



## **Gippsland Basin Seismic Programme**

**VIC/P41, VIC/P42, VIC/P47, VIC/P53,  
VIC/P58**

### **Environment Plan**

**Document No. EA-00-RI-153**

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## 1 INTRODUCTION

Apache Energy Limited (Apache) is proposing to undertake a three dimensional (3-D) seismic programme within its exploration permit VIC/P58 and also within the exploration permits VIC/P47, VIC/P42, VIC/P41, VIC/P53 on behalf of Bass Strait Oil Company. Thus, the seismic programme in this environmental plan refers to all 5 survey areas. These permits are situated within Commonwealth waters and the survey areas are shown on Figure 1.

Petroleum exploration activities in Commonwealth waters are regulated under the provisions of the *Petroleum (Submerged Lands) Act 1967* and the associated regulations, *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999* and *Petroleum (Submerged Lands) Regulations Schedule Specific Requirements as to Offshore Petroleum Exploration and Production 1995*.

Under Designated Authority (DA) arrangements the environmental assessment of petroleum exploration proposals in Victoria is managed by the Department of Primary Industries (DPI) on behalf of the Commonwealth Department of Industry Tourism and Resources (DITR).

In Victorian State waters, within the three nautical mile limit, exploration is subject to the Victorian *Petroleum (Submerged Lands) Act 1982*, which essentially mirrors the legislation of the Commonwealth Act.

### 1.1 Proponent

The proponent for the seismic programme is Apache Northwest Pty Limited, a subsidiary of Apache Energy Ltd. The Company address is:

Apache Energy Ltd  
Level 3, 256 St Georges Terrace  
Perth WA 6000  
Ph: (08) 9422 7481  
Fax: (08) 9422 7575  
Contact: Libby Howitt, Senior Environmental Scientist

### 1.2 Scope of Environment Plan

The Environment Plan for this seismic programme has been prepared in accordance with the Commonwealth regulatory requirements of the *Petroleum (Submerged Lands) Management of Environment Regulations 1999*.

The Environment Plan details the environmental risk assessment of the proposed seismic programme and defines the mitigation measures and management strategies that will be used to address the potential environmental impacts identified.

The Environment Plan includes:

- a description of the proposed seismic programme (Section 2.0);
- a description of the existing environment in which the proposed seismic programme will take place (Section 3.0);
- an analysis of the potential environmental effects from routine activities and unplanned events and their environmental management (Section 4.0); and
- the environmental implementation strategy including objectives, standards and criteria for environmental performance of the seismic programme (Section 5.0).

In addition to complying with statutory requirements, the Environment Plan ensures that the seismic programme is carried out in a manner that is commensurate with Apache's Environmental Policy (Appendix 1).

It is also intended to serve as a practicable environmental management tool that can be used throughout the proposed seismic programme by operators to achieve the stated environmental control measures.

## **2 PROPOSED SEISMIC PROGRAMME**

Marine seismic surveys are a critical component of offshore oil and gas exploration. Data collected from the surveys are used to map sub-surface geological structures, allowing the identification and definition of potential hydrocarbon deposits.

Operators of the permit areas in this seismic programme are committed to undertaking exploration activities within the permit areas as a condition of holding the permits.

### **2.1 Timing**

The proposed 3D seismic survey is scheduled to start from mid-December 2004, subject to receiving the necessary statutory approvals. It is anticipated that it will take approximately 128 days to complete the 5 surveys, being dependent on the prevailing weather conditions and logistical constraints during the surveys. This estimate includes an additional 20% to cover weather and logistical contingencies. Seismic operations would be 24 hours a day for this period.

### **2.2 Location**

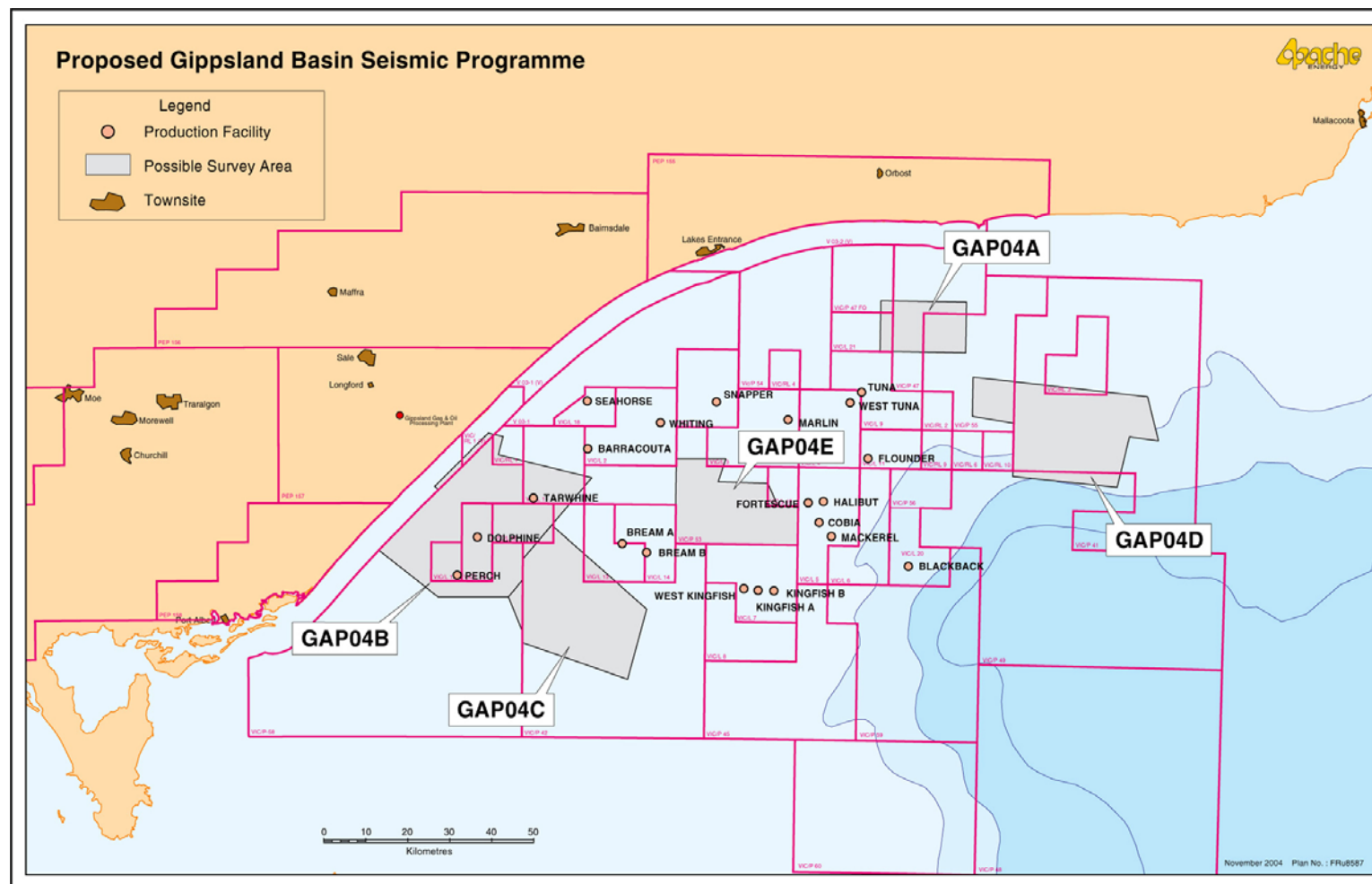
The survey areas are located in offshore Gippsland Basin covering Exploration Permits VIC/P41, VIC/P42, VIC/P47, VIC/P53 and VIC/P58 (Figure 1). Further information about these survey areas is given in Table 1.

**Table 1. Information on individual survey areas**

<b>Permit Block</b>	<b>VIC/P41</b>	<b>VIC/P42</b>	<b>VIC/P47</b>	<b>VIC/P53</b>	<b>VIC/P58</b>
Company reference	Oscar	Omeo	Moby	Bazzard	Sue
Operator	Bass Strait Oil Company	Bass Strait Oil Company	Bass Strait Oil Company	Cue Petroleum Pty Ltd	Apache Northwest Pty Ltd
Agent for acquisition	Apache	Apache	Apache	Apache	Apache
Vic DPI survey name	GAP04D	GAP04C	GAP04A	GAP04E	GAP04B
Probable sequence	4th	3rd	1st	5th	2nd
Additional permits covered in Commonwealth waters	VIC/RL3 VIC/P49 VIC/P55	VIC/L13 VIC/L16 VIC/P58	VIC/L21 VIC/P47FO VIC/P55	VIC/L3 VIC/L19	VIC/RL1 VIC/RL1(V) VIC/L1 VIC/L15 VIC/L16 VIC/L17 VIC/P42 VIC/P53
Additional permits covered in State waters	None	None	None	None	VIC/RL1 & vacant acreage
Approx. length of survey (days)	30	30	10	18	40
Maximum area of survey (km <sup>2</sup> )	751	683	245	458	1047
Range of water depths (approx. in m)	100 - 350	50 – 70	50 – 80	60 – 70	20 – 50
Distance to shore (km)	35.5	30.4	18	39.2	4.2
Distance to 90 Mile Beach MNP (km)	133	27.4	115.2	60.6	0.3
Distance to Point Hicks MNP (km)	36.3	150.5	48.3	107	146.5



Figure 1. Map showing location of the proposed seismic programme



The proposed seismic programme covers a total area of 3,185 km<sup>2</sup>. The survey for VIC/P58 approaches within 4.2 km of the coastline and comes within 0.3 km of Ninety Mile Beach Marine National Park (Table 1, Figure 2). Seismic acquisition will not be undertaken within the Marine Park boundary and the vessel and trailing gear will not traverse the Marine Park. This survey area is the only one that acquires data within State waters.

## 2.3 Seismic Operations

The Western Trident, operated by Western Geco, is the seismic vessel to be used throughout this seismic programme.

The Western Trident will tow 8 streamers; each one is 6,000 metres long and is trailed behind the vessel. The vessel navigates along the pre-selected survey lines within each survey area. An array of hydrophones or acoustic receivers is attached within the streamer. Two seismic source arrays about 50 m apart are also towed approximately 75 m astern of the vessel, and will release alternately on average every 8-10 seconds, acoustic pulses into the water column.

These acoustic pulses are directed downward through the water column and into the underlying seabed and sedimentary strata. The reflected signals from the changes in subsurface geological structures are then recorded by the hydrophone arrays within the towed streamers. The hydrophones collect the returning signal which is stored in the vessels onboard computers for subsequent processing and analysis. The return times and character of the signals are used to plot the underlying geological strata.

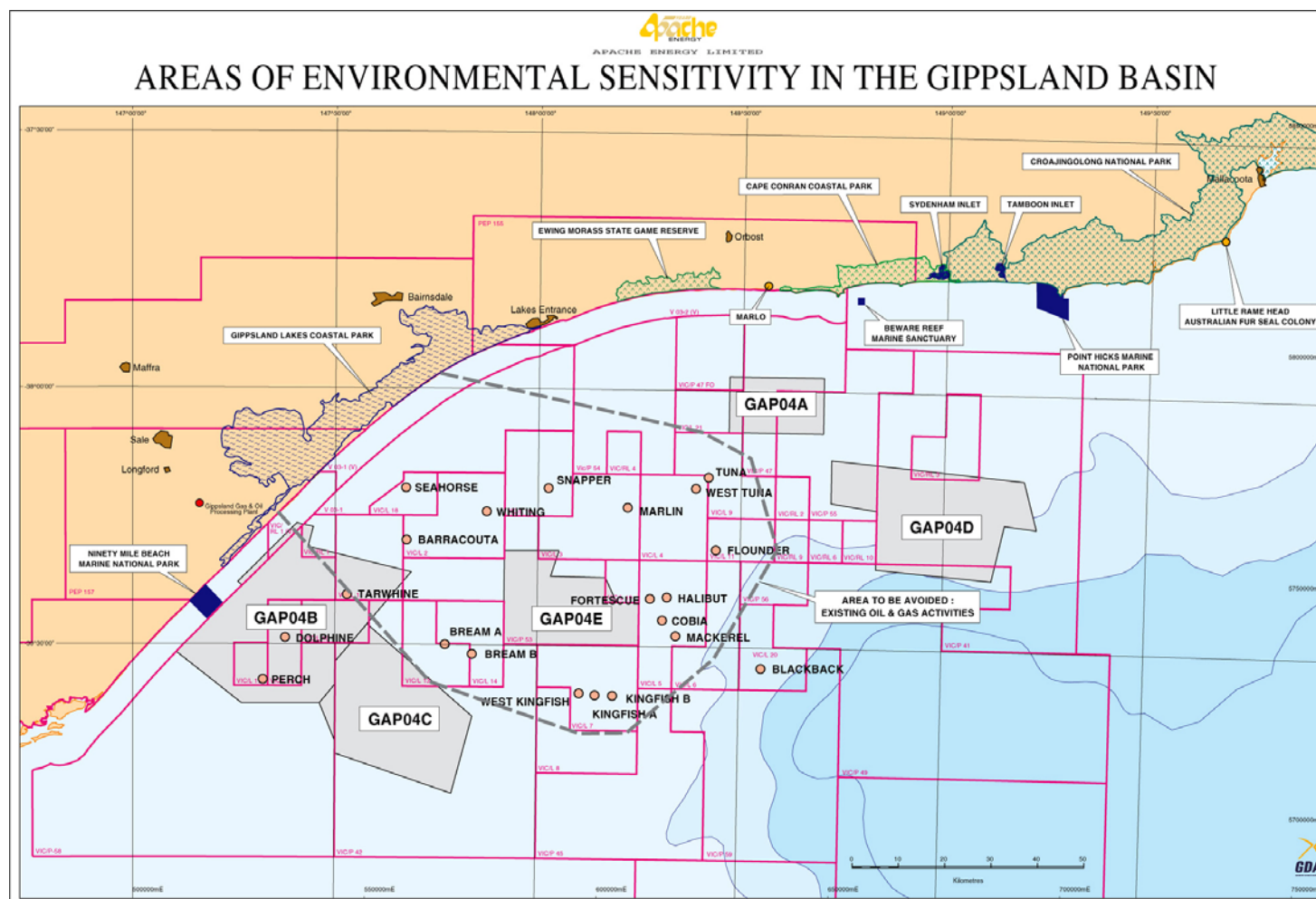
The seismic vessel speed will be set at approximately 4.5 to 5 knots resulting in a release from the seismic source array every 18.75 m. In a normal 24 hour working day approximately 40 km<sup>2</sup> of data acquisition can be achieved. Details of the seismic array are given in Table 2.

**Table 2: Details of the seismic array**

No. of streamers	8
Length of streamers	6,000 m
Number of seismic source arrays	2
Total volume of seismic source arrays	3,000 cui
Operating pressure of seismic source arrays	2,000 psi
Depth of streamers in water column	7-10 m
Depth of seismic source arrays	6 m
Interval between sound pulses	18.75 m (8-10 sec)
Peak source of sound pulse	212 dB re 1 $\mu$ Pa-m
Frequency range	5 - 120 Hz

Prior to this survey, the Western Trident will have been working in Malaysian waters. In Australia initially, the seismic vessel and crew are likely to be mobilised out of Portland. As the survey is estimated to take 128 days, the vessel will require refuelling at sea. Bunkering will be undertaken at sea with the support vessels refuelling and collecting supplies out of Eden or Welshpool. Subsequent crew changes will take place via helicopter from Essendon.

Figure 2. Map showing location of seismic survey areas in relation to environmental resources in the Gippsland Basin region.



## 3 DESCRIPTION OF THE EXISTING ENVIRONMENT

### 3.1 Physical Environment

A brief description of the physical environment of the survey area, including the climate, oceanography and bathymetry is given in this section. The Gippsland Basin is included in the Twofold Shelf grouping by IMCRA (1998).

#### 3.1.1 Climate

The climate of the Gippsland Basin can be described as moist cool temperatures with warm summers, with a regular winter-spring rainfall. The region is located on the northern edge of the westerly wind belt known as the roaring forties. Winds often freshen to gale force from the north and north-west, ahead of approaching fronts during all seasons. Once the fronts have passed they then swing abruptly south-west behind the front at similar speeds and abate until they again freshen ahead of the next front. Additionally, low pressure systems can generate wind systems known as the “East Coast Lows”, which consist of strong south easterly winds.

#### 3.1.2 Oceanography

Regionally, Bass Strait has a unique geometry consisting of a broad shallow region, which descends abruptly to very deep water on each side. The Gippsland Basin is the broad shallow region on the eastern side of Bass Strait. The flux of water through the strait and its variations are key components of many physical and biological processes in the region (Butler *et al.*, 2002).

The currents within the Gippsland Basin region include components due to tides and wind stress. As a function of this in the open waters, tides generally result in an elliptical movement of the water mass (URS, 2003).

The East Australian current brings warmer waters into Bass Strait and influences water temperatures. Sea surface temperatures for Bass Strait range from 16 to 18°C in February and 12 to 14°C in August (Middleton, 1995).

Wave energy is relatively low, particularly in the broader shelf area in the Gippsland Basin. However, stalled low-pressure systems in the Tasman Sea during the summer can generate higher wave energy at this time. Intermittent upwellings occur along parts of the east Gippsland coast (URS, 2003).

#### 3.1.3 Bathymetry

The water depth range for each survey varies and is given in Table 1. The survey in VIC/P58 is located in relatively shallow water depths compared to the other survey areas, ranging from approximately 20 to 50 m, with a gradual gradient from shallow to deeper waters.

A detailed bathymetric survey using Laser Airborne Depth Survey (LADS) will be done prior to the seismic survey in VIC/P58 to fully define the 20 m depth contour. To do this, it is envisaged that an area of approximately 215 km<sup>2</sup> will be surveyed in a strip parallel to the coastline and starting 2.5 nautical miles out from it.

## **3.2 Biological Environment**

### **3.2.1 Marine Habitats**

Over the years, seabed surveys have been done by other oil and gas companies in Bass Strait providing the following general information regarding the nature of the seabed and associated fauna within Bass Strait:

- dominated by soft seabed habitats with sediments ranging from fine to coarse sand and areas of shell accumulations and aggregations of the introduced New Zealand screw shell
- sandstone or calcarenite reefs are distributed intermittently along the east Gippsland coast and may be periodically covered by sand or shell
- soft-sediment infauna are dominated by polychaetes, molluscs and crustaceans with substantial spatial and temporal variation
- epibiota of the region is sparse and characterised by scallops and other large bivalve molluscs, crabs, seasquirts, seapens, sponges and bryozoans.

### **3.2.2 Marine Biota**

A review of the Commonwealth Department of Environment and Heritage database indicates that there are a number of listed species identified as potentially occurring within the seismic survey areas. These species, their status and their likely presence in the area during the proposed surveys are given in Table 3.

Further discussion of these listed species and other biota is given under faunal groupings in the following sections: marine mammals, seabirds, fish and sharks.

**Table 3: Listed species under the EPBC Act that have been identified by the Department of Environment and Heritage database for consideration in relation to the proposed seismic programme**

**E = endangered V = vulnerable**

Scientific Name	Common Name	Status	Migratory	Presence during seismic survey
<b>MAMMALS</b>				
<i>Arctocephalus pusillus</i>	Australian Fur Seal			possible
<i>Balaenoptera acutorostrata</i>	Minke Whale			possible
<i>Balaenoptera edeni</i>	Bryde's Whale		X	possible
<i>Balaenoptera musculus</i>	Blue whale	E	X	unlikely
<i>Caperea marginate</i>	Pygmy Right Whale		X	possible
<i>Eubalaena australis</i>	Southern Right Whale	E	X	unlikely
<i>Megaptera novaeangliae</i>	Humpback whale	V	X	unlikely
<i>Delphinus delphis</i>	Common Dolphin			possible
<i>Grampus griseus</i>	Risso's Dolphin			possible
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin			possible
<i>Orcinus orca</i>	Orca		X	possible
<i>Tursiops aduncus</i>	Spotted Bottlenose Dolphin			possible
<i>Tursiops truncatus s. str.</i>	Bottlenose Dolphin			possible
<b>BIRDS</b>				
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle		X	possible
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		X	possible
<i>Catharacta skua</i>	Great Skua			possible
<i>Diomedea amsterdamensis</i>	Amsterdam Albatross	E	X	possible
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	X	possible
<i>Diomedea dabbenena</i>	Tristan Albatross	E	X	possible
<i>Diomedea epomophora</i>	Southern Royal Albatross	V	X	possible
<i>Diomedea exulans</i>	Wandering Albatross	V	X	possible
<i>Diomedea gibsoni</i>	Gibson's Albatross	V	X	possible
<i>Diomedea sanfordi</i>	Northern Royal Albatross	E	X	possible
<i>Halobaena caerulea</i>	Blue Petrel	V		possible
<i>Lathamus discolor</i>	Swift Parrot	E		unlikely
<i>Macronectes giganteus</i>	Southern Giant Petrel	E	X	possible
<i>Macronectes halli</i>	Northern Giant Petrel	V	X	possible
<i>Thalassarche bulleri</i>	Buller's Albatross	V	X	possible
<i>Thalassarche cauta</i>	Shy Albatross	V	X	possible
<i>Thalassarche chlororhynchos</i>	Yellow-nosed Albatross			possible
<i>Thalassarche chrysostoma</i>	Grey-headed Albatross	V	X	possible
<i>Thalassarche impavida</i>	Campbell Albatross	V	X	possible
<i>Thalassarche melanophris</i>	Black-browed Albatross		X	possible
<i>Thalassarche salvini</i>	Salvin's Albatross	V	X	possible
<b>SHARKS</b>				
<i>Carcharodon carcharias</i>	Great White Shark	V	X	possible
<i>Rhincodon typus</i>	Whale shark	V	X	unlikely
<b>FISHES</b>				
27 species	Pipefish, Pipehorse, Seahorse			Possible



## **Marine Mammals**

Forty three species of whales and dolphins occur in Australian waters (Bryden *et al.*, 1998), with approximately 50% of these reported in Victorian waters.

Humpback whales and southern right whales are unlikely to be encountered during the seismic surveys as timing of their migration through the Gippsland Basin region is broadly between May and October each year (DEH, 2001).

Blue whales migrate to their feeding grounds in October to December, however, the closest feeding grounds are to the west of the survey areas in the Otway Basin (feeding between December and May) and to the north off Eden in New South Wales (feeding between October to December). Migration pathways for Blue whales are widespread, not obviously following coastlines or oceanographic features (Bannister *et al.*, 1996). A Blue whale was recorded once from an aerial survey just prior to The Esso Northern Fields Seismic Survey in eastern Bass Strait that began in October 2001 and ended in July 2002. For the remainder of the survey, Blue whales were not sighted during continuous dedicated boat-based observations (Esso, 2003). Due to the location and timing of the seismic programme, Blue whales are highly unlikely to be in the vicinity of the seismic programme.

Little is known of the distribution of feeding grounds, migration paths and calving areas of the other species of whales and dolphins found in Bass Strait. Minke whales occur worldwide and are oceanic, they are thought to mate from August to September and calve from June to July each year (Bannister *et al.*, 1996).

Five species of dolphins with differing migration and habitat preferences (Bannister *et al.*, 1996) are known to occur within the proposed survey areas.

The Australian fur-seal (*Arctocephalus pusillus*) occurs throughout Bass Strait. There are numerous breeding colonies near Wilson Promontory, Philip Island and King Island. There are no breeding grounds within the seismic survey areas or in the immediate surrounding waters (Bryden *et al.*, 1998).

The seals moult, breed and rest on land, and tend to come ashore on rock platforms, reefs or rocky beaches. They utilise artificial structures including Bass Strait oil and gas infrastructure and mooring buoys, as resting locations.

## **Seabirds**

Migratory seabirds such as albatross and petrels, which are protected by international agreements (Bonn Convention, JAMBA, CAMBA), may pass through or near to the survey areas on their way to islands in Bass Strait and/or Tasmania. For example, the wandering albatross *Diomedea exulans*, visits Australian waters between June and September each year, however, breeding takes place on subantarctic islands and commences in early November (Australian Museum, 2003 on [www.amonline.net.au](http://www.amonline.net.au)). Foraging groups of seabirds are also sighted sporadically in the eastern Bass Strait area.

The swift parrot breeds in Tasmania and migrates to mainland Australia in autumn so is unlikely to be encountered during the survey period (Tasmanian Department of Primary Industries, Water and Environment, 2001).

## ***Fish and Sharks***

Great white sharks are uncommon but are generally known to frequent waters around seal colonies, particularly during seal pupping season (October to December). The known Australian Fur Seal colonies closest to the survey areas are at Wilson's Promontory to the south west and the Skerries to the north east.

Whale sharks are highly unlikely to be this far south with the southern most sighting being in Eden, New South Wales.

Members of the Family Syngathidae (pipefishes and seahorses) are usually associated with kelp forests in sheltered or moderately exposed reef areas (Edgar, 1997) and are therefore unlikely to occur within the survey areas.

Many pelagic and demersal fish species are found in the waters of Bass Strait and deeper waters to the east, such as orange roughy, flathead, school whiting, john dory, silver trevally, snapper, ocean perch and several shark species are some that are of commercial significance. Commercial species of fish are discussed in Section 3.3.2.

## ***Infauna***

A highly diverse array of invertebrate groups have been recorded from the Bass Strait region including polychaetes, pycnogonids, pericarid crustaceans, opisthobranch molluscs, bryozoans and brachipods being species rich (Wilson and Poore, 1987; Parry *et al.*, 1990).

## ***Epibiota***

The majority of the substratum in the Gippsland Basin consists of unconsolidated sediments; however, there are also areas of broken and unbroken limestone reef on the seafloor (Parry *et al.*, 1990). These low-profile limestone reefs are generally long and narrow and are oriented parallel to the coast, following the depth contours. The limestone reefs are generally the same level as the surrounding sediment and consist of sand ripples separated by troughs containing small rocks. These areas provide habitat for sponges, bryozoans and ascidians in greater numbers than areas with only fine sediment. In some areas these limestone reefs are raised above the surrounding sediment and support a more diverse reef fauna including rock lobster and kelp (Parry *et al.*, 1990).

## ***Plankton***

More than 170 species of zooplankton have been recorded in central and eastern Bass Strait, with copepods making up approximately half of the species encountered (Watson and Chaloupka, 1982). Plankton is likely to be extremely variable both spatially and temporally in the seismic survey areas. Plankton distribution will be dependent upon prevailing ocean currents such as the East Australia Current, west to east flows from Bass Strait and Southern Ocean masses. Plankton populations are likely to comprise characteristics of tropical, central Bass Strait and Tasman Sea populations.



