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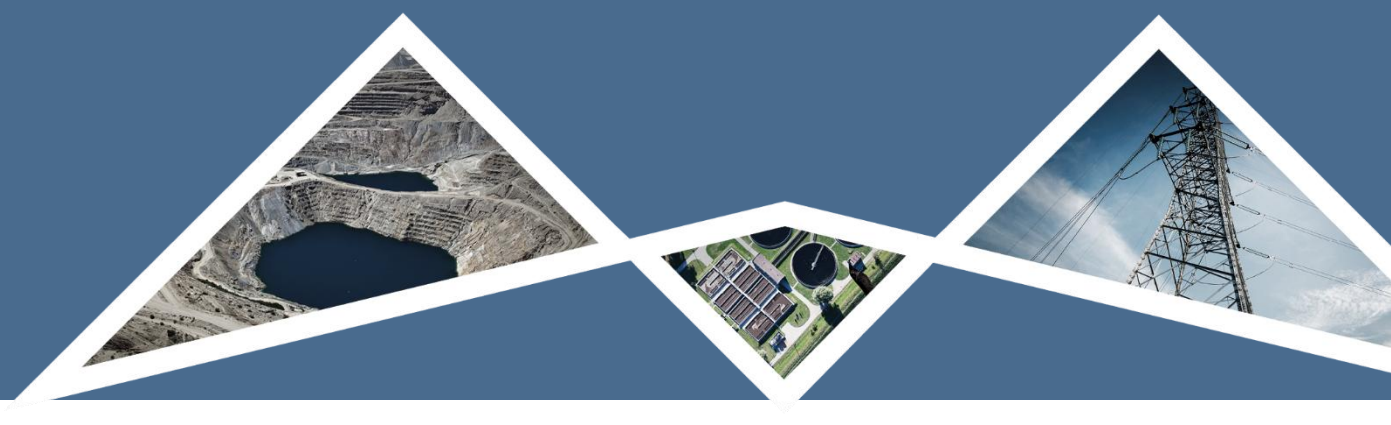
ENVIRONMENTAL MANAGEMENT PROGRAMME

EXPLORATION SEISMIC SURVEYS IN BLOCK 9 AND 11A



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REVISION AND AMENDMENTS

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[1] The content of this EMPr was copied from the 2014 EMPr compiled by Environmental Resources Management for Block 9 and 11a. EIMS was appointed in 2025 to revise and amend this EMPr based on recommendations from an Independent Audit undertaken in 2025.

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1.2 CONTACT PERSON

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1.3 AREA AND LOCATION

This EMPR covers potential exploration activities in Petroleum Licence Block 9 and 11a, located offshore the South coast of South Africa within what is known as the Bredasdorp Basin. The location of the lease areas in relation to the coast is illustrated in Figure 1.

PetroSA's Block 9 license area covers a surface area of 22,756 km^2 and is located 140 km south of Mossel Bay. Block 11a covers 1270 km^2, is located 60 km from shore and has water depths ranging from 100 to 140 m. The co-ordinates of Blocks 9 and 11a are indicated in Figure 2. In Block 9 known hydrocarbon prospects are located approximately 50 to 150 km from the Bredasdorp coast.

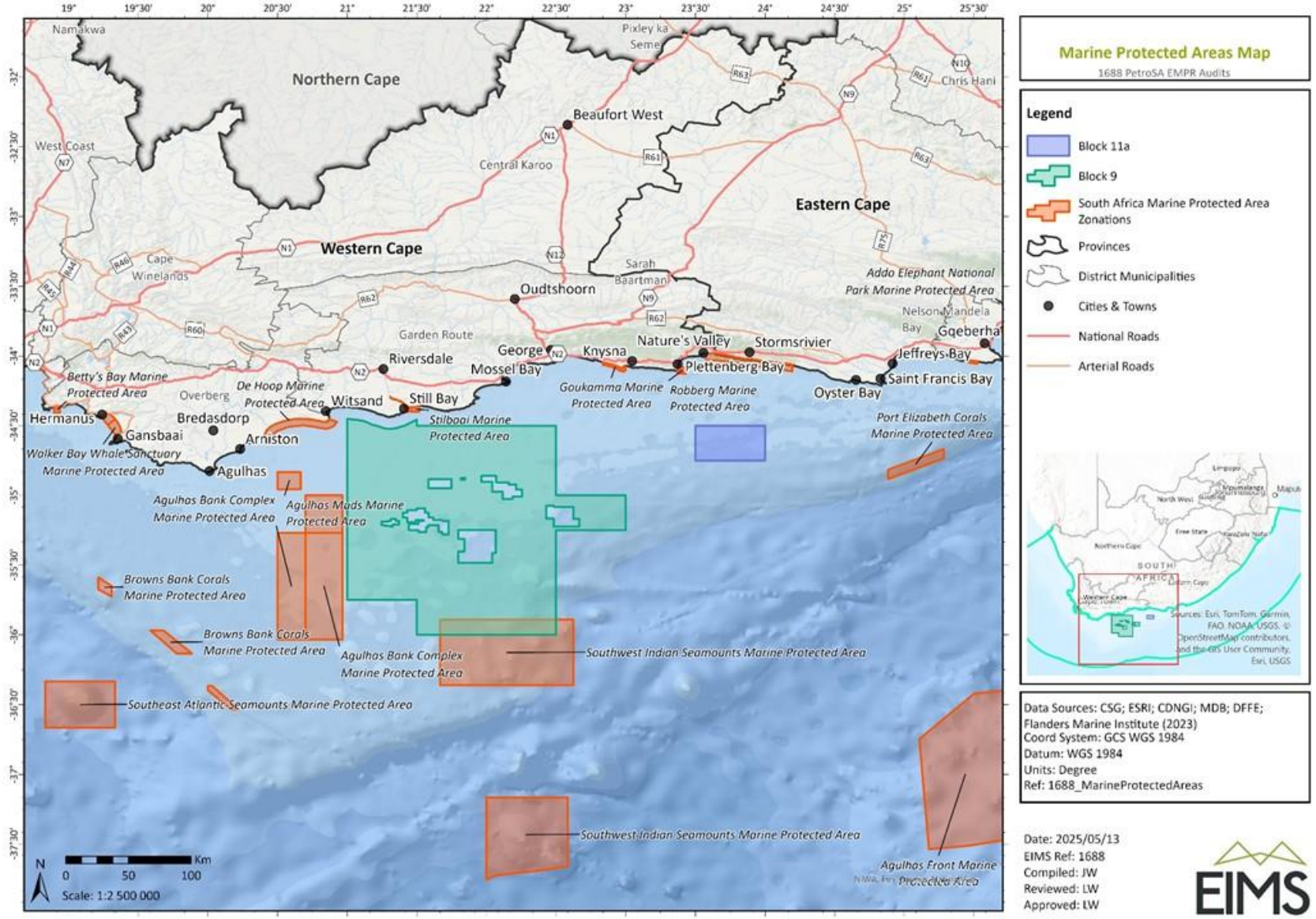
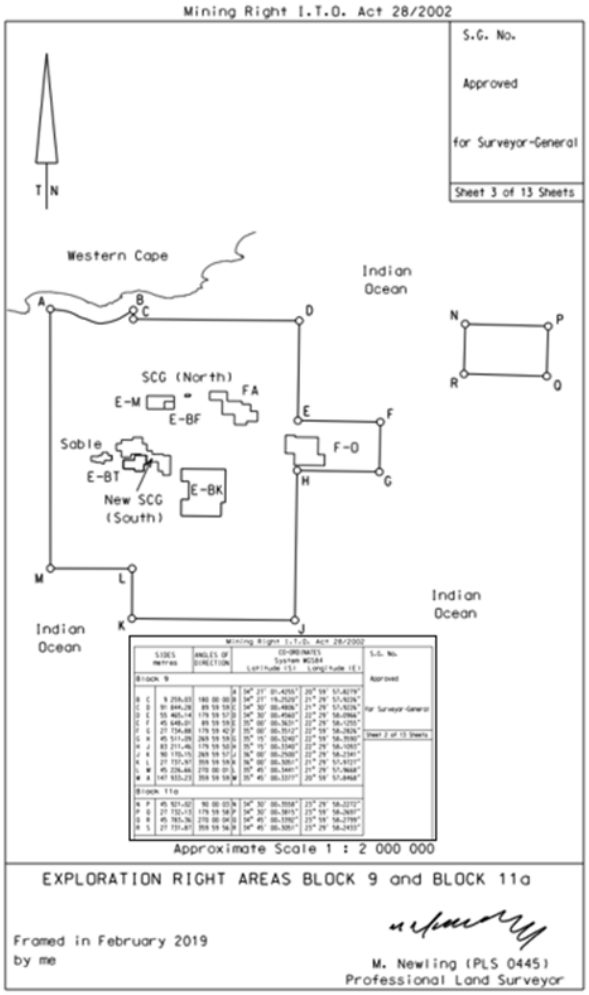


Figure 1: Location of the offshore license blocks offshore Mossel Bay showing the location of Block 9 and 11a.



AREAS EXCLUDED FROM EXPLORATION RIGHT AREA

Production Right: Excluded Area - EBT

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
A1	A2	6 323.86	89 59 57	A1	35°12'18.4169"	21°26'32.9455"
A2	A3	2 557.82	359 59 56	A2	35°12'18.4135"	21°30'42.9561"
A3	A4	6 452.17	89 59 58	A3	35°10'55.4153"	21°30'42.9546"
A4	A5	4 930.74	179 59 57	A4	35°10'55.4130"	21°34'57.9657"
A5	A6	1 315.02	269 59 58	A5	35°13'35.4093"	21°34'57.9684"
A6	A7	3 913.81	179 59 57	A6	35°13'35.4098"	21°34'05.9661"
A7	A8	5 131.42	269 59 58	A7	35°15'42.4070"	21°34'05.9682"
A8	A9	1 294.34	359 59 56	A8	35°15'42.4094"	21°30'42.9592"
A9	A10	6 320.38	269 59 57	A9	35°15'00.4101"	21°30'42.9583"
A10	A1	4 992.41	359 59 57	A10	35°15'00.4136"	21°26'32.9476"

Production Right: Excluded Area - FA

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
C1	C2	9 703.70	89 59 49	C1	34°51'35.4238"	21°51'50.0334"
C2	C3	5 207.76	179 59 56	C2	34°51'35.4029"	22°04'12.0538"
C3	C4	8 149.39	89 59 57	C3	34°54'24.3969"	22°04'12.0573"
C4	C5	1 664.03	179 59 55	C4	34°54'24.3918"	22°09'33.0695"
C5	C6	4 822.76	89 59 58	C5	34°55'18.3900"	22°09'33.0708"
C6	C7	3 913.56	179 59 56	C6	34°55'18.3877"	22°12'43.0785"
C7	C8	3 932.67	89 59 57	C7	34°57'25.3831"	22°12'43.0810"
C8	C9	5 608.44	179 59 56	C8	34°57'25.3808"	22°15'18.0869"
C9	C10	6 034.84	269 59 57	C9	35°00'27.3742"	22°15'18.0906"
C10	C11	1 972.20	179 59 58	C10	35°00'27.3776"	22°11'20.0814"
C11	C12	6 667.30	269 59 57	C11	35°01'31.3750"	22°11'20.0821"
C12	C13	5 700.89	359 59 56	C12	35°01'31.3786"	22°06'57.0722"
C13	C14	6 874.41	269 59 57	C13	34°58'26.3857"	22°06'57.0685"
C14	C15	7 919.56	359 59 56	C14	34°58'26.3899"	22°02'26.0582"
C15	C16	7 007.51	269 59 44	C15	34°54'09.3991"	22°02'26.0530"
C16	C1	4 745.60	359 59 58	C16	34°54'09.4205"	21°57'50.0347"

Production Right: Excluded Area - EBF

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
E1	E2	5 407.29	89 59 58	E1	34° 54' 43.4336"	21° 41' 21.9776"
E2	E3	4 129.29	179 59 58	E2	34° 54' 43.4319"	21° 44' 54.9895"
E3	E4	5 404.86	269 59 58	E3	34° 56' 57.4282"	21° 44' 54.9907"
E4	E1	4 129.29	359 59 59	E4	34° 56' 57.4298"	21° 41' 21.9783"

Production Right: Excluded Area - FO

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
F1	F2	5 320.28	90 00 00	F1	35°04'30.0000"	22°25'39.0000"
F2	F3	832.07	180 00 00	F2	35°04'30.0000"	22°29'09.0000"
F3	F4	12 666.17	90 00 00	F3	35°04'57.0000"	22°29'09.0000"
F4	F5	9 584.23	180 00 00	F4	35°04'57.0000"	22°37'29.0000"
F5	F6	3 795.84	90 00 00	F5	35°10'08.0000"	22°37'29.0000"
F6	F7	6 009.48	180 00 00	F6	35°10'08.0000"	22°39'59.0000"
F7	F8	16 817.07	270 00 00	F7	35°13'23.0000"	22°39'59.0000"
F8	F9	6 410.11	0 00 00	F8	35°13'23.0000"	22°28'54.0000"
F9	F10	4 934.81	270 00 00	F9	35°09'55.0000"	22°28'54.0000"
F10	F1	10 015.67	0 00 00	F10	35°09'55.0000"	22°25'39.0000"

Production Right: Excluded Area - Sable

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
B1	B2	4 237.76	89 59 59	B1	35°11'17.7886"	21°14'48.8446"
B2	B3	616.34	0 00 33	B2	35°11'17.7881"	21°17'36.3477"
B3	B4	1 867.23	89 59 60	B3	35°10'57.7887"	21°17'36.3509"
B4	B5	1 559.30	0 00 13	B4	35°10'57.7886"	21°18'50.1507"
B5	B6	3 160.73	90 00 04	B5	35°10'07.1910"	21°18'50.1538"
B6	B7	1 593.22	180 00 02	B6	35°10'07.1934"	21°20'55.0558"
B7	B8	2 165.84	89 59 56	B7	35°10'58.8916"	21°20'55.0552"
B8	B9	2 813.59	179 59 56	B8	35°10'58.8899"	21°22'20.6572"
B9	B10	4 077.48	270 00 02	B9	35°12'30.1873"	21°22'20.6588"
B10	B11	1 753.48	180 00 04	B10	35°12'30.1861"	21°19'39.4512"
B11	B12	1 400.94	269 59 59	B11	35°13'27.0842"	21°19'39.4501"
B12	B13	520.80	359 59 42	B12	35°13'27.0845"	21°18'44.0516"
B13	B14	3 548.28	270 00 02	B13	35°13'10.1851"	21°18'44.0501"
B14	B15	721.07	0 00 05	B14	35°13'10.1836"	21°16'23.7459"
B15	B16	2 400.34	270 00 02	B15	35°12'46.7851"	21°16'23.7465"
B16	B1	2 742.67	0 00 08	B16	35°12'46.7848"	21°14'48.8411"

Production Right: Excluded Area – SCG North

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
G1	G2	2 920.71	89 59 57	G1	34° 52' 30.4334"	21° 48' 56.0018"
G2	G3	862.83	179 59 58	G2	34° 52' 30.4318"	21° 50' 51.0012"
G3	G4	507.90	269 59 57	G3	34° 52' 58.4311"	21° 50' 51.0075"
G4	G5	523.86	179 59 56	G4	34° 52' 58.4314"	21° 50' 31.0067"
G5	G6	2 412.40	269 59 57	G5	34° 53' 15.4309"	21° 50' 31.0030"
G6	G1	1 386.69	359 59 57	G6	34° 53' 15.4322"	21° 48' 56.0024"

Production Right: Excluded Area - EM

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
D1	D2	15 084.64	89 59 58	D1	34° 53' 02.4396"	21° 35' 00.9550"
D2	D3	3 112.35	179 59 59	D2	34° 53' 02.4350"	21° 44' 54.9892"
D3	D4	5 407.29	269 59 58	D3	34° 54' 43.4319"	21° 44' 54.9895"
D4	D5	4 129.29	179 59 59	D4	34° 54' 43.4336"	21° 41' 21.9776"
D5	D6	9 667.82	269 59 58	D5	34° 56' 57.4298"	21° 41' 21.9783"
D6	D1	7 241.66	359 59 58	D6	34° 56' 57.4334"	21° 35' 00.9574"

Production Right: Excluded Area – New SCG South

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
H1	H2	2 835.88	89 59 57	H1	35°07'28.4253"	21°23'57.9343"
H2	H3	2 064.72	359 59 57	H2	35°07'28.4235"	21°25'49.9390"
H3	H4	6 280.88	89 59 58	H3	35°06'21.4250"	21°25'49.9381"
H4	H5	1 540.83	359 59 54	H4	35°06'21.4222"	21°29'57.9482"
H5	H6	5 420.75	89 59 58	H5	35°05'31.4234"	21°29'57.9467"
H6	H7	3 605.54	179 59 58	H6	35°05'31.4216"	21°33'31.9568"
H7	H8	2 329.50	89 59 58	H7	35°07'28.4187"	21°33'31.9581"
H8	H9	3 790.47	179 59 57	H8	35°07'28.4178"	21°35'03.9627"
H9	H10	3 087.81	89 59 58	H9	35°09'31.4149"	21°35'03.9646"
H10	H11	1 941.47	179 59 57	H10	35°09'31.4140"	21°37'05.9702"
H11	H12	6 174.36	89 59 58	H11	35°10'34.4126"	21°37'05.9711"
H12	H13	647.16	179 59 59	H12	35°10'34.4101"	21°41'09.9845"
H13	H14	3 871.36	89 59 58	H13	35°10'55.4096"	21°41'09.9846"
H14	H15	10 940.11	179 59 52	H14	35°10 55.4079"	21°43'42.9936"
H15	H16	4 170.06	269 59 57	H15	35°16'50.3989"	21°43'43.0015"
H16	H17	2 157.22	359 59 49	H16	35°16'50.4009"	21°40'57.9934"
H17	H18	2 527.86	269 59 58	H17	35°15'40.4027"	21°40'57.9896"
H18	H19	5 177.30	359 59 56	H18	35°15'40.4036"	21°39'17.9830"
H19	H20	6 576.09	269 59 58	H19	35°12'52.4079"	21°39'17.9798"
H20	H21	3 605.60	359 59 57	H20	35°12'52.4103"	21°34'57.9675"
H21	H22	3 011.02	269 59 58	H21	35°10'55.4130"	21°34'57.9657"
H22	H23	647.16	359 59 57	H22	35°10'55.4139"	21°32'58.9603"
H23	H24	5 339.23	269 59 58	H23	35°10'34.4144"	21°32'58.9600"
H24	H25	1 725.75	179 59 56	H24	35°10'34.4167"	21°29'27.9511"
H25	H26	5 515.31	269 59 57	H25	35°11'30.4154"	21°29'27.9522"
H26	H27	3 667.24	359 59 56	H26	35°11'30.4186"	21°25'49.9430"
H27	H28	2 834.70	269 59 57	H27	35°09'31.4208"	21°25'49.9409"
H28	H1	3 790.48	359 59 57	H28	35°09'31.4226"	21°23'57.9361"

Production Right: Excluded Area – E-BK

SIDES		metres	ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
J1	J2	24 468.55	90 00 00	J1	35°14'54.0901"	21°47'48.0278"
J2	J3	18 463.83	180 00 00	J2	35°14'54.0901"	22°03'55.8924"
J3	J4	2 280.08	270 00 00	J3	35°24'53.2049"	22°03'55.8924"
J4	J5	7 688.05	180 00 00	J4	35°24'53.2049"	22°02'25.5178"
J5	J6	22 119.40	270 00 00	J5	35°29'02.6620"	22°02'25.5178"
J6	J7	9 133.03	0 00 00	J6	35°29'02.6620"	21°47'48.0278"
J7	J8	4 164.66	90 00 00	J7	35°24'06.3188"	21°47'48.0278"
J8	J9	10 022.44	0 00 00	J8	35°24'06.3188"	21°50'33.0742"
J9	J10	4 169.30	270 00 00	J9	35°18'41.1118"	21°50'33.0742"
J10	J1	6 996.41	0 00 00	J10	35°18'41.1118"	21°47'48.0278"

Figure 2: Coordinates of Block 9 and 11a and the hydrocarbon production areas in Block 9 covered by updated EMPrs.

1.4 BRIEF DESCRIPTION OF SEISMIC OPERATIONS

Future seismic operations for Block 9 and 11a have not been confirmed and a generic description of the activities involved in seismic exploration is described here.

