PILOTAGE - PLAIN SAILING OR NOT IN TORRES STRAIT AND THE GREAT BARRIER REEF

1. INTRODUCTION

Ladies and Gentlemen - I am honoured to be invited to address such an august body as The Maritime Law Association of Australia and New Zealand. Most seafarers have a keen interest in maritime law but unfortunately, any improvement or widening of their knowledge in this field is generally associated with misadventure. A very large part of the ambitions of every Master Mariner and indeed of any pilot is to complete his career without being the subject of the dreaded Marine Court of Inquiry where generally the outcome is bad for the seafarer but rewarding for the lawyer!

On a less serious note professionally to the seafarer, the legal aspects of maritime commercial matters probably provides him with more day to day interests, yet his formal tuition in such matters is pathetically inadequate.

In the Congress brochure my paper is entitled "Pilotage - Plain Sailing in Torres Strait". This is certainly a true description of how a lot of my friends, who are not seafarers see life as a Torres Strait Pilot.

It is not my purpose today to deny that there are many enjoyable facets to the life of a pilot but I am sure this Congress will be more interested if I dealt with the problems and concerns in the everyday life of a pilot and I have therefore amended the title of my paper to read "Pilotage - Plain Sailing or Not in Torres Strait and the Great Barrier Reef".

2. BACKGROUND OF PILOT SERVICE

The Queensland Coast and Torres Strait Pilot Service has been operating with formally licensed pilots since 1884 - a period of 104 years of dedicated service to the international and local shipping industry. Before speaking on various topics and issues of the present time it is helpful and appropriate that I briefly describe the historical background of pilotage and navigation in the Great Barrier Reef.

The Torres Strait sea route became a reality for commercial shipping in the early 1800's. Navigable passages through the Great Barrier Reef had been discovered or explored much earlier by some of history's most famous seafarers : Torres in 1606 was the first known person to traverse Torres Strait. Cook, Bligh, Flinders and Jeffreys followed over 100 years later. Naval surveyors - King, Blackwood, Yule, Stanley and others then came and basic charts and sailing directions were soon available. The first ships to seek advantage of this short cut to Asia were sailing vessels from

Sydney bound for China, the East Indies or India. The complexities of the route made it extremely hazardous for these vessels of limited manoeuvrability. They generally chose to sail outside the Reef as far North as Raine Island entrance about 100 miles South of Torres Strait - enter the inner route at this point and proceed North and West through Torres Strait. Hundreds of known wrecks on the seaward approaches to Raine Island Entrance are evidence of the hazards experienced by these vessels.

In 1865 a two way steamship service between Brisbane and Batavia via Torres Strait was commenced. This service was under charter to the Queensland Government and the two small vessels were piloted by "Officers of the Government Service", presumably Queensland Government Naval Officers. The first known commercial pilotage along the Queensland Coast was in 1872 between Moreton Bay and Bowen.

In 1874 the Eastern and Australian Mail Steamship Company introduced a steamer service between Australian ports and the Orient via Torres Strait. Two master mariners - Captains Peake and Hannah both well experienced in reef waters were chosen to provide exclusive Reef pilotage services to E & A ships. Captain Peake performed the first documented full length pilotage in the Reef from Brisbane to Torres Strait onboard the S.S. Sun Foo on its inaugural voyage.

As E & A's pioneering shipping service expanded, steamers of other companies and nationalities began to make use of the route. Local knowledge became a commodity in strong demand. Men with Barrier Reef experience offered their services as pilots and were quickly engaged by shipmasters seeking guidance through a navigationally complex area, still only sparsely charted and lacking navigational aids.

In 1884 the Marine Board of Queensland introduced regulations for the operation of a coast pilot service. They provided for the issue of licences to "persons of approved competency", for the level of pilotage fees, and for other related matters. Six licences were granted on 5 August that year. These men were the first of more than 130 others in the ensuing century to provide the service as it is known today.

3. "CURRENT STATUS"

Each year about 1200 piloted ships pass through Torres Strait and about 400 through Hydrographers Passage and other Reef entrances and are serviced by some 40 licensed pilots. Approximately 70 million tonnes of shipping is handled annually. Administration of the Service is by Secretaries appointed by the Marine Board of Queensland in accordance with the Queensland Marine Act and the Queensland Coast and Torres Strait Pilot Service Regulations made under the Act.

Entry requirements to the Pilot Service are strict.

The regulations require candidates to be at least 25 years of age, possess a Foreign-going Masters Certificate (now known as Master Class I), to be experienced in the area and be subject to a medical and eyesight examination. In addition, the Pilot Service has its own requirement that a candidate has at least two years command time and be in command at the time of his application. The age range of successful candidates is generally between 35-50 years. Pilots are required to apply annually to their licensing authority, the Marine Board of Queensland, for renewal of licence. Prior to annual renewal of licence the Board may subject the pilot to a medical examination and renewal of eyesight certificates must be done every two years. The Marine Board of Queensland may also issue instructions to pilots in relation to safe navigation and other matters, conduct investigations into the conduct of pilots, and hear appeals by pilots on matters relating to the regulations.

A Code of Conduct for Pilots more stringent but similar in scope to the IMO Rules and Regulations for the Good Government of Deep Sea Pilotage in the North Sea and English Channel (IMO Resolution A486(XII) Adopted 19.11.81) has recently been introduced. Its provisions include:-

- Entry requirements
- Issue of Licence
- Scope of knowledge required

- Operational practices
- Information dissemination relating to - Marine Parks - Ausrep ship reporting system - IMO Recommendation on pilotage - Two Way Route in the Inner Route and numerous other items.
- Equipment to be carried by pilot (charts, publications)

The Pilot Service is consulted widely on matters relating to the Great Barrier Reef, to shipping generally and to pilotage. Frequent contacts at the highest level are maintained with such bodies as :-

- Marine Services Advisory Committee (Joint government industry group making recommendations on surveys, navaids etc).
- Great Barrier Reef Marine Park Authority; and
- International Maritime Pilots Association.

A Service representative is often requested to attend other meetings and conventions.

Before mentioning the Safety Record of the Service it is appropriate that I briefly cover its commercial structure. The Service itself is not incorporated and is non profit making. Pilots are individually licensed and in the last few years have been able to self incorporate if they so choose. Under the terms of the Queensland Marine Act pilots have immunity from pecuniary damages and this has been extended to pilot

companies. Earnings are on an individual basis and a rostering system is devised that allows pilots to earn evenly. The non profit concept of the Service supports the Service's genuine concern for safety of navigation and the environment within the area. Increase in piloted traffic merely means more pilots and does not advantage individual pilots earnings.

Safety Record : Only two ships have been lost while under the control of a licensed Torres Strait Pilot, both last century. In 1890 the British India steamer Quetta struck an uncharted rock in Torres Strait and sank, the pilot later being exonerated. The second casualty was the 900 tonne Australian steamer Corea which stranded on Eel Reef in the Inner Route in 1898. Compared to the hundreds of ships that have been lost in Great Barrier Reef waters in the last 100 years this record is laudable.

During the last 20 years there has been one serious casualty involving a piloted ship. In 1970 the tanker Oceanic Grandeur struck a rock in Torres Strait while under pilotage. About 4000 tonnes of crude oil was released. Damage to the surrounding reefs and the local pearl culture industry was extensive, most of it caused by the chemicals used to disperse the oil that nature was doing its best to disperse naturally. The pilot was exonerated because the depth of water over the rock was incorrectly charted. He was, rather, commended for his action following the accident which helped

to contain the spillage.

During this same period unpiloted ships have been involved in four serious strandings and several more minor strandings.

As previously mentioned, pilots are licensed by the Marine Board of Queensland and the area specified in the licence is for the "waters of Queensland Coast, Torres Strait and the area between Booby Island and Bramble Cay".

Keeping in mind that there have been changes in legislation (particularly Federal) since the format of this licence was devised it should be appreciated that pilots do have concern on the geographical extent of the "waters of the Queensland Coast". Being by nature men of caution their concern applied particularly to the strength of the Queensland Marine Act in providing immunity from pecuniary liability in an area which is up to 65 miles outside Australian Territorial Base Lines, but however within the "Great Barrier Reef Region" as proclaimed in the Great Barrier Reef Marine Park Act. In 1984 prior to the Service commencing operations at Hydrographers Passage the Marine Board of Queensland answering a query from the Service ruled that the existing licence adequately covered the forecast operation in that area.

A study of a map showing the territorial base lines of Australia (Appendix 1) indicates that a large proportion of waters of the Great Barrier Reef are undoubtedly classed as the "high seas" and particularly South of Cairns coast pilots are in fact piloting in these "high seas". Jurisdiction over coast pilots has been exercised without interruption by Queensland legislation since 1884, however when the Australian Governments Sea and Submerged Lands Act 1973 came into force, the question of continuing responsibility for coast pilots was raised. It is my understanding that in the absense of particular and detailed federal legislation it was agreed that amongst other traditional state maritime responsibilities (including port navigation and pilotage) that matters relating to coast pilots be left in the hands of the state. This was formalised I understand in 1980 when the Commonwealth gave the states title to waters up to 3 miles off their shorelines but retained responsibility for international negotiation with regard to these areas and also for the administration of the Great Barrier Reef Region through the Great Barrier Reef Marine Park Act.

The Torres Strait Area and Great North East Channel is subject to a Treaty ratified in 1985 between Australia and Papua New Guinea. Shipping movements through the area are unimpeded (Appendix 2); Torres Strait itself being regarded as an "international waterway". This will be seen later in this paper to cause difficulties in administering an acceptable level of safety

of navigation in this area. (Item 8 hereof)

The Torres Strait Route, as it has been known now for more than a century, constitutes the shortest safe shipping track between Australia east coast ports and the seaboard of Asia from Western Japan to Suez. In terms of importance if not in traffic volume it is one of the world's major shipping channels. Each year some 1700 oceangoing merchant ships take advantage of the route; ships of all nations engaged on a wide variety of trades.

However, Australia's northeast coastline is blockaded to some extent by a thousand mile long coral blanket. Ships wishing to take advantage of the substantial short cut that the Torres Strait Route provides between the Pacific and the Indian Oceans are obliged to pass through, or in some places across, the 80,000 square mile area of scattered reefs, rocks, islands and shoals that together make up the Great Barrier Reef.

Fortunately, there are several well surveyed shipping channels through the region, all adequately serviced by navigational aids. These channels are not dangerous, in the sense that ships are likely to strike uncharted hazards or might be dashed onto reefs or shoals by sudden unpredictable currents running at rates greater than the ship's speed. Certainly they are narrow in places, shallow in others, cluttered with fishing vessels and subject to varying strong tidal streams, but

they can be navigated in safety by any ship having competent officers, functional bridge equipment and access to the best, current local knowledge available.

It is unreasonable to expect the master of a ship to possess the detailed knowledge of a coastline enshrouded by countless reefs, rocks and other hazards for a thousand miles of its length. It is even more unreasonable to demand of him the intense concentration required to navigate his vessel through such an area over perhaps three or four days - and still retain a watching brief over the ship's everyday activities as his position requires.

When the unpiloted Eastern Argosy grounded in the Inner Route of the Great Barrier Reef in 1966 the Court of Marine Enquiry held in Hong Kong found the Master and Officer of the Watch negligent. An extract of the findings was:-

> "The decision to proceed without a Pilot was the Master's and the Court feels that he made the wrong decision bearing in mind the fatigue induced by twenty-four hours concentrated navigation in difficult waters following approximately ten days responsibility for the navigation of the vessel from Hong Kong to the entrance to the Great Barrier Reef. The Court does not consider it good practice for a vessel to proceed the full length of the Barrier Reef without the services of a Pilot which are readily available".

The Eastern Argosy was a case where General Average was declared and the fact that the master testified that it was his decision alone to proceed unpiloted

no doubt saved his owners from exposure to more substantial claims than could have been the case should they have influenced his decision or directly ordered him to proceed unpiloted.

For most of this century, this premise has received universal acceptance. Few ships ventured into the Barrier Reef without first securing the services of a licensed coastal pilot. Those that did were mostly of small or moderate size and engaged on regular, frequent voyages through the area and were manned by European officers - many of whom resided in Australia.

In the last ten to fifteen years, however, the scene has changed. There has been several separate but related developments:

- the volume of traffic has expanded;
- the boom in ship size has resulted in frequent investigations into the depth of channels as ship owners demand deeper and deeper transits;
- the whole of the Queensland coast is now a region of intense fishing exploitation. Channels are frequently obstructed by trawlers sometimes displaying incorrect lights and signals, and incurring other breaches of the International Collision Regulations; and
- the volume of unpiloted traffic has expanded, and with it an increase in strandings and near collisions.

The last of these presently causes the most serious risk to shipping and the environment. The reasons for it are many and varied and will be covered later in this paper.

Concern for shipping safety is universal among ship onwers, charterers, operators, cargo interests, maritime unions and organisations, governmental transport authorities and, marine underwriters. In the region in question there is an added matter of concern - the environment. Protection of this highly sensitive area from the risks of pollution arising from maritime casualties is a high priority with the Australian nation, reflected through its government, and with environmental organisations around the world. As the danger of pollution increases, so does the intensity of efforts to protect the region. Among the steps taken over the last decade are:

- establishment of Marine Parks;
- inclusion of the Great Barrier Reef on the World Heritage List;
- expansion of the shore-based navigational aid network;
- improvements to marine charts and the introduction of a two way route;
- extension of the Pollution Act to effectively prevent the discharge of oil anywhere in the Great Barrier Reef;
- recommendations by the Australian Government on the use of pilots;

- adoption by IMO of a recommended pilotage district.

One option open to the Australian Government which might appear to be the simple solution - the imposition of a compulsory pilotage district - has been considered carefully but rejected, for a number of reasons which will be covered later in this paper.

Easily the strongest of the steps listed is the IMO recommendation. The Great Barrier Reef is only the second such area in the world to be so designated. There is evidence of some compliance with the recommendation, but it is insignificant compared to the continued flood of unpiloted shipping. It is also of interest to note that there have been three strandings in the Barrier Reef involving unpiloted ships since the recommendation was announced; one a tanker in Torres Strait that had very serious potential for disaster.

One can only speculate as to the financial consequences of such a disaster. As well as damage to the ship - which would be paid subject to a successful claim against the underwriters - there will be the costs of pollution clean-up, loss of cargo, loss of income to the owner, charterer, shipper, underwriter and in some cases the ship's crew, all in amounts that vary directly with the severity of the casualty. The costs to shipping of a blocked channel defy estimation. Environmental damage could be horrendous.

4. THE MAIN SHIPPING ROUTES IN GREAT BARRIER REEF (Appendix 1)

INNER ROUTE

The Inner Route is the principal channel for ships trading between Australian east coast ports and the Asian seaboard from western Japan to Suez. Its southern entrance to the Great Barrier Reef is in the vicinity of the Tropic of Capricorn (near Gladstone). From there it follows the Queensland coastline northeastwards for about 1000 miles and exits at Booby Island at the western end of Torres Strait.

In many ways the route is like a giant river estuary; reasonably broad at its southern entrance and narrowing considerably as it proceeds northwards. The narrowest part for any ship unconstrained by draft is 0.6 miles in width (Appendix 6) off Goods Island in the Prince of Wales Channel (POW), the principal channel through Torres Strait. Ships constrained by draft, i.e. requiring a rise of tide to make a transit, are obliged to use a channel that is just 400 feet wide, at Gannet Passage, off Booby Island (Appendix 5).

Controlling depth for the route is 10.1 metres, at Gannet Passage. With tidal rises, pilots of the Queensland Coast & Torres Strait Pilot Service (QC&TSPS) will handle ships up to 12.2 metres on any day of the year. For most of the northern part of the route the depth is in the range of 15 to 30 metres. South of Cairns the depth increases to 30 metres and more. (Appendices 1, 2 and 5 to 16).

In general terms, for a northbound ship the navigation is relatively straightforward from the South as far as Townsville or Cairns, and increasingly intense from there onwards, through to Torres Strait.

GREAT NORTH EAST CHANNEL

The Great North East Channel runs for 162 miles from Booby Island in Torres Strait along the southern coastline of Papua New Guinea to Bramble Cay in the Gulf of Papua. It is used mostly by ships trading between ports in the Indian and South Pacific Oceans. The channel is similar in appearance and navigational complexity to the northern half of the Inner Route. Depths are in the range 15 to 30 metres with a controlling depth of 12.2 metres near Bet Reef (Appendix 11).

