



Australian Government

Department of the Environment and Water Resources

Environment Protection and Biodiversity Conservation Act 1999.

General Permit Application for:

- **Threatened species and ecological communities (section 201)**
- **Migratory species (section 216)**
- **Whales and dolphins (section 238)**
- **Listed marine species (section 258)**



If the person completing this form is representing a small business (i.e. a business having less than 20 employees), please provide an estimate of the time taken to complete this form.

Please include:

- the time taken spent reading the instructions, working on the questions and obtaining the information; and
- the time spent by all employees in collecting and providing this information.

Hours

Minutes

Purpose of this form

This form is for an action which will affect any species or ecological community listed under the EPBC Act in the above categories where that action is within a Commonwealth Area, and for whale/dolphins where the action is within the waters of the Australian Whale Sanctuary, or internationally.

Complete this form in addition to either Supplementary Form A, B or C described in question 1 on the next page. Please return this form, along with the relevant Supplementary Form to the Department of the Environment and Water Resources.

Do not use this form for permits in:

- The Great Barrier Reef Marine Park. These permits are available at: www.gbrmpa.gov.au/corp_site/permits/
- A Commonwealth park or reserve (e.g. Kakadu National Park). These permits are available at: www.environment.gov.au/epbc/permits/parks/
- State Waters

Additional information

Please ensure that you have read the following information sheet:

Permits required for actions affecting EPBC Act listed species in Commonwealth Areas including the Australian Whale Sanctuary

This information sheet is available at www.environment.gov.au/epbc/permits/index.html. Further information is also available by contacting the Department on phone: (02) 6274 1111 or email: epbcwild@environment.gov.au.

Incomplete information

Applications that are incomplete or contain insufficient information cannot be assessed. Delays will occur whilst further information is sought from the applicant.

If you need more space

If there is insufficient space on this form to fully address any of the questions please attach additional pages and list these attachments at question 10.

Privacy

Information provided in this application form may be exchanged with other Commonwealth and State agencies for the purposes of administering the EPBC Act and relevant State legislation.

In accordance with section 515A of the EPBC Act a list of all permits issued under the Act are published on the Department's website.

1 Which of the following best describes the purpose of this application?

Research on whales/dolphins ⇒ You will also need to complete Supplementary Form A for Whales and Dolphins (cetaceans).
Now go to 2

To take an action that will have an incidental impact on whales/dolphins ⇒ You will also need to complete Supplementary Form A for Whales and Dolphins (cetaceans).
Now go to 2
E.g. whales and dolphins are not the purpose of the action but they will be indirectly affected

Whale and Dolphin watching in a Tier 2 area ⇒ You will also need to complete Supplementary Form B for Whale and Dolphin Watching.
Now go to 2

To kill, injure, take, trade, keep or move a listed species (other than whales/dolphins) or ecological community in Commonwealth areas ⇒ You will also need to complete Supplementary Form C *Listed species / ecological community, listed migratory species or listed marine species.*
Now go to 2

2 Period of permit requested
Permits are usually not issued for more than 5 years.

Start date: 1 Aug 2009	End date: 31 Dec 2009
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3 The permit holder can be a group such as a business, company, or corporation?

Is the proposed permit holder a group?

No ⇒ *Go to next question*


Yes ⇒ *Give details below*

Group Name
Street address:
Postal address:
Telephone No.:
Fax No.:
Email address:

Now go to 5

4 Is the proposed permit holder individual(s)?

No ⇒ *You must provide a permit holder -> complete either q3 or q4.*

Yes ⇒ *Give details below of each individual to whom the permit would be issued. If insufficient space, attach a separate list.* 

1	Name: Dr Michael Noad
	Residential address:
	Postal address:
	Telephone No.:
	Fax No.:
	Email address:

2	Name:
	Residential address:
	Postal address:
	Telephone No.:
	Fax No.:
	Email address:

3	Name:
	Residential address:
	Postal address:
	Telephone No.:
	Fax No.:
	Email address:

5 Applicant details (if different from proposed permit holder(s))

Name:
Residential address:
Postal address:
Telephone No.:
Fax No.:
Email address:

6 Give the relevant qualifications and experience of all people who will carry out the actions. If insufficient space, attach a list.

1	Name: Dr Michael Noad
	Qualifications and experience: BVSc PhD 14 years working with humpback whales inc. population assessment, acoustic communication, effects of noise, controlled exposure experiments, acoustic & visual tracking, biopsying, fluke photography and tagging with suction cup tags. Coordination and management of the research program with hands-on activities including all of the above.

2	Name: Dr Robert McCauley
	Qualifications and experience: BSc PhD Working on seismic exploration issues since 1992 including many publications on the effects of this on fish and whales. Has experience running a single air gun and conducting controlled exposure experiments on humpback whales in Western Australia. Main role in this project will be managing and operating the air gun used.

