Report on the investigation of

the grounding of

British Enterprise

Ahirkapi Anchorage Area

Istanbul, Turkey

on

11 December 2004

Marine Accident Investigation Branch
Carlton House
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Report No 25/2005
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Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 13(9) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purpose is to attribute or apportion liability or blame.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AIS	-	Automatic identification system
BA	-	British Admiralty
Bogazi	-	Strait
CCTV	-	Closed-circuit television
CHIRP	-	Confidential Hazardous Incident Reporting Programme - an independent body dedicated to receiving confidential reports concerning accidents and incidents, to improve safety at sea.
DF	-	Direction finding
DSC	-	Digital selective calling
E/K	-	Even keel
ENC	-	Electronic navigation chart
IHO	-	International Hydrographic Organisation
IMO	-	International Maritime Organization
LNG	-	Liquefied Natural Gas
LPG	-	Liquid Petroleum Gas
LT	-	Local time
R/T	-	Radio telephony
Seiches	-	Seiches are oscillations in enclosed bodies of water caused by seismic waves
SMS	-	Safety Management System
SOLAS	-	Safety of Life at Sea
THO	-	Turkish Hydrographic Organisation
TSS	-	Traffic Separation Scheme
TSVTS	-	Turkish Straits Vessel Traffic Service
UKC	-	Under keel clearance
UKHO	-	United Kingdom Hydrographic Office
VHF	-	Very High Frequency
VTS	-	Vessel Traffic Service

SYNOPSIS

On 11 December 2004, at about 1405, the UK registered tanker *British Enterprise* grounded in the Port of Istanbul, Ahirkapi Anchorage Area. The vessel was aground for 5 days before she was floated off following a lightening operation. There was no damage to the vessel and no pollution.

British Enterprise had loaded a cargo of crude oil at the port of Batumi on the Black Sea, and sailed at 0412 on 9 December bound for Agio Theodorio, Greece.

The vessel passed southbound through the Istanbul Boğazi during the morning of 11 December. The master then advised the VTS he wished to take bunkers, and requested an anchor position. Permission was granted and he was instructed to anchor in "*Charlie* flammable cargo and explosives anchorage".

The master anchored the vessel in section C6 of the anchorage later that morning at 0546.

Once bunkering was completed, and the barges were gone and clear, the master informed the VTS he was ready to depart, and was duly granted permission to sail from the port. The anchor was weighed at 1343, the master turned the vessel around using rudder and engine, and began proceeding out of C6 anchorage, intending to cross C5 anchorage before heading out to sea. She had a maximum draught of 11.17 metres.

At 1405, as *British Enterprise* passed through C5 anchorage, the master noticed the vessel's speed had reduced to zero and, realising she was aground, he immediately stopped her engine. The bridge team checked the position and, after confirming that the chart showed sufficient water depth for the vessel (between 13 and 14 metres), the master attempted to manoeuvre her clear of what appeared to be an uncharted shoal or obstruction.

At 1440, the master realised the vessel was hard aground, and he advised the VTS of the situation.

The master had noticed the vessel was listing slightly to port. As the echo sounder indicated an under keel clearance of 2 metres under the bow, the master believed she was aground on a shoal under his starboard quarter. He ordered the chief officer to begin gravitating ballast water into a number of forward and port side segregated ballast tanks.

About 1000 tonnes of ballast had been taken on board by 1520, but attempts to manoeuvre the vessel clear were still unsuccessful. The master then updated the VTS with a situation report. VTS ordered him to cease all ballasting and engine movements immediately.

Pilots and port officials boarded *British Enterprise* later that day and informed the master that, if he was unable to re-float the vessel within 48 hours, the authorities would appoint a salvor.

During the following 48 hours, the ship's crew attempted to re-float the vessel using rudder and engine movements. They were unsuccessful.

Turkish authorities re-boarded *British Enterprise* at 2325 on 13 December, and the master signed a Salvage and Assistance Agreement (Turkish Open Form) with the state controlled General Management of Coastal Safety and Salvage Administration.

During the following 3 days, ballast water and cargo were unloaded from *British Enterprise* into lightening vessels. The vessel was successfully re-floated at 1510 on 16 December.

The vessel's cargo was loaded back onboard, and the vessel sailed from the port at 2000 on 23 December.

On the day following the grounding, the master had informed the UK Hydrographic Office (UKHO) of the uncharted shoal using a hydrographic note. The UKHO forwarded the information to the Turkish Hydrographic Organisation (THO) on 20 December. The area of grounding was later surveyed by the Turkish Navy and a bank with a shoal area with least depth of 6.1m was discovered. The difference between charted and actual water depth was such that the THO issued a notice to mariners on 29 January 2005 for all relevant Turkish nautical charts, which included a block for the largest scale Turkish chart.

During the investigation, it was found that at least two other vessels had grounded in C5 anchorage in recent years. Investigations carried out after these accidents had not identified the shoal area.

Research into the survey history of the area has indicated the presence of a shoal with about 10m least depth on 19th century and early 20th century charts, which is not shown on modern charts. The area lies close to a geological fault line, and it is possible that seismic activity, and the very strong currents that can be experienced in the area, have combined to make the bottom topography unstable. A 1979 survey of the area failed to find any evidence of its existence.

Since the accident, BP Shipping Limited has taken a number of actions to avoid a similar accident in the future. As a result of the MAIB investigation, recommendations have been made to organisations representing ships' masters and officers to, among other things, ensure that uncharted navigational hazards that may be identified are promptly reported to the correct authority. In addition, a recommendation has been made to:

- The International Harbour Masters Association: to, bearing in mind the protracted time that can elapse between discovery of uncharted dangers to navigation and promulgation of the appropriate chart corrections, remind its members of the importance of harbour authorities and/or coastal states issuing appropriate navigation warnings.

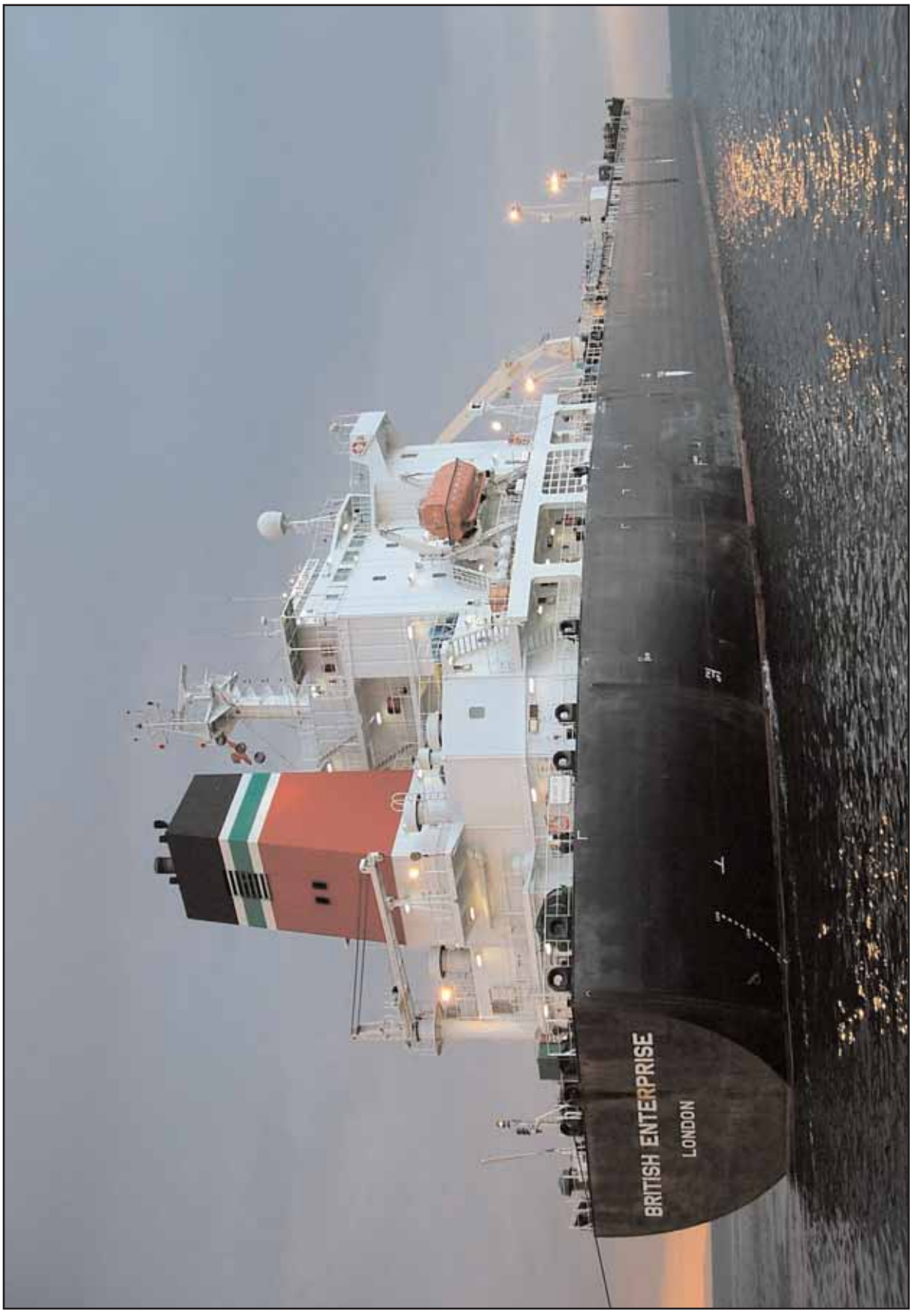
SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *BRITISH ENTERPRISE* AND ACCIDENT

Vessel details		**See Figure 1**
Registered owner	:	Indico Star Shipping Limited, British Virgin Islands
Manager(s) + bareboat charterer	:	BP Shipping Limited
Port of registry	:	London
Flag	:	United Kingdom
Type	:	Double hulled, tanker
Built	:	2001, Daedong, South Korea
Classification society	:	Lloyd's Register of Shipping
Length overall	:	176.17 metres
Gross tonnage	:	23682
Net tonnage	:	8834
Engine power and type	:	7800kW Motor
Other relevant info	:	Single screw fixed propeller

Accident details		
Time and date	:	1405LT on 11 December 2004
Location of accident	:	C5 Anchorage, Istanbul, Turkey
Persons on board	:	24
Injuries/fatalities	:	None
Damage	:	Cosmetic damage to hull coating

Figure 1



Vessel aground

1.2 NARRATIVE

(All times are UTC/GMT +2 hours)

British Enterprise arrived at her load port of Batumi, Georgia, in ballast condition on the evening of 6 December 2004. The vessel berthed mid-morning the next day, where she loaded a full cargo of 34,500 tonnes of Keimer crude oil.

In the early hours of 9 December, the vessel sailed from Batumi with a draught of 11.01m E/K bound for Agio Theodori, Greece.

The vessel had an uneventful trip across the southern Black Sea, and arrived off the northern entrance to the Istanbul Bogazi at 2218 on 10 December.

A pilot boarded the vessel at 0311 the following morning, the vessel safely transited the Istanbul Bogazi, and the pilot disembarked at 0430.

The master then called the VTS via VHF radio, and requested a position where he could anchor the vessel and load bunker fuel. The VTS operator advised the master to anchor her "within *Charlie* anchorage in a safe position".

The master manoeuvred the vessel towards the anchorage and anchored in C6 anchorage at 0546 **(see Figure 2)**.

Bunkering operations were completed at 1330 after loading 450 tonnes of fuel oil and 30 tonnes of gas oil. At this time, the draught was 10.76 metres forward and 11.17 metres aft.

