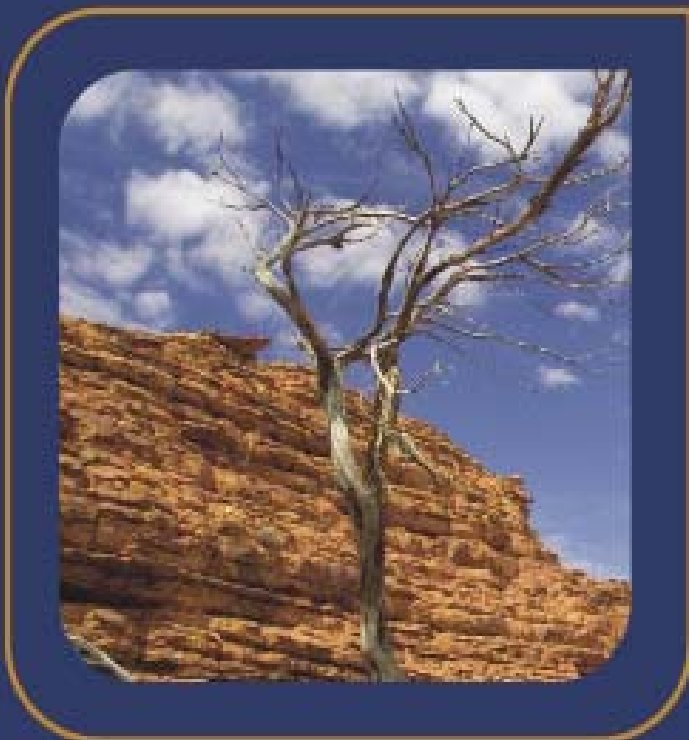


**Summary of** Environment Plan  
Geoscience Victoria

2D Southern Flanks Seismic  
Acquisition Survey (Gippsland Basin)



## Summary

### 1. Introduction

GeoScience Victoria, a department of the Victorian Department of Primary Industries (DPI) is proposing to undertake a 2-dimensional (2D) seismic acquisition survey in the Gippsland Basin located in Commonwealth waters offshore from East Gippsland, Victoria. As such this document has been prepared to facilitate the seismic approval process as required under the *Offshore Petroleum & Greenhouse Gas Storage Act 2006* (OPGGSA) and a Greenhouse Gas Research Consent issued by the Department of Resources, Energy & Tourism (DRET) under Section 425 of the OPGGSA.

The planned seismic activities are expected to commence in February 2010 and will take approximately 60 days to complete subject to weather conditions.

### 2. Project Location

The 2D Southern Flanks Seismic Survey area is located in waters off the Gippsland coast in Bass Strait as shown in **Figure 1**. The area of acquisition is highlighted in red and covers approximately 16,500km<sup>2</sup>. Co-ordinates of the seismic acquisition area are provided in **Table 1**. The survey is planned to acquire approximately 8,000km of 2D seismic data.