3	Name: Dr Rebecca Dunlop
	Qualifications and experience: BSc (hons) PhD Six years working with humpback whales inc. population assessment, acoustic communication, effects of noise, controlled exposure experiments, acoustic & visual tracking and tagging with suction cup tags. Main role will be assisting Noad including performing all activities, and data analysis.

7 Have you applied for or obtained any other approvals, permits or licences relating to this action under Commonwealth, State or Territory legislation?

No ⇒ *Go to next question*

Yes ⇒ *Attach copies*

8 Have you previously held a permit from the Australian Government to undertake this action?

No ⇒ *Go to next question*

Yes ⇒ *Give details below*

Permit number	Date permit expired
E2002/00030	1 Nov 2005
2008-0002	31 Dec 2009

9 Offences

A proposed permit holder is taken to have been convicted of an offence if, within 5 years before the application is made, the proposed permit holder:

- has been charged with, and found guilty of, the offence but discharged without conviction; or
- has not been found guilty of the offence, but a court has taken the offence into account in passing sentence on the proposed permit holder for another offence.

Section 6 of the *Crimes Act 1914* deals with being an accessory after the fact. Sections 7 and 7A and subsection 86(1) of the *Crimes Act 1914* and sections 11.1, 11.4 and 11.5 of the *Criminal Code* deal with attempts to commit offences, inciting to or urging the commission of offences by other people and, conspiracy to commit offences.

Part VIIC of the *Crimes Act 1914* includes provisions that, in certain circumstances, relieve persons from the requirement to disclose spent convictions and require persons aware of such convictions to disregard them.

Has the proposed permit holder been convicted of, or subject to proceedings for an offence under any of the following?

- a. offences under the *EBPC Act* or *Regulations*
- b. a law of the Commonwealth or a State or Territory about the protection, conservation or management of native species or ecological communities;
- c. section 6, 7 or 7A, or subsection 86(1), of the *Crimes Act 1914* (Commonwealth) or sections 11.1, 11.4 or 11.5 of the *Criminal Code Act 1995* (Commonwealth) in relation to an offence under a law mentioned in (a) or (b) above; or
- d. a provision of a law of a State or Territory that is equivalent to a provision mentioned in (c) above.

No

Yes ⇒ *Attach details*

10 Attachments

Indicate below which documents are attached.

Additional permit holders
See question 4

Additional qualifications details
See question 6

Copies of other approvals/permits
See question 7

Details of offences
See question 9

Other supporting documentation
List all additional documents below

Titles of all attached documents (*include the document title, the specific section(s) and the page number(s) on which the information appears*)

Additional Information for General Permit Application for Whales and Dolphins Qld EPA permit application

11 Declaration

I declare that the information contained in this application is correct to the best of my knowledge.

Signature of applicant

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Name of person signing

Michael Noad

Date

1 Jul 2009



Supplementary Form A — Whales and Dolphins (cetaceans)

Application under section 238 of the Environment Protection and Biodiversity Conservation Act 1999.



If the person completing this form is representing a small business (i.e. a business having less than 20 employees), please provide an estimate of the time taken to complete this form.

Please include:

- the time taken spent reading the instructions, working on the questions and obtaining the information; and
- the time spent by all employees in collecting and providing this information.

Hours

Minutes

This form has two purposes:

1. To apply for a permit to undertake an action which will contribute significantly to the conservation of whales and dolphins such as research on whales and dolphins.
2. To apply for a permit to interfere with whales and dolphins, where that interference is incidental to and not the purpose of the action, for example, building an underwater structure where you may come into contact with whales or dolphins.

Please supply the following information if you will interfere with, injure, take, keep, move, possess or treat (cut up/divide) a cetacean or part of a cetacean in the Australian Whale Sanctuary or waters beyond the Australian Whale Sanctuary (overseas). If you are proposing to send specimens out of Australia you will need an export permit. Import permits will be necessary for bringing parts or products of cetaceans into Australia. For more information on imports and exports contact International Wildlife Trade Section on 02 6274 1900.

This form should be completed in conjunction with The General Permit Application form.

If you need more space

If there is insufficient space on this form to fully address any of the questions please attach additional pages and list these attachments at question 16.

When using additional documentation to answer individual questions in this application, please refer to the document title, the specific section(s) and the page number(s) on which the information appears.

Application fee

There is a \$25 fee for permits where the action will contribute significantly to the conservation of cetaceans. There are some fee exemptions in certain circumstances, details of which can be obtained from the Department at the below address.

Where to send the forms and the application fee

Please send the completed General Permit Application and this form and any accompanying attachments to:

Director
Cetacean Policy and Recovery Section
Department of the Environment and Water Resources
GPO Box 787
CANBERRA ACT 2601
Fax: 02 6274 1542

1 Details of species that will be affected by the action. Use the following codes to enter details in columns 3 and 5.

Column 1 Common name of species. Common and scientific names are available at the Departmental website: http://www.environment.gov.au/erin/applications/biodiversity/sprat/	Column 2 Scientific name of species	Column 3 Conservation status of threatened species under EPBC Act (e.g. the blue whale is endangered EN) Codes for Column 3 EW Extinct in the wild EX Extinct CE Critically endangered EN Endangered VU Vulnerable CD Conservation dependent	Column 4 Estimated number that will be affected.	Column 5 Type of effect Codes for Column 5 IC Interfering with a cetacean IN Injuring TA Taking KE Keeping MO Moving TC Treating PO Possessing
Humpback whale	Megaptera novaeangliae	VU	450	IC

2 Provide the latitude and longitude of where the action will be conducted. Latitude and longitude references should be used instead of AMG and/or digital coordinates.

