The Petroleum Oil and Gas Corporation of South Africa (Pty) Ltd.
Reg. No.1970/008130/07

ENVIRONMENTAL MANAGEMENT PROGRAMME

FA-EM PRODUCTION AREA

DOCUMENT DATE	REVISION
February 2010	01
March 2026	02

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EXTERNAL EMPr COMPILING TEAM: SUMMARY OF QUALIFICATIONS AND EXPERIENCE

Sue Lane – Lwandle Technologies, Cape Town: *Sue holds a Masters degree in Environmental Science (UCT, 1990) and has theoretical and practical experience in international and domestic marine law. She has been leading and participating in environmental planning and management for the offshore oil and gas industry in Southern Africa since 1999, including decommissioning of infrastructure in South Africa and Angola.*

Dr Robin Carter – Lwandle Technologies, Cape Town: *Robin holds a PhD in marine ecology (UCT, 1983). From 1983 – 2005 he conducted contract work on oil and gas developments on continental shelves, harbour developments, primarily in Saldanha Bay, estuary management and mariculture development focussing on abalone, initially for CSIR and then as an independent specialist consultant. In 2005 he joined Lwandle Technologies (Pty) Ltd and has since led or participated in >35 contract studies which include work on offshore oil and gas developments and aspects of oil field decommissioning in RSA and Angola. Robin is registered as a Professional Natural Scientist in marine science with the South African Council for Natural Scientific Professions (registration # 400245/060).*

Craig Matthysen – Lwandle Technologies, Cape Town: *Craig holds a Master of Science degree in Physical Oceanography (UCT, 1994), and has qualifications and practical experience in Business and in Quality management. He also has wide experience as a field oceanographer on many continents, deploying survey and metocean equipment and interpreting data for clients. Craig also has experience in sales and marketing. He is now part owner of and runs Lwandle Technologies (Pty) Ltd.*

Errol Cerff – Independent Specialist, Cape Town: *Errol has an M.Sc in Biological Sciences from the University of Natal (1985). He has had extensive experience in strategic and technical evaluations of a wide range of industries and public enterprises. His analytical and strategic skills have been honed by participation in drafting white papers and legislation as well as developing strategic plans. Whilst in his employ with the CSIR he was involved in the environmental assessment of Soekor offshore sites and therefore has a detailed knowledge of the industry.*

Jessica Hughes - Independent Environmental Consultant, Cape Town: *Jessica holds a Masters degree in Zoology from the University of Natal (1991) and a Masters degree in Environmental Science (UCT, 1993), and has 18 years experience in a wide range of environmental impact assessments and management plans including several for the diamond mining and oil/gas industry offshore Southern Africa.*

Revision 1 Team- EIMS

Revisions to the EMPr undertaken for Revision #01 were undertaken by Liam Whitlow form EIMS. Liam Whitlow is an experienced Environmental Scientist with a B.Sc. Honours in Environmental Management and over 25 years of professional experience. Liam is a registered Environmental Assessment Practitioner and Professional Natural Scientist. His expertise includes environmental impact assessments, project management, and environmental monitoring, with significant experience in the oil and gas, mining and infrastructure sectors.

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Reviewer 14	*Dian John*	*Environmental Leader*	*March 2026*

CONTENTS

ACRONYMS & ABBREVIATIONS USED IN THE EMPr

µg chl*a*/litre	micrograms of chlorophyll 'a' per litre
mg C/m^2/hr	milligrams of carbon per square meter per hour
CALM	Catenary Anchor Leg Mooring
DEA	Department of Environmental Affairs
EMPrs	Environmental Management Programmes
E&P	Exploration and Production
EXCO	PetroSA Executive Committee
FPF	Floating Production Facility
FPSO	Floating Production Storage and Off-loading vessel
GTL	Gas to Liquid
JOC	Joint Operation Centre
MANCO	PetroSA Management Committee
MARPOL	International Convention for the Prevention of Pollution from Ships 73/78
MPAs	Marine Protected Areas
MEG	Mono Ethyl Glycol
MPRDA	Minerals and Petroleum Resources Development Act 28 of 2002
MPRDAA	Minerals and Petroleum Resources Development Amendment Act 49 of 2008
MSDS	Material Safety Data Sheet
NEMA	National Environment Management Act 107 of 1998 (as amended)
OHS	Occupational Health and Safety 85 of 1993 (as amended)
OIM	Offshore Installation Manager
PASA	Petroleum Agency of South Africa
PLEM	Pipeline End Manifold – connection system
PPE	Personal Protective Equipment
ROV	Remote Operated Vehicle
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resources Agency
SAMSA	South African Maritime Safety Authority
SCG	South Coast Gas
SHEQ	Safety, Health, Environment and Quality
UCT	University of Cape Town
UTA	Umbilical Termination Assembly – control system

section 1: introduction

1.1 NAME OF PRODUCTION AREA

FA-EM Production Area

1.2 CONTACT PERSON

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1.3 AREA & LOCATION

This EMPr covers the FA-EM production area in Petroleum Licence Block 9, located offshore the South coast of South Africa within what is known as the Bredasdorp Basin.

PetroSA's Block 9 licence area covers a surface area of 22,756km2 and presently includes four production lease areas: FA-EM; South Coast Gas (SCG), Sable and Oribi/Oryx (Figure 1.1 below). Each of these areas is required to have its own EMPr. The FA-EM, SCG, and Sable lease areas currently produce gas from about 19 wells (of which five wells at the FA Platform; one well at the satellite gas fields; and a further five wells in the EM Block, are currently operational). All gas flows to the FA Platform where it is processed; condensate is separated out and the gas and condensate are pumped ashore, in two separate lines, to the GTL refinery at Mossel Bay. The Oribi/Oryx field currently produces oil from 4 production wells which flows to and is processed at the ORCA, a floating production refinery, from where it is pumped to a buoy for loading onto a shuttle tanker for onward shipment, to the Port of Saldanha Bay.

The location of the FA-EM production area within the context of the other production areas in Block 9 is illustrated in Figure 1.1. The FA-EM production area is made up of the FA gas fields and the adjoining FA Satellites gas fields (covered by the grey FA lease area in the figure) and EM-EBF fields some 50 km to the west (pink and yellow blocks in the figure) of the FA Platform.

A fixed manned platform in the FA field is situated at 340 58,2' south and 220 10,2' east, about 85 km south of the coastal town of Mossel Bay. The nearest point to shore from the platform is the Gouritz River mouth about 74 km away.

The Co-ordinates of the 223.92 km^2 FA Lease Area are described by the Surveyor General in S.G. No. 2315/2007 and the layout, with gas wells, is illustrated in Figure 1.2. Figure 1.3a illustrates the layout of the EM mining lease area with gas wells. The co-ordinates of the EM area are described by the Surveyor General in S.G. No. 2315/2007. Also included in this production area is a single well in the adjoining EBF block, illustrated in Figure 1.3b.

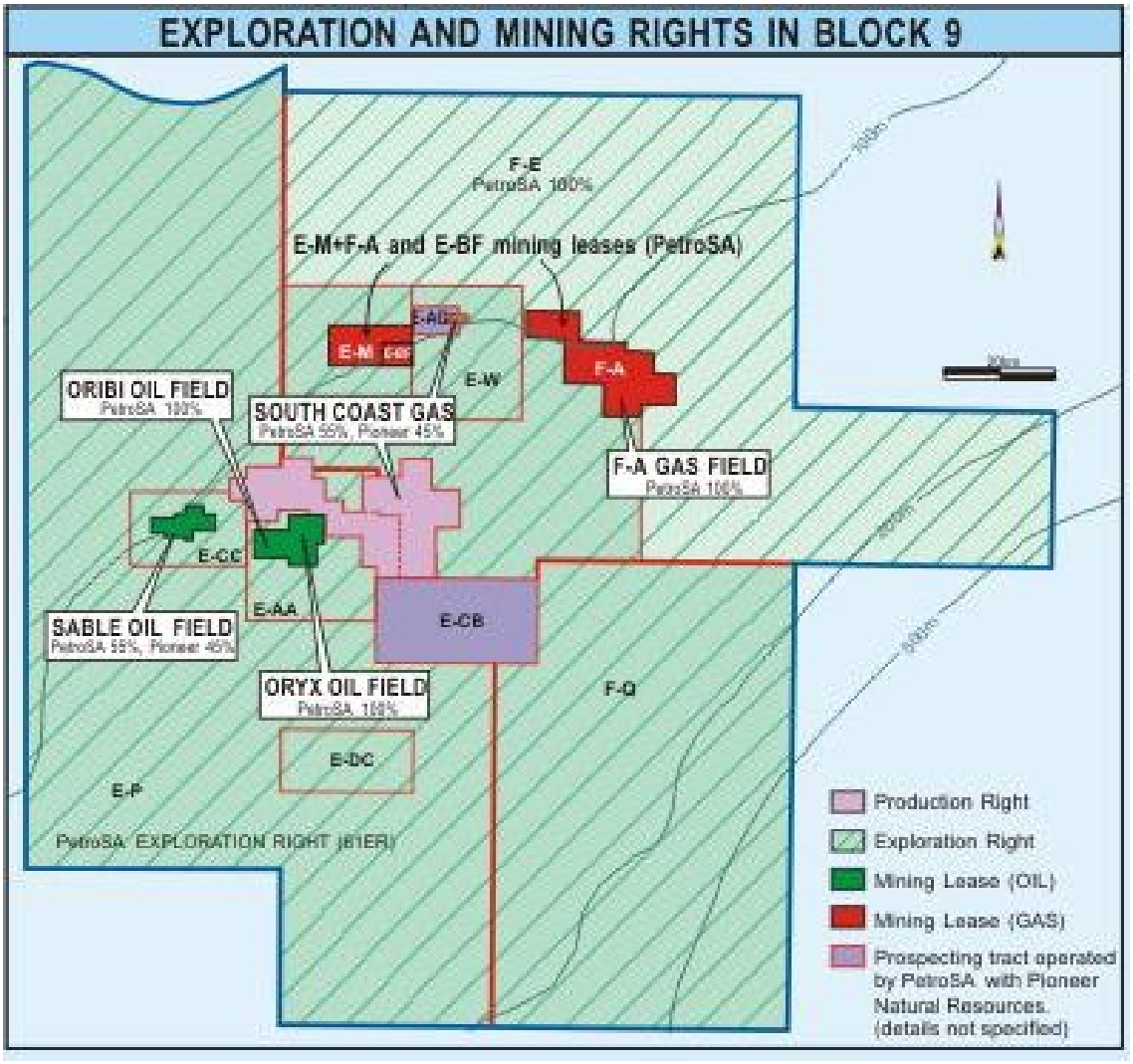

Figure 1.1: Location of the FA-EM Production Area (red blocks) within the context of the other production areas in Block 9 offshore Mossel Bay (from PetroSA).

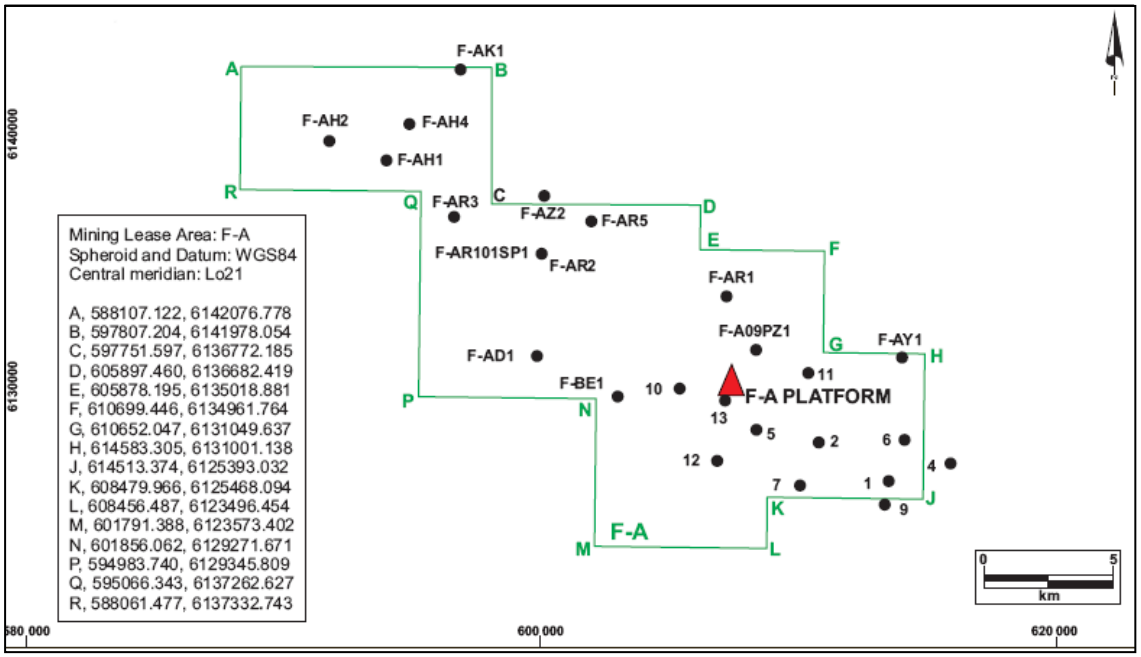

Figure 1.2: Detail of the FA lease area which includes the FA Platform and FA gas fields (in the south eastern sector of the block) and FA Satellite gas fields (in the north western sector) (Source, PetroSA).

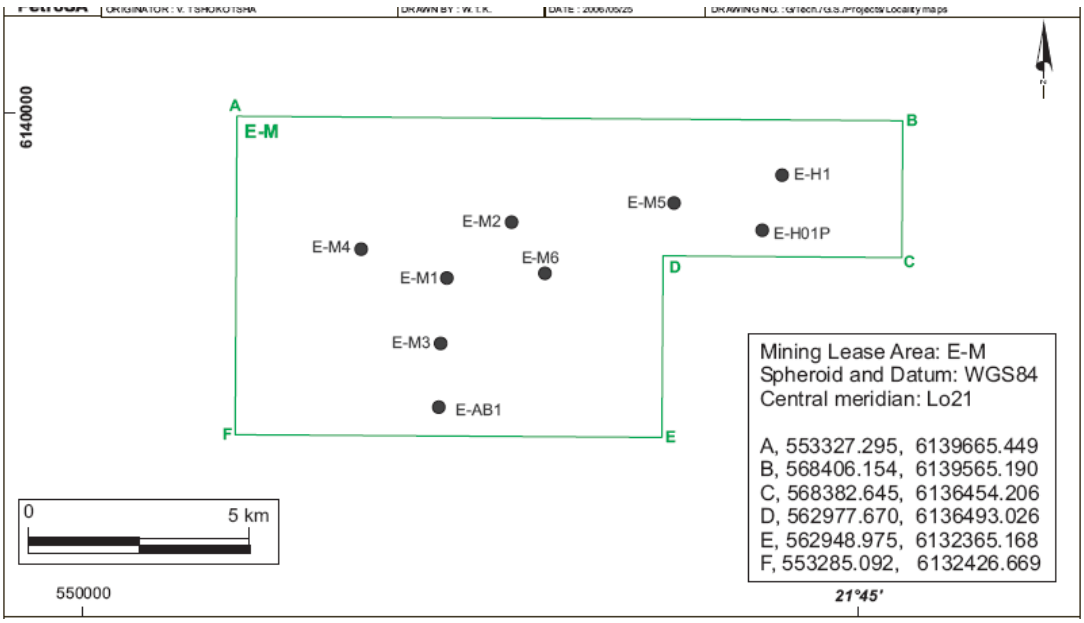

Figure 1.3a: Detail of the EM lease area and wells (Source, PetroSA).

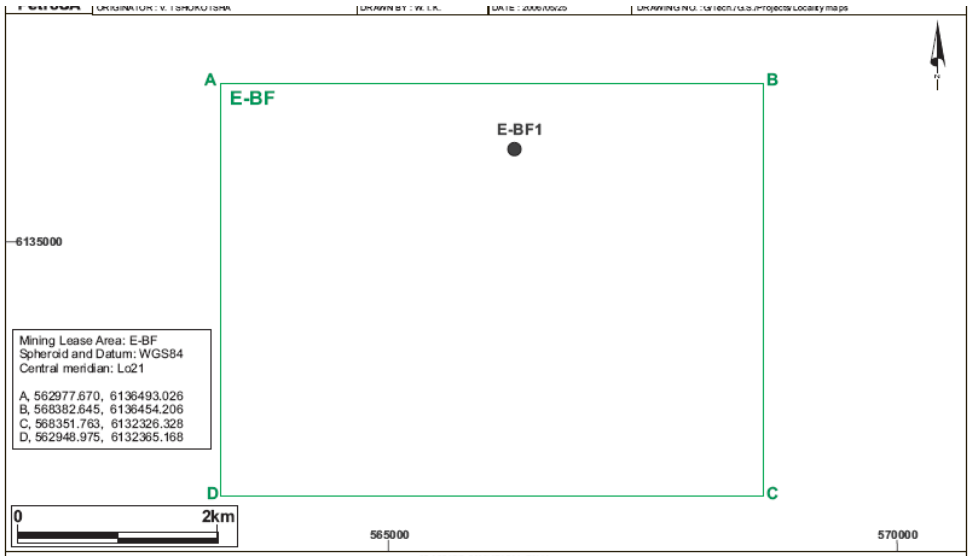

Figure 1.3b: Representation of the EBF section of the EM facility. EBF was one of the wells that was never productive. (Source, PetroSA).

1.4 BRIEF DESCRIPTION OF OPERATIONS

The FA-EM production area comprises the following gas wells:

- Nine almost immediately beneath the FA Platform of which five of the wells are presently in production and four have stopped flowing.
- Three wells in the Satellite gas fields of which only one is still in production. These wells are linked to the FA Platform via a 16 km multiphase subsea pipeline; the control of the subsea wellheads is via an umbilical cable running between the subsea trees and the FA Platform, and
- Seven wells in the EM field, also including E-BF01P, of which five are still in operation and two (including E-BF01P) have never produced gas. All the wells in the EM field are connected to the FA Platform via an 18" subsea production pipeline which is about 50km long. This pipeline also supports a 3" flow line that is used to inject MEG from the Platform at the furthest point of the field PLEM (Pipe Line End Module) as a hydrate inhibitor. Three wells from this field are operated from the FA via the EM Control Buoy, located approximately at the centre of the reservoir areas. Unlike the other fields, the F-A control room is connected to the Control Buoy via a microwave link for communication with the facility and the wellheads. The Control Buoy contains control facilities to enable the safe operations of the remote subsea wells. The other two wells in the field are controlled directly from the F-A Platform PCR via a control umbilical.

As described above, at the FA Platform, produced gas and condensate from the aforementioned wells, and from all other gas fields in Block 9, is processed and separated before they are exported to the GTL plant through two separate pipelines.

This Platform is the central and largest piece of fixed offshore infrastructure in the Block and is secured by 24 piles (supports), each 2 meters in diameter, driven 120 meters into the seabed. It is connected to the shore and to the gas fields via separate concrete-coated pipelines. The water depth at the Platform is approximately 104m, and the top of the platform is ~116m above sea level.

The Platform is a self-sufficient facility as it generates its own power and produces it own potable water.

1.5 EMPr CONTEXT

The FA gas field was discovered in 1980, and the Platform and associated Gas to Liquid (GTL) refinery were commissioned in 1992 by SOEKOR. This development predated formal EMPr requirements as stipulated in law in terms of the Minerals Act, 50 of 1991 and (more recently) the Mineral and Petroleum Resources Development Act, 28 of 2002 (the "MPRDA") which repeals the Minerals Act, so is operated in accordance with procedures laid down in the FA Platform's Operation Manuals, and with the operational phase section of the 2007 EMPr for the South Coast Gas project.

The FA Satellite gas fields were Commissioned in 1997 by Mossgas to feed gas to the FA platform, and are operated in accordance with a 1996 EMPr, updated by procedures laid down in the FA Platform's Operation Manuals and in accordance with the operational phase section of the 2007 EMPr for the South Coast Gas project.

The EM gas field was commissioned in 2001 by Mossgas to supply gas to the FA platform. It is operated in accordance with a 1998 EMPr drawn up as an addendum to the Satellite Fields EMPr compiled in the same year, and updated by procedures laid down in the FA Platform's Operation Manuals and in accord with the operational phase section of the 2007 EMPr for the South Coast Gas project.

The original reports broadly describe the management of the operational phase, and set objectives for the decommissioning and closure phase, of the fields. An updated EMPr is required for (i) conversion of the current Mining Rights, issued under Section 25(1)(g) of the Mining Rights Act 20 of 1967, to a Production Right in terms of Section 84(1) of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA); and (2) to cater for eventual decommissioning and closure.

1.6 PURPOSE & SCOPE OF THE UPDATED EMPR

The revised and updated Environmental Management Programme (EMPr) (this document) covers the operational phase and makes provision for decommissioning. It reflects changes that have taken place in the company structure, legal requirements and operational activities. Specifically, the EMPr has been upgraded to:

- Comply with the applicable requirements respectively of the NEMA and the MPRDA for current activities, and make provision for the development of a detailed EMPr for decommissioning activities;
- Supersede previous versions of the EMPrs encompassing operation and decommissioning of the FA-EM Production Area;
- Contain the same standards and reporting requirements as all other EMPrs for production areas in Block 9.
- Only deal with environmentally-related actions or activities for which staff of the offshore installation is directly responsible. The EMP therefore does not deal with activities such as:
    - obtaining permits or a licence to operate, since operations are already approved,
    - corporate social responsibility programmes, and
    - health and safety (for which a number of operational procedures exist) except where such issues can have environmental consequences.
- Integrate with existing PetroSA management systems and procedures, primarily the environmentally-related issues within the Safety, Health and Environment Quality (SHEQ) procedures. Accordingly, this EMPr summarises key elements of PetroSA's activities/ actions that are relevant to environmental management to facilitate environmental compliance and performance auditing during operations and decommissioning.

1.7 CLOSURE OF THE FA-EM PRODUCTION AREA

Decommissioning the Block 9 infrastructure will take place at some time in the future, and will be subject to obtaining various authorisations (refer to legal opinion by Smith et al 2010). There will be a number of processes which must be followed to design the details of, and obtain approval/s for, decommissioning.

Furthermore, by the time decommissioning is to be undertaken laws may have changed and technology may have advanced so making possible some options which are currently impossible. In addition, our knowledge of the marine environment may be increased through on-going research and monitoring.

For these reasons details about decommissioning activities cannot be included; the decommissioning strategy and associated cost estimates are provided under "Activity 11, Decommissioning" in this EMPr.

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section 2: general context

2.1 OVERVIEW OF ENTIRE BLOCK 9 PRODUCTION OPERATIONS

- Since 1992, PetroSA (previously Soekor and Mossgas) has been undertaking offshore gas and oil production in the Block 9 area.
- A network of wells, valves, pipelines and control umbilicals on the seafloor convey gas to a fixed, manned FA Platform, and oil to the floating Orca rig. Periodically modifications are made to the platform, wells are closed down or reopened, rigs and buoys are moved and new wells added to the network.
- As of 2008 only the Oribi / Oryx field is producing oil, which is loaded via a CALM buoy onto vessels at sea for onward shipment to the Port of Saldanha Bay.
- Twenty-two wells (on average, as the precise number of operating wells may vary for technical reasons) in the FA, EM, South Coast Gas and Sable fields are producing gas which is piped to the FA Platform for processing. At the Platform water and mono-ethyl-glycol (MEG) are removed and gas and condensate are separated out; the MEG is returned to the gas wells where it is reused; the water is treated and released back into the sea; and the gas is compressed and piped to shore via a 90km long x 46mm diameter concrete-encased steel pipeline. The condensate is piped to shore via a 20mm diameter concrete-coated steel pipeline which follows the same route as the gas pipeline.
- There are major international and local shipping routes passing through the area, and demersal trawling also occurs. As a consequence, Notices to Mariners are issued by SAMSA giving warnings to stay clear of structures. The offshore facilities are also marked on official navigation charts and platforms and surface structures have 500m radius Exclusion zones around them which exclude unauthorised traffic. All other infrastructure on the seafloor is demarcated by a 500m Safety zone, around or on either side of it, which does not exclude traffic but prohibits anchoring and trawling. In addition, platforms and surface structures have markings and warning lights to alert shipping and fishing and other vessels to their presence.
- Approximately 120-130 people live at sea on the offshore installations for two weeks at a time operating these facilities. Up to eight service vessels and three helicopters convey people and their food and water and other goods between Mossel Bay and the offshore destinations. Waste is returned to shore every two weeks on average.
- Operation and maintenance of the facilities requires the use of fuels, biocides, cleaning agents, medical supplies, oils, paints, spare parts and other goods and chemicals. All of these are ordered, purchased, delivered to the platform or rig, stored, used and eventually disposed of.
- Good housekeeping and regular maintenance and monitoring of the offshore infrastructure and machinery are undertaken to ensure all is kept in good working order and repaired in time to prevent significant overflows, spills, losses or a major accident.
- Mishaps or emergencies are dealt with according to PetroSA approved standard procedures.

Figure 2.1 shows the location of all hydrocarbon fields that are producing in Block 9 offshore of Mossel Bay South Africa, which this general introduction to the Block 9 EMPrs covers.

