

EXCLUSIVE ECONOMIC ZONE AND CONTINENTAL SHELF (ENVIRONMENTAL EFFECTS) ACT 2012 (the Act)

Trans-Tasman Resources Limited iron sand extraction and processing application

M21 – Minute of the Decision-Making Committee – 7 February 2017

Approved questions for parties and their witnesses for consideration at expert conferencing or at the hearing

1. On the 30 January 2017 the Decision-making Committee (DMC) received questions from the following parties:
 - a. Trans-Tasman Resources Limited (TTRL);
 - b. Fisheries Submitters (FINZ – 122009, New Zealand Federation of Commercial Fisherman Inc – 122022, Talley's – 121986, Southern Inshore Fisheries Management Company Limited – 121998 and Cloudy Bay Clams Limited – 122048)
 - c. Karen Pratt (123055);
 - d. KASM & Greenpeace (123042 & 121900);
 - e. Ngā Motu Marine Reserve Society (121660);
 - f. Origin Energy Resources Kupe Ltd (125745); and
 - g. Te Kaahui o Rauru (121947).

At this stage the DMC has agreed that all questions that it has received will be put, and these are attached as Appendix 1.

2. The DMC has the expectation that many of the questions will be addressed through expert conferencing. Questions directed to those persons not taking part in expert conferencing will be addressed by the DMC at the hearing, along with any other questions remaining to be addressed after expert conferencing.
3. If a question has been posed to a person, but another person is better placed to answer the question (or series of questions), then these questions may be put to that alternative person. If a question falls outside an expert's expertise they should not attempt to answer and this should be acknowledged.
4. The DMC requests that on completion of the expert conferencing that the joint witness statement clearly identifies which questions have been answered and those that remain unanswered. Where closed questions have been put by parties, the DMC expects those involved in expert conferencing to provide substantiated responses to provide the DMC with useful information.

5. In summary, we expect answers to focus on providing the DMC with the best available information.

For the DMC:

A handwritten signature in blue ink, appearing to read 'Alick Shaw'.

Alick Shaw

DMC Chair

7 February 2017

List of approved questions for parties and their witnesses for consideration at expert conferencing or at the hearing

Issued 7 February 2017

1. Sediment Plume Modelling					
	Witness	Party Represented	Question from	Reference number	Question
A	Dr Michael Dearnaley	TTRL	The Fisheries Submitters	MD1	<p>In 2014 TTR commissioned HR Wallingford (HRW) to undertake a series of laboratory tests to investigate the behaviour of the tailings under both saline and freshwater conditions. As part of the tests, PSD analyses of sediment samples supplied by TTR to HRW were carried out.</p> <p>Sediment samples show that the tailings material contains a much larger proportion of fine sediments (>70%) than adopted in the plume modelling (<4%). Modelling was conducted with the assumption that there would be mud content of less than 4%.</p> <p>Can you explain why it was assumed that mud and fines discharge would be as low as 4%?</p> <p>Do you agree that there would be a significant difference to the extent of the expected plume and sedimentation rates if fines were greater than 20% compared to less than 4%?</p>
				MD2	<p>NIWA Sediment Plume Modelling (from page 47 et seq) shows 6 case scenarios based upon differing wind and swell conditions. Do the inputs into the Regional Ocean Modelling System (ROMS) relied upon by NIWA to predict the spread of the plume, include in their inputs the wide and frequent variability of ocean movements including constantly changing tidal flows, wind generated currents, localised effects of storm events, longshore currents, long wave swells and combinations of these conditions?</p>
				MD3	<p>Fishermen frequently fish along thermoclines in the water column. Has TTR considered the effect of thermoclines within the STB on the movement of sediment from the plume?</p>
				MD4	<p>The volume of de-ored sediment produced by the proposed mining operation is not verified by GHD. To what extent do you think this uncertainty might affect (favourably and/or unfavourably) the size, composition and extent of the plume?</p>
				MD5	<p>GHD suggests that the generation of the sediment plume by the crawler itself has not been included in the modelling. What will the cumulative effect of the discharge of de-ored sediment AND the operation of the crawler be on the size and composition of the plume?</p>
				MD6	<p>When a new pit is commenced on the surface of the seabed, what is the likely sediment plume at the mining face where the crawler turns the sand into slurry so that it can be sucked up to the vessel? Has this been included in the calculations/modelling of the sediment plume?</p>
				MD7	<p>Why have the results of the updated Sediment Plume Modelling (Hadfield & McDonald, 2015) not been used in the assessment of effects of the extraction on sediment transport?</p>
				MD8	<p>Does the reference to "discharge of de-ored sediment 4m above the seabed" in proposed Condition 55 refer to the pre-extraction bed level, or also include the extraction lane where appropriate?</p>

Karen Pratt

MD9

Can you provide evidence of how have you assured yourself that the wave and current data is Project site reflective, and how has the modelling addressed the following factors listed:

A. The impacts of pits and mounds on waves was modelled by NIWA as being at a mining depth of 10 m (middle block) and mining depth of 9 m (other two blocks) – which is non-reflective of the actual depths. In the EMMP 7.4 it is noted that bathymetry has a distinct influence on waves particularly as water depths increase.

B. The EMMP states there will be localised effects on currents through the formation features several kilometres long being pits and mounds.

C. Malcolm Green (in the previous application) did no modelling for pits other than a 300m x 300m pit, because he was not given information on arrangement of pits.

There has been no further work on pit infilling rates or mound deflation in this current application. Malcolm Green accepted my point raised in the last submission that pits could run to many kilometres long.

D. Origin non-expert evidence 3.19 The results of this investigation suggested that local variations in the seabed topography to the south east of the Kupe pipeline and wellhead had a considerable localised effect on the metocean conditions."

E. The 3D modelling results for 0.1mm/s fraction to arrive at settling rates had eight scenarios – 50% were at 2m wave height, 25% 3m wave height and 25% at 3.5m wave height. These scenarios do not account for the fact 'At the deep sites, significant wave heights in excess of 4 m were routinely observed.' (NIWA oceanographic report)

F. The 3D modelling results for the 0.1mm/s fraction had 62% of scenarios with a 0.2m/s current and 38% with a 0.28m/s current. These scenarios do not account for the fact 'Currents in the STB were substantially affected by meteorological conditions. Large current speeds of around 1 m/s were measured on a number of occasions during periods of high winds' (NIWA oceanographic report).

G. The 1DV modelling used only 0.2m/s current and 2m waves to arrive at trapping percentages – what percentage of time is this reflective of the Project site?

MD10

Point 12 of your Expert Evidence states 'the scale of the extraction and return of de-ored sediment makes the proposed project similar to other large scale dredging projects around the world' – could you explain that comment in terms of the tonnage m³ of TTR verses other operations I have found and graphed below. The scale of TTR's extraction does not appear to 'be similar'. (see pages 14-29 of my non-expert evidence for supporting data). You did not provide any evidence to support your statement, could this be provided.