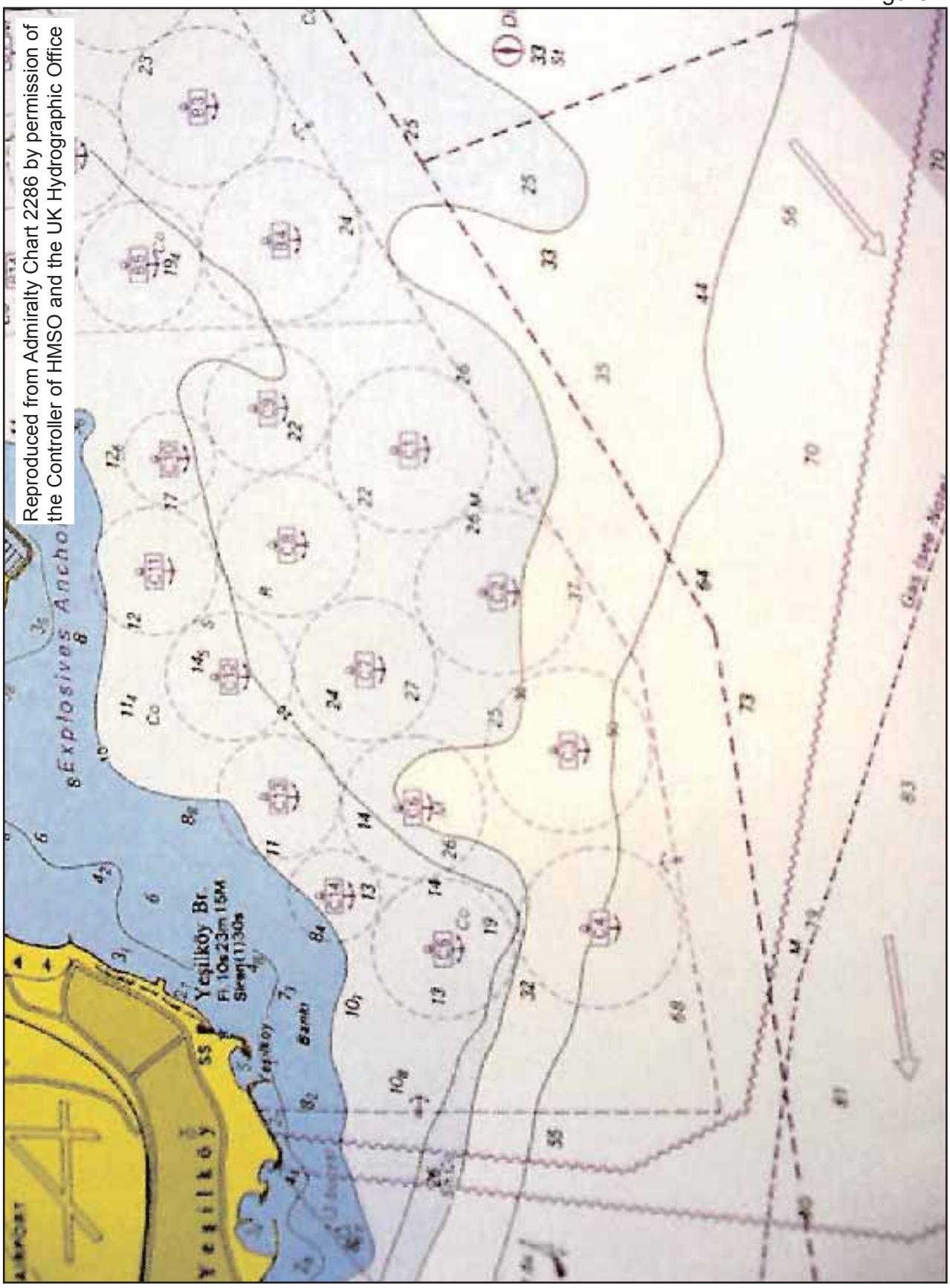
The relevant bridge checks and tests were satisfactorily completed as the vessel was made ready for departure. The master called the VTS advising them of his wish to depart, and permission was duly granted for him to do so.

The bridge team consisted of the master, third officer, the second officer who was acting as helmsman and two lookouts.

British Enterprise was lying to a northerly wind, and therefore it was necessary to turn her around to proceed to sea. As there were two vessels anchored on his starboard side in C2 and C7 anchorages, the master decided to swing the vessel around to port, and, to that end, once the anchor was aweigh at 1343, he ordered the helm to be put hard to port, and he put the engine telegraph to slow and then to half ahead. He chose to swing the vessel to port because there was sufficient water to do so and it meant that he did not have to swing towards the other two vessels.

At about 1350, the vessel had swung about 40º, and the master decided, rather than approach too close to the shallows inshore, to halt her forward movement. He ordered the helm to be placed amidships, and put the engine telegraph to slow, then half astern.

Figure 2



Extract from BA 2286 showing charlie anchorage

At 1355, with the vessel at a safe distance from the charted shallows off Yeşilkőy, the master stopped the engine and ordered the helm to be placed hard to port once again. He put the engine telegraph to half ahead and resumed swinging the vessel to port. Once *British Enterprise*'s heading was about 240º, the master ordered the helmsman to begin steadying on that course.

At 1405, the vessel gently ran aground at a speed of about 5 knots. The master, on realising the speed had reduced to zero, immediately stopped the vessel's engine. There was no vibration or any other indication that she had taken the ground.

The master and third officer checked the vessel's position and assured themselves she should still have sufficient water according to charted depths as indicated on the British Admiralty chart in use, BA2286, *The Southern Approaches to Istanbul Bogazi (The Bosporus)*. The master began implementing the company emergency contingency plans, which included sounding and checking all tanks and voids, and inspecting the vessel for cargo leakage. The master then attempted to manoeuvre her clear of the uncharted shoal or obstruction.

British Enterprise's position remained static, and, realising she was hard aground, the master ordered the appropriate signals to be exhibited. At 1440 he informed the VTS via VHF radio that the vessel had grounded. The VTS operator acknowledged the call.

The master had noticed *British Enterprise* was listing slightly to the port side (about 0.8º), and as the forward transducer of the echo sounder was showing 2 metres of clear water under the bow, the master deduced the vessel was in contact with the seabed under the starboard quarter.

Taking this information into consideration, he ordered the chief officer to begin flooding seawater into the vessel's fore peak and port side forward segregated ballast tanks.

Meanwhile, the master continued trying to manoeuvre the vessel off what he believed to be an un-charted shoal, using the rudder and main engine. He was unsuccessful.

At 1520, the master informed the VTS of the situation, and the VTS operator ordered him to cease all operations, including ballasting, until advised further. The master immediately complied with this order.

During this period, the master, officers and crew were completing all checks required by the manager's contingency plans, including internally sounding around the various ship's compartments and tanks.

The master began sending a company casualty report to all interested parties.

The soundings of the internal tanks and compartments confirmed that no water ingress had occurred, other than that ordered by the master shortly after the grounding, and no cargo had been lost. The crew were instructed to continue sounding all spaces at intervals of 30 minutes.

Port officials boarded *British Enterprise* at 2235, and informed the master he could attempt to re-float her after submitting a plan to the harbourmaster. BP Shipping Limited wished to begin salvage operations immediately, utilising its extensive knowledge and connections, however, the master was told that he could not use any external assistance such as salvors or tugs, and he could not pump out any ballast to the sea or lighten any cargo. The master was also informed that if, after a 48-hour period, the vessel was still aground, the state would appoint a salvor, in accordance with local regulations.

The following day, an oil boom was rigged around *British Enterprise* to protect the environment in case of pollution. In response to a request from the ship's managers, the harbourmaster granted permission for an underwater survey of the hull and seabed to be undertaken by a team of divers.

The divers entered the water at 1645 on 12 December, and recorded their findings on video. No hull damage was found, other than the hull coating being scored and scraped. The divers reported that just 42 metres of the vessel's mid-length section, between frames 57 and 72, was aground, and there was about 4 metres depth of clear water under the stern, and between 1 and 2 metres under the fore part of the hull. They also reported they had found a small "hill" of sand and shells on the port side of the vessel at about mid-hull length **(see Figures 3, 4, 5, 6 and 7)**.

That evening, the master faxed a contingency plan to the harbourmaster, describing how they intended to attempt to re-float the vessel the following day. The harbourmaster agreed to the plan.

At about 0830 the following day, the master unsuccessfully attempted to manoeuvre *British Enterprise* clear of the shoal using main engine and rudder.

Another contingency plan was drawn up and submitted to the harbourmaster. This plan entailed pumping overboard the segregated ballast which had been taken just after the grounding. However, concerned about the possibility of pollution from contaminated ballast water, the harbourmaster refused to grant permission for the operation.

Samples of the ballast water were taken and landed ashore for analysis. No oil was found in the samples, but understandably, permission to pump the segregated ballast overboard was still refused as even though MARPOL allows discharge of segregated ballast to the sea, the internal condition of the vessel was unknown.

Figure 3

Seabed and clearance under stern

Figure 4

Hull grounded section on level sand

Figure 5

Vessel aground showing broken seabed

Figure 6

Showing keel clearance under the bow, and unbroken seabed

Figure 7

Port side of hull showing broken seabed and hill

The divers' report confirmed that the depth of water at the vessel's position was much less than had been charted, so that day, the master sent the UKHO a hydrographic note informing them of the uncharted shoal. The minimum depth of water found in the vessel's position, which was reported to the UKHO, confirmed by the divers and notified to *British Enterprise,* was 9.6 metres.

On the same day, at 2325, a state appointed salvage master boarded the vessel and, as the 48-hour period had lapsed, the master signed a Salvage and Assistance Agreement with the General Management of Coastal Safety and Salvage Administration, a department within the Turkish Maritime Administration.

The officials then left the vessel to prepare for the salvage operation.

At 0055 on 14 December, a salvage tug was made fast to the vessel's stern.

During the next 2 days, about 2300 tonnes of cargo and 500 tonnes of ballast were unloaded into lightening vessels. An unsuccessful attempt was made to manoeuvre *British Enterprise* clear of the shoal during the evening of 15 December **(see Figures 8 and 9)**.

Figure 8

Cargo lightening operation and tug in attendence

Figure 9

Cargo lightening operation

The following day, a further 350 tonnes of ballast water was unloaded into slop barges and, with the aid of tugs, and use of the engine and rudder, the vessel was re-floated at 1510 on 16 December. The vessel was then moved and safely anchored in an adjacent anchorage.

After *British Enterprise* was re-floated, VTS operators, using VHF radio, began warning other vessels that were intending to anchor in *Charlie* anchorage to avoid C5.

On 20 December 2004, the UKHO forwarded the information contained in the hydrographic note that had originated from *British Enterprise* to the Turkish Hydrographic Organisation.

Over the 7 days following the re-floating of the vessel, the cargo was reloaded and formalities associated with the grounding and subsequent salvage were completed. The vessel was able to resume her passage to Agio Theodorio at 2000 on 23 December 2004, 12 days after grounding.

The Turkish Hydrographic Organisation (THO), which is the only body permitted to carry out marine survey operations in Turkish waters, was requested by the Turkish Maritime Administration to conduct a survey of the anchorage areas which might have been affected by seismic activities since 1999, which included the area where *British Enterprise* grounded. The survey was completed, the THO analysed the results and concluded that the differences between the charted and the actual depth was such that they should issue a notice to mariners, to update their charts of the area.

The THO issued a notice to mariners, 19/2005, on 29 January 2005, giving details of the actual soundings found during the survey, and included a block update for insertion onto the largest scale Turkish chart.

1.3 THE CREW

British Enterprise had a complement of 24, including the master, chief officer, three deck officers, chief engineer, four engineer officers, a deck assistant, a deck cadet, a bosun and five deck crew.

The master was the holder of a Class 1 Certificate of Competency, and had sailed onboard tankers for many years.

1.4 VESSEL'S CERTIFICATION

The vessel's statutory certification was inspected and found to be in order.

1.5 THE ISTANBUL BOGAZI

The Istanbul Bogazi is a 35-km natural deep water channel which winds its way through the city of Istanbul. In places, it is as little as 700 metres wide.

The channel is the only maritime passage linking the Black Sea with the Mediterranean.

In 1938, the annual number of vessels passing through the straits was 4,500. Recent statistics show that 50,000 vessels now pass through the straits each year. This is three times the traffic using the Suez Canal and includes vessels carrying oil, LNG, LPG and chemicals. Approximately 80 million tonnes of oil and oil products were transported through the straits in 2000. Further increases in traffic volume are expected as oil and gas reserves in the east of the region are further developed.

Bearing in mind the strategic importance of the waterway, and the fact that a major casualty could have a significant detrimental effect on the environment, Turkey has taken steps to improve the safety of navigation in the area. It has done this by promulgating rules and regulations concerning traffic transiting the straits, and developing a Traffic Separation Scheme that has been adopted by IMO. A Vessel Traffic Service (VTS) has recently been established.

1.6 VESSEL TRAFFIC SERVICE

The Turkish Straits Vessel Traffic Service (TSVTS) provides full coverage of both the Istanbul Bogazi and the Canakkale Bogazi.

Istanbul Bogazi traffic is monitored using a combination of a series of fixed radars, ENC, AIS, CCTV and VHF equipment such as VHF R/T, DSC and DF **(see Figures 10, 11 and 12)**.