### 3.2.3 Areas of Environmental Significance

There are no known areas of regional environmental significance within the proposed seismic survey areas. There are, however, areas along the Victorian coastline of environmental significance (Figure 2). These include:

- 90 Mile Beach Marine Park, located in state waters to the west of the survey areas;
- Point Hicks Marine Park, located in state waters to the north of the survey areas;
- Gippsland Lakes Coast Park;
- Lakes Entrance is listed as a Ramsar wetland;
- Ewing Morass State Game Reserve;
- Cape Conran Coastal Park;
- Croajingolong National Park;
- Little Tern rookeries at Tamboon and Sydenham Inlets; and
- Australian Fur Seal colony near Little Rame Head and a haul out site at Beware Reef.

The seismic survey will not be conducted within the Ninety Mile Beach Marine National Park nor will the survey vessel traverse the park. Further information regarding the Marine National Parks is given on the Parks Victoria website at <http://www.parkweb.vic.gov.au/resources>.

## 3.3 Social Environment

### 3.3.1 Population Centres

The closest population centres to the seismic programme are the East Gippsland coastal towns of Lakes Entrance and Marlo. Lakes Entrance is one of the largest fishing ports of the region, with a population of 5,300 residents. Between 10 to 15 % of the population of Lakes Entrance are employed in the commercial fishing industry, with 2 to 5% employed by the industry on a broader regional scale (Australian Bureau of Statistics Population and Housing Census, 1996).

Mallacoota, Marlo and Seaspray are much smaller towns on the coastline with fewer permanent residents. All of these coastal towns are a tourist destination during school holidays and their populations increase substantially during these periods.

### 3.3.2 Commercial Fisheries

The main sources of data used to get detail about fisheries in the study area were:

- Victorian Department of Primary Industries' website;
- Seafood Industry of Victoria's website;
- Australian Fisheries Management Authority's website;
- Department of Agriculture, Fisheries and Forestry's 'Marine Matters Atlas of Marine Activities and Coastal Communities in Australia's South-east Marine Region by Larcombe *et al.*, (2002);
- Fisheries Victorian Commercial Fish Production Information Bulletin 2003 (Anon 2003); and

- A report of the Marine Resources off East Gippsland South-Eastern Australia by Parry *et al.*, (1990).

### **Ports of Landing**

There are three main commercial fishing ports of landing in the Gippsland Basin area; Mallacoota, Lakes Entrance and Port Albert (Figure 1). These ports support a diverse range of fisheries and fleets. Commercial fisheries catches and value from the areas around these ports are summarised in Table 4.

Abalone diving is the major fishery in Mallacoota. There are 21 abalone licence holders based at Mallacoota with 18 selling their catch to the local Abalone Fishermen's Co-operative. Other smaller, relevant ocean fisheries operating from Mallacoota include prawn trawling and rock lobster fisheries.

Lakes Entrance is the major eastern Victorian commercial fishing port. Current ocean fishing operations in the area include:

- The last Danish seine trawl fleet in Australian (17 boats);
- Deep water board trawlers (5 boats);
- A shark fishing fleet (6 boats);
- A scallop harvesting fleet that also catch squid when in season (30 boats);
- Rock lobster (3 boats);
- A fleet of inshore vessels (6 boats) who ply their trade in diverse forms of fishing close to the coast including prawn fishing; and
- Bait fishers who supply recreational anglers (9 boats).

Fish landings to the port vary from 5,000 to 9,000 tonnes annually and represent a value to the Victorian community in the order of \$150 million.

The majority of the fisheries in the Port Albert Area operate inside the sheltered waters of an embayment. A small shark fishery, however, also operates out of Port Albert using gillnets and demersal longlines outside of Victorian waters (5.5 km).

### **Commercial Fisheries Under State Jurisdiction**

#### **Abalone Fishery**

The Abalone Fishery in Victoria is the state's most valuable commercial fishery valued at an estimated \$55 million annually. The fishery's central zone; Lakes Entrance to the Hopkins River near Warrnambool includes the stretch of Ninety Mile Beach adjacent to one of the proposed seismic survey areas. Abalone grounds in the Gippsland Basin are restricted to nearshore reefs east of Lakes Entrance. As such there would be no overlap between the proposed seismic survey areas.

#### **Rock Lobster and Giant Crab Fishery**

The Victorian Rock Lobster Fishery is valued at an estimated \$17 million. The eastern zone (east of Apollo Bay) contributes about 10 % of the Victorian catch (50 – 75 tonnes) and there are 53 license holders with 2000 licensed pots. The majority of the eastern zone rock lobster catch is landed in the western most ports of the zone. The species caught in Victorian waters is the southern rock lobster (*Jasus edwardsii*). Giant crabs (*Pseudocarcinus gigas*) are caught as incidental and occasionally targeted bycatch of the rock lobster fishery and are only of minor commercial importance in the eastern zone.

**Table 4. Catch and value by port of landing in eastern Victoria for selected species groups during 1999/00 - 2002/03.  
(Source: Anon (2003))**

Port of Landing	Financial Year	Abalone		Rock Lobster		Scale Fish		Scallops		Sharks		Other		Total	
		Tonnes	\$'000	Tonnes	\$'000	Tonnes	\$'000	Tonnes	\$'000	Tonnes	\$'000	Tonnes	\$'000	Tonnes	\$'000
<b>Inverloch</b> to <b>Port Albert</b> (Wilson's Prom & Corner Inlet)	1999 / 00	84	3457	9	280	369	1653	2	4	30	135	4	19	498	5548
	2000 / 01	79	3970	6	211	541	1585	0	0	24	110	16	36	666	5912
	2001 / 02	109	4638	7	297	483	1663	58	135	17	71	4	12	678	6816
	2002 / 03	91	3857	4	182	457	2110	90	196	17	81	1	3	660	6429
<b>Paynesville</b> to <b>Lake Tyers</b> (Lakes Entrance)	1999 / 00	0	0	0	0	1487	2718	290	580	6	27	264	2202	2047	5527
	2000 / 01	0	0	0	0	1361	2888	812	1772	7	20	301	2844	2481	7524
	2001 / 02	0	0	0	0	1554	4137	490	1144	12	36	222	2165	2278	7482
	2002 / 03	0	0	0	0	1523	5439	546	1169	15	42	141	1558	2225	8208
<b>Tamboon</b> to <b>Eden</b> (South - East Corner)	1999 / 00	443	18190	0	0	462	462	0	0	5	23	11	95	574	18770
	2000 / 01	446	22221	4	131	424	424	0	0	1	6	9	64	530	22846
	2001 / 02	448	19415	0	0	507	507	0	0	3	18	4	88	551	20028
	2002 / 03	399	126853	0	0	468	468	0	0	3	16	2	37	467	17374

The nearest ports of landing to the proposed survey areas for the Rock Lobster Fishery are the Inverloch to Port Albert ports and the Tamboon to Eden ports which had catches of 4 – 9 tonnes and 0 - 4 tonnes respectively since 1999 (Table 4). The closest ports to the survey area (Paynesville to Lake Tyers) have not landed rock lobster in the last four years.

Some of the proposed survey areas overlap areas of reef where the Rock Lobster Fishery and Giant Crab Fishery operate (Figures 3 and 4).

### **Wrasse Fishery**

The commercial Wrasse Fishery is a relatively new fishery in Victorian waters since the increase in restaurant demand for live wrasse in the 1990s. There are currently 51 fishery access licences and the fishery has an estimated catch of 51 tonnes and a value of around \$500,000 (Department of Primary Industries, 2004).

The fishery targets the blue throat wrasse (*Notolabrus tetricus*) and to a lesser extent the saddled wrasse (*Notolabrus fucicola*). Both species are likely to be resident to particular reefs. Fish are taken mainly by handlines, which ensures that they are captured in good condition and retained alive. Wrasses are taken in waters from 10 to 40 m in areas of rocky reef habitat. The majority of the catch is taken in the central and western coastal section of Victoria, although catches are recorded along the entire coast (Figure 5). Catches of wrasse in the general area of the proposed surveys have been recorded, although detailed information about location and catch volume is unavailable.

The majority of catch in the Gippsland region occurs within nearshore areas and as such 4 of the 5 proposed survey areas would not overlap with the fishery (Figure 5).

### **Scallop Fishery**

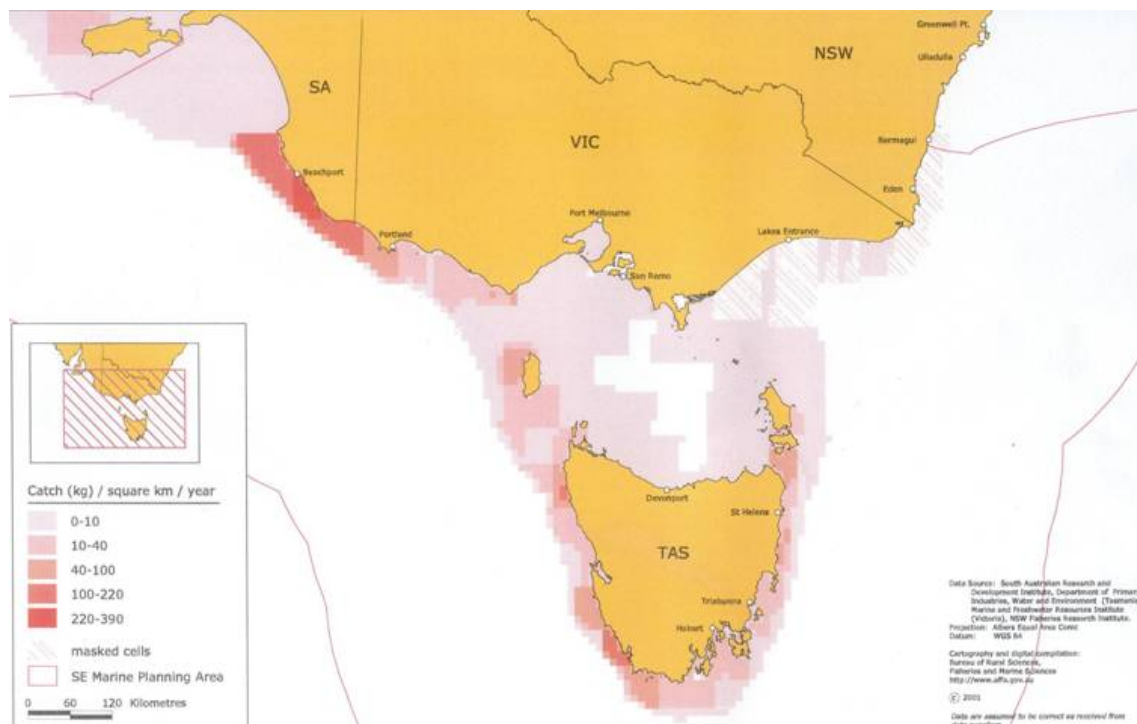
The Victorian scallop fishery is limited to oceanic waters to 20 nm off the coast in eastern Bass Strait since the closure of the Port Phillip Bay fishery in 1996. Beyond 20 nm the fishery is managed by the Commonwealth. The species of scallop caught in Victorian waters is *Pecten fumata*. Annual Victorian catches have varied between 300 and 850 tonnes since 1999 and are valued at around \$0.5 to \$2 million annually (Table 4).

The main ports of landing are Paynesville to Lake Tyers (Lakes Entrance); handling 85 -100 % of the catch, with the remaining catch being landed in the Inverloch to Port Albert ports. The scallop fishery operates between July and September and the fishery is opened and closed each year by fisheries notice. A closed season exists during the summer and autumn months so that the scallops can spawn and reproduce. Scallops are harvested using a self-tipping mud dredge towed along the seabed. There are currently 94 Victorian scallop licences divided among about 30 vessels. Scallops are generally dredged on sand or shale substrates in depths between 20 and 55m.

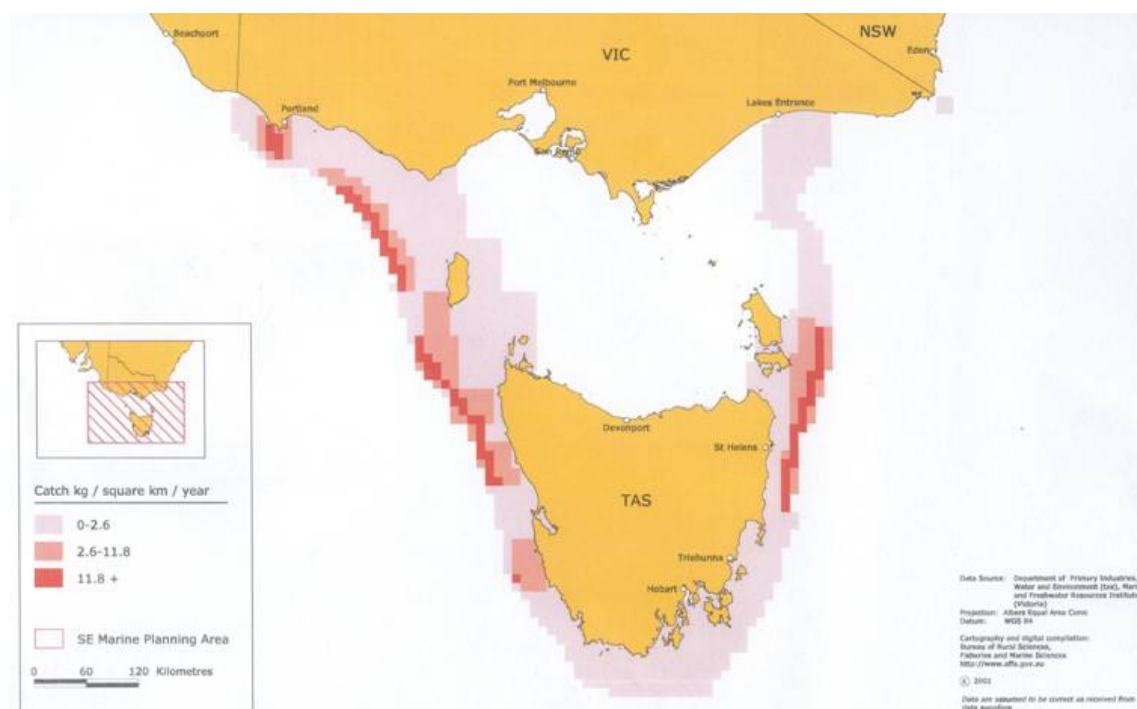
Some of the proposed survey areas include known productive scallop grounds (Figure 6), however, the timing of the seismic programme is during the closed season.

### **Ocean General Fishery**

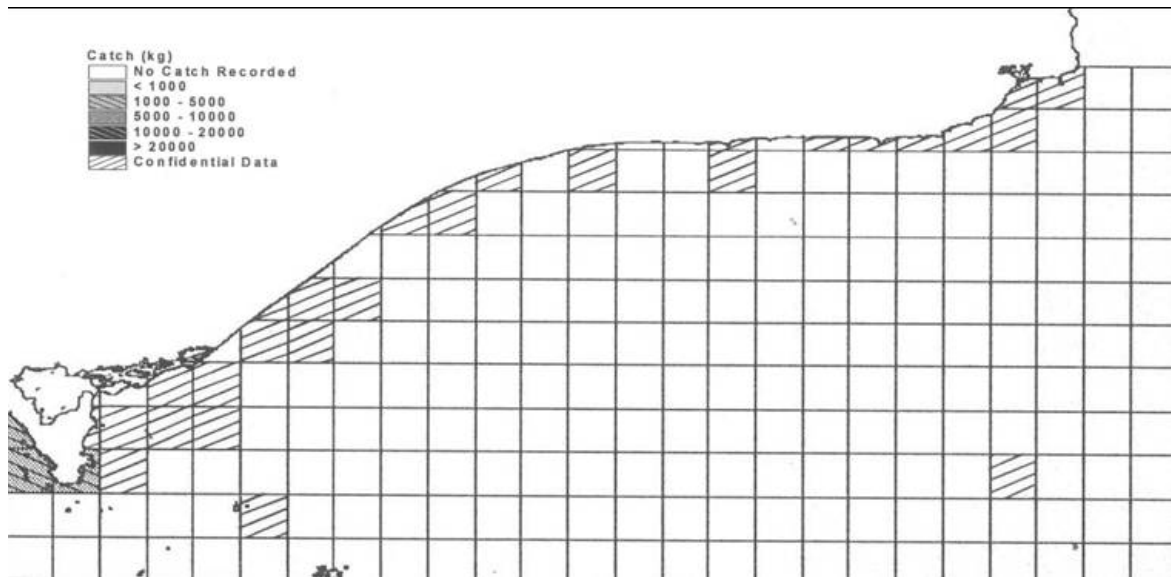
The definition of this managed fishery has changed through the 1990s, with major components including Australian salmon purse seining managed separately from 1996. The remainder comprises a variety of fishing techniques and target species.



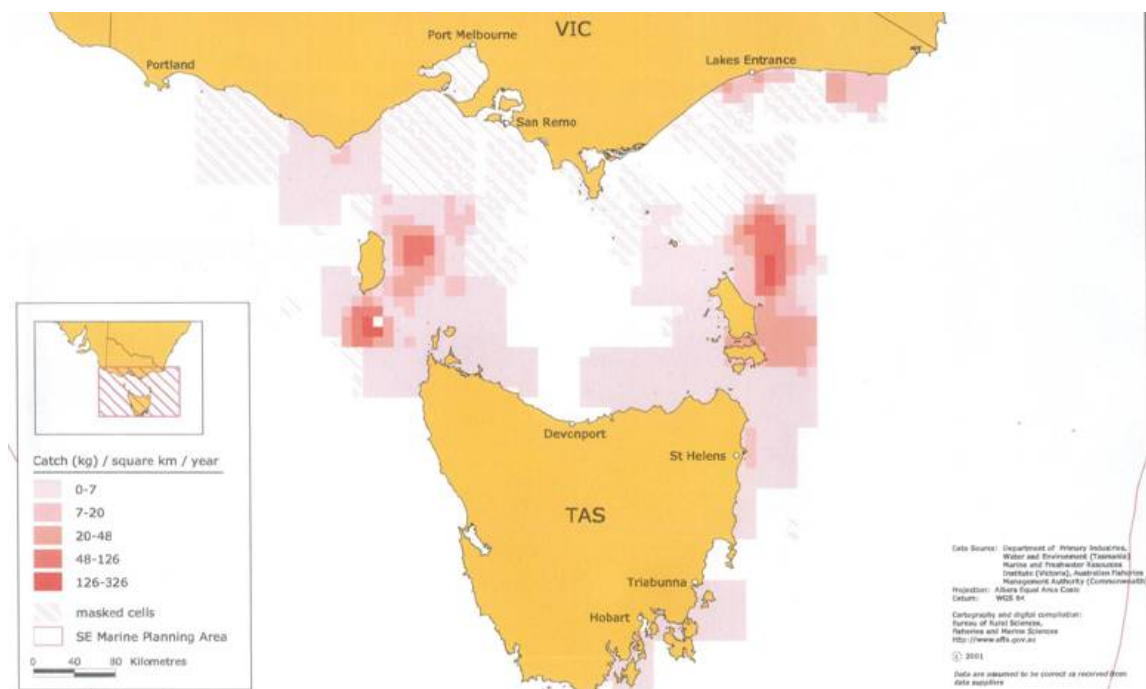
**Figure 3.** Average catch of rock lobster in south-eastern Australia from 1995-99. NB. Includes catch data from State and Commonwealth managed fisheries. (Source: Larcombe *et al.*, 2002)



**Figure 4.** Average catch of giant crab in south-eastern Australia from 1995-99. NB. Includes catch data from fisheries managed by Tasmania and Victoria. (Source: Larcombe *et al.*, 2002)



**Figure 5.** Catch of blue-throat and saddled wrasse in the Gippsland Basin 1998 – 2000 in the Victorian Wrasse Fishery. (Source: DPI 2004)



**Figure 6.** Catch of scallop in south-eastern Australia from 1995-99. NB. Includes catch data from State and Commonwealth managed fisheries. The Victorian managed sector includes water within 20 nm seaward of the coast. (Source: Larcombe *et al.*, 2002)



not elsewhere managed as part of other Victorian fisheries or by the Commonwealth. Operators are usually licensed to another fishery, such as the Rock Lobster Fishery, but retain an 'Ocean General' licence to diversify opportunities.

A wide variety of gears are used in the fishery including handline, troll, gillnet, beach seine and octopus pot. The main species caught are snapper (*Pagrus auratus*), gummy shark (*Mustelus antarcticus*), Australian salmon (*Arripis* spp.) and octopus (*Octopus* spp.). The 1999 total catch was 350 tonnes with a landed value of \$1.29 million.

Fishing is focused on near-shore areas, from Portland in the west through to Wilsons Promontory in the east, but there is some fishing effort in the Gippsland Basin.

### ***Commercial Fisheries Under Commonwealth Jurisdiction***

#### **Eastern Tuna and Billfish Fishery (including skipjack)**

The Eastern Tuna and Billfish Fishery (ETBF) extends around the east Australian coast from the high water mark (3 nm line in NSW) to 200 nm seaward from the Victorian – South Australian Border to Cape York. The fishery uses mainly pelagic longlines; however minor lines, poling and purse-seining are also used. The fishery is relatively stable with the value in 2003 at approximately \$68 million. The major species caught being skipjack tuna, yellowfin tuna, bigeye tuna and swordfish.

The majority of the ETBF operates at the edge or seaward of the continental shelf using pelagic longlines and as such would not overlap with the seismic survey areas (Figure 7). However, the purse seining and the pole and line components of the fishery are known to occur within the seismic survey areas (Figure 8).

#### **Southern and Eastern Scalefish and Shark Fishery**

The Southern and Eastern Scalefish and Shark Fishery is a new arrangement that has brought together some existing fisheries in the southern regions of Australia. These are the Great Australian Bight Trawl Fishery, South East Trawl Fishery and the Gillnet Hook and Trap Fishery (formerly the South East Non-trawl and Southern Shark Fisheries). This has been done to provide an overarching management framework to manage these fisheries which have overlapping areas of waters and species. Quota and/or boat statutory fishing rights (SFRs) will be granted to those who satisfy the eligibility criteria listed in the plan. Boat SFRs will be gear specific and will reflect existing rights to use particular gear and/or access particular areas of the fishery. The proposal is viewed as a step towards implementing an ecosystem-based approach to fisheries management in the region.

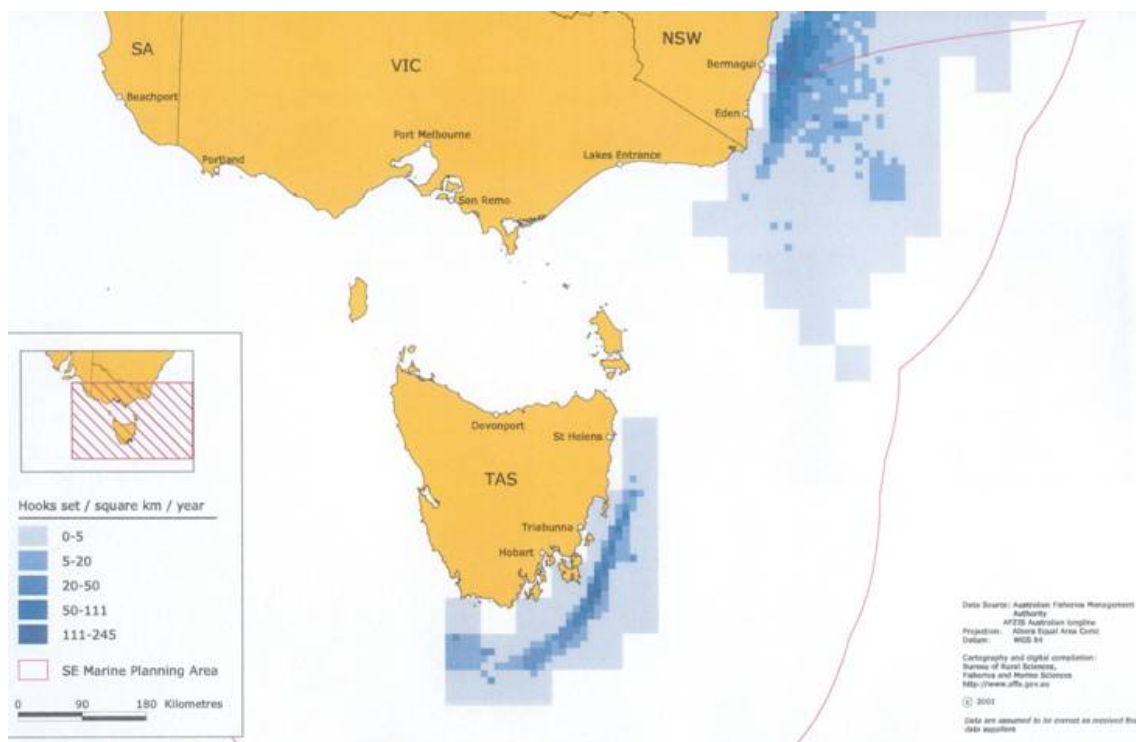
Only the South East Trawl Fishery and the Gillnet Hook and Trap Fishery are relevant to the proposal.

