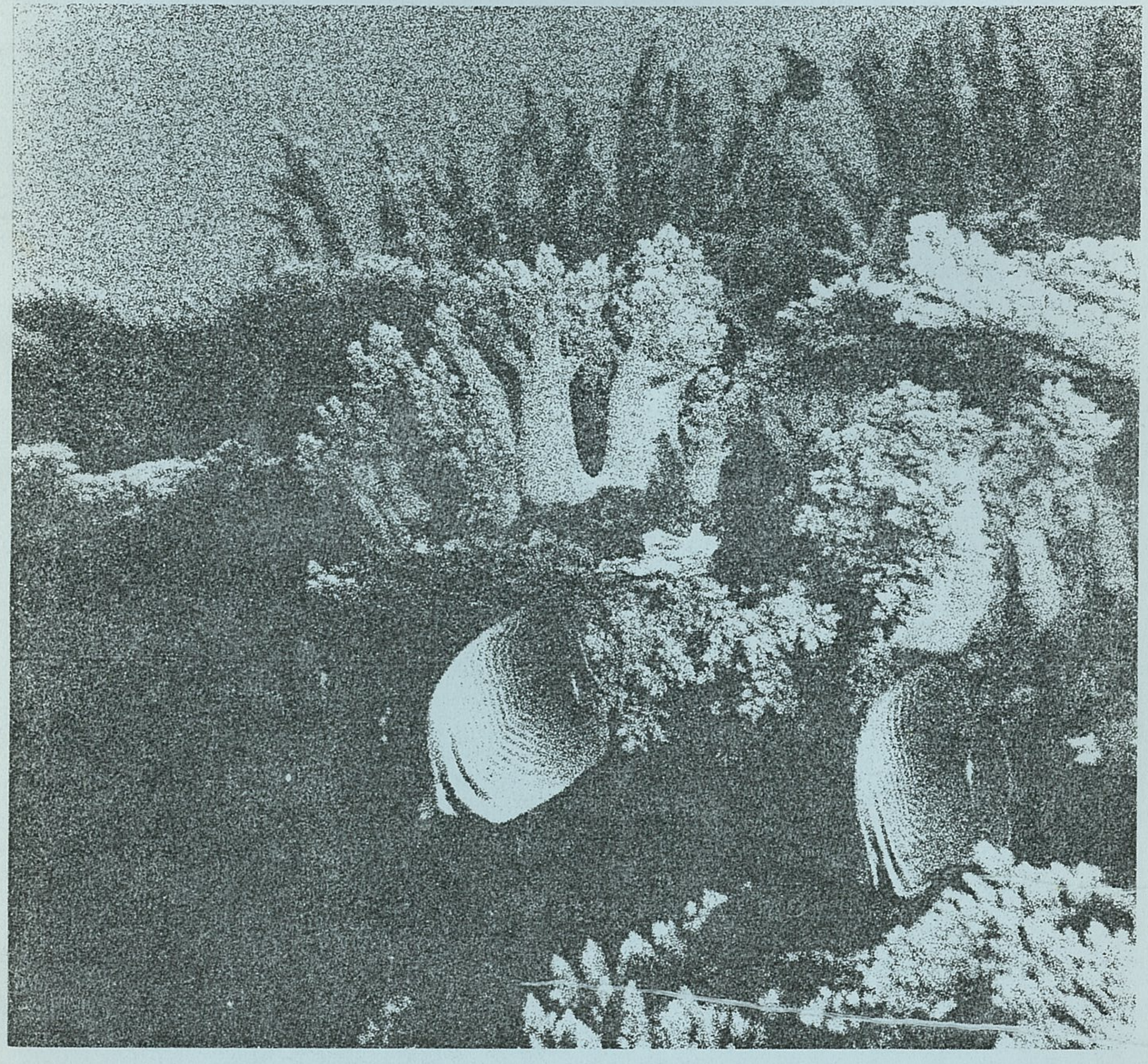
WORKSHOP: RESPONSE TO HAZARDOUS CHEMICAL SPILLS IN THE GREAT BARRIER REEF REGION
Background Papers



GREAT BARRIER REEF MARINE PARK AUTHORITY
Workshop 3 August 1984

WORKSHOP SERIES No. 6.

RESPONSE TO HARZARDOUS CHEMICAL SPILLS IN THE GREAT BARRIER REEF REGION

9:00am to 5:00pm

Friday August 3, 1984.

LOWTHS HOTEL

Townsville

PROGRAM

&

BACKGROUND PAPERS

GREAT BARRIER REEF MARINE PARK AUTHORITY

CONTENTS

Part A: General Details

BACKGROUND

The Department of Transport, as part of their responsibility for the National Plan to Combat Pollution of the Sea by Oil, has been preparing a response plan for the Great Barrier Reef Region. An element of that plan which has not yet been finalised is the scientific response which might be initiated in the event of an oil spill.

Oil spills are an area of potential concern, but there are other hazardous chemicals transported through the Great Barrier Reef Region. To date, there appears to have been little attention directed towards either a scientific or environmental protection response, in the event of a spill of hazardous chemicals other than oil in the Great Barrier Reef Region. There may be a need to link plans to protect the Reef from an oil spill with similar responses in the event of other hazardous spills.

