep a good lookout for these signals and should avoid impeding the passage of a VLCC by reducing speed or stopping if necessary and should in no circumstances cross ahead of such a vessel.

**Caution.**—In order to avoid damage to vessels berthed at Pulau Bukom vessels passing N of that island must not exceed a speed of 8 knots in Selat Singkeh between the E extremity of **Cyrene Reefs** (1°15'30"N., 103°45'00"E.) and the entrance to Keppel Harbor.

Mariners are warned to keep outside of the shoal area that extends about 1.7 miles W of **The Sisters** (1°13'N., 103°50'E.) because depths of 4.6 to 11m lie along the 20m curve between positions 1°13'05"N., 103°48'15"E., and 1°12'45"N., 103°49'35"E.

## Singapore Road

**9.24 Singapore Road** (1°16'N., 103°53'E.), lying E of Keppel Harbor, is approached between **Pulau Sakijang Bendera** (1°13'N., 103°51'E.) and **Tanjong Katong** (1°17'36"N., 103°53'38"E.), about 5 miles NE.

At the head of the bay is the town and river of Singapore, with Gelang River, within **Tanjong Rhu** (1°17'39"N., 103°52'09"E.), to the E.

**Malay Point** and **Malay Spit** (1°16'10"N., 103°51'07"E.), located N of **Tanjong Pagar** (1°15'45"N., 103°50'48"E.), are mostly absorbed by the reclamation of the land on which there is a container and ro-ro terminal.

Heavy squalls during the SW monsoon occasionally impede cargo operations in Singapore Road.

**Telok Ayer** (1°16'30"N., 103°51'09"E.) used mainly by small craft, lying with its S end about 0.7 mile NNE of Tanjong Pagar. The basin is protected from E winds by a large land reclamation to the E. Telok Ayer basin is used by small craft.

**Tanjong Rhu** (1°17'39"N., 103°52'09"E.) is the W end of a peninsula. The peninsula, about 1 mile long together with **Tanjong Katong** (1°17'36"N., 103°53'38"E.), forms the N shore of Singapore Road; it is separated from the W shore of the bay by a channel about 0.2 mile wide.

Reclamation has been carried out along the coast E of Tanjong Rhu. Shoals with depths of less than 5m extend over 0.5 mile S of the reclaimed area, between Tanjong Rhu and Tanjong Katong.

**Depths—Limitations.**—The depths in Singapore Road are only from 3.7 to 7m for over 1 mile seaward of the river, and from about 0.2 to 0.7 mile seaward of the reclaimed areas.

Southwest, S, and SE of Tanjong Katong, and within the 10m curve, are several detached depths of 0.9 to 5.8m.

Seaward of the 10m curve and within **Outer Shoal** (1°15'N., 103°52'E.) there are depths of 11 to 22m, mud and sand bottom, from 1.3 to 2 miles SE of the town and river of Singapore, available for all classes of vessels.

The water shoals somewhat abruptly within the 10m curve in most places, as will be seen on the chart requiring caution in vessels of deep draft when selecting an anchorage.

**Outer Shoal** (1°15'N., 103°52'E.), the SW end of which lies about 1.2 miles SSE of the S end of the land reclamation project above, is, within the 10m curve, about 2.2 miles long NE and SW, and from about 0.5 to 1 mile wide.

A least depth of about 5.7m is reported to lie on the SW end of the shoal.

Obstructions, with a least charted depth of 4.6m and marked by a light, also lie on the SW end of the shoal. Less water than charted was reported on Outer Shoal.

A shoal, with depths of 9.4 to 10m, lies between the SW end of Outer Shoal and the reef extending NE from **Pulau Seringat** (1°13'42"N., 103°51'09"E.).

A tall lattice radio mast, about 79m in elevation, stands on Fort Canning, about 1.7 miles N of **Tanjong Pagar** (1°15'45"N., 103°50'48"E.). Close NE there is a disused lighthouse, a white iron tower, about 66m high.

Close SW of **Telok Ayer** (1°16'30"N., 103°51'09"E.) is the Singapore Polytechnic, surrounded by a lattice radio mast, and near the N end is the Asia Insurance Building, 77m high and prominent.

Katong Light Beacon stands about 1 mile E of **Tanjong Rhu** (1°17'39"N., 103°52'09"E.). A light is shown at Bedok, a little over 4 miles ENE of Tanjong Rhu.

Considerable reclamation work has been carried out along the coast E of Tanjong Rhu. Shoals, with depths of less than 5.5m, extend more than 0.5 mile S from the reclaimed area, between Tanjong Rhu and a position about 2.2 miles E.

**Signals.**—The following signals should be made, when necessary, by vessels lying in the Inner Harbor or Outer Road:

When in need of customs, use Flag "C" of the International Code of Signals when requiring clearance, or a green light above a red light at night.

When in need of police assistance use Flags "CB3" of the International Code of Signals, or two red lights above a white light, vertically disposed at night, when requiring immediate police assistance; at the same time a ship should sound three long blasts on the siren, repeated at intervals of one minute.

For fresh water needs, use Flags "CDZero" of the International Code of Signals, or a green light above a white light at night.

**Fullerton Signal Station** (1°17'10"N., 103°51'16"E.) maintains constant visual watch, but can accept day signals only. It can receive signals at night, but can not reply. It does not repeat traffic or berthing signals for Keppel Harbor. Local signal code may be obtained from the Director of Marine's office, near the mouth of the Singapore River.

Moored dredges will display, by day, a black ball at the masthead and a similar ball at the yard arm on the side on which it is safe to pass. A red, flag will be displayed on the side on which it is dangerous to pass. At night, white lights will be displayed in place of the black balls, and a red light in place of the red flag.

**Anchorage.**—Deep-draft vessels may be able to find good anchorage in **Singapore Eastern Roads** (1°15'30"N., 103°51'45"E.), between the NW side of Outer Shoal and the 10m curve off the city, with Fullerton Light bearing between 310° and 335°, in depths of 12.8 to 22m.

Smaller vessels may run in closer to the shore, guided by soundings, and anchor in any convenient berth, or, if under 60m long, may anchor in Inner Harbor. When approaching the anchorage, the depths shoal somewhat abruptly inside the 10m curve in some places.

The following special purpose anchorages are located W and SW of Singapore:

1. Western Anchorage—General purpose.
2. Western Petroleum Anchorage—For vessels loaded with petroleum and non gas-free vessels.
3. Western Quarantine and Immigration Anchorage—For vessels seeking quarantine and immigration clearance.
4. Pasir Panjang Holding Anchorage—For vessels as directed by the Port Master.
5. Sultan Shoal Petroleum Anchorage B—Tankers or vessels as directed by the Port Master.
6. Sultan Shoal Petroleum Anchorage—For vessels loaded with petroleum and non gas-free vessels.
7. LPG/LNG/Chemical Carriers Anchorage—For non gas-free LPG, LNG, and chemical carriers.
8. West Jurong Anchorage—For vessels awaiting a berth, vessels under repair, or special vessels.

9. Tuas Explosives Anchorage—For vessels loading or discharging explosives and Group 1 dangerous cargo or vessels in transit with such cargo on board.

10. Selat Pauh Anchorage—For vessels under arrest, laid-up vessels, and other vessels with permission of the Port Master.

11. Raffles Reserved Anchorage—For LASH vessel operations, damaged vessels, vessels requiring emergency repairs, or as directed by the Port Master.

The following special purpose anchorages are located W and N of Pulau Bukom:

1. Triton Petroleum Anchorage—Tankers or vessels as directed by the Port Master.
2. Tuas Explosives Lighterage Anchorage—For small craft loaded with explosives.

The following special purpose anchorages are located SE of Singapore:

1. Changi General Purpose Anchorage—For vessels over 20,000 grt wishing to remain in port for not more than 8 hours for the purpose of exchanging crew or loading ship's stores, upon prior permission of the Port Master.
2. Changi Holding Anchorage—For vessels over 20,000 grt wishing to remain in port for not more than 8 hours for the purpose of exchanging crew or loading ship's stores, upon prior permission of the Port Master.
3. Eastern Special Purposes Anchorage C—For vessels over 20,000 grt other than LPG/LNG vessels, oil rigs, and drill ships, for the purpose of taking on bunkers, upon prior permission of the Port Master.
4. Changi Special Purposes Anchorage—For vessels over 20,000 grt other than LPG/LNG vessels, oil rigs, and drill ships, for the purpose of taking on bunkers, upon prior permission of the Port Master.
5. Eastern Special Purposes Anchorage B—For vessels under arrest, damaged vessels or vessels requiring repair, and other vessels, upon prior permission of the Port Master.
6. Eastern Petroleum Anchorage B—For non gas-free vessels and vessels loaded with petroleum.
7. Eastern Special Purposes Anchorage A—For vessels under arrest, damaged vessels, deep draft vessels, vessels requiring repairs, and other vessels, upon prior permission of the Port Master.
8. Laid-up Vessels Anchorage—For vessels laid-up in port.
9. Small Craft Anchorage—For harbor tugs, pontoons, barges, and other small craft, including fishing vessels.
10. Man-of-War Anchorage—For visiting warships.
11. Eastern Explosives Lightering Anchorage—For small craft loaded with explosives.
12. Eastern Anchorage—General purpose.
13. Eastern Petroleum Anchorage A—For non gas-free vessels and vessels loaded with petroleum.
14. Eastern Holding Anchorage A—For vessels as directed by the Port Master.
15. Eastern Holding Anchorage B—For vessels as directed by the Port Master.
16. Eastern Holding Anchorage C—For tankers waiting to service vessels in Keppel Harbor.

Anchoring is prohibited within the area of the submarine cables that are laid SE from a position about 2 miles E of Tanjong Rhu.

Vessels over 15m in height are not permitted to enter, transit, or anchor in the area S and SE of Changi International Airport and on the W side of Kuala Johor. This area includes Eastern Special Purposes Anchorage B.

No vessel whose height, measured vertically from the waterline of the vessel to the highest point of the vessel, including its cargo, structure, or equipment on board, exceeds 49m shall enter, transit, or anchor in the height restricted area in the Eastern Special Purposes Anchorage A, Eastern Petroleum Anchorage B, or Eastern Special Purposes Anchorage C. This height restricted area is bounded, as follows:

- a. 1°18'18"N, 103°56'37"E.
- b. 1°18'18"N, 103°56'45"E.
- c. 1°17'30"N, 103°59'05"E.
- d. 1°17'39"N, 104°01'12"E.
- e. 1°16'38"N, 104°01'46"E.
- f. 1°16'38"N, 103°59'05"E.
- g. 1°16'38"N, 103°56'37"E.

**Directions.**—The lattice radio mast that is on Fort Canning, bearing 345°, leads over the W part of the shoal lying between Outer Shoal and Pulau Renget, but W of Outer Shoal.

The greater and shallowest part of this shoal, and the SW part of Outer Shoal, are covered by the fixed red sector of Tanjong Pagar light. The whole of Fort Canning radio mast, bearing about 298° and open NE of **Superior Court Dome** (1°17'22"N., 103°51'10"E.), leads NE of Outer Shoal.

**Caution.**—It was reported that less water exists over Outer Shoal than charted.

Numerous dangerous wrecks, some of a shifting nature, lie in Singapore Road. Information as to positions and markings can best be obtained from the area chart.

It is suspected that the wreck buoys are used as moorings by native craft, and their positions must therefore be considered unreliable. Vessels should navigate with caution in this area.

Deviation from recommended tracks within harbor limits requires cognizance of and careful regard for charted dangers.

**9.25 Pulau Sakijang Bendera** (St. John Island) (1°13'N., 103°51'E.), a coral island lying about 0.7 mile E of The Sisters, is about 30m high. Hospital buildings and fumigating sheds of the quarantine station stand on the island.

Tanjong Lokas is the SE extremity of the island; two lattice radio masts stand about 183m N and about 0.1 mile NW, respectively, of Tanjong Lokos.

A conspicuous chimney stands 206m W of the pier located on the E side of the island.

**Pulau Sakijang Pelepah** (Lazarus Island) lies E of Pulau Sakijang Bendera. The islands are separated by Cooper Channel, with a least width of 183m and a least charted depth of 15.5m. The island is 53m high and is uninhabited.

The summit of the island is marked by a light; an aviation light stands close W of the summit.

Both islands are about 0.7 mile long and are surrounded by drying reefs. A 10.7m shoal lies about 0.7 mile SSW of Tanjong Lokos.

**Pulau Tembakul** (Peak Island) (1°13'N., 103°52'E.), lying E of Pulau Sakijang Pelepah, is wooded, 33m high to the tops of the trees, and surrounded by a reef which extends about 0.2 mile from its NW extremity and about 0.1 mile from its S extremity. A small village, with a temple on a rock close W of it, stands on the NW end of the island. A white stone obelisk stands near the SE end of the island.

Pulau Renget Kechil, a small islet, lies close N of Pulau Sakijang Bendera on the S side of a reef about 0.7 mile long and about 0.2 mile wide.

**Pulau Tekukor** (1°13'51"N., 103°50'21"E.), a narrow island about 0.3 mile long and 23m high, lies between Pulau Sakijang Bendera and the S extremity of Sentosa.

An unused explosives magazine complex is situated on Pulau Tekukor. There is a concrete jetty, with a depth of 4.3m alongside, on the SW side of the island.

**Sentosa** (Blakang Mati Island) (1°15'N., 103°50'E.) lies S of the S part of Singapore Island, from which it is separated by Keppel Harbor. The island is about 2 miles long in an ESE and WNW direction, and its W end terminates in Tanjong Rimau, the S point of the W entrance to Keppel Harbor. The point is formed of cliffs and patches of shelving rock projecting from their bases. A light is shown close NW of Tanjong Rimau.

Mount Siloso, 47m high, lies about 0.1 mile ESE of Tanjong Rimau. A summit is covered by a clump of high fir trees.

**9.26 Mount Imbiah** (15°23'N., 103°49'E.), 68m high to the tops of the trees, is 0.5 mile ESE of Tanjong Rimau. Other small hills, covered with scrub and small trees, are in the vicinity.

**Terembu Palawan** (1°15'N., 103°49'E.) is approximately 0.1 mile long steep-to drying reef lying about 183m off the coast of Sentosa, about 0.8 mile SE of Tanjong Rimau. The reef is marked by a light. Shoal depth, best seen on the chart, lie close WNW and ENE of the reef.

**Tanjong China** (1°14'N., 103°50'E.) is the S extremity of Sentosa.

**Mount Serapong** (1°15'N., 103°50'E.), rising to a height of 83m, is about 0.6 mile to the N of Tanjong China. It is wooded on its N side but barren on its S side; a number of buildings stand on its summit. It is a prominent mark from the E. A conspicuous radio mast stands about 0.2 mile SE of the summit.

Drying reefs extend up to about 0.1 mile off the SW and SE sides of Sentosa.

