

กรมควบคุมมลพิษ
Pollution Control Department

Development and Verification of Mathematical Model for Prediction of Oil Spill Movement

PCD OIL SPILL EMERGENCY PLAN

Pollution Control Department
Ministry of Science, Technology and Environment

ส่วนแหล่งน้ำทะเล สำนักจัดการคุณภาพน้ำ กรมควบคุมมลพิษ

Marine Environment Division, Water Quality Management Bureau, Pollution Control Department



PREFACE

This Plan was produced by Babcie BMT (Thailand) Co., Ltd. in association with International Response Corporation (IRC), AEA Technology plc, and STS Engineering Consultants Co., Ltd. as part of the project 'Development and Verification of Mathematical Model for Prediction of Oil Spill Movement' for the Pollution Control Department of the Ministry of Science, Technology and Environment, Thailand.

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GLOSSARY

AEA	Atomic Energy Authority
ASEAN	Assoc. of South East Asian Nations
BMT	British Maritime Technology
BP	British Petroleum
cSt	Centi Stokes (unit of viscosity)
ERP	Oil Spill Environmental Recovery Plan
EEZ	Exclusive Economic Zone
FID	Flame ionisation detector
g	Gram
GC	gas chromatography
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatography/mass spectrometry
GIS	Geographical Information System
IESG	Industry Environmental Safety Group
IRC	International Response Corporation
L	Litre
m	Meter
m ³	cubic metre
m ³ s ⁻¹	cubic meter per second
mg	Milligram
ml	Millilitre
MOU	Memorandum of Understanding
nm	Nautical Mile
NRDA	natural resource damage assessment
OEPP	Office of Environmental Policy and Planning
OMPC	Office of Maritime Promotion Commission
OPRC	International Convention on Oil Pollution Preparedness, Response



	and Co-operation
OSIS	Oil Spill Information System
OSPAR	Oil Spill Response Action Plan
OSR	Oil Spill Response
PAH	polycyclic aromatic hydrocarbons
PAHs	polyaromatic hydrocarbons
PCD	Pollution Control Department
pH	Measure of acidity/alkalinity
POSEIDON	specific name of a computer software provided in this project
ppb	parts per billion
ppm	parts per million
PTT	Petroleum Authority of Thailand
RTN	Royal Thai Navy
S2	Tidal harmonic constituent (Semi -diurnal)
SEACOR	SEACOR Holdings, Inc.
SEAWATCH	Ocean monitoring research programme in Thailand
SHC	saturated hydrocarbons
SMA	special management area
SOCRATES	Shoreline Oil Cleanup
SPRC	Star Petroleum Refinery Co., Ltd.
STAR	Oil company name
STS	STS Engineering Consultants Co., Ltd.
TAT	Tourism Authority of Thailand



1 INTRODUCTION

1.1 Plan Content

The PCD Emergency Plan sets out the policy of PCD and the actions to be performed by its staff in the response to oil spills in Thai waters. The plan consists of three main sections: the STRATEGY PLAN, the ACTION PLAN, and the DATA SECTION.

During a spill, reference should be made to the STRATEGY PLAN for clarification of PCD's general policy for performing the tasks assigned to it. The step-by-step procedures set out in the ACTION PLAN are accompanied in certain sections by forms to be completed and distributed by PCD representatives, and the relevant contact details specific to the task in question.

The DATA SECTION contains the contact details of relevant government and private organisations.

1.2 Purpose & Objectives

The aim of the plan is to provide PCD with the background information and structure to perform its role in oil spill response as set out by the Office of the Prime Minister's Regulation on the Prevention and Combating of Oil Pollution (1995). The plan is written as part of Development and Verification of Mathematical Model for Prediction of Oil Spill Movement¹, the overall aim of which was to provide PCD with the tools to perform its role in oil spill response in Thailand. The plan itself is designed to link closely with the handbooks and computer software also produced as part of the above mentioned project and which are listed in section 1.2.1 below.

1.2.1 Co-ordination with Other Plans, Handbooks and Software

The plan is designed to interface closely with the National Response Plan and the oil spill response plans of the Royal Thai Navy, the Harbour Department, IESG and the local provinces (where in existence).

As mentioned above, the Emergency Plan is written in conjunction with the following software and handbooks which were also developed for PCD as part of the Development and Verification of Mathematical Model for Prediction of Oil Spill Movement¹. Significant cross-referencing exists within the text of the emergency plan and the following products to allow rapid access to relevant information by PCD staff during an oil spill incident.

¹ "Development and Verification of Mathematical Model for Prediction of Oil Spill Movement" 1998 by Pollution Control Department, Ministry of Science, Technology and Environment.

Software:

- *Oil Spill Information System (Thailand)*

The Oil Spill Information System (OSIS) is a computer software package that provides oil spill trajectory, weathering and fate modelling of oil at sea. As part of the PCD project, an OSIS model has been developed for Thailand, allowing the monitoring of oil spills in Thai waters. This model is held and operated by PCD.

- *SOCRATES (Thailand)*

SOCRATES is an oil spill management software package that takes the trajectory analysis from OSIS to provide oil spill clean-up strategies. A detailed Geographical Information System containing information on resources in Thailand has been developed and incorporated in SOCRATES. This model is held and operated by PCD.

Handbooks:

- *Oil Spill Chemical Use Handbook*

This handbook provides guidelines for the use of dispersants in response to oil spills in Thailand.

- *Oil Spill Environmental Recovery Plan*

This handbook provides guidelines on the considerations and decision-making process for the clean-up and recovery of impacted resources during an oil spill incident.

- *Oil Spill Natural Resource Damage Assessment Handbook*

This handbook provides guidelines and procedures to assess the damage to natural resources as a result of an oil spill and to recover financial compensation from the responsible party.

1.2.2 Plan Distribution

The plan distribution list is provided in Annex 1. In addition to key PCD staff, the plan has been distributed to all other key government and industry organisations listed as OPERATING UNITS or SUPPORT UNITS as set out in the National Oil Spill Response Plan.

1.2.3 Update Procedures

The Plan Up-date Programme for the plan along with the Record of Changes, are included in Annex 2. Based on the initial date of approval by the Director General of PCD, the plan will receive a partial review every six months to ensure that essential personnel lists and contact information is up-to-date. Once a year, the plan will undergo a major review to account for any organisational, legislative, procedural, and any other such changes that may have occurred. Also lessons learnt from oil spill exercises during the year (see section 1.2.4, below) will be

incorporated at this time. Revisions to the plan will be recorded in the Record of Changes form and will be distributed to all recipients of the plan listed in Annex 1. Responsibility for ensuring the plan is up-dated as set out in Annex 2 lies with the Chief of the Marine Pollution Sub-Division.

1.2.4 Training & Exercises

All spill team members of the PCD Marine Pollution Sub-division and senior staff of the Water Quality Management Division should be fully familiar with the procedures outlined of this Plan. In order to achieve this, two internal one-day table-top exercises / training sessions will be run each year to test the plan and the ability of the PCD staff to perform their role. All staff of the Marine Pollution Sub-Division and Senior staff of Water Quality Management Division should attend at least one of these exercises per year. All new staff joining the Marine Pollution Sub-Division will be required to read the Plan within the first few weeks of joining the unit, and will be required to attend the first available table-top exercises / training session.

These exercises will be in addition to outside exercises, such as those run by IESG, in which PCD will be involved.

2 STRATEGY PLAN

2.1 Response Organisation

This section sets out the structure and organisation for response to oil spills. It aims to define how PCD fits into the national and regional organisation, and provide a clear explanation of PCD's internal organisation and procedures for response.

2.1.1 The National Response Organisation

The organisation for response to oil spills was as established by the Office of the Prime Minister's Regulation on the Prevention and Combating of Oil Pollution (1995). Under this regulation, overall responsibility for oil spill response in Thai waters is delegated to the Committee on the Prevention and Combating of Oil Pollution (herein called the "Committee"). In 1995, the Committee developed the National Oil Spill Response Plan². This plan aims to define the responsibilities of the various government and oil industry organisation involved in oil spill response in Thailand and in doing so has established the structure as set out in Figure 1.

2.1.1.1 Committee on the Prevention and Combating of Oil Pollution

The *Committee on the Prevention and Combating of Oil Pollution* consists of representatives from numerous government agencies and is chaired by the Minister of Transport and Communication. It is responsible for reporting to Cabinet on the activities associated with significant oil spill incidents.

2.1.1.2 Co-ordination Centre

The role of the *Co-ordination Centre* is performed by the Harbour Department. The Co-ordination Centre has the following tasks:

- processing of oil spill reports
- notification of the concerned parties of an oil spill incident
- reporting of response operations to the Co-ordinating Committee
- taking charge of public relations issues
- co-ordinating of activities of concerned agencies
- co-ordination with other countries with regard to spills in the contiguous sea
- arrangement of a budget for training, exercises and response operations.

² National Oil Spill Response Plan - Harbour Department, 1995

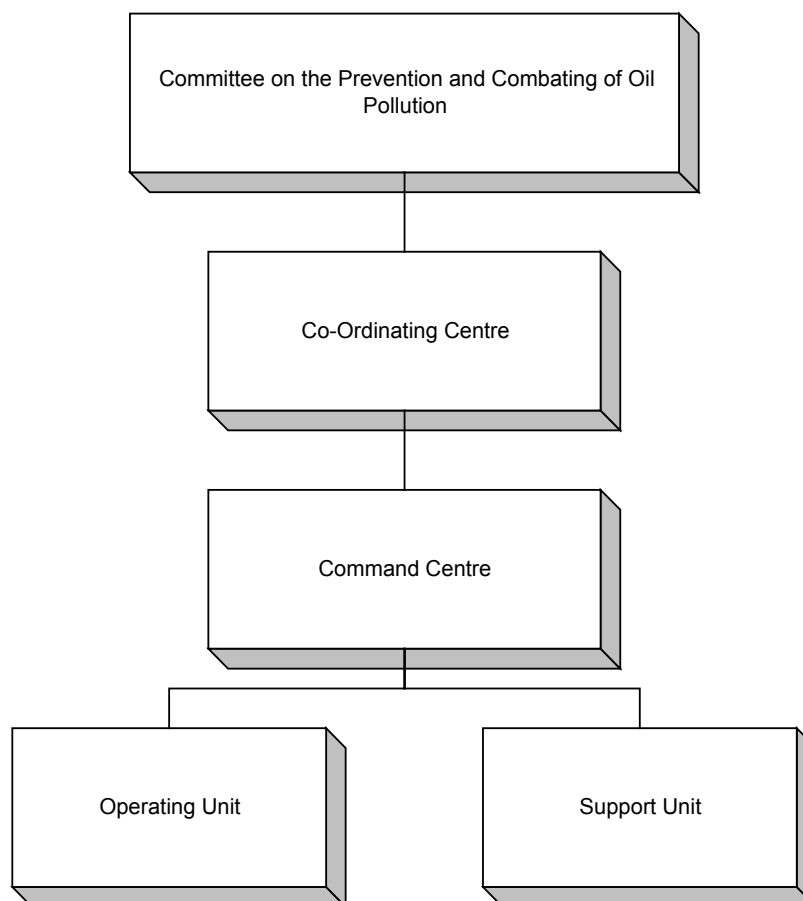


Figure 1 National Oil Spill Response Organisation

2.1.1.3 Command Centre

The **Command Centre** will be formed in the event of an incident and is the main body responsible for undertaking the oil spill response operations. Overall responsibility for the activities of the Command Centre and response to an incident lies either with the Royal Thai Navy or the Harbour Department, depending where the spill occurs:

Spill Location:	Director of Command Centre:
Rivers, estuaries, lakes & within port limits	Harbour Department
Beyond port limits to territorial waters/EEZ	Royal Thai Navy (RTN)

The Command Centre has the following responsibilities:

- development of action plans and determination of response methods
- direction, supervision & co-ordination of the response operations
- reporting of response activities to the Co-ordination Centre.

The **Command Centre** consists of representatives of the “Operational” and “Support” units. Representation of the various Operations and Support Units

within the Command Centre is as deemed necessary by the Director of the Centre.

2.1.1.4 Operation Units

In general terms, the Operation Units are responsible for conducting the response to the oil spill incident as directed by the Command Centre.

Table 1. OPERATION UNITS and their Responsibilities

Organisation	Responsibility	Resources
Harbour Department	<ul style="list-style-type: none"> Spill surveillance & verification spill clean-up assistance to RTN - clean-up of spills beyond port limits 	<ul style="list-style-type: none"> assorted marine craft oil spill response equipment
Royal Thai Navy	<ul style="list-style-type: none"> Spill surveillance & verification, spill clean-up assistance to Harbour Dept.- clean-up of spills in rivers, estuaries, lakes beyond port limits 	<ul style="list-style-type: none"> assorted marine craft aircraft (fixed wing/helicopter) oil spill response equipment
Industrial Environmental Safety Group (IESG)	<ul style="list-style-type: none"> information on the verification of a spill participation in oil spill clean-up assistance in equipment support from abroad 	<ul style="list-style-type: none"> oil spill response equipment personnel
Provincial Administration	<ul style="list-style-type: none"> Preventative measures for shoreline impact Clean-up of impacted Shoreline 	<ul style="list-style-type: none"> personnel, vehicles & equipment

Harbour Department

The Harbour Department is the lead agency for response to spills which occur in coastal waters, inland waterways, and within port limits.

Internally, the Harbour Department identifies certain of its divisions as Operational Units and other as Supporting Units for response to ship accidents and oil spills (Table 2). Of the Operational Units, the Technical Division, through the head of the Environmental Section has the dominant role in oil spill response and has overall responsibility for directing clean-up operations. The Pilot radio station is responsible for receiving and communicating oil spill reports both to Harbour Department personnel and other concerned agencies.

Table 2. Harbour Department Internal Organisation for Spill Response

Unit	Division
ACTION	Technical Division (Head of Environmental Section)
	Ship Inspection Division
	Pilotage Division
	Water Transportation Division
	Provincial Harbour Authorities
SUPPORTING	Stores Division
	Dredging & Channels Divisions
	OMPC Training Centre
	Office of the Departmental Secretary

Royal Thai Navy

The Royal Thai Navy (RTN) is the lead agency for response to spills which occur at sea outside of port limits. RTN divides the country into three operating regions:

Region 1: Upper Gulf of Thailand

Region 2: Lower Gulf

Region 3: Andaman Sea

The headquarters for the three regions are Sattahip (Region 1), Songkhla (Region 2) and Pang-Nga (Region 3). Although overall control of Royal Thai Navy activities lies with the Naval Command Centre in Bangkok, operational response to spills in the three regions is headed by the regional command Centres (Figure 2).

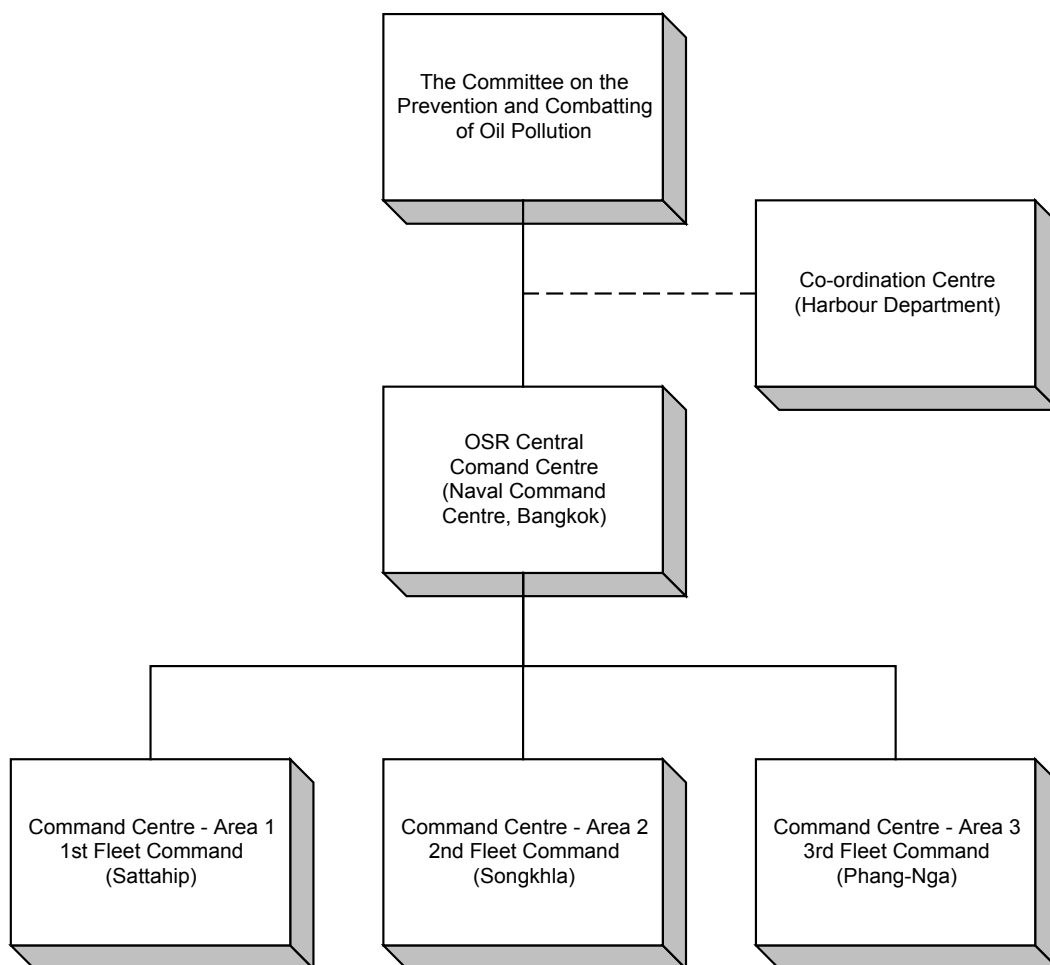


Figure 2 RTN Internal Response Structure

RTN maintains limited amounts of specialised oil spill response equipment and various marine craft and aircraft for aerial surveillance and dispersant spraying at sea. For significant incidents however, the RTN relies on specialist oil spill resources from other sources (IESG and Harbour Department).

