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## EEZ100016: Tamarind Taranaki Limited marine consent and marine discharge consent applications – Tui Field

### Review of further information, applicant evidence and submissions pertaining to the marine environment

31 August 2018

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#### 1. Qualifications and experience

1. Ian Baxter holds a BSc (Zoology) degree from The University of Western Australia and an MSc (Marine Biology) degree from James Cook University of North Queensland.
2. Ian is a Member of the Environment Institute of Australia and New Zealand (MEIANZ) and has been a Certified Environmental Practitioner (CEnvP) since 2005.
3. He has worked as a marine environmental consultant since 1990. Over that time, he has primarily been engaged on projects in the petroleum and ports sectors.
4. These projects have comprised site selection studies, baseline habitat assessments, environmental impact assessments, project environmental approvals (including significant projects such as the ConocoPhillips and INPEX LNG plants in Darwin Harbour, the Chevron Wheatstone LNG plant in the Pilbara region of WA, and their associated offshore petroleum leases), environmental management plans and environmental monitoring programmes.
5. At the core of the environmental impact assessments undertaken for offshore petroleum developments has been the assessment of risks to the marine environment from their installation, operation and decommissioning.
6. Ian has recent experience in assessing impacts to the marine environment in the South Taranaki Bight (STB). This has been through an initial role for the Environmental Protection Authority (EPA) as their technical expert for benthic ecology in the deliberations attendant to the Trans Tasman Resources Limited application to mine iron sands in the region. In addition to his role in the expert conferencing for the benthic ecology aspects of the project, he also attended (as an observer) the other expert conferencing sessions pertaining to marine environmental issues.
7. Ian's most recent experience in the region was his assessment, on behalf of the EPA, of the marine environmental aspects of the Marine Consent and Marine Discharge Consent applications, and accompanying environmental impact assessment, submitted by Shell Todd Oil Services Limited (now Shell Taranaki Limited) for the use of a jack-up rig within the Māui Field. The Māui Field abuts the south-eastern boundary of the Tui Field.
8. Coupled with his 27 years of experience in assessing the impacts of developments upon the marine environment, his understanding of the marine environment in the STB region placed him in a strong position to undertake a robust appraisal of the impact assessment submitted by Tamarind Taranaki Limited (Tamarind). This appraisal was undertaken in May 2018.
9. This document presents the outcomes of Ian's review of the further information and evidence provided by the Applicant, and of information provided in submissions that are of relevance to the marine environment.

#### 2. Code of Conduct

10. I confirm that I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Practice Note dated 1 December 2014 and I agree to comply with this Code.

### 3. Introduction

11. The purpose of this report is to identify whether:
  - a) On the basis of the further information received, there are any changes to the conclusions or advice provided to the Board of Inquiry in the review of the marine environmental impact assessment (dated 26 May 2018).
  - b) There are any areas (pertaining to the marine environment) in which it is considered that the Board of Inquiry may require further information.

### 4. Information Review

#### 4.1. Documents Reviewed

12. The following documents were reviewed:
  - a) Tamarind's responses to the further information requests from the EPA, 24 July 2018.
  - b) Tamarind's evidence pertaining to:
    - i) Marine mammals (23 July 2018)
    - ii) Fisheries (23 July 2018)
    - iii) Plankton, fish (including sharks) and reptiles (23 July 2018)
    - iv) Seabirds and shorebirds (23 July 2018)
    - v) Benthic ecology (31 July 2018)
    - vi) Ecotoxicity (23 July 2018).
  - c) Submissions and comments (noting that no Submitter evidence was tendered).