	MD11	<p>Nowhere in your report do you discuss the tonnage reduction due to your assumptions about settling rates. As the reductions are material in nature (see far right two columns) could you provide an indication of the movement in tonnages if the following aspects were addressed?</p> <p>A. Page 224 of my submission: Percentage proportion by mass, for the various settling rates. What is the tonnage impact if NIWA's results were used, rather than combining HRW & NIWA results?</p> <p>B. Page 256 of my submission: What is the tonnage impact, if results of 1DV modelling, sand and mud discharge 94% trapping of the 10mm/s is used – instead of the 100% trapping result used for NIWA plume modelling?</p> <p>C. Provide the tonnage results, that would occur if the 3D results from the more extreme current and wave heights were applied to all sediment sizes e.g. 0.28 current and 3.5m waves . . . the result was NIL trapping for the 0.1mm/s. . . but this result was not used.</p> <p>D. The 3D modelling used a scenario of 0.28 current and 3.5 waves – the results of which were not used (nil settling) – how often would these ocean conditions be expected to occur at the Project site?</p> <p>E. Page 38 of the HRW 2014 report reference Eisma 1986 and Dyer 1989 – in regards to turbulence breaking up flocs. What would the currents and waves need to be at the Project site to cause flocculation breakup?</p>
	MD12	As an increase of 9°C increases settling velocities up to 40% - could you indicate the degree of conservatism you have used in your modelling for settling rates – by comparing each lab test temperature & 1DV & 3D temperatures used, against NIWA recorded surface and seafloor temperatures at the Project site. Also provide comment on the 5C TTR provided for the seafloor temperature for use in the patch modelling in the previous submission. (see pg 303 of my submission)
	MD13	Pages 78,79 & 80 of my submission give just three examples of important recreational fishing and dive spots which are in the geographic areas totally missed for BEMP and EMMP monitoring. HRW report and time series of SSC misses these areas also. My submission was full of examples of reef knowledge from local recreational and commercial fishermen – what was the basis for not acknowledging this information source in any way? A well documented Citizen Science Project off Patea, captured at detail in my submission, was also not captured by the BEMP, EMMP monitoring sites, or referred to by HRW.
Nga Motu Marine Reserve Society	MD14	<p>Quantitative response limits and consent limits have been provided for suspended sediment concentrations. Should quantitative response limits and consent limits also be provided for sedimentation? If not, why not?</p> <p>Note question also asked to Dr Michael Dearnaley, Dr Mark James and Phillip Mitchell</p>
	MD15	<p>Have animations showing predicted movement of the sediment plume been produced?</p> <p>Can these be made publicly available as part of the application?</p> <p>Note question also asked to Dr Michael Dearnaley and Dr Mark James</p>

B	Dr Mark James and Mr Shawn Thompson		KASM and Greenpeace	MJ/ST1	<p>Do you accept that (Mead para. 23) that the revised plume model (Hadfield & Macdonald 2015) is based on laboratory tests done by HR Wallingford (2014, 2015) on three different sediment types with only one sample for each sediment type and that this violates basic principles for the design of meaningful tests and the interpretation of their results?</p> <p>For instance, there are no replicates for the three sediment types, so it is not possible to establish whether the tested samples are representative of each specific sediment type? And do you accept that any test will always confuse the "sediment type effect" with the individual identity of the only replicate available for each sediment type? Do you accept that 3 samples were not enough for such a huge area of 65 sq km?</p>
				MJ/ST2	Do you accept that the use of low period waves in the modelling may lead to an underprediction of the amount of sediment leaving the pit (Greer para 15)?
				MJ/ST3	<p>Do you accept that (Mead para. 23) that the revised plume model (Hadfield & Macdonald 2015) is based on laboratory tests done by HR Wallingford (2014, 2015) on three different sediment types with only one sample for each sediment type and that this violates basic principles for the design of meaningful tests and the interpretation of their results?</p> <p>For instance, there are no replicates for the three sediment types, so it is not possible to establish whether the tested samples are representative of each specific sediment type? And do you accept that any test will always confuse the "sediment type effect" with the individual identity of the only replicate available for each sediment type? Do you accept that 3 samples were not enough for such a huge area of 65 sq km?</p>
				MJ/ST4	Do you accept that the use of low period waves in the modelling may lead to an underprediction of the amount of sediment leaving the pit (Greer para 15)?
				MJ/ST5	Do you accept that the near field modelling used by the far field boundary conditions assumes a constant wave height and that the current and wave directions are at right angles to each other, a condition which maximises the amount of material that remains in the pit? (Greer para 15)
				MJ/ST6	Do you accept that the wave period used in the model is very low (Greer para 15) and that in reality the quantity of sediment that leaves the pit in the form of a passive plume will vary over time leading to greater variability in the size of the plume than is represented in the subsequent far field modelling?
				MJ/ST7	Do you accept that the NIWA higher settling fraction should have been calculated as this would have led to a considerably larger plume in the far field model, and that the model would need to be rerun to determine how much larger the plume would be. (Greer para 17)?
				MJ/ST8	Do you agree that the an erosion rate of $8E-4$ kg m ⁻² s ⁻¹ was typical, rather than conservative? (Greer para 22)
				MJ/ST9	Do you accept that background levels may be underestimated in the model by up to a factor of two? (Greer para 23)
				MJ/ST10	Do you accept that Background SSC levels referred to as 'natural' in expert evidence and in the main application are in fact anthropogenic and thus it is inappropriate to use them for comparison with the predicted plume. (Greer para 32).

2. Optical effects and Effects of Sediment plume on Primary productivity					
	Witness	Party Represented	Question from	Reference number	Question