Figure 1: Location Map

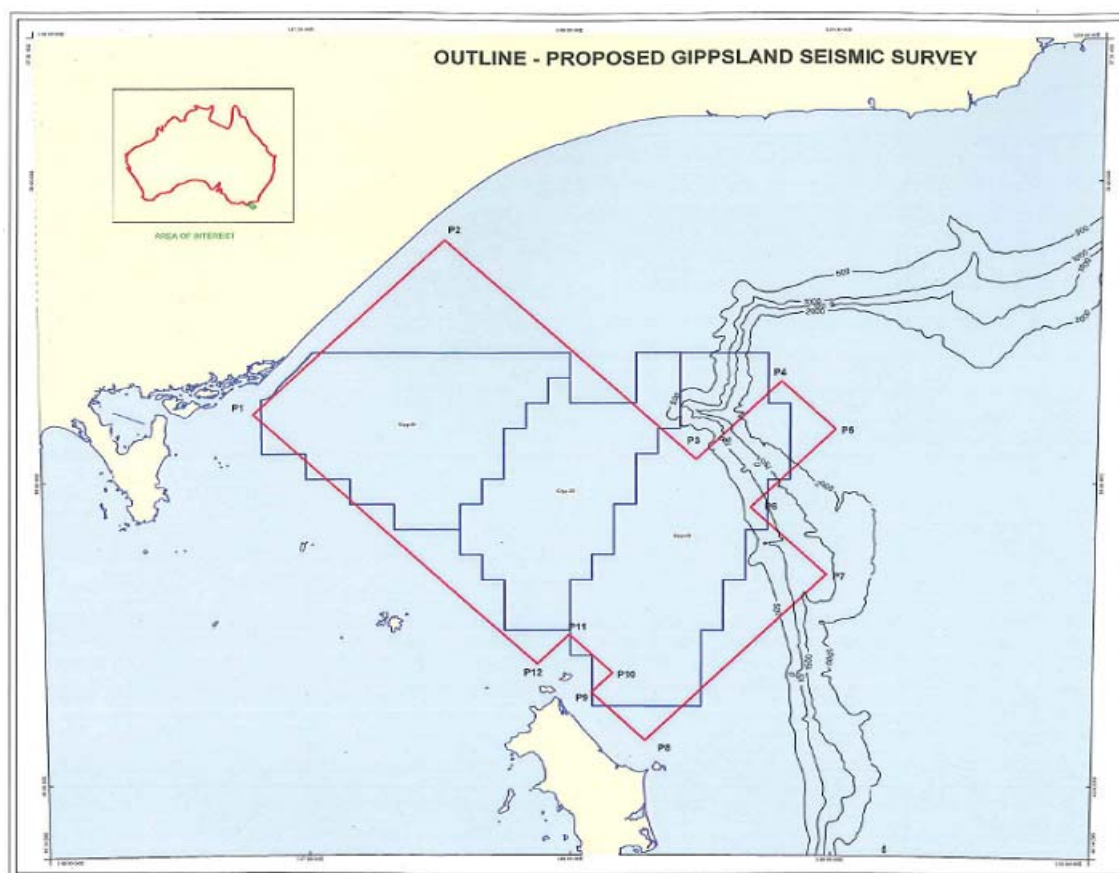


Table 1: Survey Area Co-ordinates

location point	Latitude			Longitude		
	degrees	minutes	seconds	degrees	minutes	seconds
P1	38	47	4.32	146	48	11.64
P2	38	12	36.32	147	31	55.4
P3	38	56	0.85	148	28	47.21
P4	38	40	27.15	148	47	58.4
P5	38	49	51.35	149	0	19.98
P6	39	5	27.05	148	41	9.13
P7	39	18	39.73	148	58	27.28
P8	39	51	43.5	148	17	13.08
P9	39	42	12.98	148	4	51
P10	39	38	20.84	148	9	44.15
P11	39	30	44.84	147	59	50.51
P12	39	36	32.35	147	52	30.54

### 3. Description of Actions

The *MV Aquila Explorer* is a specialist seismic acquisition vessel operated by Seabird Exploration and has been contracted for the survey.

The acoustic source will comprise a 2360in<sup>3</sup> single source array at 5m water depth, firing at 25m intervals (i.e. a source release every 10-12 secs) which will generate a pressure pulse wave through the subsea geological layers. Reflected sound waves will be collected in a single hydrophone collector of approximately 6000m in length towed behind the seismic vessel. The hydrophone cable streamer will be controlled to a depth of 8m below the sea surface and will be mainly gel-filled (solid). There is a very small amount of fluid where the hydrophones are located in the streamer which amounts to approximately 5.9 litres in each 150m section. In each of the three stretches, which are located head and tail of the streamer, there is approximately 250-300L of the chemical Isopar M.

The boat will cruise at a speed of about 4.5 knots through the water and therefore the vessel and its passive trailing gear will transit over any one spot for approximately 40 minutes. The seismic vessel is certified to carry 43 persons.

The seismic vessel will be accompanied by a support vessel, *MV Lady Roula*, that will assist with in-water streamer maintenance, ward away any shipping which may encroach on the operations, provide assistance in the unlikely event of the *MV Aquila Explorer* losing all power, and transfer stores in accordance with approved HSE procedures and maritime regulations.

Mobilisation to the area will be directly from petroleum permits located elsewhere in Bass Strait. Once on site the nearest major port for operational supplies is likely to be Burnie or Melbourne. Re-fuelling will be in port based on a 5 week rotation.

