BEFORE THE ENVIRONMENTAL PROTECTION AUTHORITY

AT WELLINGTON

IN THE MATTER	of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
AND	
IN THE MATTER	of a decision-making committee appointed to hear a marine consent application by Trans Tasman Resources to undertake iron ore extraction and processing operations offshore in the South Taranaki Bight

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EXPERT REBUTTAL EVIDENCE OF DANIEL GOVIER ON BEHALF OF TRANS TASMAN RESOURCES LIMITED

10 FEBRUARY 2017

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INTRODUCTION

1. My name is Daniel Govier.

2. I prepared Expert Evidence dated 15 December 2016 (First Statement) with respect to these proceedings on behalf of Trans-Tasman Resources Limited (TTRL).

3. My qualifications and experience as a Marine Ecologist are set out in paragraphs 2-9 of my First Statement.

4. I repeat the confirmation given at paragraph 11 of my First Statement that I have read the Code of Conduct for Expert Witnesses and agree to comply with it.

5. The purpose of this Rebuttal Evidence is to respond to ten matters raised in submitter evidence relating to the monitoring and management plans.

6. In preparing this evidence I have reviewed the following statements of evidence:

   (a) Bruce Paterson Clarke, Dr Gregory Matthew Barbara, Helen Margaret Anderson, and Anthony Leonard Piper for Fisheries Submitters;

   (b) Ngaire Robyn Phillips, Elisabeth Slooten, Shaw Trevor Mead, John Cockrem, and Dr Leigh Torres for Kiwis Against Seabed Mining Incorporated (KASM);

   (c) Natasha Sitarz and Anton Leo Van Helden for Royal Forest and Bird Protection Society of New Zealand Incorporated (Forest & Bird); and

BASELINE ENVIRONMENTAL MONITORING PROGRAMME

7. Various witnesses have suggested that there is insufficient information available to reliably assess the effects of the proposal and that there is an unacceptable level of uncertainty that can only be addressed by collecting additional data. I do not agree and insofar as it relates to the matters addressed in my evidence I am satisfied that the existing environment is well defined and in sufficient detail for me to have confidence in the veracity of the assessments undertaken.

8. The extensive amount of baseline monitoring data that has been collected within the South Taranaki Bight (STB) specifically for the Project is summarised in **Appendix 1**.

9. The fisheries submitters, KASM and Forest and Bird have raised concerns that the BEMP should have been completed prior to the application being lodged; and that without more baseline data there is not enough information to inform the preparation of an impact assessment (IA), or for the Decision

Making Committee (DMC) to make an informed decision. I disagree with this opinion and consider that these witnesses are overlooking the extensive baseline data that has been gathered to date (see **Appendix 1**), and are perhaps confused about the intention of the BEMP.

10. Rather than describing the marine environment the intention of the BEMP is to:

    (a) validate both the placement of monitoring stations and the suspended sediment concentrations proposed as 'response' and 'compliance' limits; and

    (b) collate data that can be statistically analysed to quantify any potential environmental changes over time once iron sand extraction activities commence.

11. To enable robust 'before and after' comparisons to be made, the data set should be collected as close to the commencement of the activity as possible. If the compliance baseline monitoring programme was conducted prior to the preparation of the IA and the lodgement of the marine consent application this data set would most likely be several years old before any iron sand extraction activities commenced. Furthermore, if the proposed conditions and/or the requirements within the BEMP and Environmental Monitoring and Management Plan (EMMP) are amended as a result of the hearing process, then some of the data collected could again be deemed invalid for comparison purposes.

BENTHIC MONITORING AND BENTHIC FAUNA IDENTIFICATION

12. In paragraph 44.2 of Dr Shaw Mead's evidence, he questioned the adequacy of the sampling effort and in particular why only three of the proposed 35 benthic monitoring stations were located within the Project Area (and only two monitoring stations added annually for the first five years of extraction activities).