Administration of the VTS is undertaken by the Director General for Coastal Safety and Salvage Administration, and the authority is the Undersecretariat for Maritime Affairs.

The VTS is in compliance with IMO Resolutions A.857(20) and A.827(19), and provides information, navigational assistance and a traffic organisation service.

1.5 TIDES AND CURRENTS IN THE ISTANBUL BOGAZI

Tidal influence has virtually no effect on water levels in the Istanbul Bogazi and Marmara Sea. The average spring range is just 10cm.

The local Sailing Directions also state that the annual range in mean sea level due to meteorological pressure effects is about 5cm; exceptionally, a rise of 15cm and a fall of 18cm have been recorded. Superimposed on this are variations resulting from changes in the amount of water entering or leaving the Black Sea of from 50cm to 1.5 metres.

Figure 10

Figure 11

Exterior and interior views of VTS centre

Figure 12

VTS system

Strong and steady winds can exercise a considerable effect on the water level, with local rise and falls of up to 30cm being recorded.

Seiches, caused by seismic disturbance, which may be some distance away, may also occur with little or no warning, and can raise or lower the sea level by as much as 1 metre.

Very strong currents run through the Istanbul Bogazi. The predominant current flows southward, with typical rates of 3 to 4 knots and, exceptionally, rates of 6 to 8 knots may be experienced. Occasional northward flowing currents with rates of up to 2 to 3 knots may also be experienced.

There is no evidence that suggests that any extraordinary environmental effects influenced the depth of water in Ahirkapi Anchorage Area on the day of the accident.

1.6 THE CHART IN USE

British Enterprise, in common with numerous other vessels under many different flags, was supplied with a United Kingdom worldwide chart outfit. The charts were kept up-to-date by information and updates received onboard contained within weekly Admiralty Notices to Mariners.

British Admiralty (BA) charts and Notices to Mariners are published by the United Kingdom Hydrographic Office (UKHO).

The UKHO produces and maintains a worldwide chart folio system comprising a mixture of charts compiled using either primary or derived data.

The UKHO charts the waters of the United Kingdom, UK overseas territories, certain Commonwealth countries and some other areas. In these areas charts are compiled from primary data, such as hydrographic surveys and maps.

Outside these areas, derived charts are either re-compiled using the data shown on the chart produced by another hydrographic office, or are published as a modified reproduction in the familiar Admiralty style.

In recent years, as the international standardisation of charts has improved, the UKHO has been accepting into its chart series more modified reproductions of national charts produced by other hydrographic offices. Many benefits stem from this, including better chart coverage in certain areas and quicker turn round times for new editions.

The UKHO and the Turkish Hydrographic Office (THO) enjoy a close working relationship, and many charts produced by the THO are incorporated into the UK chart series, either by re-compilation or as modified reproductions.

The chart being used on the bridge of *British Enterprise*, BA2286, was re-compiled from Turkish chart TR2923.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 THE HYDROGRAPHIC HISTORY OF YEŞILKŐY BANK AND THE POSSIBLE REASONS FOR A LOCALISED REDUCTION IN WATER DEPTH

2.2.1 Survey history of Yeşilkőy Bank

The sea of Marmara and Istanbul Bogazi have been the subject of many hydrographic surveys by various countries throughout history.

- The Spanish surveyed the area prior to 1812.
- About the same time, the French surveyed the area.
- The area was surveyed twice in the 1850s.
- In 1879, another survey of the area was completed by the Royal Navy vessel *H.M.S. Fawn,* and information from this was used to compile BA2286, see Section 2.2.2.
- The THO undertook a survey of the area in 1979, details of which were unavailable to this investigation, and a chart was published in 1980, see Section 2.2.2.

After the accident, THO re-surveyed the area, and issued a notice to mariners on 29 January 2005, see Section 2.2.2.

2.2.2 Chart history of Yeşilkőy Bank

A Spanish chart of the Sea of Marmara was published in 1812, and a bank extending south of Point St. Stephen, now Yeşilkőy, is clearly defined **(see Figure 13)**.

A chart from the 1830s also shows evidence of a bank extending south of Stephano Point, now Yeşilkőy. The chart was based on a French chart of 1826, with further corrections up to 1831 **(see Figure 14)**.

A larger scale Admiralty chart of the area (chart 2286) was published in 1882, based on the survey of 1879 **(see Figure 15)**.

The MAIB has superimposed C5 anchorage on the 1879 survey details **(see Figure 16)**, and, after converting the imperial soundings to metric, the results were put on a plan of C5 anchorage **(see Figure 17)**.

Figure 17 shows that in 1879 Yeşilkőy Bank extended well into what is now C5 anchorage, and showed a reported depth of water of about 11 metres at the position where British Enterprise grounded.

Admiralty chart 1198 *The Bosporus* was published on 4 March 1905 using information from the surveys conducted in 1853, 1854 and 1880 **(see Figures 18 and 19)**. Like chart 2286, published in 1882, chart 1198 is of a larger scale than the present chart, and the bank within the anchorage area off Yeşilköy is shown in good detail. However, a chart of this scale does not exist today.

The UKHO published a new metric version of BA2286 in 1975. **Figure 20** shows an extract from the first edition of the 1975 chart, with C5 anchorage superimposed. No new British survey had been undertaken and, in accordance with International Hydrographic Organisation (IHO) guidelines, the UKHO used Turkish chart TR2923, which had been published between 1965 and 1971, as the source of the latest hydrographic information.

The only evidence of the bank extending into what is now C5 anchorage is the single charted sounding of 10.1 metres.

In 1980, the THO published a new edition of TR2923, using data from the 1979 survey. The second edition of British chart, BA2286, was published in 1984 **(see Figure 21)**, using information from this chart.

It can be seen that the 10.1 metre sounding shown on the first edition of the British chart is no longer marked.

A new edition of Turkish chart TR2923 was published in 1985, and this was used for the third edition of British chart BA2286, which was published in 1989 **(see Figure 22)**.

The UKHO published further new editions of BA2286 during the next few years, which included information from all Turkish notices to mariners, however, there were no changes to the relevant charted soundings.

Another new edition of Turkish chart, TR2923, was published on 9 September 2000. This depicted the new anchorage area south of Yeşilköy Light **(see Figure 23)**.

A sixth edition of British chart BA2286 was published on 27 March 2003. This was the most recent BA chart in existence at the time of the accident.

After the accident, Turkish notice to mariners 19/2005 was issued on 29 January 2005, following a survey of the area by THO. The survey revealed the minimum sounding within C5 anchorage to be 6.1 metres. The notice to mariners was accompanied by a chart block correction for chart TR2923. **Figure 24** shows the block inserted onto the chart.

Information regarding this recent survey was received at the UKHO, and chart BA2286 was updated by Notice to Mariners 1121/2005 issued on 3 March 2005.