#### ***South East Trawl Fishery***

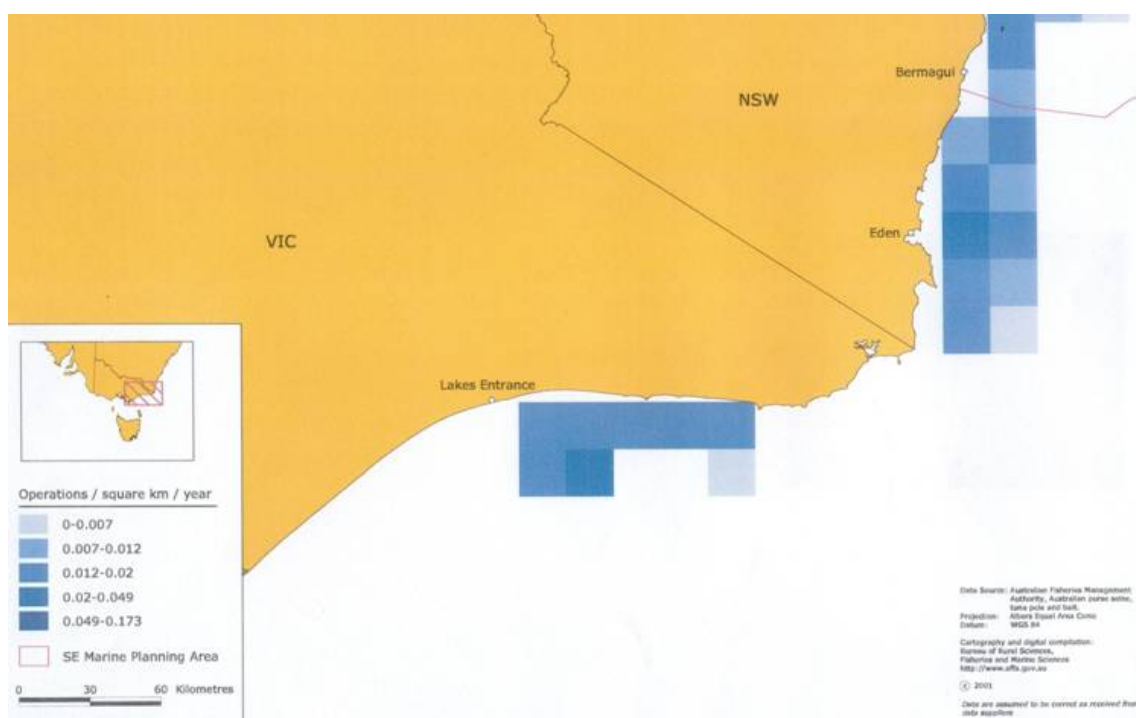
The South East Trawl Fishery (SETF) extends from Sydney to Kangaroo Island. The methods used in the SETF include demersal trawl (otter trawl), deepwater bottom trawl and Danish seine. The catch and value of demersal species caught in the SETF in recent years are listed in (Table 5). In the past trawling has concentrated along the edge of the continental shelf and the upper part of the continental slope but



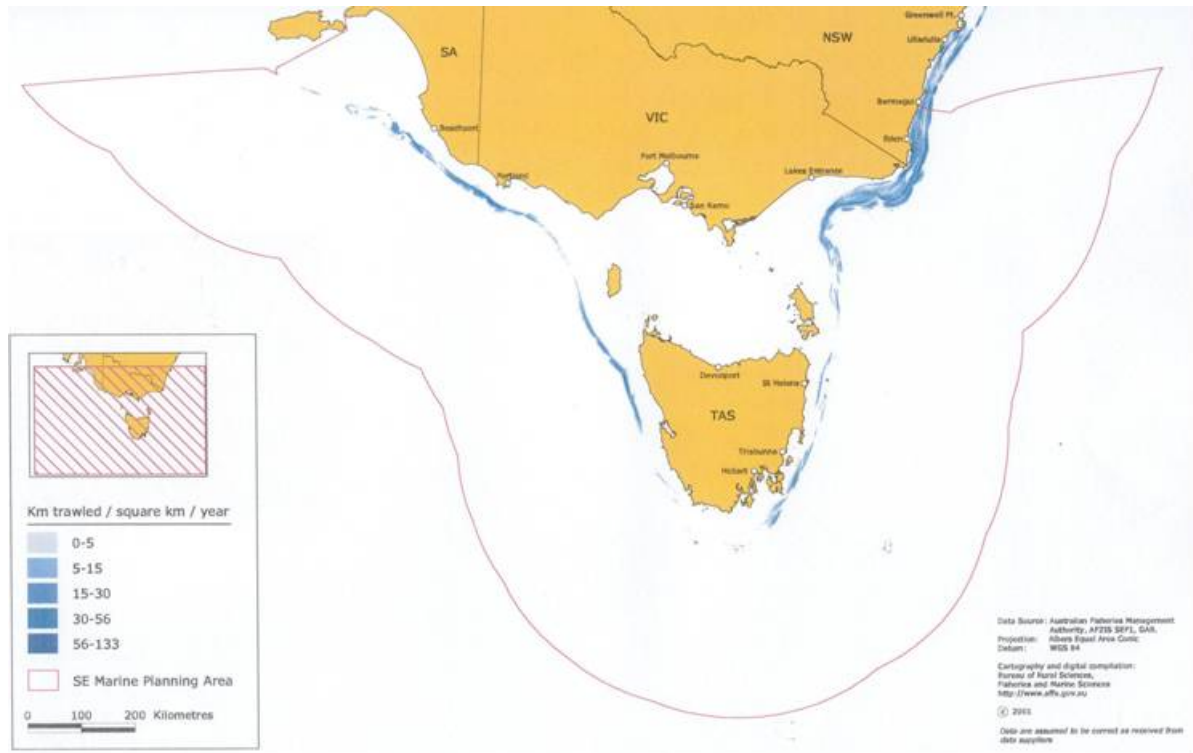
with the recent inclusion of the Victorian Inshore Trawl Fishery there is also considerable inshore trawling (Figures 9 and 10).



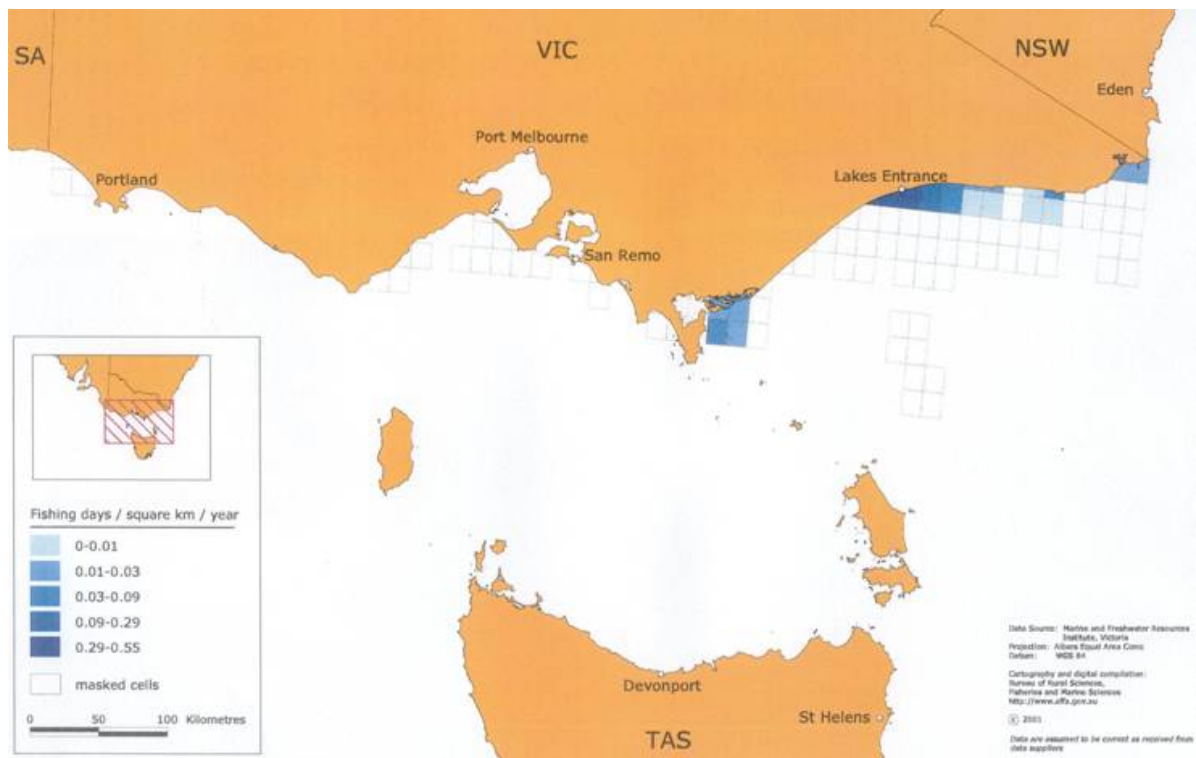
**Figure 7. Catch from pelagic longline in the Eastern Tuna and Billfish Fishery from 1995-99. (Source: Larcombe *et al.*, 2002)**



**Figure 8. Catch from purse seine, pole and line from 1995-99. NB. Includes catch from the Eastern Tuna and Billfish Fishery and Small Pelagic Fishery. (Source: Larcombe *et al.*, 2002)**



**Figure 9. Catch from deep water trawling from 1995-99 in the South East Trawl Fishery. (Source: Larcombe *et al.*, 2002)**



**Figure 10. Catch by Danish seine from 1995-99 in the Victorian Danish Seine Fishery. NB This fishery is now managed as part of the Commonwealth South East Trawl Fishery. (Source: Larcombe *et al.*, 2002)**

The majority of inshore trawlers work out of Lakes Entrance for prawns, although some target demersal species of fish such as tiger flathead. The SETF is a major supplier of fresh fish to the domestic market in south-eastern Australia and significant export markets exist for some species. The fishery is stable. The total catch in 2003 was 30,000 tonnes with a landed value of \$65 million.

The Commonwealth Danish seine fleet operates mainly out of the port of Lakes Entrance, Victoria, with a small number of boats operating from San Remo and Port Welshpool, east of Wilsons Promontory. Fishing activities are centred on inshore grounds close to shore as well as on the edge of the continental shelf in eastern Bass Strait (Figure 11). Most of the catch is marketed fresh for consumption in south-eastern Australia. Catches have been relatively stable through the 1990s, with an annual catch of some 2,200 tonnes, valued at \$3.7 million in 1999.

There is substantial overlap between SETF fishing grounds and the proposed areas for seismic surveys.

**Table 5. Catch and value of species caught in the South East Trawl Fishery from 2000/01 to 2002/3. (Source: ABARE 2004).**

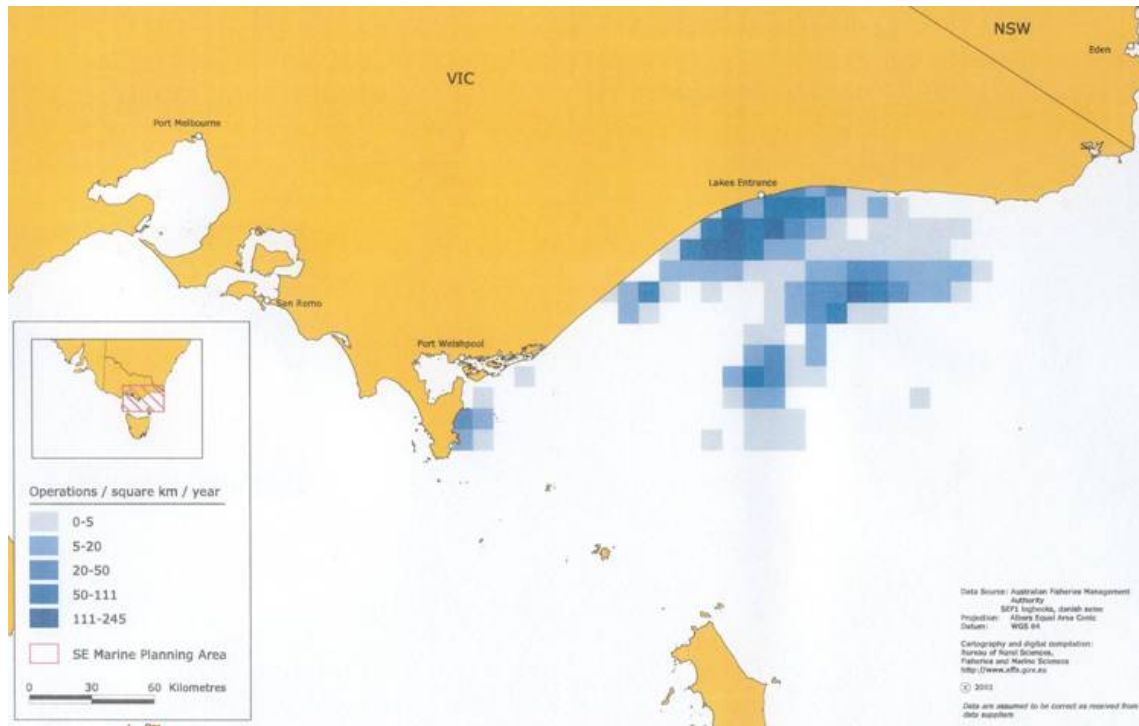
Species	2000/01		2001/02		2002/03	
	tonnes	\$'000	tonnes	\$'000	tonnes	\$'000
Orange roughy	4 186	14 107	3 422	12 491	4 162	15 065
Blue grenadier	7 561	9 754	9 157	18 039	8 815	14 104
Tiger flathead	2 631	6 235	2 855	11 933	3 369	8 187
Redfish	774	1 346	864	1 175	777	1 158
Blue warehou	363	838	328	499	280	487
Silver warehou	3 792	5 119	3 657	5 486	4 181	4 348
School whiting	496	621	509	1 533	606	1 237
Jackass morwong	919	1 681	795	1 646	851	1 361
Ling	1 465	6 550	1 179	3 606	1 054	5 532
Gemfish	456	1 784	221	852	269	833
Silver trevally	121	391	144	294	147	312
Mirror dory	239	705	406	795	622	1 088
Royal red prawn	283	1 064	378	1 250	232	654
Ocean perch	373	567	307	901	327	835
John dory	143	1 145	135	790	157	950
Blue eye	103	727	68	384	59	372
Gummy shark	90	298	108	520	101	389
School shark	33	127	32	166	40	150
Saw shark	50	135	77	164	123	366
Elephant fish	8	14	10	16	32	50
Other	527	10 604	3 630	7 508	4 310	8 187
<b>Total</b>	<b>28 614</b>	<b>63 814</b>	<b>28 280</b>	<b>70 049</b>	<b>30 512</b>	<b>65 665</b>

#### *Gillnet Hook and Trap Fishery*

The Gillnet Hook and Trap Fishery (GHTF) has been created by merging the previously separately managed South East Non-Trawl and Southern Shark Fisheries into a single fishery. Whilst the total area of the GHTF is large, operators are limited to specific areas based on historical fishing methods, as specified on their fishing permits.

The South-East Marine Region contains only part of this fishery. The total catch in 2003 was 4,665 tonnes with a landed value of \$25.5 million. Total catches have declined over the last 20 years, due largely to falling school shark catches. Gummy

shark catches have been relatively stable. The catch and value of demersal species caught in the GHTF in recent years are listed in (Table 6).



**Figure 11. Catch by the Danish seine sector of the South East Fishery from 1995-99. NB. This fishery is now managed under the Commonwealth South East Trawl Fishery. (Source: Larcombe *et al.*, 2002)**

**Table 6. Catch and value of species caught in the Gillnet Hook and Trap Fishery from 2000/01 to 2002/3. (Source: ABARE 2004).**

Species	2000/01		2001/02		2002/03	
	tonnes	\$'000	tonnes	\$'000	tonnes	\$'000
Blue eye	n/a	n/a	n/a	n/a	526	2 067
Blue warehou	n/a	n/a	n/a	n/a	5	8
Ling	n/a	n/a	n/a	n/a	554	2 854
Gummy shark	n/a	n/a	n/a	n/a	2 384	12 707
School shark	n/a	n/a	n/a	n/a	288	1 533
Saw shark	n/a	n/a	n/a	n/a	271	887
Elephant fish	n/a	n/a	n/a	n/a	90	141
Other shark	n/a	n/a	n/a	n/a	204	377
Other species	n/a	n/a	n/a	n/a	354	1 013
<b>Total</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>4 665</b>	<b>21 587</b>

Operators in the GHTF use a variety of fishing methods including demersal gillnets, drop lines, demersal longlines and traps.

The scalefish hook sector of the fishery includes all waters of the Australian fishing zone off South Australia, Victoria and Tasmania to the low water mark. Scalefish hook operators use various hook and line methods to target scalefish, principally blue

eye trevalla, ling and blue warehou. Scalefish hook operators are limited to a 100kg limit of shark quota species each trip. This trip limit must be covered by quota.

The shark hook sector of the fishery includes waters from the New South Wales/Victorian border to the South Australian/West Australian border, including the waters around Tasmania from the low water mark to the extent of the Australian fishing zone. Waters inside 3nm of the Victorian coast are closed to targeted shark fishing. Shark hook operators use demersal longlines to target shark. There are no limits applicable to the number of hooks which can be attached to each of these lines for operators fishing outside 3nm.

The gillnet sector of the fishery includes waters from the New South Wales/Victorian border to the South Australian/West Australian border, including the waters around Tasmania from the low water mark to the extent of the Australian fishing zone. Waters inside 3nm of the Victorian coast are closed to targeted shark fishing. Gillnets are used in the GHTF excluding waters below 41° south and deeper than 200 metres. Gillnet operators in the GHTF are permitted to use up to 4,200m (outside 3nm) regardless of any limits that have applied in the past. All mesh sizes must be greater than or equal to 15 centimetres in width and less than or equal to 16.5 centimetres in size (diagonal to diagonal).

Generally the area of the trap sector of the fishery is the same as the hook sector, with the exception that no traps may be set south of 42°20' South. Each trap operator has a different area in which they are authorised to fish. Five operators in the Fishery are permitted to use fish traps, however, these fishing concessions were granted on the basis that the operators had historical access to this method. AFMA is not currently issuing any further fish trap entitlements in the GHTF.

There is overlap between GHTF fishing grounds and the proposed areas for seismic surveys (Figures 12 and 13).

### **Jack Mackerel (Small Pelagics) Fishery**

The Small Pelagics Fishery occurs in Commonwealth waters from the NSW/QLD border across southern Australia and into Western Australia to latitude of 31°south. The main species targeted by the fishery are jack mackerel (*Trachurus declivis*), yellowtail scad (*T. novaezealandiae*) and Peruvian jack mackerels (*T. symmetricus*), blue (slimy) mackerel (*Scomber australasicus*) and redbait (*Emmelichthys nitidus*). The number of licences as at 1 December 2003 was 75 of which less than 5 vessels are active. The estimated catch and value of the fishery in 2002-2003 was 5,703 tonnes and A\$1,703.60. The methods used in the fishery are purse seining and mid-water trawl and these occur within the seismic survey areas (Figure 8).

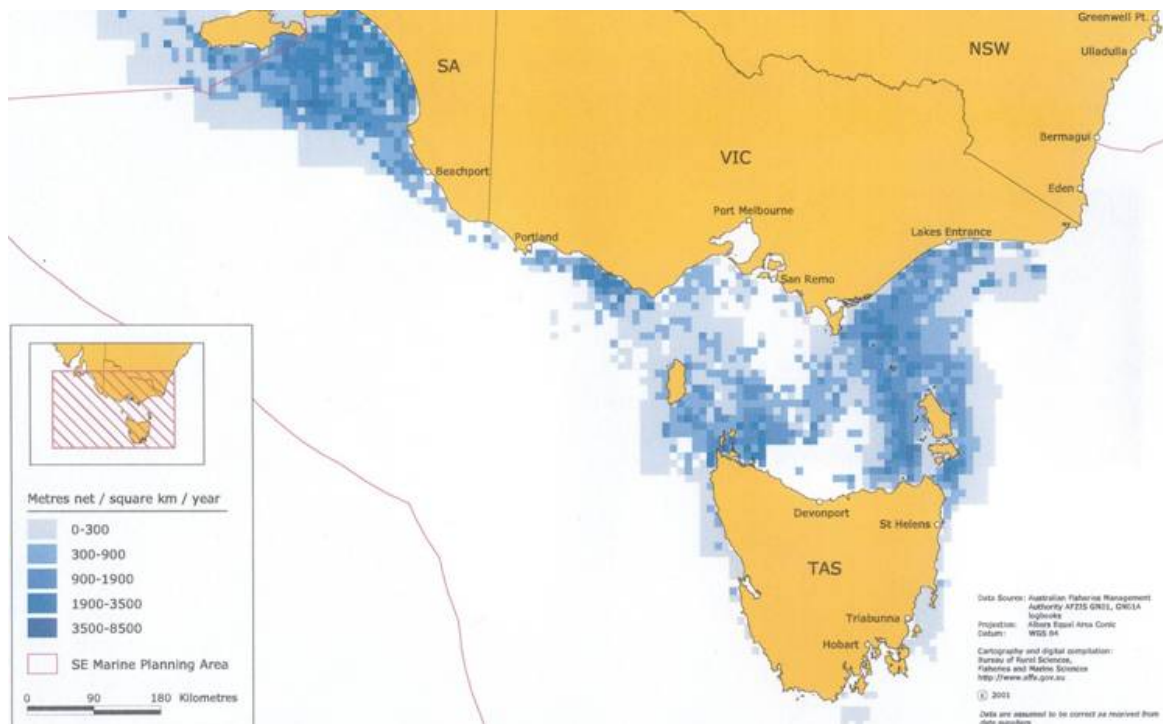
### **Southern Squid Jig Fishery**

The Southern Squid Jig Fishery (SSJF) extends from Sandy Cape on Fraser Island to the South Australian/Western Australian border and includes all Commonwealth waters around Tasmania. The main area fished is in western Bass Strait and off western Victoria. In recent years there have been up to 43 active vessels in the fishery. Average vessel participation has been 35 over the past 6 years. The possibility of further development in the fishery exists as there were 83 entitlements in the Commonwealth SSJF for the 2002/03 season.

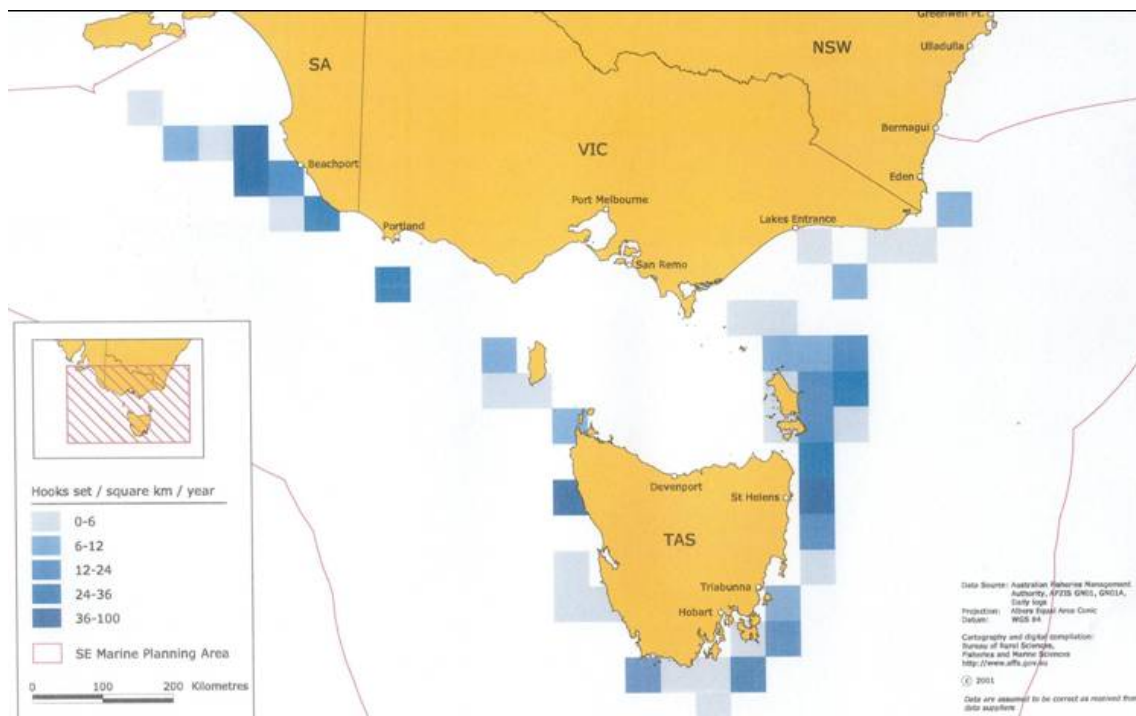
The SSJF operates at night. Squid are attracted to powerful lights on vessels and caught using automatic jigging machines, although manual hand-held jigging is

sometimes practised. The arrow squid (*Nototodarus gouldi*) makes up most of the catch, although there are other oceanic squids of commercial potential likely to be caught such as the inshore (less than 60m) southern calamari (*Sepioteuthis australis*), the offshore red ocean squid (*Ommastrephes bartrami*) and the Southern Ocean arrow squid (*Todarodes filippovae*). Some squid may also be caught as a by-product of target fishing for finfish by demersal trawl vessels operating in the South East Trawl (SETF) on shelf grounds, particularly in the 100-270 metre depth range. Almost all of the squid jig catch is taken between January and July each year, with the highest catches occurring between February and June.





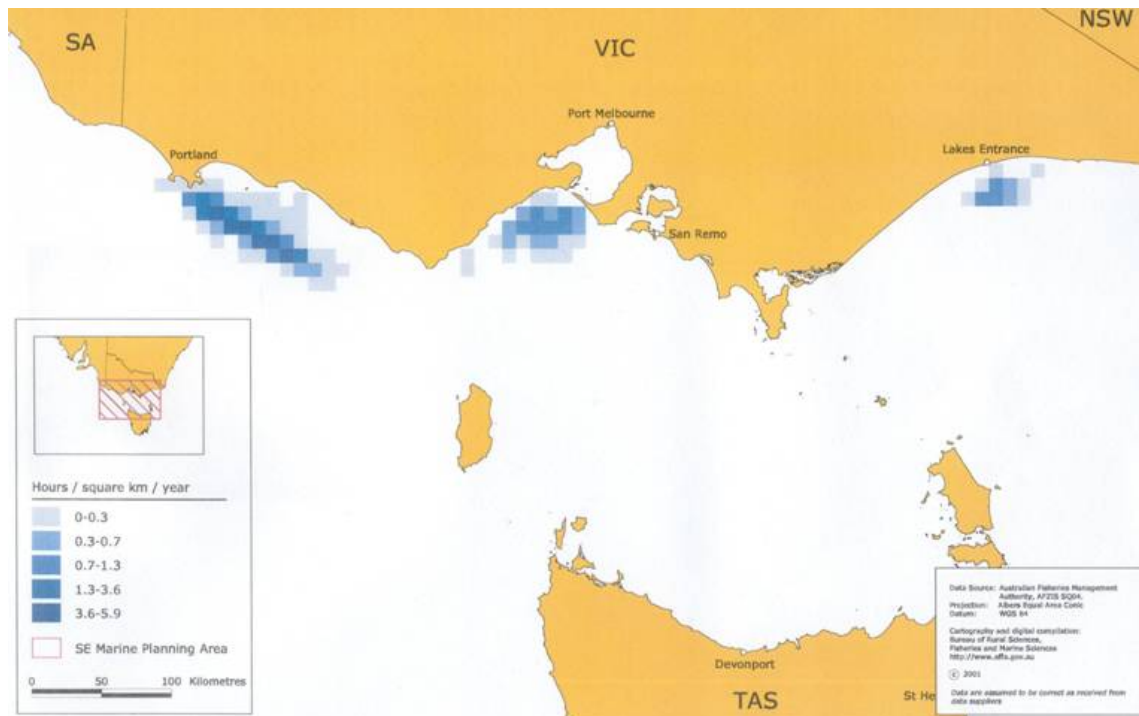
**Figure 12. Catch by gillnet from 1995-99. NB Gillnets were used in the South-east Non-trawl and Southern Shark Fisheries and these are now known as the Gillnet, Hook and Trap Fishery. (Source: Larcombe *et al.*, 2002)**



**Figure 13. Catch by dropline and bottom longline from 1995-99. (Source: Larcombe *et al.*, 2002)**



In recent years the most productive fishing grounds have been between Queenscliff and Portland in the 50-100 metre depth range, however, during the 1998/99 and 1999/00 seasons, significant catches were taken off Lakes Entrance (Figure 14). Thus there is a small overlap with the location of the seismic surveys (Figure 14).