**Berhala Spit** (1°15'N., 103°50'E.) is the NE extremity of Sentosa. Tanjong Berhala, a wooded peninsula 23m high to the tops of the trees, lies about 0.2 mile W of Berhala Spit.

Tanjong Berhala is connected to the 12m high cliffs of Sentosa by a narrow concrete causeway.

**Buran Darat** (1°15'N., 103°51'E.), off the E side of Sentosa, is a coral reef, with occasional patches of sand, about 1 mile long, and 0.25 mile wide at its N end, tapering to a point at its S end; rocky heads dry in places 1.2 and 1.5m. A shoal, depth of 1.8m, lies close N of the NW end of the reef.

A disused spoiling ground extends about 183m NE from the NE end of Buran Darat. A number of reefs, some of which dry at LW, lie between the S end of Buran Darat and Pulau Dakijang Bendera and may best be seen on the chart.

**Tides—Currents.**—Tidal currents in the W approaches to Singapore, within a line joining the W end of **Selat Jurong** (1°18'N., 103°43'E.), **Raffles Lighthouse** (1°09'36"N., 103°44'33"E.), **Pulau Tembakul** (1°13'24"N., 103°51'51"E.), and the E end of **Keppel Harbor** (1°15'30"N., 103°50'30"E.) are as follows:

In this area the current is mainly diurnal; that is to say, the portion which varies with the declination of the moon and sun, and which is slack twice only in each lunar day, runs at a greater rate than the portion which varies with the moon's phases and which is slack four times in each lunar day.

The current usually follows the direction of the channels, the flood running to the W, NW or SW, and the ebb to the E, NE, or SE; the rate at any moment is approximately the same over the whole area, and the current turns everywhere at approximately the same moment.

The strength of the current may be increased off salient points and slack water may be found, or eddies occur, on the lee side of these; when the current is strong, overfalls and swirls may be formed, due to inequalities of the bottom.

Eddies and swirls occur on the SE side of the channel between **Pulau Pesek** (1°17'00"N., 103°41'30"E.) and **Pulau Ayer Chawan** (1°16'30"N., 103°42'00"E.) near LW.

In **Selat Sinki** (1°15'N., 103°44'E.) the W approach to Singapore, there is a confused sea during W winds when the current is running to the W.

Noticeable eddies and swirls occur between **The Sisters** (1°13'N., 103°50'E.) and **Pulau Sakijang Bendera** (1°13'N., 103°51'E.); a vessel at anchor in this channel, obtaining tidal current observations, was frequently swung rapidly through an arc of 60°, and as rapidly back again, during the strength of the current.

There are also eddies and swirls between Pulau Sakijang Bendera and **Pulau Tekukor** (1°13'51"N., 103°50'21"E.) and between Pulau Tekukor and **Sentosa** (1°15'N., 103°50'E.).

The E current is not strong N of **Pulau Sakijang Pelepah** (1°13'N., 103°51'E.) and Pulau Tembakul where there may be eddies during the strength of this current.

In **Selat Sinki** (Keppel Harbor) there are swirls and eddies at the E entrance and on the spit extending from the military pier.

In Keppel Harbor the E current runs strongly and causes somewhat dangerous swirls and eddies.

There are eddies close to the telegraph company's wharves in **Selat Chermin** (1°16'N., 103°49'E.) and at both ends of the P. & O. Company's wharf.

It was reported that the E current sets on the oil wharf immediately E of King's Dock and the W current causes an offset.

The W current runs with great strength between the W entrance points, where the rate may reach 4 knots. It is weak along the Port of Singapore Authority wharves from the drydock as far as W wharf, but increases then toward the W entrance, and is hardly felt along the wharf at **Pulau Brani** (1°15'30"N., 103°50'00"E.). There is, during this current, slack water on the W side of **Tanjong Pagar** (1°15'45"N., 103°50'48"E.); this should be remembered when approaching the docks, for with the bow in slack water and a strong current on the quarter, an awkward sheer might be experienced.

The average directions and rates of the tidal currents in a position about 1.3 miles S of **Tanjong Piai** (1°16'N., 103°31'E.) at each hour before and after HHW at Singapore are given in the table below.

The rates are increased, without material change in direction, at springs and when the moon is in high declination; the increase may be as much as 75 percent when the moon is in maximum declination at springs. The rates are reduced and directions become less regular at neaps and when the moon is in low declination; when the moon is on the Equator at neaps, the current is weak and irregular.

The currents off Tanjong Piai differ materially both in character and time from those in **Singapore Main Strait** (1°09'N., 103°45'E.); average conditions at corresponding times are, as follows:

Before HHW (Hours)	Direction	Rate (Knots)	After HHW (Hours)	Direction	Rate (Knots)
12	093°	1.1	0	100°	0.3
11	098°	1.0	1	093°	0.5
10	103°	0.7	2	104°	0.4
9	115°	0.3	3	114°	0.3
8	230°	0.2	4	163°	0.1
7	264°	0.5	5	249°	0.2
6	280°	1.0	6	254°	0.4
5	280°	1.3	7	278°	0.4
4	282°	1.3	8	279°	0.5
3	284°	1.0	9	282°	0.3
2	295°	0.3	10	283°	0.2
1	106°	0.2	11	086°	0.7
0	100°	0.3	12	093°	1.0

Average conditions for a strong E current is 10 hours after to 9 hours before HHW. For a strong W current, it is 8 hours before to 2 hours before HHW.

Average conditions for a weak E current is 1 hour before to 4 hours after HHW. For a weak W current, it is 5 hours after to 9 hours after HHW.

Within the Singapore Main Strait, the weak W current is 10 hours after to 10 hours before HHW. For the strong W current, it is 9 hours before to 2 hours before HHW. For the strong E current, it is 1 hour before to 7 hours after HHW and for the weak E current, it is 8 hours after to 9 hours after HHW.

Caution is therefore required in navigating the W approach to the Main Strait, for a comparatively small change in position may cause a great change in the direction and rate of the currents.

It should be noted that, as the current in the Main Strait is mainly diurnal, average conditions occur only when the moon is in average declination 3 or 4 days after springs and neaps; at all other times conditions may differ widely from the average.

Off Tanjong Piai the current, being mainly semidiurnal, is more constant.

**Directions.**—In proceeding E through the W part of Singapore Strait, from a mid-channel position between **Karimun-Kecil** (1°09'N., 103°24'E.) and **Tanjong Piai** (1°16'N., 103°31'E.), where there are depths of about 35m, no directions are necessary for a vessel beyond keeping in the fairway other than observing that **Raffles Lighthouse** (1°09'36"N., 103°44'33"E.), bearing 101°, midway between the 8.7m and 10.5m shoals on either side of the fairway.

Having passed **Pulau Nipa Lighthouse** (1°09'N., 103°40'E.) steer to round Raffles Lighthouse from 0.5 mile to 1 mile distant; or if the wind and tidal current be adverse, or from other circumstances it may be desirable to anchor to the W of **Pulau Senang** (1°10'18"N., 103°44'18"E.), out of the strength of the current.

Having rounded Raffles Lighthouse, steer to pass Pulau Sakijang Bendera about 0.5 mile distant, passing about 1 mile S of **Lighted Beacon No. 45** (1°11'51"N., 103°48'27"E.), so as to avoid the rocks SW of **Pulau Sebarok** (1°12'24"N., 103°47'45"E.).

After passing **Pulau Sakijang Bendera** (1°13'N., 103°51'E.), if a vessel is bound for Singapore Road, round Pulau Tembakul at a distance of about 0.2 mile and steer NNW to pass between **Outer Shoal** (1°15'N., 103°52'E.) and the shoals SE of **Sentosa** (1°15'N., 103°50'E.).

A least depth of 9.1m can be carried through this channel, but caution is necessary if the tide is setting strongly across the track. When Tanjong China, the S end of Sentosa, bears 235°, course may be changed NE for the anchorage.

If bound through the E part of Singapore Strait, set a course to pass N of **Horsburgh Light** (1°20'N., 104°24'E.), and then into the South China Sea.

**Caution.**—Numerous dangerous wrecks, some of a shifting nature, lie in Singapore Road, and may best be seen on the chart.

**9.27 Singapore** (1°17'N., 103°51'E.) is built on each side of the Singapore River, which is a small stream only navigable by small craft. The river is barred by a flat, with about 0.3 to

0.9m at LW, which fronts the shore to a distance of about 0.2 mile. Several bridges span the river. The lower one at the mouth is Anderson Bridge and the next above it is Cavanagh Bridge.

The river is always crowded with cargo boats, the central part being kept dredged and clear for those under way.

Marina Bay, formerly Inner Roads, lies SE of the mouth of Singapore River. Reclamation continues between Marina wharf and the entrance to Marina Bay.

Another reclaimed area fronts the shore between the entrances to Singapore River and Kallang Basin. Further improvements are being made E of Tanjong Rhu, the E entrance point to Kallang Basin, for about 2 miles and up to 0.75 mile from the shore. A large part of the area is enclosed by sea walls and prohibited areas surround them.

The commercial area of the town is situated on the S side of the river. The banks on either side are lined with quays and go downs for the landing and receiving of goods. Singapore is a free port.

Several conspicuous buildings stand on the reclaimed ground.

Among the most conspicuous objects in the vicinity, when seen from seaward, is the **Victoria Memorial Hall** (1°16'50"N., 103°51'08"E.) a yellow stone building, surmounted by a dome and clock tower, the clock being illuminated at night; the crown surmounting this building is 57.3m above HW, and conspicuous when the sun is shining on the clock tower.

From the open square in front of the Victoria Memorial Hall a fine esplanade extends for 0.25 mile along the sea front; behind this esplanade is located the Recreation Ground fronting **St. Andrews Cathedral**, (1°17'32"N., 103°51'13"E.) which is reported to have a tower surmounted by a spire about 65m high.

Ocean Building is very tall with a conspicuous roof that is green.

**Fullerton Building** (1°17'10"N., 103°51'16"E.) has a red roof and is one of the more conspicuous buildings on the water front.

There are numerous tall buildings which are constantly being added to on the S side of the entrance to Singapore river.

The War Memorial stands on the shore opposite the Recreation Grounds, a lattice radio mast and a disused lighthouse are located on **Fort Canning Hill**, (1°17'33"N., 103°50'56"E.), which rises gradually above the center of the town to a height of about 47m.

The Director of Marine's Pier is located close eastward of Fullerton Building.

## **Keppel Harbor (1°16'N., 103°50'E.)**

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**9.28 Keppel Harbor**, between Singapore and Sentosa, is about 3 miles long in an E and W direction, but the main channel takes a somewhat serpentine course; its width is about 0.2 mile, but in several places is not more than about 0.1 mile wide.

Situated as it is, Keppel Harbor is of considerable importance and possesses extensive dock and wharf accommodation.

### Tides—Currents

Tidal currents in **Selat Sengkir** (1°15'21"N., 103°50'00"E.) have considerable strength, the flood flowing to the W and the ebb to the E.

With no slack water; there are swirls and eddies at the E entrance. Tidal ranges are about 2.3m at springs and 1.1m at neaps.

In the E approach to Keppel Harbor, the tidal currents are very irregular in the passages among these islands, running sometimes 4 knots.

In Keppel Harbor the currents run strongest at the W entrance points off the N end of **Pulau Brani** (1°15'30"N., 103°50'00"E.), at the rate of 3 knots, but in the W entrance, at times it reaches 4 knots.

The E current commences about 1 hour before HHW, and runs until about 2 hours after LLW.

The W current is reported to commence about 2 hours after LLW, and runs until about 1 hour before HHW at varying strength.

The ebb or E current at springs running through Keppel Harbor causes somewhat dangerous swirls and eddies; the flood or W current is more uniform, with eddies only occurring between the points of the W entrance.

In **Selat Chermin** (1°16'N., 3°49'E.) the currents sweep around **Pulau Hantu** (1°15'51"N., 103°48'49"E.) with considerable force, but close to the wharves at the head of that bay is an eddy current on both sides.

There is also a slight eddy at each end of the Port of Singapore Authority wharves.

Alongside the wharf at Pulau Brani, it is quite slack water on the flood, but the ebb runs strongly.

The flood current sweeps W along the harbor board's wharves from the dry docks as far as West Wharf, with very little strength, but then it runs strongly. On the flood, on the W side of Tanjong Pagar, the projecting line of wharves causes slack water on that side.

Approaching Tanjong Pagar, if unaware of this fact, the bow being in slack water with a strong current on the quarter, an awkward sheer might be experienced.

### Depths—Limitations

Keppel Harbor, and both entrances to it, have sufficient water for all classes of vessels; there are depths of 5.2 to 11.3m or more alongside the wharves at LW.

The W entrance, with a least depth of 11.6m in the fairway, is a little more than 183m wide and lies between **Tanjong Rimau** (1°15'35"N., 103°48'30"E.) and Tanjong Berlayer, about 0.1 mile NW.

The E entrance between **Tanjong Pagar** (1°15'45"N., 103°50'48"E.) and the E extremity of Pulau Brani to the SW is about 0.4 mile wide.

Keppel Harbor is divided into two parts by a causeway linking **West Wharf** (1°15.8'N., 103°49.5'E.) with Tanjong Risim, the W extremity of Pulau Brani.

Vessels are prohibited from transiting through Keppel Harbor.

Tanjong Pagar Terminal, which handles container and ro-ro vessels, has a total berthing length of 3,600m, with alongside depths of 9.4 to 13m.

Keppel Terminal, located W of Tanjong Pagar Terminal, has ten berths, with depths of 10.7 to 13.6m alongside.

There are three berths for cruise ships situated on the N side of Keppel Harbor close W of the causeway. Berths CC1, CC2, and CC3 have depths alongside of 11, 11, and 10m, respectively.

Marine Terminal, located W of Keppel Terminal and E of the causeway, has six berths, with a total berthing length of 953m and alongside depths of 9.8 to 11m.

### Pilotage

Pilotage information is found in paragraph 9.2.

### Regulations

**Cruise Bay** (1°16'N., 103°49'E.) is the W part of Keppel Harbor. Vessels with a length of over 30m or whose height exceeds 30m should obtain permission from Cruise Bay Control on VHF channel 5 before entering, leaving, or maneuvering in Cruise Bay.

All vessels maneuvering within Cruise Bay should maintain a listening watch on VHF channel 5.

Entry into Cruise Bay is prohibited to vessels over 52m high. Vessels between 48 and 52m high must obtain written permission from the Port Master to enter or remain in the area.

### Anchorage

Anchorage is prohibited in the whole of Keppel Harbor, in Selat Sengkir, and in the E entrance.

### Caution

Both sides of Keppel Harbor are reported to be fringed with drying reefs.

Reclamation work is being done in the Keppel Harbor area and mariners are advised to use caution.