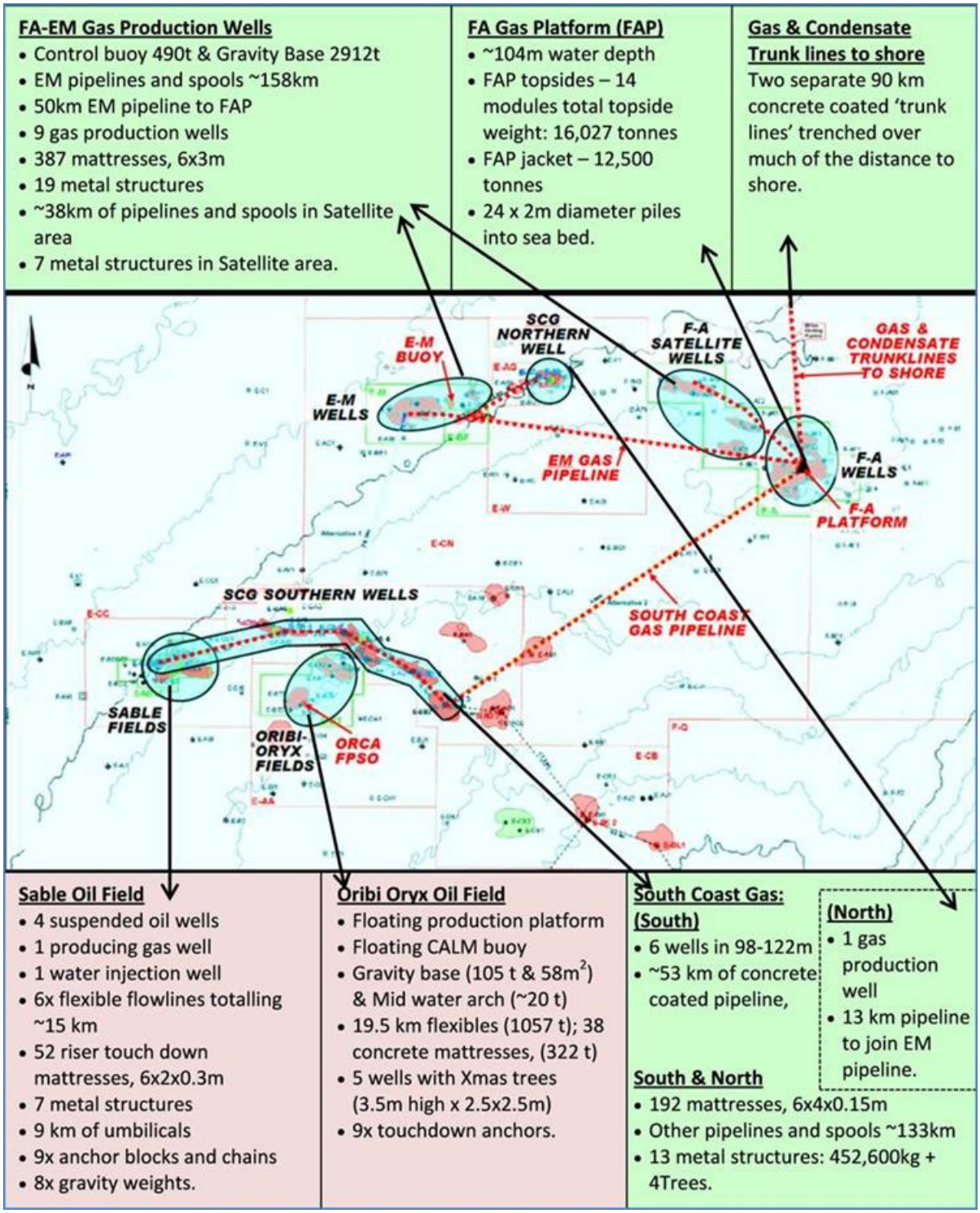


Figure 2.1: Location, layout and components of all hydrocarbon production areas (circled with names in black) covered by the updated EMPrs. All except Oribi-Oryx are producing gas via the FA Platform.

2.2 SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT

The production areas in Block 9 are located on the Agulhas Bank south of Mossel Bay (Figure 2.2).

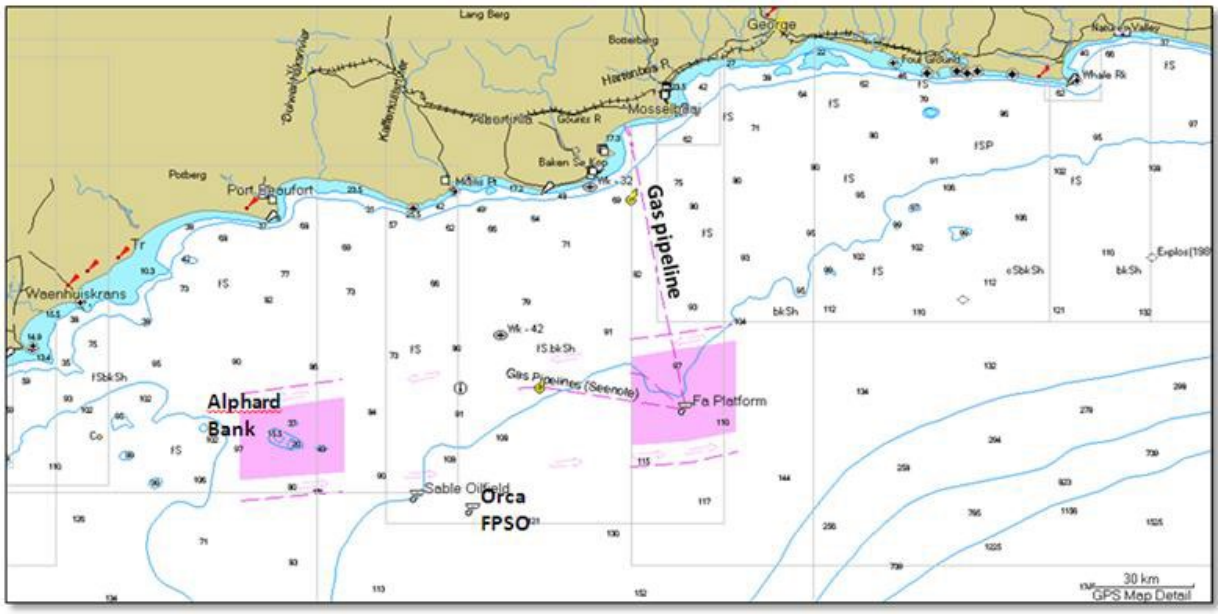


Figure 2.2: Chart showing bathymetry and location of gas and oil fields offshore of Mossel Bay, South Africa (MapSource 2010).

This summary environmental description has been compiled primarily from scientific publications on the region (see synthesis of research on the Agulhas Bank in the 'South African Journal of Science' Volume 90, 1994), information in assessments for development and proposed developments in the region, e.g. the South Coast Gas Development Project (PetroSA 2006), and the recently completed assessments of offshore biodiversity on the Agulhas Bank and the role of gas and oil field infrastructure in this (Sink et al., 2010). The description is focused on the marine environmental components that are most likely to be affected by the operation and decommissioning of the gas and/or oil production facilities. These include the water column and seafloor in the immediate areas of the operation and the dependent ecosystem service of fisheries..

2.2.1 Regional Overview

The Agulhas Bank is a large, triangular shaped expanse of continental shelf extending from Cape Point in the west to East London in the east and to ~220 km offshore at its widest point. From the coast, water depths increase sharply to approximately 50 m and then more gradually to 200 m which marks the offshore boundary of the Agulhas Bank. Winds in the project area are mainly zonal with an approximate annual balance between westerly and easterly winds. There is seasonal asymmetry with the former being dominant in winter and spring whilst easterly winds occur most frequently in summer. Gales (winds >60 km/hr) are most common during winter whilst calm conditions are characteristic of autumn.

The Agulhas Bank is characterized by large ocean waves with a median significant wave height of 2.30 m (Figure 2.3). Wave periods for the larger waves (>3.0 m) are generally in the 9 14 second

range (Figure 2.4) showing the influence of the passage of frontal systems south of the southern African subcontinent on the wave regime (e.g. Hunter 1987).

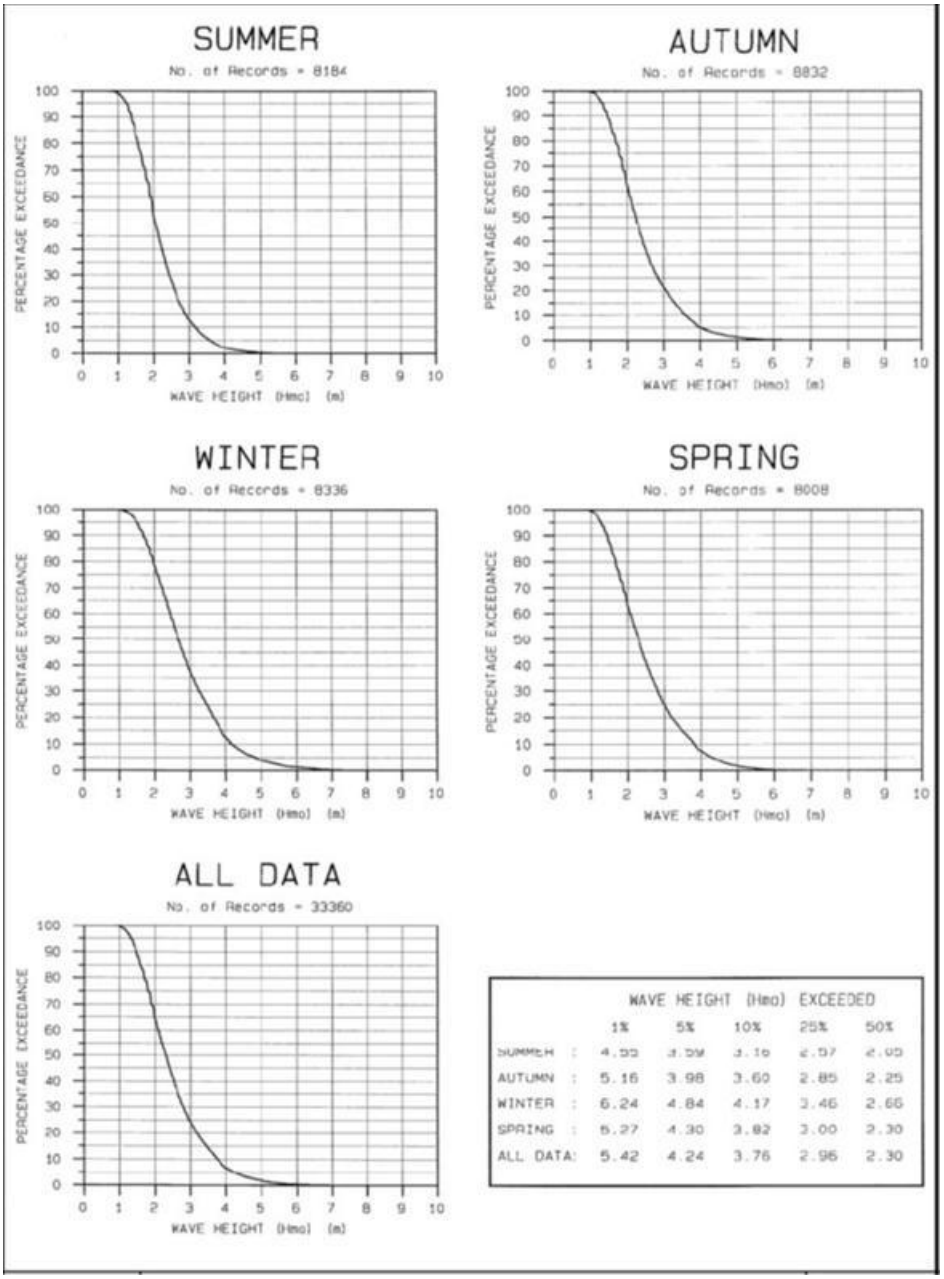


Figure 2.3: Wave height exceedance plots for the vicinity of the FA Platform for the period 30/1/1997 to 1/7/2008 (from CSIR 2009).

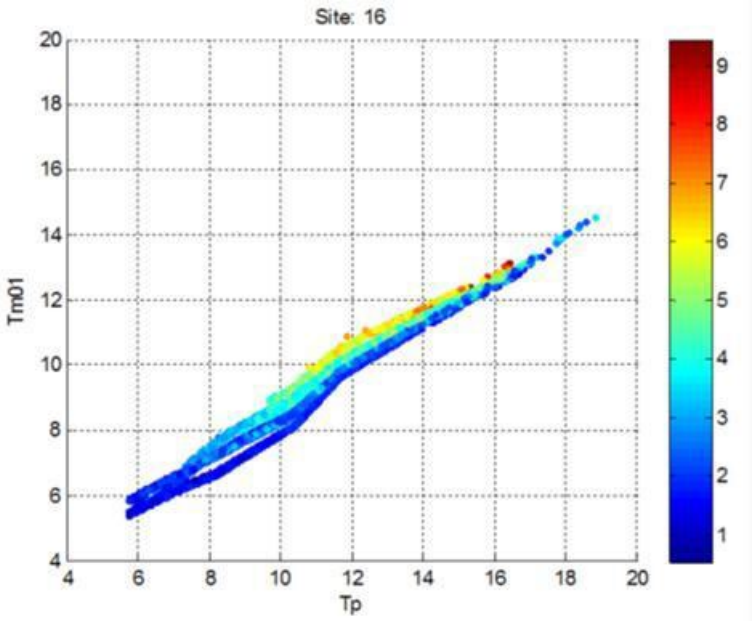


Figure 2.4: Scatter plot of peak and mean wave periods in the vicinity of the FA Platform; the colour bar indicates significant wave height (from CSIR 2009).

Large ocean waves on the Agulhas Bank are generally associated with weather systems passing south of South Africa (e.g. CSIR 2009) and as such they are episodic features and have a seasonal distribution (Figure 2.3). High wave persistence is also seasonally distributed with mean durations of >3.0 m waves ranging from 15.7 hours in summer to 23.5 hours in the stormier winter (Table 2.1a). There is an inverse distribution of calmer conditions with longer periods of lower waves being recorded in summer than in the other seasons (Table 2.1b). Note, however, that wave distributions on the Agulhas Bank are highly variable as indicated by the standard deviations being larger than the mean values listed in Table 2.1.

Table 2.1: Wave persistence statistics for waves in the vicinity of the FA Platform (from CSIR 2009).

a) Waves >3.0 m

Period	Mean (hrs)	Std dev. (hrs)	N observations
Annual	20.0	25.0	1215
Summer	15.7	20.8	306
Autumn	18.7	21.6	304
Winter	23.5	27.9	401
Spring	20.4	26.1	204

b) Calms (waves <3.0 m)

Period	Mean (hrs)	Std dev. (hrs)	N observations
Annual	62.4	94.5	1214
Summer	87.5	122.7	304
Autumn	65.0	93.0	303
Winter	37.7	51.9	399
Spring	55.4	77.7	208

The Agulhas Bank is a transition zone between the major oceanographic features of the warm Agulhas Current to the east and the cooler Benguela Current to the west. The Agulhas Current supplies most of the seawater on the eastern and central portions of the Bank mainly through frictional upwelling on its inshore margin but also through eddies that invade the area. As it is upwelled water from mid-depth in the Agulhas Current subsurface waters on the Agulhas Bank can be cool (10 12 °C) although they may be overlain by warmer water in summer. This leads to the development of very strong thermoclines in the central areas of the Agulhas Bank and, under easterly wind conditions, causes coastal upwelling at the pronounced capes on the coastline in summer. In winter, water column stratification is generally broken down by the vigorous winds and cooler atmospheric temperatures that occur in this season. A prominent summer to autumn oceanographic feature of the central Agulhas Bank is the subsurface ridge of cool water that generally extends offshore in a SW direction from Cape St Francis and terminates on the middle Agulhas Bank ~140 km south of Still Bay. Water (current) circulation on the central Agulhas Bank appears to be mainly cyclonic around the cool water ridge with nearshore flows directed eastwards and a south westward flow offshore.

The Agulhas Bank supports commercially important populations of pelagic fish (sardine, anchovy, horse mackerel), demersal species (hake, kingklip, snoek, kob, sparids, sole, gurnard and monkfish), amongst other species, squid and large pelagic species, such as tuna. The area is critically important in the life cycle of sardine and anchovy and associated predators such as African Penguin and Cape Gannet. Whales and dolphins resident on the Agulhas Bank include Bryde's whale (population size = 600), common dolphin (15 000 20 000 individuals), bottlenose and Indo-Pacific humpback dolphin and killer whale (population size <100). Southern right and humpback whales are seasonal (austral winter/spring) visitors with the former breeding in shallow, inshore bays. Humpbacks generally migrate through the region into subtropical waters in and north of Mozambique to breed (Best 2007). A further 24 cetacean species have been recorded as occasional occurrences. Loggerhead and leatherback turtles have been recorded in the region as by-catch in the pelagic long-line fishery (Petersen et al., 2009); frequency of occurrence is low, however, implying a small population size.

Clearly, the Agulhas Bank is immensely important for marine biodiversity, and goods and services dependent on this, mainly commercial fishing.

2.2.2 Block 9 Area Details

2.2.2.1 Topography and sediment distribution

The seafloor in the Block 9 gas and oil field development areas is flat with water depths ranging between 100 m and 115 m. Seafloor sediment texture ranges from muddy sand (on the 'Blues' fishing ground) to sand and gravel around the FA Platform (Figure 2.5). ROV surveys of pipeline routes confirm the presence of silt and clayey sands in the west but show that east of 21°50' E the seafloor becomes more rocky with very low relief reef.

There are no known high relief rock reefs in the region apart from Alphard Bank, 118 km west of the FA Platform and ~40 km north west of the Sable gas/oil field (Figure 2.2 above) and the 42 and 78 mile reefs extending south west of the Alphard Bank.

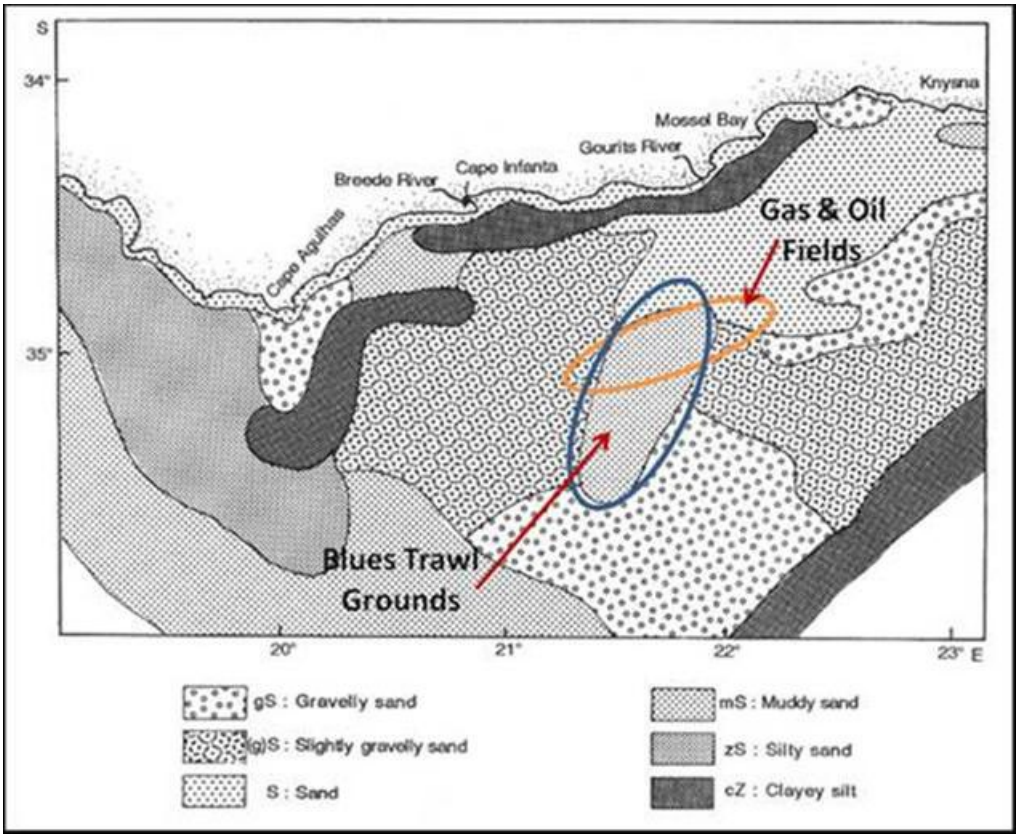


Figure 2.5: Seafloor sediment distributions offshore of Mossel Bay. The approximate locations of the PetroSA gas and oil fields and the Blues trawling grounds on the central Agulhas Bank are shown (modified from Le Clus et al., 1996).

2.2.2.2 Oceanography

The major oceanographic feature of the development area is the 'cold ridge' that lies across the central Agulhas Bank extending out from the coast between Cape Seal and Cape St Francis along the 100 m isobath. Figure 2.6 shows a schematic of this feature in relation to the gas and oil field. The 'cold ridge' is a semi-permanent feature of the region in spring and summer and is considered to be linked to oceanic forcing by the Agulhas Current. The 'cold ridge' separates an area of intense thermocline development (5 °C 11 °C/10 m) in spring and summer in inner Agulhas Bank waters between Cape Agulhas in the west and Cape St. Francis in the east, from less intensely developed thermal stratification (3 °C 7 °C/10 m) in deeper offshore waters. There is a corresponding difference in circulation with cyclonic flow around the ridge with currents offshore of the feature flowing westwards whilst to the inshore the flow is mainly eastwards.

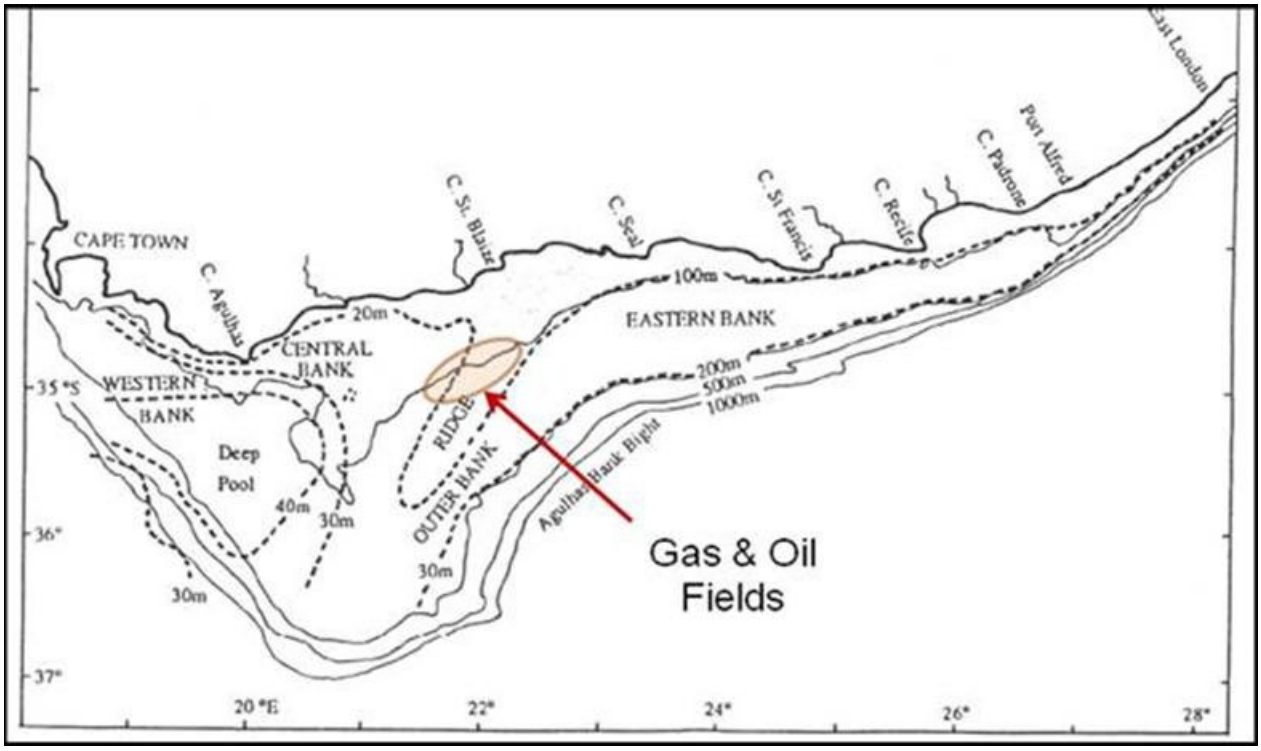


Figure 2.6: Schematic of thermocline distributions in spring and summer on the Agulhas Bank in relation to the PetroSA gas and oil fields. Dotted lines show thermocline depths whilst solid lines show bathymetry (Modified from Probyn et al., 1994)

2.2.2.3 Ecology

2.2.2.3.1 Plankton

The 'cool ridge' across the central Agulhas Bank and its associated shallow thermoclines lead to the development of intense subsurface phytoplankton biomass maxima at the base of the upper mixed layer or in the thermoclines themselves. Biomass can attain >10 µg chla/litre but these high concentrations are generally restricted to narrow layers of <10 m thick. This phenomenon is interpreted to be a result of the interplay between light and nutrient availability in controlling phytoplankton production. Upper mixed layers are nutrient limited but have high light levels whereas sub-thermocline layers are nutrient rich but dark. Phytoplankton is sustained by vertical diffusion of nutrients into the lower euphotic zone allowing positive net growth. Despite marginal light conditions phytoplankton population doubling times under these conditions can be short ranging from 0.64 1.72 days at the depth of maximum phytoplankton production (Carter et al., 1987). Overall phytoplankton production is 200 800 mg C/m^2/hr with generally large celled diatoms and dinoflaggelates dominating the subsurface phytoplankton community.

The relative seasonal permanency of the 'cool ridge' and its associated productive phytoplankton populations allows the development of substantial populations of the large zooplanktonic calanoid copepod *Calanus agulhensis*. This species dominates the zooplankton comprising 44 64% of the total copepod biomass in the region. The life-cycle of *C. agulhensis* is linked to the development of the 'cool ridge' and its circulation features and is an important prey item of small pelagic shoaling fish (anchovy, sardine, red-eye), and probably juvenile chokka squid, which occur on the Agulhas Bank.