1.4.1 BACKGROUND INFORMATION

Seismic surveys are carried out in the investigation of sub-sea geological formations during marine oil and gas prospecting. During the seismic surveys high level, low frequency sounds are directed towards the seabed from near-surface sound sources that are towed by a seismic vessel. Signals reflected from geological discontinuities below the sea floor are recorded by towed hydrophones. Analyses of the returned signals allow for interpretation of sub-sea geological formations.

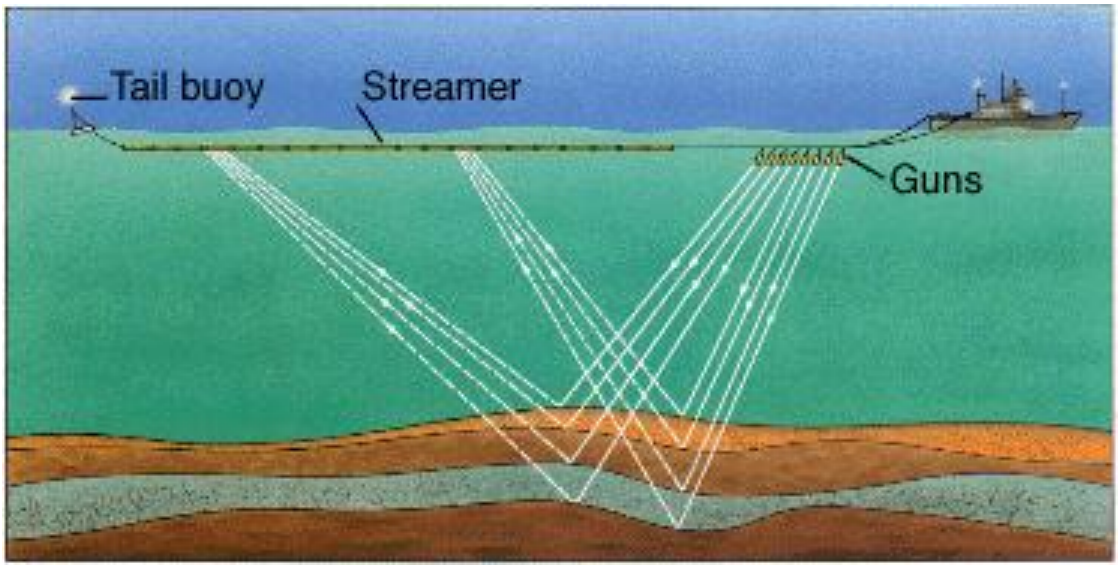


Figure 3: Principles of Offshore Seismic Acquisition Surveys.

A seismic vessel travels along transects of a prescribed grid that is carefully chosen to cross any known or suspected geological structure in the area. The sound source is fired at approximately 6-20 second intervals. The sound waves are reflected by boundaries between sediments of different densities and returned signals are computer processed after being recorded by the hydrophone streamers. During surveying vessels travel at a speed of four to six knots. The airgun sound source is situation some 300 m behind the vessel at a depth of 5-10 m below the surface.

1.4.2 2D AND 3D SEISMIC SURVEYS

Seismic surveys are undertaken to collect either two-dimensional (2D) or three-dimensional (3D) data. The 2D surveys provide a vertical slice through the earth's crust along the survey track-line. The vertical scales on displays of such profiles are generally in two-way sonic time, which can be converted to depth displays by using sound velocity data. 2D surveys are typically applied to obtain regional data from widely spaced survey grids (tens of kilometres) and infill surveys on closer grids (down to 1 km spacing) are applied to provide more detail over specific areas of interest such as potentially drillable petroleum prospects. For a 2D survey the entire seismic array from the tow-ship to the end of the streamer may be up to 6000 m or more in length.

Advances in position-fixing of the vessel and streamer tail buoys as well as computer processing and display has allowed 3D data sets to be obtained. A typical 3D seismic survey configuration is illustrated in Figure 4 and comprises the following components:

- a towed airgun array and up to 10 lines of geophones spaced 5 to 10 m apart (Figure 4) between 3 m and 20 m below the water surface. The array can be up to 4500 m long and 1000 m wide;

- a series of towed strings (commonly termed ‘streamers’) of hydrophones towed behind the survey vessel. Streamer spacing is ~100 m; and
- a control and recording system co-ordinating the firing of shots, the recording of returned signals and accurate position fixing.

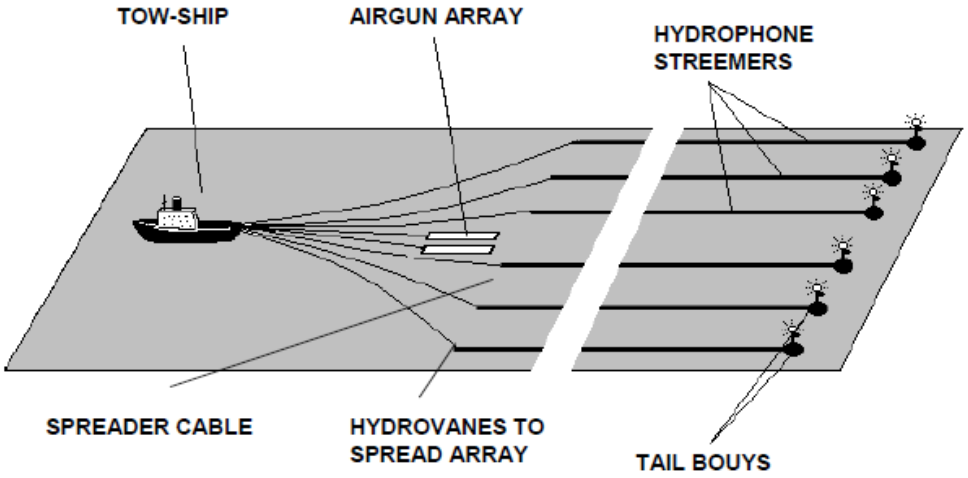


Figure 4: Configuration of typical 3D seismic survey.

The data is gathered as a 3D data set, which can be processed and displayed in a variety of ways. The 3D surveys are typically applied to promising petroleum prospects to assist in fault line interpretation, distribution of sand bodies, estimates of oil and gas in place, and the location of boreholes. The 3D data are also commonly processed to provide a direct indication of the presence and distribution of gas.

As data acquisition requires that the position of the survey vessel and the array be accurately known, seismic surveys require accurate navigation of the sound source over pre-determined survey transects. As a result, the array and the hydrophone streamers need to be towed in a set configuration behind the seismic vessel, means that the survey operation has little manoeuvrability while operating, and cannot deviate from the planned seismic lines. Ship tracks in a 3D survey are typically some 450 m apart because of the wide turning circle (~ 6 km) of the vessel and its tow.

1.4.3 SOUND SOURCES

Sound sources (commonly referred to as ‘airguns’) are underwater pneumatic devices from which high-pressure air is released suddenly into the surrounding water. On release of pressure the resulting bubble pulsates rapidly producing an acoustic signal that is proportional to the rate of change of the volume of the bubble. The acoustic signal propagates through the water and the subsurface and reflections are transmitted back to the surface. The sound source must be submerged in the water, typically at a depth of 5 to 10 m.

The frequency of the signal depends on the energy of the compressed air prior to discharge. Airguns are used on an individual basis (usually for shallow water surveys) or in arrays. Arrays of airguns are made up of towed parallel strings of airguns (usually comprised of between 12 and 70 airguns in total). A single airgun could typically produce sound levels of the order of 220-230 dB re 1 mPa @ 1m, while arrays produce sounds typically in the region of 250 dB re 1 mPa @ 1m. The majority of energy produced is in the 0 - 120 Hz bandwidth, although energy at much higher frequencies is also recorded. High-resolution surveys and shallow penetration surveys require relatively high frequencies of 100-1000 Hz, while the optimum wavelength for deep seismic work is in the 10-80 Hz range.

The airgun can be used as a single unit or as an array. The airguns are normally towed between 50 m and 100 m behind the seismic vessel, either individually or as an array of up to six airguns (see Figure 5).

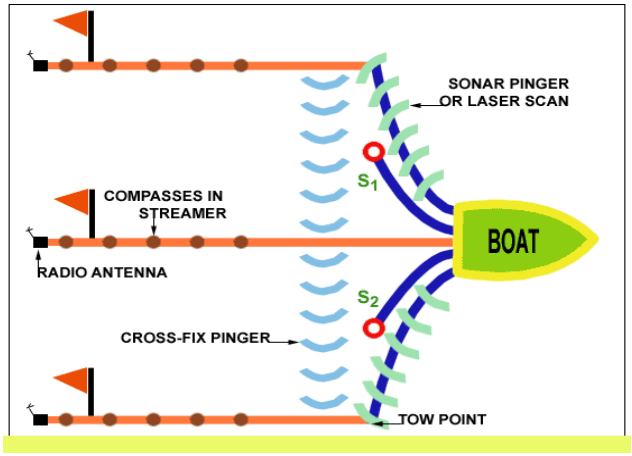


Figure 5: *3D seismic survey*

One of the required characteristics of a seismic shot is that it is of short duration (the main pulse is usually between 5 and 30 milliseconds). The main pulse is followed by a negative pressure reflection from the sea surface of several lower magnitude bubble pulses. Although the peak levels during the shot may be high the overall energy is limited by the duration of the shot.

1.4.4 RECORDING EQUIPMENT

Signals reflected from geological discontinuities below the sea floor are recorded by hydrophones mounted inside streamer cables. Hydrophones are typically made from piezoelectric material encased in a rubber plastic hose. This hose containing the hydrophones is called a streamer. A typical marine streamer containing hydrophones is illustrated in Figure 6. The reflected acoustic signals are recorded and transmitted to the seismic vessel for electronic processing. Analyses of the returned signals allow for interpretation of subsea geological formations.

The length of streamers can range from 2000 m to 8000 m. A 2D survey involves only one length of streamer towed behind the vessel, while 3D surveys typically involve an array of up to 16 streamers, spaced 50 m to 100 m apart.

Figure 6: *Typical Marine Stream containing hydrophones.*

1.4.5 CONTROLLED SOURCE ELECTROMAGNETIC METHOD (CSEM)

The Controlled Source Electromagnetic (CSEM) method (alternatively described as “Sea Bed Logging”) is an offshore geophysical technique, similar to seismic surveys (described above), which uses electromagnetic remote-sensing technology to indicate the presence and extent of potential hydrocarbon accumulations below the seabed. This offshore technology has seen increased use and acceptance globally as an exploration and delineation technique since 2000. The CSEM survey technique uses a dipole source in a tow-fish that is towed above the seafloor and transmits a time-varying electromagnetic field into the earth. The electromagnetic field is modified by the presence of subsurface resistive layers and these changes are logged by an array of receivers placed on the seabed. Because hydrocarbon-bearing formations are highly resistive compared with surrounding formations, a CSEM survey can be used to indicate the presence of oil and gas in offshore situations.

While seismic is a proven method for defining structures and identifying possible reservoirs, CSEM is often used in a complementary manner to determine whether these seismically mapped reservoirs contain hydrocarbons or water.

Typically in CSEM surveys one or two lines of receivers are deployed over the prospect. Receivers are normally placed with 1km spacing and line length is determined by the size of the prospect.

The sequence of a typical survey is as follows:

- Vessel arrives in the survey area and records a bathymetry profile along all the survey lines. This detailed bathymetry information is used when deploying the receivers and when towing the source.
- Receivers are deployed to the sea floor on all lines with approximately 1km spacing
- The source is deployed and towed at an altitude of approximately 30-50m above the seabed across the receiver line or receiver field
- The receivers are recovered after completing the towed source lines, leaving their anchors behind to dissolve.

The field survey vessel (Figure 7) is similar to many large offshore vessels (e.g., supply vessels, cable laying vessels, etc.). The vessel will be large enough to accommodate ship’s officers and crew and scientific and technical personnel for a total of about 30-40 personnel. It will have dynamic positioning capabilities and a large aft deck to accommodate and deploy the equipment safely and efficiently by crane.

Seismic surveying uses sound waves that reflect off interfaces between rock layers with different acoustic properties. By comparison, CSEM measures the difference in electrical resistivity between sedimentary layers. Sedimentary layers saturated with hydrocarbon are more resistive than those filled with saline water.

Figure 7: *Typical CSEM vessel.*

The seabed logging source is a horizontal electric dipole. It consists of a power supply onboard the vessel, a cable from the vessel down to the tow-fish, two electrodes separated by 270m of cable and some instrumentation. An alternating current is set up to flow between the two electrodes. The direction of the flow of this current is typically changed every 1 to 2 seconds. This will generate an electric and a magnetic field. The amplitude of the current flowing between the electrodes is typically around 1000Amp; the voltage drop between the two electrodes is around a 100 Volt. The direction of the current flowing will typically be changed with a frequency between 0.05 and 10Hz.

This means that the electric field is approximately 60V/m at the electrodes surface. The sea water is a conductive media and the electric field strength decreases rapidly with distance from 60V/m at 1 m from the source to 0.25V/m at 10m. International research into the behaviour of fish exposed to electric fields show that the fish starts to react to the presence of an electric field with a strength of around 2 – 8 V/m.

The strength of the magnetic field is approximately 200µT at 1m and 2µT at 100m distance from the source respectively. Four metres away from the source the field measures 50µT which is comparable to the earth's magnetic field (40-60 µT).

The seabed logging receiver is placed on the seafloor with concrete anchors (about 1 m x 1 m x 10-15 cm). Receivers are released remotely and retrieved at the end of the survey. The anchor is left on the seabed when the recording instrument is recovered.

The concrete mixture is a patented mixture that contains anhydrate which starts to deteriorate when it comes into contact with seawater. The height of the concrete blocks is such that it does not pose a risk to fishing and trawling activities during the deterioration period. Within 6 - 8 months the concrete anchor is completely dissolved and only the sand medium is left on the seabed or dispersed by seafloor currents. The concrete mixture contains no chemicals considered harmful to the environment.

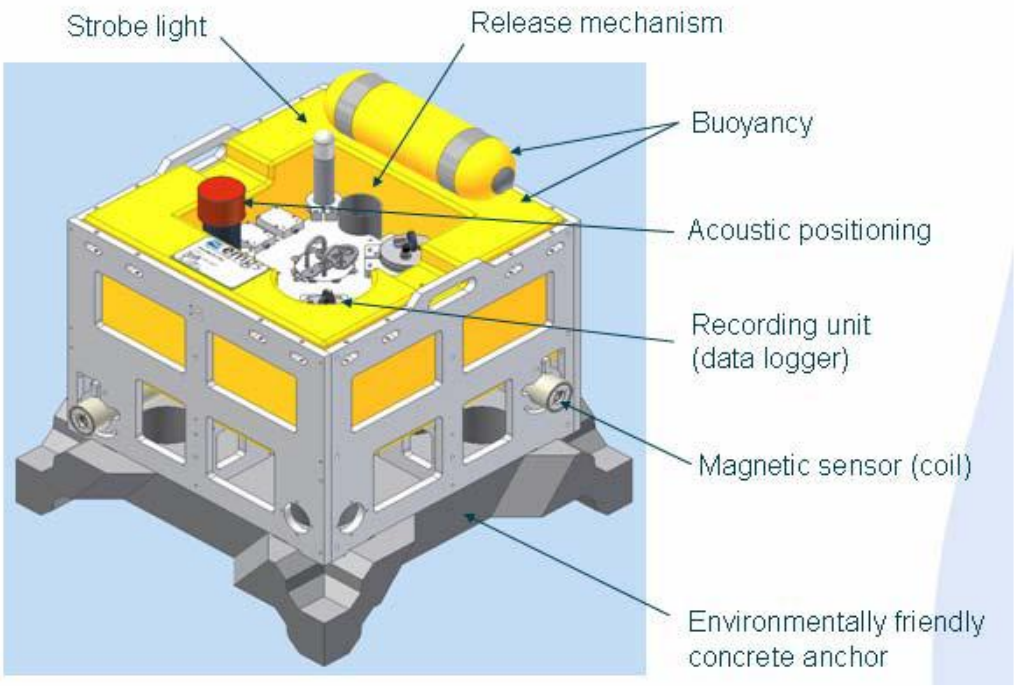


Figure 8: *Sea bed logging equipment on sea floor.*

1.4.6 EXCLUSION ZONE

Under the Merchant Shipping Act No 57 of 1951 (Merchant Shipping/ Collision Regulations 1996), a seismic survey vessel that is engaged in surveying is defined as a 'vessel restricted in its ability to manoeuvre' (see Rule 3: General definitions (g)(ii)). Rule 18 (Responsibilities between vessels: (c)(ii)) therefore requires that vessels engaged in fishing shall, so far as possible, keep out of the way of a vessel restricted in her ability to manoeuvre. Furthermore, under the Marine Traffic Act No 2 of 1981, a seismic survey vessel and its array of airguns and hydrophones falls under the definition of an 'offshore installation'. As such it is protected by a 500 m safety zone and it is an offence for unauthorised vessel to enter the safety zone. In addition to a statutory 500 m safety zone, a seismic contractor will request a safe operational limit (that is greater than the 500 m safety zone) that it would like other vessels to stay beyond. Typical safe operational limits are illustrated in Figure 9.

At least a 500 m exclusion zone will need to be enforced around the seismic vessel at all times and a chase boat (small manoeuvrable vessel) would be used to warn vessels that are in danger of breaching the exclusion zone. A 'sweeper vessel' is generally used to sail ahead of the seismic vessel removing fishing gear and other obstacles from the path of the vessel, or liaising with fishing operators to do so.

For semi-industrial, industrial and recreational fishers and other related activities, the seismic survey journey plan and exclusion areas will be communicated to these stakeholders well in advance to ensure that the appropriate planning can be done in accordance with a communications plan. Notices to Mariners will be communicated through the proper channels, and harbour/ port masters at Mossel Bay, Port Elizabeth and Ngqura will be informed of exclusion zones.

A 3D survey may deploy between four and eight streamers, where an overlap in seismic lines is required. The seismic vessel may therefore need to systematically turn and acquire the lines in the form of a spiral. As a result of the level of coverage and overlap required during the 3D survey, it is likely that the exclusion time could be greater than for a 2D survey.

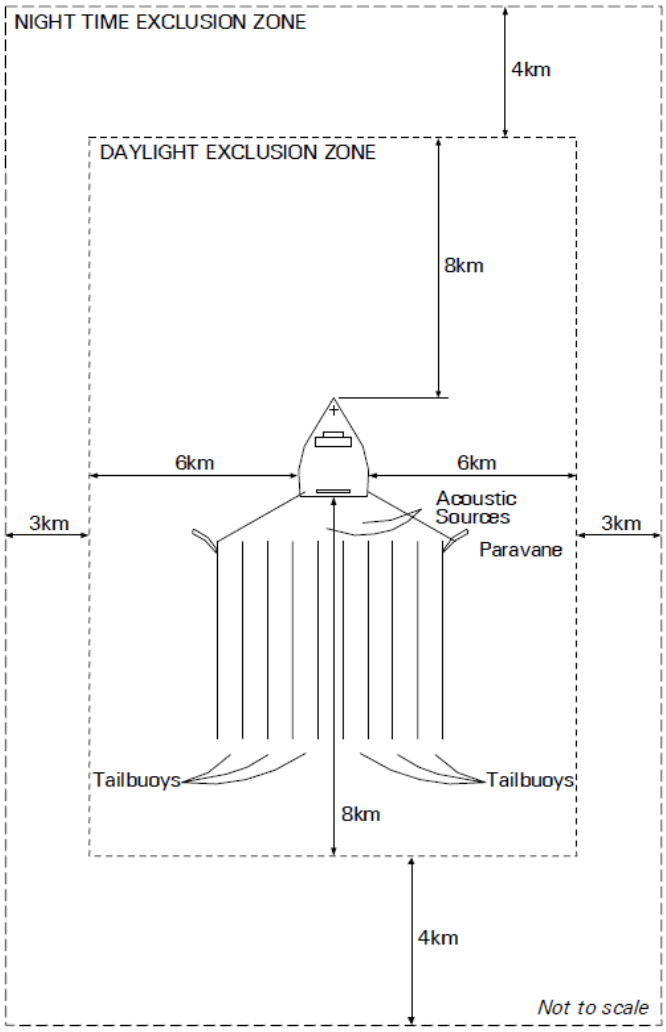


Figure 9: *Typical exclusion and safety zones for a seismic operation.*

1.4.7 NOISE, WASTE EMISSIONS AND DISCHARGES

1.4.7.1 **AIR EMISSIONS**

Air emissions would be generated by combustion of diesel fuel to power the seismic vessel. The air emissions from the survey and support vessels would be no greater than that from any other vessel of a similar tonnage.

