

Report of the Marine Mammal Impact Assessments/Marine Mammal Mitigation Plans Technical Working Group

Part of the 2015–2016 Seismic Code of Conduct Review process



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Cover photo: Marine mammal observer station. Photo: © Blue Planet Marine

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Preface: background to the Technical Working Group

The review of the Code

In 2012, the Department of Conservation (DOC) developed a voluntary Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations ('the Code'), in consultation with international and domestic stakeholders representing industry, operators, observers and marine scientists. The Code (and its supporting reference document) aims to provide effective, practical measures to minimise the acoustic disturbance of marine mammals during seismic surveys. It was updated in 2013 after being incorporated by reference into the Exclusive Economic Zone and Continental Shelf (Environment Effects – Permitted Activities) Regulations 2013 ('the EEZ Regulations'; see SR2013/283).

At the time the 2012 Code was implemented, DOC committed to the Code being reviewed after three years. Accordingly, the review of the 2013 Code began in July 2015, with a request for feedback from numerous stakeholders (the Seismic Code Review Group; SCRG). In August 2015, this feedback was combined with that obtained during the three years since implementation.

Role of the Technical Working Groups

In August 2015, DOC established nine technical working groups (TWGs) to address the technical issues raised in the feedback and to provide expert advice on the most suitable methods for addressing them. It was intended that DOC would then draw on this advice when redrafting the Code. The TWGs were:

1. Marine Mammal Observer/Passive Acoustic Monitoring Requirements
2. Marine Mammal Observer/Passive Acoustic Monitoring Observer Data
3. Marine Mammal Impact Assessments/Marine Mammal Mitigation Plans
4. Consultation Requirements for Operators
5. Sound Propagation and Cumulative Exposure Models
6. Acoustic Ground-truthing
7. Non-Standard Surveys
8. Non-Commercial Surveys
9. Biologically Relevant Sound Levels

The work of these TWGs was supplemented by two workshops that were co-hosted by DOC in association with scientific conferences in 2015, to discuss the appropriate mechanisms to facilitate the integration of methodological and technological advances into the revised Code.

The nine TWGs worked until January 2016 to provide feedback on the issues assigned to them. This is the report of the third TWG: Marine Mammal Impact Assessments/Marine Mammal Mitigation Plans.

Scope of work for the Marine Mammal Impact Assessments/Marine Mammal Mitigation Plans TWG

There were a number of issues raised in feedback on the 2012/2013 Code pertaining to MMIA/MMMP documents. These include clearly defining the required scope of baseline biological information, ensuring consistency of information between surveys and operators, and potentially developing template documents that apply across surveys (perhaps regionally), which can be modified to suit a specific survey. This TWG was asked to provide recommendations on these topics and other issues related to MMIA and MMMP documents, to inform the impact assessment components of the revised Code.

Specific issues raised to date indicate the need for the following tasks:

- 1) Establish a list of elements that should be incorporated into the MMIA/MMMP process and documentation, with rationale.
- 2) Provide realistic options for streamlining the processes of MMIA/MMMP production and review. Note that consideration should be given to mechanisms for reallocating sufficient resources, if these options include any transfer of responsibility from the project operators to other entities.
- 3) Provide realistic options for better and earlier planning with regard to location, source levels and other survey design elements to minimise the overall impacts of surveys on marine mammals.
- 4) Provide opinion on how much detail and documentation needs to be incorporated into mitigation solutions in MMIA/MMMPs to support informed decision-making without requesting unnecessary information.
- 5) Provide opinion on the possible need for, and incorporation of, noise exposure modelling into MMIA/MMMPs.
- 6) Provide opinion on the possible need for, and incorporation of, cross-project/cross-company cumulative impacts modelling into MMIA/MMMPs if more than one company plans to operate in the same general area (ie where the noise will overlap).

Part 1: Introduction and information base

1. This report offers advice for assessing impacts from seismic surveys

The report of this Technical Working Group (TWG) presents options and recommendations for improvements to requirements for Marine Mammal Impact Assessments (MMIA) and Marine Mammal Mitigation Protocols (MMMP), which are outlined in Appendix 1 of the Department of Conservation (DOC) 2013 Code of Conduct. The TWG was asked to consider several issues, with the aim of producing a more effective and streamlined process for MMIA and MMMPs.