2.2.2.3.2 Pelagic fish

The important small pelagic fish species on the Agulhas Bank are anchovy, sardine and red-eye. The estimated collective biomass of these species is estimated at 2 3 million tonnes during summer. Horse mackerel are also abundant on the Agulhas Bank with estimated biomass of up to 850 000 tonnes. All of these species forage on plankton, primarily zooplankton, and are thus ultimately critically dependent on oceanographic processes and water quality that sustain local phytoplankton production.

2.2.2.3.3 Demersal fish

The Agulhas Bank supports a diverse assemblage of demersal fish species with 14 trawl fish species and 16 'common' line fish species being listed for the region (Japp et al., 1994). Cape hakes, gurnards and panga dominate the biomass of the former while east coast sole are important on the coast parallel mud belt (Figure 2.5 above). Carpenter, kob, geelbek and yellow tail comprise large proportions of the line-fish assemblage. Chokka squid (*Loligo reynaudii*) occur throughout the shallower regions of the Agulhas Bank but also spawn in deeper water (>100 m) although this is mostly limited to east of 22.5° E (Roberts et al., in preparation). There are no records of squid egg masses in the vicinity of the Block 9 gas and oil field (survey data 1985 2008 in Roberts et al., in preparation). The reef fish species community includes blue hottentot, red stumpnose, red steenbras, and roman; these species are present at deep reefs such as the Alphard Bank but have not been observed around the gas and/or oil field infrastructure (Sink et al., 2010).

2.2.2.3.4 Pelagic predators

The important predator groups on the Agulhas Bank, listed by Smale *et al* (1994), comprise:

- Fish such as the migratory tunas, sharks, geelbek, snoek, yellowtail, and the inshore species elf and leervis;
- Seabirds including resident species such as African Penguin, Cape Gannet, Cape Cormorant, gulls and terns and various migratory species such as albatrosses, petrels, shearwaters, prions, terns and skuas, and
- Seals and cetaceans including Cape fur seal, resident cetaceans such as dolphins, killer and Bryde's whale, seasonal visitors including southern right and humpback whales and occasional visitors to the region including a number of dolphin species, pilot whale species, sperm, beaked, minke, blue, sei and fin whales.

2.2.2.3.5 Epifauna and Benthos

Apart from the gas and oil field infrastructure itself there are three main habitat types in the project area; the muddy sand of the 'Blues' fishing ground, gravelly (shell debris) sand and exposed low relief rock and rock debris (Quick and Sink 2005). Benthos distributional data in these habitat types are limited to that obtained in opportunistic and dedicated ROV surveys and the quantitative assessment of benthic infauna on transects extending out from an oil well in the Oribi-Oryx field (Sink et al., 2010).

Benthic epifauna on sand substrates in the Sable field exclusion zone include burrowing heart urchin *Spatangus capensis* (abundant), starfish, sponges, whelks, horse mussels, crabs, the urchin *Echinus gilchristi* and burrowing tube anemones *Cerianthus* sp. This latter species was the dominant epifaunal species present on soft substrates in the 'Blues' fishing ground followed by the burrowing

urchin *Brissopsis lyrifera capensis*. Other fauna observed to be present by Sink et al. (2010) were starfish, crabs, horse mussels, seapens and the urchin *E. gilchristi*. The notable differences between the trawled and non-trawled areas in terms of epifauna were the absence of the burrowing heart urchin in the former and the absence of *B. lyrifera capensis* in the latter. Unfortunately the observational data are too limited to attribute such differences to the disturbance of seafloor fauna by demersal trawling.

No observational data are available for the other natural seafloor habitat types in the area but Quick and Sink (2005) predict relatively high benthos biodiversity in the physically stable gravelly sand habitat with fauna including seapens, molluscs, echinoderms, cerianthids, sponges and south coast rock lobster. The low relief rock and rock debris habitat benthos community includes sponges, black corals and ascidians, and probably soft corals, lace corals, bryozoa, echinoderms, south coast rock lobster and other crustaceans. Quick and Sink (2005) consider the low relief rocky reef benthic fauna to be vulnerable to physical disturbance mainly due to the apparent longevity of the characteristic fauna. This also applies to the benthos on the gravelly sand habitat.

Quantitative soft sediment benthic infauna surveys on the adjacent Oribi-Oryx oil field showed that crustaceans and polychaetes were numerically dominant, comprising 91% of the benthos community with echinoderms, molluscs and 'other taxa' making up the remaining 9% of the numbers. Although only contributing ~4% of the taxon abundance, because of their larger body sizes, echinoderms completely dominated the biomass distribution making up 86% of the benthic infauna sampled.

Species diversity was uniform across all of the benthic infauna sites sampled but multivariate analysis showed distinct differences between sites closely adjacent (250 m) to the oil well investigated by Sink et al. (2010) and those distributed at distances greater than 500 m. These differences are attributable to variations in the abundance of a single crustacean amphipod species and a single polychaete species within the overall infauna community sampled. The ecological significance of these differences is unknown. Following this trend of slight differences down putative disturbance gradients variation in infaunal abundance and biomass between trawled and untrawled sample sites was also slight. Multivariate analyses do indicate differences in that the trawled and untrawled sample sites did form separate groupings according to infauna community structure but the similarity levels were high at 70% 80%. It is notable that large (and long-lived) fauna such as the burrowing urchin *B. lyrifera capensis* and brittle stars (*Ophiuroidea sp*) appeared to be common in the trawled area sample sites, indicating perhaps that disturbance from trawling was not intense at these sites.

The biofouling community on the gas and oil field infrastructure (FA platform, flowlines, umbilicals, mattresses, well heads etc.) has been described by Sink et al. (2010). On the FA platform the community is structured with depth; above 30 m depth the community resembles that of the inter- and shallow sub-tidal on the adjacent southern Cape coastline whilst below this depth the biofouling community is largely distinct from this and the benthic communities on deep water reefs in the area. In the shallower depths mussels (*Perna perna* but also *Mytilus galloprovincialis*) and barnacles (giant and gooseneck) form dense clumps along with the ascidian *Pyura*, sponges, anemones and bryozoans. Below 30 m the biofouling community is relatively reduced with barnacles, anemones, sponges and hydroids dominating. Below 70 m biofouling biomass is typically low with the community dominated by anemones (including *Sagartia elegans* and *Metridium senile*, the latter at low numbers) and low densities of barnacles may be present along with hydroids. Piles of mussel/barnacle shells and shell debris are present on the seafloor below and adjacent to the FA platform, most probably derived from the biofouling community on the upper parts of the structure. Starfish (*Marthasterias glacialis*) are present on these piles and the adjacent sandy seafloor and probably prey on dislodged mussels.

Gas and oil field infrastructure lying on or near the seafloor supports biofouling communities in which the introduced anemone species *S. elegans* and *M. senile*, and other suspected alien species such as ascidians, are represented. Sink et al. (2010) recorded these fauna on flowlines and mattresses, wellheads, umbilicals and mooring chains. Other fauna associated with the infrastructure include urchins *(E. gilchristi¸ Parechinus sangulosus*), starfish, gorgonians (apparently rare), anemones, crabs, Cape and south coast rock lobster.

The important observations made by Sink et al. (2010) include the facts that a) the deep biofouling community is distinct from that on adjacent reefs, b) there were no appreciable populations of sparid reef fish associated with the gas or oil field infrastructure and c) the alien anemone species *S. elegans* and *M. senile* were ubiquitously distributed on it. These indicate that this infrastructure is probably unimportant in maintaining the natural biodiversity of the middle continental shelf region of the Agulhas Bank and that it may be an important reservoir of alien species in the area.

2.2.3 Ecosystem Services

2.2.3.1 Commercial fisheries

Currently the only ecosystem service extracted from the hydrocarbon production area is commercial fishing. Figure 2.7 shows the distributions of the main fishing operations on the Agulhas Bank. It is apparent that demersal trawl fishing on the 'Blues' fishing ground targeting hakes is the dominant activity in the area.

South African demersal trawl fish catch data is collected by 1/3 degree squares (i.e. 20 nm x 20 nm) and the designated commercial grid blocks for the study area are 553, 554, 555, 539, 540 and 541 (Wilkinson and Japp, 2005). Average annual landings from the 'Blues' fishing ground by the inshore trawl fleet over the 10-year period 1999 2008 are 3 006 metric tonnes; Figure 2.8 shows the individual and proportional contributions to this overall total by the commercial grid blocks in the hydrocarbon production area.

Fifty nine percent of the 'Blues' fishing ground annual landings are derived from the commercial grid blocks in Block 9, although catches are not uniformly geographically distributed as commercial grid blocks 554 and 555 contributes 66% of this. Further, Wilkinson and Japp (2005) state that it is only in commercial grid 554 that there is any important interaction between oil and gas field operations and the fishing industry, e.g. through implementation of exclusion zones around subsea infrastructure. Note that the landings data for the 'Blues' fishing ground summarised above cover the period 1999 2008 when most of the oil and gas infrastructure in the project area had already been established. Therefore associated disturbances, if any, that may have been caused by the infrastructure installation and/or operations are probably already reflected within the fisheries data.

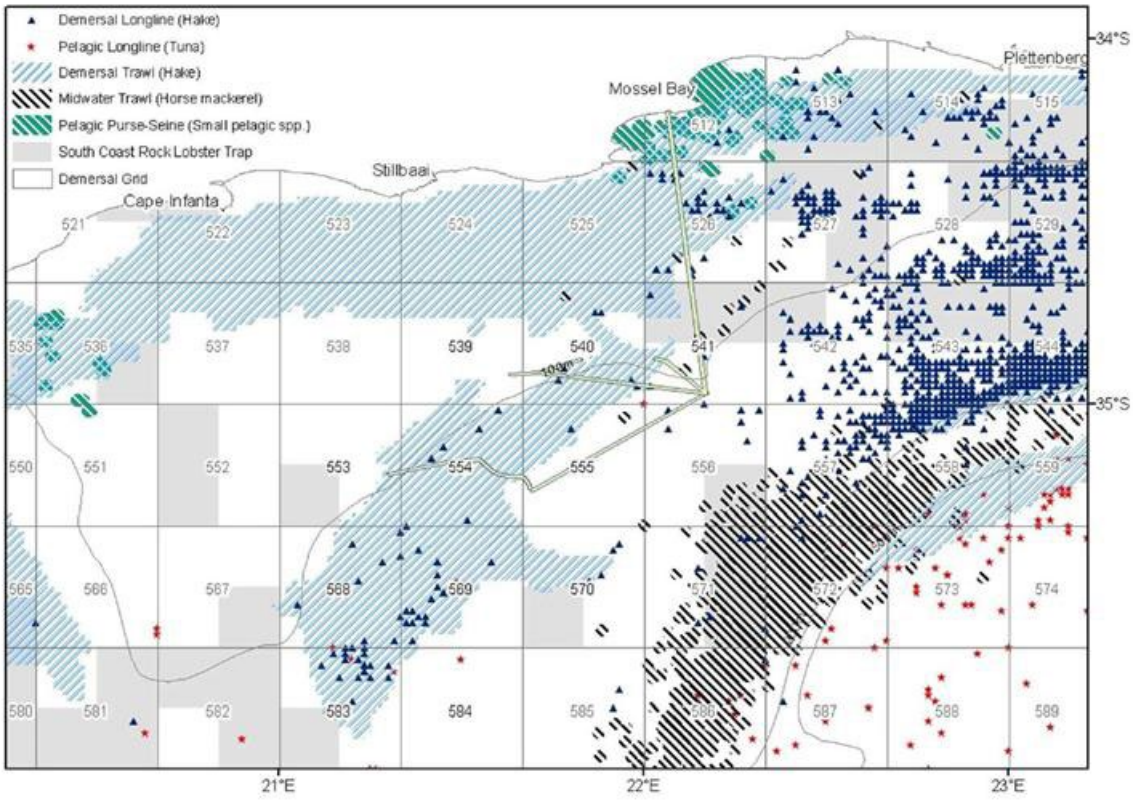


Figure 2.7: Distribution of the main commercial fishing activities and commercial grid blocks on the Agulhas Bank relative to the Block 9 gas and oil field development area (figure supplied by Capricorn Fishing (Pty) Ltd).

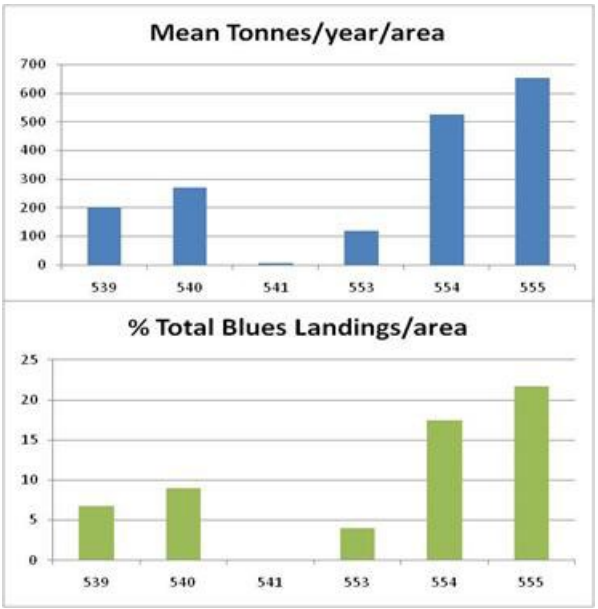


Figure 2.8: Distribution of demersal trawl landings in the commercial grid blocks in the Block 9 area and respective proportions of annual 'Blues' trawling ground catches (data from Wilkinson and Japp 2005 and Capricorn Fishing (Pty) Ltd).

Figure 2.9 is a time series plot of the combined catches for commercial grid blocks 554 and 555 reported to MCM by the inshore trawl industry over the period covering the initial installation of the Block 9 gas and oil field infrastructure (1991) and its subsequent operation. These data do not show any variations that can be attributed to the gas or oil field. It should be noted that the data reflect catches only and do not give any indications on possible variations in the more reliable catch per unit effort (CPUE). MCM data, however, indicate that fishing effort in terms of numbers of trawls has been relatively constant at 500 1 000 per year for these blocks over the period 1985 2004 implying that the variability in annual catches in Figure 2.9 is probably a reflection of fish availability rather than fishing effort.

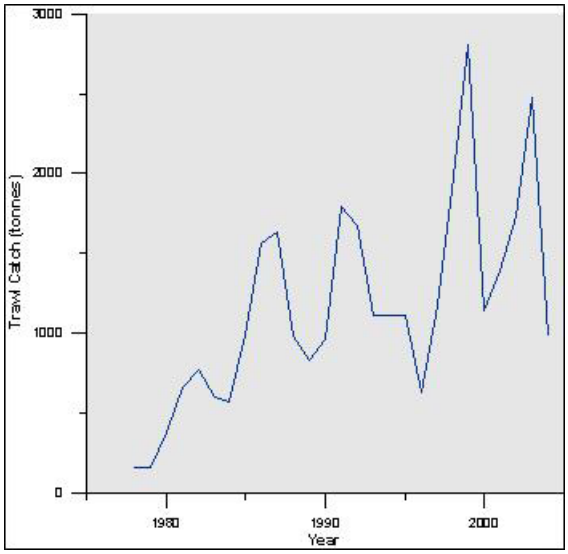


Figure 2.9: Combined annual landings for commercial grid blocks 554 and 555 reported by the inshore trawl industry for the period 1978 2004 (data supplied by MCM).

2.2.3.2 Conservation

The Agulhas Bioregion supports a large proportion of the RSA's endemic marine species including sea breams (*Sparidae*), octocorals and algae (Lombard *et al*., 2004) and the sub-photic component of the bioregion is rated as vulnerable according to biodiversity conservation status (http://soer.deat.gov.za/582_ToX-KQ9X4Mk.img). Conserved areas, in the form of marine protected areas (MPAs) comprise <2% of the Agulhas Bioregion. This is insufficient for marine biodiversity protection and falls short of the national biodiversity conservation action plan that targets 30% of untrawlable ground for protection (Quick and Sink 2005). It has been generally considered that the seafloor areas within the project area may be suitable for conservation as they fringe the intensely trawled 'Blues' fishing ground and include low relief reef and gravelly sand habitats. Both of these habitats were trawled for primarily panga in the 1980s but have since been left undisturbed (Japp *et al*., 2004). However, Sink *et al*. (2010) could not demonstrate increased fish abundance or diversity in either the exclusion zones for the trawl fishery or around and/or in the gas or oil field subsea infrastructure. Specifically, it appears that this infrastructure does not provide habitat for vulnerable, reef associated line fish species such as members of the Sparidae family. Consequently the Block 9 area may not be an overly important area in terms of biodiversity conservation. Figure 2.9.a provides a map depciting the delineated cionsrevtaion and protected areas.

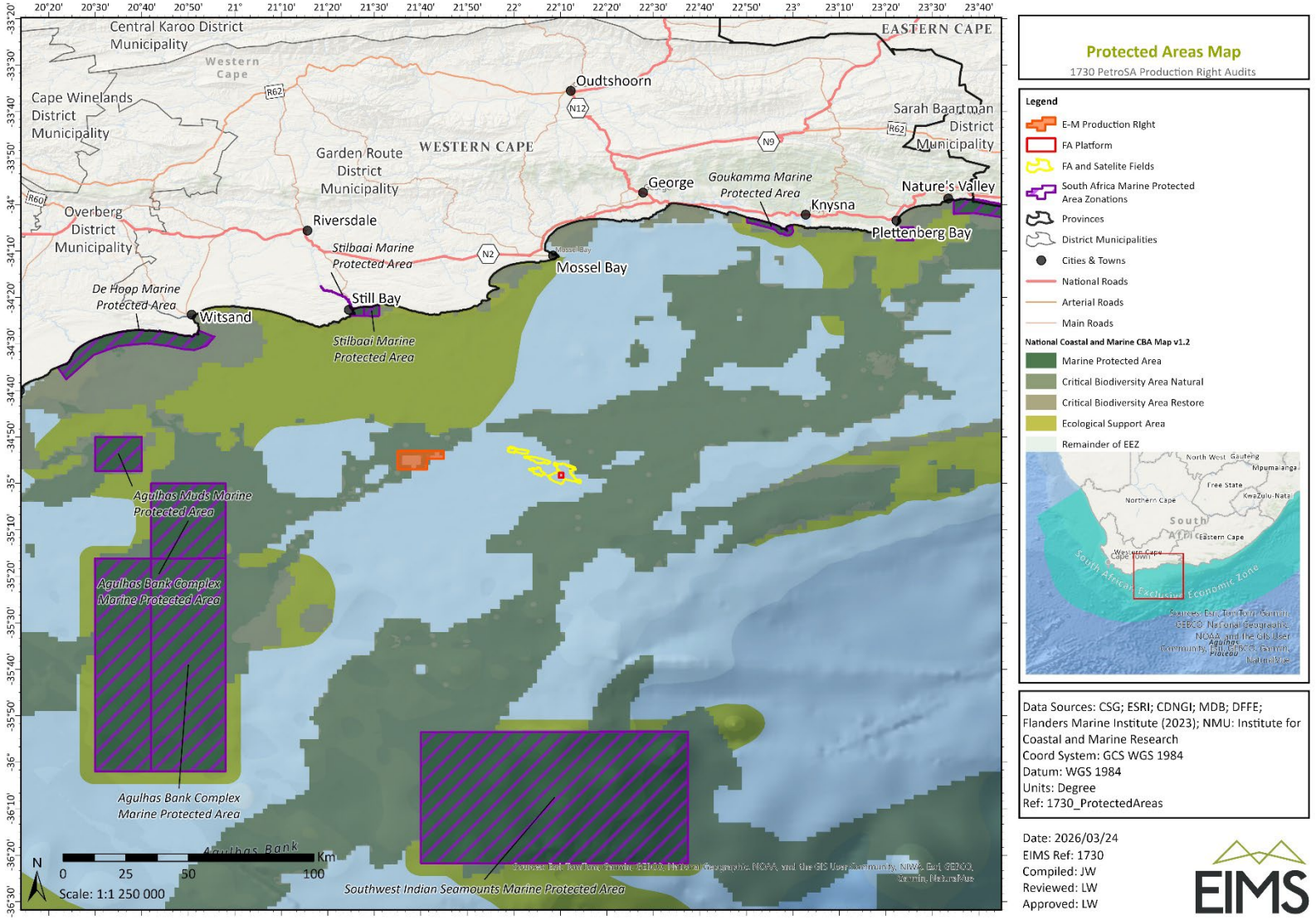


Figure 2.9a: Protected areas and biodiversity areas in relation to the Production Right boundary.

2.3 SPECIFIC VULNERABILITIES TO OPERATIONS AND DECOMMISSIONING

The environmental components most likely to be affected by the gas and oil field operations and decommissioning are the water column and seafloor in the immediate areas of the operation, and the dependent ecosystem service of fisheries. In addition, possible far-field effects may be generated by dispersal of alien species from the project area in, for instance, ports that receive decommissioned infrastructure.

2.3.1 Water Column

The Block 9 region is important for the generation and maintenance of zooplankton populations that sustain small pelagic shoaling fish such as anchovy, sardine and red-eye. The dominant copepod found in the area, *Calanus agulhensis*, is considered to be a primary prey item for chokka squid juveniles and may thus be critical in recruitment of squid to the fishery.

Risk sources from gas and oil field operations include discharges of contaminated water from machinery spaces, improperly treated domestic wastes, and produce water, etc. from the FA Platform and surface installations on the Oribi/Oryx oil field. Risk sources from upset conditions include toxicity effects on plankton of accidently discharged natural oil, fuel oil or diesel (fuels), hydrogen sulphide and other contaminants associated with natural gas (methane is the dominant component of natural gas, this has a low water solubility, readily disassociates to carbon dioxide and water in the presence of oxygen, and has very low toxicity) should this be accidently discharged. Risk sources from decommissioning activities are primarily linked to release of hydrocarbons and/or detergents into the sea from cleaning of gas field and oil field infrastructure and associated pollution effects, possible pollution 'legacy' from discarded reactive metals (e.g. non-ferrous metals including zinc-aluminium anodes), etc.

The Agulhas Bank supports resident cetacean populations as well as seasonal visitors such as southern right and humpback whales. Risk sources to these populations and individual animals are predominantly linked to noise generation during decommissioning activities. This would be associated with ship movements, e.g. those requiring use of bow thrusters, and possibly with the use of explosives should these be necessary to cut through steel. Note, however, that explosives are not considered to be necessary specifically for the decommissioning of the FA platform as there are alternative methods available for cutting sub-sea structures.

Low level sounds such as those produced by shipping can cause hearing impairment in whales and dolphins and/or alter their behaviours. Hearing impairment can be either temporary or permanent depending on the intensity and duration of exposure (IWC 2004). Temporary impairment can be caused by exposure to narrow band sound for relatively short (hours) periods of time at received levels of 150 190 dB re 1 µPascal at 1 m when this is 80 90 dB above the species specific threshold. As stated these thresholds vary between species but a conservative estimate that should include most baleen and odontocete whales is 40 80 dB (IWC 2004). Behavioural modification, possibly affecting foraging success, may be generated at 120 dB and above (Southall et al., 2007).

Sound attenuation with distance from various sound sources commonly present in oil and gas field operations is shown in Figure 2.10. This demonstrates that, for temporary hearing impairment, a cetacean would have to be within 20 m distance of the sound sources and stay there for the period of time sufficient to generate impairment. Similarly, cetaceans would have to remain within 500 m of the sound source for an appreciable time for any resulting modification to foraging behaviour to significantly alter energy balances. Neither scenario appears likely given the distributions and

mobility of these large animals and therefore the effect of sounds generated during gas field operations and decommissioning on cetaceans is not considered further here.

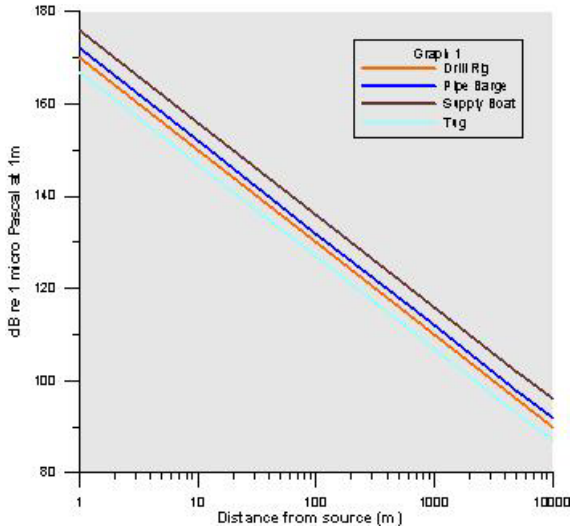


Figure 2.10: Sound attenuation with distance from various sources used in oil/gas field operations (from Entrix Inc. 2004).

2.3.2 Seafloor

It is moot whether the Block 9 seafloor is regionally important for biodiversity conservation. However, risk sources for this are direct disturbance and/or alteration to seafloor habitats by gas / oil subsea infrastructure and littering of the seafloor by hardware and other materials either accidently or deliberately discarded into the sea. Both can prejudice the present or future biodiversity value of the project area. Decommissioning of the infrastructure represents a special case here as options to be considered include leaving (cleaned) pipelines, gravity bases and possibly elements of the FA Platform in place at their present locations after removal of most or all the recoverable topside infrastructure and thorough cleaning of the remnant structures. This represents a modification of the original undisturbed seafloor but in effect is a continuance of the current situation where the FA Platform specifically is acting as an artificial reef/fish aggregation device (FAD), at least in the upper part of the water column.