Charts reproduced by permission of The British Library

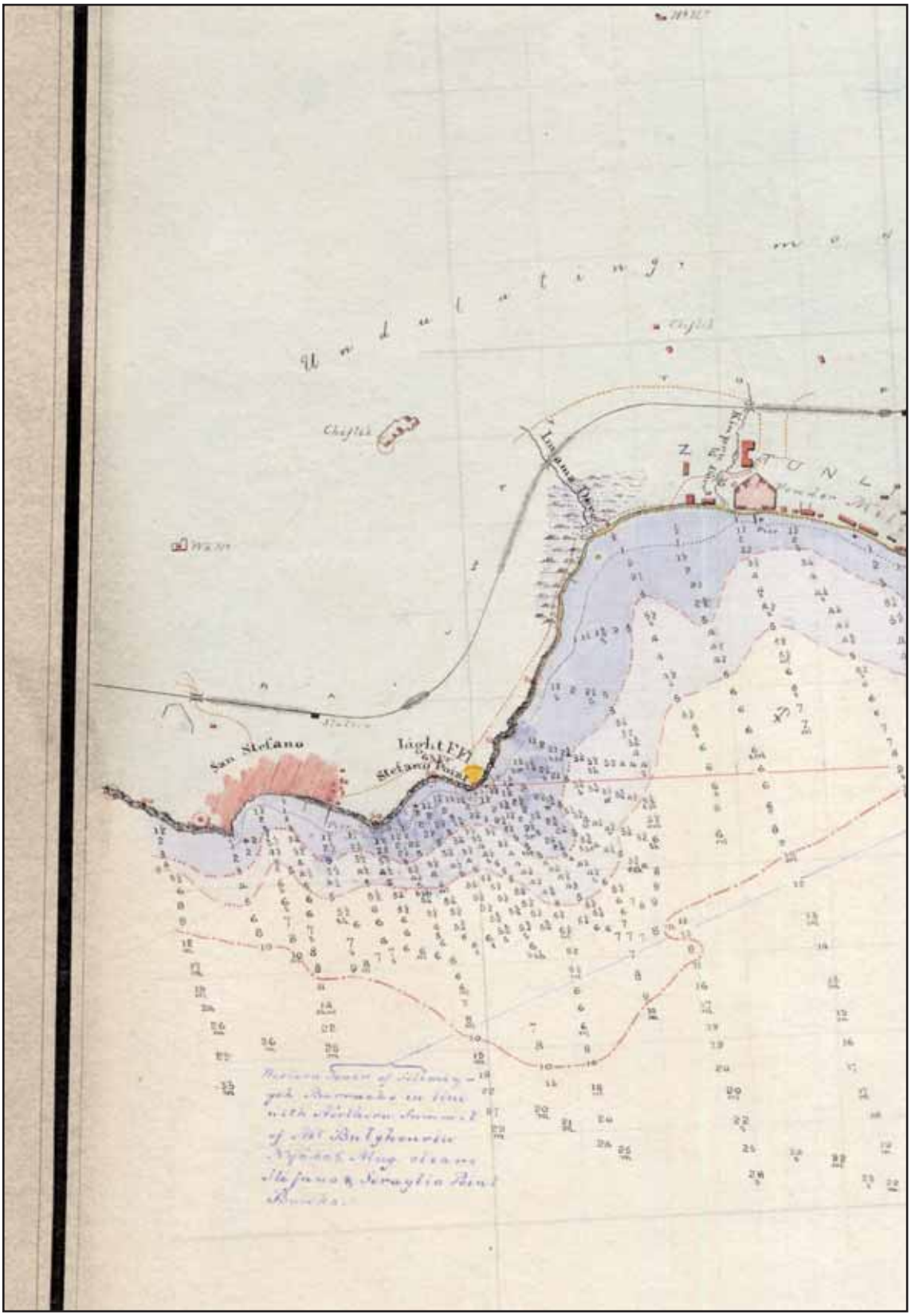
Figure 13

Sea of Marmara, from a Spanish survey by Galiano, 1st April 1812

Figure 14

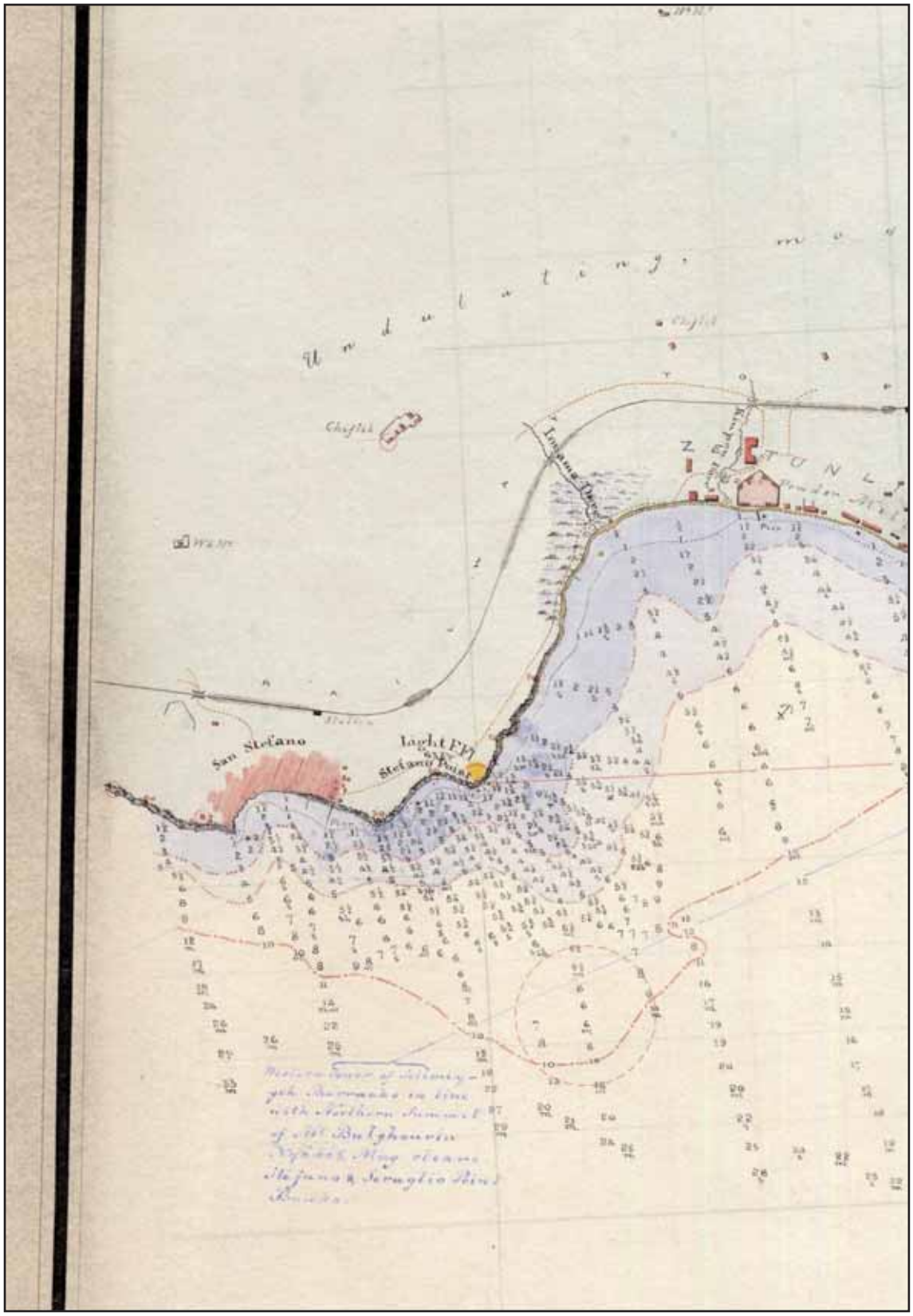
Sea of Marmara from the chart published at Depot de la Marine 1826

Figure 15



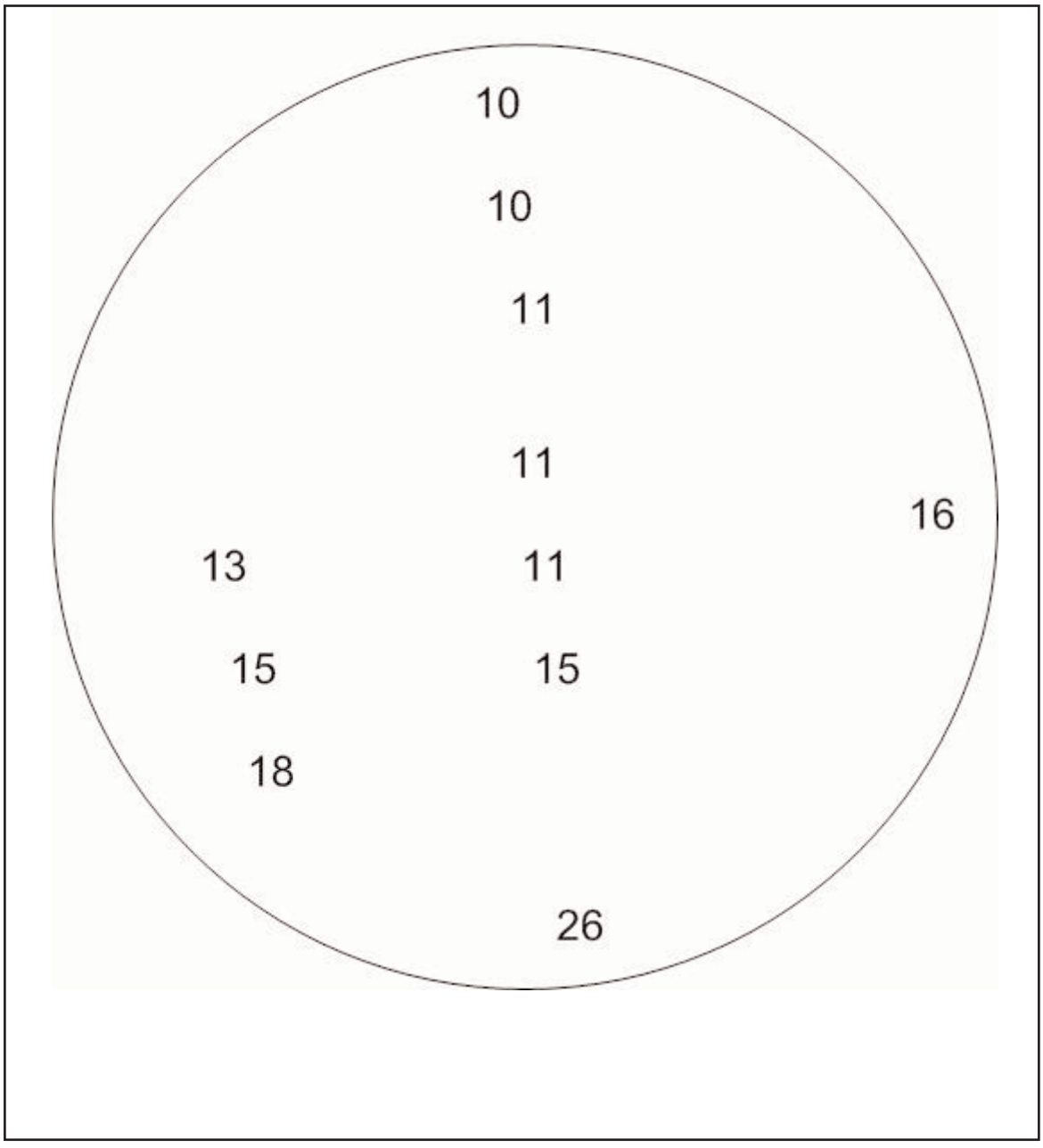
Extract from the survey sheet (A6805) 1879 by HMS Fawn

Figure 16



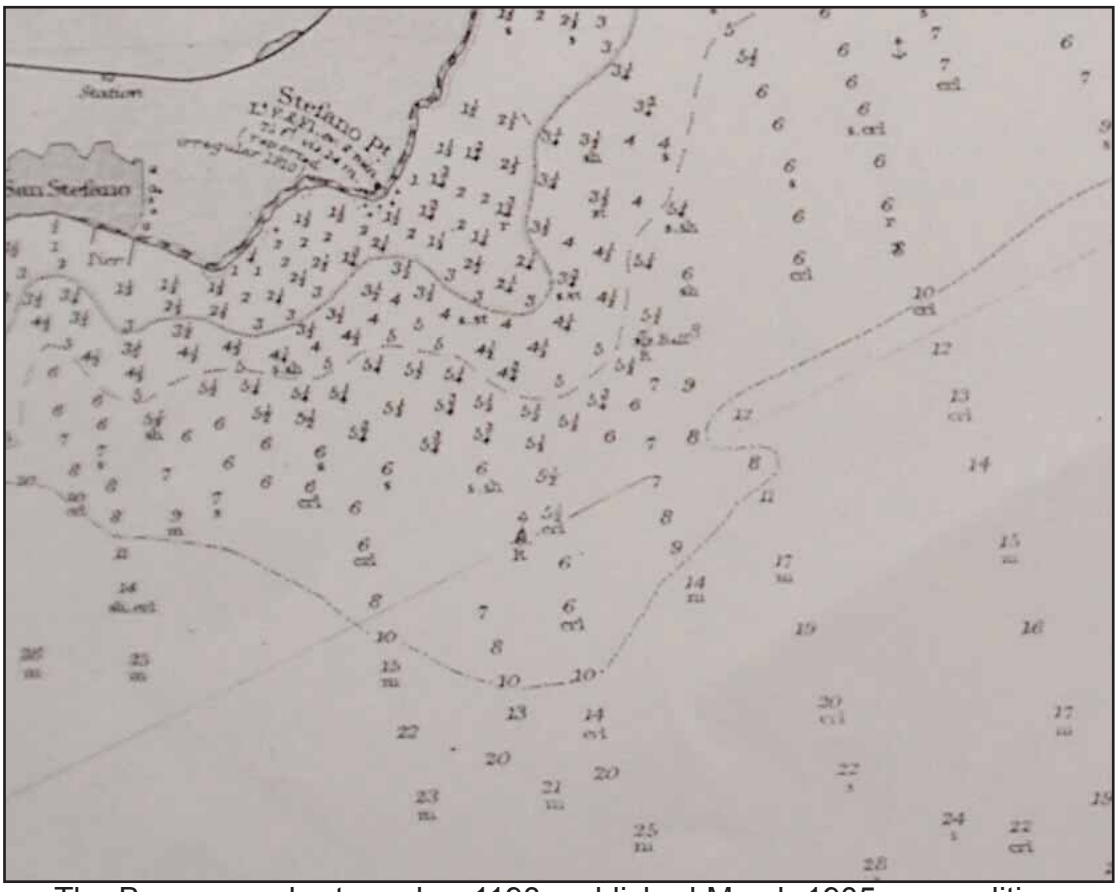
C5 sector superimposed upon 1879 survey report
(soundings in fathoms)

Figure 17



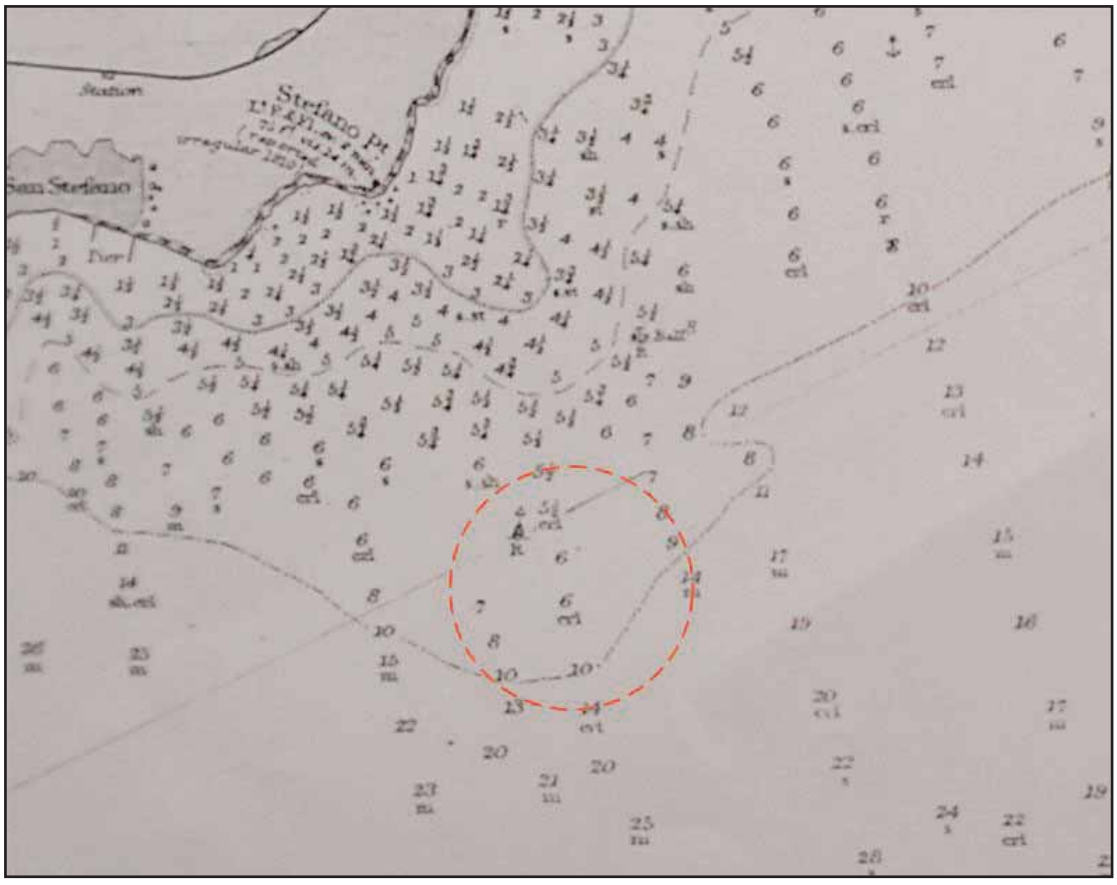
C5 Anchorage depths from 1879 survey
(soundings in metres)