Where the project area is less than 1 square km, provide a single pair of latitude and longitude references.

Where the project area is greater than 1 square km or any dimension is greater than 1 km, attach a list of coordinates to enable accurate identification of the location of the project area.

Latitude

Degrees Minutes Seconds

26	20	00
26	40	00
26	20	00
26	40	00

Longitude

Degrees Minutes Seconds

153	06	00
153	06	00
153	15	00
153	15	00

Locality

Waters off the Sunshine Coast from Noosa to Maroochydore, Qld


3 Attach an A4 sized map to show the boundaries of the area in which the action will be conducted.

4 Provide an attachment describing the action addressing the following points.

- A. The equipment and methods used to comply with the EPBC Act Regulations.
- B. What steps will be taken to minimise impacts on cetaceans.
- C. The objectives and purposes of the action.

5 Attach a description of any research relevant to the affected species or community that will be carried out in the course of or in conjunction with the proposed action, including:

- A. A copy of the research proposal.
- B. The names of the researchers and institutions involved in or supporting the research.
- C. Relationship of the researchers to the permit applicant, including any funding being provided by, or to, the permit applicant

- 6 Will the action involve invasive techniques?
- No ⇒ *Go to next question*
- Yes ⇒ Attach application and approval from an Animal Ethics Committee. 
- 7 Are you applying on the basis that the action will contribute significantly to conservation of cetaceans? (**Please note**, a fee of \$25 is required for this type of permit — see Question 21)
- No ⇒ *Go to 9*
- Yes ⇒ *Go to next question*
- 8 Why do you believe that the action will contribute significantly to the conservation of cetaceans?

The main aim of this program of research is to develop a better understanding of how anthropogenic underwater noise affects baleen whales. This contributes directly to the conservation of baleen whales in enabling better modelling of the effects of various human activities on the whales at individual as well as population levels. This information is critical for the development of mitigation measures to protect baleen whales are protected from anthropogenic noise in a rational way that is supported by good data.

The pilot study (the subject of this permit application) is a critical first step in the overall program of research. It will allow us to develop safe, responsible research methodologies for the larger experiments over the next few years.

The other aim of this work is to develop non-invasive methods of studying the physiology of baleen whales. This will enable us to develop many studies to better understand their reproduction and to measure the stress induced by various anthropogenic influences.

- 9 Are you applying on the basis that the effect on cetaceans will be incidental to, and not the purpose of, the action?
You must also answer questions 10, 11 & 12 to apply for this type of permit.
- No ⇒ You are not able to apply for a permit using this form, please contact the Cetacean Policy and Recovery Section at epbcwild@environment.gov.au, or call (02) 6274 1111.
- Yes ⇒ Why do you believe that the impact of the action will be incidental to and not the purpose of the action?

The action is to conduct research on how noise affects humpback whales. The performance of CEEs, biopsies and the deployment of DTAGs on whales is an important part of this process but is incidental when placed in the context of the overall work for this project. These are only small components of our field program the bulk of which relies on passive observations of whales. The fieldwork, in turn, is just one component of the entire study together with planning, building equipment, analyses, writing reports and manuscripts, etc.

Now go to 13

- 10 Why do you believe that the proposed action will not adversely affect the conservation status of a species of cetacean or population of that species?

This action is to conduct research on how whales respond to sounds so that better mitigation models can be developed and therefore is of benefit to the conservation of these whales. The components of the proposed action that involve interactions with whales will only have a minor and transitory effect on the individuals exposed or affected, and the numbers of individuals affected will be small compared to the size of the population (in the order of ~15,000 whales in 2009). The pilot study is a critical first step in our research program that will allow us to safely and responsibly refine our methodology for the larger experiments.

- 11 Describe how the proposed action will be consistent with any *recovery plans* or *wildlife conservation plans* in force for the species of cetaceans that may be affected by the action.

Commonwealth recovery and wildlife conservation plans that are in force are available from the Department of the Environment and Water Resources web site:

www.environment.gov.au/biodiversity/threatened/recovery/index.html


State and territory recovery plans will be available from state and territory environmental agencies.

One of the main objectives of the humpback whale recovery plan (2005) is to "maintain the protection of humpback whales from human threats". Acoustic pollution is identified as a threat and assessing and managing acoustic pollution is listed as a recommended action. The main aim of this research is to develop a better understanding of how seismic air gun noise, one of the main sound sources of concern for humpback whales, affects baleen whales enabling the development of well-informed mitigation programs that are grounded in good science.