Depending on how the vessel contracted for the survey is fitted, certain types of non-hazardous waste may be incinerated onboard the vessel. The incineration of any waste onboard would release soot as well as minor amounts of air pollutants (CO, CO_2). If the vessel did not have an incinerator on-board waste would be transported ashore for disposal.

1.4.7.2 **DISCHARGES TO SEA**

All survey vessels are expected to comply fully with international agreed standards regulated under MARPOL 73/78, as well as the South African Marine Pollution Act (Act 2 of 1986 -which incorporate MARPOL 73/78 standards) and the Dumping at Sea Control Act. The International Association of Geophysical Contractors (IAGC) have a 'no dumping at sea' policy.

1.4.7.3 NOISE EMISSIONS TO AIR

The noise emissions from survey vessels above the surface of the sea will be no greater than that from any other vessel of a similar size.

1.4.8 SUPPORT SERVICES AND EMPLOYMENT

Highly skilled and experienced crew and seismic operators are required for the seismic operations and labour for a seismic survey is generally employed through the seismic acquisition contractor. The size and nature of the crew will depend on the size of the vessel, and may be consist of between 35 and 50 people on-board at any one time. Given the specific technical and experience requirements the crew is likely to consist of international specialist of various nationalities. On-board marine mammal observers (MMOs) as well as some unskilled and semi-skilled workers may be sourced from South Africa.

Vessel supplies, including food, water, fuel and lubricants will likely be loaded at the port of Mossel Bay.

Bunkering of the seismic survey vessel is expected to be undertaken at the Port of Mossel Bay with no requirement for refuelling while at sea.

1.5 SCOPE OF THE UPDATED EMPR

The EMPr has been updated and amended at various stages of the ER. The following specific EMPr updates are noted:

1.5.1 2014 EMPR UPDATE

The revised and updated Environmental Management Programme (EMPr) (~~this~~ 2014 EMPr ~~document~~) reflects changes that took ~~have taken~~ place in the company structure, legal requirements and operational best practice for seismic survey activities. Specifically, the EMPr was ~~has been~~ upgraded to:

- Comply with the requirements of the NEMA and MPRDA (No. 28 of 2002) as amended;
- Supersede previous versions of seismic EMPrs in Block 9 and 11a;
- Contain the same standards and reporting requirements as the EMPrs for production areas in Block 9.
- Focus on environmentally-related activities for which staff involved in seismic surveys is directly responsible. The EMPr therefore does not deal with activities such as:
    - corporate social responsibility programmes, and
    - health and safety (for which operational procedures exist for seismic contractors) 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 procedures that are relevant to environmental management to facilitate environmental compliance and performance auditing.

1.5.2 2025 EMPR UPDATE

PetroSA is required to implement the exploration activities (as approved in the work programme) in accordance with the requirements of the approved EMPr. A Regulation 34 National Environmental Management Act (Act 107 of 1998-NEMA), Environmental Impact Assessment Regulations (GNR982)(EIA Regulations) compliance audit was conducted in 2025. The findings of the audit included recommendations to amend the EMPr. This EMPr reflects these amendments and will, once approved, form the EMPR to be implemented for future exploration activities. The 2025 amendments focus on addressing insufficient impact management outcomes and actions, as identified in the 2025 Audit. The 2025 amendments are reflected in the EMPr in blue text for ease of reference. Where aspects of the 2014 EMPr have been removed in this 2025 amendment, such are presented with strike through text.

2 SECTION 2: GENERAL CONTEXT

2.1 OVERVIEW OF ENTIRE BLOCK 9 AND 11A ACTIVITIES

2.1.1 BLOCK 9

- SOEKOR E and P (PTY) Ltd. obtained authorisation for seismic surveys within Blocks 9 offshore the Republic of South Africa through Section 39 (4) Mineral Act 1991 (50 of 1991). The authorisation for seismic surveys was converted to exploration rights under the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). This right was acquired by virtue of a cession by SOEKOR (PTY) Ltd. to SOEKOR E and P (PTY) Ltd. of its rights and obligations contained in the principle lease OP26 insofar as it relates to Blocks 9. All activities within Block 9 are regulated by the terms and conditions of OP26 and the Mining Lease issued pursuant thereto.
- Since 1992, PetroSA (previously SOEKOR and Mossgas) has been undertaking offshore gas and oil production in the Block 9 area.
- PetroSA submitted an application for new order rights in 2007 in line with the MPRDA and applied for renewal of these rights in 2010, 2014 and 2019. The existing EMPr was submitted approved along with the new order right in 2007
- A number of seismic surveys were undertaken in Block 9 prior to the approval of the EMPr in 1997. Since then 3D seismic surveys were conducted in 1998, 2000 and 20121.
- 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 such as wells. Surface structures such as drilling rigs have 500m radius exclusion zones around them which exclude unauthorised traffic, while exclusion zones around seismic vessels are larger and move as the seismic survey moves. In addition, all offshore facilities including vessels have markings and warning lights to alert shipping and fishing and other vessels to their presence.
- Approximately 35-50 people are generally employed on a seismic vessel at any one time. It is expected that all servicing and supplies and waste offloading will be done in Mossel Bay Harbour.
- PetroSA approved standard procedures form the framework for any mishaps or emergencies as a result of any offshore activities.

2.1.2 BLOCK 11A

- 12 exploration wells have been drilled in Block 11a between 1968 and 1990 to depths ranging from 2273 to 4396 m.
- 2D and 3D seismic surveys have been undertaken.
- No wells are under production in Block 11a.

Figure 10 shows the location of all existing hydrocarbon production areas in Block 9.

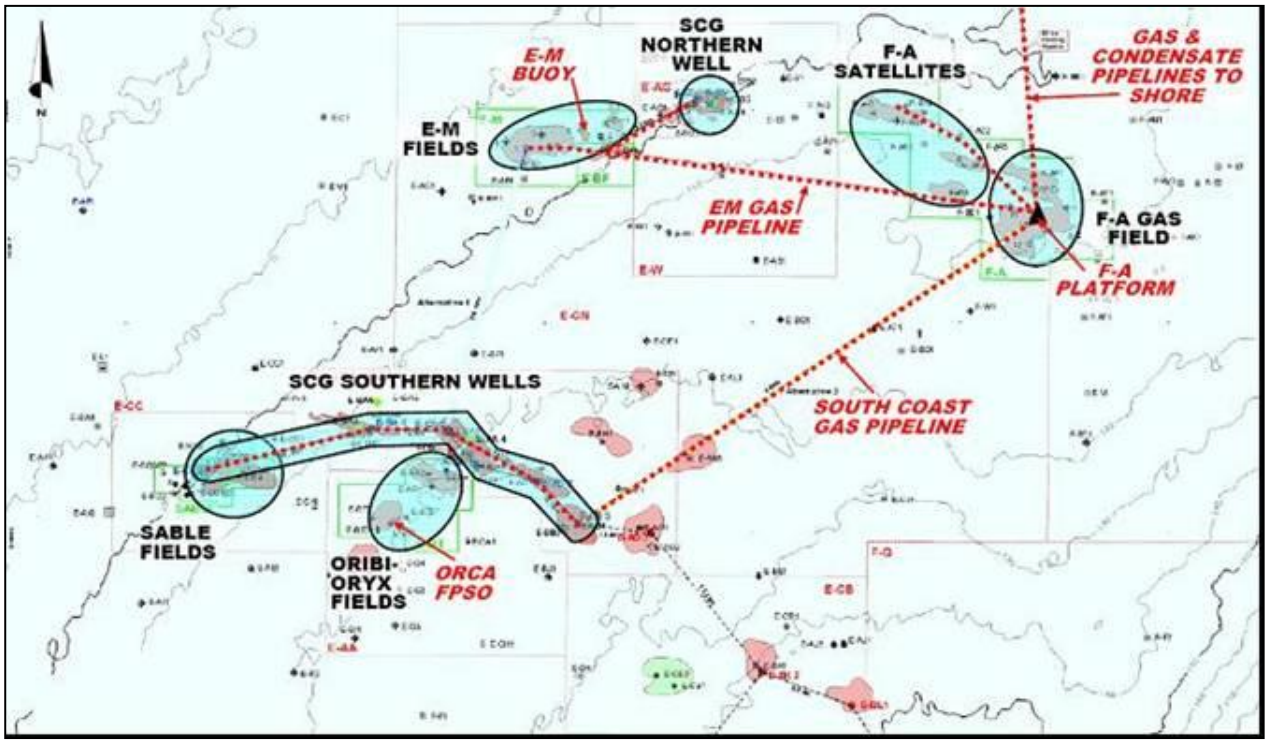


Figure 10: Location of all hydrocarbon production areas in Block 9 (circled with names in black) covered by updated EMPRs. All except Oribi and Oryx are producing gas via the FA Platform.

2.2 SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT

The exploration areas of Block 9 and 11a are located on the Agulhas Bank south of Mossel Bay (Figure 11).

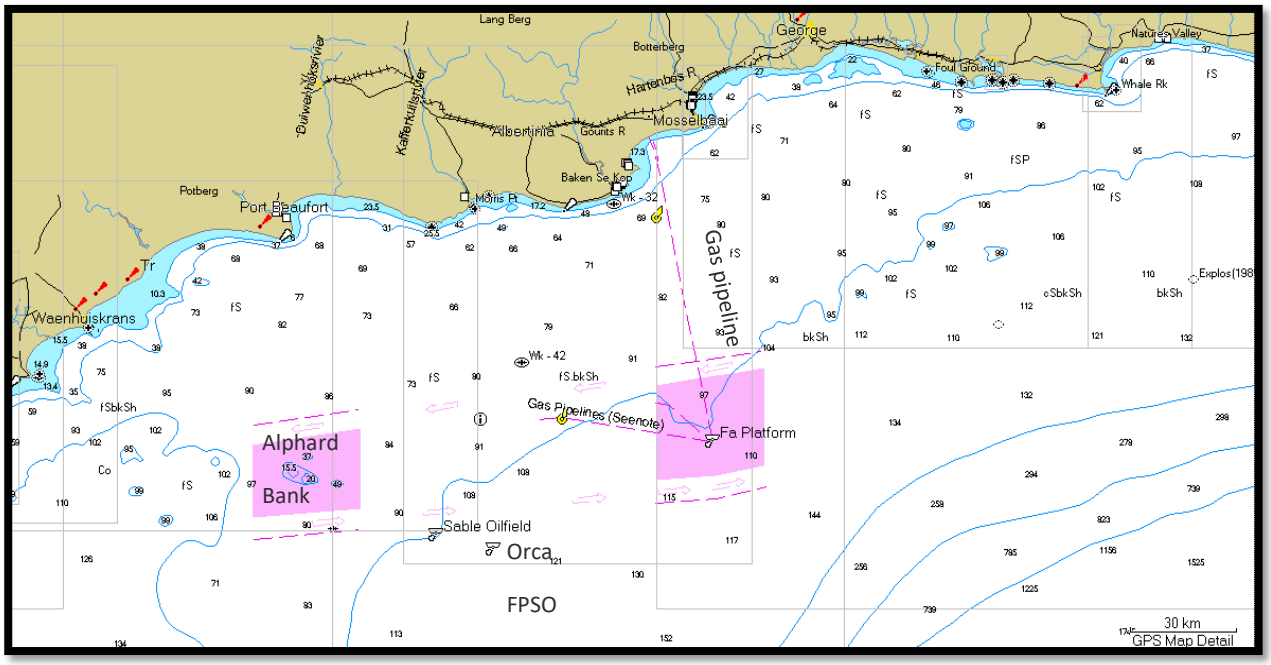


Figure 11: Chart showing bathymetry and location of gas and oil fields offshore of Mossel Bay, South Africa (Map Source 2010).

This summary environmental description has been compiled from scientific publications on the region (see synthesis of research on the Agulhas Bank in the 'South African Journal of Science' Volume 90, 1994) and information contained in assessments for developments and proposed developments in the region, e.g. the South Coast Gas Development Project (PetroSA 2006). Information was also taken from Chapter 4 of the E-BT Environmental Impact Assessment (CSIR, 1995) and this document should be sourced for further details and references. The information presented here provides a broad overview of Agulhas Bank oceanography and ecology and includes a description of the coast and its important features. The description is focused on the environmental components that are most likely to be affected by offshore exploration, operational activities and decommissioning of the facilities. These are 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 study area comprises the continental shelf area (water depth <200m) extending from Cape Point to Cape Padrone in the east. The major feature of the region is the Agulhas Bank, the largest continental shelf off the South African coast. The Agulhas Bank is roughly triangular and, within the 200 m isobath, encloses an area greater than 100,000 km^2. 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. The eastern margin of the Bank is under the influence of the Agulhas Current (the western boundary current of the southern Indian Ocean) whilst the western margin is part of the southern Benguela current with its typical coastal upwelling characteristics. The Agulhas Bank extends over 9° of longitude and for convenience is divided into western, central and eastern sections.

Winds in the project area are mainly zonal with an approximate annual balance between westerly and easterly winds. There is seasonal asymmetry with westerly winds 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 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 near-shore 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 visitors. Loggerhead and leatherback turtles have been recorded in the region as by-catch in the pelagic long-line fishery (Petersen *et al.,* 2009) although frequency of occurrence is low, implying a small population size in the area.

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

2.2.1.1 PHYSICAL COASTLINE

The coastline between Cape Point and Cape Padrone is exposed and rugged, has few truly sheltered embayments and is dominated by a high energy wave regime and strong winds throughout most of the year. There are 81 small estuaries in the region between Cape Point and Woody Cape which have irregular connections with the sea. In South Africa an estuary is considered to be that portion of a river system which has permanent and/or intermittent contact with the sea.

2.2.2 OPERATIONAL AREA DETAILS

2.2.2.1 TOPOGRAPHY AND SEDIMENT DISTRIBUTIONS

The seafloor in the project area is flat with water depths ranging between 100 m and 115 m. Seafloor sediment texture ranges from silty sand (on the 'Blues' fishing ground) to sand and gravel around the FA Platform (Figure 12). 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 rocky.

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 and oil field (Figure 11).

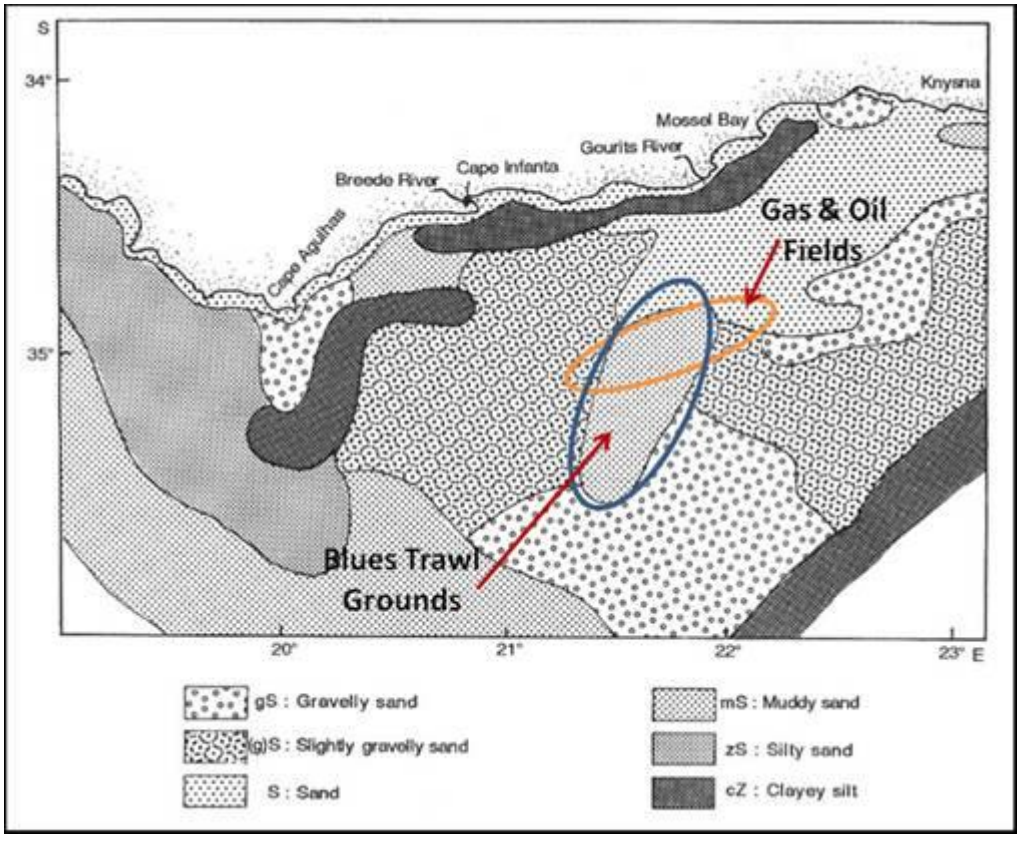


Figure 12: Seafloor sediment distributions offshore of Mossel Bay. The approximate locations of the PetroSA gas and oil fields and the Blues trawling grounds on the central Agulhas Bank are shown (modified from Le Clus et al., 1996).

2.2.2.2 OCEANOGRAPHY

The major oceanographic feature of the project 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 isobaths. Figure 13 shows a schematic of this feature in relation to the project area. 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 in spring and summer (5 °C-11 °C/10 m) in the 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 ridge flowing westwards whilst to the inshore the flow is mainly eastwards.

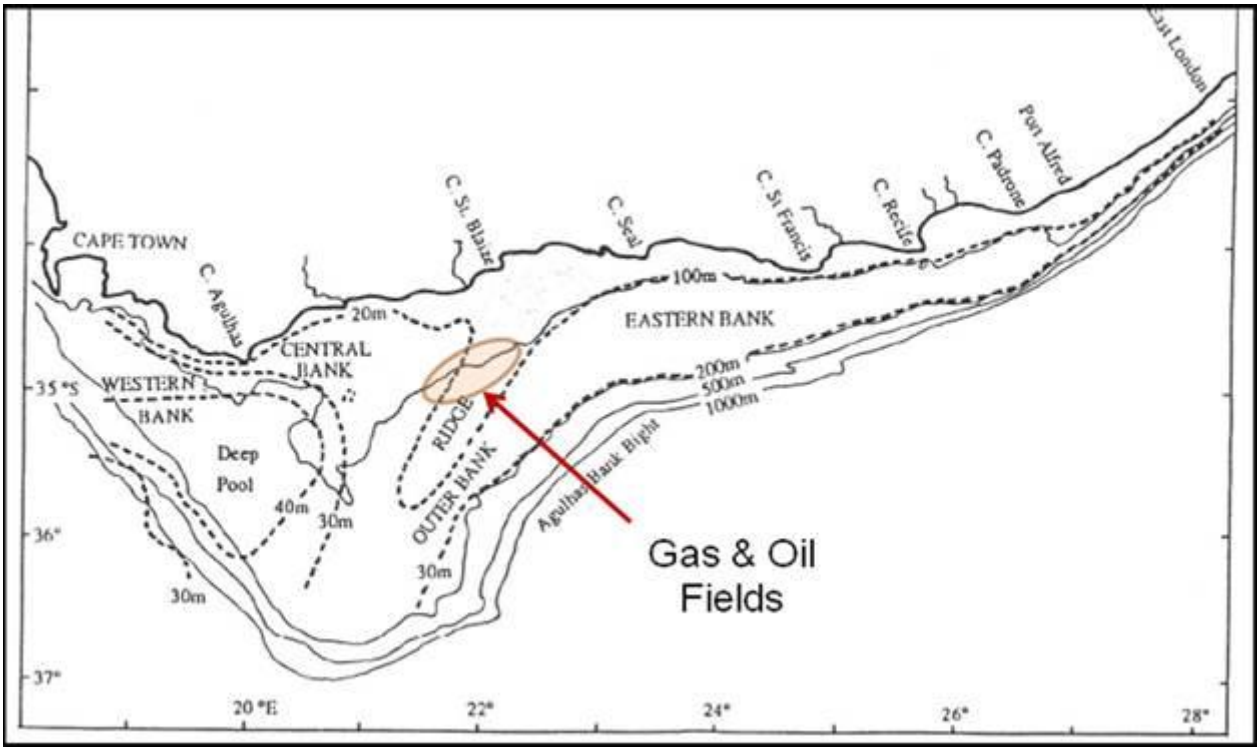


Figure 13: Schematic of thermocline distributions in spring and summer on the Agulhas Bank in relation to the PetroSA gas and oil fields. Dotted lines show thermocline depths whilst solid lines show bathymetry (Modified from Probyn et al., 1994)

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. 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 1). There is an inverse distribution of calmer conditions with longer periods of lower waves being recorded in summer than in the other seasons (Table 1). 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 1.