13. The aim of environmental monitoring within the Project Area is to determine the nature and extent of recovery of subtidal assemblages and habitats and in particular the recolonisation rates of de-ored sediment. The baseline monitoring undertaken by NIWA within the Project Area (referred to above) has already provided a detailed understanding of the different habitats present in the Project Area.

14. Following the iron sand extraction process within each mining block, it is anticipated that the benthic communities will be removed and the benthic habitat will change in composition. Therefore, having a large number of monitoring stations within the Project Area to assess the wider

'before and after' effects of iron sand extraction activities from the outset is of little benefit, as any time-series data will become redundant once that location is mined.

15. After each year of mining, two additional monitoring stations will be included in the Project Area. These samples will be located in recently mined areas and will be sampled in triplicate (i.e. six benthic samples collected) to assess the rate of recolonisation and hence quantify the benthic assemblage/habitat changes following mining.

16. In Paragraph 40.3 of his evidence, Dr Mead has also questioned whether the identification of benthic fauna to "family level" would be sufficient to identify any differences in community structure through multivariate analysis. In response to this comment, the BEMP and EMMP have been updated to state that benthic fauna will be identified to the lowest practical taxonomic level. This is often to genus or species level and is consistent with the taxonomic identification approach that has been undertaken in other benthic surveys within the STB.

SEDIMENT QUALITY AND PHYSICO-CHEMICAL PROPERTIES

17. Dr Barbara in his evidence has raised a question around which suite of metals will be tested for within the monitoring programmes (Paragraphs 44-46). In the BEMP it was stated that a full suite of metals will be assessed but the specific metals were not listed. The list of physico-chemical parameters that will be tested for each sediment sample is provided in **Appendix 2**. The BEMP and EMMP have been updated accordingly to reflect these specific parameters.

WATER COLUMN ANALYSIS

18. Dr Barbara made a recommendation to include lead (Pb), chromium (Cr VI & CRIII), Zinc (Zn), trbutyl tin (TBT) and arsenic (As) within the water quality testing. This recommendation has been adopted and **Appendix 2** provides a list of the metals (and other parameters) that will be tested within each water sample. The BEMP and EMMP have been updated accordingly.

INTERTIDAL SURVEYS & BEACH PROFILING

19. As part of Subtidal and Intertidal Reef Monitoring (BEMP and EMMP) annual aerial photography of intertidal reefs during summer is proposed to allow the quantification of sand inundation through time. Dr Shaw Mead considers that annual imaging is insufficient and that photographs should be taken at multiple times throughout the year (Paragraph 40.3b of his evidence). The BEMP and EMMP have been updated to include aerial photographs in both summer and

winter to obtain additional temporal data for the assessment of sand inundation.

20. In addition, Terry Hume (in his Expert Rebuttal Evidence) recommended that the BEMP and EMMP be amended to include beach profile surveys to periodically quantify the topography of STB beaches. This recommendation has been adopted.

21. The beach profiling protocol that has been adopted into the BEMP and EMMP is based on NIWAs previous beach profiling investigations; where 32 profile sites were established and monitored at eight locations from June 2011 to April 2012 to assess shoreline stability along the STB from Kai Iwi to Ohawe (see MacDonald *et al*., 2015). The BEMP proposes to continue this monitoring on a monthly basis throughout the two year period of the compliance baseline monitoring programme; utilising the same sites and methodology as presented in MacDonald *et al*., 2015.

22. With regards to the intertidal transect surveys proposed in the BEMP and EMMP, Dr Mead (in Paragraph 40.3b of his evidence) states that sampling along one transect is not adequate to capture the diversity of the intertidal biota. The methodology proposed in the BEMP and the EMMP is consistent with the Taranaki Regional Council (TRC) state of the environment and compliance monitoring programmes, where the sample transect is placed horizontally along the reef at 0.6 m above chart datum. Therefore, the proposed monitoring design will enable comparisons to be determined between the TTRL intertidal monitoring data and the time series of data collected by the TRC around the Taranaki coastline. For this reason, I am of the opinion that a single transect per reef is sufficient to achieve the objective of the monitoring programme.