IESG

IESG is a co-operative grouping of oil companies for response to oil spills. The group consists of 9 companies involved in the oil industry in Thailand:

- The Bangchak Petroleum Public Company Limited (Bangchak)
- BP Oil (Thailand) Limited (BP)
- Caltex Oil (Thailand) Limited (Caltex)
- ESSO (Thailand) Public Company Limited (ESSO)
- Mobil Oil Thailand Limited (Mobil)
- Petroleum Authority of Thailand (PTT)



- The Shell Company of Thailand Limited (Shell)
- Thai Oil Company Limited (Thai Oil)
- Star Petroleum Refining Company Limited (SPRC)

Members are required to maintain sufficient resources to cope with Tier 1 incidents at their own facilities. For spills of larger than Tier 1, IESG has developed an Oil Spill Response Plan in order to provide co-ordination between the spiller, other IESG members and the relevant government authorities.

The organisation (see Figure 3) is overseen by the main committee consisting of the oil company members and an advisory group consisting of the Harbour Department, Royal Thai Navy, PCD, the Office of Environmental Policy & Planning and the Defence Energy Department. The organisation is then split into four regional sub-committees consisting of those oil company members operating in the respective regions.

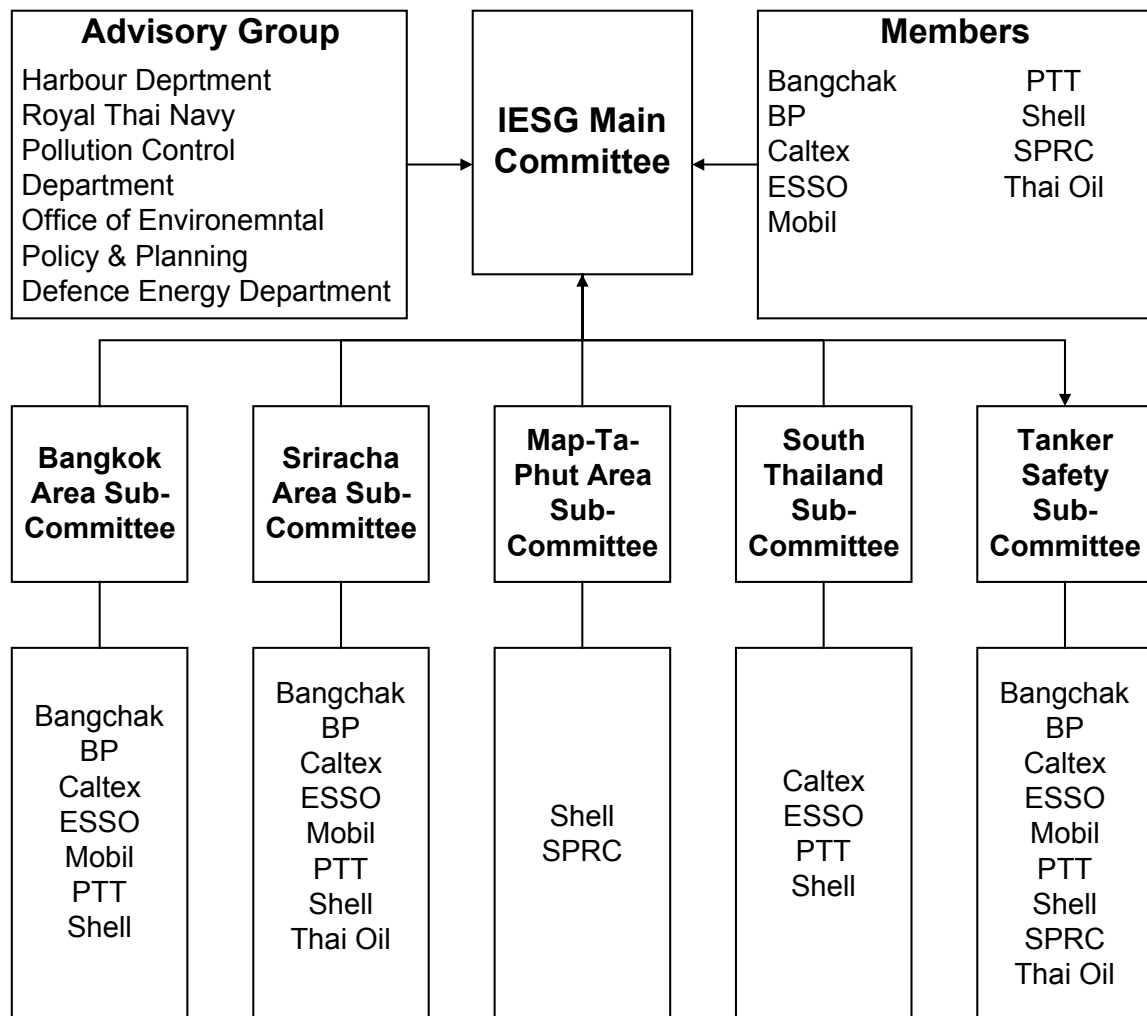
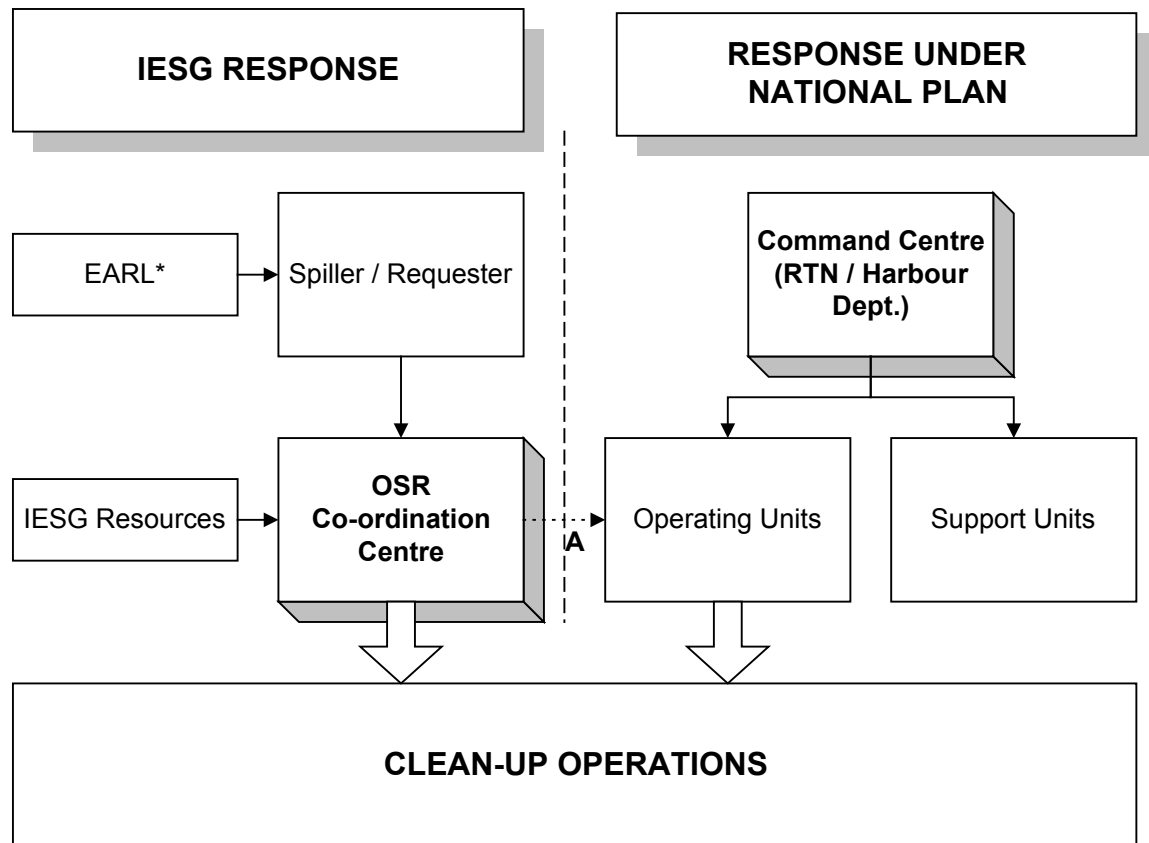


Figure 3 IESG Organisational Structure



In the event an IESG member has a spill (Figure 4), according to the IESG plan, it will act as the lead organisation for the clean-up, with the ability to request resources from other IESG members to supplement its own. However, the lead role in the response may be assumed by the government in the event the National Plan is activated. In the event the National Plan is not activated, the OSR Co-ordination Centre will act as the interface between the various concerned parties involved in the clean-up operation.



A - in the event the national plan is activated
 * - for EARL members only

Figure 4 IESG Response Structure

In the event the National Plan is not activated, and the response is being lead by an IESG member, that member can call for assistance from other IESG companies and government authorities such as the Harbour Department and Navy.

Provincial Administration

Although the National Plan defines Provincial Administrations as Operation Units, their involvement is primarily when the oil impacts the shoreline under their responsibility. The National Plan is unclear with respect to the jurisdiction and control of clean-up operations of the shoreline between the Command Centre



(RTN or Harbour Department) and the provincial administration. In reality, it is possible that control of the clean-up operation will revert to the provincial authorities when the bulk of the oil has impacted the shoreline.

2.1.1.5 Support Units

Support Units are responsible for providing various technical, legal, administrative and field support to the spill response effort as outlined in Table 3 below.

Table 3 *SUPPORT UNITS and their Responsibilities*

Organisation	Responsibility
Pollution Control Department	<ul style="list-style-type: none"> • modelling of oil spill characteristics & movement • identification of sensitive sites • verification of oil spill reports • restoration of the environment • legal action against polluter
Airforce	<ul style="list-style-type: none"> • aerial monitoring oil spill movement (when requested) • air transport of equipment from abroad
Army	<ul style="list-style-type: none"> • manpower & general equipment (shoreline clean-up) • aerial monitoring of oil spill movement (when requested)
Civil Aviation Department	<ul style="list-style-type: none"> • search & rescue • receipt & transmission of aerial oil spill sightings • facilitate aerial transportation of equipment from abroad
Marine Police	<ul style="list-style-type: none"> • receipt & verification of oil spill reports • control of marine traffic at spill incident
Meteorological Department	<ul style="list-style-type: none"> • provision of information on weather conditions
Local Administration Department	<ul style="list-style-type: none"> • support of shoreline clean-up operation with provision of equipment and vehicles for transport of personnel & oily debris
Office of Environmental Policy & Planning	<ul style="list-style-type: none"> • provision of information on marine resources and use of coastal zone

Table 3 (Continue)

Organisation	Responsibility
Fisheries Department	<ul style="list-style-type: none"> provision of information on spawning, cultivation & fishery grounds provision of work boats (when requested)
Bureau of Royal Rainmaking & Agricultural Aviation	<ul style="list-style-type: none"> provision of aircraft for dispersant application at sea
Customs Department	<ul style="list-style-type: none"> facilitate the temporary importation of oil spill equipment from abroad
Department of Treaties & Legal Affairs	<ul style="list-style-type: none"> advise on legal issues concerning a foreign vessel
Immigration Department	<ul style="list-style-type: none"> facilitate the entry of foreign personnel to assist the response
Port Authority of Thailand	<ul style="list-style-type: none"> receipt, surveillance and verification of oil spills & ship salvage within port limits, and in the vicinity of ports under PAT control
Communications Authority of Thailand	<ul style="list-style-type: none"> facilitate communications with sea-going vessels for receipt of spill reports provision of communications equipment to support spill response
Controller-General's Department	<ul style="list-style-type: none"> facilitate disbursement of advance funds and central budget funds for spill response
Bangkok Metropolitan Authority	<ul style="list-style-type: none"> provision of boats, equipment & transportation for clean-up in Chao Phraya

2.1.2 Regional Organisation

2.1.2.1 Thailand-Malaysia Co-operation in Prevention and Combating of Oil Spills

The Thailand-Malaysia agreement on co-operation in the prevention and combat of oil spills followed the oil spill from the NAGASAKI SPIRIT incident, which affected the waters of Indonesia, Malaysia and Thailand. With the existence of the busy Malacca Straits bordering both countries, the aim of this agreement is to facilitate co-operation and combine resources in response to major incidents beyond the capability of the individual countries. The general aims of the agreement are as follows:

- To enhance the capacity of each country to respond to an oil spill which is beyond the national capability
- To provide a co-operative plan for mutual assistance in the event of a major spill beyond the capability of the national government and resident oil industry
- To institute prompt measures to control and mitigate oil spills, whether caused accidentally or intentionally
- To co-ordinate and integrate the actions of Thailand and Malaysia in the prevention and combat of oil spills.

2.1.2.2 ASEAN-OSRAP MOU

Memorandum of Understanding Amongst the Governments of Brunei, Darussalam, Indonesia, Malaysia, the Philippines, Singapore, and Thailand on Oil Spill Response.

In Tokyo in 1993, a memorandum of understanding (MOU) was signed by a number of SE Asian countries as part of the OSPAR project on co-operation in oil spill response in the ASEAN region. The MOU was an attempt to strengthen mutual co-operation at an operational level in light of the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990, and the development of the ASEAN Oil Spill Response Action Plan (ASEAN-OSRAP).

The MOU specifies the ASEAN-OSRAP as the basis for co-operation between the countries at an operational level. It also designates Jakarta, Indonesia as the focal point for the ASEAN-OSRAP. The MOU calls upon the countries to:

- conduct mutual visits for oil spill preparedness and response
- undertake joint exercises and training
- promote research and development of oil pollution combating measures
- facilitate trans-boundary movement of personnel, equipment and materials in the event of an oil spill emergency.

In addition to strengthening co-operation, the OSPAR project has involved the establishment of a number of oil spill response equipment stockpiles in the ASEAN region and the development of an “information network system”.

2.1.3 PCD Response Organisation

2.1.3.1 Roles and Responsibilities

As part of the oil spill project conducted in 1996/97, the general outline of PCD's roles and responsibilities as set out in the National Plan have been further refined and developed as follows:

- Provision of Expertise on Oil Behaviour and Monitoring
- Identification and Classification of Sites Sensitive to Oil Spills
- Technical and Scientific Support on Oil Spill Clean-up and Environmental Recovery

- Advise and Monitoring of the Use of Chemicals in Oil Spill Response
- Assessment of Damages to the Natural Environment
- Development of Compensation Claims for Damage to the Natural Environment and Claims advise to Third-Party Claimants

Section 2.1.2 of the Strategy Plan sets out in more detail the way in which PCD will fulfil these tasks in the event of a spill.

2.1.3.2 Internal Response Organisation

Figure 5 shows the internal organisation of PCD. Within PCD, the lead group for the response to oil spills is the Marine Pollution Sub-Division, which has the responsibility for carrying out the tasks outlined in section 2.1.1.7 above. The Marine Pollution Sub-Division is part of the Water Quality Management Division, and although it presently consists of only 9 staff, additional personnel can be called upon from the Coastal Water Quality Sub-Division in the event of a major incident, providing a total of 18 staff. Plans exist to up-grade this sub-division to division status at sometime in the future which should result in a significantly larger number of staff.