Table 1: Wave persistence statistics for waves in the vicinity of the FA Platform (modified 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

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 chl*a*/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 to 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 to 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 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 shown in Figure 12 above. Carpenter, kob, geelbek and yellowtail comprise large proportions of the line-fish assemblage.

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 BENTHOS

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 habitats are limited to that obtained in opportunitstic and dedicated ROV surveys and the quantitative assessment of benthic infauna on transects extending from an oil well in the Oribi and Orxy field within Block 9 (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, horsemussels, 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 starfishs, crabs, horsemussels, 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 gas field 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 and 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 samples 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 variations in infaunal abundance and biomass between trawled and untrawled sample sites were also slight. Multivariate analyses do indicate differences in that the trawled and untrawled sample sites did form separate groupings 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 field infrastructure (FA platform, flowlines, umbilicals, mattresses, well heads etc) has been described by Sink *et al.* (2010). 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 field infrastructure lying on or near the seafloor support biofouling communities in which the introduced invasive anemone species *S. elegans* and *M. senile,* and other suspected alien species such as ascidians, are represented due to the habitat created by the infrastructure. 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*¸ *Paraechinus angulosus*), 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 field infrastructure and c) the invasive alien anemone species *S. elegans* and *M. senile* were ubiquitously distributed on it. These indicate that the gas field 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 invasive species in the area.

2.2.3 ECOSYSTEM SERVICES

2.2.3.1 **COMMERCIAL FISHERIES**

Commercial fishing is the only ecosystem service in the project area. Figure 14 shows the distribution of the main fishing operations on the Agulhas Bank in the vicinity of Block 9. Demersal trawl fishing on the 'Blues' fishing ground targeting hakes is the dominant activity in the Block 9 project area and is regarded as a prime fishing area. Fishing activities in the vicinity of Block 11a mainly comprises longlining for hake; inshore trawling for sole and line trapping of south coast rock lobster.

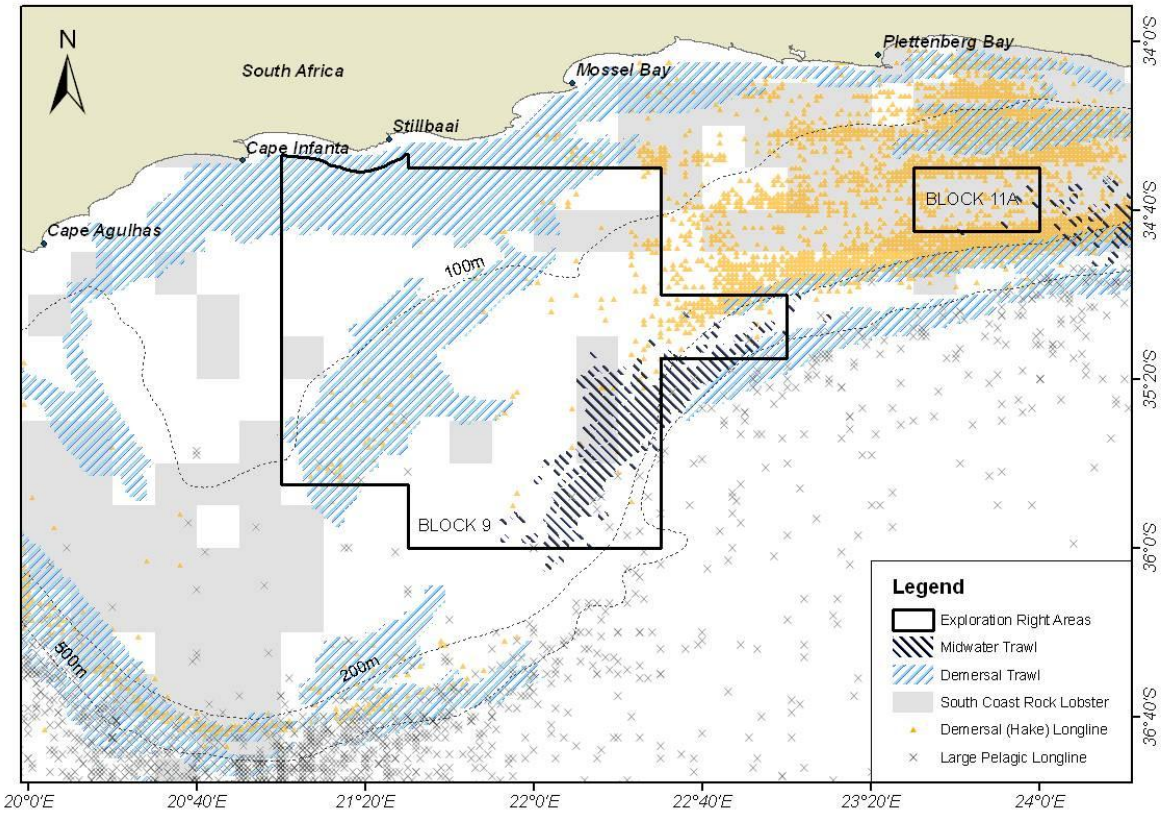


Figure 14: Distribution of the main commercial fishing activities on the Agulhas Bank relative to the Block 9 and 11a blocks (figure supplied by Japp 2011).

South African demersal trawl fish catch data is collected for 1/3 degree squares (i.e. 20nm x 20nm) and the commercial grid blocks for the Block 9 study area are designated as 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 3006 metric tonnes.

Fifty-nine percent of the 'Blues' fishing ground annual landings are derived from the commercial grid blocks in the project area, 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 in Block 9 and the fishing industry, mainly. through implementation of exclusion zones around subsea infrastructure. 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 already reflected within the fisheries data.

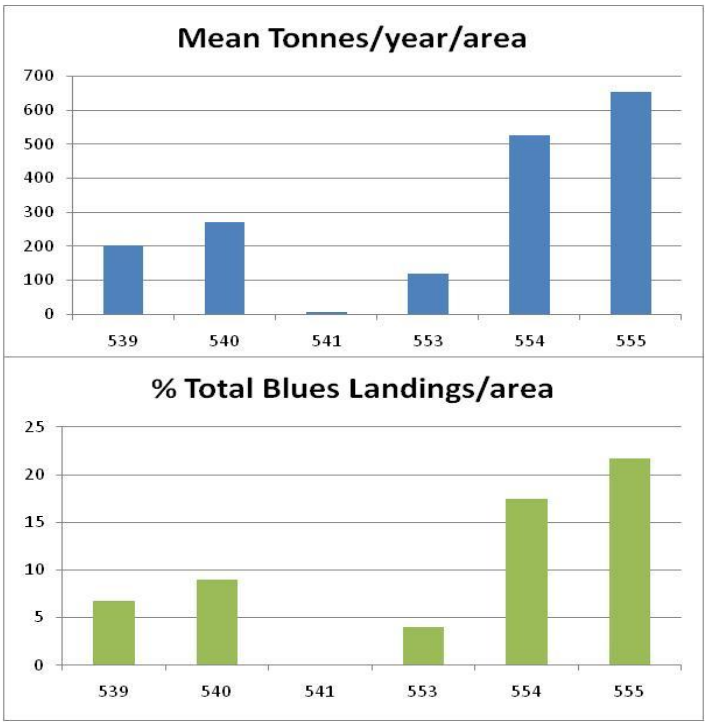


Figure 15: Distribution of demersal trawl landings in the commercial grid blocks in the Block 9 project area and respective proportions of annual 'Blues' trawling ground catches (data from Wilkinson and Japp 2005 and Capricorn Fishing (Pty) Ltd).

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). Seafloor areas within the project area may be suitable for this as they fringe the intensely trawled 'Blues' fishing ground and include low relief reef and gravelly sand habitats. Both of these habitats were trawled primarily for panga in the 1980s but have since been left undisturbed (Japp *et al.,* 1994, 2004). However, the status of the benthos and associated fauna in these habitats is unknown and this would need to be determined prior to any steps being taken on biodiversity conservation.

2.3 ENVIRONMENTAL VULNERABILITIES AND POTENTIAL IMPACTS OF OPERATIONS

The environmental components most likely to be affected by the exploration seismic activities are the marine life in the immediate areas of the seismic survey, and fishing and shipping activities. Points of interaction between seismic activities and the environment are shown in Table 2 below.

Table 2: Summary of interaction points between seismic activities and environmental components (modified from CCA 1997).

Phase of Activity	Seismic s Activity	Geology & Sediment	Oceaography	Physical Surrounds	Marine fauna (eg cetaceans, fish)	Histocial / Cultural Sites	Recreation	Transport routes / Navigation	Maricultture	Commercial Fishing	Air Quality	Potential for small spills	Potentail for large spills
Establishment													
Operations	Vessel			X				X		X		X	
	Airgun array			X				X		X			
	Airgun emission				X								
	Operating lights				X							X	X
	Waste												
	Chemical storage												
	Radioactive equipment												
Decommissioning													
Post closure													

2.3.1 WATER COLUMN

The region in which exploration seismic surveys may take place in future 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 seismic activities on the water column could include minor discharges of contaminated water from seismic vessels, spillages during fuel bunkering (if bunkering at sea takes place), and incorrect treatment or disposal of domestic wastes.

2.3.2 PHYSICAL COASTLINE

The coastline may only be affected by the escape of oils from accidental spillage in the event of a vessel collision during seismic surveys. An exclusion zone will be maintained throughout a seismic survey which will significant reduce this risk and the 80km distance from shore will further minimise this risk from normal controlled seismic activities.

2.3.3 MARINE FAUNA

Pulses from seismic survey vessels can result in possible impacts to marine fauna, ranging from plankton and marine invertebrates to fish and marine mammals. Possible impacts on marine biota may include:

- Behavioural changes: which may be manifested by a cessation of normal activities and the commencement of avoidance or 'startle' behaviour. Continued exposure often results in a habituation to the sound, followed by commencement of normal behaviour.
- Interference with sounds produced by animals: which is especially relevant in terms of marine mammal communication and echolocation.
- Physical damage or injury: This can arise from the differential rate of transmission of sound pressure waves through tissues of varying densities, and which is especially marked between tissue and gas filled cavities (eg Fish's swim bladders). Another source of possible physical harm is to the sound receiving hair cells of many organisms, which are especially sensitive to vibrations, over stimulation of which can lead to permanent damage.
- Shifts of hearing threshold: Repeated or continual exposure to high level sound results in a gradual deterioration of hearing through permanent or temporary threshold shifts.

Previous studies have generally concluded that, in general, seismic effects on marine fauna are short term and largely negligible, although the full effects of seismic activities on marine fauna are difficult to quantify and not well understood, and therefore reduces the confidence of impact ratings. Hence, precautionary behaviour is generally taken to avoid peak cetacean breeding and migrating seasons and to implement soft start firing to deter any marine fauna from entering the area.

2.3.4 FISHERIES

The key interactions of seismic activities with fishing is caused primarily by the exclusion of fishing activities from the vicinity of the seismic vessel while it is in operation). This may create a nuisance to fishing vessels through having to cease trawling in this area in the short term, particularly in the Blues Fishing area. Minor interactions can also occur through navigational detours required to avoid the seismic survey area.

Exclusion zones of 500 m currently exist around all subsea infrastructure in Block 9, including flow lines, umbilicals, mid-water arches and pipeline end manifolds which can be damaged by demersal trawls and *vice versa*. Similar exclusion zones also apply to surface infrastructure such as the FA Platform, the Orca FPSO, and associated oil-loading systems such as the CALM buoy etc. The fishing industry is therefore already familiar with operating under these restrictions, although impacts would be greater where surveys are proposed in the Blues Fishing Grounds. Early notification with stakeholders is key to ameliorating this impact.

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2.3.5 DIAGRAMMATIC SUMMARY OF POTENTIAL IMPACTS

This diagram summarises potentially significant impacts on the environment from seismic in Block 9 and 11a.

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.

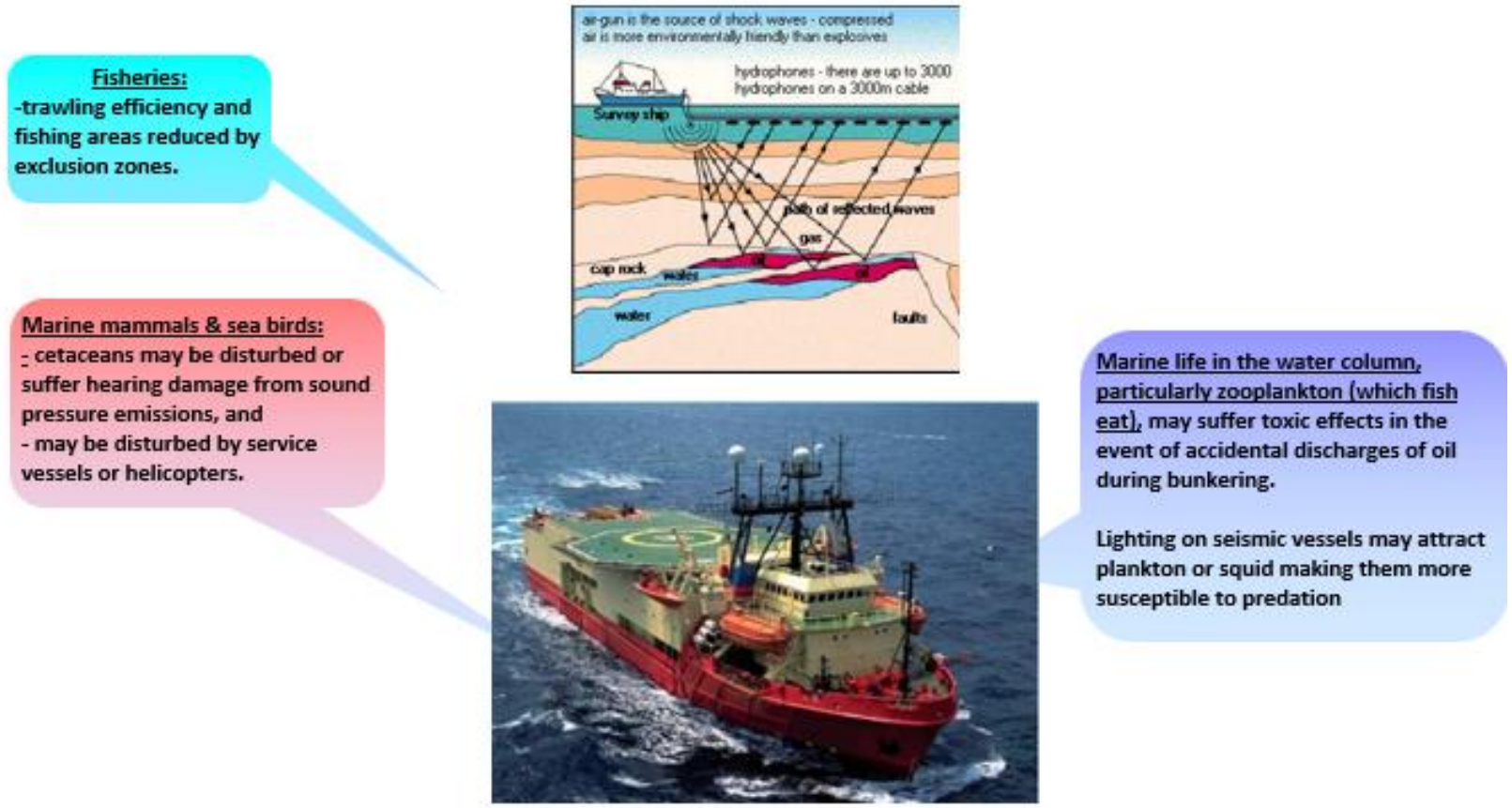


Figure 16: Diagrammatic Summary of Potential Impacts of Seismic Activities

2.4 LEGISLATIVE PROVISIONS

2.4.1 DIAGRAMMATIC SUMMARY OF LEGISLATIVE PROVISIONS

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

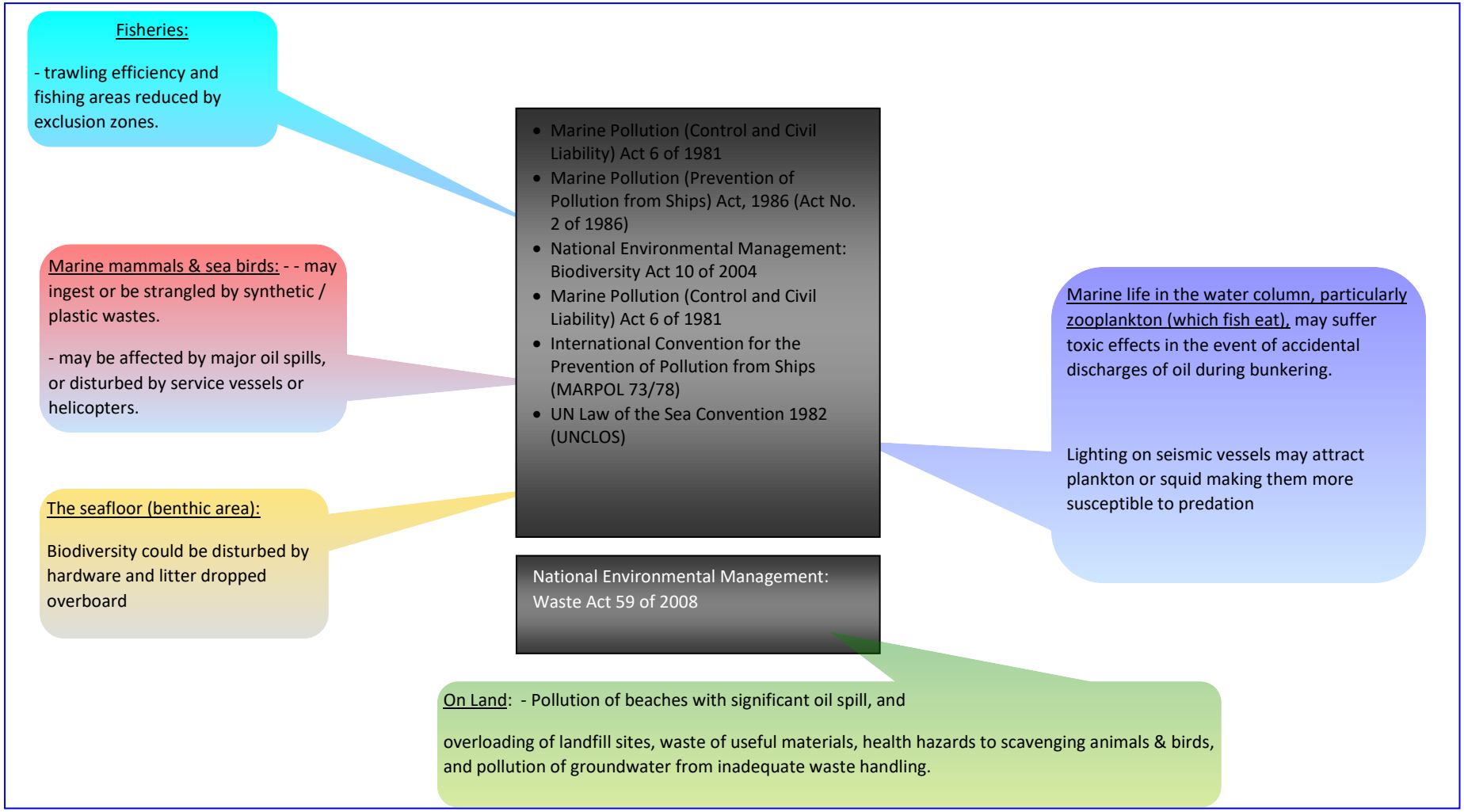


Figure 17: Overview of key legislation related to offshore seismic activities

2.4.2 APPLICABLE POLICIES, CONVENTIONS, LAWS & PERMIT REQUIREMENTS

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 seismic projects to comply with the relevant aspects of these laws and conventions.

Table 3: List of Legislation and Policies relevant to PetroSA operational activities.