As part of its Great Barrier Reef Region management responsibilities, the Great Barrier Reef Marine Park Authority is proposing to conduct a workshop in response to hazardous chemicals in the Great Barrier Reef Region. The workshop is being organised to take advantage of the presence in Australia of Professor John Gray, from Oslo University, Senior Queen's Fellow in Marine Science at James Cook University and Professor Michael Champ of The American University, also a Senior Queen's Fellow in Marine Science, both of whom are experts in oil (and other oceanic) pollution matters and the measurement and monitoring of its impacts.

The workshop will bring together researchers in the areas of risk analysis, marine chemistry, oceanography and marine contaminants, officers from State and Commonwealth Government agencies with interests in this area, a representative from the Queensland and Torres Strait Pilot Service and industry representatives.

The objective of the workshop is to examine the necessity and feasibility of establishing a response capability, particularly a scientific response capability, for hazardous chemical spills in the Great Barrier Reef Region.

WORKSHOP: RESPONSE TO HAZARDOUS CHEMICAL SPILLS IN THE GREAT BARRIER REEF REGION.

9.00am - 5.00pm

Friday 3 August 1984 Lowth's Hotel, Townsville

PROGRAM

Chairman: Dr. Alistair Gilmour, GBRMPA

9.00-9.05	Opening (Dr. Alistair Gilmour)
9.05-9.45	United States experience with oil and other hazardous chemical spills. (Professor Michael Champ, National Oceanographic and Atmospheric Administration and Senior Queens Fellow in Marine Science.)
9.45-10.15	Norwegian experience with oil spills: scientific response (Professor John Gray, University of Oslo and Senior Queens Fellow in Marine Science.)
10.15-10.45	Morning Tea.
10.45-11.05	Resume of state of existing Great Barrier Reef Region response arrangements (National Plan to Combat Pollution of the Sea by Oil) (Dr. David Kay, Department of Transport).
11.05-11.30	Risk assessment with particular reference to the Great Barrier Reef Region (Dr. Maurice James, Department of Civil and Systems Engineering, James Cook University.)
11.30-12.30	General discussion.
12.30-2.00	Lunch
2.00-3.15	Discussion groups. Attendees will be divided into 2 or 3 discussion groups. The objectives of the discussion groups are to consider . the necessity and feasibility of establishing a response capablity . terms of reference for working groups to discuss the three items on the attached sheet . possible working group Chairmen and members.

Discussion group Chairmen:
Dr. David Kay
Captain Roger Neve
Dr Wendy Craik

Rapporteurs
Mr Dan Claasen
Mr. Richard Kenchington
Mr. Ian Dutton

3.15-3.45	Afternoon Tea
3.45-4.50	Reports from Chairmen, Rapporteurs of Discussions Groups/General Discussion.
4.50-5.00	Summary (Dr. Alistair Gilmour)

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OBJECTIVE

To examine the necessity and feasibility of establishing a response capability, particularly a scientific response capability for hazardous chemical spills in the Great Barrier Reef Region.

In meeting this objective, the framework below is suggested. This framework covers the following points:-

- identification of hazardous chemicals and risks;
- decisions to respond;
- organising the response.

Three points are covered in more detail below.

1. What are the nature and relative magnitudes of the major potential hazardous chemical spills in the GBR ecosystem

   - materials, source, fate and effects
   - risk estimation, sensitivity mapping
   - prediction of outcome
   - cost of spills

2. Response to hazardous chemical spill situations

   i. Immediate environmental protection response (role of National Plan)

- oil
- other chemicals
- criteria for response
- type of response

ii. Utilising situation to enhance knowledge basic to the protection of the Great Barrier Reef

- criteria for response
- type of response

3. Organisation of response

- who should organise
- what should be organised
- how should be organised
- costs

4. Establishment of working groups to consider future action for 1 to 3

- definition of terms of reference
- selection of leader and members of group

It is anticipated that the workshop might consider the establishment of working groups to examine these questions in greater detail.

LIST OF PARTICIPANTS

Dr Trevor Beckman	Qld Government Chemical Laboratory
Dr Lance Bode	James Cook University
Professor Cyril Burdon-Jones	James Cook University
Professor Michael Champ	National Oceanic and Atmospheric Administration, Senior Queen's Fellow
Mr Dan Claasen	Planning Section, Great Barrier Reef Marine Park Authority
Dr Michael Coates	Griffith University
Dr Wendy Craik	Research and Monitoring Section, Great Barrier Reef Marine Park Authority
Mr Geoff Crane	Bureau of Meteorology
Mr Bob Craswell	Water Quality Council
Dr Colin Dahl	Australian Government Analytical Laboratory
Dr Gary Denton	James Cook University
Mr Ian Dutton	Research and Monitoring Section, Great Barrier Reef Marine Park Authority
Dr Frank Gillan	Australian Institute of Marine Science
Dr Alistair Gilmour	Great Barrier Reef Marine Park Authority
Dr J. Gordon-Smith	Department of Home Affairs and Environment
Captain Donald Grant	Qld and Torres Strait Pilots Service
Professor John Gray	Oslo University, Senior Queen's Fellow