The *MV Aquila Explorer* is fitted with MARPOL compliant pollution control devices for oily water, sewage, putrescibles and incineration. The vessel also operates under a Shipboard Oil Prevention Emergency Plan (SOPEP) which details actions to be taken in the event of a shipboard oil spill emergency. General emergency response is undertaken in accordance with the *MV Aquila Explorer* Offshore Emergency Response Procedure.

Seismic activities are planned to occur on a 24hr operational basis and in sea-states of <4.5m. Streamer/gun deployment and retrieval are limited in sea-states greater than 4.5m.

## 4. Environmental Description

### 4.1 Physical Environment

As part of the interim marine and coastal regionalisation for Australia, the IMCRA Technical Group (1998) has classified the area where the survey is located as part of the meso-scale region defined as 'Twofold Shelf' and 'Flinders'. Water depths in the seismic survey area vary from 20m (near shore) to approximately 2500m. The details of this region are provided in **Table 2** below.

Table 2: Mesoscale Region and Description

Mesoscale Region	Data Description	Description
Twofold Shelf Region	Location	East of Wilson's Promontory and north to Tathra NSW (36°48'S).
	Climate	Moist cool temperate with warm summers and a tendency towards winter-spring rainfall.
	Oceanography	<p>Water temperatures reflect the influence of warmer waters brought into Bass Strait by the East Australian Current, with the southern section of the Twofold Shelf being considerably warmer in summer than other more southerly Tasmanian regions.</p> <p>Along the NSW section coastal oceanographic circulation is influenced mainly by northwards setting coastally trapped waves generated in Tasman Sea waters, although inshore a northerly flowing tongue of Bass Strait water is generally present. Intermittent upwellings occur along parts of the east Gippsland coast. Wave energy is relatively low, particularly in the broader shelf area in the Gippsland Basin. Stalled low pressure systems in the Tasman Sea during summer generate higher wave energy at this time. The wave climate in the NSW section is characterised by a range of typical breaker heights between 1.0 and 2.0m, and a low relative frequency of peak wave energy fluctuations, with a peak of wave energy occurring in February.</p>
	Geology & Geomorphology	The NSW and northern Victorian sections are bordered by the Lachlan Fold Belt and the Victorian coastline is dominated by Quaternary dunes and dune sediments and associated sandy shorelines (mainly Ninety Mile Beach). It also contains numerous occurrences of Palaeozoic sediments and granites. The continental shelf is relatively

Mesoscale Region	Data Description	Description
		narrow in the northern section, becoming much broader (and shallower) in the southern area of the Gippsland Basin. Changes in shelf width are associated with marked changes in coastline orientation, from east facing in the north to south-southeast facing in the south. The continental shelf shows a very steep inshore profile (0–20m), with a less steep inner (20–60m) to mid (60–120m) shelf profile, and a generally flatter outer shelf plain (120–160m) south-west of Cape Howe. Seaward the sediments are poorly sorted, with a median of 92% sand and 8% gravel; they are composed of organic material, with a median of 64.5% calcium carbonate.
Flinders Region	Location	Eastern entrance to Bass Strait and including Wilsons Promontory, Flinders Island and other islands ( not the Kent Group)
	Climate	Cool temperate, meso thermal climate with cool wet winters and warm summers.
	Oceanography	Mean sea-surface temperature varies from 20°C in summer to 13°C in winter. Submaximal wave exposure which is highly variable especially on Wilsons Promontory with wave energy of 18.4kW/m on the western side to 4kW/m on the eastern side where it is protected from the dominant south-west swell direction. Tidal range varies from 2-3m with the greatest range occurring between the islands in the southern part of the region.
	Geology & Geomorphology	Predominantly granite (Wilsons Promontory, Flinders and other Islands) and unconsolidated clastic sediments. Rocky headlands and promontories are prevalent with long sandy beaches between. Located on the continental shelf on the eastern entrance to Bass Strait. Low offshore slopes and extensive offshore reef systems often present in the south but shores plunge steeply onto sandy floor to north around Wilsons Promontory.

## 4.2 Fauna

Previous studies on seabed sediment infauna in eastern Gippsland have indicated that the infauna in the region is rich and diverse with polychaetes, molluscs and crustaceans comprising the majority of individuals and species recorded.