A	Dr Lawrence Cahoon	TTRL	The Fisheries Submitters	LC1	<p>Your evidence at paragraph [29] and Figure 5 illustrates the effects of light reduction at different spatial scales. These effects are not evenly distributed over the Sediment Model Domain (SMD).</p> <p>Given this, do you agree that estimates of declines in energy flux averaged over the SMD obscure localised reductions that may be far higher than the average?</p> <p>Do you agree that estimates of effects at smaller spatial scales would be more useful to begin assessing the ecological effects and those effects on fisheries?</p>
				LC2	<p>Talley's Group Limited vessels use dyes to influence the movement of tuna during their fishing operation, given their sensitivity to optical changes in the water. Additionally, turbidity has an immediate and direct impact on fish movement. NIWA – Optical Effects of Proposed Iron Sand Mining in the South Taranaki Bight Region – September 2015 as reviewed by GHD (and EPA's experts, DHI) focused their modelling on the Graham Banks and the Traps, but they do not address potential impacts other wider geographic areas within the STB where migratory fish stocks occur (such as mackerel and tuna). This includes the areas adjacent to the mining area (to the east and west). NIWA cannot predict with any certainty the extent of the plume, and the number of days that the sediment plume will reduce light in the water column.</p> <p>Have you or anyone at NIWA considered the optical effects of mining within the proposed mine area, and the downstream plume, on the movement patterns of highly migratory species and their prey within the wider STB?</p> <p>Note question asked to Dr Alison MacDiarmid and Dr Lawrence Cahoon</p>
			Nga Motu Marine Reserve Society	LC3	<p>If photoadaptation occurs in response to reduced light levels, will chlorophyll a act as a reliable proxy for biomass taking into account changes in chlorophyll a:biomass ratios?</p> <p>Note question asked to Dr Lawrence Cahoon and Daniel Govier</p>
				LC4	<p>TTRL do not intend to measure primary production or use a modelling approach to assess the impact of the plume on primary producers. Is the proposed monitoring adequate for detecting impacts on primary producers from a food web perspective?</p> <p>Note question asked to Dr Lawrence Cahoon and Daniel Govier</p>
B	Dr Mark James	TTRL	The Fisheries Submitters	MJ1	<p>You state at paragraph [48] of your evidence that energy flow to the seabed would be reduced by 5.8% (range 3.1-11.9%) for mining at Location A, and less than that for mining at Location B. These estimates are averaged over the entire modelling domain.</p> <p>Did you estimate reductions in energy flow at smaller spatial scales that would be more relevant to understanding effects on the aquatic environment and fisheries?</p> <p>If so, why were these not discussed in your evidence?</p>
				KASM and Greenpeace	MJ2
				MJ3	<p>In para 29 you say that reductions in light reaching the seabed over the modelled domain will average 1.9% and 1.6% for iron sand recovery at the inner and outer source locations (Locations A and B respectively) though may be up to 25% within the plume up to 20 km downstream.</p> <p>What would the impact of 25% reduction in light reaching the seabed be on biota?</p>
				MJ4	<p>Do you accept that if the plume estimates are wrong, these figures may be higher?</p>

			Nga Motu Marine Reserve Society	MJ5	Quantitative response limits and consent limits have been provided for suspended sediment concentrations. Should quantitative response limits and consent limits also be provided for sedimentation? If not, why not? Note question asked to Dr Michael Dearnaley, Dr Mark James and Phillip Mitchell
				MJ6	Have animations showing predicted movement of the sediment plume been produced? Can these be made publicly available as part of the application? Note question also asked to Dr Michael Dearnaley and Dr Mark James

3. Effects on Benthic Ecology

	Witness	Party Represented	Question from	Reference number	Question
A	Dr Mark James	TTRL	KASM and Greenpeace	MJ7	In paragraph 3 you say that "Recovery of early successional stages and smaller biota would occur at a timescale of weeks-months once extraction and redeposition has ceased in that area, but up to several years for late successional and larger biota." But Alison MacDiarmid said that (para 55) recovery of some taxa such as polychaete would be expected to start within a few weeks of the iron sand recovery operations moving elsewhere within the consent area. However she said that larger, long-lived biota could take months to several years to fully recover in the excavation area." So why do you say that recovery of early successional stages and smaller biota would occur at a timescale of weeks, when she says that recovery would only start in that timescale? And why do you not say that long-lived biota may take several years to recover?
				MJ8	Do you accept that recovery may remain influenced by high sedimentation levels (Mead para 38.2)
				MJ9	In para 5 you say that reductions in carbon flux to the benthos has been conservatively estimated as up to 40% close to the source (< 2 km) and that effects of light attenuation on primary production (PP) as a result of the plume will be minor within 5 km of the coast and minor to moderate for a small distance downstream of the ISR site. Please quantify minor to moderate. Do these depend on the Wallingford modelling? Do you accept that they may inaccurate? By what factor do you estimate they may be inaccurate? How would that affect your evidence?
				MJ10	At para 111 you say that the minor effects on benthic animals at distances greater than 2 km from the ISR operations means that there will be no more than minor, if any effect on higher levels in the food web. This is based on the modelling?
				MJ11	At para 116 you accept that there may be other rocky reefs affected but that "predictions are that even the closest reefs will receive less than 1 mm of sedimentation over five days and will be unlikely to settle for long." But you haven't done a survey of reefs have you?
				MJ12	Have you read the evidence of Shaw Mead for KASM and Greenpeace?
				MJ13	Do you accept that the updated predictions on the impacts of the mining activities on benthic systems are not based on a better understanding of the benthic ecology of the area, but mainly on revised models of sediment dispersion (Hadfield & Macdonald 2015), optical effects Pinkerton & Gall (2015) and primary production (Cahoon et al. 2015).? (Mead para 10) Do you accept that no effort has been made to gather more information about benthic habitats and communities of the STB and to combine the modelling information with field observation and experimental data (Mead para 12).

				MJ14	Do you accept that your evidence in effect represents the best case scenario (Mead para 15)? And that do you accept that the worse-case scenario is that the operations will cause wide-spread ecological change that is disruptive, causes cascade impacts which change community structures and ecosystem function, reduces biodiversity, contributes to cumulative impacts that displace key species (e.g. canopy-forming kelp), and results in a large reduction in productivity over a large area of the STB for the duration of the activity and potentially beyond (e.g. permanent changes to the benthic ecology of the mined area, permanent displacement of some species/communities, etc.)? (Mead para 15)
				MJ15	Do you accept that since no information is provided about how the operations will move through the proposed project area (PPA), it is unclear where the plume will originate at any given time? (Mead para 19)
				MJ16	Do you accept that it is impossible to establish whether increased sedimentation down-current from the excavation site will keep impacting areas already mined (thereby affecting the recovery process) and/or non-mined areas (which are expected to act as a source of larvae to repopulate the mined areas). (Mead para 19)
				MJ17	Do you accept that no sampling was systematically repeated through time, and that these snapshots do not provide any information about seasonal changes in benthic habitats and communities and about their responses to natural disturbance events? (Mead para 19.1) And do you accept that there is a seasonal bias for the core sampling, so differences in benthic habitats and communities among regions are potentially confused by natural seasonal changes? (Mead para 19.2)
B	Dr Alison MacDiarmid	TTRL	The Fisheries Submitters	AM1	At paragraph [20] you state that “[n]ew species of bryozoan, sponge, annelids and algae, as well as new records for many groups for the regions were identified during the NIWA survey of the Patea shoals region.” Does this mean that new species, previously unknown to science, have been discovered at the Patea shoals? If that is correct, has NIWA determined the population size or distribution of these species? Can you provide any assurance that these new species will not be at significant risk (including potential extinction) as a result of the proposed mining operation?
				AM2	At paragraph [93] relating to marine effects and benthic ecology you state: “[t]hese levels of deposition are highly unlikely to clog the respiratory or feeding surfaces of benthic organisms. Organism growth and movement is sufficient to ensure that smothering will not occur at these rates of deposition over the lifetime of the operations. The NIWA modelling indicates that mining derived sediments suspended in the water column or deposited on the seafloor surf are highly unlikely to affect surf clams along the Manawatu coast or aquaculture areas in the Marlborough Sounds.” The NIWA Sediment Plume Model (Page 40 and following) shows the plume impacting the surf zone from Patea to Foxton with varying concentrations of sediment. Do you have a clear understanding and/or knowledge of the biomass and extent of the fish and clam species distribution in the mining area, the adjacent shore and the STB?
				AM3	Have you considered the effect of mining-related suspended sediment concentrations on each of the following five species of Surf Clams (Diamond Shell <i>Spisula aequilatera</i> ; Moon Shell <i>Dosinia anus</i> Storm Clam <i>Mactra murchisoni</i> Frilled Venus <i>Bassina yatei</i> ; and Tua Tua <i>Paphies donacina</i>) and their food sources that occur from 4 to 15 m depth in the coastal zone?
				AM4	Does your analysis consider the unique biology of the surf clam, its feeding mechanisms, and its sensitivity to fine sediment?
				AM5	Did your analysis consider the sensitivity of surf clams to algal blooms and heavy metal concentrations?
				AM6	At paragraph [13] of your evidence you state that there was bivalve rubble. How was the dredge efficiency established in the varying substrates during sampling, and what is the identified species make-up of this rubble?