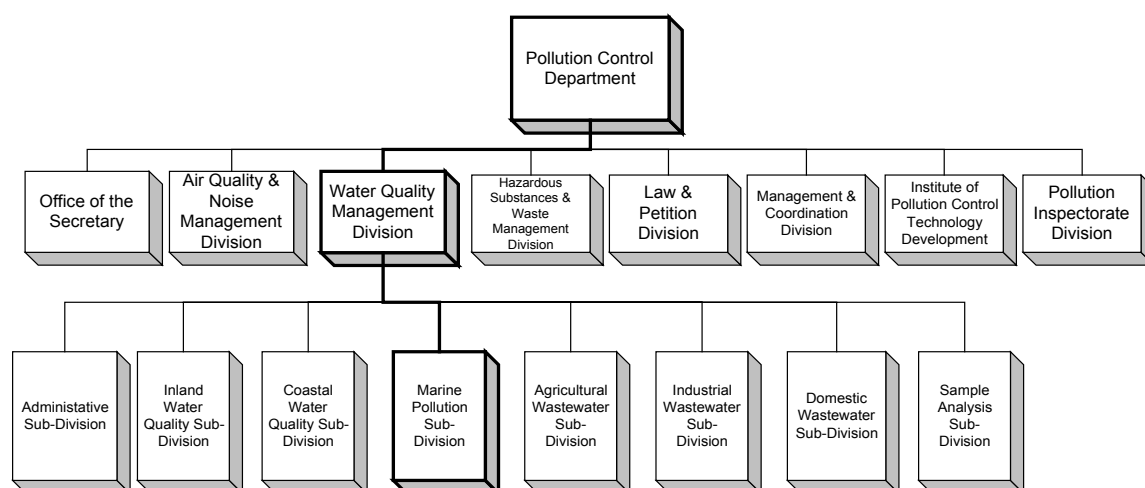


Figure 5 Structure of PCD (Oil Spill Departments Highlighted)

2.1.3.3 Communication Structure & Procedures

External Notification of PCD

During office hours, notification of an oil spill to PCD is made either to the dedicated numbers below or to the PCD Duty Officer who constantly carries a pager and mobile phone. Outside of office hours, notification is made to the Duty Officer.

2.1.3.4 Mobilisation of PCD Resources & Personnel

The mobilisation of PCD personnel and resources to the site of an incident will depend primarily on the size and location of the spill, and the impact/threat to natural resources. In the case of smaller spills, where there is little threat of substantial damage to natural resources, it is unlikely that PCD will provide staff on-site. The following Table 4 is designed to give guidance on decision-making relating to the mobilisation of PCD personnel, although it is important that flexibility is maintained in order to account for unforeseen circumstances and case-by-case considerations. Where the symbol “•” has been inserted in Table 4, it is suggested that, in addition to the size of the spill and the threat/impact to natural resources, PCD should also take into consideration factors such as the following when assessing mobilisation of PCD staff:

1. the toxicity & persistence of the oil
2. local considerations
3. requests from OPERATING UNITS for PCD assistance on-site
4. the perceived need to perform an NRDA

Where an “X” has been inserted, it is unlikely that PCD on-site presence would be required. Where a “✓” has been inserted, it is recommended that PCD provide an on-site presence.

Table 4 Guidance on Mobilisation of PCD Personnel

Spill Size			
>50m ³	•	✓	✓
10-50m ³	X	•	✓
<10m ³	X	X	•
	Low	Medium	High

Threat/Impact to Natural Resources

Whenever a PCD representative is sent to a spill, an office-base staff member will be allocated to provide general support to the field representative. In the event that it is decided not to send a PCD representative to site, a Case Handler will be selected in the PCD office to carry out any work relating to that particular spill.

2.2 PCD Roles & Responsibilities

This section of the STRATEGY PLAN sets out in detail the roles and responsibilities of PCD and its staff in response to oil spills

2.2.1 Oil Movement & Behaviour

This section deals with PCD's role in providing predictions on the movement and behaviour of oil spills in the marine environment. This is achieved through a combination of computerised modelling and aerial observation. The aim of this section is to explain the general strategy for the application and use of computer simulation and aerial surveillance during an oil spill.

2.2.1.1 Computer Simulation of Oil Movement

PCD maintains OSIS (Oil Spill Information System), a coupled oil spill model and Geographical Information System (GIS). The GIS is shared with the Shoreline Oil Clean-up, Recovery and Treatment Evaluation System (SOCRATES) which is described below, and contains the databases of reference data such as natural resources, equipment stockpiles, coastline & seabed types, water quality data, socioeconomic data, shipping and port data, etc. Figure 6 shows the configuration of the databases and the GIS system which feed into OSIS.

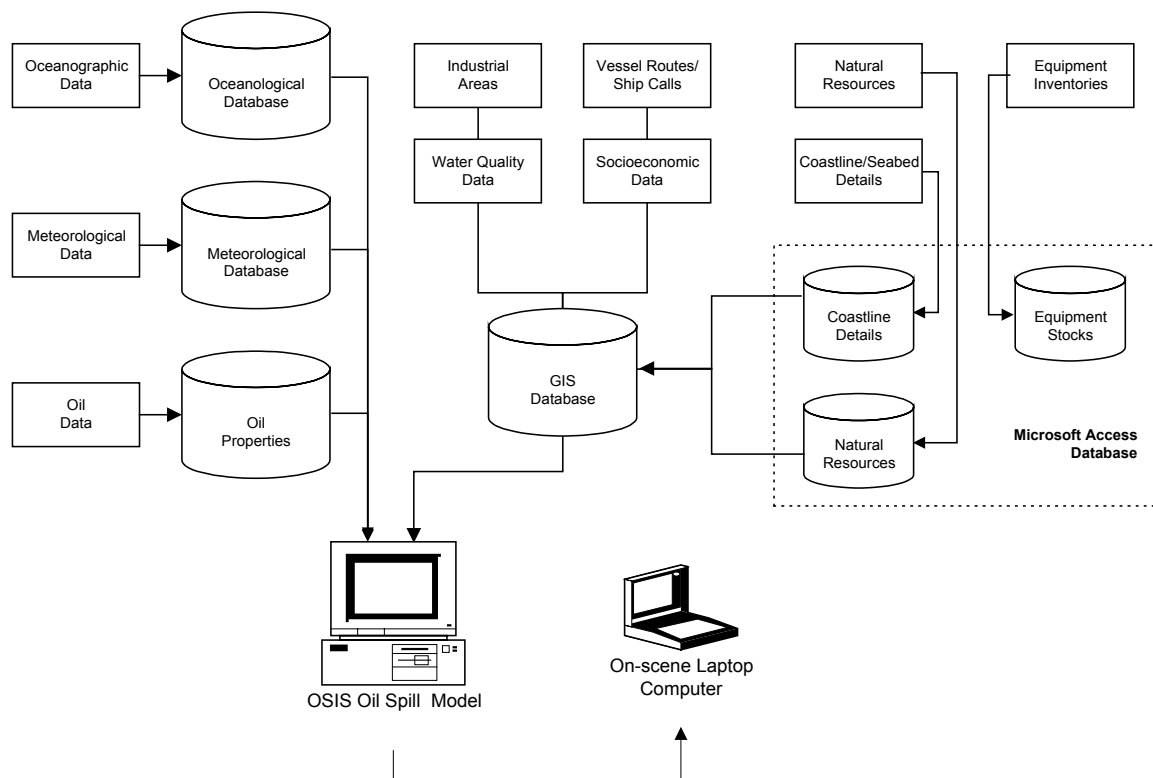


Figure 6 OSIS Configuration & Associated Databases

The OSIS model forms the basis for PCD's ability to predict a number of behavioural characteristics of an oil spill (Figure 7) occurring anywhere within Thai waters. A full explanation of how OSIS is operated is provided in the OSIS User Manual.

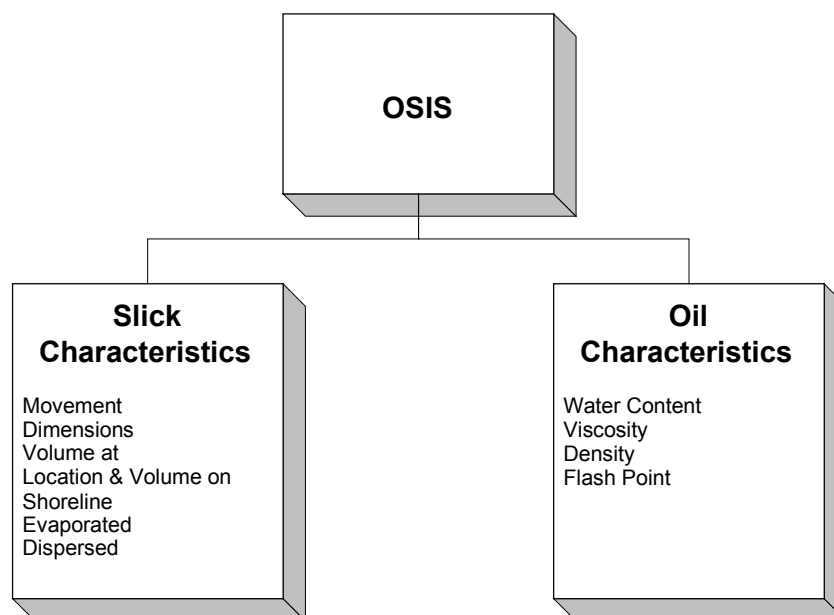


Figure 7 Oil Spill Characteristics Predicted by OSIS

During model runs, OSIS predicts the weathering characteristics of the oil as well as displaying the extents of the oil against the reference map. Figure 8 and Figure 9 show examples of some of the predictions provided by OSIS to illustrate the explanation below and the general application of the model.

a) Prediction of oil spill movement

PCD will use OSIS to provide predictions of the movement of oil to the appropriate agencies. Figure 8 shows a typical trajectory prediction for a spill occurring off the Eastern Seaboard of the Gulf of Thailand. This software is maintained on one PC desktop within the Marine Pollution Sub-Division and on a Lap-top computer which is in the possession of the Chief, Marine Pollution Sub-Division during office hours and the Duty Officer outside of office hours. The Duty Officer will be fully trained in the use of the OSIS and SOCRATES models. This enables spill predictions to be run on the OSIS model at any time of day or night.

In the event of a spill, in order to provide a prediction of the movement, PCD will quickly ascertain the following information:

- The location of the spill,
- The quantity and type of oil spilled
- The weather conditions in the region

Current conditions are already incorporated within the OSIS system. Although the model does contain typical wind data in order to provide a rapid predictions in the early stages of a spill, actual wind conditions will need to be sought quickly to provide reliable predictions. Section 3.5.2 of the ACTION PLAN sets out the procedures to be followed and information to be collected to run the model.

b) Identification of resources at risk

Having predicted the likely movement of the oil, the operator of the OSIS model will be able to identify resources that are at risk from the oil. The following list sets out the main resources contained within the GIS and accessible through OSIS.

- Shoreline Type (sandy, rocky, mud)
- Mangrove
- Seagrass
- Coral
- Marine Mammals
- Birds
- Fisheries
- Turtles
- Aquaculture
- Tourist Beaches
- Industrial Area (e.g. Power Stations)

OSIS provides the operator with the ability not only to identify these resources, but to access further information on the particular resources in question. Such resources include natural resources (e.g. seagrass, coral reefs, mangroves) and economic resources (e.g. tourist areas, aquaculture zones, fishing areas). Data is stored as thematic layers in the GIS. Each individual resource is represented as a polygon, symbol or line and these objects can be interrogated to access textual information such as descriptions or statistics, and graphical information such as photographs for identification purposes.

c) Targeting response resources

In addition to the shoreline sensitivity analysis of the Thai coastline which is contained in the GIS (see Section 2.2.1.1), the information provided by PCD on the resources at risk is important for the Command Centre as it forms the basis to the prioritisation of response strategies.

d). Response Techniques

As highlighted in b) above, OSIS provides information on the nature of the impacted shoreline. This is invaluable first-hand information for the OPERATING UNITS to select the most appropriate response technique when they may not have had an opportunity to survey the shoreline.

The physical and chemical properties of the spilled oil have a significant impact on the effectiveness and approach taken for different response techniques. OSIS will be used to provide the Command Centre with guidance on the changing characteristics of the oil in order that the most effective response techniques can

be adopted. Table 5 below highlights the main characteristics that will be monitored using OSIS.

Figure 9 shows a selection of the analytical screens of the oil/slick properties produced by OSIS.

e). Spill source identification

In some circumstances, a spill may be identified without the source of the spill being known. In this case, OSIS can be used to attempt to “back-track” the oil in to identify the source. This is particularly useful in the case where the release is not continuous and hence difficult to identify from the air. Where appropriate, these predictions will be used to support prosecution of the spiller.

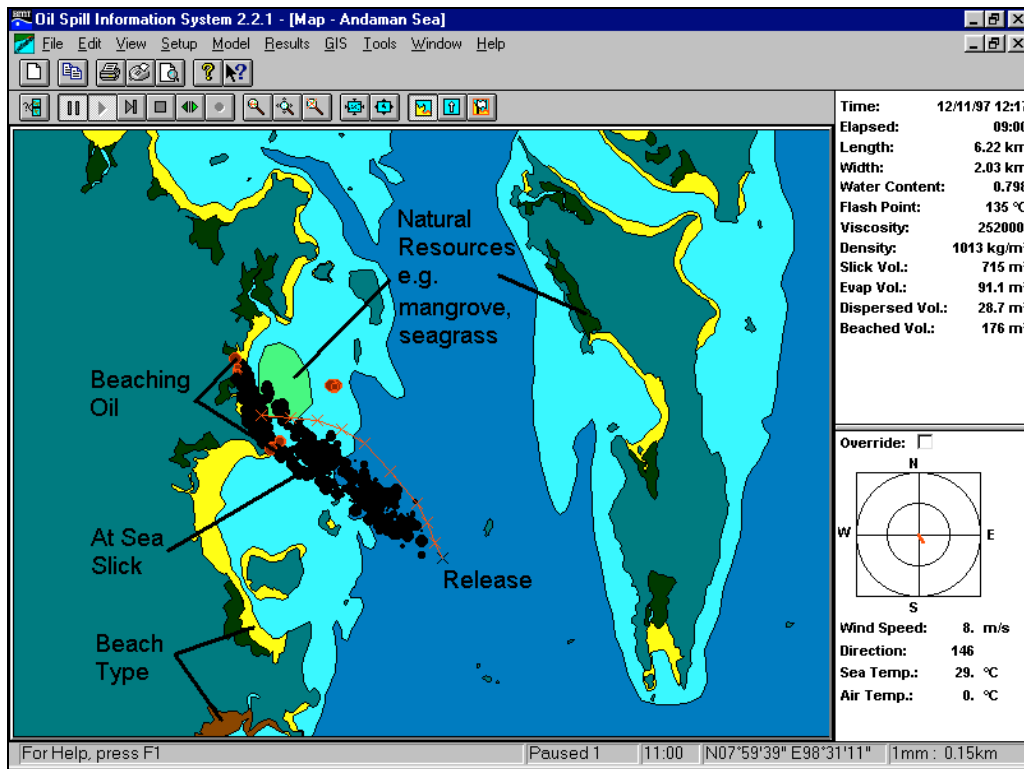


Figure 8 Example Oil Spill Trajectory Analysis

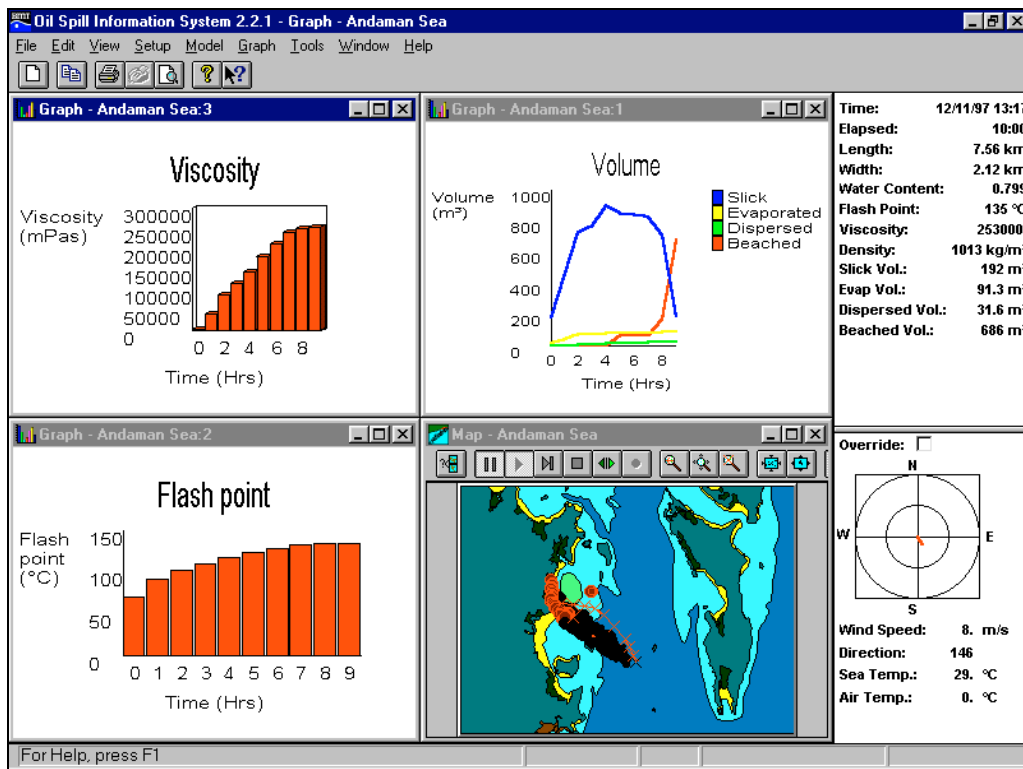


Figure 9 Example Oil Spill Property Predictions



Table 5 Oil Spill characteristics Monitored by OSIS and their Relevance in the Clean-up Response

Response Technique	Oil Characteristics Monitored Using OSIS	Affect on Response Technique
Dispersant	Viscosity	Increased viscosity reduces dispersant effectiveness
	Water Content	Emulsification often reduces dispersant effectiveness
	Slick Volume	Effects the determination of the quantity of dispersant to be mobilised/used
	Slick Area	Effects the determination of the quantity of dispersant to be mobilised/used
Mechanical Recovery	Viscosity	Increased viscosity generally reduces effectiveness of skimmers & affects selection of skimmer type
	Water Content	Emulsification increases oil volume and results in greater storage requirements
	Flash Point	Has implications for safety of recovery operations
	Slick Area	Affects the containment systems used

Aerial Observation of Spilled Oil

In order to verify the trajectory predictions being given by OSIS and make any adjustments that may be necessary, trained PCD personnel will take part in aerial observation performed by the Harbour Department and / or RTN.