2.3.3 Fisheries

Subsea infrastructure including flow lines, umbilicals, mid-water arches and pipeline end manifolds can be damaged by demersal trawls and vice versa. Consequently under existing (operational) conditions this infrastructure has associated exclusion zones extending 500 m to either side. Similar exclusion zones also apply to surface infrastructure such as the FA Platform, EM and CALM Buoys and the ORCA rig, but in these cases exclusion zones are circular and generally of a 500 m radius.

The exclusion zones affect fishing by reducing the area that can be trawled and, as trawling is generally carried out parallel to the bathymetry (e.g. the 100 m isobath), affecting trawling efficiency most in cases where subsea infrastructure such as pipelines are placed normal to the bathymetry.

Decommissioning of the subsea infrastructure may lead to the pipelines, mattresses and/or gravity bases remaining in place, with exclusion zones maintained, or their partial or complete removal with correspondingly modified exclusion zones. This will have implications for the existing fishery. Decommissioning of the FA Platform is unlikely to affect the associated existing exclusion zone as at least some remnants of the structure may be left in place leading to this being a possible hazard to trawling. However, the FA Platform is outside of the current trawling area so effects for the fishery are likely to be neutral.

2.3.4 Alien Species Dispersal

The Block 9 gas and oil field infrastructure hosts a number of alien species (Sink et al., 2010). These include: the invasive Mediterranean mussel (*Mytilus galloprovincialis*), now widespread on rocky intertidal shores in the western and southern Cape;, the anemone *Metridium senile*, considered to be invasive as it has apparently dispersed from its original point of establishment in the Port of Cape Town;, the anemone *Sagartia elegans*, to date only recorded from the Agulhas Bank gas and oil field infrastructure, although a congeneric species occurs in Saldanha Bay/Langebaan Lagoon (Prof C Griffiths, Zoology Department, University of Cate Town, pers. comm.) as well as other anemone, ascidian and bryozoan species. In addition the cryptogenic (i.e. of unknown origin) starfish *Marthasterias glacialis* was found to be common on both the structures and associated shell mounds. This species preys heavily on mussels (Branch et al., 1994), amongst other organisms, and was recorded by Day (1969) as being 'common in (sample) dredgings and often on rocky shores particularly when breeding'. Hence its presence in the region predates that of the gas and oil field subsea infrastructure.

Given that the deep water component of the gas and oil field infrastructure is not considered to be an important biodiversity resource (above) the existing populations of alien species are probably not exerting any important effects where they are presently distributed. However, they do represent local reservoirs for dispersal to other habitats. The presence of common intertidal species on the shallow depth components of the FA platform indicates that there is some exchange with the adjacent shoreline. The dominant circulation pattern around the mid-shelf ridge of cool water on the Agulhas Bank indicates that this exchange may well be bi-directional implying that at least elements of the alien species community resident on the infrastructure may be capable of reaching and establishing populations on suitable substrates nearer the coast or alongshore. The consequences of such dispersals are not well known but are considered to be potentially serious if they lead to habitat modification, as has the Mediterranean mussel on western and southern Cape intertidal communities (Robinson et al., 2005 cited in Sink et al., 2010). Note that this risk is unique to those alien species that are present on the gas and oil field infrastructure but not (yet) represented in other habitats on the South African coast or continental shelf. From the records provided by Sink et al. (2010) this would appear to apply only to *Sagartia elegans* and possibly the unidentified anemone, ascidian and bryozoan species these authors listed.

In addition to 'natural' dispersal the process of decommissioning gas and/or oil field infrastructure may redistribute alien species to other habitats. An example would be upliftment and transfer to a local port of large structural elements of the FA platform jacket along with populations of alien species. In such a case it is conceivable that there may be escapement of alien species into the port and/or adjacent environments and establishment of viable populations. This can displace indigenous species and/or modify the local environment affecting ecological structure and possibly linked ecosystem services. Similar to natural dispersal the risk is specific to alien species not (yet) represented in other South African coastal or continental shelf habitats.

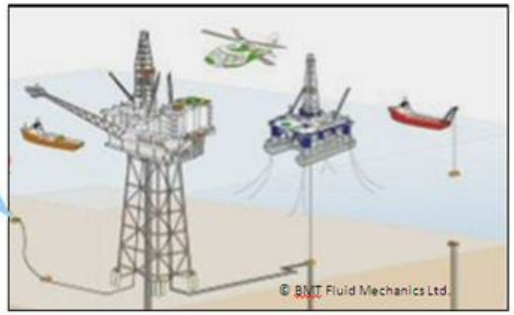
2.3.5 Diagrammatic Summary of Potential Impacts

This diagram summarises potentially significant impacts on the environment as identified by the respective EIAs for operations in Block 9.

At sea: Operations (and decommissioning) are most likely to affect the quality of the water and modify the characteristics of the seafloor and the dependent ecosystems in the immediate areas of operation. However, ocean currents can move a local disturbance to the coast or other regions of the sea.

On Land: Land-based impacts relate to waste disposal, including overloading of landfill sites, waste of useful materials, health hazards to scavenging animals & birds, and pollution of groundwater from inadequate waste handling. Significant oil spills at sea can cause pollution of beaches.

Fisheries:
-trawling efficiency and fishing areas reduced by exclusion zones.
- potential snags caused by obstructions on the sea bed.



Air quality & climate: are affected by
-flaring,
- engine exhausts.

Navigation hazards:
- platforms and buoys are potential obstructions to shipping.

Marine mammals & sea birds: - - may ingest, or be strangled, by synthetic / plastic wastes.
- may be affected by major oil spills, or disturbed by service vessels or helicopters.

Sessile alien species:
- have colonised artificial substrates and may spread to other habitats.

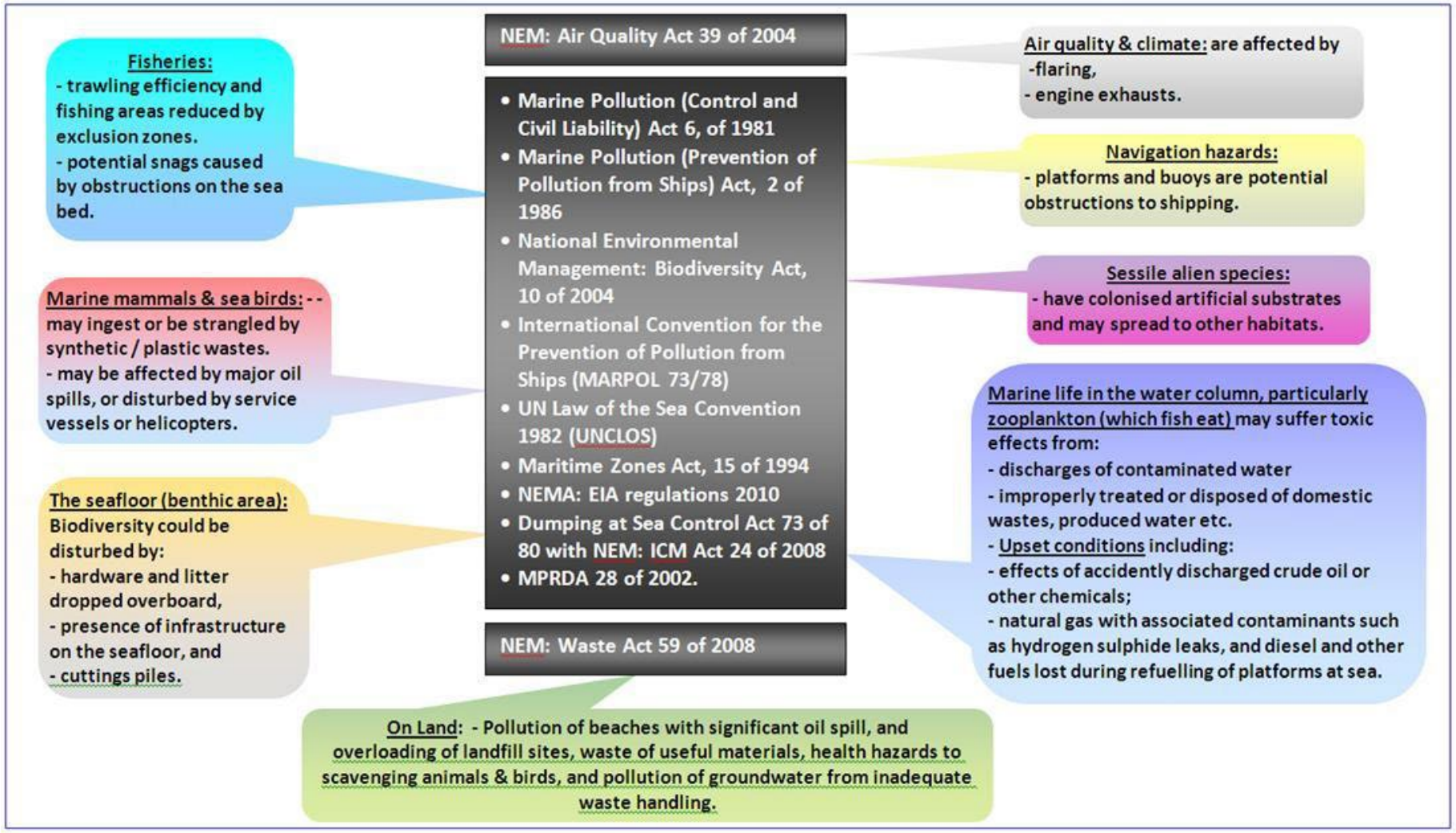
The seafloor (benthic area): Biodiversity could be disturbed by:
- hardware and litter dropped overboard,
- presence of infrastructure on the seafloor, and
- cuttings piles.

Marine life in the water column, particularly zooplankton (which fish eat), may suffer toxic effects from:
- discharges of contaminated water
- improperly treated or disposed of domestic wastes, produced water etc.
- Upset conditions including:
- effects of accidently discharged crude oil or other chemicals;
- natural gas with associated contaminants such as hydrogen sulphide leaks, and diesel and other fuels lost during refuelling of platforms at sea.

2.4 LEGISLATIVE PROVISIONS

2.4.1 Diagrammatic Summary of Legislative Provisions

This diagram summarises legislative provisions for the management of activities with potentially significant impacts on the environment.



2.4.2 Policies, Conventions, Laws & Permit Requirements Applicable to Operations and Decommissioning

The tables below summarise legislative provisions for the management of activities with potentially significant impacts on the environment. This is not intended to be an exhaustive list and should be verified against the continually updated legal register. PetroSA's EMPrs are designed to assist the production projects to comply with the relevant aspects of these laws and conventions.

Table 2.1: List of Legislation and policies relevant to PetroSA's activities off-shore.

Legislation or policy	Nature of issue	Specific requirements
Dumping at Sea Control Act, 73 of 1980	Provides for the dumping of substances at sea	Permitting requirements are stipulated in section 3 of the Act. (This Act will be repealed and replaced by the applicable provisions of the NEM: Integrated Coastal Management Act, 24 of 2008, when those become operational.)
Gas Act, 48 of 2001, read with the *Piped Gas Regulations*	Registration requirements	Activities that ordinarily require licensing under the Act are required only to be registered if they were on-going at the time that the gas Act became operational.
National Environment Management Act 107 of 1998	EIAs and EMPs	Deals with all aspects of environmental management, including EIAs and EMPs, although specific requirements in this respect have been amended in the NEMAA 62 of 2008 (see directly below). The EIA Regulations include various activities that may be associated with decommissioning and would require environmental authorisation before they can proceed.
National Environmental Management Amendment Act, 62 of 2008	Content of EIAs and EMPs and delegation of responsibility for permits/ rights/ authorisations.	Specifies the scope of EIAs and EMPs. However, the NEMAA only applies to mining activities 18 months after either NEMAA or the MPRDAA become operational (whichever commences last) at which point the Minister of Minerals becomes the competent authority in terms of NEMA for all mining and prospecting activities. Any activity related to prospecting and mining that constitutes a "listed activity" in terms of Government Notices R. 544, 545 or 546 will require environmental authorisation in terms of NEMA. The mining company must also obtain the necessary approvals in terms of MPRDA.
Mineral and Petroleum Resources Development Act, 28 of 2002 (MPRDA)	EMPrs	Governs the administration of prospecting, exploration and mining and production of minerals and petroleum resources which are subject to an "approved environmental management programme" (now amended to "environmental authorisation" in compliance with NEMA's requirements in Chapter 5). The MPRDA is underpinned by the principles of NEMA and as such, any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations. PetroSA is responsible for complying with its EMPrs, and for remedying any environmental damage caused by its activities or by pollution events.
Mineral and Petroleum Resources Development	EMPrs	Amends the 2002 Act (see above) to align the MPRDA more closely with the NEMA environmental authorisation requirements. The Minister (of Minerals) is authorised to issue an "environmental authorisation" if deficiencies in the environmental management plan or environmental

Legislation or policy	Nature of issue	Specific requirements
Amendment Act, 49 of 2008 (MPRDAA)		management programme compiled under the 2002 act or prior to NEMA 1998 have been addressed and if satisfied that the requirements in Chapter 5 of the [*NEMA*] have been met.'' Thus, any new EMPrs must conform to the requirements of NEMA. EMPrs cannot be amended without the permission of the Minister. Issue of a closure certificate requires an application to the Regional Manager in the area where the project is located within 180 days of completion or cessation of the mining operation. The application must be accompanied by the required information, programmes, plans and reports prescribed in terms of the MPRDA (as amended), and NEMA. A closure certificate will be issued subject to approval in writing from the Chief Inspector and each government department with legal jurisdiction for the environment. (No mention is made in MPRDAA of decommissioning requirements).
Mine Health and Safety Act, 29 of 1996	Health and Safety	Provides for health and safety requirements for mining operations and includes hazard and risk assessments, monitoring and awareness training.
National Environmental Management: Waste Act, 59 of 2008	Waste management licence	Regulates all aspects of waste management, with effect from 1 July 2009 (see also the activities that require a waste management license, as from 3 July 2009). The Act specifies requirements for waste management plans with emphasis on waste minimisation, and recycling. Accordingly, PetroSA must have integrated waste management plans and may be required by the Minister or the Waste Management Officer (Provincial) to provide an annual waste management report.
National Environmental Management: Air Quality Act, 39 of 2004	Air quality	Regulates all aspects of air quality, including prevention of pollution, providing for national norms and standards regulating air quality monitoring, management and control and including a requirement for atmospheric emissions licenses for listed activities, such as emissions from the petroleum industry. Remaining provisions of the Act became operative on 1 April 2010.
Maritime Zones Act, 15 of 1994 (MZA)	Identification and description of maritime zones, together with provisions regarding off-shore installations	The Act defines the applicable South African maritime zones, in a manner consistent with UNCLOS. The MZA establishes that all waters inshore of 12 nautical miles and the airspace above it, are "territorial waters" regulated by the laws the Republic. The "exclusive economic zone" is the sea beyond the territorial waters but within a distance of 200 nautical miles from the baseline/ low water mark. Within this zone South Africa has the exclusive right to explore and exploit living and non-living resources in and on the sea bed and in the water column. South Africa also has the duty to conserve, and manage activities affecting, these resources.
	Installation jurisdiction	This sub-section provides that the jurisdiction in terms of any disputes or issues arising with regards to an installation will fall within the Municipal jurisdiction of the district as designated by the Minister of Justice or where no designation has been made, within the district nearest to the installation, for example, Mossel Bay. (See also the deeming provisions in regard to 'installations' and the application to those facilities (including where they are situated in the EEZ) of the whole body of South African law.)
	Maritime casualties	Provides for measures to be taken against any vessel or aircraft in order to protect the coastline or related interests, to include fishing, from pollution or any threat of pollution resulting from a maritime casualty or an act or omission relating to such casualty which may reasonably be expected to result in major harmful consequences.
NEM: Integrated	Marine and	The ICMA supports the authorisation requirements of NEMA but specifies

Legislation or policy	Nature of issue	Specific requirements
Coastal Management Act, 24 of 2008 (ICMA)	Coastal Pollution / Dumping at Sea	additional criteria for regulating activities or developments and provides for pollution control within the coastal zone, where the coastal zone includes the Exclusive Economic Zone defined in the Maritime Zone Act (see above). Relevant provisions of the Act to PetroSA's offshore activities include the prohibition of incineration and dumping waste at sea without a permit (section 70); issuance of dumping permits (section 71) and emergency dumping at sea (section 72), where dumping at sea includes storage of waste material on the seabed and abandonment of structures as well as deliberate disposal of waste from a vessel or structure. These provisions apply to the EEZ and continental shelf. It also includes requirements for application for a coastal lease or concession for development within the coastal zone. Permits may not be issued if levels of radioactivity greater than that defined by International Atomic Energy Agency and MARPOL; can lead to floating debris, or poses a serious obstacle to fishing or navigation.
Marine Pollution (Control and Civil Liability) Act, 6 of 1981 (MPCCLA)	Marine Pollution	The purpose of this Act is to provide for the protection of the marine environment from pollution by oil and other harmful substances, and for that purpose to provide for the prevention and combating of pollution of the sea by oil and other harmful substances. It also determines liability for loss or damage caused by the discharge of oil from ships, tankers and offshore installations and for related matters. The MPCCLA covers: • reporting of hazardous discharges to authorities • the transfer of hazardous materials between installations and vessels offshore subject to permission of the South African Maritime Safety Authority; • requirement for safety pollution certificates to operate installations and subject to a contingency plan for combating pollution.
National Ports Act, 12 of 2005	Navigation and cargo handling within port limits	Regulates and controls navigation within port limits and the approaches to ports; cargo handling, and the pollution and the protection of the environment within the port limits. Specifies a requirement for a license from the National Ports Authority Limited to operate a ports facility or service.
Maritime Traffic Act, 2 of 1981	Marine traffic	Regulates marine traffic in South Africa's territorial waters. The act prohibits the laying up of vessels outside harbour, specifies the lay-up requirements for vessels, and regulates the entry and dropping of anchor within 500m safety zone of installations.
National Heritage Resources Act, 25 of 1999	Heritage assessments and procedures in the event of finding archaeological or heritage objects.	Provides for the protection of South Africa's natural heritage, including wrecks or associated debris or artefacts that may be found or disturbed on the sea bed. In the event that archaeological or heritage objects are found on the sea floor, PetroSA must cease activities and notify the South African Heritage Resource Authority (SAHRA) of the find, who will then determine the next step. This may include the application for a permit to, inter alia, alter, demolish, relocate, destroy or damage such object/s. A Heritage Assessment is required for any new pipelines exceeding 300m in length or new structures exceeding 5000m^2.
National Environmental Management: Biodiversity Act, 10 of 2004.	Protection of marine biodiversity	Regulates the carrying out of restricted activities that may harm listed threatened or protected species or activities that encourage the spread of alien or invasive species subject to a permit. The listed restricted activities do not generally apply to PetroSA activities directly although the "conveying, moving or otherwise translocating any specimen of an alien or listed invasive species" could be brought about

Legislation or policy	Nature of issue	Specific requirements
		during decommissioning through the removal of subsea structures to which alien marine species may have become attached. Under the act, PetroSA has a duty of care towards all protected species such as fish, turtles, seabirds and marine mammals that may be affected by the operation of vessels and helicopters.

Table 2.2: Permits or licences relevant to environmental aspects of PetroSA Offshore Operations

Act, Regulation or By-law	Permit or licence	Requirements	Implementing Agency	Relevance to PetroSA
Integrated Coastal Management Act, 24 of 2008	Dumping permit	Permit to dump waste or man-made structures. Validity: 2 years, renewable for further 2 years maximum.	Marine and Coastal Management?	Relevant to operation and decommissioning.
Marine Pollution (Control and Civil Liability) Act 6 of 1981	Pollution Safety Certificate	Certificate required to operate an offshore facility	SAMSA	Relevant to platform operation
The National Heritage Resources Act, 25 of 1999	Heritage permit	Permit to allow disturbance or removal of a heritage object.	SAHRA	Relevant if heritage objects found on the sea bed during inspection or laying new pipelines etc.
Air Quality Management Act, 39 of 2004	Atmospheric Emissions License	License for atmospheric emissions	DFFE ~~DEA~~	Flaring from installations

Table 2.3: International Agreements / Conventions to which SA is a signatory and that have been enacted in domestic legislation

Convention	Key Provisions
International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)	Provides regulations covering the various sources of ships-generated pollution. It covers regulations for the prevention of pollution by oil, sewage, garbage (galley waste and solid waste) and atmospheric emissions. MARPOL specifies the following standards applicable to PetroSA activities: Drainage and ballast water: 15ppm oil in water. Sewage: maceration of galley waste to <25mm, and disposal seaward of 12 nautical miles. Solid waste: prohibits discharge to sea.
UN Law of the Sea Convention, 1982 (UNCLOS)	Covers prevention of marine pollution and the compensation for damage caused by such pollution. It contains provision relating to the prescription and enforcement of pollution standards and contingency plans to prevent and handle pollution. Signatories are required to adopt legislation to reduce marine pollution from sea-bed activities in the EEZ and on the continental shelf. It specifies a requirement for removal of decommissioned platforms but does not expressly exclude disposal through dumping. It does not make reference to subsea structures such as anchors and pipelines.
International Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972 (London Convention)	The "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", the "London Convention" for short, is one of the first global conventions to protect the marine environment from human activities and has been in force since 1975. Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by

Convention	Key Provisions
	dumping of wastes and other matter. In 1996, the "London Protocol" was agreed to further modernize the Convention and, eventually, replace it. Under the Protocol all dumping is prohibited, except for possibly acceptable wastes on the so-called "reverse list". The Protocol entered into force on 24 March 2006 and there are currently 37 Parties to the Protocol (including South Africa).
United Nations Framework Convention on Climate Change (UNFCCC), 1992	This convention aims to stabilise greenhouse gas concentrations in the atmosphere and parties to this convention agree to promote sustainable management and promote and cooperate in the conservation and enhancement of sinks and reservoirs of all greenhouse gases, such as terrestrial, marine and coastal ecosystems.
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal – adopted 22 March 1989	The convention obliges member states to minimise and control the generation and movement of hazardous wastes between states, and to protect the environment in the transport and disposal of such waste. Hazardous waste includes waste mineral oils unfit for their originally intended use; waste oils/water; hydrocarbons/water mixtures, and emulsions.
Convention on Biological Diversity – 5 June 1992	This convention aims to protect biodiversity and in particular, to adopt measures for recovery and rehabilitation of threatened species.

2.4.3 Summary of Legislation Applicable to Decommissioning[1]

From a legal perspective, PetroSA must adhere to South Africa's obligations under several international instruments relevant to the use of the sea, and to marine conservation (and marine pollution prevention laws), and conventions to which South Africa has acceded. Furthermore, there are regional international instruments which impose duties on South Africa and which may find applicability in the context of the decommissioning of the oil and/or gas field infrastructure. PetroSA will also be obliged to adhere to obligations imposed by South African legislation within this context.

The international legal perspective

South Africa has ratified the United Nations Law of the Sea Convention ("UNCLOS")[2] and has also acceded to the following instruments which are relevant to decommissioning offshore infrastructure:

- the International Convention on Oil Pollution Preparedness, Response and Co-operation[3] (the "OPRC Convention");
- the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter[4] (the "London Convention"); and
- the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the "London Protocol")[5].

Obligations imposed under the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (the "Basel Convention")[6] may potentially become relevant to the decommissioning activities in the event that hazardous waste (as defined in this Convention) emanating from the decommissioning activities is transported from South Africa to another country, either for sale or for disposal purposes.

[1] *Summary compiled by Smith Ndlovu & Summers Attorneys*
[2] *Ratified by South Africa on 23 December 1997*
[3] *Acceded by South Africa on 4 July 2008.*
[4] *Acceded by South Africa on 23 December 1998.*
[5] *Acceded by South Africa on 23 December 1998.*
[6] *Acceded to by South Africa on 5 June 1994.*

The regional legal perspective

From a regional perspective, South Africa has ratified the Convention for Co-Operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (the "Abidjan Convention")[7] , as well as the protocol thereto titled the Protocol Concerning Co-operation in Combating Pollution in Cases of Emergency in the Western and Central African Region (the "Abidjan Protocol")[8].

Generally, the Abidjan Convention imposes an obligation on member states to take all appropriate measures to prevent, mitigate and control pollution to the marine areas to which the Convention applies.[9] Additionally, member states are also required to ensure the sound environmental management of natural resources within that area by using the best practicable means at its disposal. The Abidjan Convention in particular requires that member states require the undertakeing of environmental impact assessments as part of any planning process entailing projects within its territory, particularly in the coastal areas that may cause substantial pollution of, or significant and harmful changes to the environment. The Abidjan Protocol places specific obligations on member states relating to any "marine emergency."[10] Generally, states are obliged to co-operate in all matters relating to the taking of necessary and effective measures to protect their respective coastlines and related interests from the threat and effects of pollution resulting from marine emergencies. The Abidjan Protocol also obliges member states to put measures in place to ensure that all marine emergencies are reported to other member states including information regarding the spillage of harmful substances at sea which are likely to present a serious and imminent threat to the marine environment or to the coast.