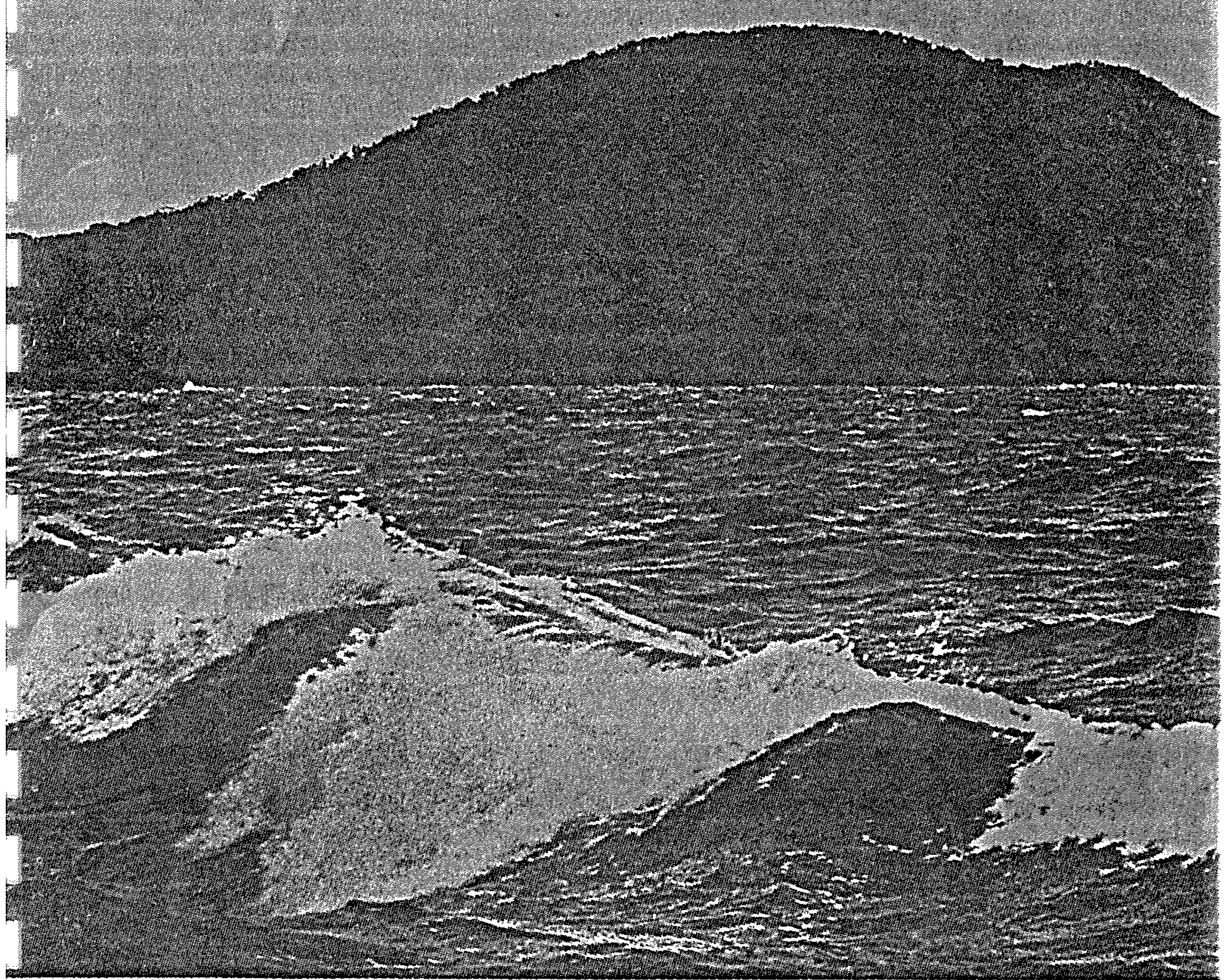
Mr Peter Gregory	Australian Institute of Petroleum
Professor Dilwyn Griffiths	James Cook University
Dr Maurice James	James Cook University
Dr David Kay	Department of Transport
Mr Richard Kenchington	Planning Section, Great Barrier Reef Marine Park Authority
Dr Peter Murphy	James Cook University
Captain Roger Neve	Department of Harbours and Marine
Mr John O'Dwyer	Planning Section, Great Barrier Reef Marine Park Authority
Mr Peter Ogilvie	Queensland National Parks and Wildlife Service
Dr John Reichelt	James Cook University
Mr Brian Slattery	Petroleum Institute Environmental Conservation Executive
Mr John Wheeler	Premier's Department

Part B: Background Papers

Department of

Transport & Construction

National Plan To Combat Pollution Of The Sea By Oil



August 1982

NATIONAL PLAN TO COMBAT POLLUTION OF THE SEA BY OIL

INFORMATION PAPER

INTRODUCTION

The National Plan to Combat Pollution of the Sea by Oil, "National Plan", has been in operation since October 1973. It represents a combined effort by Commonwealth and State governments, with the assistance of the oil industry, to help provide a solution to the threat posed to the coastal environment by oil spills from ships.

BACKGROUND

The grounding of the OCEANIC GRANDEUR in Torres Strait in 1970 accelerated the implementation of a nationwide plan to ensure that Australia would be prepared to respond to ship sourced pollution incidents, not only from oil tankers, but also from large bulk carriers and container vessels which may be carrying significant quantities of bunker fuel.

At a meeting between Commonwealth and State ministers in September 1971, agreement was reached on the basic divisions of responsibility for combating pollution of the sea by oil from ships.

COMMONWEALTH/STATE ADMINISTRATIVE ARRANGEMENTS

An initial requirement for the successful handling of oil spill incidents in Australia was a clear definition of the responsibilities of the two major participants, the Commonwealth and the States. This was provided in a set of Commonwealth/State administrative arrangements which includes such matters as access to Commonwealth stockpiles, financial arrangements and joint use of resources. Based on these arrangements the prescribed role of the Commonwealth, through the Department of Transport and Construction, is one of coordination, training, and the provision of logistic support, materials, equipment and finance.