HYDROGRAPHERS PASSAGE

Opened for shipping in late 1984, Hydrographers Passage is a 60 mile long channel that cuts across the Great Barrier Reef in latitude 20 degrees south. It is used almost exclusively by large bulk carriers engaged on the coal trade from Central Queensland to the North West Pacific region. The outer section of the channel, over the last twenty miles, is narrow and subject to exceptionally strong tides that defy accurate rate and direction predictions. Controlling depth is 25 metres (Appendix 17).

PALM PASSAGE

Palm Passage is a 20 mile long channel across the Great

Barrier Reef in the vicinity of Townsville. It services the ports of Townsville, Lucinda and occasionally Abbot Point near Bowen. The channel is about five miles wide and reasonably straightforward to navigate. On the debit side, its landfall approach is not exceptionally good. Also ships approaching are obliged either to cross, or skirt around, a broad unsurveyed section of isolated reefs in the centre of the Coral Sea. Depths of about 30 metres are available (Appendix 1).

GRAFTON PASSAGE

Grafton Passage is a 10 mile long channel across the Great Barrier Reef in the vicinity of Cairns. It services the ports of Cape Flattery, Cairns, Mourilyan and Lucinda mostly, although it is not uncommon for a ship to use Grafton en route to Townsville or even Hay Point. It is about five miles wide with depths in excess of 30 metres (Appendix 1).

SURVEYS, CHARTS, NAVAIDS

Most of the area between the Great Barrier Reef and the Queensland Coast, plus the various shipping channels and the approaches to all ports have been surveyed to varying degrees of accuracy. In Torres Strait, saturation surveys have been conducted to an accuracy of plus or minus one decimetre.

Modern metric charts are available for the area from Townsville north, most to a scale of 1:150,000. A programme is in hand to metricate the charts of the

southern areas. The chart of Prince of Wales Channel in Torres Strait is drawn to a scale of 1:37,500.

A "Two-way Route" is depicted on the current metric charts running continuously from Booby Island in Torres Strait to Low Isles near Cairns. A printed legend on each chart makes clear that the route is not a traffic separation zone and its use is not mandatory. It simply indicates "the best route for ships of moderate draft (up to nine metres) having regard to charted depths and dangers".

The Two-way Route legend states:-

1. The two-way route shown on this chart is not mandatory and it is not a traffic separation zone. The International Regulations for Preventing Collisions at Sea 1972 apply equally to all vessels whether navigating inside or outside the two-way route.
2. The two-way route indicates the best route for vessels of moderate draught (up to nine metres) having regard to the charted depth and dangers. Larger vessels constrained by draught may be encountered in the two-way route and in its vicinity in certain areas.
3. In accordance with the Safety of Life at Sea convention 1974 all vessels should maintain a listening watch on VHF Channel 16.
4. The symbol (<— — — >) indicates that traffic is free to move in both directions along the route.

All the shipping channels in the Great Barrier Reef are serviced by adequate network of shore-based navigational aids installed and maintained by the Australian Government's Department of Transport and Communications. Landfall lights at Hydrographers Passage, Grafton Passage and the Great North East Channel are long range and are fitted with dual band racons. Booby Island is equipped with a 26 mile range light and RDF beacon. Throughout the northern part of the Inner Route light beacons have been established at reasonably short spacings on strategic hazards; more than 50 lighted beacons or buoys over the northern 400 miles of the Inner Route.

In Torres Strait telemetric tide gauges transmit tidal heights at four strategic locations at short intervals, three over VHF channels, one over the Booby Island RDF transmitter. It can be said without hesitation that the entire area is well equipped with navigational aids and that most areas are adequately surveyed and improvements to surveys are continually being carried out as facilities allow.

Apart from draft in restricted areas, which in turn necessitates reduced speed, there are no other size or speed restrictions on vessels and it is customary for ships of any length, beam or tonnage to traverse the route in safety at "full sea speed".

5. PROBLEMS FOR PILOTS

5.1 Adverse weather -

For the most part the weather through the Great Barrier Reef is good. The problems associated with bad weather generally relate to the cyclone season from December to April when destructive winds and seas have foundered many small vessels over the years. For oceangoing vessels the dangers in cyclonic weather are more from the reduced visibility in restricted waters than from heavy seas. Persistent strong winds of about 30 knots in the South East or Winter season cause sea haze which sometimes reduces visibility to 3 miles can also prove of concern to larger vessels. Small objects such as yatchs, fishing vessels, other small craft and some navigational beacons are difficult to sight in these conditions.

5.2 Navigational hazards -

In the eyes of a pilot these come in varying forms - geographical, geological, structural, mechanical and human are but a few, however I shall deal with the more obvious ones.

5.3 Narrow Channels -

The International Regulations for Preventing Collisions at Sea 1972 were drawn up at a conference sponsored by the International Maritime Organisation and brought into force 15 July 1977 and have been amended by further IMO Resolutions up to 1 June 1983 and may soon be further amended at the next General Assembly of IMO.

Rule 18(d) i and ii being a case in point covering vessels limited in their ability to manoeuvre due to deep draught.

The term "narrow channel" is not defined in Rule 3 (Appendix 3) under the general definitions and we must therefore assume the term to be open to interpretation and possibly non defineable. This causes great concern and wonderment amongst the practioners of the art of seafaring and pilotage in particular because there is a substantial amount of instruction in Rule 9 (Appendix 3) on the conduct of vessels in narrow channels or fairways. Mention is also made in the Colregs about the need to avoid "close quarters situations" however this undesirable situation is neither quantified or defined causing even more wonderment amongst simple sailors. There are cynics amongst mariners that believe this is done on purpose by lawyers to provide an inexhaustable supply of conditions which could provide them with sustenance to the end of time.

Perhaps the most erudite interpretation made of the term "narrow channel" was some 22 years ago following a collision in Sydney Harbour between a French vessel the Velay and the Australian bulk carrier Iron Flinders, both having pilots onboard at the time. It was considered by the Judge at that time that a narrow channel was one in which a vessel could not reverse her course by the action of the rudder alone. I understand precedents for this opinion are recorded in Marsden.

This interpretation seems such a logical uncomplicated one that it is surprising it is not better known and made use of, even allowing for the fact, that what would be a narrow channel for one vessel, may not be for another smaller and more manoeuvrable vessel. Considering the sluggish manoeuvrability of vessels in shallow water it would be reasonable to assume the average turning circle of .5 mile for large ships traversing the Great Barrier Reef to be increased to between 0.7 and 1.0 mile in shallow water with probable conditions of wind and some tidal influence (Appendix 4). Allowing for a distance apart of 0.2 miles for two opposing vessels to pass clear of each other in a mid channel area it could be reasonably said that a narrow channel for the average ship in the Great Barrier Reef would be at least 2.0 miles width of navigable water. If one accepts this reasoning, there are eleven such areas along the inner route of the Great Barrier Reef between Cairns and Booby Island to be regarded as narrow channels and two in the Great North East Channel between East Strait Island and Bramble Cay. Also at Hydrographers Passage seaward end where there are maximum widths of less than 1.5 miles in two places (Appendix 17). Along the inner route some of these are restricted to an effective width less than 1.0 mile. In one area near Goods Island in the Prince of Wales Channel this is 0.6 mile (Appendix 6) and in the Gannet Passage close to Booby Island recent surveys indicate the channel for deep draught is merely 400 feet wide (Appendix 5). In the Prince of Wales Channel where a deep draught vessel is constrained there are three areas of between

2 and 1.2 cables, 1200 and 720 feet respectively in width. (Appendices 6, 7 and 8)

It may be appropriate to mention at this point that it is usual for harbour authorities to insist on dredged channels being at least 3 times the width of the maximum beam of ships using that channel, on a one way no passing basis. Relating this to Gannet Passage confirms pilots concerns that in requiring a one way no passing situation in that area, they cannot be certain of achieving this in the present circumstances of unregulated non piloted vessels. For the sake of comparison it is interesting to note that the width of dredged channel in Gladstone is 600 feet marked by pairs of beacons and traffic controlled.

Before proceeding to the hazard of shallow water I would like to cover the manoeuvring information available to pilots/mariners on any particular vessel. (Appendix 4). Trials are done in both ballast and loaded conditions in deep water, little wind and no current. Data from these trials is displayed on the ships bridge together with warnings that any variation to these conditions could substantially alter the data. This could occur through any single one or any combination of the following:-

An intermediate load condition;

Trim different to trial condition;

Greater wind component;

Any tidal component; and

Depth of water less than twice the ships draught. (Appendix 4).

The last item in particular has a severe effect on a ships turning circle.

Assessment of the manoeuvring ability of any vessel is one of the most difficult tasks faced by a pilot and this brief explanation should assist in appreciating the figures quoted for turning circles in narrow channels and shallow water.

5.4 Shallow Areas

Shallow areas, where ships are required to either wait for sufficient tidal rise, proceed at reduced speed or deviate from the usual track and not favour the starboard side of the channel exist in three places in Torres Strait (Appendices 5, 6 and 7), two more along the Inner Route (Appendices 9 and 10) and one in the Great North East Channel (Appendix 11).

Keeping in mind that vessels of up to 12.2 metres draught may be piloted in the area and that low water depths of 10.1 metres at Gannet Passage (Appendix 5) and 11.2 and 11.6 metres in the Prince of Wales Channel exist (Appendices 6 and 7), it is obvious that great attention must be paid to ensuring sufficient tide to maintain safe under keel clearances.

Considering what has been said on the subject of narrow

channels and shallow areas it is patently obvious that Colregs Rule 3(h) "vessel constrained by her draught" - Rule 9 "Narrow Channels" and Rule 18(d) i and ii are of great concern to pilots in the Great Barrier Reef (See Appendix 3).

5.5 Unpiloted Ships

Most navigators of unpiloted ships are unaware of the restrictions on deep draught ships in certain areas of the Great Barrier Reef. As a result they fail to appreciate the deep ships problems or the fact that in some cases it is severely restricted in its ability to comply with the collision regulations. (Appendix 3). When this occurs in other parts of the World "Traffic Control Measures" are introduced. In this area there is a mutually accepted form of traffic control between pilots by use of VHF radio but a danger exists when unpiloted ships and other small vessels such as fishing boats are involved.

The qualifications, experience and seamanship of many deck officers - including the masters - of flag of convenience ships is in most cases alarmingly inadequate. A convention for the Standards of Training and Certification of Watchkeepers was adopted by IMO 28 April 1984 and this aimed to have all signatory states agree to the minimum standards set out in the document. The state of Panama which has one of the Worlds largest fleets in its register is not a signatory to the S.T.C.W. convention and there are other states which

have signed but pay little heed to observing the spirit of the convention. Observed behaviour of some of these mariners casts doubts on their ability to handle difficult or emergency situations in clear waters let alone the confined waters of the Great Barrier Reef.

One of the skills of piloting as different to navigating is to know at all times how far a ship may deviate from a pre determined track rather than navigate strictly along it. Licensed coast pilots must be able to do this and in fact before being granted a licence must have sufficient knowledge to enable them to conduct a vessel anywhere in the pilotage area without reference to a chart.

5.6 Fishing Vessels

In the last decade the Great Barrier Reef has been well frequented by prawners. In the winter months there may be several hundred boats operating in the area. Some of these concentrate their fishing in the Inner Route and the Great North East Channel throughout the season whilst others commence work in the Gulf of Carpentaria and fall back on the Inner Route if the fishing is poor.

It is an unfortunate fact that the vessels engaged in this trade are in some cases inadequately manned, both in respect to crew numbers, qualifications and experience. In more recent times there has been some improvement in this regard due to increased concern

and action by regulatory authorities. Nevertheless it is well known that the wheelhouse is unattended for considerable periods when fishing - all hands being engaged on deck. These boats fish with impunity all over the Great Barrier Reef subject only to any zone restrictions by the Great Barrier Reef Marine Park Authority. They work in and around many of the main shipping routes and frequent at least 4 areas mentioned earlier as being narrow channels for large vessels and those restricted by draught. (See Appendices 9, 10, 11, 12, 13 and 14) If the interpretation of narrow channel given earlier in this paper is accepted then there are frequent and blatant breaches of Colregs Rule 9 (c) (Appendix 3) by fishing vessels in these areas. There have been several collisions between merchant ships and fishing vessels in the last few years and many more close calls that were rendered innocuous only by the skills of the pilot on the ship. Reports of misdemeanours by fishermen are voluminous but the range of offences would include:-

5.6.1. Not abiding by the "Rule of the Road";

5.6.2. Failing to show the correct lights and shapes (or smothering them with powerful working lights);

5.6.3. Fishing in the middle of shipping channels at strategic and narrow course alteration points;

5.6.4. Failure to communicate on VHF when called, or bad VHF procedures which confuse visual identification of that particular vessel;

5.6.5. Failure to maintain a proper lookout.

Most of the above offences are direct breaches of the International Regulations for the Prevention of Collisions at Sea.

The incident of the collision between the fishing vessel "Pelorus" and Tiruna off Cape Flattery in 1982 has provided substantial material for thought by mariners. The Pelorus proceeding Northwards and running free ran down and sank the Tiruna which was fishing and proceeding slowly on a similar course. The incident occured on a clear dark night.

At a Marine Court of Enquiry held in accordance with the Queensland Marine Act conducted by a Magistrate, the skipper of the Pelorus had disciplinary action taken against him for negligence. Later in the Supreme Court of Queensland where a civil action for damages was heard, the Judge in his findings considered the exposure of the bright working lights on Pelorus had not contributed to the collision, yet conceded they were in breach of Rule 20(d) of the Colregs. Items 5.6.1., 5.6.2., 5.6.3., 5.6.4., and 5.6.5. mentioned previously all occured in this incident.

5.7 Unpiloted Shipping

Commercial Aspects and Casualties :

Commercial Aspects - Prior to the adoption of the IMO Recommendation on pilotage in the Great Barrier Reef it was estimated that the non piloted traffic had incre-

ased from 9.8% in 1978/79 to 23.9% in 1985/86. This increase was also in line with the increase in flag of convenience vessels manned by nationals of countries which had little maritime background, poor training and little experience.

When considering the reasons for not employing a pilot, there is firm evidence that shipmasters are financially induced or coerced by their owners or charterers and sometimes agents to transit the Great Barrier Reef without pilotage assistance. Rarely do masters make this decision on their own. The persuasion is applied regardless of whether the master in question has any experience of the Great Barrier Reef, or indeed of any reef navigation at all. Exacerbating the problem is the fact that there is often some disputation between owner and charterer as to who is liable to pay the pilotage account. Bad debts for pilotage services, particularly with FOC ships have occured.

Inducement often takes the form of a sum of money in the hand. The going rate is usually 50% of the gazetted pilotage fee: but this is the basic fee and does not take into consideration such elements as tonnage or draft surcharges, factors introduced to spread the level of fees more equitably across the shipping spectrum.

Coercion can take several forms; from direct instruction to requests, to suggestions that the ship might not be re-chartered. Occasionally it is neither direct-

ly verbal nor written, but implied.

There have been many occasions when ships masters have said to the pilot - "Why isn't the pilotage compulsory when the recommendations are so strong? It would make it so much easier for the Master." Charter parties have only recently shown some signs of including pilotage costs in "non compulsory areas" to charterers accounts. When considering this topic it is well to keep in mind the vast numbers of ship owners who are merely nominal and the vessel is in fact owned by all kinds of obtuse interests that have little knowledge of maritime matters or in the practice of good seamanship or ship management. The short term bottom line being the limit of their horizon.

5.8 Boarding and Landing from Vessels -
Helicopters and Launches

A study of the Chartlet of Queensland (Appendix 1) showing the territorial base lines and areas of operation of coast pilots reveals that boardings and landings occur outside harbour limits almost without exception and outside Territorial Limits in at least 5 areas.

Two papers by Mr M W D White and Mr D R Boughen respectively representing the Maritime and Aviation Law Societies; were presented at an International Maritime Pilots Association Congress, Gold Coast Queensland February 1988. These papers dealt admirably with the points of concern to pilots involved with offshore

transfers.