MARINE MAMMAL MONITORING AND MANAGEMENT PLAN

Marine Mammal Monitoring:

23. The evidence from a number of submitters suggested that the proposed acoustic monitoring for marine mammals should be amended to cover a larger area (Dr Leigh Torres, Dr Gregory Barbara, Mr Anton van Helden). In particular it was suggested that additional loggers should be positioned to incorporate the collection of more data offshore of the Project Area. The Marine Mammal Monitoring Plan (MMMP) (as set out in the BEMP) does not specify the exact location of the loggers; however, three locations are proposed in the Underwater Noise Baseline Monitoring Plan (also in the BEMP) with the secondary objective here being to 'inform the MMMP'. A marine mammal acoustician would be engaged to design the acoustic survey. However, as pointed out by Dr Childerhouse, the low frequency vocalisations of baleen

whales (such as blue whales) will be audible over tens of kilometres, so more offshore loggers may not be needed.

24. Suggestions were also made to ensure that all threatened species would be detectable by the acoustic monitoring programme (Dr Barbara; Mr van Helden); noting in particular that loggers should be broad spectrum to allow for all marine mammal vocalisation frequencies to be detected (in particular bottlenose dolphins). The BEMP and EMMP have been updated to specifically incorporate bottlenose dolphins into the acoustic monitoring programme.

25. With regard to aerial surveys it has been noted that some marine mammals spend very little time at the sea surface so may not be detected despite having a presence in the area (Mr van Helden). A combination of aerial and acoustic surveys has been proposed to address this issue.

26. It has also been noted that fur seals are good indicator species for ecosystem health and should therefore be considered for inclusion in the MMMP (Dr Barbara). Fur seal data will be collected during aerial surveys along with all other marine mammal species observed (only incidental fur seal sightings are excluded).

27. The duration of the compliance baseline monitoring programme for marine mammals was criticised (Prof. Liz Slooten) as not being long enough to collect meaningful distribution and abundance data. The BEMP states that it is not the intention of aerial surveys to obtain absolute abundance estimates of marine mammal species. Instead, relative abundances between surveys are sought to detect any apparent trends in density. As confirmed by Dr Childerhouse (in his rebuttal evidence), the proposed two year compliance baseline data collection period is anticipated to fulfil this intention.

Proposed Marine Mammal Mitigations

28. Two specific criticisms were received in relation to the proposed underwater noise trigger level conditions; the first questioned how a noise limit could be set without first knowing which species are likely to be affected (Ms Natasha Sitarz), the second questioned the relevance of this trigger level and the RMS linear method used to develop it (Mr van Helden). In relation to both of these questions, the trigger levels proposed were developed by the Expert Working Group on Marine Mammals for the previous TTRL application and are endorsed by the Department of Conservation as being relevant to the proposed activities. Dr Childerhouse states that these noise levels provide an excellent control on potential impacts.

TECHNICAL REVIEW GROUP

29. Within the EMMP the representatives of the Technical Review Group (TRG) were listed and Helen Anderson noted in her evidence that Sanford Limited was listed instead of Fisheries Inshore New Zealand (FINZ). This is acknowledged and Sanford Limited has now been replaced with FINZ.

BIOACCUMULATION OF METALS.

30. Concerns have been raised over bioaccumulation of contaminants/metals within the biota in STB. In Mark James's rebuttal evidence he does not consider contaminants/heavy metals would reach concentrations that would have any adverse effects on biota due to the dilution rates. However, to address submitter concerns I have included the testing for accumulation of contaminants within shellfish tissue with both the BEMP and EMMP. Mussels will be suspended in cages at selected permanent mooring stations and analysed for the same metals as detailed in **Appendix 2**.