**Figure 14. Catch by Squid jig from 1995-99. (Source: Larcombe *et al.*, 2002)**

### Bass Strait Central Zone Scallop Fishery

Scallop fishing in Bass Strait commenced when large concentrations of commercial scallops were discovered off Lakes Entrance in 1970. Promising scallop beds along the coast of northern Tasmania were first exploited in 1973. New beds were discovered off the Furneaux Island Group in eastern Bass Strait in the late 1970s. Fishing activities reached a peak in 1982-83. The same species caught by the Victorian Scallop Fishery (*Pecten fumata*) is harvested in the Commonwealth fishery, and the same dredging operation is used. Victoria manages scallop fishing in waters within 20 nm of the coast and the Commonwealth manages harvesting outside of this area.

Lack of restrictions in the 1980s led to over-exploitation. The Fishery was closed in 1990 because the stock had collapsed, but reopened in 1991 under a statutory Management Plan that reduced and limited entry to the Fishery. Since then the Fishery has been managed under a temporary system of annual Fishing Permits using a combination of input (limited entry, size limits, seasonal and area closures) and output controls (catch limits). Due to a sharp decline of scallop catches in the 1998 season, the Fishery remained closed to commercial fishing during 1999 to allow stocks to rebuild.

Under the Management Plan 2002, fishing permits will be replaced by a system of Statutory Fishing Rights (SFRs). It was expected that the provisional grant of SFRs

would begin in early 2004 and that these changes will be in place for the beginning of the 2005 season.

Some of the proposed seismic survey areas include known scallop grounds, although the most productive grounds occur in areas outside of the seismic survey areas (Figure 6).

### 3.3.3 Recreational Fisheries

Recreational fishing activity in the study area is unlikely to be affected as there would be little overlap with this activity and the proposed seismic survey areas. Within the Gippsland Basin region, shore-based recreational fishing occurs on the beaches with the catches being mainly composed of Australian salmon, gummy shark, flathead, tailor, trevally and sea mullet (Parry *et al.*, 1990). Boat-based recreational fishing occurs mainly out of Lakes Entrance as there are few other access areas. Boat anglers principally catch snapper, flathead and trevally and mostly operate reasonably close to the shore (Parry *et al.*, 1990). Given that there are no seismic survey areas within 40 km of Lakes Entrance it is considered that there would be little, if any, overlap with recreational fishing.

### 3.3.4 Shipping and Shipwrecks

The southern section of Bass Strait is heavily utilized by passing shipping traffic, emanating from either Port Phillip Bay or the Southern Australian waters as well as vessel traffic sailing from Eastern Australian waters. Shipping traffic traversing the Tasmania/eastern seaboard route also passes by this area.

An "Area to be Avoided" exists around the current operating petroleum facilities (Figure 2). Under the Petroleum (Submerged Lands) Act, 1967, unauthorized vessels larger than 200 tons gross tonnage are not permitted within this area. Designated shipping traffic channels occur to the south of this exclusion zone. To the south of Esso/BHP's Kingfisher B platform a Traffic Separation Scheme exists which delineates ship traffic into separate one direction lanes for vessels heading north eastwards and those heading south westwards.

The Australian National Shipwreck Database was searched for any shipwrecks recorded in or in the vicinity of any of the 5 seismic survey areas. None were recorded in the database.

### 3.3.5 Oil and Gas Industry

Since the discovery in 1965 of hydrocarbons in the offshore Gippsland Basin, the region has continued to be a significant petroleum province supplying both Victoria's domestic gas demand and the nation's oil requirements. Oil production from the Gippsland Basin peaked in 1985 at a production rate of 450,000 barrels of oil per day. Presently, oil production from the Gippsland Basin accounts for 17% of Australia's crude oil production (DPI website).

The Esso and BHP Joint Venture has been the dominant oil and gas producer in the Gippsland Basin since the early successful discoveries in the mid 60s. Their major oil and condensate reservoirs include the Bream, Flounder, Fortescue, Halibut, Kingfish, Tuna, West Kingfish and the West Tuna fields (Figure 1). These eight fields are now responsible for producing more than 67% of liquid hydrocarbons in the Gippsland Basin. The Barracouta, Marlin, and Snapper fields are the key natural gas fields within the Basin (Figure 1). All of these production fields are joined by a

network of pipelines to the eighteen offshore production facilities and transported via pipelines to the Longford gas processing and oil stabilisation plants near Sale.

Other producers in the Basin include OMV Australia with the Patricia – Baleen gas fields in the VIC/L21 production license. The Patricia – Baleen development was commissioned in December 2002. Natural gas is transported from this offshore development via a subsea pipeline to an onshore gas plant.

Seismic and drilling activities are undertaken as a regular occurrence within the Gippsland Basin. In 2003, the Esso/BHP joint venture completed a large 3D seismic survey over its northern section of acreage, resulting in further exploration drilling being undertaken in the Basin (BHP website). Other exploration companies active in the Gippsland Basin include Santos and Bass Strait Oil Company Ltd (BSOC).

## 4 ENVIRONMENTAL RISKS AND MANAGEMENT

The aspects or activities associated with the operations of the seismic programme that have the potential to result in environmental risks and effects are:

- releases from the seismic source;
- discharge of grey water, sewage, oily water, putrescible galley wastes, solid wastes and waste oil;
- atmospheric emissions;
- artificial lighting;
- anchoring activity;
- hydrocarbon spills from vessel collisions or groundings, streamer damage or refuelling operations;
- introduction of marine pests; and
- displacement of other users of the marine environment.

A qualitative risk assessment has been carried out using a risk assessment matrix based on managing risks to as low as reasonably practical (Appendix 2). The risk assessment specific to this seismic programme is given in detail in Table 4.

Evaluation of the environmental risks associated with routine operations and unplanned events and their environmental management and mitigation measures are discussed further in the following sections.

### 4.1 Risks and Effects of Routine Operations

#### 4.1.1 Releases from Seismic Source

Marine seismic surveying involves the discharge of compressed air to create sound impulses that are reflected differentially from various geological layers under the sea floor and recorded by receivers towed behind the seismic vessel.

There are a range of potential impacts to marine animals from sounds emanating from a seismic source. These impacts vary with seismic release intensity, distance from the source, species and mitigation measures. Potential impacts range from mortality or pathological damage from close exposure to high sound levels to avoidance and temporary or permanent shifts in hearing thresholds and associated interference with acoustic signals (McCauley, 1994; McCauley *et al.*, 2003).

The predominant sound frequencies from seismic acoustic arrays are 10 to 300 Hz, although the main frequencies used in seismic surveying in Australian waters are generally in the 10 to 100 Hz range (McCauley *et al.*, 2000). The resultant sound intensity varies with the frequency such that for 10 to 100 Hz frequencies the sound intensity at one metre from a 2,678 cubic inch acoustic array is calculated as 258 dB re 1  $\mu$ Pa peak-peak (equivalent to 243 dB re 1  $\mu$ Pa mean squared pressure or root mean square pressure (McCauley *et al.*, 1998).

*In situ* monitoring of sound intensity at various distances from seismic sources provided the following results (McCauley *et al.*, 2000). Records from a 2,678 cu in array with an output of 243 dB re 1  $\mu$ Pa at one meter from the sources produced sound intensities of approximately 170 dB at 1 km reducing to approximately 160 dB

re 1 $\mu$ Pa at 2 km and 145 dB re 1 $\mu$ Pa at 6 km, with a variability of +/- 5 dB depending on the orientation from the sound source, bathymetry and ocean conditions.

The sounds produced during a seismic survey are not outside the range of other sounds in the ocean. Table 5 presents a comparison of some sounds heard underwater.

**Table 5: Characteristics of sounds in the ocean (APPEA, 2004 compiled from references cited therein).**

Source	Sound Intensity (dB re 1 $\mu$ Pa)	Sound Frequency (Hz)
Undersea earthquake	272	50
Seafloor volcanic eruption	255+	Varied
Lightning strike on sea surface	255	Varied
Seismic acoustic source	230 - 255	< 200
Sperm whale clicks	Up to 235	100 – 30,000
Bottlenose dophin click	Up to 229	Up to 120,000
Ship sound (close to hull)	200	10 – 100
Breaching whale	200	20
Blue whale vocalisations	190	12 - 400
Ambient sea sound	80 – 120	Varied

During seismic surveys, the sound sources are directed downwards towards the seafloor rather than horizontally. Seismic sound intensity reduces rapidly with distance from the acoustic source. Depending on local conditions, reduction to background intensity can be achieved within 10's of kilometres (APPEA, 2004).

A review of the marine impacts from seismic surveys, undertaken by McCauley (1994) as part of an independent scientific review commissioned by the Australian Petroleum Production and Exploration Association (APPEA), concluded the following:

- the response of Australian marine animals to marine seismic survey sounds will range from no effect to various behavioural changes;
- except for plankton and larvae at close range, few species are likely to be killed outright;
- the sound intensities required to produce pathological changes in marine mammals probably occur at <100 m and at < 200 m for fish;
- most invertebrates, dugong and small toothed whales have poor hearing at low frequencies (e.g. the range of seismic discharges);
- some fishes, baleen whales and possibly sea turtles may hear seismic sounds well and behavioural changes may occur at greater distances;
- it is possible that animals will habituate to sound;
- behavioural impacts can include flight response, displacement, dispersal, and disruption of feeding or breeding activity;
- operating seismic vessels for protracted periods across narrow, restricted migratory paths may hinder the passage of migrating animals;
- the greatest risk from marine seismic surveys to marine animals appears to be during breeding or spawning periods;

- provided that seismic surveys are avoided at locations and times of particular sensitivity, and given the relatively small scale of seismic activity, the often large scales over which biological events occur, the low probability of encounter between seismic surveys and 'at risk' populations at an appropriate time and place, then the wider implications of disruption by seismic surveys appear to be small for most species.

Specific risks to individual marine species and groups from this seismic programme are discussed below.

### **Cetaceans**

Baleen whales such as blue, southern right and humpback whales, communicate by low frequency sounds and are therefore considered to be the most sensitive of the marine mammals to specific low frequency sounds. The hearing of baleen whales is thought to overlap with the energy output of seismic related noise (McCauley *et al.*, 1994).

Baleen whales display a gradation of behavioural responses to seismic activities with evidence of subtle shifts in respiratory and diving patterns, suggesting that the seismic discharge is audible to whales at considerable distances from the sources; however, they are not disrupted from normal activities (McCauley, 1994). It is known that baleen whales will avoid operating seismic vessels but this is variable between and even within species (Richardson *et al.*, 1995; McCauley *et al.*, 1998; Stone, 2003). It is considered that this avoidance behaviour represents only a minor effect on either the individual or the species unless avoidance results in displacement of whales from nursery, resting or feeding areas. The proposed timing of the survey is outside of the migration period for southern right and humpback whales.

Toothed whales produce a wide range of whistles, clicks, pulsed sounds and echolocation clicks. These range in frequency from 10 to 900 Hz with source levels ranging from 100 to 180 dB re 1 $\mu$ Pa (Richardson *et al.*, 1995). Little empirical data exists on the response of toothed whales to seismic surveys. Smaller toothed cetaceans have poor hearing in the low frequency range of seismic sources so may be able to approach operational seismic vessels closely without adverse behavioural or pathological effects (McCauley, 1994).

Physical damage to the auditory system of cetaceans may occur at noise levels of about 230 -240 dB (Gausland, 2000) which is equivalent to a distance of 1 to 2 m from the seismic source. Because of the good swimming abilities of marine mammals and their avoidance of either the vessel or the seismic source, it is highly unlikely that any marine mammals will be exposed to levels likely to cause pathological damage (McCauley, 1994).

The management guidelines for seismic vessels operating in Australian waters so as to avoid or minimise interference with whales and certain other larger cetaceans (Attachment 6 of the Guidelines on the application of the Environment Protection and Biodiversity Conservation Act to interactions between offshore seismic operations and larger cetaceans, October 2001 included as Appendix 3) will be adhered to throughout the seismic programme.



Some of the protection measures included in the DEH guidelines are:

- Visual observations during daylight hours for the presence of whales before the commencement of seismic acquisition,
- Delay procedures should whales be observed within a 3 kilometres of the survey vessel,
- Soft start procedures *i.e.* a sequential build up of "warning" pulses over a 20 minute period will be activated prior to the commencement of operations to deter fauna from entering the zone of influence,
- cetacean sightings will be recorded and reported to DEH (Appendix 4).

Given the timing and location of the seismic programme and the adherence to DEH cetacean guidelines, the risk of effects to cetaceans from the proposed seismic programme is considered negligible.

### **Seals**

The hearing ability of seals is not well understood and only small amounts of data from audiograms are available from captive seals in the northern hemisphere (McCauley, 1994). From these audiograms it was concluded that otariid seals (fur seals and sea lions) are less sensitive to low frequency (<1 kHz) than to higher frequency (>1 kHz) sounds, thus they are unlikely to be impacted directly by seismic surveying. It is possible that indirect impacts may occur through the temporary change in the behaviour, abundance or distribution of prey items such as squid, cuttlefish, octopus and fish as a result of proximity to seismic operations (McCauley, 1994).

Given that the seismic programme is distant from known Australian Fur seal colonies, does not overlap significantly with seal pupping season (October to December) and the apparent insensitivity to low frequency sounds by seals, it is predicted that impacts on seals would be highly unlikely from this seismic programme.

### **Fish and Sharks**

There are three broad responses that have been identified in fish as resulting from seismic surveys (McCauley *et al.*, 2000; Kenchington, 1999):

- mortality, where fish cannot escape sounds generated during seismic surveys (e.g. species that are weak swimmers or attached to solid surfaces);
- physical or physiological impacts that cause sublethal injury; or
- behavioural responses, where biota show a visual response during seismic surveys (e.g. they move away).

All of these types of response could potentially affect populations of fish and invertebrates.

Direct physical damage may occur to fish within 1 to 2 m of a seismic source. For example, caged snapper, *Pagrus auratus* exposed to a seismic source sustained damage to their sensory epithelia that was apparent as ablated hair cells (McCauley *et al.*, 2000, McCauley *et al.*, 2003). No evidence of repair or replacement to the cells was evident up to 58 days after exposure. In addition to direct experimentation, McCauley *et al.* (2000) modelled the effects of a seismic source exposure on fish otoliths to predict sound thresholds above which behavioural response or mechanical damage occurred. It was found that above a threshold of 171 dB relative to 1 µPa there was a rapid increase in displacement of fish hearing systems, suggesting that associated behavioural response and mechanical damage would increase

accordingly. For the proposed seismic programme, it is considered highly unlikely that mortality of fish due to close proximity to the seismic source would occur because the proposed survey areas are in deeper water with predominantly featureless sandy seabed and highly mobile fish fauna. In addition, the seismic operational procedures include soft starts which would allow fish to move out of close range.

Direct physical damage to fishes is species dependent. For instance, those with swim bladders closely connected to the inner ear are more susceptible to seismic pulses than those without (McCauley, 1994). For instance, elasmobranchs (sharks and rays), scombrids (mackerel and tuna) and many flatfishes and flounder do not possess a swim bladder and so would be less susceptible to seismic pulses.

Physical damage is unlikely for fish further away from the seismic source; however, behavioural changes in fish may occur. Seismic pulses are reported to elicit behavioural changes in fish in the form of startle response (e.g. Pearson *et al.*, 1992, McCauley *et al.*, 2000, Wardle *et al.*, 2001), changes in feeding activity, changes in schooling behaviour (McCauley *et al.*, 2000) and vertical distribution (Slotte *et al.*, 2004). For these reasons, concern has centred upon the possible effects of seismic surveys on distribution and migration patterns of fish which in turn can affect catchability. The behavioural changes in fish are species dependent, localised and transient in nature and are unlikely to have an impact at the population level.

### ***Benthic Invertebrates and Plankton***

Marine invertebrates lack sensory organs that are used to perceive sound pressure and do not have gas spaces such as swim bladders within their bodies. Some have organs or tactile hairs which are sensitive to hydrostatic disturbances (McCauley, 1994). Because of this it has been postulated that crustaceans, molluscs and most other invertebrates can only detect seismic survey sounds at close range, less than 15 m away from the source. Two recent studies in Australia support this.

ExxonMobil examined the effects of seismic surveys on scallops (*Pecten fumata*) in Bass Strait by deploying cages with scallops in areas subject to seismic surveys and in a control area. Results indicated there was no difference in mortality or strength of adductor muscles between the two treatments (Parry *et al.*, 2002). Also, surveys of plankton abundance (including bivalve larvae) indicated no difference between the area subject to seismic surveys and the control.

McCauley *et al.* (2000) also studied responses of squid (*Sepioteuthis australis*) in cages to seismic sources. The squid showed a strong alarm response to nearby airguns starting up, with many firing their ink sacs and jetting directly away from the source. It was found, however, that firing of ink sacs was not evident if the seismic source was ramped up.

### ***Commercial Fisheries***

Changes to the behaviour of fish have the potential to affect their catchability and as such could affect commercial fisheries (The Ecology Lab, 2004). Reports have been variable on impacts to commercial fisheries, with some studies showing:

- increased catches, for example, Lokkeborg and Soldal (1993, cited in Wardle *et al.* 2001) observed temporary increases in the catch rates of cod in trawls during seismic activities. The authors suggested that cod may swim towards the bottom and remain immobile during disturbance, hence becoming more vulnerable to capture (Dalen and Raknes 1985, cited in Wardle *et al.* 2001).



- decreased catches, for example, investigations in the North Sea and off California have shown evidence for a decrease in the catches of trawlers and longliners fishing in areas where seismic operations were in progress (e.g. Kenchington 1999, Pearson *et al.* 1992, Skalski *et al.* 1992). Fish in these studies were mostly large relative to the species targeted in the Adriatic Sea.
- no effect on catch, for example, a study of the effects of seismic surveys on fisheries in the Adriatic Sea found no effect on trawl catch between periods before and after seismic surveys, no change in pelagic biomass and no change in density of venerid clams caught in a scallop dredge (La Bella *et al.*, 1996).

Some of the variability in reported findings is thought to be due to differences in the behaviour of species and sizes of fish in response to seismic surveys and the duration or intensity of seismic surveys.

The view often held by commercial fisherman is that seismic activities are disruptive to their fishing operations (McCauley *et al.*, 2000; SIV and LEFCOL verbal communication). The potential impacts on commercial fisheries in the Gippsland Basin is summarised as follows (V = Victoria managed fishery, C = Commonwealth managed fishery):

- no overlap with seismic programme, no potential impacts – Abalone<sup>V</sup>, Wrasse<sup>V</sup>, Ocean General<sup>V</sup>
- slight overlap with seismic programme, small potential for gear entanglement – Rock Lobster and Giant Crab<sup>V</sup>
- slight overlap with seismic programme, small potential for disruption to deployment of fishing gear, no evidence of impacts to target species – Scallop<sup>V</sup>, Southern Squid Jig<sup>C</sup>, Bass Strait Central Zone Scallop<sup>C</sup>
- some overlap, potential for disruption to deployment of fishing gear, potential impact likely to be transient as fish disperse within large fishing grounds – Eastern Tuna and Billfish<sup>C</sup>, South East Trawl<sup>C</sup>, Gillnet, Hook and Trap<sup>C</sup>, Jack Mackerel (Small Pelagics)<sup>C</sup>.

Potential impacts on commercial fisheries are largely due to navigational conflicts, given that seismic vessels tow long arrays and fishers often deploy trawl nets or long lines over the same areas. Effective communication and up to date notification of the location of the seismic vessel to commercial fishermen in the region will alleviate this.

### **Recreational Fisheries**

Recreational fishing activity is unlikely to be affected by the proposed seismic programme as there would be little overlap with this activity and the seismic survey areas. Shore-based recreational fishing occurs on the beaches with the catches mainly composed of Australian salmon, gummy shark, flathead, tailor, trevally and sea mullet (Parry *et al.*, 1990). Boat-based recreational fishing occurs mainly out of Lakes Entrance as there are few other access areas. Boat anglers principally catch snapper, flathead and trevally and mostly operate reasonably close to the shore (Parry *et al.*, 1990). Given that there are no seismic survey activities proposed adjacent to any beaches in the study area or within 40 km of Lakes Entrance it is considered that there would be little, if any, effect on recreational fishing.

#### **4.1.2 Disposal of Wastes**

All wastes generated on the survey vessel will be managed in accordance with the P(SL)A clause 222 (Housekeeping) and MARPOL 73/78 regulations.

The risk of adversely affecting water quality within any of the survey areas is considered negligible based on the short duration that the vessel is at any one location, the highly dynamic and extensive receiving water and the small quantity and concentration of pollutants within waste-waters discharged from the survey vessel.

The specific procedures for onboard waste management are detailed below.

### ***Solid Wastes***

The seismic vessel will comply with regulations regarding the disposal of any debris, garbage or litter (including kitchen wastes) into the sea. The vessel will take particular care to ensure synthetic materials such as plastic bags and other containers, synthetic ropes, packaging foams and other similar materials are not disposed of or blown from the vessel. Such materials are persistent in the environment, cause visual pollution, can adversely affect wildlife and are also banned under Australian regulations. The survey will comply with the MARPOL regulations which prohibit the disposal of:

- any garbage within 12 nautical miles of the nearest land;
- cargo packing materials and all other organic garbage greater than 25 mm in diameter between 3 nm and 12 nm from the nearest land;
- cargo packaging material between 12 nm and 25 nm from the nearest land; and
- plastics into the ocean at any time or any place.

All solid wastes except aerosol cans generated during the seismic programme will be incinerated on board.

### ***Sewage and Grey Water***

Sewage is treated in an onboard treatment plant prior to discharging. Discharge of sewage will not occur in nearshore waters within 12 nm of the mainland, islands or chartered reefs. The holding tank size on the Western Trident is 36.93m<sup>3</sup>. The amount of treated sewage daily is approximately 0.4 m<sup>3</sup> based on 6 L per person per day.

As the vessel will generally be underway when discharging, the effluent will be subject to rapid dilution and dispersion resulting in minimal effects to the surrounding water quality.

Grey waters from showers, galley and laundry will be disposed to sea. These comprise primarily fresh water and detergents. Only biodegradable detergents will be permitted onboard the seismic vessel and, given the small volumes involved and the nature of the receiving environment, grey water discharge will have negligible biological impact.

### ***Bilge Water***

Bilge water will be pumped into a holding tank and then passed through an oily water separator, which reduces oil concentrations to less than 15 ppm, prior to discharge. The oily water separator is hooked up to the engine room and should a fault occur an alarm is raised. The discharge is monitored automatically and, if oil content increases to >15ppm, an alarm is activated and the water is recirculated to the

sludge tank. Any discharge of bilge water from the vessel will not, therefore, contain hydrocarbon levels which would adversely affect marine life.

#### 4.1.3 Anchoring

Anchoring should not be required during the program. In the event that unforeseen contingencies require the Vessel Master to anchor the vessel, anchoring will be restricted to areas of sandy seafloor, unless vessel safety would be compromised.

#### 4.1.4 Refuelling

Refuelling at sea will be required during the seismic programme. This activity will be carried out in strict accordance with Western Geco's Bunkering Procedure (M3ISM/P008).

In the extremely unlikely event of an accidental oil spill to the ocean, the contractor vessel's approved Shipboard Oil Pollution Emergency Procedure (SOPEP) would be immediately activated, in conjunction with the Emergency Procedures Manual if necessary. All spills must be logged and reported to the Vessel Master. Any spills greater than 80L must also be immediately reported to DPI.

#### 4.1.5 Onboard Storage and Handling of Materials

All oils or chemicals used or stored onboard the survey vessel will be contained and managed to prevent damage to the containers or leakage/spillage onto the deck or into the ocean. These materials will be stored in bunded areas such that any spills or leaks can be contained and recovered. Deck drains and bunds will be inspected to ensure their integrity prior to the commencement of operations. Sufficient absorbent materials will be held onboard to mop up possible leaks.

The streamer cable will be carefully handled and stored to avoid damage and ensure that no loss of buoyancy fluid occurs. Any cable maintenance that might result in the loss of buoyancy fluid will be undertaken onshore, wherever practicable. If offshore maintenance of this sort is essential, it will be undertaken on deck areas with closed drains or other means of ensuring a spill could not enter the marine environment.

Should onboard spills or leaks occur, they would be cleaned up immediately using absorbent materials held on the vessel. Recovered oils or chemicals and used absorbent materials will be placed in appropriately marked drums for recycling or onshore disposal.

### 4.2 Risks and Effects from Unplanned Events

#### 4.2.1 Rupture of Streamer

The hydrophone pockets of the streamers are filled with a very small quantity of Isopear (kerosene) in order to maintain neutral buoyancy. Per 100 meters of streamer, there are approximately 78 hydrophone pockets containing a total of 11.7 litres of Isopear. This equates to a total volume of 5,616 litres for the array of streamers. This quantity of hydrocarbons is contained within individual partitions of the streamer that are baffled so if the streamer is punctured only a small section of fluid is lost and not the entire streamer contents.

Management of the streamer consists of running it at a preferred depth of 7 to 10 metres below the sea surface. The streamer depth is modified by adjusting the winged depth controllers (birds) attached to the streamer, raising it or lowering it in the water column. The cables will also only be deployed and retrieved once at the start and end of the survey which reduces the risk of damage during handling.

In the event of a loss of the streamer buoyancy fluid or any other hydrocarbon spill associated with the survey, the seismic vessel has onboard storage and spill containment equipment to manage such spills. Should a portion of any spill incident not be able to be recovered or contained, its impact would decrease in a relatively short time as the hydrocarbons would rapidly disperse and evaporate. The small volume of any potential hydrocarbon loss from the streamer, the constant movement of the seismic vessel through the survey areas coupled with the distances the vessel will be away from the mainland, make it unlikely that any streamer incident would have a major environmental impact on the surrounding environment.

#### 4.2.2 Vessel Running Aground

The Western Trident has a draft of 7.5 metres. The shallowest survey area is GAP04B with a depth range of 20 to 50 m. A detailed bathymetry survey will be undertaken using LADS technology to accurately map the shallower sections of this survey area and fully define the 20 m depth contour. To do this, it is envisaged that an area of approximately 215 km<sup>2</sup> will be surveyed in a strip parallel to the coastline and starting 2.5 nautical miles out from it.

