TO:	**THE HONOURABLE MINISTER, DR DEON GEORGE**
	MINISTER OF FORESTRY, FISHERIES AND ENVIRONMENT
ATTENTION:	DEPARTMENT OF FORESTRY, FISHERIES AND ENVIRONMENT
	APPEALS AND LEGAL REVIEWS DIRECTORATE
ATTENTION:	DIRECTOR-APPEALS AND LEGAL REVIEWS
	appeals@dffe.gov.za
COPY:	PETROLEUM AGENCY OF SOUTH AFRICA
	EAappeals@petroleumagencysa.com
COPY:	DEPARTMENT OF MINERAL RESOURCES AND ENERGY
	Pieter.Alberts@dmre.gov.za
COPY:	EIMS
	searcher48@eims.co.za
COPY:	SEARCHER GEODATA UK LTD
	d.sewell@searcherseismic.com

13 November 2024

Dear Honourable Minister,

APPEAL IN TERMS OF SECTION 43(2) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 106 OF 1998 AGAINST THE ENVIRONMENTAL AUTHORISATION GRANTED TO SEARCHER GEODATA UK LTD FOR THE PROPOSED 3D SEISMIC SURVEYS, OFF THE WEST COAST OF SOUTH AFRICA
DMRE Ref: 12/1/048

1. This is an appeal against the environmental authorisation ("EA") granted by the Acting Director-General of the Department of Mineral Resources and Energy ("Acting DG") on 21 October 2024, to Searcher Geodata UK Ltd for the proposed 3D seismic surveys, located between 256 km offshore of St Helena Bay, extending north along the western coastline

to 220 km offshore of Hondeklip Bay over several petroleum licence blocks, off the west coast of South Africa.

2. This appeal is made by Natural Justice, The Green Connection and is endorsed by Project 90 by 2030 (“Project 90”);

    2.1. Natural Justice: Lawyers for Communities and the Environment is a non-profit organisation specialising in environmental and human rights law in Africa - with a focus on the pursuit of social and environmental justice for local and indigenous communities. Natural Justice offers direct support to local and indigenous communities impacted by the ever-increasing demand for land and resources, through legal empowerment.

    2.2. The Green Connection is a non-profit company, that believes that economic growth and development, improvement of socio-economic status and conservation of natural resources can occur only in a commonly understood framework of sustainable development. It aims to provide practical support to both the government and non-governmental/ civil society sectors which are an integral part of sustainable development.

    2.3. Project 90 is a social and environmental justice organisation inspiring and mobilising South African society towards a sustainably developed and equitable low-carbon future by means of a Just Energy Transition. Project 90 works with stakeholders and decision makers to identify policies and actions that support climate justice; with a specific focus on developing environmental leadership in youth and increasing people’s ability to engage government – through active public participation – to address climate change, energy poverty, and the social injustices that intersect in their communities.

3. The Appellants have legal standing to bring the appeal not only in terms of section 43 of the National Environmental Management Act, 107 of 1998 ("NEMA"), but also to enforce environmental laws in terms of section 32 of NEMA.

4. As stated above, the EA was granted by the Acting DG on 21 October 2024. However, the Appellants received copies of the EA notification and EA from EIMS via email on 24 October 2024, and the appeal is accordingly lodged timeously within 20 days of receipt of same. See attached copies of the notification and EA marked **Annex A**.

5. In compliance with regulation 4(2}(iii) read with regulation 4(1) of the Appeal Regulations, we hereby confirm that:

    5.1. this letter, with the attached Appeal submissions and supporting documentation, is copied- and will be sent simultaneously- to Searcher Geodata UK Ltd, and to the Environmental Assessment Practitioner, EIMS;

5.2. insofar as it is reasonably practical, the Appeal will also be emailed to interested and affected parties that are reflected in the I&APs list provided to us by the EAP.

6. We enclose and hereby submit the following:

   6.1. a copy of the email notification from the EAP and environmental authorisation as **Annex A**;
   6.2. the detailed Grounds of Appeal, together with supporting documentation as **Annex B**;
   6.3. the DFFE's appeal response form containing the grounds of appeal, in Word format.
   6.4. a copy of the endorsement letter from Project 90 marked **Annex C**.

7. The Appellants have sought, to the best of their ability, to comply with the legal requirements of the National Appeal Regulations.

8. Kindly confirm receipt of this letter and the enclosed annexes comprising the Appeal.

9. Should you have any queries in relation to this Appeal, or require any additional information, please let us know.

10. Kindly also keep us updated on the progress of the Appeal.

Yours Sincerely,

____

NATURAL JUSTICE
Per: David Mtshali
david@naturaljustice.org

____

THE GREEN CONNECTION
Per: Priyanka Naidoo
priyanka@thegreenconnection.org.za

24 October 2024

Our ref: 1623/JP/am

PASA ref: 12/1/048

To whom it may concern

Dear Registered Interested and Affected Party (I&AP):

NOTIFICATION: ENVIRONMENTAL AUTHORISATION IN TERMS OF REGULATION 24 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998): ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS (2014) FOR THE PROPOSED SEARCHER SEISMIC SURVEY BASIC ASSESSMENT PROJECT, LOCATED OFFSHORE EXTENDING FROM APPROXIMATELY 256KM OFFSHORE OF ST HELENA BAY TO 220KM OFFSHORE OF HONDEKLIP BAY, OFF THE WEST COAST, SOUTH AFRICA.

Notice is given in terms of the Environmental Impact Assessment (EIA) Regulations (Government Notice R982 as amended, promulgated under the National Environmental Management (Act 107 of 1998-NEMA)), that the above-mentioned project was granted an Environmental Authorisation on the 21 October 2024 by the Department of Mineral Resources for the following:

- Environmental Authorisation (EA) in accordance with the NEMA- Listed activity/ies:)- Listed Activity 21(b) (GNR 983): *Any activity including the operation of that activity which requires a reconnaissance permit in terms of section 74 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required to exercise the reconnaissance permit, excluding-*

  (a) any desktop study; and

  (b) any arial survey.

The reasons for the decision provided by the competent authority are provided as an attachment hereto. A copy of the decision and Environmental Authorisation (EA) is available upon request from EIMS at the details provided below:

- Contact Person: Alex Msipa
- EIMS Reference Number: 1623
- Postal Address: P.O. Box 2083; Pinegowrie; 2123
- Telephone: (011) 789 7170/ Fax: (086) 571 9047
- E-mail: searcher48@eims.co.za

Please include the project reference number 1623 in all correspondence.

A copy of the decision and EA can also be downloaded from the EIMS website: https://www.eims.co.za/public-participation/

Should you wish to Appeal any aspect of the decision, an appeal may be lodged against the decision in terms of the National Appeal Regulations of 2014 (Government Notice R993) within 20 days of the date of this notification i.e. by 13 November 2024 and must be submitted in writing in the prescribed appeal form obtainable from the relevant appeal administrator.

An extract from Chapter 2 of the National Appeals Regulations is presented below for your convenience:

4(1) An appellant must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered interested and affected party[1] and any organ of state with interest in the matter within 20 days from:

a) the date that the notification of the decision for an application for an environmental authorisation or a waste management licence was sent to the registered interested and affected parties by the applicant; or

b) the date that the notification of the decision was sent to the applicant by the competent authority, issuing authority or licensing authority, in the case of decisions other than those referred to in paragraph (a).

4(2) An appeal submission must be:

a) submitted in writing in the form obtainable from the appeal administrator; and

b) accompanied by-

i. a statement setting out the grounds of appeal;

ii. supporting documentation which is referred to in the appeal submission; and

iii. a statement, including supporting documentation, by the appellant to confirm compliance with regulation 4(1) of these Regulations.

An appeal, including any supporting documentation, must be submitted to the Appeals Administrator whose contact details are presented below:

1 – Department of Forestry, Fisheries and the Environment

Appeals and Legal Review Directorate

Attention: Director: Appeals and Legal Review

Email: appeals@dffe.gov.za

Post: Private Bag X 447, Pretoria, 0001

By Hand: Environmental House, Corner Steve Biko and Soutpansberg Street, Arcadia, Pretoria, 0083

2 – Copy(s) of the lodged appeal(s) to the Petroleum Agency SA

Attention: The Chief Executive Officer

Email: EAappeals@petroleumagencysa.com

Post: Private Bag X 5111, Tygervalley, 7536

By Hand: Heron Place, Heron Cl, Second floor, Century City, Cape Town, 7411

3 – Copy(s) of the lodged appeal(s) to the Department of Mineral Resources and Energy

Attention: Director: Legal Services

Email: Pieter.Alberts@dmre.gov.za

Post: Private Bag X 59, Arcadia, 0007

By Hand: Trevenna Campus Building 2C, c/o Meintjies and Francis Baard Street, Sunnyside, 0007

[1] Please note that as a registered I&AP, and in accordance with our Privacy Policy, your contact information as contained within the I&AP database will be made available to any appellant on request for the purposes of complying with Regulation 4(1).

Please feel free to contact the undersigned if you have any queries or concerns.

Kind Regards,

Alex Msipa

EIMS | ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

24 October 2024

Our ref: 1623/JP/am

PASA ref: 12/1/048

Vir wie dit mag aangaan,

Geagte Belanghebbende en Geaffekteerde Party (B&GP):

KENNISGEWING: OMGEWINGSMAGTIGING INGEVOLGE REGULASIE 24 VAN DIE WET OP NASIONALE OMGEWINGSBESTUUR (WET 107 VAN 1998): REGULASIES VIR OMGEWINGSIMPAKBEPALING (2014) VIR DIE VOORGESTELDE SEARCHER- SEISMIESE OPNAME BASIESE ASSESSERING, WAT AFLANDIG GELEË IS EN WAT ONGEVEER 256 KM VANAF DIE KUS VAN ST. HELENABAAI TOT ONGEVEER 220 KM VANAF DIE KUS VAN HONDEKLIPBAAI AAN DIE WESKUS, SUID-AFRIKA STREK.

Kennis word gegee ingevolge die Regulasies vir Omgewingsimpakbepaling (OIB)(Staatskennisgewing R982 soos gewysig, gepromulgeer ingevolge die wet op Nasionale Omgewingsbestuur (Wet 107 van 1998) (NEMA), dat bogenoemde projek deur die Departement van Minerale Hulpbronne en Energie omgewingsmagtiging toegestaan is op 21 Oktober 2024 vir die volgende aktiwiteite:

1. Omgewingsmagtiging (EA) in ooreenstemming met die NEMA Genoteerde aktiwiteit/e:)- Genoteerde Aktiwiteit 21(b) (GNR 983): *Enige aktiwiteit insluitend die werking van daardie aktiwiteit wat 'n verkenningspermit ingevolge artikel 74 van die Wet op die Ontwikkeling van Minerale en Petroleumhulpbronne vereis, asook enige ander toepaslike aktiwiteit soos vervat in hierdie Noteringskennisgewing of in Noteringskennisgewing 3 van 2014, vereis om die verkenningspermit uit te oefen, uitgesluit -*

(a) enige lessenaar studie; en

(b) enige lugopname.

Die redes vir die beslissing deur die bevoegde owerheid, word as 'n aanhangsel hierby verskaf. 'n Afskrif van die besluit en omgewingsmagtiging (EA) is op aanvraag beskikbaar by EIMS by die onderstaande besonderhede:

1. Kontakpersoon: Alex Msipa
2. EIMS-verwysingsnommer: 1623
3. Posadres: Posbus 2083; Pinegowrie; 2123
4. Telefoon: (011) 789 7170/ Faks: (086) 571 9047
5. E-pos: searcher48@eims.co.za

Sluit asseblief die projekverwysingsnommer 1623 in alle korrespondensie in.

'n Afskrif van die beslissing en EA kan ook afgelaai word vanaf die EIMS-webwerf: https://www.eims.co.za/public-participation/

Indien u teen enige aspek van die beslissing wil appelleer, kan 'n appèl teen die beslissing ingevolge die Nasionale Appèlregulasies van 2014 (Staatskennisgewing R993) binne 20 dae vanaf die datum van hierdie kennisgewing teen 13 November 2024 ingedien word, dit moet skriftelik ingedien word in die voorgeskrewe appèlvorm wat van die betrokke appèladministrateur verkrygbaar is.

'n Uittreksel uit Hoofstuk 2 van die Nasionale Appèlregulasies word hieronder vir u gerief aangebied:

4(1) 'n Appellant moet die appèl by die appèladministrateur indien, en 'n afskrif van die appèl aan die applikant, enige geregistreerde belanghebbende en geaffekteerde party[1] en enige staatsorgaan met belang in die aangeleentheid binne 20 dae vanaf:

a) die datum waarop die kennisgewing van die beslissing vir 'n aansoek om 'n omgewingsmagtiging of 'n afvalbestuurslisensie deur die aansoeker aan die geregistreerde belanghebbende en geaffekteerde partye gestuur is; of

b) die datum waarop die kennisgewing van die beslissing deur die bevoegde owerheid, uitreikingsowerheid of lisensie-owerheid aan die aansoeker gestuur is, in die geval van ander besluite as dié waarna in paragraaf (a) verwys word.

4(2) 'n Appèlvoorlegging moet:

a) skriftelik ingedien word op die vorm wat van die appèladministrateur verkrygbaar is; en

b) vergesel word deur-

I. ‘n verklaring wat die gronde van appèl uiteensit;

II. stawende dokumentasie waarna in die appèlvoorlegging verwys word; en

III. 'n verklaring, insluitend stawende dokumentasie, deur die appellant om nakoming van regulasie 4(1) van hierdie Regulasies te bevestig.

'n Appèl, insluitend enige stawende dokumentasie, moet by die appèladministrateur ingedien word by:

1 – Departement Bosbou, Visserye en Omgewing

Direktoraat Appèl en Regshersiening

Aandag: Direkteur: Appèlle en Regsoorsig

E-pos: appeals@dffe.gov.za

Pos: Privaatsak X 447, Pretoria, 0001

Met die hand: Environmental House, h/v Steve Biko en Soutpansbergstraat, Arcadia,

Pretoria, 0083

2 – Afskrif(te) van die aangetekende appèl(le) by die Petroleumagentskap SA

Aandag: Die Hoof Uitvoerende Beampte

[1] Let asseblief daarop dat u kontakinligting soos vervat in die I &AP-databasis as 'n geregistreerde I &AP, en in ooreenstemming met ons privaatheidsbeleid, op versoek aan enige appellant beskikbaar gestel sal word vir die doel om aan Regulasie 4(1) te voldoen.

E-pos: EAappeals@petroleumagencysa.com

Pos: Privaatsak X 5111, Tygervallei, 7536

Met die hand: Heron Place, Heron Cl, Tweede Vloer, Century City, Kaapstad, 7411

3 – Afskrif(te) van die aangetekende appèl(le) by die Departement van Minerale Hulpbronne en Energie

Aandag: Direkteur: Regsdienste

E-pos: Pieter.Alberts@dmre.gov.za

Pos: Privaatsak X 59, Arcadia, 0007

Met die hand: Trevenna kampus gebou 2C, h/v Meintjies en Francis Baard straat, Sunnyside, 0007

Kontak gerus die ondergetekende indien u enige navrae of bekommernisse het.

Vriendelike groete,

Alex Msipa

24 EyeDwarha 2024

Imbekiselo yethu: 1623/JP/am

Imbekiselo yePASA: 12/1/048

Kulowo ochaphazelekayo

Othandekayo Obhaliswe Njengeqela Elinomdla Nelichaphazelekayo (I&AP):

ISAZISO: ISIGUNYAZISO SENDALO ESINGQONGILEYO NGOKUVISISANA NOMMISELO 24 WOMTHETHO KAZWELONKE WOLAWULO LWENDALO ESINGQONGILEYO (UMTHETHO 107 KA-1998): IMIMISELO YOHLOLO LWEFUTHE KWINDALO ESINGQONGILEYO (KA-2014) UKWENZELA IPROJEKTHI YOPHONONONGO LWE-SEISMIC ELIYAKUBA KUMGAMA OMALUNGA NE-256KM UKUSUKA KUNXWEME LWE-ST HELENA BAY NAMA 220KM UKUSUKA KUNXWEME LWE-HONDEKLIP BAY, EMZANTSI AFRIKA.

Sikhupha isaziso sokuba ngokuvisisana nemiMiselo yokuHlolwa kweFuthe kwiNdalo esiNgqongileyo (EIA) (Isaziso sikaRhulumente R982 ngokohlengahlengiso, esikhutshwa phantsi komthetho woLawulo lweNdalo esiNgqongileyo (uMthetho 107 ka-1998-NEMA), le projekthi ichazwe ngasentla inikwe isiGunyaziso seNdalo esiNgqongileyo ngo wama-21 kweyeDwarha 2024 liSebe lobuNcwane beziMbiwa ngokuphathelele oku kulandelayo:

- IsiGunyaziso seNdalo esiNgqongileyo (EA) ngokuvisisisana ne-NEMA- umsebenzi/imi:)-uMsebenzi oDwelisiweyo 21(b) (GNR 983): *Nawuphina umsebenzi kuquka izinto ezenziwa kuloo msebenzi ezifuna imvume yokwamkelwa ngokuhambisana necandelo 74 loMthetho woPhuhliso lobuNcwane beziMbiwa namaFutha, kwakunye nayiphina imisebenzi njengoko kubhalwe kwiSaziso soDweliso okanye iSaziso soDweliso 3 sika-2014, ofunekayo ukuze kufunyanwe imvume yokwamkelwa, ngaphandle -*

    (a) kophononongo olwenziwa ekhomphutheni; kunye

    (b) naluphina uhlolo olwenziwa emoyeni.

Izizathu zesigqibo esibonelelweyo ligunya elifanelekayo zibonelelwa njengesongezelelo apha. Ikopi yesigqibo kunye nesiGunyaziso seNdalo esiNgqongileyo (EA) iyafumaneka xa uyicela kwii-EIMS ngokweenkcukacha ezibonelelwe apha ngezantsi:

- Umntu Ongaqhagamshelana naye: Alex Msipa
- I-Reference Number Ye-EIMS: 1623
- Idilesi Yeposi: P.O. Box 2083; Pinegowrie; 2123
- Umnxeba: (011) 789 7170/ Ifeksi: (086) 571 9047
- I-E-mail: searcher48@eims.co.za

Nceda uquke inombolo yeprojekthi 1623 kuyo yonke imbalelwano.

Ikopi yesigqibo ne-EA ungazifumana kwiwebhusayithi ye-EIMS: https://www.eims.co.za/public-participation/

Xa unganqwenela ukufaka isiBheno kuso nasiphina isigqibo, isibheno singathi sifakwe nxamnye neso sigqibo ngokuvisisana nemiMiselo kaZwelonke yokuFaka isiBheno ka-2014 (iSaziso sikaRhulumente R993) phakathi kwiintsuku ezingama-20 zomhla wesi saziso i.e. ukuya kumhla we-13 kweyeNkanga 2024 kwaye simele sifakwe ngembalelwano kwifomu ebekelwe izibheno oyifumana kumlawuli wezibheno ofanelekileyo.

Isicatshulwa esivala kwisaHluko 2 seMimiselo yeziBheno kaZwelonke sinikelwe apha ngezantsi ukukwenzela lula:

4(1) *Lowo ufaka isibheno umele afake isibheno sakhe kumlawuli wezibheno, kwaye ikopi yesibheno inikwe umfaki-sicelo, nalo naliphina iqela elinomdla nelicaphazelekayo*[1] *nalo naliphina icandelo likarhulumente elinomdla kulo mbandela phakathi kwiintsuku ezingama-20 ukususela:*

a) *kumhla wesaziso ngesigqibo somfaki sicelo ngesigunyaziso sendalo esingqongileyo okanye ilayisenisi yokulawulwa kwenkunkuma iye yathunyelwa kumaqela abhalisiweyo nachaphazelekayo ngumfaki-sicelo; okanye*

b) *kumhla apho isaziso esithunyelwe ngawo kumfaki sicelo ligunya elifanelekileyo, igunya elikhupha isigunyaziso okanye igunya elikhupha ilayisenisi, xa kusenzeka ukuba kubekho isigqibo esingesiso esokubhekiselwe kuso kwisiqendu (a).*

4(2) Isibheno esifakiweyo simele:

a) *sifakwe ngembalelwano kwifomu efumaneka kumlawuli wezibheno; kwaye*

b) *ikhatshwe*

i. *sisitatimente esibeka isiseko sesibheno;*

ii. *amaxwebhu axhasayo ekubhekiselwe kuwo xa kufakwa isibheno; kunye*

iii. *nesitatimente, esiquka amaxwebhu axhasayo, avela kumfaki-sicelo ukuqinisekisa ukuba ukuthotyelwa kommiselo 4(1) wale Mimiselo.*

Isibheno, kuquka nawaphina amaxwebhu axhasayo, simele sifakwe kubaLawuli beziBheno abaneenkcukacha zoqhagamshelwano ezibekwe apha ngenzantsi:

1 – ISebe lezamaHlathi, ukuLoba neNdalo esiNgqongileyo

UMlawuli woHlolo lweziBheno nezoMthetho

Iya ku: Director: Appeals and Legal Review

I-Email: appeals@dffe.gov.za

IPosi: Private Bag X 447, Pretoria, 0001

Ngesandla: Environmental House, Corner Steve Biko and Soutpansberg Street, Arcadia, Pretoria, 0083

2 – I(ii)Kopi yesi(zi)bheno esi(zi)fakiweyo kwi-Petroleum Agency SA

Iya ku: The Chief Executive Officer

I-Email: EAappeals@petroleumagencysa.com

Iposi: Private Bag X 5111, Tygervalley, 7536

Ngesandla: Heron Place, Heron Cl, Second floor, Century City, Cape Town, 7411

3 – I(ii)Kopi yesi(zi)bheno esi(zi)fakiweyo kwiSebe lobuNcwane beziMbiwa naMandla

Iya ku: Director: Legal Services

I-Email: Pieter.Alberts@dmre.gov.za

Iposi: Private Bag X 59, Arcadia, 0007

[1] Nceda uqaphele ukuba njenge-I&AP ebhalisiweyo, kwaye ngokungqinelana noMgaqo-nkqubo wethu waBucala, iinkcukacha zakho zoqhagamshelwano njengoko ziqulathwe kuvimba weenkcukacha ze-I&AP ziya kwenziwa zifumaneke kuye nawuphi na umbheni ngesicelo ngenjongo yokuthobela uMmiselo 4(1).

Ngesandla: Heron Place, Heron Cl, Second floor, Century City, Cape Town, 7411

Nceda uzive ukhululekile ukuqhakamshelana nalo usayine apha ngezantsi ukuba unayo nayiphina imibuzo okanye izinto ezikuxhalabisayo.

Ngokuzithoba Okukhulu,

Alex Msipa

mineral resources
& energy

Department:
Mineral Resources and Energy
REPUBLIC OF SOUTH AFRICA

Enquiries: Ms Sinazo Mnyaka

EAP Reg No.: 2022/5486

Email Address: mnyakas@petroleumagencysa.com

By E-MAIL

Searcher Geodata UK Ltd
Unit 6 Albion House
High Street
Woking
United Kingdom
GU21 6BG

Attention : **Ms Debbie Sewell**
Email : d.sewell@searcherseismic.com

ENVIRONMENTAL AUTHORISATION IN TERMS OF SECTION 24 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT 107 OF 1998) AS AMENDED, READ WITH REGULATION 19 OF THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 AS AMENDED, FOR THE PROPOSED THREE-DIMENSIONAL SEISMIC SURVEY, OFF THE WEST COAST OF SOUTH AFRICA

I, Mr Tseliso Maqubela, in terms of the powers delegated to me, in terms of regulation 20 of the National Environmental Management Act, 1998 (Act 107 of 1998): Environmental Impact Assessment Regulations, 2014 as amended (hereinafter referred to as the 'EIA Regulations') decided to grant an environmental authorisation (hereinafter referred to as the 'authorisation') in respect of the application lodged on 28 May 2024. Herewith attached is a copy of the authorisation and reasons for the decision to grant.

You are instructed in terms of regulation 4(2) of the EIA Regulations to notify all interested and affected parties (I&APs), in writing, within fourteen (14) days of the date of the decision, of the outcomes of your application. You are also required to inform I&APs of the procedure to submit appeals against the decision as contained in the National Environmental Management Act, 1998 (Act 107 of 1998): National Appeals Regulations, 2014 (hereinafter referred to as the 'Appeals Regulations').

Should you wish to appeal the decision or any aspect thereof, you must submit an appeal in the prescribed form and in accordance with Chapter 2 of the Appeals Regulations, within twenty (20) days from the date of notification of the decision. The said must be submitted to the Minister of Forestry, Fisheries and the Environment, and copies sent to the Department of Mineral Resources and Energy (Head Office) and the Petroleum Agency SA by one of the following means:

1) **Department of Forestry, Fisheries and the Environment**

Appeals and Legal Review Directorate

Attention	: Director: Appeals and Legal Review
Email	: appeals@dffe.gov.za
Post	: Private Bag x 447, Pretoria, 0001
By Hand	: Environmental House, Corner Steve Biko and Soutspansberg Street, Acardia, Pretoria, 0083

2) **Copy(s) of the lodged appeal(s) to the Petroleum Agency SA**

Attention	: The Acting Chief Executive Officer
Email	: EAappeals@petroleumagencysa.com
Post	: Private Bag x 5111, Tygervalley, 7536
By Hand	: Heron Place, Heron Cl, Second Floor, Century City, Cape Town, 7441

3) **Copy(s) of the lodged appeal(s) to the Department of Mineral Resources and Energy**

Legal Services Directorate

Attention	: Director: Legal Services
Email	: Pieter.Alberts@dmre.gov.za
Post	: Private Bag x 59, Arcadia, 0007
By Hand	: Trevenna Campus, Building 2C, c/o Meintjes and Francis Baard Street, Sunnyside

The authorised activities shall not commence within twenty (20) days of the date that the notification of this authorisation decision was sent to I&APs. Please note that should the Minister of Forestry, Fisheries and the Environment receive appeals against this authorisation or conditions thereof, this authorisation will be suspended in accordance with section 43(7) of the National Environmental Management Act, 1998 (Act 107 of 1998) pending the decision on such appeals.

Yours sincerely,

....

MR TSELISO MAQUBELA
ACTING DIRECTOR-GENERAL
DATE: 21/10/2024

mineral resources
& energy

Department:
Mineral Resources and Energy
REPUBLIC OF SOUTH AFRICA

Enquiries: Ms Sinazo Mnyaka

EAP Reg No.: 2022/5486

Email Address: mnyakas@petroleumagencysa.com

ENVIRONMENTAL AUTHORISATON IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT 107 OF1998) AS AMENDED AND ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 AS AMENDED

IN RESPECT OF

THE PROPOSED THREE-DIMENSIONAL SEISMIC SURVEY ACTIVITIES, OFF THE WEST COAST OF SOUTH AFRICA

APPLICATION DETAILS

Application Reference Number	12/1/048
Holder of Environmental Authorisation	Searcher Geodata UK Limited
Location of the Activity	The environmental authorisation application area is located between ~256 km offshore of St Helena Bay, extending north along the western coastline to ~220 km offshore of Hondeklip Bay over several petroleum licence blocks. The survey area, at its closest point is ~218 km offshore from the Western Cape and Northern Cape coast.
Size of the Environmental Authorisation Application Area	~ 30 000 km^2 in extent

This environmental authorisation (hereinafter referred to as the "authorisation") does not negate the holder of this authorisation of the responsibility to comply with any other statutory requirements that may be applicable to the undertaking of the proposed activity.

DECISION ON THE AUTHORISATION

ACRONYMS

AGENCY	: Petroleum Agency SA
BAR	: Basic Assessment Report
DEPARTMENT	: Department of Mineral Resources and Energy
ECO	: Environmental Control Officer
EIA	: Environmental Impact Assessment
EIA REGULATIONS	: Environmental Impact Assessment Regulations, 2014, as amended
EMPr	: Environmental Management Programme
I&APs	: Interested and Affected Parties
MPRDA	: Mineral and Petroleum Resource Development Act, 2002 (Act 28 of 2002), as amended
NEMA	: National Environmental Management Act, 1998 (Act 107 of 1998), as amended
APPEALS REGULATIONS	: National Appeals Regulations, 2014
NEMPAA	: National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)
SOPEP	: Shipboard Oil Pollution Emergency Plan
SANHO	: South African National Hydrographic Office
3D	: Three Dimensional

The Department is satisfied with the information made available to it, and subject to compliance with the conditions of this authorisation, Searcher Geodata UK Limited should be authorised to undertake activities listed under the EIA Regulations, specified below. Details regarding the basis on which the Department reached this decision are set out in Annexure 1 of this authorisation.

ACTIVITY (S) AUTHORISED

By virtue of the powers conferred on it by NEMA and the EIA Regulations the Department hereby **grants** the authorisation to **Searcher Geodata UK Limited** to undertake activities listed under the EIA Regulations, specified in section 3 below and as described in the BAR/EMPr submitted on **08 August 2024.**

The granting of this authorisation is subject to compliance with conditions specified under section 5 below.

1. DETAILS OF THE HOLDER OF THIS ENVIRONMENTAL AUTHORISATION

Searcher Geodata UK Limited
Unit 6 Albion House
High Street
Woking
United Kingdom
GU21 6BG

Contact Person : Ms Debbie Sewell
Email : d.sewell@searcherseismic.com

2. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Environmental Impact Management Services (Pty) Ltd
8 Dalmeny Road
Pine Park
Randburg
2194

Contact Person : Mr Vukosi Mabunda
Email : vukosi@eims.co.za

3. LIST OF ACTIVITIES AUTHORISED

Table 1 below tabulates the listed activity(s) authorised under the EIA Regulations: Listing Notice 1 (Government Notice No. R 983) of 04 December 2014, as amended.

Table 1: Authorised Listed Activity

Activity No.	Activity Description	Applicability
21(b)	Any activity including the operation of that activity which requires a reconnaissance permit in terms of section 74 of the MPRDA, as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required to exercise the reconnaissance permit, excluding: (a) any desktop study; and (b) any arial survey	The undertaking of 3D seismic survey reconnaissance activities requires a reconnaissance permit in terms of section 74 of the MPRDA.

The holder of this authorisation is authorised to conduct the following activities within the area described under section 4 below:

- The acquisition of 3D seismic survey data, which involves the generation of low frequency sound pulses by an acoustic instrument towed behind a survey vessel below the sea surface.
- The use of a seismic sound source and multiple hydrophone streamers, which are ~12 000 m long and 2 000 m wide. The sound source would be towed behind the vessel at a depth of between 5 – 10 m below the surface.
- The towing of streamers at a depth of 6 to25 m below the surface. The streamers are therefore not visible, except for the tail-buoy at the terminal end of the cable.
- The operation of an array at a pressure of 2 000 pounds per square inch.
- The use of a support vessel to ensure other vessels remain at a safe distance from the survey vessel.

4. LOCATION OF THE APPLICATION AREA

The authorisation application area is located between St Helena Bay (~256 km offshore), extending north along the western coastline to Hondeklip Bay (~ 220 km offshore). It covers the Northern Cape Ultra Deep, Mid Orange Basin and various other offshore exploration areas. The authorisation application area is ~30 000 km^2 (9 000 km^2 area surveyed between January and April 2024 is excluded) in extent. It is adjacent to the Namakwa District Municipality and the West Coast District Municipality located in the Northern Cape and Western Cape Provinces respectively. The authorisation application area coordinates are listed in Table 2 below.

Table 2: Coordinates of the Authorisation Application Area

Point	Latitude	Longitude	Point	Latitude	Longitude
		Reconnaissance Permit Application Area			
1	~30° 14' 20.3646"	~14° 04' 01.4328"	12	~32° 10' 00.5402"	~13° 58' 47.2533"
2	30° 27' 02.4644"	14° 16' 06.5743"	13	~31° 53' 40.5803"	~13° 50' 17.2474"
3	31° 00' 01.3293"	14° 47' 37.1143"	14	~31° 49' 20.6094"	~13° 47' 47.2497"
4	31° 05' 40.9497"	14° 53' 02.6665"	15	~31° 42' 20.6158"	~13° 44' 07.2416"
5	31° 05' 40.9497"	14° 59' 56.5256"	16	~31° 36' 40.6302"	~13° 41' 17.2488"
6	31° 05' 40.9497"	15° 09' 38.6339"	17	~31° 15' 30.7137"	~13° 33' 07.2379"
7	31° 15' 01.0986"	15° 09' 38.8124"	18	~31° 01' 20.7564"	~13° 28' 17.2401"
8	32° 00' 01.2222"	15° 09' 38.8811"	19	~30° 50' 40.7684"	~13° 24' 37.2354"
9	32° 35' 25.5423"	15° 09' 38.9210"	20	~30° 39' 24.9181"	~13° 21' 01.7084"
10	~32° 35' 33.6389"	~13° 54' 25.9869"	21	~30° 32' 20.7014"	~13° 35' 39.2243"
11	~32° 33' 10.4617"	~13° 54' 27.2447"	22	~30° 25' 05.6174"	~13° 47' 32.1985"
EZ A	~30° 40' 30.43"	~13° 21' 21.07"	EZ D	~ 31° 05' 24.61"	~14° 34' 08.27"
EZ B	~ 30° 35' 01.67"	~13° 34' 12.98"	EZ E	~31° 30' 04.88"	~13° 55' 28.74"
EZ C	~ 30° 20' 58.61"	~13° 56' 52.74"	EZ F	~30° 56' 52.61"	~13° 26' 50.26"
		Survey Exclusion Zone			
EZ A	~30° 40' 30.43"	~13° 21' 21.07"	EZ D	~ 31° 05' 24.61"	~14° 34' 08.27"
EZ B	~ 30° 35' 01.67"	~13° 34' 12.98"	EZ E	~31° 30' 04.88"	~13° 55' 28.74"
EZ C	~ 30° 20' 58.61"	~13° 56' 52.74"	EZ F	~30° 56' 52.61"	~13° 26' 50.26"

5. CONDITIONS OF THE AUTHORISATION

5.1 SCOPE OF AUTHORISATION

5.1.1 The holder is authorised to undertake activities specified in section 3 above.

5.1.2 The authorised activities must only be carried out within the authorisation application area specified in section 4 and table 2 above.

5.1.3 The holder of this authorisation is responsible for ensuring compliance with the conditions of this authorisation.

5.1.4 Any person(s) acting on behalf of the holder, inclusive of contractor(s), subcontractor(s), consultant(s), and employees are also subject to the conditions of this authorisation. This condition, however, does not exonerate the holder from its accountability and responsibility to ensure compliance with the conditions of this authorisation.

5.1.5 Any changes to, or deviations from, and amendments to the proposed activities and conditions of this authorisation must be approved in writing by this Department before such changes, deviations or amendments are effected. The Department reserves the right to request the submission of information deemed necessary to assess and evaluate the significance and impacts of such changes, deviations, and amendments. Any changes, deviations and amendments may be subject to the provisions of Chapter 5 of the EIA Regulations pertaining to the amendments of this authorisation.

5.2 NOTIFICATION AND APPEAL OF AUTHORISATION

5.2.1 The holder must, in writing, within fourteen (14) days of the date of this authorisation, notify all I&APs of the outcome of the application.

5.2.2 The notification contemplated above must, amongst other issues:

5.2.2.1 Stipulate the date of the decision, and the date of issue of the authorisation.

5.2.2.2 Provide reasons for the decision.

5.2.2.3 Inform I&APs of the appeals procedure in terms of the NEMA:NA Regulations.

5.2.2.4 Draw the attention of the I&APs to the manner in which they may access the decision, including obtaining the copy of the authorisation.

5.3 COMMENCEMENT OF THE ACTIVITY(S)

5.3.1 This authorisation will only be effective in the event that an application for a reconnaissance permit is granted in terms of the MPRDA. None of the activities listed in this authorisation may therefore commence without a reconnaissance permit.

5.3.2 The authorised activities shall not commence within twenty (20) days of the date that the notification of this authorisation decision was sent to I&APs, pending potential lodgement of appeal(s).

5.3.3 Where an appeal is lodged against the decision by any party, this authorisation or any provision or condition thereof will be suspended in accordance with section 43(7) of the NEMA; and as such you may not commence with any activity, until a decision on the appeal(s) is taken.