Karen Pratt	AM7	Why has there been no survey work conducted on sub-tidal reefs? In your Expert Evidence you note: "hard rock outcrops (dredges at sites 5 & 6) accounted for more than 25% of all specimens and 61% of all species collected during the nearshore survey. This result is significant, and yet diver benthic surveys and transect work have not been conducted over the two years since this nearshore survey was conducted. My submission was full of evidence on sub-tidal reefs and not referred to your expert evidence, although you state in point 87 you have responded to key concerns.
	AM8	Why has there been no reference in your Expert Evidence to the Cawthron 'Sensitive Habitats Report' commissioned by Taranaki Regional Council and received by Councillors on 1 September 2016? My submission covered the findings at great depth. The EEZ Act s61(b) states the EPA MUST base decisions on the best available information & s58(2)(e) the EPA MUST take into account the importance of protecting rare and vulnerable ecosystems and the habitats of threatened species.
	AM9	What is the basis for not investigating (point 38 of your Expert Evidence) 'the extent and location of recreational fisheries?
	AM10	If you are unaware of local reef structures, and hence macroalgae density & with the modelled reduction in light at the seafloor being of material consequence on a local scale – could you provide a conclusion on this matter – as your Expert Evidence Conclusions, points 114-117 do not address this matter.
KASM and Greenpeace	AM11	Why were no further surveys undertaken reviewing the benthic ecology?
	AM12	You describe an experiment in Wellington harbour. Please describe the differences with the STB. Why was the experiment not conducted in the STB? You indicate that the role of iron concentration in re-colonisation would need to be confirmed. What if it is found to be significant? What other results may be different?
	AM13	Do you accept that the experiment provides no indication relevant to the application (Mead para 38.5) because of the obvious differences in biota and physical environment between the Wellington Harbour and the STB, in addition to a number of artefacts associated with the experimental procedures?
	AM14	You say that (para 7) "there should be negligible effects of mining 50 Mt per annum according to standard evaluation criteria". By this you mean the species live in other places, correct? Do you accept that there will be effects on the species in the area mined and affected to be mined? Do you also accept that there may be species that you have not found or that are affected in other ways? Such as if the plume is larger than forecast? Such as the eagle ray? (paragraph 8)
	AM15	At para 114 you give estimates of recovery times. What are these based on? How long would starfish take to recover? How long would coral take to recover? What may the impacts be on the eagle ray?
	AM16	What do you know about the reproduction and early life history of the organisms which would be expected to recover (Mead para 38.4)
	AM17	Do you accept that there is no evidence of responses of benthic communities to natural disturbance events in the STB because no study has assessed the temporal variability of these communities (Mead para. 25)? And that there is no strong ground for any solid inference into the stability, resistance and recovery capacities of these communities, especially in a high-energy, dynamic environment like the STB? (Mead para 25).
	AM18	Do you accept that sediment discharge from the proposed activities will have no downtime 'press' type impact) and will constantly superimpose its effects on natural disturbance and that this will result in an altered disturbance regime which could last up to 35 years. Predicting the responses of benthic communities to this unprecedented event is impossible given our lack of understanding of their current dynamics under normal conditions? (Mead para 26)
	AM19	Do you accept that current sediment levels in the STB are not natural and that elevated sediment inputs from the rivers result from anthropogenic degradation of freshwater quality through intensive land use, and that this is a cumulative impact (Mead para 27).

			AM20	Do you accept that there are different locations and volumes to sediment loading and that this has not been taken into account? (Mead para 28).
			AM21	Do you accept that there has been no mention of how PPA biodiversity compares to that of similar systems in New Zealand or elsewhere (Mead para 29)
			AM22	Do you accept that we cannot predict whether or not the communities are at their natural stress loads already? (Mead para 32), and that we have inadequate information on benthic organism tolerance limits and sensitivities to the effects of suspended sediment?
			AM23	Do you accept that there is uncertainty as to the long term effects of elevated nickel and copper on larval stages of aquatic biota from the mining? (Ngaire Phillips para. 87)
		Nga Motu Marine Reserve Society	AM24	Why was additional surveying of inshore reefs undertaken, as presented in Anderson et al., 2015, but no additional surveying of mid-shelf reefs within the area affected by the sediment plume?
			AM25	Is the Society correct in thinking that the results of the multibeam survey were not presented in the 2016 TTRL application? Why was this?
			AM26	What areas have been surveyed by multibeam and how was this information used to ground-truth the distribution of rocky reefs within the Patea Shoals? Based on the answer, is the distribution of rocky reefs presented in the TTRL application accurate and complete? To what extent could reefs present in the area of the sediment plume have been missed?

4. Effects on Marine Mammals

	Witness	Party Represented	Question from	Reference number	Question
A	Dr Simon Childerhouse	TTRL	The Fisheries Submitters	SC1	<p>The focus for assessing potential impacts to marine mammals has been on cetaceans. However, of all marine mammals documented within the STB and PPA, New Zealand fur seals are the most frequently sighted species.</p> <p>Seals are an indicator species of the health of a fishery, and are also known to be opportunistic exploiters of human activities.</p> <p>Do you think it would be prudent to obtain baseline information about the numbers and health of seals in and around TTR's proposed operations to enable monitoring of any potential changes in their health?</p>
				KASM and Greenpeace	SC2
				SC3	Do you accept that the information provided by TTR includes a population survey which is inadequate for the purpose, and some habitat modelling based on anecdotal information (Slooten para 13)? Do you accept that problems include the small size of the area covered and a lack of data on sighting probability? (Slooten para 13)
				SC4	In para 3 you say "If noise levels of the dredge are comparable to those of shipping as the literature suggests "
				SC5	In para 10 you say that you have not undertaken any field studies in relation to this proposal. Why not?