Figure 18



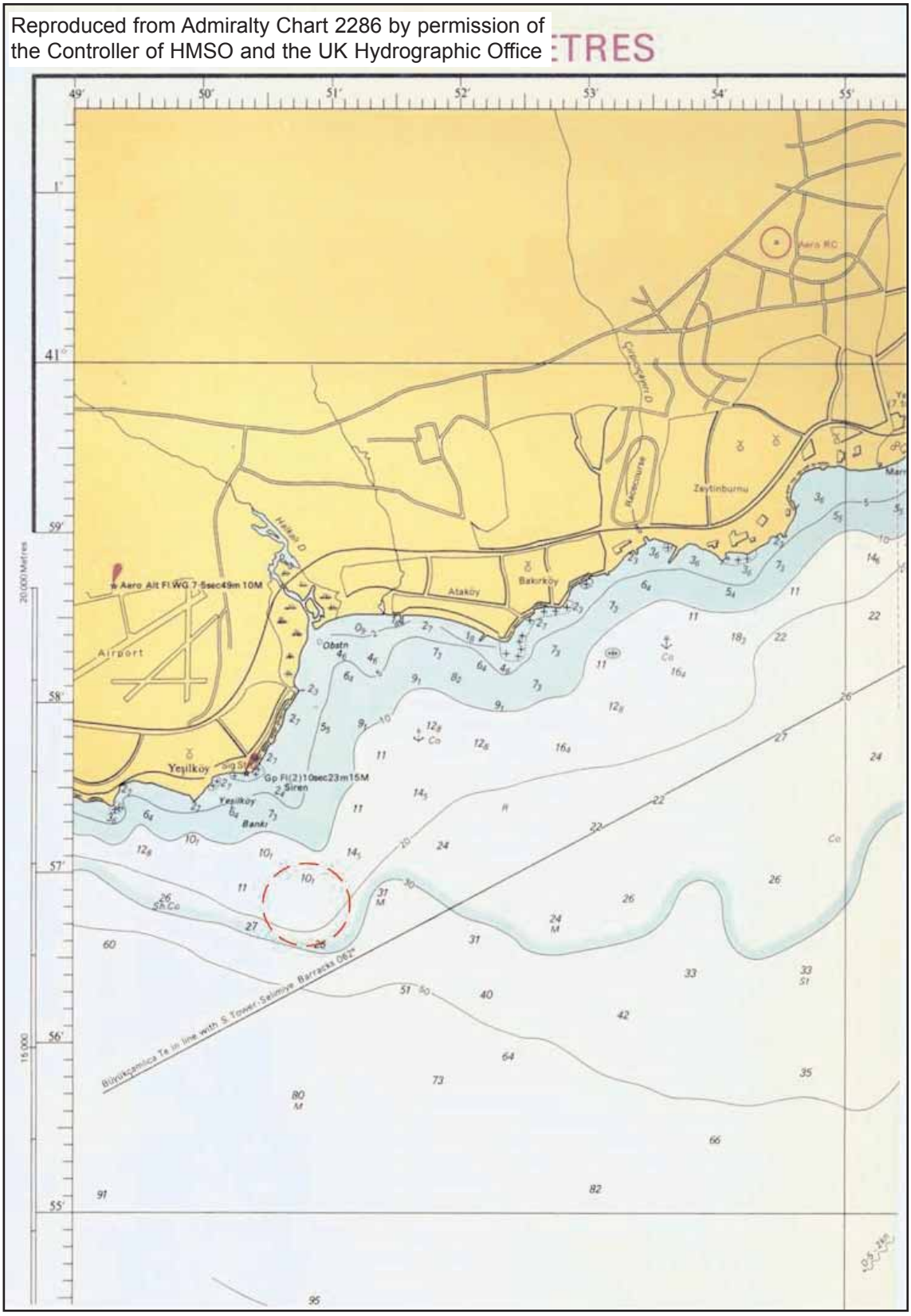
The Bosporus, chart number 1198, published March 1905, new edition November 1915 (soundings in fathoms)

Figure 19



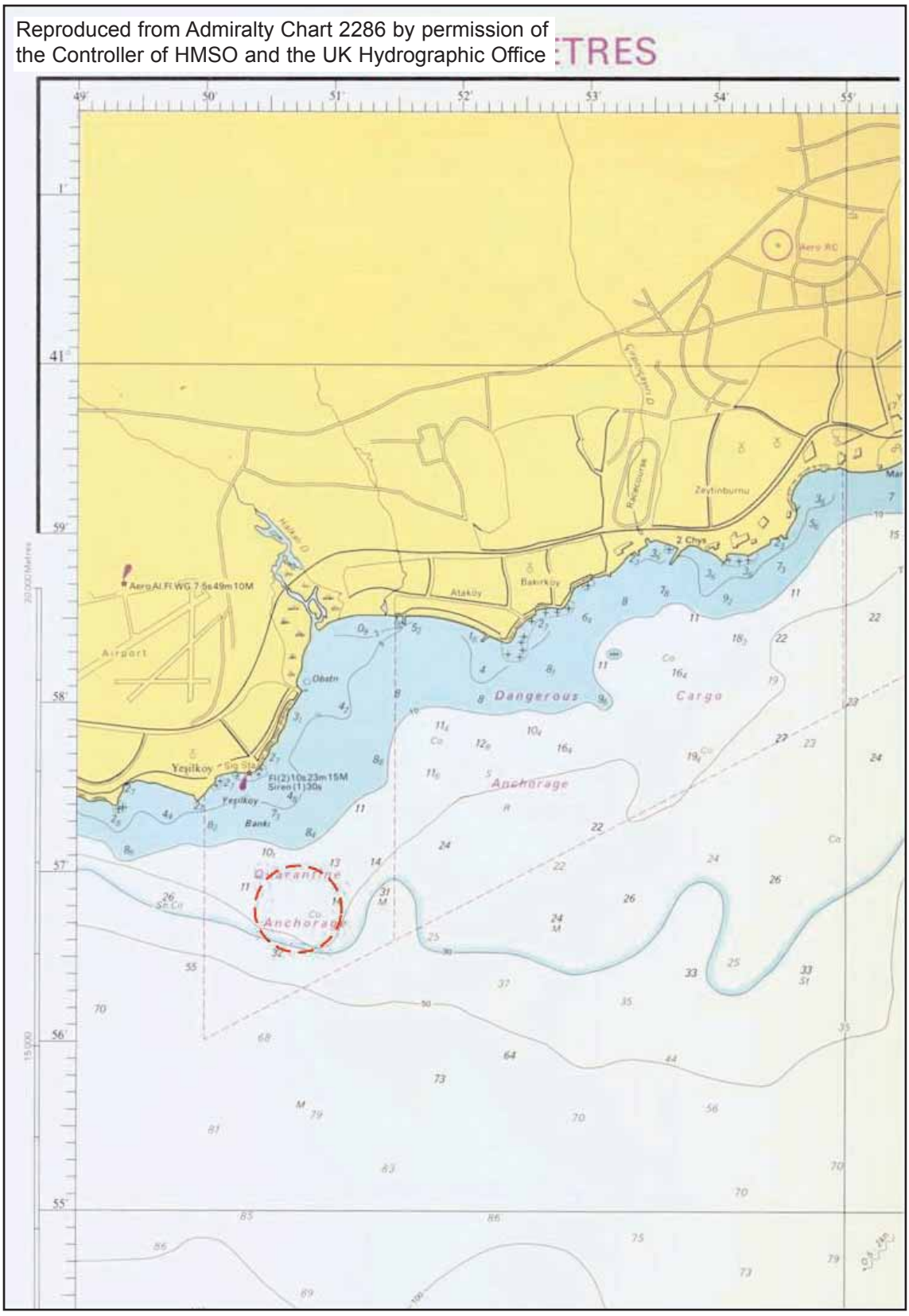
C5 anchorage superimposed upon the 19th November 1915 edition of chart 1198 published 4th March 1905 (soundings in fathoms)

Figure 20



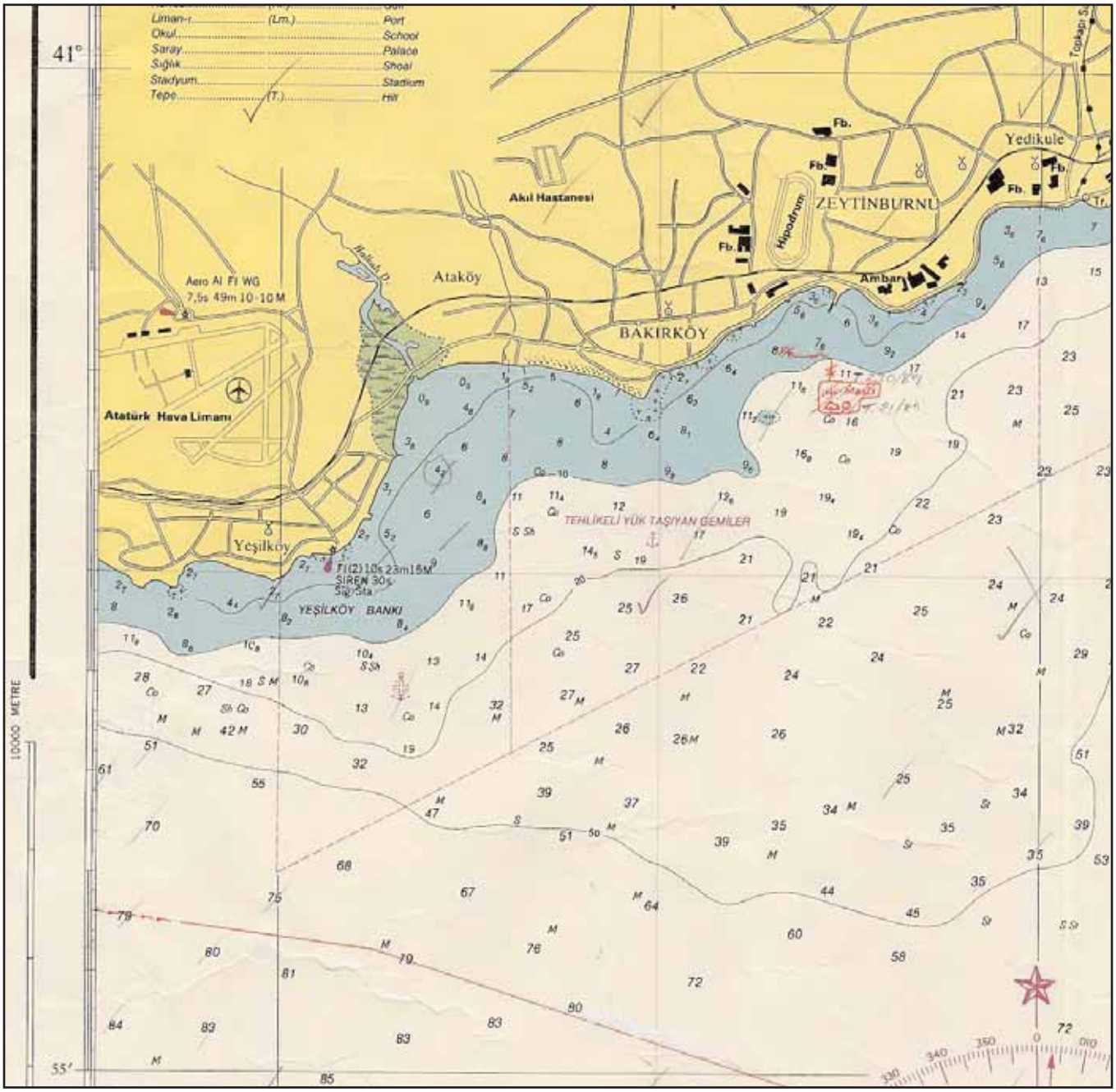
1975 BA chart of area Edition 1
(soundings in metres)