2.2.1.2 Dissemination of Oil Spill Prediction

During an oil spill incident, PCD will, in most cases, provide all information on the movement and behaviour of the oil directly to the Command Centre for dissemination. However, this information will undoubtedly be subject to widespread distribution both to involved agencies and outside organisations alike, and may be subject to misinterpretation. This being the case, PCD spill predictions will always be provided in the format set out in the **Spill Movement & Behaviour Report Form** (Annex 3), whereby the trajectory analysis is accompanied by a text print out of the parameters and results of the OSIS model along with a text section for any specific comments. The **Spill Movement & Report Form** is automatically generated by SOCRATES by following the procedures set out in Section 3.5.2 of the ACTION PLAN.

2.2.2 Use of Chemicals in Oil Spill Response

This section outlines PCD's approach to the use of dispersants in the response to oil spills. A detailed discussion of the use of dispersants is provided in the Oil Spill Chemical Handbook. Section 3.5.3 of the ACTION PLAN provides the procedures to be followed by PCD in order to carry out its duties relating to the use of dispersant.

2.2.2.1 Consideration in the Use of Dispersant

NOTE: It is essential that the dispersant application procedures are expedited as rapidly as possible in order to maximise the effectiveness of the dispersant.

When considering the use of dispersants, the PCD adheres to the following general principles:

- a) The dispersant used should be pre-approved by PCD.

PCD has a list of pre-approved dispersants for usage in Thai waters. PCD will make this list freely available to Operating Units. However, Operating Units applying dispersant should consult with PCD for the granting of final authorisation to spray dispersant **before** application where the Chemical Use Handbook advises. The granting of final approval will be done by the **Director General, PCD** or in his / her absence, the Director, Water Quality Management Division.

b) Use of dispersant must produce net environmental benefit

The assessment of net environmental benefit is achieved by examining all relevant environmental implications, and by balancing the advantages and disadvantages of dispersant usage and comparing them to other response methods. Most of this process should be completed at the contingency planning stage, although the following elements are spill-specific and can only be considered at the time of the spill:

- How effective is the dispersant application likely to be, in view of factors such as the weather conditions and the type and amount of oil spilled
- Will the dispersed oil be diluted to low impact level and, if so, how long will it take to reach these levels
- What is the estimated time scale for the recovery of the habitat

c) The quantities of dispersant used should be in proportion to the Incident

A number of factors should be considered when reviewing the use of dispersants in order that their usage is appropriate to the circumstances:

- the size of the spill,
- the dispersibility of the slick,
- the severity of the threat to sensitive resources
- the effectiveness of natural dispersion.

d) Dispersant usage should be constantly monitored to take into consideration the changing characteristics of spilled oil

A monitoring programme of the dispersant operation will be mounted by PCD in significant incidents in order to determine at which point the spraying operation becomes ineffective or when the oil is adequately dispersed. The procedures of the monitoring programme are set out in Section 5.5 of the Oil Spill Chemical Handbook.

In the initial stages of an aerial spraying operation, aerial monitoring will be performed by PCD. In the later stages of the aerial operation or during shipborne spraying, monitoring will occur both from the air and from boats. **The spraying operation should not wait for the monitoring operation.**

2.2.2.2 Decision-making at the time of a spill

The general consideration for the use of dispersant are set out in Section 6 of the Oil Spill Chemical Handbook. Detailed Guidance on toxicity aspects of dispersants and their application in different habitats are provided in Sections 2.5 and 3 the Oil Spill Chemical Handbook.

2.2.2.3 Application of Dispersants

The following are some general technical requirements for the application of dispersant that PCD will monitor during a spill response operation:

- a) dispersant should not be applied to oil sheens
- b) dispersant should be applied to the thick parts of the slick
- c) aircraft and ships should be directed in spraying operations by a spotted plane
- d) aircraft application should be parallel to the wind
- e) vessel application should be into the wind
- f) dispersant application should not be attempted in winds exceeding 30 knots

2.2.3 Clean-up and Environmental Recovery Options

Guidance on the clean-up and recovery activities is provided in the **Oil Spill Environmental Recovery Plan (ERP)**. The ERP will be used by PCD personnel both in the field and in the office to provide input into the selection and implementation of clean-up operations. The ERP should be taken by PCD who attend a spill as an essential reference document.

The primary aims of this Oil Spill Environmental Recovery Plan (ERP) are therefore to provide:

- A description of the vulnerability of the various coastal and marine resources to oil spills;
- A simple system for prioritising each resource for protection and clean-up;
- Guidelines on the most appropriate techniques for their protection and clean-up;
- Guidelines for carrying out impact surveys and for monitoring the recovery of damaged resources

Use of the ERP is closely linked with the various other elements of the PCD oil spill system:

- The SOCRATES database provides information on the distribution of the various resources around Thailand and listings of the resources present in the area affected by a spill.
- The Chemical Handbook provides information on the use of dispersant chemicals on oil slicks and is therefore referred to in the ERP where dispersants are appropriate (or not appropriate) for protection and clean-up of particular resources.
- The Oil Spill Natural Resource Damage Assessment cross-refers to the ERP for information on the various resources and methodologies for assessing damage.

There are seven essential stages to the ERP methodology, marked as 1 to 7 in the flowchart (Figure 10) and described below:

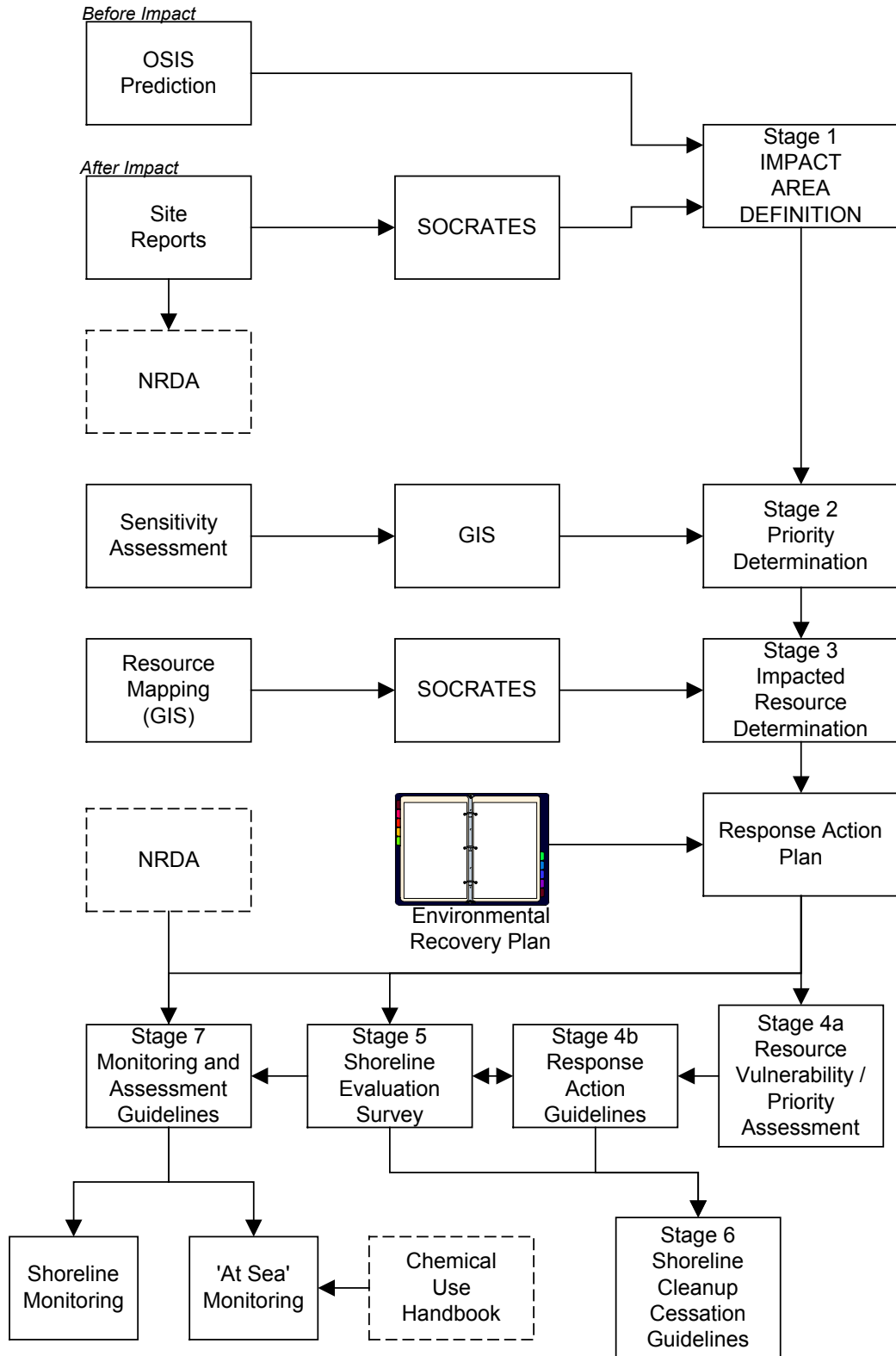


Figure 10 Use of the Oil Spill Environmental Recovery Plan in oil spill response



Stage 1: Impact Area Definition

If the spill has yet to impact the coastline, the OSIS model would be used to simulate the spill conditions and to determine the likely coastline impact area of the spill. As the situation develops and oil reaches the shoreline, the predictions from the model may be supplemented by real data collected by shoreline evaluation surveys and reported in the SOCRATES system.

Stage 2: Priority Determination

The next stage is to determine the priority of resources that may be, or have been, impacted by the oil spill. This stage of the Plan uses the resource priority maps that are presented in the GIS, which give the overall vulnerability of each section of coastline. Figure 11 shows an example of the coastal sensitivity map for the area between Ko Tatutao and Satun.

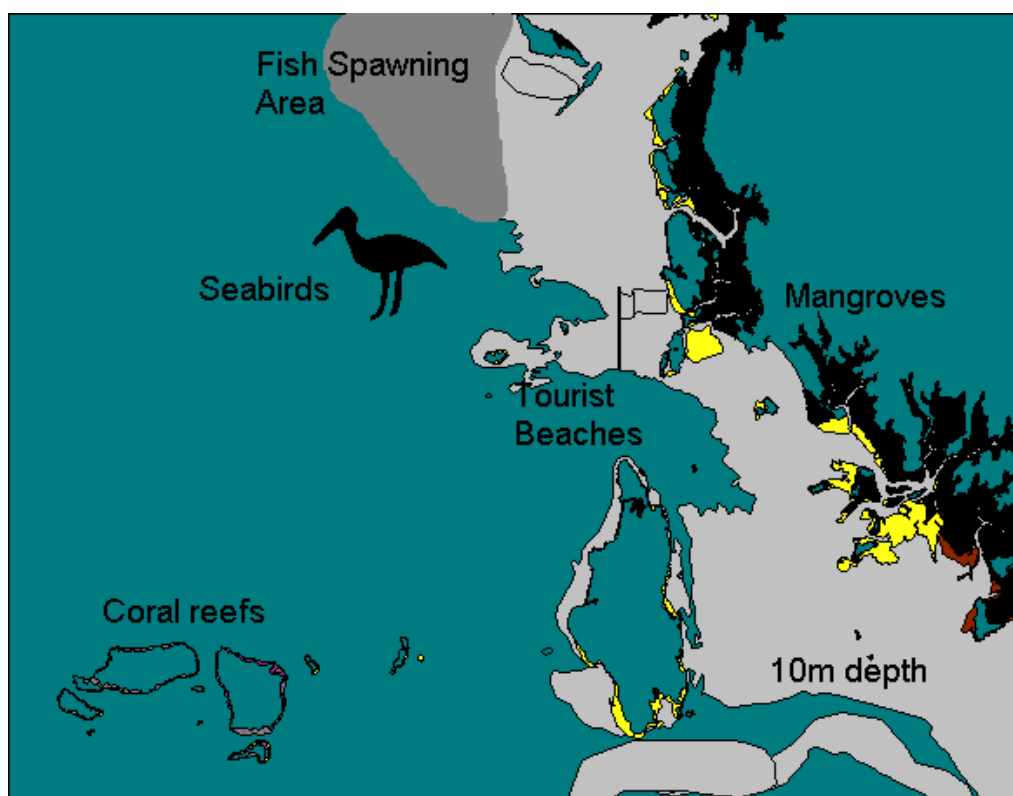


Figure 11 Sensitivity Map for Area between Ko Tarutao and Satun

Stage 3: Impacted Resource Identification

The third stage of the Oil Spill Environmental Recovery Plan combines Stages 1 and 2 to provide a listing of all impacted resources within the spill impact zone. This is carried out by generating an impacted resource identification report using SOCRATES together with the GIS database of resources.

Stage 4: Response Action Plan

Based on the impacted resource listing produced in Stage 3, the Response Action Plan is developed. Each individual resource category (e.g. mangrove, amenity beach, shrimp pond etc.) is presented in the Oil Spill Environmental Recovery Plan. The response guidelines are in two parts:

a) Assessment of specific resource vulnerabilities

For each resource a short description is available with comments on its sensitivity to oil pollution and a list of the factors which are important for assessing vulnerability to oil spills. A response decision tree (in a semi-graphical format) then guides the user to a High, Medium or Low priority for the specific resource, based on the factors listed.

b) Guidelines for response

For each resource there is a concise list of important things to do to mitigate the spill impact and important things not to do (i.e. which may further damage the resource).

Stage 5: Shoreline evaluation surveys

A survey methodology and proforma are provided in the Environmental Recovery Handbook for evaluating the impact to shoreline resources. These systematic surveys will form the basis to:

- assess the requirement for shoreline clean-up
- select the most appropriate cleanup methods
- determine priorities for shoreline cleanup
- document the spatial oil distribution over time
- maintain consistent records of oil distribution for use in other scientific surveys

Stage 6: Cessation of clean-up

This stage of the Plan provides a decision process on stopping clean-up activity on a particular resource.

Stage 7: Monitoring & Assessment

The Monitoring & Assessment stage of the Oil Spill Environmental Recovery Plan is divided into 'at sea' and 'shoreline' assessment. The guidelines are presented on a resource specific basis as each resource tends to have very specific sensitivities to oil spills. Response action monitoring would be focused, for

example, on the effectiveness of a dispersant application operation to check that it was having the desired effect on the spill.

2.2.4 Natural Resources Damage Assessment

NRDA deals with the assessment and valuation of damages to the public natural resources of Thailand. The detailed approach to the NRDA system is set out in the NRDA Handbook.

The following are some examples of the types of damages that would be covered under the NRDA process:

- Damage to mangrove forest resulting in reduced productivity and ecological function as a result of death of seedlings, juveniles and adult trees.
- Damage to seagrass beds resulting in reduced productivity and ecological function as a result of dieback, or reduction in biomass and species abundance or density.
- Damage to coral reefs due to physical destruction due to grounding or mortality of reef organisms from oil exposure.
- Death of mammals and birds from direct contact with oil, or reduced reproduction rates from direct oiling or contamination of prey.
- Death of sea turtle eggs, hatchlings, juveniles and/or adults
- Reductions in fish populations
- Reduced primary and secondary productivity of intertidal and subtidal habitats.
- Loss of use by the public of beaches or other coastal recreational sites because of closure or avoidance by users.

Private third-party losses relating to economic damage to natural resources (fishing, commercial exploitation of mangrove, tourist industry) are not covered by NRDA and are discussed in Section 3.5.4.

2.2.4.1 Framework for Assessing Natural Resource Damages

The NRDA framework for Thailand provides for two general approaches:

A. Restoration-based approach

This approach is based on the cost of restoring natural resources actually injured during an oil pollution incident, and is most appropriate for habitats where restoration methods have been proven to be feasible and cost effective in Thailand (e.g. mangrove and seagrass).

B. Compensation schedule-based approach

This approach calculates the monetary value of the injury on the amount and type of oil spilled and the sensitivity of the affected resources. It will be applied where there are no feasible or cost-effective restoration options for the impact resource.