5.3.4 This authorisation is granted for one (1) year from the date of commencement of the authorised activity contained in section 3. If the authorisation lapses and the holder intends to undertake the authorised activity(s), a new authorisation in terms of the EIA Regulations must be obtained.

5.4 MANAGEMENT, MONITORING AND AUDITING OF OPERATIONS INCLUDING REPORTING REQUIREMENTS

5.4.1 The EMPr submitted with the BAR is hereby approved. It is hence mandatory for the holder to implement all the recommendations and management measures stipulated in the EMPr throughout all phases of the proposed activities.

5.4.2 Any non-compliance with the EMPr constitutes non-compliance with this authorisation, and any non-compliance with this authorisation may result in its suspension and may render the holder guilty of an offence in terms of section 49A of the NEMA and may, if convicted, be liable for penalty as contemplated in terms of section 49B(1) of the NEMA.

5.4.3 Should there be changes in the operation and management of the authorised activities, the EMPr must be amended to accommodate those changes and be submitted in accordance with the EIA Regulations.

5.4.4 The holder of this authorisation must undertake the necessary measures, to ensure that operators, contractors, subcontractors, and any person(s) acting on behalf of the holder, has full awareness of the recommendations of the EMPr before commencing with any authorised activity.

5.4.5 The EMPr must be included in all contractual documentation entered in between the holder and contractor(s).

5.4.6 A copy of the EMPr must always be kept onboard the survey vessel(s).

5.4.7 The holder must, before the commencement of the authorised activity, appoint the following:

5.4.7.1 An independent and experienced ECO who will ensure that the conditions of this authorisation and recommendations of the EMPr are implemented and adhered to.

5.4.7.2 Independent, qualified, and experienced Marine Mammal Observers (MMO) and Passive Acoustic Monitoring (PAM) Operators to monitor the interaction between marine mammals and survey operations for the duration of the activity.

An independent, qualified and experienced Fisheries Liaison Officer (FLO) to monitor interactions with other marine users for the duration of the activity.

5.4.8 The holder of this authorisation must submit daily and monthly environmental monitoring reports during the seismic survey operations. Furthermore, the holder must within sixty (60) days of completion of the 3D seismic survey, submit an audit report, completed by the ECO.

5.5 SPECIFIC CONDITIONS

5.5.1 The holder or appointed ECO must, thirty (30) days before the commencement of the seismic survey, distribute notifications to the I&APs including the Agency informing them of the operational plans. The said notifications must include the following:

5.5.1.1 Commencement date, including survey and support vessel(s) mobilisation date, and anticipated duration of the survey.

5.5.1.2 Details of the seismic survey and support vessel(s).

5.5.1.3 Sketch plans showing the operational area(s) including survey grids.

5.5.1.4 Details of the ECO, FLO, MMO, PAM Operators and contact details for reporting environmental issues associated with the planned activities.

5.5.1.5 Invitations to I&APs to confirm if they should be included in the distribution list for the daily MMO, PAM and FLO reports.

5.5.2 Avoid operating during periods of peak fishing efforts and migratory season of cetaceans and their aggregates from the southern feeding grounds into the low latitude waters and the summer feeding grounds between St Helena Bay and Dassen Island.

5.5.3 MMO must be equipped with infra-red cameras.

5.5.4 PAM must be used 24- hours a day when the seismic source is in operation. If the PAM system is not functional, operations must temporarily be suspended to prevent any potential impacts to marine mammals.

5.5.5 The holder must submit a Shipboard Oil Pollution Emergency Plan (SOPEP) which is developed in accordance with MARPOL 73/78 Annex I and the National Oil Spill Continency Plan.

5.5.6 In addition to the SOPEP, an Emergency Response and Medical Evacuation Plan must be submitted. The said plans must take into consideration all resources that may be required in the event of an oil spill incident or any emergency incident. The plans must be submitted to the Agency thirty (30) days before the mobilisation of the seismic survey vessel.

5.5.7 Ensure that "turtle-friendly" tail buoys are used by the survey contractor or existing tail buoys are fitted with either exclusion or deflector "turtle guards".

5.5.8 Ensure that solid streamers are used instead of fluid-filled streamers to avoid leaks.

5.5.9 Maintain a pre-acquisition watch of sixty (60) minutes before any instances of seismic source testing. This must be implemented to confirm that there are no penguins or feeding aggregations of diving seabirds, shoaling large pelagic fish, turtles, seals, or cetaceans within 500 m of the seismic source. A soft- start" procedure as defined in the approved BAR/EMPr must be implemented. If only a single lowest power seismic source is tested, the pre-acquisition watch period can be reduced to thirty (30) minutes.

5.5.10 Line changes and breaks of more than 5 minutes but less than 20 minutes in acquisition must follow the procedures defined in the approved BAR/EMPr and must be synchronized with soft start procedures as defined in the approved BAR/EMPr.

5.5.11 A 60-minute pre-acquisition watch and a "soft-start" procedure must be implemented prior to continuing with the survey operation for seismic source breaks of 20 minutes or longer.

5.5.12 Terminate seismic source on detection and/or observation of penguins or feeding aggregations of diving seabirds, turtles, slow swimming large pelagic fish (including whale sharks, basking sharks, manta rays) or cetaceans within the 500m mitigation zone.

5.5.13 Illegal dumping of waste or any equipment aboard the vessels is prohibited. In the event of loss of any equipment that presents a risk to navigational activities, other marine users and the environment, measures to retrieve lost equipment must be undertaken. Such incidents must be reported to the Agency and SANHO within twelve (12) hours of occurrence.

5.5.14 During the demobilisation process, the holder must ensure that the survey area is left as it was prior to the operations and all I&APs must be informed of the completion of the survey.

5.5.15 A grievance mechanism must be implemented for any issues or complaints related to the seismic survey operations.

5.5.16 The community engagement protocol developed in 2023/2024 must be implemented during the seismic survey operations.

5.5.17 A distance of 40 km must be mainlined from other survey vessels in the event where multiple surveys are taking place at the same time.

5.5.18 All recommended mitigation measures included in the BAR and EMPr dated 08 August 2024 are deemed to be conditions of this authorisation and must therefore be adhered to.

6. DISCLAMER

The Department shall not be responsible for any damages or losses suffered by the holder in an instance where the operation is temporarily or permanently stopped for reasons of non-compliance with the conditions as set out herein or any other subsequent document or legal action emanating from this decision.

7. RECOMMENDATION

In view of the above, and having taken into consideration environmental management principles as set out in section 2 of the NEMA, and information presented in the authorisation application and the BAR, and subject to compliance with conditions of this authorisation, this Department is satisfied that the proposed activities will not be in conflict with the objectives of the integrated environmental management set out in Chapter 5 of the NEMA and will not result to any detrimental risks to the environment and public. This authorisation is accordingly granted.

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MR TSELISO MAQUBELA
ACTING DIRECTOR-GENERAL
DATE OF THE AUTHORISATION: 21/10/2024

APPENDIX 1: REASONS FOR DECISION

1. Information Considered in Making the Decision

All the information presented to the Department was considered in making this decision. The said information includes amongst others:

1.1 The provisions of Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998), as amended (NEMA) which relates to the integrated environmental management and section 2 of the NEMA principles; the Environmental Impact Assessment Regulations, 2014, as amended (EIA Regulations) and other relevant NEMA regulations and guidelines.

1.2 The environmental authorisation (hereinafter referred to as the "authorisation") application dated 28 May 2024.

1.3 The information contained in the final basic assessment report (BAR) and environmental management programme (EMPr), compiled by an independent Environmental Assessment Practitioner (EAP) from Environmental Impact Management Services (Pty) Ltd, submitted to the Department on 08 August 2024.

1.4 The information contained in the following specialist reports submitted with the BAR on 08 May 2024:

1.4.1 Marine Ecological Assessment prepared by Pisces Environmental Services (Pty) Ltd.

1.4.2 Fisheries Impact Assessment prepared by Capricorn Marine Environmental (Pty) Ltd.

1.4.3 Heritage Assessment prepared by PGS Heritage (Pty) Ltd.

1.4.4 Social Impact Assessment prepared by Equispectives Research & Consulting Services.

1.4.5 Acoustic Technical Report prepared by SLR Australia.

1.5 The results of the public participation process (PPP) submitted with the BAR, which highlighted issues, concerns, and comments raised by various interested and affected parties (I&APs) and responses by the EAP.

2. Submission and Consideration of the Basic Assessment Report and Supporting Documents

2.1 In terms of regulation 19(1)(a) and (b) of the EIA Regulations, 2014, the applicant must, within ninety (90) days of receipt of the application by the competent authority, submit to the competent authority-

(a) A basic assessment report, inclusive of specialist reports, an EMPr and where applicable a closure plan, which was subjected to a PPP of at least thirty (30) days and which reflects the incorporation of comments received, including any comments of the competent authority; or

(b) a notification, in writing, that the basic assessment report, inclusive of the specialist reports, and EMPr and where applicable a closure plan, will be submitted within one hundred and forty (140) days of receipt of the application by the competent authority, as significant changes were made or significant new information was added to the basic assessment report or EMPr or, where applicable, a closure plan, which changes or information was not contained in the report or plans consulted on during the initial public participation process contemplated in sub-regulation (1)(a) of the EIA Regulations and that the revised reports or EMPr or, where applicable, a closure plan will be subjected to another public participation process of at least thirty (30) days.

2.2 The BAR and supporting documents, subjected to a PPP of thirty (30) days, were submitted to the Department within the regulated timeframe.

3. Key Findings

Careful consideration of information submitted to the Department, resulted in the following conclusions:

3.1 All fundamental and procedural requirements prescribed in the applicable legislation are satisfied.

3.2 The proposed 3D seismic survey is a widely used oil and gas exploration technology worldwide. The said technology is currently used in South Africa and is generally regarded as non-intrusive in nature. The technology poses potential impacts on fisheries and marine fauna. However, the majority of the potential impacts were assessed to range from low to very low significance with mitigation.

3.3 The identification and assessment of potential impacts of the activity, including cumulative impacts, was adequately undertaken, and the proposed mitigation and management measures are aligned with potential impacts. Furthermore, the implementation of mitigation measures in all phases of the proposed 3D seismic survey activities will ensure that the planned activities will not result in any detrimental impacts on the environment.

3.4 The motivation for the need and desirability of the proposed 3D seismic survey activity is in line with the requirements of the EIA Regulations and it addressed key issues in the Need and Desirability Guideline (2017), published by the then Department of Environmental Affairs. The need and desirability of the proposed activity is motivated by its potential to provide information regarding the presence of viable gas and/or oil resources and alternative energy supply options.

3.5 Policy and legislative framework relevant to the proposed project was assessed. This amongst others include NEMA, MPRDA, NEMPAA, Integrated and Coastal Management Act, 2008 (ICMA), marine pollution related legislation, energy and climate change policies. The requirements of the aforementioned including section 63 of the ICMA are adequately addressed in the BAR.

3.6 Project Alternatives: The location, layout, technology, and no-go alternatives were identified and briefly assessed. However, due to the nature of proposed exploration operations, no in-depth assessments were carried out. The preferred location was selected based on its high likelihood of containing significant hydrocarbon reserves and because it is located outside fisheries ring fenced areas. No layout alternative was considered, because there are no proclaimed or no-go environmentally sensitive areas overlapping with the proposed seismic survey area. The preferred 3D seismic survey is considered a suitable technology to achieve the intended objective of the proposed project. In addition, seismic survey technology is currently the only commercially available technology to achieve the desired objectives of the project. The no-go alternative was not preferred due to the positive impacts that might be derived from undertaking the planned project.

3.7 The PPP complied with Chapter 6 of the EIA Regulations, and related guidelines. The PPP included the following:

(a) Identification of I&APs inclusive of authorities, fisheries, and non-governmental organisations.

(b) Notifications in English, Afrikaans and isiXhosa were distributed to pre-identified I&APs through registered mails, fax and emails.

(c) Newspaper advertisements were published in five newspapers i.e., Cape Times (English and IsiXhosa), Sentinel News (English and Afrikaans), Weslander (English and

Afrikaans), Ons Kontrei and Die Platterlander (English and Afrikaans) on 18 and 19 April 2024 and on 20, 21, 27 and 28 June 2024.

(d) The proposed project was advertised in the national government gazette on 26 April 2024 and 21 June 2024.

(e) Site notices written in English, Afrikaans and isiXhosa were placed at 100 onshore locations along the west coast stretching from Hout Bay to Port Nolloth from 22 to 26 April 2024.

(f) Radio advertisements were published in four radio stations i.e., KFM (English), Radio NFM (English and Afrikaans, and isiXhosa), Radio West Coast (English and isiXhosa) and Radio Namaqualand (English and Afrikaans) between 15 to 19 April 2024.

(g) Public meetings were held in Port Nolloth, Springbok, Doring Bay, Elands Bay, St Helena Bay, Langebaan, Yzerfontein, Hout Bay and Mitchell's Plain between 24 June and 05 July 2024. A report summary and a comment form both written in English, Afrikaans and isiXhosa were made available at meeting venues. A virtual meeting was held on 10 July 2024.

(h) Hard copies of the draft BAR were placed at Hout Bay, Sea Point, Vredenburg, Lamberts Bay and A.J Bekeur libraries and at Kamiesburg Local Municipality on 21 June 2024.

(i) Comments and issues raised by I&APs were adequately addressed in the BAR.

4. Conclusion

In view of the above and having taken into consideration the environmental management principles as set out in section 2 of the NEMA, this Department is satisfied that the proposed activities will not conflict with the objectives of the integrated environmental management set out in Chapter 5 of the NEMA and will not result to any detrimental risks to the environment and public. This authorisation is accordingly granted.

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MR TSELISO MAQUBELA
ACTING DIRECTOR-GENERAL
DATE OF THE EA: 21/10/2024

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(i) Comments and issues raised by I&APs were adequately addressed in the BAR.

4. Conclusion

In view of the above and having taken into consideration the environmental management principles as set out in section 2 of the NEMA, this Department is satisfied that the proposed activities will not conflict with the objectives of the integrated environmental management set out in Chapter 5 of the NEMA and will not result to any detrimental risks to the environment and public. This authorisation is accordingly granted.

....

MR TSELISO MAQUBELA
ACTING DIRECTOR-GENERAL
DATE OF THE EA: 21/10/2024

David Mtshali

From: 1623 Searcher (048) Reconnaissance BA <searcher48@eims.co.za>
Sent: Thursday, 24 October 2024 16:00
To: 1623 Searcher (048) Reconnaissance BA
Subject: Environmental Authorisation Decision - Searcher Reconnaissance 048 Project
Attachments: 1623_EA Notification Combined.pdf; EA - Reasons for Decision.pdf

Dear I&AP,

Please refer to the attached notification regarding the granting of the Environmental Authorisation (EA) for the Searcher Reconnaissance 048 Project and the opportunity to appeal. Attached herewith are the Reasons for the EA Decision.

Geagte B&GP,

Verwys asseblief na die aangehegte kennisgewing oor die toekenning van die Omgewingsmagtiging (EA) vir die Searcher Reconnaissance 048-projek en die geleentheid om te appelleer. Hierby aangeheg is die redes vir die EA-besluit.

Othandekayo Obhaliswe Njengeqela Elinomdla Nelichaphazelekayo (I&AP)

Nceda ubhekisele kwisaziso esiqhotyoshelweyo malunga nokunikezelwa koGunyaziso lokusiNgqongileyo (EA) lweProjekthi yeSearcher Reconnaissance 048 kunye nethuba lokubhena. Okuqhotyoshelwe apha ziZizathu zeSigqibo seEA.

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APPEAL IN TERMS OF SECTION 43(2) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 106 OF 1998 AGAINST THE ENVIRONMENTAL AUTHORISATION GRANTED TO SEARCHER GEODATA UK LTD FOR THE PROPOSED THREE-DIMENSIONAL SEISMIC SURVEYS, OFF THE WEST COAST OF SOUTH AFRICA

DMRE Ref: 12/1/048

INTRODUCTION

1. This is an appeal against the environmental authorisation ("**EA**") granted by the Acting Director-General of the Department of Mineral Resources and Energy ("**Acting DG**") to Searcher Geodata UK Ltd for the proposed 3D seismic surveys, located between 256 km offshore of St Helena Bay, extending north along the western coastline to 220 km offshore of Hondeklip Bay over several petroleum licence blocks, off the west coast of South Africa.

2. This appeal is lodged by Natural Justice and The Green Connection (collectively "**Appellants**").

3. Natural Justice: Lawyers for Communities and the Environment, a non-profit organisation specialising in environmental and human rights law in Africa - with a focus on the pursuit of social and environmental justice for local and indigenous communities. Natural Justice offers direct support to local and indigenous communities impacted by the ever-increasing demand for land and resources, through legal empowerment.

4. The Green Connection is a registered non-governmental organisation, that believes that economic growth and development, improvement of socio-economic status and conservation of natural resources can only take place within a commonly understood framework of sustainable development. The Green Connection aims to provide practical support to both the government and non-governmental/civil society sectors, which are an integral part of sustainable development.

5. The Appellants have legal standing to bring the Appeal not only in terms of section 43 of the National Environmental Management Act, 107 of 1998 ("**NEMA**"), but also to enforce

environmental laws (including "a principle contained in Chapter 1, or of any provision of a specific environmental management Act, or of any other statutory provision concerned with the protection of the environment or the use of natural resources") in terms of section 32 of NEMA. The Appellants act in the interest of, or on behalf of, persons who, for practical reasons, are unable to institute such proceedings, including members of coastal communities who do not have the capacity or resources to do so; in the interests of coastal communities whose interests are affected by the proposed seismic activities, in the public interest, and in the interest of protecting the environment, to further the objectives of section 24 of the Constitution of the Republic of South Africa, 1996 ("**Constitution**") and NEMA.

6. The Appellants contend that the Final Basic Assessment Report ("**FBAR**") was fatally flawed, for the reasons set out in this Appeal, and cannot serve as a lawful basis for granting an environmental authorisation. The authorisation granted by the Acting DG of the DMRE is therefore defective and should be set aside in this appeal.

7. Natural Justice and The Green Connection made substantive written submissions during the EIA process to the environmental assessment practitioner ("**EIMS**") appointed by Searcher Geodata UK Ltd. These written submissions contain the Appellants' detailed comments on and objections to the application, and in turn inform the grounds for this appeal because the FBAR and related reports, specialist impact assessment reports and Environmental Management Programme ("**EMPr**") did not deal with the issues raised in a meaningful manner or resolve the issues raised. These submissions should be read with this appeal as if specifically incorporated herein.

<u>BACKGROUND</u>

8. This appeal process is preceded by several relevant events (court decisions, environmental authorisation etc.) which are imperative for context. Searcher was granted a reconnaissance permit without environmental authorisation in May 2021. In January 2022 Searcher commenced surveying operations which prompted fishing communities who were not consulted to approach the high court for urgent relief. Accordingly, in March 2022 the Western Cape Division of the high court granted an interim interdict in favour of the fishing communities and others, prohibiting Searcher from commencing with surveys, pending part B of the court application (review).

9. Late in 2022, the DMRE granted environmental authorisation to Searcher in respect of reconnaissance permit 12/1/043. This EA expires on 10 November 2024 and thus Searcher applied for a new reconnaissance permit under reference number 12/1/048 which requires environmental authorisation in terms of NEMA.

10. During June 2024, EIMS (environmental assessment practitioner hired by Searcher) published a basic assessment report (“**BAR**”) for public comment. Accordingly, in July 2024 the Appellants submitted their comments to the BAR.

11. On the 21st of October 2024 the Acting DG granted environmental authorisation in respect of the reconnaissance permit 12/1/048 and the Appellants were notified about the EA decision and reasons thereof on 24 October 2024. Accordingly, this is the decision that the Appellants are appealing through this appeal.

GROUNDS FOR APPEAL

12. The Appellants lodge this appeal on the following grounds:

    12.1. Failure to consider climate change as part of need and desirability assessment.

    12.2. Inadequate consideration of substantive concerns raised by the Appellants in their comments to the FBAR.

    12.3. Inadequate consideration of relevant coastal management considerations or compliance with the National Environmental Management: Integrated Coastal Management Act 24 of 2008 ("ICMA").

    12.4. Inadequate consideration of the precautionary principle.

    12.5. Failure to consider alternatives.

    12.6. Failure to consider the unlawfulness of PASA's acceptance of multi-client speculative surveys.

    12.7. Failure to adequately consider cumulative impacts of the project

    12.8. The seismic survey activities will result in unacceptable, significant impacts on the marine environment that cannot be effectively mitigated

    12.9. Noise impacts have not been adequately assessed

13. These grounds are set out in more detail below.

FIRST GROUND OF APPEAL: ***Failure to consider climate change and other relevant factors as part of need and desirability assessment***

Refusal to consider climate change impacts

14. The FBAR asserts that potential negative impacts that may result from production of oil and gas cannot be assessed at this stage (surveying phase). The relevant passage of the report reads as follows: "*it is not currently possible to assess the risks associated with oil and gas activities, given that the specific details of these potential future activities (production) are unknown and therefore*

climate change impacts would need to be assessed during any subsequent Scoping and EIA processes for any potential subsequent oil and gas production projects."[1]

15. The Appellants submit that the claim that it is impossible to accurately assess the risks of oil and gas activities at this stage, is flawed and incorrect. It is a globally accepted scientific fact that fossil fuels (oil, coal, and natural gas) are the biggest contributors of greenhouse gas emissions which result in climate change.[2] In acknowledging the risks associated with climate change, the South African government made several commitments to reduce greenhouse gas emissions, it set a fixed target for greenhouse gas emissions levels[3] and developed an investment plan to transition the country's energy sources away from non-renewables to renewables.[4] Furthermore, the impacts of climate change have already been factually established[5] and a comprehensive assessment that looks at the need and desirability of a project is, according to two high court judgements, pivotal for decision-makers or the competent authority responsible for environmental authorisation of projects.[6]

16. In the same vein and contrary to its position on the possibility of assessing climate change risks, the FBAR argues future economic benefits to justify the need and desirability of the project, despite its finding that production activities which may take place in the future are subject to a separate environmental assessment.[7] On one hand, the FBAR finds the proposed project desirable because of its future economic benefits and on the other hand, it argues that future climate change impacts are impossible to assess during the surveying phase of the project. This is an unnecessary inconsistency. The Appellants submit that, this contradiction can be avoided by conducting a comprehensive assessment that assesses, *inter alia*, climate change impacts.

17. In refusing to assess the project's impact on climate change, the EAP missed an opportunity to assess the impact of climate change, environmental degradation, and food insecurity on children and their environmental rights. There is consensus amongst scholars and researchers that climate change affects children in different parts of the globe differently.[8] The difference in how climate change affects children is thought to be largely influenced by the preexisting social and economic disparities and geographical variabilities. Notably, the project will require

[1] Par 5.2. of the FBAR.
[2] Paris Agreement 2015.
[3] Nationally Determined Contributions 2015 updated in 2021.
[4] South Africa's Just Energy Transition Investment Plan 2023-2027 (JETIP).
[5] IPCC Special Report on global warming, amongst others.
[6] *Sustaining the Wild Coast NPC and Others v Minister of Mineral Resources and Energy and Others* 2022 (6) SA 589 (ECMk) paragraph 125; *Earthlife Africa Johannesburg v Minister of Environmental Affairs and Others* 2017 2 All SA 519 (GP) paragraph 115.
[7] par 5.2. of the FBAR.
[8] Sheridan Bartlett "Understanding the impacts for children of factors related to climate Change" 2008; Sheffield P E and Landigan P J "Global Climate Change and Children's Health: Threats and Strategies for Prevention" 2011; Currie J and Deschênes O "Children and Climate Change: Introducing the Issue" 2016; Akresh R "Climate Change, Conflict and Children" 2016.

highly skilled personnel and thus jobs for interested and affected communities will be limited. This makes it difficult to even argue in favour of the economic development part of the project. The impacts are uniquely different for children compared to adults because of the vulnerability of their developing bodies. The warm spells and heat waves caused by climate change exposes children to heat stress, respiratory and vector-bone diseases, and malnutrition with long term implications. Heavy precipitation events and intense tropical cyclones put children at higher risk of death than adults, exposes them to water-borne /water washed illnesses and malaria, reduces their options for play and social interaction etc. Furthermore, extreme high sea levels may increase the risk of death and bad health for children.

Failure to consider negative impacts of exploration drilling or production

18. The objective of engaging in the proposed seismic survey is to discover oil and gas reserves to explore. However, the broader objective is the production of oil and gas. The FBAR argues that it is impossible to assess negative impacts of production activities during seismic survey phase.[9] The Eastern Cape High Court judgment in *Sustaining the Wild Coast and Others*, held that seismic surveys are stages leading to oil and gas production, which contribute to greenhouse gas emissions, worsening climate change and affecting people's livelihood and food security. The court underscored the fact that a comprehensive assessment of the impact of new oil and gas reserves is required for proper assessment of the need and desirability of the project. The FBAR fails to evaluate the negative long-term effects of oil and gas production, and totally ignores risks to coastal communities' livelihoods.
19. There are currently multiple applications and/or approvals for exploration in and around the survey area. Additionally, a production right is already held for nearby block XXX, whilst an environmental impact assessment report has already been produced for TEEPSA's 11B/12B production right application. The impacts associated with exploration and production activities, in a general sense, are readily ascertainable from these projects, as well as experience across the continent and the world. It is a misnomer to say that it is not possible to predict the future impacts from the lifecycle of the project.

Reliance on benefits of production to justify need and desirability of reconnaissance activities

20. The FBAR highlights future benefits of exploiting oil and gas to justify need and desirability of the proposed activities.[10] However, it deliberately avoids dealing with negative impacts of such exploitation. While acknowledging the importance of understanding the full scope of seismic data, the FBAR focusses on the perceived advantages, including using natural gas as a transition fuel, reducing greenhouse gas emissions, supporting renewable energy initiatives and creating jobs. It does not adequately assess the long-term risks associated with oil and gas exploration and production.

[9] par 5.2. of the FBAR.
[10] Par 5.2. of the FBAR.

Assumption of gas as a transition fuel

21. The FBAR argues that natural gas can act as a transition fuel to help South Africa meet its climate goals, citing its lower carbon dioxide emissions compared to coal and oil. It argues that natural gas emits significantly less carbon dioxide than coal and oil, especially when using Combined Cycle Gas Turbines. However, these claims are unsubstantiated. The FBAR overlooks the lifecycle impacts of natural gas which includes potential methane leaks during extraction and transportation which makes natural gas more harmful than coal.

22. It is worth noting that, the impending global carbon border adjustment mechanisms will restrict the exportation of products with high carbon footprints. This will make South Africa's economy vulnerable if it relies on gas for electricity generation instead of cleaner renewable options. In sum, investing in fossil fuels is not a sustainable approach for South Africa to balance its climate commitments with economic development.

Additional factors relevant to need and desirability

23. The FBAR also fails to explain the need and desirability of three seismic surveys over the same project area, beyond commercial profit for each permit holder. The risk of harm cannot be justified to achieve the same result two or three times over.

24. The FBAR states that in the previous survey, it committed to acquiring up to 10 000 km2, which was largely achieved as ~9 000 km2 was surveyed. This leaves only 10% of its intended survey incomplete. Despite the claim that Searcher met almost 90% of its intended work plan, the FBAR gives several reasons for not completing the full survey.

25. It is not clear in the FBAR, but it appears that Searcher intends to survey approximately 21 000 km2 in terms of the new reconnaissance permit and authorisation. It is also not clear a) how Searcher now intends to achieve more than double the survey area in the same window, and over the same time period of 127 days and b) how Searcher intends to overcome the difficulties it faced previously – the appeal phase, viable acquisition windows, vessel availability and survey window limitations.

26. These are all factors relevant to determine the need and desirability of the project for a second, or third, time, which were not considered.

SECOND GROUND OF APPEAL: ***Inadequate consideration of substantive concerns raised by the Appellants in their comment to the BAR***

27. The Appellants submit that the FBAR fails to adequately assess or mitigate the seismic survey's impact on marine ecosystems, despite the high likelihood of harm. Seismic surveys produce high-decibel acoustic pulses that interfere with essential behaviours in marine species, including communication, reproduction, and migration. These activities violate Section 24 of the Constitution, which enshrines the right to an environment not harmful to health or well-being.

Under Section 2(4)(a)(vii) of NEMA, the precautionary principle obliges authorities to adopt protective measures in the face of scientific uncertainty, requiring decision-makers to err on the side of caution where environmental harm is probable or irreversible.

28. In the *Sustaining the Wild Coast NPC and Others v Minister of Mineral Resources and Energy*[11]the Eastern Cape High Court emphasized the importance of robust mitigation measures in seismic activities, given the potential for irreversible harm to marine ecosystems. The court noted that failure to apply the precautionary principle when addressing potential harms would undermine environmental protections required by law. Similarly, the BAR's reliance on inadequate mitigation strategies such as Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring (PAM) is insufficient to prevent significant harm, given the scope of potential impact. Therefore, the seismic survey should not proceed without a scientifically sound impact assessment that conforms to NEMA's principles.

29. The assessment of noise impacts in the FBAR is fundamentally deficient. Seismic surveys emit intense acoustic waves, sometimes exceeding 200 decibels, impacting marine life at distances well beyond the immediate survey area. This kind of underwater noise pollution is known to cause both temporary and permanent threshold shifts in hearing, disrupt migration patterns, and interfere with mating and feeding behaviours, particularly in sensitive species like whales and dolphins. The *Earthlife Africa Johannesburg v Minister of Environmental Affairs and Others*[12] decision establishes the need for comprehensive environmental assessments, particularly when cumulative impacts are at stake. By disregarding these factors, the FBAR falls short of the legal requirements for a proper environmental assessment under NEMA, and its conclusions cannot be deemed credible or legally sufficient.

30. The FBAR inappropriately confines its impact assessment to the immediate physical "footprint" of the survey, ignoring indirect, cumulative, and landscape-scale impacts. Marine ecosystems are interconnected, with the activities in one area affecting migratory routes, breeding grounds, and feeding zones critical to marine biodiversity across a broader region. Section 23(2)(b) of NEMA mandates an integrative assessment that considers the holistic environmental effects of an activity. However, the FBAR fails to address how the survey may disrupt Marine Protected Areas (MPAs), Ecologically or Biologically Significant Areas (EBSAs), and Critical Biodiversity Areas (CBAs), all of which enjoy enhanced legal protections under NEMA.

31. In *Border Deep Sea Angling Association and Others v Minister of Mineral Resources and Energy and Others* [2021] ZAWCHC 111, the court emphasized that seismic activities within ecologically sensitive marine areas require robust cumulative impact assessments to comply with legal protections. The FBAR's disregard for these cumulative and indirect impacts directly contravenes these requirements, undermining the assessment's validity and failing to meet the comprehensive standards for environmental protection mandated by law.

[11] [2022] (6) SA 589 (ECMk).
[12] [2017] 2 All SA 519 (GP).

32. Neither the FBAR nor the Cultural Heritage Report provide any evidence that the concerns raised during previous processes by coastal communities about their cultural and heritage associations with the ocean have been considered.

33. Furthermore, the proposed and authorised mitigation measures are totally inadequate. The mitigation measure set out in the EMPr is to re-assess impacts post-project.[13] This is flawed for a number of reasons, including:

33.1. firstly, it in no way mitigates the impacts of the operations and cannot be described as a mitigation measure;

33.2. secondly, the measure is aimed at providing "resources and support for communities to develop and undertake safeguarding measures or plans to enhance the mitigation capacity of their intangible cultural heritage by fostering dialogue, mutual understanding and reconciliation between and within communities", which in no way holds Searcher accountable for any impacts caused by the reconnaissance activities; and

33.3. thirdly, it fails to comprehend and mitigate any of the economic or other harm to livelihoods, and cultural and heritage practices and identity.

34. The pre-mitigation significance given to this impact is rated as Medium, and then Low post mitigation. If mitigation does not actually change the impact then it cannot change the rating. There is no rational connection between the results of the arbitrary, and somewhat absurd, mitigation measure and any change in the impact caused by the reconnaissance activities on coastal communities.

35. Further, and unacceptably, cumulative impacts on these rights have not been considered: "At this stage, cumulative impacts are purely speculative. Still, the potential for the future increase in cumulative impacts due to current and future seismic surveys and the potential for future Oil and Gas production cannot be excluded but is not quantifiable at this stage for cultural heritage."[14]

36. Despite the proximity of the seismic survey area to the territorial waters of Namibia, the FBAR fails to identify and assess impacts that are transboundary in nature. This is especially concerning, given the significance associated with the three Ecologically or Biologically Significant Areas ("EBSAs") spanning the border between South Africa and Namibia,3 that the Benguela Current flows in a generally northerly direction, and that "[t]he major feature of the Benguela Current is coastal upwelling and the consequent high nutrient supply to surface waters leads to high biological production and large fish stocks".[15]

37. Considering international law obligations, the EIA process should have included an assessment of transboundary impacts. Failure to do so renders the assessment deficient.

[13] Page 32 of the EMPr.
[14] Page 195 of the FBAR.
[15] Page 47 of the FBAR.

THIRD GROUND OF APPEAL: ***Inadequate consideration of relevant coastal management considerations or compliance with the ICMA***

38. Section 63(1) of NEM:ICMA requires a competent authority to take account of specific factors when deciding whether or not to grant an environmental authorisation under NEMA for "coastal activities". By virtue of this section, the Acting DG ought to have appreciated that in deciding whether to grant an environmental authorisation or not, he or she was required to consider additional factors specified in section 63 of NEM:ICMA[16] and whether or not the proposed project "would be contrary to the interests of the whole community". This required an eco-centric consideration of the impacts of the proposed project in an area that must be afforded a particularly high standard of protection given the natural functioning of the dynamic coastal processes.

39. The Acting DG asserts that one of the reasons that led to him granting the EA is that the requirements in section 63 of ICMA were adequately addressed in the FBAR.[17] However, the FBAR contains no evidence that the factors set out in section 63 were considered or assessed. Neither the FBAR nor the Acting DG's reasons for the decision make reference to section 12 and 21 of the ICMA.

40. Properly considered, the Acting DG's decision was made without any factual investigation as required by section 63 of ICMA, including a determination of whether the coastal public property and the coastal protected zone would be impacted, and if so, to what extent is the proposed activity consistent with the goal of establishing or protecting those areas.[18] Furthermore, the management plans which are relevant in these areas, like the Coastal Management Program for the Western Cape Province have not been taken into consideration.

41. The FBAR does not consider the interests of the affected human and non-human communities in any collective way.

42. Consequently, the interests of the whole community had not been presented to the decision-maker and without evidence of specific consideration of these interests in their decision to grant environmental authorisation, the Acting DG has not evaluated these interested in their decision to grant environmental authorisation.

43. Additionally, neither the FBAR or the Acting D-G’s decision indicate that Searcher’s compliance with its previous permits and environmental authorisation have been considered, as required by section 63.

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[16] S 63(1)(c), s 63(1)(h)(i), s 63(1)(h)(iv) ands 63(1)(i).

[17] Par 3.5. of the Reasons for the decision.

[18] Section 63(1)(c) of the ICMA.

FOURTH GROUND OF APPEAL: ***Inadequate consideration of the precautionary principle***

44. This ground of appeal was properly argued by the Appellants in the 'Comments to the BAR'.[19] However, the FBAR did not properly consider this principle and by implication the Acting DG did not adequately consider it when granting the EA.

45. The cumulative impacts of seismic surveys on the marine environment are not well-studied, and there is no scientific consensus on their ecological impact. Given this uncertainty, the Precautionary Principle, which calls for caution when the potential harm of a project is not scientifically established, should be applied. This principle is crucial not only in granting EAs but also during the environmental impact assessment process. Therefore, it is inappropriate to make subjective judgments about harm in the absence of scientific certainty. Instead, seismic survey noise impacts on fish eggs and larvae should be considered potentially harmful unless proven otherwise through credible research.