Legislation or policy	Nature of Issue	Specific requirements
National Environment Management Act 56 of 2002 (NEMA)	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.
National Environmental Management Amendment Act 62 of 2008 (NEMAA)	Content of EIAs and EMPrs 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 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 operation related to prospecting and mining that constitutes listed activities in terms of ~~GN No. R. 544, 545, and 546~~ the prevailing Listed Activities will require environmental authorisation in terms of NEMAA. Listed activities include the reconnaissance, exploration, production and mining as provided for in the MPRDA 28 of 2002, as amended, in respect of such permits and rights. The mining company must also obtain the necessary approvals in terms of MPRDA No. 28 of 2002.
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 the EIA regulations promulgated in terms of Chapter 5 of NEMA (Act 107 of 1998), as amended). In terms of the MPRDA an environmental authorisation issued by the Minister shall be a condition prior to the issuing of a permit or the granting of a right in terms of this Act. ~~an exploration right must be obtained prior to commencing exploration activities, for which an EMPr must be undertaken and approved in accordance with Section 39~~ 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

Legislation or policy	Nature of Issue	Specific requirements
		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 environmental damage caused by its activities or pollution events.
Mineral and Petroleum Resources Development Amendment Act 49 of 2008 (MPRDAA)	EMPrs	Amends the 2002 act (see above) to align the MPRDA more closely with the NEMA environmental authorisation requirements. The Minister (of Mines and Energy) is authorised to issue an "environmental authorisation" if deficiencies in the environmental management plan or environmental management programme compiled under the 2002 act or prior to NEMA 1998 have been addressed and that the requirements in Chapter 5 of the National Environmental Management Act, 1998, have been met.'' Thus, any new EMPrs must conform to the requirements of NEMA. EMPrs cannot be amended without the permission of the Minister. Issuance 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 1998. 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, 1996 (Act No. 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. It 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 Management 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

Legislation or policy	Nature of Issue	Specific requirements
		for listed activities, such as emissions from the petroleum industry.
Maritime Zones Act 15 of 1994 (MZA)	Maritime zoning	The Act defines the maritime zones. 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 "contiguous zone is defined as the sea beyond the territorial waters but within 24 nautical miles from the low water line and in which the Republic shall have the right to exercise all the powers considered necessary to prevent contravention of any fiscal law or any customs, emigration, immigration or sanitary law and to make such contravention punishable. The "exclusive economic zone" is the sea beyond the territorial waters but within a distance of 200 nautical miles from the low water line and in terms whereof all natural resources in this zone shall vest the same rights and powers as Republic has in respect of its territorial waters. The "continental shelf" is that defined in Article 76 of the United Nations Convention on the Law of the Sea "UNCLOS"), 1982, in terms whereof exploration and exploitation of natural resources, as defined in paragraph 4 of Article 77 of the UNCLOS and any law relating to mining of precious stones, metals or minerals, including natural oil shall be deemed to be unalienated State land.
	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. In terms of the MZA an installation includes an exploration vessel.
	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.

Legislation or policy	Nature of Issue	Specific requirements
Integrated Coastal Management Act 24 of 2008 (ICMA)	Marine and Coastal Pollution / Dumping at Sea	The ICMA supports the authorisation requirements of NEMA but specifies 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 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 are 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) amended by the Marine Shipping (Civil Liability Convention) Act 25 of 2013 w.e.f. 30 May 2014	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.

Legislation or policy	Nature of Issue	Specific requirements
The 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 500 m safety zone of installations.
The 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 during discharge or exchange of ballast water and 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 4: 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 (MCM)	Relevant to leaving waste or equipment on the sea floor.

Act, Regulation or By-law	Permit or licence	Requirements	Implementing Agency	Relevance to PetroSA
Marine Pollution (Control and Civil Liability) Act 6 of 1981	Pollution Safety Certificate	Certificate required to operate an offshore facility	SAMSA	Relevant to offshore vessels and platforms

Table 5: 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 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	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

Convention	Key Provisions
Wastes and their Disposal – adopted 22 March 1989	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.

2.5 INSTITUTIONAL FRAMEWORK

2.5.1 PETROSA ENVIRONMENTAL MANAGEMENT RESPONSIBILITIES

Table 6 lists the persons with environmental responsibility as detailed in the EMPr.

Table 6: Table of PetroSA Staff Responsibilities for Exploration Seismic Surveys.

PERSONS RESPONSIBLE	ENVIRONMENTAL AREAS OF RESPONSIBILITY EXPLORATION SEISMIC SURVEYS
PetroSA VP: New Ventures Upstream	• Overall responsibility for environmental performance of activities within the division including drilling.
PetroSA Asset Manager	• Ensure that all requirements to fulfil the commitments in terms of the Exploration Right are met
PetroSA Operations Geophysics Manager	• Assess and deal with any incidents • Safe keeping of all records/ data/ documentation • Monthly reporting of monitoring results
PetroSA SHEQ Manager	• Compliance with SAMSA requirements to avoid pollution incidents • Report on waste management programme • Assess and deal with any incidents • Safe keeping of all records/ data/ documentation • Quarterly reporting of monitoring results • Appoint Marine Mammal Observer • Environmental Notification and Close out reporting • Environmental Auditing
PetroSA Onboard SHEQ Rep	• Daily HSE reporting • Monitoring of on board compliance
PetroSA Logistics Base Manager	• Waste management and handling
Seismic Contractor	• Compliance with EMP and best practice operating procedures • Monthly reporting • Ensure implementation of environmental awareness • Ensure careful storage, handling, disposal of chemical substances and solid objects to prevent losses and spills • Implement waste management programme • Monitoring of any discharges • Implementation of Incident reporting and management system

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 Health, Safety and Environment Policy Statement, PetroSA is committed to minimising its' environmental impacts in areas in which it operates.

Key institutions that PetroSA report to on the environmental aspects of their offshore activities are the Petroleum Agency of South Africa (PASA), Department of Mineral and Petroleum Resources (DMPR), Department of ~~Environmental Affairs (DEA)~~ Forestry, Fisheries and the Environment (DFFE) 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.

- **DMPR**: 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.
- **DEA (now DFFE)**: Is responsible for the National Environmental Management Act 107 of 1998 which 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 (etc). The Marine and Coastal Management Branch 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. It's responsibilities include monitoring and enforcing compliance with safety and environment protection standards, and responding to marine pollution incidents and other maritime emergencies.

3 ENVIRONMENTAL PROTECTION ACTIVITIES

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 seismic activities. It draws on the previous EMPr undertaken for seismic surveys in Block 9 by CCA/CSIR in 1997, the update by ERM in 2014, and is updated with additional best practice information from more recent seismic EMPrs, as identified during the compliance audits. Management measures are aligned where possible with PetroSA's procedures for support activities eg waste management, logistics etc to facilitate environmental compliance and performance auditing.

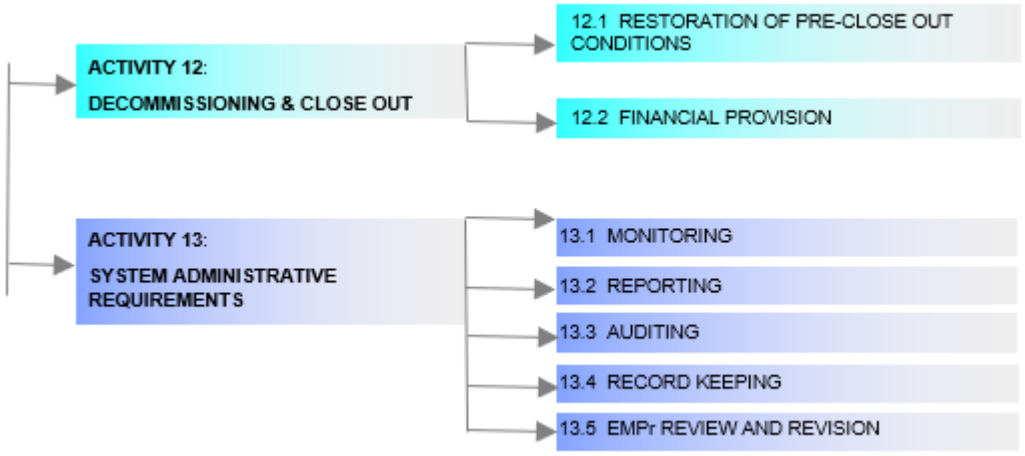
Each sub-section starts with a 'rationale' giving the reasons why specific kinds of damage to the environment should be avoided, and why there is a need to manage specific activities.

Following this, the 'objectives' of what PetroSA is specifically trying to achieve, are set out.

Then, instructions or 'auditable actions' are listed, staff responsibilities 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.


ACTIVITIES 1-3:
PLANNING PHASE
1. LEGAL REQUIREMENTS
2. SUBSIDIARY PLANS
3. SEISMIC CONTRACTOR CERTIFICATION
ACTIVITY 4:
STAKEHOLDER ENGAGEMENT
4. STAKEHOLDER ENGAGEMENT
ACTIVITY 5:
ENVIRONMENTAL TRAINING AND AWARENESS
5. ENVIRONMENTAL TRAINING AND AWARENESS
ACTIVITIES 6:
POLLUTION PREVENTION – SUPPORT SERVICES
6.1 VESSES & OTHER SHIPPING
6.2 HELICOPTER SERVICES
6.3 TRANSFER OF MATERIALS / DROPPED OBJECTS
6.4 WORKSHOPS, REPAIRS & CHEMICAL HANDLING AND STORAGE
6.5 REFUELLING / BUNKERING
ACTIVITY 7:
SEISMIC OPERATIONS
7.1 SCHEDULING OF SEISMIC ACTIVITIES
7.2 EXCLUSION ZONES
7.3 MARINE MAMMAL OBSERVERS & ACOUSTIC EMISSIONS
7.4 SEISMIC FIRING AND SOFT START PROCEDURES
ACTIVITY 8-10:
WASTE MANAGEMENT
8.1 SOLID WASTE MANAGEMENT – GENERAL MEASURES
9. DISCHARGE OF EFFLUENT
9.1 Deck and Bilge Water
9.2 Sewage
10. GASEOUS EMISSIONS
ACTIVITY 11:
INCIDENTS AND EMERGENCIES
11.1 LIQUID SPILLS OR LEAKS
11.2 LOST MATERIALS AND EQUIPMENT
11.3 INJURY OR DEATH OF MARINE FAUNA
11.4 GENERAL INCIDENT REPORTING & AUDITING


ACTIVITY 12:
DECOMMISSIONING & CLOSE OUT
12.1 RESTORATION OF PRE-CLOSE OUT CONDITIONS
12.2 FINANCIAL PROVISION
ACTIVITY 13:
SYSTEM ADMINISTRATIVE REQUIREMENTS
13.1 MONITORING
13.2 REPORTING
13.3 AUDITING
13.4 RECORD KEEPING
13.5 EMPr REVIEW AND REVISION

3.1 ACTIVITY 1: PLANNING PHASE

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
1.1. ADHERENCE TO LEGAL REQUIREMENTS			
Rationale: A number of international conventions and national legislation and guidelines regulate the offshore oil and gas industry. These are primarily focussed on combating marine pollution and maintaining vessel safety at sea. The MARPOL standards are the primary international standards governing pollution at sea and specify limits for release of oily water, sewage, galley waste and solid waste. South Africa's Air Pollution Standards under the NEMA Air Quality Act 39 of 2004) are applicable to air emissions from offshore installations, and apply to drilling and seismic vessels. PetroSA will be responsible for ensuring all the necessary legal requirements including permits are obtained prior to initiating additional seismic surveys in Block 9. This EMPR is also a legal document and the specified measures included here, once approved, are legally binding on PetroSA and the Seismic Survey Contractor.			
Objectives: To ensure all legal requirements described in Section 2.4.2 and all provisions specified in these Activity Schedules (1-14) are complied with in order to ensure environmental protection and human and vessel safety at sea.			
1.1.1.	Prepare a register of all legislation applicable to seismic and other geophysical survey activities	*PetroSA Legal Counsel*	*Prior to Survey*
1.1.2.	Ensure all required permits and approvals are obtained prior to conducting seismic activities and adhere to all conditions attached.	*PetroSA Asset Manager*	*Prior to Survey*
1.1.3.	Prepare schedule of all environmental and compliance monitoring measures required during survey operations as well as a schedule of all reports required during and after the survey has been completed. The schedule must specify the inspection and reporting frequency and party responsible for the inspection and reporting, using 14.1 as minimum guideline.	*PetroSA SHEQ Rep*	*Prior to Survey*
1.1.4.	Seismic and Other Survey Contractors must be provided with a copy of the EMPR and a written confirmation of receipt must be obtained. The survey contractor as well as PetroSA representatives on the survey must be instructed to have the EMP available on board the survey and any support vessels at all times.	*PetroSA SHEQ Manager*	*Prior to Survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
1.1.5. Copies of the EMPr must be readily available on-board the seismic vessel and support vessels at all times and the necessary equipment and personnel are available to meet the requirements of the EMP.	*Seismic Contractor*	*Throughout Survey*
1.1.6. Contracts with service providers shall specifically require that the service provider complies with all relevant legislation. PetroSA reserves the right to inspect survey activities at any time during the survey operation to assess compliance to the EMPr. Deviations from the EMPr without sound justification will be deemed a breach of contract.	*PetroSA SHEQ Manager; PetroSA legal counsel*	*Prior and during seismic activities*
1.1.6.1. Once specific target areas for future seismic surveys are defined the requirements of item 7.1.4.1 must be complied with. This **must be done prior to** finalisation of the survey and must inform amendments to the impact management outcomes and actions in this EMPr if applicable.	PetroSA SHEQ Manager	Well in advance of commencement of survey.

1.1.6.2.
• **The Holder must appoint an independent Environmental Control Officer (ECO) prior to commencement of any offshore exploration activities.**
• **The ECO should have appropriate training and/or experience in the implementation of environmental management specifications. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field. The ECO's key role is auditing the implementation of the EMPr.**
• **The ECO will be responsible for the auditing function as well as the clarification of environmental conditions contained in this EMPr to anyone working on the site. The ECO does not necessarily have to be onboard the survey vessel, provided that relevant information is provided by the MMO / PAM.**
• **The ECO roles include:**
  ○ **Recommendations for review and update of the EMPr;**
  ○ **Liaison between the Applicant, Contractors, authorities and other lead stakeholders on high importance environmental concerns;**
  ○ **Ensures that correct shape files have been uploaded into the vessel navigation systems to support effective implementation of spatial controls**
  ○ **Review the site induction training to ensure environmental issues receive adequate attention and important site-specific issues are included;**
  ○ **Conduct environmental audits of the site/contractors including relevant documentation on a monthly basis;**
  ○ **Validating the regular site inspection reports, which are to be prepared by the relevant contractor's EO or Lead MMO/PAM (who will be tasked with the onsite responsibilities of the ECO);**
	PetroSA SHEQ Manager	*Prior and during seismic activities*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
○ **Maintain a record of all non-conformances and incidents to ensure that measures are put in place to remedy such;** ○ **Maintain a public consultation register in which all complaints are recorded, as well as action taken; and** ○ **Verification that all environmental monitoring programmes (sampling, measuring, recording etc. when specified) are carried out according to protocols and schedules.**		
1.1.7. Audit guidelines • Audits should, through examination of records retained by the contractor verify that: ○ Legislation register was prepared prior to survey operations and is applicable to the survey activities ○ **Updated specialist assessments completed, and any additional recommendations and Impact Management Actions incorporated into approved EMPr.** ○ All the required permits were obtained prior to the start of survey operations ○ All license conditions have been complied with throughout survey operations ○ Schedule of monitoring requirements prepared for all survey activities ○ Seismic Survey Contractor was provided with copies of the EMPR and proof of receipt was obtained. ○ A copy of the EMPr was available on-board throughout the survey. ○ All monitoring requirements have been undertaken in accordance with the scheduled frequency ○ All audit guidelines specified throughout this report have been complied with.	*PetroSA SHEQ Manager*	*Prior to and Throughout Seismic survey*

3.2 ACTIVITY 2: SUBSIDIARY PLANS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: This EMPr specifies the requirements for environmental management, pollution control and emergency procedure as far as possible for this generic seismic survey EMPr. However, under the framework provided by this EMPr, certain subsidiary plans will need to be developed by PetroSA or the seismic survey contractor for each seismic campaign, and which details the specific measures that need to be taken for certain activities; the roles and responsibilities of staff in this regard, and reporting procedures and lines of communication.		
Objective: • Subsidiary plans are developed and are in place prior to seismic activities • Subsidiary plans provide the necessary level of detail and are aligned with the requirements provided in this EMPr and relevant existing procedures of PetroSA..		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
2.1. Subsidiary Plans		
2.1.1. Ensure that the service providers (seismic and support vessels etc) have the following subsidiary plans in place: • Oil Spill Contingency Plan • Emergency Response Plan, including MEDIVAC plan • Support Vessel and Helicopter Emergency Response Plans • Waste Management Plan • Incident Management and Reporting	*PetroSA Asset Manager; PetroSA Operational Geophysicist*	*Prior to commencing seismic activities*
2.1.2. Compile a Communications Plan that outlines the communications procedures for all stakeholder engagement, including a Stakeholder Engagement Register, responsibilities for review of stakeholder comments, feedback to the stakeholder and close out actions and requirements. **The plan must include an effective Grievance Mechanism aligned with the requirements of the IFC, considering mechanisms for grievance input, assessment, action, monitoring, and closure.**	*PetroSA SHEQ Rep*	*Prior to commencing survey activities*
2.1.3. Ensure that subsidiary plans are aligned with national plans (e.g. National Oil Spill Contingency and Response Plan), and other regional, provincial, local and PetroSA plans and procedures as relevant (eg Integrated Waste Management Plans, Incident Management Plan, Communications Plan etc).	*PetroSA SHEQ Rep & PetroSA Operational Geophysicist*	*Prior to commencing seismic activities*
2.1.4. All contingency response plans contain up to date details of: • Contact names and numbers for different response contingencies • Clear lines of communication for specific tasks are tabulated • Clear role and responsibilities allocated to specific staff roles with incumbents particular to the operation specified • Training and awareness needs and activities, if relevant • Formats for reporting eg filing incident reports, waste manifests etc.	*Seismic Contractor*	*Before and throughout seismic activities*
2.1.5. All plans shall be readily available and accessible on the survey and support vessels at all times.	*Seismic & Other Contractors*	*Throughout seismic survey*
2.1.6. PetroSA to keep copies of all subsidiary plans (listed in 2.1.1) in the Emergency Response Centre during seismic activities	*PetroSA SHEQ Rep*	*Throughout seismic survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
2.1.7. Retain copies of all subsidiary plans for five years.	*PetroSA Operational Geophysicist*	*Five years*
2.1.8. The pre-survey meeting agenda between PetroSA and the Seismic Contractor must include a formal handover of subsidiary plans. All staff of the seismic contractor and PetroSA staff must be familiar with the content of the plans.	*Seismic Contractor*	*Pre seismic survey*
2.1.9. Audit Guidelines • Audits should, through examination of records retained by the facility, visual inspections and targeted interviews, verify that: ○ The required subsidiary plans are compiled prior to commencing seismic activities ○ The plans contain the necessary level of detail to meet the intended purposes while ensuring optimal environmental protection ○ The plans are aligned with the content of this EMPr ○ The plans are aligned with relevant National, Provincial and Local Plans where relevant ○ The plans are available at the Joint Operations Centre (JOC)	*PetroSA SHEQ Manager*	*Pre seismic survey*

3.3 ACTIVITY 3. SEISMIC CONTRACTOR CERTIFICATION

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Seismic investigation is a highly specialist activity. For this reason, highly qualified contractors and staff, and certified equipment and materials, are required to ensure maximum safety and environmental protection.		
Objective: • Ensure all contractors and staff operate to the highest possible safety and environmental protection standards, and are appropriately certified.		
3.1. Certification of Seismic Contractor and Seismic Vessel		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
3.1.1. The Seismic Survey Contractor shall be registered with the International Association for Geophysics Contractors (IAGC) and shall be able to demonstrate a track record for maintaining optimum safety and environmental protection.	*PetroSA Operational Geophysicist*	*Prior to Contract Award*
3.1.2. Ensure the seismic vessel is certified for seaworthiness through an appropriate internationally recognised certification programme (eg Lloyds Register, Det Norske Veritas)	*PetroSA Operational Geophysicist*	*Prior to Contract Award*

3.1.3. Audit Guidelines
• Audits should, through examination of documents retained by PetroSA verify that:
  ○ The seismic contractor was registered with IAGC
  ○ The seismic vessel held a valid certificate for seaworthiness through an international certification body eg DNV.
	PetroSA SHEQ Manager	*Pre seismic survey*