12 *The applicant is required to take all reasonable steps to minimise interference with cetaceans.*

How will this be carried out?

1. The numbers of whales 'used' in this study will be the minimum number that are necessary to address the aims of the study.
2. Close approaches by boat are probably the most stressful component of the work, and so where possible, multiple procedures will occur with a single close approach, e.g. tagging and collection of mucus.
3. By conducting a pilot study with a single, small air gun and using the results to inform our methodology for later, larger experiments, we are minimising risk of unduly loud exposures to the whales.
4. We will follow the EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales, by shutting down if a whale is within 500m of the air gun.
5. Calves will not be biopsied.

13 Attach details of any proceedings against the proposed permit holder under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources. 

14 Fees

The following fees apply:

- If you answered **yes** at question 7, for an action which will contribute significantly to the conservation of cetaceans - \$25 (there are fee exemptions in some circumstances).
- An incidental action relating to cetaceans - nil

15 Are you paying by credit card?

No ⇒ Attach a cheque, go to next question

Yes ⇒ Complete the following details

Card: Visa Bankcard MasterCard

Card number

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Expiry date (month/year)

--

Card holder's name as shown on card

--

Amount

--

Cardholder's signature

--

16 Attachments

Indicate below which documents are attached.

- Attach a map. *See question 3*
- The equipment and methods used to comply with the EPBC Act Regulations. *See question 4*
- What steps will be taken to minimise impacts on cetaceans. *See question 4*
- The objectives and purposes of the action. *See question 4*
- Copy of research proposal. *See question 5*
- Names of researchers and institutions. *See question 5*
- Relationship of researcher to permit applicant. *See question 5*
- Ethics committee approval. *See question 6*
- Details of any proceedings against the permit holder under a Commonwealth, State or Territory law. *See question 13*
- Cheque for payment of fee. *See question 14*
- List all additional documents below

Titles of all attached documents (*include the document title, the specific section(s) and the page number(s) on which the information appears*)

Additional Information for Supplementary Form A – Whales and Dolphins

Map of the area

Univ. Qld Animal Ethics Application and email showing provisional approval (subject to permits being granted)

Research proposal

17 Declaration

I declare that the information contained in this application is correct to the best of my knowledge.

Signature of applicant

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Name of person signing

Michael Noad

Date

1 Jul 2009

Additional Information for General Permit Application for Whales and Dolphins (section 238)

Q6 – Persons carrying out actions under the permit (cont.)

Professional participants	Qualifications	Experience
Douglas Cato	BSc PhD	The most experienced whale acoustics researcher in Australia with more than 25 years working on whale acoustics. Work has included measurement of whale songs and ambient noise around Australia. Role in this project will be as Chief Scientist, providing scientific and acoustic advice, equipment and technical support.
Melinda Rekdahl	BSc (Hons)	Six years experience in marine mammal research including visual observations and tracking of humpback whales and acoustic recording of humpback whales. PhD student whose main role is to help conduct acoustic recordings of the whales both using the remote hydrophone array and using a hydrophone deployed from a boat.
David Paton	BSc	More than 20 years performing field research on large whales in Australia and the South Pacific; experienced in particular with driving boats near whales, biopsy collection, fluke photography and tagging as well as land-based visual tracking. Main role will be driving boats near whales for biopsy collection, fluke photography and tagging.
Curt Jenner	BSc	Also more than 20 years experience in whale related field research including the operation of small boats around humpback whales, biopsy collection, fluke photography and tagging of humpback whales.

Q7 – A permit application covering the same activities for adjacent state waters has been submitted (attached).

Q8 – Previous permits have been obtained from both the Queensland and Commonwealth Governments to carry out many aspects of this study including use of Dtags, biopsying and exposure of whales to conspecific social sounds and artificial tones (but not seismic signals).

Additional Information for Supplementary Form A – Whales and Dolphins (Cetaceans)

Q1. Additional notes:

- Several types of activity will occur that will require permitting under the Act
- Many whales may be subjected to more than one type of activity, so the numbers involved will vary with different activity types
- The activities that require permitting include (i) approaching whales to within 100m, (ii) collecting biopsy skin samples, (iii) exposing whales to underwater sounds for the purposes of gauging their reactions to sounds (Controlled Exposure Experiments or CEEs), (iv) attaching suction cup tags to whales, (v) taking fluke photographs of whales, (vi) the collection of mucus from the blows of whales, (vii) implantation of satellite tracking tags to whales
- The above mentioned activities will take place in the context of benign visual and acoustic tracking of whales that do not require permitting as the whales are not approached or harassed in any way. The number affected, 450, includes all whales that may be followed visually from land during a pilot study in 2009. Of these a maximum of 350 are expected to be exposed to seismic sounds at a level that might cause a behavioural change and less than 30 will be tagged or biopsied.
- Depending on the results of this study, a further two years of work will be planned. We will apply separately for permits for these years once we have established firm experimental protocols (which will depend on the results of the pilot study).