46. In the Shell Wild Coast Seismic Survey judgment[20] in the main case, the court referred to applicants' relying on expert reports for their contention that the anticipated harm to marine and bird life is a fundamental consideration, noting that these experts were in agreement that there is a reasonable apprehension of harm to marine and bird life and that the mitigation measures proposed by Shell did not adequately manage the threat of harm. The court also referred to the experts relied upon by Shell to refute the suggestion of possible harm to marine life, and noted that the respondents suggest that the detrimental effect of seismic surveys are not known and that, in so far as there is a possibility of death or stranding of marine animals from exposure to sound from seismic surveys, there are appropriate mitigating and monitoring measures in place. The court went on to point out that '[b]ecause of the apparent dispute between the experts as to the adequacy of the mitigation measures minimising the known effects of seismic surveys, it would be incumbent on the decision-maker to invoke the precautionary principle'.

47. Accordingly, the Appellants submit that the Acting DG should have applied the precautionary principle in this case.

FIFTH GROUND OF APPEAL: ***Failure to consider alternatives***

48. This ground of appeal was argued fully in the 'Comment to the BAR'[21] but the FBAR does not adequately it. Accordingly, and for the sake of brevity, a summary of the argument on this ground of appeal is provided below.

[19] Pars 11-12 of the Comment to the BAR.

[20] *Sustaining the Wild Coast NPC and Others v Minister of Mineral Resources and Energy and Others* 2022 (6) SA 589 (ECMk).

[21] Pars 51-55 of the Comment to the BAR.

49. The Guideline on Need and Feasibility in terms of the EIA Regulations, requires specific evaluation of the need and feasibility of the proposed activity during EIA process.

50. Reasonable and feasible alternatives include the option of not implementing the activity.

51. The FBAR asserts that not implementing this proposed activity would result in a missed opportunity to identify oil and gas resources within the survey area.

52. The Appellants submit that, a proper consideration of a "no go" alternative entail consideration of the potential economic and social costs of future oil and gas development including greenhouse gas emissions and the risks of oil spills. Additionally, the assessment should evaluate the ecological and socio-economic benefits of the no go option for small-scale fishers and communities, and explore alternative energy sources, such as renewable energy, that carry less long-term ecological and socio-economic risks.

SIXTH GROUND OF APPEAL: ***Failure to consider the unlawfulness of PASA's acceptance of multi-client speculative surveys***

53. The Appellants' Comment to the BAR dealt with this issue in detail. However, the FBAR does not address these comments.

54. Accordingly, the Appellants submit that the acceptance of Searcher's reconnaissance permit application in circumstances where exploration rights are held by another person/s over the area, is unlawful. In terms of s74 of the MPRDA, 'any person' who wishes to apply to the Minister for a reconnaissance permit must lodge the application as indicated in subsection (1)(a) to (c), and PASA must within 14 days accept an application for a reconnaissance permit if, among other things, 'no other person holds a technical co-operation permit, exploration right or production right for petroleum over any part of the area'(emphasis added). If the application does not comply with the requirements of this section, the designated agency must notify the applicant in writing within 14 days of the receipt of the application and provide reasons

55. In the Searcher judgement referred to above, Thulare J interpreted the meaning of the wording in s75(1)(c) of the MPRDA. While dealing with the issuing of a reconnaissance permit, the wording of s75(1) is similar to the wording used in s74(2): s75(1) provides that the Minister must issue a reconnaissance permit if the provisions of s75(1)(c) are met, namely that the reconnaissance will not result in unacceptable pollution, ecological degradation or damage to the environment and that an environmental authorisation is granted. Thulare J explained what is required as follows:

    55.1. There must be evidence that the proposed reconnaissance will not result in unacceptable pollution, ecological degradation or damage to the environment, an environmental authorization is mandatory and the Minister would act unlawfully in granting a reconnaissance permit where section 75(1)(c) was not satisfied.

56. Applying the reasoning of Thulare J to section 74(2) of the MPRDA, it follows that there must be evidence that no other person holds an exploration right for petroleum over any part of the area, and that PASA would be acting unlawfully if it accepted a reconnaissance permit application where section 74(2)(b) was not satisfied.

57. The FBAR indicates that the survey area covers a number of blocks:

Petroleum License Blocks Covered by Application Area	The following license blocks are covered by the application area: • 12/3/274 ER; • 12/3/343 ER; • 12/3/339 ER; and

58. This clearly indicates that three exploration rights have been granted in respect of three of the Petroleum License Blocks covered by the application area. These exploration rights are held by other persons, not Searcher.

59. The Appellants further submit that there is no statutory basis in the MPRDA for the granting of reconnaissance permits to seismic survey companies to conduct speculative multi-client seismic surveys in Blocks where exploration rights are held by other persons, and that the Minister would be acting ultra vires the enabling provisions of the MPRDA should he grant a reconnaissance permit to Searcher.

SEVENTH GROUND OF APPEAL: ***Failure to adequately consider cumulative impacts of the project***

60. Section 2(d) of Appendix 1 to the EIA Regulations states that the objective of the BA process incudes the undertaking of an impact and risk assessment process, inclusive of cumulative impacts, to determine the nature, significance, consequence, extent, duration and probability of the impacts occurring.

61. Section 3(1)(j)(i) of Appendix 1 to the EIA Regulations requires a BA report to contain an assessment of each identified potentially significant impact and risk, including cumulative impacts, and, in section 3(1)(o), a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.

62. For ease of reference, I set out below the definition of a cumulative impact, as described in the EIA Regulations:

    "cumulative impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities;

63. This requires that cumulative impacts associated with both similar and diverse activities are considered.

<u>Multiple seismic surveys</u>

64. The FBAR acknowledges the possibility of two other seismic surveys which could occur simultaneously: projects by TGS and GX Technologies. If multiple projects did occur at the same time, this would extend the overall high noise exposure to the environment, increasing the probability of harm for marine organisms, and increasing the probability for elevated stress levels in marine organisms at a regional level.

65. In turn, if multiple projects were to occur at the same time, it would also render the mitigation measures even less effective. For example, part of the EIA mitigation plan hinges on there being a 'safe place' for marine organisms to retreat to avoid the impacts of extremely high amplitude sound, or by minimizing the spatial and temporal scale of sound exposure associated with the project. These assumptions are untrue if multiple projects occur simultaneously, which is not considered in the FBAR.

<u>Failure to consider the cumulative impacts associated with exploration and production activities</u>

66. The project area overlaps with several licence blocks, in which exploration activities have been authorised, or are at advanced stages of environmental impact assessment processes. This includes Shell Offshore Upstream South Africa B.V, TotalEnergies's Deep Water Orange Basin project, and Africa Oil's Block 3B/4B project. Additionally, various other projects are proposed in near and adjacent blocks.

67. None of the cumulative impacts associated with these projects have been considered.

68. Given the limited remaining durations of the exploration rights held for the overlapping licence blocks, the possibility that the Searcher seismic survey will be undertaken at overlapping times with exploration activities in the overlapping or nearby blocks, cannot be discounted and should have been included in the assessment of cumulative impacts. Even where the activities may not directly overlap temporally or spatially, the multiple and confounding impacts on a disturbed marine environment should have been considered.

69. This is a fatal flaw in the assessment process.

<u>Cumulative climate impacts have not been considered</u>

70. The FBAR has not considered the cumulative climate impacts associated with the discovery of additional oil and gas reserves.

71. Having regard to the global Climate Emergency and South Africa's international commitment in the NDC to 'working with others to ensure temperature increases are kept well below 2°C above pre-industrial levels, which could include a further revision of the temperature goal to below 1.5°C in light of emerging science' by reducing greenhouse gas (GHG) emissions, the seismic survey would, if additional commercially viable resources are identified and developed through to production phase, inevitably add to South Africa's overall GHG emissions.

72. As a reasonably foreseeable future impact that may become more significant, especially in combination with impacts arising from similar offshore oil and gas exploration and production activities, it is submitted that the cumulative impacts of such GHG emissions need to be identified and assessed. It is further submitted that an evaluation of future emissions is entirely possible.

73. By approving each project in isolation, the government cannot know whether the major push to develop South Africa's oil and gas resources is consistent with the country's climate change obligations. Where effectively no oil and gas is being produced, the introduction of these many projects could have an outstanding influence on South Africa's carbon budget, potentially far exceeding its NDC targets. There is no adequate reason for why this type of cumulative GHG assessment was not done, and approving each project without this cumulative impact assessment is unreasonable and contrary to the requirements of NEMA.

EIGHTH GROUND OF APPEAL: ***The seismic survey activities will result in unacceptable, significant impacts on the marine environment that cannot be effectively mitigated***

74. The Appellants submit that the proposed seismic survey presents unacceptable risks of significant harm to the marine environment, which cannot be adequately mitigated through the mitigation measures proposed in the FBAR and the environmental authorisation.
75. The same appeal ground was raised in the Appellant's previous appeal, but the then Minister Creecy found these risks, as identified in the BAR, were acceptable.
76. However, it remains the Appellants' submission that the harm associated with the proposed 3D seismic surveys has not been adequately assessed, and that the project poses unacceptable and significant impacts to the marine environment.

<u>Lack of baseline information</u>

77. Very little biological and ecological data exists in respect of the seismic survey area, and the FBAR is based on the entire Orange Basin Area. Substantive information relating to the specific area, species and ecosystems that are at risk is absent. The WildTrust scientists identify a number of gaps in scientific information, particularly in respect of the South African context.

78. The subjective rating system, despite data gaps, does not provide confidence of the impact predictions.

79. In the need and desirability analysis, the FBAR indicates that the reconnaissance activities can be used "more generally for providing more insight and understanding into the regional geology of the area for scientific purposes" and that "[t]his project can also provide an opportunity to conduct independent research on how fish species on the West Coast such as snoek respond to seismic surveying. Bearing in mind that the location of this particular survey is far offshore and impacts on the biophysical environment are expected to be relatively low this project is seen as a

good opportunity to obtain local data and conduct local research which could be useful for similar projects and applications that may take place in the future."[22]

80. Searcher has already conducted two seismic surveys in and near the Project Area. There is no indication in the FBAR that it indeed took the opportunity to gain "more insight and understanding into the regional geology of the area for scientific purposes" or that any "independent research" was conducted to understand impacts, or that it used the opportunity to understand more about the baseline conditions. If there was any such research or information gained, then this should have informed the FBAR, and the Acting D-G's decision. The repetition of such a promise in the FBAR is hollow and misleading.

81. Further, neither the FBAR nor the Acting D-G's decision appear to have been informed by the results of its monitoring during the previous surveys. Searcher's compliance with its previous environmental authorisation has also not been disclosed.

82. Reconnaissance activities, which will likely have significant impacts on the marine ecosystem, cannot be justified for research purposes, and the existence of a significant gap in information cannot justify the authorisation of the activity for the purpose of obtaining data. It is opposite – appropriate scientific information should first be available to inform a comprehensive assessment of impacts, before a decision can be made whether to authorise a harmful activity. Without this, the decision-makers should be following a precautionary approach.

83. Section 2(4)(a)(vii) of NEMA provides that sustainable development requires the consideration of all relevant factors, including "that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions". In *WWF South Africa v Minister of Agriculture, Forestry and Fisheries and others*, the Court found that "[p]otential errors are 'weighted in favour of environmental protection', the object being 'to safeguard ecological space or environmental room for maneuver."[23] Here, in weighing the relative reliability of two studies which suggest different degrees of harm to zooplankton, the decision-maker should err in favour of an interpretation that protects the environment.

84. This approach was confirmed by the court in *Sustaining the Wild Coast NPC and others v Minister of Mineral Resources and others*:[24]

> "on a proper application of the precautionary principle, the court should find that the threat of harm to marine and bird life justifies a cautious approach, which was not given heed to when the exploration right was granted"[25]

[22] Page 40 of the FBAR.
[23] WWF South Africa v Minister of Agriculture, Forestry and Fisheries and Others (11478/18) [2018] ZAWCHC 127; [2018] 4 All SA 889 (WCC); 2019 (2) SA 403 (WCC) (26 September 2018) at para 104.
[24] *Sustaining the Wild Coast NPC and Others v Minister of Mineral Resources and Others* (3491/2021) [2022] ZAECMKHC 55.
[25] Para 31.

"Because of the apparent dispute between the experts as to the adequacy of the mitigation measures minimising the known effects of seismic surveys, it would have been incumbent on the decision-maker to invoke the precautionary principle."[26]

85. A precautionary approach requires that in the absence of sufficient evidence to allay risks of significant harm, protective action should be taken such that authorisation for the seismic testing is not granted.

Unacceptable, significant risks of harm

86. We refer to the appeal of WildTrust, and the appeal report prepared by experienced marine scientists Drs Harris, Olbers and Wright, and Ms Pillay, dated 13 November 2024 and attached marked **Annex B1**. The conclusions of the WildTrust Appeal are incorporated herein.

87. The WildTrust scientists raise important concerns about the potential impacts on species such as the critically endangered African penguin, sea turtles and cetaceans, amongst others. They conclude that:
    87.1. "the proposed seismic surveys for reconnaissance pose an unacceptable ecological risk to the marine ecosystems and species in South African waters"; and
    87.2. "the acute anthropogenic noise over a prolonged period of time, and the extensive survey gear in the water is an ecological risk to threatened and protected marine fauna that primarily use sound to survive and/or are unable to avoid the area of impact".
88. Importantly, the current proposal is also more harmful than the 2022 survey proposal:
    88.1. The proposed 3D seismic survey covers an areas of approximately 21 000 km^2, which is more than double the area subjected to 3D seismic surveys in the 2021 proposal.
    88.2. The proposed 3D seismic surveys will take 127 days including downtime, which is 60% more time than then 2021 plan.
    88.3. Scientific evidence supports that 3D seismic surveys are more harmful than 2D seismic surveys, through the use of multiple airgun arrays and multiple receiving lines or streamers, which provides more detailed information.
        88.3.1. "Any consideration of effect should also take scale into account. Conventional exploratory surveys (2D techniques) may cover large areas and are only briefly in a localized area. Such surveys are typical for speculative wide area coverage, with each trackline being several kilometres apart. However, 3D surveys methods have been developed in which several parallel hydrophone streamers and possibly airgun arrays are deployed from a single vessel. Tracklines for 3D site evaluation may be only 50–100 metres apart. This type of survey may focus work on small spatial scale, and proceed for weeks at a time (McCauley, 1994). **Such surveys may have more pronounced effects on organisms in surrounding areas, and also will have greater impacts on fishing success**."[27]
        88.3.2. "However, although this may reduce emission time at the vessel, during many 3D surveys the fish within the survey area may hear the emitted sound during the whole

[26] Para 109.
[27] Hirst & Rodhouse, Impacts of Geophysical Seismic Surveying on Fishing Success (2000), [(PDF) Impacts of geophysical seismic surveying on fishing success (researchgate.net)]

active period of survey, while they are likely to experience periods of relative silence during 2D surveys that cover larger areas."[28]

88.3.3. "2D seismic surveys increased the daily SEL by −30 dB in the survey area on the day of the survey. In comparison, 3D seismic surveys similarly increased the daily SEL in each ship pass, while multiple passes generated an overall larger increase in daily SEL."[29]

88.4. The survey will include a significant amount of irreplaceable and near-replaceable CBAs. 36.4% of the Permit Areas has been designated as CBA Class 1 or 2.

89. The FBAR does not provide reasoning as to why the period of Late December to May is proposed for the survey period. Nevertheless, the survey window conflicts with the BAR's own findings, which make it clear that between December and May, the survey would take place during the peak abundances for many baleen species:

89.1. Bryde's Whale: "Its seasonality on the West Coast is thus opposite to the majority of the balaenopterids with abundance likely to be highest in the broader project area in **January – March**. Several strandings of adult offshore Bryde's whales in central Namibia confirm that the species passes through the project area."[30]

89.2. Pygmy Right Whale: "In the last decade, both species have been increasingly observed to remain on the west coast of South Africa well after the 'traditional' South African whale season (June – November) into spring and early summer (**October – February**) where they have been observed feeding in upwelling zones, especially off Saldanha and St Helena Bay. Increasing numbers of summer records of both species, from the southern half of Namibia suggest that animals may also be feeding in the Lüderitz upwelling cell and will therefore occur in or pass through the project area."[31]

89.3. Humpback Whales: "Humpback whales are thus likely to be the most frequently encountered baleen whale in the project area, ranging from the coast out beyond the shelf, with year-round presence but numbers peaking in **July – February** and a smaller peak with the southern breeding migration around September – October but with **regular encounters until February** associated with subsequent feeding in the Benguela ecosystem."[32]

89.4. Southern right whale: "Recent sightings (2018-2021) confirm that there is still a clear peak in numbers on the West Coast (Table Bay to St Helena Bay) between **February and April**. Given this high proportion of the population known to feed in the southern Benguela, and current numbers reported, it is highly likely that **several hundreds of right whales** can be expected to pass through the southern portion of the Reconnaissance Permit Area when migrating southwards from the feeding areas between **April and June**"[33]

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[28] Slabbekorn et al., Population-level consequences of seismic surveys on fishes: An interdisciplinary challenge (2019), [Population-level consequences of seismic surveys on fishes: An interdisciplinary challenge (wiley.com)]

[29] Affatati & Camerlenghi, Effects of marine seismic surveys on free-ranging fauna: a systemic literature review (2023), [Frontiers | Effects of marine seismic surveys on free-ranging fauna: a systematic literature review (frontiersin.org)]

[30] Page 83 of the FBAR.

[31] Page 84 of the FBAR.

[32] Page 85 of the FBAR.

[33] Page 85 of the FBAR.

90. Furthermore, this period if not appropriate for turtles, as this is a time of peak turtle abundances: "Hatchlings of both species emerge from their nests from **mid-January to mid-March** with most dispersing south-westward within the Agulhas Current. The Agulhas Current migration corridor will therefore be very active with migrating sea turtles between **January and April**, some of which may be distributed along the West Coast through mass transport of Agulhas Current water into the southeast Atlantic by warm core rings. Despite their extensive distributions and feeding ranges, the numbers of adult and neonate turtles encountered in the Survey area may therefore be seasonally high, particularly in the Child's Bank and Orange Shelf Edge MPAs, and the Orange Seamount and Canyon Complex transboundary EBSA, which may be frequented by leatherbacks on their migrations."[34]

91. The survey will include foraging grounds of the Endangered Atlantic Yellow-Nosed Albatross and the vulnerable Wandering Albatross.[35] In the *Adams* judgment, the court recognised that the "surveys should not be conducted within the foraging ranges of sensitive seabird species".[36]

92. The December – May timing would only be useful for avoiding the migrations of a number of species which have a **low probability** of being found in the project area: Sei whales, fin whales, blue whales and minke whales.

93. The survey period is therefore inappropriate and will result in unacceptable harm to the species described above.

94. The precautionary approach should also be applied in respect of the broader ecosystem impacts from seismic surveys. For example, zooplankton are the basis for the marine ecosystem by providing food and nutrients for other species. As set out in the WildOceans appeal, experts confirm that seismic testing is very likely to significantly impact zooplankton populations. This will have unacceptable knock-on impacts in the food chain and ecosystems, with impacts on *inter alia*, juvenile fish and rock lobsters. Noise impacts should be assumed to be unsafe in the absence of credible scientific data showing that the impacts on zooplankton are not significant.

95. Lynne Shannon, Principal Researcher in the Department of Biological Sciences at the University of Cape Town, echoes the concerns of the WildTrust scientists regarding ecosystem impacts. In her expert report in the Searcher litigation, she highlights the confounding ecosystem impacts, which remain relevant in the context of the revised Searcher proposal:

    95.1. "[F]oraging behaviours can extend across multiple species and parts of the food web, and are at risk of being interrupted/negatively impacted by seismic activity off the west coast."

    95.2. "A further concern is the additional pressures that seismic surveys will add to an already stressed ecosystem. Noise, vibrations, possible oiling etc. need to be viewed in the context of cumulative (and often jointly worsened) impacts of anthropogenic activities in our marine ecosystems (Skern-Mauritzen et al. 2021). Fishing, shipping, land-based activities

[34] Page 167 of the FBAR.
[35] Page 73 of the FBAR.
[36] Para 33 of *Adams* judgment.

(pollution, change in bay circulation etc.), and now seismic activities, will all act together to impact our marine biodiversity and ecosystem functioning, thereby influencing the services and contributions of nature to people (Brauman et al. 2020). These impacts will likely be compounded to exacerbate negative impacts of ecosystems and human well-being, and will be further exacerbated under climate change (Diaz et al. 2019)."

95.3. "In summary, noise and vibrations from the spatially and temporally extensive seismic surveys proposed, can have notable and widespread direct and indirect impacts on individuals, species, animal communities and thus the food web as a whole. Although several of the species of concern may be largely located inshore or in marine protected areas, may mostly frequent the west coast designated zones in months other than those currently earmarked for surveys, or may reside in ecosystem types that are not (yet) classified as "high risk", we do not know the distances across which fish, turtles, and marine mammals may be affected, nor what the indirect ecosystem effects are likely to be. We also do not know how the addition of a new pressure in the form of seismic activity on the west coast may alter current risk status of an ecosystem type. We do however know that the effects of seismic activity have been recorded to extend up to 100km from the source in the case of African penguins (Pichegru et al. 2017)."

95.4. "We also know that numerous marine species elsewhere in the world have been shown to be negatively impacted by seismic activity (Weilgart 2013). And we know and appreciate that species comprise diverse assemblages that determine how ecosystems function; we cannot rule out possible significant detrimental effects on our marine species and the ecosystems to which they belong. Upsetting even one connection in the food web has repercussions for other linkages and the overall ecosystem functioning – which in turn has implications for multiple fisheries in terms of what the ecosystem may be able to support in terms of catches, and where. Disruption of spatial-temporal patterns in predator-prey interactions in our marine ecosystem puts at risk fishing sectors and human communities that rely on availability of fish off our west coast."

95.5. "All in all, the above considerations underline the uncertainty and poor knowledge as to the extent of species-level AND ecosystem-level impacts of proposed seismic activity off our coast, stressing that a precautionary approach (see Shannon et al. 2020b for details) is appropriate. The UN Fish Stocks Agreement (Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks) states that the absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures. International guidelines and best practice, such as that adopted by Canada, states "in circumstances where there is potential for imminent harm, it may be appropriate to make decisions and implement precautionary measures in the near term". In the light of species-level effects noted above, in the literature and discussed in the SLR report, and given the uncertainty that bounds potential ecosystem-level impacts, I strongly urge decision-makers to act with the appropriate level of precaution in this instance. "

96. Lynne Shannon's expert affidavit is attached as **Annex B2**.

97. Further scientific support for these expert opinions are found in the expert affidavit of Colleen Maloney, a marine ecologist and associate professor within the same department at UCT:

> "This region is fertilised on a large scale and an almost continuous basis by the transport of water rich in nutrients (e.g. nitrogen and phosphorous) from depth to the well-lit surface waters where photosynthesis can occur. This results in a proliferation of microscopic phytoplankton (photosynthetic organisms) and small zooplankton, which feed on phytoplankton and which themselves are food for fishes. The west coast thus has several nursery grounds for fishes, including species that are commercially exploited and non-commercial species. The large abundances of fishes, large crustacean zooplankton and squids also support top predator populations, such as seabirds and marine mammals...
>
> As examples of measured short-term impacts, larval and juvenile lobsters in an Australian study were damaged up to 500 m from a seismic survey sound source…
>
> South Africa's west coast has a large abundance of marine organisms, with much spatial and temporal heterogeneity in the environment, such that impacts need to be understood in the context of localised patches of enhanced abundance and dense aggregations of marine organisms.
>
> In conclusion, current understanding of impacts associated with seismic surveys on zooplankton is too sparse and localised to allow definitive conclusions to be drawn about the extend and ecosystem impact of these surveys off the west coast of South Africa."[37]

98. A copy of Ms Maloney's affidavit is attached marked **Annex B3**.

99. In the WildOceans appeal, the scientists identify a number of flaws with the proposed mitigation measures. In particular:
    - 99.1. the Ineffectiveness of MMO sightings, affected by distance offshore, time of day, sea conditions, underwater noise, as well as the attention span of the MMO, and a lack of best practice standards for MMOs. In particular, MMOs cannot operate at night, and yet the surveys will continue around the clock.
    - 99.2. That Passive Acoustic Monitoring is ineffective where cetaceans do not vocalise, and are not designed to detect the vocalisations of non-mammal marine animals.

100. The consequence is that the harms to the marine environment are not adequately mitigated, and the impacts, even with mitigation, are significant.

101. Given the likelihood of significant impacts on the marine environment, and confounding ecosystem impacts, the decision to authorise the seismic survey violates the State's obligations under the Constitution and NEMA to take reasonable measures to protect the environment.

[37] Expert Affidavit of Coleen Maloney in *Adams and Others v Minister of Mineral Resources and Energy and Others* (1306/22) [2022] ZAWCHC 24 (1 March 2022)

NINTH GROUND OF APPEAL:: ***Noise impacts have not been adequately assessed***

102. The Noise Specialist Study does not consider cumulative noise impacts over 24 hours, though the FBAR notes that the survey is planned to last 4 months.[38] Four months of continuous blasting reverberating for long distances through the marine soundscape is likely to have very different effects than a 24 hour survey would, including in particular behavioural effects that reduce species' fitness due to masking and long-term avoidance of the blast areas.

103. The Noise Specialist Study relies upon a 2014 U.S. government document to support the use of a 40km buffer between vessels during concurrent simultaneous surveys,[39] however those buffers are based upon a threshold of 160 dB for harassment, a standard that the U.S. government has has since recognized is not supported by the science.[40] See extract attached marked **Annex B4**. Scientists also agree that harm occurs at exposure levels far below the 160 dB threshold. See for example, the See expert evidence of Professor Nowacek from the *Sustaining the Wild Coast* litigation, marked **Annex B5**.[41]

104. In addition to the issues associated with mitigation generally, as referred to above, the mitigation measures associated with noise impacts are designed to only attempt to avoid permanent threshold shifts. They also do not include any seasonal avoidance considerations, which would help to reduce harms on species undertaking activities particularly sensitive to acoustic disturbance.

105. The use of passive acoustic monitoring as a mitigation measure has limited benefit as whales "will not be detected even when present if they are quiet or not vocalizing or if background noise is too high" and is "essentially useless for detecting mother-calf pairs."[42]

106. The FBAR presents information in a biased manner. For example, it cites no authority and makes much of the claim that: "Of all human-generated sound sources, the most persistent in the ocean is the noise of shipping."[43] However, the FBAR fails to acknowledge that of all human-generated sound sources in the ocean, the absolute loudest are seismic blasts, coming in almost 100 dBs louder than the next human-generated sound.

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[38] Page 167 of the FBAR.

[39] Page 45 of the Noise Specialist Study..

[40] See Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Geophysical Surveys Related to Oil and Gas Activities in the Gulf of Mexico, 83 Fed. Reg. 29,212, 29,247-48 (June 22, 2018) (U.S. government announced that "[s]tudies of marine mammals in the wild and in experimental settings do not support" use of a single 160-decibel threshold and that "that an approach reflecting a more complex probabilistic function is better reflective of available scientific information," because it "takes the fundamental step of acknowledging the potential for . . . harassment at exposures to received levels below 160 [decibels].")

[41] See Douglas Nowacek, Supporting Affidavit, filed in *Sustaining the Wild Coasts and Others v. Minister of Mineral Resources and Energy and Others*, at Para. 18 (incorporating underlying expert declaration paras 24-31, demonstrating science shows that "seismic surveys can disrupt important behaviors in baleen whales at exposure levels far below the 160 dB threshold").

[42] See Annex B5. Nowacek Decl. at para 13.4 (citing to expert declaration para 46, which is quoted).

[43] See page 163 of the FBAR.

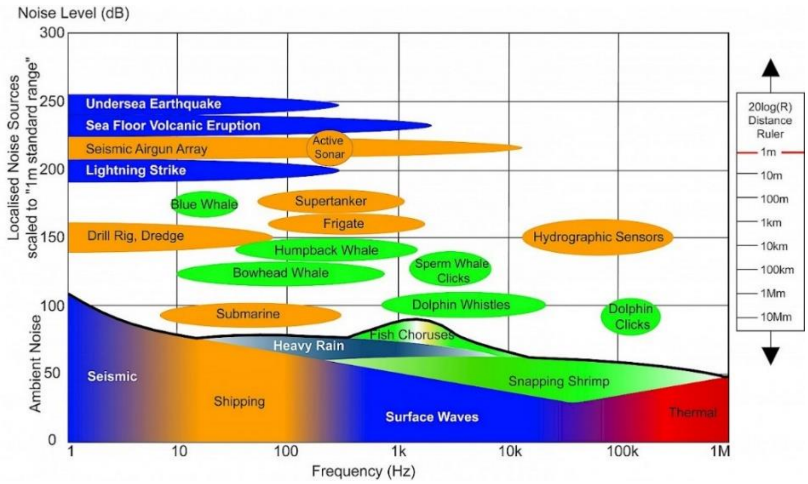

Figure 1. Levels and frequencies of anthropogenic and naturally occurring sound sources in the marine environment. Specturum Noise Level ("Acoustic intensity per Hertz") versus Frequency (measured in Hertz or "cycles per second").[44]

107. As a result, the assessment of noise impacts is woefully inadequate. Given the impacts of noise on marine fauna, this is significant, and should not have justified a decision to grant environmental authorisation.

CONCLUSION

108. The Appellants have set out in this appeal a number of grounds on which the decision to grant environmental authorisation to Searcher was fatally flawed. The decision to authorise the project is consequently unlawful, in that it failed to comply with, *inter alia*, the Constitution, NEMA and the 2014 EIA Regulations.

109. For all the reasons set out in this appeal, Natural Justice, and The Green Connection, submit that the appeal should succeed, and that Searcher's application for the environmental authorisation granted by the Acting DG of DMRE should be refused.

[44] See OSPAR Convention, Underwater Noise, available at https://www.ospar.org/work-areas/eiha/noise.

"Annex B1"

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13 November 2024

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Notification:
All Interested & Affected Parties (as supplied by EIMS)

RE: APPEAL IN TERMS OF THE SECTION 43(2) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 106 OF 1998, ON THE ENVIRONMENTAL AUTHORISATION GRANTED FOR THE 3D SEISMIC SURVEY BY SEARCHER IN THE ORANGE BASIN, WEST COAST OF SOUTH AFRICA. DMRE APPLICATION NUMBER: 12/1/048; EIMS REFERENCE NUMBER: 1623

We hereby submit an appeal to the Honourable Minister of the Department of Forestry, Fisheries and the Environment, directed at the Director: Appeals and Legal Review of the Department of Forestry, Fisheries and the Environment, to set aside: the Environmental Authorisation (EA) issued by the Director-General: Mineral Resources and Energy to Searcher Geodata on 24 October 2023.

These comments were prepared by WILDTRUST marine scientists, namely Dr J. Harris, Dr J. Olbers, Dr K. Wright, and Ms A. Pillay. The initial comments to the Draft Basic Assessment Report (BAR) by the WILDTRUST (21 July 2023). Despite the responses to the comments in the final BAR Report, and the minor changes made, WILDTRUST remains extremely concerned about the proposed seismic survey activities that pose a serious risk and threat to marine biodiversity and the behaviour of our threatened cetacean and turtle populations in South African waters. Therefore, it is recommended that this Environmental Authorisation be set aside in the interests of the South African people and our natural heritage.

The ground-swell of the South African public objecting to offshore oil and gas development and geophysical surveys is a testament to the discontent of these activities and the development of oil and gas in South Africa's offshore waters. As a single example, in 2023, over a period of less than 20 days, more than 25 protests, marches and anti-seismic survey activations were undertaken (primarily on 9 December 2023), together with ~27,000 signatures across two petitions relevant to the CGG Services seismic survey off the southeast coast. Due diligence by the relevant authority would ensure that the weight of this concern by the South African people is taken into account in the decision-making process.

The Grounds of Appeal are as follows, and are summarised in the Appeal Template:

1. Impacts of Seismic surveys in the Global Context
2. Seismic Surveys in the South African Context with impacts to protected and threatened species
3. Ineffectiveness of Mitigation measures

In preparing this Appeal, we have reviewed the scientific literature on the physiological and behavioural impacts of seismic surveys on the marine environment from a global context, with a focus on impacts on protected and threatened species within South Africa. In addition, the effectiveness of the mitigation measures stated in the BAR was thoroughly reviewed, with some concerns highlighted.

1. Impacts of Seismic surveys in the Global Context

Globally, seismic surveys' environmental impacts and consequences are better documented, although not uniform in results or widely accepted within all sectors. The primary mitigation measures for seismic surveys in South Africa include soft-starts, which is a gradual and systematic increase in power of the airgun array undertaken to warn and drive mobile marine species, such as cetaceans (whales and dolphins), seals, flightless birds and turtles away from the sound source before the full-power airgun blasts begin, thus attempting to minimise the negative effects of the airgun blasting activity. Various studies contest this assumption (McCauley et al. 2000; Weilgart 2013; Dunlop et al. 2016) and have revealed a growing concern for animals that are unable to avoid or out-swim the airgun arrays.

Animals use sound critical to their life cycles (Jasny et al. 2005) in three ways, by actively producing sound (Tyack 1981), by listening to sounds emitted by other living organisms (Clark et al. 2009; Van Opzeeland 2010) and taking cues from physical or non-living factors producing sounds, contributing to the ambient background noise, such as wind, waves, swell, bubbles, currents, turbulence, earthquakes, rainfall, ice cracking or breaking (Hildebrand 2005). Many marine animals produce sound for communication, reproduction, aggression, defence mechanisms, antagonistic interactions, courtship, group coordination, orientation, navigation, and prey identification (Hildebrand 2005). They rely on producing a sound that is heard while hearing a sound and interpreting the sound for their survival.

Various physical responses to acoustic disturbance have been documented, with physical responses including soft tissue damage (Balcom and Claridge 2001), embolisms (Dolman and Simmonds 2005), damage to organs used in balance (André et al. 2011), concussions in penguins (Cooper 1982), haemorrhaging (Evans et al. 2001) and decompression sickness (Fernández et al. 2005). Hearing impairment in the form of Temporary Threshold Shift (TTS) or Permanent Threshold Shift (PTS) has also been reported (Hildebrand 2005). Threshold shift refers to an increase in the minimum sound level required for an animal to hear a sound. A TTS is followed by successful recovery to normal hearing thresholds after a given period of time in the absence of that sound, while PTS is when the sensory hair cells in the inner ear are permanently damaged and lost making recovery impossible (Weilgart 2013).

Stress caused by disturbance is associated with a change in body chemistry (Jasny et al. 2005) and can be equally disruptive as physical damage. Stress has implications on sexual maturation, inhibits growth, reproduction and general survival ability (Pickering 1992; McCormick 1999; Consten et al. 2001). Perceptual effects can occur when there is an interference of sounds of interest to a specific animal but are being drowned out or masked by anthropogenic noise. The impact of this in the long term could have implications on breeding populations, thus on reproduction within a population (Erbe 2001). Many animals may have the ability to counteract this and make minor changes to their vocalisations and behaviour; however, these modifications may come at a cost in terms of energy expenditure (Tyack 2008) and are likely to reduce breeding productivity of the population. This is of particular concern for species that are threatened.

Behavioural responses to noise are dependent on various factors, such as age, sex, presence of offspring, location and an individual animals' previous encounter with a specific sound or noise. Behavioural responses may include modification of vocal behaviour, displacement from important habitats, and other subtle responses, including increased breathing rates, change in dive duration, time spent at the surface, rapid or erratic movements (Bowles et al. 1994; Lesage et al. 1999; Williams et al. 2002; Hastie et al. 2003; Ng and Leung 2003; Aguilar de Soto et al. 2006). These all with potentially high energetic costs (Williams et al. 2006; Koper and Plön 2012).