3.4 ACTIVITY 4. STAKEHOLDER ENGAGEMENT

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Seismic surveys may have impacts upon a number of different stakeholders. In the case of offshore seismic activities, this normally includes short term negative impacts such as limitations on trawling efficiency and navigational restrictions on other marine users, and potential disruption of biodiversity, particularly cetaceans (whales and dolphins). It is incumbent on PetroSA to engage with stakeholders in terms of the principles of NEMA and to this end the Agulhas Offshore 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 and exploration campaigns.		
Objective: • To provide regular general feedback to relevant and key stakeholders • To establish and maintain a register of stakeholders • To provided timeous notification to stakeholders regarding seismic surveys • To receive, process and respond to inputs from external and internal stakeholders		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
4.1. Stakeholder Engagement		
4.1.1. Fishing stakeholders and other marine users who operate in the area shall be notified in writing of seismic activities and the location and presence of exclusion and safety areas at least ~~**15 days**~~ **3 weeks** prior to the scheduled commencement of survey activities. Should seismic activities extent beyond the original time frame stakeholders should be notified within 24 hours. Stakeholders include: • Overlapping and neighbouring users with delineated boundaries in the marine petroleum and mineral prospecting and mining industries • South African and foreign fishing vessels, who can be informed through the recognized fishing associations and Department of Agriculture, Forestry and Fisheries (DAFF) examples include the South African Deep Sea Trawling Association, Inshore Pelagics, Rock Lobster and Tuna Associations, fishing companies and fishing agents • Government Departments with jurisdiction over marine activities, particularly ~~**DEA**~~ **DFFE** and PASA, SAN Hydrographer, South African Maritime Safety Authority (SAMSA) and local Port Captains. • **DFFE Vessel Monitoring, Control and Surveillance Unit in Cape Town**.	*PetroSA SHEQ Rep*	*3 Weeks ~~15 days~~ prior to seismic activities and within 24 hours if extension of seismic survey be required.*
4.1.1.1. • **An experienced Fisheries Liaison Officer (FLO) should be placed on board the seismic or escort vessel to facilitate communications with fishing vessels in the vicinity of the seismic survey area.** • **Ensure project vessels fly standard flags and lights to indicate that they are engaged in towing surveys and are restricted in manoeuvrability.** • **Notify any fishing vessels at a radar range of 12 nm from the seismic vessel via radio regarding the safety requirements around the seismic vessel.**	*FLO*	*Appointment prior to commencement, and throughout survey.*
4.1.2. PetroSA will, in writing, request the SAN Hydrographic Office at Silvermine to put out Radio Navigational Warnings throughout the operational period and issue Notices to Mariners.	*PetroSA SHEQ Rep*	*Notice to Mariners 24 hours prior to start*
4.1.3. Stakeholder engagement process will be undertaken in accordance with a Communications Plan (see action 2.1.2)	*PetroSA SHEQ Rep*	*Throughout seismic survey*
4.1.4. PetroSA will implement and maintain a Stakeholder Engagement Register which shall include the following information: • Contact details of stakeholder	PetroSA SHEQ Rep	Prior and throughout seismic survey

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
	• Date and time of stakeholder input • Nature of input • Stakeholder engagement form reference number • Name of reviewing manager • Date of Review • Result of Review • Date of communication with stakeholder		
4.1.5.	Any feedback from stakeholders concerning offshore exploration activities shall be reported in PetroSA's Quarterly Report	*PetroSA SHEQ Rep*	*Quarterly*
4.1.6.	Audit Guidelines • Audits should, through examination of records retained by PetroSA, verify that: o A stakeholder engagement register has been maintained o Documents notifying stakeholders have been retained o Any stakeholder inputs have been reviewed by the responsible manager o The above stakeholder inputs have been responded to appropriately o The stakeholder has been informed of the outcome of the review by the responsible manager.	*PetroSA SHEQ Rep*	*End of seismic activities*

3.5 ACTIVITY 5: ENVIRONMENTAL TRAINING AND AWARENESS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Poor staff awareness about potential seismic effects on marine fauna, waste management and pollution control can result in accidents or avoidable incidents through ignorance. It is important to raise environmental awareness to encourage active staff participation in implementation of environmental protection measures and human safety and how to respond in an emergency event.		
Objectives: • To equip all personnel on the seismic and support vessels 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 governing best practices		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
5.1. Environmental Training and Awareness			
5.1.1.	Contractors must be registered with IAGC (see action section 3) and all staff on the seismic and support vessels must be suitably trained and qualified to fulfil their duties as demonstrated by the crew manifest and training records.	*PetroSA Operational Geophysicist*	*Prior to Contract Award*
5.1.2.	Toolbox talks or similar shall be used to discuss environmental awareness and to report back on environmental performance applicable to the specific work area. Topics should include content of subsidiary plans as a minimum.	*Seismic Contractor*	*Monthly*
5.1.3.	All personnel shall receive regular training on the handling and management of waste**, and incident response and reporting procedures.**	*Seismic Contractor*	*Prior to and during survey*
5.1.4.	Audit Guidelines • Audits should verify that: ○ All seismic personnel have received appropriate training ○ Regular tool box talks or similar have been undertaken on environmental awareness and management ○ Staff members are familiar with the provisions of the EMPr related to their area of work and the general incident and emergency reporting procedures.	*PetroSA SHEQ Manager*	*End of seismic activities*

3.6 ACTIVITY 6: POLLUTION PREVENTION

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
6.1. Vessels and Other Shipping		
Rationale: Offshore seismic and support vessels pose potential hazards to marine traffic, creating a navigational obstacle and restricting fishing activities. Vessels carrying personnel or supplies to and from the offshore installations may negatively impact on the environment through reckless behaviour, negligence and/or accidents. A collision involving the seismic vessel and other vessels can create a pollution risk to the marine environment through the release of oils and fuels and the deposition of objects on the sea bed. PetroSA and/or the seismic contractor may be jointly responsible for the immediate response and remediation of any such environmental damage. Various measures need to be taken to minimise the risk of collisions through alerting shipping to the presence of the seismic operations.		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
The seismic and support vessels should be equipped with and use all the required navigational aids and warnings. The chase vessel will be on duty at all times throughout seismic operations to alert marine users ahead to the seismic operations and to ensure the survey path is clear. It is obviously important that the seismic and chase 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 minimise navigational risks to other marine users • 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. • To ensure that the provisions are effective in maintaining "visibility" of the vessels.		
6.1.1. All measures prescribed by SAMSA to minimise the risks of collision of marine traffic with the seismic and support vessel(s) must be implemented and maintained.	Geophysics Contractor	Throughout seismic survey
6.1.2. Measures to be implemented include: • Maintenance of safety and exclusion zones through Notices to Mariners issued by SAN Hydrographic Office 24 hours prior to commencement of survey (see action Section 4). • 24-hour chase vessel on patrol in exclusion zone at all times • Maintenance of standard watch procedures • Issue Radio Navigational Warnings if visibility of vessel(s) 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 a 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 11.	Geophysics Contractor	During seismic survey
6.1.2.1. **The lighting on the survey and support vessels should be reduced to a minimum compatible with safe operations whenever and wherever possible. Light sources should, if possible and consistent with safe working practices, be positioned in places where emissions to the surrounding environment can be minimised.**	Geophysics Contractor	During seismic survey
6.1.2.2. • **Avoid the unnecessary discharge of ballast water.**	Geophysics Contractor	During seismic survey

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• **Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.** • **Ensure that routine cleaning of ballast tanks to remove sediments is carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's Ballast Water Management Plan.** • **Ensure all infrastructure (e.g. arrays, streamers, tail buoys etc) that has been used in other regions is thoroughly cleaned prior to deployment.** • **Comply with the requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention).**		
6.1.2.3. **Ensure that solid streamers rather than fluid-filled streamers are used. Alternatively, low toxicity fluid-fill streamers could be used.**	Geophysics Contractor	During seismic survey
6.2. Helicopter Services		
Rationale: Helicopters may be used for crew changes, other support or to attend to life-threatening events should they arise. Helicopter operations may disturb coastal and marine life and interfere with coastal activities such as tourism and fishing. An accident involving a helicopter could cause marine pollution as well as threaten human safety		
Objectives: • To minimise disturbance to coastal sea bird populations and large marine fauna from helicopter flights • To minimise disturbance to coastal communities and activities such as tourism and recreational fishing		
6.2.1. 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 Service Provider*	*Throughout seismic survey*
6.2.2. Helicopter transfers to and from seismic survey areas shall fly at a minimum height of 500m above sea level and shall not hover or circle over whales, dolphins, sharks, turtles or aggregations of seabirds.	Logistics Service Provider	Throughout seismic survey
6.2.3. Helicopter flight logs will be kept to demonstrate compliance with set flight paths. **Pre-planned flight paths must avoid sensitive areas and colonies.**	Logistics Service Provider	Throughout seismic survey

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
6.2.4. Audit guidelines • Audits should, through examination of records retained by the logistics service provider, verify that: ○ Flight logs are maintained and can demonstrate compliance with set flight ○ paths with reasons provided for any deviations from such routes.	SHEQ Manager	During and post seismic activities
6.3. Transfer of Materials / Dropped Objects		
Rationale: Seismic vessel operations and loading and offloading of equipment and personnel poses a risk of solid objects and liquids falling into the sea, which could pose a risk to shipping or 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, standard procedures are in place to limit any such loss and to retrieve objects falling overboard wherever possible.		
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		
6.3.1. Procedures shall be implemented to minimise the risk of objects and other materials being dropped overboard during transfer of goods or leaking from storage containers or during handling.	Logistics Service Provider	Throughout seismic survey
6.3.2. The incident management procedure should be followed in the event of a lost object or other materials (see Activity 11.1). **Notify SANHO of any hazards left on the seabed or floating in the water column, and request that they send out a Notice to Mariners with this information.**	Logistics Service Provider	Throughout seismic survey
6.3.3. Audit guidelines • Audits should, through examination of records retained by the vessel, verify that: ○ Incidents involving dropped objects 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	PetroSA SHEQ Manager	During and post seismic surveys

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
○ 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		
6.4. Workshops, Repairs and Chemical Handling and Storage		
Rationale: The seismic vessel may store small quantities of oils and fuels, and other potentially polluting substances. Equipment and repair operations do not always take place in a defined workshop area but may take place anywhere on the vessel. These activities pose a risk of polluting substances leaking or spilling into the sea and/ or solid objects falling overboard (see Activity 6.3 above). However, the first line of pollution prevention is behavioural and contingent upon adequately trained staff and appropriate operational protocols. 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 programme is to ensure that environmental issues are adequately addressed.		
Objectives: • To manage repairs 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 handle, store and dispose of chemicals in such a way as to minimise the risk of spillage or leakage • To respond to any spills and or leaks in such a way that environmental damage does not occur		
6.4.1. Repair and servicing of loose equipment or machinery shall be undertaken only in defined workshop areas or where adequate drainage is in place to contain spilled liquid and where risk of loss of object overboard is minimised.	Survey Contractor	Throughout survey activities
6.4.2. Any spills of liquids or polluting substances shall be treated as an incident and handled according to the procedure detailed under Activity 11.1.	Survey Contractor	Immediately on occurrence
6.4.3. A chemical register shall be maintained and will detail: • All chemicals used and stored on the vessel • Chemical characterisation of each chemical including SABS (or similar) 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	Survey Contractor	Throughout survey activities

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
6.4.4.	All fuels, greases, oils and other chemicals shall be stored and handled as per chemical handling procedures specified in the seismic contractor's standard operating procedures and in accordance with the Material Data Safety Sheets (MSDS).	Survey Contractor	Throughout survey activities
6.4.5.	All chemicals shall have current Material Safety Data Sheets (MSDS) prominently displayed at the location of storage and use.	Survey Contractor	Throughout survey activities
6.4.6.	Personnel using chemicals shall be trained in their use, disposal and clean-up.	Survey Contractor	Annually
6.4.7.	Expired chemicals shall be labelled as waste and treated in accordance with the disposal requirements specified in their MSDS.	Survey Contractor	Throughout survey activities
6.4.8.	Appropriate absorbent materials and clean up equipment is on board and easily available in the event of a chemical spill.	Survey Contractor	Throughout survey activities
6.4.9.	Any liquid spills of more than 5 litres shall be treated as an incident and handled according to the incident procedure detailed under Activity 11.1 below.	Survey Contractor	Immediately on occurrence
6.4.10.	Any loss of chemicals overboard shall be treated as an incident and handled according to the procedure detailed under Activity 11.1.	Survey Contractor	Immediately on occurrence
6.4.11.	Audit Guidelines • Audits should verify that: o Repair and servicing of mobile equipment and machinery takes place in defined areas with adequate drainage measures in place. o The chemical register is current and verified and storage accords with details contained in the MSDS o All hazardous chemicals were labelled correctly and the emergency procedures to be adopted in the event of a spill clearly are detailed on MSDS at the site of storage o Chemical dispensers or drums are positioned on / or over drip trays o Spills are reported and handled according to the liquid incident management procedure under Activity 11.1 o Spill absorbents are available at the location of use and that they are appropriate to the nature of the chemical being used o Expired chemicals are labelled as expired and handled as waste.	SHEQ Manager	During survey activities

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
6.5. Refuelling / Bunkering		
Rationale: In the event that offshore bunkering is required there is a risk of fuel spillage, especially when connecting and disconnecting hoses and valves. Spillage may be more likely to occur in rough marine or stormy conditions. Bunkering activities are regulated under International Convention for the Protection of Pollution from Ships MARPOL 73/78 (Annex 1); Pacoposoa (Prevention and Combating of Pollution of the Sea by Oil Act) Amendment Act 24 of 1991, and the Marine Pollution (Control and Civil Liability) Act 6 of 1981.		
Objectives: • To minimise the risk of spills and marine pollution during bunkering.		
6.5.1. No bunkering is permitted within 50 nautical miles of the coast	Geophysics Contractor / Service Provider	Bunkering
6.5.2. If bunkering at sea is found to be necessary, permission must be obtained from SAMSA five days prior to bunkering.	Geophysics Contractor / Service Provider	Bunkering
6.5.3. Diesel and other fuels must be stored in enclosed and secured tanks, designed to withstand extreme events and conditions	Geophysics Contractor / Service Provider	Bunkering
6.5.4. Drip trays must be in place to collect leakage from connection and discharge points	Geophysics Contractor / Service Provider	Bunkering
6.5.5. Offshore bunkering will not be allowed in the following circumstances: • Wind force and sea state conditions of 6 or above on the Beaufort Wind Scale, • During any workboat or mobilisation boat operations, • During helicopter operations,	Geophysics Contractor / Service Provider	Bunkering

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• During the transfer of in-sea equipment, **and** • **At night or times of low visibility**.		
6.5.6. Floating hoses 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 marker lights 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 / crew boats.	Survey Contractor / Service Provider	During bunkering
6.5.7. Spillages of fuel during bunkering must be logged as an incident in accordance with the procedures given in Activity 11.1.	Survey Contractor / Service Provider	Immediately
6.5.8. Audit Guidelines • Audits should, through examination of records retained by the facility, verify that: ○ Proof of SAMSA approval for bunkering and notification of bunkering events ○ Fuel is stored and drip trays provided and available for bunkering ○ Hoses and other equipment meet the required specifications ○ Incidents recorded in the incident register were investigated and closed out.	PetroSA SHEQ Manager	During and post-seismic activities

3.7 ACTIVITY 7: SEISMIC OPERATIONS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
7.1. Maintenance of Exclusion Zones		
Rationale: Seismic vessels are defined as an offshore installation in terms of the Marine Traffic Act 2 of 1981 and as such, survey operations are protected by a 500 m exclusion zone in which it is an offence for any unauthorised vessel to enter. In addition, because of a seismic vessels inability to manoeuvre to avoid other vessels when in operation, a safe operational limit will be defined, typically 8-9km on each side around the vessel. Communications plan is required in order to inform stakeholders of the seismic vessel movement plan and a chase vessel will warn off vessels that may breach the exclusion zone.		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
Objectives: • To minimise safety risks to other vessels at sea and to avoid conditions that could pose a risk of marine pollution. • **To ensure site specific sensitivities are identified, assessed and controlled depending on the location and extent of the planned activities.**			
7.1.1.	Comply with standard marine navigation warnings requirements issued to keep other marine users informed of seismic survey activities and CSEM activities (see Activity 4), including Radio Navigational Warnings, Notices to Mariners and email notices to known marine users operating in the area.	Geophysical Contractor	Throughout seismic operations
7.1.2.	Keep constant watch for approaching vessels during operations, and issue warnings by radio and chase boat if required.	Geophysics Contractor	Throughout seismic operations
7.1.3.	Use warning lights at night and in periods of low visibility.	Geophysics Contractor	Throughout seismic operations
7.1.4.	Transgressions of the exclusion zone must be recorded as an incident and adhere to the incident reporting and investigation procedure in Activity 11.4.	Geophysics Contractor	Throughout seismic operations
7.1.4.1.	**Once specific target areas for future seismic surveys are defined the following must be undertaken prior commencement:** • **Undertake survey (technical specifications) and location specific sound transmission loss modelling (acoustic modelling) in order to define the magnitude and extent of potential underwater noise.** • **A cultural heritage impact assessment should be undertaken by a suitable qualified specialist with specific focus on the intangible heritage.** • **Revise the impact assessment on the basis of the outcomes of the acoustic modelling (with inputs from relevant specialists including but not limited to marine ecology, and fisheries). Impact on Small Scale Fisheries must be included.** • **Supplement the impact management actions and impacts contained in the EMPr to account for the site and survey specific controls.** • **Obtain relevant approvals from the competent environmental authority in accordance with relevant legal requirements (e.g. amendments to EA and/or EMPR in accordance with NEMA requirements).**	PetroSA SHEQ Manager	Well in advance of commencement of survey.
7.1.4.2.		Seismic Contractor	Throughout seismic operations

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

• **All seismic vessels must be fitted with Passive Acoustic Monitoring (PAM) technology, which detects animals through their vocalisations.**
• **The PAM technology must have enough bandwidth to be sensitive to the whole frequency range of sensitive marine life expected in the area.**
• **The use of PAM 24-h a day must be implemented to detect deep diving species.**
• **Ensure the PAM streamer is fitted with at least four hydrophones, of which two are HF and two LF, to allow directional detection of cetaceans.**
• **Ensure the PAM hydrophone streamer is towed in such a way that the interference of vessel noise is minimised.**
• **Ensure spare PAM hydrophone streamers (e.g. 4 heavy tow cables and 6 hydrophone cables) are readily available in the event that PAM breaks down, in order to ensure timeous redeployment.**
• **An independent Passive Acoustic Monitoring (PAM) Operator is required on board at all times. As a minimum, at least one PAM must be on watch at all times while the acoustic source is active. The duties of the PAM operator would be to:**
  ○ **Provide effective regular briefings to crew members, and establish clear lines of communication and procedures for onboard operations;**
  ○ **Ensure that the hydrophone cable is optimally placed, deployed and tested for acoustic detections of marine mammals;**
  ○ **Confirm that there is no marine mammal activity within 500 m of the seismic source array prior to commencing with the "soft-start" procedures;**
  ○ **Record species identification, position (latitude/longitude), distance and bearing from the vessel and acoustic source, where possible;**
  ○ **Record general environmental conditions;**
  ○ **Record seismic source activities, including sound levels, "soft-start" procedures and pre-start regimes;**
  ○ **Request the delay of start-up and temporary termination of the seismic survey, as appropriate.**
	PAM Operator
	PetroSA SHEQ Manager	

7.1.4.3. **Define and enforce the use of the lowest practicable seismic source volume for production. Design arrays to maximise downward propagation, minimise horizontal propagation and minimise high frequencies in seismic source pulses (have this verified by independent evaluators).**	Geophysics/ Seismic Contractor	Throughout seismic operations
7.1.4.4. • **The vessel operators should keep a constant watch for marine mammals and turtles in the path of the vessel.**	MMO	Throughout seismic operations