Marine mammals are a feature of the region's fauna. Twenty-seven species of cetacean are listed as potentially occurring in the vicinity of the proposed seismic acquisition area. Both the New Zealand Fur Seal (*Arctocephalus forsteri*) and Australian Fur Seal (*Arctocephalus pusillus doriferus*) are found within the region.

It is estimated that there are over 500 species of fish found in the waters of Bass Strait many of them having commercial importance There are also two species of fish that are listed as 'conservation-dependent' within the region. Two species of shark, the White Shark (*Carcharodon carcharia*) and Whale Shark (*Rhincodon typus*) are listed under the EPBC Act as occurring in the region, have a threatened status (vulnerable) and are a listed migratory species. An additional 30 species of fish (including pipefish and seahorse species) are also listed under the EPBC Act and require a permit to remove from the area.

The Bass Strait area also traditionally provided habitat for commercial scallops (*Pecten fumatus*) and fisheries. Current fishery closures are now limiting commercial harvesting of stock to provide for fishery recovery.

There are no islands or seabird colonies within the proposed seismic acquisition area. A search of the EPBC database, documents that 19 bird species are listed under the EPBC Act as threatened species. This includes 16 species of albatross, and 3 species of petrel. One additional species of albatross is listed as migratory. These threatened/migratory bird species may overfly and forage within the survey area, however given the seismic program is at least 10km from islands or rocky outcrops, the seismic activity is not expected to have a significant impact on these species.

In the South-east Marine Region, 115 marine pest species have been introduced and an additional 84 have been identified as cryptogenic. The seismic vessel will mobilise from Western Australian waters.

### **4.3 Conservation Areas**

The seismic survey is not in proximity to, nor does it impact World/National Heritage properties, RAMSAR wetlands, threatened ecological communities, Commonwealth conservation reserves/parks or critical habitats. The Commonwealth marine parks of Beagle, Flinders and East Gippsland are respectively 6km SW, 73km SE and 80km NE from the closest boundaries of the seismic survey area.

### **4.4 Socio-Economic Activities**

The commercial fisheries operating in the Bass Strait area is a high value industry. Consultation with the fishing industry will be undertaken before any activities commence.

Bass Strait is one of Australia's busiest shipping areas. In East Bass Strait two traffic separation schemes have been instituted to enhance safety of navigation by separating shipping into discrete one-direction lanes. In addition, there is an Oil Rig Exclusion Zone (Area to be Avoided) designated by the IMO. As such all ships over 200 gross tonnage are not permitted in the area and are restricted to the shipping channels to the east and south of the area.

Bass Strait contains large deposits of oil and gas of national economic significance producing. Esso/BHP has been the dominant oil and gas producer in the Gippsland Basin since the early 1960's. Other producers include Santos, ANZON and Nexus Energy. Seismic and drilling activities routinely occur in the Gippsland Basin. Key explorers include Esso/BHP, Santos and the Bass Strait Oil Company Ltd (BSOC).

## **5. Major Hazards and Controls**

A formal qualitative risk assessment of potential routine & non-routine environmental impacts was carried out by a methodology consistent with the Australian/New Zealand Standard AS/NZS 4360:2004 Risk Management and HB203:2006 Environmental risk management- Principles and process.

Potential environment effects associated with seismic acquisition survey offshore include:

- The physical presence of the vessel (lighting, anchoring, interference with other marine users);
- Introduction of Exotic Species (ballast discharge, biofouling);
- Discharges to the Marine Environment (sewage, oily water, foodscraps, atmospheric emissions);
- Use of the seismic air gun array (acoustic disturbance to marine fauna); and



- Oil or chemical spills.

The management practices identified in Appendix A keep environmental risks as low as reasonably practicable (ALARP) while maintaining economic viability for the proposed activity. These management practices are taken into consideration in calculating the residual risk associated with the activity of impact.

## 6. Management Approach

GeoScience Victoria is committed to protection of the environment in all activities it undertakes. Activities are undertaken in accordance with relevant legislated standards and where legislated standards do not exist, responsible standards are adopted.

Successful environmental outcomes are achieved by understanding how proposed activities interact with the environment, identifying possible and foreseeable impacts, and implementing management controls which eliminate or reduce the environmental risk to as low as reasonably practicable.