Most scientific research on the impacts of seismic surveys has been conducted on cetaceans, and as a result, most mitigation measures are to protect these animals. In South Africa, this is no different, despite the lack of regulations or guidelines specific to South African conditions. It is becoming more and more evident that mitigation measures are not adequate (Weilgart 2013). In the Gulf of Mexico, it was recorded that ~250 male fin whales appeared to stop singing for several weeks to months during a seismic survey. These animals resumed singing within hours or days after the survey ended (IWC 2007). The assumption is that male fin whales use vocalisations for reproduction by finding and attracting mates (Croll et al. 2002); it can only be assumed that such an effect would be biologically significant (Weilgart 2013). In addition to this, a blue whale ceased calling in the presence of a seismic survey at 10 km away (Macdonald et al. 1995). Conversely, a different group of blue whales appeared to have the opposite reaction. They changed their vocalisations (De Lorio et al. 2010) by calling consistently more on days when the seismic surveys were actively ongoing, suggesting that seismic survey noise interfered with important signals used in their social interactions and feeding (De Lorio et al. 2010).

Other reactions to seismic airguns can be subtle or hard to detect (Weilgart 2013) and it has been found that Sperm whales in the Gulf of Mexico did not appear to avoid a seismic airgun survey area but reduced their swimming effort and their tendency to reduce foraging effort (Miller et al. 2009). It has also been documented that as a result of changes in behaviour, the result could be lower reproductive rates and have negative consequences for the population (Miller et al. 2009). In comparison, bowhead whales showed no avoidance or change in vocalisations in the area of seismic surveys; however, their dive duration was shorter (Richardson et al. 1986). In Brazil, a reduction in cetacean species diversity during 2000 and 2001 was noted with the increased occurrence of seismic surveys in the area being implicated in the possible cause of these animals vacating the area (Parente et al. 2007). In other areas, marine mammals have been recorded to avoid seismic noise by leaving an area (Castellote et al. 2012; Weir 2008; Stone and Tasker 2006). The long-term impacts of various changes in behaviour are largely unknown but potentially impact their ability to feed and/or reproduce as in some species, these life-history stages are site or habitat-specific.

McEwen and Wingfield (2003) suggested that all organisms must gather energy for growth and reproduction throughout their life cycle and that organisms must retain reserves for predictable changes such as seasons, and challenges that are less predictable such as disturbance, predation pressure, or social conflict. Often colloquially, this is referred to as the "fitness" of the animal. The accumulated cost in the balance between energy intake and demand is called the 'allostatic load', of physiological and behavioural mechanisms that enable allostasis or adaptation to these changes. McEwen and Wingfield (2003) use the word "allostasis" to signify mechanisms that allow an organism to regain equilibrium while dealing with external challenges; if energy demand is more than intake, then animals may activate a survival mode that may increase energy available, reduce energy demand, or both, to regain its energy balance. Implications for individuals and populations of this energy imbalance are unknown.

Several studies have reported negative impacts of acoustic signals from airguns on zooplankton (small, aquatic microorganisms living in the water column, including crustaceans, larvae, juvenile fish, juvenile invertebrates, eggs etc.) from more than 10 m away (Kostyuchenko 1972; Kosheleva 1992; Parry et al. 2002) with some laboratory experiments on lobster larvae showing no impact at all (Day et al. 2016). However, Christian *et al.* (2003), showed retardation in some individuals in the development of snow crab eggs after being exposed to certain sound levels.

The effects of seismic noise on zooplankton were brought under the spotlight when McCauley et al. (2017) presented evidence from an *in-situ* study that suggested that seismic surveys cause significant mortality to zooplankton populations. Zooplankton, unlike vertebrates, do not have hearing structures (although they can sense pressure change) and their bodies are generally the same density as the surrounding water, so sudden pressure changes associated with seismic activities were presumed not to cause physical damage (Parry and Gason 2006). McCauley et al. (2017) disputed this and has shown zooplankton mortality at distances of up to 1.2 km from the sound source.

Similarly, inconsistent findings occur with fish assemblages. The impacts on fish assemblages are difficult to interpret because of multiple factors at play, including but not limited to the ability of a species to move from an area as well as the receiving habitat. We acknowledge the validity of the results presented by Meekan et al. (2021) which highlights that exposure to an experimental seismic source did not have an impact on the assemblage of tropical demersal fishes found along the northwest shelf of Western Australia. However, it must be noted that the findings have been stated to be applicable only to other habitats with similar physical environments, in particular similar water depths (50 – 70 m), highlighting the need for South African-specific and local research to be undertaken.

A global review of the effect of seismic activities on fish and invertebrates by Carroll et al. (2017) acknowledged the limits of the available research due to experimental design, or to the focus on single species which prevents extrapolation to other regions, other seismic surveys, species, or biological responses. In addition, they highlighted a serious concern, that there was a lack of research focused on confounding effects and multiple stressors, therefore potential impacts of seismic surveys which had previously been identified may be reflective of under-estimation or over-estimation and would depend on the type of interaction (i.e., synergistic, additive, or antagonistic).

Furthermore, the indirect effects of seismic activity on cetaceans are a concern. It is well known that the productivity and health of the oceans are under-pinned by marine plankton (Raymont 1983; Alcaraz & Calbet 2009). While forming the basis of the food webs, plankton has been implicated in links to climate change via their role in iron fertilisation and carbon sequestration through whales foraging on krill and subsequent defecation (Smetacek and Nicol 2005; Smetacek 2008; Nicol et al. 2010). In 2010, Pershing et al. suggested that over-fishing of large fish and commercial whaling had compromised the ocean's ability to store and sequester carbon, thus contributing to climate change. They indicated that populations of large baleen whales now store 9.1×106 tonnes less carbon than before commercial whaling and that protecting whales (and other large over-exploited species), would be a form of a carbon management scheme. The cascading and knock-on effects of seismic survey impacts between the upper (cetaceans) and lower reaches (plankton) of the food web, as each are being impacted are unknown. McCauley et al. (2017) noted that the ramifications of compromised larval recruitment could be massive for higher predators and for ocean health as a whole.

2. Seismic Surveys in the South African Context with impacts to protected and threatened species

Despite seismic surveys having been undertaken for decades in South African waters, together with the knowledge that some impact to marine fauna does indeed occur, there remains very little scientific research on the effects of seismic surveys, and in addition there are no legislated guidelines for seismic surveys in South African waters (Purdon 2018). Considering this, there are studies that have been done both locally and internationally that can be translated into the South African context. Most research is centred around the behavioural and physiological impacts of seismic surveys on cetaceans. However, in recent years, attention has been given to the impacts of seismic surveys on diving birds and sea turtles, in that, these animals can be directly affected by seismic survey gear and equipment or indirectly by affecting their prey distribution. These impacts of 2-D and 3-D seismic surveys on marine animals in the offshore waters are further discussed below.

<u>Birds</u>

In South Africa, only a single focused field study on the impact of seismic surveys has been undertaken. This study, off Gqeberha, was within the foraging area of the endangered, endemic African Penguin (*Spheniscus demersus*). Pichegru et al. (2017) demonstrated that penguins avoided their preferred foraging areas during seismic surveys and foraged further from the survey vessel when in operation. Upon termination of seismic surveys, the penguins reverted to their normal behaviour (Pichegru et al. 2017), a behaviour which was also observed in Gray whales (*Eschrichtius robustus*) off Sakhalin Island in Russia (IWC 2005). However, the long-term effects on populations of this temporary retreat of the area are unknown. Given the results of this study by Pichegru et al. (2017), strict management measures and decisions on seismic survey activities should have been established in South Africa. Furthermore, the cumulative effect of multiple, concurrent seismic surveys within the region may cause cumulative impacts.

<u>Sea turtles</u>

Significant impacts on sea turtle species are a concern. Adult turtles may be less vulnerable to sound damage than cetaceans as the air spaces in their cochlear are smaller than those in cetaceans, making them less sensitive to sound shockwaves (Popper et al. 2014). However, while studies have shown that adult sea turtles have a moderate ability to move from an area being surveyed (Lenhardt 1994; O'Hara and Wilcox 1990), they are prone to TTS after exposure to sound within 1 km of a sound source, with signs of recovery only two weeks after injury (Lenhardt 1994). In a study undertaken on captive turtles, it was found that loggerhead turtles (*Caretta caretta*) responded to sound by swimming to the surface and remaining there or staying slightly submerged (Lenhardt 1994), as this area, regarded as a sound shadow, and is hypothesised as being where sound waves cancel each other out and the noise is at a minimum. Cummings et al. (2004) disputed this saying that although near the surface, could be a place where animals take refuge, they are not in a 'zone of silence'. With an increasing exposure of sound levels, the behaviour of caged green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles increased their swimming speed, potentially showing agitation to sound (McCauley et al. 2000). Turtle behaviour is difficult to interpret (DeRuiter and Doukara 2012), given that some studies have reported that turtles do not display any signs of distress (Pendoley 1997).

There are five resident sea turtle species that migrate within South African waters: Endangered green turtles (*Chelonia mydas*); Critically Endangered hawksbills (*Eretmochelys imbricata*); regionally Near Threatened loggerheads (*Caretta caretta*); regionally Critically Endangered leatherbacks (*Dermochelys coriacea*); and vagrant Vulnerable olive ridleys (*Lepidochelys olivacea*) (Le Gouvello et al., 2024).

There is cause for concern of harm to these threatened species of sea turtles both at the population as well as the species level. Sea turtles employ nest site fidelity, essentially returning to the beach where they were born to lay eggs. In South Africa, the leatherback and loggerhead nesting trends have been monitored since 1965, within their rookeries in northern KwaZulu-Natal (KZN), giving clear indications of local population levels. Both species are already under significant pressure offshore including being caught as bycatch in fishing gear and having to contend with increasing plastic pollution. Current estimates of loggerhead turtles are low, with an estimated 801 and 615 adults nesting in the KZN rookery during the 2021/2022 and 2022/2023 seasons, respectively (Figure 1; Bachoo, 2022; Bachoo, 2024). Of more concern is the leatherback turtle, in which only 96 identified individual adults nested during the 2021/2022 season and declined to 46 individuals in 2022/2023 (Figure 2; Bachoo, 2022; Bachoo, 2024). Both populations have shown extremely slow recovery since conservation measures in South Africa were implemented, and further anthropogenic loss could, in our opinion, constitute irreparable harm.

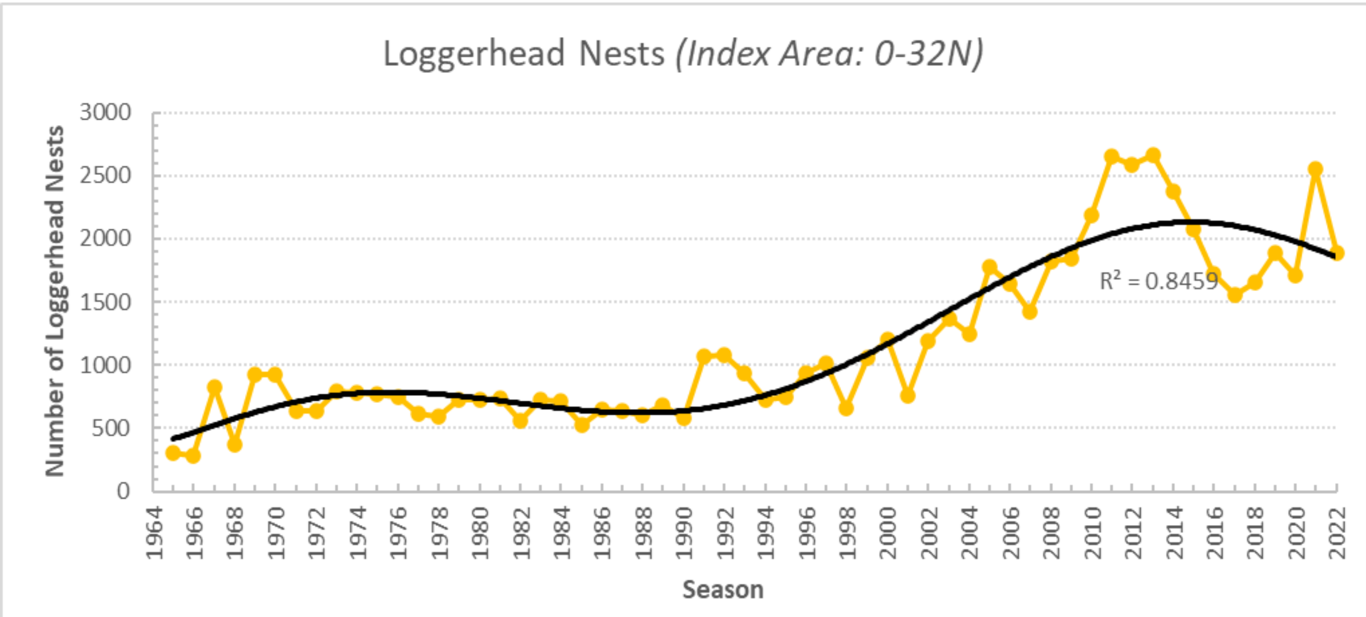

Figure 1. Number of loggerhead turtle nests in the index area (0 – 32 N) from the 1965/1966 nesting season to the 2019/2020 nesting season. From Bachoo (2022) and Bachoo (2024).

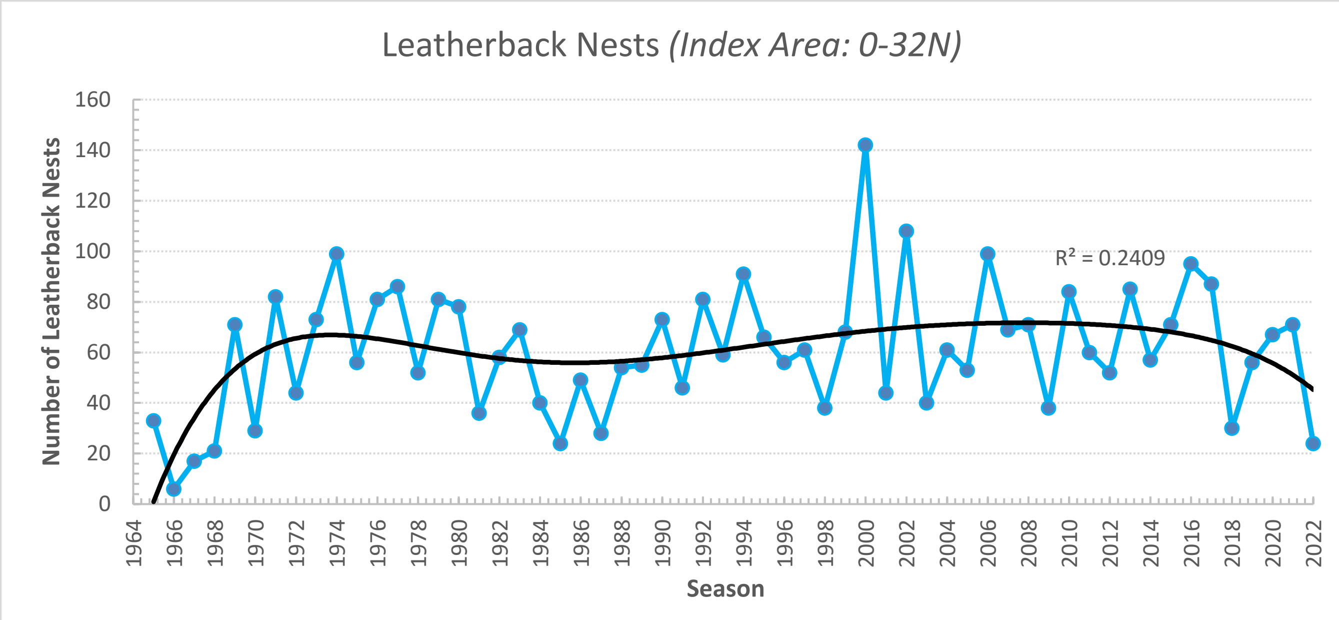

Figure 2. Number of leatherback turtle nests in the index area (0 – 32 N) from the 1965/1966 nesting season to the 2019/2020 nesting season. From Bachoo (2022) and Bachoo (2024).

The migratory lifestyle of sea turtles is mostly attributed to its complex life-cycle and their innate nature to return to their natal areas for nesting (Pendoley, 1997). Nesting of both leatherback and loggerhead turtles, on the beaches of the iSimangaliso Marine Protected Area (KwaZulu-Natal, South Africa) and Ponta do Ouro (southern Mozambique), occurs between October and March, with a peak from December to January (Table 1; Nel et al., 2013; Le Gouvello et al., 2020). Turtle hatchlings are likely to enter the ocean during the first quarter of the year, where they feed off plankton and remain in the open ocean currents until their development is complete (Luschi et al., 2003; Le Gouvello et al.,2024). It is almost impossible to track these 'tennis ball sized' hatchlings, in addition to their high mortality rates and rapid growth, further complicating the attachment of tracking devices. The result, is termed the "lost years", where it remains unclear where sea turtles <10 years old occur before returning to their shallow water foraging grounds (Musick and Limpus, 1997; Luschi et al., 2003). The movement of sea turtle hatchlings and early juveniles from coastal waters into the open pelagic ocean is strongly influenced by currents, which aid in moving them away from inshore predatory waters and prevents them from being cast higher ashore (Lucshi et al., 2003). The current systems serve as the optimal environment for hatchlings and juveniles where their passive dispersal movement is a consequence of drifting (Luschi et al., 2003).

A recent scientific investigation by Le Gouvello et al. (2024) employed modelling techniques to examine the trajectory of neonate (<1 year old) turtles from hatching to one years old, using high-resolution ocean models in conjunction with particle tracking simulations. Juvenile sea turtles, both loggerhead and leatherback, leaving the iSimangaliso Marine Protected Area and Ponta do Ouro, take approximately 200-365 days to reach the west coast region (Figure 3a & 3b; Le Gouvello et al., 2024). Considering the loggerhead and leatherback movements and duration from the east coast to the west coast, raises the question of whether this can be considered a migration behaviour (Luschi et al., 2003). This means that due to the annual introduction of new hatchlings between January and March, and their movement around the coastline from east to west, it is indicative of a high likelihood that juvenile sea turtles will occur throughout the year (Table 1; Figure 3a & 3b; Le Gouvello et al., 2024).

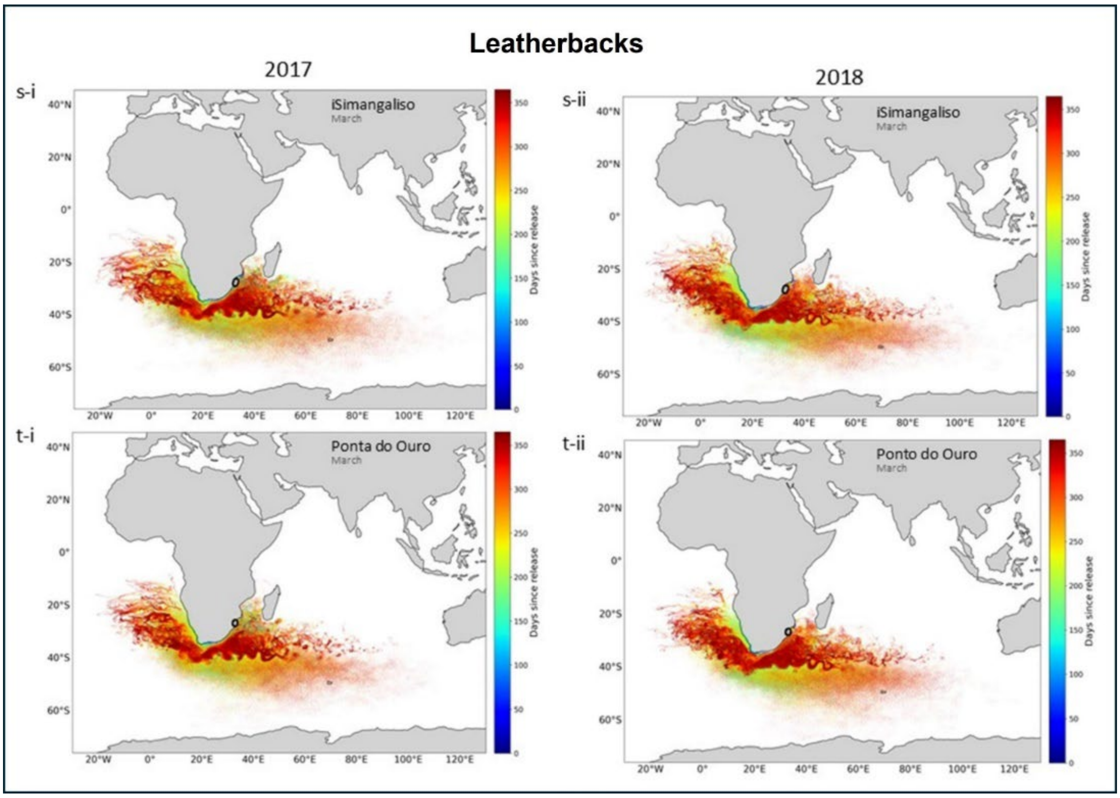

Figure 3a: Dispersal maps showing 12 month trajectories of 5000 particles released from the respective nesting sites (white circles) of leatherbacks in 2017 (-i) and 2018 (-ii) from two rookeries (iSimangaliso MPA and Ponta do Ouro). Colours (blue to red) indicate the number of days since release, and grey text gives the month of release. From Le Gouvello et al. 2024.

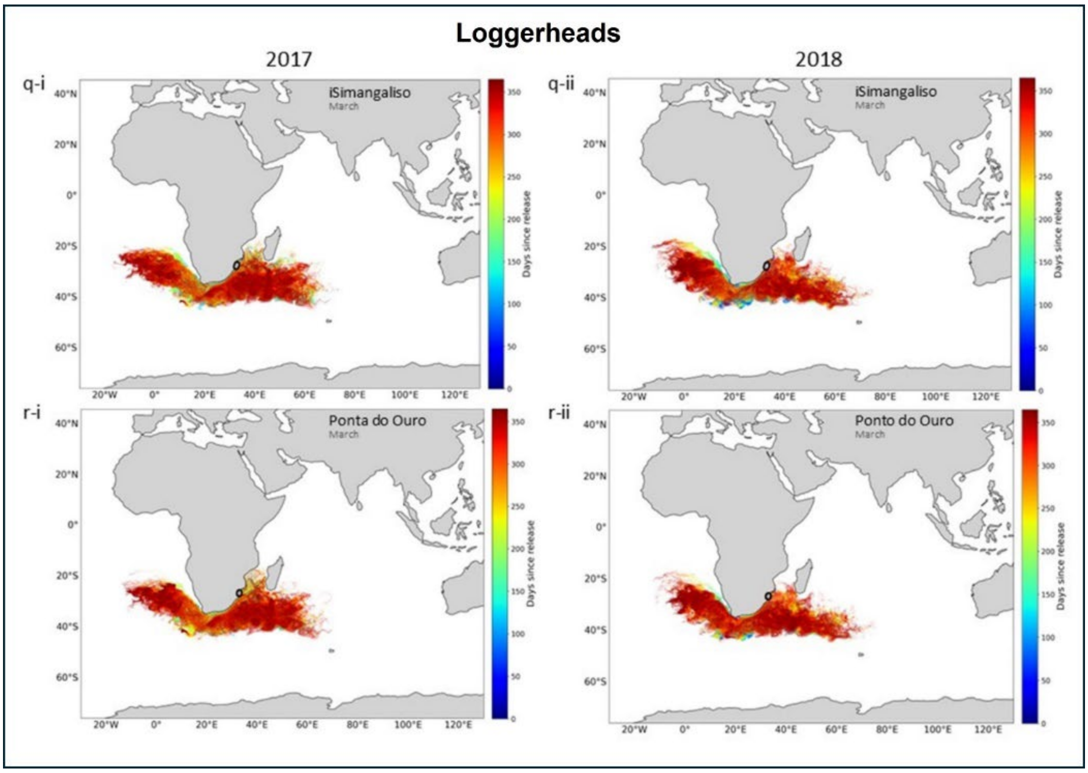

Figure 3b: Dispersal maps showing 12-month trajectories of 5000 particles released from the respective nesting sites (white circles) of loggerheads in 2017 (-i) and 2018 (-ii), from two rookeries (iSimangaliso MPA and Ponta do Ouro). Colours (blue to red) indicate the number of days since release, and grey text gives the month of release. From Le Gouvello et al. 2024.

Satellite tracking data of stranded, rehabilitated and released sea turtles of various species (loggerhead, green, olive ridley) and sizes (juvenile to sub-adult) further confirms their presence on the west coast year-round (Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Figure 4a, 4b, 4c). The routes of sea turtles from satellite tracking often show direct paths to their destination, but individual turtles may only arrive at their destination after a long detour, making their movements unpredictable.

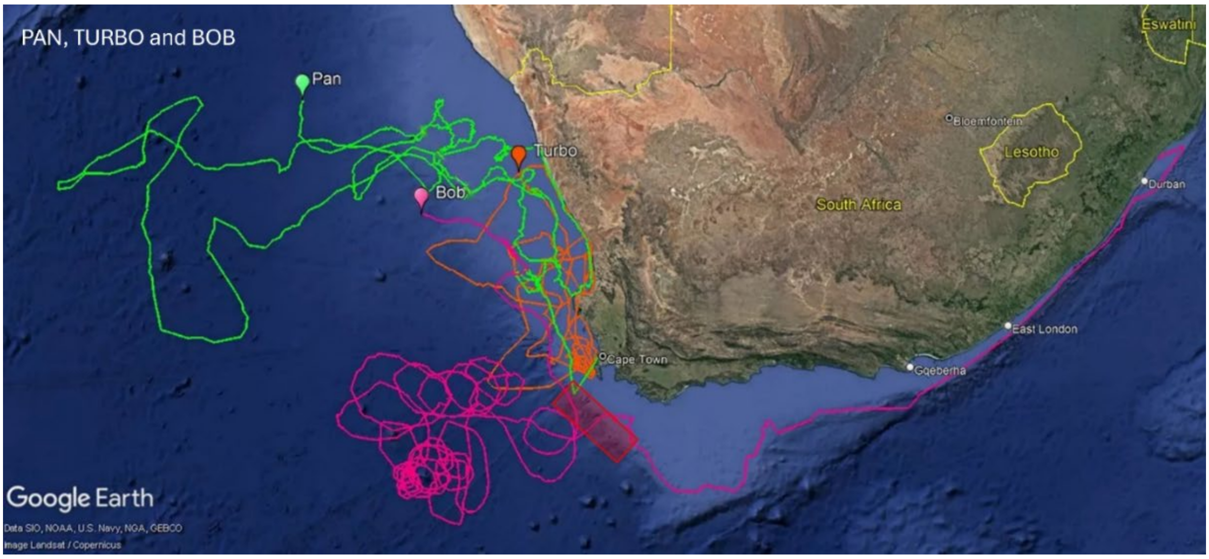

Figure 4a: Satellite tracks of three stranded, rehabilitated and released sea turtles (green and loggerhead), indicating overlap with AOI on the west coast of South Africa. Images from Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Talitha Noble-Trull, Pers. comm.).

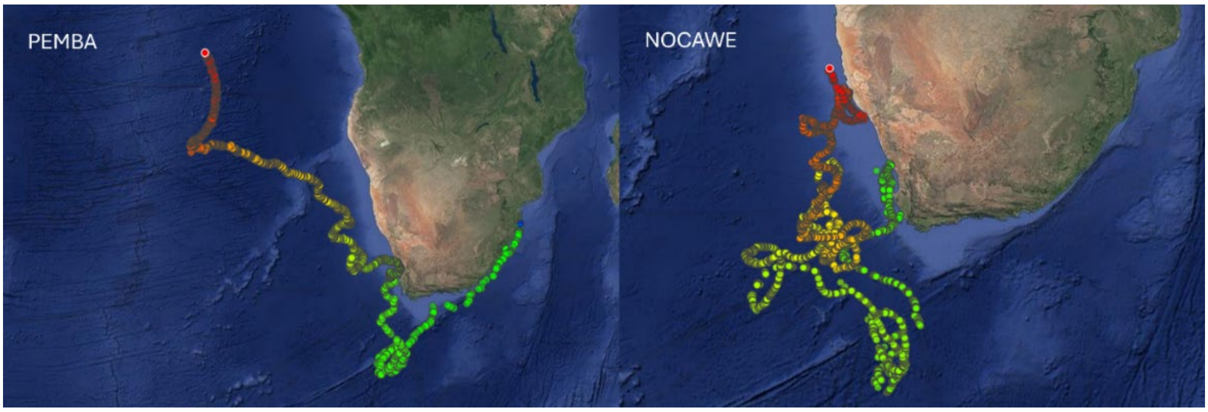

Figure 4b: Satellite tracks of two stranded, rehabilitated and released sea turtles (loggerhead and olive ridley), showing overlap with AOI. Images from Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Talitha Noble-Trull, Pers. comm.).

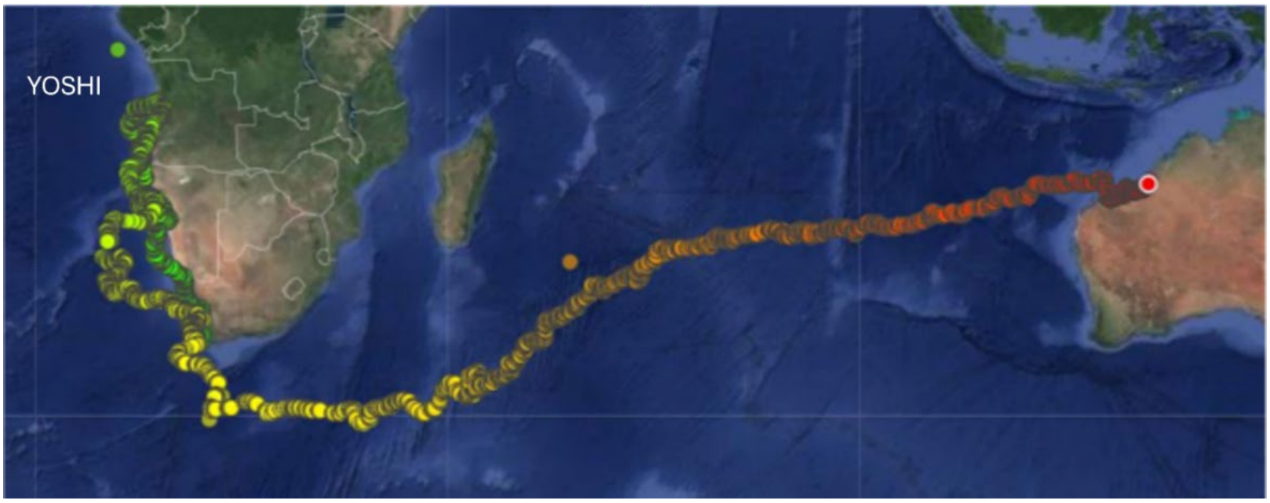

Figure 4c: Satellite tracks of one stranded, rehabilitated and released sea turtle (loggerhead), showing overlap with AOI. Images from Two Oceans Aquarium Foundation, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data; Talitha Noble-Trull, Pers. comm.).

The presence of sea turtles at different stages in their life history, are present throughout the year along the west coast and likely within the AOL (Table 1; Le Gouvello et al. 2024; Satellite tracking data, Bayworld, Port Elizabeth and South African Association for Marine Biological Research, unpublished data).

Table 1. Presence and location of sea turtles each month occurring on the southern African nesting beaches and in the area of interest (AOI) throughout the year based on local literature.

	J	F	M	A	M	J	J	A	S	O	N	D
Nesting period	Peak											Peak
Hatching period		Peak	Peak	Peak								
Presence of post-hatchling & immature sea turtles within the AOI (based on Le Gouvello et al. 2024)												

These sea turtles live out their early years on and close to the surface, only being able to dive to depths of 2-3 m. These juveniles and hatchlings cannot swim effectively or fast enough away if in close proximity to the sound source. Up to now, there are no effective mitigation measures which can be offered to mitigate the impact of sound/airgun blasts on the smaller turtles, and this is of extreme concern, not only due to their inability to evade the radius of blasts, but also since they will not be readily visible to visual observers due to their small size and behaviour in the water. Given that the success rate of visual observations by MMOs for large species such as humpback whales is only 44% of the time (Wilkinson, 2021), it renders this method of mitigation ineffective for smaller animals such as sea turtles, but especially for post-hatchling (palm-sized) and juvenile (dinner plate-sized) turtles. The difficulty in visually detecting these animals in the offshore environment is further corroborated by turtle researchers (Musick and Limpus 1997).

A further potential physical impact for sea turtles from seismic surveys is entanglement and/or entrapment in equipment (Nelms et al., 2016). It was noted by Weir et al. (2007) that off the west coast of Africa prior to the turtle nesting season, an influx of sea turtles are observed during seismic surveys, as well as in the vicinity of seismic vessels and its towed equipment (Ketos Ecology (2009). Turtles tend to bask on the ocean surface to slow down metabolic processes and conserve energy during hot and favourable weather conditions (Ketos Ecology, 2009). Therefore, turtle startle dive responses to seismic vessels and equipment may be delayed and occur only after visual detection of approaching objects at close range (< 1 m) (Ketos Ecology, 2009). This basking behaviour of turtles can leave them vulnerable to collisions with dilt floats and tail buoys, which are usually located several kilometres astern the ship and pose a challenge of observing and monitoring for turtle entrapments (Ketos Ecology, 2009). In addition, loggerhead, olive ridley and Kemp's ridley (*Lepidochelys kempii*) are likely species falling victim to tail buoy entrapments while foraging alongside a seismic cable, inevitably causing the fatality of trapped turtles (Ketos Ecology, 2009).

Their presence, coupled with an inability to mitigate the risk of seismic surveys on sea turtles, means that post-hatchling and juvenile sea turtles are at significant risk of harm. Furthermore, with their limited ability to swim and avoid obstacles, pelagic loggerhead and leatherback juvenile turtles are highly vulnerable to seismic surveys because of direct injury or mortality from the towed hydrophone streamers (Le Gouvello et al., 2024). In 2020, Le Gouvello et al. reported that female loggerhead turtle size is declining in South Africa, even though their nesting grounds are protected. Therefore, population growth is not always guaranteed if survival is not ensured at other life stages at sea (Crouse et al. 1987; Crowder et al. 1994; Chaloupka and Limpus 2001; Bjorndal et al. 2005; Margaritoulis 2005; Mazaris et al. 2006), and although coastal marine protected areas do work in protecting sea turtles (Nel et al., 2013; Le Gouvello et al., 2020) there is a need for integrated management strategies (Le Gouvello et al., 2020), to protect threatened species.

Cetaceans

The BAR highlights that occurrences and encounters with various cetacean species are inevitable, all of which are protected in South African waters. Information supplied on cetaceans is largely based on observational data, i.e. Marine Mammal Observer (MMO) surveys (Figures 31, pg 83; Basic Assessment Report). These data are somewhat outdated and do not account for the population dynamics of the cetaceans present in the reconnaissance area or area of interest (AOI). To understand the risk of seismic surveys on cetaceans, the population status of species of concern needs to be established. This requires many years of research and depends on the temporal trends for each marine mammal species (Nowacek et al., 2015) specific to the AOI. Considering this, developing other metrics for cetacean population status, such as current distribution, ranging patterns, population structure, and body condition, should be a priority (Nowacek et al., 2015). Furthermore, without a proper understanding of the ecosystem within and surrounding the AOI, as highlighted in the BAR, it is impossible to assess the impacts of seismic noise on prey distribution, which ultimately influences the predator populations and distributions, such as with cetaceans (Nowacek et al., 2015).

Behavioural responses to noise are dependent on various factors, such as age, sex, presence of offspring, location and an individual animals' previous encounter with a specific sound or noise. Behavioural responses may include modification of vocal behaviour, displacement from important habitats, and other subtle responses, including increased breathing rates, change in dive duration, time spent at the surface, and rapid or erratic movements (Bowles et al. 1994; Lesage et al. 1999; Williams et al. 2002; Ng and Leung 2003; Aguilar de Soto et al. 2006). These all with potentially high energetic costs (Williams et al. 2006; Koper and Plön 2012). The time period, frequency and magnitude of a behaviour modification caused by anthropogenic disturbance, with its associated long-term implications, at a population level, remains unknown, and there remains no evidence to suggest that the change in behaviour is not detrimental.