Q4 – The Action

There is currently a great deal of concern about the potential impacts of underwater noise on marine mammals and the oil and gas extraction industry is considered one of the main acoustic polluters. Prospecting for oil and gas deposits at sea involves ships towing large arrays of **seismic airguns** which generate a very loud bang every ten seconds or so. These loud impulsive sounds travel through the water column, penetrate the sea bed and reflect off various rock strata. These faint reflections are picked up by hundreds of hydrophones (underwater microphones) towed behind the same ship and enables the development of a picture of the undersea geology of the area. When conducting a survey, the airguns operate 24h per day for weeks.

The sounds produced are loud and broadband (covering a great range of acoustic frequencies) but most of the energy is at low frequency (tens to hundreds of Hz) and **there is concern that these sounds may affect baleen whales in particular** as they use similar frequencies for communication and are likely to have hearing sensitive to these frequencies. The effects of these sounds may include a range of things extending from hearing damage if the whales are very close to the airguns (within hundreds of metres) to behavioural reactions at distances of many, perhaps many tens, of kilometres. 'Behavioural changes' itself may include a range of effects such as

displacement from important habitats to avoidance behaviours to mild and transitory changes in diving behaviour.

Regulations currently exist in Australia and other countries that effectively require 'power downs' if whales are sighted within 1 to 2 km of the airgun array (depending on array power) and 'shutdowns' of airguns if whales are sighted within 500m of the array. **While these guidelines are useful for preventing hearing damage, they do not attempt to prevent or tackle the potentially much larger issue of behavioural reactions to the airguns.** One problem is that the term 'behavioural reactions' itself covers a wide range of potential behaviours some of which may indicate a significant negative impact on the whales (e.g. separation of mothers and calves) while others may be incidental and of little importance (e.g. small changes in dive behaviour or transitory avoidance behaviour). The nature and importance of these reactions, and the factors that may elicit them (e.g. how loud the sound is, how far away the airguns are, the social behaviour of the whales) have not been comprehensively studied and are not understood. In fact, not only are the nature of behavioural reactions to seismic not known, but the scope of normal, unaffected humpback whale avoidance behaviours, elicited in response to normal, natural, harmless stimuli such as other humpback whales, is only partly understood.

This project is a continuation of projects conducted in 2003, 2004 and 2008 which attempted to determine the range of behavioural reactions of humpback whales to normal stimuli (e.g. the presence of, or acoustic calls and songs from, other whales) and compare these with reactions to the playback of (i) humpback whale social calls and (ii) artificial tones. **The current project will apply the same principles and basic experimental design but use seismic airguns as the playback stimulus** rather than tones or humpback social sounds. The project aims to (i) measure the behavioural reactions of humpback whales to seismic airgun signals over a range of received levels (levels at the whale) and distances from the playback vessel, (ii) use this to develop a dose-response relationship between the behaviour seen and the received level, (iii) test ramp-up or soft-start as a mitigation measure, and (iv) determine whether behaviours elicited are within the normal suite of behaviours used by the whales in response to normal, natural signals, or whether they are 'abnormal' and therefore possibly indicate harmful reactions or behaviours.

The proposed program of fieldwork will take place in September and October in 2009 - 2012 during the whales' southward migration past southeast Queensland and the Exmouth Gulf region of Western Australia. During the east coast work (2009 - 2011) humpback whales will be observed from multiple platforms as they migrate along the coast between Noosa and Maroochydore on the Sunshine Coast north of Brisbane. During experimental periods, observations will be made on passing whales before, during and after exposure to seismic airguns (Controlled Exposure Experiments or CEEs). During non-experimental periods, normal, undisturbed behaviours will be measured by remote visual and acoustic observation and recording. During CEEs these observations will continue. In addition, a small number of whales will be tagged with suction cup, temporary behavioural tags ('Dtags') and a smaller number still with satellite tags. This will allow us to determine the range of normal behaviours to natural stimuli and contrast these with behaviours during seismic exposure experiments.

Note that this permit application is only for the east coast work in 2009 which is a pilot study for the rest of the program of research. Additional permit applications will be made for the rest of the work once procedures and methodology is finalised pending on the results of the pilot study. The remaining part of the description given here will be for the pilot study only.

The field site, **Peregrin Beach** (see attached map), is an inshore site that we used in the previous experiments which included CEEs using whale social sounds and artificial tones. Many whales migrate close to the coast here making it an excellent place for experimental work. Whales will be observed visually and tracked using a theodolites from a hill as they migrate southward along the coast. An array of hydrophone buoys moored offshore will allow us to simultaneously track vocalising whales and monitor the underwater acoustic environment including ships, airgun noise, etc.

The pilot study has **two main aims**:

1. **To conduct a small number of CEEs using a single air gun** on southward migrating humpback whales. This will show us the sort of reactions we are likely to get to air guns in this area and the sort of received levels likely to elicit them.
2. **To measure in detail the propagation of an air gun signal** across the study site so that acoustic levels (loudness) at the whales during CEEs with air guns can be accurately estimated during the rest of the project.