Implementation of controls is managed systematically with all personnel appropriately trained and aware of possible environmental impacts associated with their activities, and equipment maintained to ensure integrity.

Environmental performance is monitored and reviewed to ensure continuous improvement in achieving environmental outcomes (objectives & standards).

All shipboard personnel, including contractors, are required to attend an environmental induction prior to mobilization.

Specific environmental commitments contained in the EP are captured in the GeoScience Victoria Seismic Program Environmental Commitments Register, which forms the basis of an implementation checklist for the seismic activities and ensures appropriate implementation of environmental management measures.

An environmental monitoring program has been identified in the EP for the Southern Flanks 2D Seismic Program to verify environmental performance objectives.

## 7. Stakeholder Consultation

### 7.1 Fisheries

GeoScience Victoria has commenced consultation with the commercial fishing industry to determine possible impacts and mitigation measures (as appropriate) to reduce impacts on these marine stakeholders to as low as reasonably practicable. The following groups have been advised of the activity:

- Australian Fisheries Management Authority (AFMA);
- Victorian Department of Primary Industries (Fisheries & Aquaculture);
- Tasmanian Department of Primary Industries, Parks, Water and Environment (Wild Fisheries Management Branch);
- Tasmanian Scallop Fisherman's Association;
- Victorian Scallop Fisherman's Association;
- Victorian Recreational Fishing (VR Fish);
- Tropical Tuna Management Advisory Committee;

- Lakes Entrance Fishing Cooperative Ltd (LEFCOL);
- Twofold Bay Fishing Cooperative;
- San Remo Fishing Cooperative;
- South-east Trawl Fishing Industry Association (SETFIA);
- South East Fishing Association (SEFA);
- Commonwealth Fisheries Association (CFA);
- Seafood Industry Victoria (SIV);
- Tasmanian Fishing Industry Council;
- Tasmanian Rock Lobster Fishermans Association;
- Victorian Abalone Divers Association; and
- Victorian Rock Lobster Association.

GeoScience Victoria is continuing discussions with all fishing groups to resolve identified concerns as far as practicable. Consultation will continue throughout the seismic program.

## 7.2 Other Stakeholders

Other stakeholders consulted regarding the proposed seismic program include:

- Department of Resources, Energy & Tourism (DRET);
- GeoScience Australia;
- Department of Environment, Water, Heritage & the Arts (EPBC Referral);
- Australian Maritime Safety Authority (Navigation Warnings);
- Border Protection Command (Defence/Customs related issues);
- Petroleum operators within the Gippsland Basin including:
- Esso Australia Resources Pty Ltd;
- Bass Strait Oil Company;
- Exoil Limited;
- Nexus Energy;
- Stuart Petroleum;
- 3D Oil Limited;
- Apache;
- DrillSearch; and
- Strategic Energy Resources Pty Ltd.

## 8. Contact Details

Further details on the seismic program can be obtained from:

Contact: Dr Matthias Raab

Position Project Manager Energy/Senior Geoscientist

Organisation: Department of Primary Industries- Geoscience Victoria



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Appendix A: Risk Assessment

Aspects	Impacts	Mitigation Measures	Residual Risk
Acoustic Noise – Survey	Damage to &/or behavioural changes to marine mammals (Cetaceans)	<p>No known feeding/breeding or aggregation grounds in proximity to survey area</p> <p>Implement &amp; comply with requirements of the DEWHA Industry Guidelines <i>Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales (2007)</i> (includes soft-start, power-down, shut-down procedures)</p> <p>Cetacean sightings during survey forwarded to DEWHA</p> <p>All sightings of dolphins when the MMO is not on watch will be brought to the immediate attention of the MMO so an informed identification of the species can be made as quickly as possible.</p> <p>Marine Crew supplied with APPEA CD as part of induction process</p> <p>Experienced MMO onboard to assist with cetacean observation.</p>	LOW
	<p>Damage/behavioural changes to fish species</p> <p>Impacts to fish yields</p>	<p>Effects of seismic transitory except at close range. No lethal effects have been observed for adult fish, crustaceans or shellfish exposed to seismic arrays (McCauley, 1994)</p> <p>Sharks thought to be less sensitive to seismic (lack of swim bladder)</p> <p>Fish may be displaced temporarily</p>	LOW