5.9 Consequences of the wrong decision

Every pilot lives in the knowledge that a decision by him, possibly made in a fleeting second or two, if wrong could have the most catastrophic results. Most pilots who are formally licensed enjoy some form of protection from pecuniary liability but the weight of responsibility lies heavily on their shoulders. Ships and cargoes worth 100 million dollars are not unheard of these days - ships which are potential explosive or toxic bombs - ships having many hundreds of lives onboard are the constant concern and responsibility of pilots.

6. RECENT CASUALTIES OF UNPILOTED SHIPS

6.1 TNT Alltrans

This Australian vessel grounded on Lady Musgrave Island on 25 March 1985 and the severity of the casualty resulted in a Court of Marine Enquiry. Whilst the position of grounding was within the area of pilots operations it would be unrealistic to consider any pilot would have been justifiably engaged on that voyage which was from Gladstone towards the open sea and New Zealand.

6.2 Maritime Gardenia

On 18 August 1985 the 11,725 t.d.w. Liberian flag cargo ship Maritime Gardenia ran aground in Torres Strait while on a voyage from Newcastle, NSW to Malaysia.

The ship passed on the wrong side of a buoy and grounded on Alert Banks, causing hull damage. Seven double bottom tanks, three of them fuel oil tanks, were breached.

An unknown amount of oil was released. The ship was refloated several hours later after being boarded by a Torres Strait Pilot. The pilot took the ship to an anchorage at the western side of Torres Strait. After temporary repairs the ship was towed to Singapore.

At the preliminary inquiry by the Australian Department of Transport the conclusions were that the accident had been caused by human error. The master was criticised for failing to give proper instructions to the officer of the watch before leaving the bridge, and for failing to return to the bridge in time. The third officer failed to use all navigational aids to determine the ships position. No allowance had been made for the tide. The master's decision to proceed without a pilot, the report said was "ill judged".

Matters relating to the Maritime Gardenia are presently the subject of litigation in Singapore and a point being considered is the question of coercion for the master to proceed unpiloted.

Unbelievably, when this vessel returned to Great Barrier Reef waters early in 1986, the transit was made without a pilot.

6.3 Baupre Island

In 1983 the 9,528 t.d.w. Panamanian livestock carrier Baupre Island, laden with live cattle, grounded for an unknown length of time on Quake Reef, about 200 miles south of Cape York. There was no report from the ship concerning the grounding, which probably would have passed undetected if a piloted ship had not passed by. Offers of help from the piloted ship were rejected. Again, this vessel later returned to Great Barrier Reef waters and proceeded unassisted as before.

6.4 Mobil Endurance

On 24 July 1986 after the announcement of the IMO Recommendation on pilotage in the Great Barrier Reef the 33,235 t.d.w. Liberian tanker Mobil Endurance, transitting Torres Strait unassisted, passed on the northern side of a buoy having a clear characteristic to indicate deep water of the southern side, and touched bottom. The ship was holed forward and proceeded on its voyage to Port Moresby without reporting the incident to Australian authorities. The ship entered Port Moresby harbour where the Harbour Master noticed she was distinctly by the head.

Amazingly, despite several Australian recommendations on pilotage for laden tankers, and this incident, some loaded Mobil tankers continued to proceed through Torres Strait unpiloted. Recently this practice has ceased.

6.5 Alam Indah

On 3 September 1986 again, after the IMO announcement

the 15,136 t.d.w. Malaysian cargo ship Alam Indah, on her way to Mackay to load sugar, stranded for several hours on Chapman Reef. She was refloated apparently without suffering severe damage.

After a preliminary enquiry in Mackay, at which the master was informed by Australian authorities about the IMO resolution, the ship took a pilot for the north bound voyage. However, on its next voyage no pilot was requested, either southbound or northbound. Since that time the ship has been regularly employing a pilot.

6.6 Ming Xi Hai

Early in 1987 this Chinese vessel grounded on the seaward side of the Great Barrier Reef to the South East of Hydrographers Passage whilst enroute to a central Queensland Coal Port. Misunderstanding of the reliability of information portrayed on the chart reflected a poor level of knowledge in this field. This vessel was literally planning to sail across the coral barrier and so avoid use of Hydrographers Passage where an IMO Recommended Pilotage was available.

6.7 Oak Pearl

Registered in Liberia this vessel grounded in October 1987 in similar circumstances to the Ming Xi Hai.

6.8 Rica Challenge

This Cypriot vessel grounded in Piper Reef in the Inner Route about 140 miles South of Torres Strait.

7. RECOMMENDATIONS TO USE PILOTS

The sequence of recommendations is as follows:-

Department of Transport recommendations :

DOT's Marine Notice No 4/1979 included the following recommendation, which now appears annually in the Torres Strait Tide Tables:

> "... that masters who are not familiar with these waters and in particular masters of vessels with limited under-keel clearance embark a pilot of the QC&TSPS for passage through Torres Strait and the Great Barrier Reef."

In 1983, at DOT's initiation, a working group was established to study "Navigational Safety in Torres Strait". Represented on the working group was DOT, the QC&TSPS, and the Hydrographic Service of the Royal Australian Navy. The group made several recommendations concerning navigational aids, tidal data and hydrographic surveys in Torres Strait, plus a recommendation that

> "The Department should encourage a greater use of pilots to reduce the risk of groundings and collisions."

In 1984, when it compiled its Sailing Directions for the newly opened Hydrographers Passage, DOT included the following recommendation:

> "The Commonwealth Department of Transport strongly recommends that all vessels engage the services of a pilot for transit of Hydrographers Passage."

As a follow-up to the IMO recommendation on pilotage in the northern section of the Inner Route, Great North East Channel and Hydrographers Passage, DOT has recommended that masters who are not familiar with the other areas of the Great Barrier Reef region, including Grafton and Palm Passage, use the Pilot Service. It further recommends that all vessels, not just those nominated in the IMO recommendation, take a pilot through Hydrographers Passage.

IMO recommendation :

As a direct result of the findings of the working group on safety in Torres Strait, DOT took up the task of making a submission to IMO on recommended pilotage in Great Barrier Reef waters. It was prompted in this by Det Norske Veritas risk analysis study, which showed the increase in risk of accidents in an area covered by an IMO recommendation, as against a compulsory district, to be fractional.

In its application to IMO the DOT stressed the Great Barrier Reefs inclusion on the World Heritage List, the difficulties of navigation in Reef waters and the attendant risks to the delicate coral ecology in the event of a grounding or collision. It was supported in its submission by the Australian Chamber of Shipping and also by shipping interests engaged in the Australian trade.

The matter was placed on the agenda at a meeting of

IMO's Maritime Safety Committee in London on 8 February 1986 and was passed without dissent. The proposal was ratified in November 1987 at the 14th IMO General Assembly. The wording of the resolution is that IMO

> "recommends that ships of 100 metres in length and over, and all loaded oil tankers, chemical carriers or liquified gas carriers irrespective of size, use the pilotage services provided by the Queensland Coast and Torres Strait Pilot Service when navigating in the Torres Strait and inner route of the Great Barrier Reef between Booby Island and Latitude 16 40'S, or through the Great North East Channel, or Hydrographers Passage."

Considering the strength of these recommendations an interesting point to consider is the view of the law in the event of misadventure or a casualty where these recommendations have been disregarded.

8. COMPULSORY PILOTAGE

While the issue is not absolutely clear, it would appear that the Australian Government possibly has the power to impose a compulsory pilotage district in part or all of the Great Barrier Reef region.

Taking into consideration the Law of the Sea Convention, (which gives a coastal state certain powers with regard to the protection and preservation of the marine environment), the Exclusive Economic Zone (declared in respect of fishing and oil pollution), the World

Heritage listing, and the Great Barrier Reef Marine Park Act, there may be sufficient mandate for the Government to act in this regard if it wishes.

The Australian Government has been subject to some pressure to make such a declaration, from conservation organisations particularly, from a parliamentary committee on oil spills, and even from the Parliamentary Committee on Public Works and sectional interests in Parliament.

The points in doubt are the international validity and the international acceptance of such a declaration. One argument against a declaration of this type is that it is an erosion of the freedom of navigation on the high seas, a freedom recognised in the Law of the Sea Convention.

An interesting and pertinent development is the recent declaration by Chile of a compulsory pilotage district for the Straits of Magellan, as from 1 December 1986. This has been imposed for safety reasons; justification for the imposition being cited as the currents and tides in the narrows, heavy tanker traffic, and the network of oil rigs in the strait which reduces the width of the channel to 13 miles. The 13 mile width in Magellan Strait makes an interesting and telling comparison with the 0.6 mile wide channel in Torres Strait or, for deep draft ships, the 400 foot wide channel at Gannet Passage.

Ramifications of a compulsory pilotage declaration:

The Australian Department of Transport and Communications (DOTC) which has studied the question of compulsory pilotage in Great Barrier Reef waters in detail, admits it is concerned as to the effects such a declaration would have on other countries. Seeking support from other countries for the imposition of a compulsory district might encourage those states to take similar action for areas that are not as navigationally complex as the Great Barrier Reef - and expect Australia to give its support to them.

DOTC has in the past made the point that, even if a declaration were legally achievable, the Government does not necessarily support the concept. At this stage it appears the Government is pinning its hopes on the efficacy of the IMO recommendation. It is clear from varying statements and actions by DOTC on this matter, however, that it is determined to do everything possible to prevent damage to the Great Barrier Reef from maritime casualties. DOTC unreservedly recommends the use of pilots, but if voluntary compliance is not evident and compulsory pilotage is necessary it may well be implemented.

There is possibly a quite ugly scenario to the imposition of compulsory pilotage. Legislative compulsion must inevitably be supported by penalties for offenders. A system of policing the legislation would have to

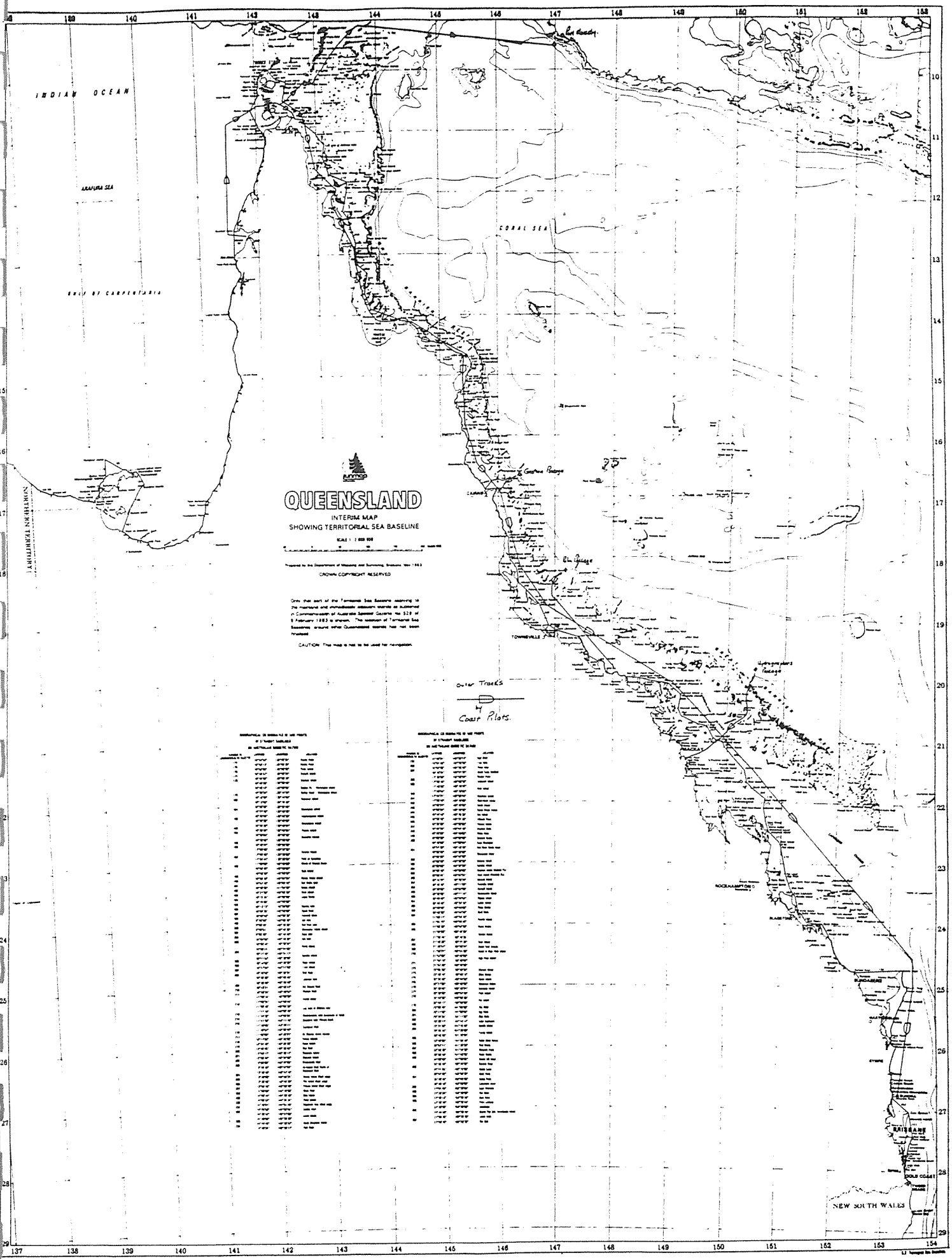
be introduced. The costs of a 500 mile long radar based Vessel Traffic Service system - which would have to be passed on to the user, i.e. ships using the route - would be collosal. The nationalisation of the Pilot Service may also be a possibility. At the moment, the QC&TSPS is run by one man, assisted by one other and two or three office staff. Administrative costs are minimal. As well, pilots do not belong to a union, and work whatever hours are necessary to do the job. The effects of a bureaucracy and unionised manning on pilotage costs would be horrendous. This scenario could be modified considerably depending upon the amount of present administration and privatisation that could be left intact by the legislators and bureaucracy.

9. CONCLUSION

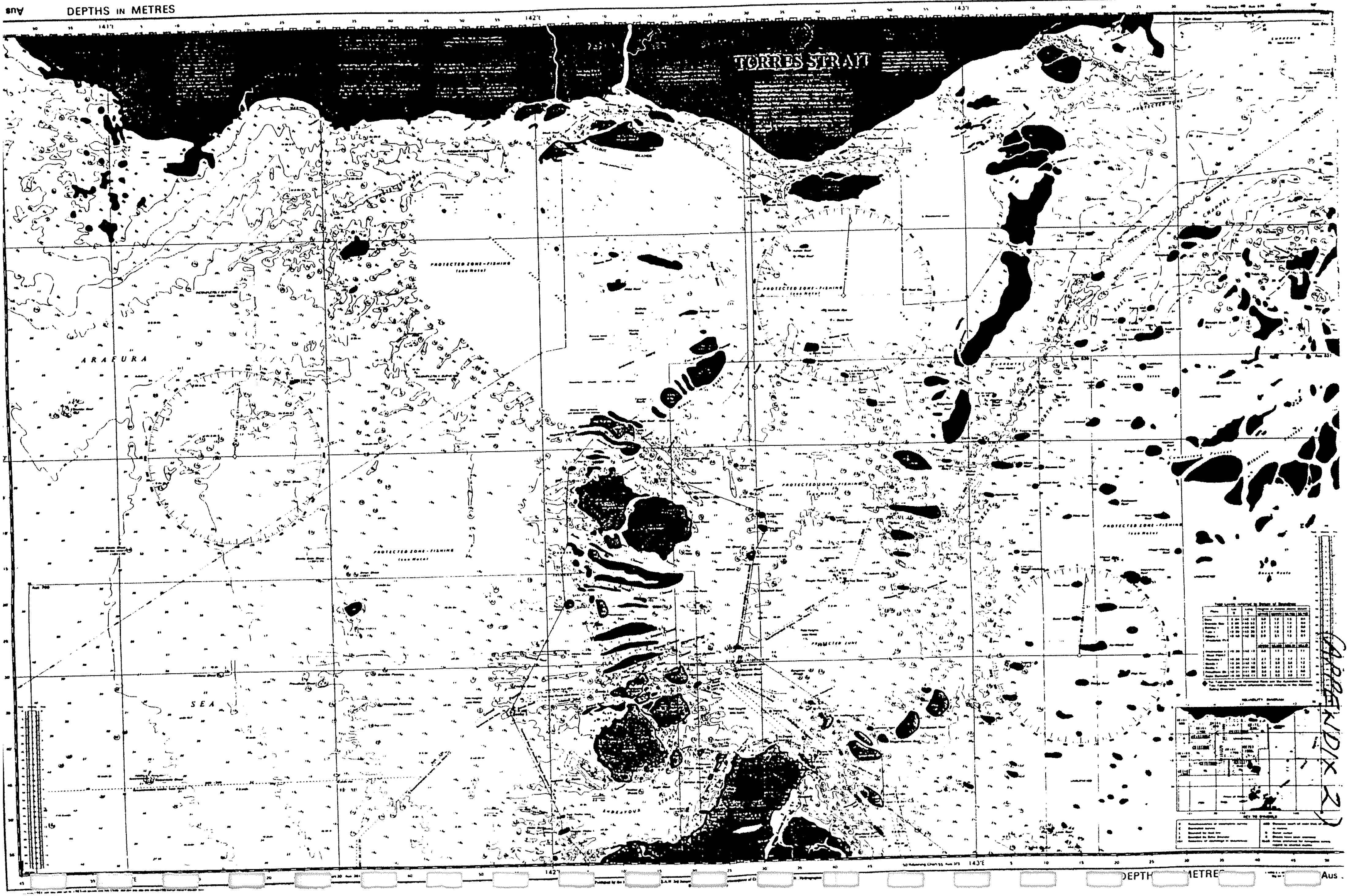
In concluding my paper today, I hope that I have been able to present sufficient points from "the life of a pilot" to provide the legal profession with some food for thought on our problems.