Due to the depth of water of the survey areas and the detailed bathymetry for the shallower section of GAP04B, grounding of the vessel or streamers is considered a highly unlikely event.

The seismic vessel will have no need to anchor during the survey eliminating the potential for damaging streamers and other marine biota. The vessel will be equipped with a differential global positioning system (DGPS), depth sounding sonar and standard navigation equipment.

#### 4.2.3 Vessel Collisions

The majority of the shipping activity occurs to the east of the survey areas and as such poses little risk for collision with the seismic vessel resulting in the possible release of diesel fuel. The potential for a hydrocarbon spill resulting from the collision of the seismic vessel with another ocean going vessel is considered negligible for the following reasons:

- radio communication will be maintained with any vessels observed transiting the area;
- information on the location and timing of the seismic programme will be communicated to vessels via AMSA through a Notice to Mariners;
- notification of the position of the seismic vessel and the area proposed to be working in will be communicated to fishing industry representatives and forwarded to the vessel fleet. This will ensure no fishing vessels are operating within the nominated daily run line of the survey, and
- a scout vessel will help monitor the activities of other vessels in the area.

#### 4.2.4 Introduction of Marine Pests

The introduction of marine pests may occur through the discharge in Australian waters of ballast water taken up overseas. Australia has mandatory ballast water requirements to reduce the risk of introducing harmful aquatic organisms into Australia's marine environment through ship's ballast water. Australia's new ballast water management requirements have legislative backing and will be enforced under the *Quarantine Act 1908*. These requirements are consistent with International Maritime Organisation (IMO) Guidelines for minimising the translocation of harmful aquatic species in ship's ballast water.

In order to comply with the Australian Ballast Water Management Requirements a full ballast water exchange at sea (Option 4 of the Requirements) will be conducted during the transit of the Western Trident from Malaysia to Australian waters.

The seismic source arrays will be cleaned onboard the vessel when they are retrieved. The streamers will be inspected when retrieved and if there is substantial marine growth, a cleaning programme may be implemented.

**Table 6. Risk Assessment of Seismic Activities and Potential Environmental Risks for Seismic Programme.**

Environmental Aspect/Incident	Likelihood of Occurrence	Potential Environmental Effect	Environmental Objective	Potential Severity (table in Appendix 2)	Risk (table in Appendix 2) and Risk Management Approach	Standards
Release of sound from acoustic source.	Expected to occur.	Pathological and physiological effects to marine biota.  Disruption to behaviour patterns of marine fauna.  Avoidance of acoustic source.	Minimise risk of adverse effect to marine biota.	Minor  Programme is outside humpback whale and southern right whale migration season.  Location of surveys is distant from known blue whale feeding areas.  Potential for pathological and physiological impacts to marine fauna limited to very close proximity of array.	B  Compliance with DEH guidelines for avoiding interference with cetaceans during seismic surveys.  If survey extends into May (beginning of humpback and southern right whale northward migration), use dedicated marine mammal observers.	Apache's Gippsland Basin 3D Seismic Program – Environment Plan.  DEH guidelines for avoiding interference with cetaceans during seismic surveys.  DEH Whale and Dolphin Sighting Report.
Grey water/sewage disposal	Expected to occur.	Localised pollution/nutrient enrichment.	Maintain marine water quality.	Negligible  Low volumes of treated discharge only (30 POB on Western Trident, 6 POB on support vessel, 3 POB on secondary support vessel).  Sewage treatment system operational and includes maceration and disinfection.  Discharge offshore in deep water with high dispersion-dilution factor.  Temporary input of nutrients to any area.	Negligible  Approved onboard sewage treatment plant.  Use of biodegradable detergents only.	Apache's Gippsland Basin 3D Seismic Program – Environment Plan.  MARPOL 73/78 Annex IV  P(SL)A Schedule 1995, clause 222(4)

Environmental Aspect/Incident	Likelihood of Occurrence	Potential Environmental Effect	Environmental Objective	Potential Severity (table in Appendix 2)	Risk (table in Appendix 2) and Risk Management Approach	Standards
Discharge of oily water from bilges	Unlikely to occur.	Localised and temporary toxic effects.	Maintain marine water quality.	Negligible Bilge discharges treated to <15 ppm hydrocarbons.	Negligible Oily water separator (World Water Systems 2500 OCD processes 2.5 m <sup>3</sup> /hour with alarm set at 15 ppm) operational with discharge quality continuously monitored. Ability to store >15ppm water in sludge tank.	MARPOL 73/78 Annex I (Regulation 16)  Oil Record Book
Incineration of putrescible galley wastes	Expected to occur.	Emission of greenhouse gases.	Maintain air quality	Negligible  Only Putrescibles incinerated.  Equipment maintained to function optimally.	Negligible	MARPOL 73/78 Annex V  P(SL)A Schedule 1995, clause 222  Western Geco – Waste Disposal Register & Contract Plan
Disposal of solid wastes	Expected to occur.	Increase in greenhouse effect.	Minimise environmental effects from waste disposal.	Negligible No disposal into marine environment of solid wastes.  Disposal by incineration (except aerosol cans – onshore disposal)	Negligible	MARPOL 73/78 Annex V  Western Geco – Waste Disposal Register & Contract Plan
Disposal of waste oil	Expected to occur.	If spilled to marine environment, localised toxic effects if spilled.	Minimise risk of adverse effect to environment from hydrocarbons.	Negligible Small volumes only.  All waste oils collected and stored for onshore recycling/disposal.	Negligible All waste oils collected and returned to shore for recycling/disposal	MARPOL 73/78 Annex I  Oil Record Book  Computer based maintenance system for machinery (TM Master) with DNV approval.  Western Geco – Waste Disposal Register & Contract Plan



Environmental Aspect/Incident	Likelihood of Occurrence	Potential Environmental Effect	Environmental Objective	Potential Severity (table in Appendix 2)	Risk (table in Appendix 2) and Risk Management Approach	Standards
Atmospheric emissions	Expected to occur.	Increase in greenhouse effect	Maintain air quality.	Negligible Small volumes/emissions.	Negligible Engines maintained to operate at optimum efficiency to minimise emissions.	Computer based maintenance system for machinery (TM Master) with DNV approval.
Artificial lighting	Expected to occur.	Disturbance to marine biota and seabirds.	Minimise risk of adverse effect to marine biota..	Negligible Majority of surveys are distant from shore with exception of survey in VIC/P58.	Negligible Lighting minimum required for navigation and safety requirements.	Apache's Gippsland Basin 3D Seismic Program – Environment Plan.
Anchoring activity	Unlikely to occur.	Localised disturbance to benthos.	Maintain abundance and diversity of benthic flora and fauna.	Negligible No significant seabed features or reefs known within survey areas.	Negligible No anchoring except in an emergency.	Apache's Gippsland Basin 3D Seismic Program – Environment Plan.
Spill during fuel transfer at sea	Unlikely to occur.	Toxic effects on marine biota from liquid hydrocarbons.	Minimise risk of adverse effect to marine ecology from hydrocarbon loss.	Moderate Majority of surveys in deep water and distant from shorelines.  Rapid dispersion and weathering of hydrocarbons in deeper water, distant from coastlines.	B Refuelling only during suitable weather and sea-state conditions, discretion of both skippers, integrity checks on equipment etc).  Oil spill modelling can be used to predict trajectory and fate of hydrocarbons.	Western Geco bunkering procedures (Procedure M3ISM/P008).  Shipboard Oil Pollution Emergency Plan (SOPEP)
Vessel grounding	Rare.	Impact to seabed.  Toxic effects on marine biota from liquid hydrocarbons.	Minimise risk of adverse effect to marine biota from hydrocarbon loss and seabed disturbance.	Moderate No significant seabed features or reefs known within survey areas.	Negligible Detailed bathymetry survey prior to seismic survey in shallower waters.  Notice to Mariners issued.	AMSA Notice to Mariners  Vessel SOPEP

Environmental Aspect/Incident	Likelihood of Occurrence	Potential Environmental Effect	Environmental Objective	Potential Severity (table in Appendix 2)	Risk (table in Appendix 2) and Risk Management Approach	Standards
Loss of streamer buoyancy fluid	Unlikely to occur.	Acute toxic effect on marine biota.	Maintain abundance and diversity of marine biota	Minor Total volume of 5,616 L of buoyancy fluid.  Buoyancy fluid is Isopar (kerosene) which rapidly evaporates and disperses.	Negligible Deployment and retrieval of streamers managed according to Manual of Permitted Operations (Western Geco Contract Plan)	Manual of Permitted Operations
Displacement of other users of marine environment	Probably will occur.	Reduction to recreational and/or commercial access.	Minimise disturbance to other users.	Minor	B Consultation with commercial fishermen prior to and throughout seismic programme  In consultation with commercial fishermen use a dedicated vessel to liaise with commercial fishing vessels on site if required.  Notice to Mariners issued	APPEA Code of Practice 1996.  AMSA Notice to Mariners
Introduction of Marine Pests	Unlikely to occur	Impact on diversity of marine biota.	Minimise risk of introducing marine pests into Australian waters	Moderate	B Full ballast water exchange by Western Trident at sea prior to entry into Australian waters.  Visual checks and cleaning if necessary of marine gear (streamers and sources) prior to entry into Australian waters.	Australian Ballast Water Management Requirements (AQIS)

## 5 ENVIRONMENTAL IMPLEMENTATION STRATEGY

This section details the controls to be implemented during the seismic programme to safeguard against the potential environmental risks and effects identified in the previous section.

These controls consist of both procedural and operational practices that will be undertaken during the seismic surveys to protect against any adverse environmental impact. Such controls are recognised as additional measures to further manage environmental risks.

### 5.1 Key Roles and Responsibilities

The organisation and structure of the seismic programme including the roles and responsibilities for all key personnel onboard the survey vessel are described in the Contract Plan between Apache and Western Geco.

With respect to this Environment Plan, the key personnel and responsibilities are:

#### Vessel Master

- Responsible for safe execution of all operations of the seismic vessel.
- Responsible for HSE management onboard the vessel and for ensuring that appropriate control and mitigation measures are implemented to minimise potential environmental effects resulting from vessel operations
- Responsible for immediately notifying the Apache Site Representative of any incidents or activities arising from vessel operations that are likely to impact on the environmental performance objectives detailed in the EP.

#### Party Chief

- Responsible for the safe execution of all operations carried out by the seismic crew onboard the survey vessel.
- Responsible for ensuring that appropriate control and mitigation measures are implemented to minimise potential environmental effects resulting from seismic acquisition (e.g. 'soft start' procedures, whale watch and stop work procedures, cetacean recording)
- Responsible for ensuring compliance with all aspects of HSE reporting and for investigations of all incidents and near misses.
- Responsible for immediately notifying the Apache Site Representative of any incidents or activities arising from seismic acquisition that are likely to impact on the environmental performance objectives detailed in the EP.

#### Apache Site Representative

- Responsible for ensuring that all subcontractors perform operations in a manner consistent with the environmental performance objectives and management procedures detailed in the EP.
- Responsible for ensuring that the Vessel Master and Party Chief are adhering to the requirements of the EP.
- Responsible for keeping fully apprised of ongoing operations

- Responsible for immediately alerting the Apache Environmental Manager of any reportable incidents or changes in operations that could have an impact on environmental performance and adherence to the EP

#### Apache Environmental Manager

- Responsible for ensuring that the Designated Authority is notified as soon as practicable of all reportable incidents.
- Responsible for ensuring full briefing of project personnel of the environmental sensitivities of the survey areas and the environmental management procedures and commitments detailed in the EP.
- Responsible for communicating details of the seismic programme to relevant government agencies in advance of operations commencing.

All personnel in all areas of Apache's activities are responsible for applying the Apache Environmental Policy (Appendix 1).

## 5.2 Environmental Legislation

### 5.2.1 Commonwealth Environmental Legislation

The majority (99.25%) of the seismic programme survey areas are located in Commonwealth waters and are controlled by the *Commonwealth Petroleum (Submerged Lands) Act 1967* (Cth) and the *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999*. The Act and its regulations are administered by the Joint Authority, which consists of the:

- Commonwealth Minister for Primary Industries and Energy, advised by the Commonwealth Department of Industry, Sciences and Resources; and
- Victorian Minister for Energy Industry and Resources, advised by the Victorian Department of Primary Industries.

The principal Commonwealth legislative requirements that are relevant to the seismic programme are summarised below:

#### ***Environment Protection and Biodiversity Conservation Act 1999***

Under this legislation all activities that will, or have the potential to, affect matters of "National Environmental Significance" are prohibited except; when undertaken in accordance with approval by the Minister for Environment, or when approved through a Bilateral Agreement with a State or Territory, or when approved through a process accredited by the Minister. Matters of "National Environmental Significance" are:

- World Heritage Areas
- Wetlands Of International Importance
- Listed Threatened Species And Communities
- Listed Migratory Species
- Nuclear Actions
- Commonwealth Marine Areas

A referral for this seismic programme has been submitted to Department of Environment and Heritage under the EPBC Act as 'not controlled action'. The decision date is 14 December 2004.

***Petroleum (Submerged Lands) Act 1967***

This Act relates to the exploration and exploitation of petroleum resources in the area of the continental shelf of Australia and certain Territories of the Commonwealth. Commonwealth law applies to lands beneath waters that are beyond the outer limits of the territorial sea adjacent to the States and the Northern Territory.

The *Petroleum (Submerged Lands)(Management of Environment) Regulations 1999* are applicable to petroleum exploration and production activities in Commonwealth waters. The objective of these regulations is to ensure that petroleum activities are carried out in a manner that is consistent with the principles of ecologically sustainable development and in accordance with an approved 'Environment Plan' that has appropriate performance objectives and standards as well as measurement criteria for determining whether the objectives and standards are met.

The *P(SL)A Schedule Specific Requirements as to Offshore Petroleum Exploration and Production 1995* clauses applicable to the seismic programme cover the following:

- Emergency Response Manuals, Clause 202
- Oil Spills, Clause 220
- Housekeeping, Clause 222
- Reporting escape or ignition of petroleum or other material, Clause 285.
- Pollution, Clause 616:

***Australian Heritage Commission Act 1975***

This Act identifies areas of heritage value - listed on the Register of the National Estate.

***Historic Shipwrecks Act 1976***

This Act protects shipwrecks, which have lain in Territorial waters for 75 years or more. It is an offence to interfere with any shipwreck covered by the Act.

***Wildlife Protection (Regulation of Exports and Imports) Act 1982***

This Act is concerned with control over the movement of Australian wildlife (fauna and flora) in or out of the country, together with the movement of exotic (non-indigenous) flora and fauna out of the country, as well as various other matters relating to quarantining.

***Hazardous Waste (Regulation of Exports and Imports) Act 1989***

This Act regulates the import and export of hazardous waste. Permits are required to dispose of waste overseas or to import waste into Australia.

***Ozone Protection Act 1989***

This Act regulates the import, export and manufacture of ozone depleting substances such as fire fighting equipment and refrigerants. The use of these substances is being phased out in Australia.

***Navigation Act 1912***

This Act requires that ships carrying oil and chemical tankers conform with Annex I of the MARPOL convention for the Prevention of Pollution from Ships.

***Protection of the Sea (Civil Liability) Act 1981***

This Act imposes civil liability for pollution damage and requires ships carrying more than 2,000 tonnes of oil in bulk as cargo to maintain insurance to cover liability for pollution damage.

***Protection of the Sea (Oil Pollution Compensation Fund) Act 1993***

This Act establishes a Commonwealth Fund to provide compensation and indemnification for certain oil pollution damage. The Fund can recover contributions on behalf of the Commonwealth.

***Protection of the Sea (Prevention of Pollution from Ships) Act 1983***

Provides for penalties of up to \$220,000 for individuals and \$1.1 m for corporations not complying with the International Convention for the Prevention of Pollution from Ships 1973/78 (MARPOL 73/78 and Annexes).

***Protection of the Sea (Powers of Intervention) Act 1981***

This Act regulates discharges from ships to protect the sea from pollution. The Act gives powers to the Australian Maritime Safety Authority to take appropriate measures to protect the Australian coastline.

***Pollution of Waters by Oil and Noxious Substances Act 1986***

Refers to oil and oily substances discharged from vessels into Victorian and Commonwealth waters within 50 nautical miles of the coastline.

***Marine Act 1988***

Gives responsibility for combating oil spills in Victorian waters to Marine Safety Victoria (MSV). The MSV has "Primary Agency" status under the National Plan for the combat of oil spills within state waters. For spills in Commonwealth waters, the Victorian DPI would be the primary agency.

## 5.2.2 International Environmental Legislation

In addition to relevant legislation and regulations, Australia is signatory to a number of international conventions and agreements which oblige the Commonwealth government to take various actions to prevent pollution and to protect specified habitats, flora and fauna. Those which are relevant to the seismic programme are summarised below.

***Climate Change Convention (1992)***

The objective of the convention is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system. Australia ratified the convention in December 1992 and it came into force on 21 December 1993.

***Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol; on Substances that Deplete the Ozone Layer (1987)***

The convention (ratified by Australia in 1987) and the Protocol (ratified in 1989) concern the phasing out of ozone depleting substances.

***Convention On Biological Diversity (1992)***

The objectives of the convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

***Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (1979)***

The Convention of the Conservation of Migratory Species of Wild Animals (Bonn Convention) was concluded in 1979 and came into force on 1 November 1983. The Convention, which arose from a recommendation of the United Nations Conference

on the Human Environment (Stockholm 1972), aims to conserve terrestrial, marine and avian species over the whole of their migratory range. This convention commits “Range States” to take action to conserve migratory species, especially those under threat. It is an umbrella agreement under which subsidiary regional agreements are established.

***Bilateral Agreements on the Protection of Migratory Birds***

Australia has negotiated bilateral agreements with Japan (JAMBA 1974) and China (CAMBA 1986) to protect species of Australian migratory birds.

***UN Convention on the Law of the Sea (1982)***

Part XII of the convention sets up a general legal framework for marine environment protection. The convention imposes obligations on State Parties to prevent, reduce and control marine pollution from the various major pollution sources, including pollution from land, from the atmosphere, from vessels and from dumping (Articles 207 to 212). Subsequent articles provide a regime for the enforcement of national marine pollution laws in the many different situations that can arise.

***London (Dumping) Convention (1972)***

Dumping at sea is regulated by the convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter 1972 (the “London Convention”). Article 4 provides a general prohibition on dumping of wastes except as specified in the Convention. The convention has annexed to it two lists of substances, the “black list” of substances which may not be dumped at all, and the “grey list” of substances which may only be dumped under a specific permit.

***International Convention for the Protection of Pollution from Ships (1973) and Protocol (1978)***

This Convention and Protocol (together known as MARPOL 73/78) build on earlier conventions in the same area. MARPOL is concerned with operational discharges of pollutants from ships. It contains five Annexes, dealing respectively with oil, noxious liquid substances, harmful packaged substances, sewage and garbage. Detailed rules are laid out as to the extent to which (if at all) such substances can be released in different sea areas.

***International Convention on Oil Pollution Preparedness, Response and Co-operation (1990)***

International Convention on Oil Pollution Preparedness, Response and Co-operation (1990) sets up a system of oil pollution contingency plans and cooperation in fighting oil spills.

***International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969)***

The convention gives States Parties powers to intervene on ships on the high seas when their coastlines are threatened by an oil spill from that ship.

***International Convention on Civil Liability for Oil Pollution Damage (1969)***

The convention and the associated International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 1971 set up a system of compulsory insurance and strict liability up to a certain figure for damages suffered as a result of an oil spill accident.



### 5.2.3 Victorian Legislation

The principal State legislative requirements that are relevant to the seismic programme are summarised below.

- *Petroleum (Submerged Lands) Act 1982*; also known as P(SL)A 1982
- *P(SL) Act Schedule Specific Requirements as to Offshore Petroleum Exploration and Production 1995* (regulates both State and Commonwealth activities)
- *Pipelines Act 1967*
- *Environmental Effects Act 1978*
- *Environmental Protection Act 1970*
- *Planning and Environmental Act 1987*

### 5.2.4 Industry and Corporate Codes of Practice

The petroleum exploration and production industry operates within an industry code of practice (APPEA Code of Environmental Practice). Apache also has its own corporate performance standards and criteria that must be met internally. These industry and corporate standards provide guidelines for activities that are not formally regulated and have evolved from the collective knowledge and experience of the oil and gas industry both nationally and internationally.

Apaches Environmental Policy (Appendix 1) provides broad guidelines for the environmental responsibilities of all company personnel and the conduct of company activities.

## 5.3 Induction and Training

All survey personnel will undertake an environmental induction prior to commencing the survey. The induction will introduce the Environmental Plan, describe the environmental aims for the project, identify the procedures in place to achieve those aims, and discuss the specific environmental sensitivities of the region. The purpose of this induction is to identify and impart environmental responsibility among all personnel.

Some specific issues that will be highlighted include:

- general housekeeping is to be kept to a high standard: decks to be kept clean of litter, rags, etc. Nothing is to be thrown or dumped overboard.
- all precautions must be made to avoid spillage of anything into the marine environment. If oil or chemicals are spilt, they must be cleaned up immediately and the soiled clean-up materials stored for correct onshore disposal. Spills must not be hosed overboard.
- all spillage >80 L must be reported to the Apache Site Representative for reporting to DPI. If smaller spills reach the marine environment, these must also be reported.
- statutory 15 ppm limits in oil in water will be followed for oily water discharge.
- emphasising the importance of proper storage of chemicals and drums. The integrity of the drums should be checked to make sure they are not leaking. Drums of liquid must be within bunded areas.

Personnel with responsibilities in specific environmental practices will be adequately trained to ensure effective implementation of the Work Instructions and Procedures for which they have responsibilities.

## **5.4 Monitoring, Recording and Reporting**

The following monitoring and records will be kept throughout the seismic survey programme:

- a daily log of seismic acquisition activities by the Party Chief;
- a record of all waste materials removed from the vessel including waste oils in Oil Record Book;
- a record of all cetacean sightings on Whale and Dolphin Sighting Report sheets (Appendix 4) and copies forwarded to Department of Environment and Heritage and Apache Environment Manager;
- a record of all interactions with commercial fishing vessels or equipment; and
- a record of any environmental incidents including oil spills and non-routine discharges.

All incidents that have the potential to cause significant effects on the environment must be reported and investigated according to legislative requirements, survey vessel procedures and the Apache Environmental Management Policy.

The designated authority will be notified of all reportable incidents, according to the requirements of the *Petroleum (Submerged Lands)(Management of Environment) Regulations 1999*. Reportable incidents are defined in these regulations as “an incident arising out of operations for the activity that is not within the parameters of the environmental performance standards in the environment plan in force for the activity”. Apache, as operator, are responsible for providing written reports on any reportable incidents to the Designated Authority.

All oil pollution incidents in commonwealth waters must be reported to AMSA, under Marine Notice 1/1996. Any spills greater than 10 tonnes in Commonwealth waters must be reported to AMSA within one hour, via the national 24 hour emergency notification contacts:

Freecall: 1800 641 792  
Fax: 02 6230 6868  
Email: mdo@amsa.gov.au

## **5.5 Environmental Performance Objectives, Standards and Criteria**

The environmental performance of the seismic programme can be measured, benchmarked and reported. Environmental performance objectives, standards and criteria are described in Table 6. They are compiled from the risk assessment in Section 4.

**Table 6. Environmental Performance Objectives, Standards and Criteria for the Seismic Programme**

Objective	Standards	Criteria
Minimise risk of adverse effect to marine biota and the marine environment.	Apache's Gippsland Basin 3D Seismic Program – Environment Plan. DEH guidelines for avoiding interference with cetaceans during seismic surveys. DEH Whale and Dolphin Sighting Report	Environmental audit verifies adherence to EP. Compliance with DEH guidelines for avoiding interference with cetaceans. Submission to DEH of Whale and Dolphin Sighting Records if seen.
Maintain marine water quality.	Apache's Gippsland Basin 3D Seismic Program – Environment Plan. MARPOL 73/78 Annex IV (Sewage) P(SL)A Schedule 1995, clause 222(4) MARPOL 73/78 Annex I (Pollution by Oil)(Regulation 16) Oil Record Book Western Geco – Waste Disposal Register Western Geco - Contract Plan	Environmental audit verifies adherence to EP, such that these standards are being met. Environmental audit verifies that Western Geco procedures comply with requirements of MARPOL, e.g. oil record book sighted and kept up to date
Maintain air quality	MARPOL 73/78 Annex V P(SL)A Schedule 1995, clause 222 Western Geco – Waste Disposal Register Western Geco - Contract Plan Computer based maintenance system for machinery (TM Master) with DNV approval.	Environmental audit verifies adherence to EP, such that these standards are being met. Environmental audit verifies that Western Geco procedures comply with requirements of MARPOL.
Minimise risk of adverse effect to environment from hydrocarbons.	MARPOL 73/78 Annex I Oil Record Book Computer based maintenance system for machinery (TM Master) with DNV approval. Western Geco – Waste Disposal Register & Contract Plan Western Geco bunkering procedures (Procedure M3ISM/P008). Shipboard Oil Pollution Emergency Plan (SOPEP) AMSA Notice to Mariners	Environmental audit verifies adherence to EP, such that these standards are being met, e.g. designated containment areas for storage of oils, chemicals and streamer fluids. Environmental audit verifies that Western Geco procedures comply with requirements of MARPOL, e.g. oil record book sighted and kept up to date Any spills >80 L reported to the designated authority.
Maintain abundance and diversity of benthic flora and fauna.	Apache's Gippsland Basin 3D Seismic Program – Environment Plan. Manual of Permitted Operations	Environmental audit verifies adherence to EP, such that these standards are being met.
Minimise disturbance to other users.	APPEA Code of Practice 1996. Communication pathways developed through consultation with stakeholders prior to seismic programme commencing. AMSA Notice to Mariners	Advice given to stakeholders with regard to location and timing of seismic surveys.
Minimise risk of introducing marine pests into Australian waters	Australian Ballast Water Management Requirements (AQIS)	Vessel log book records a full ballast water exchange at sea prior to entry into Australian waters.

## 5.6 Audit and Review of Performance

The Apache Site Representative will conduct a compliance audit against the Environment Plan during the seismic programme and will forward the results to the Environment Manager at Apache. Any required remedial actions will be carried out immediately.

## 5.7 Stakeholder Consultation

Consultation with stakeholder groups, primarily commercial fishermen and their representative associations, concerning the proposed seismic programme has commenced.