More specifically, this report provides opinion and recommendations on the specific information to be included within these two documents, and how this should be reflected within the Code.

This report is divided into two parts:

- Discussions of and recommendations on the information to be included within the MMIA and MMMP
- Discussions of and recommendations on the processes and procedures surrounding the MMIA and MMMP

2. Addressing conflict of interest

It was noted that MMIA author independence would be beneficial, and could be achieved if industry funds an independent body that would tender work out to qualified individuals in the same way as DOC's Conservation Services Programme tenders research. However, in general the TWG agreed that impact assessment documents are almost always written by proponents, and the review by DOC should minimise concerns. Alternatively, MMIA could be peer reviewed to remove conflict of interest concerns.

3. Recommendations to improve baseline data prior to planned survey activities

Collecting baseline data prior to surveys is critical. However, the TWG was unsure how this could fit into the MMIA process. Some TWG members noted that marine mammal observer (MMO) data from seismic surveys is already constantly adding to the knowledge base of marine mammal distribution around New Zealand. However, it was noted that such MMO data should be more easily accessible to better feed into the development of MMIA. Other TWG members cautioned that even easily available MMO data would be insufficient for advising impact assessments for seismic surveys in new areas.

Some remarked that baseline surveys would need to be very comprehensive to be meaningful. For example, even a single season of marine mammal survey data is

inadequate to predict what will happen in subsequent seasons. If the MMIA was to focus on marine mammals and not general environmental conditions, there is little value (to the impact assessment) in doing other baseline studies except to draw on general characterisation of bathymetry, currents, productivity, etc that are already available. Some TWG members suggested that it makes more sense to require proponents to use existing data and literature. They argued that the mitigation measures in place under the Code should be adequate to protect any unexpected occurrence of animals in the area. Furthermore, the benefits of baseline surveys need to be proven to operators before they are required to commit to it.

3.1 Better ways to collect baseline data

Despite the general resistance to requiring proponents to collect baseline data, the TWG offers some alternative ways to encourage or facilitate the collection of baseline data prior to actual surveys. Scientific advice can be provided to inform what level of data is required. Depending on the species, collection of acoustic data might be possible. The TWG offered the suggestions below:

- Collecting data during pre-seismic multibeam (or similar) surveys
- A pre-survey transect through the survey area
- Generalised marine mammal surveys in permitted areas
- Licensing fees that contribute funds to dedicated marine mammal surveys

Part 2: Information content

4. Elements that should be incorporated in the MMIA/MMMP process and documentation

A broad range of comments were offered on this topic. Most agreed that the documents contained the same general information, but could be improved by applying standards and guidance to ensure consistency.

4.1 Recommendations for guidance on requirements for MMIA

The fundamental purpose of an MMIA seems unclear. There is some inconsistency in Appendix 1 of the Code. Given its title (Marine Mammal Impact Assessment), Appendix 1 casts the net more broadly to include investigation of potential effects on marine species and the wider marine environment. The definition of an MMIA in the Code states that such documents are referred to as Environmental Impact Assessments (EIAs) in other legislation; the Code, however, is concerned with managing potential effects of seismic surveys on marine mammals. Therefore, some TWG members argued that a full EIA does not fit the objectives of the Code. This inconsistency was mainly centred around topics required within the Existing Environment section. The TWG recommended two possible alternative solutions:

1. Retain the MMIA title, and reduce the content by including only relevant data – that which affects marine mammals either directly or indirectly.

Topics such as critical habitat, food sources, water quality, etc should be retained for cetaceans and pinnipeds to account for general productivity. The direct impacts from noise, vessel strike, disturbance as a result of vessel presence, entanglement, etc should also be retained as these constitute cumulative impacts.

It was suggested by some members that data related to fish species, benthic sediments, seabirds, non-mammal marine fauna, etc should be excluded. Others noted that, while the Code is ultimately for marine mammals, it can be argued that impacts on large marine life should be included (even if they are eventually scoped out of risk assessment). The Code states that proponents should avoid or mitigate for other key species such as penguins, turtles or seabirds. The TWG members favouring this solution suggested that DOC should remove the above sentence from the Code.

The TWG agreed that an EIA evaluating all expected environmental consequences of seismic surveys should be mandatory before approval of any operation. If this was the case, the MMIA could be incorporated into one part of this, with information unnecessary for the MMIA included in the rest of the EIA.