Figure 21



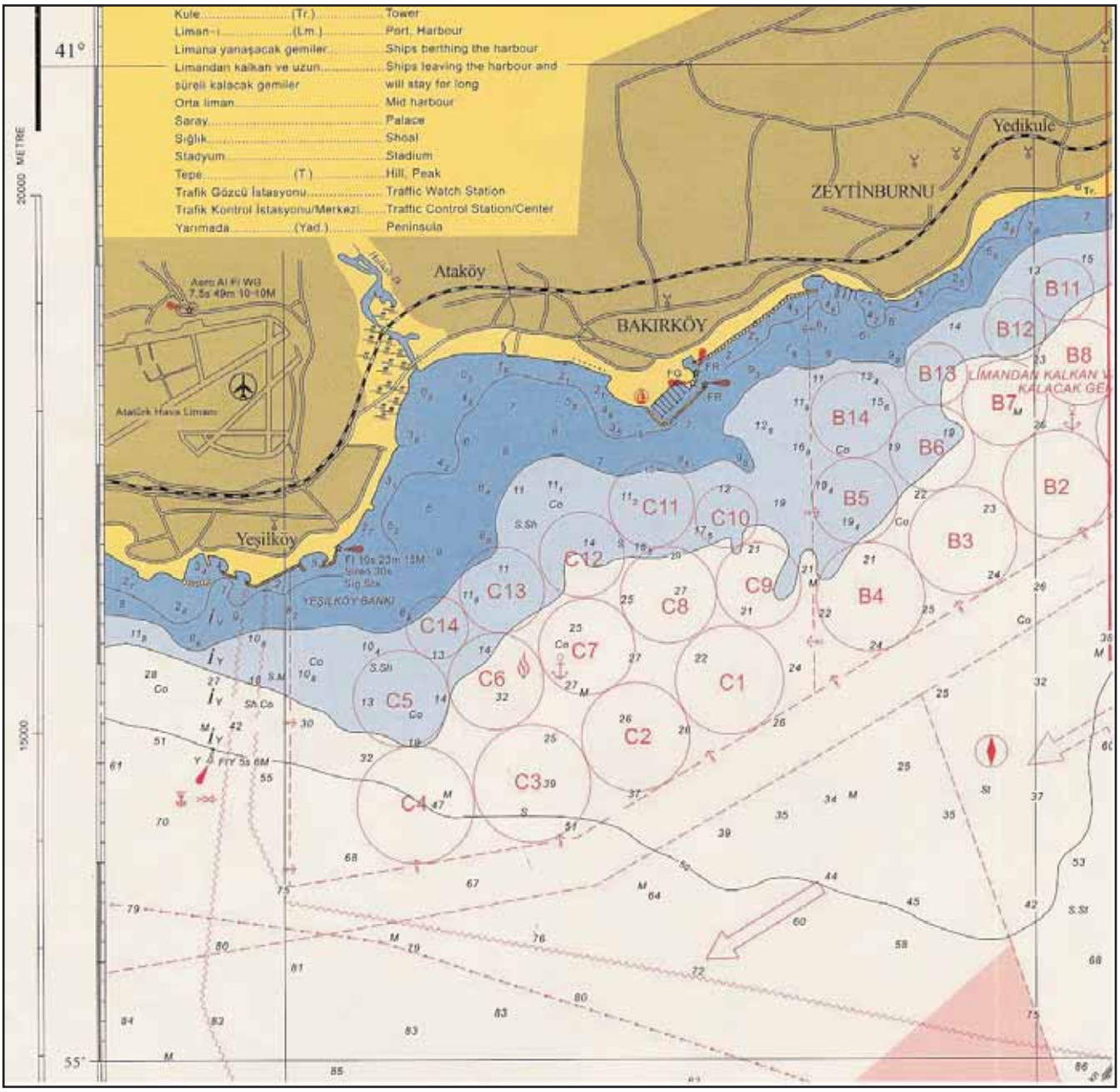
1984 BA chart of area Edition 2

Figure 22



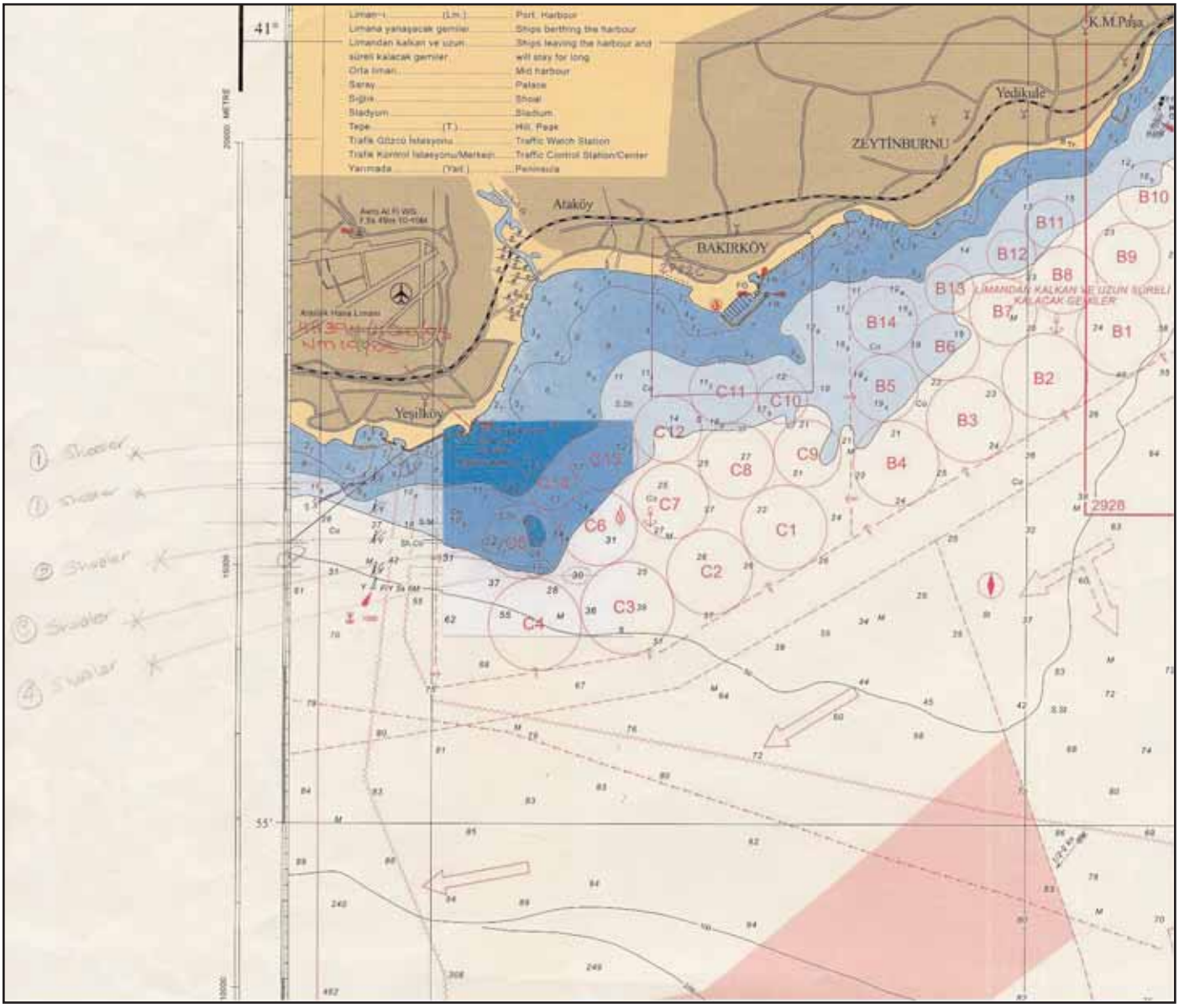
1985 Turkish chart of area

Figure 23



2000 Turkish chart of area showing Charlie anchorage area

Figure 24



Turkish chart of area with added block from NM 2005-5

It would appear from the above history that, what is now C5 anchorage area, had a bank with a depth of about 10 metres at the time of the HMS *Fawn* survey in 1879 and before. The 10-metre charted depths gradually disappeared from the charts of the area until 1975, when the only indication was a single 10.1m sounding. The MAIB has not been allowed sight of the 1979 Turkish survey, but is told by Turkish authorities that no evidence of the bank was found, and therefore the 10.1m sounding was duly removed.

2.2.3 Chart scale

The scale of a chart is the ratio of a given distance on the chart to the actual distance it represents on the earth. Charts are constructed on various scales from 1:2,500 to 1:14,000,000.

Large scale charts, normally less than 1:50,000, are used for harbours, anchorages and rivers.

Coastal charts, 1:50,000 to 1:150,000, are used for inshore navigation.

Large scale charts contain much more detail, and for this reason, mariners are advised to use the largest scale chart available for navigation.

British Admiralty chart 2286 and Turkish chart 2923 are scale 1:50,000, and are the largest scale charts available for "Charlie" anchorage. A larger scale chart would enable more soundings, and therefore more detail of the bottom topography to be shown. This in turn would also facilitate more accurate navigation, helping masters to make better informed decisions on where to safely anchor their vessels, and also allowing the navigator more space on which to plot regular positions and plan the passage safely.

Taking into consideration the increased size and draught of vessels that now transit the Turkish Straits, and the proximity of the anchorages to the coast and local shoals, the MAIB believes the 1:50,000 scale to be inappropriate for these busy anchorages.

2.2.4 "Charlie" anchorage

When the decision was taken in the late 1990s to designate the area "*Charlie* flammable cargo and explosives anchorage", a new survey was not undertaken. This was because the area had been used as an anchorage for many years and the Turkish Hydrographic Office had not received any reports or information regarding unreliable depths.

2.2.5 Changes to the seabed and decrease in charted water depth

In August 1999, the region suffered a strong earthquake, which resulted in major loss of life and which caused severe damage to coastal communities in the immediate vicinity.

Charlie anchorage is situated close to a geological fault line.

It is therefore possible that seismic activity during the 1999 earthquake altered the seabed to the extent the water depth was reduced to its current minimum 6.1 metres depth. However, research conducted after the accident has been unable to conclude whether this was the case.

The MAIB investigators also considered whether the bank was the result of spoil dumping. This seemed possible, especially as major construction projects have been completed in the vicinity in recent years. No evidence could be found to

support this theory, and local and national authorities discounted it due to the heavy restrictions placed on dredging operations by the state in Turkish waters. Illegal spoil dumping would also be unlikely to occur undetected because of the Turkish naval units which patrol the area.

2.2.6 Conclusion

It is possible the bank had been reduced due to the effect of strong local currents or seismic activity between 1879 and 1979, see Section 1.7. It is also possible that the present bank formed after the strong earthquake in 1999, see Section 2.2.5, or that the bank was not detected during the 1979 survey because of the limitations of the survey equipment then in use.

2.3 GROUNDING OF *BRITISH ENTERPRISE*

The draughts of *British Enterprise,* when departing C6 anchorage, were 10.76 metres forward and 11.17 metres aft.

When assessing how *British Enterprise* would depart from C6 anchorage, the master took into account the presence of other vessels which were anchored in C2 and C7 anchorages between 0.4 and 0.5 mile from his vessel.