#### 4.2. Additional Information on Proposed Activities

13. The fundamental activities upon which the review of the marine environmental impact assessment (dated 26 May 2018) are unchanged. The following additional information of relevance to the assessment of potential impacts upon the marine environment was provided by Tamarind:
  - a) There will be no contingency rig placements, even where work has stopped due to equipment or weather downtime. Hence the drilling rig will only be moored at up to four locations in the Tui field. The baseline environmental conditions at these locations were described in the impact assessment accompanying the marine consent application.
  - b) Only synthetic based mud (SBM) will be used as a drilling fluid for the sidetrack drilling. The cuttings returned to surface during drilling operations will be sieved aboard the rig to remove the majority of the SBM, which will be recycled by return to the drilling fluid system. The separated drill cuttings will be sealed in skips and transported back to shore for processing and storage. This removes the potential for drill cuttings and muds to impact upon benthic communities in the vicinity of the drilling operations, or for indirect impacts associated with turbid plumes from the discharges to occur.
  - c) The harmful substances with the highest risk of entering the deck drains are those used in the drilling fluids or cements as these are held and used in the greatest quantities and will be present as residues on drill pipe, casings and other equipment that may be stored on deck areas. Other harmful substances will include hydraulic fluids and lubricants (although all equipment using these fluids will be within contained areas) and products used in very small quantities such as protective grease where there is not considered to be a feasible risk of spillage into deck drains. Six harmful substances are anticipated to be used in drilling fluids or cements:

- i) One product (Aldacide G) contains glutaraldehyde (10-30% of total product), which is classified as 'very ecotoxic in the aquatic environment' (Hazardous Substances Classification 9.1A).
  - ii) One product (Saraline 185V) contains a component that is classified as 'ecotoxic in the aquatic environment' (9.1B).
  - iii) The other four products contain only components that are classified as 'slightly harmful to the aquatic environment or are otherwise designed for biocidal action' (9.1D) or 'not ecotoxic to aquatic organisms'.
- d) The expected configuration of areas where harmful substances will be stored and used is as follows:
- i) Bulk SBM, cementing products and other harmful substances will be stored in fully enclosed areas in which any spills will not have the potential to reach the offshore processing drainage system.
  - ii) Drill pipe will be stored in an enclosed area where any runoff of residual SBM will be collected and recirculated into the closed loop mud system; it will not enter the offshore processing drainage system.
  - iii) Only equipment that is being changed out for technical reasons will be stored on deck areas where runoff has the potential to enter the deck drainage system. All of this runoff will be directed to the hazardous drains system for settlement of solids and processing through oil filtering equipment.
  - iv) The sealed skips containing drill cuttings will be contained in a fully bunded area, which will allow for containment and clean-up of any spillage before any runoff is directed to the hazardous drains system.
- e) There will be no temporary structures placed on the seafloor to support ROV operations.

#### 4.3. Applicant's Evidence - Key Marine Environmental Features

14. Tamarind has provided statements of expert evidence pertaining to the following key marine environmental features identified as potentially occurring in the general area of influence (AOI) of the proposed activity:
- a) Marine mammals
  - b) Fisheries
  - c) Plankton, fish (including sharks) and reptiles
  - d) Seabirds and shorebirds
  - e) Benthic ecology.
15. The statement of expert evidence on **marine mammals** includes the following:
- a) Additional comments on some of the species listed in the Impact Assessment, and new or updated information on blue whales, Hector's dolphins, Maui dolphins, common dolphins and dusky dolphins.
  - b) Predictions from modelling of sound generated from the semi-submersible drilling rig:
    - i) Possible behavioural disturbance of marine mammals out to a distance of 1.25 km from the rig.
    - ii) Permanent Threshold Shift not predicted to occur at any distance from the rig.
    - iii) Possible Temporary Threshold Shift within a distance of 50 m from the rig, though individuals would need to remain within this distance for 10 minutes or more to potentially be affected.