One of the most important factors in responsibly carrying out a CEE is being able to determine how loud the sound used is as the whale so that: (i) the sound is loud enough to be effective, (ii) the level is known so it can be used as a covariate in modelling the response, and (iii) the sound is not too loud so that the experiment is safe. This pilot study aims to measure the propagation of air gun sounds around our study area so that, for any given distance between the air gun and a whale, we will be able to estimate how loud the received sound is at the whale. The pilot study will also be using a single, small air gun (20 cubic inch capacity) so that we have the quietest seismic signal possible to determine propagation and likely behavioural reactions to air guns. In future years we want to use small arrays of air guns, but **the use of single small air gun initially will enable us to perform initial experiments responsibly and safely**, and to calculate how big the array could be for future experiments.

During each CEE one or two groups of whales in the northern part of the study area (approximately 5 to 10km north of the hill and hydrophone array) will be identified and will be designated 'focal groups'. These will be followed by separate dedicated theodolite teams from the hill. One of the groups will be approached by small boat and the placement of a Dtags will be attempted. After tag boat has left the group (with or without a successful tagging) the whales are followed visually for at least 30 mins by the visual observers and by the small boat at a distance of at least 500m. As they approach the middle of the study area exposure will begin with the vessel towing a single 20 cubic inch air gun moving from approximately 1.5km off the beach eastwards, out to sea and across the migratory path of the whales. The vessel will maintain a speed of 5 knots and its easterly course regardless of the movements of the whales. If any whale comes within 500m of the vessel the air gun will be shut down

(in line with Commonwealth Government guidelines and noting that powerdown is not possible with a single air gun as that relies on reducing the number of operating guns in a larger array). Otherwise the exposure will continue for 30 – 40 mins then stop. The whales will continue to be followed visually from the hill and by the tag boats for at least 30 more minutes before the boats may move in to attempt biopsy sample collection. Exposure experiments will only occur in good weather and once or twice daily.

During propagation studies, we will simply tow the air gun around the study area while recording the signal on multiple hydrophones around the area. The hydrophones will be attached to floating buoys, deployed from boats or attached to autonomous recorders deployed on the bottom. We will avoid any whales in the area when possible (this will be relatively easy with the assistance of the land-based spotting team) and will again shut down the air gun if a whale is seen within 500m of the airgun.

In addition to conducting CEEs using airguns, we will also perform other activities including (i) attaching suction cup tags, (ii) implanting satellite tags, (iii) collecting small, shallow biopsy samples and (iv) photographing the whales. The **suction cup tags** used will be Dtags. More than 30 Dtags have been deployed successfully at this study site in 2003, 2004 and 2008 (under Commonwealth and Queensland state permits) and are now used around the world on a range of species including beaked whales (which are considered to be very sensitive to any anthropogenic disturbance). Humpback whales are disturbed temporarily by the close approach of the tagging boat (to within 10m or so) but tolerate the tags well once they are on. The tags collect highly detailed behavioural and dive data as well as record the acoustic field at the whale and so provide a very powerful tool for measuring behavioural reactions of whales while underwater and also measuring received levels of sound at the whale. The tags are programmed to fall off the whale after hours or days and are recovered by boat to collect the data. We anticipate that less than 30 whales will be tagged and/or biopsied.

Although Dtags provide excellent data over a period of hours, we also want to be able to measure behavioural changes that may last for days. In order to do this we need to use tags that can transmit data via satellites rather than necessarily needing to be retrieved by a boat. A small number of whales (less than 10) may be implanted with **satellite tags** although it is not known at this stage if satellite tags will be available for the pilot study. The precise design of the tags is yet to be determined but will be of a size and penetration depth similar to those deployed previously in Australian waters by N. Gales (Australian Marine Mammal Centre, Australian Antarctic Division). At a minimum these tags will transmit position to allow us to look at changes in swimming speed and movements. If possible the tag will also collect some dive profile data.

Biopsy collection will be used to determine the sex of whales exposed to seismic signals so that the various reactions seen can be examined in the context of the whale's sex and social context (e.g. a male and female travelling together may react differently to a lone female). Biopsies will be collected using a Paxarm rifle that fires a small dart with a stainless steel biopsy tip at the whale. The tip is less than 2cm long and bounces out of the flank of the whale immediately after impact. This system has been used previously and routinely both in Australia and around the world and has

become the standard way of biopsy collection in cetaceans. The samples collected include both skin which can be used for genetics, and blubber which can be used for hormone analysis. The maximum number of biopsies we envisage collecting would be around 150 per year (around 1.5% of the population).

Calves will not be biopsied or tagged.

While collecting these data we will also incidentally be able to collect samples for **hormone analyses**. If we can develop robust hormone extraction and measurement techniques, this will compliment the acoustic work by providing physiological data on the vocalizing whales as well as open a new and important field of research with great potential for non-intrusively monitoring the reproductive status and welfare of whales.