**9.29 Tanjong Berlayer** (1°15'48"N., 103°48'24"E.), the NW entrance point to Keppel Harbor, is formed of cliffs about 18.3m high. Tanjong Rimau, about 0.1 mile SE of Tanjong Berlayer, is the SE entrance point to Keppel Harbor. A white obelisk stands 46m NW of Tanjong Berlayer.

A T-headed oil terminal, flanked by concrete dolphins, is 0.1 mile ENE of Tanjong Berlayer. A military pier, with 7.6m at its extremity, is 119m NE of Tanjong Berlayer; mooring buoys are located E of the pier head.

**Berlayer Rock** (Blayer Rock), lying about 91m WSW of Tanjong Berlayer, has a least depth of 1.8m and is steep-to on its S side.

A depth of 5.2m lies about 0.3 mile W of Tanjong Berlayer; it is the shallowest part of a ridge with depths of 5.5 to 14.6m.

There are depths of 9.1 to 11m between the ridge and **Pasir Panjang** (1°16'N., 103°48'E.).

A reef, with 2.7 to 4.9m, extends almost 91m W from **Tanjong Rimau** (1°15'35"N., 103°48'30"E.). A fishtrap is located about 165m SSW of the same point. A military pier, with 8.8m at its extremity, stands 0.2 mile E of Tanjong Rimau.

**Caution.**—Due to the existence of submarine cables, vessels should not anchor within 1 mile of Tanjong Berlayar or N of a line joining that point and the lighted beacon on **Cyrene Reefs** (1°15.5'N., 103°45.0'E.).

A submarine cable extends from Tanjong Rimau NNW to the military pier standing NE of Tanjong Berlayar.

Eastward between Tanjong Berlayar and **Bukit Chermin** (1°15'58"N., 103°48'39"E.) there is an impassable mangrove swamp, into which **Berlayar Canal** (Blayer Canal) (1°16'00"N., 103°48'28"E.) discharges, off the mouth of which a reef extends up to about 200m seaward.

**Pulau Hantu** (1°15'51"N., 103°48'49"E.), the small, round, densely wooded island lying in front of Selat Chermin, is about 0.1 mile in diameter, and 45m high to the tops of the trees. A reef fringes the E and N sides of the island.

The channel between the island and the coast is about 91m wide and has charted depths of 6.8 to 13.6m. Berthing facilities in the vicinity of Pulau Hantu can best be seen on the chart.

**Pulau Renggis** (1°15'37"N., 103°48'59"E.) is the central portion of a coral reef, covered with mangroves, the tops of which are 5.5m above HW; it lies about 0.5 mile E of Tanjong Rimau and 91m from the S shore. The reef, which dries, extends about 119m W and about 64m N and E from the islet, with shallow water extending 91m beyond the E part.

**Pulau Brani** (1°15'30"N., 103°50'00"E.), on the S side of Keppel Harbor, forms the N side of Selat Sengkir; it is nearly 0.6 mile in length, in an E and W direction, with an extreme width of 0.4 mile.

On its NE side are three hills, the middle one, which is the highest, being 48m high and covered with trees.

**Tanjong Risim** (1°15'34"N., 103°49'40"E.), from which a fringing reef extends W about 0.2 mile, is the W end of Pulau Brani. The NW coast of Pulau Brani is fronted by a reef which ends about 0.2 mile NE of Tanjong Risim. A pier is situated close NE of Tanjong Risim. A submerged pipeline extending to Singapore is laid in the vicinity. Mooring buoys are laid close off the NW coast of Pulau Brani.

Brani Terminal is located on the S side of Keppel Harbor, along the N shore of Pulau Brani; it has nine berths that are best seen on the chart. Berths B1 to B3 have alongside depths of 12m; Berths B4 and B5 have alongside depths of 15m; and Berths B6, B7, B8, and B9 have alongside depths of 14.1m, 13.9m, 14.1m, and 12.3m, respectively.

A concrete wharf, 15m long, with 2.7 to 4.6m alongside, is located on the S side of Pulau Brani close ESE of Tanjong Risim.

**Caution.**—An aerial tramway, with a vertical clearance of 56m, crosses the channel between Sentosa and Singapore about 0.4 mile W of Tanjong Risim. The tramway, which is about 1 mile long, has a conspicuous tower and two conspicuous cable car stations on Singapore and a conspicuous tower and cable car station on Sentosa.

Submarine cables, the locations of which can best be seen on the chart, lie in the W part of Selat Sengkir.

**Tanjong Tereh** (1°15'49"N., 103°49'57"E.), the N end of Pulau Brani, is a bold red point rising within to a height of 29m, with many buildings on its grassy slopes, and is conspicuous from either entrance to Keppel Harbor.

**Selat Singkir** (1°15'21"N., 103°50'00"E.), the channel between Pulau Brani and Sentosa, with a least depth of 3m in mid-channel but greater depths elsewhere, is navigable for vessels of light draft.

**Directions.**—Vessels proceeding into Keppel Harbor through the W entrance, which is little more than 183m wide, should keep in mid-channel.

Inbound from Main Strait toward Keppel Harbor W entrance, the channel that is between **Pulau Sebarok** (1°12'24"N., 103°47'45"E.) and **The Sisters** (1°13'N., 103°50'E.) is very recommended.

Between the shoals W of The Sisters and the sunken rock, lying about 0.6 mile SE of the SE end of Pulau Sebarok, the channel is about 0.7 mile wide.

When approaching this channel from SE, **Pulau Jong** (1°12'54"N., 103°47'18"E.), bearing 304° and kept well open of Pulau Sebarok, leads E of the rock.

**Terumbu Selegi** (1°13'36"N., 103°49'36"E.), marked by a beacon, about 0.7 mile NW of The Sisters, should be given a wide berth.

**Terumbu Palawan** (1°15'N., 103°49'E.), marked by a beacon and near the coast of Sentosa, should be given a berth of 183m; then to the W entrance to Keppel Harbor there are no dangers beyond 0.25 mile offshore.

Deep draft vessels should avoid the ridge with 7.8m extending W of the 5.5m depth W of The Sisters, and the ridge with the same depths E of **Pulau Bukom** (1°14'N., 103°46'E.).

Eastward of The Sisters, and between them and **Pulau Sakijang Bendera** (1°13'N., 103°51'E.), is a good and deep channel about 0.5 mile wide, for which the chart is sufficient guide.

**9.30 East Keppel Fairway** (1°14'N., 103°52'E.) is the relatively wide fairway leading NE of the islands and reefs forming the E part of Port Singapore for 3 miles to the E entrance to Keppel Harbor.

East Keppel Fairway has been dredged (1996) to a depth of 15m; the dredged limits are best seen on the chart.

**Caution.**—Anchorage in the vicinity of the port of Singapore and areas which anchorage is prohibited are charted.

Vessels may not anchor in Keppel Harbor except in an emergency or when berthing or unberthing.

A prohibited area exists at the E entrance to the Selat Singkir, the limits of which are best shown on the chart.

No vessel of any description, except vessels authorized by the Port Captain or the Commander, Republic of Singapore Navy, shall enter the area for anchorage, passage, or any other purpose.

**9.31** The E part of Singapore Strait, E of **Pulau Sambu** (1°10'N., 103°54'E.), is formed by Pulau Batam, on the W side of the N entrance to **Selat Riau** (1°10'N., 104°13'E.), and by Pulau Bintan on the E side of the strait.

**Teluk Jodoh** (1°10'N., 103°58'E.), lying close E of Pulau Sambu, is 6.5 miles wide between it and **Taluung Sengkuang** (1°11'N., 104°02'E.) to the E. The depths in the outer part of the bay vary from 18.3 to 47.5m but close to the shore reefs, there are depths of 10.9 to 12.8m; caution is necessary when working toward them.

**Pulau Dongas** (Pulau Dangas) (1°09'N., 103°57'E.) lies close off the shore of Teluk Jodoh. A wreck lies about 2 miles NNE of the island.

**Caution.**—A floating storage tanker is reported to be moored about 2 miles N of Pulau Dongas.

The bight between Pulau Dongas and Pulau Bakor (Pulau Bokur) affords anchorage in depths of 6.1 to 7.3m.

Vessels may anchor in about 7.3m, with Pulau Bokor bearing 135°, distant 0.5 mile. The depths decrease sharply to 5.5m toward the island, but decrease more regularly towards the reefs on the E side of Teluk Jodoh.

**Pelabuhan Batuampar** (Pelabuhan Batu Ampar) (1°10'N., 104°00'E.), on the E shore of Teluk Jodoh, consists of a square-shaped basin about 0.2 mile wide. The basin, which has a controlling depth of 4.9m, has a total berthing length of 1,000m.

Another narrow basin, with a controlling depth of 3.4m, lies about 0.3 mile N of the main basin.

**9.32 Tanjung Sengkuang** (1°11'N., 104°02'E.) is the NE extremity of a peninsula that separates Teluk Jodoh from Teluk Tering to the E.

**Teluk Tering** (1°11'N., 104°04'E.) is about 3 miles wide between Tanjung Sengkuang and **Tanjung Kapur** (1°11'N., 104°05'E.), and is about 4 miles in length.

**Pulau Nongsa** (1°12'15"N., 104°04'54"E.) is about 0.2 mile in extent and surrounded by a reef. It is rocky, wooded and 26m high to the tree tops, and lies about 0.5 mile off **Tanjung Batubelah** (1°11'36"N., 105°05'09"E.) shore reef.

On the S edge of the islet is a sand cay, overgrown with low trees. A wreck is charted about 0.5 mile E of the islet. The islet is reported to be marked by a light.

**Rosa Rock** (1°12'23"N., 104°05'53"E.), which uncovers, lies nearly 1 mile E of Pulau Nongsa. Vessels should not stand S of the line of Pulau Nongsa bearing 262°.

The best anchorage in Teluk Tering is on the E side of its approach, in 11m, about 1 mile WSW of Pulau Nongsa; small vessels may go further in.

The N entrance to Selat Riau lies between **Tanjung Babi** (1°11'51"N., 104°06'04"E.), the N point of Pulau Batam, and Tanjung Sebong about 9.7 miles ESE.

Eastward of Tanjung Babi the shore reef, to the N entrance of Selat Riau, projects about 0.7 mile in places.

**Pulau Bintan** (1°14'N., 104°34'E.), of which Tanjung Berakit is the NE end, is the largest island on the S side of Singapore Strait.

Like most of the other land forming Singapore Strait, it is covered with trees, and, excepting the hills inland, is not much elevated.

Vessels should not venture in by the curve, as the depths are very irregular, with shallow patches which are difficult to

approach by the lead, though they may frequently be distinguished by tide rips.

**9.33 Gunung Bintan-besar** (1°04'N., 104°27'E.), located about 7 miles within the N coast of Pulau Bintan, is 348m high; it may be seen in clear weather from a distance of about 40 miles and is a good mark in approaching Singapore Strait from the N.

When viewed from the N it shows up as a saddle-shaped summit, lying 3 miles N and appearing to be joined to Gunung Bintan-besar is Gunung Bintan-ketjil, a 195m high conical hill.

**Tanjong Tondang** (1°11'N., 104°19'E.) lies about 7 miles NE of Tanjung Sebong; Tanjung Pergam lies about 1.6 miles farther E. Teluk Sebong indents the coast E of Tanjung Sebong.

**Lagoi Reef** (1°12'N., 104°21'E.), consisting of several rocky heads with depths of less than 1.8m lies between 0.9 mile and about 1.8 miles NE of Tanjung Pergam.

**Karang Manjang** (1°12'N., 104°22'E.), a narrow ridge about 0.5 mile in length, lies between Lagoi Reef and the shore, along with other shoals.

**Diana Reef** (1°14'N., 104°27'E.), consisting of several ridges of sand, with depths of 4.9 to 5.5m, lies from 4 to 5.5 miles ENE of Lagoi Reef. Vessels should keep outside the 20m curve.

Between Lagoi Reef and Diana Shoal are several patches, on which lie depths of as little as 6.2m. More isolated rocks are found between Diana Shoal and the shore.

**Tanjong Sambang** (1°11'52"N., 104°22'48"E.), a prominent point on the N coast of Pulau Bintan having a hill, lies about 3 miles E of Tanjung Pergam.

Between Tanjung Sambang and **Tanjung Sading** (1°12'15"N., 104°23'37"E.), a bluff, is a bight about 1 mile in extent.

Small vessels can obtain temporary anchorage in 7.3m in the middle of a bight between Tanjung Said and Tanjung Sambang, about 1.6 miles E, being careful to avoid Lagoi Reef and Karang Manjang.

**Teluk Sumpat** (Sumpat Bay) (1°12'N., 104°29'E.) lies between Tanjung Sading and the W end of Tanjung Berakit, 9.5 miles distant. The head of the bay and its E shore are fronted by coral reefs to distances of from 0.5 to 1 mile offshore. Anchorage can be taken in the bay in depths of 12.8 to 18.3m.

**Pulau Sumpat** (1°11'45"N., 104°31'40"E.), a rocky wooded islet, 70m high and located on the E side of Teluk Sumpat, may be readily identified by its saddle shape. Sumpat Village is located on the coast S of the islet.

A rock of small extent, with a depth of 4.9m, lies near the center of the bay, about 2.7 miles NW of the summit of Pulau Sumpat; a wreck lies close SE of the rock.

**9.34 Tanjung Berakit** (1°14'N., 104°34'E.), the NE end of Pulau Bintan, is marked by a light. Some hills, with elevations of up to 39m, lie on the E side of the island about 2 miles S of the point. Some trees grow on the point. Reefs and foul ground extend up to 1.75 miles off the point. Dangerous wrecks may best be seen on the chart.

**Pulau Berakit** (1°14'N., 104°35'E.), about 12m high to the tops of the trees, small, and wooded stands on the shore reef, at about 0.5 mile N of Tanjung Berakit; the reef is covered with

large stones, several of which uncover at half tide. Black Rock lies about 0.33 mile W of the island above.

**Pulau Koko** (1°13'N., 104°35'E.), 12.2m high, is narrow and about 0.5 mile long; it lies close-to and appears to form the E side of Tanjong Berakit.

**Tanjong Lokan** (1°13'N., 104°35'E.), the E point of the peninsula, lies about 1 mile S of Pulau Koko and is fronted by a reef to a short distance.

**Karang Bebek** (1°15'N., 104°33'E.), with a least depth of 3.6m, lies near the W end of a bank, with depths of less than 11m, lying about 1.7 miles NNW of the N end of Tanjong Berakit.

**Karang Berakit** (1°16'N., 104°36'E.), with a least depth of 0.9m, lies about 3 miles NE of Tanjong Berakit. A coral patch, with a depth of 5.8m, lies about 0.2 mile NW of the reef; the depths in the vicinity are irregular. A dangerous wreck lies close SW.

**Directions.**—The E summit of Guning Bintanbesar in range with the NW extremity of Tanjong Berakit, bearing 211°, leads W of Karang Berakit.