SC6	Do you accept that noise produced by the mining operations may directly disrupt blue whale foraging, cause blue whales to move out of important feeding areas, interfere with blue whale communication causing loss of feeding or mating opportunities, cause changes in vocal behavior patterns with subsequent energetic consequences, and induce increased physiological stress that compromises blue whale health? (Torres para 9)
SC7	Do you accept that the expected sediment plume from the mining operations may impact the distribution and availability of <i>N. Australis</i> (krill), thus reducing the foraging ability and efficiency of blue whales (Torres para 9)?
SC8	Do you accept that the STB is an important habitat and foraging area for blue whales?
SC9	Do you accept that Blue whales have extreme energy demands, and each disturbance to their feeding opportunities and success rate can impact their viability and reproductive capacity. Added noise, habitat impacts, prey disturbance and vessel density in the STB by the mining operation would add physiological and behavioral consequences and burdens to blue whales already living within an impacted and compromised ecosystem? (Torres para 9)
SC10	Do you accept that with every increase in anthropogenic activity in the STB region, the risk of vessel strike of a blue whale increases? (Torres para. 33)
SC11	Do you accept that the conservation status and cumulative impacts for Maui dolphin are of serious concern? (Slooten para. 18.1) Do you accept that there is still considerable overlap between Maui dolphins and fisheries in the area, which is likely to be exacerbated by the mining and the sediment plume resulting from the mining. (Slooten 18.1)
SC12	Do you accept that a detailed assessment of the conservation implications of the proposed mining, including cumulative impacts, will be essential in order to provide the DMC with enough information to make a science-based appraisal of the potential impacts of the proposed mining on marine mammals, in particular for Maui dolphins which are already at an extremely high risk of extinction (Slooten 18.1)
SC13	Do you accept that TTR have failed to provide either measurements of the noise made by the proposed mining operation (ships, generator and dredge to be used) or measurements of the background "ambient" noise off Taranaki? (Slooten para. 15)
SC14	Why did TTR perform no actual assessment of the ambient noise levels at the mining site? (Torres para 37) rather only of Lyttelton Port for only 15 minutes? Do you accept that the Lyttelton recorded sound is surprisingly high (Slooten para. 15.8)?
SC15	Do you accept that ambient ocean noise is highly site specific, as well as variable temporally? (Torres para 37, Slooten para 15.7))
SC16	Do you accept that there is no information on local sound propagation conditions that will impact the distance sound will travel (because these local conditions were never measured) (Torres para 42) And do you accept that sound propagation depends strongly on underwater topography, benthic substrate and water temperature (Slooten para. 15.7)
SC17	Do you accept that each sound increase contributes to the behavioral and physical consequences to ocean animals, including blue whales (Torres para 49)?
SC18	You have not estimated sound levels and frequencies at various distances have you? And do you accept without this information and without marine mammal surveys, you are unable to predict effects on specific marine mammal species at different distances?

				SC19	Do you accept that the plume will cause impacts on ecosystem productivity through reduced light penetration and subsequent change to the zooplankton community, including <i>Nyctiphanes australis</i> (krill), the target prey item of blue whales in the region? (Torres para 51) And do you accept that that with increased sediment in the water column dense patches of <i>N. australis</i> – needed by blue whales to survive – may be less numerous, more difficult to detect, and occur in unusual areas that reduce availability to whales (Torres para 51)?
				SC20	Do you accept that there is an important biomass of <i>N. australis</i> in the STB with an unknown distribution (spatially or seasonally), yet the studies that do exist show increasing abundance toward the proposed mining site, and therefore, habitat disturbance that impacts prey availability for blue whales in this area should be considered and avoided? (Torres para 53)
				SC21	Do you accept that in conclusion, “it is naive to think that a 35 year mining project within the STB region will not impact this population of blue whales, through elevated noise within their frequency range, habitat displacement, vessel impacts, and prey disturbance.” (Torres para 58). And do you accept that the absence of credible, scientifically robust data on background noise and the noise produced by the mining operation mean that it is not possible to determine the impact of the noise from the proposed mining operation on marine mammals, nor to develop conditions relating to noise (Slooten 15.9)
B	Dr Alison MacDiarmid	TTRL	KASM and Greenpeace	AM27	In paragraph 107 (d) on Maui’s dolphins you are relying on modelling, correct? Not on surveys? Why were no surveys undertaken? Does your conclusion stand that “mining 50 Mt per annum is likely to have negligible effects on this species” if one Maui’s dolphin is killed or displaced or reproduction is affected by mining?
				AM28	In paragraph 107 (a) you discuss blue whales. Do you accept Dr Torres findings that the STB is an important habitat and foraging area for blue whales? (Torres para 9)
				AM29	Do you accept that the mining may affect <i>Nyctiphanes australis</i> (krill) and therefore blue whales? (Torres para 9)
				AM30	Is your finding of negligible impacts affected if one blue whale was known to forage in the “in the vicinity of the proposed mining areas”?
				AM31	At paragraph 108 ff you discuss cumulative impacts. Do you accept that noise can be a cumulative impact? Why did you not measure it?
				AM32	How about other disruption by ship activities? You do not discuss ocean acidification. Can this be a cumulative impact?

5. Effects on seabirds					
	Witness	Party Represented	Question from	Reference number	Question
A	Dr Mark James	TTRL	KASM and Greenpeace	MJ18	At para 112 you discuss the effects on penguins. You say firstly that “like other seabirds and mammals these animals forage over wide areas, with penguins feeding mostly on surface schooling small fish, squid and crustaceans. These resources will not be affected at the levels of SSC and sedimentation predicted”. Do you accept that there are penguins living and breeding in the area (John Cockrem para. 14)?
				MJ19	Do you accept that there have not been any systematic surveys of the Taranaki and Whanganui coastlines to search for little penguins along these coastlines, so the full extent of little penguin breeding along the Taranaki and South Taranaki Bight coastlines is currently not known. c