2. Change the Appendix 1 title to ‘Environmental Impact Assessment’, with current content requirements remaining the same – to provide more clarity. As discussed the requirement for a full EIA may not fit in with the objectives of the Code.

Please see **Appendix 1** for the recommended list of elements to be included in each MMIA.

4.2 Recommendations for guidance on requirements for MMMP

The Code does not provide guidance on the content of an MMMP. It states that an MMMP is only needed if mitigation measures additional to those required in the Code are agreed for a survey. Technically, if there is no additional mitigation required and the survey complies with the Code, then an MMMP is not required. Appendix 1 of the Code states that a monitoring and reporting plan should be specified, and it seems that the MMMP is where many have tried to fulfil this requirement. It was noted that MMMPs seem to be carried out for most surveys – presumably because either all surveys require additional mitigation, or it has just become part of the process.

In general, the MMMPs produced tend to provide information on additional mitigation measures with some specific operational details (eg comms plans, etc) and much duplicated information also present in the MMIA. It was pointed out that the MMIA is not written to be easily digestible for MMOs and passive acoustic monitoring (PAM) operators – it is written to meet a regulatory function, therefore the MMMP encompassing these topics provides clear operational guidance to the MMO and PAM operators. The general consensus was that MMMPs are useful tools for those offshore to refer quickly to job-specific mitigation requirements, and should be a requirement for all surveys.

However, most also agreed that little in MMIA is not also required in the MMMP. The TWG agreed the documents could be improved by applying standards and guidance to ensure consistency. However, there are conflicting views on what should be included in the MMMP as discussed below.

Some suggested that MMMPs should only contain details of the additional mitigation required, as all other mitigation should be in the Code. It was suggested that as a provider of observers, an operational document could be produced in conjunction with other documents that would not be a requirement of the Code. It was noted, however, that there is potential for misinterpretation between multiple documents, especially as MMO/PAM operators would need to refer to more than one document. There have been some instances where documents have provided conflicting/differing advice. This makes it challenging to determine which document takes precedence.

Please see **Appendix 2** for the TWG’s recommendations for the MMMP content.

4.3 Quantitatively incorporating noise exposure modelling into MMIA/MMMPs

There was a short discussion on this topic. The general consensus was that it would not be currently feasible to achieve this in New Zealand, because the underlying data for robust analyses (eg marine mammal density distribution maps) does not exist. However, it was suggested that industry could begin to collect these data by conducting such ‘baseline’ surveys in areas of interest. This has been conducted in the Moray Firth in Scotland for seismic surveys and routinely for pile-driving (for offshore wind farm development) in UK waters.

5. Detail and documentation required for mitigation solutions in MMIA/MMMPs to inform decision-making

This topic was addressed during general discussion of what elements should be included in an MMIA/MMMP. Members noted that each MMIA is submitted with a slightly different method for assessing potential impacts. Many of the risk-assessment criteria used are generic and may not have enough detail to differentiate between high and low-risk surveys (ie the criteria are broad and all surveys are likely to fall into the same risk category). This makes the relative risks hard to compare, and affects DOC's ability to ensure consistency in the review of these documents.

It was suggested that if all MMIA's were developed using the same risk assessment criteria, these issues would be resolved. This is discussed further in the next section.

5.1 Recommendations provided on standardised risk assessment criteria to be used in all MMIA's

Risk assessment criteria should use quantifiable survey characteristics (eg shot interval, # shots/km, # shots/day, sound levels) to characterise risk where possible. Where quantifiable characteristics are not appropriate, standard risk assessment matrices should be developed. The underlying criteria for these matrices should also take into account the potential risks related to individual surveys, and the total cumulative risk of multiple surveys (simultaneous or across a season) and other human activities that may take place in the area. The TWG discussed options for creating standardised risk assessment criteria for all MMIA's. Its recommendations and suggestions are outlined below.