Although, high-frequency hearing cetacean groups containing delphinid species (e.g., bottlenose dolphin, common dolphin, and pilot whale, beaked whales, sperm whales, and killer whales), are perceived to be less likely to be affected by seismic noise (Southall et al., 2019), despite the physiological effects on deep-diving toothed whales having been noted. A well-documented physiological effect of deep diving toothed whales to anthropogenic noise is the formation of nitrogen gas bubbles in the bloodstream, which are caused by these animals rising to the surface too quickly, forming lesions and fat embolisms in the blood vessels and parenchyma of vital organs (Purdon 2021; Peng et al. 2015). Similarly, bottlenose dolphins (*Tursiops truncates*), exposed to seismic airgun noise (*44–207 kPa or 213–226 dB re 1 μPa peak pressure*) presented with a significant increase in aldosterone, subsequently affecting the maintenance of homeostasis and physiological acclimation to external stressors, whereas a decrease in monocytes can impact the immunity of the animal (Hart et al., 2015; Peng et al., 2015). The stress response of marine mammals to anthropogenic noise at great depths can have consequential effects, such as strandings and death when they rise too fast to the surface (Purdon 2021).

South Africa's south and west coasts are hosts to eight species of beaked whales (Ziphiidae) (Best 2007). In 2021, a new species, called Ramari's beaked whale, *Mesoplodon eueu* was described (Carroll et al 2021). This eighth species of whale and its significance (deep diving) was omitted from the BAR. This family of whales are globally recognised as being sensitive to anthropogenic noise and having raised conservation concerns. New et al. (2013) found that adult female beaked whales could survive but not reproduce in times or areas of lower habitat quality. They may extend the duration of lactation in mediocre conditions to increase their chance of survival, while still reproducing. New et al. (2013) found that some beaked whale species require high-quality habitat to meet their requirements for reproduction and survival. They suggested that even minor, non-lethal disturbances resulting in changes in behaviour, such as displacement from preferred habitats and stress (discussed above), could impact a population.

Barendse et al. (2010), Best & Allison (2010), and Elwen et al. (2014) highlighted that there is no existing evidence of a clear 'corridor' of migration of whales and humpback whales appear to be spread out widely across the shelf and into deeper pelagic waters, especially during the southward migration, in the Benguela ecosystem. Despite various species being recorded frequently on the coasts and within the Exclusive Economic Zone, the location of breeding grounds of Sei (*Balaenoptera borealis*) and Fin whales (*Balaenoptera physalus*) are <u>unknown</u>, the seasonality of pygmy (*Kogia breviceps*) and dwarf (*Kogia sima*) sperm whales are <u>unknown</u> and the abundance and occurrence of the offshore common dolphin (*Delphinus delphis*) is also <u>unknown</u>, highlighting that encounters with these animals cannot be predicted and the generic mitigation measures may be insufficient.

In 2020, Vermeulen et al. warned that there is an observed decrease in Southern Right Whale calving success (i.e. low numbers of unaccompanied adults) of the South African population, with a strong link to foraging success (Vermeulen et al. 2023). It was highlighted that reduced maternal body condition, could contribute to a decreased reproductive rate and potentially have serious consequences for cow-calf pairs in relation to South Africa's whale-watching industry in the future. Germishuizen (2024) and Vermeulen et al. (2023) show that Southern Right Whales are responding to changing climate conditions by modifying foraging behaviours within their high-latitude foraging grounds. These adaptive strategies, which include altering migratory behaviours, are associated with energetic costs (Vermeulen et al. 2023). The consequences of these changes in energetic costs, at a population level, remain <u>unknown</u>.

3. Ineffectiveness of Mitigation measures

Given the myriad of ‘unknowns’ in terms of the presence of and impacts on threatened species as outlined above, encounters with these animals are inevitable and generic mitigation measures as proposed in the BAR may be insufficient, not to mention that the survey window which is identified as January to May conflicts with the BAR’s own findings, where the survey would occur during the peak abundances for many baleen species including Bryde's Whales, Pygmy Right Whales, Humpback Whales, and Southern right whales.

Notwithstanding the above, the ability of an MMO to detect all animals, at all times is problematic in the context of the BAR. During the 2018 and 2019 humpback whale (*Megaptera novaeangliae*) migration period along the east coast of South Africa, Wilkinson (2021) estimated the relative abundance of migrating humpback whales sighted by trained observers from two towers located 22m apart (both observers viewing the same area), located at 70m above sea level on a dune with a horizontal vantage length of approximately 20 km. Over the observation periods during the peak of migration, it was estimated that observers from both towers missed between 41-44% of whale groups while distance offshore decreased the probability of sightings. If the best percentage sighting (56%) was achieved within 1-5km of the observers' vantage point, then more than 40% of whales were missed. Given that this survey was done during the northward migration when mostly larger animals are present, the sighting success may be less when small calves are present as well. This begs the question of the efficacy and reliability of the mitigation method of Marine Mammal Observers (MMO), while assuming that whales (and other cetaceans) are thus regularly missed by MMOs and could be harmed.

Furthermore, bearing in mind the examples above, i.e., blue and fin whales ceasing to sing, the use of Passive Acoustic Monitoring (PAM) technology to detect cetaceans is baseless if cetaceans do not vocalise. This approach can promote availability bias which is when an animal is present but goes undetected because it was not producing detectable cues (Verfuss et al., 2018). For example, deep-diving cetaceans that are silent and cannot be seen by MMOs and/or detected by PAM operators, become vulnerable to availability bias (Verfuss et al., 2018). This availability bias is particularly concerning for deep-diving cetaceans because the BAR indicates that “*the survey area would largely be in waters deeper than 1 000 m where sperm whales and other deep-diving odontocetes are likely to be encountered…”*.

As per best practice, in an effort to improve mitigation, PAM technology is complemented by visual searching over an area of 500m around the vessel by qualified Marine Mammal Observers (MMO). However, this technique is also flawed because it has been noted that rough seas and breaking waves form visual impairments above the water, as well as underwater noise (Verfuss et al., 2018). Rain can affect visual detection and mask underwater cues or signals from marine mammals due to increased background noise (Verfuss et al., 2018). This type of underwater “noise” is a type of sound for the receiver that interferes with the detection of other sounds of interest. The opposite of noise is a “signal”, i.e., a sound that contains some useful or desirable information” (Harding and Cousins, 2022). However, species have the natural ability to cope with natural ‘noise’, while anthropogenic ‘noise’ refers to sound that has a negative impact on marine animals, which causes a change in animal behaviour and/or physiology, as a result of the animal attempting to cope with that ‘noise’.

While the BAR describes that there should be “*provision for placing at least one qualified PAM operator on board the seismic vessel”*, there is a concern of coverage for the full duration of the survey. Implementing only one MMO and PAM operator on duty highly compromises the detection of marine mammals and other animals in the vicinity of the seismic survey. This can further influence perception bias whereby animals are present for detection, but the detection system fails to detect either the visual or vocal cue of the animal (Verfuss et al., 2018). For instance, an animal may go visually undetected because of poor weather conditions, or the observer is looking in another direction or simply just fails to notice the animal for any given reason (Verfuss et al., 2018).

In addition, PAM systems were not designed to detect the vocalizations of non-mammal marine animals (Harding and Cousins, 2022).
Furthermore, the effectiveness of MMOs in detecting marine mammals and other animals is further compromised by their narrow field of view and limited attention span which renders this method personnel-intensive and challenging, even during the day with fair weather conditions (Wright and Robertson, 2015). It is simply assumed that this method of MMOs and PAM works because it is generally accepted as a mitigation measure (Wright et al., 2016). There is not much in terms of detail or standards given for the selection of the MMO, i.e. their level of experience in marine mammal detection (Wright et al., 2016), and while experience is important, it does not necessarily translate into being effective (Wright et al., 2016). Together with no monitoring standards stipulated for the MMO, such as the position of the observer on the ship, available distractions (e.g. cellphone), duration of shift or shift changes, and comparison of performance between MMOs, if there is more than one on a vessel (Wright and Robertson, 2015). It has been noted that regular shift changes are necessary for maintaining MMO alertness, however, this cannot be achieved with only a single MMO on board (Wright and Robertson, 2015). Therefore, both PAM and MMO's are insufficient to detect, with certainty, cetaceans within the surrounding survey area. These types of mitigation could only be effective for all affected species if airgun firing ceases between sunset and sunrise, and in adverse weather conditions that limit visibility.

CONCLUSION
The cumulative and long-term effects of seismic survey sound are not entirely understood (Jasny et al. 2005); however, it is accepted that ocean noise may have ecosystem-scale effects (Hildebrand, 2005) and the "knock-on" effects on animals, their prey and their predators will have consequences within the food chain (Koper and Plön 2012).

For the reasons outlined above, it is our opinion that the proposed seismic surveys for reconnaissance pose an unacceptable ecological risk to the marine ecosystems and species in South African waters. In point 3.2 of the EA, seismic surveys are described as "*generally regarded as non-intrusive in nature",* and although states that *"the technology poses potential impacts on fisheries and marine fauna,...the majority of the impacts were assessed to range between low to very low significance with mitigation".* In our opinion, the acute anthropogenic noise over a prolonged period of time, and the extensive survey gear in the water is an ecological risk to threatened and protected marine fauna that primarily use sound to survive and/or are unable to avoid the area of impact. We therefore disagree with the finding of the BAR and Reasons for Decision in the EA, that seismic surveys are regarded as 'non-intrusive', especially when the report clearly acknowledges the presence of impacts, before assessing their significance as low despite the impacts being largely unknown. Therefore, it is our view that the Environmental Authorisation should be set aside.

All documentation pertaining to this Appeal can be downloaded from the following link:
https://drive.google.com/drive/folders/1tyhwhtI8A63Jv7Ua4_hItfbM-7LcCO94?usp=drive_link

Yours sincerely,

Dr Jean Harris
Strategic Lead WILDOCEANS
WILDTRUST

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IN THE HIGH COURT OF SOUTH AFRICA
(WESTERN CAPE DIVISION, CAPE TOWN)

Case No: ______/___

In the matter between:

CHRISTIAN ADAMS AND OTHERS Applicants

And

MINISTER OF MINERAL RESOURCES AND ENERGY Respondents

EXPERT AFFIDAVIT

I, the undersigned,

LYNNE JANE SHANNON

do hereby make oath and say:-

1. I am an adult female fisheries scientists and Principal Researcher in the Department of Biological Sciences at the University of Cape Town.

2. The facts contained in this affidavit are within my personal knowledge, except where the context indicates otherwise, and are to the best of my belief both true and correct.

3. I have prepared the report annexed hereto marked "**LS1".**

4. My qualifications and experience are set out in a copy of my *curriculum vitae,* attached to this affidavit marked “**LS2**”. I respectfully submit that I am qualified by my qualifications, training and experience to express the expert opinions which are set out in the report referred to above.

5. I further confirm that the report is to the best of my knowledge and belief true and correct.

____

LYNNE JANE SHANNON

I hereby certify that the deponent has acknowledged that she:

(a) knows and understands the contents of this affidavit;

(b) has no objection to taking the oath;

(c) considers the oath to be binding on her conscience.

Thus signed and sworn to before me, at on **January 2022**.

____

COMMISSIONER OF OATHS

NAME:

CAPACITY:

ADDRESS:

AREA:

Short ecosystem-based commentary by Lynne Shannon, Principal Researcher, Department of Biological Sciences, University of Cape Town.

This short commentary serves as an addition to species-specific concerns already discussed in the SLR report and detailed in the scientific literature. Here I highlight the role of diverse species in the overall functioning of South Africa's marine ecosystems, to provide a broader context within which any proposals to undertake seismic surveys off our coast should be considered.

The marine ecosystem off the west coast of South Africa is a unique and highly productive one. It includes the southern sub-system of the Benguela Upwelling ecosystem, which is one of the World's four eastern boundary upwelling systems. Upwelling systems, although covering less than 1% of the World's ocean area, notably support about one fifth of the world's marine fish catches.

The Southern Benguela marine ecosystem is characterized by a complex food web that is supported by high upwelling intensity in the area. The ecosystem is a strongly dynamic one, driven by internal predator-prey interactions[1] and heavily influenced by environmental variability (Shannon et al. 2020) as well as anthropogenic pressures such as those arising from fishing, shipping, land-based activities, amongst others (Sink et al. 2019).

As already noted in the SLR report, seismic surveys are known to have notable impacts on several marine species; explosions such as those during seismic surveys cause tissue damage, hearing loss, stress, detrimental effects on growth and reproduction arising from behavioural and physiological impacts that compromise foraging and/or spawning/reproduction, migration and communication among individuals.

One notable specific example is the Endangered African penguin that frequents the west coast of South Africa. African penguins have been shown to suffer disrupted foraging (penguins avoid their usual foraging areas) within a 100km radius of seismic survey activity (Pichegru et al. 2017). Although the birds return to their favoured foraging areas once seismic activities cease, the longer-term impacts on the birds (their stress levels, behaviour and implications of increased foraging effort required to fulfil nutritional requirements, and ultimately the influence these factors have on breeding success and survival) is not known. Thus, there is potential for seismic surveys to have large implications for the population of the already Endangered African Penguin.

Similarly, alarmingly little is known as to the direct or indirect effects of seismic activity on species of turtle (e.g. Near-threatened/endangered loggerhead turtles), whales (e.g. Humpback whales), dolphins (e.g. dusky dolphins), seals (Cape fur seal) and elasmobranchs (e.g. demersal elasmobranchs) off the South African west coast in terms of the long-term effects of seismic activity on their migration, reproduction, nursery areas, feeding and communication. These are all long-lived, slow reproducing species that play important stabilizing roles in our marine ecosystem, especially through predation. Predators play a vital role in balancing and structuring food webs, maintaining their functioning and productivity. Should any/all of the aforementioned predators be severely affected through seismic activity, the marine ecosystem off western South Africa is at risk of suffering trophic cascades and possible collapse. Trophic cascades are widely recognized as occurring when the effects of altered abundance or foraging activity of one or more predatory species are felt across multiple parts of a food web (e.g. Ripple et al. 2016).

[1]For example, small pelagic fish such as anchovy and sardine form the crux of the food web, exerting both top-down and bottom-up pressures (controls) on their planktonic prey and their fish, mammal and bird predators (Cury et al. 2000).

A further consideration, should disruption of marine animals' migratory pathways result from seismic surveying, is disruption of the nutrient balance in our marine ecosystems – for example, defaecation by humpback whales, which feed on euphausids off the west coast, plays an important role in nutrient input to the marine environment. Driving whales away from frequented areas may change nutrient flux in these zones, with possible ecosystem repercussions.

Large pelagic fish such as tuna and snoek, closely follow the distribution of their prey e.g. smaller pelagic fish. Some predatory fish are known for benefitting other predators by "herding" their prey. This behaviour has also been observed in African penguins (McInnes and Pistorius 2019), where sardine have been driven from depths exceeding 30m towards the surface of the ocean, simultaneously making these fish readily accessible to volant seabirds such as gulls and terns. Cetaceans are also well known for cooperative feeding, whereby a pod of dolphins work together to herd fish into "bait balls" to facilitate successful hunting; an example is common dolphin herding sardine off South Africa, with benefit to the Vulnerable Cape gannet, for example. These kinds of foraging behaviours can extend across multiple species and parts of the food web, and are at risk of being interrupted/negatively impacted by seismic activity off the west coast.

Little is known about the differential impacts of seismic activity on young or smaller fish/turtles/cetaceans, which may be even more susceptible to physiological damage of such activity than their larger/adult counterparts. Should this be the case, recruitment of young fish to sustain adult fish populations, as well as a possible shift in size-structure of fish communities, could result, with knock-on effects through the food web. These would have implications for fisheries in terms of size and species structure of fish assemblages, abundances and availability (distribution in/off-shore, alongshore, vertically).

A further concern is the additional pressures that seismic surveys will add to an already stressed ecosystem. Noise, vibrations, possible oiling etc. need to be viewed in the context of cumulative (and often jointly worsened) impacts of anthropogenic activities in our marine ecosystems (Skern-Mauritzen et al. 2021). Fishing, shipping, land-based activities (pollution, change in bay circulation etc.), and now seismic activities, will all act together to impact our marine biodiversity and ecosystem functioning, thereby influencing the services and contributions of nature to people (Brauman et al. 2020). These impacts will likely be compounded to exacerbate negative impacts of ecosystems and human well-being, and will be further exacerbated under climate change (Diaz et al. 2019).

In summary, noise and vibrations from the spatially and temporally extensive seismic surveys proposed, can have notable and widespread direct and indirect impacts on individuals, species, animal communities and thus the food web as a whole. Although several of the species of concern may be largely located inshore or in marine protected areas, may mostly frequent the west coast designated zones in months other than those currently earmarked for surveys, or may reside in ecosystem types that are not (yet) classified as "high risk", we do not know the distances across which fish, turtles, and marine mammals may be affected, nor what the indirect ecosystem effects are likely to be. We also do not know how the addition of a new pressure in the form of seismic activity on the west coast may alter current risk status of an ecosystem type. We do however know that the effects of seismic activity have been recorded to extend up to 100km from the source in the case of African penguins (Pichegru et al. 2017). We also know that numerous marine species elsewhere in the world have been shown to be negatively impacted by seismic activity (Weilgart 2013). And we know and appreciate that species comprise diverse assemblages that determine how ecosystems function; we cannot rule out possible significant detrimental effects on our marine species and the ecosystems to which they belong. Upsetting even one connection in the food web has repercussions for other linkages and the overall ecosystem functioning – which in turn has implications for multiple fisheries in terms of what the ecosystem may be able to support in terms of catches, and where. Disruption of spatial-temporal patterns in predator-prey interactions in our marine ecosystem puts at risk fishing sectors and human communities that rely on availability of fish off our west coast.

All in all, the above considerations underline the uncertainty and poor knowledge as to the extent of species-level AND ecosystem-level impacts of proposed seismic activity off our coast, stressing that a precautionary approach (see Shannon et al. 2020b for details) is appropriate. The UN Fish Stocks Agreement (Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks) states that the absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures. International guidelines and best practice, such as that adopted by Canada, states "in circumstances where there is potential for imminent harm, it may be appropriate to make decisions and implement precautionary measures in the near term". In the light of species-level effects noted above, in the literature and discussed in the SLR report, and given the uncertainty that bounds potential ecosystem-level impacts, I strongly urge decision-makers to act with the appropriate level of precaution in this instance.

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LS2

LYNNE JANE SHANNON

Updated: January 2022

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Lynne.Shannon@uct.ac.za

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http://www.eafsa.uct.ac.za/lynne-shannon-dr-0

Lynne Shannon is a Fisheries Scientist specialized in ecosystem-based management, with expertise in ecosystem modelling and the use of ecological indicators as a means of addressing ecosystem considerations in exploited marine ecosystems. She holds the position of Principal Researcher (Professor level) in the Department of Biological Sciences at the University of Cape Town, South Africa.

Lynne has twenty-two years' experience undertaking ecological research and modelling to contribute to ecosystem-based management, and seventeen years of postgraduate student supervision. She has constructed trophic models in the Benguela to provide an understanding of structure and functioning and changes in the marine food webs. Her work aims to facilitate pragmatic ways in which ecosystem considerations might be incorporated into fisheries management, especially the use of ecological indicators. To undertake the supporting scientific work required for implementation of the EAF in South Africa, she has established an extensive, functional network of collaboration with ecosystem and fisheries scientists from around the world. This facilitates useful comparative studies and collaborative projects that are beneficial for the development of capacity within South Africa. Lynne is co-chair the international working group "IndiSeas" (www.indiseas.org), evaluating effects of fishing and natural variability on marine ecosystems using suites of ecological, environmental, biodiversity and human dimension indicators in comparative approach. She is currently leading case studies in two All Atlantic Alliance (Horizon 2020) projects, viz. "Triatlas" and "Mission Atlantic", the South African ecosystem modelling group of the "One Ocean Hub" project and a work package in the Belmont "EXEBUS" project. She has published 150 papers (38 of which are first authored) in peer-reviewed journals, has presented over 30 first-authored papers at scientific meetings/conferences, and is a rated researcher of the South African National Research Foundation (NRF).

RECENT/CURRENT PROFESSIONAL MEMBERSHIPS

- Co-chair of the IndiSeas (Indicators for the Seas) EUROCEANS/IOC/UNESCO WG on Comparative Ecosystem Indicators for Fisheries Management, 2010 onwards, ongoing.
- South African Representative to ICSU-SCOR (Scientific Commission on Oceanic Research of the International Council for Science, www.scor-int.org), 2005-2015
- Co-lead of the SARChI Marine Ecology and Fisheries Group at UCT, 2009 onwards.
- Acting Director of the Marine Research Institute (MA-RE) of the University of Cape Town – 2015-2016

- Member of the Scientific Advisory Board of the Nordic Centre of Excellence for Research on Marine Ecosystems and Resources under Climate Change (NorMER project, a Nordic Centre of Excellence), 2011-2016.
- Served as Member of the international scientific council of LabexMER, a cluster of excellence in Brittany, France, funded for 9 years within the framework of the French strategic programme "Investment for the Future", July 2012-2016.
- Invited member of the Future Earth Natural Assets Knowledge Action Network advisory panel: 2017-2018 (https://futureearth.org/networks/knowledge-action-networks/natural-assets/)
- Co-chair of Scientific Steering Committee of the Global Research Project (under Future Earth) bioDISCOVERY: 2017 onwards, ongoing.
- A lead author of Chapter 2 (Nature's Contribution to People) of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services IPBES Global Assessment 2016-2019 (www.ipbes.net)
- Member of the Scientific Steering Committee of the IMBeR Programme (https://imber.info/), active from 2022
- Scientific Steering Committee member for the World Biodiversity Forum (2020 and 2022)
- Steering Committee member for the 5th Conference on Effects of Climate Change on World Oceans to be held in 2023.

STUDENT SUPERVISION

Supervised the following completed student degrees: completed student degrees: 3 Honours;5 Masters, 6 PhD students, 5 two-year post docs}; currently supervising one masters student, two PhD students and a post doc (2021).

EDITORIAL AND REFEREE ACTIVITIES

- Reviewed 80 manuscripts for peer-reviewed scientific journals and have reviewed 20 national/international scientific programmes/projects.
- Guest editor of four published journal volumes/special issues
- Serve on Editorial boards of Editorial Board of the African Journal of Marine Science (2007 onwards) and Fisheries Oceanography (September 2015 onwards); was an Associate Editor of Animal Conservation (August 2015-December 2018); Guest Editor of new Special Issue in Frontiers in Marine Science, 2022

IN THE HIGH COURT OF SOUTH AFRICA
(WESTERN CAPE DIVISION, CAPE TOWN)

Case No: ______/___

In the matter between:

CHRISTIAN ADAMS AND OTHERS Applicants

And

MINISTER OF MINERAL RESOURCES AND ENERGY Respondents

EXPERT AFFIDAVIT

I, the undersigned,

COLEEN L MOLONEY

do hereby make oath and say:-

1. I am an adult female marine ecologist and Associate Professor at the Department of Biological Sciences at the University of Cape Town.

2. The facts contained in this affidavit are within my personal knowledge, except where the context indicates otherwise, and are to the best of my belief both true and correct.

3. I have prepared the report annexed hereto marked "**CM1**".

S.J.L.

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4. My qualifications and experience are set out in a copy of my *curriculum vitae,* attached to this affidavit marked "**CM2**". As appears there, my research interest is the study of marine ecosystems off the coasts of southern Africa; the use of models to study and understand marine populations, food webs and ecosystems; the roles of microbes in energy transfer and nutrient cycling; the responses of marine ecosystems to global change.

5. I respectfully submit that I am qualified by my qualifications, training and experience to express the expert opinions which are set out in the report referred to above.

6. I further confirm that the report is to the best of my knowledge and belief true and correct.

CM Moloney

COLEEN MOLONEY

I hereby certify that the deponent has acknowledged that she:

(a) knows and understands the contents of this affidavit;

(b) has no objection to taking the oath;

(c) considers the oath to be binding on her conscience.

Thus signed and sworn to before me, at MUIZENBERG on 19 **January 2022**.

S. J. L.

CM

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CST.
SJ.LENGISI

COMMISSIONER OF OATHS

NAME: LENGISI

CAPACITY: Constable

ADDRESS: 7 school street Muizenberg.

AREA: MUIZENBERG

SUID-AFRIKAANSE POLISIEDIENS
COMMUNITY SERVICE CENTRE
MUIZENBERG
19 JAN 2022
COMMUNITY SERVICE CENTRE
MUIZENBERG
SOUTH AFRICAN POLICE SERVICE

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CM1

Potential impacts of seismic surveys on zooplankton

Coleen L. Moloney
Department of Biological Sciences, University of Cape Town

I am a marine ecologist with expertise in marine ecosystems, particularly the living organisms that comprise the low trophic levels in marine food webs. Much of my research has focused on the ecosystem off the west coast of South Africa, which is one of the world's most productive marine environments. This region is fertilised on a large scale and an almost continuous basis by the transport of water rich in nutrients (e.g. nitrogen and phosphorous) from depth to the well-lit surface waters where photosynthesis can occur. This results in a proliferation of microscopic phytoplankton (photosynthetic organisms) and small zooplankton, which feed on phytoplankton and which themselves are food for fishes. The west coast thus has several nursery grounds for fishes, including species that are commercially exploited and non-commercial species. The large abundances of fishes, large crustacean zooplankton and squids also support top predator populations, such as seabirds and marine mammals.

I will concentrate in this short report on zooplankton. This group contains representatives of almost all marine groups and comprises life stages from eggs to adults. Among the species that have young stages (eggs, larvae and juveniles) as part of the zooplankton are numerous commercially-important fishes, squids, rock lobsters, mussels, abalone, etc. Zooplankton are small animals (typically less than 2 cm in length) and are key prey items for the abundant shoaling fish species on the west coast of South Africa (mainly sardine, anchovy and redeye round herring) and also for larvae and juveniles of most fishes. They are the reason the west coast contains important fish nursery grounds, which are areas where juvenile fish grow into adults. Thus, impacts on the zooplankton can propagate to other groups either by direct mortality of juveniles of different species, thus reducing future adult populations, or by influencing food sources, thus reducing productivity of juvenile and adult fishes.

Seismic impacts on zooplankton

There is limited information worldwide on the impacts of seismic surveys on plankton and, to my knowledge, none off southern Africa. Based on existing observations, it has been suggested that acoustic waves primarily cause damage to zooplankton via their mechanosensory structures (McCauley et al. 2017), which can be tiny hair-like structures or more complex organs (statocysts) used for orientation and balance. The net effects of excessive sound can be both immediate and direct (killing the animal) (McCauley et al. 2017) or delayed and indirect (causing behavioural changes and stress) (Day et al. 2021). This is possibly exacerbated in the zooplankton by the small body sizes of the organisms, increasing their vulnerability.

Several peer-reviewed scientific papers describing impacts on zooplankton have been published in recent years, involving experimental studies that emulate real-life conditions (Fields et al. 2019) and at least one large-scale field study (off Tasmania) (McCauley et al. 2017). There also is at least one modelling study (Richardson et al. 2017) available as a non peer-reviewed report. In general, results indicate that several groups of organisms can be affected by seismic surveys, ranging from plankton to whales (Carroll et al. 2017). However, the severity of measured/observed impacts varies from none (Meekan et al. 2021) to severe (McCauley et al. 2017). Carroll et al.

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(2017) reviewed available literature and concluded that differences among studies in observed responses could be caused by technical issues: differences in sound exposure levels and duration in the respective studies or, in some cases, interference caused by the holding tanks. However, they were not able to discount taxon-specific differences in physical vulnerability to acoustic stress, making it difficult to generalise impacts (or lack of impacts) across all taxa.

As examples of measured short-term impacts, larval and juvenile lobsters in an Australian study were damaged up to 500 m from a seismic survey sound source (Day et al. 2021). The lobster early life stages showed damage to the mechanosensory statocyst organ that provides the sense of balance, influencing body position and movement, which are used in predator avoidance behaviour. They also showed stress, with a delay in subsequent moults. These negative impacts were most apparent in animals close to the noise source, indicating a localised effect.

In a Tasmanian field study (McCauley et al. 2017), which emulated a two-day seismic survey and compared before and after results at different locations within the survey area, zooplankton mortality increased by up to three-fold, with the severity of the effect appearing to be taxon-dependent; there was greatest mortality for small copepods and larvae of krill, an important prey item of fishes and other predators. In contrast, in a study in the North Atlantic (Fields et al. 2019) a key copepod species (*Calanus finmarchicus*), which is an important prey item of fishes, did not appear to be affected by seismic bursts at locations more than 10 m from the source.

The ecosystem impacts of seismic surveys

There is little clarity on what the spatial extent is of the impacts on zooplankton of seismic bursts. Some studies concluded that the spatial extent of the impacts was limited to less than 10 m from sources (Fields et al. 2019), but the extensive Australian field study (McCauley et al. 2017) showed impacts 1.2 km from source, which was their study's maximum extent. Thus the actual impacts on zooplankton might extend even further and this aspect requires more research. The spatial extent of impacts also is likely to be influenced by ambient environmental conditions.

Zooplankton are largely invisible components of marine ecosystems so it is difficult to observe and document large scale mortality events. Using the information from the Tasmanian experiment (McCauley et al. 2017), a modelling study was conducted to investigate potential ecosystem impacts of seismic surveys off northwest Australia (Richardson et al. 2017). The results indicated that impacts are likely to be limited beyond 150 km of the survey region, with recovery times of one to two months. These hypothetical results still need to be validated in the field, and there needs to be an assessment of indirect effects on the ecosystem through knock-on effects on adult populations and predators of zooplankton; this aspect was not covered by the Richardson et al. (2017) study. In addition, it is not clear whether the same results would be obtained for other ecosystems.

South Africa's west coast has a large abundance of marine organisms, with much spatial and temporal heterogeneity in the environment, such that impacts need to be understood in the context of localised patches of enhanced abundance and dense aggregations of marine organisms.

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In conclusion, current understanding of impacts of seismic surveys on zooplankton is too sparse and localised to allow definitive conclusions to be drawn about the extent and ecosystem impact of these surveys off the west coast of South Africa.

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Meekan, M.G., Speed, C.W., McCauley, R.D., Fisher, R., Birt, M.J., Currey-Randall, L.M., Semmens, J.M., et al. (2021). A large-scale experiment finds no evidence that a seismic survey impacts a demersal fish fauna. Proceedings of the National Academy of Sciences 118 (30) e2100869118; DOI: 10.1073/pnas.2100869118

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CM2

CURRICULUM VITAE: Coleen L. Moloney

Associate Professor: Department of Biological Sciences, University of Cape Town, Cape Town, SOUTH AFRICA

Research interests

The study of marine ecosystems off the coasts of southern Africa; the use of models to study and understand marine populations, food webs and ecosystems; the roles of microbes in energy transfer and nutrient cycling; the responses of marine ecosystems to global change.

Education

1988: PhD, Zoology Department, University of Cape Town. Thesis title: *A size-based model of carbon and nitrogen flows in plankton communities.* 1983: B.Sc Honours Marine Biology, University of Cape Town (with distinction). 1982: BSc, University of Cape Town (Botany and Zoology).

Employment

Associate Professor, Department of Biological Sciences, University of Cape Town. 2015 to present.

Deputy Head of Department, Department of Biological Sciences, University of Cape Town. 2016 to 2020.

Director: Marine Research Institute, University of Cape Town. March 2012 to December 2015.

Associate Professor, Zoology Department, University of Cape Town. 2010-2014. Academic co-ordinator of an MSc programme in Applied Marine Science.

Senior Lecturer, Zoology Department, University of Cape Town. June 2001 to December 2009. Academic co-ordinator of an MSc programme in Applied Marine Science.

Specialist Scientist, Marine and Coastal Management. August 1996–May 2001. Responsible for research related to stock assessments of commercial fish stocks.

Research Officer, Zoology Department, University of Cape Town. January 1994–July 1996. Carried out modelling research within the Benguela Ecology Programme.

Postdoctoral Researcher, University of California, Davis, USA. 1992–1993. Developed population models of commercial crab populations and ocean models.

Senior Scientific Officer, Zoology Department, University of Cape Town 1984–1991. Modelling research within the Benguela Ecology Programme.

Postgraduate students

20 PhD Graduates: Nicole Dames (2022), Zimkhita Gebe (2021), Grea Groenewald (2021), Ffion Atkins (2017), Amy Harrington (2017), Saachshaini Sadchatheeswaran (2017), Bernardino Malauene (2015), Yonss Jose (2014), Shannon Hampton (2014), Margit R. Wilhelm (2012), Rodrigo S. Martins (2010), Sergio E. Neira Alarcón (2008), Paul de Bruyn (2007), David C.M. Miller (2006), Kasturi Reddy-Lopata (2006), Wendy D. Robertson (2003), Colin G. Attwood (2002), Lynne J. Shannon (2001), Anthony J. Richardson (1998), Franck Touratier (1996)

36 Masters Graduates: Brandon Opie (2021), Kanakana Mushanganyisi (2020), Jessica Burger (2019), James de Haast (2019), Sandra Hörbst (2019), Alice McGrath (2018), Samantha Grusd (2017), Fisokuhle Mbatha (2017), Ben Brooker (2016), Pavanee Annasawmy (2015), Antonio Massot Mascaro (2015), Sifiso Mbambo (2014), Robert

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Schlegel (2014), Annerie Lamprecht (2013), Solange Bih Awa (2012), Thulwaneng Mashifane (2012), Kathryn Mc Laverty (2012), Erich Koch (2011), Izwandy Idris (2010), Bernardino Malauene (2010), Grea Wessels (2009), Yonela Geja (2008), Qayiso K. Mketsu (2008), Sandisiwe Sono (2008), M. Beau Tjizoo (2008), Tarryn-Lee Duthie (2007), James Howard (2007), Lucinda Fairhurst (2005), Gcobani Popose (2005), Mussie G. Sebhatu (2005), Nontsasa P. Tobi (2005), Philiswa P. Tukwayo (2004), Mbulelo T. Dopolo (2003), Alana Duffell-Canham (2003), Terence P. Jayiya (2001), M. Verónica Toral-Granda (1998)

Current postgraduate students: 3 PhD, 2 MSc

Scientific publications
First author of ~30 scientific publications, co-author of >70 scientific publications and seven popular articles or reports, and co-editor of three special issues and one book.

Invited conference presentations
Four plenary keynote presentations (Brazil 2015, Norway 2014, Canada 2009, Italy 2008) and two session keynote presentations (Spain 2014, Canary Islands 2008) in the last ten years.

Membership of international science committees
Member of Scientific Committee of IMBER (2004-2009), GLOBEC Focus 3 Working Group (2000-2005), Coastal Ocean Observations Panel of GOOS (2000-2004), Continental Margins Task Group of JGOFS/ LOICZ (1995-1997), co-chair of IMBER/ GLOBEC Task Group on end-to-end food webs, member of editorial board of Journal of Marine Systems (1996-2006) and Environmental Research Letters (2009+), member of Scientific Organising Committees of various (nine) international conferences and workshops.

Membership of national science committees
Member of SCOR National Committee (2012-2020), Chair (1997-1999) and member (1996-2001) of Steering Committee of Southern African Network for Coastal and Oceanic Research, chair (2010-2012) and member (2006-2012) of Programme Management Committee of South African SEAChange programme, member of NRF evaluation panels for SEAChange funding proposals, member and chair of Scientific Committees for various (five) national conferences and workshops.

Awards
- Gilchrist Memorial Medal (2014) for contributions to South African marine science.
- Eskom Award for Research Capacity Development (2004) from South Africa's National Science and Technology Forum.