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• **Keep watch for marine mammals behind the vessel when tension is lost on the towed equipment and either retrieve or regain tension on towed gear as rapidly as possible.** • **Ensure that 'turtle-friendly' tail buoys are used by the survey contractor or that existing tail buoys are fitted with either exclusion or deflector 'turtle guards'.** • **Ensure vessel transit speed between the survey area and port is a maximum of 12 knots (22 km/hr), except in MPAs where it is reduced further to 10 knots (18 km/hr).** • **Should a cetacean become entangled in towed gear, contact the South African Whale Disentanglement Network (SAWDN) formed under the auspices of DEA to provide verbal specialist assistance in releasing entangled animals where necessary.** • **Report any collisions with large whales to the International Whaling Commission (IWC) database, which has been shown to be a valuable tool for identifying the species most affected, vessels involved in collisions, and correlations between vessel speed and collision risk**	Seismic Contractor	
7.1.5. Audit guidelines • Audits should verify that: o **Updated specialist assessments** completed, **and any additional recommendations and Impact Management Actions incorporated into** approved **EMPr.** o PAM Records are being kept. o The appropriate communications were undertaken and proof of notifications were retained. o Incidents were recorded and investigated as per requirements in Activity 11.4.	PetroSA SHEQ Manager	Throughout seismic operations
7.2. Marine Mammal Observers & Acoustic Emissions from Airguns		
Rationale: Acoustic emissions during seismic operations may cause damage to the hearing organs and air -containing tissues of marine animals such as swim bladders in fish and lungs in mammals. Risks to such animals, particularly cetaceans (whales and dolphins) will be higher during the months when they breed and calve in South African waters (June to November). Disorientation of fish due to acoustic firing may increase seabird predation. Seismic surveys are generally restricted to periods outside of whale breeding seasons when significant disturbance may be caused. Therefore, seismic surveys must take precautions to ensure that sensitive marine mammals are not present at the commencement of firing airguns.		
Objectives: • To reduce acoustic risks to marine animals • To minimise risk of behavioural disturbance to breeding mammals, particularly whales		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
7.2.1.	Seismic surveys should not be scheduled during whale breeding periods from 1st June to 30th November ~~June to November~~ when higher numbers of whales are present.	Geophysics Contractor	Planning of seismic operations
7.2.2.	Experienced marine mammal observers (who can identify cetaceans and other marine species including differentiating between baleen and beaked whales) will be used during the seismic survey and during CSEM (seabed logging) to carry out observations and to record presence and responses of marine mammals, turtles and seabirds to seismic & CSEM activities.	MMO	Throughout seismic / CSEM operations
7.2.3.	During daylight, marine mammal observations should be undertaken using binoculars from a high observation platform on the seismic or CSEM vessel. Where higher than usual numbers of cetaceans are expected or visibility is poor, consideration could be given to the use of Passive Acoustic Monitoring (PAM) or infra-red / night vision binoculars.	MMO	Throughout seismic / CSEM operations
7.2.4.	For a period of 30 minutes prior to seismic firing or sea bed logging, marine mammal observers (MMOs) must conduct focussed observations to ensure no marine mammals are present within a 500 m radius of the vessel.	MMO	30 minutes prior to seismic firing & CSEM logging
7.2.5.	Firing of seismic guns must not be initiated until observations have confirmed that the 500m radius around the seismic source ~~vessel~~ is clear of marine mammals, no visible swimming or shoaling large pelagic fish, and that no turtles or diving sea birds are seen to be present. The MMO must be in close communication with the seismic airgun or seabed logging personnel and should issue an "all clear" signal prior to initiating seismic airgun firing or seabed logging.	MMO	Prior to seismic firing
7.2.6.	An incident should be logged in the incident register by the MMO if seismic firing was initiated prior to obtaining the "all clear" from the MMO. The MMO shall report incidents of deliberate flouting or transgressions of measures contained in this EMPr and which pose an unacceptable risk to marine fauna to the Department of Environmental Affairs).	Seismic Contractor (MMO)	Throughout seismic operations
7.2.7.	Accurate records must be kept of: • MMO personnel on duty, time and length of periods on watch, method of observation and faunal sightings • Soft start occasions	MMO	Throughout seismic / CSEM operations

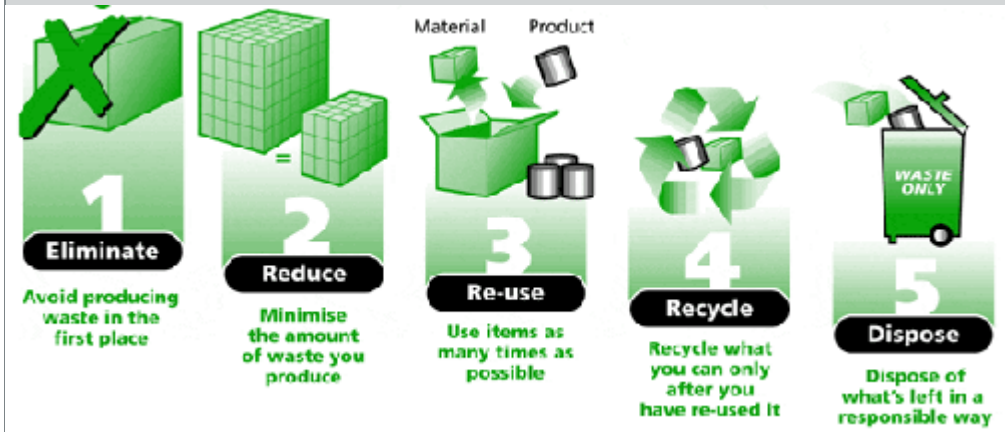
Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• Pre-firing observations, feeding behaviour of marine fauna within the streamers, sightings (location, time, species) of injured or dead species in the vicinity of the vessel and any behavioural observations linked to seismic operations. (See action 7.3.for soft start protocols)		
7.3. Seismic Firing and Soft Start Procedures		
Rationale: Given the acoustic risks to marine fauna indicated in action section 7.2 above, additional means of reducing the frequency (or pressure intensity) of the acoustic signals is required to warn animals away from the survey area. These preliminary and reduced intensity pulses are termed "soft starts" and are commonly used in seismic surveys and seabed logging (CSEM).		
Objectives: • To reduce risk of injury to marine animals by discouraging marine mammals from entering the seismic survey or seabed logging (CSEM) area.		
7.3.1. Low level warning air gun discharges should be fired at regular intervals during night time changes in order to keep animals away from the survey activities.	Seismic Contractor	Throughout seismic operations
7.3.2. A "soft start" procedure will be implemented at commencement of operations in accordance with IAGC procedures. The duration of the "soft start" will be a minimum of 20 minutes. In the case of shooting having already been carried out, the subsequent "soft start" shall be the duration of the shooting break.	Seismic Contractor	Throughout seismic / CSEM operations
7.3.3. In situations where a mammal is sighted the following applies: • Where the course of both the mammal and the vessel suggests that their paths are likely to cross within 500 m of the vessel then the survey vessel shall be obligated to cease firing of the airguns, and as far as possible without compromising the navigational safety of the vessel, alter course to avoid the animal. • If the movements and behaviour of the mammal relative to the vessel suggest that the animal is not interested in the vessel and if the animal is likely to pass well clear of the vessel, no avoidance action shall be deemed necessary • If there is more than one animal eg a pod of whales, and if it is apparent that the behaviour of the pod as determined by the MMO is most likely related to breeding, feeding or other activity such that the group is unlikely to avoid the vessel then the airguns should be stopped and the vessel, as far as possible, shall take action to avoid the group by at least 500 m.	Seismic Contractor	Throughout seismic / CSEM operations

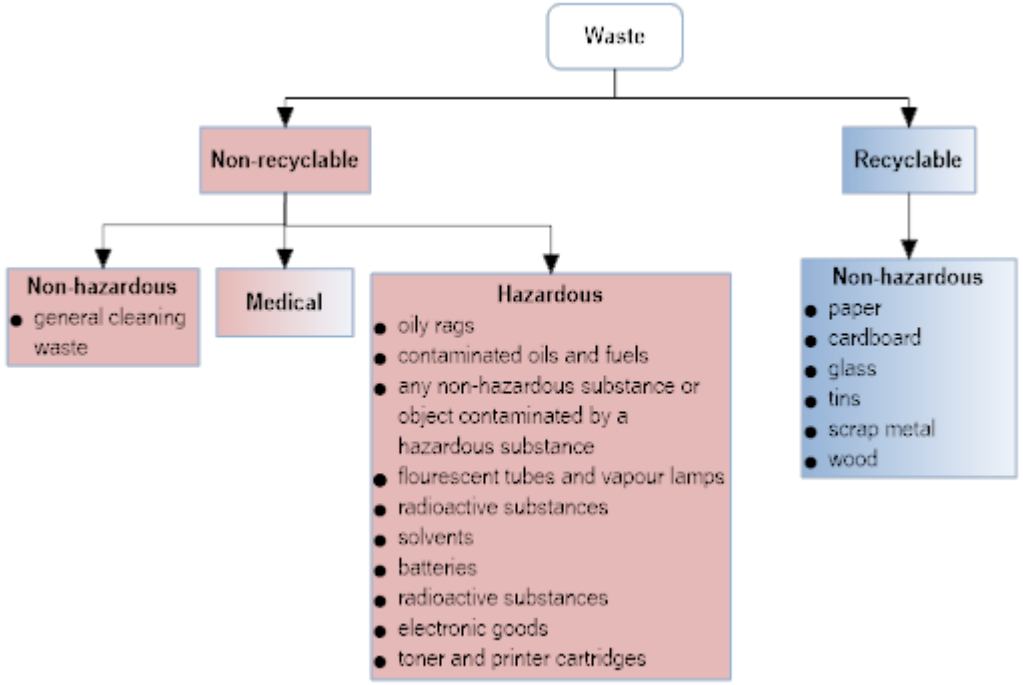
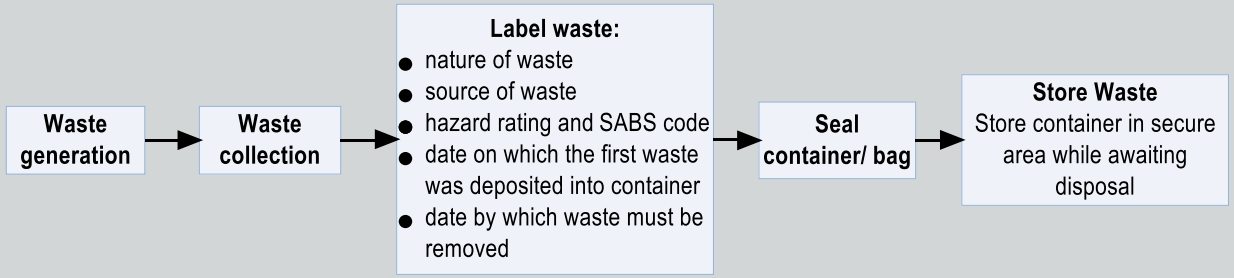
Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
7.3.4. With respect to groups of dolphins and seals the following applies: • Groups of such species which frequently investigate vessels and which are highly mobile are not generally a concern and no evasive action is required by the seismic vessel. • If, however, such a group is clearly stressed by the seismic airgun firing evidenced by signs of injury or mortality or as determined by the MMO then airguns must be stopped immediately and action taken to avoid further distress. • The Department of Environmental Affairs (Oceans and Coast) and other marine mammal interest groups should be notified if injured or dead animals are seen in the vicinity of the seismic vessel and provided with approximate positions in order to retrieve individuals and investigate the situation should this be desired.	Seismic Contractor	Throughout seismic operations
7.3.5. Incidence of seabird foraging should be recorded by the MMO including unusual attractions of seabirds. In situations where unusual or rare species may be at risk consideration should be given to the possibility of terminating seismic shooting until the birds are clear of the area.	MMO	Throughout seismic operations
7.3.6. Audit guidelines • Audits should verify that: o MMOs were employed on a 24 hour watch basis and records indicate that watch periods and record keeping accord with the requirements indicated in this EMPr including: ▪ Sightings of marine fauna including time, location, proximity to boat or streamers, direction of travel and general behaviour. ▪ Timings and duration of "soft start" firing ▪ Sightings of unusual behaviour or injured or dead animals ▪ Incidents such as firing of air gun prior to giving the all clear and recording whether marine mammals were present at the time. ▪ All occasions when seismic operations were halted to avoid risk to marine fauna with details of the reason.	PetroSA SHEQ Manager	Throughout seismic /CSEM operations

3.8 ACTIVITY 8: SOLID WASTE MANAGEMENT

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
8.1. General Measures for Solid Waste Management		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
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 unnecessarily uses up landfill airspace and 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 should only be adopted as a final resort. This requires an active and ongoing assessment of waste production to identify creative ways of satisfying the objectives 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.			
8.1.1.	The seismic contractor is required to have and provide to PetroSA prior to commencing seismic operations, an integrated waste management plan in line with the waste management hierarchy below.	*Seismic Contractor*	*Prior to Seismic Survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
8.1.2. Waste Management Hierarchy 		
8.1.3. The seismic vessel shall maintain a Waste Register which shall detail: • Categories and volume estimates of different waste types generated on the seismic and support vessels • Their source • Their SABS class and hazard rating • Their storage requirements • Their disposal methods, including quantities incinerated and to landfill • Any specific precautions or legislative requirements.	*Seismic Contractor*	*Prior and throughout seismic survey*
8.1.4. The Waste Register shall be updated to record actual waste volumes generated during the seismic campaign where it differs substantially from the predicted waste generation.	*Seismic Contractor*	*As required*
8.1.5. Waste shall be segregated into the following categories shown in the figure below. Recyclables shall be stored separately as shall hazardous waste.	*Seismic Contractor*	*Throughout Seismic Survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
		
8.1.6. All wastes shall be handled according to the flow diagram in the Figure below while awaiting transport to disposal sites. 	*Seismic Contractor*	*Throughout seismic survey*

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
8.1.7.	No waste may be stored for more than 30 days on any vessel without formal permission from DFFE ~~DEA~~.	*Seismic Contractor*	*Throughout seismic survey*
8.1.8.	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 (or the latest update thereof).	*Seismic Contractor*	*Throughout seismic survey*
8.1.9.	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, or the latest update of this document).	*Seismic Contractor*	*Throughout seismic survey*
8.1.10.	Galley waste shall be macerated at sea to pieces smaller than 25mm and deposited overboard at a distance at least 12 nautical miles from shore in accordance with MARPOL requirements. No galley waste to be discharged within 3 nautical miles of shore.	*Seismic Contractor*	*Throughout seismic survey*
8.1.11.	Sewage shall be discharged as outlined in action Section 9.2.	*Seismic Contractor*	*Throughout seismic survey*
8.1.12.	The seismic contractor shall develop and maintain a waste manifest system which includes: • The quantities of different categories of wastes leaving the vessel • The nature and source of the waste types • The date upon which the waste was removed • The date upon which they were received by the disposal facility, and • Proof of correct disposal by the landfill site (including a safe disposal certificate for any hazardous waste). • Obtaining completed waste disposal certificates including quantities and method of disposal for different waste types.	*Seismic Contractor*	*Throughout seismic survey*
8.1.13.	Hazardous waste shall be disposed of at a registered waste disposal site, and a safe disposal certificate shall be issued for each load of hazardous waste.	*Seismic Contractor/ Logistics Service Provider*	*Throughout seismic survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
8.1.14. Waste manifests shall be provided to PetroSA and reported in the Seismic Contractor's Monthly Report.	*Seismic Contractor*	*Monthly*
8.1.15. Audit Guidelines • During seismic survey, audits should, through examination of records retained, verify that: o The waste register is current and verified o Storage accords with legal requirements and the details contained in the register and waste management plan o Any hazardous wastes were labelled as such o No wastes are stored on the vessel for longer than 30 days without approval from DEA o Each container of waste is labelled with its source and contents o Safe disposal certificates were obtained for any hazardous waste load.	*PetroSA SHEQ Manager*	*During and after seismic survey*
• The post-seismic audit should verify that: o Waste reduction targets were met o All personnel received training in waste management and handling on at least one occasion during the seismic survey o A complete record of waste management throughout the seismic campaign for record keeping.	*PetroSA SHEQ Manager*	*After seismic survey*

3.9 ACTIVITY 9. DISCHARGE OF EFFLUENT

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Liquid wastes arise from cleaning the decks, works areas, ablutions, and bilges. The discharge has the potential to be detrimental to the marine environment if it does not meet MARPOL discharge standards.		
Objectives: • To contain effluents which could pose a threat to the marine environment • To treat effluents before discharge in order to minimise damage to the marine environment • To comply with legislative obligations for effluent discharge.		
9.1. Deck & Bilge Water		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
9.1.1.	Drainage water from deck and bilges shall be routed to separate drainage systems on seismic vessels, and shall include contaminated oily water from closed drains and drainage water from non-process areas (open drains).	*Seismic Contractor*	*Throughout seismic survey*
9.1.2.	Drip trays or bunds shall be provided to contain contaminated water from all works areas that do not drain or route to a closed drainage system	*Seismic Contractor*	*Throughout seismic survey*
9.1.3.	No deck or bilge water may be discharged to the sea unless the oil concentration is below 15ppm (MARPOL standard). Monitoring must be undertaken to ensure compliance with this standard.	*Seismic Contractor*	*Throughout seismic survey*
9.1.4.	In the event that the discharged oil concentration exceeds 15ppm the root cause of non-compliance shall be investigated and rectified.	*Seismic Contractor*	*Immediately on occurrence*
9.1.5.	Oil concentration records shall be retained and submitted to PetroSA in the Monthly Report.	*Seismic Contractor*	*Throughout seismic survey*
9.1.6.	Where possible, environmentally-friendly, low toxicity, and biodegradable cleaning materials shall be used.	*Seismic Contractor*	*Throughout seismic survey*
9.2. Sewage			
9.2.1.	Sewage shall be comminuted to <25mm in size before discharge to the sea at greater than 12 nautical miles in accordance with MARPOL standards.	*Seismic Contractor*	*Throughout seismic survey*
9.3. Audit Guidelines			
9.3.1.	Audits should, through examination of records retained by the Seismic Contractor and Monthly and Close-Out Reports to PetroSA, verify that: • The waste water streams were monitored at the specified frequency • The laboratory equipment used for analysis has valid certificates, and is 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	*PetroSA SHEQ Manager*	*During and post seismic survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• No waste water was discharged from bilge tanks with a concentration of greater than 15ppm oil (MARPOL) • 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.		