Aspects	Impacts	Mitigation Measures	Residual Risk
Acoustic Noise – Survey	Damage to invertebrates (scallops)	<p>Seismic activities undertaken after spawning period (Oct-Dec) &amp; after spat settlements (+1mth after spawning)</p> <p>Seismic activities will not physically disturb spat beds</p> <p>Research undertaken (Parry et al, 2002) indicates that no significant impacts to adult scallops result from seismic activities</p> <p>Seismic program and lines to accommodate sensitive fishing areas where possible (based upon precautionary principle)</p> <p>Lowest practicable source size used in the survey</p>	LOW
Seismic Vessel Presence & Movement	Interference with Commercial Shipping (risk of vessel collision)	<p>Seismic activities transient with no permanent infrastructure left on seabed (i.e. no petroleum safety zones disrupting shipping lanes)</p> <p>Information on the location and timing of seismic program to be communicated to vessels via AMSA through a Notice to Mariners issued for the activity's duration</p> <p>Navigation lighting on <i>Aquila Explorer</i></p> <p>Vessel equipped with navigation aids (radio, radar &amp; visual watches) &amp; crew vigilant for commercial vessels during survey</p> <p>Crew competency with required maritime training standards</p> <p>Escort vessel available to manage vessel interactions (i.e. vessel's not responsive to radio and radar) &amp; minimise interference with seismic equipment</p> <p>Providing program to pilot stations to ensure that departing crews are aware of seismic activities</p> <p>In accordance to MARPOL, the vessels will operate under Shipboard Oil Pollution Emergency Plan (SOPEP). Crew is trained in preparedness and routine drills undertaken</p>	MEDIUM
	Interference with Commercial Shipping (risk of streamer collision/damage)	<p>Mitigation measures as per Interference with commercial shipping (risk of vessel collision) (Detailed above)</p> <p>Streamer depth increased as far as possible to avert possible damage</p>	LOW

Aspects	Impacts	Mitigation Measures	Residual Risk
Seismic Vessel Presence & Movement	Interference with Commercial Fishing vessels (Economic impacts)	<p>Seismic Program details forwarded to fisheries liaison point for distribution</p> <p>Seismic vessel to accommodate fishing vessels by alternate line acquisition if a conflict where possible</p> <p>Local vessel to act as escort/liaison vessel to the <i>Aquila Explorer</i></p> <p>Engage Fisheries Representative to educate seismic crew on fishing techniques/types in area</p> <p>Detailed Notifications to marine users prior to survey commencement (vessel type, survey conducted)</p> <p>Continued consultation with fishing industry groups during seismic activity</p> <p>Interactions monitored and recorded (including interaction position data)</p>	LOW
	Interference to other marine users (oil & gas & other infrastructure)	<p>Notification to marine users of activity details &amp; survey commencement timeframe (requesting details associated with any planned diving activity within 3-4 months)</p> <p>Observe legislated petroleum safety zones around oil and gas facilities (500m)</p>	LOW
Seismic Vessel Lighting	Interference with marine fauna and birds	<p>Light emissions are in accordance with navigation safety and workplace safety requirements</p> <p>Extent of light-spill limited</p> <p>Survey area located at distance from nearest land</p>	LOW
Seismic Vessel Anchoring	Anchoring activity creating disturbance to seabed benthos	<p>Seabed substrate is predominantly sand allowing for rapid recolonisation</p> <p>No anchoring except in emergency</p>	LOW
Ballast Water Discharges	Introduction of exotic species which colonise and create competition for local resources	<p>Initial mobilisation internationally will observe AQIS Australian Ballast Water Management Requirements</p> <p>Mobilise to Gippsland Basin from Western Australian Waters</p> <p>Local ballasting only during seismic within survey area</p>	LOW
Vessel Bio-fouling	Introduce bio-fouling species/colonisation	<p>Vessel to be assessed for bio-fouling risk prior to entry to Gippsland Basin</p> <p>Mobilisation from WA waters to Gippsland Basin</p>	LOW