The N end of Tanjong Berakit, bearing S°, leads N of Diana Reef.

A conspicuous double tree, on a hill 4 miles S of **Tanjong Lokan** (1°13'N., 104°35'E.), kept well open of Tanjong Lokan, bearing 192°, leads E, and **Horsburgh Lighthouse** (1°20'N., 104°24'E.), in range with the highest coast hill on **Tanjong Penyusok** (Datok) (1°22'N., 104°17'E.) bearing 285°, leads N.

The whole of the N coast of Pulau Bintan is fronted with dangers, and it is advisable that vessels should not attempt to come inside **Diana Reef** (1°14'N., 104°27'E.) and **Lagoi Reef** (1°12'N., 104°21'E.).

These will be guarded against by keeping **Pulau Sekerah** (1°07'27"N., 104°14'30"E.) well open of Tanjong Kalumpang, bearing 227°, until the N extremity of Tanjong Berakit bears 097°. Pulau Sumpat, bearing 165°, will lead W of the shoals in the vicinity of Tanjong Berakit.

**Caution.**—An ammunition dumping ground, about 5 miles square, is centered about 22 miles ENE of the Horseburgh Lighthouse.

## North Shore of Singapore Strait

**9.35** The N shore of the E part of Singapore Strait is formed by the SE part of **Singapore Island** (1°20'N., 103°55'E.), **Johor Shoal** (1°19'N., 104°03'E.), and **Tanjong Penyusop** (1°22'N., 104°17'E.), the SE part of the Malay Peninsula.

**Lima Islands** (1°22'N., 104°18'E.), with several rocks and dangers near them, together with **Ramunia Shoals** (1°27'N., 104°26'E.), **North Patch** (1°29'N., 104°27'E.) and **Eastern Bank** (1°31'N., 104°31'E.), extend E of Tanjong Penyusop nearly as far as the meridian of **Tanjong Berakit** (1°14'N., 103°34'E.) on the opposite shore.

From Tanjong Takong, the NE limit of Singapore Road, the coast trends NE about 5 miles to **Tanjong Bedok** (1°20'N., 103°58'E.); about midway between is the village of Siglap.

**Tanjong Changi** (1°23'N., 104°00'E.), the E end of Singapore Island, is low land with a white sandy beach and is the S point of the E entrance of Johore Strait.

The airport is situated at the NE end of Singapore Island. Its runway extends about 2 miles SSW from a position within 0.5 mile W of the reclamation of Tanjong Changi. The flight path of aircraft taking off and landing passes over Kuala Johor.

**Regulations.**—The Civil Aviation Authority of Singapore (CAAS) has requested that shipyard operations and masters, owners, or agents of vessels with heights exceeding 100m intending to conduct intra-port movements (within port limits) which require to transit, leave, or move between longitudes 103°54'E, and 104°05'E, S and E of Changi Airport, to notify CAAS at least 3 working days in advance of such movements.

This is to allow CAAS to issue a NOTAM (Notice to Airmen) in order to keep aircraft pilots informed of such tall ship movements.

Masters of vessels with heights exceeding 100m above the waterline intending to enter, transit, or leave the area described above are also required to report to Sembawang Control on VHF channel 21 when passing either longitudes, or if entering or leaving the Traffic Information Area of Serangoon Harbor.

An extensive sea area in the vicinity of the airport, best seen on the chart, is prohibited to vessels whose height measured from the waterline to the highest point of the ship's structure, including its cargo and equipment on board, exceeds 15m.

In addition to the above reporting procedures, shipyard operators, masters, owners, or agents are reminded that every vessel 2,000 grt or more or with a height of more than 30m above her waterline are to comply with the Traffic Information System for vessels navigating in Serangoon Harbor.

**Tanah Merah Ferry Terminal** (TMFT) (1°19'N., 103°59'E.) is located E of Singapore Changi Airport and S of Tanjong Changi. All vessels should obtain permission from the TMFT before entering, leaving, or maneuvering within the TMFT and its approaches. Vessels maneuvering within the TMFT and its approaches should maintain a continuous listening watch on VHF channel 5.

**Kuala Sungai Johor** (Kuala Johor) (1°20'N., 104°05'E.) lies between the dangers extending over 1 mile S of **Tanjong Pengelih** (1°22'N., 104°06'E.), a bluff promontory on the E, and Johor Shoal and Red Cliff Bank on the W. It is about 3 miles wide abreast Johor Shoal, with irregular depths of 10.1 to 23.8m in the fairway, decreasing toward Tanjong Pengelih.

Between Red Cliff Bank and the bank extending S from Pulau Tekong Besar the channel 12.8 to 23.8m in the fairway.

Farther in, between **Pulau Ubin Bank** (1°24'N., 104°00'E.), and Pulau Sajahat and Pulau Tekong Kechil to the E, the width is about 0.7 mile with depths of 12.8 to 21.9m.

**Red Cliff Shoal** (1°20'N., 104°00'E.) and Red Cliff Bank form an extensive flat of mud and sand, with patches of rock and coral, extending from the E part of Singapore Island, between **Tanjong Bedok** (1°20'N., 103°58'E.) and **Tanjong Changi** (1°23'N., 104°00'E.).

Its apex, with a depth of 5.5m is 3 miles E of Large Red Cliffs, with a detached shoal, known as **Angler Bank** (1°21'N., 104°03'E.) extending from 0.25 to 0.75 mile further E; there are depths of less than 1.8m on Red Cliff Bank.

**Caution.**—A dangerous wreck, with a depth of 9.9m, lies about 0.5 mile ESE of Angler Lighted Buoy.

**9.36 Johor Shoal** (1°19'N., 104°03'E.), fronting Kuala Sungai Johor, the E entrance of Johor Strait, is 3 miles long and

about 0.2 mile wide. It is composed of hard sand and has a least depth of 2.3m and depths of 3.7 to 5.5m elsewhere, which may best be seen on the chart. A light situated on the W end of the shoal.

**Sungai Johor** (1°28'N., 104°02'E.) entered between Pulau Tekong Kechil and **Tanjong Kopok** (1°26'N., 104°00'E.), about 2 miles NW, is navigable for vessels with local knowledge drawing up to 6.1m as far as **Pulau Layang** (1°36'N., 103°59'E.), about 10 miles above Tanjong Kopok.

**Pulau Tekong** (1°25'N., 104°04'E.) and **Pulau Tekong Kechil** (1°25'N., 104°01'E.) are two islands lying NW of Tanjong Pengelih, at the entrance of Sungai Johor and dividing it into two branches. Pulau Tekong, 53m high, is about 4 miles long, E and W and 2.33 miles wide, N and S.

Pulau Tekong Kechil, lying close to the W side of the larger island, is nearly round, its diameter being about 0.6 mile.

**Pulau Sajahat** (1°24'N., 104°01'E.), consisting of three conspicuous rocks covered with vegetation, lies about 0.7 mile S of Pulau Tekong Kechil. A drying rock lies 0.2 mile NW of Pulau Sajahat. A bank, steep-to in places, extends 1.5 miles S of Pulau Tekong and 2.5 miles N of Pulau Tekong Kechil.

A bank, with depths of less than 5.5m and on which there are many above and below-water rocks, extends about 2 miles SE of Pulau Sajahat.

**Malang Tiga** (1°23'N., 104°02'E.), three rocky heads, awash, lies 1.25 miles SSE of the S point of Pulau Tekong Kechil; a shoal, with depths of less than 5.5m, extends 0.6 mile further SE. A ruined masonry beacon stands on the E most rocky head.

A reef, on which there is a drying coral patch, lies close W of the N end of Pulau Tokong, a depth of 5.5m lies about 0.6 mile W of the same point.

**9.37 Tanjong Pengelih** (1°22'N., 104°06'E.), lying about 2 miles SE of the SE side of Pulau Tekong, is the end of the W slope of **Bukit Pengerang** (1°23'N., 104°06'E.).

This hill, which lies about 0.9 mile NE of the point and is 186m high, is of a regular oblong sloping form and has been planted with trees. It is one of the most conspicuous objects in Singapore Strait.

The tidal range at Tanjong Pengelih is 2.2m at springs and 1m at neaps.

**Calder Harbor** (1°23'N., 104°05'E.) is the space between Pulau Tekong and the coast extending N of Tanjong Pengelih. The harbor, which is about 0.7 mile wide, affords anchorage in depths of 9.1 to 14.6m. Sungai Santi, with a depth of 1.8m entrance is on the E side of the harbor.

**Merlin Rock** (1°23'N., 104°05'E.), with a least charted depth of 5m, lies about 0.75 mile N of Tanjong Pengelih.

**Malang Berdaun** (1°21'N., 104°06'E.), a rocky islet 3m high to the tops of the trees, lies about 0.7 mile SE of Tanjong Pengelih, within the edge of the drying bank which extends about 0.7 mile from the coast; shallow water extends further from the islet. A drying reef lies 0.6 mile S of Tanjong Pengelih.

**Anchorage.**—Four special purpose anchorages are designated between Tanjong Pengelih and Tanjong Stapa, about 3.3 miles ESE.

There are several villages between Tanjong Pengelih and Tanjong Bulat. The whole area between the shore and the 10m

curve is so crowded with fishing stakes and traps as to render navigation impossible.

**Tanjong Stapa** (Langkah Blak) (1°20'N., 104°08'E.), lying about 3 miles ESE of Tanjong Pengelih, is a somewhat prominent point. A light is shown from the point.

The coast between Tanjong Stapa and Tanjong Ayam should not be approached in a depth of less than 12.8m.

A wreck, with a depth of 26m, lies about 4 miles SSE of Tanjong Stapa.

**Tanjong Ayam** (1°20'N., 104°12'E.), the S point of this part of the Malay Peninsula, lies nearly 4 miles E of Tanjong Stapa, with **Tanjong Kapal** (1°20'N., 104°10'E.) between.

**Tanjong Bulat** (1°21'N., 104°14'E.) lies nearly 2 miles E of Tanjong Ayam. The 5.5m edge of the shore bank is rather more than 0.5 mile off Tanjong Bulat but from the head of the bight between it and Tanjong Penyusop, it extends 1.3 miles off Two rocks, with less than a 1.8m depth, lie 0.35 mile and 0.45 mile S of Tanjong Bulat.

**Pulau Che Kamat** (1°21'N., 104°14'E.), about 0.5 mile NE of Tanjong Bulat, is a round island, 31m high and about 0.25 mile in extent, with an islet 15.2m high off its SW part.

**Telok Ramunia** (1°22'N., 104°15'E.) is an open roadstead where there is anchorage about 2 miles offshore. Several facilities for loading bauxite into lighters are located along the bay's shoreline. The harbormaster of Johor is responsible for Telok Rumunia.

Vessels usually anchor between the 10 and 20m curves, smooth mud bottom with good holding ground.

There is no protection during the NE monsoon. Fishermen often completely enclose the anchorage with their nets.

**9.38 Tanjong Penyusop** (1°22'N., 104°17'E.), the SE extremity of the Malay Peninsula, and the N side of the E entrance to Singapore Strait, is level land covered with trees, with some small hills behind. Coral reefs extend 0.1 to 0.3 mile off the point, with Lima Islands in the offing.

**Bukit Pelali** (1°24'N., 104°12'E.), 191m high and located about 5 miles WNW of Tanjong Penyusop, is a regular pyramid rising from the low land and a useful object in making Singapore Strait from the N. It is completely wooded but is conspicuous by its height.

Another hill, 100m high, is located 1 mile W of Tanjong Penyusop.

**Bukit Iwato** (1°30'N., 104°15'E.), 139m high to the tops of the trees, is located near the coast about 6 miles NNE of Bukit Pelali. It has a group of trees on its summit and is a little more elevated than the coast, which is all rather low and wooded to the N of the hills over Tanjong Penyusop.

It is discernible during hazy weather much sooner than Bukit Pelali and is a useful mark when approaching Singapore Strait from the N.

**Tanjong Punggai** (1°26'N., 104°18'E.) lies about 4 miles N of Tanjong Penyusop; the summit of the point is conspicuous, wooded, and 61m high to the tops of the trees.

Pulau Punggai, 22m high to the tops of the trees, lies about 0.1 mile S of Tanjong Punggai.

**Tanjong Penawan** (1°30'N., 104°07'E.) lies about 5 miles N of Tanjong Punggai; foul ground extends about 0.7 mile off the

point. A wreck, with a mast showing, lies about 3 miles E of the point.

**9.39** The S and SE coasts of Singapore Island are level and wooded. The most conspicuous objects are the Small Red Cliffs or **Tanah Merah Kechil** (1°20'N., 103°57'E.), SW of Tanjong Bedok, and the Large Red Cliffs or **Tanah Merah Besar** (1°21'N., 103°59'E.), about 3 miles NE of them.

The Large Red Cliffs are visible from a considerable distance.

A conspicuous prison tower with a flagstaff stands about 0.7 mile WNW of Tanah Merah Besar.

**Directions.**—In approaching **Kuala Sungai Johor** (1°20'N., 104°05'E.) from E, Tanjong Changi should be steered for, bearing 302°, which leads E of Johor Shoal and Red Cliff Bank in not less than 12.8m.

When abeam of **Angler Bank Light Buoy** (1°21'N., 104°03'E.), distant about 0.2 mile, the light structure on **Tanjong Chek Jawa** (1°25'N., 104°00'E.), the SE end of Pulau Ubin, should be brought into range with the beacon standing about 183m SE.

When appropriate, alter course for Serangoon Harbor or Sungai Johor. At night, a vessel should keep in the white sector of Tanjong Chek Jawa light.

Reclamation in progress on the bank fringing the coast in the vicinity of **Tanjong Bedok** (1°20'N., 103°58'E.) and NE toward **Tanjong Changi** (1°23'N., 104°00'E.).

An area in which navigation is prohibited extends up to 3 miles SE from the coast of Singapore Island between these two points; its limits are indicated on the charts.

**Caution.**—Unmarked obstructions may be encountered inshore of the 20m curve between Singapore Approach Light Buoy and Johor Shoal Light Buoy.

A disused ammunition dumping ground lies about 8 miles ESE of the E extremity of Johor Shoal.

A disused dumping area lies about 4.5 miles SE of the same point.

Obstructions exist in **Kuala Sungai Johor** (1°20'N., 104°05'E.) in the passage between **Pulau Sajahat** (1°24'N., 104°01'E.) and Singapore Island.

Malang Tiga Lighted Buoy, about 1 mile WSW of **Tanjong Batu Koyok** (1°24'N., 104°02'E.) and marks the E side.

Paku Lighted Buoy, about 1 mile W of the same point, marks the W side of Johore Channel.

## Singapore Strait—East Entrance

**9.40** The E entrance to the strait lies between **Tanjong Penyusop** (1°22'N., 104°17'E.), off which are the Lima Islands, and Ramunia Shoals extending about 13 miles NE of the point on the N, and **Tanjong Berakit** (1°14'N., 104°34'E.), about 19 miles SE of Tanjong Penyusop on the S.