- c) Comments on marine mammal behaviour that would serve to mitigate the potential risk of impacts from sound generated by the rig:
- i) The limited likelihood that a marine mammal could get sufficiently close to the sound source to be affected, as noise is generated from dispersed sources.
  - ii) To reach within 1 m of the sound source, an animal would have to swim through a steadily increasing sound field until the noise became uncomfortable, which the expert witness considers to be unlikely. I believe this is a plausible conclusion.
  - iii) The expert witness considers it unlikely that a marine mammal would stay in the vicinity of an intense noise source for any length of time, particularly as no marine mammal species appears to be dependent on habitat in the immediate vicinity of the drilling operation. I concur with this conclusion.
- d) Conclusions that there is little likelihood that turbidity or the deposition of equipment or material on the seabed will have any impacts on marine mammals or their prey. Given that no cuttings or muds are being discharged from the rig, I consider that these are sensible conclusions.
- e) A conclusion that there will be no direct or indirect impacts on marine mammals from artificial light. I believe that this is a reasonable conclusion.
- f) A conclusion that the likelihood of vessel strike of marine mammals is extremely low given the slow speeds of the vessels operating around the rig. I concur with this conclusion. A statement is also made that 'operational vessels will have the same risk profile as any other vessel transiting the Taranaki area'. I do not believe that this can be taken as an indication that the likelihood of vessel strike of marine mammals from these transiting vessels can also be considered 'extremely low'; rather it indicates to me that the risk posed by transiting vessels is greater than the risk posed by vessels when they are operating around the rig. Hence it will be imperative to have mitigation measures in place when the vessels are transiting to reduce the risk of vessel strike on marine mammals.
- g) A conclusion that the likelihood of entanglement of marine mammals in anchor lines is extremely low. The expert witness notes that this risk was not identified in the Impact Assessment. Given the physical properties of the mooring lines and chains, and the tension that will be maintained upon them, I concur with this conclusion.
- h) Agreement with the Impact Assessment that the severity of impact of unplanned events (e.g. accidental spills, loss of well control) on marine mammals would be high, in particular if the spill was to reach an area where Maui dolphins may occur. I concur with this assessment.
- i) Agreement with the Impact Assessment that impacts upon marine mammals from localised discharges of harmful substances would be of negligible significance. This conclusion is predicated upon the small amounts of harmful substances that may be discharged, the high levels of dilution that will occur immediately upon entering the ocean, and the likelihood that any exposure would be of extremely short duration and unlikely to be repeated (given the large range and foraging areas of marine mammals). Given the more detailed information on the deck drainage system provided by Tamarind in their Further Information, I concur with the conclusion that the mitigation measures are appropriate to reduce the risk of discharges and of potential impacts on marine mammals.
- j) A conclusion that there is no risk of cumulative impacts on marine mammals from noise generated by the proposed Tamarind activity and other operations in the STB. As noise generated from the Tamarind rig that could potentially impact upon marine mammals is predicted to extend only as far as 1.25 km from the rig, the other operations are sufficiently distant that there would be no cumulative effect. Rather, any disturbances

and/or displacement will be restricted to immediate area around each activity. I concur with this conclusion.