You may even agree with my view that a Pilots Life is Not Plain Sailing in Torres Strait.

(Appendix 1)


INDIAN OCEAN
ARAFURA SEA
GULF OF CARPENTARIA
CORAL SEA
NORTHERN TERRITORY
QUEENSLAND
INTERIM MAP
SHOWING TERRITORIAL SEA BASELINE
CROWN COPYRIGHT RESERVED
CAUTION: This map is not to be used for navigation
Outer Tracks
Coast Pilots.
NEW SOUTH WALES

(APPENDIX 2.)


Aus
DEPTHS IN METRES
TORRES STRAIT
ARAFURA
SEA
PROTECTED ZONE - FISHING
CHANNEL
142°E
143°E
DEPTHS IN METRES
Aus

APPENDIX 3

EXTRACTS FROM COLREGS

RULE 1—APPLICATION

(a) These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.

(b) Nothing in these Rules shall interfere with the operation of special rules made by an appropriate authority for roadsteads, harbours, rivers, lakes or inland waterways connected with the high seas and navigable by seagoing vessels. Such special rules shall conform as closely as possible to these Rules.

RULE 3—GENERAL DEFINITIONS

For the purpose of these Rules, except where the context otherwise requires—

(h) the term "vessel constrained by her draught" means a power-driven vessel which because of her draught in relation to the available depth of water is severely restricted in her ability to deviate from the course she is following;

RULE 9—NARROW CHANNELS

(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.

(b) A vessel of less than 20 metres in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway.

(c) A vessel engaged in fishing shall not impede the passage of any other vessel navigating within a narrow channel or fairway.

(d) A vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34 (d) if in doubt as to the intention of the crossing vessel.

(e) –

(i) In a narrow channel or fairway when overtaking can take place only if the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34 (c) (i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34 (c) (ii) and take steps to permit safe passing. If in doubt she may sound the signals prescribed in Rule 34 (d);

(ii) This Rule does not relieve the overtaking vessel of her obligation under Rule 13.

(f) A vessel nearing a bend or an area of a narrow channel or fairway where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal prescribed in Rule 34 (e).

(g) Any vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.

RULE 18—RESPONSIBILITIES BETWEEN VESSELS

(d)—

(i) any vessel other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draught, exhibiting the signals in Rule 28;

(ii) a vessel constrained by her draught shall navigate with particular caution having full regard to her special condition.

Part C—Lights and Shapes

RULE 20—APPLICATION

(b) The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper look-out.

ENGINE ORDER / RPM / SPEED TABLE

ENGINE ORDER	RPM	TRIAL IMO BALLAST COND.	TRIAL DESIGN CONDITION
NAV. FULL AHEAD	75	15.23 KNOTS	14.70 KNOTS
FULL AHEAD	62	12.74 KNOTS	12.05 KNOTS
HALF AHEAD	50	10.42 KNOTS	9.60 KNOTS
SLOW AHEAD	38	8.13 KNOTS	7.12 KNOTS
DEAD SLOW AHEAD	30	5.50 KNOTS	4.54 KNOTS
DEAD SLOW ASTERN	30		
SLOW ASTERN	38		
HALF ASTERN	50		
FULL ASTERN	62		
NAV. FULL ASTERN	75		

(Appendix A)

FINAL

PRINCIPAL DIMENSIONS

LENGTH	O. A.	229.732 m.
LENGTH	B. P.	220.000 m.
BREADTH	(MLD.)	46.000 m.
DEPTH	(MLD.)	19.200 m.
DRAUGHT	(DESIGN EXT.)	12.189 m.
DRAUGHT	(SUMMER EXT.)	13.619 m.

DEPT NO: 204	CLASS: L.R	SCALE: NONE	DATE: 1987-01-10
MANAGER K.S.Lee	TITLE: 95,000 DWT. CRUDE/PRODUCT TANKER		
CHIEF M.C.Baek	MANEUVERING CHARACTERISTICS (M/T. "ERA")		
CHECKED BY D.J.Sim			
DRAWN BY Y.M.JANG			
HULL NO 1047	DWG NO PD601.71		

SHI SAMSUNG SHIPBUILDING & HEAVY INDUSTRIES CO., LTD.

S. = 1/175

G-17

(Appendix 4)

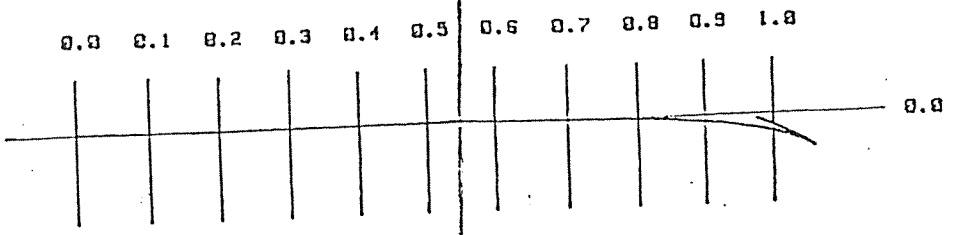
(5) CRASH STOP ASTERN/AHEAD ES

FULL AHEAD ⟶ FULL ASTERN

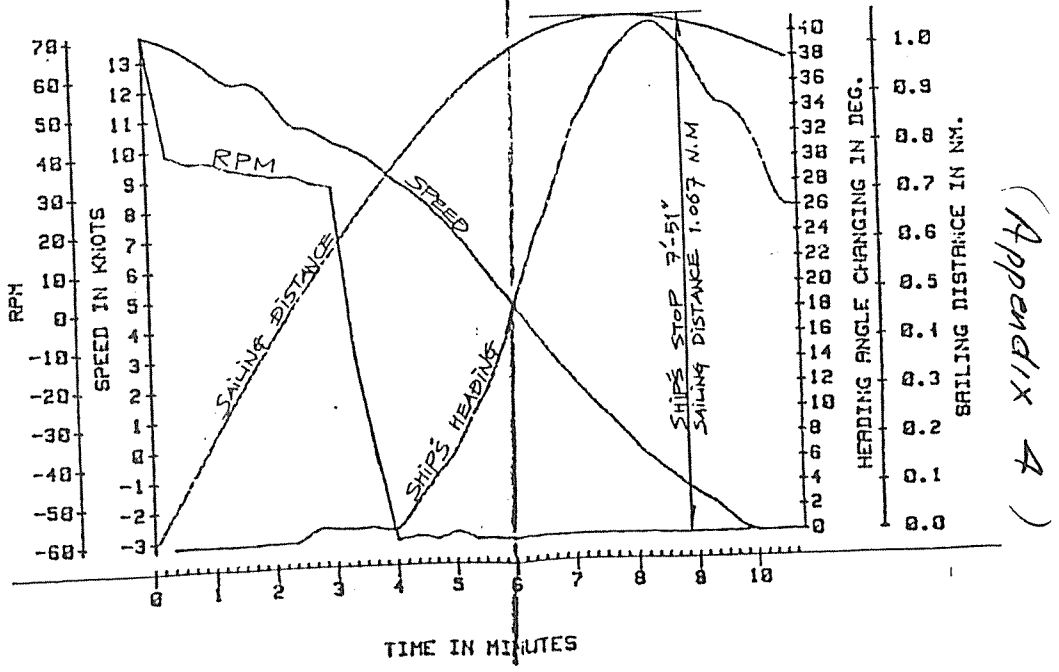
IMO BALLAST CONDITION

DATE	: 87-01-07
PLACE	: OFF KOJE ISLAND
WEATHER	: FINE
SEA CONDITION	: SMOOTH
SEA DEPTH	: 109 M
WIND DIRECTION & VELOCITY	: S55°/7m/S
SHIP CONDITION	: IMO BALLAST

TIME OF "ORDER OF ASTERN"	: 06:29
BASE COURSE	: 150°
MAIN ENGINE R.P.M. (JUST BEFORE "ASTERN" TELEGRAPHED)	: 71
SHIP'S SPEED (JUST BEFORE "ASTERN" TELEGRAPHED)	: 13.82 KTS
TIME FROM "ORDER OF ASTERN UNTIL SHAFT STOP	: 3'-19"
TIME FROM "ORDER OF ASTERN" UNTIL SHIP STOP	: 7'-51"
SAILING DISTANCE UNTIL SHIP STOP	: 1.067 N.M (1976 M)



(SHIP'S TRACK)

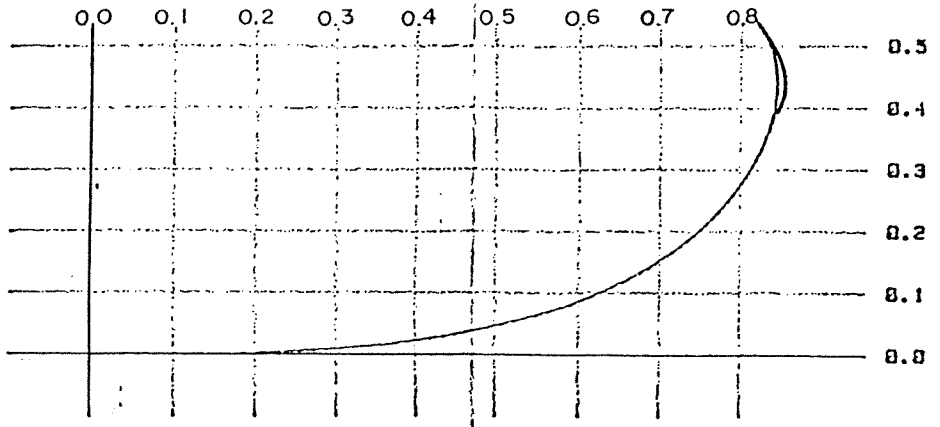


(Appendix 4)

FULL AHEAD ⟶ FULL ASTERN

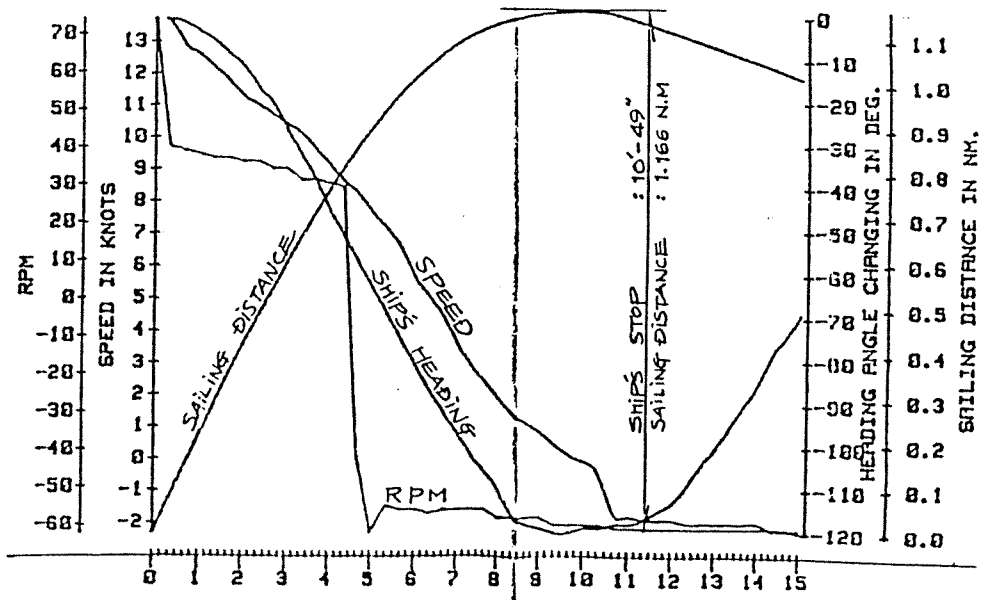
DESIGN CONDITION

DATE	: 86-01-05
PLACE	: OFF KOJE ISLAND
WEATHER	: CLOUDY
SEA CONDITION	: SLIGHTLY ROUGH
SEA DEPTH	: 120 M
WIND DIRECTION & VELOCITY	: P55°/9m/S
SHIP CONDITION	: DESIGN DRAFT



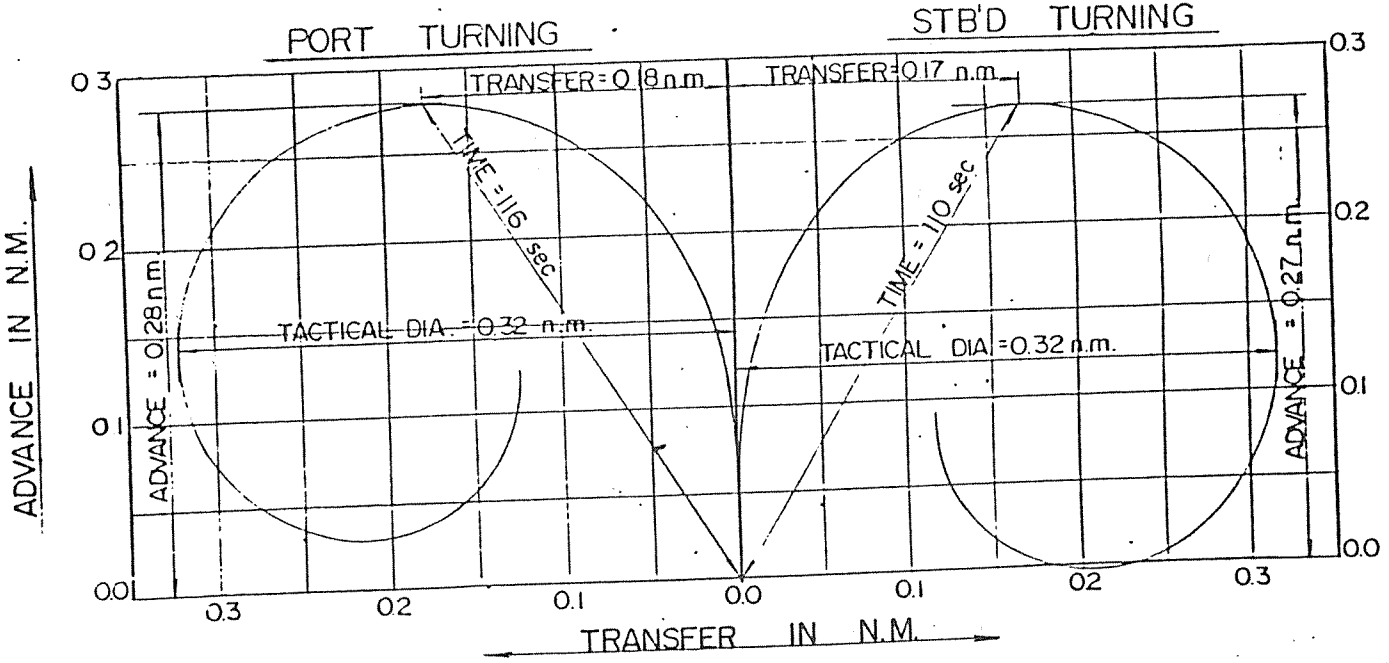
(SHIP'S TRACK)