DIVISIONS OF RESPONSIBILITY

Based on the capacity to take action to prevent or clean up pollution by oil from ships, the Commonwealth/State administrative arrangements provide that the responsible authority may request another authority to accept prime responsibility for action. This concept has been implemented already in certain territorial seas. Prime responsibility for action lies with:

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(1) <u>within a port or harbour</u>:

the administrative authority of that port or harbour

(2) <u>on beaches and foreshores</u>:

the relevant State government or Territorial authority

(3) <u>in territorial seas</u>:

(a) in Western Australia, Victoria and Tasmania, the relevant State government authority

(b) in all other States and the Northern Territory, the Commonwealth Government authority (represented by Commonwealth regional authorities), at the request of the relevant State government or Territorial authorities

(4) <u>on the high seas</u>:

the Commonwealth Government authority, represented by Commonwealth regional authorities.

<u>Responsible authority</u> is defined as that authority having the appropriate legislative jurisdiction over a pollution incident.

<u>Prime responsibility for action</u> is defined as the responsibility for controlling and coordinating operations to combat a pollution incident.

OPERATION

The basic concept of the plan was to provide spraying equipment and dispersant material at strategic locations around the coast. This has since been supplemented by the purchase of control and recovery devices and a central stockpile of ship-to-ship cargo transfer equipment.

Stockpiles of dispersant and associated spraying equipment are established at Cairns, Brisbane, Sydney, Melbourne, Hobart, Devonport, Adelaide, Perth, Port Hedland and Darwin. The dispersant used is BP-AB and the spraying equipment, based on the British Warren Spring Laboratory equipment, is designed for use aboard fishing vessels, harbour tugs and other similar-sized craft.

Use of dispersants will, however, be limited to incidents where the damage to the coastal and marine environments by the oil would be greater than that caused by any dispersant/oil mixture.

In the event of a major oil spill, a depleted stockpile can be replaced from any or all of the other stockpiles with further supplies available from commercial sources.

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The ship-to-ship transfer equipment, located in Sydney, is for use in lightening vessels in the event of a collision, stranding or similar incident. It consists of submersible pumps, hoses, fenders, lighting and power generating equipment.

Oil control booms of varying capacities are held at strategic stockpile locations together with four Marco oil recovery vessels and a variety of smaller oil recovery devices. All are used in exercises at regular intervals. This equipment is complemented by equipment held by port authorities and oil companies.

In the event of a major oil spill this country could call upon assistance from overseas as has been done in similar incidents abroad. Provision has been made for speedy entry into the country of equipment and manpower from overseas if required.

Although technology may develop better methods of dealing with oil spills, each incident is unique and requires the development of its own plan of action.

An Operations and Procedures Manual sets down the various procedures required to implement the National Plan and is complemented in each State by an appropriate supplement.

FUNDING

The National Plan is based on the "polluter pays" principle and to achieve this a levy similar to that applied to maintain navigational aids is imposed on commercial shipping using Australian ports.

In addition to providing funds for maintenance and administration of the Plan the levy provides contingency funds to cover those costs which

(1) could not be attributed to the polluter; or,

(2) upon conviction, the polluter proved unable to meet.

Where a ship sourced incident involves the use of more than 500 litres of dispersant, or where costs of clean up are in excess of $500, the cost of combating the incident is borne by the National Plan pending recovery from the polluter.

LEGISLATION

In November 1972, the 'Pollution of the Sea by Oil (Shipping Levy) Act 1972' and the 'Pollution of the Sea by Oil (Shipping Levy Collection) Act 1972' were passed by the Australian Parliament. These Acts will be replaced by the 'Protection of the Sea (Shipping Levy) Act 1981' and the 'Protection of the Sea (Shipping Levy Collection) Act 1981' when they are proclaimed in 1982. The new Acts re-define "oil" to bring the legislation into line with other Commonwealth pollution legislation and will also introduce a $10 minimum levy so as to ensure the collection of economic rates of levy.

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The Acts apply to vessels which are in excess of 100 net registered tons, having at least 10 tonnes of oil onboard.

Regulations made under the existing legislation have set the current rate of levy at 2 cents per net registered ton per quarter. The rate of the levy is not to exceed 4 cents per ton per quarter.

The levy was first imposed on 1 October 1973, the date on which the National Plan became operational. The rate of levy is reviewed annually.

SUPPORT ORGANISATION

To ensure maximum involvement of those concerned with the effective combat of oil spills in all areas of responsibility and to maintain an awareness of developments in the state of the art and equipment technology, the National Plan receives input from two committees. A Working Group on the National Plan (WGNP) established under the auspices of the Marine and Ports Council of Australia makes decisions on funding, equipment and training. The WGNP includes representatives from relevant operational areas of Commonwealth and State governments and meets at regular intervals.

The Maritime Services Advisory Committee - Marine Pollution, with representatives from Commonwealth Government departments and the oil and shipping industries, provides advice of a more scientific nature and may be required to nominate areas of research for the ongoing development of the Plan.

TRAINING

Three levels of oil spill response training are conducted.

(1) Oil spill clean up operations: personnel from port and marine authorities and the oil industry are trained in the operation of equipment available in their area and are shown the basic techniques for combat of a spill.

(2) On scene coordination: officers who may be required to assume the duties of an on scene coordinator attend a forum at which all aspects of clean up management are addressed.