The South African legal perspective

More directly, PetroSA will be obliged to adhere to the range of South African environmental laws which regulate activities which have the potential to harm the environment. The National Environmental Management Act [11] ("NEMA") is one of the most important in this regard. Section 24F of NEMA prohibits the commencement of any activity, identified as one for which prior environmental authorisation is required under NEMA (referred to as "listed activities"). The application procedure to obtain environmental authorisation requires the applicant to undertake an environmental impact assessment ("EIA") process regulated by the EIA Regulations promulgated under NEMA.[12]

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[7] Ratified by South Africa on 16 May 2002.
[8] Ratified by South Africa on 16 May 2002.
[9] Article 1 of the Abidjan Convention states that the Convention shall cover the marine environment, coastal zones and related inland waters falling within the jurisdiction of the states of the West and Central African Region, from Mauritania to Namibia inclusive. The Abidjan Convention's area of application was extended to include South Africa when it acceded to the Convention on 16 May 2002.
[10] Defined in the Abidjan Protocol as any incident, occurrence or situation, however caused, resulting in substantial pollution or imminent threat of substantial pollution to the marine and coastal environment by oil or other harmful substances and includes, in particular, collisions, strandings and other incidents involving ships, including tankers, petroleum production blow-outs and the presence of oil or other harmful substances arising from the failure of industrial installations.
[11] Act 107 of 1998.
[12] These Regulations are respectively the Regulations under section 24(5) of the [NEMA]: Environmental Impact Assessment Regulations; the Regulations under section 24(2)(a) and (d) of [NEMA] – Identification of activities and competent authorities (process in terms of Regulations 22 to 26) (the "Basic Assessment List"); and the Regulations

On 18 June 2010, a new set of EIA Regulations was published by the national Department of Environmental Affairs. These Regulations came into effect on 2 August 2010.[13]

With the commencement of the new EIA Regulations, the implications for the decommissioning of the oil and gas production infrastructure are that if PetroSA's application for an environmental authorisation is submitted subsequent to the coming into effect of the new EIA Regulations, then the application process for an environmental authorisation will be governed by the new EIA Regulations. The successful undertaking of the EIA process is of primary importance because that process will inform all other domestic application procedures for other related environmental approvals and/or additional permits that will or may be required.

The requirements of the Mineral and Petroleum Resources Development Act [14] ("MPRDA") are also relevant in this regard, in particular in the context of PetroSA meeting obligations imposed by approved Environmental Management Programmes for rehabilitation of the areas previously exploited, as well as the removal of infrastructure used in that context.[15]

Furthermore, the Maritime Zones Act [16] (the "MZA") finds application on the facts of this assessment. The MZA stipulates that any law in force in South Africa, including the common law, shall also apply on and in respect of any "installation"[17] within internal waters, territorial waters, or the exclusive economic zone, or on or above the continental shelf of South Africa, as those areas are defined in the MZA. The FA Platform and associated infrastructure such as pipelines to and from the platform fall within the definition of an installation in terms of the MZA. It follows that all the laws of South Africa will apply to the decommissioning operations undertaken at the FA Platform.

In addition to the laws described above, there will therefore be several substantive obligations imposed on PetroSA by other environmental legislation (such as those relating to the protection of marine biodiversity, marine pollution prevention and control, and protection of the coastal zone) for the undertaking of the proposed decommissioning activities by reason of the potential environmental impacts which may arise in that context. Broadly, the obligations imposed by

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under section 24(2)(a) and (d) of [NEMA] – Identification of activities and competent authorities (process in terms of Regulations 27 and 36) (the Scoping and EIA List"). The Regulations referred to in this foot note were promulgated respectively in Government Notice R385, R386 and R387 in Government Gazette 28753 of 21 April 2006. The Basic Assessment List and the Scoping and EIA List were amended in 2009 by Government Notice 719 in Government Gazette 32369 dated 3 July 2009.

13 *The (new) Regulations were published in Government Gazette 33306 dated 18 June 2010. The Regulations were respectively the National Environmental Management Act , 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations published in Government Notice R. 543; the National Environmental Management Act , 1998 (Act No. 107 of 1998) Listing Notice 1: List of Activities and competent authorities identified in terms of sections 24(2) and 24D [of NEMA] published in Government Notice R. 544; the National Environmental Management Act , 1998 (Act No.107 of 1998) Listing Notice 2: List of Activities and competent authorities identified in terms of sections 24(2) and 24D [of NEMA] published in Government Notice R. 545; and the National Environmental Management Act , 1998 (Act No. 107 of 1998) Listing Notice 3: List of Activities and competent authorities identified in terms of sections 24(2) and 24D [of NEMA] published in Government Notice R. 546.*

[14] Act 28 of 2002.

[15] See section 39 of the MPRDA read with section 10(5) of Schedule II to the MPRDA.

[16] Act 15 of 1994.

[17] The term "installation" is defined in the MZA as including "any exploration or production platform used in prospecting for or the mining of any substance" within the internal waters, territorial waters or the exclusive economic zone or on or above the continental shelf of South Africa, as those areas are defined in the MZA.

legislation require PetroSA to take reasonable steps to prevent significant harm to the sea environment. Of particular relevance are PetroSA's obligations under the National Environmental Management: Integrated Coastal Management Act [18] (the "ICMA") which inter alia requires that PetroSA takes positive measures to prevent significant environmental harm to the marine and coastal environment. The ICMA also empowers the Minister of Environmental Affairs to take certain measures to cause PetroSA to adhere to its obligations under the ICMA (such as by issuing a directive obliging certain conduct) and a failure to adhere to such action will amount to a criminal offence.

Where waste will be generated as a result of proposed decommissioning activities, the generator and handler of that waste will be under strict obligations to minimise that waste and to follow an integrated waste management approach. Additionally, where an activity amounts to a "waste management activity" as defined in the National Environmental Management: Waste Act[19] (the "Waste Act"), then a waste management licence will be required from the competent authority before that activity may be carried out. The Waste Act also prohibits the disposal of waste in a manner that will harm the environment, unless the most environmentally friendly manner to deal with the waste was adopted. The application for this licence also involves an EIA process which may be subsumed within the EIA process undertaken in terms of NEMA.

It should be noted that the summary set out above does not purport to be an exhaustive analysis of all of the relevant and applicable legislation, but is intended to convey a summary of the salient issues which will be relevant from a legal perspective to the anticipated decommissioning activities.

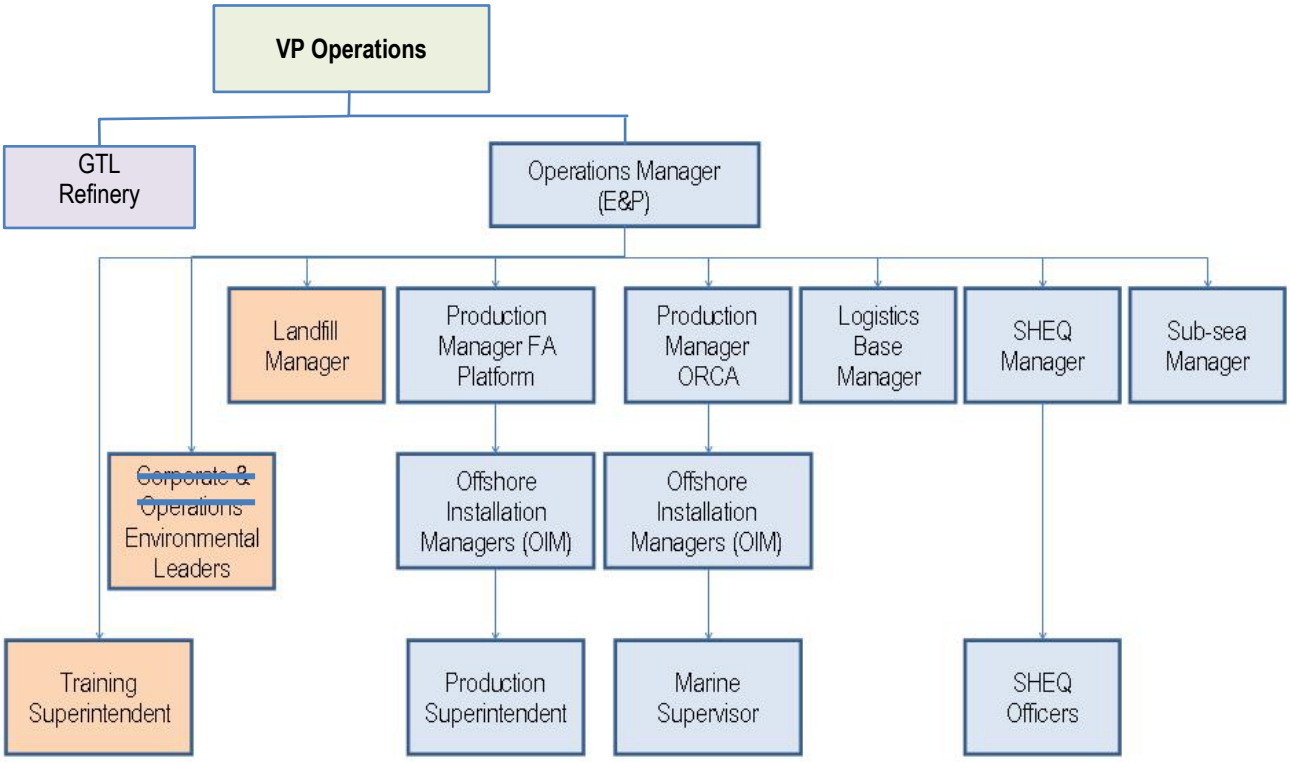
2.5 INSTITUTIONAL FRAMEWORK & REPORTING

2.5.1 PetroSA Environmental Management Structure & Responsibilities

The organogram below depicts the onshore and offshore management structure as it relates to environmental matters; the table below indicates areas of environmental responsibility as detailed in the EMPr.

[18] *Act 24 of 2008.*
[19] *Act 59 of 2008.*

Onshore and Offshore Management Structure as it Relates to Environmental Matters:



Areas of Environmental Responsibility as Detailed in the EMPr:

PERSONS RESPONSIBLE	ENVIRONMENTAL AREAS OF RESPONSIBILITY PLATFORMS & SUPPORTING SERVICES
Operations Manager E&P	• Decommissioning strategy review • Accountable for overall environmental performance compliance
Operations SHEQ Manager	• Audit all environmental management activities / tasks annually • Retain all data, records, monitoring results
Sub-Sea Manager	• Inspection and maintenance of subsea infrastructure to prevent spills/ leaks • Store and characterise visual imagery for monitoring • Report monthly on activities
Logistics Base Manager	• Compliance by helicopter and support vessel operations • Waste tracking and management • Handling of equipment/ fuel supplies to prevent pollution
Offshore Installation Manager (OIM)	• Compliance with SAMSA requirements to avoid pollution incidents • Design and report on waste management programme • Assess and deal with liquid spills • Assess and deal with loss of solid objects • Safe keeping of all records/ data/ documentation • Monthly reporting of monitoring results

PERSONS RESPONSIBLE	ENVIRONMENTAL AREAS OF RESPONSIBILITY PLATFORMS & SUPPORTING SERVICES
SHEQ Officers	• Monthly reporting section for The Monthly Report • Present 'tool box talks' • Ensure careful storage, handling, disposal of chemical substances and solid objects to prevent losses and spills • Implement waste management programme • Monitoring of produced water, bilge water, flare emissions' solid waste production and disposal • Assess and deal with liquid spills • Assess and deal with loss of solid objects
Production Superintendent / Marine Supervisor	• Operation of oily water separators to prevent oil / chemical spills to sea from produced water, deck and bilge water • Maintain sewage system to standard • Control gaseous emissions
Training Superintendent	• Develop and implement an environmental training programme for all personnel
Operations Environmental Leader	• Develop and maintain a stakeholder engagement register • Interactions with stakeholders via Forum meetings • Organise monitoring of marine life from subsea inspection imagery • Report to E&P MANCO
Corporate Environmental Leader	• Audit performance of the Environmental Management Plan • Update EMPrs, including decommissioning issues • Report to PASA, DFFE ~~DEA~~, EXCO, MANCO.

2.5.2 Institutional Linkages

PetroSA is the government-owned oil and gas company mandated by cabinet to commercialize all the state-owned assets in the petroleum sector and to manage them as a profitable business for the benefit of all South Africans. As described in its Environment Policy Statement, PetroSA is committed to safeguarding the environment (and reducing its' environmental impacts) in areas in which it operates.

Key institutions that PetroSA reports to on the environmental aspects of its offshore activities are the Petroleum Agency of South Africa (PASA), Department of Minerals (DMR), Department of Environment~~al~~ Forestry and Fisheries (DFFE) ~~Affairs (DEA)~~, and the South African Maritime Safety Authority (SAMSA). In addition to the administration of laws listed above, the relevant roles and overarching responsibilities of these bodies are:

PASA: Is designated in terms of the Mineral and Petroleum Resources Development Act to promote and regulate exploration for onshore and offshore oil and gas resources and their optimal development on behalf of government. The Agency also strives to ensure operators give effect to the general objectives of integrated environmental management as stipulated in the National Environmental Act, 1998.

DMR: Is responsible for the administration of South Africa's mining laws and for promoting the development of the industry. They also govern the minerals and energy sectors to be secure, safe, healthy and environmentally sound. Under the One Environment System the DMR is the competant Authority for Environmental Applications for petroleum rights.

DFFE ~~DEA~~: Is responsible (along with provincial environmental departments) for the implementation and enforcement of the National Environmental Management Act 107 of 1998 (as well as a suite of other environmetal legislation, like the NEM: AQA). NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment; institutions that will promote cooperative governance; and procedures for co-ordinating environmental functions exercised by organs of state (among a myriad of other functions). The Chief Directotae: Marine and Coastal Management ("MCM") advises the Minister and the Department about the development and conservation of marine and coastal resources to ensure the sustainable utilisation of such resources, as well as to maintain marine ecosystem integrity and quality.

SAMSA: Is established in terms of the South African Maritime Safety Authority Act 5 of 1998, and is accountable to the Minister of Transport. Its responsibilities include monitoring and enforcing compliance with safety and environment protection standards, and responding to marine pollution incidents and other maritime emergencies. SAMSA's principal function is to prevent marine pollution, whereas DFFE's ~~DEA's~~ MCM is charged with managing pollution if and when it occurs (i.e. it is charged with pollution control).

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section 3: table of environmental protection activities

WHAT THIS SECTION COMPRISES:

- Section 3 lists the specific actions required, or steps which should be taken, by PetroSA to avoid or limit damage to the environment from offshore operations and decommissioning.
- It draws on and summarises key elements of PetroSA's procedures that are relevant to environmental management to facilitate environmental compliance and performance auditing.
- It does not try to duplicate or conflict with existing procedures, but integrates with existing PetroSA management systems and procedures, primarily SHEQ procedures.

- Each sub-section starts with a 'rationale' giving the reasons why specific kinds of damage to the environment should be avoided, and why there is a need to manage specific activities.
- Following this, the 'objectives' of what PetroSA is specifically trying to achieve, are set out.
- Then, instructions or 'auditable actions' are listed, staff responsiblities allocated, and the required timing or frequency of actions stipulated.

The next page provides a Layout of the Table showing contents and inter-linkages between the sub-sections.

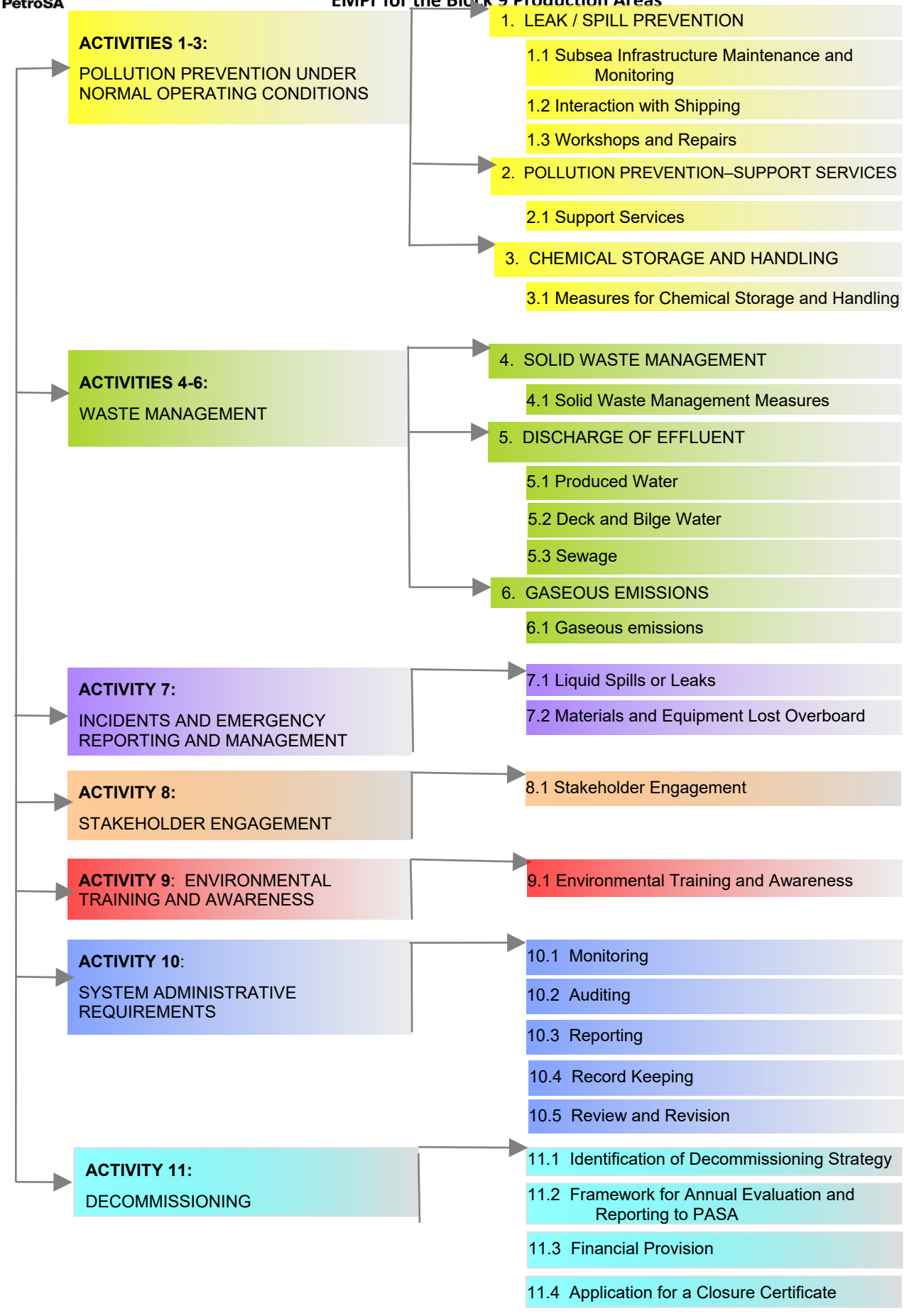


Figure 1: Layout of the Table.

Environmental Protection Activities

pollution prevention under normal operating conditions

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 1. LEAK/ SPILL PREVENTION

1.1 Subsea Infrastructures Maintenance and Monitoring

Rationale:

Gas and oil is transported from wellheads to the surface in pipelines via valves and other equipment. In a saline and turbulent environment if the pipe work and associated connectors and valves are not maintained regularly they could deteriorate and result in their contents leaking to the sea. Scheduled maintenance and regular inspections are essential to maintain the integrity of the system of pipelines and risers used to convey the oil or gas. Since the contents of the pipeline are a valuable product there are procedures in place to maintain and inspect the system to limit losses. The focus of this plan is to ensure that environmental issues are adequately addressed.

Objectives:

- To check the integrity of all pipe work and equipment on the platform and sea bed in a systematic and scheduled manner to minimise the risk of rupture or leakage which could cause pollution of the sea
- To replace, repair and maintain all pipe work and equipment on the platform and sea bed in a systematic and scheduled manner to minimise the risk of rupture or leakage which could cause pollution of the sea
- To detect any leaks or ruptures so that they can be repaired speedily
- To formally and critically evaluate the circumstances of any ruptures and leaks in order to plan for prevention of recurrence.

1.1.1	*All undersea structures including pipe works and valves shall be subject to scheduled inspection and maintenance as per the flow diagram below.*	***Subsea Manager***	***Max interval 5 years***

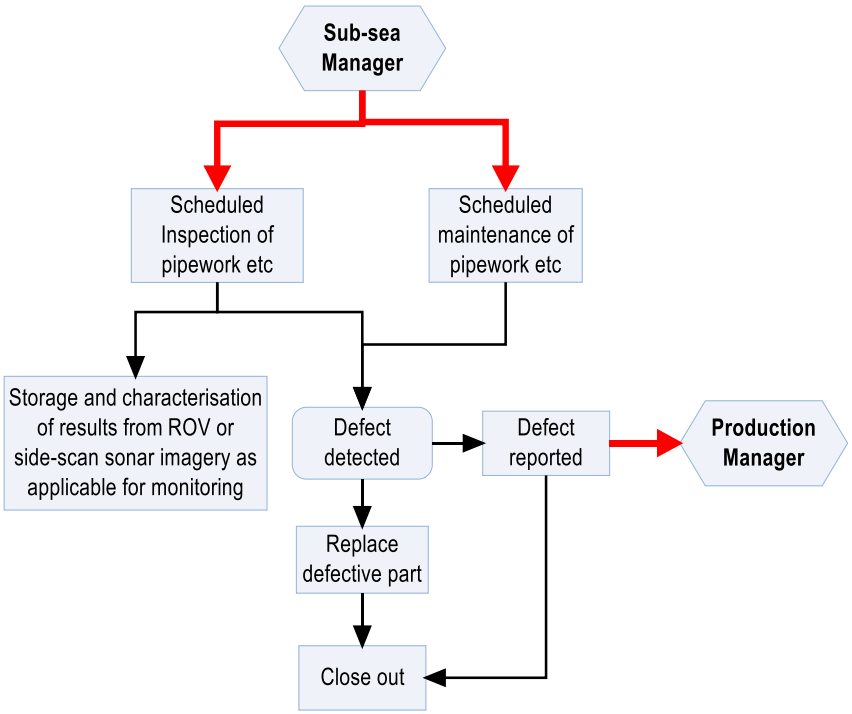


Figure 1: Pipeline maintenance and inspection

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
1.1.2 The results of the scheduled inspections surveys shall be subject to systematic, documented review.	***Subsea Manager***	***Within 2 months of survey***
1.1.3 Any repairs shall be reported in The Quarterly ~~Monthly~~ Report	***Subsea Manager***	***Quarterly ~~Monthly~~***
*1.1.4 Any leak or spill of liquids, be they on the surface or sub-sea, shall be regarded as an incident and/ or emergency and dealt with according to the incident procedure below (**Activity 7.1**).*	***Subsea Manager***	***Immediately***
1.1.5 Ensure that all well interventions and workovers at the FA, FA-Satellite and EM wellfields are planned and executed under approved procedures that include defined activity scope, updated risk assessments, verified well barriers, controlled management and disposal of fluids, certified well control equipment (including BOPs), pre- and post-operation ROV seabed surveys, issued navigational notices, and documented environmental monitoring and reporting.	***Environmental Manager***	***Prior to commencement of activity. During activity.***
1.1.6 Audit guidelines (maintenance) ▪ Audits should, through examination of records retained by the facility, visual inspections and targeted interviews, verify that: ○ The maintenance schedule was adhered to ○ The inspection schedule was adhered to ○ Any defects were repaired ○ Incidents were recorded in the incident reports ○ The response time to incidents is appropriate to their significance ○ *Environmental* Incidents were subject to comprehensive evaluation by management ○ Requisite changes were made to operational procedures to ensure that the incident is not repeated ○ Incidents arising from the same root cause(s) are not repeated ○ Trial runs and/or drills for major incidents are conducted at least annually ○ The response for major contingencies are formally reviewed by management annually	***SHEQ Manager***	***Annually***
1.2 Interaction with Shipping		
1.2.1 Service Vessels		
Rationale: Vessels carrying personnel or supplies to and from the offshore installations may negatively impact on the environment through reckless behaviour, negligence and/or accidents. PetroSA may be jointly responsible for the immediate response and remediation of any such environmental damage. Furthermore, any residual environmental damage resulting from actions by the supply vessels may increase the costs and extent of PetroSA's decommissioning rehabilitation. It is therefore important that the supply vessels are operated by competent personnel, are seaworthy and appropriate for their tasks, and managed in such a way as to minimise the risk of any environmental damage occurring. In the event that damage does occur, the correct and appropriate response is undertaken by the Master(s) of the vessel(s) concerned.		
Objectives: ▪ To ensure that professional and seaworthy certification is appropriate to requirements		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
▪ To inform the Masters of the supply and transport vessels of the actions to be taken to minimise environmental damage and the actions to be taken in the event of such damage occurring ▪ To check that the requisite actions are taken and that they are effective in minimising environmental damage.		
1.2.1.1 All contracts with service providers shall require compliance by the service provider with the EMPrs. The contracts shall specifically require that the service provider complies with all relevant legislation and indemnifies PetroSA of any shared liability in the event that the service provider contravenes legislation in spite of being required to adhere to the EMPr. PetroSA reserves the right to inspect operations on the service-provider's vessel to assess compliance. Deviations from the PetroSA procedures shall be deemed breach of contract.	***Logistics Base Manager***	***Ongoing***
1.2.2 Other Shipping in the Area		
Rationale: The offshore structures are potential hazards to all marine traffic. A collision between a ship and any structure or PetroSA service vessel may result in marine pollution through the release of oils and fuels and the deposition of objects on the sea bed. Various measures need to be taken to minimise the risk of collisions through alerting shipping to the presence of the structures and/or operations.		
Objectives: ▪ To ensure that provisions prescribed by SAMSA to ensure that the structures and associated vessels are "visible" to marine traffic and aircraft have been implemented ▪ To ensure that the provisions are effective in maintaining "visibility" of the structures and associated vessels.		
1.2.2.1 All measures prescribed by SAMSA to minimise the risks of collision of marine traffic with the offshore structures must be implemented and maintained.	***OIM***	***Ongoing***
1.2.2.2 Measures to be implemented include: • Maintenance of safety and exclusion zones • Maintenance of standard watch procedures • Issue navigational warnings if visibility of structures is diminished (e.g. power outages or failure of fog horn) • Radio communication to alert approaching vessels • Use of Flares and Sirens where necessary • Recording of interactions with vessels in the installation log book • Collisions, near misses or other transgressions with associated pollution risks will be treated as incidents and handled according to the procedure detailed under **Activity 7.**	***OIM***	***Ongoing***
1.3 Workshops and Repairs		
Rationale: The platforms and vessels contain workshops of various descriptions and sizes in which machinery containing oils and fuels are repaired and serviced. Furthermore, the workshops store oils and fuels and other potentially polluting substances. The workshop and repair operations do not always take place in a defined workshop area but may take place anywhere on the platform or vessel. While drainage mechanisms exist, there is a risk of polluting substances leaking or spilling into the sea and/ or solid objects falling overboard (**see Activity 7**). Procedures are already implemented to minimise loss of equipment or personnel. The focus of this plan is to ensure that environmental issues are adequately addressed.		
Objectives: ▪ To manage the workshops in a manner that minimises the risk of liquids polluting the sea and to expedite clean up of any such spillages that do occur ▪ To minimise the risk of polluting the environment during repairs and maintenance on the vessel or platform.		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
*1.3.1 All fuels, greases, oils and other chemicals shall be stored and handled as per chemical handling procedures specified in PetroSA standard operating procedures and summarised in the chemical handling procedures below (**Activity 3**).*	***SHEQ Officer***	***Ongoing***
1.3.2 Repair and servicing of loose equipment or machinery shall be undertaken only in the workshops or within areas of the vessel or installation which has drainage dedicated to containing spilled liquid and suspended debris.	***SHEQ Officer***	***Ongoing***
1.3.3 Where repair of equipment or machinery must take place in situ, precautions appropriate to the location must be taken to minimise the risk of spills or loss of objects overboard.	***SHEQ Officer***	***Ongoing***
*1.3.4 Any spills of liquids shall be treated as an incident and handled according to the procedure detailed under **Activity 7.1** below.*	***SHEQ Officer***	***Immediately***
*1.3.5 Any loss of objects overboard shall be treated as an incident and handled according to the procedure detailed under **Activity 7.2** below*	***SHEQ Officer***	***Immediately***
1.3.6 Audit Guidelines ▪ Audits should, through examination of records retained by the facility, visual inspections and targeted interviews, verify that: ○ Repair and servicing of mobile equipment and machinery takes place in the workshops or within areas which drain to the effluent tanks ○ Where such repair is not possible, that the measures taken to minimise spillage or loss of objects overboard were appropriate to the situation and location ○ Incidents were managed as per the incident procedure under **Activity 7**	***SHEQ Manager***	***Annually***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 2. POLLUTION PREVENTION - SUPPORT SERVICES

2.1 Support Services

Rationale:

The platforms and vessels are serviced by other vessels and helicopters which load and off-load equipment personnel and materials. Such operations may disturb marine life, solid objects and liquids may fall into the sea which could pose a risk to shipping or the fisheries, while certain articles and liquids may also be detrimental to marine life and could pollute the sea. Since all such cargo has a monetary value procedures exist to limit any such loss and to retrieve objects falling overboard wherever possible. The focus of the environmental management plan is to ensure that the procedures adequately address environmental issues.