TIME OF "ORDER OF ASTERN"	: 16:43
BASE COURSE	: 84°
MAIN ENGINE R.P.M. (JUST BEFORE "ASTERN" TELEGRAPHED)	: 74
SHIP'S SPEED (JUST BEFORE "ASTERN" TELEGRAPHED)	: 13.7 KTS
TIME FROM "ORDER OF ASTERN UNTIL SHAFT STOP	: 4'-23"
TIME FROM "ORDER OF ASTERN" UNTIL SHIP STOP	: 10'-49"
SAILING DISTANCE UNTIL SHIP STOP	: 1.166 N.M (2159 M)



(Appendix 4)

DESIGN CONDITION



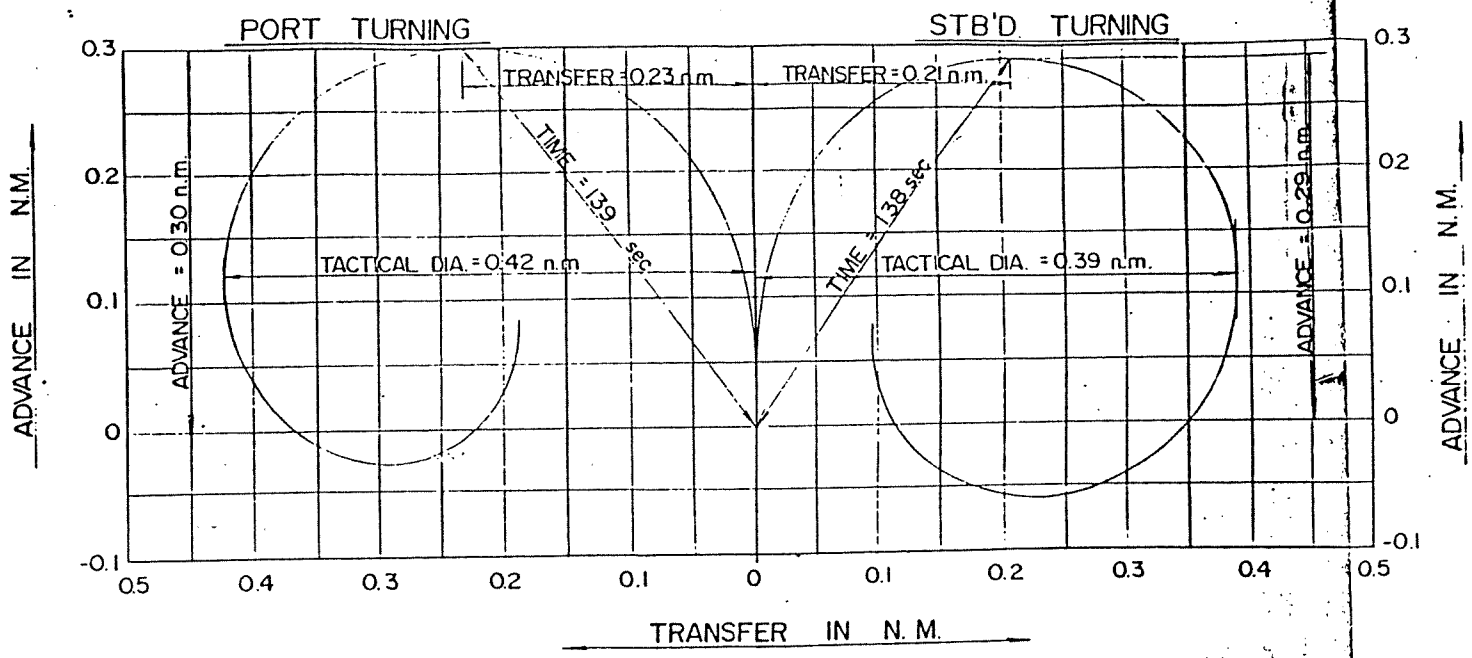
TURNING DATA		PORT	STB'D	
INITIAL COURSE	:	201	195	deg
INITIAL SPEED	:	13.18	13.07	knots
REV. PER MIN	:	72	72	rpm
RUDDER IND. TIME	:	17	17	sec
RUDDER ANGLE	:	35	35	deg
TRANSFER	:	0.18	0.17	n.m.
TACTICAL DIA.	:	0.32	0.32	n.m.
ADVANCE	:	0.28	0.27	n.m.

WIND DIRECT : P160°, 5m/sec. P170°, 8m/sec
DRAFT FWD. : 12.210 m.
MIDSHIP : 12.250 m.
AFT. : 12.225 m.
DISPLACEMENT : 98729 tonnes
RUDDER AREA : 62.891 m^2

Appendix 4)

TURNING (FULL SPEED)

IMO BALLAST CONDITION

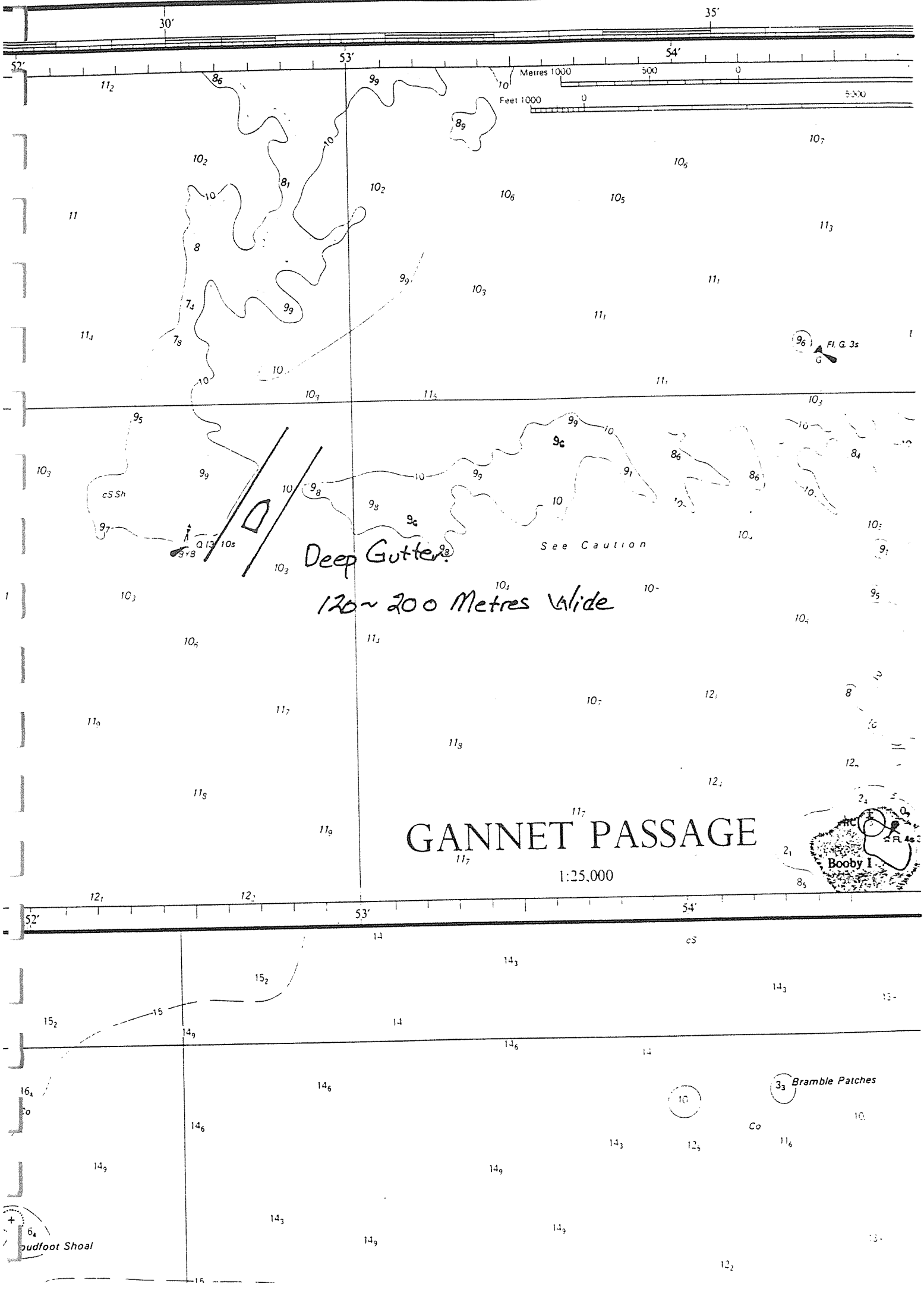


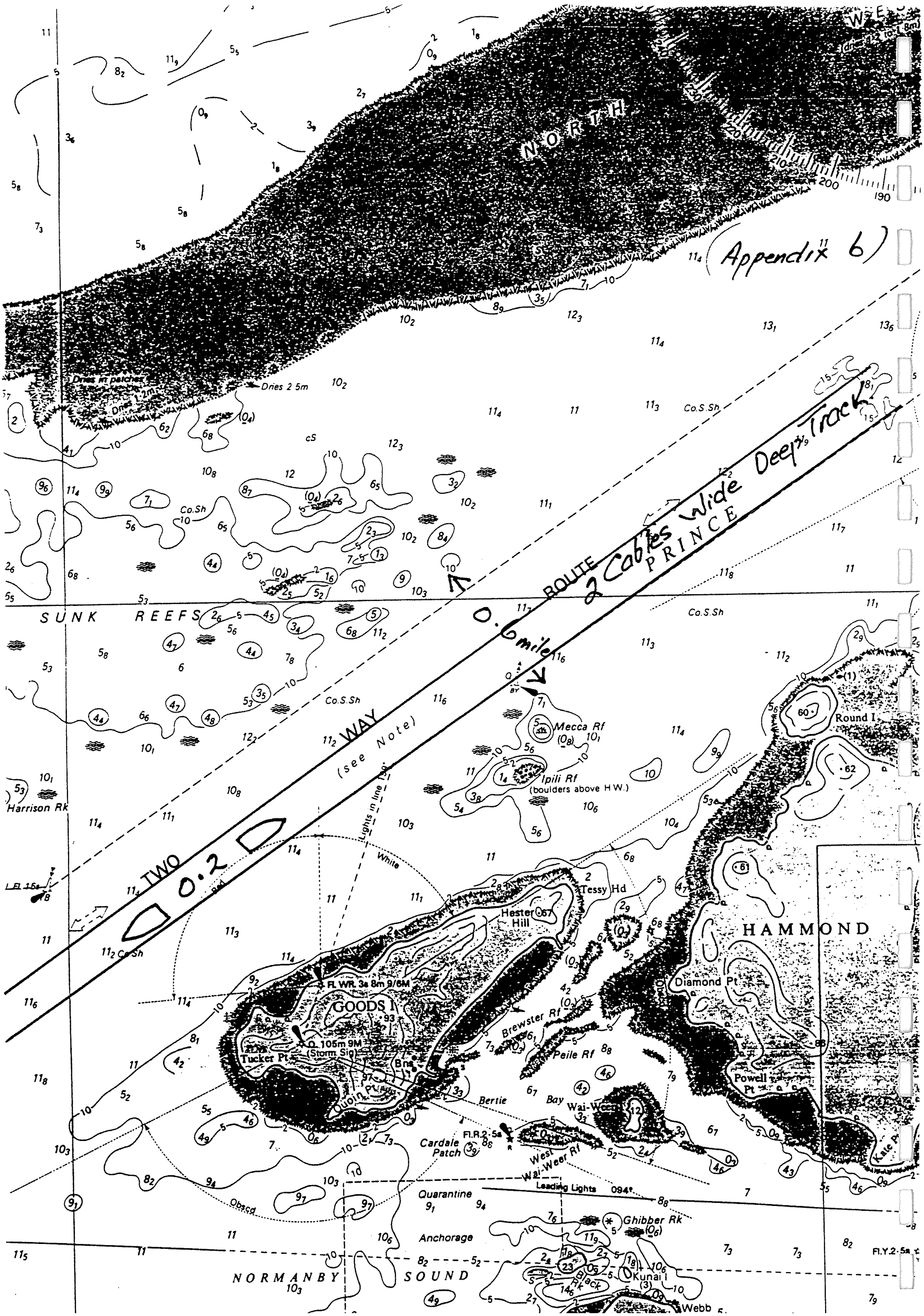
TURNING DATA		PORT	STB'D	
INITIAL COURSE	:	170	205	deg
INITIAL SPEED	:	13.1	12.88	knots
REV. PER MIN	:	72	72	rpm
RUDDER IND TIME	:	17	17	sec
RUDDER ANGLE	:	35	35	deg
TRANSFER	:	0.23	0.21	n.m.
TACTICAL DIA.	:	0.42	0.39	n.m.
ADVANCE	:	0.30	0.29	n.m.

WIND DIRECT	:	P 20°, 10m/sec . P 20° ,15m/sec
DRAFT FWD.	:	5.64 m
MIDSHIP	:	7.24 m
AFT.	:	8.83 m
DISPLACEMENT	:	52972 tonnes
RUDDER AREA	:	51.724 m^2

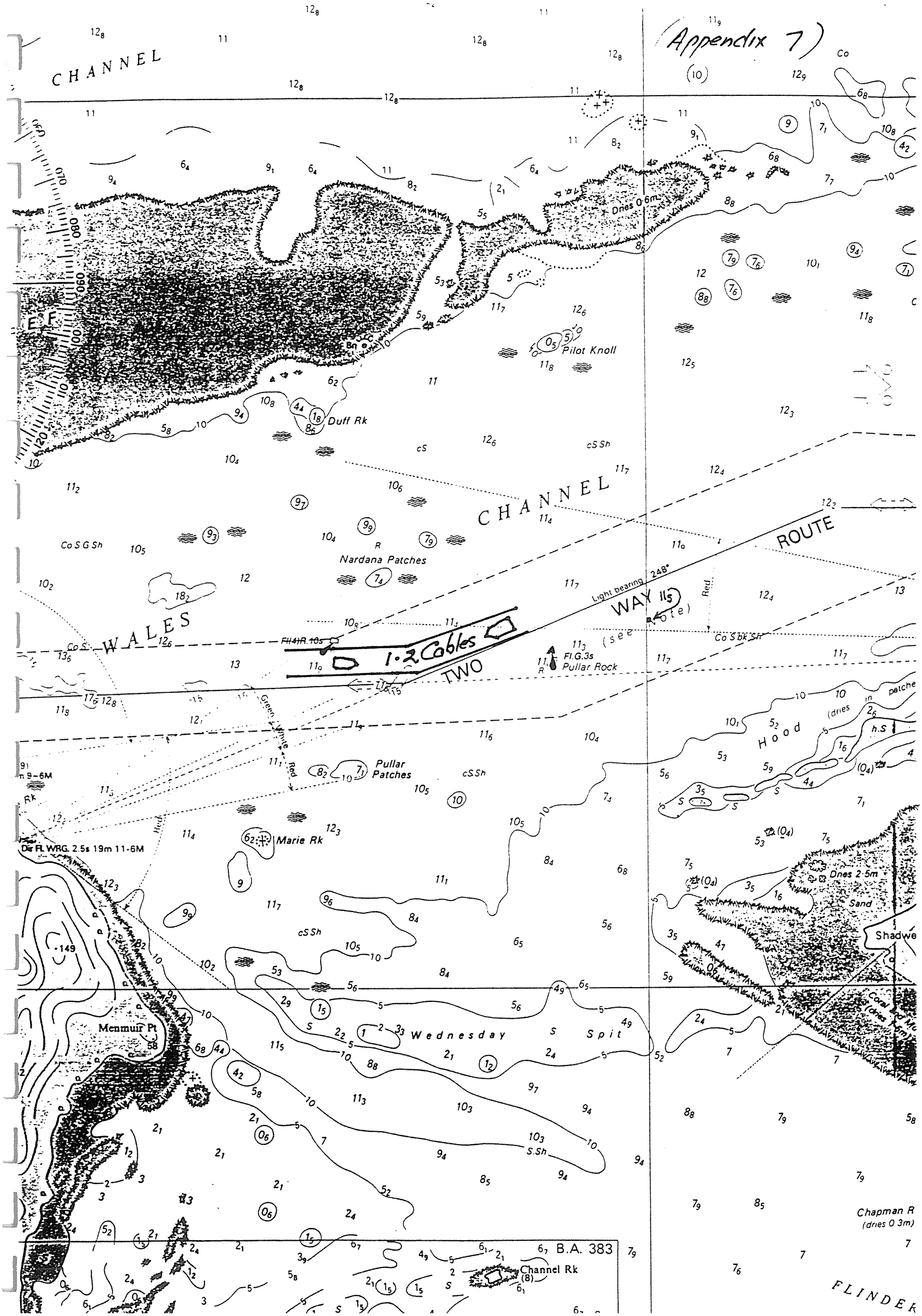
(Appendix 4)