(3) Contingency planning: this training explores the various requirements for protection of a section of coastline, grades the area according to sensitivity and assesses the resources necessary to mount a combat operation. Local involvement of Shire councils, press, police and emergency services organisations is encouraged.

SELECTED POLLUTION EQUIPMENT AVAILABILITY REGISTER

The Selected Pollution Equipment Availability Register (SPEAR) is a computer based register of selected oil spill combat equipment available in Australia. It contains details of equipment held at National

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Plan stockpiles as well as equipment owned by State and port authorities, the oil industry and others, including distribution agencies. SPEAR is incorporated in CSIRONET , the CSIRO's national computer network, and may be searched by an on scene coordinator to determine the location and availability of equipment to assist with combat operations.

OIL POLLUTION RISK ANALYSIS

A detailed oil pollution risk analysis has been carried out by the Bureau of Transport Economics (BTE). The purpose of the analysis was to provide an assessment of the desirable distribution of anti-pollution material and equipment around Australia during the 1980's and an indication of stockpile holdings. Utilising all available data the analysis aimed at identifying the most appropriate statisical distributions governing Australian oil spills.

ON SCENE SPILL MODEL

The On Scene Spill Model (OSSM) is a computer model, also accessible via CSIRONET, which simulates the movement of oil spills. Developed in the United States the model enables authorities to take countermeasures to minimise damage to the marine environment. Utilising forecasts of wind, tide and current movements, and taking into account the nature of the oil, OSSM indicates where the oil will spread for several days ahead and what form it will be in. The assessment is continually updated as weather and other conditions change.

The model has been used successfully in the United States and was first used, on a test basis at an actual spill, in Australia following the grounding of the container ship ANRO ASIA in October 1981.

A segment on OSSM is incorporated in the National Plan training courses.

MARINE POLLUTION OPERATIONS

Department of Transport and Construction
PO Box 111
DICKSON ACT 2602

August 1982

REVISED DRAFT JULY, 1983

OIL SPILL WORKSHOP REPORT

Venue & Date: GBRMPA Conference Room, March 3, 1983, 8.05 a.m.

Participants: Dr Gilmour, Chairman, Drs Kermond (GBRMPA), Tomczak (CSIRO), Sobey (JCU), Spillane (CSIRO), J.C. Andrews (AIMS), Ray Steedman (AIMS Council); and, Professor Stark (JCU)

The format for the workshop was established and agreed upon. Essentially this consisted of an introduction by Dr Gilmour, a review of part of the Galt Oil Spill Model by Dr J.C. Andrews, and discussion leading to the formulation of recommendations to the GBRMPA regarding its`role in oil spill decision-making.

Introduction (A Summary)

In the introduction, Dr Gilmour stressed three main points: as the Galt model is established on CSIRONET it is accessible and being used by the States; there is a need to consider oil spill contingencies in the Region especially in regard to the co-ordination of advice to other agencies or authorities more directly involved in the oil spill containment, clean-up etc; and, the Authority requires advice in its role as a technical-policy body in the preparation for and response to oil spills in the Great Barrier Reef Region.

Galt Model Review

Dr J.C. Andrews addressed his review of part of the NOAA developed "Galt" model. In general, he found the diagnostic sub-routine of the model that deals with geostrophic ocean currents inadequate in reef applications, and cited the following:

(i) Model requires constant initialization, and unlike the research and operational situation in the U.S., this may not always be possible in the reef region;

(ii) Model has 3 open boundaries which creates problems;

(iii) Time variability is not good;

(iv) Because of the simplistic data input needs, (e.g. around 200 bathymetric points and sea surface elevations) the model can only simulate linear sections, which, at approximately $100 per min on CSIRONET make the model fairly expensive in terms of computer costs;

(v) Model is useful in defining risk areas, but is not as useful in calamity management as it could be;

(vi) No shoals or reefs included in original assumptions underlying the Galt model.

Discussion Summary

Oceanographic data needs were discussed for models in general, including the JCU Hydrodynamic model. Data sets for modelling were held by AIMS for the reef region near Townsville, while JCU held data for the Capricornia/Mackay region. It was agreed that the minimum basic needs for modelling and predicting the movement of an oil spill were the following advection components: geostrophic current, wind driven layer, tides, surface driven slick speed.

Steedman and Associates have developed hydrodynamic models for use in the NW shelf waters. These have both wind field and waves input. It was pointed out, though, that such models have problems with non-linear processes such as shoreline rips and in accommodating mangroves and mudflats.

There was some discussion on the characteristics of an oil slick on the ocean. Data needs included information on the nature of the oil (chemical-physical changes and surface tension, decay, dispersants, viscosity, microbial attack etc), the turbulent dispersion (shearflow, transport down the gradient).

Final Remarks

1. There can be some danger in applying northern hemisphere oceanographic computer models in the southern hemisphere if due regard is not given to the constants, etc..

2. There is a need for more accurate, reliable and timely input of data from the Bureau of Meteorology.

3. One way to address the problem of providing advice regarding an oil spill in the Region would be to have a person devoted full-time to such a task -- for instance an Experimental Officer position could be created. The discussion suggested that such a position would be appropriate to generate background data for GBRMPA which might be used on a long-term basis in future search and rescue operations. This data would be provided in the form of solutions of the hydrodynamics of all areas within the Great Barrier Reef Region selected in order of priority for study so that a compendium of results would be available for use in emergency type situations which might require quick decisions to be made concerning possible movement of oil spills. The Officer could also be used to develop a co-ordinated program which might be used by the Search and Rescue Unit. The Search and Rescue Unit on the other hand is an operational unit with emergency capabilities which would not utilise, for the first few years at least, large computer real time solutions during operations. This information will have already been provided in the data compendium. (There was no discussion on the responsibility of various organizations, cost estimates, timing, management and funding.)