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Scientific publications

2021 Malauene, B.S., Lett, C., Marsac, F., Roberts, M., Brito, A., Abdula, S., **Moloney**, C.L. 2021. Spawning times and areas of two shallow-water penaeid shrimps *(Penaeus indicus* and *Metapenaeus monoceros*) on the Sofala Bank, Mozambique. *Estuarine, Coastal and Shelf Science* 253: 107268. DOI: 10.1016/j.ecss.2021.107268

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 217

[Docket No. 110811494–7925–01]

RIN 0648–BB38

Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Geophysical Surveys Related to Oil and Gas Activities in the Gulf of Mexico

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS has received a petition for an incidental take regulation (ITR) from the Bureau of Ocean Energy Management (BOEM). The requested ITR would govern the authorization of take of small numbers of marine mammals over the course of five years incidental to geophysical survey activities conducted by industry operators in Federal waters of the U.S. Gulf of Mexico (GOM). BOEM submitted the petition in support of oil and gas industry operators, who would conduct the activities. A final ITR would allow for the issuance of Letters of Authorization (LOA) to the aforementioned industry operators over a five-year period. As required by the Marine Mammal Protection Act (MMPA), NMFS requests comments on its proposed rule, including the following; the proposed regulations, several alternatives to the proposed regulations described in the ''Proposed Mitigation'' and ''Alternatives for Consideration'' sections of the preamble, two baselines against which to evaluate the incremental economic impacts of the proposed regulations (addressed in the ''Economic Baseline'' section), and, two sections with broader implications: A clarification of NMFS's interpretation and application of the ''small numbers'' standard (see the ''Small Numbers'' section of the preamble); and an alternative method for assessing Level B harassment from exposure to anthropogenic noise (see the ''Estimated Take'' section of the preamble).

DATES: Comments and information must be received no later than August 21, 2018.

ADDRESSES: You may submit comments on this document, identified by NOAA–NMFS–2018–0043, by any of the following methods:

• *Electronic submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2018-0043,* click the ''Comment Now!'' icon, complete the required fields, and enter or attach your comments.

• *Mail:* Submit written comments to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East West Highway, Silver Spring, MD 20910.

Comments regarding any aspect of the collection of information requirement contained in this proposed rule should be sent to NMFS via one of the means provided here and to the Office of Information and Regulatory Affairs, NEOB–10202, Office of Management and Budget, Attn: Desk Officer, Washington, DC 20503, *OIRA@omb.eop.gov.*

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Ben Laws, Office of Protected Resources, NMFS, (301) 427–8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-oil-and-gas.* In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Purpose and Need for Regulatory Action

This proposed rule would establish a framework under the authority of the MMPA (16 U.S.C. 1361 *et seq.*) to allow for the authorization of take of marine mammals incidental to the conduct of geophysical survey activities in the GOM. We received a petition from BOEM requesting the five-year regulations. Subsequent LOAs would be requested by industry operators. Take would occur by Level A and/or Level B harassment incidental to use of active acoustic sound sources. Please see the ''Background'' section below for definitions of harassment.

Legal Authority for the Proposed Action

Section 101(a)(5)(A) of the MMPA (16 U.S.C. 1371(a)(5)(A)) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region for up to five years if, after notice and public comment, the agency makes certain findings and issues regulations that set forth permissible methods of taking pursuant to that activity and other means of effecting the ''least practicable adverse impact'' on the affected species or stocks and their habitat (see the discussion below in the ''Proposed Mitigation'' section), as well as monitoring and reporting requirements. Section 101(a)(5)(A) of the MMPA and the implementing regulations at 50 CFR part 216, subpart I provide the legal basis for issuing this proposed rule containing five-year regulations, and for any subsequent LOAs. As directed by this legal authority, this proposed rule contains mitigation, monitoring, and reporting requirements.

Summary of Major Provisions Within the Proposed Rule

Following is a summary of the major provisions of this proposed rule regarding geophysical survey activities. These measures include:

• Standard detection-based mitigation measures, including use of visual and acoustic observation to detect marine mammals and shut down acoustic sources in certain circumstances;

• Time-area restrictions designed to avoid effects to certain species of marine mammals in times and/or places believed to be of greatest importance;

• Vessel strike avoidance measures; and

• Monitoring and reporting requirements.

Background

Section 101(a)(5)(A) of the MMPA (16 U.S.C. 1361 *et seq.*) directs the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other

The CCE report is described here in order to present information regarding potential longer-term and wider-range noise effects from sources such as airguns. The metrics applied in this study do not, in and of themselves, document the consequences of lost listening area or communication space for the survivorship or reproductive success of individual animals. However, they do translate a growing body of scientific evidence for concern regarding the degradation of the quality of high-value acoustic habitats into quantifiable attributes that can related to baseline conditions, including those to which animals have evolved.

In general, losses of broadband listening area far exceeded losses of communication space when evaluated at the same locations and under the same activity levels. This is appropriate to the interpretive role of the lost listening space calculation, which is to provide a more conservative estimate of the areas over which animals have access to a variety of acoustic cues of importance to their survival and reproductive success. Acoustic cues provide particularly important information in areas where other sensory cues are diminished (*e.g.,* dark) and where navigation is challenging (*e.g.,* complex coastlines and topography). Documentation of such cues (*e.g.,* Barber *et al.,* 2009; Slabbekoorn *et al.,* 2010) indicate that they can be well outside of the frequencies that animals use to communicate with conspecifics, are often of lower source levels than conspecific calls and in many cases cannot benefit from evolved capacity to compensate for noise (*e.g.,* gain applied to communication space calculations), due to the absence of a mechanism for natural selection to act (*e.g.,* most eavesdropping contexts). The results of the CCE study highlight the need for further long-term monitoring in the GOM.

Estimated Take

This section provides an estimate of the number and type of incidental takes that may be expected to occur under the proposed activity, which will inform NMFS's negligible impact determination. Realized incidental takes would be determined by the actual levels of activity at specific times and places that occur under any issued LOAs.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines ''harassment'' as: Any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Incidental takes would primarily be expected to be by Level B harassment, as use of the described acoustic sources has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result for mysticetes and high frequency species due to the size of the predicted auditory injury zones for those species. Auditory injury is less likely to occur for mid-frequency species, due to their relative lack of sensitivity to the frequencies at which the primary energy of an airgun signal is found, as well as such species' general lower sensitivity to auditory injury as compared to high-frequency cetaceans. As discussed in further detail below, we do not expect auditory injury for mid-frequency cetaceans. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable. No mortality is anticipated as a result of these activities.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to exhibit behavioral disruptions (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment—Although available data are consistent with the basic concept that louder sounds evoke more significant behavioral responses than softer sounds, defining sound levels that disrupt behavioral patterns is difficult because responses depend on the context in which the animal receives the sound, including an animal's behavioral mode when it hears sounds (*e.g.,* feeding, resting, or migrating), prior experience, and biological factors (*e.g.,* age and sex). Some species, such as beaked whales, are known to be more highly sensitive to certain anthropogenic sounds than other species. Other contextual factors, such as signal characteristics, distance from the source, and signal to noise ratio, may also help determine response to a given received level of sound. Therefore, levels at which responses occur are not necessarily consistent and can be difficult to predict (Southall *et al.,* 2007; Ellison *et al.,* 2012; Bain and Williams, 2006).

Based on the practical need to use a relatively simple threshold based on available information that is both predictable and measurable for most activities, NMFS has historically used a generalized acoustic threshold based on received level to estimate the onset of Level B harassment. This approach was developed based on the 1997 High-Energy Seismic Survey Workshop (HESS, 1999) and a 1998 NMFS workshop on acoustic criteria, and assumed a step-function threshold. A step-function threshold assumes that animals receiving SPLs that exceed the threshold will always respond in a way that constitutes behavioral harassment, while those receiving SPLs below the threshold will not. This approach assumes that the responses of marine mammals would not be affected by differences in acoustic conditions; differences between species and populations; differences in gender, age, reproductive status, or social behavior; or the prior experience of the individuals (or any other contextual factor). For impulsive sources, such as airguns, a threshold of 160 dB rms SPL was selected on the basis of measured avoidance responses observed in whales. Specifically, the threshold was initially derived from data for mother-calf pairs of migrating gray whales (Malme *et al.,* 1983, 1984) and bowhead whales (Richardson *et al.,* 1985, 1986) responding when exposed to airguns. Subsequent data collection has not suggested that the 160-dB value is generally unrepresentative, inasmuch as a single-value threshold used to predict behavioral responses across multiple taxa and contexts can be adequately representative. This threshold was historically unweighted, meaning that the assessment of potential for behavioral disturbance does not account for differential hearing sensitivity across species.

However, most marine mammals exposed to impulse noise demonstrate responses of varying magnitude in the 140-180 dB rms exposure range (Southall *et al.,* 2007), including the whales studied by Malme *et al.* (1983, 1984), and potential disturbance levels at SPLs above 140 dB rms were also highlighted by HESS (1999). Studies of marine mammals in the wild and in experimental settings do not support the assumptions described above for the single step approach—different species of marine mammals and different individuals of the same species respond differently to noise exposure. Further, studies of animal physiology suggest that gender, age, reproductive status, and social behavior, among other variables, probably affect how marine mammals respond to noise exposures (*e.g.,* Wartzok *et al.,* 2003; Southall *et al.,* 2007; Ellison *et al.,* 2012).

Southall *et al.* (2007) did not suggest any specific new criteria due to lack of convergence in the data, instead proposing a severity scale that increases with sound level as a qualitative scaling paradigm. Lack of controls, precise measurements, appropriate metrics, and context dependency of responses all contribute to variability. Subsequently, Wood *et al.* (2012) proposed a probabilistic response function at which 10 percent, 50 percent, and 90 percent of individuals exposed are assumed to produce a behavioral response at exposures of 140, 160, and 180 dB rms, respectively. It is important to note that the probabilities associated with the steps identify the proportion of an exposed population that is likely to respond to an exposure, rather than an individual's probability of responding. This function is shifted for species (or contexts) assumed to be more behaviorally sensitive, *e.g.,* for beaked whales, 50 percent and 90 percent response probabilities were assumed to occur at 120 and 140 dB rms, respectively.

In assessing the potential for behavioral response as a result of sonar exposure, the U.S. Navy has developed, with NMFS, acoustic risk functions (or ''dose-response'' functions) that relate an exposure to the probability of response. These assume that the probability of a response depends first on the ''dose'' (in this case, the received level of sound) and that the probability of a response increases as the ''dose'' increases (*e.g.,* Dunlop *et al.,* 2017). Based on observations of various animals, including humans, the relationship represented by an acoustic risk function is a more robust predictor of the probable behavioral responses of marine mammals to noise exposure. Similar approaches are commonly used for assessing the effects of other ''pollutants''. However, no such function has yet been developed for exposure to noise from acoustic sources other than military sonar. Defining such a function is difficult due to the complexity resulting from the array of potential social, environmental, and other contextual effects described briefly above, as well as because it requires definition of a ''significant'' response (*i.e.,* one rising to the level of ''harassment''), which is not well-defined.

NMFS acknowledges that the 160-dB rms step-function approach is simplistic, and that an approach reflecting a more complex probabilistic function is better reflective of available scientific information. Such an approach takes the fundamental step of acknowledging the potential for Level B harassment at exposures to received levels below 160 dB rms (as well as the potential that animals exposed to received levels above 160 dB rms will not respond in ways constituting behavioral harassment). Zeddies *et al.* (2015) assessed the potential for behavioral disturbance of marine mammals as a result of the specified activities described herein against both the 160 dB rms step-function and the Wood *et al.* (2012) approach described above. Although Wood *et al.* (2012) also used a modified risk function for migrating baleen whales due to assumed heightened sensitivity when in that behavioral state, this approach was deemed not relevant for the GOM as the only baleen whale present is resident. The modified risk function for sensitive species was used for beaked whales. While there has been no direct evaluation of beaked whale sensitivity to noise from airguns, there is significant evidence of sensitivity by beaked whales to mid-frequency sonar (Tyack *et al.,* 2011; DeRuiter *et al.,* 2013; Stimpert *et al.,* 2014; Miller *et al.,* 2015), as well as to vessel noise (Aguilar Soto *et al.,* 2006; Pirotta *et al.,* 2012).

The approach described by Wood *et al.* (2012), which we are using here, also accounts for differential hearing sensitivity by incorporating frequency-weighting functions. The analysis of Gomez *et al.* (2016) indicates that behavioral responses in cetaceans are best explained by the interaction between sound source type and functional hearing group. Southall *et al.* (2007) proposed auditory weighting functions for species groups based on known and assumed hearing ranges (Type I). Finneran and Jenkins (2012) developed newer weighting functions based on perceptual measure of subjective loudness, which better match the onset of hearing impairment than the original functions (Type II). However, because data for the equal-loudness contours do not cover the full frequency range of the Type I filters, a hybrid approach was proposed. Subsequently, Finneran (2016) recommended new auditory weighting functions (Type III) which were adopted by NMFS (2016). While Type III filters are better designed to predict the onset of auditory injury, as a conservative measure Type I filters were retained for use in evaluating potential behavioral disturbance in conjunction with the Wood *et al.* (2012) probabilistic response function.

NMFS is currently evaluating available information towards development of guidance for assessing the effects of anthropogenic sound on marine mammal behavior. For this specified activity we have determined it appropriate to use the Zeddies *et al.* (2015) exposure estimates produced using the Wood *et al.* (2012) approach as our basis for estimating take and considering the effects of the specified activity on marine mammal behavior.

While we believe that the general approach of Wood *et al.* (2012)—a probabilistic risk function that allows for the likelihood of differential response probability at given received levels on the basis of multiple factors, including behavioral context, distance from the source, and particularly sensitive species—is appropriate, we acknowledge that there is some element of professional judgment involved in defining the particular steps at which specific response probabilities are assumed to occur and that this remains a relatively simplistic approach to a very complex matter. However, we believe that the Wood *et al.* (2012) function is consistent with the best available science, and is therefore an appropriate approach. We are aware of the recommendations of Nowacek *et al.* (2015)—*i.e.,* a similar scheme, but shifted downward with the 50 percent response probability midpoint at 140 dB rms—but disagree that these recommendations are justified by the available scientific evidence. In fact, our preliminary analysis of data presented in available studies describing behavioral response to intermittent sound sources (including airguns and sonar) (*e.g.,* Malme *et al.,* 1984, 1988; Houser *et al.,* 2013; Antunes *et al.,* 2014; Moretti *et al.,* 2014), conducted using a non-parametric regression method, indicates that the 50 percent midpoint is very close to 160 dB rms (*i.e.,* 159 dB rms). While there may be other recommended iterations of this basic approach, we address the differences between Wood *et al.* (2012) and Nowacek *et al.* (2015) below.

Both the Wood *et al.* (2012) and Nowacek *et al.* (2015) functions acknowledge that Level B harassment is not a simple one-step function and responses can occur at received levels below 160 dB rms. The relevant series of step functions provided within Wood *et al.* (2012) for beaked whales (50 percent at 120 dB; 90 percent at 140 dB) and all other species (10 percent at 140 dB; 50 percent at 160 dB; 90 percent at

IN THE HIGH COURT OF SOUTH AFRICA
(EASTERN CAPE DIVISION, GRAHAMSTOWN)

Case No: 3941**/**2021

In the matter between:

SUSTAINING THE WILD COAST AND OTHERS Applicants

and

MINISTER OF MINERAL RESOURCES AND ENERGY AND OTHERS Respondents

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SUPPORTING AFFIDAVIT

I, the undersigned,

DOUGLAS NOWACEK

do hereby make oath and say:

1 I am an adult male and the Repass-Rodgers Chair of Marine Conservation Technology in the Nicholas School of the Environment and the Edmund T. Pratt School of Engineering, at Duke University in Durham, North Carolina, United States of America.

2 The contents of this affidavit are to the best of my knowledge true and correct. Unless I indicate otherwise, or the contrary appears from the context, they are within my personal knowledge and belief.

3 My CV is attached marked DN1. I confirm that it is accurate.

<u>Background and Expertise</u>

4 I have studied the behavioral and acoustic ecology of marine animals throughout my professional career, with particular expertise in the subject of anthropogenic noise. I have authored or co-authored more than 100 publications on marine animal ecology and acoustics, with about one quarter of those papers and reports specifically focused on ocean noise, from analyses of acoustic sources to impacts on marine animals to the mitigation of those impacts.

5 In January of 2019 I provided an expert declaration that was filed in a United States court and which provided the court with a summary of scientific evidence about the impacts of seismic airguns on marine life, and in particular on North Atlantic right whales ("Expert Declaration"). Because of the short timeframe and urgency of this matter, I attach and incorporate herein the Expert Declaration (attached marked DN2), and use this declaration to clarify the Expert Declaration's applicability to the proposed seismic survey at issue here and identify other applicable scientific evidence (attached marked DN3).

6 I continue in my role at Duke University as the Repass-Rodgers Chair of Marine Conservation Technology in the Nicholas School of the Environment and the Edmund T. Pratt School of Engineering, at Duke University. The Expert Declaration describes in more detail my experience and background. Expert Decl. ¶¶ 2- 4.

7 For this opinion, I have reviewed Shell Exploration and Production South Africa notification letter for the Transkei Survey, dated 29 October 2021. I have also reviewed sections of the 2013 Environment Management Programme (EMPr) describing the seismic survey and mitigation measures for cetaceans. I also have reviewed the chart of threatened and protected cetacean, bird and fish species present in the survey area included in the report by Simon Elwin and Tess Gridley, dated 2 December 2021.

8 It is my understanding that the EMPr for the project was completed in 2013. According to the EMPr, a vessel will tow an airgun array with up to 12 or more lines of hydrophones spaced 5 to 10 meters apart and between 3 and 25 meters below the water surface. The array can be upwards of 12,000 meters long and 1,200 meters wide. The airgun would be fired at approximately 10 to 20 second intervals, and would be expected to produce sound levels of around 220 decibels.

Expert Declaration's Conclusions May be Applied to Seismic Surveying Activities in South Africa

9 My Expert Declaration describes how seismic airgun noise travels in the ocean and discusses harms from seismic surveys to marine mammals, Expert Decl. ¶¶ 7- 15. I summarize some of the key points below.

10 Seismic airgun noise has a number of characteristics that give it a remarkably large acoustic footprint. The sounds that seismic arrays produce are among the loudest that humans regularly introduce into the ocean, exceeded only by the occasional

use of explosives. Seismic noise can also travel great distances and has been heard at distances of up to nearly 4000 kilometers (km). Seismic airgun noise also has a broad temporal scale. While airgun arrays are loudest when they are firing, they also significantly elevate background levels of noise between shots. The sound that results is said to "spread" across the interval between pulses, becoming virtually continuous at distance. Seismic airguns are, in effect, a hybrid source, producing both a powerful impulsive sound that can be damaging if the receiver is too close and a virtually continuous sound that raises ambient noise levels at much greater distances, Expert Decl. ¶¶ 37-38. Thus, marine animals exposed to noise from seismic airguns must contend with both loud individual pulses every 10 to 15 seconds and with continuous reverberating energy in the periods between the pulses.

11 In addition to describing these general harms, my Expert Declaration focuses in detail on the impacts to North Atlantic right whales from acoustic surveys, Expert Decl. ¶¶ 16 – 39, relying on, as well, studies on baleen and bowhead whales to draw informed opinions, Expert Decl. ¶ 18. North Atlantic right whales, *Eubalaena glacialis*, are the same genus as Southern right whales, *Eubalaena australis*, which are found in the Transkei seismic survey area between July and November. Because they are from the same genus, scientifically the studies and general conclusions (i.e. those that do not relate to activities or bathymetry specific to the Atlantic) may be interchangeably applied.

12 Studies on bowhead and other baleen can be relied upon to make informed opinions about other whales that are in the Shell survey area because baleen whales are all members of the sub-order *Mysticeti*, and share common features amongst themselves; this makes them appropriate proxies for assessing impacts on other baleen whales found in the seismic surveying area. According to the 2013 EMPr, the baleen whales in the seismic survey area include: Southern right whales (*Eubalaena australis*), Humpback whales (*Megaptera novaeangliae*), Minke (*Balaenoptera bonaerensis*), Dwarf minke (*Balaenoptera acutorostrata*), Fin whale (*Balaenoptera physalus*), Antarctic blue whale (*Balaenoptera musculus musculus*), Sei whale (*Balaenoptera borealis*), Bryde's (inshore) (*Balaenoptera brydei (edeni)*), and Pygmy right (*Caperea marginata*). While we have very limited data on many of the species in this list, the general conclusions about impacts (i.e. those that do not relate to activities or bathymetry specific to the Atlantic) may be applied to the baleen whales that will subject to seismic surveys taking place in the Transkei.

13 The following main findings from my Expert Declaration are applicable to the Transkei survey:

13.1 Noise from the seismic activity will likely adversely impact the cetaceans in at least three ways: 1) by inducing a physiological stress response; 2) by disrupting biologically essential behavior such as vocalizing, mating, or foraging; and 3) by masking acoustic communication, including communication between mothers and calves, Expert Decl. ¶¶ 19 – 39.

13.2 The noise from seismic surveys would be felt by cetaceans over large areas of ocean because sound travels farther and faster in water than in air and the acoustic energy from airguns can propagate hundreds to thousands of kilometers in marine environments. Expert Decl. ¶¶ 7– 15, 35 – 39.

13.3 The noise from seismic surveys experienced by sound-dependent marine animals, would not be limited to the pulse of the airgun shot and includes an increase in the median ambient noise in the ocean even at a distance of 100 kilometers. Expert Decl. ¶¶ 35 – 39.

13.4 Mitigation measures such as time-area closures, visual observers, and passive acoustic monitoring and "soft starts" or "ramp ups" are inadequate to protect cetaceans present year-round or deep-diving beaked whales. Expert Decl. ¶¶ 40 – 47.

<u>Scientific Understanding of Acoustic Impacts on Marine Animals Has Evolved Since 2013</u>

14 Like the ocean, science is dynamic. The field of acoustics in the marine environment has evolved substantially since 2013 when the EMPr was completed.

15 The EMPr, even prior to the consideration of the lowering effect of mitigation factors, found overall impacts to marine animals by seismic noise during the operational phase of activities that ranged from negligible (phytoplankton & zooplankton; invertebrates, including squid) to low (fish; turtles; seabirds, including penguins) to

medium (cetaceans). EMPr 6-11 to 6-42, and table 6.3 at 6-53 to 6-54. Recent scientific literature that was not considered in 2013 contradicts these findings.

16 A 2021 literature review provided a systematic assessment of 538 scientific papers relating to the “effects of impacts of anthrophony and other human alterations to ocean soundscapes on marine animals” (Duarte et al., 2021). The review examined published literature since 1970 and demonstrated that there was a significant post-2010 uptick in published papers on this subject (Duarte et al., 2021). That same review demonstrated that 74.4% of those studies statistically testing the impacts of seismic surveys on marine animals found significant negative impacts to these animals from the surveys (medium-high confidence) (Duarte et al., 2021). For another example, a 2017 study found that a single airgun blast kills over 50% of zooplankton within a 1 kilometer radius, contradicting the 2013 EMPr’s assertion that the seismic surveys will have negligible impacts on phytoplankton and zooplankton (McCauley et al., 2017). As an intermediary between primary producers (plankton) and fish, marine mammals, and birds, zooplankton are vital to ocean productivity and healthy ocean ecosystems. Similarly, while the EMPr found a medium impact on cetaceans, scientists have found that even slight disturbances which result in the displacement of acoustically sensitive beaked whales may have population level effects, certainly an impact beyond medium significance. (New, 2013).

17 Lastly, important studies have taken place prior to and since 2013 that demonstrate the harms of seismic testing and anthropogenic noise on cetaceans. Post-2013

studies include examples of negative effects on cetaceans generally (Dunlap et al, 2021; Gomez et al., 2016; Castellote and Lorens, 2016; Nowacek et al. 2015) and specifically on physiological stress effects (Expert Decl. ¶¶ 20 – 23; Lemos et al., 2021 – gray whales); behavioral disruptions (Expert Decl. ¶¶ 24-31; Dunlop, 2015, 2020 – humpback whales; Bröker et al., 2015 - gray whales; Miller et al., 2015 & DeRuiter et al., 2013 – beaked whales; Pirotta et al., 2014 - porpoises), and communication disruptions (Expert Decl. ¶¶ 32-34; Tennessen and Parks 2016 - North Atlantic right whales; Cerchio et al., 2014 – humpbacks; Blackwell et al., 2013, 2015 – bowhead whales).

18 Since 2013, we have also come to understand much better how seismic gun noise is not limited to the airgun pulses themselves, but also increases ambient noise. Expert Decl. ¶¶ 35-39.

19 Lastly, presence and abundance can change in an eight-year period. Climate change for example is increasingly causing shifts in the timing and duration of migrations, changes in distribution, habitat loss, and reduced fecundity (van Weelden et al. 2021). Notably, at the time of the EMPr in 2013, humpback whales were presumed to be seasonal in the surveying area. See Table 6.4 of EMPr at 6-54. Without accurate data on which species are in the seismic survey area, how many, and when, there is a significant risk that mitigation measures could be rendered ineffectual.

Modeling

20 It is standard practice in the United States to model the acoustic footprint of the proposed survey over appropriate time and space scales. The effects could extend over hundreds of square kilometers. The EMPr contains no such modelling.

21 In addition, such modeling must analyze the aggregate sound field, not just the specific airgun survey, to estimate the overall influences of changes in the acoustic environment at appropriate ecological scales, the potential impacts on marine life, and the potential effects on populations (Southall et al., 2013). Given our rapidly improving understanding of the spatial, temporal, and spectral scales of the acoustic footprints generated by these seismic activities, the single-source regulatory approach is no longer appropriate (Southall et al., 2021; Nowacek et al., 2015).

22 Without acoustic modeling, the EMPr could not have accurately assessed the harms that the seismic survey could cause.

Mitigation Measures

23 An assessment for the harms of a seismic surveying activity that does not use the most current science and does not contain acoustic modeling cannot accurately assess the harms that this seismic surveying will cause. This means that mitigation measures could be inutile and misdirected. The mitigation measures proposed for seismic surveying in the Transkei include measures such as using visual observers,

passive acoustic monitoring, and the use of a “ramp-up” or a “soft start.” These may be ineffective. The essential point is that, without any modelling, it is simply not possible to conclude that mitigation measures are effective at either reducing or eliminating harm.

24 In discussing the residual impact on cetaceans after mitigation measures, the EMPr characterizes the duration of the surveying activities of four-five months as “short.” EMPr at 6-42. Four to five months of continuous seismic in an area of 6,011 km^2 is not short, particularly in the context of seasonal use of the area by a sensitive marine mammal. This is especially true when the data relied upon are at least eight years old.

Conclusion

25 In my opinion, the Transkei seismic survey which lasts four to five months will likely cause harm to marine mammals. The EMPr assessment did not use acoustic modeling and relied upon what is now eight-year old science regarding acoustic impacts on marine species and outdated information on the presence and abundance of animals in the seismic surveying area. Therefore, the proposed mitigation measures are of unknown efficacy, because the acoustic footprint of the survey remains unknown.

DOUGLAS NOWACEK

Thus signed and sworn to before me at ________________on this _______ day of _____________________ 2021 by the deponent who has acknowledged that he knows and understands the contents of this affidavit, that he has no objection to taking the prescribed oath and that the prescribed oath is binding on his conscience.

____

NOTARY PUBLIC

NAME:

CAPACITY:

ADDRESS:

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF SOUTH CAROLINA

SOUTH CAROLINA COASTAL CONSERVATION LEAGUE; CENTER FOR BIOLOGICAL DIVERSITY; DEFENDERS OF WILDLIFE; NATURAL RESOURCES DEFENSE COUNCIL, INC.; NORTH CAROLINA COASTAL FEDERATION; OCEANA; ONE HUNDRED MILES; SIERRA CLUB; AND SURFRIDER FOUNDATION,

Plaintiffs,

v.

NATIONAL MARINE FISHERIES SERVICE; WILBUR ROSS, in his official capacity as the Secretary of Commerce; and CHRIS OLIVER, in his official capacity as the Assistant Administrator for Fisheries,

Defendants.

Civ. No. 2:18-cv-3326-RMG
(Consolidated with 2:18-cv-3327-RMG)

EXPERT DECLARATION OF DR. DOUGLAS P. NOWACEK IN SUPPORT OF PLAINTIFFS' MOTION FOR A PRELIMINARY INJUNCTION

EXPERT DECLARATION OF DR. DOUGLAS P. NOWACEK

I, Douglas P. Nowacek, declare the following:

Background and Expertise

1. I submit this declaration in support of Plaintiffs' Motion for a Preliminary Injunction. The statements I make are true and correct to the best of my knowledge and, in the case of my opinions, I believe them to be true.

2. Since 2008, I have been the Repass-Rodgers Chair of Marine Conservation Technology in the Nicholas School of the Environment and the Edmund T. Pratt School of Engineering, at Duke University. Before joining Duke, I was a faculty member in the Oceanography Department at Florida State University. I hold a bachelor's degree from Ohio Wesleyan University and a Ph.D., in Biological Oceanography and Ocean Engineering, from the Massachusetts Institute of Technology and Woods Hole Oceanographic Institution. A true and correct copy of my *curriculum vitae* is attached hereto as Exhibit A.

3. I have studied the behavioral and acoustic ecology of marine animals throughout my professional career, with particular expertise in the subject of anthropogenic ocean noise. I have authored or co-authored more than 100 publications on marine animal ecology and acoustics, with about one quarter of those papers and reports specifically focused on ocean noise, from analyses of acoustic sources to impacts on marine animals to the mitigation of those impacts. I have also served as an invited editor of journal volumes dedicated to the topic and as a member of international expert panels on the issue. In 2015, I served as a peer reviewer for the National Oceanographic and Atmospheric Administration's (NOAA's) draft acoustic guidelines for marine mammals.

4. Since 1999, when I was selected as a National Research Council postdoctoral scholar, I have been studying North Atlantic right whales (*Eubalaena glacialis*), particularly their acoustic and behavioral ecology and their responses to anthropogenic impacts, including noise. My professional research experience with right whales includes: (i) tagging studies, (ii) experiments in controlled acoustic exposures, (iii) photo-identification research, (iv) studies of diving behavior, and (v) studies on the effects of noise on their behavior and acoustic activities. In addition to my own research on right whales, I served as Chair of the North Atlantic Right Whale Consortium for a three-year term and on the Board of the Consortium for nine years. I have also served on NOAA's Atlantic Scientific Review Group for 13 years, with right whales and bioacoustics as my primary areas of expertise on that panel.

5. The purpose of this declaration is to provide the court with a summary of scientific evidence about the impacts of seismic airguns on marine life, and in particular on North Atlantic right whales, *Eubalaena glacialis*. It is my expert opinion that the five airgun surveys recently authorized by the National Marine Fisheries Service (NMFS) will have adverse impacts on individual right whales in the forms of habitat abandonment, disrupted communication and social behavior, and noise-induced stress; and on the right whale population as a whole through the potential loss of young calves and through further decrements in the health of whales, including females, on whom reproduction and population growth depend.

6. In preparing this declaration, I reviewed NMFS's proposed and final incidental harassment authorizations, issued in June 2017 and November 2018, for five seismic oil and gas surveys in the Atlantic; as well as numerous technical reports from the scientific literature. A full list of the scientific journal articles cited in this declaration is appended as Exhibit B.

Overview of the Impacts of Seismic Airgun Surveys on Marine Mammals

7. It is almost impossible to overestimate the importance of sound to ocean animals. While marine animals do use chemical, visual, and even electrical cues to perceive their environment, sound is of unparalleled importance for many species. From invertebrates to whales, animals rely on sound for biological activities such as foraging, breeding, predator avoidance, and orientation that are essential to their survival and reproduction. This reliance is due in part to the efficiency with which sound moves through water, traveling five times faster in water than in air and covering long distances, particularly in the low frequencies (Croll et al. 2002). Researchers in marine bioacoustics have been documenting the fundamental importance of sound to ocean animals for many decades (Tavolga 1964).

8. It is well established that exposure to unwanted sound, or "noise," can and does cause behavioral and physiological harm to animals. A recent review of more than 300 papers in the bioacoustics literature found remarkable consistency in the types of behavioral impacts documented across both marine and terrestrial wildlife populations exposed to noise. These impacts include, in short, "altered vocal behavior to mitigate masking; reduced abundance in noisy habitats; changes in vigilance and foraging behavior; and impacts on individual fitness and the structure of ecological communities" (Shannon et al. 2016). The physiological impacts of noise on mammals, including hearing loss, immune system impacts, and acute and chronic stress, are also well documented and have been recognized for many decades (e.g., Welch and Welch 1970), although we are just beginning to understand the full extent of physiological impacts on marine species.

9. As a stressor on wildlife, ocean noise differs from airborne noise because animals suffer impacts over much larger distances, due to the much greater efficiency with which sound travels through water.

10. Seismic airgun noise has a number of characteristics that give it a remarkably large environmental footprint. To penetrate hundreds to thousands of meters of water and then potentially thousands of meters of hard substrate, seismic signals must contain tremendous amounts of energy. The multiple airguns in a seismic array are configured to focus their energy into a single pulse, so as much coherent energy as possible is injected into the water and subsequently into the substrate (Caldwell and Dragoset 2000). The array configuration is reasonably effective in focusing the sound downwards; nonetheless, substantial energy is emitted in all directions (DeRuiter et al. 2006), and this, coupled with the reverberation of the main pulse, fills the water column with noise. The sounds that seismic arrays produce are among the loudest that humans regularly introduce into the ocean, exceeded only by the occasional use of explosives.

11. The great distances at which the noise from seismic activity can be heard has been well documented in several parts of the world. For example, signals from seismic surveys off Brazil and West Africa have been recorded along the Mid-Atlantic Range, a chain of seamounts, at distances of up to nearly 4000 kilometers (km) (Nieukirk et al. 2012). In the Gulf of Mexico, another study found that a seismic survey conducted in a submarine canyon off Louisiana raised background noise levels on sensors located throughout the northern Gulf, as far as Pensacola, Florida. Noise from this survey was even detected in the extreme southeastern corner of the Gulf, some 400 km from the sensor that recorded the loudest signals (Estabrook et al. 2016).

12. Seismic airgun noise also has a broad temporal scale. While airgun arrays are loudest when they are firing, they also significantly elevate background levels of noise between shots. This effect is due to basic physics. First, the duration of the pulse lengthens as it travels through the ocean due to the multiple paths the sound takes through the water; second, the sound energy reverberates as it is reflected and refracted by the geological formations it encounters. The sound that results is said to "spread" across the interval between pulses, becoming virtually continuous at distance.

13. Acousticians often distinguish between impulsive noise, which is typically sharp and brief in duration, and non-impulsive noise, which can run continuously during a given time period. Biologically, these types of sound sources can impact animals differently. Seismic airguns are, in effect, a hybrid source, producing both a powerful impulsive sound that can be damaging if the receiver is too close and a virtually continuous sound that raises ambient noise levels at much greater distances (e.g., Guerra et al. 2016; Nieukirk et al. 2012), as described below in paragraphs 37-38. Thus, a whale exposed to noise from seismic airguns must contend with both loud individual pulses every 10 to 15 seconds and with continuous reverberating energy in the periods between the pulses.

14. Numerous studies have documented responses of marine mammals to seismic surveys. From large whales to small porpoises, toothed and baleen whales alike respond to airgun noise. For example, one study reported decreased foraging rates in sperm whales exposed to seismic airgun noise, with a substantial decrease in prey-capture sounds, or buzzes, at relatively low levels of exposure (Miller et al. 2009). Another study showed a similar result in harbor porpoises, as animals exposed to seismic survey pulses produced 15 percent fewer feeding buzzes, with the most significant impacts observed in porpoises closest to the sound

source (Pirotta et al. 2014). Responses in other important behavioral contexts, including breeding (e.g., Cerchio et al. 2014) and migration (e.g., Blackwell et al. 2013, 2015) have also been well documented, with effects detected at very low levels of noise exposure (as low as 90 decibels)[1] or at large distances from the seismic source (tens to hundreds of kilometers).

15. Other studies (some of which I describe further below) indicate that anthropogenic noise sources like seismic surveys interfere with whale communication and induce chronic stress. These effects can aggregate into what the recent literature review of noise impacts described as "impacts on individual fitness and the structure of ecological communities" (Shannon et al. 2016)—in other words, population-level consequences. Such species-level impacts are particularly concerning for endangered populations like the North Atlantic right whales discussed below.

Impacts of the Authorized Seismic Airgun Surveys on North Atlantic Right Whales

16. North Atlantic right whales are deeply imperiled. The current low birth rate and extraordinarily high death rate, particularly for females (Pace et al. 2017), leaves little margin for error for conservation of the species.