DEPTHS IN METRES (APPENDIX 5)



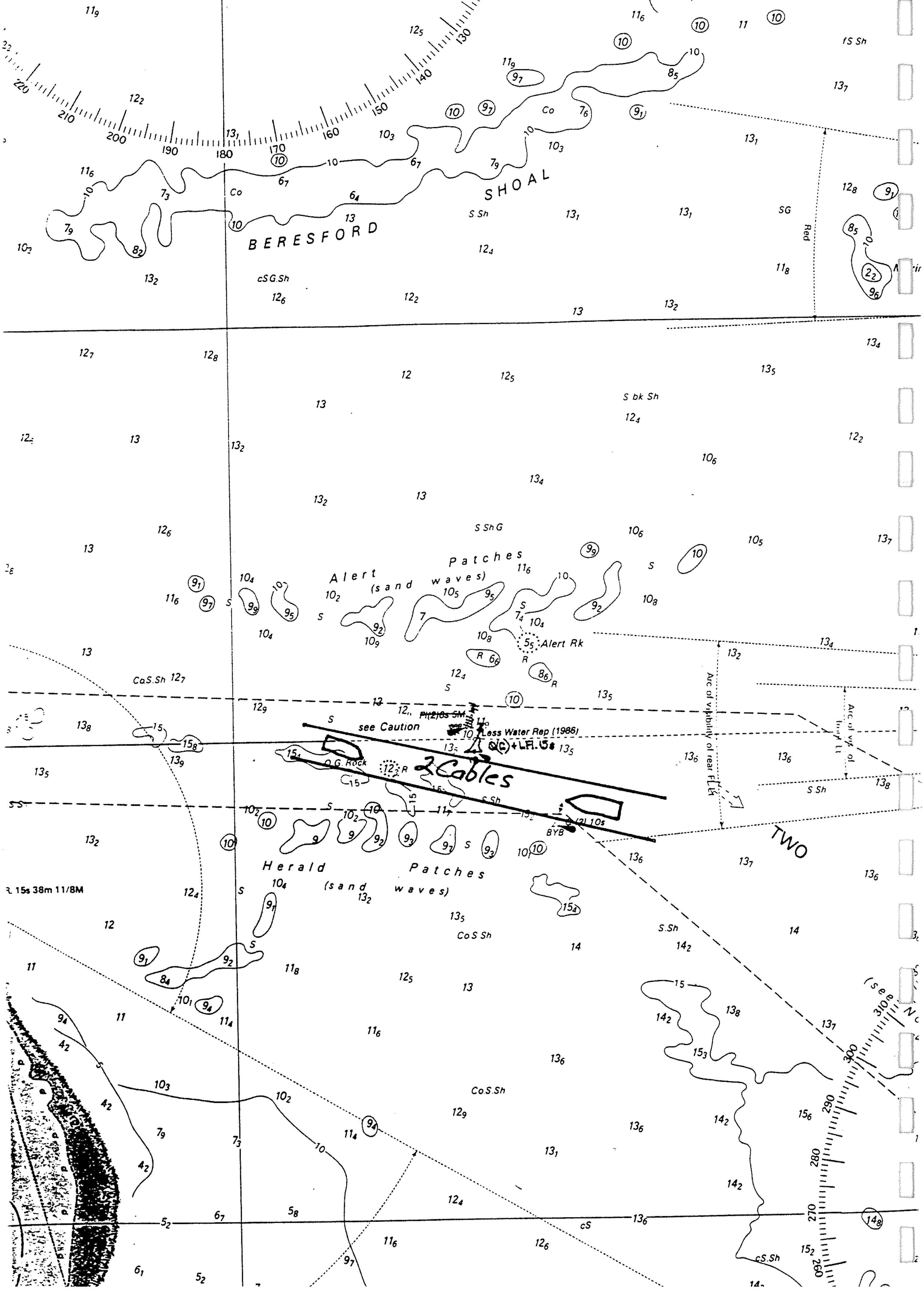


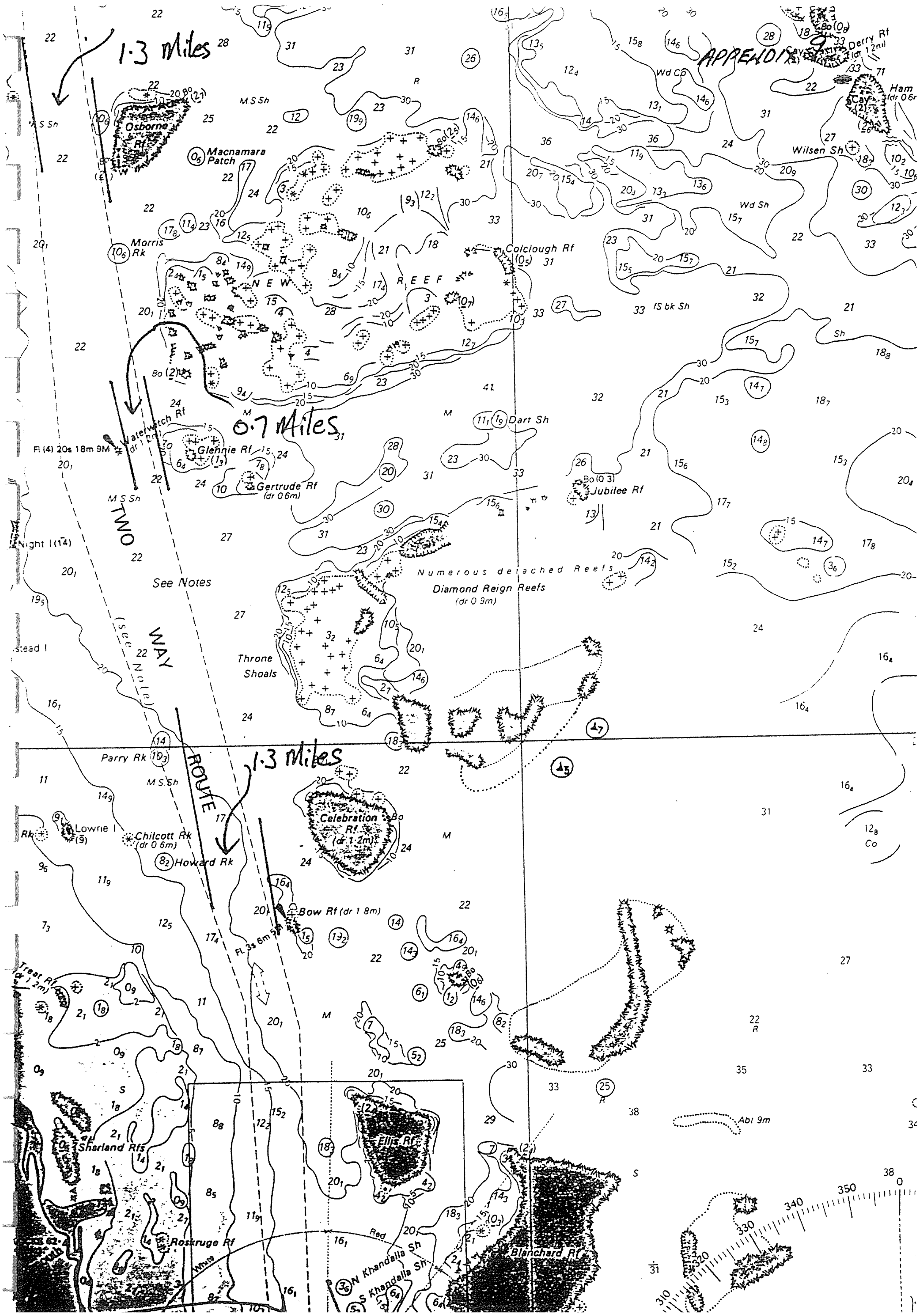
(Appendix 6)
NORTH
Dries in patches
Dries 2.5m
Dries 1.2m
Co.S.Sh
SUNK REEFS
ROUTE
PRINCE
2 Cables Wide Deep Track
0.6 mile
TWO WAY
(see Note)
0.2
Harrison Rk
Mecca Rf
Ipili Rf
(boulders above H.W.)
Round I
Lights in line
White
Tessy Hd
Hester Hill
HAMMOND
Diamond Pt
GOODS I
Fl. WR. 3s 8m 9/6M
Q. 105m 9M
(Storm Sig)
Tucker Pt
Quoin Pt
Bns
Brewster Rf
Peile Rf
Bertie Bay
Wai-Weer
Powell Pt
Cardale Patch
Fl.R.2·5s
West Wai-Weer Rf
Leading Lights 094°
Obscd
Quarantine
Anchorage
Ghibber Rk
Black Rk
Kunai I
Webb
NORMANBY SOUND
Fl.Y.2·5s



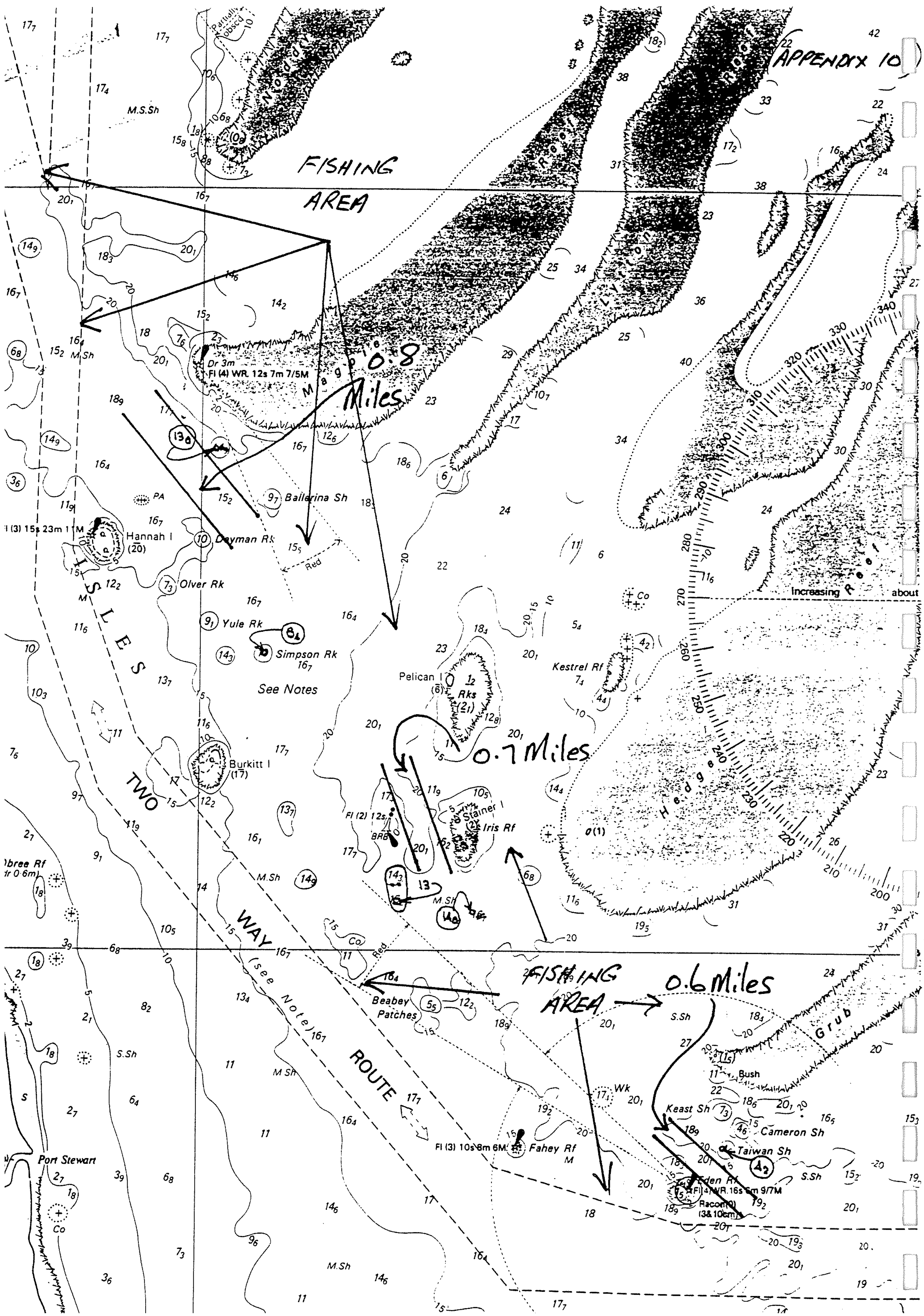
(Appendix 7)
CHANNEL
Dries 0·6m
Pilot Knoll
Duff Rk
CHANNEL
WALES
Nardana Patches
TWO WAY ROUTE
Light bearing 248°
(see note)
1·2 Cables
Fl(4)R.10s
Fl.G.3s
Pullar Rock
Green
White
Red
Pullar Patches
Marie Rk
Dir Fl. WRG. 2.5s 19m 11-6M
Hood
Dries 2·5m
Sand
Menmuir Pt
Wednesday Spit
Channel Rk
B.A. 383
Chapman R
(dries 0 3m)
FLINDER

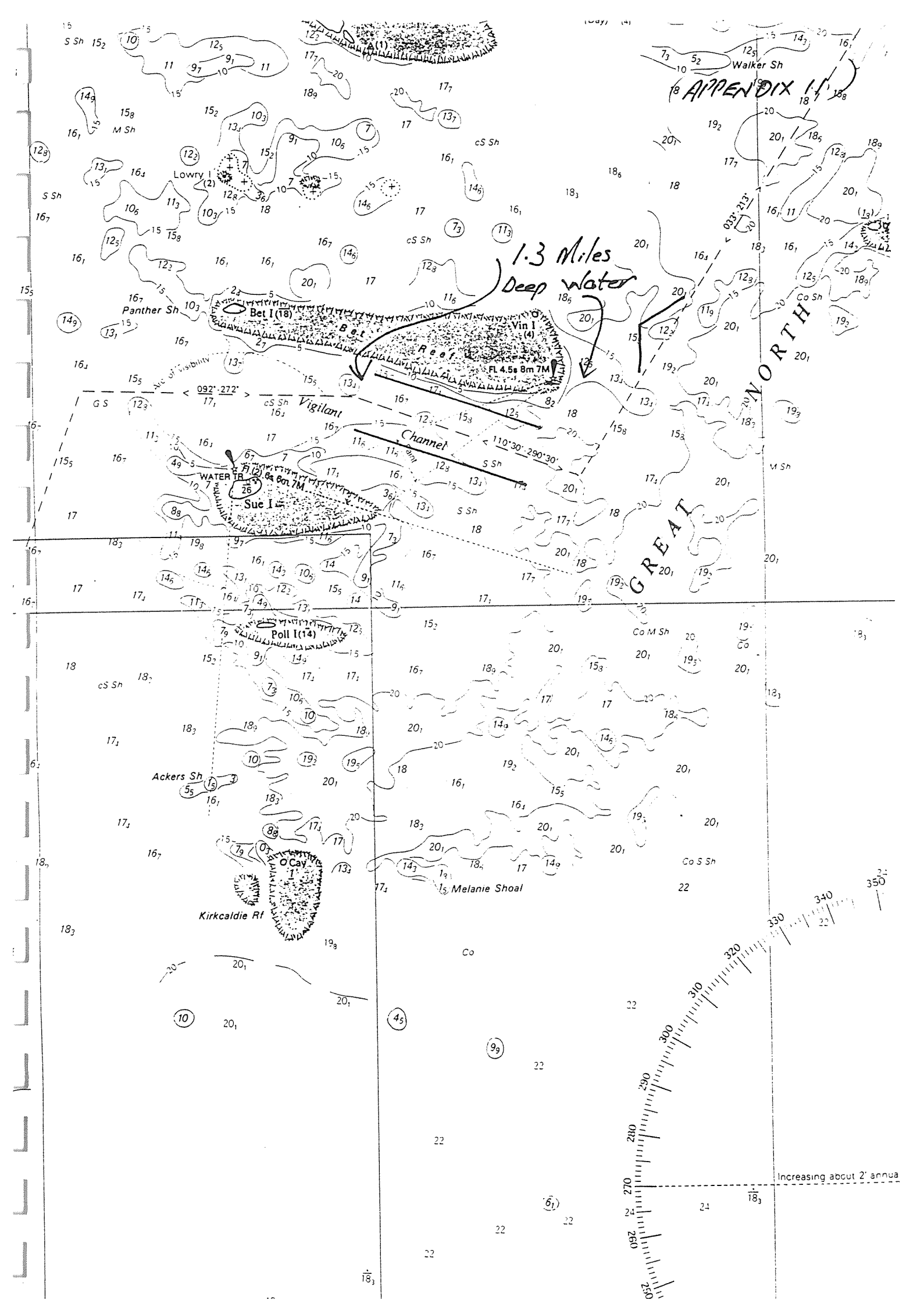
(Appendix 8)