- k) Commentary that the Impact Assessment would be better served by considering threatened marine mammal species separately from the other marine mammal species; this would result in a more sensible significance designation for the non-threatened species. I concur with this suggestion.
  - l) Recommendations pertaining to proposed consent conditions, all of which I consider would add value, are as follow:
    - i) Addition of the collection and provision of photos of marine mammals sighted, where practically possible.
    - ii) Provision of a marine mammal guide for each vessel authorised by the consent.
    - iii) Implementation of noise measurements covering the full range of noise-generating activities, to confirm that noise levels are within the range of noise levels assumed by the expert witness. While I consider that the measured levels would have to be orders of magnitude greater than those assumed to warrant any changes to the risk profile of the proposed works, such measurements could add confidence to future impact assessments of drilling undertaken by semi-submersible rigs.
    - iv) The addition of a condition specifying that all personnel are made aware of their responsibilities under the *Marine Mammals Protection Act 1978*.
  - m) Overall conclusions:
    - i) The assessments of impacts of a range of activities on marine mammals provided in the Impact Assessment are reasonable given the available information, the expert witness' understanding of marine mammals and their ecology within the region, and the nature of the activity. I concur with this conclusion.
    - ii) The likely impact on marine mammals from the proposed activity is considered by the expert witness to be negligible to minor. The one exception I would raise to this that, following the risk assessment methodology in the Impact Assessment, the residual risk of impacts to threatened species needs to be considered as moderate. According to the risk assessment methodology in the Impact Assessment, this higher designation does not indicate the need for further mitigation measures to be implemented. However, I believe that implementation of the additional mitigation measures recommended above by Tamarind's expert witness will be important to reduce the risk of adverse impacts upon threatened marine mammals, in particular during the transit of vessels between the field and their home ports.
16. The statement of expert evidence on **fisheries** primarily focuses on existing interests, with reference to the expert evidence of others with respect to impacts on the marine environment that may lead to effects on fisheries. While I have reviewed the statement of expert evidence on fisheries, my comments in regard to potential impacts on the marine environment that may affect fisheries are included in my reviews of these other statements (including the statements on plankton and fish, ecotoxicity and ecological effects).
17. The statement of expert evidence on **plankton, fish (including sharks) and reptiles** includes the following:
- a) A more detailed description of plankton communities, and the oceanographic characteristics that determine their spatial and temporal distribution, than was presented in the Impact Assessment.
  - b) Concurrence with the conclusion in the Impact Assessment that the overall impact of turbidity from the proposed activities on planktonic communities and fish will be negligible. Noting that no discharge of drill cuttings or muds into the marine environment will occur, I also consider this to be a sound conclusion.

- c) A conclusion that any adverse effects on fish populations from sediment deposition will be very modest, with a negligible effect on their populations in the AOI and the STB. Again, as drill cuttings and muds will not be disposed into the marine environment I consider this to be a sound conclusion.
  - d) A conclusion that the movement of fish and reptiles away from the rig will mitigate the risk of their long-term exposure to damaging levels of sound; hence the effects of sound is likely to be minor for sensitive rare species and negligible for all other species. I concur with this conclusion.
  - e) A conclusion that it is highly unlikely that artificial lighting, which will be confined to areas immediately adjacent to the rig and support vessels (which are very small relative to the size of the Tui field), will have any significant impact upon the fish and reptile populations in the AOI. I consider this to be a sound conclusion.
  - f) A conclusion that it is highly unlikely that physical disturbance or exclusion of fish and reptile species due to the presence of the rig and support vessels will have any significant ecological effect on these species in the AOI. I concur with this conclusion.
  - g) Concurrence with the conclusion in the Impact Assessment that the overall impact of deck drain discharges on plankton, fish and reptiles is likely to be negligible and without any significant ecological effect. Taking account of the more detailed information on the design of the deck drainage system presented in the applicant's further information report, I also concur with this conclusion.
  - h) Concurrence with the conclusion in the Impact Assessment that the overall impact of a hydrocarbon release from a loss of well control is as low as reasonably practicable. I also concur with this conclusion, which is derived from the consideration of a high severity of impact but an extremely unlikely occurrence.
  - i) A conclusion that, given the small and highly localised scale of potential impacts upon plankton, fish and reptiles, there is negligible potential for cumulative adverse effects from the proposed activity. I consider this to be a reasonable conclusion.
  - j) Overall conclusions:
    - i) The effects of the proposed activities on plankton, fish (including shark) and reptile species in the STB will be negligible. I concur with this conclusion.
    - ii) In the unlikely event of a hydrocarbon spill, the biota most vulnerable to impact will be plankton, pelagic fish eggs and larvae, and reptiles. Inshore obligate reef fish and invertebrate species will be the next most vulnerable. Pelagic fish occurring near the water surface are considered less likely to be exposed, and deeper water demersal and benthic fish species are considered to be the least likely of all to be exposed. I consider this to be a sound conclusion.
18. The statement of expert evidence on **seabirds and shorebirds** includes the following:
- a) A far more detailed description of seabirds and shorebirds, and their conservation status, than was presented in the Impact Assessment.
  - b) Concurrence with the conclusion in the Impact Assessment that artificial nocturnal lighting will have a minor effect on seabirds. This is accompanied by a recommendation that an addition be made to draft Condition 14 to indicate that nocturnal lighting should be directed or shielded so that light spill outwards and upwards from the rig and support vessels is minimised as far as is reasonably practical. I do not concur with the residual impact designation of 'minor' as, following the risk assessment process in the Impact Assessment, the residual impact to endemic, endangered or protected species would need to be designated as 'moderate'. However, I consider that the implementation of the recommended additional mitigation measures would reduce the risk to as low as reasonably practicable.