3.10 ACTIVITY 10 GASEOUS EMISSIONS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Gaseous emissions of concern on seismic vessels are limited to gases generated from the combustion of diesel fuel used to power the seismic vessel, and are not expected to be any greater than any other vessel of similar tonnage. Some seismic vessels may incinerate waste on board. Gas emissions from these sources may include SO2, CO2, CO, and NOx and sooty particulates. At present there are no legislated limits for the emissions produced by the offshore oil and gas industry in South Africa.		
Objectives: • To reduce the volumes of green house gases emitted and minimise air pollution.		
10.1. Gaseous Emissions		
10.1.1. Incinerators, if used on board, shall be maintained to ensure efficient combustion of waste. Instances of release of excessive black smoke shall be investigated and rectified.	*Seismic Contractor*	*Throughout seismic survey*
10.1.2. Incineration of waste must comply with MARPOL standards.	*Seismic Contractor*	*Throughout seismic survey*
10.1.3. Sustained emission of black smoke for a period of more than 24 hours shall be recorded as an incident (see action section 11) and incinerator waste should be stored separately until the problem is rectified.	*Seismic Contractor*	*Immediately*
10.1.4. All valves, taps and pipe connections should be inspected regularly in accordance with the maintenance and monitoring schedule to check for leaks and should be immediately rectified in the event of leak detection.	*Seismic Contractor*	*According to maintenance & monitoring schedule*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

10.1.5. Audit Guidelines
• Audits should, through examination of records, verify that:
  ○ Emissions are monitored according to the specified schedule
  ○ The laboratory equipment used for analysis has valid certificates, or
  ○ The laboratory equipment use for analysis was calibrated and maintained according to the manufacturer's specifications, and
  ○ Incinerators, if used, have been maintained in accordance with the maintenance schedule
  ○ Incidents of black smoke for extended duration were investigated appropriately and measures taken to rectify the identified problem.
	PetroSA SHEQ Manager	*During and on completion of seismic survey*

3.11 ACTIVITY 11: INCIDENTS AND EMERGENCIES

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: An incident is an unplanned event which could or does result in harm or loss to people, property, process or environment and covers every incident from minor spills and leaks to large-scale emergencies, and pollution or damage to marine life. In the case of seismic activities, incidents could include injury or death of marine fauna due to acoustic emissions from airguns; near miss and collisions involving vessels; spills during fuel bunkering or any other maintenance activity, and loss of objects overboard. Prevention of incidents and emergencies during seismic surveys is generally achieved through: • Following appropriate navigation notification procedures (section 4.2) • Preparing emergency response plans and other subsidiary plans prior to seismic activities (section 2) • Contracting internationally certified seismic contractors (section 3) • Scheduling seismic surveys outside of peak cetacean breeding and migration seasons (section 7.1) • Maintaining exclusion and safety zones (section 7.2) • Adhering to pollution prevention requirements (section 6) • Following precautions relating to seismic firing eg "soft start" procedures (sections 7.3 and 7.4) Nonetheless, despite adherence to the above procedures, there is still a risk of incidents and emergencies occurring in any seismic activity. The procedures to be followed should such an incident or emergency occur are outlined below.		
Objectives:		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• To undertake seismic operations in such a way as to minimise risks to marine life (see section 8) • 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.		
11.1. Uncontrolled Release of Polluting Liquids		
11.1.1. The Seismic Contractor will comply with the incident management steps outlined in 11.1.2 below, and with the Contractor's Incident Management Plan and Emergency Response Plan in place prior to commencing seismic activities.	*Seismic Contractor*	*Throughout seismic survey*
11.1.2. Incident management shall entail the following key steps: • Incident detection • Rapid assessment of incident severity • Implement response actions, as follows: ○ <u>Routine Incident</u>: In the case of an onboard spill or leak confined to the seismic vessel or other incident that does not pose a risk of major harm to the environment or people, then the following steps may be taken: ▪ Mobilisation of onboard response person or team to: • contain the spill and shut off or control the source of the incident event, and • clean up the spill or take steps to rectify the incident consequences ▪ Complete an incident report form ▪ Conduct an investigation, and ▪ Close out the incident ○ <u>Major Oil Spill (Emergency)</u>: In the case of an oil spill to sea with serious potential consequences to marine and human life, the following key steps will be required: ▪ Classify the spill scenario, size and nature of the spill	*Seismic Contractor, PetroSA and other agencies (as required)*	*Immediately on occurrence*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
▪ Notify PetroSA, who will in turn notify DEA, SAMSA and other relevant authorities to respond depending on the nature of the emergency ▪ Mobilise on-board resources and take all practical steps on the seismic vessel to contain the oil spill ▪ Adhere to all notification, investigation procedures, and reporting requirements.		
11.1.3. An incident and the results of any investigation shall be recorded and submitted to PetroSA in the Monthly Report	*Seismic Contractor*	*Monthly*
11.2. Materials and Equipment Lost Overboard		
11.2.1. If a solid object falls overboard, the incident shall be managed as follows: • Retrieve object if possible to do so • If object not retrievable, record location (GPS Coordinates) and assess whether it will pose a hazard to other marine users. • If object poses a hazard then notify PetroSA who in turn will inform SAMSA / HydroSAN • Complete the Incident Report Form and Dropped Object Log • Conduct an Incident Investigation through to close out.	*Seismic Contractor, PetroSA and other agencies (if required)*	*Immediately*
11.2.2. Notifiable incidents as set out in the Incident Management Plan shall be reported by the Seismic Contractor to PetroSA within 48 hours, and must be included in the monthly report to PetroSA. Incidents posing a threat to human life or significant marine pollution should immediately be reported to the designated Emergency Coordinator of PetroSA.	*Seismic Contractor*	*48 hours of incident or immediately on occurrence*
11.3. Injury or Death of Marine Fauna		
11.3.1. Notifiable incidents related to death or injury of marine fauna that may be discovered during seismic surveys shall follow the general incident reporting requirements of outlined in section 11.4 below, and shall include: • completion of an incident reporting form including recording of details such as time of observation, status of seismic firing, location in relation to seismic vessel and streamers, GPS coordinates, type and number of animals involved, and other comments relating to possible correlation with seismic activities. • immediately reported to PetroSA and included in the monthly report to PetroSA.	*Seismic Contractor*	*Immediately on occurrence*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• PetroSA shall immediately report to the DEA: Oceans and Coasts who will in turn follow the correct procedures to investigate or retrieve injured or dead animals. • Follow up investigations and close-out of the incident.		
11.4. General Incident Reporting and Auditing		
11.4.1. General Reporting • All incidents that may occur during seismic surveys will require the following investigation and reporting, and which shall be detailed in the Incident Management Plan: o Assessment of the nature and source of the incident o Assessment and evaluation of the impact and affected environmental receptors o Recording the date and time o Description of incident o Actions taken to remedy the incident and report the incident o Investigation into root cause o Identification of measures to prevent reoccurrence and communication of such.	*Seismic Contractor*	*During and after an incident*
11.4.2. Audit Guidelines • Audits should, through examination of records retained by the Seismic Contractor or PetroSA, verify that: o Maintenance and system checks were undertaken in accordance with specifications and all spill preventive measures recorded as fully operational. o All incidents have been reported and recorded as per specifications indicated in the sections above. o All incidents have been comprehensively investigated to identify root causes. o The incident reports detail the results of the investigations into root causes and advises on amendments to procedures or equipment as needed. o The advised changes are implemented. o A trend analysis on incidents is conducted monthly o Incidents are reported within an appropriate time frame, along with the root cause analyses. o Sufficient oil and chemical spill containment and absorbent equipment and materials are stored in sufficient quantities in areas where spills are most likely to occur. o The emergency response plan and oil spill contingency plan is current and in particular all contact details are up to date.	*PetroSA SHEQ Manager*	*After incident or during post seismic survey audit*

3.12 ACTIVITY 12: DECOMMISSIONING AND CLOSE OUT

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: At the end of a seismic survey, several actions must be taken to ensure that the seismic area is left in its original condition and no restrictions remain on other marine users who previously used the area. This includes: • Retrieval of all equipment • Disposal of all onboard waste, and • Informing other marine users of the removal of the exclusion and safety zone		
Objectives: • To restore the marine environment and seabed to its pre-survey condition by removing any equipment used or dropped during the seismic survey and correctly disposing of on-board waste • To allow other marine users to use the area for fishing or marine traffic by informing stakeholders of the cessation of activities		
12.1. Restoration of Pre-Survey Conditions		
12.1.1. Retrieve all deployed equipment and any dropped objects from the marine environment prior to cessation of seismic activities.	*Seismics Contractor*	*End of seismic survey*
12.1.2. Inform all key stakeholders (see section 4) of the closure of seismic activities within 24 hours.	*PetroSA SHEQ Rep*	*Within 24 hours of end of seismic survey*
12.1.3. Dispose of all waste retained onboard at a licensed waste site using a licensed waste disposal contractor and obtain a final waste disposal certificate.	*Seismic Contractor*	*End of seismic survey*
12.1.4. Compile a Seismic Close Out Report at the end of the seismic survey which shall document compliance with the provision of this EMPR, deviations from specified standards, and details of any incidents arising. (see section 13.2.2.4 for contents).	*PetroSA Geophysics Manager*	*Within 60 days post-seismic survey*
12.2. Financial Provision		
Rationale:		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• At the end of a seismic survey, several actions must be taken to ensure that the seismic area is left in its original condition and no restrictions remain on other marine users who previously used the area. This includes: • Retrieval of all equipment • Disposal of all onboard waste, and Informing other marine users of the removal of the exclusion and safety zone		
Objective: To ensure there is sufficient legal and financial provision for rehabilitation or clean up in the event of a pollution event		
12.2.1. Environmental management actions that would be required as a result of an incident or accident would be covered by PetroSA's insurance[2], as described below: • Third Party liability which includes personal injury, property damage and seepage and pollution as a result of any offshore exploration and production operations is covered up to USD150,000,000 per occurrence • Well control insurance which would include blowouts and seepage and pollution is covered up to USD150,000,000 per occurrence.	*PetroSA Insurance Department*	*Prior and throughout Seismic surveys*
12.2.2. In addition, as a condition of contract, PetroSA requires contractors to carry the following insurance and will not permit any of its contractors to undertake any work until certificates of insurance are provided • workmen's compensation insurance as required in terms of the provisions of the Compensation for Occupational Injuries and Diseases Act, Act No. 130 of 1993; • employer's liability insurance with a limit of liability at all times of not less than USD1, 000, 000,00 (one million US Dollars) for each occurrence or such larger amounts for which Contractor already have cover; • non-ownership aviation liability with a limit of liability at all times of not less than US$50 000 000,00 (fifty million US Dollars) for each occurrence or such larger amounts for which Contractor already has cover; • comprehensive general public liability insurance including pollution with a limit of liability of not less than USD1,000,000.00 (one million US Dollars) per occurrence; • motor vehicle liability insurance including passenger liability indemnity; • Physical Damage Insurance for loss or damage to contractor's equipment and machinery. Such coverage shall be on *All Risks Insurance basis or its equivalent* for full value of Contractor Group material and equipment;	*PetroSA Legal Department*	*Prior and throughout d Seismic surveys*

[2] All figures as for 2010/11 insurance

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• *Hull and Machinery Insurance* in the form of Full Form Hull and Machinery Insurance, including collision liability, with limits of liability at least equal to the full value of the vessel; and • *Standard Protection and Indemnity Insurance*, at least equal to the value of each vessel owned or chartered (including Towers Liability, where applicable		
12.2.3. 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. • Copies of the insurance cover carried by the contractors will be provided together with the environmental notification submitted to PASA at least 7 days prior to the commencement of any drilling or seismic activity. • The annual revision of the closure provision will be submitted together with the annual Performance Assessment reports.	*PetroSA SHEQ Manager*	*End of Seismic surveys*

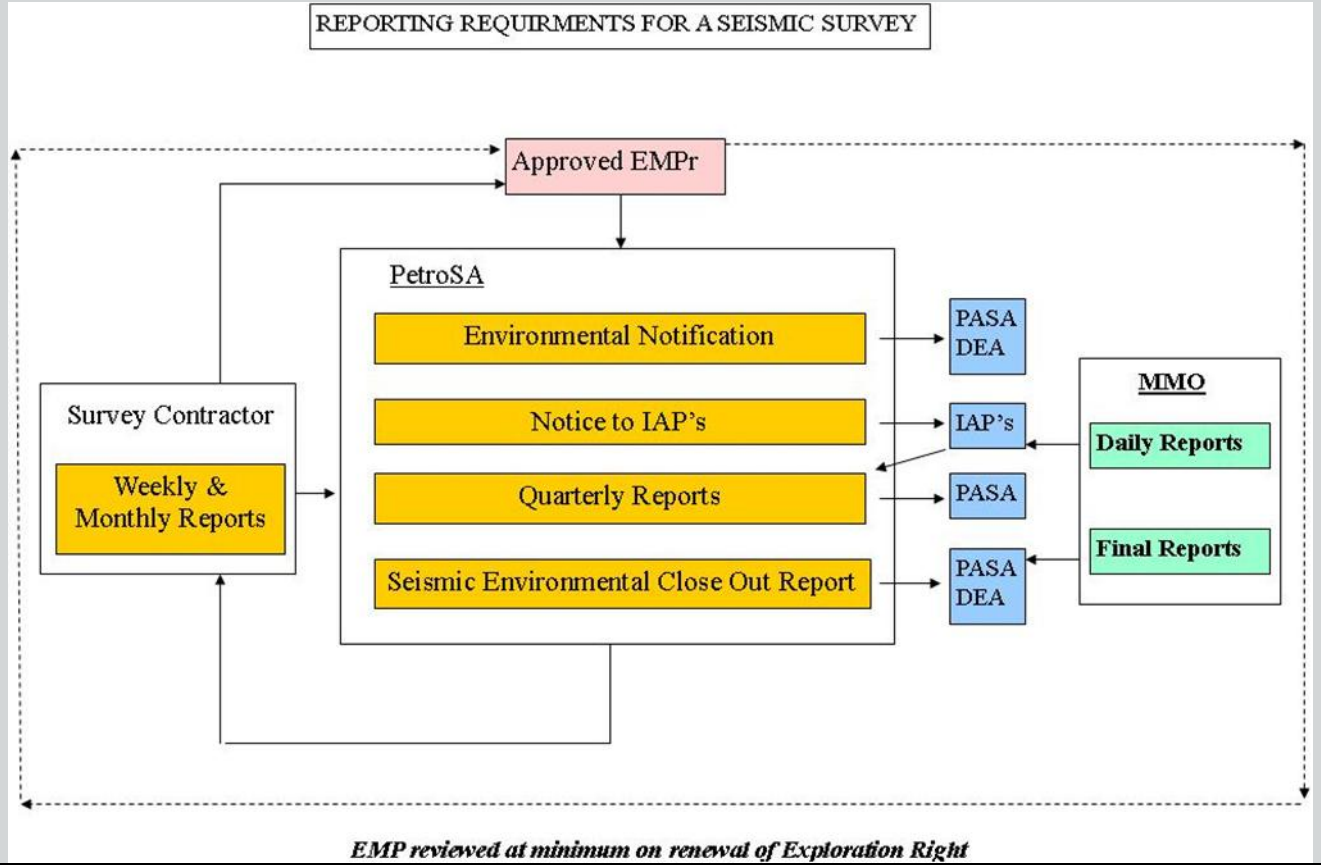
3.13 ACTIVITY 13: SYSTEM ADMINISTRATIVE REQUIREMENTS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
<u>Rationale:</u> A seismic subcontractor generally has its' own administrative requirements for environmental protection that complies with international best practice and legislation. This section outlines the administrative requirements that must be complied with during seismic activities to ensure adherence to legal and best practice, and to demonstrate proof of compliance. Administrative systems and record keeping enable an organisation to: • assure itself of its conformance with its own stated environmental policy • demonstrate conformance, and • ensure compliance with environmental laws and regulations amongst other things		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
This section summarises some key system requirements to ensure the effective implementation of the environmental management plan at different stages of a seismic programme: planning and design, during and post-seismic operations based on the ISO system model of the 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). 		
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.		
13.1. Monitoring		
The following parameters shall be monitored during seismic activities:		
13.1.1. Deck & bilge water discharge: oil concentrations to ensure compliance with MARPOL standards of <15 ppm (Refer to section 9.1.1).	*Seismic Contractor*	*MARPOL requirements*
13.1.2. Solid waste production and disposal (Refer to section 8.1.17)	*Seismic Contractor*	*Monthly*
13.1.3. Marine fauna: sightings (Refer to section 7.3 and 7.4).	*MMO*	*Monthly*
13.1.4. Soft starts production and disposal (Refer to section 7.4)	*Seismic Contractor*	*Monthly*
13.1.5. Monitoring results shall be reported to PetroSA in the Monthly Report.	*Seismic Contractor*	*Monthly*
13.1.6. PetroSA shall report monitoring results to PASA in the Quarterly Report.	*PetroSA SHEQ Rep*	*Quarterly*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
13.1.7. Monitoring results shall be retained for 5 years.	*PetroSA*	*Monthly*
13.2. Reporting		

13.2.1. Reporting Requirements for a seismic campaign are indicated in the flow chart below:



Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
13.2.2. Reporting by PetroSA to PASA		
13.2.2.1. EMPR: In accordance with the requirements of the MPRDA (Act 49 of 2008), PetroSA shall submit an EMPr to obtain approval for an exploration right (as per this EMPr).	PetroSA SHEQ Rep	Prior to seismic activities
13.2.2.2. Notification of PASA: PetroSA shall notify PASA in writing of the commencement of seismic survey 30 days prior to starting activities	PetroSA SHEQ Rep	30 days prior to seismic activities
13.2.2.3. Quarterly Reports: PetroSA shall submit Quarterly Reports to PASA, which shall include key information on: • the progress of seismic activities and any changes to the seismic schedule • any incidents (eg pollution spills, navigational incidents, loss of equipment etc.), and • non-compliance with or exceedance of monitoring standards and steps taken to rectify these.	PetroSA SHEQ Rep	Quarterly
13.2.2.4. Monthly Independent ECO Reports: • PetroSA shall appoint an Independent ECO to undertake regular **environmental audits of the** survey**/contractors including relevant documentation on a monthly basis**.	ECO	Monthly
13.2.2.5. Close Out Report PetroSA shall submit a Close Out Report to PASA within 60 days of completing a Seismic Campaign. The information contained in this report shall be based on the monthly reports compiled by the Marine Mammal Observer, Seismic Contractor and other data and records compiled during the seismic campaign. The Close Out Report shall contain a full description of all aspects of the seismic campaign, including: • The seismic contractor and vessel details • Marine mammal observer details • Description of the seismic campaign (location, timetable & duration); • Establishment information (eg receipt of EMPr by Contractor and notification of other sea users/ stakeholders) • Operational Phase Activities (eg environmental awareness, communications, provision for emergencies, waste management, lost equipment, helicopter use, acoustic emissions; faunal monitoring results (including final MMO report) • Monitoring and performance assessments	PetroSA SHEQ Rep	End of Seismic Activities

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• Decommissioning and Closure (e.**g.** notification, close out reporting, and final waste disposal)		
13.2.3. Contractor Reporting to PetroSA and Documentation Requirements		
13.2.3.1. Pre-Seismic Survey Agreements and Documentation Prior to seismic surveys, the following documentation will be provided to PetroSA by the Seismic Contractor: • Signed Contractor's Acknowledgement of Receipt of EMPR • Environmental Safety and Health Policy • Certificates of Sea Worthiness and Safety & Pollution Prevention Certificates. • Plan for supply of information to compile the Environmental Close Out report.	PetroSA SHEQ Manager	Prior to seismic survey
13.2.3.2. Monthly Report The following information shall be compiled by the seismic contractor, and submitted to PetroSA on a monthly basis in the form of a Monthly Report: • Incidents, including tangling of gear, incidents with marine fauna, spills and discharges, encroachments in the exclusion zone • Amount and type of waste generated and disposed of • Times and durations of acoustic firing including number and duration of soft starts.	Seismic Contractor	Monthly
13.2.3.2.1. **The environmental monitoring data collected (including the MMO and PAM) must be made available to the DFFE, SANBI and SAEON for their use in future scientific research.**	PetroSA SHEQ Rep	After Seismic Survey
13.3. Auditing		
13.3.1. General		
13.3.1.1. Compliance with the environmental management plan shall be subject to an internal audit before, during and at the end of a seismic campaign. The findings of these audits shall contribute towards PetroSA's annual performance report.	*PetroSA SHEQ Rep*	*Throughout seismic survey*
13.3.1.2. The audits shall review and report on the auditing requirements detailed in each section of this management plan	*Corporate: Environmental Leader*	*Throughout seismic survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
13.3.2. Pre-seismic Survey		
13.3.2.1. The pre-seismic audit shall check the following: • The EMPr has been approved by PASA and all reporting requirements have been complied with. • The Seismic Contractor has received a copy of the EMP, understands the content; the content of the EMPr is aligned with the seismic contractor's standard operating procedures, and has agreed to its implementation. • The Seismic Contractor has the necessary equipment and protocols in place and staff on the vessel are suitably trained to implement the monitoring requirements outlined in the EMPr.		
13.3.3. During Seismic Survey Audit		
13.3.3.1. Audits during the seismic campaign shall check the following: • Monitoring is being undertaken in accordance with the requirements described in this EMPr for the variables summarised in Section 13.1. • Monitoring data are retained and all deviances reported correctly in the Monthly Reports. • Incidents, where relevant, have been reported as per the incident reporting and investigating requirements (see Section 11). • Observations made on the vessels check the contractor's commitments to good housekeeping and waste management protocols, and • General audit measures indicated in Section 13.3.5.	*PetroSA SHEQ Rep*	*During seismic survey*
13.3.4. Post Seismic Audit		
13.3.4.1. The post-seismic audit shall take the form of a close out report shall check and include the following: • Monitoring was undertaken in accordance with the requirements described in this EMP for the variables summarised in Section 13.1. • Monitoring data are retained and all deviances reported correctly in the Monthly Reports. • Incidents, where relevant, have been reported as per the incident reporting and investigating requirements and have been closed out (see Section 11). • All records comply with EMP requirements and are stored in an accessible and logical manner.	*PetroSA SHEQ Rep*	*Post seismic survey*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
13.3.5. Audit Guidelines Audits should, through examination of records retained by the seismic contractor and PetroSA, 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.	*PetroSA SHEQ Rep*	*Annually*
13.4. Record Keeping		
13.4.1. All records shall be retained for 5 years.	*SHEQ Manager*	*Ongoing*
13.4.2. The following records shall be maintained as part of the Environmental Management Plan and cross-referenced for auditing purposes: • Effluent discharge volumes, quality results, including non-compliance • Incident reports, including incident close out results • Water manifests and disposal certificates • 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 Seismic EMPrs • All EIAs and application for environmental authorisations • Correspondence with permitting authorities such as PASA, DEA, SAMSA etc	*SHEQ Manager & Seismic Contractor*	
13.5. EMPr Review and Revision		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
13.5.1. The environmental management plan shall be subject to review at least upon renewal of exploration right and updated if required. The review shall consider the following information: • Audit reports • Feedback from stakeholders • Technology changes • Performance assessment reports • Changes in regulations/legal compliance	*PetroSA Asset Manager*	*Renewal of exploration rights (every 2-3 years)*

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