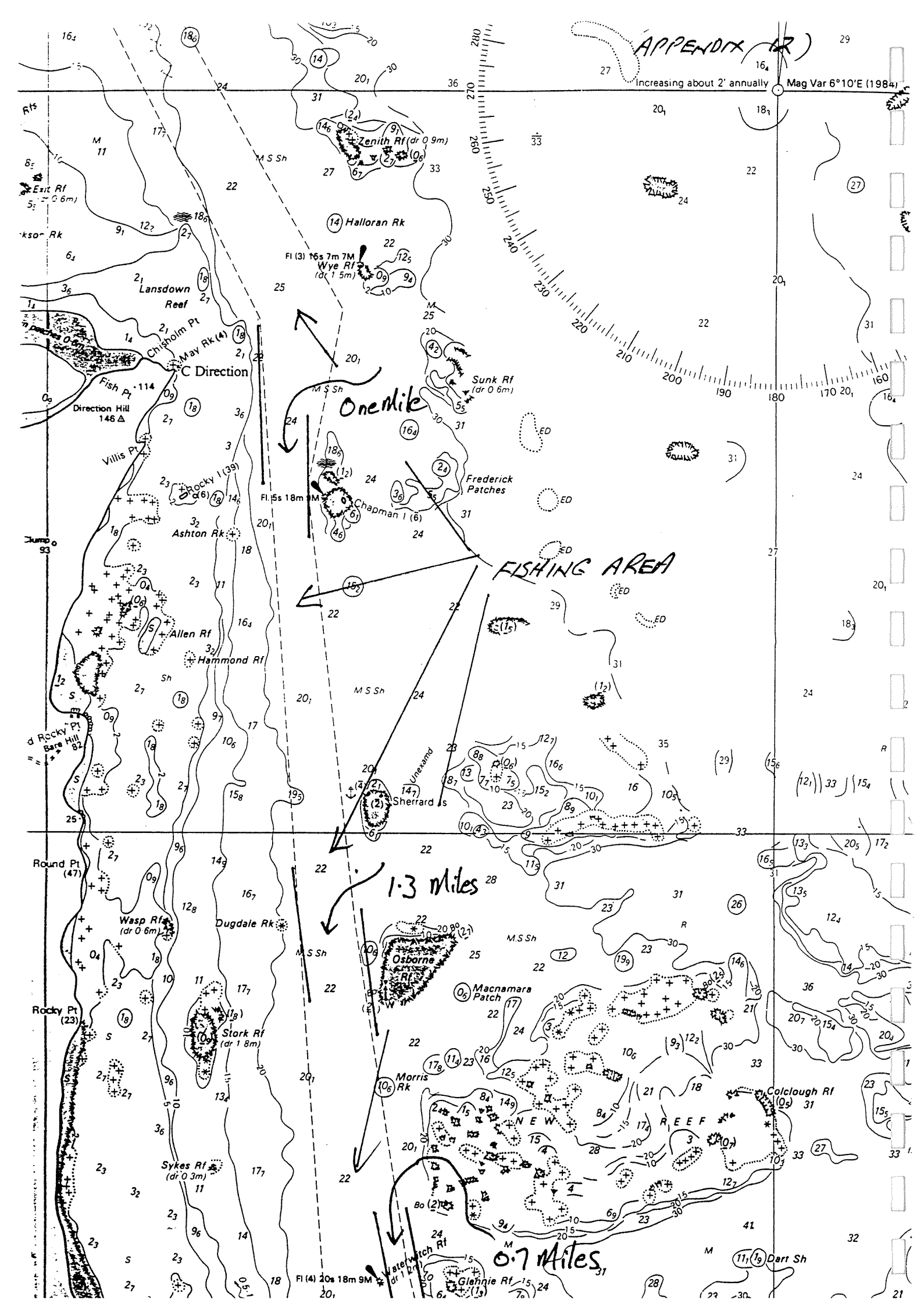

BERESFORD SHOAL
Alert Patches (sand waves)
Alert Rk
Herald Patches (sand waves)
see Caution
Less Water Rep (1986)
Q.G. Rock
2Cables
BYB
Arc of visibility of rear F.Ld
TWO
Red
R. 15s 38m 11/8M

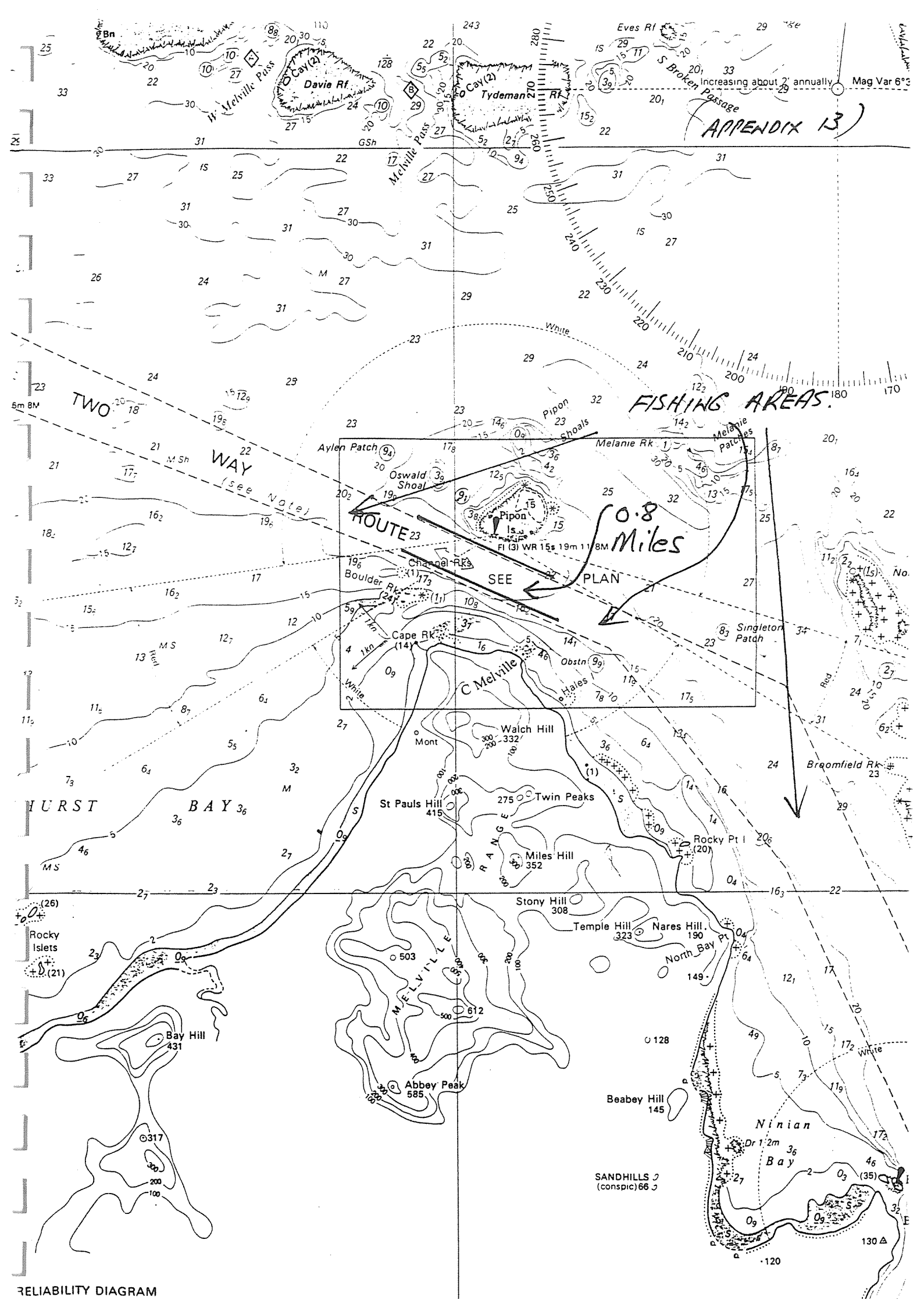


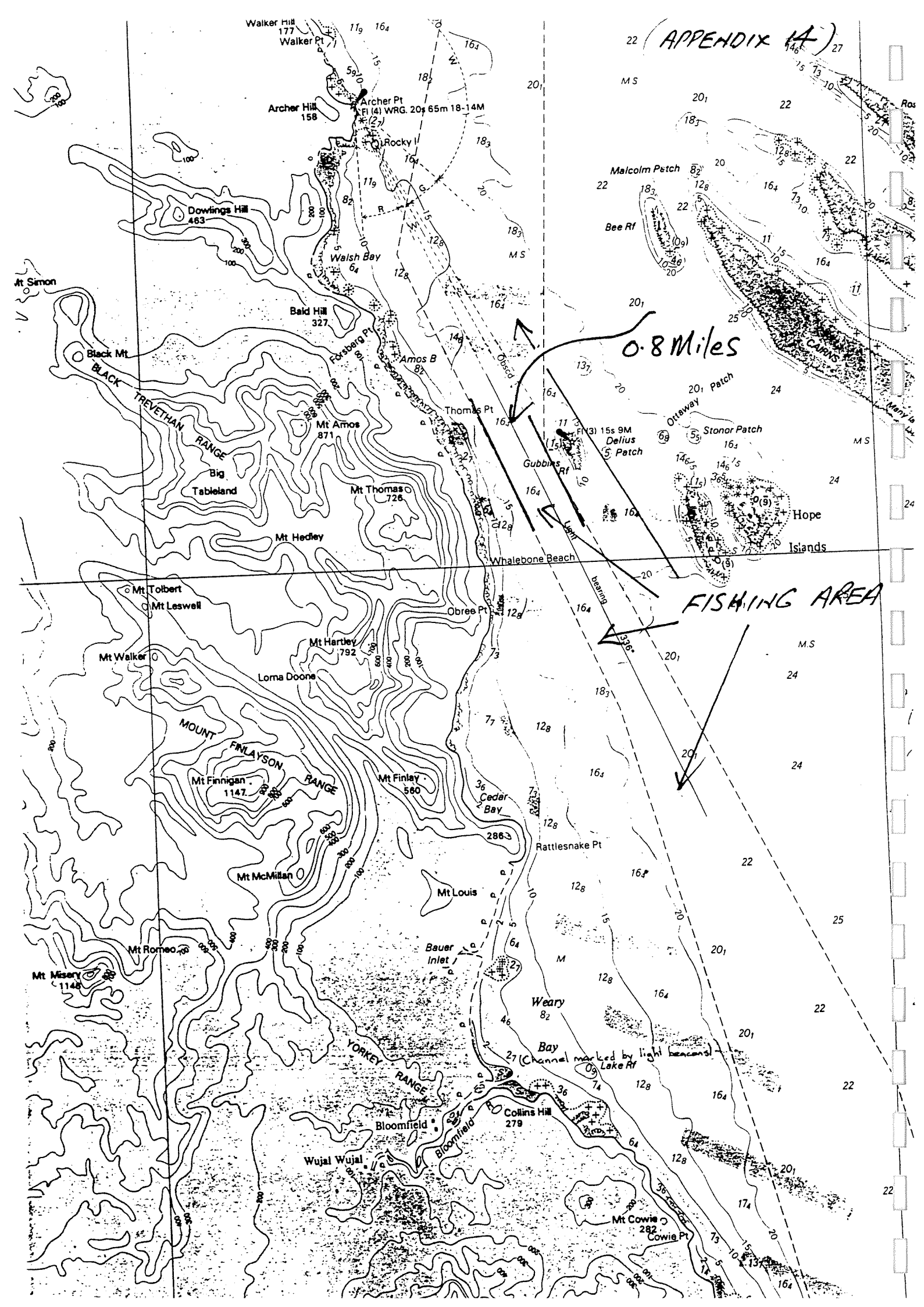
APPENDIX 9
1·3 Miles
0·7 Miles
1·3 Miles
TWO WAY ROUTE
(see Note)
See Notes
Osborne Rf
Macnamara Patch
Morris Rk
NEW REEF
Colclough Rf
Derry Rf
Ham Cay
Wilsen Sh
Waterwitch Rf
Glennie Rf
Gertrude Rf
Dart Sh
Jubilee Rf
Night I
Numerous detached Reefs
Diamond Reign Reefs
Throne Shoals
Parry Rk
Celebration Rf
Lowrie I
Chilcott Rk
Howard Rk
Bow Rf
Treat Rf
Sharland Rfs
Ellis Rf
Roskruge Rf
N Khandalla Sh
S Khandalla Sh
Blanchard Rf
Fl (4) 20s 18m 9M
M S Sh
Wd Sh
Abt 9m


APPENDIX 10
FISHING AREA
0.8 Miles
0.7 Miles
0.6 Miles
Magpie
Reef
Lytton
Hedge
Grub
Ballerina Sh
Dr 3m
Fl (4) WR. 12s 7m 7/5M
Hannah I
Dayman Rk
Olver Rk
Yule Rk
Simpson Rk
See Notes
Pelican I
Rks
Burkitt I
Stainer I
Iris Rf
Kestrel Rf
Fl (2) 12s
Beabey Patches
TWO ISLES
TWO WAY ROUTE
(see Note)
Port Stewart
Wk
Fahey Rf
Fl (3) 10s 8m 6M
Keast Sh
Cameron Sh
Taiwan Sh
Eden Rf
Fl 4 WR. 16s 6m 9/7M
Racon (3&10cm)
Bush
Increasing
about
M.S.Sh
M.Sh
S.Sh
Red
Co
PA