Figure 12 provides the process and decision-making framework for Oil Spill Natural Resource Damage Assessments carried out by PCD in corporation with OEPP. There are three main phases to this process:

I. Pre-assessment Phase

The primary objective of this phase is to decide if there is a need to conduct an NRDA and, if so, to select the most appropriate method. Following an incident, the available information on the incident will be reviewed by the **NRDA Government Council**, which consists of many of the agencies with responsibility for natural resources. The council is chaired by PCD, and makes the decision as to whether an NRDA claim is pursued.

II. Damage Assessment Phase

The aim of this phase is to determine the nature, degree and extent of any injuries to natural resources. If the restoration-based approach is being followed, this information is needed to evaluate the need for, and cost-effectiveness of restoration options. If the compensation schedule approach is used, this information is needed to complete the calculation of the total monetary value of damages. Even for the compensation schedule approach, this phase should also include selection and costing out of restoration options, so that there is a clear plan on how to spend the collected funds. Thus, this phase is divided into two activities: Injury Assessment and Restoration Selection.

III. Restoration Phase

The final phase in the NRDA process is the funding and implementation of the selected restoration options. The process includes the following:

- 1) Establishment of an account where the recovered funds can be placed and from where they can be administered.
- 2) Formation of a Restoration Council which oversees and monitors restoration actions.
- 3) Identification of the agency or group who will actually contract out and manage on a day-to-day basis the restoration work.
- 4) Setting of criteria for successful restoration work and development of a monitoring plan which will measure success against the criteria.

2.2.4.2 NRDA Methodology

Section 3 of the NRDA Handbook, provides guidance to PCD staff on the data collection and analysis protocols needed to complete the NRDA for the natural resources likely to be injured by oil spills in Thailand. The resources addressed will include those which have been identified as being sensitive to oil spills in the Emergency Recovery Plan.

2.2.4.3 Compensation Schedule Formula

In the event the compensation schedule-based approach is adopted, PCD will use a formula to calculate the level of the compensation claim against the spilled. This formula is based on the volume of oil discharged, the characteristics of oil discharged and the sensitivities of the natural resources impacted. Section 5 of the NRDA Handbook provides the procedures to be followed in the use of compensation schedule formulae.

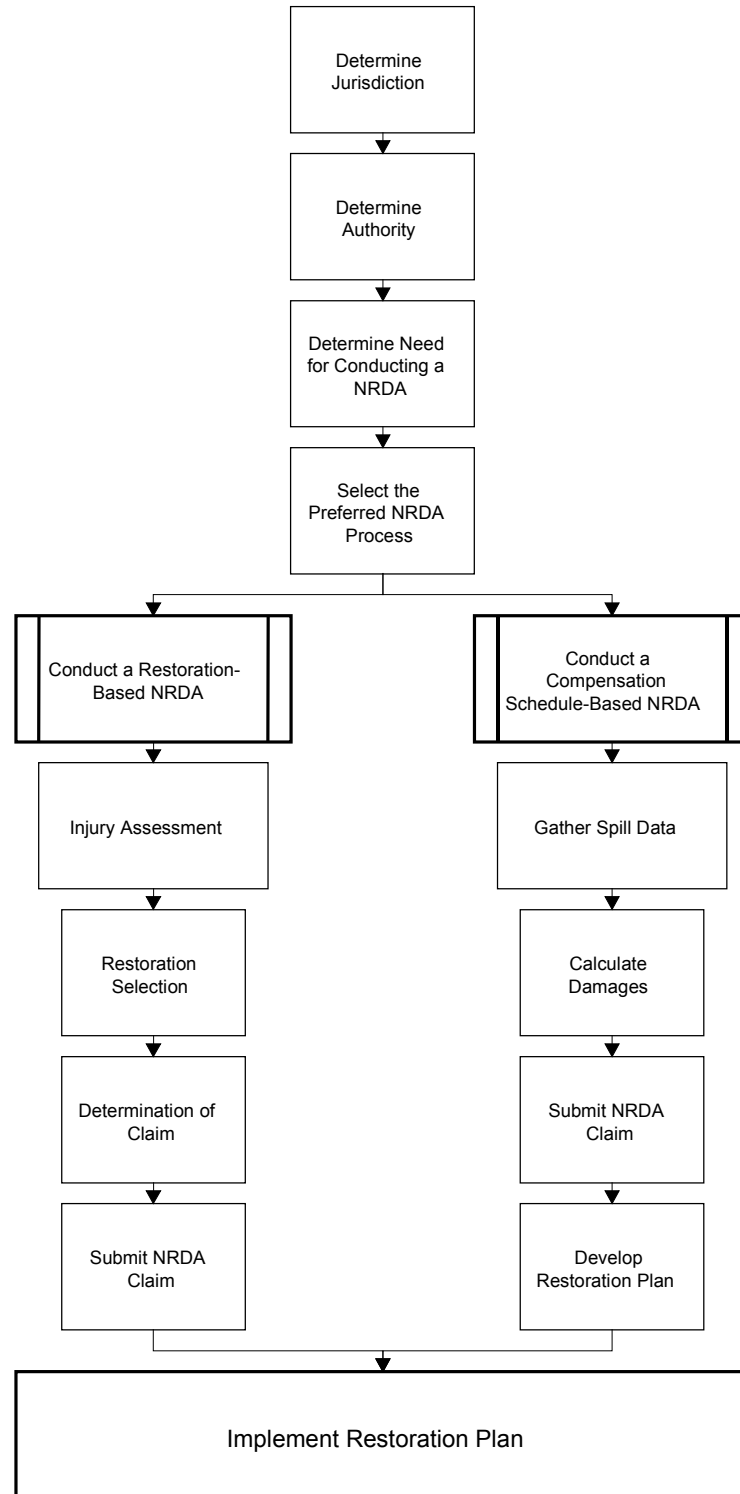


Figure 12 NRDA Process Diagram



2.2.5 Claims Formulation and Negotiation

PCD's responsibilities with regard to the claims formulation and negotiation are as follows:

- Technical and scientific input into the development and negotiation of claims based on the NRDA process described in Section 2.1.2.4 above
- The formulation and presentation of claims for the costs incurred by PCD itself in performing its role as a result of the oil spill incident.
- Advice to private third-party claimants on formulation and presentation of claims (e.g. commercial fisheries, commercially exploited mangroves, hoteliers, etc.).

In all cases, a claim should be developed so that it is clear and contains sufficient detail to allow assessment by the claims assessor. The information in such claims should be as comprehensive as possible and supported by invoices and other relevant documentation such as work sheets and explanatory notes. In the event of spills from vessels, the insurance companies concerned (referred to as a "Protection & Indemnity Clubs") are often located in London. In such a case, the compensation claim should be completed in English so as to aid in its assessment.

2.2.5.1 NRDA Claims

The technical and scientific evidence collected and presented by PCD for NRDA claims, may be used by the appropriate government authority to support legal proceedings against the spiller. The NRDA Handbook provides details of the methodology for conducting the NRDA process.

2.2.5.2 PCD Claims for Work Conducted

In cases where the spiller has appropriate insurance cover for pollution incidents, PCD will be entitled to recover costs incurred by the department in carrying out its responsibilities with regard to the incident. As outlined in Section 2.1.2.6 below, a detailed record of PCD activities and expenses will be kept in order to seek reimbursement from the spiller and his insurance company. The standard daily work sheet to be completed by PCD staff involved in a response to an oil spill incident is contained in Annex 4 of the ACTION PLAN. The Compensation Claim Information Sheet in Annex 4 should be used to ensure that PCD claims are complete.

2.2.5.3 Third Party Claims

PCD will distribute the claims information sheet (contained in Annex 4) to third-party claimants that have suffered damage and wish to claim against the spiller. This sheet outlines the information that should be collected to support their claims.

2.2.6 Record Keeping and Documentation

It is essential that detailed records of the observations and activities of PCD staff are kept throughout an oil spill event. These records may be important in the legal proceedings against the spiller, and will be invaluable for subsequent contingency planning and training purposes. In the event a PCD Field Representative is sent to the spill site, it will be his/her task to collect and format the spill records. However, if PCD does not have an on-site presence, a PCD office-based staff member will be designated to perform this task.

The general information that is to be recorded includes the following:

- a). Nature of the Incident and Details of the Source
- b). Characteristics of the Spill (including behaviour and movement)
- c). Details of the Response and Clean-up (both PCD and other agencies)
- d). Description of Environmental Recovery Techniques & Level of success
- e). Details of the NRDA process and findings (if undertaken).

A detailed description of the procedures to be followed by the various PCD staff involved is set out in Section 3.5.6 of the ACTION PLAN.

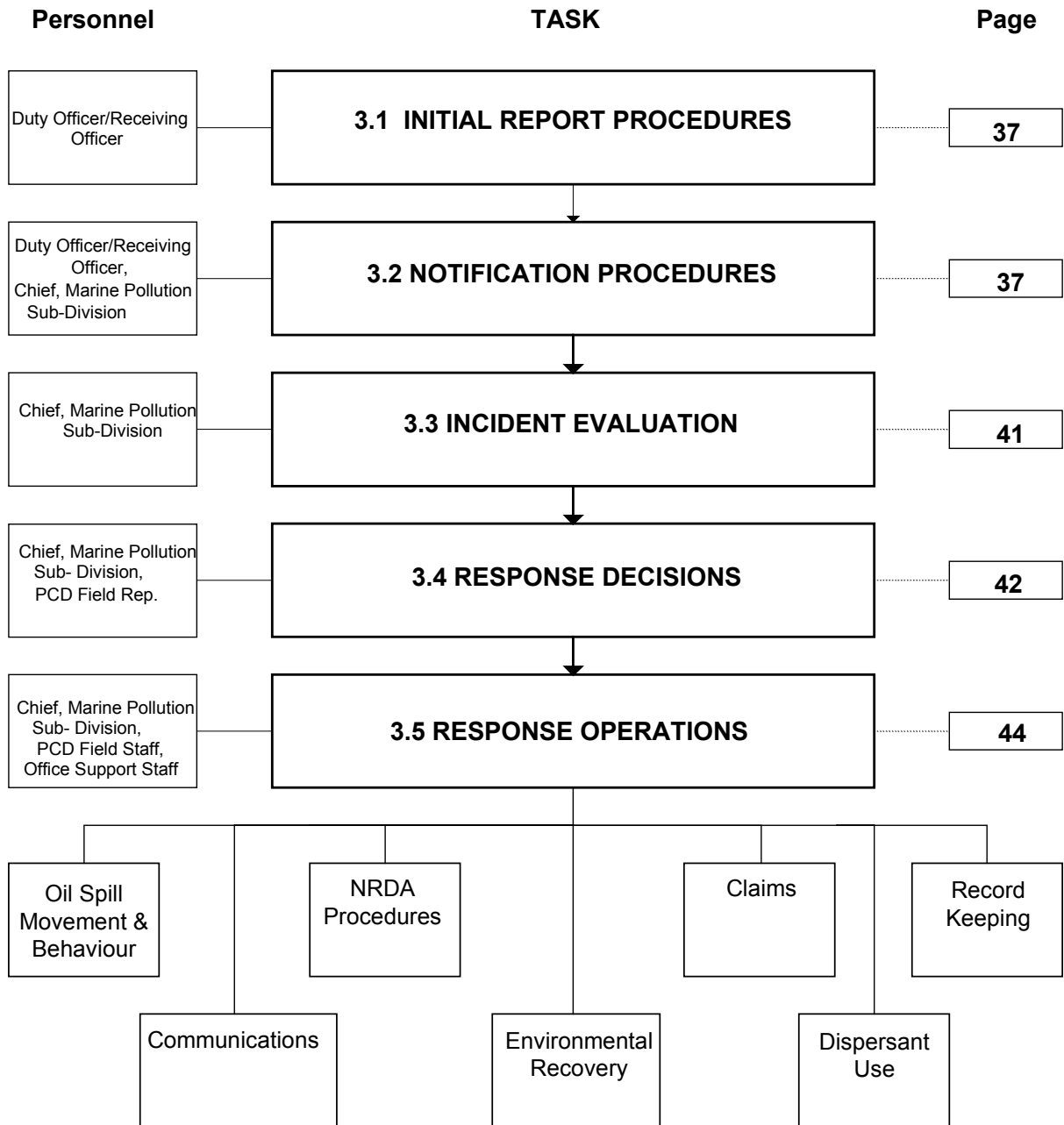
2.2.7 Liaison & Public Relations

During an on-going oil spill clean-up operation, information produced by PCD, such as spill trajectory predictions, assessments of damage to natural resources and advise on recovery option will be passed through the COMMAND CENTRE for onward dissemination to the press and public. However, PCD staff may be contacted directly by the press for comment. The following are broad guidelines on the how PCD staff should deal with the press:

1. Only comment on the technical and scientific aspects of the spill
2. Only comment on facts, not speculation or rumour
3. Do not criticise the efforts and/or methods of other groups without the appropriate facts
4. Do not speculate on the cause or size of the spill

3 ACTION PLAN

Structure



3.1 Initial Report Procedure

Receiving Officer

1. On receipt of a spill report, collect all available information as quickly as possible in order to fill in the **Oil Spill Incident Report Form** in Annex 3.

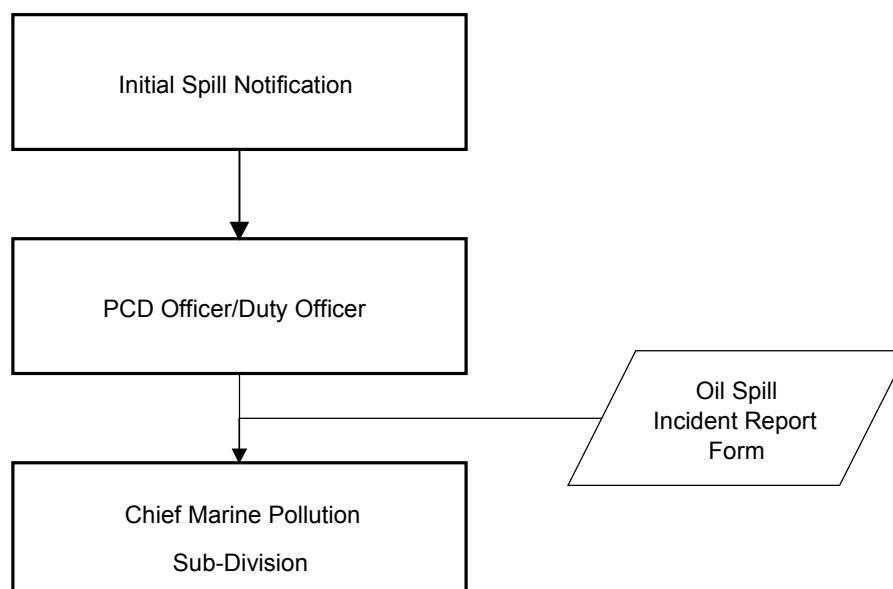
Note: *As much information as possible should be included in the form but its release to appropriate PCD staff should not be delayed if information is not available at the time of the initial report. Any missing information should be investigated and provided later.*

3.2 Notification Procedures

Receiving Officer:

1. Following completion (or partial completion) of the Oil Spill Incident Report Form, notify senior PCD personnel as follows:

a) During Office Hours (0900-1700hrs)