31. The trace metals listed in **Appendix 2** will also be monitored within the wastewater discharge and the wastewater discharge plume. This has been included within the EMMP.

COMMERCIAL FISHING

32. Within the evidence of Ms Anderson and Dr Barbara it was noted that commercial fishing has been left out of the BEMP and EMMP. This is correct, no monitoring programme has yet been established for commercial fishing as the development of this monitoring programme will be undertaken in collaboration with representatives of the commercial fishing industry as nominated by FINZ in accordance with proposed condition 9.

BIOSECURITY

33. In response to a recommendation made by Dr Barrie Forrest in his Expert Rebuttal Evidence, the BEMP and the EMMP have both been updated to include specific surveillance for harmful algal bloom species in the water column and non-indigenous species on the benthos..

CONCLUSIONS

34. The points raised by submitters have not affected my overall conclusions in my first statement of evidence. However, some of their points raised have been incorporated into updated versions of the BEMP and EMMP and have been summarised in my evidence above.

Daniel Govier

10 February 2017

REFERENCES

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APPENDIX 1: ENVIRONMENTAL MONITORING SUMMARY CONDUCTED WITHIN STB FOR TTRL BASELINE MONITORING

Field Study Sample type	Sample method	Number of Stations	Number of samples
Zooplankton	Heron Net for fractioned biomass, ID and enumeration	18	18
	Munsell Colour Cards for surface water colour	18	18
	Surface water sample	18	18
Patea Shoals benthic flora & fauna	Underwater still photographs for benthic habitat and macro-organisms	144	4560
	Underwater video footage for benthic habitats and macro-organisms	144	43.2 km of video transect
	Sediment cores for heterogeneity, iron ore presence, grain size distribution, macrofauna distribution	103	331
	Epibenthic Dredges for benthic macrobenthos	116	35.1 km of transects (9.75 hrs)
	Recolonisation trials – pilot study – Lyall Bay & Taranaki	2	11 containers
	Recolonisation trials – Wellington harbour	2	18 bins out, 22 cores taken over 5 weeks
Nearshore Benthic habitats	Splashcam transects – continuous footage and photographs	36	432 photo quadrats along 3.6 km of transect
	Deltz Sediment grab for grain size distribution	36	26 grabs at each station
	Agassiz & Oklemann dredges for macrobenthic communities	17	17 dredges over 2.55 km of transects
Fisheries	Diver fish counts for relative abundance. **Note:** These diver fish counts were from outside the STB but were drawn upon in the	467 sites	467 diver fish counts

Field Study Sample type	Sample method	Number of Stations	Number of samples
	assessment of fisheries		
Nearshore Optical Water Quality	Bio-Fish profiling instrument for various optical parameters	42 sites	98 profiles
	Water samples for SSC, particulate absorption spectra, coloured dissolved organic matter, Chl-a and particle size distribution	53 sites	53 profiles
	DOBIE gauge moored deployments for water level and optical backscatter	6 sites	Deployments at each site ranged from 40 and 64 days giving total of 32,000 turbidity measures
	Seabed sediment cores for sediment grain size	6 sites	6 cores
	4L surf zone water samples for SSC, CDOM, Chl-a and particle size	11 sites	33 samples
	20 L surf zone water samples for visual water clarity	11 sites	33 samples
Shoreline monitoring	Surface sediments for particle size distribution	8 sites	8 samples
	Trimble GPS Profile positions and elevation data	8 sites	8 benchmarks, 352 beach profiles (4 profiles per site, surveyed on 11 occasions)
	Beach profile photographs for profile positions	8 sites	1408 photos
Cetacean Monitoring	Aerial surveys for cetacean distribution. Undertaken every 2-3 months over a two year period.	14-16 transect lines	Providing a total of ~8,400 km of transects
Oceanographic measurements	ADCP deployments for currents, sig. wave height, mean spectral period, mean direction of wave propagation	5 sites	Three sites had 2 deployments for a 12 week period, two sites had 1 deployment for a 6 week period, providing