				MJ20	Do you accept that Little penguins generally forage within 20 km of their nests when feeding chicks, so penguins breeding on the south Taranaki coast are dependent on feeding areas that would be affected by the proposed sand mining? (Cockrem para. 16) And do you accept that The STB may be an important feeding area for the continued survival of populations of little penguins that breed in the Marlborough Sounds (Cockrem para. 17)?
				MJ21	Do you accept that Pinkerton and Gail (2015) Fig. 6.21 that on average sand mining would cause light intensity at the seabed to be reduced over an area of more than 600 km2 extending from south of Hawera to south of Foxton? (Cockrem para. 19) And do you accept that little penguins are visual foragers, so any reduction in light intensity in the water and any reduction in visibility in the water caused by sand mining would reduce foraging opportunities for little penguins? (Cockrem para. 20)
				MJ22	Do you accept that the estimated population of 2.8 million fairy prions that breed on Stephens Island may depend on the availability of food in the STB for successful breeding, and that whilst the extent to which sand mining would adversely affect fairy prions in the STB cannot be determined, any reduction in food availability due to sand mining could affect large numbers of prions? (Cockrem para 29)
				MJ23	Do you accept that indirect effects would be due to reductions in the ability of the birds to see and catch fish, and indirect effects would come from reductions in the availability of prey fish which themselves might be adversely affected by a reduction in water visibility (Cockrem para 30)? You then say that "as discussed in MacDiarmid et al. (2016) the area impacted is negligible compared with their foraging area, they are not very common in the area of the ISR operation and there would be no minor effects on food resources even 20 km away from the ISR site." Does Ms MacDiarmid discuss penguins in her evidence? Have there been any studies on penguins in the impacted area?

6. Effects on Fish

	Witness	Party Represented	Question from	Reference number	Question
A	Dr Mark James	TTRL	The Fisheries Submitters	MJ24	At paragraph [35] of your evidence, you discuss "entrainment" of fish. Is it intended that TTR will report to the Ministry for Primary Industries on species and volume of fish caught? And if so, should this be a condition of consent?
				MJ25	In Mr Douglas Saunders-Loder's evidence at paragraph [20], he mentions that Talley's Group Ltd (TGL) owns 2 tuna purse seiners that operate in FMA 8 and that Tuna are very sensitive to salinity, temperature, water colour and sediment and toxic load and noise in the water. Fish are highly sensitive to noise. TGL uses noise (banging on hull, deployment of helicopters, and speed boats) and dyes to influence the movement patterns of Tuna while fishing. Have you considered the noise effects of the crawler, the mining vessels, and the additional support vessels and activity within the proposed mine area upon the movement patterns of highly migratory species, demersal species and their prey in the STB? <i>Note question asked to Dr Mark James and Dr Alison MacDiarmid</i>
			KASM and Greenpeace	MJ26	In para 64 you say that the total area directly impacted will be 66 km2. Do you accept that it may be larger than that?
				MJ27	In para 35 Do you accept that fish may be attracted to disturbed invertebrates and rather than swim away be attracted to the mining site?

				MJ28	In para 36 you say that the area of disturbance will be limited to 5 km2 per year thus compared with the foraging area for fish, seabirds and mammals the area affected is negligible. Do you really mean "is"? What is that based on? Is that not instead a projection?
				MJ29	May small fish, squid and crustaceans. be affected at the levels of SSC and sedimentation predicted? And may they be affected if levels are higher than predicted?
B	Dr Alison MacDiarmid		The Fisheries Submitters	AM33	In Mr Douglas Saunders-Loder's evidence at paragraph [20], he mentions that Talley's Group Ltd (TGL) owns 2 tuna purse seiners that operate in FMA 8 and that Tuna are very sensitive to salinity, temperature, water colour and sediment and toxic load and noise in the water. Fish are highly sensitive to noise. TGL uses noise (banging on hull, deployment of helicopters, and speed boats) and dyes to influence the movement patterns of Tuna while fishing. Have you considered the noise effects of the crawler, the mining vessels, and the additional support vessels and activity within the proposed mine area upon the movement patterns of highly migratory species, demersal species and their prey in the STB? Note question asked to Dr Mark James and Dr Alison MacDiarmid
				AM34	Talley's Group Limited vessels use dyes to influence the movement of tuna during their fishing operation, given their sensitivity to optical changes in the water. Additionally, turbidity has an immediate and direct impact on fish movement. NIWA – Optical Effects of Proposed Iron Sand Mining in the South Taranaki Bight Region – September 2015 as reviewed by GHD (and EPA's experts, DHI) focused their modelling on the Graham Banks and the Traps, but they do not address potential impacts other wider geographic areas within the STB where migratory fish stocks occur (such as mackerel and tuna). This includes the areas adjacent to the mining area (to the east and west). NIWA cannot predict with any certainty the extent of the plume, and the number of days that the sediment plume will reduce light in the water column. Have you or anyone at NIWA considered the optical effects of mining within the proposed mine area, and the downstream plume, on the movement patterns of highly migratory species and their prey within the wider STB? Note question asked to Dr Alison MacDiarmid and Dr Lawrence Cahoon

7. Effects on Fishing (Commercial, Recreational and Customary Fishing)

	Witness	Party Represented	Question from	Reference number	Question
A	Dr Alison MacDiarmid	TTRL	The Fisheries Submitters	AM35	Based on the maps provided in Figure 3.6 of the Impact Assessment the worm fields identified during NIWA's surveys within and surrounding the PPA do not appear to occur elsewhere within the STB. These areas also appear to align with where some of the greater catch returns for fisheries arose [Figure 11.1 of the South Taranaki Bight Factual Baseline Environmental Report]. Why was there no analysis or comparison of catch return with benthic habitat type? Could a figure be produced to show how catch return and the predicted impact area of the plume align? Can you confirm whether these worm fields exist in the southern extents of South Taranaki Bight?
				AM36	The "Effects and Consequence" analysis you refer to at paragraph [66], and which is summarised in Table 2.2 of Report 17, only considers biological factors. This analysis underpins your conclusion at paragraph [72] that effects on fish species would be negligible. You then expand on this with regard to "commercial fish species" at paragraph [75]. Your evidence almost exclusively considers biological effects on fish and other marine species. Why is your assessment limited to potential biological impacts? Why did you not undertake an assessment of the other potential effects on fisheries?