The following organisations have been contacted and informed of Apache's proposed seismic programme so far:

- Seafood Industry Victoria;
- South East Trawl Fishing Industry Association;
- Lakes Entrance Fishermens Co-operative Ltd;
- South-east Fishery Association;
- SeaNet Victoria;
- Australian Fisheries Management Authority;
- Department of Primary Industry Tasmania;
- Department of Primary Industry – Lakes Entrance Fisheries Officers;
- Esso;
- OMV; and
- Lakes Entrance tourist operators.

In addition, the following organisations will be contacted:

- Victorian Ocean Prawn Trawl Association;
- San Remo Fisherman's Co-operative; and
- Corner Inlet Fisheries Association.

Apache plan to carry out further consultation with commercial fishing interests to ensure effective communication pathways with respect to the timing and location of the seismic vessel throughout the seismic programme.

Newsletters have been distributed to stakeholders (Appendix 5) and will continue throughout the programme.

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## Appendix 1 Apache Environmental Policy



### ENVIRONMENTAL MANAGEMENT POLICY

Whilst our core business is the development of petroleum resources to meet Australia's energy needs, we share the community's concern for the proper care and custody of our environment for present and future generations. At Apache protecting the environment and valuing cultural heritage are an integral part of the way we do business.

Our objective is to implement best environmental practices wherever possible and practical to do so. We are committed to demonstrating leadership in environmental management and ensuring that our actions are performed in a manner which has minimal impact on the land, sea and air.

We will comply with all applicable environmental legislation and regulations relevant to our business and implement the Australian Petroleum Production and Exploration Association's Code of Environmental Management Practice.

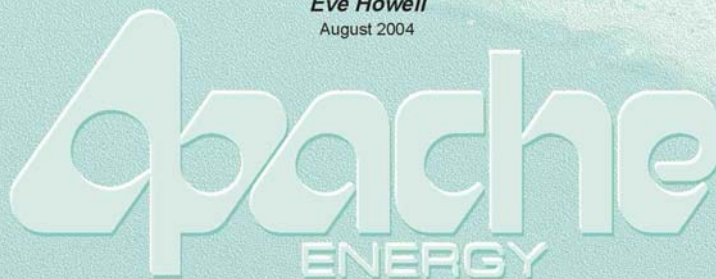
Wherever we operate we will:

- Maintain open community and government consultation regarding our activities and our environmental performance
- Educate, train and encourage our workforce to conduct activities in an environmentally responsible manner
- Identify, assess and manage risks to the environment and the surrounding community in order to prevent pollution and minimise impacts
- Develop and implement systems to manage all activities which have the potential to affect the surrounding natural environment
- Measure our environmental performance and set targets for continual improvement
- Conduct monitoring of the surrounding natural environment thereby contributing to knowledge of natural systems and enabling any impacts to be detected

This policy has been reviewed and endorsed by Apache Energy management who foresee benefits in, and take responsibility for, its successful implementation. By accepting employment with Apache, each employee and contractor acknowledges that he/she is responsible for the application of this policy.

A handwritten signature in blue ink, appearing to read "Eve Howell".

**Eve Howell**  
August 2004



## Appendix 2 Risk Assessment Matrix

Generic Qualitative Environmental Risk Matrix

		SEVERITY				
		Serious	Significant	Moderate	Minor	Negligible
LIKELIHOOD (of activity being undertaken )	Expected to Occur	Unacceptable	Unacceptable	Unacceptable	B	Negligible
	Probably will Occur	Unacceptable	Unacceptable	A	B	Negligible
	Moderate	Unacceptable	A	B	B	Negligible
	Unlikely to occur	A	A	B	Negligible	Negligible
	Rare	A	B	Negligible	Negligible	Negligible

### SEVERITY

- Negligible – Possible incidental impacts to flora and fauna locally, no ecological consequences
- Minor – Change to abundance/biomass/behaviour of biota in the affected area, no changes to biodiversity or ecological function.
- Moderate – Changes to abundance/biomass/behaviour of biota in the affected area with localised changes in biodiversity.
- Significant – Large changes to abundance and diversity of biota in the affected area with changes to ecological function.
- Serious – Broad-scale damage to regional ecosystem

### RISK

- Unacceptable – Changes to design or procedures are required (hazardous discharge or large volumes or close to sensitive resources)
- A – Risk reduction measures are required
- B – Acceptable risk, risk reduction measures should be considered depending on proximity to sensitive resources.
- Negligible – Acceptable risk (small volumes or discharge innocuous or remote from sensitive marine resources or no impact expected)

**Appendix 3 Department of Environment and Heritage (DEH) (2001) Guidelines  
on the application of the Environmental Protection and Biodiversity  
Conservation Act to interactions between offshore seismic operations and  
larger cetaceans, October 2001.**

**Guidelines on the application of the  
Environment Protection and Biodiversity Conservation Act  
to interactions between offshore seismic operations and larger cetaceans  
October 2001**

**Purpose**

The purpose of these Guidelines is to assist proponents of offshore seismic operations address certain of their obligations under the Environment Protection and Biodiversity Conservation Act 1999 (the Act) relevant to interactions with whales and certain other larger cetaceans.

**Limitations**

These Guidelines set out in plain English general advice about how Environment Australia intends to apply relevant provisions of the Act. They do not provide definitive advice relevant to any particular case. In each application of the Act, the particular circumstances of that case will need to be taken into account.

These Guidelines do not in any way fetter the discretion or responsibilities of the Minister for the Environment and Heritage or Environment Australia under the Act.

These Guidelines refer only to seismic operations and interactions with those cetaceans or whales listed at attachment 1. They do not relate to interactions with small cetaceans (such as dolphins) or other marine species (such as turtles or dugong). Whether a seismic survey will have a significant impact on a species at Attachment 3, other than those species listed at Attachment 1, should be considered prior to undertaking a survey. Other matters of national environmental significance such as the protection of World Heritage areas, Ramsar Convention listed wetlands of international importance, or the wider aspects of the Commonwealth marine environment trigger are also not addressed in these guidelines.

In relation to seismic operations and interactions with cetacean species other than those listed at Attachment 1, proponents need to determine the likelihood of the operation having a significant impact on the species or a population, or of interfering with individual animals of these species.

It is essential that all proponents make themselves familiar with the detail of their obligations under the Act. The Act can be found at [www.ea.gov.au/epbc/about](http://www.ea.gov.au/epbc/about). The Government has separately published general Administrative Guidelines for the Act on whether a proposed action is likely to have a significant impact on any matter of national environmental significance. See [www.ea.gov.au/epbc/assessapprov/guidelines/index.html](http://www.ea.gov.au/epbc/assessapprov/guidelines/index.html) or attachment 2.

**When would a seismic operation that is likely to interact with whales require approval under Part 9 of the EPBC Act?**

In the following circumstances a proposed seismic operation would be considered a 'controlled action' under the Act and so would require the approval of the Minister for the Environment and Heritage.

- Where a proposed seismic operation, whether in Commonwealth waters or in coastal waters, would be likely to have a significant impact on any threatened or migratory cetacean species. A full list of threatened or migratory cetacean species is at attachment 3.
- Where a seismic operation in Commonwealth waters would be likely to have a significant impact on any cetacean species.

Seismic operations will be regarded as being likely to have a significant impact on a cetacean species (including threatened and migratory cetacean species) in the following circumstances.

- Where the seismic operation is to be carried out in, or within 20 kilometres of, a feeding, breeding or resting area for a relevant cetacean species during the period when cetaceans are present.
  - The known feeding, breeding and resting areas for Southern right whales, Blue whales and Humpbacks - and the times when whales are believed to be present in these areas - are set out in the maps at Attachment 4. Areas for other species will be delineated in future as our knowledge increases.
- Under some circumstances seismic operations in or near migratory paths for cetaceans (as set out in maps at Attachment 5) at specified times may be likely to have a significant impact.
  - Proponents should consider referring relevant proposed operations in or near migratory paths to the Minister for decision on a case-by-case basis. Factors that may be relevant include: whether the migratory species is endangered; whether the seismic operations would be in a migratory path adjacent to a feeding, breeding or resting area; whether young calves or pregnant females may be affected; whether significant numbers (relative to the species or populations) of migrating cetaceans may be affected.

Should a proponent wish to remove uncertainty whether the action is a controlled action, the proposed action can be referred to the Minister for a decision about whether the action is a controlled action. Such a decision must be given in 20 days. (See section 75(5) of the Act.)

The undertaking of two surveys simultaneously in adjoining areas may lead to significantly greater interference than might be expected from a single survey and may lead to each of the surveys being considered to have a significant impact on the species.

### **When should you apply for a permit under Part 13 of the EPBC Act for a seismic operation that may interact with whales?**

With limited exceptions, an action that will injure, take or interfere with a cetacean in Commonwealth waters is an offence under the Part 13 of the Act unless a permit has been granted. In general, permits will not be granted to injure or take cetaceans. Accordingly, these two circumstances will not be considered further here.

A seismic operation that would interfere with a cetacean in Commonwealth waters would not be an offence under Part 13 of the Act if a permit has been granted.

Interference is defined in the Act to include harass, chase, herd, tag, mark or brand the cetacean. For the purposes of these Guidelines a precautionary approach has been taken to the definition of interference; that is causing a significant change in behaviour, including a

significant deviation from their migratory path or a substantial change in respiration or swimming pattern, will be considered harassment and so interference.

Under the following circumstances Environment Australia may consider a seismic operation as interfering with a cetacean.

- Where a seismic operation is a controlled action under Part 3 of the Act (and so must be approved by the Minister) as a result of its potential interactions with cetaceans. In these cases the permitting and approvals processes will be managed together.
- Seismic operations that are not controlled actions under Part 3 of the Act, but nonetheless take place in or near migratory paths around the time when migrations may occur. Such seismic operations may cause any present whales to modify their behaviour (for example deviate from their migratory path) and so may interfere with them.
  - Maps of migratory pathways for Humpback whales, Blue whales and Southern right whales are at attachment 5. Seismic operations in these areas during the peak of the Humpback migratory season and for all of the Blue whale and Southern right whale migratory season will be considered to be likely to interfere with any present whales. As areas important for other species become known, additional areas will be delineated.

In general, a seismic operation will **not** be regarded as interfering with cetaceans under the following circumstances.

- The seismic operation will take place outside of the migratory pathways and migration period for whales and outside of the breeding, feeding and resting areas during the times when these areas are occupied; and
- the management prescriptions set out in attachment 6 are observed.
  - These management prescriptions are intended to ensure that the proponent will take proper efforts to identify whether whales are in the area where seismic operations are to commence, and should there be whales in the area that every reasonable effort is taken to undertake the seismic operations in a manner that eliminates or minimises impacts on them.

### **What is the relationship between Part 3 approvals and Part 13 permitting processes in the Act?**

From the above it is clear that, given the different objectives of the approvals and permitting provisions under the Act, proponents of seismic operations should have regard to a number of possible outcomes. These are broadly set out below.

Some seismic operations will not require an approval and nor will the permit provisions apply.

- That is, where there is no significant impact on a cetacean species and there is no interference with any individual cetacean (and other NES matters are not affected).

For some seismic operations only the permit provisions will apply.

- For example, where a seismic operation in Commonwealth waters may interfere with migrating whales the permit provisions will apply, but if a significant impact on the species or a population of species is not likely no approval will be required.

Some seismic operations will require approval but the permit provisions will not apply.

- For example, a seismic operation in coastal waters that is likely to impact significantly on a population of a threatened cetacean will require approval. However, because the action is in coastal waters (and not Commonwealth waters) the permit provisions would not apply.

For some seismic operations in Commonwealth waters, both an approval will be required and the permit provisions will apply.

- This will be the case where a proposal will have both a significant impact on a species of cetacean and will also interfere with individual cetaceans. In such cases, approvals and permits will be processed together to avoid any delay or duplication. For practical purposes, there will be one process and the same documentation from the proponent can be used to meet both requirements.

### **What do you have to do for the Part 3 approvals process?**

Where a proposed action has been referred to the Minister for the Environment and Heritage and found to have or be likely to have a significant impact on a matter of national environmental significance (a controlled action), the action will require the approval of the Minister. The process for obtaining approval is outlined at Attachment 7. Further information on the process can be gained at [www.ea.gov.au/epbc/assessapprov/index.html](http://www.ea.gov.au/epbc/assessapprov/index.html).

### **What do you have to do for the Part 13 permitting process?**

Under the EPBC Act applying for a permit to undertake an action that may interfere with a cetacean automatically requires that the action be treated like a controlled action.

From this step a similar process as described for the Part 3 approval is followed, though at the end of the process a permit is issued (or refused) rather than an approval being given (or refused). Conditions may be placed on the permit.

The permit process has a simultaneous step of advising persons on the Register for consultation about permits of the permit application and seeking their comment on the application.

### **Standard Conditions**

As a general rule proponents of seismic operations should expect to be subject to conditions applying to approvals or permits.

The conditions will be based on the set of management prescriptions set out at Attachment 6. These are for guidance only and specific conditions will be determined for each proposal depending on the particular circumstances of the operational environment.

In general these conditions are intended to ensure that:

- every reasonable effort is taken to identify whether whales are in the vicinity of a seismic operation;
- should whales be in the vicinity, avoidance of interference and mitigating action takes place, and
- if whales do not appear to be in the vicinity, the operation is commenced and managed in a precautionary manner to minimise interference with whales that may not have been



identified and to cease operations quickly should whales be identified and interference be avoidable.

#### Supporting notes

##### **Feeding, breeding and resting areas**

Whales that are feeding, breeding and resting (in particular with calves) are considered susceptible to disturbance. Generally the conditions supporting these activities are unlikely to be available in other locations. Disturbing whales under these circumstances is likely to have an impact on the population of the species. The sensitivity of cow/calf pairs to disturbance when resting during migrations requires that a substantial buffer of 20 kilometres around these resting areas is applied to allow the calves to regain strength for the migration.

##### **Migratory paths**

Generally whales are robust animals able to travel long distances. Under most circumstances, a whale making a small deviation within its general migratory path to avoid seismic operation is unlikely to be adversely affected in terms of successful migration. However, in some circumstances precautionary management suggests that causing such deviations should be avoided where possible. These would best be judged on a case-by-case basis, considering factors such as the conservation status of the relevant species, or the likelihood of young calves or pregnant females being in the area.

##### **Sound levels**

The impact of sound from seismic sources is the subject to ongoing work in many parts of the world, including Australia. The impact of disturbance on whales in the short and long term is also unknown. Evidence to date shows that sounds heard by whales of over approximately 140db in feeding, breeding or resting areas may be considered likely to significantly disturb whales that are present. Sounds heard by whales of over 150db in other areas, such as migratory paths, may significantly disturb whales that are in the area. A document outlining the current justification for these sounds levels is available from Environment Australia).

##### **Contact**

For further information on the operation of these guidelines contact:

Director  
Marine Species Section  
Environment Australia  
GPO Box 787  
CANBERRA ACT 2601

**List of whales species to which these guidelines relate**

<b>Common name</b>	<b>Scientific name</b>
Shepherd's beaked whale	<i>Tasmacetus shepherdi</i>
Dense-beaked whale	<i>Mesoplodon densirostris</i>
Hector's beaked whale	<i>Mesoplodon hectori</i>
Longman's beaked whale	<i>Mesoplodon pacificus</i>
Andrew's beaked whale	<i>Mesoplodon bowdoini</i>
True's beaked whale	<i>Mesoplodon mirus</i>
Ginkgo-toothed beaked whale	<i>Mesoplodon ginkgodens</i>
Strap-toothed whale	<i>Mesoplodon layardii</i>
Gray's beaked whale	<i>Mesoplodon grayi</i>
Arnoux's beaked whale	<i>Berardius arnuxii</i>
Cuvier's beaked whale	<i>Ziphius cavirostris</i>
Killer whale	<i>Orcinus orca</i>
Long-finned pilot whale	<i>Globicephala melas</i>
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>
Southern bottlenose whale	<i>Hyperoodon planifrons</i>
Sperm whale	<i>Physeter macrocephalus</i>
Southern right whale	<i>Eubalaena australis</i>
Pygmy right whale	<i>Caperea marginata</i>
Minke whale	<i>Balaenoptera acutorostrata</i>
Sei whale	<i>Balaenoptera borealis</i>
Bryde's whale	<i>Balaenoptera edeni</i>
Blue whale	<i>Balaenoptera musculus</i>
Fin whale	<i>Balaenoptera physalus</i>
Humpback whale	<i>Megaptera novaeangliae</i>

**Criteria for significance under the three matters of NES, listed threatened species, listed migratory species and Commonwealth marine environment.**

**Listed Critically endangered and endangered species**

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed critically endangered or endangered species.

**Criteria**

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

1. lead to a long-term decrease in the size of a population,
2. or reduce the area of occupancy of the species, or fragment an existing population into two or more populations,
3. or adversely affect habitat critical to the survival of a species,
4. or disrupt the breeding cycle of a population, or
5. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
6. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat\*,
7. or interfere with the recovery of the species.

(\*Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.)

**Listed Vulnerable species**

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed vulnerable species.

**Criteria**

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

1. lead to a long-term decrease in the size of an *important* population of a species,
2. or reduce the area of occupancy of an *important* population, or
3. fragment an existing *important* population into two or more populations, or
4. adversely affect habitat critical to the survival of a species, or
5. disrupt the breeding cycle of an *important* population, or
6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
7. result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat\*, or
8. interferes substantially with the recovery of the species.

(\* Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.)

An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

1. key source populations either for breeding or dispersal,
2. populations that are necessary for maintaining genetic diversity, and/or
3. populations that are near the limit of the species range.

In addition to the above information, Commonwealth adopted Recovery Plans may also provide further guidance on whether an action is likely to be significant.

### **Listed Migratory Species**

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed migratory species.

#### **Criteria**

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

1. substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
2. result in invasive species that is harmful to the migratory species becoming established\* in an area of important habitat of the migratory species, or
3. seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

(\* Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.)

An area of important habitat is:

1. Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
2. habitat utilised by a migratory species which is at the limit of the species range, or
3. habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an ecologically significant proportion of the population varies with the species (each circumstance will need to be evaluated)

### **Commonwealth marine environment**

An action will require approval from the Environment Minister if the action has, will have, or is likely to have an impact on the environment of the Commonwealth marine area.

#### **Criteria**

An action has, will have or is likely to have a significant impact on the environment in a Commonwealth marine area if it does, will, or is likely to:

1. result in a known or potential pest species becoming established in the Commonwealth marine area\*, or
2. modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results, or
3. have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (eg breeding, feeding, migration behaviour, and life expectancy) and spatial distribution, or
4. result in a substantial change in air quality\*\* or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or
5. result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected.

(\* Translocating or introducing a pest species may result in that species becoming established.

\*\* The Commonwealth marine area includes any airspace over Commonwealth waters.)

### **Guidelines for the Mining Industry**

Guidelines on significance have been published for the mining industry. These include a reference to seismic activity in the marine environment which states:

*'Seismic exploration (using air guns) is not likely to have a significant impact on a matter of national environmental significance unless the activity is undertaken in an area that contains habitat for threatened or migratory species and the seismic activity is likely to interfere with breeding, feeding or migration. Similarly, seismic exploration using air guns would not normally be expected to have a significant impact on the Commonwealth marine environment unless it was undertaken in an area that contains habitat for threatened or migratory species and the seismic activity is likely to interfere with breeding, feeding or migration. In addition, seismic activity in shallow or near shore environments in or adjacent to a Commonwealth marine area or a Ramsar wetland is likely to have a significant impact on a matter of national environmental significance.'*

**Cetaceans occurring in Australian waters that are listed as a listed threatened species or a listed migratory species or both.**

At least 44 species of cetaceans have been reported in Australian and Antarctic waters. This includes 26 species of whale, 17 species of dolphins and one species of porpoise (which occurs in sub-Antarctic waters).

Five of the whale species found in Australian waters are also considered threatened and are listed as endangered or vulnerable under the Act. In addition, a number of the whale and dolphin species are migratory (visiting Australia for only part of the year or having populations that straddle international borders) and are listed under the Convention on the Conservation of Migratory Species of Wild Animals (the CMS or Bonn Convention).

**Both a listed **critically endangered or endangered species** and a listed **migratory species****

Blue whale	( <i>Balaenoptera musculus</i> ) - Appendix 1 Bonn Convention
Southern right whale	( <i>Eubalaena australis</i> )

**Both a listed **vulnerable species** and a listed **migratory species****

Humpback whale	( <i>Megaptera novaeangliae</i> ) - Appendix 1 Bonn Convention
----------------	--

**Listed **vulnerable species****

Sei whale	( <i>Balaenoptera borealis</i> )
Fin whale	( <i>Balaenoptera physalus</i> )

**Listed **migratory species****

Spectacled porpoise	( <i>Phocoena diotropica</i> ) - listed Appendix 2 Bonn Convention
Indo-Pacific humpback dolphin	( <i>Sousa chinensis</i> )
Dusky dolphin	( <i>Lagenorhynchus obscurus</i> )
Indian Ocean bottlenose dolphin	( <i>Tursiops aduncus</i> )
Pantropical spotted dolphin	( <i>Stenella attenuata</i> )
Spinner dolphin	( <i>Stenella longirostris</i> )
Fraser's dolphin	( <i>Lagenodelphis hosei</i> )
Irrawaddy dolphin	( <i>Orcaella brevirostris</i> )

All cetaceans occurring in Commonwealth waters are protected. The impact a proposal may have on an important population of any cetacean species is considered under the marine environment matter of national Environmental Significance. A permit is required to interfere with any individual cetacean of any species within Commonwealth areas

### Recognised aggregation, breeding and resting areas



### 1. Rottnest, Western Australia



## 2. Otway, Victoria



### 3. Eden, New South Wales

### Blue Whales - Recognised aggregation areas







1. Broome (Cape Gage)



3. Carnarvon (Break Bay)



6. Cape Langer (Wilkes Bay)



7. Kuneneberg (Harvey Bay)



2. North West Cape (Ningsuloo)



4. Perth



8. Mandurah (Whitlam Bay)



5. Albany (Morrison Bay)

### Breeding and resting areas of Humpback Whales (*Megaptera novaeangliae*)



Source:  
 AUSLIS 1990: Australian Coastlines and Seas Boundaries  
 AUSLIS 1997: Australian Maritime Boundary Information System (AUSLIS)  
 AUSLIS 1990: Gazetteer of Australia

Correct Data used are assumed to be correct as received from the data suppliers.

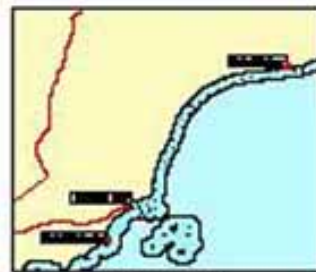
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 December 2000  
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1. Port Phillip



2. Yellup Bay



3. Innes Bay



4. Turlington Cove



5. Mordyemans Bay



6. Head of the Bight



7. Foster Bay



8. Michael Bay



9. Ermenter Bay



10. Wharfedale



11. Eden



12. Marks Island

## Aggregations of the Southern Right Whale

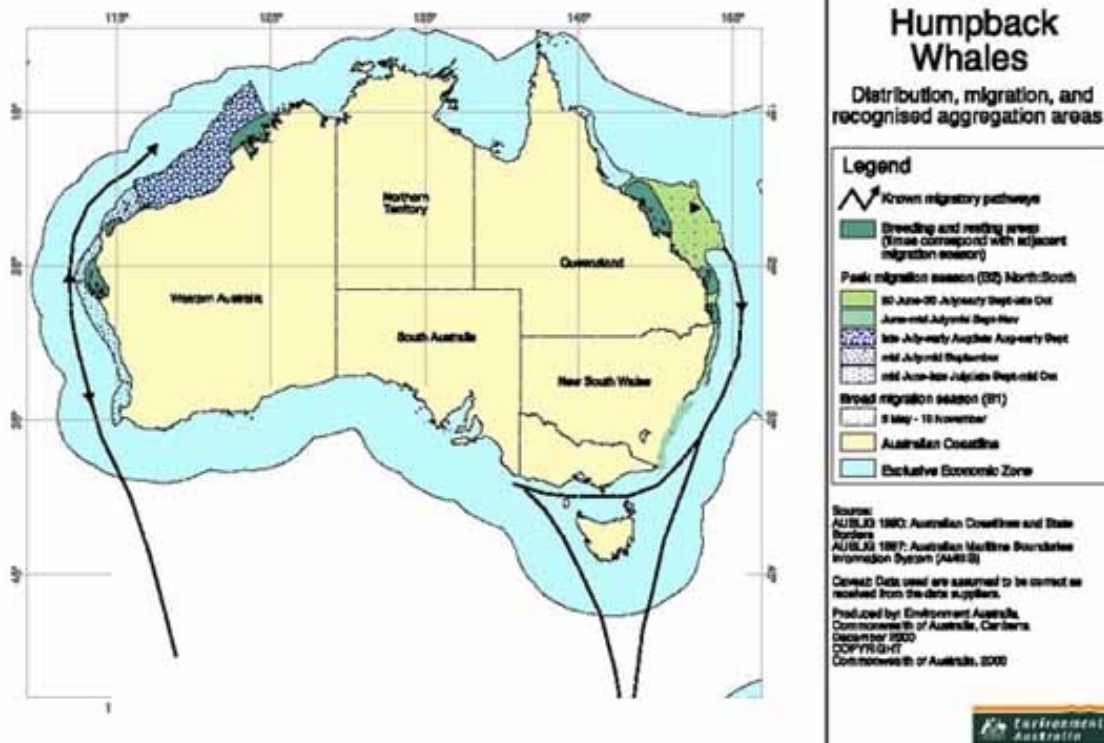
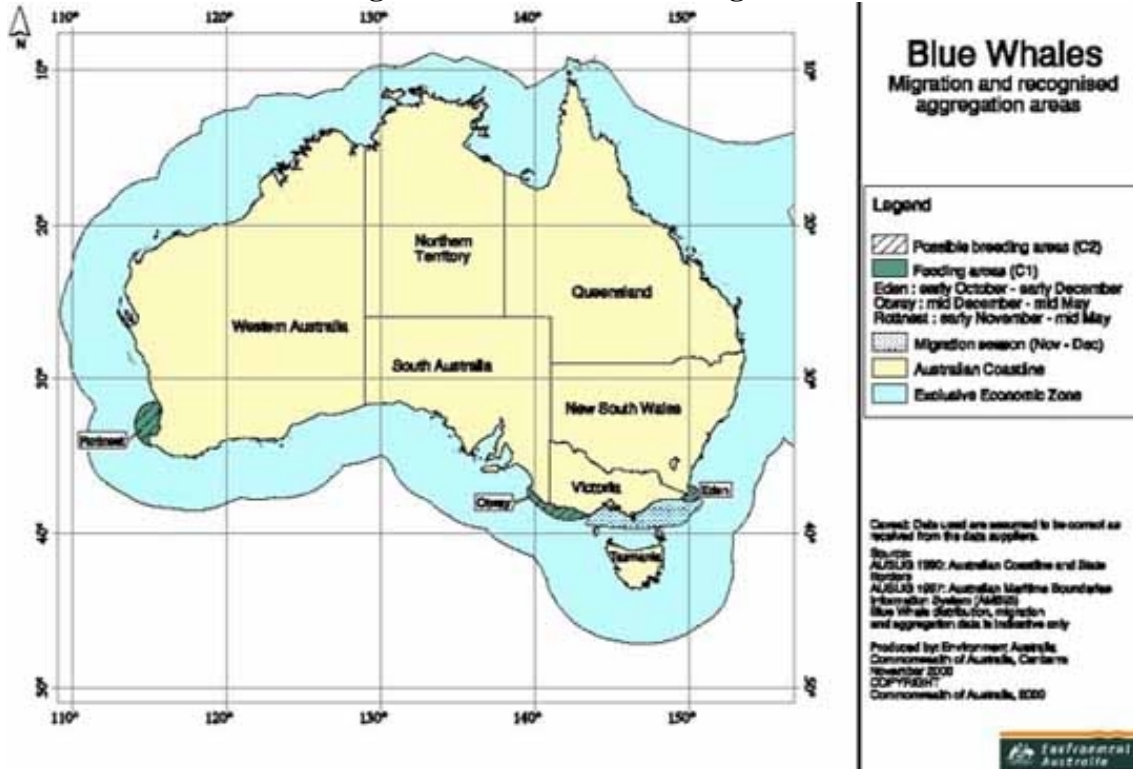