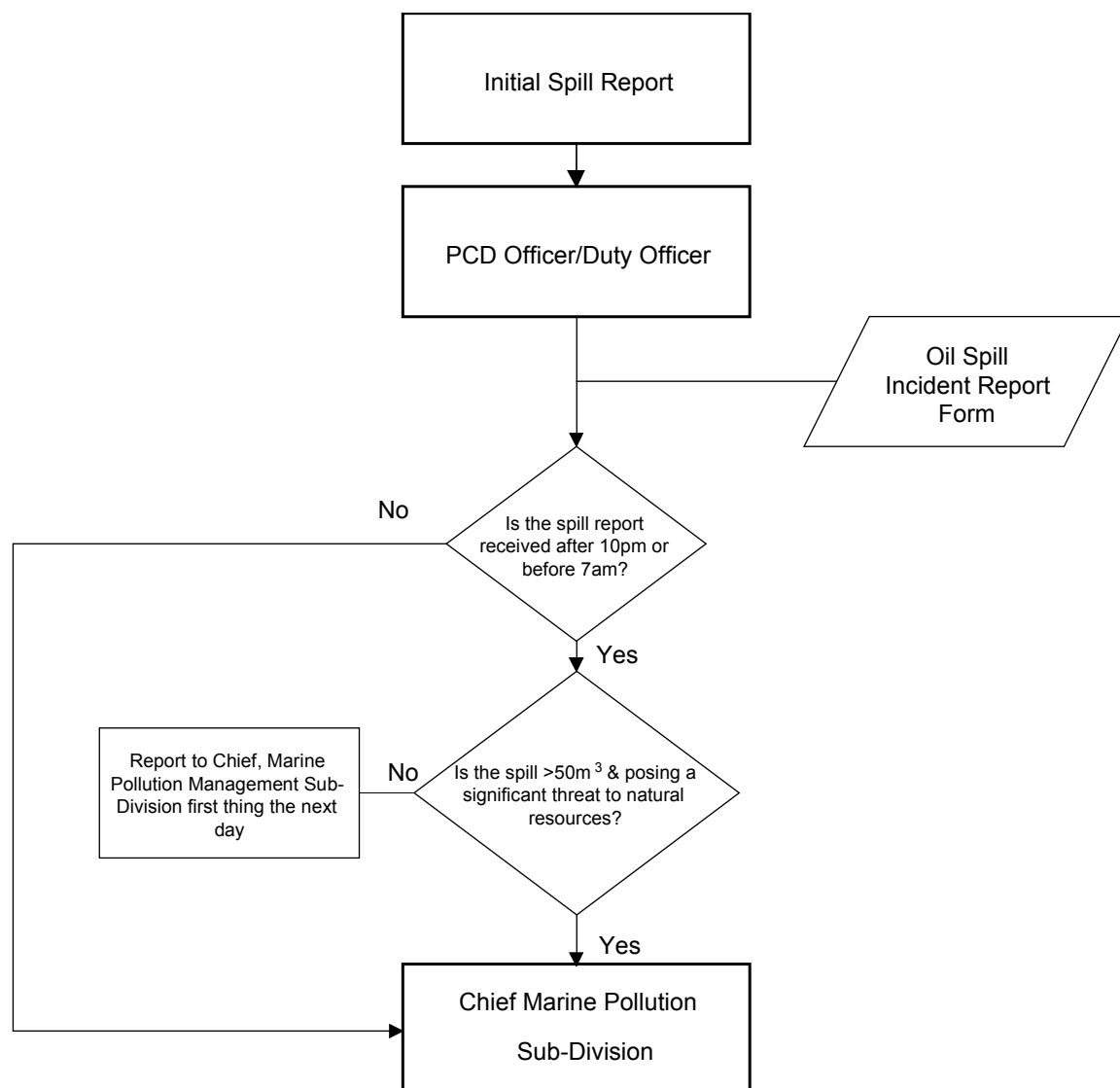


	Tel (Office)	Tel (Home)	Mobile	Pager
Chief, Marine Pollution Sub-Division	(02) 619 2312	(02) 937 4088	01-9373239	1188 call 6314633

Note: These procedures should be followed for all spills, irrespective of size

Receiving Officer:

b). Outside Office Hours (after 1700hrs and before 0900hrs):



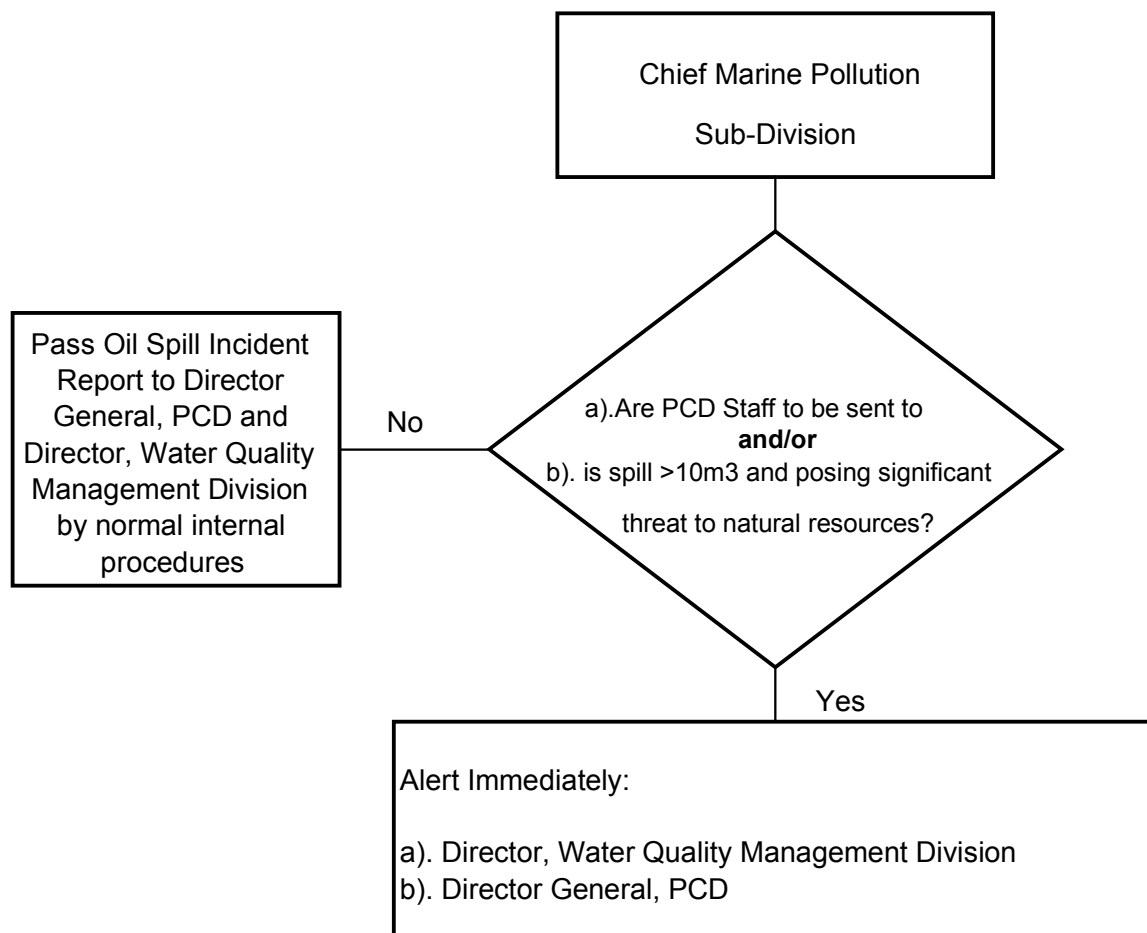
	Tel (Office)	Tel (Home)	Mobile	Pager
Chief, Marine Pollution Sub-Division	(02) 619 2312	(02) 937 4088	01-9373239	1188 call 6314633



Chief, Marine Pollution Sub-Division:

1. Following reception of the initial report, notify your senior colleagues of the incident as follows:

a). During Office Hours (0900-1700hrs):

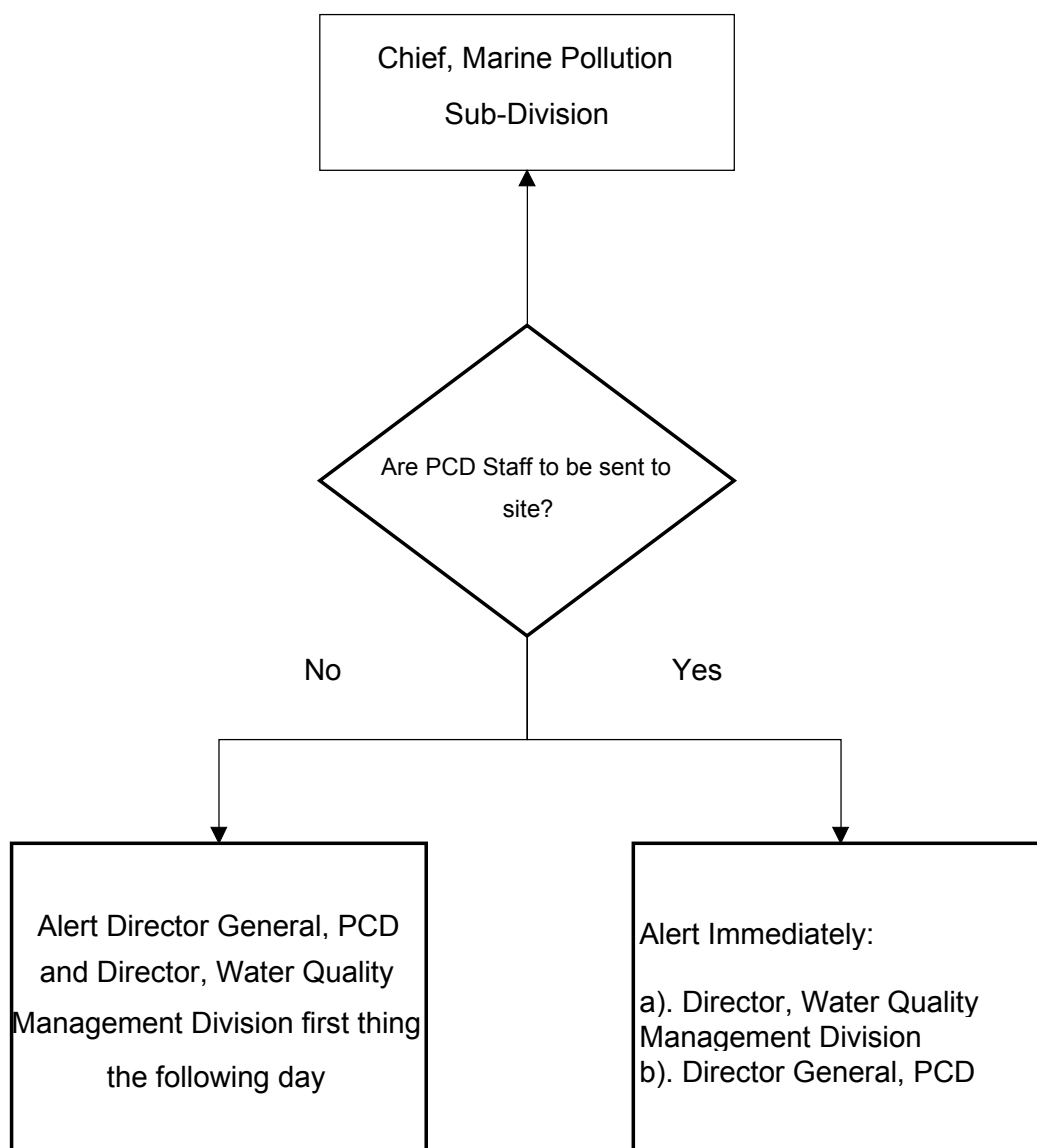


	Tel (Office)	Tel (Home)	Mobile	Pager
Director, Water Quality Management	(02) 619 2311	(02) 466 6187	01-9190762	-
Director General, PCD	(02) 619 2316	(02) 574 5966	01-935 6145	-



Chief, Marine Pollution Sub-Division:

b). Outside Office Hours (after 1700hrs and before 0900hrs):



	Tel (Office)	Tel (Home)	Mobile	Pager
Director, Water Quality Management	(02) 619 2311	(02) 466 6187	01-9190762	-
Director General, PCD	(02) 619 2316	(02) 574 5966	01-9356145	-



3.3 Initial Incident Evaluation

Chief, Marine Pollution Sub-Division

Spill Characteristics and Movement

1. Initiate the following procedures immediately following the receipt of the spill report and the completion of the notification procedures.
 - a) Run the OSIS model following the procedures set out in Section 3 of the OSIS User Manual, inputting information on the spill location, size, oil type, and weather conditions from the Initial Oil Spill Report Form.
 - b) Identify the changes in the behavioural characteristics of the spilled oil (in particular, the increase in viscosity over time, the water content, and changes in the volume of the spill due to factors such as evaporation and dispersion)
 - c) Identify the geographical spread of the spill and the potential for coastal impact.
 - d) Identify the extent of any coastal impact

Assessment of Threat

The assessment of threat is conducted via a two part process defined in the Oil Spill Environmental Recovery Plan (Stages 2 and 3 of ERP Methodology).

Part 1 (ERP Stage 2) Priority Determination

This part determines the priority of resources that may be, or have been, impacted by the oil spill. This part uses the 'Resource Priority' layer given in the GIS database. The area priority classification given on this layer, based on the detailed GIS mapping of resources from the data collation/collection exercise, summarises the relative overall vulnerability and sensitivity of each area of coastline to impacts from oil spills. Information on the specific vulnerabilities and sensitivities of the 23 different resource types is provided in Section 4 of the ERP. The area priority categories (Low, Medium and High) are presented as coloured areas on the 'Resource Priority' layer. These priority categories allow the user to rapidly assess the relative importance of areas affected by the spill.

Part 2 (ERP Stage 3) Impacted Resource Identification

The second part uses the model predictions and site reports in combination with the information from Part 1 to provide a listing of all impacted resources within the spill impact zone. This is carried out using SOCRATES together with the GIS database of resources. The spill impact area (determined by modelling or site observation) is transferred to SOCRATES (if OSIS has been used for the spill prediction) or entered directly in SOCRATES (if site impact reports have been completed). An impacted resource identification report is then selected from the menu. SOCRATES then interrogates all the layers in the GIS to generate a listing of the resources which are within the spill impact area. All appropriate attribute data associated with these resources in the GIS is also provided in the report.



Initial Incident Evaluation Form

1. Using the information gathered in above, complete the **Initial Evaluation Report Form**. This is achieved by following the procedures set out in the SOCRATES User Guide.
2. When completed, the **Initial Evaluation Report Form** should be marked "URGENT" and immediately distributed to the following:

	Tel:	Fax:
Royal Thai Navy (Naval Command, Bangkok)	(02) 472 1897 4650024	(02) 466 0010
Harbour Department (Environmental Division, Bangkok)	(02) 233 1311-8	(02) 236 7248

If the Command Centre has already been established, the **Initial Evaluation Form** should be sent to the centre immediately. The form should also be sent to the relevant Provincial Government office and IESG member (see **Data Section**, sections 4.2 & 4.3).

3.4 Response Decisions

3.4.1 Mobilisation

Chief, Marine Pollution Sub-Division

1. Using the guideline Table 4 provided in Section 2.1.1.7 of the STRATEGY PLAN, determine the requirement for PCD to send personnel to the site of the spill.
2. If the decision is not to mobilise a PCD representative to site, select a PCD office-based representative as the case handler for the spill.
3. If the decision is to send a PCD representative to the site, contact the Director General, Pollution Control Department for permission to send PCD staff to the spill site.
4. Select and contact an appropriate staff member (PCD internal contact details, DATA SECTION, Section 4.1). Also select and contact a PCD staff member who will be based in the Bangkok office and will act as support to the field staff.
5. Ensure that the PCD field staff member and the office-based support person have each others 24 hour contact details

6. Notify the following organisations that PCD will be sending a representative to the spill site, when the representative will be arriving, and the relevant contact details for the PCD representative (Hotel, mobile telephone number, etc.):
- a) Command Centre (if formed)
 - b) Harbour Department – Bangkok office & Relevant Regional Office
 - c) RTN – Bangkok & Relevant Regional Fleet Command Centre
 - d) Relevant Regional Office of Environmental Policy & Planning (OEPP)

PCD Field Representative

1. With assistance of the Office-based support staff member, make appropriate travel and accommodation arrangements to attend the spill site.

2. Ensure that you take the following items:

tick box

a) PCD Oil Spill Emergency Plan

b) Oil Spill Environmental Recovery Plan

c) Oil Spill Chemical Handbook

d) NRDA Handbook

e) Camera

f) Video Camera

g) Lap-top computer with OSIS/SOCRATES

h) Mobile Telephone

i) Claim Advise Sheets

j) Appropriate Charts & Maps

3. On arriving at the site of the spill, immediately contact i) the Command Centre, if already established, or ii) the local representatives of the OPERATING UNITS to report your presence. Provide the Command Centre with your 24-hour contact details.

3.5 Response Operations

This section sets out the procedures to be followed when PCD is called upon to respond to an incident. The section assumes that a PCD representative is sent to the site of the spill. If PCD attendance at site is not required, the relevant roles and responsibilities of the PCD Field Representative are performed by PCD office staff.

3.5.1 PCD Personnel – General Responsibilities

Chief, Marine Pollution Sub-Division

Coordinate PCD’s overall response to the oil spill incident

1. Management of field staff and office staff



2. Report developments in the incident to senior PCD staff
3. Attendance on-site in the event of a major incident
4. Provision of general support to PCD field staff members
5. Dissemination of information on the spill both within PCD and to outside organisations where appropriate.

PCD Field Representative**On arriving at site:**

1. Establish your position as part of the Command Centre and find a place from which to work.
2. Contact the Director of the Command Centre to inform him of PCD's general plan of activities
3. Contact PCD head office in Bangkok to give 24 hour contact details

Daily

1. Perform the work tasks outlined in the Action Plan relating to
 - Oil spill movement and behaviour
 - NRDA
 - Environmental Recovery
 - Dispersant Use
 - Record Keeping
 - Communications
 - Preparing for and attending Command Centre meetings
2. Provide support to the Director of the Command Centre and Operating Units
3. Monitor the effectiveness and environmental sound nature of the cleanup operations

Office Spill Support Staff

1. Assistance to Chief, Marine Pollution Sub-Division with regards to general support to PCD field representative
2. Liaison between Chief, Marine Pollution Sub-Division and PCD field representative.
3. Assistance to Chief, Marine Pollution Sub-Division with regards to the dissemination of information on the spill both within PCD and to outside organisations.
4. Maintenance of a comprehensive spill file.