- c) Conclusions that physical disturbance, noise and turbidity will have non-existent to negligible effects on seabirds. This applies to all bird species, including those that are endemic, endangered or protected; I concur with these conclusions.
  - d) Concurrence with the severity rating of 'high' for impacts to shorebirds from a loss of well control, as presented in the Impact Assessment, but also recognising that the 'extremely unlikely' likelihood of a hydrocarbon release renders the residual risk to be as low as reasonably practicable. I agree with this conclusion.
  - e) Consideration that effects on seabirds from unplanned spills of chemicals, fuel or oil would be minor, and from deck drain discharges would be negligible. However, given the presence of 'sensitive receptors', following the risk assessment process in the Impact Assessment a residual impact designation of 'moderate' is indicated. Taking account of the more detailed information on the design of the deck drainage system presented in the applicant's further information report, though, I believe that the residual risk can be considered to be as low as reasonably practicable.
  - f) Consideration that cumulative effects on seabirds would be minor to negligible, though it is noted that the author appears to have considered the cumulative effects of all potential sources of impact within the AOI, rather than cumulative effects with other sources of impact in the broader region. Notwithstanding this, given the generally localised scale of potential impacts upon seabirds, I consider that there is unlikely to be significant additive adverse effects from the proposed activity and other activities in the region.
19. The statement of expert evidence pertaining to **benthic ecology** includes the following:
- a) Criteria to guide assessment of ecological value of benthic communities and to assess the magnitude of ecological effects. A matrix combining value and magnitude is then presented, from which 'effect levels' are derived.
  - b) Far more detailed descriptions of sediment quality and characteristics, and benthic communities, than those presented in the Impact Assessment.
  - c) Consideration that the magnitude of effect of the mooring and removal of the rig on benthic communities would be moderate in the short-term and low in the long-term. Given the natural recolonisation that will take place after disturbance, it is considered that mitigation measures are not required. I consider these to represent sound reasoning.
  - d) Consideration that there will only be very low levels of effects on benthic communities from turbidity, vibration, the discharge of milling fluids and cement, logistical support activities, and deck drain discharges. I concur with these designations.
  - e) Consideration that low levels of effect would arise in offshore benthic habitats from large scale oil spills or the dropping of materials or supplies; a moderate level of effect would arise from a vessel sinking as a result of a collision; and a very high level of effect (though at a likelihood of 'extremely unlikely') would arise in coastal benthic habitats if a large-scale oil spill was to reach shore. I consider that each of these designations reflects sound reasoning.
  - f) Assessment of biosecurity risk, which does not appear to have been included in the Impact Assessment. With the implementation of best practice management measures, it is considered by the author that only a very low level of effect would arise. Provided that appropriate biosecurity conditions are implemented, I concur with this assessment.
  - g) Consideration that, putting the proposed works into the context of other activities within the Tui field and the broader STB, cumulative effects on benthic ecology would be at a low level. Given the generally localised nature of the impacts (with the exception of impacts to coastal benthic communities from a large-scale oil spill), I concur with this assessment.