Objectives:

- To minimise the risk of objects being lost overboard during transit or transfer
- To retrieve objects which have fallen overboard before they pose a risk to the environment or shipping
- To log the existence and location of fallen objects for future reference/ action
- To notify interested parties of the existence and location of un-retrieved fallen objects
- To minimise disturbance to large marine fauna from helicopter flights

2.1.1 Existing PetroSA and aviation service providers' procedures, such as the Materials Handling & Transport and Marine Support Services procedures, shall be implemented to minimise the risk of objects and chemical substances being dropped overboard, during cargo transfer, leaking from storage containers and during handling.	***Logistics Base Manager***	***Ongoing***
2.1.2 Helicopter transfers to and from offshore installations shall fly at a minimum height of 500m above sea level (or as instructed by the Relevant National Airport Air Traffic and Navigation Services) and shall not hover or circle over whales, dolphins, sharks, turtles or aggregations of seabirds.	***Logistics Base Manager***	***Ongoing***
2.1.3 Helicopter flight logs will be kept to demonstrate compliance with set flight paths.	***Logistics Base Manager***	***Ongoing***
2.1.4 Audit guidelines ▪ Audits should, through examination of records retained by the facility, verify that: ○ Incidents were recorded in the incident reports ○ The response time of incidents is appropriate to their significance ○ The decision whether or not to retrieve objects was environmentally appropriate ○ Incidents were subject to comprehensive evaluation by management ○ Requisite changes were made to operational procedures to ensure that the incident is not repeated ○ Incidents resulting from the same root cause(s) are not repeated ○ Trial runs and/or drills for major incidents are conducted at least annually ○ The response for major contingencies are formally reviewed by management annually	***SHEQ Manager***	***Annually***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 3. CHEMICAL STORAGE AND HANDLING

Rationale:

Vessels and platforms store and use a range of chemicals (both solid and liquid) which could potentially contaminate the marine environment. The activities of all personnel dealing with chemicals must minimise the risk of spillage. Not only do spillages constitute waste but they also pose a risk to the environment. Thus the first line of prevention is behavioural. Workshop management has been dealt with above under **Activity 1.3**. Even with effective plans in place, accidents do still occur. To this end the vessels and platforms have dedicated drainage systems which channel onboard spillages to tanks for treatment and / or disposal if required. Measures are required to contain any leaks and spillages to avoid the development of a hazardous cocktail in the bilge which could not be discharged to the sea and would require treatment and removal as hazardous waste.

Many of the procedures for chemical handling and storage are legislated under the Occupational Health and Safety Act 85 of 1993 as amended but the focus of the environmental management plan is to ensure that environmental issues are adequately addressed.

Objectives:

- To handle and store chemicals in such a way as to minimise the risk of spillage or leakage
- To dispose of expired chemicals in an environmentally responsible and legal manner
- To respond to any spills and or leaks in such a way that environmental damage does not occur
- To formally evaluate any spills or leaks in order to plan for prevention of recurrence

3.1 Measures for Chemical Storage and Handling		
3.1.1 A chemical register shall be maintained by the facility which will detail: ○ All chemicals used and stored by the facility ○ Chemical characterisation of each chemical including SABS class and hazard rating ○ Specific storage handling or disposal requirements for each chemical including Personal Protective Equipment ○ Emergency response actions for each chemical ○ The process used to verify the information contained in the register	***SHEQ Officer***	***Ongoing***
3.1.2 All containers of hazardous liquids shall be stored inside impermeable bunds (portable or fixed) which have a total capacity of 110% of the total amount liquid stored inside them. This shall apply both in store-rooms and in situations where containers have been temporarily moved from the store room to a position close to where the contents are being used for convenience.	***SHEQ Officer***	***Ongoing***
3.1.3 All chemicals shall have current Material Safety Data Sheets (MSDS) prominently displayed at the location of storage and use	***SHEQ Officer***	***Ongoing***
3.1.4 Incompatible chemicals shall not be stored in the same location	***SHEQ Officer***	***Ongoing***
3.1.5 Personnel using chemicals shall be trained in their use, disposal and clean-up.	***SHEQ Officer***	***Annually***
3.1.6 Any chemicals which are used at a location distant from their storage shall be transported in drip trays.	***SHEQ Officer***	***Ongoing***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
3.1.7 Expired chemicals shall be labelled as waste and treated in accordance with the disposal requirements specified in their MSDS	***SHEQ Officer***	***Immediately***
*3.1.8 Any liquid spills of more than 5 litres shall be treated as an incident and handled according to the incident procedure detailed under **Activity 7.1** below*	***all staff***	***Immediately***
*3.1.9 Any loss of chemicals overboard shall be treated as an incident and handled according to the procedure detailed under **Activity 7.1**.*	***SHEQ Officer***	***Immediately***
3.1.10 Offshore bunkering will not be allowed to take place in the following circumstances: ○ *Wind force and sea state conditions of >24 knots mean wind speed, >4m wave height,* ○ *During any workboat or mobilisation boat operations,* ○ *During helicopter operations,* ○ *During the transfer of in-sea equipment, and* ○ *At night or times of low visibility.*	***SHEQ Officer***	***Immediately***
3.1.11 Floating hoses should be utilised for bunkering of chemicals or substances which could potentially contaminate the marine environment. These will be made of flexible double carcass sections and will be equipped with a breakaway coupling for protection against excessive tension or overpressures in the fuel system. The closure time will be set to minimise the volume of oil spilled to the sea whilst being slow enough to prevent surge pressure building up. Hoses will also be fitted with high visibility markers and will have built-in buoyancy with a minimum reserve of 25% (to cope with a situation where the hose becomes filled with seawater and immersed). This will also prevent accidental damage to unseen hoses by supply vessels.	***SHEQ Officer***	***Immediately***
3.1.12 Audit Guidelines ▪ Audits should, through examination of records retained by the facility, verify that: ○ The chemical register is current and verified ○ Storage accords with legal requirements and the details contained in the MSDS ○ All liquids were stored inside bunds of requisite capacity ○ The bunds are sealed and the containment integrity is checked regularly ○ All hazardous chemicals were labelled as such and the emergency procedures to be adopted in the event of a spill clearly are detailed on MSDS at the site of storage ○ All MSDS are current and accurate ○ Mobile liquid chemical dispensers or drums are positioned on / or over drip trays ○ Spills are reported and handled according to the liquid incident management procedure under **Activity 7.1** ○ Spill absorbents are available at the location of use and that they are appropriate to the nature of the chemical being used ○ Expired chemicals are labelled as expired and handled as waste	***SHEQ Manager***	***Annually***

Environmental Protection Activities

waste management

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 4. SOLID WASTE MANAGEMENT

Rationale:

Globally there is a recognition that wastage of resources must cease. A major concern is that final disposal to landfill of potentially renewable resources will unnecessarily use up landfill airspace and also wastes resources that still have value.

Since the enactment of the National Environmental Management: Waste Act (No 59 of 2008) there is now a positive obligation on waste generators to assess their resource usage and attempt to eliminate or reduce waste production and where this is not possible, to develop ways of re-using or recycling waste. Disposal to landfill is then only adopted as a final resort. This requires an active and ongoing assessment of waste production to identify creative ways of satisfying the objects of this Act. The procedure below provides an overview of the steps which should be taken.

Objectives:

- To prevent any waste from entering the marine environment except for macerated galley waste and macerated and treated sewage waste
- To reduce the amount of waste disposed to landfill by reducing waste generation and maximising recycling and reuse
- To comply with waste management legislation
- To dispose of all solid waste in an environmentally responsible manner

4.1 Measures necessary for Solid Waste Management		
4.1.1 *The facility shall review its waste management on an annual basis using the waste management hierarchy depicted below. This shall be a documented, and targets for reduction/ reuse/recycling provided.* ~~*The facility shall review its waste management on an annual basis using the hierarchy depicted below (source* **http://www.envirowise.gov.uk/uk/our-services/resource-efficiency.html***). This shall be a formal, documented review of all wastes, and results shall be reported to MANCO. The program shall document waste reduction targets for the forthcoming year.*~~	***SHEQ Manager***	**Annually**
4.1.2 *Waste Management Hierarchy*		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
 *Figure 1: Waste Management Hierarchy*		
4.1.3 The facility shall develop and maintain a Waste Register which shall detail: ○ Each waste produced by the facility ○ Their source ○ Their SABS class and hazard rating ○ Their disposal methods ○ Any specific precautions or legislative requirements	***SHEQ Officer***	***Ongoing***
4.1.4 Waste Register		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

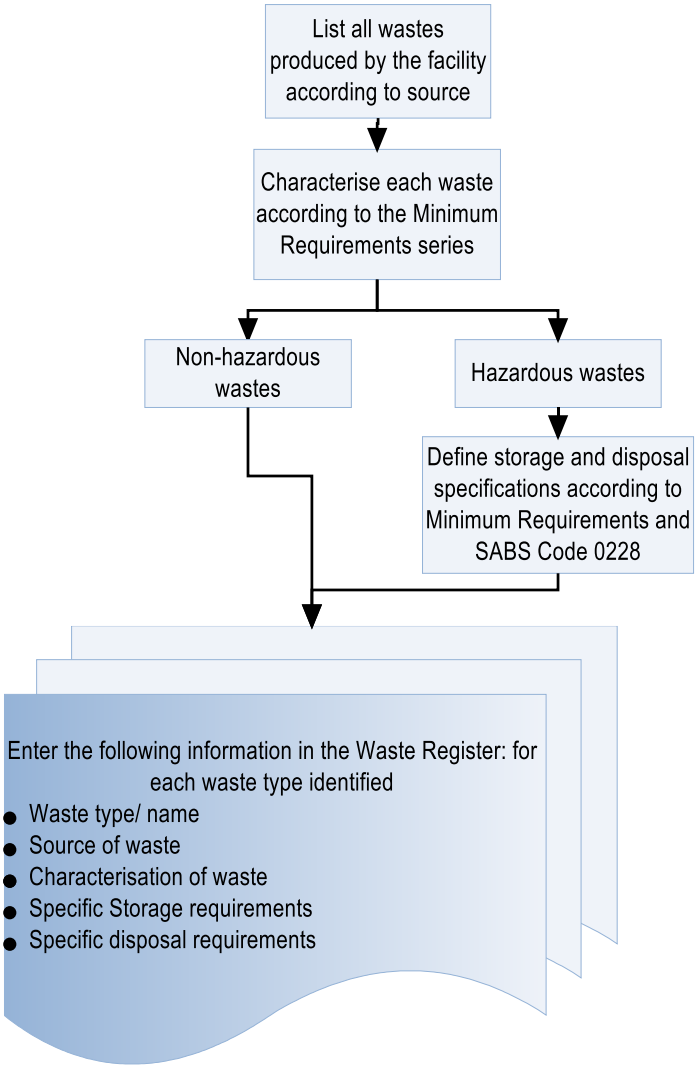


Figure 2: Waste Register

4.1.5 The Waste Register shall be reviewed and updated annually	***SHEQ Officer***	***Annually***
4.1.6 Waste shall be segregated into the following categories. Recyclables shall be stored separately as shall hazardous waste.	***SHEQ Officer***	***Ongoing***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

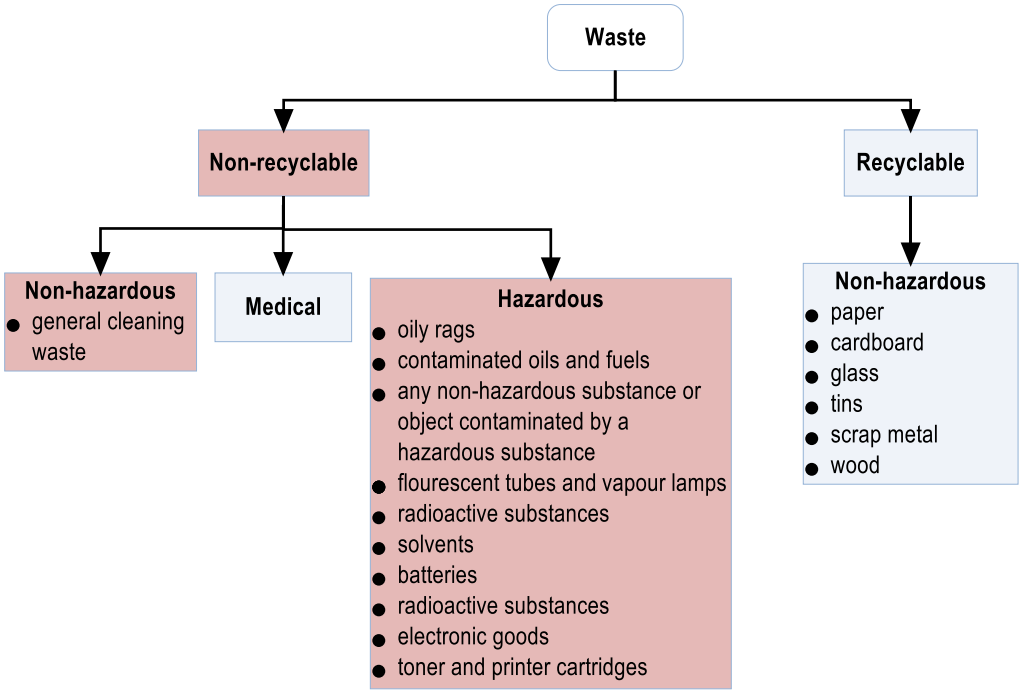


Figure 3: Possible waste segregation categories

4.1.7	*All wastes shall be handled according to the flow diagram below while awaiting transport to disposal sites.*	***SHEQ Officer***	***Ongoing***

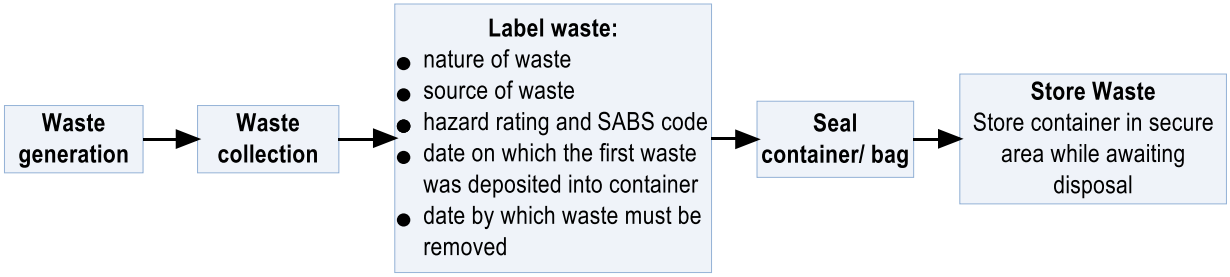


Figure 4: Waste Handling

4.1.8	*No waste may be stored for more than 30 days on any facility without formal permission from PASA ~~DEA.~~*	***SHEQ Officer***	***Ongoing***
4.1.9	*Wastes shall be stored in sealed containers or bags and protected from the environment according to specifications for storage in the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste published by Department of Water Affairs and Forestry in 1998.*	***SHEQ Officer***	***Ongoing***
4.1.10	*Comply with the National Norms and Standards for the storage of waste under the Waste Act, 2008. If non-compatible wastes are to be stored, care should be taken to adequately separate them, to prevent possible interactions in the event of fire or spillage. Flammable or combustible wastes must in any event be stored separately from other waste materials.*	***SHEQ Officer***	***Ongoing***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
~~*Incompatible waste may not be stored in the same location (see the hazard ratings for wastes in the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste published by Department of Water Affairs and Forestry in 1998 for compatibility).*~~		
4.1.11 Galley waste shall be macerated at sea to pieces smaller than 25mm and deposited overboard in accordance with MARPOL requirements, or disposed to landfill onshore.	***SHEQ Officer***	***Ongoing***
4.1.12 Sewage shall be treated as per Section 5.3.	***SHEQ Officer***	***Ongoing***
4.1.13 Waste removal from the platform or vessel shall be handled according to the following flow diagram.	***SHEQ Officer***	***Ongoing***

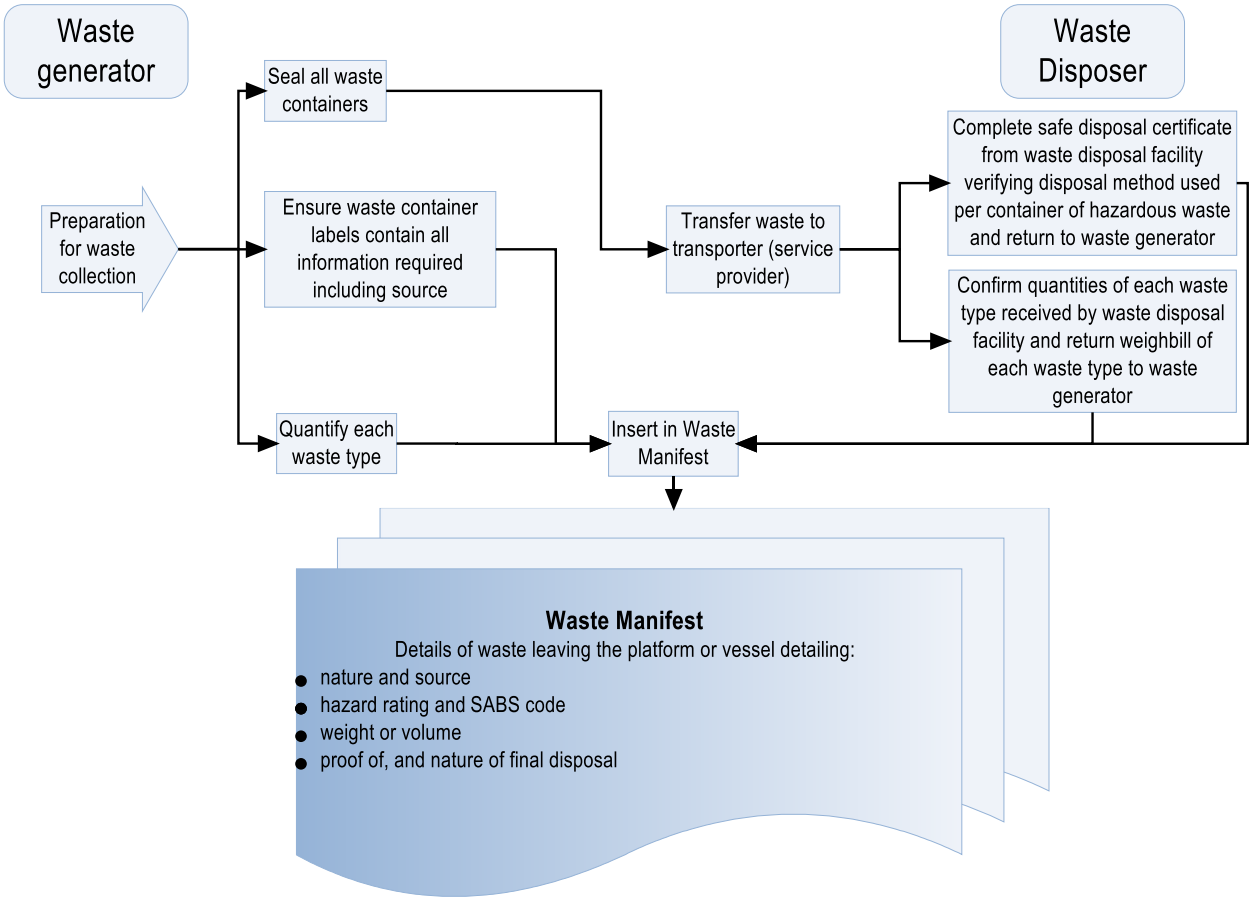


Figure 5: Waste removal

4.1.14 The offshore facility shall develop and maintain a waste manifest system which details: ▪ The quantities of all wastes leaving the facility ▪ The date upon which they left ▪ The date upon which they were received by the disposal facility	***SHEQ Officer***	***Ongoing***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
▪ Proof of correct disposal by the landfill site (safe disposal certificate for hazardous waste)		
4.1.15 *A safe disposal certificate shall be issued for each load of hazardous waste, excluding hazardous wastes lawfully disposed of at the PetroSA Landfill. ~~A safe disposal certificate shall be issued for each load of hazardous waste~~.*	***Landfill Manager***	***Ongoing***
4.1.16 *The safe disposal certificate shall be kept on file in PetroSA's waste records. ~~The safe disposal certificate shall be filed in the waste manifest~~*	***SHEQ Officer***	***Ongoing***
4.1.17 *The volumes of each waste type generated and disposed as well as the disposal site and method shall be reported in The Quarterly ~~Monthly~~ Report*	***SHEQ Officer***	***Quarterly ~~Monthly~~***
4.1.18 *Waste disposal records shall be stored for submission to the PASA or other regulatory agencies should they ~~Waste Management Officer should the Officer at DEA~~ require it.*	***SHEQ Officer***	***Ongoing***
4.1.19 *All personnel shall receive regular training on the handling and management of waste*	***SHEQ Officer***	***Annually***
4.1.20 *Audit Guideline* ▪ Audits should, through examination of records retained by the facility, verify that: ○ The waste characterisation register is current and verified ○ The Waste Register has been reviewed within the last 12 months ○ The waste management program has been reviewed within the last 12 months ○ Waste reduction targets have been met ○ Procurement practices have been reviewed with a view to avoiding and /or minimising waste through selective purchasing practices ○ Storage accords with legal requirements and the details contained in the register ○ All liquid wastes were stored inside bunds of requisite capacity ○ The bunds are sealed and the containment integrity is checked regularly ○ All hazardous wastes were labelled as such ○ No wastes are stored by the facility for longer than 30 days without approval from PASA ~~DEA~~ subject to the submission of a Basic Assessment Report ○ The amount of general waste stored on site does not exceed 30 tonnes per day or does not exceed a throughput rate of 20m^3 per day without approval from PASA ~~DEA~~ subject to the submission of a Basic Assessment Report ○ The temporary storage of hazardous waste does not exceed 3 tonnes on any one day without approval. If the amount of hazardous waste generated exceeds 3 tonnes per day, this is a scheduled activity in terms of the Waste Act and requires approval from PASA ~~DEA~~ via a scoping / Basic Assessment process. ○ Each container of waste is labelled with its source and contents ○ Safe disposal certificates are obtained for every hazardous waste load ○ All personnel have received training in waste management and handling within the last 12 months	***SHEQ Manager***	***Annually***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 5. DISCHARGE OF EFFLUENT

Rationale:
Bulk liquid wastes arise from cleaning the decks, from ablutions, from the bilges and from produced water. These are stored prior to discharge but the discharge has the potential to be detrimental to the marine environment if it does not meet MARPOL discharge standards.