17. Given where seismic surveys are authorized to take place, it is virtually certain that right whales will be exposed at biologically meaningful levels to the noise that seismic airguns produce. We know definitively that right whales inhabit the authorized survey areas at all times of year. Researchers have documented the occurrence of right whales in Virginia waters throughout the year (Salisbury et al. 2016). Others have reported right whales in waters off

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[1] Decibels (dB) are units expressing the amplitude, or "volume," of a sound. They are logarithmic in scale, meaning that every 10 dB increase represents a ten-times increase in acoustic intensity. Sounds in the ocean are conventionally referenced to one microPascal, a measure of pressure.

Georgia and North Carolina outside the winter calving period, when presence is thought to peak (Hodge et al. 2015); and have demonstrated the presence of right whales as far south as the Georgia coast during nine months of the year and as far south as the mouth of the Chesapeake throughout the year (Davis et al. 2017, Whitt et al. 2013). These empirical findings are consistent with the results of a recent study in which right whale specialists were asked to define the seasonal presence of right whales in the mid-Atlantic. In that study, experts concluded that even in July—when right whale presence in the region is expected to be at its lowest—there are likely to be females in the mid-Atlantic (Oedekoven et al. 2015).

18. In analyzing the likely impacts of seismic surveys on right whales, I will frequently refer to studies involving bowhead whales and other baleen whales. Because right whales are so critically endangered, scientists have limited opportunities to directly study their response to industrial noise like seismic surveys. However, bowhead whales are one of the closest relatives of the North Atlantic right whale and are an excellent proxy for assessing behavioral impacts to right whales. Bowhead whales are in the same family as North Atlantic right whales (the *Balaenidae*), and they have similar life histories, foraging patterns, and morphology to right whales. Bowhead responses to industrial activity, including seismic surveys, have been studied for decades, and are therefore a good indicator of the probable behavioral impacts that seismic surveys will have on right whales. Similarly, other baleen whales share common features with right whales that make them appropriate proxies for assessing impacts on right whales.

19. Noise from the authorized seismic activity will likely adversely impact right whales in at least three ways: (1) by inducing a physiological stress response; (2) by disrupting biologically essential behavior such as vocalizing, mating, or foraging; and (3) by masking

acoustic communication, including communication between mothers and calves. All three of these impacts have been observed in baleen whales in close association with, or as a direct result of exposure to, low-frequency anthropogenic noise.

Physiological Stress Effects

20. It has long been established that exposure to noise causes physiological stress in mammals (Welch and Welch 1970). That is, exposure causes an elevation in levels of stress hormones such as cortisol, cortisone, adrenaline, and noradrenaline. These are the hormones that prepare animals for the 'fight or flight' response; they influence heart rate, blood pressure, and a number of other biologically important functions. Activation of the stress response prioritizes survival over reproductive and immune function, which in the short term can benefit the animal. In the long term, however, the stress response can be extremely detrimental.

21. Chronic stress (i.e., stress response that is sustained or repeated over days to weeks) has been directly linked to severe negative consequences, including adverse effects on reproduction. In mammals, prolonged exposure to noise can result in loss of body weight, reduction of vital organs (e.g., Sackler et al. 1959), decreases in survival and recruitment (e.g., Blas et al. 2007; Halfwerk et al. 2011; MacDougall-Schackleton et al. 2009), and birth abnormalities (e.g., Møller and Swaddle 1998). Noise-related stress appears to be particularly damaging to females. Taken together, this research indicates that prolonged exposure to noise can have direct consequences for fitness, reproduction, and population health in mammals.

22. In addition to this widespread evidence of a physiological stress response to noise across mammalian species, we have strong evidence that right whales in particular exhibit the same response. In the days following the 9/11 terror attacks, shipping along much of the east coast of the U.S. and Canada came to a near halt. As a result of the near lack of shipping, noise

levels dropped dramatically in the Bay of Fundy, Canada, where researchers from the New England Aquarium were in the process of collecting right whale fecal samples and acoustic data. These scientists reported a dramatic drop in corticol steroid hormone levels in right whales in the days following 9/11 (Rolland et al. 2012). This dramatic drop in stress hormone levels in conjunction with a reduction in sound is a clear indicator that right whales, like other mammals, exhibit a physiological stress response to noise.

23. Given the density and duration of the authorized surveys and our knowledge of right whale occurrence in the mid- and south Atlantic, it is likely that individual whales will be subjected to multiple days, weeks, or possibly months of seismic survey noise. In light of the year-round presence of right whales off the mid-Atlantic, and the expert opinions that at least some of these are females, it follows that reproductively active females would be in this cohort.

Behavioral Disruptions

24. In general, seismic surveys have repeatedly been shown to disrupt vital behaviors, including foraging, breeding, and migration, in baleen whales (for reviews see Nowacek et al. 2007, 2015). For right whales, the most concerning of these impacts are displacement from prime habitat and foraging locations and reduction in vocalization and communication.

25. One of the most commonly documented behavioral responses is displacement of whales in the presence of seismic surveys. For bowhead whales in particular, displacement due to seismic surveys is well documented, and has been found to occur at distances of more than 20 km from the airgun array and at received sound levels of 120-130 dB (Richardson et al. 1999).

26. There is reason to believe right whales may be foraging off the mid- and southeast Atlantic coast. Aerial surveys sighted several groups of right whales in the area this past winter (New England Aquarium 2018), and while such survey data cannot provide definitive evidence

of feeding, these types of aggregations are characteristic of right whale foraging activity. Additionally, skim feeding has been observed in the mid-Atlantic in the past (Whitt et al. 2013). If whales have found a food patch, displacing them even temporarily from this resource, given their body condition, could impact fitness. Whales that are not displaced can also experience foraging loss from sound exposure. While some studies of acoustic impacts (e.g., McCauley et al. 2000) have documented little or no whale displacement, other studies indicate that animals will remain in an area and tolerate behavioral disturbance or otherwise deleterious effects of noise, including reduced foraging, because they have a strong biological need to stay where they are (Forney et al. 2017; Miller et al. 2009).

27. In addition to displacing whales, seismic surveys are also known to disrupt whale vocalization patterns. Such disruptions have repeatedly been observed in baleen whales across a variety of behavioral states and over large spatial scales. For example, researchers have documented the cessation of singing in fin whales, a behavior closely associated with mating, at scales of hundreds of thousands of square kilometers (Castellote et al. 2012). Another paper documented reductions in singing by humpback whales, on their breeding grounds off southwest Africa, at received sound levels that would occur tens to hundreds of kilometers from seismic arrays (Cerchio et al. 2014).

28. The most comprehensive analysis of the responses of bowhead whales to seismic surveys published to date, synthesizing more than ten years of studies, found that seismic surveys broadly disrupted vocalizations in that species (Blackwell et al. 2015). Migrating bowhead whales reacted to airgun pulses virtually as soon as the signals were audible; increased their

calling rates until the cumulative sound energy level reached about 94 decibels;[2] and began decreasing their calling rates when exposure levels exceeded approximately 127 decibels, until, when sound levels reached approximately 160 decibels, virtually none of the whales continued calling. From the perspective of a behavioral ecologist and bioacoustician, my interpretation of this behavior is as follows: When whales detect some interference (noise) in their communication channel, they attempt to compensate by increasing their calling rate. The leveling off that occurs above 94 decibels likely indicates the maximum calling rate that the whales are able to maintain to compensate for noise. When noise levels get high enough (i.e., above 127 decibels), the whales begin "giving up," as they likely perceive that they are unable to compete with the noise, and eventually shut down use of the vocal channel. This interpretation is consistent with that of the study's authors. I would expect similar impacts on right whales.

29. The importance of vocalizations for cetaceans is indisputable. Vocal behavior plays a sophisticated and critical role in various aspects of the lives of these animals, such as foraging, socializing, and mating (e.g., Quick et al. 2012; Rendell and Whitehead 2003; Videsen et al. 2017). These observations are broadly consistent with more than five decades of study in the behavioral ecology of wildlife. It is well established that vocal behavior is essential to the ecology of birds (e.g., Marler and Tamura 1964) and terrestrial mammals (e.g., Green 1975), and that sound and its patterns of production are deeply seated in the neural architecture and physiology of these species (e.g., Bottjer and Johnson 1997). In its November 2018 notice,

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[2] This metric, cumulative sound energy level, represents an animal's cumulative exposure to sound over a period of time. In the case of the bowhead study, the period of time was set to 10 minutes, to capture the exposure of migrating whales as they came within the vicinity of the survey. This level will normally be only slightly higher than the loudest single pulse that occurs within the 10-minute window. Otherwise, except where noted, references to decibels in this declaration imply sound pressure levels, a metric that represents the amplitude of a single seismic shot.

NMFS appears to discount the importance of changes in baleen whale vocal behavior, particularly those associated with seismic exposure. The agency's position is inconsistent with decades of research on marine mammals and other species indicating that changes in vocal behavior represent substantial changes in behavioral patterns.

30. As indicated above, seismic surveys can disrupt important behaviors in baleen whales at exposure levels far below the 160 dB threshold that NMFS applied to the authorized surveys. Gomez et al. (2016) systematically reviewed hundreds of papers that reported behavioral responses of marine mammals to man-made noise and evaluated those changes for their severity, using a severity scale that NMFS has adopted in other contexts. Based on an assessment of 41 studies, Gomez et al. (2016) found that by 140 dB, fully half the baleen whales exposed to seismic airgun or explosive noises demonstrated a behavioral response having a "higher potential" to negatively affect the animal's foraging, survival, or reproduction. Similarly, by 160 dB, half the exposed baleen whales underwent a behavioral response considered "likely" to affect survival or reproduction, with some responses beginning at exposures below 110 dB. The 41 studies captured by the review cover a broad range of contexts of noise exposures. NMFS's adoption of a 160 dB threshold contradicts the scientific literature on the behavioral responses of baleen whales to seismic surveys and significantly understates the potential for adverse impacts on vital rates.[3]

[3] NMFS's selection of a 160 dB threshold significantly influences its assessment of the spatial scale at which impacts will occur. While physical factors (e.g., bathymetry) can and do affect propagation and must be accounted for, it is still basic physics that the area exposed to a particular level of sound increases exponentially as the sound spreads (Urick 1983). Thus, for example, the area exposed to 140 dB of sound can exceed by tens to hundreds of times the area exposed to 160 dB, and the area exposed to 120 dB can exceed by tens to hundreds of times the area exposed to 140 dB. If NMFS had chosen a lower threshold for baleen whales, its estimate of impacts on right whales and other species would have increased by similar proportions.

31. Much of the study of behavioral responses to noise have focused on immediate and short-term responses, but it is also important to consider whether any effects are prolonged and could thus be cause for additional concern. We have concrete examples of baleen whales demonstrating lasting changes in behavior in response to seismic surveys, including at relatively long ranges. Castellote et al. (2012) reported that singing fin whales changed their vocal behavior and moved away from a seismic source within 48-72 hours of the onset of the survey and that these changes persisted for approximately 14 days after the survey concluded; these effects occurred over an area of approximately 100,000 square kilometers. Blackwell et al. (2013) found that, within about 50 km of a seismic source, bowhead whales moved away, dramatically reduced their calling rate, or both, and that this effect lasted for at least seven days after the survey concluded. The persistence of these effects in baleen whales well beyond the duration of exposure is of substantial concern for right whales.

Masking of Mother-Calf Communications

32. Relatedly, seismic surveys are likely to mask right whale communications. One realistic consequence of masking for right whales is that a calf could become separated from its mother if their vocal communication channel becomes unavailable or obstructed.

33. When baleen whale calves are first born, they remain within a few meters of their mothers, making communication between mother and calf easy. But within the first month of calves' lives, they begin to spend increasing amounts of time separated from their mothers (Taber and Thomas 1982; Cartwright and Sullivan 2009). For North Atlantic right whales, this means that within weeks of birth on the calving grounds and during their northward migration from the calving grounds, temporary separations can occur naturally. Under normal circumstances, mothers and calves are able to acoustically communicate with one another

through calls and can reunite after such temporary separations. If background noise levels become elevated, however, there is a significant risk that mothers and calves will be unable to hear each other and reunite.

34. Based on the source levels of recorded right whale upcalls and what we know about right whale hearing, scientists have demonstrated that noise levels as low as 106 decibels can hinder the right whale's ability to effectively maintain contact (Tennessen and Parks 2016). The range at which seismic survey signals will raise background noise levels to 106 dB is many tens of kilometers and possibly hundreds of kilometers, depending on propagation and reverberation conditions. This threshold was derived from a study that assessed masking of adult right whale calls (Tennessen and Parks 2016). As we know that calves produce quieter vocalizations than adults (Root-Gutheridge et al. 2018) and communicate with their mothers using a different type of call that is harder to detect (Parks and Nowacek unpub. data), the threshold is quite possibly an underestimate for the potential for disruption and masking risk for mother-calf pairs. NMFS asserts that calves, when young, stay close to their mothers, from which it concludes that masking will not occur. However, the agency presents no data on mother-calf separation distances or duration. I have personally seen very young calves, less than one month old, separate from their mothers by tens to hundreds of meters, which is precisely the type of separation that could threaten an acoustically-mediated reunion at times and places of elevated background noise.

Scale of Impacts

35. Should the authorized surveys proceed, the impacts that I have described above would be experienced by right whales over large areas of ocean. It is well established that the acoustic energy from seismic airgun surveys can propagate hundreds to thousands of kilometers

in marine environments (Estabrook et al. 2016; Guerra et al. 2016; Nieukirk et al. 2012). To illustrate the sound fields generated by seismic airgun explosions, my colleagues and I modeled the sound fields generated by a 40-airgun array operating within the authorized survey area, off the Virginia-North Carolina coast.[4]

36. Because our focus was on North Atlantic right whales, we included only the seismic airgun energy in the 3rd-octave intervals spanning the 71-224 Hertz (Hz) frequency band, as this is the frequency band in which right whales produce their most common contact call. Figure 1 presents a typical illustration of the sound field produced by a large airgun array of the size included in NMFS's authorizations.[5] This figure indicates the remarkable spatial acoustic footprint of a single survey, indeed of just a few of the millions of seismic shots that NMFS has authorized. Light blue represents background ambient noise levels absent the seismic survey; noise levels increase as the colors progress from green to yellow, orange, and red. The asymmetrical pattern is due to the asymmetry of noise radiating from the airgun array, which is louder at the sides than at the front and back, and to normal variations in sound as it travels through deeper and shallower water. It is important to observe that we modeled the sound field only within a 100 km radius of a typical airgun array; the actual acoustic footprint of the array would be significantly larger.

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[4] The model took into account what are typically considered the most salient environmental parameters for the propagation of sounds in water, such as the properties of the sea bottom, the speed profile of sound in the water column, and variation in water depth, as well as the acoustic characteristics of the seismic source.

[5] The sound field appears static and fairly uniform because it integrates the sound energy over multiple airgun shots, analogous to leaving a camera lens open for a number of minutes.

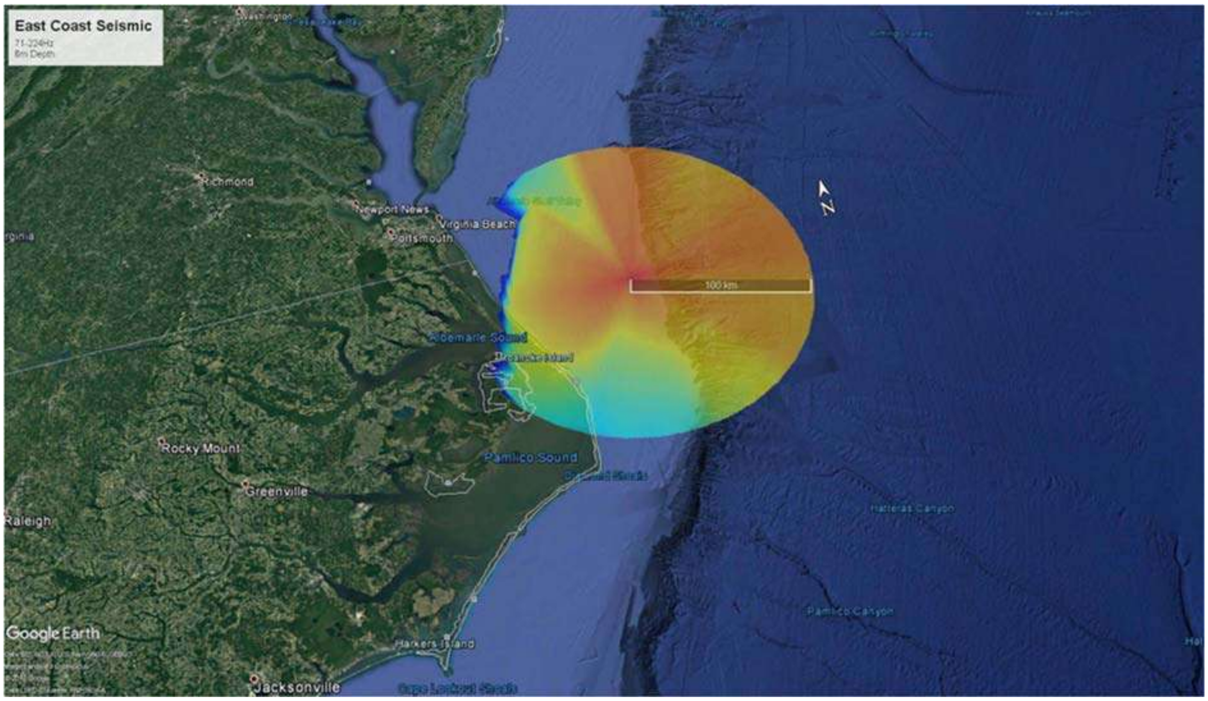

Figure 1.

37. This type of visual illustration is helpful, but it does not capture the dynamics of the sound field nor the noise levels that are present at these ranges. Figure 2, below, from Guerra et al. (2016), shows actual data recorded up to 100 km from a seismic survey near Greenland, at different intervals of time. The dark blue, light blue, yellow, and red symbols, which appear to run together due to their sheer number, show the sound received at 2.5 second intervals from the original pulse, culminating, in the red symbols, with the noise levels experienced 5 to 7.5 seconds after each shot was taken. The figure demonstrates that the survey raised background noise levels, represented by the horizontal lines, by as much as 25 decibels between shots, hardly falling off before the cycle began again. With conventional airgun surveys, there is not enough time between pulses for the sound energy to fully dissipate.

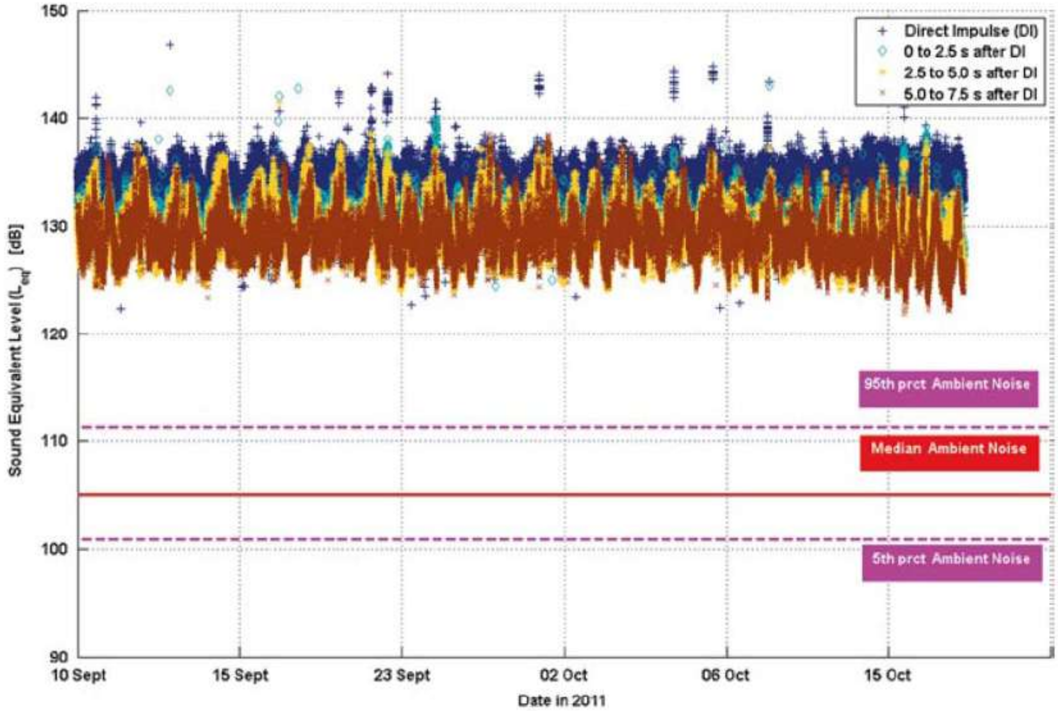

Figure 2. Seismic airgun noise recorded 60-100 km from the source, from Guerra et al. (2016)

38. This figure is noteworthy for three reasons. First, even 7 seconds after an individual pulse, noise levels were found to remain 25 decibels above the median ambient noise level. For seismic surveys like the ones NMFS has authorized, this means that there will be little to no "quiet" period between pulses. Second, the recorded noise levels were more than 30 decibels above those at which behavioral disruptions were documented in bowhead whales in the Blackwell et al. (2015) study referenced above. In other words, even at a distance of 100 km, these seismic surveys were loud enough to cause disruptions in biologically important behavior in the species that offers our best proxy for right whale responses. Third, the recorded noise levels are above those at which researchers reported elevated stress hormone levels in right whales (Rolland et al. 2012), and above those that scientists found would disrupt adult right whales in their ability to maintain communication (Tennessen and Parks 2016).

39. In sum, the authorized surveys would significantly disrupt essential behavior and induce physiological stress in right whales over large distances from each seismic array.

Ineffectiveness of NMFS's Mitigation Measures for Right Whales

40. To mitigate impacts on North Atlantic right whales, NMFS relies primarily on three measures: an exclusion of seismic activities from coastal areas at particular times of year, known as a "time-area closure"; monitoring for right whales around the seismic vessel; and a phased increase, or "ramp-up," of the airgun array at the beginning of operations. Given the distribution of right whales and the distances over which impacts are expected to occur, these mitigation measures are unlikely to prevent significant impacts on individuals or population-level impacts on this endangered species as a whole.

Inadequacy of Time-area Closures

41. Fundamentally, the time-area closures proposed by NMFS are not sufficient to protect right whales. As I have described above, low-frequency sounds, like those from ships and seismic surveys, travel extremely well through the ocean. Shallow water affects this process in that low frequencies do not travel as well through shallow waters as they do in deeper waters. Nonetheless, sound from surveys occurring at the shelf break or on the shelf will likely travel large distances up onto the shelf, ensonifying essentially all the waters utilized by right whales, including the species' only known calving grounds.

42. For example, the amount of seismic energy that would reach the right whale's calving grounds, the area of highest historic right whale densities, would be enough to cause behavioral changes (both locomotive and vocal), including changes that could jeopardize the survival of calves. I ran a propagation model, using a standard parabolic equation model employed by the U.S. Navy (Collins 1993; Margolina et al. 2018), with the seismic source

positioned at 90 km offshore.[6] At 20 km offshore, a common location for right whales in this area, the whales would receive sound pressure levels of 116 dB. This level is well above where bowhead whales show a change in vocal behavior and a full 10 dB above the level at which scientists have determined that noise can hinder adult right whales' ability to effectively maintain contact (Tennessen and Parks 2016). Thus, keeping seismic vessels out of nearshore waters will not prevent airguns from ensonifying prime right whale habitat to the point where right whale behavior is significantly affected.

43. Second, as noted above, NMFS's authorizations do not account for the best available information with respect to the times and areas occupied by right whales. Because right whales are known to occur as far south as Georgia during nine months of the year and as far south as the mouth of the Chesapeake throughout the year, and because they occur further offshore than previously thought, the time-area closures proposed by NMFS are not sufficient to protect right whales in areas and seasons not included in the closures. Additionally, NMFS intends to allow companies to conduct seismic surveys closer to shore, between 47-80 km from the coast, even during the height of right whale season, upon approval of plans for additional monitoring and mitigation. In my opinion, there is no additional mitigation plan that could reduce to acceptable the exposure and risk of having seismic operations occurring at the eastern edge of the highest-density right whale area.

[6] I ran this model at a frequency of 500 Hz because it was the closest to the 250-300 Hz range used by right whales that the model could produce. The difference in sound propagation between 300 and 500 Hz is likely to be insignificant as the propagation depends primarily on the relationship between the wavelength and the water depth. Sounds of both frequencies propagate well in waters offshore of the calving grounds.

44. With our improved and evolving knowledge of right whale distribution, and in light of the precarious status of the species, the NMFS time-area closures fall well short of the protections necessary to prevent harm to right whales on a broad spatial and temporal scale.

Inadequacy of Monitoring

45. NMFS's required monitoring scheme is also inadequate. The use of visual observers to detect right whales is imperfect at best, for several reasons. First, observers will be unable to spot whales in low light or other poor-visibility conditions, such as fog or high sea states; and second, it is very difficult to spot whales even when one is searching for them under ideal conditions. The whales must be at the surface for them to be detected visually, and what little data we have for female right whales nursing calves off the southeast U.S. coast indicates that they are available for detection from boats only half the time at most, and perhaps as infrequently as 10 percent of the time (Nowacek et al. 2018). Additionally, the area available for detection by vessel-based observers, about a 1 km radius, is dramatically smaller than the area where impacts are expected, a radius of tens to hundreds of kilometers. Visual observation from the survey vessel is helpful only in preventing immediate physical injury, although detection within this injury area still falls well short of 100 percent, particularly during poor-visibility conditions.

46. Similarly, the requirement to conduct passive acoustic monitoring will have very limited benefit for North Atlantic right whales. Although the "up-calls" produced by right whales can be an effective tool for passive acoustic monitoring in the research context (Van Parijs 2009), such monitoring has substantial limitations, especially when used for real-time mitigation in the manner that NMFS intends. As with all passive acoustic monitoring, whales will not be detected even when present if they are quiet or not vocalizing or if background noise is too high.

Results from the U.S. Navy's monitoring program indicates that passive acoustic monitoring is essentially useless for detecting mother-calf pairs off the southeastern United States due to reduced vocalization rates in this cohort and quieter mother-calf calls. For example, one female whale, tagged twice by researchers in 2016, went from calling 45 times in 5 hours when she was pregnant to not calling once in 5 hours when her calf was about 2 weeks old (Nowacek et al. 2018). In general, right whales studied off the coasts of South Carolina, Georgia, and Florida have variable vocal rates that are relatively quiet and infrequent compared to the vocal rates documented off the northeastern United States (Nowacek et al. 2018). Finally, studies show that baleen whales cease vocalizing in the presence of even low levels of seismic survey noise (e.g., Blackwell et al. 2015).

47. Related to near-vessel monitoring is the practice of "ramp-up" as a mitigation measure, to reduce the likelihood that an individual whale will be exposed to injurious levels of noise. In this practice, instead of commencing operations with all the airguns in an array, small numbers of guns are slowly added until the full array is firing. There has been no experimental confirmation that this procedure is broadly effective at reducing overall exposure (*see* Wensveen 2017). Regardless, even if it worked perfectly, this mitigation measure would reduce only the number of injuries incurred in the vicinity of the seismic vessel and does not address at all the larger body of effects.

Conclusion

48. It is my expert opinion, especially in light of the roughly 850 survey days and the close to 90,000 trackline miles they entail, that the seismic airgun surveys authorized by NMFS will adversely affect many individual right whales. These effects will have both behavioral and physiological consequences. It is highly likely, given the species' dire conservation status and

the extent of seismic survey activity, that the surveys will cause adverse impacts at both the individual and population level due to increased noise-induced stress, displacement of whales, and/or the interruption of communication between individuals, especially mother-calf pairs.

50. I have worked professionally for more than a decade on methods and means to minimize the impacts of seismic surveys on large whales (see, e.g., Nowacek and Southall 2016). I am not an alarmist about the impacts of these activities; I generally believe that less environmentally harmful approaches are available to mitigate their effects. If NMFS had authorized a survey of a discrete area within the region for a short period of time (e.g., one month), then I would have reached a different opinion about the magnitude of impact; but this virtually unchecked level of noise being injected for as many as 850 days, in less than two years, into an environment that is clearly inhabited by right whales, is almost certain to have individual and population-level impacts on this species.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on January 16, 2019, at Beaufort, North Carolina.

Douglas P. Nowacek, Ph.D.

Exhibit A
CURRICULUM VITAE

DOUGLAS PAUL NOWACEK

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&
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EDUCATION:

B.A. Ohio Wesleyan University, Delaware, Ohio; Zoology; *summa cum laude* & Phi Beta Kappa (1991)

Ph.D. Woods Hole Oceanographic Institution & Massachusetts Institute of Technology, Biological Oceanography (1999)

Dissertation Title:
Sound use, sequential behavior, and ecology of foraging bottlenose dolphins, *Tursiops truncatus*

Dissertation Advisor:
Peter L. Tyack

POSITIONS:

Professor, Duke University, Nicholas School of the Environment & Pratt School of Engineering (2018-present)
Associate Professor, Duke University, Nicholas School of the Environment & Pratt School of Engineering (2008-2018)
Visiting Scholar, Institute of Marine and Antarctic Sciences, University of Tasmania, Hobart, Tasmania, Australia (2013)
Adjunct Professor, Department of Biology and Marine Biology, University of North Carolina Wilmington (2008-present)
Assistant Professor, Department of Oceanography, Florida State University (2003–2008)
Guest Investigator, Woods Hole Oceanographic Institution (2002–2003)
Staff Scientist, Sensory Biology and Behavior Program, Center for Marine Mammal and Sea Turtle Research, Mote Marine Laboratory (2002–2003)
Postdoctoral Research Associate, National Research Council/National Oceanic and Atmospheric Administration, Northeast Fisheries Science Center (2000–2002)
Postdoctoral Fellow, Department of Biology, Woods Hole Oceanographic Institution (1999–2002)

Academic and Research Awards & Distinctions

2017	*Sally Connally Hardie Visiting Researcher*, University of St Andrews, Scotland
2015	Invited Testimony, U.S. House of Representatives, Committee on Natural Resources, Oversight Hearing on "The Fundamental Role of Safe Seismic Surveying in OCS Energy Exploration and Development"
2013	*Visiting Fellow*, University of Tasmania
2003-05	*Young Investigator Award*, Office of Naval Research
2000-2002	*National Research Council, Research Associate Fellowship*, National Academy of Sciences
1993-1995	*National Defense and Science and Engineering Graduate Fellowship,* Office of Naval Research
1987-1991	*Presidential Scholarship*, Ohio Wesleyan University

Current Professional service

Western Gray Whale Advisory Panel, The International Union for the Conservation of Nature (IUCN), Gland, Switzerland
Invited Guest Editor, *Marine Ecology Progress Series*
Atlantic Scientific Review Group, NOAA Fisheries
Cetacean Specialist Group, Species Survival Program, IUCN, Switzerland
Technical Working Group on Biologically Relevant Sound Levels, Department of Conservation, Government of New Zealand
Expert Assessor, Research Council of Norway
Invited contributor, Cetacean Tagging Best Practices Guidelines.

Past professional service

North Atlantic Right Whale Consortium, Chair & Board Member
NSF Graduate Research Fellowship Program, Panel Member, 2015
Associate Editor, *Marine Mammal Science*
Society for Marine Mammalogy, Member of Board of Governors
National Fish and Wildlife Foundation, Reviewer (2007)
NSF Biological Oceanography Panel, Reviewer (2006)
Independent Scientific Review Panel, The World Conservation Union (IUCN), Gland, Switzerland (2005)
NOAA Right Whale Program, Reviewer (2004)
NOAA, National Marine Fisheries Service, Atlantic Large Whale Take Redcution Team, Northeast Implementation Team (2000-02)
Acoustical Society of America, Animal Bioacoustics Committee

Grants

Selected list, full list provided in separate document.
Total received by Duke with Nowacek as PI or Co-PI since 2012 ~$5.88M

Pending:

Sigma Xi. Hormone responses to acoustic stimuli in short-finned pilot whales (*Globicephala macrorhyncus*). $1749, **D.P. Nowacek** (PI) with Ms. Jillian Wisse (Duke PhD student).

Current:

2017-2020 NSF Office of Polar Programs. Collaborative Research: Foraging behavior and ecological role of the least studied Antarctic krill predator, the Antarctic minke whale (*Balaenoptera bonaerensis*). $177,322, **D.P. Nowacek** (Duke PI), D.W. Johnston (Co-PI).

2017-2020 Bureau of Ocean Energy Management (BOEM). Spatial and Acoustic Ecology of Marine Megafauna (SPAM). $2,334,438. D. Ann Pabst (UNC Wilmington) lead PI. **D. P. Nowacek**, Co-PI and Duke PI.

2017-18 Naval Facilities Engineering Command, via HDR. "Multi-Scale Behavioral Response Studies of Cetaceans and MFAS Along the US East Coast." $473,409. B.L. Southall, Southall Environmental Associates and UC Santa Cruz lead PI; Duke PIs Read (lead) and **D.P. Nowacek** (Co-PI).

2016-19 Office of Naval Research, "Acoustic Startle Responses as Aversive Reactions and Hearing Indicators in Cetaceans". $572,304, V. Janik (Univeristy of St. Andrews) lead PI, **D.P. Nowacek** (Duke PI) with A.J. Read (Co-PI).

2016-18 Socioambiental Consultorers, Brazil, "Acoustic, Behavioral and Foraging Ecology of Cetaceans off the Coast of Brazil: A Baseline Study". $252,014 **D.P. Nowacek** (PI) with D. Haas (Duke PhD student).

2016-18 Office of Naval Research, "Developing a bioenergetic model for baleen whales to assess population consequences of disturbance - Phase 1" $110,416.00, F. Christiansen, Murdoch University, lead PI, Co-PIs L. Bejder (Murdoch), P.T. Madsen (Aarhus University, Denmark), and **D.P. Nowacek.**

2016-17 Naval Facilities Engineering Command, "North Atlantic Right Whale Tagging and Tracking on the Southeast US Calving Grounds". $347,475, **D.P. Nowacek** (PI), Co-PIs A.J. Read and S.E. Parks (Syracuse University)

2015-17 Marine Corps Air Station Cherry Point, via HDR Inc. "Autonomous Passive Acoustic Monitoring." $188,587, **D.P. Nowacek** (PI).

2015-18 National Science Foundation, HBCU-UP Research Initiation Award, "Physical forces impacting the temporal variability of mesopelagic prey at the Cape Hatteras marine top-predator diversity hotspot". $282,106, A. Kaltenberg, Savannah State (PI) with collaborators **D.P. Nowacek** and D. Savidge.

2015-20 NSF Long Term Ecological Research Program, “LTER Palmer, Antartica (PAL): Land Shelf Ocean Connectivity, Ecosystem Resilience and Transformation”. $6.4M (Mammal group ~$120,00/year), Lead PI Hugh Ducklow (Columbia), A.S. Friedlaender lead mammal group PI. Duke PI D.W. Johnston, Co-PIs A.J. Read and **D.P. Nowacek.**

2014-17 Morris Animal Foundation, “Morris Animal Foundation fellowship training grant”. $67,868, **D.P. Nowacek** (PI) with R. Cassoff, VMD (Duke PhD student).

Past:

2015-16 BOEM, ”Studies to Inform the Delineation of Wind Energy Areas within the Published Areas of Interest for North Carolina”. C. Peterson (UNC-CH) lead PI. $15,000, **D.P. Nowacek** Duke PI.

2011-15 Strategic Environmental Research & Development Program, ”Delphinid Cetaceans: Quantifying Behavioral Ecology and Response to Predators Using a Multi-Species Approach”. $1,476,412, A.J. Read (PI), **D.P. Nowacek** (Co-PI)

2014-15 Naval Facilities Engineering Command, “North Atlantic Right Whale Tagging and Tracking on the Southeast US Calving Grounds”. $336,760, **D.P. Nowacek** (PI), Co-PIs A.J. Read and S.E. Parks (Syracuse University).

2013-15 Office of Naval Research, “WIZARD: A moored system for measuring the temporal variability of prey fields of deep diving predators off Cape Hatteras”. $421,450, **D.P. Nowacek** (PI).