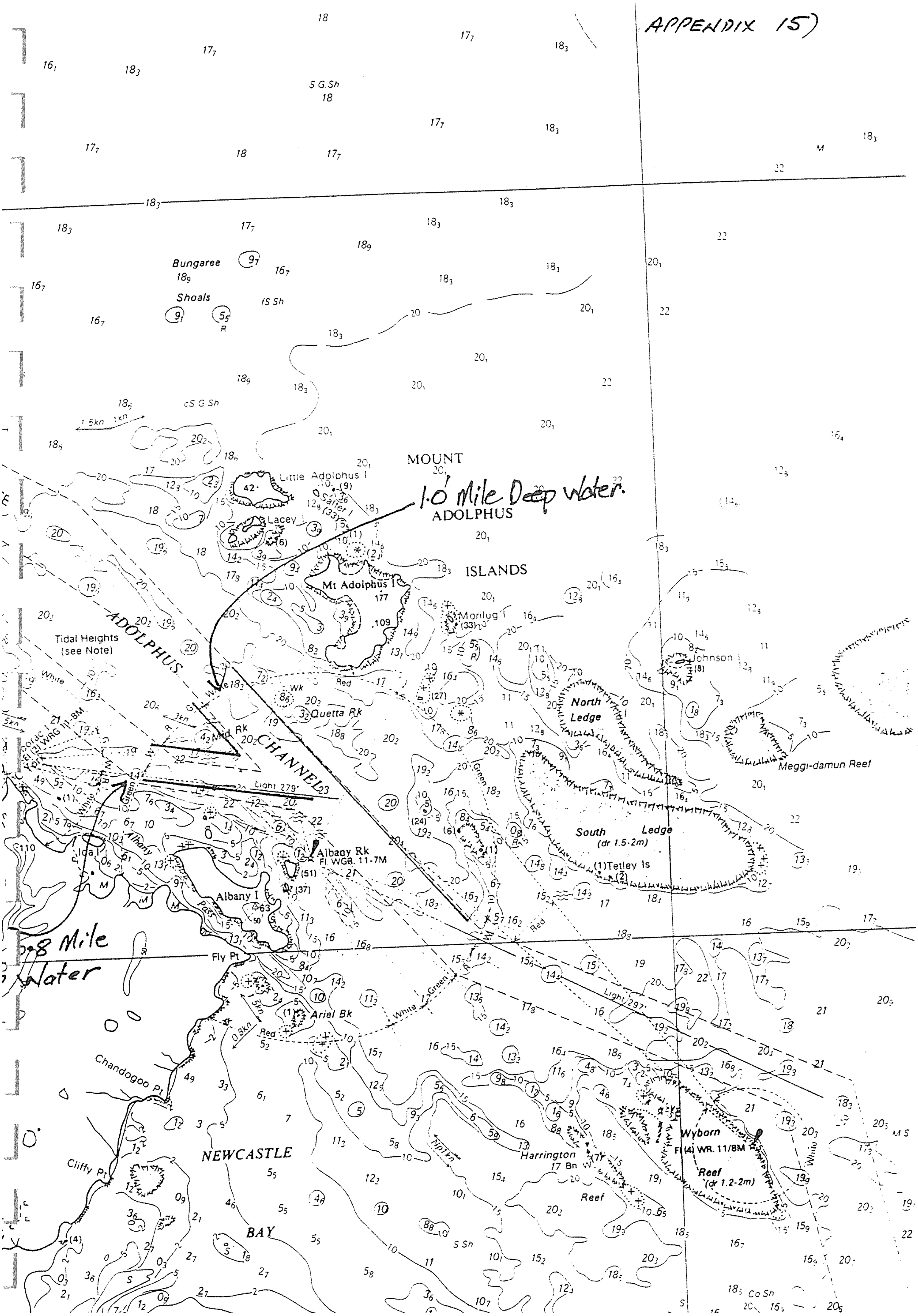

APPENDIX 1
1.3 Miles
Deep Water
Walker Sh
Lowry I
(2)
Panther Sh
Bet I (18)
Bet
Reef
Vin I
(4)
FL 4.5s 8m 7M
Vigilant
Channel
WATER TR
Fl (2) 6s 6m 7M
Sue I
Poll I (14)
Ackers Sh
O Cay
Kirkcaldie Rf
Melanie Shoal
GREAT
NORTH
033°-213°
092°-272°
110°-290°
Arc of Visibility
M Sh
cS Sh
S Sh
Co Sh
Co M Sh
Co S Sh
Co
GS
Increasing about 2' annua

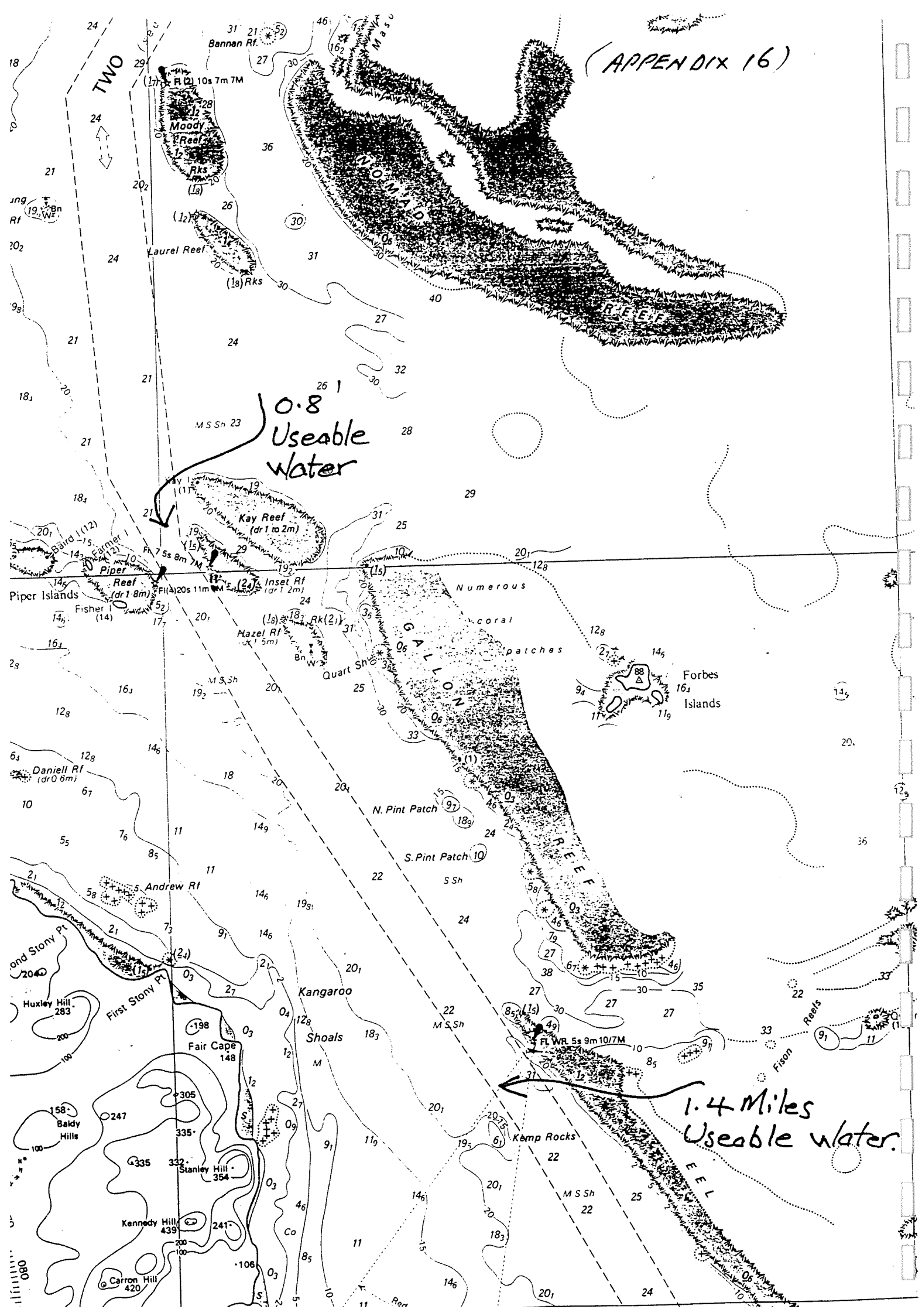

APPENDIX (R)
Increasing about 2' annually
Mag Var 6°10'E (1984)
Zenith Rf (dr 0 9m)
Halloran Rk
Wye Rf (dr 1 5m)
Fl (3) 16s 7m 7M
Lansdown Reef
Chisholm Pt
May Rk (4)
C Direction
Fish Pt
Direction Hill 146
Villis Pt
Rocky I (39)
Fl 5s 18m 9M
Chapman I (6)
Ashton Rk
Frederick Patches
Sunk Rf (dr 0 6m)
One Mile
FISHING AREA
Allen Rf
Hammond Rf
Sherrard Is
Unexamd
Round Pt (47)
Bare Hill 82
Wasp Rf (dr 0 6m)
Dugdale Rk
1·3 Miles
Osborne Rf
Macnamara Patch
Rocky Pt (23)
Stork Rf (dr 1 8m)
Morris Rk
NEW REEF
Colclough Rf
Sykes Rf (dr 0 3m)
Waterwitch Rf (dr 1 2m)
Fl (4) 20s 18m 9M
Glennie Rf
0·7 Miles
Dart Sh
Exit Rf (dr 0 6m)

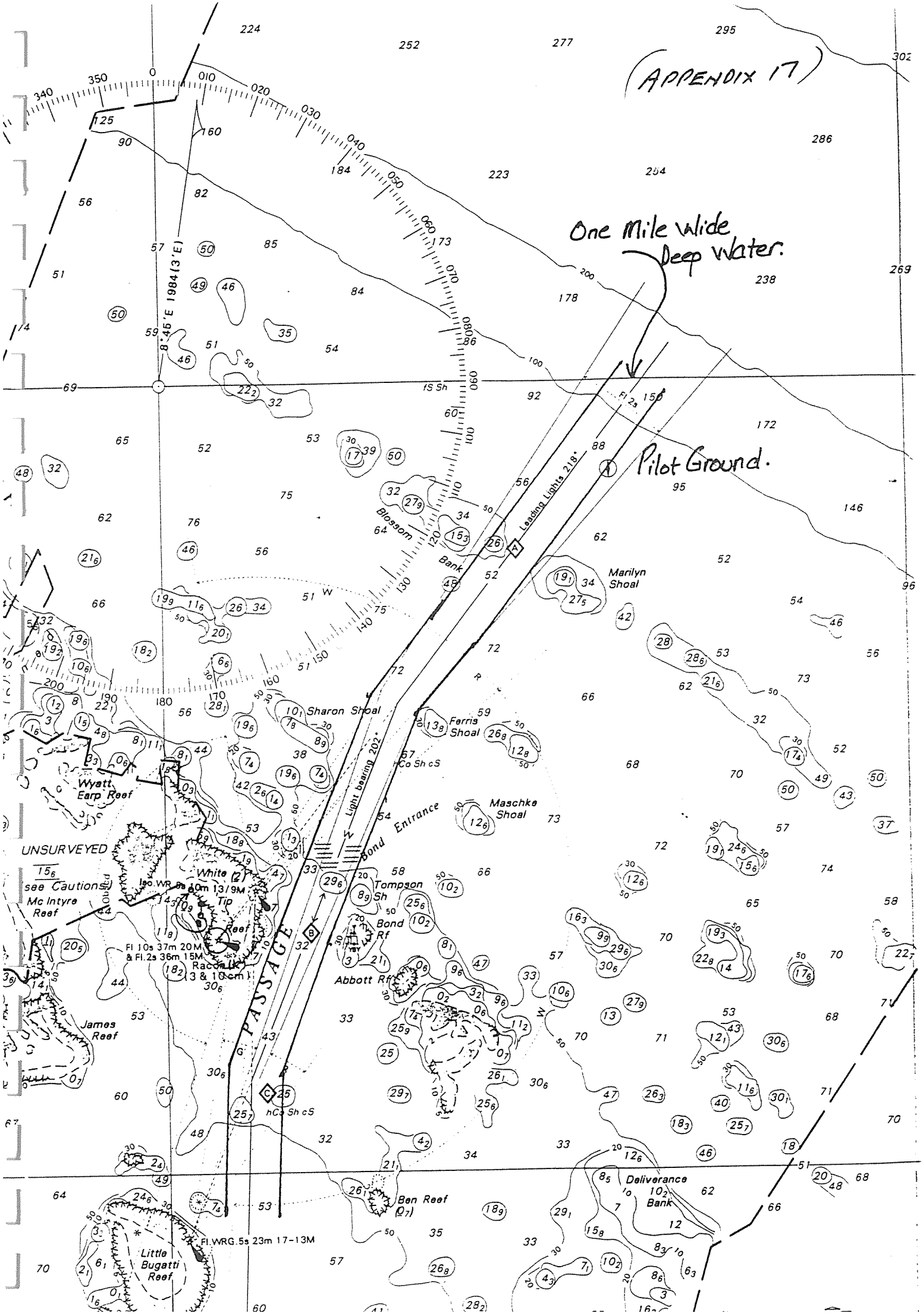

APPENDIX 13
FISHING AREAS.
TWO WAY (see Note)
ROUTE
0.8 Miles
SEE PLAN
Pipon Is
Fl (3) WR 15s 19m 11 8M
Aylen Patch
Oswald Shoal
Pipon Shoals
Melanie Rk
Melanie Patches
Channel Rks
Boulder Rk
Cape Rk
C Melville
Hales Obstn
Singleton Patch
Broomfield Rk
Walch Hill 332
St Pauls Hill 415
Twin Peaks 275
Miles Hill 352
Rocky Pt
Stony Hill 308
Temple Hill 323
Nares Hill 190
North Bay Pt
Rocky Islets
Bay Hill 431
Abbey Peak 585
Beabey Hill 145
Ninian Bay
SANDHILLS (conspic) 66
Davie Rf
Tydeman Rf
Eves Rf
S Broken Passage
Melville Pass
W Melville Pass
Increasing about 2' annually
Mag Var 6°3
RELIABILITY DIAGRAM


(APPENDIX 14)
0·8 Miles
FISHING AREA
bearing
336°
Walker Hill
177
Walker Pt
Archer Hill
158
Archer Pt
Fl (4) WRG. 20s 65m 18-14M
Rocky I
Dowlings Hill
463
Walsh Bay
Mt Simon
Bald Hill
327
Black Mt
BLACK TREVETHAN RANGE
Forsberg Pt
Amos B
Mt Amos
871
Big Tableland
Mt Thomas
726
Thomas Pt
Fl(3) 15s 9M
Delius
Gubbins Rf
Light
Malcolm Patch
Bee Rf
Ottaway
Stonor Patch
20₁ Patch
CAIRNS
Hope Islands
Whalebone Beach
Mt Hedley
Mt Tolbert
Mt Leswell
Obree Pt
Mt Walker
Mt Hartley
792
Lorna Doone
MOUNT FINLAYSON RANGE
Mt Finnigan
1147
Mt Finlay
560
Cedar Bay
286
Rattlesnake Pt
Mt McMillan
Mt Louis
Mt Romeo
Mt Misery
1148
Bauer Inlet
Weary Bay
(Channel marked by light beacons)
Lake Rf
YORKEY RANGE
Bloomfield
Bloomfield R.
Collins Hill
279
Wujal Wujal
Mt Cowie
282
Cowie Pt

APPENDIX 15)


Bungaree
Shoals
MOUNT
ADOLPHUS
ISLANDS
1.0 Mile Deep Water.
Little Adolphus I
Lacey I
Salter I
Mt Adolphus I
Morilug I
Johnson I
North Ledge
South Ledge
(dr 1.5-2m)
Tetley Is
Meggi-damun Reef
ADOLPHUS
CHANNEL
Tidal Heights
(see Note)
Quetta Rk
Mid Rk
Albany Rk
Fl WGB. 11-7M
Albany I
Albany Pass
Ida I
Fly Pt
Ariel Bk
Light 279°
Light 297°
0.8 Mile
Water
Chandogoo Pt
Cliffy Pt
NEWCASTLE
BAY
Harrington
17 Bn
Reef
Wyborn
Fl (4) WR. 11/8M
Reef
(dr 1.2-2m)


(APPENDIX 16)
TWO
Bannan Rf.
Fl (2) 10s 7m 7M
Moody Reef
Rks
Laurel Reef
Rks
NOMAD
REEF
0·8 Useable Water
Kay Reef (dr 1 to 2m)
Baird
Farmer
Piper
Fl 7·5s 8m 7M
Piper Reef (dr 1·8m)
Fl(3)20s 11m 7M
Inset Rf (dr 1·2m)
Piper Islands
Fisher
Hazel Rf (dr 1·5m)
Rk
Quart Sh
Numerous coral patches
GALLON REEF
Forbes Islands
Daniell Rf (dr 0·6m)
N. Pint Patch
S. Pint Patch
Andrew Rf
Second Stony Pt
First Stony Pt
Huxley Hill 283
Fair Cape 148
Kangaroo Shoals
Baldy Hills 158
Stanley Hill 354
Kennedy Hill 439
Carron Hill 420
Fl WR 5s 9m 10/7M
Kemp Rocks
Fison Reefs
1·4 Miles Useable water.


(APPENDIX 17)
One Mile Wide Deep Water.
Pilot Ground.
Leading Lights 218°
Light bearing 202°
Bond Entrance
PASSAGE
Blossom Bank
Marilyn Shoal
Sharon Shoal
Ferris Shoal
Maschke Shoal
Wyatt Earp Reef
UNSURVEYED
see Cautions)
Mc Intyre Reef
White (2)
Tip
Reef
Tompson Sh
Bond Rf
Abbott Rf
James Reef
Little Bugatti Reef
Ben Reef
Deliverance
Bank
Fl 10s 37m 20M
& Fl.2s 36m 15M
Racon (K)
(3 & 10cm)
Fl.WRG.5s 23m 17-13M
8°46'E 1984(3'E)