A. The equipment and methods used to comply with the EPBC Act Regulations.

Equipment used will include a Paxarm biopsy rifle for collecting small skin/blubber samples, airguns for the controlled exposure experiments, digital tags (Dtags) and satellite tags for measuring behavioural responses to acoustic stimuli, and digital SLR cameras for fluke identification photos.

The **Paxarm biopsy rifle system** is now commonly used for cetacean biopsies, including those of small dolphins, around the world. It is considered safe and reliable. The size of the biopsy sample is small – approximately 8mm in diameter and 15mm long. Several studies have examined the effects of biopsy on humpback whales. In more than 50% of cases, the whales display no overt sign of being darted, while in most other cases the reaction is very mild (e.g sounding rapidly, a tail flick) (Clapham & Mattila, 1993; Brown et al., 1994). Indeed, Smith et al. (1999), in a large photo ID and biopsy study of humpbacks in the North Atlantic that included the collection of more than 2000 biopsy samples, concluded that the effect of biopsy was so small that it did not matter whether photos or biopsies were obtained first. These studies confirm our own observations from biopsying performed at the same site and time of year in 2002, 2003 and 2004. On impact, the biopsy darts immediately bounce out of the whale and float awaiting pickup. Only one biopsy will be taken from each whale and calves will not be biopsied. The biopsy tips are sterilized by soaking in alcohol and flaming before each use to minimise the risk of infection.

Seismic airguns are essentially pressure chambers that inject air into the water at high pressures. The bubbles produced oscillate violently and rapidly producing a broadband, high level ‘bang’. While a single airgun can be used (and will be used in the initial phase of this study) airguns are more usually used in a group or ‘array’ with airguns spaced so that the maximum acoustic energy is focused downwards towards the seafloor to maximise acoustic penetration below the array. A lot of acoustic energy still radiates laterally, however, and it is this horizontal transmission that is of most concern to whales. Airguns are measured by their capacity (much like a car engine). A small single airgun may have a capacity of 20 cubic inches (cui) while a commercial array may have a total capacity of 2000 – 6000 cui. Seismic airgun regulations in Australia are designed to prevent whales receiving individual pulses greater than 160 dB re $1\mu\text{Pa}^2\cdot\text{s}$. This is based on preventing whales from being exposed to a cumulative dose (i.e. the additive effects of hearing lots of ‘shots’) of

183 dB re $1\mu\text{Pa}^2\cdot\text{s}$ although a whale would need to be exposed at this level for around 30 min for this to occur. If they receive more than this dose then there may be a risk of affecting their hearing although this is likely to only be temporary (a 'temporary threshold shift'). In this study we will use a single 20 cui airgun initially to measure how airgun sounds propagate around our study area. Once we know this we can design an array of airguns that will produce the range of received levels that are likely to produce behavioural reactions (125 to 170 dB). This will be no more than 500 cui total capacity and will be operated in a way to prevent any individual whale receiving a dose more than $183\text{ dB re }1\mu\text{Pa}^2\cdot\text{s}$. Once we know the propagation conditions and finalise the array design and test its source level, we will calculate an appropriate exclusion zone (likely to be several hundred metres) and will cease stop the exposure experiment if a whale comes into this area. There will be marine mammal observers on board the airgun vessel as well as observers monitoring boat and whale movements with theodolites from land.

In order to be able to measure the reactions of animals on a finer scale than just by tracking them from land, we will deploy **Dtags** (Digital tags – Johnson & Tyack, 2003) on some whales during playback trials. These tags have an inbuilt hydrophone to record the sounds at the whale and use movement sensors to record the movements of the whale (i.e. pitch, roll, yaw). When combined with a depth sensor, this allows the development of a 3D underwater track for the whales with synchronized sound recording, providing a very powerful window into the behaviours of individual whales in response to acoustic signals. Dtags have now been deployed on hundred of whales worldwide and have become a standard research tool for whales as they are so well tolerated (e.g. Stimpert et al., 2007; Johnson et al., 2008). We deployed some of the first Dtags on humpback at Peregrine in 2003 with no mishaps. The tags are held on to the whale by suction cups. The whale is approached by a small boat (5.6m). The boat carries a long (13m) carbon fibre tagging pole. The end of the pole has the tag on it. The boat is carefully manoeuvred so that the whale surfaces just in front and to the side of the whale and the tag is slapped down quickly on to the back of the whale and pulls off the end of the pole. The tag is programmed to fall off the whale (by venting the suction cups) at a predetermined time (usually 2-4h). Once detached, it floats to the surface and gives off a radio signal so that it can be picked up by a boat. If the whale does not like the 'feel' of the tag, breaching will dislodge it.

The final design of the **satellite tags** to be used has not been determined. The tags, however, will be of similar size and depth of penetration to those recently deployed in Australian waters by N. Gales (Australian Marine Mammal Centre, Australian Antarctic Division). There is now a growing body of evidence from Australia and overseas that these tags, while invasive, are well tolerated by the whales and do not lead to infections or long-term problems. While these tags will give us valuable information about the behaviour of exposed animals over a period of several days, they may continue to operate for months and provide additional data on the migratory routes of the whales on their return journey to the Antarctic.