2013-14 The Ocean Foundation, “Comparing humpback whale feeding ecology: Pacific, Atlantic and Antarctic”. $270,817, A.S. Friedlaender (PI), **D.P. Nowacek** and D.W. Johnston (Co-PIs).

2013-14 Naval Facilities Engineering Command, “North Atlantic Right Whale Tagging and Tracking on the Southeast US Calving Grounds”. $289,339, **D.P. Nowacek** (PI), Co-PIs A.J. Read and S.E. Parks (Syracuse University).

2013-14 National Science Foundation, “A SAFE vessel: Advancing research capabilities to the Gulf Stream”. $141,101, C.L. van Dover (PI), **D.P. Nowacek** and J.E. Hench (Co-PIs).

2012 National Oceanic and Atmospheric Administration (NOAA), “Duke University Seminar on Methods in Marine Bioacoustics”. $20,000, **D.P. Nowacek** (PI).

2012-13 National Science Foundation, “RAPID: Linking the movement patterns and foraging behavior of humpback whales”. $76,833, A.S. Friedlaender (PI) and **D.P. Nowacek** (Co-PI).

2011-14 Office of Naval Research, "Improving Attachments of Non-invasive (Type 3) Electronic Data Loggers to Cetaceans". M.J. Moore (WHOI) lead PI. $182,717, **D.P. Nowacek** (PI) and D. Rittschof (Co-PI).

2009-12 National Science Foundation, Office of Polar Programs. "Collaborative Research: The ecological role of a poorly studied Antarctic krill predator". $473,898, **D.P. Nowacek** lead PI, Co-PIs Friedlaender, A.S., Johnston, D.W., and Read, A.J. and 1 non-Duke Co-PI.

2008-12 National Oceanographic Partnership Program: Office of Naval Research, "Prey fields and habitat of deep divers: 3D characterization and modeling of beaked and sperm whale foraging areas in the Tongue of the Ocean". $530,475. **D.P. Nowacek** lead PI with P. Halpin, P. Tyack, and T. Stanton (WHOI).

Recent, unsuccessful proposals:

2017 National Aeronautics and Space Administration, "Cross scale assessment of phytoplankton biogeochemistry and mammal movement ecology across energetic ocean fronts". $1,293,099, Z.I. Johnson lead PI, Duke Co-PIs **D.P. Nowacek** and D.W. Johnston and 4 non-Duke Co-PIs.

2016 BOEM, Department of Interior, "Atlantic Deepwater Ecosystem Observatory (ADEON): An Integrated System". $6,499,977, **D.P. Nowacek** lead PI, Duke Co-PI P.N. Halpin and 8 non-Duke Co-PIs.

2016 National Science Foundation, "EAGER: Citizen Science with CBET and Enviornmental Engineering". $99,863, E. Dimattia (PI) and **D.P. Nowacek** and D.W. Johnston Co-PIs.

2016 Office of Naval Research, invited proposal, "The Involvement of Lung Compression in the Detection of Cetaceans as Active Sonar Targets". $385,119, **D.P. Nowacek** PI.

2015 NOAA Office of Explorarion, invited proposal, " Integrating scientific echosounders into autonomous ocean gliders to measure pelagic communities" $540,687, **D.P. Nowacek** lead PI, Co-PIs Schofield and Kohut (Rutgers) and J.C. Taylor (NOAA).

2014 Southeast Coastal Ocean Observing Regional Association, "Marine Biodiversity in the Southeast U.S.: A Regional Demonstration of a National Network". $1,737,195, P.N. Halpin lead PI, Co-PIs D.P. Nowacek and six non-Duke.

2013 National Science Foundation, "Collaborative research: Krill Predators of the Peninsula, Sharing a Resource in the Western Antarctic Peninsula". $785,086, **D.P. Nowacek** lead PI, Co-PIs D.W. Johnston, A.J. Read, and 3 non-Duke.

PEER REVIEWED PUBLICATIONS

Published or In Press:

Nowacek mentored *postdoc, **graduate student, ***undergraduate student. #authors contributed equally. Papers in red are included in top publications.

97. Howle, L.E., Kraus, S.D., Werner, T.B., and Nowacek, D.P. 2018. Simulation of the entanglement of a North Atlantic right whale (*Eubalaena glacialis*) with fixed fishing gear. *Marine Mammal Science* DOI: 10.1111/mms.12562
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95. Tyson, R. B., Piniak, W. E., Domit, C., Mann, D., Hall, M., Nowacek, D. P., & Fuentes, M. M. (2017). Novel bio-logging tool for studying fine-scale behaviors of marine turtles in response to sound. *Frontiers in Marine Science*, *4*, 219.
94. Stanistreet, J, Nowacek, D, Bell, J, Cholewiak, D, Hildebrand, J, Hodge, L, Van Parijs, S, and Read, A. "Spatial and seasonal patterns in acoustic detections of sperm whales Physeter macrocephalus along the continental slope in the western North Atlantic Ocean." *Endangered Species Research* 35 (January 15, 2018): 1-13. Full Text
93. Narazaki, T, Isojunno, S, Nowacek, DP, Swift, R, Friedlaender, AS, Ramp, C, Smout, S, Aoki, K, Deecke, VB, Sato, K, and Miller, PJO. "Body density of humpback whales (Megaptera novaengliae) in feeding aggregations estimated from hydrodynamic gliding performance." *Plos One* 13, no. 7 (January 2018): e0200287-null. Full Text
92. Rycyk, AM, Deutsch, CJ, Barlas, ME, Hardy, SK, Frisch, K, Leone, EH, and Nowacek, DP. "Manatee behavioral response to boats." *Marine Mammal Science* (January 1, 2018). Full Text
91. Stanistreet, JE, Nowacek, DP, Baumann-Pickering, S, Bell, JT, Cholewiak, DM, Hildebrand, JA, Hodge, LE, Moors-Murphy, HB, Van Parijs, SM, and Read, AJ. "Using passive acoustic monitoring to document the distribution of beaked whale species in the western North Atlantic Ocean." *Canadian Journal of Fisheries and Aquatic Sciences* 74, no. 12 (December 2017): 2098-2109. Full Text Open Access Copy
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88. Root-Gutteridge, H, Cusano, DA, Shiu, Y, Nowacek, DP, Van Parijs, SM, and Parks, SE. "A lifetime of changing calls: North Atlantic right whales, Eubalaena glacialis, refine call production as they age." *Animal Behaviour* 137 2018: 21-34. Full Text
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12. Nowacek, S.M., Wells, R.S., Owen, E.C.G., Speakman, T.R., Flamm, R.O., & **Nowacek, D.P**. 2004. Florida manatees, *Trichechus manatus latirostris*, respond to approaching vessels. *Biological Conservation,* 119: 517-523.
11. **Nowacek, D.P**., Johnson, M.P., & P.L. Tyack. 2004. Right whales ignore ships but respond to alerting stimuli. *Proceedings of the Royal Society B: Biological Sciences*, 271: 227-231.

10. **Nowacek, D.P**., Casper, B.M., Wells, R.S., Nowacek, S.M., & D.A. Mann. 2003. Intraspecific and geographic variation of West Indian manatee (*Trichechus manatus* spp.) vocalizations. *Journal of the Acoustical Society of America*, 114(1): 66-69.
9. **Nowacek, D.P.** 2002. Sequential foraging behaviour of bottlenose dolphins, *Tursiops truncatus,* in Sarasota Bay, FL. *Behaviour*, 139 (9): 1125-1145.
8. Matthews, J.N., Brown, S., Gillespie, D., Johnson, M., McLanaghan, R., Moscrop, A., **Nowacek, D.P**., Leaper, R., & P.L. Tyack. 2001. Vocalisation Rates of the North Atlantic Right Whale. *Journal of Cetacean Research and Management* 3(3): 271–282.
7. Miksis, J.L., Grund, M.D., **Nowacek, D.P**., Solow, A.R., Connor, R.C., & P.L. Tyack. 2001. Cardiac responses to acoustic playback experiments in the captive bottlenose dolphin *Tursiops truncatus*. *Journal of Comparative Psychology*, 115 (3): 227-232.
6. **Nowacek, D.P**., Johnson, M.P., Tyack, P.L., Shorter, K.A., McLellan, W.A., & D.A. Pabst. 2001. Buoyant balaenids: the ups and downs of buoyancy in right whales. *Proceedings of the Royal Society B: Biological Sciences*, 268: 1811-1816.
5. **Nowacek, D.P**., Wells, R.S., & P.L. Tyack. 2001. A platform for continuous behavioral and acoustic observation of free-ranging marine mammals: Overhead video combined with underwater audio. *Marine Mammal Science* 17(1): 191-199.
4. Flamm, R.O., Owen, E.C.G., Weiss, C.F., Wells, R.S., & **D.P. Nowacek**. 2000. Aerial videogrammetry from a tethered airship to assess manatee life-stage structure. *Marine Mammal Science*, 16(3): 617-630.
3. **Nowacek, D.P**., Tyack, P.L., Wells, R.S., & M.P. Johnson. 1998. An onboard acoustic data logger to record biosonar of free-ranging bottlenose dolphins. *Journal of the Acoustical Society of America* 103(5), Pt. 2: 2908.
2. Jacobs, M., **Nowacek, D.P**., Gerhart, D.J., Cannon, G., Nowicki, S., & R.B. Forward, Jr. 1992. Seasonal changes in vocalizations during behavior of the Atlantic bottlenose dolphin. *Estuaries*. 16(2): 241-246.
1. Grant, D.C., Ligibel, J.A., **Nowacek, D.P**., Horsburgh, S.E., Link, M.A., Ngu, M.N., Furr, K.I., & C.M. Hall. 1991. Impact of feral horse migration on soft bottom infaunal community structure. *The Journal of the Elisha Mitchell Scientific Society*. 107(1): 13-20.

In review or prepration:

Wilson, R.M., Tyson, R.B., Nelson, J.A., Balmer, B.C., Chanton, J.P., and **Nowacek, D.P.** Stable isotopes highlight differences in prey selectivity among common bottlenose dolphins (*Tursiops truncatus*) sighted in St. George Sound, Gulf of Mexico. In review *Frontiers in Marine Science*

Wang, Z-T, **Nowacek, D.P**., Akamatsu, T., Wang, K-X., Liu, J-C.,Duan, G-Q., Cao, H-J., Wang, D. In prep. Diversity fish sound types in the Pearl River Estuary, China

Stanistreet, J.E., **Nowacek, D.P**., Bell, J.T., Cholewiak, D.M., Hildebrand, J.A., Hodge, L.E.W., Van Parijs, S.M., Read, A.J. In prep. Spatial and seasonal occurrence patterns of sperm whales (*Physeter macrocephalus*) measured with passive acoustics along the western North Atlantic shelf slope.

Howle, L.E., Kraus, S.D., Werner, T., and **Nowacek, D.P**. In prep. Simulation of the Entanglement of a North Atlantic Right Whale (*Eubalaena glacialis*) with Lobster Trap Gear.

Root-Gutteridge, H., Cusano, D.A., Shiu, Y., **Nowacek, D.P**., Van Parijs, S.M., and Parks, S.E. A lifetime of changing calls: North Atlantic right whales (*Eubalaena glacialis*) continue to refine call production as they age.

SCIENTIFIC CORRESPONDENCE

Gannon, D.P., Johnston, D.W., Read, A.J., & D.P. Nowacek. 2004. Resonance and Dissonance: Science, Ethics, and the Sonar Debate. *Marine Mammal Science*, 20(4):898-899.

POPULAR ARTICLES AND BOOKS

Clark, C.W., Gillespie, D., Nowacek, D.P., & S.E. Parks. 2007. Listening to their world: Acoustics for monitoring and protecting right whales in an urbanized ocean. In: Kraus, S.D. & R.M. Rolland (eds). *The Urban Whale: North Atlantic Right Whales at the Crossroads*. Harvard University Press.

Nowacek, S.M., & D.P. Nowacek. 2006. *Discovering Dolphins*. Colin Baxter Photography, Voyageur Press.

BOOK REVIEWS

Echolocation in Bats and Dolphins. 2004. Thomas, J.A., Moss, C.F. & M. Vater (editors). University of Chicago Press, Chicago, IL. Reviewed at the request of the Press.

RESEARCH EXPEDITIONS LED

2016 *R/V Neil Armstrong*, PI, Deployment of WIZARD acoustic mooring

2010 *R/V Nathaniel B Palmer*, Chief Scientist, Multi-Scale and Interdisciplinary Study of humpback whales and prey, NSF Award

2009 *R/V Laurence M Gould*, Chief Scientist, Multi-Scale and Interdisciplinary Study of humpback whales and prey, NSF Award

TEACHING AND GRADUATE TRAINING

Courses Taught:

Marine Bioacoustics, Duke University (2011-present)
Ocean Engineering, Pratt School of Engineering, Duke University (2012-present)
Conservation Biology and Policy (aka Marine Conservation Summer Institute) (2011-present)
Marine Ecology, Duke University (2011-2013)
Marine Ichthyology, Duke University (2009-2011)
Acoustics and Hearing, Pratt School, Duke (2008)
Applied Ocean Acoustics, Florida State University (2006–2008)
Marine Vertebrates Field Course, Florida State University (2006)
Bioacoustics, Florida State University (2005–2008)
Marine Nekton, Florida State University (2004–2008)
Biology of Marine Mammals, Florida State University (2004–2008)
Biology of Marine Mammals, Eckerd College (2000)
Biology of Marine Mammals, Duke University (1999–2004)
Marine Mammals, Boston University Marine Program (1999)

Advisor for current students in:

Ph.D. Program in Ecology, Duke University (2)
Ph.D. Program in Marine Science and Conservation, Duke University (5)
Masters in Environmental Management, Duke University (3)

Advisor for Ph.D. Graduates from Florida State and Duke Universities:

Stanistreet, J.E. 2016. Ecology of Beaked Whales and Sperm Whales in the Western North Atlantic Ocean: Insights from Passive Acoustic Monitoring. Duke, University Program in Ecology.
Phillips, G. 2016. Passive Acoustics: A Multifaceted Tool for Marine Mammal Conservation. Duke, Marine Science and Conservation.
Bowers, M.T. 2016. Behavioral Ecology of the Western Atlantic Short-finned Pilot Whale (*Globicephala macrorhynchus*). Duke, Marine Science and Conservation.
Xian, Y*. 2015. Detection and classification of whale acoustic signals. Duke, Electrical and Computer Engineering. *Co-Advisor with Dr. Loren Nolte.
Reny B Tyson. 2014. Fine-Scale Foraging Behavior of Humpback Whales *Megaptera novaeangliae* in the Near-Shore Waters of the Western Antarctic Peninsula. Duke, Marine Science and Conservation.
Rycyk, A.M. 2013. Environmental, behavioral, and experiential factors that affect the likelihood and type of a manatee's response to approaching boats. FSU, Earth, Ocean and Atmospheric Sciences.
Wilson, R.M. 2010. Using chemical tracers to evaluate feeding habits in coastal marine ecosystems: stable isotopes and organic contaminants. FSU Department of Oceanography.
Anna Nousek-McGregor. 2010. The costs of locomotion in North Atlantic Right Whales (*Eubalaena glacialis*). Duke, Marine Science and Conservation, Nicholas School of the Environement.

Advisor for Masters in Environmental Management Graduates from Duke University:

Elliott, B. 2017. Analyzing the Role of Sound in the Endangered Species Act: A Petition for Sperm Whale (*Physeter macrocephalus)* Critical Habitat in the Gulf of Mexico.
Alcaraz, N. 2017. Spatial Assessment of Antarctic Krill (*Euphausia superba*) in the Palmer Long-Term Ecological Research (LTER) Study Site using Acoustic Doppler Current Profiler (ADCP) Technology.
Nasgovitz, M. 2017. Mapping anthropogenic noise in the Arctic.
Hartigan, K. 2017. Using Acoustic Indices to Determine Changes in Biodiversity off the Coast of Cape Hatteras, NC
Heywood, E. 2016. Ambient noise in the Kitimat Fjord system.
Wagner, A. 2015. A comparative analysis of the status of the U.S. marine mammal stock assessment program.
Guttenplan, K. 2015. Investigating Boat Noise in Wellfleet Harbor, MA
Carnal, H.L.B. 2014. Geospatial analysis and comparison of habitat costs for resident Sarasota Bay bottlenose dolphins (*Tursiops truncatus*).
Bonamusa, J. 2014. Spatial and temporal variability of sea surface temperature and fisheries distribution with the North Atlantic Oscillation.
Latchford, L.E. 2013. Conservation or culture? An analysis of shark fin soup in America.
Carduner, J. 2013. Best practices for baseline passive acoustic monitoring of offshore wind energy development.
Jessica Richardson 2012. Evaluating opportunistic sighting records of large whales around South Georgia Island.
Gabriell Vires 2011. Echosounder Effects on Beaked Whales in the Tongue of the Ocean (Bahamas)
Casey Dziuba. 2011. Sea level rise education and outreach for coastal North Carolina.
Jaime L. Budzynkiewicz. 2011. A comparison of Environmental Impact Statement methodologies for assessing sound propagation, density determination and impacts of protected marine mammals: BEOMRE & the U.S. Navy.
Kimberly Gordon. 2010. Catch share management: An appropriate tool for New England?

Advisor for Masters in Engineering Management Graduates from Duke University:

Jonathon Buie 2017. Blue Devil Ocean Engineering XPrize IMU.

Advisor for M.Sc. Graduates from Florida State University:

Reny B. Tyson. 2008. Abundance of bottlenose dolphins in the Big Bend region of Florida: St. Vincent Sound to Alligator Harbor.

Athena Rycyk. 2007. Acoustic ecology of the bottlenose dolphin (*Tursiops truncatus*) in the Big Bend region of Florida. Current position – Ph.D. student, Department of Oceanography, Florida State University, D.P. Nowacek, advisor.

Marie E. Chapla. 2006. Florida manatee (*Trichechus manatus latirostris*) outer and middle ear morphology: Potential sound pathways and middle ear mechanism. Current position – Research associate, NOAA, National Marine Fisheries Service, Pacific Islands Fisheries Science Center, Honolulu, HI.

Graduate Thesis Committees:

Duke University
University of North Carolina at Wilmington
Florida State University
North Carolina State University

PRESENTATIONS AT SCIENTIFIC MEETINGS

First-Author Presentations (*Invited):

***Nowacek, D.P.** and Southall, B.L. 2016. Effective planning strategies for managing environmental risk associated with geophysical and other imaging surveys. World Congress, International Union for the Conservation of Nature, Honolulu, HI.

***Nowacek, D.P.** Cetacean Ecology of the Antarctic Peninsula. Department of Environmental Sciences, University of Virginia, 13 October 2016.

***Nowacek, D.P.** Ocean Noise: Impacts and Ideas for Management. Department of Marine and Coastal Sciences, Rutgers University, 11 April 2016.

***Nowacek, D.P.** Seismic surveys and marine wildlife: Ideas for managing real and perceived impacts. Society for Exploration Geophysicists, Annual Meeting, 18-23 October, 2015. New Orleans, USA.

***Nowacek, D.P.** Seismic surveys and marine wildlife: Impacts, the lack thereof and thoughts on managing both. Hot Topics in Acoustics, Session 3pID, 170th Meeting of the Acoustical Society of America. Jacksonville, FL 2-6 November 2015.

***Nowacek, D.P.** Invited witness at House of Representatives hearing, 'The Fundamental Role of Safe Seismic Surveying in OCS Energy Exploration and Development'. **House Natural Resources Committee, Energy and Minerals Subcommittee.** 14 July 2015.

Nowacek, D.P., Clark, C.W., Mann, D.A., Miller, P.J.O., Rosenbaum, H.C., Golden, J.S., Jasny, M., Kraska, J., and Southall, B.L. 2015. Marine seismic surveys and ocean noise: Mitigation, monitoring and a plan for international management. 21st Biennial Conference on the Biology of Marine Mammals, San Francisco, CA.

***Nowacek, D.P**., Bowers, M., Cannon, A., Hindell, M., Howle, L.E., Murray, M.M., Rittschof, D., Shorter, K.A., and Moore, M. The next generation of multi-sensor acoustic tags: sensors, applications and attachments. 2014. 166th Meeting of the Acoustical Society of America in San Francisco, CA.

***Nowacek, D.P.**, Parks, S.E., and Read, A.J. 2015. Tagging and Tracking of North Atlantic Right Whales in the SE U.S. U.S. Marine Mammal Commission Annual Meeting, Charleston, SC.

***Nowacek, D.P.** Seismic surveys: Potential impacts on animals and ideas for mitigation, monitoring and management. 2015. U.S. Marine Mammal Commission Annual Meeting, Charleston, SC.

Nowacek, D.P., Hindell, M., Howle, L.E., Murray, M.M., Rittschof, D., Shorter, K.A., and Moore, M. The next generation of multi-sensor tags: improving attachments of non-invasive tags with bio-compatible glues and microstructure. 2014. The 5th International Bio-Logging Science Symposium, 22-26 September, Strasbourg, France.

Nowacek, D.P.& P.L. Tyack. 2007. Assessing effects of anthropogenic sound on behavior of marine mammals. International Conference on the Effects of Noise on Aquatic Life, Nyborg, Denmark.

***Nowacek, D.P.** 2007. Biological functions of acoustic communication and the effects of noise on marine animals. Potential Application of Vessel-Quieting Technology on Large Commercial Vessels. Convened by NOAA, National Marine Fisheries Service - Acoustics Program, Washington, DC.

Nowacek, D.P. 2006. Application of tagging data to the design and implementation of right whale ship strike mitigation, U.S. Marine Mammal Commission Review of Right Whale Research, Marine Biological Labs, Woods Hole, MA

Nowacek, D.P.& D.A. Mann. 2006. GNOMES – Gulf of Mexico noise monitoring system. Part of 'Understanding Acoustic Impacts on Marine Animals: National Lecture Series', NOAA Acoustics Program, held at Duke University, Nicholas School of the Environment and Earth Sciences.

***Nowacek, D.P.**2006. Methods for assessing the response of cetaceans to seismic exploration. International Whaling Commission, Scientific Committee, St. Kitts.

***Nowacek, D.P**., Mann, D.A., Remage-Healey, L., & A.H. Bass. 2006. Dolphin foraging sounds suppress calling and elevate stress hormones in a prey species, the Gulf toadfish. Carnivores 2006, St. Petersburg, FL.

***Nowacek, D.P.**2005. Do dolphins have language? Philosophy Department, Case Western Reserve University, Cleveland, OH.

Nowacek, D.P., Renner, W., Cavanagh, R., & A. Eller. 2005. Transmission of Vessel Noise Through Right Whale Environments. 16th Biennial Conference on the Biology of Marine Mammals, San Diego, CA.

Nowacek, D.P., Barton, K., Bocconcelli, A., Johnson, M.P., Moore K.C., Parks, S.E., Shorter, K.A., & P.L. Tyack. 2005. Response of right whales at the surface to alert/alarm signal. North Atlantic Right Whale Consortium, New Bedford, MA.

Nowacek, D.P.2005. Behavioral Ecology of Marine Mammals. Southeast and Mid-Atlantic Marine Mammal Symposium, University of North Carolina Wilmington.

Nowacek, D.P.2005. Detection of boats by manatees. Manatee Forum IV, Florida Fish and Wildlife Conservation Commission. St. Petersburg, FL.

Nowacek, D.P.2004. Behavioral ecology and bioacoustics of cetaceans: 'tales from tagging'. Hopkins Marine Station, Stanford University.

Nowacek, D.P., Renner, W., Cavanagh, R., & A. Eller. 2004. Transmission Of Vessel Noise Through Right Whale Environments. North Atlantic Right Whale Consortium, New Bedford, MA.

Nowacek, D.P.2004. Effects of Shipping Noise on Marine Mammal Behavior. NOAA Fisheries Symposium: "Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology", Washington, DC.

Nowacek, D.P.2004. Behavioral responses of marine mammals to human generated noise. Part of 'Understanding Acoustic Impacts on Marine Animals: National Lecture Series', NOAA Acoustics Program', held at Mote Marine Laboratory, Sarasota, FL.

Nowacek, D.P., Tyack, P.L., & M.P. Johnson. 2003. North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alarm signal. 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC.

Nowacek, D.P., Tyack, P.L., & M.P. Johnson. 2003. North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alarm signal. Environmental Consequences of Underwater Sound, San Antonio, TX.

***Nowacek, D.P**., Tyack, P.L., & M.P. Johnson. 2003. North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting signal. Hawaiian Islands humpback whale National Marine Sanctuary, Vessel collision avoidance workshop, Wailea, Maui, Hawaii.

***Nowacek, D.P**., Tyack, P.L., & M.P. Johnson. 2003. North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting signal. U.S. Marine Mammal Commission, Annual Meeting, Newport, RI.

Nowacek, D.P., Johnson, M.P., & Tyack, P.L. 2003. North Atlantic right whales ignore ships but respond to alerting stimuli: have we found the 'right whale deer whistle'? 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC.

Nowacek, D.P., Tyack, P.L., Johnson, M.P., Allen, B.D., Argo, E., Biassoni, B., Bocconcelli, A., Carson, C., Loer, A., Parks, S., Partan, J., Samuels, A., Shorter, K.A., Waples, D, & M. Zani. 2002. Playback experiments to study risk factors for vessel collision in right whales. North Atlantic Right Whale Consortium, New Bedford, MA.

Nowacek, D.P., Johnson, M.P., Tyack, P.L., Buckstaff, K.C. Nowacek, S.M., & R.S. Wells. 2002. Use of a multi-sensor tag to record the behavioral responses and acoustic environment of marine mammals exposed to vessels. Proceedings of the Florida Marine Mammal Health Conference, Gainesville, FL.

Nowacek, D.P., Tyack, P.L., & M.P. Johnson. 2001. Use of a multi-sensor acoustic tag to assess risk factors associated with collisions between ships and right whales. Southeast and Mid-Atlantic Marine Mammal Symposium, Duke Marine Lab, Beaufort, NC.

Nowacek, D.P., Tyack, P.L., & M.P. Johnson. 2001. Use of a multi-sensor acoustic tag to assess risk factors associated with collisions between ships and right whales. 15th Annual Conference of the European Cetacean Society, Rome, Italy.

Nowacek, D.P.2000. The acoustic ecology of bottlenose dolphins. College of Marine Science, University of South Florida, St. Petersburg, FL.

Nowacek, D.P., Johnson, M.P., Shorter, K.A. & P.L. Tyack. 1999. Right whale diving behavior, playbacks, & vessel approaches: early insights into ship strikes. North Atlantic Right Whale Consortium, Boston, MA.

Nowacek, D.P., Wells, R.S., & P.L. Tyack. 1999. Sequential foraging behavior and ecology of bottlenose dolphins, *Tursiops truncatus*. 13th Biennial Conference on the Biology of Marine Mammals, Wailea, Maui, HI.

Co-Authored Presentations:

Blawas, A.***, Coonley, K.*, Dalla Rosa, B.***, Evezich, K.***, Hermiller, B.***, Naclerio, N.***, Sequeira, D.**, Toone, T.***, Wang, J.***, Brooke, M., Mann, B. and **D.P. Nowacek**. 2017. Designing an Energy Harvesting Buoy. NC State Energy Conference, Raleigh, NC.

Tyson, R.B., Piniak, W.E.D., Domit, C., Mann, D., Hall, M., **Nowacek, D.P.,** and Fuentes, M.M. P. B. 2017. Applications for studying fine-scale behaviors of marine turtles in response to sound. Annual Symposium on Sea Turtle Biology and Conservation, Las Vegas, NV, April 14-20.

Quick, N.J., **Nowacek, D.P** and Read, A.J. 2015. Hidden Markov Models reveal complexity in the diving behaviour of short-finned pilot whales. 21st Biennial Conference on the Biology of Marine Mammals, San Francisco, CA.

Bowers**, M.T., DeRuiter, S., Friedlaender, A.S., **Nowacek, D.P.,** Quick, N.J., Southall, B.L. 2015. Short-finned pilot whales and Risso's dolphins respond strongly and divergently to biphonic calls of mammal-eating killer whales. 21st Biennial Conference on the Biology of Marine Mammals, San Francisco, CA.

Pallin**, L., Johnston, D.W., **Nowacek, D.P.**, Read, A.J., Robbins, J., and Friedlaender, A.S. 2015. Pregnancy rates of humpback whales along the western Antarctic Peninsula. 21st Biennial Conference on the Biology of Marine Mammals, San Francisco, CA.

Friedlaender, A.S., Heaslip, S., Johnston, D.W., Read, A.J., **Nowacek, D.P.**, Durban, J., Pallin, L., Goldbogen, J., and Gales, N., 2015. Using state-space models to compare the foraging ecology of humpback and minke whales around the Antarctic Peninsula. 21st Biennial Conference on the Biology of Marine Mammals, San Francisco, CA.

Stanistreet**, J., **Nowacek, D.P**., Hench, J., Hodge, L., Van Parijs, S., Bell, J., and Read, A.J., 2015. Do foraging beaked whales and sperm whales target the Gulf Stream frontal edge off Cape Hatteras? Using long-term passive acoustic monitoring to explore habitat associations. 21st Biennial Conference on the Biology of Marine Mammals, San Francisco, CA.

Bowers**, M.T., **Nowacek, D.P**., Howle, L.E., Murray, M.M., Rittschof, D., Shorter, K.A., and Moore, M. Sticking it to the Whales: Adhesive Attachment of Biologging Devices to Cetaceans. 2013. 20th Biennial Conference on the Biology of Marine Mammals, Dunedin, New Zealand.

Read, A.J., Bowers,** M.T., Janik, V., Quick, N.J., and **Nowacek, D.P**. 2013. Behavioral response of short-finned pilot whales to the calls of predators. 20th Biennial Conference on the Biology of Marine Mammals, Dunedin, New Zealand.

Tyson**, R. B., Friedlaender, A. S., Ware, C., Stimpert, A. K., Hazen, E., Warren, J. D., Curtice, C., and **Nowacek, D. P.** (July 2013). Do humpback whales in Antarctica feed according to optimal foraging theory? 50th Annual Meeting of the Animal Behavior Society, Boulder, Colorado.

Tyson**, R. B., Friedlaender, A. S., Stimpert, A. K., Ware, C., and **Nowacek, D. P**. June 2012. Humpback whale (*Megaptera novaeangliae*) mother and calf foraging behaviors: in synch? 49th Annual Meeting of the Animal Behavior Society, Albuquerque, New Mexico.

Tyson**, R. B., Friedlaender, A. S., Ware, C., and **Nowacek, D. P.** November 2011. In Synch? Humpback whale (*Megaptera novaeangliae*) mother and calf foraging behavior in the Western Antarctic Peninsula. 19th Biennial Conference on the Biology of Marine Mammals, Tampa, Florida.

Friedlaender, A. S., Hazen, E. L., Ware, C., Haplin, P. N., Stimpert, A. K., Tyson**, R. B., **Nowacek, D. P.** 2011. Decisions, decisions. Direct measurements of humpback whale feeding in relation to vertically-stratified prey abundance. 19th Biennial Conference on the Biology of Marine Mammals, Tampa, Florida.

Tyson**, R. B., Friedlaender, A. S., Ware, C., and **Nowacek, D. P.** March 2011. Humpback whale (*Megaptera novaeangliae*) mother and calf foraging behavior: insights from multi-sensor suction cup tags. The Fourth Science Symposium on Bio-logging. Hobart, Tasmania, Australia.

Friedlaender, A. S., Ware, C., Tyson*, R. B., and **Nowacek, D. P.** March 2011. Using multi-sensor suction cup tags to quantify the kinematics of lunge feeding in humpback whales (*Megaptera novaeangliae*) in the water around the West Antarctic Peninsula. The Fourth Science Symposium on Bio-logging. Hobart, Tasmania, Australia.

Tyson**, R.B., **Nowacek, D. P.**, Arsenault, R. J., Espinasse, B., Halpin, P., Johnston, D. W., Friedlaender, A. S., Hazen, E. L., Peavey, L., Read, A. J., Revelli, E., Stimpert, A. K., Ware, C., Zhu, Y., Zhou, M. June 2010.. Foraging ecology of humpback whales (*Eubalaena glacialis*) in the Western Antarctic Peninsula. The 22nd International Coastal Society Conference, Wilmington, North Carolina.

McGregor**, A.E., Fish, F.E., **Nowacek, D.P.** Finding the window of energetic opportunity: traveling North Atlantic right whales use dive depths that avoid surface drag. Annual Meeting of the Society-for-Integrative-and-Comparative-Biology, JAN 03-07, 2010

Dobbins, P. & **D.P. Nowacek**. 2007. Azimuth localization in Pod-Track - a passive acoustic monitoring system for wild dolphins. IEEE Oceans07, Aberdeen, Scotland.

Tyson***, R.B., **Nowacek, D.P**., & P.J.O. Miller. 2006. Nonlinear dynamics in killer whale (*Orcinus orca*) vocalizations. National Conference for Undergraduate Research, Ashville, NC.

Parks, S., Searby, A., Celerier, A., **Nowacek, D.P.**, Johnson, M.P., & P.L. Tyack. 2006. Calling behavior of right whales in the Bay of Fundy: DTAG data from 1999-2005. North Atlantic Right Whale Consortium, New Bedford, MA.

Tyson***, R.B., & **D.P. Nowacek**. 2005. Nonlinear dynamics in North Atlantic right whale vocalizations. 16th Biennial Conference on the Biology of Marine Mammals, San Diego, CA.

Chapla**, M.E., **Nowacek D.P.,** Rommel, S.A., Sadler, V.M., & L.M. Witmer. 2005. Three-dimensional reconstructions of a Florida manatee (*Trichechus manatus latirostris*) head and isolated ear bone: the search for sound pathways. 16th Biennial Conference on the Biology of Marine Mammals, San Diego, CA.

Rycyk**, A.M., & **D.P. Nowacek**. 2005. Acoustic behavior of bottlenose dolphins (*Tursiops truncatus*) in the Big Bend region of Florida. 16th Biennial Conference on the Biology of Marine Mammals, San Diego, CA.

Mann, D.A., Locasio, J., **Nowacek, D.P**., & W.N. Tavolga. 2003. Spatial and temporal patterns of fish sound production in Charlotte Harbor. Charlotte Harbor Conference, Sarasota, FL.

Johnson, M.P., Tyack, P.L., Miller, P.J.O. & **D.P. Nowacek**. 2003. DTAG: A synchronous sound and orientation recording tag for wild marine mammals. Environmental Consequences of Underwater Sound, San Antonio, TX.

Gannon, D.P., Barros, N., **Nowacek, D.P.,** Read, A.J., Waples, D. & R.S. Wells. 2003. Prey detection by coastal bottlenose dolphins: testing the passive listening hypothesis. 15th Biennial Conference on the Biology of Marine Mammals, Greensboro, NC.

Nowacek, S.M., Wells, R.S., **Nowacek, D.P.,** & K.C. Buckstaff. 2002. Behavioral responses of dolphins and manatees to vessel approaches. Proceedings of the Florida Marine Mammal Health Conference, Gainesville, FL.

Mann, D.A., **Nowacek, D.P**., & W.N. Tavolga. 2002. Charlotte Harbor Acoustic Survey. Charlotte Harbor Conference, Sarasota, FL.

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ANNEX C

PROJECT 90 BY 2030 | Inspire. Mobilise. A low-carbon generation.

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13 November 2024

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Letter indicating endorsement of Natural Justice and The Green Connection's appeal submission regarding Searcher Geodata UK Pty Ltd environmental authorization (EIMS 1623, PASA 12/1/048)

Project 90 by 2030 ("Project90") is a social and environmental justice organisation inspiring and mobilising South African society towards a sustainably developed and equitable low-carbon future by means of a Just Energy Transition.

We work with stakeholders and decision makers to identify policies and actions that support climate justice; with a specific focus on developing environmental leadership in our youth, and increasing people's ability to engage government – through active public participation – to address climate change, energy poverty, and the social injustices that intersect in their communities.

Project 90 endorses the appeal submitted by Natural Justice and The Green Connection regarding the Searcher Geodata UK Pty Ltd environmental authorization (EIMS 1623, PASA 12/1/048).

Sincerely,

Gabriel Klaasen
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