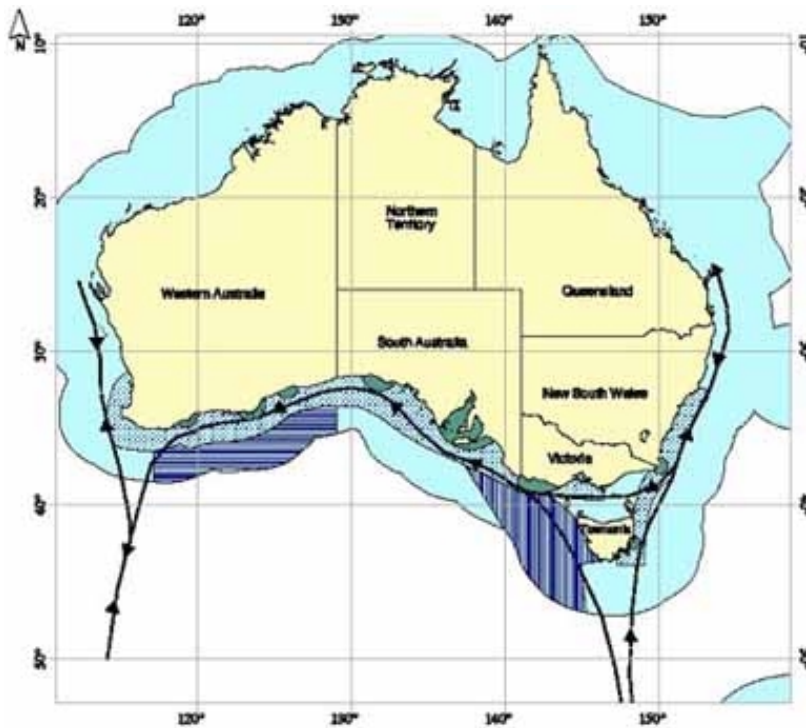
Source:  
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 and State Borders (1990)  
 AUGUST 1990: Bureau of Australia  
 AUGUST 1990: Australian Maritime  
 Science Information System  
 (AMIS) data.  
 Current data used are assumed to be  
 correct as reported from the data  
 suppliers.  
 Produced by: Environment Australia  
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 October 1990  
 CCF 170817  
 Commonwealth of Australia, 1990

Aggregation area boundaries are given as an indication only and provide no basis for management.  
 Hatched areas added to the main waters through separate habitat may attach further offshore, or not as far as is shown in some localities



# Recognised distribution and migration routes





## Southern Right Whales

Distribution, migration and recognised aggregation areas

### Legend

- Breeding areas (C2)
- mid May - and September
- Known migratory pathways
- Migration seasons
- mid May - and September (R2)
- early September - mid October (R2)
- early May - and June (R2)
- Australian Coastline
- Exclusive Economic Zone (200 nm)

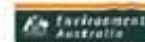
Copyright Data used are assumed to be correct as received from the data suppliers.

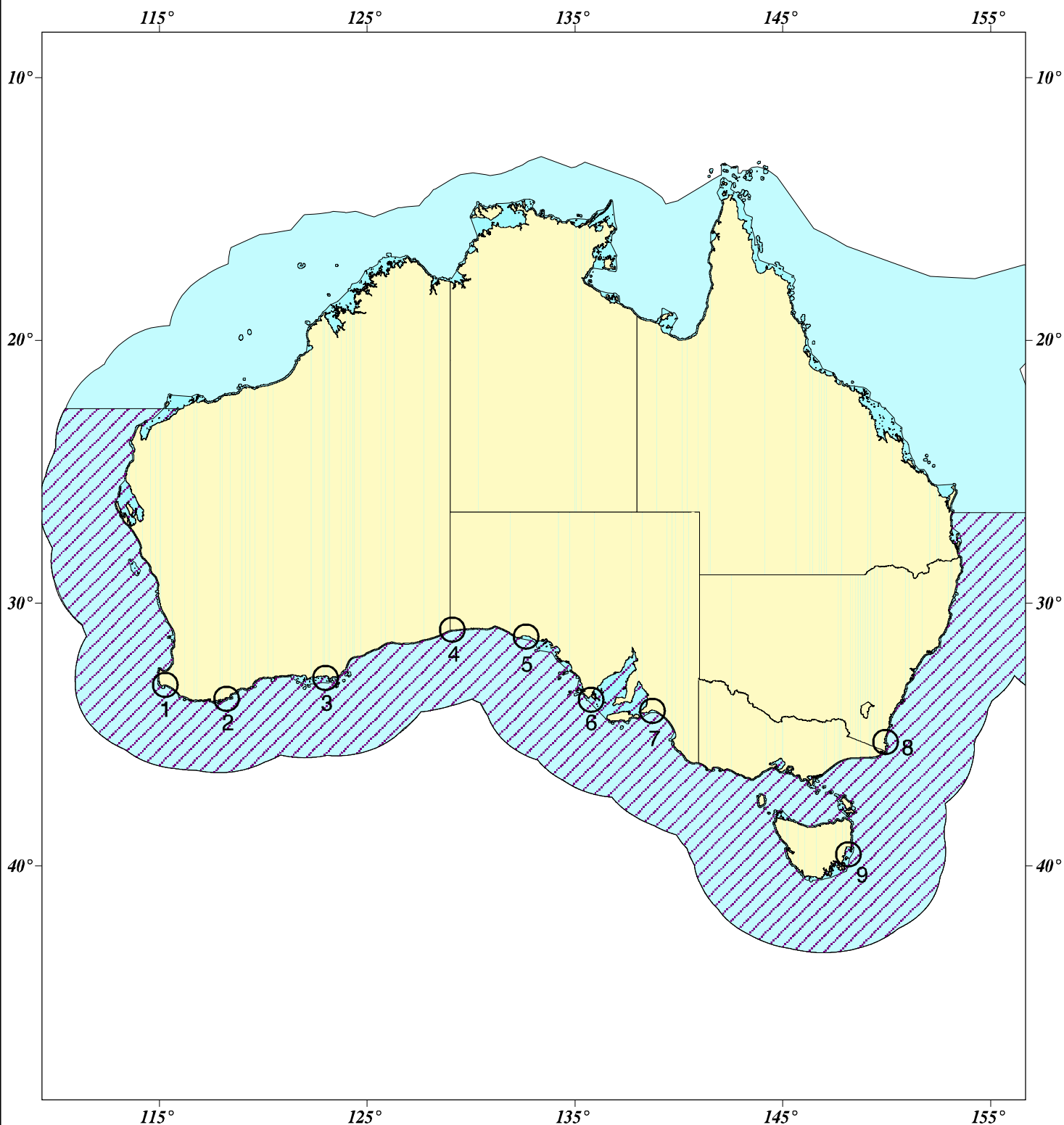
Source:  
AUSLIG 1986: Australian Coastline and State Borders

AUSLIG 1997: Australian Maritime Boundary Information System (AMISIS)

Southern Right Whale distribution, migration and aggregation data is indicative only






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December 2000  
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## Southern Right Whale - Areas of frequent use

### Legend

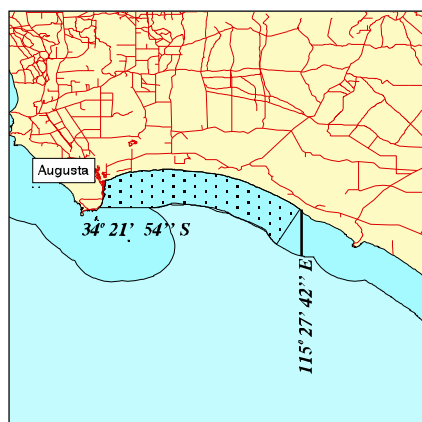
-  Frequent use areas - letters refer to thumbnail maps
-  Whale distribution within the EEZ (indicative only)
-  Australian Mainland
-  State Waters
-  Exclusive Economic Zone (EEZ)

Frequent use area data was derived using State waters (3 nautical miles) and land-based geographic features as landmarks. They are indicative only.

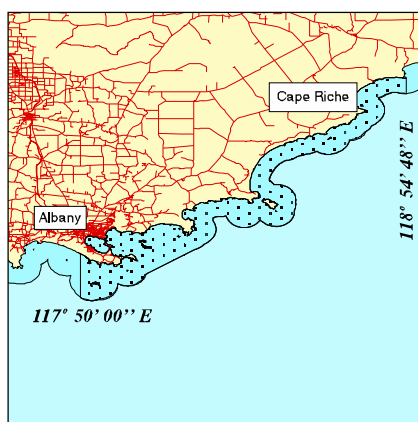
Source:  
 AUSLIG 2001: Australian Maritime Boundary Information System (AMBIS).  
 AUSLIG 1990: Australian Coastline and State Borders (100K)

Caveat: Data used are assumed to be correct as received from the data suppliers.

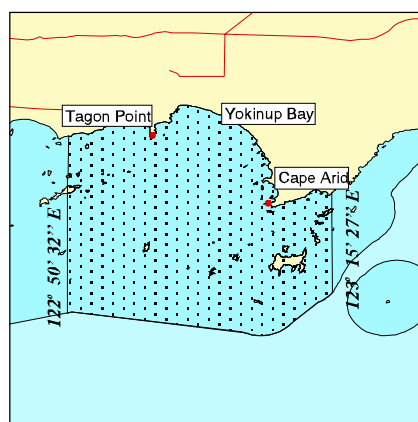
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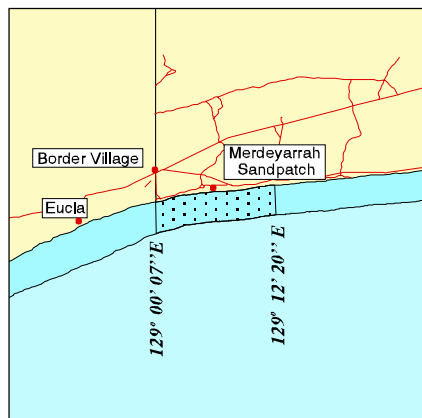
1. Flinders Bay



2. Albany/Cape Riche



3. Yokinup Bay/Cape Arid



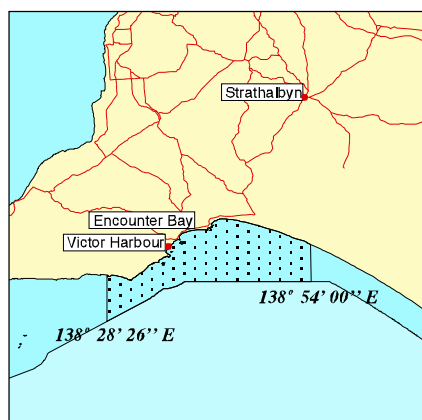
4. Merdeyarrah Sandpatch



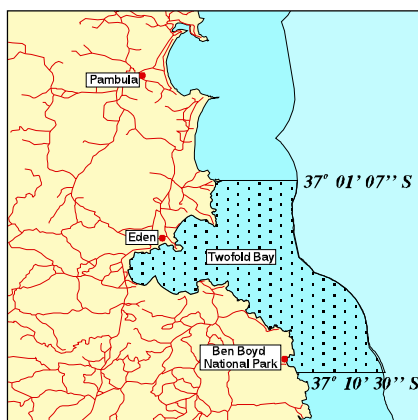
5. Fowlers Bay



6. Sleaford Bay



7. Encounter Bay



8. Eden



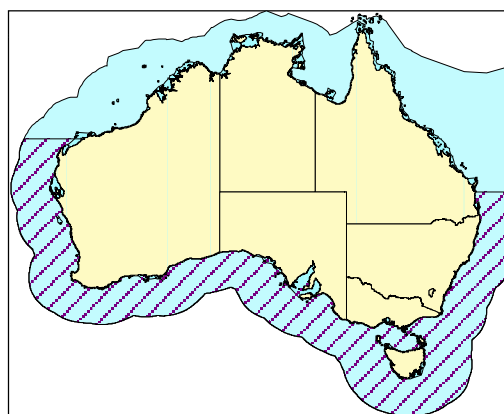
9. Maria Island

## Southern Right Whale - Areas of frequent use

### Legend

- Areas of frequent use
- Australian Mainland
- Main Roads
- Exclusive Economic Zone
- State Waters

Boundaries of these frequent use areas are given as an indication only and provide no basis for management. Dotted areas extend to the state waters although important habitat may stretch further offshore, or not as far as is shown in some localities. Coordinate values are for guidance only and should not be used for navigation purposes



### Source:

AUSLIG 2001: Australian Maritime Boundary Information System (AMBIS).  
AUSLIG 1990: Australian Coastline and State Borders (100K)  
AUSLIG 1996: Gazetteer of Australia.

Caveat: Data used are assumed to be correct as received from the data suppliers.

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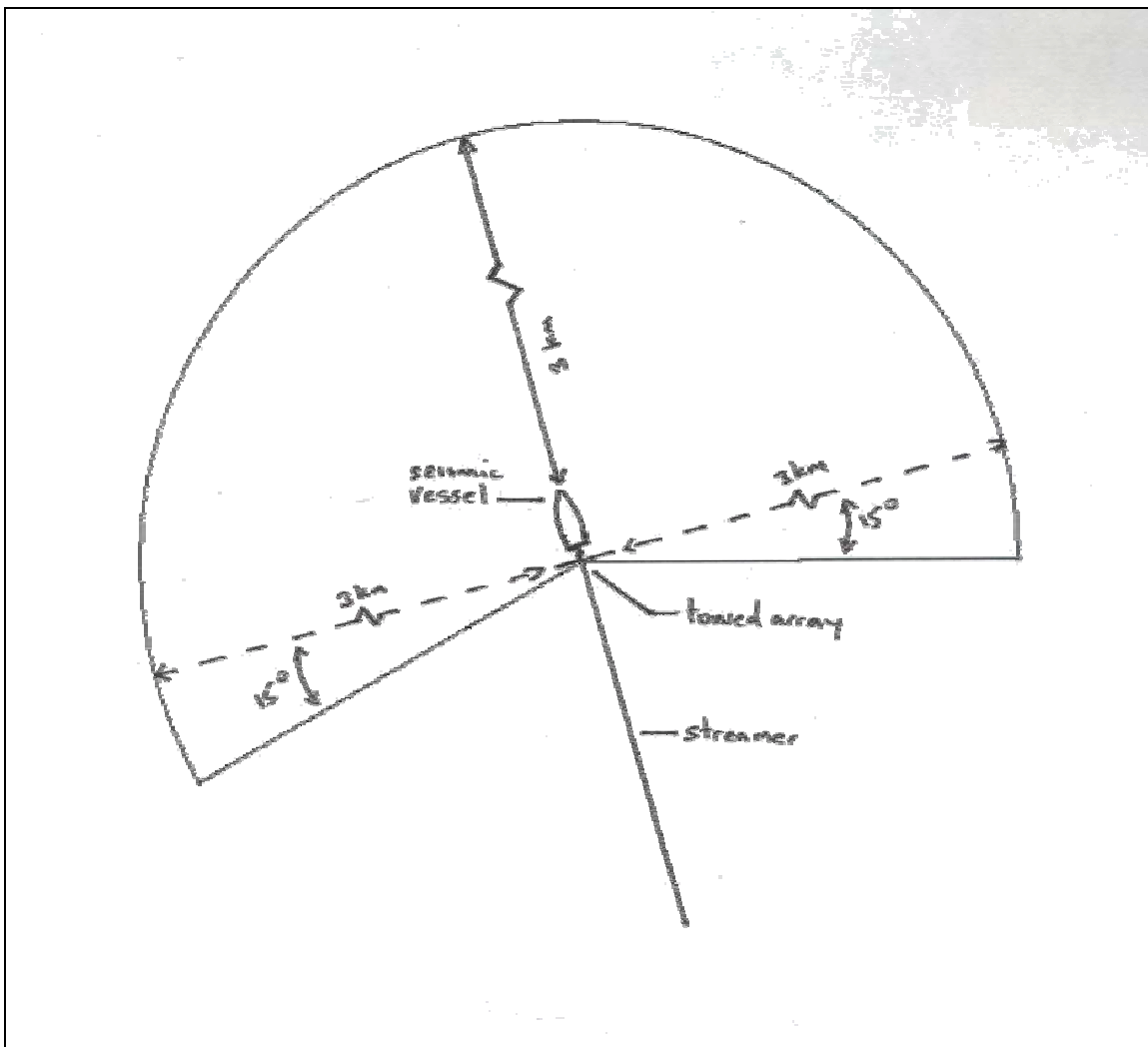
**MANAGEMENT GUIDELINES FOR SEISMIC VESSELS OPERATING IN AUSTRALIAN WATERS SO AS TO AVOID OR MINIMISE INTERFERENCE WITH WHALES AND CERTAIN OTHER LARGER CETACEANS.**

*The following procedures should be followed by all seismic vessels operating in Australian waters during all seismic surveys so as to avoid interference with whales and other larger cetaceans as set out in the attached list.*

**PRE START-UP VISUAL OBSERVATION PROCEDURES**

For all seismic surveys in all waters the following checks should be made:

- During daylight hours, visual checks (using binoculars from a suitable, high observation platform on the survey vessel) for the presence of whales will be undertaken before the commencement of operations.
  - During night time operations, Infra-Red (IR) or night-vision binoculars will be used to undertake visual checks before the commencement of operations.
  - Observations will begin at least 90 minutes prior to use of any high-energy acoustic sources, with particular focus on a 3 kilometres radius around the survey vessel. (See attached diagram).
- ⇒ For Information, indicators of whale activity may be in the form of blows and surface activity resulting in large splashes.



*Diagram of area surrounding a seismic vessel that must be monitored for the presence of whales*



- ⇒ For information, a practical and reliable method to accurately determine the range of a marine mammal from a ship's bridge is to measure the angle of the whale below the horizon. By then using standard formula which take into account the earth's curvature and refraction, and using the known height of eye of the observer, a reasonable estimate of the whale range can be calculated. The Norie's Nautical Almanac has standard tables and formula for calculating range from angles below the horizon. There are two methods of measuring angles below the horizon:
- Range finding binoculars which have a graticule of set angle increments fixed in one eyepiece. The number and fraction of graticule units from the whale to horizon gives the angle below the horizon;
  - Sextant angles below the horizon. These provide the most accurate measure, and although require some experience at using and reading a sextant, are relatively easy to measure, although care needs to be taken whether reading the angle off or on the arc.
- ⇒ For information, acoustic monitoring, either ship based using signals taken from the streamer, or externally based from sonar buoys, is becoming an increasingly practical method of monitoring the presence of many whales species. There is merit in the continued exploration of this method of monitoring the presence of cetaceans. Where acoustic monitoring is used on a vessel, the signal should be continuously monitored on the bridge. The use of acoustic monitoring should be used to assist visual monitoring rather than replace it.

## START-UP DELAY PROCEDURES

For all seismic surveys in all waters the following procedures should be followed:

- Discharge of the acoustic sources will not commence unless there are no whales within a minimum distance of 3 km from the survey vessel.
- If whales are detected within this zone the start up of acoustic sources will be delayed until they have been observed to move away outside the 3km radius or, if they are no longer observable, 30 minutes after the last sighting within 3km.

## SOFT START PROCEDURES

For all seismic surveys in all waters the following procedures should be followed:

- A sequential build-up of warning pulses will be carried out at the commencement of all surveys. The whole array will not be fired without a full soft start. Soft starts will be used even if no whales have been seen.
  - Visual observation will be maintained continuously during soft starts to establish the presence or absence of whales within 3 km of the vessel.
  - If whales are sighted during this soft start procedure within the 3km zone, the seismic source will be shut down. Re-commencement of soft start procedures will take place after 30 minutes has lapsed since the last whale sighting within the 3km zone.
  - There may be continued discharge of the acoustic source during line turns or changes. Discharge of only a limited number of air-guns in the acoustic array would be sufficient in this case.
  - Alternatively the array may be completely shut down between the lines of a survey. In the event that the array is completely shut down between the lines of a survey, the full start-up delay and soft start procedures will be undertaken prior to the whole array being fired.
- ⇒ For information, the soft start procedure involves a gradual increase in the number of air-guns fired over a 20 minute period prior to commencement of a line, and serves to send out a series of warning pulses to whales and give them adequate time to leave the vicinity.

## VISUAL OBSERVATION PROCEDURES DURING SURVEY LINE

For all seismic surveys in all waters where a permit under Part 13 Division 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (the Act), or approval under Part 3 of the Act, is not required the following procedures should be followed at a minimum:

- Visual observations of 10 minute duration per hour will be carried out during seismic operations.
- During night time operations, Infra-Red (IR) or night-vision binoculars will be used for the hourly observations. Night time visual observations will also be of 10 minute duration per hour.
- Where a whale of a species included in Attachment 1 is seen as part of the observation procedures, continual observations should occur until 2 hours have passed since the last observation of a cetacean of a species included in Attachment 1.
- All cetacean observations, whether within 3km or not, should be documented and reported.
- ⇒ For information, the area to be monitored for the presence of whales is the same as that applying for pre-start surveys.
- ⇒ For information, wherever practicable a trained, independent observer should be used for the task of undertaking visual monitoring both to ensure that the required observations are undertaken and to ensure that the best information is obtained from these opportunities to monitor cetaceans.
- ⇒ For information, aerial surveys can increase the amount of information available on the presence of cetaceans in an area and assist in monitoring these animals. Where planning and safety considerations permit aerial surveys of the area to be surveyed could be undertaken to supplement shipboard observation.

For all seismic surveys in circumstances where a permit or approval is required (feeding, breeding and resting areas and migratory routes, as identified in the accompanying maps) the following procedures will form the basis for the consideration of conditions. The exact conditions will be assessed on a case-by-case basis to ascertain if the requirements should be varied.

- In or near migratory paths, other than non-peak Humpback migration paths, 30mins per hour observation by a trained and dedicated cetacean observer will normally be required.
- In feeding, breeding or resting areas, continuous observation by a trained and dedicated cetacean observer will normally be required.
- In addition, an independent observer may be required to ensure that the best information is obtained from these opportunities to monitor cetaceans.
- ⇒ For information, the area to be monitored for the presence of whales is the same as that applying for pre-start surveys.
- ⇒ For information, the nominated observer is additional to standard bridge crew members and will have some experience with whale observations. Note: Whale observations become increasingly difficult as sea state increase. An upper limit for practical whale observation is sea state 5. This coincides with the operational weather limits for most seismic vessels.
- ⇒ For information, aerial or stand-off vessel observation is likely to be required as part of any permit or approval.

## STOP WORK PROCEDURES

For all seismic surveys in all waters the following procedures should be followed:

- Where a seismic vessel with an operating acoustic source approaches within 3km of an individual whale or pod of whales, the acoustic source will be shut down.
- Where an individual whale or pod of whales approaches within 3 km of a seismic vessel, the acoustic source will be shut down unless the animal or animals are seen to be skirting the edge of the 3km limit.
- Seismic source operations will not recommence until the animal or pod has been seen to move outside of a 3 km range, or has not been seen for 20 minutes.
- ⇒ For information, the area to be monitored for the presence of whales is the same as that applying for pre-start surveys.
- ⇒ For information, it is important to monitor the behaviour of any whales that may be approaching the stop-work distance. Ascertain what the whale is doing and the direction it is travelling. If it is seen to be heading away from the seismic vessel and is outside the 3km zone, a shut down may not be necessary.
- ⇒ For information, particular care should be exercised in the monitoring for cetaceans under conditions of reduced visibility.

## AERIAL SURVEY AND STAND-OFF VESSEL PROCEDURES

For all seismic surveys in waters where a permit or approval is required (feeding, breeding and resting areas and migratory routes, as identified in the accompanying maps), additional surveys are likely to be required as permit conditions or as part of the approval, if granted. These surveys will in most cases be aerial surveys except where vessel based surveys are required to collect special information or where aerial surveys are impractical. Two types of surveys are envisaged and the requirement for either or both will be assessed on a case-by-case basis.