Objectives:
- To contain any effluents which could pose a threat to the marine environment
- To treat any effluents before discharge in order to minimise damage to the marine environment
- To comply with legislative obligations for effluent discharge.

5.1	**Produced Water**		
5.1.1	*No produced water may be discharged to the sea unless the oil concentration is below 40ppm.*[1]	***Production Superintendent / Marine Supervisor***	***Ongoing***
5.1.2	*Oil concentration of produced water shall be monitored continuously automatically and concentrations logged daily. In the event of breakdown of automatic measurements, manual measurements shall be made at least twice daily until equipment is repaired.*	***Production Superintendent / Marine Supervisor***	***Daily***
5.1.3	*In the event that the oil concentration reaches or exceeds 40ppm the root cause of exceedance shall be investigated and rectified.*	***Production Superintendent / Marine Supervisor***	***Immediately***
5.1.4	*The systems controlling the produced water discharges must be kept in good working order*	***Production Superintendent / Marine Supervisor***	***Ongoing***
5.1.5	*The monitoring results shall be filed and retained for 5 years.*	***SHEQ Manager***	***5 years***
5.1.6	*The concentration of oil in produced water as determined in 5.1.2 shall be reported in The Quarterly ~~Monthly~~ Report*	***SHEQ Officer***	***Quarterly ~~Monthly~~***
5.1.7	*Any discharges of produced water at or exceeding 40ppm oil concentration shall be treated as an incident, reported and investigated accordingly.*	***SHEQ Officer***	***Immediately***
5.2	**Deck & Bilge Water**		
5.2.1	*No deck or bilge water may be discharged to the sea unless the oil concentration is below 15ppm (MARPOL standard)*	***Marine Supervisor/ Production Superintendent***	***Ongoing***

[1]*Limit specified in a Pollution Safety Certificate issued by SAMSA on 23/01/2008. In contrast PARCOM 1/17/1 stipulates that no produced water may be discharged to the sea unless the oil concentration is below 100ppm, further discharged produced water oil content should be managed such that the monthly mean concentration is equal to or less than 40ppm.*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
5.2.2 Oil concentration of discharged bilge and deck water shall be monitored continuously automatically and concentrations logged daily. In the event of a breakdown of automatic measurements then manual measurements shall be made twice daily until equipment is repaired	***Marine Supervisor/ Production Superintendent***	***Twice daily***
5.2.3 In the event that the discharged oil concentration exceeds 15ppm the root cause of exceedance shall be investigated and rectified.	***Marine Supervisor/ Production Superintendent***	***Immediately***
5.2.4 The concentration of oil in bilge water as determined in 5.1.2 shall be reported in The Quarterly ~~Monthly~~ Report	***SHEQ Officer***	***Quarterly ~~Monthly~~***
5.2.5 The monitoring results shall be filed and retained for 5 years.	***SHEQ Manager***	***5 years***
5.3 Sewage		
5.3.1 Sewage shall be comminuted before discharge to the sea in accordance with MARPOL standards.	***Marine Supervisor/ Production Superintendent***	***Ongoing***
5.3.2 Audit Guidelines		
▪ Audits should, through examination of records retained by the facility, verify that: ○ The waste water streams were monitored at the specified frequency ○ The laboratory equipment used for analysis was calibrated and maintained according to manufacturer's specifications ○ Sewage macerators are maintained and fully functional ○ Any elevated levels were investigated and the sources identified and appropriate action was taken ○ Any such remedial action was documented and the effectiveness monitored ○ No waste water was discharged from bilge tanks with a concentration of greater than 15ppm oil (MARPOL) and of produced water with an oil concentration of greater than 40ppm ○ Any discharges of concentrations greater than those specified were formally investigated, reported and remedial action taken ○ Any such remedial action was documented and the effectiveness monitored.	***SHEQ Manager***	***Annually***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 6. GASEOUS EMISSIONS

Rationale:
Gaseous emissions of concern on the offshore installations are escaped Freon from the refrigeration units and gases resulting from flaring. At present there are no legislated limits for the emissions produced by PetroSA. Should this change in future the performance criteria will be amended accordingly.

Objective:
- To reduce the volumes of green house gases emitted

6.1 Gaseous Emissions		
6.1.1 Maintain all refrigeration equipment in accordance with the scheduled maintenance program to minimise Freon release.	***Production Superintendent / Marine Supervisor***	***Ongoing***
6.1.2 Any accidental releases of Freon shall be treated as incidents, and in addition to normal incident reporting, shall be reported to PASA ~~DEA~~	***Production Superintendent / Marine Supervisor***	
6.1.3 Incidents shall be reported to PASA ~~DEA~~.	***~~Operations~~ Environmental leader***	***Quarterly***
6.1.4 The volume of gas flared on a daily basis shall be reported in The Quarterly ~~Monthly~~ Report	***SHEQ Officer***	***Quarterly ~~Monthly~~***
6.1.5 Greenhouse gas emissions must be reported in accordance with the requirements of the National Greehouse Gas Reporting Regulations, published under the National Environmental Management: Air Quality Act.	*SHEQ Officer*	*Annually*
6.1.6 Audit Guidelines ▪ Audits should, through examination of records retained by the facility, verify that: ○ Emissions are monitored according to the specified schedule ○ The laboratory equipment used for analysis was calibrated and maintained according to the manufacturer's specifications ○ Any elevated levels were investigated and the sources identified and rectified	***SHEQ Manager***	***Annually***

Environmental Protection Activities

incidents and emergency reporting and management

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 7. INCIDENTS & EMERGENCY REPORTING & MANAGEMENT

Rationale:

An incident is an unplanned event which could or does result in harm/ loss to people, property, process or environment and covers every incident from minor spills and leaks to large-scale releases and emergencies. This includes well blow-outs, ruptures of pipelines, collision between vessels and the platforms, spills during fuel bunkering or any other operation, and loss of objects overboard.

The single biggest environmental incident risk, given the nature of PetroSA operations, is of oil and chemical spills to the sea from a variety of sources. Not only is this prohibited by a range of different national and international laws and regulations but any product spillage constitutes a financial loss. Thus, PetroSA has a number of standard operating procedures which not only aim to prevent spills during normal operations and emergency situations but also to manage the response in the event of a spill. The incident management procedure is employed as the first stage of a spillage, which includes an assessment of the magnitude and severity of the spill in order to determine whether the incident constitutes an emergency and if the oil spill contingency plan must be activated.

Objectives:

- To provide a coherent, planned response to any incident which could adversely affect the environment
- To improve response time and efficiency of the plans and the activities of staff members through drills and test runs
- To provide a process for the management of an incident or emergency depending upon the severity of the occurrence
- To minimise the risk of loss of solid objects overboard and to expedite the retrieval (if possible) of any objects which fall overboard
- To log the existence and location of fallen objects for future reference/ action
- To notify interested parties of the existence and location of un-retrieved fallen objects
- Through post-emergency evaluations, minimise the risk of a recurrence of the incident

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
7.1 Liquid Spills or Leaks		
7.1.1 *All incidents, including liquid spills, shall be managed in accordance with the PetroSA Incident Management Procedure (QAL/PR/COR/002), and/or the approved OSCP, depending on the nature of the incident.* ~~*Any incident shall be managed according to the procedure outlined in the flow diagram below. This diagram summarises the PetroSA procedures specified for incident management and oil spill contingency management. PetroSA documents should be consulted for more details on procedures and reporting instructions.*~~	***all staff***	***Immediately***
7.1.2 *Liquid Incident Reporting & Management*		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

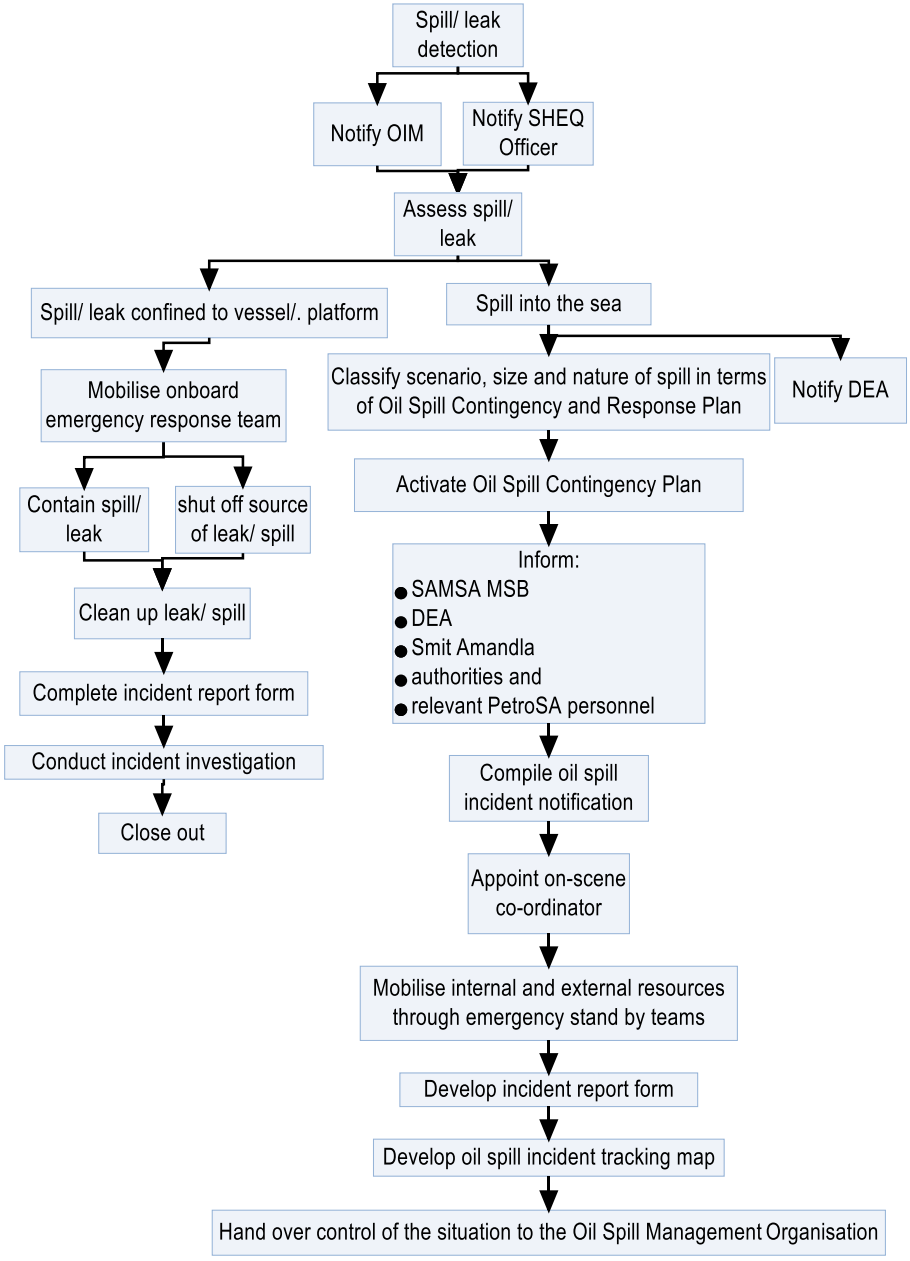


Figure 1: Liquid Incident Reporting & Management

7.1.3	*The incident and the results of the investigation shall form part of The Quarterly ~~Monthly~~ Report*	***OIM***	***Quarterly ~~Monthly~~***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
7.1.4 *The plan should be aligned to the National Oil Spill Contingency Plan (NOSCP) and updated every five years or sooner if significant changes occur, such as new developments, or emergency incidents that alter the risk of marine pollution. Check and update the contact details in the OSCP every 6 months or on notification by government or other key organisations.* ~~*Check and update the contact details in the oil spill contingency plan every 6 months or on notification by government or other key organisations*~~	***OIM***	***5 yearly Bi-annually***
7.2 Materials and Equipment Lost Overboard		
7.2.1 *If a solid object falls overboard, the incident shall be managed according to the flow diagram below.*	***all staff***	***Immediately***

7.2.2

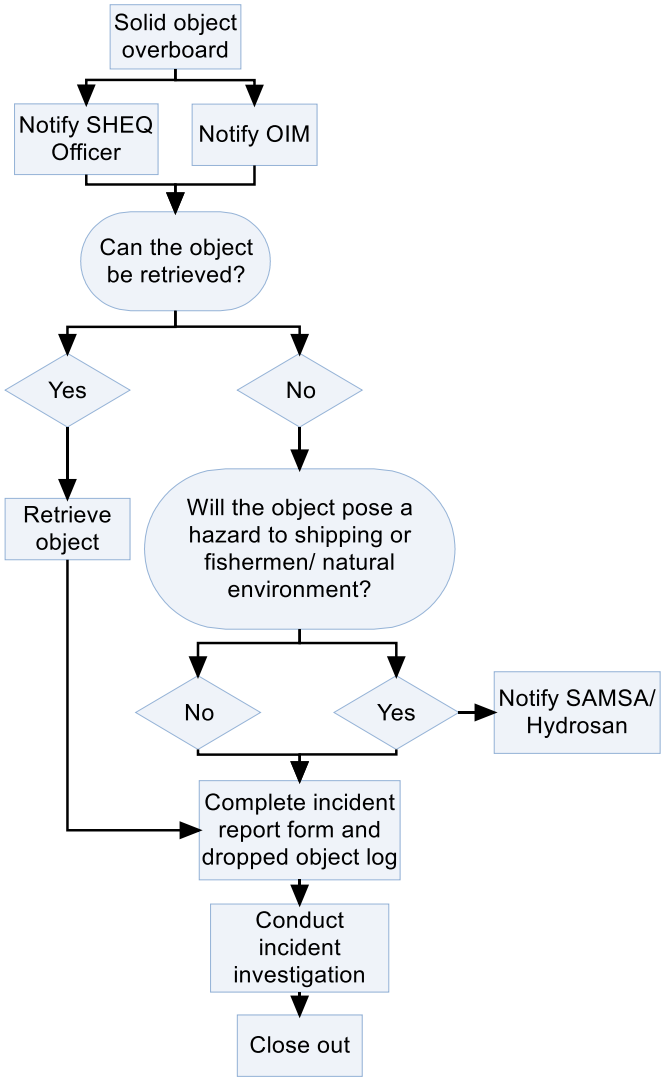


Figure 2: Dropped Object Incident Response

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
7.2.3 Any incidents shall be reported in The Quarterly ~~Monthly~~ Report.	***SHEQ Officer***	***Quarterly ~~Monthly~~***
7.2.4 Audit Guidelines • Audits should, through examination of records retained by the facility, verify that: ○ All incidents have been reported and recorded as per specification in the flow diagram above. ○ All incidents have been comprehensively investigated to identify root causes ○ The incident reports detail the results of the investigations into root causes and advises on amendments to procedures or equipment as needed ○ The advised changes are implemented ○ A trend analysis on incidents is conducted monthly ○ Incidents are reported weekly and monthly along with the root cause analyses ○ Sufficient oil and chemical spill containment and absorbent equipment is stored in sufficient quantities in areas where spills are considered most likely. ○ The oil spill contingency plan is current		

Environmental Protection Activities

stakeholder engagement

ACTIVITY 8. STAKEHOLDER ENGAGEMENT 2

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
ACTIVITY 8. STAKEHOLDER ENGAGEMENT		
Rationale: The activities of the offshore oil and gas production installations have or may have impacts upon a range of stakeholders. These impacts can range from positive job creation or second order income generation to negative impacts such as limitations on trawling efficiency and potential disruption of biodiversity. It is incumbent on PetroSA to engage with stakeholders in terms of the principles of NEMA and to this end the Agulhas Forum has been established, which meets every 6 months and includes representatives from the fishing industry, conservation NGOs, and government departments. The aim of the forum is to provide a mechanism for dissemination of information about PetroSA activities and to receive and answer stakeholder concerns. In so doing, the forum meetings seek to improve the level of transparency of the nature and timing of PetroSA operations		
Objectives: ▪ To provide regular feedback to the stakeholder forum ▪ To establish and maintain a register of stakeholders ▪ To receive, process and respond to inputs from external and internal stakeholders		
8.1 Stakeholder Engagement		
8.1.1 A stakeholder feedback process as detailed in the flow diagram below shall be maintained	~~*Operations*~~ *Environmental Leader*	*Ongoing*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

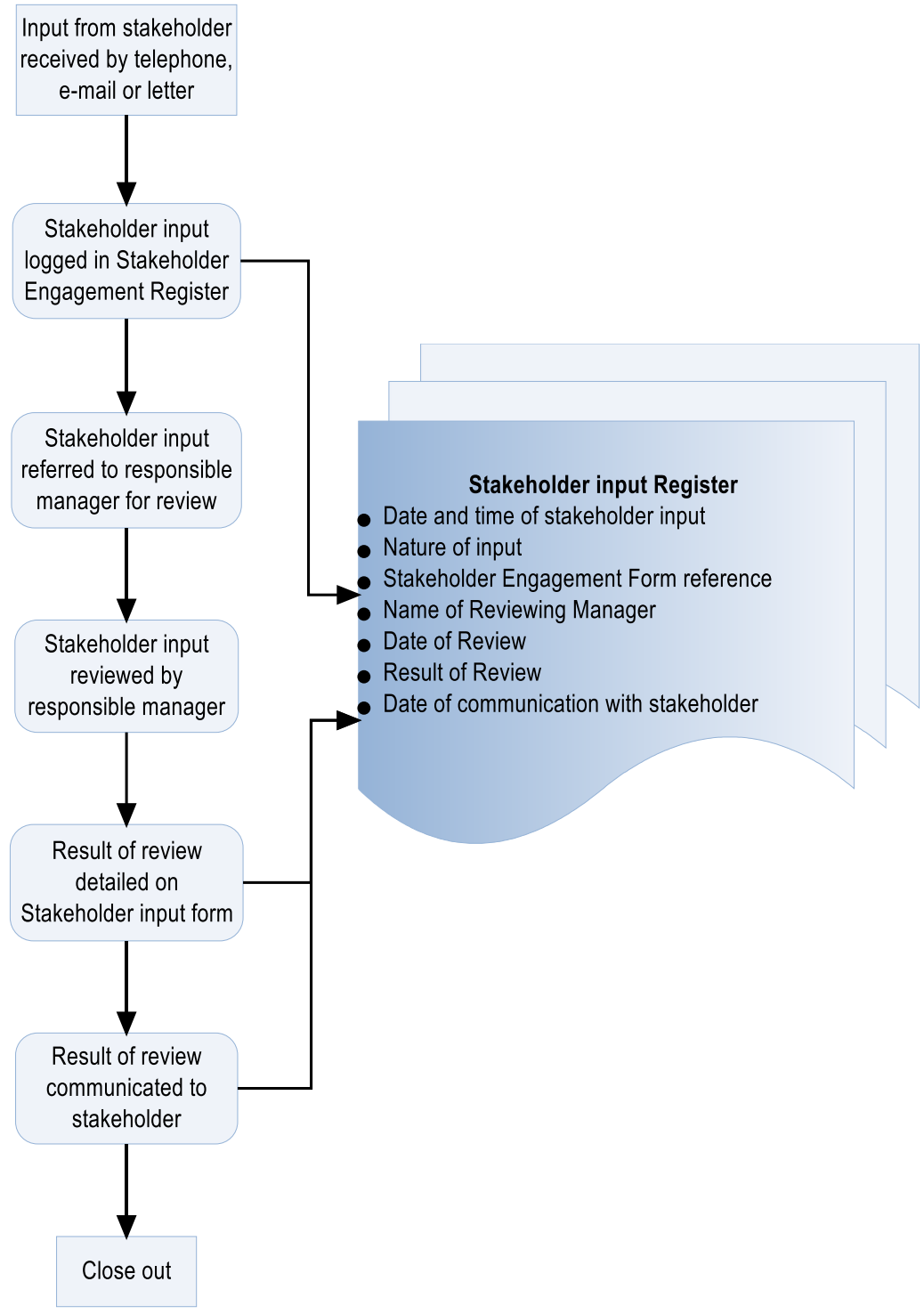


Figure 1: Stakeholder Feedback Management

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
8.1.2 Any feedback from stakeholders concerning offshore operations shall be reported in The Quarterly ~~Monthly~~ Report	*SHEQ Officer*	*Quarterly ~~Monthly~~*
8.1.3 Audit Guidelines • Audits should, through examination of records retained by the facility, verify that: ○ A stakeholder register has been maintained ○ Any stakeholder inputs have been reviewed by the responsible manager ○ The above stakeholder inputs have been responded to appropriately ○ The stakeholder has been informed of the outcome of the review by the responsible manager		*Annually*

Environmental Protection Activities

environmental training and awareness

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 9. ENVIRONMENTAL TRAINING AND AWARENESS

Rationale:

Poor staff awareness about resource efficiency, waste management and pollution control is common in many organisations. This can result in accidents or avoidable incidents through ignorance. It is important to raise environmental awareness to stimulate staff participation. To raise awareness and obtain commitment, staff need to be given the facts about the costs of waste and incidents which generate waste; how the programme applies to them as individuals, and the benefits of resource efficiency to the business. This can assist personnel to be appropriately equipped to conduct their duties in an environmentally responsible manner.

Objectives:

- To equip all personnel on the platform/ rig etc to perform their duties in an environmentally responsible manner through regular training
- To raise environmental awareness through feedback on environmental performance and any changes in legislation of best practices

9.1 Environmental Training and Awareness		
9.1.1 A matrix detailing environmentally related training shall be developed in consultation with the Operations Environmental Leader This shall detail elements of this environmental management plan that are appropriate to each work area on the facility.	***Training Superintendent***	***Every 2 years***
9.1.2 Toolbox talks shall be used to discuss environmental awareness and to report back on environmental performance applicable to the specific work area.	***SHEQ Officer***	***2 monthly***
9.1.3 Deviations of procedure by staff members shall initiate a retraining exercise	***SHEQ Officer***	***Immediately***
9.1.4 Repeated deviations from procedures after retraining shall result in disciplinary procedures being instituted against the offender(s)	***OIM***	***As required***
9.1.5 Audit Guidelines • Audits should, through examination of records retained by the facility, verify that: ○ The training matrix has been developed and is current ○ The training matrix was used to plan training programs for all personnel ○ All personnel have received appropriate training at least annually ○ Deviations from procedures identified in incident investigations have resulted in retraining ○ Complete training records are maintained for 5 years	***SHEQ Manager***	***Annually***

Environmental Protection Activities

system administrative requirements

ACTIVITY 10. SYSTEM ADMINISTRATIVE REQUIREMENTS 2

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 10. SYSTEM ADMINISTRATIVE REQUIREMENTS

Rationale:

Systems enable an organisation to:

- assure itself of its conformance with its own stated environmental policy
- demonstrate conformance
- ensure compliance with environmental laws and regulation amongst other things

The ISO system model operates on the system of Plan – Do – Check – Act cycle.

Plan – establish objectives and make plans (analyze your organization's situation, establish your overall objectives and set your interim targets, and develop plans to achieve them).
Do – implement your plans (do what you planned do).
Check – measure your results (measure/monitor how far your actual achievements meet your planned objectives).
Act – correct and improve your plans and how you put them into practice (correct and learn from your mistakes to improve your plans in order to achieve better results next time).[1]"

This section summarises some key system requirements to ensure the effective implementation of the environmental management plan. Further details are available in PetroSA's EMS documentation.

Objectives:

- To provide a comprehensive and coherent system which accesses and stores information pertinent to environmental management from diverse sources to verify responsible environmental practices
- To provide a formal platform for reporting on environmental performance
- To monitor and audit environmental performance against pre-determined criteria
- To use formal management reviews to continuously improve the system itself and thereby environmental performance as a whole.