AM37	To the extent that any analysis on fisheries was conducted in Report 18, do you accept that species in different QMAs must be regarded as separate fish stocks (e.g. ACE from one QMA cannot be used in another QMA)?
AM38	By using the distribution of catch and effort in your study area that includes two QMAs for many species (Figure 2.1 of Report 18), do you agree that your analysis of the proportion of total catches summarised at paragraph [79] is invalid from a fisheries management perspective?
AM39	Would you agree that a significant proportion of the catch and effort data you present in Figures 3.1 – 3.8 in Report 18 is included in FMA 7? This being the case, do you agree that using data from FMA 7 as the denominator in an assessment of effects makes little sense from a fisheries management perspective?
AM40	At paragraph [74] of Dr Greg Barbara's evidence for the Fisheries Submitters, he points out that the TTR reports do not directly overlap the catch effort maps with the plume modelling or the proposed project area, so it is difficult to determine the actual overlap and the possible impacts on fish stocks in the proposed mining area and wider STB. Has any work been undertaken to overlay fisheries catch and effort maps with the different plume scenarios set out in the NIWA (and other experts) plume modelling?
AM41	A pre-requisite for harvesting surf-clams is conducting a "sanitation survey" of the sea water off the beaches under the Animal Products (Regulated Control Scheme-Bivalve Molluscan Shellfish) Regulations 2006. This seeks to identify potential sources of pollution and determine sanitary quality of water followed by a full classification of the area to establish health standards fit for human consumption and export market access. Have you considered the effect of increased algal and sediment loads on water quality and the possible effects on health standards for the surf clam fishery?
AM42	The Fisheries Act 1996 sets out strict parameters for the management of fish and fish stocks in New Zealand fisheries. In making decisions under the Act all persons are required to have regard to detailed environmental principles including the following: (a) associated or dependent species should be maintained above a level that ensures their long-term viability; (b) biological diversity of the aquatic environment should be maintained; (c) habitat of particular significance for fisheries management should be protected. Has TTR given adequate consideration to the long term viability of fish stocks, and the maintenance of the biological diversity of the STB?

8. Ecotoxicity effects

	Witness	Party Represented	Question from	Reference number	Question
A	Dr Mark James	TTRL	The Fisheries Submitters	MJ30	In her evidence, Dr MacDiarmid at paragraph [93], relating to marine effects and benthic ecology, states: "These levels of deposition are highly unlikely to clog the respiratory or feeding surfaces of benthic organisms. Organism growth and movement is sufficient to ensure that smothering will not occur at these rates of deposition over the lifetime of the operations. The NIWA modelling indicates that mining derived sediments suspended in the water column or deposited on the seafloor surf are highly unlikely to affect surf clams along the Manawatu coast or aquaculture areas in the Marlborough Sounds." Did your analysis consider the sensitivity of surf clams to algal blooms and heavy metal concentrations?
			Karen Pratt	MJ31	Points 95-98 of your report only discuss Vopel 2013 - why did you not read Vopel March 2014 and February 2014 as these contain important data?

				MJ32	Why have you not raised the issue that Vopel gave a cautionary note that the CORMIX modelling for dilution modelling was done at 20metres (which is not representative of the height of outflow)
				MJ33	Why did you not raise the cautionary note by Vopel that the Cormix modelling was not exhaustive and may not have covered the worst case?
				MJ34	Why has the area close to the EEZ border, approx. 23m, had no heavy metal samples taken? (Three sampling sites Christina (38–43 m water depth); two sites Diana (32–37 m water depth).
				MJ35	Vopel (Feb 2014) has an important context note, that is missing from your commentary – why? “I note, however, that uncertainty remains in regard to variations in iron sand properties across the entire TTR mining area and any changes in these properties at depth below seafloor greater than five meters.”
				MJ36	From the table below you can see that not all samples were taken to 5m – why? And is this statistically sound?

9. Coastal processes

	Witness	Party Represented	Question from	Reference number	Question
A	Dr Terry Hume	TTRL	The Fisheries Submitters	TH1	Why has there been no effort to update the beach profile data since 2012 to provide a longer, more representative record of short term shoreline change?
B	Dr Iain MacDonald	TTRL	KASM and Greenpeace	IM1	You describe 7.1 metre waves in 2012 (para 30). Do you accept that warmer oceans and climate change will lead to more intense storms? <i>Note: under section 59 5(b) of the EZZ Act the EPA must not have regard to the effects on climate change of discharging greenhouse gases into the air.</i>
				IM2	You don't discuss climate change in your evidence. Do you accept that warmer oceans and climate change also lead to changed currents? <i>Note: under section 59 5(b) of the EZZ Act the EPA must not have regard to the effects on climate change of discharging greenhouse gases into the air.</i>

10. Economics

	Witness	Party Represented	Question from	Reference number	Question
A	Mr Jason Leung-Wai	TTRL	The Fisheries Submitters	JL1	Do you agree that because the fishing industry may land product caught within the STB in other ports, and that fishers may be domiciled outside the area, any contextual description of the scale of the commercial fishing industry needs to consider areas wider than just activity within Taranaki's administrative boundaries?
				JL2	At paragraph [59] of your evidence you suggest "negligible impacts on commercial fisheries". Given that submitter evidence suggests impacts would be more than negligible, or that there is insufficient baseline information to make this conclusion, would your assessment of the economic impact on commercial fishing change and to what extent would it change?

JL3	<p>At paragraph [77] you state: "My analysis touched on possible negative impacts on tourism and fisheries based on current activity in the study area, the likelihood of potential adverse outcomes, and the possible negative impact of that outcome. However, expert advice [in reference to Dr MacDiarmid] suggests that impacts on fisheries will be negligible. Even if negative impacts did occur, monitoring and response identified in the proposed consent conditions would quickly contain any likely impact. As such, my analysis has focused on the economic benefits that could accrue from the project."</p> <p>What qualification do you have to form an opinion as to whether the monitoring and proposed consent conditions would quickly contain any likely impact?</p>	
JL4	Is it normal for economic analysis of proposed activities relying on incomplete baseline information about the receiving environment to assume zero economic risk to surrounding established activities?	
JL5	Should you have taken a precautionary approach to your evidence and considered potential significant risks, notwithstanding your contention the likelihood of any impact occurring on commercial fisheries is low?	
JL6	Should you have included in your assessment of the economic effects an analysis of existing and future anticipated returns to the commercial fishing industry of activities within the STB?	
JL7	Why have you not analysed the possible economic effects of the displacement of catch from FMA 8?	
JL8	<p>In Mr Douglas Saunders-Loder's evidence, he states that Talley's Group Limited own quota valued at approximately NZ\$7,177,357 (excluding the value of tuna). A minor disturbance of the feeding and migration patterns of these fish and displacement from FMA 8 would have an economic effect on the value of Talley's (and other quota holder's) quota.</p> <p>Why has a consideration of the possible economic effects on Talley's (and other quota holder's quota and non-quota species) not been included in your economic assessment of the effects of the TTR mining operation?</p>	
JL9	<p>Dr MacDiarmid asserts that fish species will be displaced from the areas where the sand mining and sediment plume occurs. She states at paragraph [80] that this displacement will have a negligible effect on commercial fishing.</p> <p>Displacement of fish will cause them to move from FMA 8, but they may not be available to be caught in adjacent FMAs as they may not aggregate in those areas.</p> <p>Why has no consideration been given to the economic effects of displacement?</p>	
Karen Pratt	JL10	Could you provide an audit trail, so readers of your report can reconcile Table 1 & Table 2 of the EPA Information Request to the figures in the Impact Assessment (see my non-expert evidence pages 93 and table page 96).
	JL11	Shipping processes are extremely automated. Can you provide independent support for the FTE requirements e.g. from the shipping provider. Can the shipping provider give details on training requirements, as my review of large vessels on the internet indicates specialised Fly-In training occurs, rather than 'local training centres'.
	JL12	What objective evidence can you supply that the Heavy Fuel Oil will not be a ship-to-ship transfer? (HFO is a materially large item for your 'domestic expenditure'). If there is uncertainty on this matter, then could you provide another set of economic results with the line item categorised as Import expenditure.
	JL13	Can you provide independent references to support your methodology of including TTR employees AND subcontracted employees as DIRECT labour? (see page 101 of my non-expert evidence, for Berl definition of DIRECT, INDIRECT AND INDUCED).