Fauna criteria for sensitivity tend to consider the protection status, abundance, and vulnerability to stressors that could potentially affect the population over multiple generations. To date, risk assessments for MMIA's have been carried out either by assessing the sensitivity of marine mammals as a group, or with species-specific assessments. The TWG agreed that, although more time consuming, the latter approach is more effective as it considers more complex factors such as functional hearing group, percentage of population affected, threat status, etc. However, data requirements should not become so onerous as to be prohibitive. The TWG believes there are critical factors to be considered when ranking sensitivity of a species:

- Likelihood of presence during survey¹
- High frequency v. low frequency hearing species
- New Zealand and international protection status (the most precautionary status should be used)
- Area significance to species (breeding/feeding/migrating, etc)
- Restricted migratory route and timing coinciding with a survey
- Whether calves are likely to be present

¹ This is somewhat difficult as the data are insufficient. However, there are definitely species the TWG considers likely to be encountered, and including those that may just be migrating through the region during specific periods.

- Proportion of a population that may be exposed
- Site fidelity
- Diving patterns
- Cumulative impacts
- Expected recovery time to pre-impact conditions

Authors of MMIA among the TWG use a range of specific risk assessment criteria to assess impact severity. These take into account the sensitivity of the environmental receptor and also the potential magnitude of the effect. Factors considered generally include seismic noise (physiological effects, masking and behaviour disturbance), vessel strike, general vessel presence, effects of discharge, etc. One member noted that their company initially carries out scoping before the assessment, to identify receptors that may be excluded from further assessments where effects are not significant. This allows a more focused assessment – for example, seawater quality is often excluded following scoping as New Zealand will be operating under MARPOL regulations. The member considered this important to help maintain focus and to not take too many factors into account.

In terms of the overall assessment of risk, there also needs to be some consideration of uncertainty. As New Zealand has no dedicated and systematic marine mammal surveys for any of the seismic survey areas (and all the data we have is from biased sources, such as fisheries or seismic surveys), we need to figure out how to include this uncertainty. However, the TWG made no specific recommendations on how to achieve this.

5.1.1 Incorporating consideration of cross-project/cross-company modelling and cumulative impacts

The TWG agreed that assessing cumulative impacts (either from multiple seismic surveys or seismic surveys taking place with other potential impacts) needs improvement. Two different approaches have been used previously:

- Assessing the effects of a suite of potential threats on a single environmental receptor
- Assessing the effects of increasing operations associated with a single activity across a range of environmental receptors

It was suggested that whilst the latter approach is more common in MMIA's, the former is often more relevant. The Code should consider giving guidance on the preferred approach for risk assessments.

Several approaches were suggested for a practicable risk assessment framework, which could be standardised across all MMIA's.² There was limited discussion, and no specific advice or recommendation was provided by the TWG. However, one TWG member noted how complex establishing risk assessment criteria can become (Muir et al 2010).

² Several TWG members submitted example risk assessment frameworks for consideration. However, as no conclusions were reached on the best approach, none are included here in the final report to ensure that they are not interpreted as recommendations.

Part 3: Processes and procedures

6. Recommendations for MMIA submission and formal approval

According to the Code there is no formal approval given by the Director-General (DG) for MMIA's. However, since implementation the Code has been given regulatory effect under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. Members suggested that formal approval should be given by the DG and/or EPA for MMIA's. Essentially this is already done since DOC and a survey proponent have a process they follow to approve a MMIA. The current process would simply be made formal. However, this change could potentially lead to a survey application being declined at this stage. If this is the case, the grounds for declining a survey application would need to be clearly stated.

It was also suggested that approval should be carried out by the agency receiving the document, so that proponents need to deal with one agency only. For example, if the application is going to DOC, the DG should be the approving authority. However, the EPA should be the approving authority if they are reviewing applications as part of a wider project.

Currently the Code requires anyone interested in conducting seismic surveys to notify the DG three months before the survey commences, but this notification does not require provision of all information. The Code currently states that the MMIA should be submitted 30 days in advance of the survey, and the TWG recommends that it should continue to set out clearly how far in advance the MMIA should be submitted. This timeframe should be long enough to allow changes to the project to be implemented if required. However, the TWG did not provide further advice on appropriate timelines.

7. Streamlining the process of MMIA/MMMP production and review

It was noted that development of templates, checklists, and guidance documents will help streamline the overall MMIA/MMMP process. It might be helpful to generate a single baseline biological description that all surveys in a region could reference in their individual impact assessments. The TWG's suggestions for these are outlined below.