#### 4.4. Applicant's Evidence - Ecotoxicity

20. Tamarind has provided a statement of expert evidence pertaining to the assessment of the **ecotoxicity** of harmful substances in offshore processing drainage, planned deck-drain discharges, and unplanned spills of fuel, oil or chemicals. The statement includes the following:
- a) A detailed discussion of the mechanisms of ecotoxicity and environmental receptors, the characteristics of the discharges and the possible exposure levels of receptors to the discharges (as influenced by discharge volumes and dilution).
  - b) Consideration that there would not be any measurable effect on marine fauna or ecosystems as a result of offshore processing drainages. Impacts would be restricted to localised effects on planktonic species, which would not impact on broader populations or any species that depend on plankton as a food source. Taking account of the more detailed information on the design of the deck drainage system presented in the applicant's further information report, I believe that the residual risk of impact can be considered to be as low as reasonably practicable.
  - c) A detailed discussion of the sources and risks of fuel, oil and chemical spills and their behaviour in the marine environment. Concurrence with the conclusions presented in the statements of expert evidence pertaining to marine mammals, plankton, fish (including sharks), reptiles, seabirds and shorebirds with respect to the low risk of potential impacts from these sources. Given the proposed mitigation measures, I believe that the residual risk of impact from these sources can be considered to be as low as reasonably practicable.
  - d) Consideration that the localised nature of effects from discharges or spills within the AOI, coupled with the distance of the AOI from other potential sources of discharges, render cumulative impacts to be not feasible. I concur with this conclusion.
  - e) Consideration that the draft conditions provided in the consent application (pertinent to the discharge of harmful substances or unplanned spill events), and the mitigation measures described in the Impact Assessment, are appropriate and commensurate with the level of risk provided by the activities. With the addition of the mitigation measures described in Tamarind's additional information report, I concur with this assessment.

#### 4.3. Submissions

21. There were 124 submissions received. Of these:
- a) Over half (64) included a single comment of relevance to the marine environment – “The risks from cumulative impacts on threatened marine mammals are unacceptable – the assessment is grossly inadequate”. I do not concur with this comment on the adequacy of the original Impact Assessment and the additional information provided in Tamarind's expert witness evidence on marine mammals further diminishes its veracity.
  - b) 23 others included this comment plus a further comment of relevance to the marine environment – “This is a precious and fragile environment and home to threatened marine species, such as whales, dolphins and penguins”. Two submissions contained only this comment and not the first. This comment is supported by Tamarind's evidence and emphasises the need to implement mitigation measures to reduce the potential for impacts to these species.
  - c) One submission contained the comment that “...the Taranaki coast is home to endangered species, and drilling in this area poses a high risk to the ecosystem and the kaimoana”. That the coast is home to endangered species is recognised by Tamarind; however, I believe that the Impact Assessment, further information and expert witness statements provide compelling evidence that the drilling will not pose a high risk to the ecosystem or the kaimoana.