4. The following stages were recommended for Authority consideration:

(i) the risk of oil spills in the Great Barrier Reef region should be made to establish the acceptable risk level in selected areas. At present many ships use the area and there appears to be few spills. The study should highlight areas of high risk. Other toxic chemicals or substances may also be considered. The study should qualify to some degree the magnitude of the problem if there is one;

(ii) review the existing literature and information on winds, waves, currents and water levels. The review should include studies of circulation, theoretical modelling (circulation and oil transport), and list in detail the available data. The data list would aid future oil spill studies, model evaluation and operational problems;

(iii) evaluate the existing numerical models of Galt and JCU using both Capricornia and Townsville data sets. Circulation models in other high risk areas may be established and tested. The number of models required to cover the Great Barrier Reef region should be assessed. Recommendations on the best type of model, i.e. the equations of motion, boundary conditions, grid size and numerical scheme, assuming the wind and tide forcing, and bathymetry are available.

Once the circulation models have been evaluated the oil transport model(s) may be considered;

(iv) to improve the understanding of the physical and chemical transport processes associated with oil spill in the region, certain processes may need investigation with the aim of improving the model parameterization, e.g. the decay rate, or evaporation, of the viscosity of a specific oil may be important to the mass transport;

(v) establish organizational and operation procedures in the event of an oil spill, bearing in mind the State and Commonwealth Government Departments responsible.

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Statistical Compilations

[These give only general figures not specific values for the Great Barrier Reef Region or for chemicals]

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SHIPPING WITHIN THE GREAT BARRIER REEF REGION

The shipping route through the Far Northern Section contains more potential hazards than the more southerly areas of the Great Barrier Reef Region (Mort 1980). This is due to the combined influences of shallow waters and fringing reefs along the coast, the reef proper coming close to the coast in places and vast areas of uncharted reefs and shoals. The shipping channels through the Far Northern Section are narrow in places (only 3/4 mile) and necessitate many sharp turns (Whiteman 1978). A list of potentially hazardous waters in the Great Barrier Reef has been compiled by Mort (1980).

The "Inner Route" through the Great Barrier Reef and Torres Strait now used only became popular from the 1860's even though the waters inside the Great Barrier Reef are generally calmer.

The early days of shipping saw numerous shipwrecks along the outer reef, but the Outer Route was favoured because of perceived dangers of navigating through the reefs of the Inner Route. The emergence of pilots for the inner route in a service which eventually became the Queensland Coast and Torres Strait Pilot Service allowed an increase in shipping through the Inner Route (Foley J.C. 19882). Today the Inner Route has the greatest use by coastal shipping.

The number of ships piloted through the Inner Route over the last five years is shown below. The total number using the inner route is estimated at 10% above the piloted number. The main cargoes carried are bauxite, sugar, coal, frozen foods (meat), oil and silica sand. In addition, small local coastal vessels servicing Thursday Island and Gulf of Carpentaria ports make 200-300 trips per annum through the Far Northern Section (Whiteman 1978).

TABLE 2: NUMBER OF SHIPS PILOTED THROUGH THE INNER ROUTE GREAT BARRIER REEF

1978/79	1319
1979/80	1442
1980/81	1360
1981/82	1300
1982/83	1250 (estimate)

(Source: Queensland Coast and Torres Strait Pilot Service)

Mort (1980) notes that a large increase in fishing in Great Barrier Reef waters plus an increase in the size of the ships navigating the area has led to a number of close encounters in recent years. Large ships using the inner route have deep drafts and must keep to deep water channels. Manouverability is limited and ships do not always keep to recommended routes.

Recommended shipping routes are determined by the Commonwealth Department of Transport and Cosntruction. An advisory two way shipping route has been implemented from 1 September 1983. This two way route is for moderate draft ships. Ships with deep drafts (the maximum clearance is 11.89m (Mort 1980) will need to keep to the deepest channels.

Collision dangers on the Great Barrier Reef

by S.W. Mort*

RECENTLY there has been a large increase in fishing in Great Barrier Reef waters and also in the size of the ships navigating the area.

This has led to a number of close encounters, and to the sinking of the trawler *Suzie PK*.

To help avoid further accidents, I want to draw the attention of fishermen to some of the problems of piloting a large vessel through the inner route of the Great Barrier Reef, particularly insofar as those problems concern fishing vessels.

Confined waters

Large vessels have deep drafts — 11.89 m (39 ft) being the present maximum draft capable of navigating the inner route — and they must keep to deepwater channels, thereby limiting the area in which to manoeuvre. By day they display a black cylinder, and by night three red lights vertically, in addition to their navigation lights.

Passage of such ships is quite safe, provided they do not have to deviate from the deep channels, which are well known to the pilots and usually approximate the recommended tracks printed on the charts. However recommended tracks are not always followed.

Ships invariably pass to the east of Burkitt Island and close to Magpie and Iris Reefs and usually to the east of Eden Reef. They also pass on either side of Heath Reef. These waters are particularly 'confined' to say the least.

On observing a fishing boat, the pilot has to start planning his avoiding action at a range of about five miles in order not to have to take drastic action at close range, which could result in getting too far off course.