7.1 Recommendations for checklist and guidance on MMIA/MMMP

DOC mentioned a desire to develop a checklist and guidance on elements to evaluate when assessing MMIA/MMMP documents. TWG members felt this checklist could be used when writing documents to ensure everyone is working to the same goal. It was suggested that template documents could be developed to help facilitate this effort, although there was concern this might take away the competitive element between consultants pitching for drafting contracts.

It was noted that some consultants keep a dynamic list of issues previously encountered on surveys, interpretation and advice received from agencies, and recommendations for future operations. All of this is incorporated into future MMIA/MMMP documents to

help guide on-water operations. The above model was considered worth replicating across the industry, so everyone can stay abreast of problems and solutions.

7.2 Improving accessibility of biological information

7.2.1 Recommendations for developing standardised regional biological descriptions

Biological data available for each region does not change significantly over the course of a season, and it might be helpful to generate a single baseline biological description that all surveys in a region could reference in their individual impact assessments.

Two suggestions were put forward to address this. Firstly, a website could be set up to outline the relevant regions, and could include a description of the habitats, a list of species of interest, and any annual significance of those species in that area. Over time, sightings in that area could be added to the database for future reference.³ There are examples of similar approaches, such as the one developed by Dragonfly Science for marine mammals and fisheries data in New Zealand,⁴ and CetMap in the US.⁵ These could translate to seismic/observer data with some revision of data collection protocols. The first example allows you to search by fishery/year/species – which could be translated into equivalents for seismic surveys (petroleum basin, species of concern, permit number, etc). This example is available online. Such a database could be set up and provide consistent data for all parties.

It was acknowledged that proponents require an interpretation of these data on a region-by-region basis. Therefore, another suggestion was to develop a large document to summarise the status quo, which would provide the required level of interpretation and be available for all proponents to use in their applications.

7.2.2 Making use of data collected on previous seismic surveys

The single biggest challenge for analysis of seismic data is including consideration of observation effort. The TWG was not sure how to do this as the current data collection protocols make it very difficult (or even impossible) to weight sightings by the level of marine mammal ‘survey’ effort. Other questions were raised related to both suggestions:

- What are the appropriate regions to use?
- Who should be responsible for drafting the documents and/or website?
- Who should pay for the drafting/updates?
- How often would the documents/website be updated?

The TWG offered the following solutions.

³ The TWG is aware there is a process being undertaken by DOC, NIWA, PEPANZ and others to develop an appropriate database to store the observer data. However, this will only support efforts to develop appropriate biological descriptions, not replace those descriptions.

⁴ <https://data.dragonfly.co.nz/psc/v20140201/whales-and-dolphins/rawl/allvessels/eez/all/>

⁵ <http://cetsound.noaa.gov/cda-index>

7.2.2.1 Appropriate regional boundaries

There is no perfect way to split the data, as they span biological distributions and human management areas such as petroleum basins. However, petroleum basins may be the most relevant because the data are going to be used in support of decision-making for seismic survey operations. Although it would be useful to summarise at the level of basins, the database/document would need to identify and delineate areas of importance within them so that individual permit holders would know what is likely to be within their area of interest.

7.2.2.2 Document authorship

It was suggested that DOC, with its marine mammal expertise, would probably be the best agency for this. EPA has a more regulatory role with this, but would obviously be stakeholders in the development of a suitable document/website. Once the original document is approved, the annual updates should be reasonably straightforward. A useful model/process might be the MPI Aquatic Environment and Biodiversity Annual Review Process, where annual updates are agreed by stakeholders.

Over time, relevant groups that would need to be consulted for activities in these areas could populate the database with specific species and areas of interest. This would inform proponents of specific areas to address during MMIA preparation and consultation with those organisations.

7.2.2.3 Document funding

The TWG considers some form of cost recovery would be needed to support standardised regional biological descriptions; but believe in the long run (if such documents could be made a reality) it would actually save operators money as less time should be needed to produce and review the MMIA's.

It was suggested that DOC is underfunded to do this work. A few options to aid funding were proposed:

- Government baseline funding
- Levies on industry (either collectively through PEPANZ or on an operator-by-operator basis)
- User-pays access
- Some combination of these

7.2.2.4 Documents lifespans

TWG Members suggested the summary document be produced and updated annually. However, this raised the issue that the database may not always have the most up-to-date data, leading to negative public perceptions of proponents for surveys relying solely on them. It should thus be stressed if any such document/website is produced, that they should support writing of biological descriptions. Documents/websites should not be relied on completely, however: if data are only being updated annually, important recent data may be missed.