Near the fairway between these points is Pedra Branca, with a deep channel on either side.

**Lima Islands** (1°22'N., 104°18'E.), together with many dangers around and among them, front Tanjong Penyusop; they extend nearly 3 miles in a NNE to SSW direction.

**Pulau Lima** (1°22'00"N., 104°17'42"E.), 34m high, is the W most and largest of the group; it lies about 0.7 mile off Tanjong

Penyusop, is barely 183m in extent, and is conspicuously covered with trees.

Pulau Besar, NE of Pulau Lima, is wooded and 27m high, with the summit cleared, except for a single tree it is about 137m in extent and situated about 91m from Pulau Lima with which it is connected by a ridge of rocks, drying at LW.

**Pulau Mungging** (1°21'45"N., 104°18'00"E.) about 0.3 mile SE of Pulau Lima is 24m high, wooded, and being the S most of the group, is easily recognized. The island is marked by a light and a racon, although the light structure is difficult to see and is obscured by trees on N bearings.

Dangerous wrecks lie 3.5 miles SW and 2.25 miles E of the island. A stranded wreck lies 0.25 mile SE of the island.

**Pulau Geruda** (1°22'N., 104°18'E.), 32m high and covered with trees, lies about 0.5 mile NE of Pulau Besar.

**Lima Channel** (1°21'N., 104°17'E.), between Tanjong Penyusop and the Lima Islands is used by coastal vessels, but as it is narrow and encumbered by shoals, it should not be used without local knowledge.

**Tides—Currents.**—In making Singapore Strait from the N, vessels should always be prepared to meet with a current running to the S in the NE monsoon, and the N in the opposite season, the strength of which is governed by the strength of the monsoon. In fine weather its rate is usually from 1.5 to 2 knots, but the rapidity of the current is also accelerated or retarded by the tidal currents near the coast.

Between **Horsburgh Light** (1°20'N., 104°24'E.) and a position 40 miles to the E it has been known to set at the rate of from 3 to 4 knots.

In the neighborhood of Horsburgh Light the main directions of the current are NE and SW, the current being of similar type to that found in the W approaches to Singapore and running at about the same velocity; the NE current near Horsburgh Light corresponds to the E current in the W approaches, but commences about 30 minutes later.

No exact information regarding the duration of the NE current, or the commencement and duration of the SW current, can be given.

The direction of the current is, for some hours before and after slack water, considerably influenced by a cross current running in a NW or SE direction; this current is of similar type to the main current and commences to run to the NW about 5 hours 30 minutes before the commencement of the NE main current, but its velocity is only about 0.3 that of the main current. It will be seen that, as the currents are of diurnal type and as the times of commencement of the NE and NW currents differ by about 5 hours 30 minutes, the cross current will be running at its greatest velocity when the main current is slack, and vice versa.

The current near Horsburgh Light runs in the direction toward which the prevailing wind is blowing; the velocity may reach 2 knots during gales or strong and long-continued monsoon winds, but during calms there may be no current.

From the above remarks it will be seen that near the summer solstice, if strong SW winds occur at about the time when the new moon is in maximum declination, a set of as much as 4 knots to the NE may be found during the period of the NE current, with no corresponding SW set; whereas near the winter solstice, if strong NE winds occur at about the time when the full moon is in maximum declination, a set to the SW

of about 4 knots may be experienced during the period of the SW current, with no corresponding NE set.

It should be particularly remarked that, in Singapore Main Strait generally, as in all places where the currents are of diurnal type, the strongest currents in each month occur a day or two after the moon reaches maximum declination, not after new or full moon, and the strongest currents of the year occur near the solstices, when the moon is in maximum declination near new and full moon, and the sun is also in maximum declination, not near the equinoxes.

**9.41** A rock 3.7m high lies near the S end of **Pulau Mungging** (1°21'45"N., 104°18'00"E.), with a reef of straggling rocks extending to the E.

A rock 0.6m high lies about 0.2 mile SW of Pulau Mungging and a rock, with a least depth of 2.7m, lies about 0.5 mile ESE of the 0.6m rock. A rock, with a least depth of 2.7m, lies about 183m SW of the above 0.6m rock.

The S most danger of the Lima Islands is a rock with a depth of 3.7m lying about 2 miles SSW of the summit of Pulau Lima; a buoy lies close SW. A depth of 7.6m lies about 0.5 mile N of this rock.

**Peak Rock** (1°21'57"N., 104°18'24"E.), 11.3m high, a barren rock of reddish color, easily recognized, lies about 0.6 mile E of Pulau Lima.

**Stork Reef** (1°21'36"N., 104°18'56"E.) is about 0.3 mile in extent, dries 0.9m, and lies about 0.6 mile SE of Peak Rock.

**Faloden Hall Shoal** (1°21'04"N., 104°18'59"E.) is about 0.2 mile in extent, with a depth of 4.3m it lies about 0.5 mile S of Stork Reef and on the NW part of a bank about 2 miles in extent, on which there are depths of 12.8 to 16.5m.

The water over this bank becomes very disturbed and discolored when the tide is running, often giving the impression of less water than actually exists. A stranded wreck is located on the shoal.

**Congalton Skar** (1°21'56"N., 104°19'20"E.), a rocky patch with a depth of 1.2m, and steep-to, lies about 0.7 mile E of Peak Rock. A shoal area, with a least depth of 8.5m, lies about 1.2 miles ENE of Congalton Skar.

**Whale Rock** (1°22'24"N., 104°18'54"E.), which dries 2.1m, lies about 0.7 mile NE of Peak Rock; it is a small ledge on which the sea generally breaks, and which is steep-to; the depths around are irregular.

**Jones Reef** (1°22'30"N., 104°19'12"E.), with a least charted depth of 1.2m, lies about 0.2 mile ENE of Whale Rock and nearly 1 mile NE of Peak Rock.

**North Rock** (1°23'15"N., 104°18'21"E.), small, 10m high, with a few bushes on it, lies about 0.7 mile N of Pulau Geruda.

A small barren rock, 0.3m high, lies about 0.3 mile SSW of North Rock, with a patch of sunken rocks between them. A reef, about 0.5 mile in extent, and with rocks which dry, lies between Pulau Geruda and North Rock; there are several patches between it and Pulau Geruda.

Between Jones Reef and North Rock are two shoals of 5.9m and 6.9m; these are steep-to with depths of 12.8 to 16.5m of water.

**Caution.**—An aircraft bombing range lies within a 1 mile radius of North Rock.

**Rumania Shoal** (Ramunia Shoals) (1°27'N., 104°26'E.) are a number of detached patches of coarse sand and gravel, extending NE and then N from Lima Islands toward North Patch. They are steep-to on their E and S sides, there being depths of 21.9 to 36.6m nearby. Between the patches there are depths of over 11m.

The shallowest spot, over which there is a depth of 4.6m, lies about 5 miles NNW of **Horsburgh Light** (1°20'N., 104°24'E.). The N extremity of the shoal lies about 11 miles NNE of Horsburgh Light.

Rumania Shoal is connected with North Patch by a ridge on which the depths are 9.1 to 16.5m, with many isolated patches of 6.4 to 9.1m; between Rumania Shoal and the Lima Islands are similar patches. Large vessels therefore should pass E of this ridge and North Patch.

The S part of the shoal is ridged with sandwaves, over which the least depth may vary from time to time, and depths less than charted may be encountered. The water over the shoal becomes very disturbed and discolored when the tide is running, often giving the impression of less water than actually exists.

**North Patch** (1°29'N., 104°27'E.), lying between 6.5 and 7.5 miles NE of the shallowest part of Rumania Shoal, is a little more than 11 miles in length, in a N and S direction, with depths of 6.4 to 8.5m. Its N end lies almost 12 miles E of **Bukit Twatow** (1°30'N., 104°15'E.) and about 10.7 miles NNE of Horsburgh Light.

**Eastern Bank** (1°32'N., 104°31'E.), the outermost of the known banks off Tanjong Penyusop in the approach to Singapore Strait, is nearly 2 miles in extent, with depths of 18.3m at the extremities. Depths of 7.3 and 14.6m lie within the bank. The bank itself lies about 6 miles within the range of Horsburgh Light, which from its N edge bears SSW, distant 14 miles.

**Caution.**—It was reported, at least one oil company recommends that VLCC's insure that there be an under keel clearance of 4m in the area about 12 miles NE of Horsburgh Light due to the possibility of an E swell on Eastern Bank.

**9.42 Pedra Branca** (1°20'N., 104°24'E.), lying in the middle of the E entrance to Singapore Strait, 8 miles from either shore, is about 7m high.

It lies on the W edge of a bank with depths of 11 to 18.3m, which extends about 0.7 mile E.

Horsburgh Light, a 22m high white round tower with black bands, stands on the islet. A conspicuous lattice mast stands close N of the light. The light is equipped with a racon; a radiobeacon transmits from the light.

A drying rock lies 0.3 mile ENE of the light. A steep-to 8.2m patch lies about 0.4 mile N of the light.

A dangerous wreck is reported to lie about 1.7 mile NW of the light.

**Anchorage.**—During the SW monsoon, small vessels can anchor in a depth of 18.3m, hard bottom, good holding ground, about 0.2 mile NNE of Horsburgh Light.

At this anchorage, during the E current, slack water continues; during the W current overfalls are not experienced until the lighthouse bears about 192°.

**Middle Rocks** (1°19'N., 104°25'E.), S of Pedra Branca, are of a whitish color, from 0.5 to 1.2m high, and stand on the S

edge of the surrounding bank, about 0.6 mile from the lighthouse.

**9.43 South Ledge** (1°18'N., 104°24'E.) consists of three rocks, the N of which dries 1.8m, the others do not uncover.

They are steep-to, depths of 29 to 37m being contained within a short distance, and are almost always marked by heavy tide rips or the sea breaking over them.

The N rock lies a little over 2 miles SSW of Horsburgh Light. Rocky heads, having depths of 18.3m, lie between the lighthouse and South Ledge.

**Carter Shoal** (1°16'N., 104°22'E.) is a pinnacle rock with a depth of 3m; it is steep-to on its E side and has depths less than 18.3m extending from its W side for a distance of 91m. It is marked by heavy overfalls. This rock lies about 5 miles SSW of Horsburgh Light.

To the S of Carter Shoal, at a distance of nearly 1 mile, are several coral patches covering an area of over 0.5 mile; the least depth is 9.1m lying about 0.7 mile SSE of Carter Shoal.

A bank with depths of 16.5 to 18.3m, about 0.7 mile in extent, lies about 6 miles WSW of Horsburgh Light. It is marked by overfalls and eddies. There are overfalls and eddies between this bank and Carter Shoal.

An IMO-adopted Traffic Separation Scheme (TSS) is established in the vicinity of Horsburgh Light as part of the Routing System in the Straits of Malacca and Singapore.

**Depths—Limitations.**—The significant depth in the W going lane of the TSS at Horsburgh Light is 21m.

**Directions.**—**Tanjong Stapa** (1°20'N., 104°08'E.), in range with **Tanjong Ayam** (1°20'N., 104°12'E.) bearing 274°, leads S of all the dangers S of the Lima Islands.

The S extremity of Pulau Mungging, bearing 256° leads S of **Rumania Shoal** (1°27'N., 104°26'E.) and Horsburgh Light, in range with the center of the W slope of **Gunung Bintan-besar** (1°04'18"N., 104°27'27"E.), bearing 169° leads E of them in a depth of about 11m, but a patch of 9.1m lies about 183m on each side of this range line.

Eddies bringing up sand and mud from the bottom make the whole shoal quite visible and is disconcerting for a mariner using this range line, or the one for **North Channel** (1°30'N., 104°23'E.) giving the impression that there is less water than there really is. It is recommended only for light draft vessels.

On Pulau Bintan, the W summit of **Gunung Bintan-besar** (1°04'18"N., 104°27'27"E.), in range with the foot of the E slope of Gunung Bintanketjil bearing 182°, leads E of **North Patch** (1°29'N., 104°27'E.) and the shoals to the S, and between **Eastern Bank** (1°31'N., 104°31'E.) and North Patch.

In thick weather the land is seldom obscured for any length of time, so that a vessel is generally able to fix its position; but if not able to do so the soundings will show whether the vessel is within the 40m curve, which should be avoided, and course altered as necessary to keep in the deep channel, passing in preference over the 16.5m bank W of Horsburgh Light, and avoiding the area within the 40m curve off Lima Islands.

If in any doubt, the vessel should haul toward the N shore, by sounding, and anchor. This shore may be approached to depths from 20.1 to 21.9m.

**9.44 Middle Channel** (1°21'N., 104°23'E.), the passage generally used by vessels passing through the straits, has an

average width of 4 miles between Horsburgh Light and the 20m curve off Rumania Shoal. There are no dangers within this area, but a vessel should, when approaching from the E, steer so as to comply with the Traffic Separation Scheme. A submarine cable lies in Middle Channel.

The entrance may be easily recognized, if the weather is clear, by Gunung Bintan-Besar, a remarkable saddle-shaped hill on Pulau Bintan and **Bukit Pelali** (1°24'N., 104°12'E.), the sharp peaked hill on the opposite side of the strait. Bearings of these objects will serve to determine the vessel's position when shaping a course to sight Horsburgh Light.

Departing from **Pulau Aur** (2°26'N., 104°32'E.), steer to bring it to bear 000° when disappearing; if the weather is clear, Gunung Bintan-Besar and Pulau Aur may be seen together, but this seldom happens. The W summit of Gunung Bintan-Besar in range with the foot of the E slope of Gunung Bintan-Ketjil, bearing 182°, leads nearly 1 mile E of the 6.4m depth of North Patch.

In slightly hazy weather, having Pulau Aur disappearing bearing about 000°, a course between 192° and 203° may be required if the NE current is running out of the strait.

The depths will decrease regularly in steering S, and the low land will probably be seen to the W when in depths of 32.9 to 36.6m; if so, steer along the coast at a distance of about 13 miles, until **Bukit Twatow** (1°30'N., 104°15'E.), a low sloping hill, is discerned, appearing like a clump of trees more elevated than the others.

When this hill bears 248°, a depth of 27.4m is the best track; with it bearing 265°, overfalls in 29.3 to 23.8m of water may be experienced, or probably less water, the vessel being then on about the parallel of the North Patch and Eastern Bank.

If there is any doubt about the position, the vessel should either haul off into deep water or anchor.

**Directions.**—With Bukit Twatow bearing 265°, if depths of 14.6 to 18.3m are obtained, and being uncertain whether these soundings are near the North Patch, or on the shallow part of Eastern Bank, haul to the SE until in 25.6 to 18.3m.

Then steer 180° until the hill bears 270°, when the vessel will be to the S of Eastern Bank, and may haul in 248°, when depths of 18.3 to 20.1m will show that these soundings are on the outer edge of Rumania Shoal.