This is fine if the fishing vessel is on a constant course and maintains a constant speed and provided it has been seen. But if the fishing boat moves erratically it compounds the problem, especially if its navigations lights cannot be distinguished because of the intense glare from its working lights, which in themselves are frequently blinding to the people on the ship's bridge.

Low visibility

Small vessels, under about 30 m (100 ft) long, can be extremely difficult to see from a large ship's bridge, particularly if there is any sea running, because they are hidden against a background of white water. Also, many boats have a lot of white paint or other low-visibility paint that makes them merge into the background, so they are not always seen at a range of five miles. In rough weather the radar echo of a fishing vessel is frequently undetectable due to the 'clutter' or sea return on the screen, so it is quite possible for the ship not to be aware of the fishing vessel's existence.

Problems with lights

A number of close encounters have occurred at night in clear weather because of a fishing vessel's working deck lights.

POTENTIALLY HAZARDOUS WATERS

Chart	Locality
AUS 832	The area around the Howick Group
AUS 833	The area between C. Melville and Pipon Is. The area between Eden Reef and Taiwan Shoal The area east of Burkitt and Hannah Islands to Iris and Magpie Reefs and on either side of Iris Reef Buoy.
AUS 834	The area between Hay and Fife Islands The area between either side of Heath, Bow and Waterwich Reefs The area between Eel Reef and Kemp Rock
AUS 835	The area between Piper Is. and Inset Reef The area around Home Islands (Clerke Island)
AUS 839	The area between Wyborn Reef and Edborac Is. (The Adolphus Channel) The area from west of Sue Reef to east of Bet Reef (Vigilant Channel)
AUG 293	The area from Herald Patches to Harrison Rock (Prince of Wales Channel)
AUS 296	The area between The Buoys of Gannet Passage

* Captain Mort is a Queensland and Torres Strait pilot.

These lights are brilliant, making it impossible for the pilot to distinguish the port and starboard side lights, so that he has no idea in which direction the fishing vessel is heading.

This is a particular problem when the vessel has her gear in and is free running. Many fishing vessels under these circumstances do not switch off their fishing and working lights, and turn on their navigation lights. This is very confusing and is an extremely dangerous practice.

Even if the proper lights are exhibited and the working lights are extinguished, the navigation lights of the trawler are difficult to see because of the height difference between the ship's bridge and the trawler.

Navigation lights are dioptic — that is, the light emanating from them is beamed in a horizontal plane so that little light is projected either up or down — so the pilot of the ship is well above the focal plane of the trawler's lights and the trawler's skipper is well below the focal plane of the ship's lights. This makes seeing each other's lights quite difficult, particularly at close quarters (see Figure 1).

If the trawler has its working lights on then the chances of the pilot seeing its side lights are very much diminished. Also, with these working lights on, the trawler skipper's vision must be limited to the circle of light surrounding him.

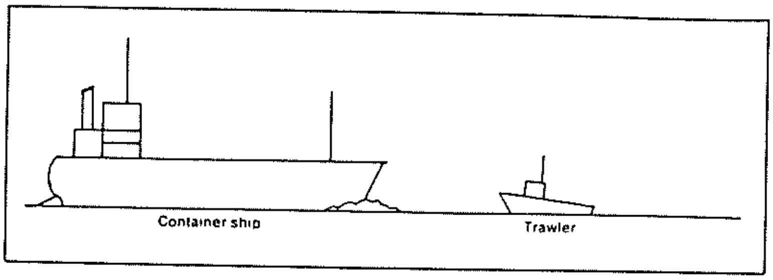

Figure 1: Dioptic light beams are horizontal and each vessel's navigation lights are on a different focal plane. It is very difficult for the vessels to see each other's lights, particularly if they are close.

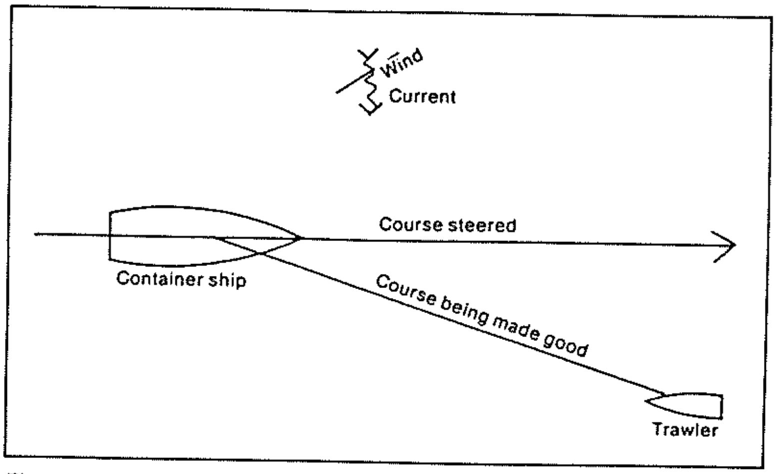

Figure 2: Trawler sees open masts by day and open mast lights and a green side light by night. Normally the trawler would be safe but because of the container ship's leeway it is in the ship's path and could be run down, irrespective of right of way.