However, proponents can still use other up-to-date data before each annual review; it would have to be stated that most recent data may not be present in the database/documents. Alternatively, it was suggested that the data would be updated as frequently as possible so that assessments based on it would be informed by the best available science. However, updates would be needed sufficiently frequently to be useful, which may be significantly more time-consuming.

7.2.2.5 Alignment of MMIA/baseline biological data

Proponents would reference the broad conclusions for a petroleum basin and then summarise specific data on their permit area from the same report.

8. The role of earlier planning to minimise overall survey impacts on marine mammals

Some survey design elements were acknowledged as flexible within certain tolerances – the general opinion was that these elements were already being modified to minimise potential impacts (eg some surveys have reduced source size based on modelling). Other design elements were not regarded as flexible (eg the overall survey location), but might be altered to accommodate conservation concerns – several surveys, for example, have avoided areas of the permit near to Marine Mammal Sanctuaries. Elements of a survey (such as timing) would appear to be flexible but were not, due to extrinsic factors (eg vessel availability).

TWG members noted that these sorts of issues are discussed with DOC prior to submission of the MMIA, typically several months in advance of any survey activity, and any issues are addressed then. It was suggested that developing a tool like the US CetMap⁶, as discussed in **section 3.2**, would enable planning at the earliest stage in deciding where licences can be permitted.

The TWG's overall view was that minimising overall impacts is an important topic to consider when planning a survey, and proponents are generally working toward this goal already. However, some noted that operators have not typically included details of how they have amended survey design to minimise impacts, and recommended that such changes should be clearly explained in the MMIA.

⁶ <http://cetsound.noaa.gov/cda-index>.

References

Muir, J.E.; Gilders, M.; Bychkov, Y. 2010: A conceptual framework for tiered risk assessment to evaluate the effects of sound from E&P operations on marine mammals. Prepared by LGL Ltd for the Joint Industry Program Sound and Marine Life Program. LGL Limited environmental research associates, Sidney, BC, Canada. 112 p. Available from: <http://www.soundandmarinelife.org/libraryfile/1262>.

Appendix 1: MMIA elements

List of Sections

- **Non-technical summary**
- **Abbreviations and glossary of terms**
- **Introduction**
 - Purpose of this report: brief summary of why the MMIA has been produced and what it covers
 - Overview of the project: summary of the survey, including the type of survey, eg 2D, 3D, location, timing and exploration history of the PEP
 - Project applicant: details of the applicant and operator
 - Project rationale/survey design and alternatives: why is the survey being conducted, what are the alternatives (including doing nothing)
 - Consultation and engagement activities: what consultation has been undertaken as part of the project and MMIA development
- **Project description**
 - Overview
 - Summary of the project
 - Project location: details of survey boundaries, including active acquisition and turn areas, should have detailed coordinates and be illustrated with a map showing relationship of the site to land and other PEPs
 - Project timing: dates and duration, including contingency time
 - Project activities and execution: details of the nature of the survey and equipment, including operational aspects relevant to the environmental footprint, such as:
 - Crewing and logistics as they relate to vessel movements to and from port, discharges, etc
 - Seismic vessels' specifications (maximums where exact vessel unknown)
 - Data acquisition
 - Mobilisation port and vessel tracks
 - Sound source (maximum if exact vessel unknown, but ideally this should be exact and used for modelling)
 - Streamer
 - Support vessels: number, specification, full-time or part-time with the survey vessel
 - Planned operational discharges – it was suggested by some in the TWG that DOC should consider using a Survey Environmental Advisor (SEA) to address this; however, this should not be combined with the MMO role and should not be needed under the requirements of the Code