If less than 18.3m is obtained, haul out directly E into depths of 27.4 to 29.3m, and then steer along the SE edge of the shoals in depths of 29.3 to 31.1m.

A course should be steered to make Horsburgh Light, bearing about 205°, distant about 6 miles. This is the start of the Traffic Separation Scheme.

At night it is necessary to keep a good outlook for **Horsburgh Light** (1°20'N., 104°24'E.), which should be in sight before a vessel can get near the dangers at the entrance of the strait. It is a sufficient guide for navigating Middle Channel.

The light bearing about 215° will lead well E of the ridge between Rumania Shoal and North Patch.

In the event of the lights in and around the Inner Harbor not being distinctly made out by the time **Bukit Pengerang** (1°23'N., 104°06'E.) bears 012°, care is necessary not to sail in depths of less than 29m toward Johor Shoal; if a depth of 18.3m is obtained the course should be altered quickly to the S,

for this shoal is steep-to and cannot be approached with safety under that depth.

**9.45 South Channel** (1°16'N., 104°25'E.) is not recommended for deep draft vessels, and there is no advantage gained by using it. Generally, South Channel is cluttered with several dangerous shoals, the bottom generally rocky and uneven. The principal dangers are **South Ledge** (1°18'N., 104°24'E.) and **Carter Shoal** (1°16'N., 104°22'E.), previously described in paragraph 9.43.

If a vessel find itself in the South Channel, the vessel should steer to the NW along the line of **Bukit Pelali** (1°24'N., 104°12'E.) open W of the highest coast hill, bearing 303°, which leads between Carter Shoal and South Ledge in not less than 18.3m; when Horsburgh Light bears between 076° and 084° a vessel may shape course within the Traffic Separation Scheme for Singapore Road.

At LW, when both South Ledge and **Middle Rocks** (1°19'N., 104°25'E.) are plainly visible, it is often preferable to pass between them instead of getting on to the range line just mentioned, especially when, as frequently happens, rain clouds obscure Bukit Pelali. Submarine cables lie in South Channel.

**9.46 North Channel** (1°30'N., 104°23'E.), lying between Rumania Shoal and the dangers outlying the Lima Islands, has a fairway with more than 11m. The channel is encumbered at its S end with shoals, with depths from 5.2 to 10m. The lack of good aids to navigation requires great care in maintaining a position in the fairway. Vessels without local knowledge should use this passage during daylight only, and with caution.

**Caution.**—Mariners are warned that North Channel should not be used for navigation, as no advantage is gained by passing through it, and it is possible that more dangers exist there than are shown on the chart.

Mariners are warned that firing and bombing practices take place in the following areas:

1. Singapore (China Sea) North Range comprises all that area of the high seas within 5 miles of positions 1°35'N, 104°25'E, and 1°50'N, 104°25'E, and within 5 miles of a line joining these positions.
2. Singapore (China Sea) South Range comprises all that area within 4 miles of **Tanjong Punggai** (1°26'N., 104°18'E.).

## Johor Strait

**9.47 Johor Strait** (1°28'N., 103°50'E.), the channel between Singapore Island and the Malay Peninsula, was formerly the passage by which all vessels proceeded between India and China when the Main Strait presently in use was not known to be navigable. There is no passage through except for small craft on account of the railway causeway E of **Johor Baharu** (1°28'N., 103°46'E.).

Numerous uncharted stilt houses and boat houses protrude into Johor Strait, especially in the vicinity of Serangoon Harbor (1° 24'N., 103° 57'E.).

Considerable reclamation has been carried out off Tanjong Gul and along the coast for about 4 miles NW to **Tanjong Karang** (1°20'42"N., 103°38'18"E.).

The **Tuas Shipyard** (1°18'N., 103°39'E.) has two drydocks, the largest of which can accommodate a vessel of up to 330,300 dwt; this drydock is 355m long, 60m wide, and has a sill depth of 9.4m. The shipyard has six repair berths, with a total length of 1,690m and alongside depths of 6 to 7.4m. The shipyard is approached from the SE via Tuas Channel, which has a least depth of 5.5m.

## West Entrance to Johor Strait

**9.48** The W approach is barred by a sandbank which stretches across from **Tanjong Piai** (1°16'N., 103°31'E.) to **Tanjong Gul** (1°18'N., 103°40'E.), with depths under 5m. A narrow channel, with a least depth of about 6.1m, is shown on the chart S and E of **Pulau Merambong** (1°19'N., 103°37'E.).

Vessels drawing more than 5.5m or exceeding 106m in length should not use the W entrance. From Tanjong Piai to Tanjong Kupang, about 7 miles NE, the coast on the W side of the entrance is low with no conspicuous features.

**Sungai Pulai** (1°20'N., 103°33'E.) flows out between Tanjong Bin, about 4.75 miles NNE of Tanjong Piai, and Tanjong Kupang.

The N shore of the entrance to the river W of Tanjong Kupang is reported composed of mud and sand backed by mangroves.

There is a depth of 16.5m in the narrows at the entrance to the river, but there is a bar across it to the S and entrance should not be attempted without local knowledge.

**Tanjong Kupang** (1°21'N., 103°36'E.) can be identified by a red-roof building standing about 46m W of the point.

**Tanjong Pelepas** (1°22'N., 103°33'E.) a new port in the SW part of Malaysia, lies about 8 miles W of Singapore, on the W side of Johor Strait at the mouth of Sungai Pilai.

**Depths—Limitations.**—The port is approached from a position in the Cross Traffic area on the Traffic Separation Scheme S of **Tanjong Piai** (1°15.9'N., 106°30.6'E.) and entered through a channel dredged to a depth of 14m. The channel is marked by light-buoys, the center line of which is marked by leading lights.

There is a total of 2,160m of berthing space available with a depth of 15m alongside.

**Pilotage.**—Pilotage is compulsory within port limits, and is available 24 hours. Pilot boards about 2 miles SE of Tanjong Piai.

**Anchorage.**—There are two designated anchorage areas as shown on the chart. A prohibited anchorage has been designated within the port limit.

North of Tanjong Kupang is a range of hills, the highest of., which is Woody Hill; it is conspicuous and is 119m high to the tops of the trees on its summit. Bukit Kupang, 84m high, stands about 0.4 mile NNW of Woody Hill. Sentinel Hill, 58m high, well-wooded and conspicuous, rises about 0.75 mile SW of Woody Hill. On the E side of the entrance to the strait are similar but lower hills; many of these hills are cleared, but those near the coast are densely wooded.

From close E of Pulau Merambong, the most conspicuous landmarks are Woody Hill and a conspicuous 29m high hill on the N side of the entrance to **Sungai Pendas** (1°23'N., 103°38'E.).

**Tanjong Teritip** (1°18'N., 103°40'E.), a low point with coconut palms, lies about 0.6 mile NW of Tanjong Gul.

**Tanjong Iluas** (1°19'N., 103°39'E.) lies about 1 mile NW of Tanjong Teritip.

**Alert Shoal** (1°17'N., 103°37'E.), with a depth of 4.9m, lies close SW of the reclaimed land in the vicinity of Tanjong Gul and is marked by a light on its W edge.

**Pulau Merambong** (1°19'N., 103°37'E.), marked by a light, is an islet 23m high to the tops of the trees. A ridge, which dries in place, extends about 2 miles NNE of the islet. Kolek Rocks, a group of drying boulders, lie about 0.2 mile NE of the islet.

**9.49 West Reach** (1°20'N., 103°37'E.) extends from Pulau Merambong to the entrance of **Sungai Perfat** (1°26'N., 103°41'E.), on the W side of the strait, about 9 miles NNE.

In places the channel is narrow and intricate, and great care is necessary, since the current is strong and the shoals numerous, the least depth in the reach is 5.5m about 0.5 mile above Kolek Rocks.

The W shore of the strait between Tanjong Kutang and the entrance to **Sungai Pendas** (1°23'N., 103°38'E.), 2.75 miles NE, is composed of mud and sand, backed by mangroves.

**Tanjong Karang** (1°20'42"N., 103°38'18"E.), the N entrance point of Sungai Blukang, is a narrow promontory, with a red cliff, 7.6m high on its W face. A drying rocky patch lies 0.25 mile N of the point. A buoy is situated about 0.3 mile NW of the point.

**Tanjong Pasir Laba** (1°21'24"N., 103°38'36"E.) lies about 0.7 mile NNE of Tanjong Karang; the headland is bare and rises on its N face to a white cliff with an elevation of 17m.

Densely wooded trees stand on the hills E of the point. The entrance to Sungai Tengeh lies between the two points.

Foul ground, with depths of less than 5.5m, extends about 0.2 mile from the shore at a point about 0.3 mile NE of Tanjong Pasir Laba.

The hills in the SW part of Singapore Island are conspicuous. Bukit Chao Kang, a cleared hill 87m high, rises about 3 miles E of Tanjong Pasir Laba.

**Tanjong Chenting** (Tanjong Bajau) (1°22'N., 103°39'E.) lies about 1 mile NE of Tanjong Pasir Laba. It is a red cliff 7m high, with the entrance to Sungai Bajau lying between the two points; the shore of the bay has some low, red cliffs.

A 3.5m patch lies about 0.3 mile N of Tanjong Chenting; this patch nearly joins a long sand spit which fronts the shore between Sungai Berih and Pulau Pergam.

**Tanjong Berih** (Tanjong Skopek) (1°23'N., 103°40'E.) lies about 0.7 mile NE of Tanjong Chenting, with the entrance to Sungai Berih lying between the two points.

**Tanjong Murai** (1°24'33"N., 103°40'01"E.) lies about 2 miles NNE of Tanjong Berih. Bukit Pergam, 85m high, is a fairly conspicuous bare hill located about 0.6 mile E of Tanjong Murai.

**9.50 Pulau Pergam** (1°24'N., 103°40'E.), about 21m high, lies on a mud bank on the E side of the strait about 1.7 miles N of Tanjong Berih. **Lucy Rock** (1°24'N., 103°39'E.), with a depth of 5m, lies in the center of the fairway about 0.3 mile WSW of Pulau Pergam, a buoy lies close SW of the rock.

**Tanjong Gedong** (1°25'32"N., 103°40'34"E.) lies about 1.2 miles NNE of Tanjong Murai; the coast between the two points is steep-to.

In **Putri Narrows** (1°26'N., 103°41'E.), from **Tanah Runtuh** (Tanjong Tebing Runtuh) (1°25'22"N., 103°40'12"E.) for a distance of about 1.7 miles NE to a point about 0.3 mile beyond **Tanjong Setajam** (Tanjong Tajam) (1°26'36"N., 103°41'28"E.), on the N side of the strait, the bottom is very foul and great caution is necessary.

Three channels are reported to lead through the Putri Narrows.

North Channel is considered the most direct and the easiest but should not be used by vessels with a draft of greater than 4.3m. Directions are given in paragraph 9.51.

Middle Channel is considered the principal channel. It is narrow and tortuous, but has the greatest depth in it. Directions are given in paragraph 9.51.

South Channel is a channel that is not recommended; no directions are given.

On the W side of the strait at Tanah Runtuh and 61m high cliffs. There is a jetty close S of the point, with a village 0.4 mile N of the point.

A white bungalow with a red roof, and with a jetty near it, is situated about 0.5 mile NNE of the point.

Bukit Tajam (Bukit Setajam), 44m high and cultivated, rises about 0.6 mile ENE of Tanjong **Anak Datok** (1°26'N., 103°41'E.), the E entrance point of Sungai Perfat, and is a prominent landmark.

**Caution.**—Between Tanjong Setajam and Pulau Sarimbun, about 0.5 mile SSW, confused eddies exist. Currents up to 3.5 knots can be expected.

An ammunition dumping ground is located about 0.2 mile SE of Tanjong Setajam.

The entrance area going into **Sungai Karang** (1°25'26"N., 103°40'40"E.), on the E shore lies close N of Tanjong Gedong, and about 0.5 mile farther NE is the entrance to **Sungai Sarimbun** (1°25'54"N., 103°41'12"E.).

**Pulau Sarimbun** (1°26'04"N., 103°41'12"E.), 39m high to the tops of the trees and densely wooded, lies on the S side of the strait, close off the mouth of Sungai Sarimbun.

Foul ground extends 91m SE and 137m E, respectively, from the island.

Batu Addis, with a depth of 1.2m, lies close to the end of the latter foul ground, but elsewhere the island is steep-to.

**May Rock** (1°26'N., 103°41'E.), with a depth of 5.5m, lies about 0.3 mile W of Pulau Sarimbun.

Sarimbun Rocks, two drying patches, lie on an extensive area of foul ground NE of Pulau Sarimbun. The W rock is marked by a beacon while the E patch is marked S by a buoy.

An isolated rocky patch, with a depth of 3.2m, lies about 0.1 mile NE of the beacon.

An ammunition dumping ground, 179 with a radius of 114m, lies with its center about 0.3 mile ENE of the beacon.

Herald Rock, with 5m, lies 0.3 mile E of Pulau Sarimbun and 160m from the S shore of Johore Strait.

Horseshoe Reef, over which there are depths of 3.2 to 5m; is a narrow ridge of rocks extending across the middle of Johor Strait near the NE end of Sarimbun Rocks.

Between the N end of this reef and the N end of the strait are several patches with depths of 3.8 to 5m.

**Sungai Melaya** (1°27'N., 103°42'E.) flows into the NW side of the strait.

On **Tanjong Melaya** (1°27'N., 103°42'E.), the SW entrance point of the river, there is a cliff 6m high, and a village.

**Pulau Buloh** (1°27'N., 103°44'E.) lies at the mouth of Sungai Buloh, on the SE side of the strait about 2 miles E of Tanjong Melaya.

**9.51 Town Reach** (1°26'N., 103°44'E.) extends from Putri Narrows E to the causeway. About 1.2 miles ENE of Sungai Melaya is **Tanjong Danga** (1°28'N., 103°43'E.), on which there is a bungalow and a pier that dries. Tanjong Danga is the S and W entrance points, respectively of Sungai Danga and Sungai Sekudai.

An extensive bank, with depths of less than 5.5m and on which there is a drying patch, extends across the mouth of Sungai Danga; the channel into Sungai Sekudai is well over on the E shore.

The land on the N side of Town Reach, E of Sungai Sekudai, is from 37 to 61m high, and consists of two ranges of hills, on which are the houses and bungalows of the residents of Johor Bahru.

The most conspicuous object in Johor Strait is the tower of the government offices, 88m high, standing about 0.45 mile WNW of the N end of The Causeway; this tower can be seen from a great distance.

Other conspicuous objects on the N shore are the two white water towers; the Mosque with four domes about 0.5 mile W of the government office tower; and the tower of the Sultan's Palace. A hotel lies about 0.8 mile WNW of the Mosque; close W of the hotel is the wharf of the Marine Department depot.