3.5.2 Procedures for Assessing and Monitoring Oil Spill Movement & Behaviour

PCD Field Representative

On arriving at site:

1. Collect as much up-to-date information on the spill as possible
2. Organise to be a regular observer on aerial surveillance flights by contacting RTN and/or the Harbour Department representatives
3. Establish a programme for predictions on the Oil Spill Movement & Behaviour.
Recommendation: Produce two oil spill trajectory predictions per day using OSIS, one in the morning following the first over-flight, and one in the mid-late afternoon (giving sufficient time for the OPERATING UNITS to plan for the next days activities).
4. Create a distribution list for OSIS predictions
5. Put in place the necessary procedures to get samples of oil from the source (co-ordinate with Harbour Department and / or RTN) and samples of spilled oil from the environment. Detailed methodology for sampling and storing oil are set out in Annex 5.

Running OSIS:

NOTE: In the event the PCD Field Representative is not in the possession of a Lap-top computer, the following tasks 2–5 will be performed in the PCD Bangkok office by the designated staff member. Task 1 is best carried out by the field representative.

1. Collect the following information for running OSIS:
 - Location of the spill
 - contact RTN/Harbour Department.
 - Quantity and type of oil spilled
 - contact RTN/Harbour Department
 - The present and forecast weather conditions in the region
 - contact Meteorological Department (contact details of regional observation stations and Weather Forecast Division on page 66, Data Section)
2. Run the OSIS model to generate an **Oil Spill Movement and Behaviour Report Form** following the instructions in the OSIS User Manual.

The comment's field is an important element of the **Oil Spill Movement and Behaviour Report Form** and should be used so as to highlight aspects of the prediction that are pertinent to the clean-up response. In particular, comment on the following:

- Any resources that are threatened by the spill and should be considered in the clean-up response
 - Volumes of oil that could be expected to impact the shoreline
 - Changes in the properties of the oil, in particular the viscosity, water content and volume which will have an impact on the response method chosen.
3. Use information collected during the aerial surveillance flights to calibrate and correct the OSIS model where necessary.
 4. Distribute the oil spill predictions according to the distribution list created
 5. Keep a file of all **Oil Spill Movement and Behaviour Report Forms** for inclusion in the general record of the oil spill incident (Section 3.5.6)

3.5.3 Procedures for Dispersant Use

Chief, Marine Pollution Sub-Division

1. In all Scenarios ensure that the dispersant that the Operation Units are proposing to use is on the list of pre-approved dispersant
2. In the event that the proposed dispersant use is within an approved dispersant zone, no approval is needed by PCD, but PCD should initiate a monitoring programme.
3. In the event that the proposed dispersant use is within a sensitive area where dispersant use is not pre-approved, perform a net environmental benefit analysis (refer to Section 4.3 & 5.1 of the Chemical Handbook)
4. Inform the Operating Units and the PCD Field Representative of the decision on the spray operation and highlight any conditions that were applied to the application (i.e. exclusion zones).

NOTE: This process should be completed as quickly as possible

PCD Field Representative

1. Establish programme to monitor the dispersant spray operation using the guidance provided in section 6.5 of the Chemical Use Handbook.
2. Monitor the dispersant application with particular reference to:
 - net environmental benefit (see section 6.1, Oil Spill Chemical Use Handbook)
 - quantity of dispersant used in relation to the size of spill & type of oil
 - the effectiveness of the operation
 - the point at which spraying operations should be terminated

3. Report the findings of the dispersant monitoring programme to the Command Centre meetings on a regular basis (at least once per day).
4. Make detailed records of the types and amounts of dispersant used, and the areas of operation.

3.5.4 NRDA Procedures

PCD Field Representative / OEPP Field Representative

General:

1. Collect all relevant information on the threat and/or impact to natural resources as early as possible in the spill
2. Pass this information to the Chief, Marine Pollution Sub Division as quickly as possible to assist in the activities of the NRDA Government Committee.

In the event a Restoration-Based NRDA is selected:

1. Under the general guidance of the Chief, Marine Pollution Sub-Division, undertake the Injury Assessment Programme (see Section 4, of the NRDA Handbook).
2. Keep detailed records of the costs connected with the NRDA studies (travel, accommodation, materials, contractors, etc.)

In the event a Compensation-Based NRDA is selected:

1. Under the guidance of the Chief, Marine Environmental Management Sub-Division, follow the procedures set out in Section 5 of the NRDA Handbook on collection of spill data (volume/type of oil, resources affected, areal extent of oiling of habitats).
2. Keep detailed records of the costs connected with the NRDA studies (travel, accommodation, materials, contractors, etc.)

Note: Report on a daily basis on findings and progress of the NRDA to Chief, Marine Pollution Sub-Division.

Chief, Marine Pollution Sub-Division

General:

1. Based on the outcome of the Initial Incident Evaluation and information from the PCD or OEPP Field Representative(s), determine if there is a need to call together a meeting of the NRDA Government Committee.
2. Chair an initial meeting of the NRDA Government Committee, with the aim of determining the requirement for an NRDA, the legal basis and legal vehicle for the claim, and the preferred NRDA methodology (see Section 2.0, NRDA Handbook).



3. Determine a schedule for NRDA Government Committee meetings.
4. Instruct the PCD Field Representative of the approach adopted by the Committee and manage the overall development and operation of the NRDA programme.
5. Establish an account for funds recovered for the restoration programme
6. Form a Restoration Committee to oversee the restoration programme
7. Establish a set of criteria for the restoration programme
8. Establish a monitoring programme for the restoration.

In the event a Restoration-Based NRDA is selected:

1. In conjunction with the PCD Field Representative, develop a methodology, programme and budget for the Injury Assessment studies.
2. Manage the injury assessment studies being conducted by the PCD Field Representative.
3. Review the Injury Assessment work conducted by the PCD Field Representative and prepare a summary of the findings for the NRDA Government Committee
4. Based on the results of the Injury Assessment, prepare a discussion document for the NRDA Government Committee on the selection of the restoration method.
5. Call a meeting of the NRDA Government Committee to discuss the findings of the Injury Assessment, the selection of the restoration methodologies, and the development of the claim.
6. Assemble the NRDA claim as agreed by the NRDA Government Committee

In the event a Compensation-Based NRDA is selected:

1. Following the general procedures set out in Section 2 of the NRDA Handbook, develop a programme for the studies to determine the areal extent of habitats contaminated by the spill
2. Using the data collected by the PCD Field Representative and the Compensation Schedule Formulae (Section 5 of the NRDA Handbook), calculate the monetary value of the natural resource damages.
3. Call a meeting of the NRDA Government Committee to discuss and approve the NRDA process and compensation claim
4. Assemble the NRDA claim as agreed by the NRDA Government Committee.

3.5.5 Procedures for Scientific/Technical Support of Spill Clean-up

PCD Field Representative



1. Contact Operating Units to collect initial information on the nature and extent of impact and related cleanup operations
2. Determine the priority for response of threatened and/or impacted resources using the resources priority maps in the Geographical Information System of SOCRATES. Submit the finds to the Director of the Command Centre.
3. If the spill has impacted the coastline, conduct an initial Shoreline Oil Contamination Survey as set out in Section 3 of the Oil Spill Environmental Recovery Plan. Submit the findings of the Shoreline Oil Contamination Survey to the Director of the Command Centre.
4. Develop a programme for on-going Shoreline Oil Contamination Surveys. Submit this programme to the Director of the Command Centre.
5. Using the Resource Action Plan (Section 4) of the Oil Spill Environmental Recovery Plan, provide resource-specific guidelines for response to the Director of the Command Centre.
6. Monitor regularly the factors specific to the impacted resources, which are identified in Section 4 of the Oil Spill Environmental Recovery Plan.
7. Use the decision-tree process described in Section 5 of the Oil Spill Environmental Recovery Plan to determine the point at which clean-up operations should be terminated.

3.5.6 Record Keeping

All PCD Staff (Field & Office-Based)

1. Complete the **Oil Spill Daily Record Form** provided in Annex 3 on a daily basis, providing a clear description of the tasks performed and the intended aims of the work.
2. Keep detailed records (including receipts where possible) of all expenses incurred in connection with response to the incident.

PCD Field Representative

1. Develop a detailed record of the following for the duration of the incident:
 - a) Nature of the Incident and Details of the Source
 - the time of position of the spill
 - cause of the incident
 - details of the source of the spill
 - b) Characteristics of the Spill
 - the movement of the spill (daily OSIS predictions should be provided)

- details on the areas affected by the spill, describing the extent of the pollution and identifying those areas which were most heavily contaminated.
 - type of oil spilled (including samples of oil from the source, and samples of the spilled when in the environment – follow the procedures set out in Annex 5)
- c) Details of the Response and Clean-up (both PCD and other agencies)
- Summary of events, including a description of the work carried out, together with an explanation of why the various working methods were selected.
 - Dates on which the work was conducted and when work was terminated
- d) Description and breakdown of costs of any Environmental Monitoring Programmes
- e) Details of the NRDA process and findings (if undertaken):
- Activities conducted as part of the NRDA process and the intended aims of those activities
- f) Travel, accommodation and living costs for PCD response personnel
- g) PCD Consumable materials (description, quantity used, unit cost, description of use).

Note: Whenever possible, collect back-up documentation in the form of photographs, maps and video.

3.5.7 Claims

The overall development, management and negotiation of claims submitted by PCD is the responsibility of the Chief, Marine Pollution Sub-Division.

3.5.7.1 Claim for PCD Operations

PCD Field Representative

1. Following completion of the clean-up operations, compile the information collected as part of the record keeping procedures outlined above (Section 3.5.6) and present to the Chief, Marine Pollution Sub-Division.

Chief, Marine Pollution Sub-Division

1. Liaise with the Director of the Command Centre (Harbour Department or RTN) to establish the procedures to be followed for the submission of claims for compensation (i.e. PCD will submit claim directly to spiller, or the claim will be submitted through another agency).
2. Establish units rates to be applied to the following for the purposes of developing the financial basis to the claim:
 - PCD staff time (regular and overtime rates),
 - Equipment use rates
 - Equipment replacement costs (where necessary)
3. Review the draft claim against the check-list in the Compensation Claim Information Sheet in Annex 4 to ensure that all necessary documentation is present.
4. Submit the finalised claim to the appropriate body

3.5.7.2 NRDA Claims

PCD Field Representative

1. Compile a detailed description of the NRDA activities undertaken, the findings of the process, and all related costs and pass to the Chief, Marine Pollution Sub-Division.

Chief, Marine Pollution Sub-Division

1. Utilising the information provided by the PCD Field Representative, compile the NRDA claim (consisting of NRDA and field study costs) and submit to the PCD Government Committee for approval
2. Review the draft claim against the check-list in the Compensation Claim Information Sheet in Annex 4 to ensure that all necessary documentation is present.
3. Submit the claim to the relevant body.

3.5.7.3 Third Party Claims**PCD Field Representative**

1. Produce copies of the Compensation Claims Information Sheet contained in Annex 4 and provide to the following:
 - Command Centre
 - Provincial Authorities
 - Local Harbour Department and RTN offices
2. Provide general guidance to third-party claimants where the claim relates to damages to natural resources.

4 DATA SECTION

4.1 PCD Internal Contacts

Name	Tel: (office)	Tel: (Home)	Mobile	Pager No.
Mr Sirithan Pairoj-Boriboon (Director General)	(02) 619 2316	(02) 574 5966	01-9356145	-
Mr Prakarn Bunchueydee (Deputy Director-General)	(02) 619 2212	(02) 513 4243	01-9085851	-
Mr Pornchai Taranatham (Deputy Director- General)	(02) 619 2298	-	01-9356143	-
Dr Yuwaree In-na (Director Water Quality Management Division)	(02) 619 2311	(02) 466 6187	01-9190762	-
Mr. Watana Sukasem (Chief, Coastal Water Quality Sub - Division)	(02) 619 2312 619 2299-304 ext. 208	(02) 574 0840	-	-
Dr Pornsook Chongprasith (Chief, Marine Pollution Sub- Division)	(02)6192312 6192299-304 ext. 210	(02) 937 4088	01-9373239	1188 call 6314633
Marine Pollution Sub-Division				
Dr.Vithet Srinete (Environmental Scientist)		(02) 737 9905	01-9190827	-
Ms Chutamad Rattikhansukla (Environmental Scientist)		(02) 425 8577 or 819 5419	-	-
Ms Pornsri Prarakkamo (Environmental Scientist)	(02) 6192312 or 619 2299- 304	(02) 379 3853	-	-
Ms Wimolporn Wilairatanadilok (Environmental Scientist)	ext. 207 / 110	(02) 215 1725	-	-
Ms. Wilai Tubchom (Environmental Scientist)		(02) 533 3409		
Coastal Water Quality Sub- Division		-	-	-
Mr. Marut Suksomjit Environmental Scientist		(02) 503 6284	-	-

Name	Tel: (office)	Tel: (Home)	Mobile	Pager No.
Ms. Wanpen Tuanwechayan Environmental Scientist	(02) 6192312 or 619 2299- 304	(02) 270 0027 (02) 278 1393 ext. 101	-	-
Mr. Saichol Sanghaisuk Environmental Scientist	ext. 207 / 110	(02) 410 2958	(01) 634 5353	-

4.2 Operating Units – Government

Organisation	Tel (Office):	Fax (Office):
Royal Thai Navy		
Directorate of Operations, Bangkok	(02) 472 1897 465 0024	(02) 466 0010
Harbour Department		
Bangkok	(02) 233 1311-8	(02) 236 7248
Samut Prakarn (Regional Harbour Master)	(02) 395 0019	(02) 389 4884
Samut Songkhram	(034) 711 270	(034) 715 613
Prachuap Khirikhan	(032) 550 889	(032) 550 889
Petchaburi	(032) 424 107	
Songkhla	(074) 311 615	(074) 324 937
Surat Thani	(077) 272 587	(077) 222 299
Pattani	(073) 331 856	(073) 331 856
Nakhon Si Thammarat	(075) 343 619	(075) 348 007
Phuket	(076) 391 174	(076) 391 174
Krabi	(075) 612 669	-
Ranong	(077) 823 246	(077) 823 246
Satun	(074) 722 409	-
Chonburi	(038) 427 675	(038) 427 675
Rayong	(038) 614 100	(038) 614 100
Chachoengsao	(038) 511 101	(038) 513 861
Provincial Government		
Samut Prakarn	(02) 395 0112, 395 0352	(02) 702 5021-4
Samut Songkhram	(034) 711 031 711 997	(034) 711 185 711 031
Samut Sakhon	(034) 411 251	(034) 411 012
Chachoengsao	(038) 512 520	(038) 512 520

Organisation	Tel (Office):	Fax (Office):
Phetchaburi	(032) 425 573	(032) 425 523
Chon Buri	(038) 275 034	(038) 279 434, 274 442
Rayong	(038) 611 585	(038) 614 003, 611 068
Chanthaburi	(039) 311 001	(039) 312 077
Trat	(039) 511 282	(039) 511 282, 512 560
Prachuap Khirikhan	(032) 601 560	(032) 611 364
Chumphon	(077) 511 551	(077) 504 376
Ranong	(077) 832 630	(077) 811 991
Surat Thani	(077) 272 926	(077) 272 176
Krabi	(075) 611 144, 611 381	(075) 611 302
Phangna	(076) 412 140	(076) 411 401
Phuket	(076) 222 886	(076) 212 730
Nakhon Si Thammarat	(075) 356 531	(075) 356 142
Trang	(075) 218 516	(075) 218 333
Songkhla	(074) 325 036	(074) 312 016
Satun	(074) 711 380	(074) 711 136
Pattani	(073) 349 002	(073) 349 645
Narathiwat	(073) 511 450	(073) 513 106

4.3 Operating Units – IESG Members

Organisation	Tel (Office):	Tel (Home):	Fax (Office):
Bangchak Petroleum			
Anusorn Sangnimnuan	(02) 331 6524, 331 0047	(02) 539 2769	(02) 745 4079
Chalerm Sak Pintu	(02) 331 0047	(02) 510 0387	(02) 745 4079
BP Oil (Thailand) Ltd			
Udom Vongsmaenthep	(02) 251 1315, 251 1301,	(02) 412 4021	(02) 254 4897-8

Organisation	Tel (Office):	Tel (Home):	Fax (Office):
	251 1283		
Caltex Oil (Thailand) Ltd			
Chatchay Thaikla	(02) 285 2700 ext. 258	(02) 385 4853, 01-9183869, 1144 call 502535	(02) 285 2088
Wallop Yammeuan	(02) 285 2700 ext. 257	(02) 735 9525, 1144 call 502535	(02) 285 2088
ESSO (Thailand)			
Somrat Yindepit	(02) 262 4171	(02) 594 2335	(02) 262 4814
Boonchai Kurdpanyawatana	(02) 262 4785	(02) 437 8610	(02) 262 4814
Mobil Oil (Thailand)			
Chadchan Bunnag	(02) 463 5590-6	(02) 564 0945, (02) 997 7110	(02) 463 2877
Krisada Chongphaibulpatana	(02) 260 7030 ext. 2225 01-938 4291	(02) 433 9361	(02) 260 7055
Petroleum Authority of Thailand			
Pipit Hongjinda	(02) 249 4515	(02) 281 5441	(02) 249 4515
Pullop Manggornchai	(02) 249 4515, 01-6232798	(02) 926 6699	(02) 712 2000- 23 ext. 7950, 7955
Shell Company of Thailand			
Thepparit Vesurai	(02) 249 0491	(02) 249 2162	(02) 249 3700
Star Petroleum Refining Co.			
Graham Edwards	(038) 699 258, 681 880, 01-486 5600	(038) 238 305	(038) 684 999
David Hurlock	(038) 699 309, 681 880	(038) 601 887	(038) 684 999
Krisda Chaikul	(038) 699 322, 681 880	(038) 681 828 ext. 1024	(038) 684 999