Aspects	Impacts	Mitigation Measures	Residual Risk
Grey water/sewage disposal	Increased nutrients in surrounding marine waters on discharge Visual amenity impacts	Sewage is treated in accordance with equipment approved under MARPOL 73/78 requirements MEPC.2(VI) Grey & black water directed to system (low volume) – POB (43) High dispersal/dilution in Bass Strait environment Discharge constraints in accordance with the requirements of the Protection of the Sea (Prevention of Pollution by Ships) Act 1983	LOW
Oily water discharges from equipment spaces	Toxicity impacts to marine flora & fauna Reduction of water quality	Oily water passes through an oil/water separator and treated to an oil-in-water content <15ppm (MARPOL 73/78 Annex 1) Oily water discharged via an IMO approved Oil-in-water (OIW) meter as per MARPOL 73/78 Annex 1 <b>with shutdown on excursion</b> Separated oil store in dedicated tank for onshore disposal (refer <i>Special wastes</i> ) Activity recorded in the Oil Record Log (onboard) Low volumes discharged and rapid dilution/dispersion in marine waters	LOW
Putrescible waste (food-scrap)	Increased nutrients in surrounding marine waters on discharge Visual amenity impacts	Waste macerated to less than 25mm particle size in accordance with MARPOL 73/78 and discharged below water line Low volumes discharged and rapid dilution/dispersion in marine waters Discharge constraints in accordance with the requirements of the Protection of the Sea (Prevention of Pollution by Ships) Act 1983	LOW
Special waste disposal (onshore)	Toxicity impacts to marine flora & fauna Reduced water quality Visual amenity impacts	Identification of waste reduction measures (at source) to prevent waste generation Clear waste identification, segregation, containment (in skips or sealed drums) and labelling; Waste storage areas are routinely inspected; Special waste disposed or recycled onshore Training and reinforcement to all crew (& other) personnel of waste management requirements; Documented Disposal Records.	LOW

Aspects	Impacts	Mitigation Measures	Residual Risk
Incineration of solid Non-Biodegradable wastes (paper, plastic & wood) & Equipment Combustion	Reduction in air quality Aesthetic impacts of smoke	Segregation/disposal requirements detailed in Vessel Garbage Management Plan Low volumes generated and rapid dilution/dispersion in atmosphere Regular equipment monitoring and maintenance undertaken to ensure maximum efficiencies All emissions from marine utilities are in accordance with the guidelines in MARPOL Annex VI Prevention of Air Pollution from Ships Diesel usage monitored	LOW
Fuel transfer spill (Seismic vessel)	Impacts on water quality and marine life	No 'at sea' refuelling planned for seismic campaign Five week endurance & refuel at port facilities via documented procedures	-
Fuel transfer spill (Escort Vessel)	Impacts on water quality and marine life	Chase boat – 20 days endurance – may refuel at sea (small vessel) via diesel drums Activity will be undertaken in accordance with approved Refuelling Procedures with all associated equipment routinely maintained and inspected; Suitable absorbent material is held on the vessel to cleanup small diesel spills; Availability of implemented and tested SOPEP.	LOW
Diesel spill due to vessel collision/grounding	Impacts on water quality and marine life Shoreline Pollution (very low probability) Disruption to fishing activities	Navigational aids on the vessel including navigation lighting, radars, radio and visual surveillance to avoid collision/grounding. Vessel operated by experienced and competent crew with access to bathymetric and marine charts Grounding risk low due to distance from nearest landmass (10km) and lack of emergent landforms in the survey area. Availability of implemented and tested SOPEP Procedure for close approach for platforms & shoals	LOW



Aspects	Impacts	Mitigation Measures	Residual Risk
Streamer Loss	Impact to seabed & marine environment & fishery equipment	<p>Streamer constructed of sponge material and not kerosene.</p> <p>Small volumes of Isopar M – MSDS states low environmental hazard &amp; high degradability</p> <p>Streamer has buoyancy and does not immediately sink to seabed, hence more readily retrievable.</p>	LOW
Chemicals spills	Impact on water quality and marine life	<p>Small quantities of chemical are stored onboard</p> <p>Chemicals are packaged &amp; labelled in accordance with legislation</p> <p>Crew members trained in the handling and PPE requirements of specific chemicals</p> <p>All chemical storage areas are appropriately signed and labelled with instructions and warnings;</p> <p>Lithium batteries – handling instructions on storage</p> <p>Chemical storage areas routinely inspected;</p> <p>MSDSs are to be made available for all chemicals;</p> <p>Spill kits to be provided in appropriate locations.</p>	LOW