In our experience, the single most stressful procedure in all this work is the **close approaches of the boats to the whales**. We are therefore very mindful of minimizing this as far as possible. (Apart from not wanted to distress the whales, there is no point conducting our playback experiments on distressed animals as it will bias the outcomes.) When distressed the whales sound (dive) quickly, show evasive behaviour

(changing direction frequently) and aggressive surface behaviours such as tail flicks and slapping. In the event that the whales we are attempting to sample or tag demonstrate these behaviours for more than two or three surfacings, we will back off and leave them alone. Groups with calves will be treated with particular care particularly with regards to any sign of separation of calves from their mothers (we have never seen this). In this protocol, individual whales will only be approached twice (once for tagging, once for biopsy). While we have considered taking the biopsy at the same time as tagging, it would still require two very close approaches one after the other (as the whales needs to be in a different position relative to the boat for each), and we think it is probably best to tag them, then let them settle down, and then do a second approach more than an hour later for the biopsy. It is worth noting also that even whales distressed by close boat approaches appear to settle quickly back down to their normal swimming routine once left alone.

B. What steps will be taken to minimise impacts on cetaceans.

It should be noted that the **majority of the data collected** during the proposed field trip will be from **entirely benign methods** – land-based visual observations and tracking, and acoustic tracking of vocalising whales using a moored array of hydrophone buoys.

Controlled exposure experiments (CEEs or ‘playback’ experiments) will be conducted for 30 – 40 mins twice daily for three or four days per week (depending on weather) limiting exposure to only comparatively brief periods. As we are working on the migration, this should also allow animals exposed in one experiment to have moved out of the study area and so not be exposed, or only exposed to low levels, a second time thus limiting exposure greatly for any individual. During exposures the positions of all whales in the study area will be monitored from the land station and the positions of focal groups (usually the ones closest to the airguns) will be monitored by dedicated teams with separate theodolites as well as from the seismic vessel and from the tagging boat. As discussed earlier once propagation measurements are made in the area (in 2009) we will be able to accurately estimate the received level of seismic signals at any whale in the area and will design protocols to ensure that no whale receives a cumulative dose in excess of $183 \text{ re } 1\mu\text{Pa}^2.\text{s}$ for the latter parts of the study (for which we will submit other permit applications). For this to occur the whale would need to be within a kilometre of the seismic array for at least 30 mins, and as both the array and the whale are moving, and generally doing so in different directions, this is extremely unlikely.

The **biopsies** are only very small samples but provide a very powerful tool for conducting conservation science. Whales will only be biopsied once and calves will not be biopsied.

The **Dtags** used are non-invasive as they are held on only by suction cups.

While **satellite tags** are more invasive than Dtags, again close approach necessary for placing the tag appears to be more stressful than the tagging itself, and the tags appear to be well tolerated by the whales.

C. The objectives and purposes of this action.

The main objectives of this action (the pilot study) are:

- To get baseline data on the range of behavioural reactions of humpback whales elicited by seismic airguns.
- To determine the how air gun sounds propagate around the study area as a precursor to larger experiments in 2010 and 2011.

The objectives of the overall program of work include:

- To determine the range of behavioural reactions of humpback whales elicited by seismic airguns.
- To determine whether the behaviours elicited are within the range of normal behaviours seen in response to natural harmless stimuli (e.g. other vocalising whales) or whether they are more severe and may indicate prolonged disturbance that may lead to population level impacts.
- To allow a review of current mitigation recommendations which are currently based on very few data.
- To better understand how whales respond to seismic signals and the interplay or factors that may alter the nature of that reactions such as received level, total acoustic dose, social context, and distance to the seismic source.
- To test whether 'ramp-up', one of the major current mitigation measures, is effective in allowing whales to move away from the seismic source in such a way as to reduce acoustic dose and stress.
- To develop recommendations on effective mitigation measures that reduce the impact of seismic explorative activity on humpback whales as much as possible.

Q5 – Research that will be carried out in conjunction with the proposed action.

This action is entirely research. See answer to Q4 for details of the aims and methods used. A copy of the original research proposal is also attached.

The principal researchers involved and their institutions include:

- Dr Michael Noad, The University of Queensland
- Dr Rebecca Dunlop, The University of Queensland
- Dr Douglas Cato, Defence Science and Technology Organisation and the University of Sydney
- Dr Robert McCauley, Curtin University of Technology

The permit applicant is Michael Noad who is also one of the principle investigators on the project. The principal investigators are Noad, Cato and McCauley. The research is being funded by the oil and gas industry (E&P Sound and Marine Life Programme – Joint Industry Program or JIP). Funding will be provided to the University of Queensland and Curtin University of Technology.

Q6 – Provisional animal ethics approval from the University of Queensland (the lead institution) is has been granted (attached email). Final approval will be granted once permits have been obtained.

Q13 – There are no proceedings against the proposed permit holder, Noad.