- d) One submission considers that the well sites are “too close and in shallow waters” and that the discharge of harmful material poses a risk of harm to fisheries, marine mammals and bird life. I believe that this assertion is not supported by the expert evidence presented by Tamarind, especially now that there will be no discharge of drill cuttings or muds and now that a more detailed plan of the deck drainage system has been provided.
  - e) One submission indicates concern with respect to the potential for impacts from the activities upon the tuna run and glass eel migration. It is the opinion of Tamarind’s expert witness on fish that this is highly unlikely and that any effects would be negligible and unmeasurable. However, there is insufficient information presented on the distributions of the different lifecycle phases of tuna for me to make a judgement call on this issue.
  - f) Four submissions provided detailed comments – these are addressed separately below.
  - g) 13 submissions requested the Board to refuse the consent application, but did not provide any comments that were of direct relevance to the marine environment, though some contained comments pertinent to existing interests.
  - h) One submission adopted a neutral position.
  - i) 13 submissions were supportive of the proposal, but did not provide any comments that were of direct relevance to the marine environment.
22. The issues of direct relevance to the marine environment in the four detailed submission are summarised here:
- a) In relation to the submission by Brett Barrett:
    - i) It is correctly indicated that the activity, if approved, will indeed lead to “destruction, damage, or disturbance of the seabed or subsoil in a manner that is likely to have an adverse effect on marine species or their habitat”. Such outcomes are inevitable from any activity that impacts the seabed. However, I believe that Tamarind’s expert witnesses have adequately demonstrated that these outcomes will not lead to significant impacts upon the marine ecosystem.
    - ii) Similarly, noise generated by the activities may have a negative impact upon some marine life, but I concur with the opinions of Tamarind’s expert witnesses that the risk of significant impacts will be as low as practicable.
    - iii) The risk of “polluting the ocean with drilling waste” has been removed by Tamarind’s commitment to dispose of drill cuttings onshore.
    - iv) I concur with Tamarind’s expert witnesses that the risk of “polluting ocean habitats” has been reduced to as low as reasonably practicable.
  - b) The personal submission by Catherine Cheung contains comments that are critical of the lack of comprehensive assessments of cumulative effects in this, and previous, applications. I contend that Tamarind’s expert witnesses have now addressed the issue of cumulative effects to a level that is appropriate for the degree of risk posed by the individual effects, most of which are localised to the AOI.
  - c) The submission by Catherine Cheung on behalf of Climate Justice Taranaki Incorporated includes the following comments that are of relevance to the marine environment:
    - i) The information provided in the Impact Assessment is considered to have insufficient detail; to be uncertain and inadequate; and to not represent ‘best available information’. I do not concur with this assessment of the information provided and the veracity of the comment is further diminished by the further information provided by Tamarind and by the evidence of their expert witnesses.
    - ii) “The application will run contrary to New Zealand’s obligations under the various international conventions relating to the marine environment...”. This is explored in greater detail in Lyndon DeVantier’s comments (see below).

- iii) The precautionary approach should be adopted as it involves an anticipatory preventative action in response to uncertainty. This sentiment is echoed in Michelle Ducat's submission on behalf of Oil Free Wellington. I believe that the mitigation measures proposed by Tamarind take adequate account of the incompleteness in the full understanding of the marine ecosystem in the AOI, the Tui field and the STB, and provide a suitably precautionary approach.
  - iv) Information on marine mammals and seabirds is presented, some of which is included in the relevant Tamarind expert witness statements. I do not consider that the information presented would elevate the residual risk rankings for any impacts on these species to the extent that further mitigation measures (in addition to those presented in the Impact Assessment and in the various expert witness statements) are warranted.
  - v) The inadequacy of the assessment of cumulative effects is raised again. My perspective is as presented above.
- d) The submission by Lyndon DeVantier includes comprehensive comments on the recognition of the STB as a global hotspot for cetaceans; New Zealand's obligations under various international conventions; and the absence of an adequately robust cumulative impact assessment. Each of these comments is addressed by Tamarind's expert witness for marine mammals and I will not paraphrase them here. On the balance of evidence presented, I am satisfied that the predicted nature and extent of potential impacts upon marine mammals from Tamarind's activities are sufficiently limited that the risk of *significant* impacts, both individual and cumulative, is as low as practicable. This is, of course, predicated upon the robust implementation of the mitigation measures described in the Impact Assessment and the expert witness statements.

## 5. Conclusions

23. The following conclusions can be drawn from the review of the documents listed in Section 4.1 of this report:
- a) On the basis of the further information received, including the expert witness statements, there are no substantive changes to the conclusions or advice I provided to the Board of Inquiry in my review of the marine environmental impact assessment (dated 26 May 2018). Some of the information presented has strengthened Tamarind's position that the risks of significant adverse impacts upon the marine environment have been reduced to as low as reasonably practicable.
  - b) I have not identified any areas (pertaining to the marine environment) in which it is considered that the Board of Inquiry may require further information.