On the S side of the strait, between **Tanjong Buloh** (1°27'N., 103°44'E.) and the mouth of **Sungai Kranji** (Kranji Reservoir) (1°26'21"N., 103°44'33"E.), about 0.7 mile SE, the shore is bordered by dense mangroves and swamps.

The mouth of the Sungai Kranji is closed by a dam, within which is a reservoir.

**Kampong Kranji** (1°26'09"N., 103°45'30"E.) stands about 1 mile ESE of the mouth of Sungai Kranji.

**Woodlands** (1°27'N., 103°46'E.), about 1.2 miles NE of Kampong Kranji, is situated at the S end of the causeway. The land in the vicinity has been partly cleared.

The railway station is situated very close to The Causeway area. There is a village close SW of the railway station.

The Causeway, which extends across the strait close E of Johor Bahru, carries the railroad and highway. A lock at the N end of the causeway is closed to navigation.

Shoals, with depths of 10.7 and 11m, lie about 0.6 mile and 0.5 mile WSW, respectively, of the Marine Department depot.

**Causeway Shoal** (1°27'N., 103°45'E.), with a least depth of 4.3m, lies in mid-channel S of Istana Garden.

The E end of the shoal is connected to the N shore of Johor Strait by a spit, which has depths of 4 to 7m. A 4.9m patch lies about 0.2 mile W of the N end of The Causeway; a 6.4m rocky patch lies about 183m W of the S part of The Causeway.

**Tides—Currents.**—In Johor Strait, before the construction of the causeway, the tidal currents were mainly diurnal, as in the approach to Singapore, but they are now mainly semi-diurnal.

Slack water generally occurs four times in each lunar day and the greatest variations in rate follow the moon's phases.

Owing to the number of sizable rivers flowing into the strait, the rate of the ebb current is increased, and the flood current decreased, during and after heavy rains.

The ebb current runs from about 1 hour after HW at Singapore until about 5 hours before the following HW at an average maximum rate of 1.6 knots at springs and 0.8 at neaps.

The flood current runs from about 5 hours before HW at Singapore until about 1 hour after HW at an average maximum rate of 1.4 at springs and 0.7 knots at neaps.

No appreciable differences were found in the rates of the current at the two positions where observations were obtained.

In Town Reach the rate of the current, especially if the flood, decreases as the causeway is approached.

**Directions.—Middle Channel.**—After passing Tanah Runtoh, keep slightly over to the NW side of the strait and bring **Sarimbun Rocks Beacon** (about 1°26'18"N., 103°41'24"E.) in line with Johor water tower bearing 058°.

Steer on this line until abreast Pulau Sarimbun, then alter course to 093°, to pass S of Sarimbun buoy, allowing for the tidal current.

When the S point of Pulau Sarimbun bears 239° and is just open of the land on the Singapore Island side SW of it, alter course to 060° to clear Horseshoe Reef.

After passing Horseshoe Reef, alter course to the N and steer for the water tower, bearing 060°, until the Sultan's bungalow on **Tanjong Danga** (1°28'N., 103°43'E.) bears 348°, then haul gradually to the E and steer 103° for the S part of the causeway, anchoring off the Istana.

**North Channel.**—Follow directions for Middle Channel until clear of **May Rock** (1°26'06"N., 103°40'52"E.), then haul to the N, and pass midway between Sarimbun Rocks Beacon and **Tanjong Setajam** (Tajam) (1°26'36"N., 103°41'28"E.), with the water tower bearing 059°. Caution is necessary to guard against a set toward the foul ground to the S.

**Pilotage.**—Pilots can be obtained at Singapore, but their knowledge of the W portion of Johor Strait is limited.

**Anchorage.**—Anchorage may be obtained anywhere in Johor Strait S of Tanah Runtoh, except that near Pulau Merambong there is at times a heavy sea.

The holding ground is generally good, consisting of stiff mud and sand.

Anchorage between **Tanah Runtoh** (1°25'22"N., 103°40'12"E.) and **Horseshoe Reef** (1°26'N., 103°41'E.) is not recommended, but farther E it can be obtained anywhere in stiff mud.

A convenient anchorage to Johor Bahru is in 13.7m, about 0.1 mile S of the Istana. Anchorage should not be made E of this point, because of eddies and tide rips made by the causeway.

**Caution.**—The directions for the W portion of Johor Strait, described above, should be used with caution. It was reported that the range marks are no longer visible.

## East Entrance to Johor Strait

**9.52** This entrance between **Tanjong Changi** (1°23'N., 104°00'E.) and Tanjong Kopok, about 3 miles N, is divided into two channels by Pulau Ubin. Serangoon Harbor, the S channel, is deeper and better. Nenas Channel is the N channel.

That part of Johor Strait between Tanjung Punggol and the mouth of Sungai Tebrau is known as Tebrau Reach. From there to The Causeway, it is known as Ordnance Reach.

The general harbor area between the E entrance point of Johor Strait N and W to The Causeway, which includes Naval Dockyard, Nenas Channel, Serangoon Harbor, Tebrau Reach, and Ordnance Reach, is known as Port of Singapore North.

**Pulau Ubin** (1°25'N., 103°58'E.), the island that divides the E entrance to Johor Strait into two channels, has a length of 4 miles in an E and W direction and a maximum width of 1 mile. The island consists of hills, most of which are thickly wooded, fronted and intersected by extensive mangrove swamps. The soil on the high parts of the island has a red color.

**Nenas Channel** (1°25'N., 103°58'E.), located on the N side of Pulau Ubin, is entered from the E between Tanjung Balai, the NE extremity of Pulau Ubin, and Tanjung Kopok, about 1.2 miles NE. Foul ground, with depths of as little as 3.9m, extends up to about 0.3 mile NNE of Tanjung Balai.

**Henderson Shoal** (1°25'N., 103°59'E.), with a least depth of 6.7m, lies NW of Tanjung Balai.

**Pulau Nenas** (1°25.6'N., 103°58.7'E.), on the N side of the channel, 1.25 miles W of Tanjung Kopok, is intersected with granite quarries and becomes conspicuous from the SE when it opens clear of the NE point of Pulau Ubin, because of the red soil covering the quarry.

A drying bank extends about 0.2 mile E of Pulau Nenas; at its outer end is a rock 0.9m high. Drying rocks also lie close off the SW side of the island.

Dawes Rock, which dries, is located on a sunken coral reef about 2 miles W of Pulau Nenas and about 0.1 mile off the N shore. The rock is marked by a light.

**Tanjung Gemok** (1°26'N., 103°56'E.), the N point of The Narrows, is located about 2.2 miles W of Pulau Nenas. The point, with a conspicuous red cliff on its W side, rises steeply to a round hill 18m high to the tops of the trees.

An obstruction, with 9.1m, lies about 0.5 mile SE of Tanjung Gemok.

**Tanjung Tajam** (1°25'N., 103°56'E.), the W extremity of Pulau Ubin, is marked by a lighted beacon.

**Fan Shoal** (1°26'N., 103°56'E.) extends from the NW side of Pulau Ubin across the W end of Nenas Channel. Depths of less than 5.5m, with a small drying patch, extend up to 0.25 mile NW of Tanjung Tajam. There are general depths of 7.3 to 9.1m on the shoal, except for a 5.5m patch lying in mid-channel on the E end of the shoal.

**Directions.**—If entering Johor Strait through Nenas Channel, steer 340° for Tanjung Kopok, which leads to the entrance of Nemas Channel. Pass N of Henderson Shoal and then keep in mid-channel, passing S of Dawes Rock and Tanjung Gemok. The N side of Pulau Ubin is marked by four beacons, the positions of which may best be seen on the chart.

**Caution.**—Fishing stakes are reported in both entrances to Nemas Channel. Shoaling has also been reported in both entrances.

**9.53 Serangoon Harbor—North shore.—Tanjung Chek Jawa** (1°25'N., 104°00'E.), the SE extremity of Pulau Ubin, is the N entrance point of Serangoon Harbor. The point is marked by a light; a beacon stands 183m SE of the light.

Pulau Sekudu, a 5.5m high rocky islet with some bushes on it, lies on a drying reef about 0.2 mile SW of Tanjung Chek Jawa. Malang Papan, a drying rock marked close SW by a light, lies about 0.1 mile S of Pulau Sekudu.

**Tanjung Jelutong** (1°24'N., 103°57'E.), the E point of the S entrance to Ketam Channel, lies about 2 miles ESE of Tanjung Chek Jawa.

**Squance Bank** (1°24'N., 103°58'E.), on which there is a least depth of 1.4m and which is marked close S by a lighted buoy, extends S and then E of Tanjung Jelutong.

**Pulau Ketam** (1°24'N., 103°51'E.), a mangrove island about 18m high to the tops of the trees, is separated from the SW side of Pulau Ubin by Ketam Channel. Both entrances to Ketam Channel are obstructed by bars with depths of 3 to 4m.

Off the NW side of Pulau Ketam, drying rocks form the SE edge of the N entrance to Ketam Channel; drying rocks extend 0.2 mile offshore from the NW edge of the channel.

The N shore of Serangoon Harbor continues 1.5 miles NW from the NW end of Pulau Ketam to Tanjung Tajam. The drying mud flats and reefs along this stretch of shoreline may best be seen on the chart.

**Caution.**—There is considerable shoal water on the N side of the E entrance of Serangoon Harbor, formed by a bank extending E from the E end of Pulau Ubin. Depths of 1.8m and less extend 0.5 mile E of Tanjung Chak Jawa.

**9.54 Serangoon Harbor—South shore.—Tanjung Changi** (1°23'N., 104°00'E.) is the S point of the E entrance to Serangoon Harbor.

**Fairy Point** (1°23'N., 103°58'E.) is located about 2 miles W of Tanjung Changi. A conspicuous water tower, 38m high, and from which four red lights are shown, stands about 0.7 mile SSW of Fairy Point.

A conspicuous radio tower stands on a hilltop about 0.4 mile E of Fairy Point; a radar scanner stands on another hilltop about 0.2 mile further E.

Batu Puteh, marked by a light, is a group of gray granite rocks, about 2.4m high, lying about 0.1 mile NNW of Fairy Point. The rocks have deep water around and between them.

Two drying rocks, about 46m apart, are located about 0.1 mile SSE of Batu Puteh.

Tidal currents, especially E, are strong in the vicinity of Batu Puteh.

In **Serangoon Harbor** (1°24'N., 103°57'E.) (World Port Index No. 49995) there are depths of at least 12.8m. The fairway has a least width of 0.2 mile and as much as about 0.4 mile between the 10m curves.

Loyang Jetty extends about 0.2 mile NNW from a position on shore about 0.5 mile SW of Fairy Point. There are depths of 7.2 to 8.1m at its head. There are depths of 6.6 and 5.7m on the N and S sides of the inner arm, respectively. Numerous small craft moorings lie in the vicinity of the jetty.

From Loyang Jetty, an extensive bank, which contains many obstructions, foul areas, marine farms, and other hazards to navigation which are best seen on the chart, extends W and

then NW to Tanjung Punggol. On this bank, extending 1.5 miles SE from Tanjung Punggol, is a strip of reclaimed land.

Serangoon Harbor affords excellent anchorage in any convenient depth. The holding ground is stiff mud.

**9.55 Tebrau Reach** (1°28'N., 103°51'E.) is E of a line joining Tanjung Punggol to Pulau Tukang, about 0.7 mile NNE. A least depth of 11.3m can be carried from abreast Tanjung Punggol to The Causeway.

The W part of this reach, W of the entrance to **Sungai Tebrau** (1°29'N., 103°48'E.), is known as Ordnance Reach.

**Pasir Gudang Port** (Johor Port) (1°26'N., 103°54'E.) is located on the N side of Tebrau Reach.

The depth in the main channel E of Johor Straits permits a maximum draft of 11.6m.

**Depths—Limitations.**—The port covers over an area of more than 500 acres and is surrounded by a vast industrial complex.

The two coastal berths have a total length of 220m, with an alongside depths of 5.5m, and can accommodate vessels up to 20,000 dwt.

The two general cargo berths have a total length of 732m, with an alongside depth of 11m, and can accommodate vessels up to 30,000 dwt.

The dry bulk berth is 410m long, with an alongside depth of 12.8m, and can accommodate vessels up to 60,000 dwt.

The container berth is 710m long, with an alongside depth of 15m, and can accommodate vessels up to 80,000 dwt.

The oil berth has an outer face, 179m long with 9m alongside, and an inner face, 179m long with about 11m alongside. Tankers up to 30,000 dwt can be accommodated.

The dangerous cargo jetty is 216m long, with 11m alongside, and can accommodate vessels up to 35,000 dwt.

The Setia Jaya Woodchip Jetty is 200m long, with a depth of 10.8m alongside.

The Sultan Iskander Power Station Jetty is 250m long, with a depth of 11.3m alongside.

The Malaysia Shipbuilding drydock, close NW of the power plant jetty, can accommodate a vessel of up to 400,000 grt.

**Pilotage.**—Pilotage is compulsory for vessels over 45m in length. All vessels are required to notify the port authority 24 hours before arrival at the pilot station. Pilot boards within the vicinity of **Johor Shoal Buoy** in position (1°18'51"N., 104°06'30"E.).

**Tanjung Punggol** (1°25'N., 103°55'E.) is marked close N by a light. The remains of a conspicuous building stand about 0.7 mile W of the point.

The tidal range of Tanjung Punggol is 2.5m at springs and 0.9m at neaps.

A bay is formed on the S shore of Tebrau Reach from Tanjung Punggol to a point about 4 miles NW.

**Pulau Seletar** (1°26'N., 103°52'E.), a mangrove island about 24m high to the tops of the trees, lies at the NW end of the bay. From the NE side of the island, Alang Perimbi, a narrow shoal of sand and mud, which dries in places, extends SE to within 1 mile of Tanjung Punggol and fronts the bay.

**Tides—Currents.**—In Johor Strait before the construction of the causeway, the tidal currents were mainly diurnal, as in the approach to Singapore, but they are now mainly semi-diurnal. Slack water occurs about four times in each lunar day and the greatest variations in rate follow the moon's phases.

Owing to the number of sizable rivers flowing into the strait, the rate of the ebb current is increased, and that of the flood current decreased, during and after heavy rains.

Calder Harbor, in mid-channel off **Tanjong Pengelih** (1°22'N., 104°06'E.), the ebb current runs from about the time of HW at Singapore until about 6.2 hours after HW, at an average maximum rate of about 1.2 knots. The flood current runs from about 6.2 hours after HW until the time of the following HW at an average maximum rate of about 1 knot.

Sungai Johor, in mid-channel between **Tanjong Surat** (1°28'N., 104°02'E.) and the shoal W, the ebb current runs from about half an hour after HW at Singapore until about 5 hours 30 minutes before the following HW at an average maximum rate of about 1.2 knots. The flood current runs from about 5 hours 30 minutes before HW until 30 minutes after HW at an average maximum rate of 1 knot.