Organisation	Tel (Office):	Tel (Home):	Fax (Office):
Thai Oil Company Ltd.			
Punnchalee Laothumthut	(02) 231 7000 (01) 625 1805	(02) 261 6515	(02) 231 7017
Charus Huntrakul	(038) 351 555	(038) 311 718	(038) 351 555 ext. 3358
Nirand Suaysom	(038) 351 555	(038) 321 118	(038) 351 555 ext. 3358
Watcharin Puttapornpaisit	(038) 351 555	(038) 322 413 (01) 910 4388	(038) 351 555 ext. 3358

4.4 Support Units

Organisation	Tel (Office):	Fax (Office):
Office of Environmental Policy & Planning		
Environmental Regional Office 3 (Chonburi)	(038) 400 824-6	(038) 400 825
Environmental Regional Office 12 (Songkhla)	(074) 321 155	(074) 324 243
Environmental Regional Office 11 (Songkhla)	(074) 324 243	(074) 324 243
Natural Resources & Environmental Management Division	(02) 227 8088, (02) 279 5202	(02) 271 3226
Royal Forestry Department (Marine National Division)		
Kao Laemya-Mouko Samed (Rayong)	(038) 653 034 (038) 652 136	-
Mou Ko Chang (Trat)	(039) 538 100	-
Kao Samroil Yord (Prachuap Khirikhan)	01-493 3959	-
Hart Vanakorn (Prachuap Khirikhan)	-	-
Sirinart - Hart Naiyang (Phuket)	(076) 637 436	-
Hart Noparattara-Mou Ko Pi Pi (Krabi)	(076) 637 436	-
Mou Ko Lanta (Krabi)	(075) 629 018-9	-
Tarnbongkoranee (Krabi)	(075) 681 071	-
Mou Ko Aungthong (Surat Thani)	(077) 283 025 (077) 286 931	-
Nam Tok Tarn Sadei (Surat Thani)	(077) 238 275	-



Organisation	Tel (Office):	Fax (Office):
Hat Sairee (Chum Phon)	(077) 580 193	-
Laemson (Ranong)	-	-
Kraburi (Ranong)	01-957 3632	-
Mou Ko Payarm (Nakhon Si Thammarat)	01-978 4962	-
Aua Phangna (Phangnga)	(076) 411 136	-
Mou Ko Surin (Phangnga)	(076) 491 378 (076) 491 028-9	-
Mou Ko Simiran (Phangnga)	(076) 411-914 (076) 411-913	-
Kao Lumpee-Hat Tai Muang (Phangnga)	01-479 2983 01-959 1672	-
Kao Lang-Lumrou (Phangnga)	-	-
Hat Chaomai (Trang)	(075) 210 664	-
Tarutao (Satun)	(074) 781 285	-
Mou Ko Paetra (Satun)	(074) 322 145	-
Tarabun (Satun)	(074) 797 073	-
The Meteorological Department		
<i>Meteorological Observations Division</i>	(02) 399 4548, (02) 399 4538	-
Meteorological Observations Stations		
• Petchaburi	(032) 478 216	-
• Hua Hin	(032) 602 020	-
• Prachuap Khirikhan	(032) 602 020	-
• Pattani	(073) 431 134	-
• Narathiwat	(073) 511 234	-
• Nakhon Si Thammarat	(075) 348 107	-
• Chumphon	(077) 511 421	-
• Surat Thani	(077) 272 959	-
• Ko Samui	(077) 424 251	-
• Satun	(074) 712 006	-
• Trang	(075) 210 175	-

Organisation	Tel (Office):	Fax (Office):
• Phuket	(076) 211 494	-
• Ranong	(077) 811 487	-
• Ko si Chang	(038) 216 196	-
• Chonburi	(038) 282 245	-
• Pattaya	(038) 250 590	-
• Rayong	(038) 655 075	-
• Chantaburi	(039) 311 026	-
• Klong Yai (Trat)	(039) 581 276	-
<i>Weather Forecast Division</i>	(02) 399 4012-3	-
<i>Climatology Division</i>	(02) 399 1423, (02) 399 3031	-
Department of Fisheries		
Marine Biological and Fishery Research Institute	(076) 391 438 (076) 391 128 (076) 391 040	(076) 391 127
National Institute of Coastal Aquaculture	(074) 312 032	-
Eastern Marine Fisheries Development Center	(038) 651 764	(038) 651 763
Quality Control Division Petroleum Authority of Thailand	(02) 249 0021-40 ext. 7166	-
Standards Bureau 3 (Thai Industrial Standards Institute)	(02) 202 3352	(02) 248 7985
Seawatch Thailand Program NRCT, Dr. Pithan	(02) 940 5515 562 0427-9	(02) 579 3035 562-0429
Remote Sensing Data Service Centre	(02) 579 0345, 579-5618 ext. 130	-
Pollution Information Sub-div, Pollution Management and Co-ordination Div, PCD	(02) 619 2305	-



Annex 1
Emergency Plan Distribution List

A - 1

ส่วนแหล่งน้ำทะเล สำนักจัดการคุณภาพน้ำ กรมควบคุมมลพิษ

Marine Environment Division, Water Quality Management Bureau, Pollution Control Department



Emergency Plan Distribution List

Organisation	Holder of the Plan
Pollution Control Department	Chief, Marine Pollution Sub-Division
<i>Royal Thai Navy</i>	
<i>Harbour Department</i>	
<i>The Bangchak Petroleum Public Company Limited</i>	
<i>BP Oil (Thailand) Limited</i>	
<i>Caltex Oil (Thailand) Limited</i>	
<i>ESSO (Thailand) Public Company Limited</i>	
<i>Mobil Oil Thailand Limited</i>	
<i>Petroleum Authority of Thailand</i>	
<i>The Shell Company of Thailand Limited</i>	
<i>Thai Oil Company Limited</i>	
<i>Star Petroleum Refining Company Limited</i>	
<i>Provincial Authorities</i>	
<i>Airforce</i>	
<i>Army</i>	
<i>Civil Aviation Department</i>	
<i>Marine Police</i>	
<i>Meteorological Department</i>	
<i>Local Administration Department</i>	
<i>Office of Environmental Policy & Planning</i>	
<i>Fisheries Department</i>	
<i>Bureau of Royal Rainmaking & Agricultural Aviation</i>	
<i>Customs Department</i>	
<i>Department of Treaties & Legal Affairs</i>	
<i>Immigration Department</i>	
<i>Port Authority of Thailand</i>	
<i>Communications Authority of Thailand</i>	
<i>Controller-General's Department</i>	
<i>Bangkok Metropolitan Authority</i>	



Annex 2
Plan Up-Date Programme & Record of Changes

A - 3

ส่วนแหล่งน้ำทะเล สำนักจัดการคุณภาพน้ำ กรมควบคุมมลพิษ

Marine Environment Division, Water Quality Management Bureau, Pollution Control Department



PLAN UP-DATE PROGRAMME**A. Six Month Plan Review**

1. Check all telephone/fax numbers and addresses are current
2. Distribute changes to all organisations outlined in the Plan Distribution List (Appendix A)

A. Annual Plan Review

1. Check all telephone/fax numbers and addresses are current
2. Review PCD, national and regional response organisation for changes
3. Review and incorporate any legislative changes relating to oil spills
4. Incorporate lesson learnt from oil spill exercises
5. Distribute changes to all organisations outlined in the Plan Distribution List (Appendix A)

Annex 3
Emergency Plan Reporting Forms

A - 6

ส่วนแหล่งน้ำทะเล สำนักจัดการคุณภาพน้ำ กรมควบคุมมลพิษ

Marine Environment Division, Water Quality Management Bureau, Pollution Control Department





OIL SPILL INCIDENT REPORT FORM

NOTE: Complete as fully as possible, but do not delay transmission in the event of missing information

A. Details of the Incident

Source: Ship (if so give name, call sign & flag), Offshore Platform, Pipeline, Storage Facility, Unknown, Others. _____

Date & Time of Incident: _____

Position: (latitude / longitude or nearest landmark): _____

Cause: _____

Estimate of Spill Quantity: _____

Likelihood of Further Spillage (including quantity of potential spillage, e.g. quantity of oil remaining onboard vessel):

A - 7



Type of Oil Spilled: _____

Resources Impacted (if any) _____



B. Weather and Sea Conditions

Wind Force & Direction: _____

Sea State: _____

C. Response Actions

Actions being taken to limit further discharge: _____

Details of Clean-up Response: _____

D. Report Information

Date & Time Report Received: _____

Report Received from: Name: _____

Organisation: _____

Position: _____

Contact Details: _____

PCD Reporting Officer: Name: _____

Position: _____

Contact Details: _____





**OIL SPILL INCIDENT EVALUATION REPORT FORM
(DRAFT - TO BE GENERATED FROM OSIS/SOCRATES)**

Date & Time of Prediction: _____

PCD Officer

(Name & Contact Details: _____

Time & Position of Initial Spill: _____

Spill Trajectory Map		
OSIS Report Form		
Viscosity Graph	Spill Volume Graph	Water Content Graph

Time to Reach a Viscosity of 2,000cSt: _____

Time to Reach a Viscosity of 5,000cSt: _____



Oil Movement

Time to First Coastal Impact: _____

Location of First Coastal Impact: _____

Resources Threatened & Protection Priorities

Resource Type	Location	Time to Impact	Protection Priority*

Low, Medium, High (according to Oil Spill Environmental Recovery Plan prioritisation).





กรมควบคุมมลพิษ
Pollution Control Department

OIL SPILL PCD PERSONNEL DAILY WORKSHEET

Name: _____

Position: _____

Date: _____

Incident: _____

Activity	Hours
Total	

Certified by.....

Approved by.....





กรมควบคุมมลพิษ
Pollution Control Department

**SPILL MOVEMENT & BEHAVIOUR REPORT FORM
(DRAFT - TO BE GENERATED FROM OSIS/SOCRATES)**

Date of Prediction: _____

Time of Prediction: _____

PCD Officer: _____

Spill Trajectory Map
OSIS Report Form
Comments Field



Annex 4
Third-Party Claims Information Sheet

A - 14

ส่วนแหล่งน้ำทะเล สำนักจัดการคุณภาพน้ำ กรมควบคุมมลพิษ

Marine Environment Division, Water Quality Management Bureau, Pollution Control Department



OIL SPILL**Compensation Claim Check-List****Introduction**

This document is aimed at providing guidance to those companies, organisation, government agencies or individuals that have suffered an economically quantifiable loss as a result of an oil spill (i.e. a “third-party claim”). In a number of such oil spill cases (in particular from ships), compensation will be available to compensate such third-party economic losses.

A check-list is provided which outlines the general information that should be included in such a claim for compensation. Failure on the part of the claimant to provide such information could delay the award of compensation and in some cases may render the claim invalid in the eyes of the polluters insurance company.

What Should the Claim Contain?**A. General**

1. Name and Address of Organisation/Company/Individual making the Claim
2. Identity of the source of the spill
3. Date, place and specific details of the incident (including type of oil involved)
4. A brief description of the activities undertaken in the clean-up operations
5. The amount of the claim

B. Cost of Clean-up/Preventative Measures

1. Delineation of the areas affected by the spill, describing the extent of the pollution and identifying those areas which were most heavily contaminated. Back-up documentation in the form of photographs, maps and video should be provided where possible.
2. Analytical evidence or any other evidence linking the oil pollution with the suspected source (i.e. chemical analysis, trajectory analysis)
3. Summary of events, including a description of the work carried out, together with an explanation of why the various working methods were selected.
4. Dates on which the work was conducted
5. A breakdown of labour costs (number of categories of personnel, regular and overtime rates of pay, hours/days worked, other costs)
6. Travel, accommodation and living costs for response personnel
7. Equipment costs (types of equipment used, rate of hire or cost of purchase, quantity used, over what period)



8. Consumable materials (description, quantity used, unit cost, description of where used).
9. In respect of purchased equipment and materials, any remaining value at the end of the operation
10. In respect of equipment not purchased for the incident in question, the age of the items
11. Transport costs (number and type of vehicles, vessels and aircraft used, number of hours or days operated, rate of hire or operating cost).
12. Cost of temporary storage (if applicable) and of final disposal of recovered oil and oily material.

C. Replacement & Repair Costs

1. Extent of pollution damage to property
2. Description of items destroyed, damaged or needing replacement, repair or cleaning (e.g. boats, fishing gear, roads, clothing), including their location
3. Cost of repair work, cleaning or replacement of items.
4. Age of items to be replaced
5. Cost of restoration after clean-up, such as repair of roads, piers and embankments damaged by the clean-up operations

D. Economic Loss

1. Nature of loss, including proof that the alleged loss resulted directly from the incident
2. Comparative figures for earnings in previous periods and during the period when economic loss was suffered
3. Comparison with similar areas outside the area affected by the oil spill
4. Method of assessment of loss

Annex 5
Oil Sampling and Storage Methodology

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SPILL SOURCE OIL

Sampling Objectives

- To obtain a sample(s) of the original product(s) involved in the incident, for characterization, fingerprinting, and predicting its fate and effects.

Sample Volume

- Collect 1 litre per sample, for each location sampled (e.g., per tank, hold, etc.).

Sampling Equipment/Containers

- Collect source samples directly into the sample bottle if possible, to minimize contamination. Use a device which holds the container, such as a Wheaton grab sampler (holds a 1-L bottle strapped to a metal rod with the ability to unscrew the cap remotely) or a frame which holds the sample bottle and is lowered on a rope.
- Other types of samplers for transferring to a container include: drum thief; coliwasa (narrow tube with positive end seal); bailer; and bomb sampler.
- Sampler material, in order of preference: teflon (there are inexpensive disposable models); plastic (may contribute phthalates, but should not interfere with interpretation); and glass.
- Under emergency conditions, a new metal (preferred) or plastic (a last resort) bucket can be used after cleaning with soap and water.
- Use glass bottles, certified-clean as organic-free (i.e., solvent rinsed), with teflon-lined lids. Wide-mouth containers are much easier to fill.
- Paper, metal, or plastic funnels are useful when transferring samples. Clean prior to use.

Sample Collection Methods

- Safety is of greatest concern. Be aware of physical and chemical hazards at the site. Get a safety briefing before entering the area. Do not enter confined spaces unless they have been determined to be safe.
- Collect the source sample as soon as possible, even for potential releases.
- Decon equipment after each oil type is sampled with rinses of acetone or methanol, then methylene chloride. Collect all rinsate for proper disposal.
- Completely fill out the chain-of-custody form, noting where each source sample was collected from, sampling device used, time and date of collection, size and type of container, and name of sampler. Note problems such as visual differences in oil from different tanks, presence of water in the sample, etc.
- Maintain strict chain of custody during sample storage and transportation.



Preservation/Holding Times

- Immediately place all samples in cooler and keep at 4°C (do not freeze).
- Do not pack source samples in the same container as environmental samples (such as water and sediments) to reduce risk of cross contamination.
- Use packing material, such as bubble wrap, around bottles to prevent breakage.
- Oil can be held at 4°C in the dark for up to 6 months without loss of sample integrity, as long as there is no organic material or water present to serve as nutrients for bacterial growth.

Analytical Methods

Petroleum products are usually analyzed for fingerprinting purposes, so that the spilled oil can be differentiated from other petroleum sources. Chemical analyses for this purpose include:

- **Saturated Hydrocarbons (SHC).** These compounds include n-alkanes and saturated isoprenoids. They are contained in the f₁ fraction and measured by GC-FID analysis. The chromatographic trace can be used to differentiate among oils and is valuable for predicting the short-term weathering and fate of the oil.
- **Polycyclic aromatic hydrocarbons (PAH).** PAHs are used to fingerprint the spilled oil, monitor weathering, and predict toxicity. If PAHs are to be measured, it is important that the analytes include the alkyl-substituted PAH homologs, in addition to the standard PAH “priority pollutants”. This method is referred to as Modified EPA Method 8270, because the list of PAHs is expanded to include the alkylated homologs, using GC/MS in the selected ion monitoring mode.

Other Considerations

- There may be different products loaded in different compartments or tanks, even when only one type of product is involved (e.g., two different types of No. 2 fuel oil could be loaded). Get a loading diagram and as much data as possible on the products. Slight differences in product properties, such as specific gravity, may indicate different products. Sample each unique product.

Make sure that the source sample(s) collected represent the product actually released. Product in intact holds may not be the same as the released product.

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**Development and Verification of Mathematical
Model for Prediction of Oil Spill Movement**

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