- **Administrative framework:** Brief details of relevant legislation. The amount of information currently input to this section is varied, with some authors including more detail than others. However, it was noted this may be more helpful to operators rather than DOC. Most agreed a short permit and legislation paragraph should suffice. However, this section may be more important when operations overlap with areas of the territorial sea – some regional coastal plans have specific requirements to meet before a seismic survey is considered a ‘permitted activity’.
- **Impact assessment methodology:** Details of how the impact/effects assessment is being undertaken. This should detail the process, criteria being applied, and any definitions for terms to be used in the assessment. Some reports did not input enough detail and explanation in this section, making it hard to follow the logic when it comes to results; these need to be easily justified to all readers. Impact assessment methodology should be consistent for all MMIA.
- **Noise propagation modelling:** Currently, where activities are planned in Areas of Ecological Importance (AEIs) or Marine Mammal Sanctuaries (MMS), sound transmission loss modelling should be incorporated into the MMIA methodology, and ground truthed during the survey by appropriate means. This indicates whether the mitigation zone is appropriate for the proposed source level, and whether it should be revised for the survey. The TMG considered this should be a requirement for all surveys.
- **Existing environment:** The TWG considered this section required the most clarification, and most discussion centered on what content should be provided in MMIA. Although these discussions are detailed earlier, in summary many felt far too much information unrelated to marine mammals was required for an MMIA. This content should either be removed or retained and the document reclassified as an EIA. **Table A1** lists the information the TWG believes should be included in the document, noting the sections that have been questioned (and which could possibly be removed).
- **Impact assessment results:** This section should identify the interactions between project activities and environmental features of interest, and sensitive areas for marine mammals. This would typically be split by environmental aspect, eg noise, light, discharges, vessel strike, unplanned spills, lost equipment and invasive species. Data gaps should also be acknowledged.

We believe this section should be robust, and the logic for drawing conclusions about effects needs to be sound and easily followed. For example, the sensitivity of the different species to the type of impact, an evaluation of the magnitude of the impact, and the overall scale of impact (a combination of sensitivity and magnitude) should all be discussed. The cumulative impacts on marine mammals should also be analysed, taking into account other human activities in the area and threats to marine mammals.

This section should clearly explain how the project’s planned activities will, and how its unplanned events could, affect marine mammals (directly or indirectly). The section should take account of the species and any seasonal factors relevant to a particular survey. The section should also consider the importance of the survey areas are for the marine mammals species present.

Table A1: Information required in the ‘Existing Environment’ section of an MMIA. The items listed in the ‘undecided’ column were those where the TWG could not reach a consensus.

Essential	Non-essential	Undecided
Physical environment	Biological benthic environment	Fishing
Bathymetry	Non-prey fish	Cultural, social and economic environment
Geology and sedimentology		Marine reptiles
Metocean conditions (upwellings)		Sea birds
Islands, reefs and shoals (feeding)		
Marine protected areas		
Plankton and fish (feeding)		
Marine mammals		
Shipping		

- **References:** the document should use current information (where possible) from credible sources, and cite them appropriately throughout to identify the source. All sources should then be referenced in full at the end of the document in accordance with good scientific writing practice, so others can find and access the source to check the information.

Appendix 2: MMMP content list recommendations

1. Introduction
2. The XXX marine seismic survey
 - 2.1. Seismic vessel and acoustic source
 - 2.2. Operational area
3. Mitigation measures required under the Code
 - 3.1. Dedicated observers (MMOs and PAMOs)
 - 3.1.1. Safety drills
 - 3.1.2. PAM not operational
 - 3.2. Crew observations
 - 3.3. Mitigation procedures
 - 3.3.1. Operational area
 - 3.3.2. Operational capacity
 - 3.3.3. Sighting conditions
 - 3.3.4. Transit
 - 3.3.5. Outline of mitigation procedure
 - 3.3.6. Pre-start observations
 - 3.3.7. Soft starts
 - 3.3.8. Acoustic source testing
 - 3.3.9. Line turns
 - 3.4. Species of concern
 - 3.5. Mitigation zones
 - 3.5.1. PAM and calves
 - 3.6. Mitigation actions
 - 3.6.1. Species of concern with calves
 - 3.6.2. Species of concern without calves
 - 3.6.3. Other marine mammals
 - 3.6.4. Mitigation posters and summary
4. Additional mitigation and reporting measures
5. Record keeping and reporting
 - 5.1. Hector's and Māui dolphin sightings
 - 5.2. Validation of Sound Transmission Loss Modelling (STLM)
 - 5.3. Contact details for the Department of Conservation
 - 5.3.1. Communication protocol
- Notifications to DOC