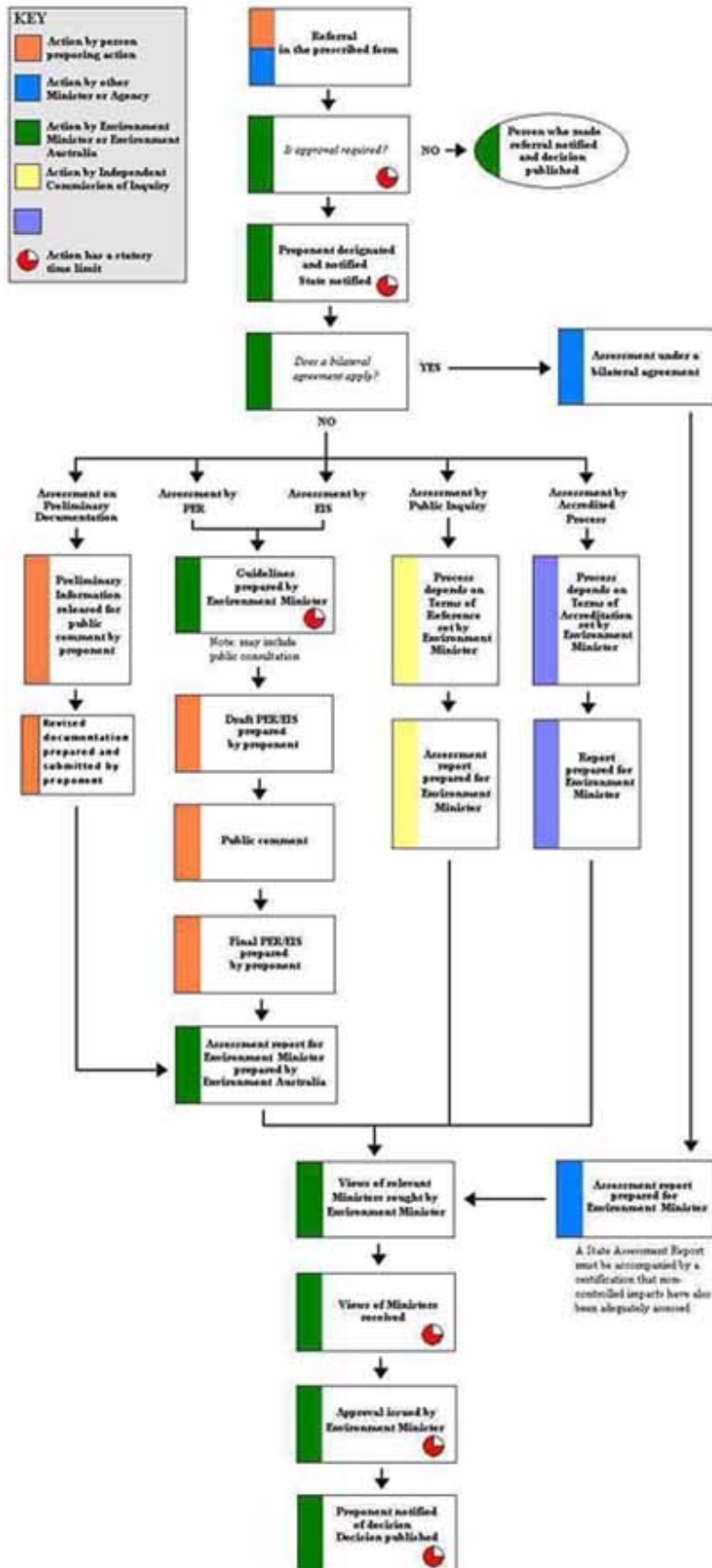
1. Surveys to identify where cetaceans are in relation to seismic activity and to identify when seismic vessels should be especially vigilant. These surveys would be run between the areas to be surveyed by the seismic vessel and the likely approach direction of cetaceans, or in the area in advance of the survey vessel.
2. Scientific surveys to identify which areas are important to cetaceans eg to identify feeding, breeding and resting areas and times of peak migration. In particular these surveys may be required in areas of potential increased sensitivity (areas C or D on the attached maps) where insufficient information currently exists to determine timing and appropriate management arrangements.

## RECORDING AND REPORTING PROCEDURES

- Any whale sightings will be recorded on the *Environment Australia Whale and Dolphin Sighting Report* form (attached). This form is also available in electronic format and can be found at [www.ea.gov.au/coasts/species](http://www.ea.gov.au/coasts/species).
- At completion of the seismic survey, copies of all report forms will be submitted to:  
Environment Australia  
Marine Species Section  
GPO Box 787  
Canberra ACT 2601

# EPBC Act - basic referral, assessment and approval steps

## OVERVIEW OF THE REFERRAL, ASSESSMENT, AND APPROVAL PROCESS



## **Appendix 4    Whale and Dolphin Sighting Report**



Marine and Water Division

National Cetacean Sighting Program

**DO NOT** approach whales/dolphins closer than 100 metres



Marine Species Section  
Environment Australia  
GPO Box 787  
CANBERRA ACT 2601 AUSTRALIA

## Whale and Dolphin Sighting Report

Date	Time (local)	Sighting from land / vessel	Location	Latitude °	' S	Longitude °	' E
------	--------------	--------------------------------	----------	---------------	-----	----------------	-----

### SPECIES DETAILS

air / oil platform  
**Species** (as close as possible eg long-finned pilot whale/pilot whale/toothed whale/whale)

**Please return to:**  
How sure are you? (please circle)  
very sure -- sure -- not sure

Animal/s length  
biggest/smallest

How did you  
estimate length?

Your distance (min/max)  
from animal

Total number of  
whales/dolphins

Behaviour of whales/dolphins (eg swimming-north, breaching, resting)

Number of calves

### WEATHER/SEA CONDITIONS

Beaufort Sea State (please circle)

0-----1-----2-----3-----4-----5-----6-----7+  
mirror moderate very  
calm white caps rough

Weather (eg sunny, clear, light rain)

Cloud cover → /8

Wind direction

Wind speed

Sea temperature (°c)

Other animals present (including fish, birds, etc...)

Other notes / sketches




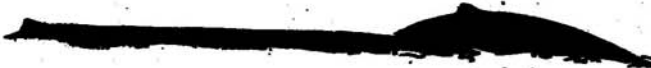
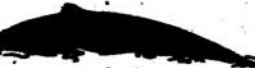




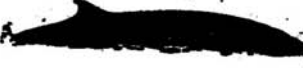


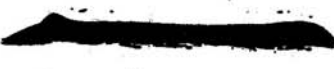





(eg. what did you use to identify the whale/dolphin)

Please draw the shape and features you observed  
(eg. flipper, tail, back and head. Mark in the colour/s and draw  
colour patterns and any unusual markings injuries, scars etc)

Were there any photographs taken Y/N

**Your Name and Address**

## Species guide

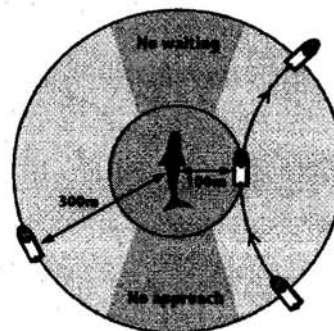
Species	On Surface	Diving	Other Characteristics	Length
Southern right				up to 17 metres
Blue				23 to 27 metres
Humpback				11 to 16 metres
Minke				about 9 metres
Sperm				12 to 18 metres
Killer				8 to 10 metres

NB: for guidance only, not all species are shown here

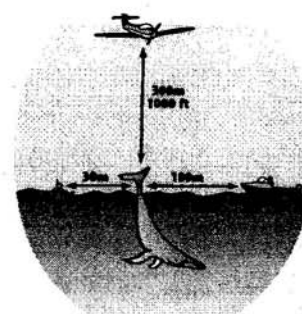
## Whale watching guidelines

- Vessels should approach whales or dolphins as in A .
- Within 300 metres of a whale move at a constant slow speed no faster than the slowest whale or at idle, 'no wake' speed.
- Avoid sudden or repeated changes in speed or direction
- Do not approach closer than 100 metres in a boat (B)
- Stopping? allow the motor to idle (1 minute) before turning off
- No more than three vessels should attempt to watch a whale or group of whales at one time
- Do not allow the whales to become boxed in, cut off their path or prevent them from leaving.
- Do not approach mothers with young calves.

Move away slowly at idle, 'no wake' speed to at least 300 metres from the closest whale

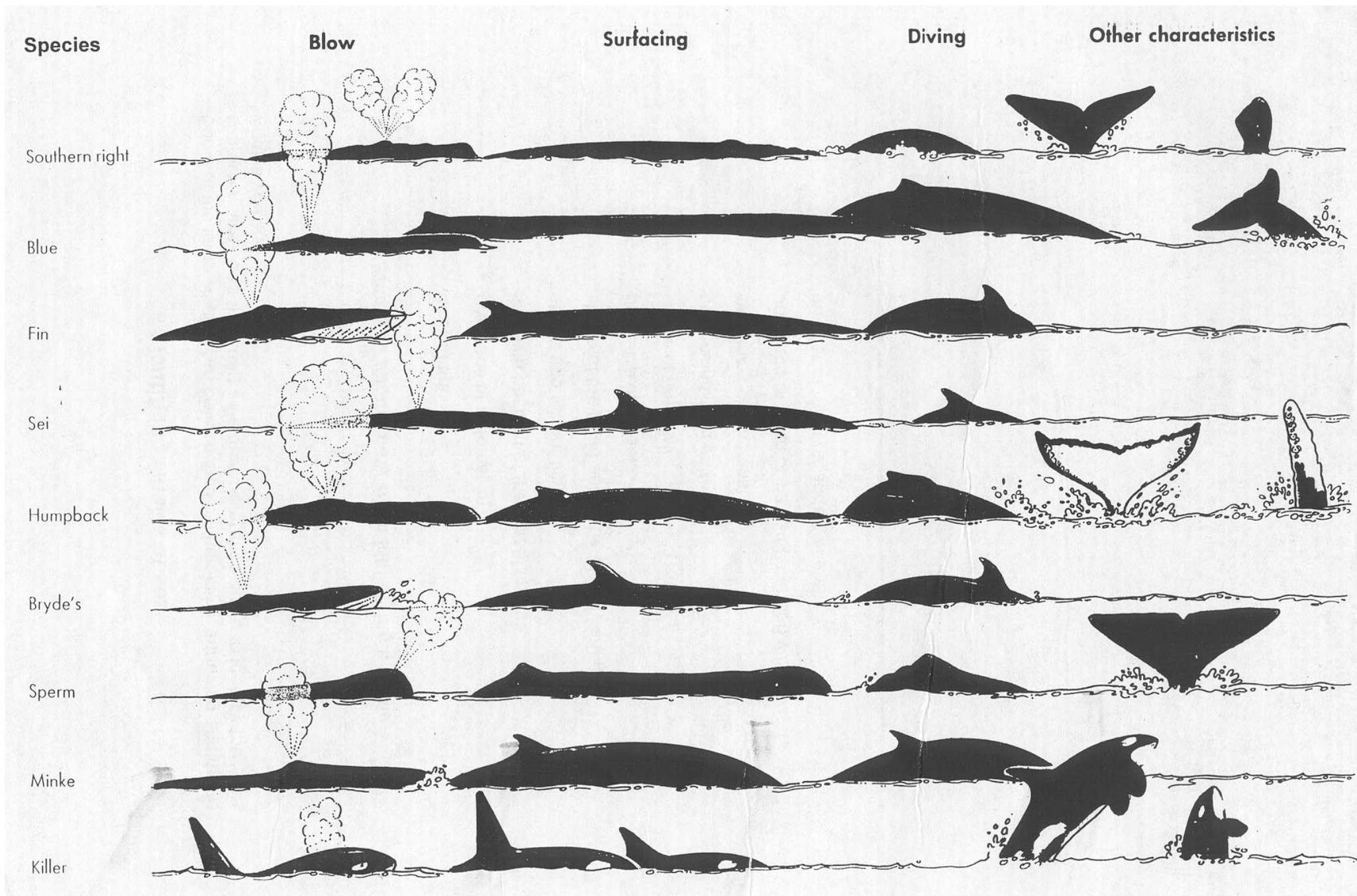


A



B





# Identifying Whales at sea

Some of the large whales can be identified by their blow, surfacing and diving characteristics. Use this chart as a quick reference guide to identify the large whales you see.

## What you should note when identifying a whale

- body length
- presence of a dorsal fin
- size and position of the dorsal fin
- shape and size of flippers
- shape of the head and general body shape
- presence of a beak
- shape of the blow
- body colour and patterns
- swimming characteristics
- presence of teeth or baleen (stranded whale)
- number of teeth (stranded whale)

## **Appendix 5 Seismic Programme Newsletters 1 and 2**





# **Gippsland Basin Seismic Project**

## **Information Newsletter 1**

### **29th October 2004**

#### **The Company**

Apache Energy Limited is the Australian subsidiary of an international oil and gas exploration company. Apache's Australian operations are based in Perth. Apache has recently acquired a permit in the Gippsland Basin and in accordance with its obligations to the government; Apache intends to explore the permit using seismic surveys as part of the ongoing search for new oil and gas reserves in Australia. Apache may also carry out surveys in other permits on behalf of another oil and gas company. The surveys are collectively called the "Gippsland Basin Seismic Project".

#### **The Gippsland Basin Seismic Project**

Potentially, the Gippsland Basin Seismic Project will comprise a number of 3D marine seismic surveys (see the attached map). The boundaries of these survey areas will be finalised over the next few weeks. This is the first newsletter in a series that will provide information to stakeholders and the general public about the Gippsland Basin Seismic Project.

3D seismic surveying is used as the exploration technique for this project because of its effectiveness for mapping potential hydrocarbon reserves. These techniques have been refined over the last 30 years since their initial development in the mid 1970's.

#### **Timing**

The Gippsland Basin Seismic Project is presently scheduled to begin in mid December 2004 and is expected to last until April 2005. As with all work done on-board ships at sea, unsuitable weather and sea conditions may extend the time required to complete the surveys.

#### **Vessels**

There will be at least two or possibly three vessels working on this project at any point in time.

The largest of these vessels will be the seismic survey vessel, which is some 90 metres in length. This vessel tows behind it all of the equipment required to conduct the survey, possibly up to 6 km in length. As a consequence it has very limited manoeuvrability and other vessels will be requested to keep clear.

The second vessel working on the survey will be a smaller supply vessel. This vessel will escort the survey vessel for most of the survey but will return to port on occasions to load fuel and supplies for both vessels.

The third vessel is likely to be a scout vessel sourced from the local fishing fleet, which will provide a practical and direct interface with the fishing industry throughout the survey.

#### **Seismic Operations**

Seismic operations consist of the release of focused acoustic energy into the seabed from a seismic source towed by the seismic survey vessel. This acoustic energy will penetrate down into the seabed and reflect from various rock layers, back up into an array of hydrophone or acoustic receivers towed by the vessel. The passive towed array is likely to be 6000 metres long and 800 metres wide. Both the acoustic source and the receivers are towed in the sea at a depth of 5 to 10 m below the surface.

Under normal circumstances the operations are conducted in a regular pattern. Such a pattern involves following a fixed course recording the reflected acoustic data for several hours followed by several hours when the vessel will be turning in preparation for the next survey pass. During these course changes no acoustic energy is released.

#### **Environmental Approval**

Apache will be submitting an Environmental Referral to the Commonwealth Department of Environment and Heritage under the Environment Protection and Biodiversity Conservation Act 1999. This referral is in preparation and once submitted can be viewed on the DEH website.

Apache will also be submitting an Environment Plan for approval by the Victorian Department of Primary Industries in accordance with the requirements of the Petroleum Submerged Lands (Management of Environment) Regulations (1999) which will cover activities in Commonwealth and State waters. Copies of the Environment Plan will be made available after it has been approved by DPI.

#### **Further Information and Feedback**

If you would like further information or wish to provide comment or feedback on the proposed Gippsland Basin Seismic Project please contact Libby Howitt on (08) 9422 7481 or email [libby.howitt@aus.apachecorp.com](mailto:libby.howitt@aus.apachecorp.com)

Information newsletters will be posted on Apache's website: [www.apache-energy.com.au](http://www.apache-energy.com.au)

Possible Gippsland Basin Seismic Project

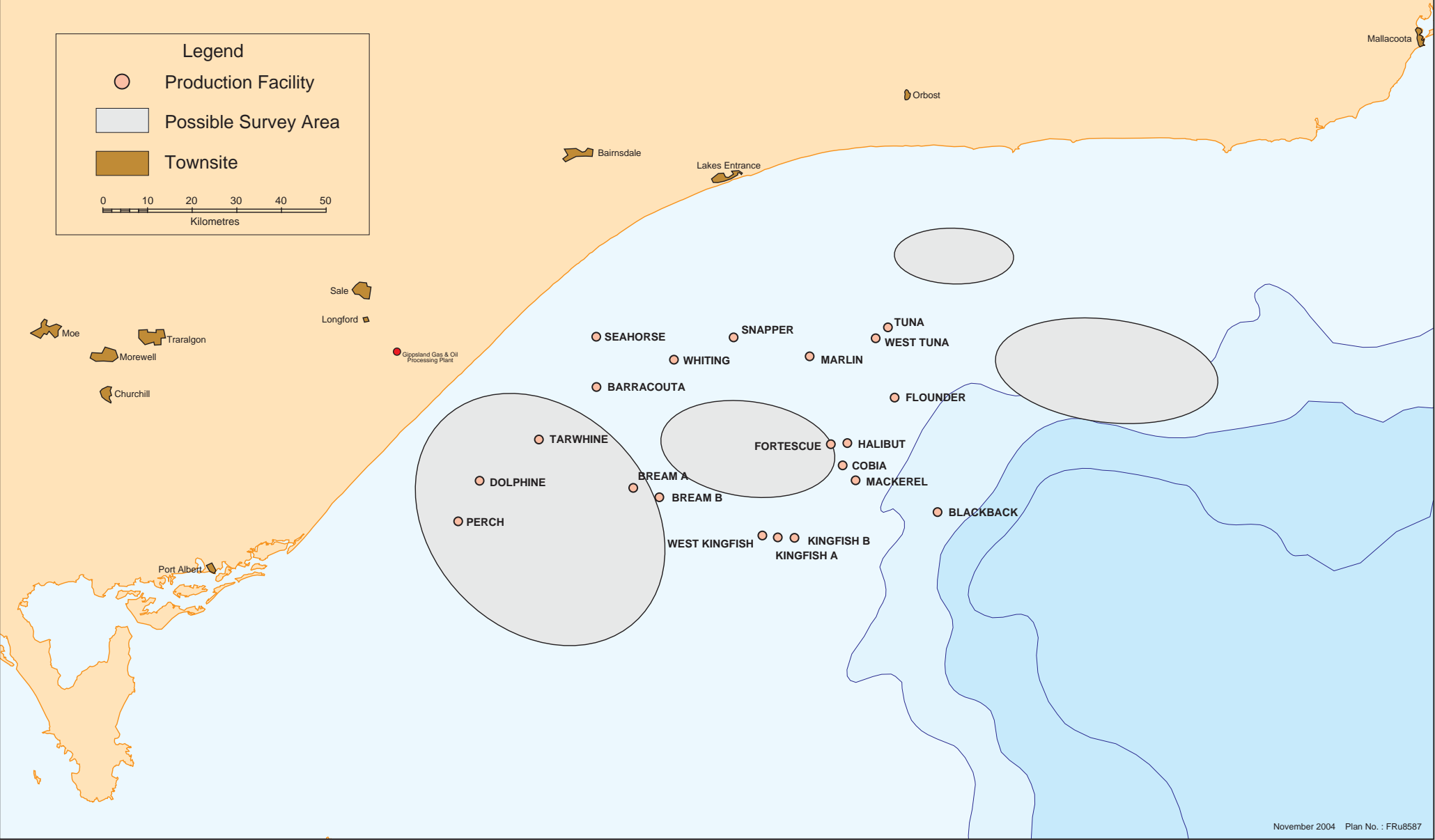


Legend

- Production Facility
- Possible Survey Area
- Townsite

01020304050

Kilometres





#### The Gippsland Basin Seismic Project

This week Apache is able to provide more definition to the areas where the seismic surveys are going to be done. The map showing these areas is included with this newsletter. While this map shows a more accurate representation than that in Newsletter 1, the areas are still subject to change and should not yet be taken as final.

A vessel has now been selected for the project, the "Western Trident", shown in the photograph below.



#### Location

The seismic programme will consist of 5 surveys as indicated on the map and detailed in the table below.

Permit Block	VIC/P41	VIC/P42	VIC/P47	VIC/P53	VIC/P58
Company Reference	Oscar	Omeo	Moby	Bazzard	Sue
Agent for Acquisition	Apache	Apache	Apache	Apache	Apache
Operator	Bass Strait Oil Company	Bass Strait Oil Company	Bass Strait Oil Company	Cue Petroleum Pty Ltd	Apache Northwest Pty Ltd
Vic DPI Survey Name	GAP04D	GAP04C	GAP04A	GAP04E	GAP04B
Probable Sequence	4th	3rd	1st	5th	2nd

#### Timing

The seismic programme is presently scheduled to begin in mid December 2004. It is anticipated that it will take approximately 128 days to complete the survey. This includes an additional 20% accounting for unsuitable weather and sea conditions.

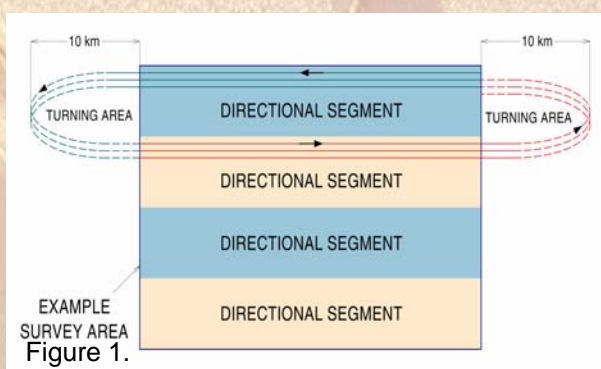
#### Environmental Approval

Apache are finalising the environmental approval documents which should be submitted to the Commonwealth Department of Environment and Heritage (DEH) and Victorian Department of Primary Industries (DPI) next week.

Once submitted the environmental referral to DEH can be viewed on their website.

#### Survey Techniques

Most 3D seismic surveys are now conducted using what has become known as "racetrack" recording. Using this method the survey vessel records a swathe of data in a segment of the survey block on one heading. Then after making a slow turn the vessel moves to another segment and records another swathe of data on the reciprocal heading. The vessel then turns again to the original segment and records an adjacent swathe to the first one. This process is then repeated as consistently as possible as shown in the diagram of Figure 1. This whole process results in a number of long thin racetracks being traced out by the vessel track.



#### Seismic Operations

General information regarding seismic operations was given in Newsletter 1. The extent of the equipment towed by the vessel for this programme is represented in the diagrams in Figure 2.

The acoustic source is normally towed some 75 metres astern of the seismic survey vessel. This source is activated every 8-10 seconds while the vessel is surveying and will not normally be audible to anyone on a passing vessel.



Visually the operation of the source can only be confirmed from above, as the large volume of compressed air, used to create the acoustic source impulse, breaks the sea surface. The source operates at 6 or 7 metres below the surface and is supported by a number of "sausage buoys" on the surface, which are all some 17 metres long.

The 8 acoustic receiver arrays to be used for this project will each be 6 kilometres long. These receiver arrays can be likened to a very long line of sensitive hearing aids all connected up to send what they hear back to the survey vessel. Because of the way these arrays are towed or streamed behind the survey vessel they have become known as "streamers".

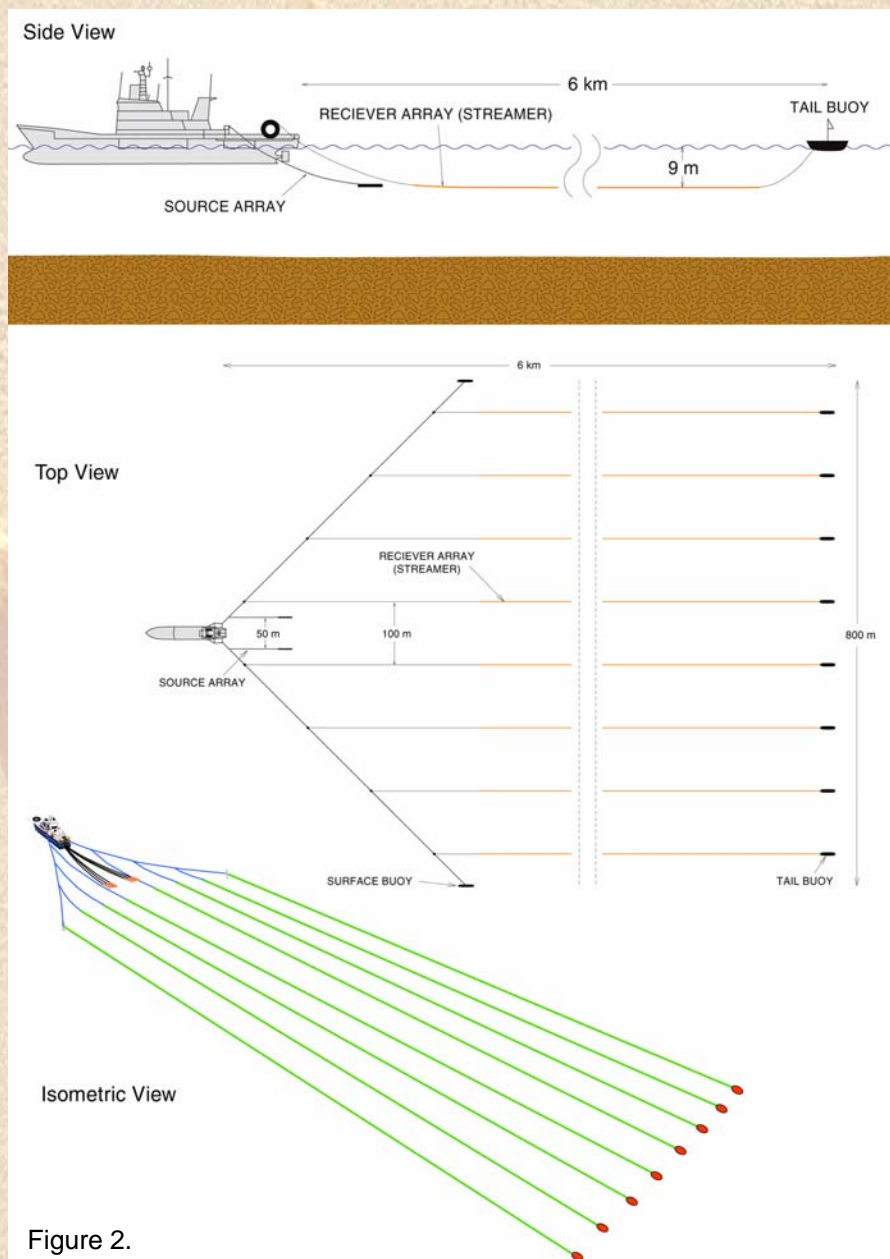


Figure 2.

### **Further Information and Feedback**

If you would like further information or wish to provide comment or feedback on the proposed Gippsland Basin Seismic Project please contact Libby Howitt on (08) 9422 7481 or email [libby.howitt@aus.apachecorp.com](mailto:libby.howitt@aus.apachecorp.com) or Frank Renton via email [frank.renton@aus.apachecorp.com](mailto:frank.renton@aus.apachecorp.com)

Information newsletters will be posted on Apache's website: [www.apache-energy.com.au](http://www.apache-energy.com.au)



# Possible Gippsland Basin Seismic Project



Legend

Production Facility

Possible Survey Area

Townsite