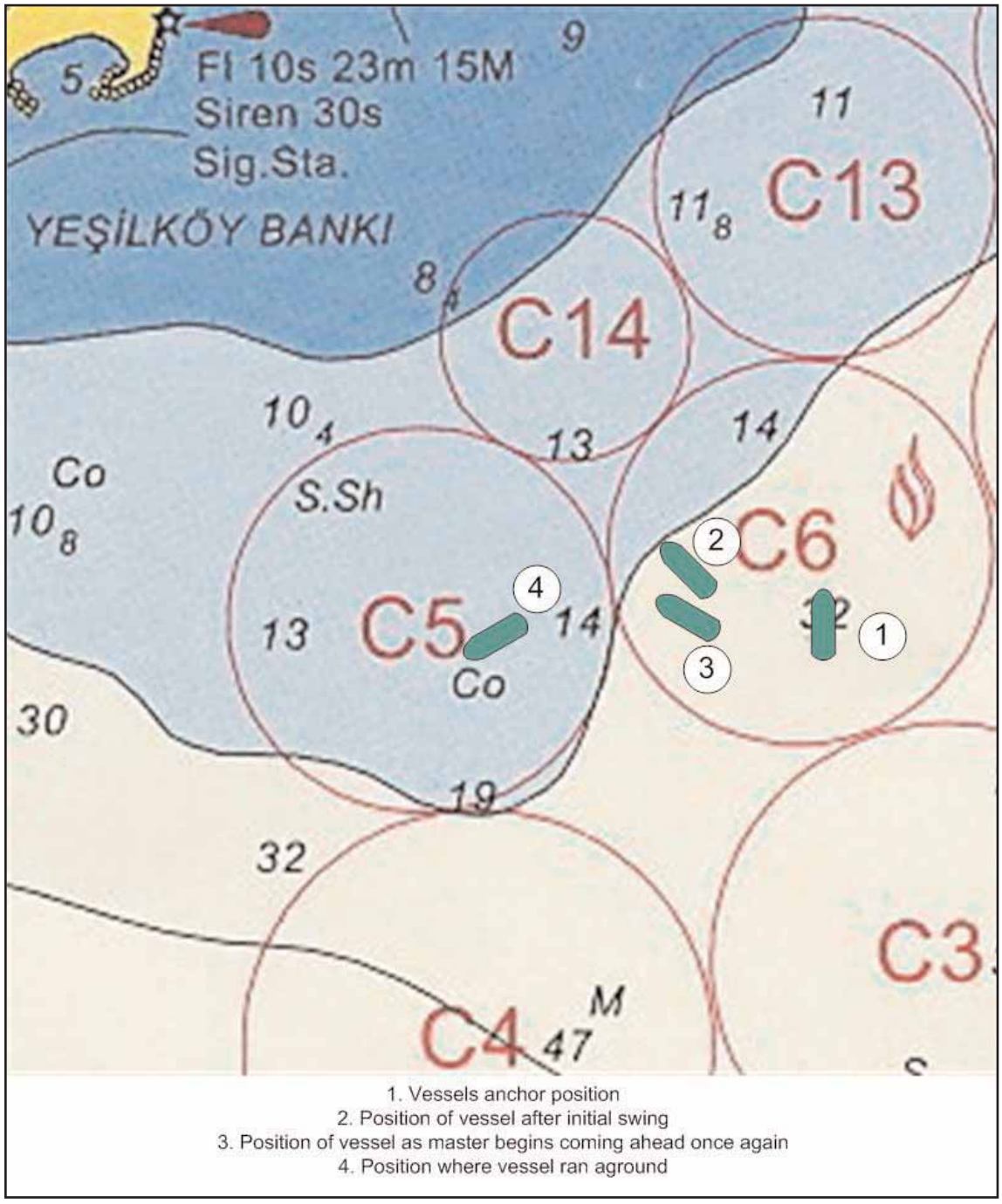
British Enterprise was lying to a moderate northerly wind, and the master elected to swing the vessel to port once the anchor was aweigh, rather than to swing her to starboard towards the other anchored vessels. Once the anchor was housed, he ordered the helm to be put hard to port, and the engine revolutions were increased to half ahead. The vessel's bow began swinging to port, but the fact that she was loaded and the stern was being pushed up into the wind, slowed the swing. The master elected to stop the vessel and manoeuvre her astern before continuing the swing to port, rather than approach too close to the shallows ahead and inshore. The master was fully aware of the vessel's position and the charted depth of water in the vicinity, and was allowing more sea room to safely complete his swing to port **(see Figure 25)**.

Once the vessel had been manoeuvred astern and the master was satisfied with his position, he ordered the helm to port again and the engine ahead to continue the swing. His intention was to cross C5 anchorage passing between the 14 and 13 metre charted soundings en route to the shipping lanes.

Bearing in mind the maximum draught of the vessel was 11.17 metres, it was concluded that it was not unreasonable for *British Enterprise* to proceed through C5 anchorage, as the vessel had a calculated under keel clearance of at least 15% of her draught. The ship managers' operational guidance was for masters to allow an under keel clearance of 10% of the draught in the approach to ports. The master had no reason to doubt the accuracy of the charted depths in such a busy anchorage.

The vessel grounded with little or no vibration and the master stopped the engine immediately he became aware her speed had reduced to zero. The engineers on watch in the engine room were not aware of the situation until the master informed them.

Figure 25



Vessel manoeuvres prior to grounding

The vessel's echo sounder was operating at the time with the forward transducer selected. No alarm setting had been entered and therefore the bridge team were given no warning that they were entering shallow water. In this situation it is unlikely that an echo sounder alarm would have given the master sufficient time to avoid the vessel grounding, however, it is good practice to use the warning features provided on bridge instrumentation including the echo sounder depth alarm.

When the vessel grounded, the master immediately implemented the company emergency contingency procedures, and then attempted to manoeuvre the vessel off the shoal using engine and rudder before any attempt was made to check the depth of water around the vessel. After about 30 minutes he realised the vessel was hard aground and he ordered the correct signals to be exhibited. He then reported the incident to the port state by informing the VTS.

National and international maritime rules and regulations require masters to inform the nearest coastal state **immediately** a vessel grounds. The master in this case first attempted to manoeuvre his vessel clear of the shoal, and only informed the VTS when he realised he was not going to be successful. The requirement to inform immediately gives the coastal state maximum time to arrange any assistance required by the vessel and to begin to put in place any measures that may be required to protect the environment. Delays in informing the coastal state may have serious consequences, and all mariners should be fully aware of their obligations to inform without delay.

Once the master had informed the VTS of the grounding, he decided to begin ballasting the vessel. He believed her starboard quarter was aground because she appeared to be listed to port and the echo sounder indicated 2 metres of water under the bow. He hoped that by taking ballast forward and to port, he would be able to refloat the vessel and manoeuvre her clear of the shoal.

In some grounding situations, it may be necessary to load ballast so as to stop the vessel being driven harder aground or, for example, to allow more time to evacuate crew and passengers from a vessel off a dangerous shoreline. Such action should only be taken after sounding round and very carefully considering all relevant factors including tide, wind, weather forecasts, nature of the seabed and the present danger to the vessel.

In *British Enterprise*'s situation, the decision to take ballast aggravated the situation by grounding the vessel more heavily. Had this caused structural damage to the vessel, the situation would have deteriorated further. An examination of the chart shows that the seabed in that area consists of sand, shells, and more importantly coral. By taking ballast, and increasing the displacement of the vessel, there was a danger that any coral under the vessel could have damaged the hull. The forces acting on a vessel aground are different to those of a vessel afloat, and therefore care must be taken when changing the stability condition and weight distribution of a vessel aground so as not to inflict structural damage or worsen any damage already caused.

Subsequent actions taken by the master, officers and crew in this difficult and protracted situation were professional and well co-ordinated. These actions included informing the UKHO of the discrepancy between the actual and charted depths which ultimately led to the publication of the Turkish notice to mariners advising other mariners of the unreported shoal in C5 anchorage.

2.4 PREVIOUS GROUNDINGS IN C5 ANCHORAGE

There have been at least two other groundings of vessels in C5 anchorage in recent years:

2.4.1 *Henza*

The Turkish flag bulk carrier *Henza,* on a voyage from the Black Sea to China, laden with 63,478 metric tonnes of fertiliser, grounded in C5 anchorage on 17 February 2003 **(Figures 26 and 27)**.