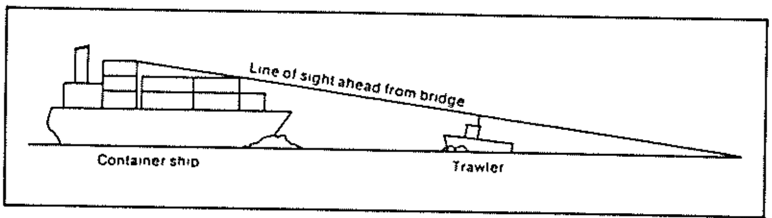

Figure 3: Line of sight ahead from container ship's bridge is restricted by deck cargo. Trawler could be run down, irrespective of right of way, because it might not even be seen.

Lookout

At sea a lookout is required to be kept by all means at the ship's disposal, namely visually, by hearing and by radar. A radar watch alone is not considered a proper lookout, and in any case, unless plotting of an approaching vessel is resorted to, it is extremely dangerous to try to assess a collision potential from watching a radar screen. In fact, radar-assisted collisions can be caused by this practice.

Also, by looking into a radar screen, the operator's night vision is very much impaired, so that even if he does go outside into darkness he would not be able to see properly for some considerable time.

Leeway problems

An average speed for ships passing through the inner route is about 15 knots. However some passenger ships and container ships are considerably faster, reaching more than 20 knots.

Both these types of ships have the problem of leeway due to a moderate draft and large wind-catching surfaces. This is particularly so in strong winds. Due to leeway being made, the course being steered can vary from the course being made good by as much as 10 degrees, so that it would be possible for a trawler to be in the direct line of approach of the ship but think otherwise, because the ship's masts would appear open by day, and by night the mast lights would be open and only one side light would be visible (see Figure 2).

Steering difficulties

Large deep ships frequently do not steer well in shallow water — under 18.3 m (10 fathoms) — but tend to yaw from side to side, in some cases up to 10 degrees from the course being steered.

Also, they take a long time to stop, and frequently engineers need considerable notice to manoeuvre engines without damaging them a great deal. They also tend to get out of control in shallow water when the engines are put astern, swinging either to port or starboard in an unpredictable way. Due to their immense weight and consequent inertia it is not possible to stop them by dropping an anchor. In fact anchors and cables on modern large vessels are very delicate pieces of equipment, and are very easily broken or damaged if too much stress is put on them. They are also very expensive.

Restricted vision

On some container ships, deck cargo restricts vision from the bridge. Frequently there is a blind spot extending from the bow of the ship forward for about two miles (see Figure 3). Also, a person standing on one side of the bridge might not be able to see the water on the opposite side of the ship.

When the language difficulties encountered on a foreign-flag ship are added to these limitations, fishermen can appreciate the difficulties pilots face to avoid fishing vessels in the confined shallow waters of the inner route of the Great Barrier Reefs.

Recommendations

Fishing vessels would greatly assist pilots by observing the following recommendations.

1. Do not fish in areas designated as 'Deep Draft Routes', particularly in the potentially hazardous waters listed on page 5.

2. At night turn off working lights when they are not required, or on the approach of or to a ship, and keep a **very good lookout** at all times.

3. Keep a constant listening watch on VHF channel 16, but do not converse on it; change to another channel for conversations.

4. Keep it constantly in mind that the pilot on an approaching ship may not have seen you or, if he has, he may not be able to tell what you are doing because he has been blinded by your working lights and is unable to see your side lights.

5. Keep to the letter of the International Regulations for the Prevention of Collisions at Sea, especially the steering and sailing rules and the rules concerning lights. (Rules 7, 8 and 9 are particularly important, as is rule 20b, which states that lights additional to the prescribed lights must **not** be shown if they impair the visibility or distinctive character of the specified lights or interfere with the keeping of a proper lookout. Many trawler lights contravene this rule.)

6. If on passage **do not** display fishing lights or have the working lights on. Both practices contravene the regulations and are very dangerous.

7. Remember the limitations of large vessels and the fact that fishing vessels do not have the right to impede the passage of other vessels navigating in narrow channels — (Rule 9c).

8. If you see an approaching ship's mast lights slightly open and see only one side light, do not assume all is well, because the ship may be making a lot of leeway, or yawing a lot in shallow water.

9. Keep a sharp lookout at all times, and especially when fishing near the shipping lanes on the chart. Remember, you can get off them but the ship cannot.

10. Assume the shipping lanes to be one mile wide on either side of the charted track unless otherwise obstructed. One mile is not much from a ship's bridge.

11. The people on the bridge may be 214 m (700 ft) from the bow of the ship and more than 30 m (100 ft) above the water. If there is a collision they possibly might not know about it, because in a loaded ship the impact would be absorbed, and any noise would not be heard due to the shielding effect of the bow and the ambient noise on the bridge from engines, radar, fans, etcetera.

12. Ships' lights when close are considerably above the normal line of sight from a trawler, so keep your eyes lifted. And do not forget, it is quite likely that your lights have not been seen from the ship's bridge.

13. The bow wave from a large ship when close can affect the steering of a small ship dramatically. The small ship may steer into the side of the large ship even against full helm in the opposite direction. There can also be a suction effect if the vessels are very close.

From the foregoing it might appear that large ships want everything their own way. Such is not the case — we all have a living to make — but they do want a fair go in the narrow channels to which they are restricted. They will give way where possible, as required by the regulations, but so should trawlers, which in any case should not restrict other traffic in these areas.

Ships are extraordinarily expensive. Even a moderate-size tanker costs about $60 million and has to earn about $40 000 a day during its life. This works out at about $1 667 an hour or almost $28 a minute.

Should this earning rate not be achieved, freight rates must rise, causing most other costs to rise, so even from this point of view it is in everybody's interest that these ships are not hampered.

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