In Kuala Johore, in a position about 2 miles WSW of Tanjung Pengelih, the tidal current is chiefly rectilinear. The ebb current runs SE from about 30 minutes after until about 5 hours before HW at Tebrau Reach. Its maximum rate of about 1.2 knots at springs and 0.7 knot at neaps is reached about 4 hours after HW at Tebrau Reach.

The flood current runs NW from about 5 hours before until about 30 minutes after HW at Tebrau Reach. Its maximum rate of about 1.3 knots at springs and 0.7 knot at neaps is reached about 2 hours before HW at Tebrau Reach.

Off **Loyang** (1°23'N., 103°58'E.), in a position about 0.3 mile W of Fairy Point, the tidal current is chiefly rectilinear.

The ebb current runs ENE from about 30 minutes after until about 6 hours after HW at Tebrau Reach. Its maximum rate of 1.2 knots at springs and 0.6 knot at neaps is reached about 3 hours after HW at Tebrau Reach.

The flood current runs WSW from about 5 hours 30 minutes before until 30 minutes before HW at Tebrau Reach. Its maximum rate of about 1.4 knots at springs and 0.7 knot at neaps is reached about 2 hours before HW at Tebrau Reach.

Off Tanjung Punggol, in a position about 0.4 mile N of Punggol Light, the tidal current is chiefly rectilinear. The ebb current runs E from about 30 minutes after until about 6 hours after HW at Tebrau Reach. Its maximum rate of about 1.6 knots at springs and 0.9 knot at neaps is reached about 3 hours 30 minutes after HW at Tebrau Reach.

The flood current runs W from about 5 hours 30 minutes before until the time of HW at Tebrau Reach. Its maximum rate of about 1.6 knots at springs and 0.9 knot at neaps is reached about 2 hours before HW at Tebrau Reach.

Off Singapore Naval Base, in a position about 0.5 mile SW of **Kanan Lighted Beacon** (1°28'39"N., 103°50'30"E.), the tidal current is chiefly rectilinear. The ebb current runs ESE from about 30 minutes after until about 6 hours after HW at Tebrau Reach. It reaches a maximum rate of about 0.4 knot at springs about 3 hours 30 minutes after HW at Tebrau Reach.

The flood current runs WNW from about 6 hours before until about the time of HW at Tebrau Reach. It reaches a maximum rate of about 0.3 knot at springs about 2 hours 30 minutes before HW at Tebrau Reach.

**9.56 Felkin Spit** (1°27'N., 103°52'E.), with depths of 5.2 to 9.1m, is an extension of the shore bank NE of Pulau Seletar.

Its SE end lies about 0.6 mile to the NE of the S end of the island. A lighted buoy is moored on the NE side of Felkin Spit, about 0.6 mile ENE of the NW end of Pulau Seletar.

Off the N shore of Johor Strait, ENE of the N end of Pulau Seletar, is a rocky patch with depths of 3 to 5.2m, extending about 0.2 mile offshore.

About 0.7 mile farther NW is a narrow shoal bank, fronting **Sungai Masai** (1°28'N., 103°52'E.), with depths of 7.3 to 9.1m, about 0.4 mile from the coast.

**Lavis Shoal** (1°28'N., 103°51'E.), with depths of 1.2 to 5.5m, extends about 0.2 mile from the S shore between a position about 0.7 mile NW of Pulau Seletar and the West Stores Basin. A lighted buoy is moored about 0.7 mile NNW of the N end of Pulau Seletar.

**Beaulieu Shoal** (1°28'N., 103°50'E.) fringes the shore immediately E of the entrance of the Naval Stores Basin; a lighted buoy is moored off the shoal.

Between the NW end of Pulau Seletar and Beaulieu House, a conspicuous house located on the S shore close SE of the shipyard, the approach to the drying coastal bank is foul and encumbered by numerous stranded wrecks, fish traps and piles. There is an obstruction with a depth of 0.3m that lies about 91m NE of a pier located close by the conspicuous house. Two more obstructions with depths of 2.7 and 1.5m lie within a distance of about 0.1 mile SE of this pier.

**9.57 Sembawang Terminal** (1°28'N., 103°50'E.) is located on the S shore of Tembrau Reach, about 2 miles NW of Pulau Seletar. In the basin are seven numbered berths, with a total quayage length of 1,182m and alongside depths of 9.2 to 11.7m.

The Bethlehem Steel Company Jetty, which extends 0.1 mile from shore, has depths of 6 to 6.7m along its E side.

There are four floating docks, which can accommodate vessels from 9,000 to 150,000 dwt.

King George VI Drydock can accommodate a vessel up to 100,000 dwt. Premier Drydock can accommodate vessels up to 400,000 dwt. Range lights, which are shown if required, lead to the drydocks.

The tidal range is about 2.5m at springs and about 1.1m at neaps.

**Caution.**—Less depths than those charted have been reported in the vicinity of the terminal.

**Rumah Merah** (Red House) (1°28'N., 103°49'E.), a house with a red roof, is conspicuous and stands on piles close off the S shore, about 0.5 mile W of the shipyard. A shoal, with a depth of 0.6m, lies 137m offshore about 0.2 mile WNW of Rumah Merah.

A group of six radio towers, each 61m high and marked by a light, is located about 1 mile SSW of Rumah Merah. Several other radio towers, each 37m high, are located N and S of the main towers.

Denman Shoals, swept to 7m but reported (1994) to have depths of as little as 6.3m, is a rocky area W of Rumah Merah; it extends as far as about 0.3 mile off the S shore. A lighted buoy is moored on the NW edge of Denman Shoals, 0.9 mile WNW of Rumah Merah.

**Red Cliff** (1°29.0'N., 103°49.5'E.), a conspicuous red bluff, 11m high and covered with scrub and bush, rises on the N shore opposite Rumah Merah. Close within the bluff is a large dome-shaped tree and a white house with a green roof.

A bank, with depths of 8.5 to 11m, extends about 0.2 mile S from Red Cliff. Another bank, with a depth of as little as 8.2m, extends WSW from Red Cliff almost to mid-channel.

Range lights, which lead through Dockyard Reach, are located at the mouth of Sungai Tebrau, about 2 miles W of Red Cliff.

**Anchorage.**—Anchorage can be obtained in any part of Tebrau Reach where the depth is convenient, except in the vicinity of submarine cables and pipelines.

**9.58 Ordnance Reach** (1°28'N., 103°47'E.) extends SW from Sungai Tebrau to The Causeway. Range beacons, which lead through the fairway, stand about 0.6 mile W of Red Cliff.

The Estana Pasir Plangi, a prominent chocolate colored house with a small water tower reported nearby, is located about 1 mile SW of the rear range beacon at the mouth of Sungai Tebrau.

**Depths—Limitations.**—The Sultan Ismail Power Station jetty stands about 0.5 mile NE of the N end of The Causeway.

The T-head, which is occasionally marked at each end by a light, is 366m long with a depth of 10.9m alongside. Vessels up to 183m long, with a maximum draft of 9.45m, can be accommodated.

An 8.2m depth, marked S by a lighted buoy, lies about 0.4 mile ENE of the jetty.

The Senoko Power Station, on the S side of Ordnance Reach, stands about 1.2 miles WSW of Rumah Merah and is marked by three conspicuous chimneys.

Armament Jetty, about 0.3 mile SW of the Senoko Power Station, is a T-headed jetty with a depth of 7.3m alongside. Lights are shown from each end of the T-head.

The RMN Jetty, an L-shaped pier, with an outer arm 215m long and marked at each end by a light, stands about 1 mile SW of Armament Jetty.

Woodlands Jetty, close SW of the RMN Jetty, is a T-headed oil jetty with a dolphin on each side of its head. The jetty is 175m long and has a depth of 8.8m alongside. A mooring buoy lies about 0.25 mile NW of the jetty.

A buried gas pipeline extends from the power station NNE across Ordnance Reach to a point close E of the entrance to Sungai Tebrau.

The coastal bank, with depths of 3.7m and less, extends for about 0.1 mile between the S end of The Causeway and a point located about 0.9 mile NE of the S end of The Causeway.

Obstructions, with depths of as little as 1.5m and which may best be seen on the chart, lie on this bank.

**Directions.**—If proceeding through Serangoon Harbor, keep the summit of **Bukit Mandai** (1°24'15"N., 103°46'12"E.) on Singapore Island, bearing 272° and open just S of the S extremity of Pulau Ketam.

When the **Pavilion** (1°22'58"N., 103°56'54"E.) on the pier about 2 miles WSW of Fairy Point bears 247°, alter course toward it to bring **Malang Papan Lighted Beacon** (1°24'06"N., 103°59'21"E.) to bear 065°, astern, and pass S of Squence Lighted Buoy.

Course should be altered NW to bring **Loyang Lighted Beacon** (1°22'58"N., 103°57'56"E.) bearing 131°, astern, and at night keeping within the white sector of the directional light.

On approaching **Serangoon Lighted Buoy** (1°24'03"N., 103°56'22"E.), course should be altered to pass SW of Tanjung Tajam, until the conspicuous water tower at Sembawang Terminal bears 291°.

The vessel should then steer on this mark, and pass NE of Perimbi lighted buoy.

When **Siniop Light** (1°28'15"N., 103°51'12"E.) bears 317° steer for it on that bearing. Having passed NE of Felkin Lighted Buoy and Lavis Lighted Buoy steer in mid-channel until Tebrau Range Lights come in range. This range leads in mid-channel abreast Sembawang Terminal.

If proceeding to an anchorage off the causeway and having reached a position abeam of **Rumah Merah** (1°28'15"N., 103°49'53"E.), steer to pass N of Denman Light Buoy.

Then steer with the range beacons located about 0.5 mile W of **Red Cliff** (1°29'00"N., 103°49'30"E.) bearing astern.

This course leads through the fairway of Ordnance Reach, passing SE of the 8.2m patch, marked by Ordnance Middle Ground buoy, moored about 1 mile from the causeway.

**Anchorage.**—Due to the existence of telegraph cables, anchorage is prohibited in **Kuala Sungai Johor** (Kuala Johor) (1°20'N., 104°05'E.) within the limits indicated by dashed lines on the chart.

**Caution.**—The maximum vessel speed permitted in East Johor Strait is 12 knots; however, vessel speed shall not exceed 6 knots in the vicinity of the following facilities:

1. Changi Sailing Club (1°23.6'N., 103°58.8'E.).
2. Pasir Gudang Port.
3. Malaysia Shipbuilding and Engineering Yard.
4. Sembawang Shipyard.

Vessels elsewhere reduce speed as necessary to avoid damage to boat moorings, ferry terminals, etc.

The N shore of the strait from close W of Pasir Gudang Port to within 1 mile of The Causeway, and the S shore from Sungai Seletar to Sembawang Terminal, is heavily encumbered with large bamboo fish traps which extend as much as 0.4 mile offshore in places, as far as the 10m curve. A number of these fish traps cover at HW.

Less water than charted has been reported in the basin at the SE end of Sembawang Shipyard.

## Traffic Information System for Vessels Transiting Serangoon Harbor

**9.59** The following vessels are required to participate in the Traffic Information System (TIS) when entering, leaving, or transiting the Traffic Information Area (TIA) in East Johor Strait:

1. Vessels of 2,000 grt and over.
2. Vessels with a height above the waterline of 30m.
3. Tugs, when engaged in towing or pushing, when the combined gross tonnage of the tugs and tows or vessels being pushed is 2,000 grt or more; or when any of the tug's or tow's height exceeds 30m.

The approximate boundaries of the TIA are, as follows:

- a. Punggol Lighted Beacon.
- b. 1°24.22'N, 103°55.95'E.

- c. Loyang Lighted Beacon.
- d. Fairy Lighted Beacon.
- e. Chanigi Lighted Buoy.
- f. 1°23.2'N, 104°00.4'E.
- g. Angler Lighted Buoy.
- h. 1°21.40'N, 104°04.15'E.
- i. Malang Tiga Lighted Buoy.
- j. 1°25.10'N, 104°01.13'E.
- k. Tanjung Todak.
- l. 1°25.00'N, 103°59.57'E.
- m. Chek Jawa Lighted Beacon.
- n. 1°23.90'N, 103°57.97'E.
- o. 1°23.90'N, 103°57.37'E.
- p. 1°24.60'N, 103°56.45'E.
- q. Tajam Lighted Beacon.
- r. Punggol Lighted Beacon.

The call sign for the Port of Singapore Authority (PSA) Control Station, Changi is Sembawang Control.

All VHF traffic is to be conducted on VHF channel 21 and vessels will keep a continuous watch on this channel when entering, leaving, transiting, or when anchoring in the traffic information area. The reserve channel is VHF channel 13. In the event that VHF channel 21 is inoperative, vessels shall check with Port Operations Control Center on VHF channel 68 for instructions.

Every vessel shall report, giving the following information, and obtain clearance from Sembawang Control before entering, leaving, or maneuvering within Johor Strait:

1. Vessel name.
2. Call sign.
3. Present location.
4. Destination (i.e., the location in the port or bound for sea).
5. Draft.
6. Height.
7. Remarks, if any (i.e., any other relevant information on the vessel which would affect its navigation).
8. ETA, used for the coordination of air traffic, at the following locations:
  - a. The line joining Tanjung Todak (1°25.5'N., 104°01.2'E.) and the NE point of Pulau Ubin (1°25.0'N., 103°59.6'E.) or longitude 103°59.6'E, extending N of the E end of Pulau Ubin.
  - b. Malang Tiga Lighted Buoy.
  - c. Paku Lighted Buoy.
  - d. Malang Papang Lighted Beacon.
  - e. Seletar Lighted Buoy.

Vessels update and confirm the above ETAs to Sembawang Control when passing the following locations:

1. Vessels bound N or W—Angler Lighted Buoy.
2. Vessels bound E—Punggol Lighted Beacon and Squance Lighted Buoy.
3. Vessels bound E entering the TIA via Nenas Channel— before entering Nenas Channel.
4. Vessels bound S from Sungai Johor—when underway.

Vessels shall monitor their ETAs and immediately report to Sembawang Control, as follows:

1. When the ETA for Malang Tiga Lighted Buoy, Paku lighted Buoy, Malang Papang Lighted Beacon, Tanjung Todak, or N of Pulau Ubin differs by 2 minutes.

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2. When ETA for Seletar Lighted Buoy differs by 15 minutes.

**Caution.**—No vessel is permitted to stop or anchor within the TIA. If a vessel has to stop or anchor in an emergency situation, the vessel shall report immediately to Sembawang Control.

No vessel should proceed S of the line between the CAAS Lighted Buoy No. 1 and CAAS Lighted Buoy No. 2.

These reporting procedures for East Johor Strait are in addition to the general reporting procedures for the Singapore Vessel Traffic Information Service (VTIS) found in paragraph 9.3.