Figure 26

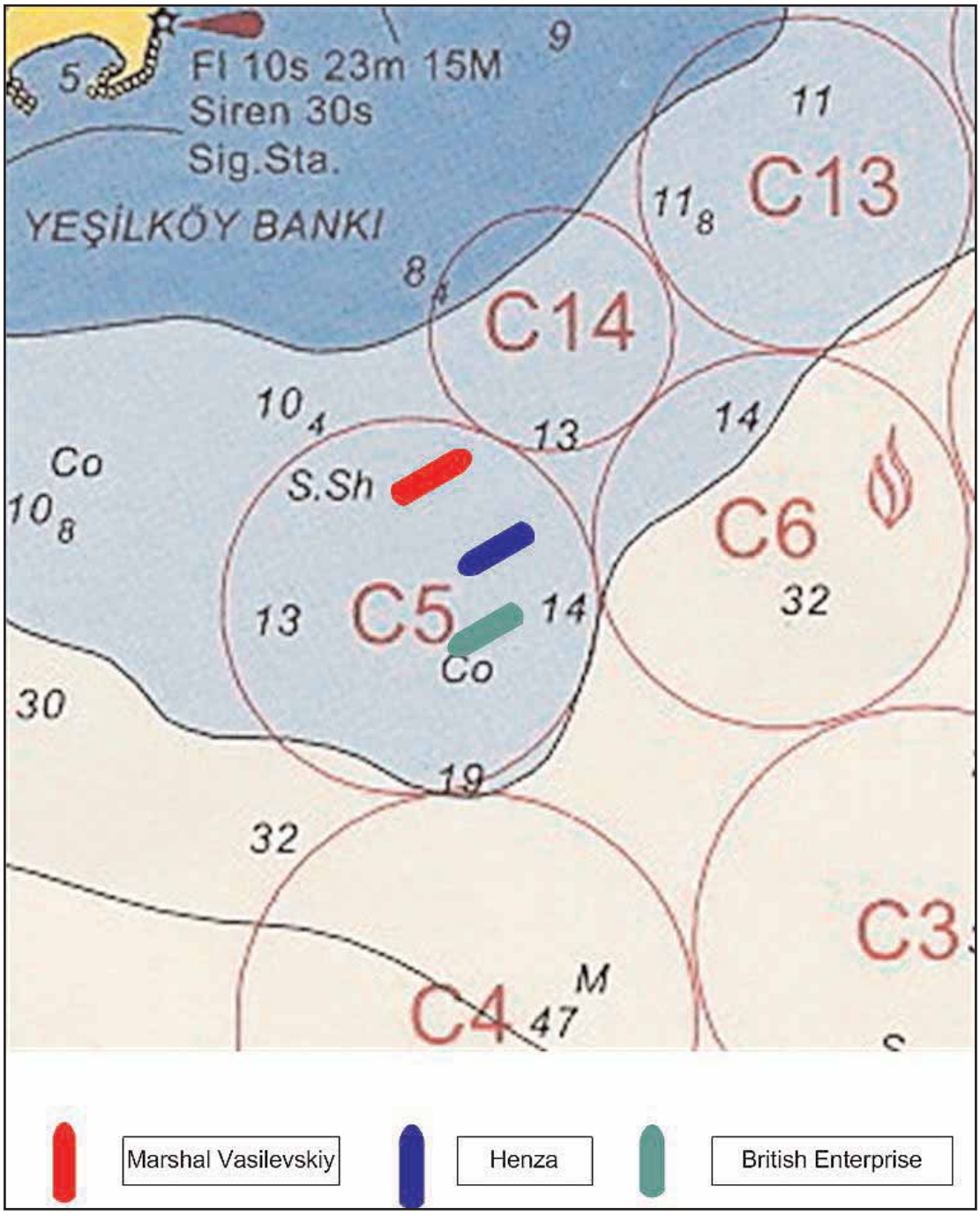


Chart extract showing three grounded vessels

Figure 27

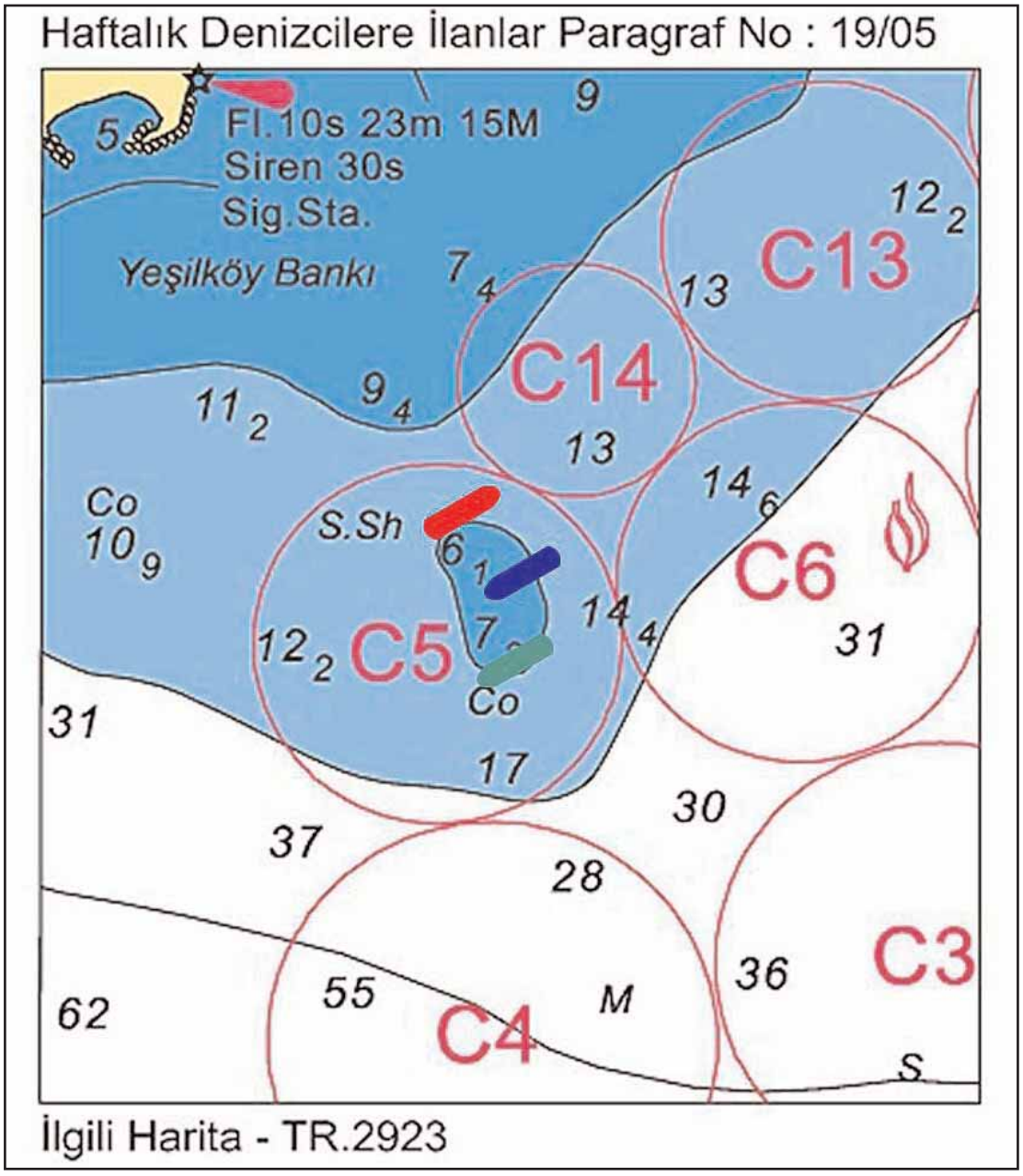


Chart extract showing three grounded vessels

An investigation into the grounding was completed by the port authority. The investigation concluded that, as the vessel had a maximum draught of 13.05 metres, and she grounded in an area with a charted depth of between 13 and 14 metres, the principal causal factors were the actions of the master and his navigating team. The investigation did not uncover any discrepancy between the actual and charted depths, therefore no re-survey of the area was made.

The vessel was aground for more than 3 weeks while the Director General for Coastal Safety and Salvage Administration salvors discharged 8,900 tonnes of cargo into lightening vessels to re-float her. The quantity of cargo unloaded equated to a bodily reduction in draught of about 1.43 metres, which should have suggested that the actual depth of water was considerably less than was charted.

2.4.2 *Marshal Vasilevskiy*

The Russian flag tanker *Marshal Vasilevskiy*, loaded with a cargo of 52,000 tonnes of heavy fuel oil, ran aground while heading on a course of 066º with her bridge in position 40º 56.965´N, 028º 50.785´E in C5 anchorage on 30 November 2001 **(see Figures 26 and 27)**. *Marshal Vasilevskiy* had a length of 242 metres and she had overshot her intended anchoring position. The vessel's draught was 11.88 metres and, whereas there was no sounding indicated at the precise grounding position, the chart gave the impression that a depth of about 13 metres could be expected.

The salvage of *Marshal Vasilveskiy* took approximately 7 days and was carried out by the state salvors.

The port authority investigated this accident and assessed that the cause was clearly navigational error and therefore no further investigation, including a survey of the seabed, were necessary. Again a valuable opportunity to identify this uncharted shoal was missed.

2.5 REPORTING INFORMATION CONCERNING HAZARDS TO NAVIGATION

Despite two previous major groundings on the bank in C5 anchorage in recent years, the existence of the bank was only reported after the grounding of *British Enterprise*, despite there being a discrepancy on each occasion between the vessels' draughts and the charted depth.

A large number of ships transit the Istanbul Bogazi and use the anchorages off the Port of Istanbul. Bearing this, and the large difference between the charted and actual depth in C5 anchorage, in mind, it is statistically highly likely that masters and pilots of other vessels have become aware of the shoal but have not reported it. They might have become aware of it after momentarily grounding, or by having noticed an anomalous depth indication on the echo sounder. Anecdotal evidence confirms this to be the case.

The International Convention for the Safety of Life at Sea SOLAS, 1974, Chapter V, Regulation 31, states that the master of every ship which meets with any of the following:

(a) Dangerous ice,

(b) A dangerous derelict,

(c) ***Or any other danger to navigation****,*

(d) Or tropical storm,

(e) Or encounters sub-freezing air temperatures associated with gale force winds causing severe ice accretion on superstructures,

(f) Or winds of Force 10 or above on the Beaufort scale for which no storm warning has been received,

is bound to communicate the information *by all means at his disposal to ships in the vicinity, and also* ***to the competent authority****.*

There is therefore an obligation upon masters to report hazards to navigation, such as uncharted shallow water hazardous to safe navigation, to a competent authority.

There are a number of reasons why masters (and pilots) might have elected not to report the existence of the shoal, including:

- Tankers are operated on notoriously tight schedules. Any delay is measured in decimals of an hour and can lead to the vessel being off-hire. Masters might have felt pressurised not to report the incident so as not to delay their vessel and incur penalties.
- It is possible that on realising there was no apparent damage to their vessel or risk of pollution they elected not to report the incident to avoid media interest and the possible reaction of the coastal state.
- It may be that masters did not wish to report an incident to protect their own and their crews' employment position.
- It might have been through negligence or apathy.

Whatever the reasons, the existence of the bank remained unreported for many years until the master of *British Enterprise* reported it to the UKHO. It is disappointing and dangerous that such reports have not been made. Although it is a master's obligation to report a hazard to navigation, any officer or crewman who believes inappropriate action has been taken in such a situation, may contact confidential hazardous incident reporting bodies such as the UK's CHIRP.

2.6 PROMULGATION OF INFORMATION CONCERNING HAZARDS TO NAVIGATION

SOLAS Chapter V, regulation 4 – Navigational Warnings as amended by Resolution A.706(17) states:

> *Each contracting government shall take all steps necessary to ensure that, when intelligence of any dangers is received from whatever reliable source, it shall be promptly brought to the knowledge of those concerned and communicated to other interested governments.*

The World-Wide Navigational Warning Service was established through the joint efforts of the International Hydrographic Organisation (IHO) and the International Maritime Organization (IMO) to co-ordinate global services for the promulgation of navigation warnings. These navigation warnings are used to inform mariners of dangers to navigation, and are often used to promulgate information prior to and while a notice to mariners is in the process of being issued and promulgated.

Navigation warnings are of three types:

a) NAVAREA warnings

In the context of NAVAREA warnings, the world is divided into 16 geographical areas. Each area has one authority designated as the area co-ordinator and is charged with ensuring long-range navigational warnings are properly collated and issued.

Among the subjects of such warnings would be newly discovered hazards to navigation in or near main shipping lanes.

b) COASTAL warnings

Coastal navigation warnings are issued for newly discovered hazards to navigation of a lesser direct importance to international shipping. They are promulgated to vessels/stations in the sea area surrounding the hazard. Among the subjects of such warnings are dangerous wrecks and amended shoal depths.

c) LOCAL warnings

Local navigation warnings are issued to supplement the coastal warning service. They usually refer particularly to inshore waters, and are often originated by coastguard, port or pilotage authorities, and they concern events inshore of the pilotage station which do not affect coastal navigation off the port.

Once *British Enterprise* was successfully re-floated, the VTS operators began to advise vessels, when they requested to provide an anchor position, to keep clear of C5 anchorage if the vessel's draught was more than 5 metres. The local authorities considered this was an effective method of warning mariners, as individual vessels were directly informed and other vessels in the area would become aware of the situation when overhearing the conversation while monitoring the port's radio frequency.

Apart from the warnings mentioned above, no other navigation warnings have been issued either by radio or Navtex concerning the uncharted shoal in C5 anchorage.

A decrease in charted depth, from 13 metres to 6.1 metres, in a busy, dangerous cargo anchorage is a significant danger to navigation and the environment. The MAIB believes the danger to be such that at least a formal local navigation warning, if not a coastal warning should have been issued and promulgated.

2.7 PROMULGATION OF INFORMATION BETWEEN HYDROGRAPHIC AUTHORITIES

The methods adopted for promulgating information between different national hydrographic offices varies widely. In some instances notices to mariners generated by one organisation are sent to all other relevant hydrographic offices which generate charts of the area. However, some hydrographic organisations expect others to monitor the notice to mariners they issue, to ensure their own charts are kept up to date.

In this instance, the UKHO received a Hydrographic Note from *British Enterprise*, and they duly forwarded the information to the THO on 20 December 2004.

After requests by the UKHO for situation updates, the THO informed the UKHO that they were going to issue a notice to mariners with a block update to their chart. This was issued on 29 January 2005.

A copy of all THO notice to mariners is sent to the UKHO, where they are translated, their content scrutinised, and the information re-promulgated as BA notices to mariners and/or added to UK charts as necessary.

The UKHO assessed the importance of the Turkish notice, and duly issued its own notice to mariners (1121/2005) on 3 March 2005 updating BA chart 2286.

Other national hydrographic offices and organisations also publish charts based on the Turkish hydrographic data for the area including Russia and the United States of America. US charts were updated by notice to mariners in April 2005, but the Russian chart of the area was not corrected until 13 August 2005.

The delay before chart updates appear on working charts, highlights the importance attached to issuing timely navigation warnings to keep mariners appraised of navigational hazards from the time that they are reported, see Section 2.6.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES

The following safety issues have been identified from the foregoing analysis. They are not presented in any order of priority.

1. The seabed topography in the vicinity of C5 anchorage was either very unstable or inaccurately charted. [2.2]

2. The 1:50,000 scale of the chart covering the anchorage area did not contain sufficient detail to allow masters to make informed decisions on anchoring positions and passage planning. [2.2]

3. It is possible that recent seismic activity may partially explain the discrepancy between charted and actual water depth. [2.2]

4. The echo sounder alarm was not active on *British Enterprise* as she manoeuvred in shallow water. [2.3]

5. The master did not inform the port state as soon as the vessel ran aground. [2.3]

6. Ballast was loaded in an attempt to re-float the vessel, despite the fact that those onboard had little or no information concerning the nature of the seabed or how the vessel was lying. [2.3]

7. At least two other serious groundings had occurred on the same shoal in the five years prior to this accident, yet the subsequent investigations had not discovered the shoal's existence. [2.4]

8. It is highly likely that other vessels have grounded on the shoal, or detected its presence, however, no reports of its existence had been received by competent authorities before this accident. [2.5]

9. Neither the VTS, nor the port authority, issued a formal local or coastal navigation warning regarding the hazard to navigation posed by the uncharted shoal in a busy anchorage within the port area. [2.6]

10. The information contained within the Turkish notice to mariners was not used to update Russian charts of the area until eight months after the accident. [2.7]

SECTION 4 - ACTION TAKEN

4.1 ACTION TAKEN BY BRITISH PETROLEUM SHIPPING LIMITED

- A note has been circulated to its fleet to remind officers to report any chart inaccuracies.

- A policy has been established that will ensure that an echo sounder display will be sited at the front of the wheelhouse clearly visible from the main conning position in all future new buildings.

- A cautionary note has been issued to its fleet which gives guidance with respect to ballasting a vessel that has grounded.

- Before granting permission for one of its vessels to bunker while on laden passage, a formal task risk assessment must be carried out by the vessel in conjunction with company marine and commercial superintendents.

- The company's Ports and Terminals team now review Lloyd's casualty data and other sources of industry information for any intelligence concerning navigation hazards.

4.2 ACTION TAKEN BY THE TURKISH HYDROGRAPHIC ORGANISATION (THO)

The THO has undertaken to:

- Publish a larger scale chart in 2006 covering Ahirkapi Anchorage areas off Istanbul.

SECTION 5 - RECOMMENDATIONS

The International Harbour Masters Association is recommended to:

2005/228 Remind its members of the importance of issuing appropriate and effective navigation warnings after new hazards to navigation have been reported, bearing in mind the protracted time that can elapse between discovery of uncharted dangers to navigation and promulgation of the appropriate chart updates by the relevant hydrographic organisation.

The International Federation of Shipmasters' Association and **The Nautical Institute** are recommended to circulate or publish a reminder to their members:

2005/229 To be aware of the importance of the chart source data, its age, and likely
2005/230 accuracy when operating with limited under keel clearance or in shallow water.

Of the obligation to report hazards to navigation, including inaccuracies in published charted depth, to the appropriate organisations.

Of the obligation to report to the coastal state if their vessel runs aground, as soon as practicable after the event.

To consider carefully the inherent dangers before ballasting any vessel which has run aground.

Marine Accident Investigation Branch
December 2005