10.1 Monitoring

The following parameters shall be monitored:		
10.1.1 Produced water discharge: oil concentration to ensure <40ppm. Section 5.1.2 *10.1.2 Produced water discharge: volumes discharged*	***SHEQ Officer***	***Continuous automatic, plus daily logging of monitoring data***
10.1.3 Bilge water discharge: oil concentrations to ensure <15ppm. Section 5.2.2	***SHEQ Officer***	***Daily***
10.1.4 Flare emissions: Gas volume flared Section 6	***SHEQ Officer***	***Monthly***
10.1.5 Solid waste production and disposal (refer Section 4.17)	***SHEQ Officer***	***Monthly***
10.1.6 Marine biodiversity – colonisation of structures by alien taxa: using existing ROV footage and underwater photography surveys of biological	~~***Operations:***~~ ***Environmental***	***Every 5 ~~3~~ years***

[1] http://www.iso.org/iso/iso_catalogue/management_standards/understand_the_basics.htm

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
communities on the offshore structures and sections of pipelines to monitor possible development of populations of large (>20 mm) alien species. (Biodiversity Convention).	***Leader***	
10.1.7 Monitoring results shall be retained for 5 years.	***SHEQ Manager***	***5 years***
10.1.8 Monitoring results shall be reported in The Quarterly ~~Monthly~~ Report	***OIM***	***Quarterly ~~Monthly~~***
10.2 Auditing		
10.2.1 The environmental management plan shall be subject to an internal audit on an annual basis. ~~This constitutes the annual performance report~~.	***~~Corporate:~~ Environmental Leader***	***Annually***
10.2.2 The environmental management plan shall be subject to an external verification audit on a three yearly basis.	***~~Corporate:~~ Environmental Leader***	***Every 3 years***
10.2.3 The audits shall review and report on the auditing requirements detailed in each section of this management plan	***~~Corporate:~~ Environmental Leader***	***As above***
10.2.4 Audit Guidelines Audits should, through examination of records retained by the facility, verify that: ○ All records required by this Environmental Management Plan have been retained and are stored in an accessible and logical manner ○ All reports required by this Environmental Management Plan have been completed and submitted to the designated recipient ○ All monitoring has been completed and any deviances responded to accordingly ○ Management reviews have been conducted and were comprehensive and any action required has been implemented		
10.3 Reporting		
10.3.1 The following reports shall be compiled and submitted: Quarterly Internal Report, Quarterly PASA Report (including a summary of all reportable incidents and stakeholder issues), Annual Performance Assessment Report (Internal Audit). • Internal Reports (Monthly during construction and operations; quarterly during Care and Maintenance): o Incidents. o Repairs. o Gas flared. o Volumes and quality of produced and bilge water discharged. o Waste generated. o Energy consumed i.t.o. fuel, diesel, gas, crude oil. • Quarterly PASA Reports: o Reportable incidents. o Consolidated from internal reporting (as per above). o Stakeholder issues. o Volumes and quality of produced and bilge water discharged. • Annual Performance Assessment Reports		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

Monthly Report (Internal)
Monthly
(all values are year-to-date)

Contents
- Incidents
- Repairs
- Gas flared
- Volumes and quality of produced and bilge water discharged
- Waste generated
- Energy consumed ito fuel, diesel, gas, crude oil
- Training
- Stakeholder issues arising to offshore installation
- Any audit results
- Any other environmental studies

Department of Environmental Affairs
Quarterly
(all values are year-to-date)

Contents
- Reportable incidents
- Volumes and quality of produced and bilge water discharged
- Stakeholder issues arising to offshore installation
- Any audit results

PASA
Quarterly
(all values are year-to-date)

Contents
- Reportable incidents
- Consolidated values from Monthly Reports
- Stakeholder issues arising to offshore installation

PASA
Annually

Contents
- Annual Performance Assessment Report

PetroSA EXCO
Annually

Contents
- Annual Performance Assessment Report
- Results of Annual Management Review

Figure 1: Summary of Reports per Recipient and Frequency

10.4 Record keeping		
10.4.1 All records shall be retained for 5 years.	***SHEQ Manager***	

10.4.2 The following records shall be maintained as part of the Environmental Management Plan. The records may be filed in another system such as the SHEQ system. The requirements of this Environmental Management Plan are satisfied if the required documents are cross-referenced for auditing purposes.

- Effluent discharge volumes
- Effluent discharge quality results
- Effluent quality exceedances
- Incident reports
- Air quality monitoring

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• ROV imagery of subsea conditions • Water manifests and waste characterisation • Waste production and disposal analyses • Training records • Prosecutions/ notices of non-compliance • Stakeholder inputs and the review thereof • Audit reports • Results of management reviews • Weekly, monthly and annual internal reports • Planned maintenance reports/ logs • All previous EMPrs • All EIAs and application for environmental authorisations • Any correspondence with permitting authorities such as PASA, ~~DEA,~~ SAMSA etc		
10.5 Review and Revision		
10.5.1 The environmental management plan shall be subject to annual review by senior management. 1. The review shall consider the following information: • Monthly monitoring records • Training records • Audit reports • Enforcement records • Feedback from stakeholders • Revisions to system documents 2. The management review shall consider whether: • All significant aspects of and risks to compliance have been identified, documented and assigned performance criteria. • There are any significant aspects of or risks to compliance which are no longer appropriate and can be removed. • Performance criteria are being met or whether other actions are required. • The Environmental Management Plan as implemented during the preceding year facilitates compliance with its' objectives and legal obligations, and if not what amendments are required.	***Senior Management***	***Annually***
10.5.2 The review by senior management shall be documented and the document retained for 5 years.		***5 yearly***

Environmental Protection Activities

decommissioning

ACTIVITY 11. DECOMMISSIONING 2

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

ACTIVITY 11. DECOMMISSIONING

Rationale

The gas and oil fields will end their economic lives and the associated infrastructure on the seabed (up to high water mark) will become redundant and will need to be decommissioned in terms of South Africa's obligations under international conventions and domestic law.

Decommissioning herein is assumed to be a natural conclusion of production and is not a separate process, i.e. the "end of production" includes the decommissioning activities.

Offshore facilities/Infrastructure needing to be decommissioned include:

- subsea equipment on or in the seabed;
- support structures and topsides for fixed and floating installations (Orca and FA production platforms, EM and control buoy);
- pipelines with PLEMs/ UTAs/ riser anchor bases;
- flow lines and umbilicals; and
- wells.

To decide on the best decommissioning option/s all activities involved in decommissioning need to be examined and compared, including:

- removal methods and disposal routes for all facility/infrastructure components;
- cleaning methods and agents and disposal of hazardous residues
- application of the principles of the waste management hierarchy;
- catering for degradation and movement and stability of remains on the seabed;
- removal of seabed debris following decommissioning works; and
- post-decommissioning monitoring and maintenance, as well as other ancillary tasks.

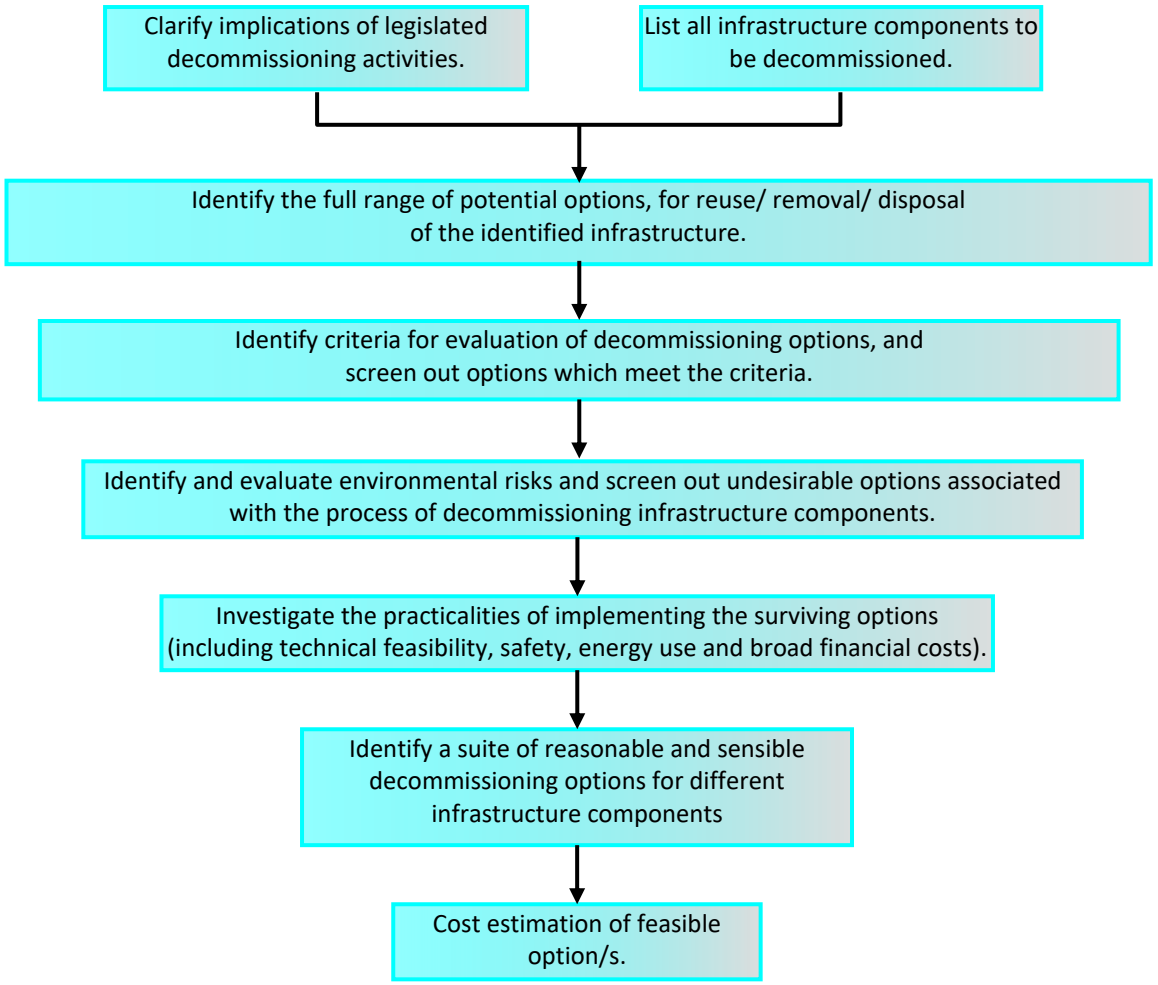
The overarching criteria that need to be used in the evaluation and selection of the optimal decommissioning option/s are:

- environmental impact (particularly biodiversity effects, implications for fisheries and fate of materials e.g. potential for re-use or re-cycling, disposal in land fill site, etc);
- complexity and associated technical risk;
- safety risks/ risks to personnel;
- possibilities for environmental offsets; and
- financial costs (including post-decommissioning).

Overall objective:

- To investigate options for the ultimate fate of all components of the offshore facilities/ infrastructure in such a way as to cause no significant adverse effects on the marine (or terrestrial) environment while having a proper regard for safety, technical, social (other legitimate uses and users of the sea), and financial costs, and to meet national and international obligations. This is so as to be able to schedule and finance contracts for decommissioning, and where necessary and feasible to adjust the operational environmental management programme to make this easier to achieve.

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
11.1 Identification of Decommissioning Strategy		
11.1.1 The process followed to identify reasonable and sensible decommissioning solutions is illustrated in the diagram below.	***VP : Operations***	***Annually***



Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
11.2 Decommissioning Strategy for FA-EM Production Area & Framework for Annual Evaluation and Reporting to PASA.		

11.2.1 For each option detailed risk assessment is carried out using 5 main risk categories and a total of 18 sub-criteria are listed below:

- Safety risks: 1.1 Safety risk to offshore personnel, 1.2 Safety risk to onshore personnel, 1.3 Safety risk to other offshore users, and 1.4 Safety risk to other onshore users.
- Environmental risks: 2.1 Energy use and GHG emissions, 2.2 Soil and groundwater contamination, 2.3 Seawater and sediment contamination, 2.4 Impact on marine ecology, and 2.5 Impact on terrestrial ecology.
- Societal risks: 3.1 Health risk to local communities, 3.2 Impact on fisheries, 3.3 Impact on livelihoods of local communities, and 3.4 Stress on local public infrastructure.
- Technical risks: 4.1 Technical challenges, 4.2 Weather challenges, and 4.3 Logistical and regulatory challenges.
- Economic risks: 5.1 Decommissioning costs, and 5.2 Post decommissioning costs.

For each sub-criterion, risks are evaluated qualitatively or semi-quantitatively and the residual risk is represented using four risk levels, viz.,

- High risk,
- Medium-high risk,
- Medium-low risk, and
- Low risk.

An elaborate scoring system along with sensitivity analysis is used, in line with international practice, For sensitivity analysis, seven scenarios have been considered:

- Base case, where safety, environmental, societal, technical and economic risk categories are weighted 20% each;
- Safety bias case, where safety risk category is weighted 40% and all the other categories 15% each;
- Environmental bias case, where environmental risk category is weighted 40% and all the other categories 15% each;
- Societal bias case, where societal risk category is weighted 40% and all the other categories 15% each
- Technical bias case, where technical risk category is weighted 40% and all the other 15% each;
- Cost irrelevant case, where economic risks are disregarded; and
- Offshore bias case, where onshore risks are disregarded.

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
11.2.2 Preferred decommissioning options: ~~Based on the independent evaluation detailed in Report 10501209-REP-07, Rev.~~ A detailed comparative risk assessment report has been prepared to evaluate the risks associated with each option available and identify the best (least risk) option for decommissioning of each offshore facility/infrastructure component. Following this, a detailed environmental impact assessment has been prepared for the selected option. The preferred decommissioning option~~s~~ for **~~the~~ each offshore facility/** infrastructure component of the FA-EM production area **~~are~~ is** summarised in the table below. **~~These shall be revisited each year;~~** Note: The options will be revisited at the time of decommissioning and reevaluated, if necessary.		

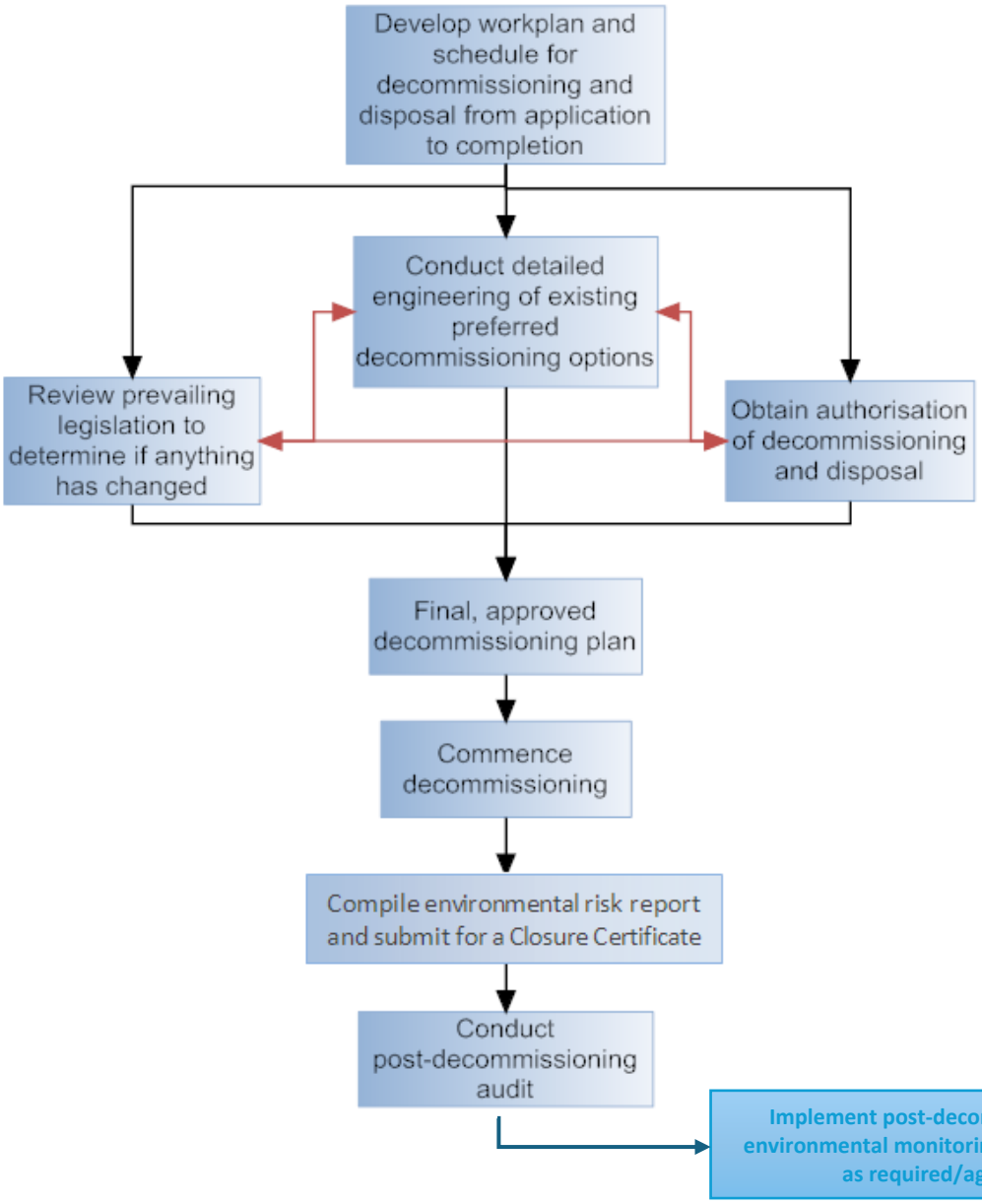
Asset type	Selected Option	Selected Strategy for Decommissioning and Disposal
Platform topsides	~~Option 2:~~ Dismantle and remove the topsides piecemeal, and transfer to them to the shore for cleaning, and reuse, recycling or disposal.	• The topsides will be removed 100% using a piecemeal approach where all modules except the MSF structure will be removed by replacement cranes. • The MSF structure will be stripped off all equipment so that only the structural steel remains. • The bare MSF structure will be disposed off by toppling into the sea along with the cut-off section of the jacket. • After removal, the dismantled equipment and parts will be transferred to the shore for disposal to external waste management facilities. • If necessary, the dismantled equipment and parts will be chemically cleaned at site (onshore) to remove the hazardous inventory (hydrocarbon and chemical residues) before they are transported to external waste management facilities, along with any cleaning waste generated. • Mostly of the waste is likely to be sold as scrap metal to local waste recycling plant or dealers.
Platform jacket and MSF structure	~~Option 3:~~ Cut off the jacket to 55m below the seawater level and topple the cut off jacket along with the bare MSF structure on to the seabed.	• The cut off jacket section along with the bare MSF structure will be toppled in place via a strategic subsea cutting program. • The jacket section from the seabed to 55 m depth will remain in place. • Any waste materials generated will be transferred to the shore for disposal to external waste management facilities.
Offshore wells	Cut off the wellheads (including the Xmas tree) at the mudline, plug the boreholes with primary and secondary barriers,	• The subsea Xmas trees, wellheads and associated wellhead platform structures will be cut off or dismantled and then transferred to the shore for disposal at external waste management facilities. • Kill fluid will be injected into the wellbore to stop the flow of well fluids. • The wellbores will be plugged with two back-to-back cement barriers and then the wells will be left in place (abandoned).

Operational Activities/ Aspects & Auditable Actions			Responsibility	Timing
	and then transfer the cut off well heads to the shore for cleaning and reuse, recycling or disposal.	• Waste material generated from the decommissioning of the offshore wells will be transferred to the shore for disposal to external waste management facilities for recycling (as scrap metal) or other means of disposal. • If necessary, the dismantled equipment and parts will be chemically cleaned at site (onshore) to remove the hazardous inventory (hydrocarbon and chemical residues) before they are transported to external waste management facilities, along with any cleaning waste generated.		
Offshore pipelines (export and in-field pipelines)	Clean all the pipelines, stabilize and leave them in situ.	• All the export pipelines and the in-field will be cleaned in situ and abandoned in-situ, with the pipe ends being left open to the sea environment. • Blind flanges will be fitted at pipeline isolation points to seal the pipelines during the cleaning process. • The cleaning method for the export pipelines consists of pigging followed by flushing with treated seawater (with solvents added if necessary) so that the residual hydrocarbon content is ≤50 ppm. • Chemical or mechanical pigging will be employed for the export pipelines to strip the inside surfaces of hydrocarbon residues and other debris, using a pig launcher and pig receiver installed on a vessel/rig/platform used for this purpose. • The cleaning method for the in-field pipelines consists of flushing with treated seawater (with solvents added if necessary) so that the residual hydrocarbon content is ≤50 ppm. • The cleaning operations will be carried out on a vessel/rig/platform in a closed cycle where oil sludge is removed from the return seawater. Flushing will be repeated as many times and as long needed, so that the target residual hydrocarbon content is reached. • Where well characteristics permit, reverse flushing (known as bullheading) may be used so that the flushing medium may be injected into the wells rather than returning to the surface for oil sludge removal. • After the cleaning process is completed, additional grout bags will be placed on the pipeline sections with free span to prevent snagging of trawler fish nets. • Pigging waste and oil sludge generated from the cleaning process will be transported to external waste management facilities for treatment or disposal.		
Subsea pipelines structures (manifolds, isolation valves and rigid riser sections)	Clean all the pipeline structures, stabilize and leave them in situ.	• The subsea pipeline structures will be cleaned in situ by seawater flushing then left on seabed to act as additional subsea anchorage to the remaining pipelines. • Flushing will be carried out on a vessel/rig/platform in a closed cycle where oil sludge is removed from the return seawater. Flushing will be repeated as many times and as long needed, so that the residual hydrocarbon content is ≤50 ppm. • Oil sludge generated from the cleaning process will be transported to external waste management facilities for treatment or disposal.		
Subsea flexible items (flexible risers, jumpers,	Clean all trenched (buried) items in situ and leave them on the seabed but	• The main umbilicals ~~between the F-A- satellite, SCG and F-O fields~~ will be cleaned in situ by seawater flushing and then left on the seabed.		

Operational Activities/ Aspects & Auditable Actions			Responsibility	Timing
spools and umbilicals)	remove all un-trenched items and transfer them to the shore for cleaning and reuse, recycle or disposal.	• Flushing will be carried out on a vessel/rig/platform in a closed cycle where oil sludge is removed from the return seawater. Flushing will be repeated as many times and as long needed, so that the residual hydrocarbon content is ≤50 ppm • Untrenched short spools, control jumpers and short flexibles will be removed and transferred to the shore for cleaning and reuse, recycling, or disposal at external waste management facilities.		
Floating structures (buoys)	Remove all the floating structures from the sea and transfer them to the shore for reuse, recycling or disposal.	~~• The export buoy in Oribi-Oryx field was already disconnected and towed to the shore in 2025. Hence no further action is needed.~~ • The control buoy in E-M field will be detached from the rigging system and transferred to the shore for reuse, recycle or disposal at external facilities. • The mooring chain will be detached from the buoy and slowly lowered onto the seabed.		
Seabed debris (gravity bases, concrete mattresses, grout bags etc.)	Reposition, where needed, and leave all debris on the seabed.	• Gravity base and mooring arrangements including chain and subsea rigging will be left on the seabed. • Concrete mattresses and grout bags will be repositioned and placed on the abandoned pipelines sections with free span (to prevent snagging of trawler fish nets) or left in place on the seabed.		
Drill cuttings	Leave all drill cutting in "as is" condition (do nothing).	• The drill cuttings lying on the seabed for over 30 years (with the more recent drilling carried out in 1992) will be undisturbed and left in situ.		
11.2.3 Decommissioning options including costs shall be updated annually for submission to PASA.			***GM : Decommissioning***	***Annually***

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
11.3 Financial Provision		
11.3.1 PetroSA shall provide for its closure commitments in the form of a liability provision, which is reflected in the balance sheet as the best estimate of the expenditure required to settle the obligation at the projected end of life of the field.	***PetroSA Financial Manager***	***Annually***
11.3.2 Reporting of Financial Provision • Proof of Financial Provision will be provided to PASA in the following manner: ○ A copy of the insurance certificate for the year will be provided on the renewal date of each year, and ○ The annual revision of the closure provision will be submitted together with the annual Performance Assessment reports.	***GM : Decommissioning***	***Annually***
11.4 Stakeholder Engagement		
11.4.1 Consult fishing communities and other offshore users for their feedback and comments on the proposed decommissioning plans and environmental management programmes so that their concerns and expectations are duly considered.	***PetroSA SHEQ Manager***	***Prior to finalising the plans and programmes***
11.4.2 Notify PASA, DFFE, fishing stakeholders and other marine users of the commencement of decommissioning activities.	***PetroSA SHEQ Manager***	***At least 1 month prior to start of decommissioning***
11.4.3 Communicate information regarding decommissioning activities to SA Navy Hydrographic office so that they can issue notices to fishing stakeholders and other offshore users to ensure all offshore users are kept informed of restrictions on fishing and other marine uses. Such a notice should provide: • the co-ordinates of decommissioning activities; • an indication of the decommissioning timeframes; • a special note on the hazards posed by decommissioning activities.	***PetroSA SHEQ Manager***	***At least 1 month prior to start of decommissioning***
11.4.4 Notify fishing stakeholders and other marine users of the completion of production activities and the location of abandoned infrastructure. Information regarding abandoned infrastructure should be communicated to the SA Navy Hydrographic office so that they can be indicated on Notices to all offshore users and marked on relevant charts.	***PetroSA SHEQ Manager***	***Immediately on cessation of decom-missioning***
11.5 Application for a Closure Certificate		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
11.5.1 Detailed **engineering specifications** shall be developed for decommissioning options	***GM : Decommissioning***	***To commence at least 12 months prior to planned cessation of production.***
11.5.2 A suite of **preferred decommissioning options** shall be selected based upon environmental and technical considerations.	***GM : Decommissioning***	***To commence at least 12 months prior to planned cessation of production.***
11.5.3 A **detailed environmental impact assessment** of the preferred decommissioning option(s) shall be undertaken for application for approval, consistent with the MPRDA and NEMA amongst others.	***Corporate Environmental Leader***	***To commence immediately on completion of 11.3.1 and 11.3.2***
11.5.4 A **detailed Closure Plan** shall be compiled and submitted to PASA.	***GM : Decommissioning***	***6 months before decommissioning starts***
11.5.5 A **seabed survey** shall be undertaken to validate the Closure Plan	***GM : Decommissioning***	***End of decommissioning***
11.5.6 A detailed **environmental risk assessment** shall be undertaken for submission **for approval and issuance of a Closure Certificate**, consistent with the MPRDA. This assessment shall contain at least the following information: • *Description and location of all abandoned infrastructure;* • *Results of seabed survey;* • *Results of Risk Assessment; and* • *Any further monitoring requirements.*	***Corporate Environmental Leader***	***Within 180 days post-production***
11.5.7 Submit a **Final Performance Report** to PASA including, inter alia: proof of environmental notification and communication with HydroSAN and other users of the sea; and the results of relevant quarterly reports.	***PetroSA SHEQ Manager***	***Within 180 days post-production***
Aspects of this process are iterative as a number of activities must inform each other as indicated in the figure below.		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
		
Auditing specifications ***1. The above steps have been completed*** ***2. The detailed performance criteria of the post decommissioning audit will be detailed in the environmental authorisations.***	***PetroSA SHEQ Manager***	***Post-decommissioning***