Field Study Sample type	Sample method	Number of Stations	Number of samples
			~6,048 measurements for each instrument per deployment
	DOBIE wave gauge for sig. wave height, mean spectral period, mean direction of wave propagation	4 sites	Two six week deployments at each site
	Surface-following datawell wave rider buoy deployments for sig. wave height, mean spectral period, mean direction of wave propagation	1 site	18 week deployment period
	MicroCat instrument deployment to record temperature and salinity	3 sites	Two sites had 2 x 12 week deployments and one site had 1 x 6 week deployment
	Acoustic backscatter sensor deployment for SSC	4 sites	Two sites had 2 x 12 week deployments and 2 sites had 1 x 6 week deployment
	Optical backscatter sensor deployment for SSC	5 sites	One site had 2 x 12 week deployments, three sites had two instruments at each site with 2 x 12 week deployments and two sites had two instruments with 1 x 6 week deployment
	Automatic weather station located at Hawera to measure wind direction and strength	1 site	A continuous 18 week deployment period
Ocean Colour	Water samples for total suspended matter, coloured dissolved organic	52	52 water samples taken

Field Study Sample type	Sample method	Number of Stations	Number of samples
	matter, particulate absorption spectra, pigments by high performance liquid chromatography, Chl-a by flurometry		over 20 days of sampling
Modelling and Desktop Studies	**Methods**	**Data History Used**	
Commercial Fisheries	MPI catch and effort database		10 years of data set used
Cetacean habitat modelling	DOC sighting database	41 years of data history	
	Incidental sighting records between ports	20 years of data history	
	Winter Sea Surface Temperature (SST) data	Eight years of data history	
	SST Gradients	Eight years of data history	
STB Fish and Fisheries	MPI Catch Effort data	6 years of data history	
Nearshore optical water quality	Long-term wind climate at Wanganui	17 years of data history	
	Rainfall and river flow data from NIWA database	Four months of data history	
Nearshore wave modelling	Wind fields – hourly inputs	One year of data history	
Zooplankton	Historic sampling within STB by various authors	Over a 13 year period	
Maritime and Navigation	AIS data from Cook Strait – Kahurangi Point – Cape Egmont	One year of AIS data history between these regions	
Sediment Plume Modelling – run for 1000 days using the data series	NIWA Tidal Model	20 years of hindcast data	
	Wind recordings at Hawera	Eight years of data history	
	MODIS-Aqua satellite SSC readings	Six years of data history	
	Sea surface temperature from the NECP Reanalysis	30 years of data history	
	NCEP Reanalysis – heat flux	60 years of data history	
Satellite ocean-colour remote	Ocean-colour satellite data from NASAs Moderate Resolution	10 years of data history	

Field Study Sample type	Sample method	Number of Stations	Number of samples
sensing	Imaging Spectrometer		
Optical Effects	Ocean-colour satellite data from NASAs Moderate Resolution Imaging Spectrometer	Six years of data history	

APPENDIX 2: SEDIMENT AND WATER SAMPLE PHYSICO-CHEMICAL PARAMETERS TO BE TESTED

Sample Type	Parameter	Details
Water Samples	Metals	Cd, Cu, Ni, Hg, Pb, Cr (CrIII and CrVI), Zn, As, TBT
	Nutrients	TP, DRP, NO_3, NO_2, NH_4, DRSi
	Salinity	
	Temperature	
	pH	
	Turbidity	
	Clarity	Secchi disk
Sediment Samples – upper 50mm of core	Particle Grainsize Distribution	
	Total Organic Carbon	
	pH	
	Metals	Cd, Cu, Ni, Hg, Pb, Cr (CrIII and CrVI), Zn, As, TBT
	Redox Potential	
	Total Free Sulphides	