KASM and Greenpeace	JL14	At 59 you say that activity is not visible from the shore and so is unlikely to directly affect tourism. Do you accept that tourists may be aware of activities that they cannot see, but hear about? Do you accept that tourists may feel differently about visiting an area which is the subject of seabed mining even if they do not see the mining? You say that recreational fishers may be inconvenienced but are free to fish in different areas.? May those recreational fishers include tourists? And may recreational fishers not being able to fish in an area not decide to fish in Taranaki at all?
	JL15	Para 75: do you accept that tourists and others may consider that the project is contrary to New Zealand's clean green image, even if there are other industries that likewise undermine it?
	JL16	At para 65 you estimate royalties at royalties at \$6.15m? Do you accept that is a small percentage of export earnings of around \$400 million a year (Alan Eggers para 29)? Do you accept that royalties revenue received by New Zealand, are supposed to represent the economic compensation for the permanent loss of the mineral resource? (Binney para 12)
	JL17	At para 67 TTR is a New Zealand company. What do you mean by that? What percentage of beneficial ownership is held by New Zealand residents? Have you undertaken a study of to where dividends would be remitted? You say that TTR has 42 shareholders, of which 19 are from New Zealand. How many of those are nominee shareholders? Are they all beneficial owners? Who are the beneficial owners of Minvest Securities (New Zealand) Limited, the largest shareholder? Do you accept Mr Binney's analysis (para 36) that the consequence of this oversea financing strategy is that the bulk of the return on investment from the project will also flow directly overseas, significantly reducing the benefits accruing to New Zealanders?
	JL18	Para 86: even if it is difficult to monetise benefits and costs over a defined time period, do you accept that it should be attempted? Do you dispute that environmental cost is a cost?
	JL19	You discuss 'double counting' environmental costs. But you have not even attempted to count them have you?
	JL20	Have you read Jim Binney's evidence for KASM and Greenpeace? He said that (para 9) he is of the firm view that a comprehensive benefit-costs analysis (BCA) is the only appropriate economic assessment methodology to inform the regulatory approvals process. This should include all relevant environmental and social values that could be adversely impacted by the project. Do you disagree with this? Do you accept that your analysis cannot be used to demonstrate the net worth of the project to New Zealanders
	JL21	Do you consider that environmental and social values need not be valued? Do you accept that (Binney para 38) no significant attempts have been made by the project proponents to evaluate the potential value of the costs to the environment attributable to the project? Do you accept that the ocean produces goods as well as ecosystem services? (Binney para 39)? That these include exchanges of matter, energy and biodiversity? Are you aware that the ocean creates 50% of the oxygen we breathe? And recycles most carbon? And has absorbed over 93% of anthropogenic heat? Are you aware of provisioning services, regulating services, habitat, and cultural services? (Binney para 43)
	JL22	Mr Binney also said (para 10) that you have adopted an I/O approach and that is generally considered to be an inferior approach to estimating impact assessment as it tends to overestimate impacts. Do you accept that?
	JL23	Do you accept that environmental risks do have economic values? (Binney 12) He estimated a range of the present value of the environmental damage could be in the range of \$28 – 543 million. (para 12) Do you accept that?
JL24	Do you accept that the flow on effects identify a measure of activity, not a measure of net benefits from the project, which needs to include social and environmental effects? (Binney 35)	

				JL25	Do you accept that the flow on effects identify a measure of activity, not a measure of net benefits from the project, which needs to include social and environmental effects? (Binney 35) Mr Binney concluded (para 13) that the use of an inappropriate approach to the economic analysis, a lack of transparency, and no real attempt to incorporate environmental risks into the economic analysis, means that the economic analysis does not demonstrate that the project would deliver a net benefit to New Zealanders. Do you accept that? Do you accept that the economic analysis undertaken by Martin Jenkins and Associates on behalf of TTR does not provide a solid economic argument that the project should be approved? (Binney para 48), and that the application of the I-O modelling has not been done in a transparent fashion and any results should be treated with extreme caution?
				JL26	Do you accept that biodiversity is underestimated due to sampling issues (Mead para 19.3)?
				JL27	Do you accept that rocky reefs areas were not adequately sampled? (Mead para 19.4)?
				JL28	Do you accept that reports give no indication of the distribution and abundance of microphytobenthos (MPB)? (Mead para 19.5) Do you agree with the criticisms of experimental design and data analyses in Mead para 19.6?

11. Geotechnical					
	Witness	Party Represented	Question from	Reference number	Question
A	Mr Matthew Brown	TTRL	KASM and Greenpeace	MB1	How much vanadium and titanium are in the sands? Is it possible either or both may be extracted? Would TTR pay royalties in such a case?
			Origin Energy Resources Kupe NZ Ltd	MB2	What will be the profile of the active cut when an area is mined, and after mining has been completed? <i>Note Question also asked to Mr Matthew Brown and Dr Iain MacDonald</i>
				MB3	Given De Beers Marine has employed similar machinery in its diamond mining operation to that which TTR are proposing to use,2 can TTR provide survey data for the seabed mined by DeBeers? <i>Note Question also asked to Mr Matthew Brown and Dr Iain MacDonald</i>
B	Dr Iain MacDonald		Origin Energy Resources Kupe NZ Ltd	IM3	What will be the profile of the active cut when an area is mined, and after mining has been completed? <i>Note Question also asked to Mr Matthew Brown and Dr Iain MacDonald</i>
				IM4	Given De Beers Marine has employed similar machinery in its diamond mining operation to that which TTR are proposing to use,2 can TTR provide survey data for the seabed mined by DeBeers? <i>Note Question also asked to Mr Matthew Brown and Dr Iain MacDonald</i>

12. Operational Description and Project Description					
	Witness	Party Represented	Question from	Reference number	Question
A	Mr Allan Eggers	TTRL	KASM and Greenpeace	AE1	Does TTR undertake to mine directly or will (or may) it sell any marine consents gained?

				AE2	He said (para 26) that TTR have spent \$18m from October 2013 to October 2016, and in paragraph 22, that Since inception TTR has spent more than \$70 million. Yet TTR claimed in paragraph 9 of their letter of 26 August, which appears as exhibit 5 to Paul Johnston's affidavit in the KASM v EPA hearing, that they have spent in excess of \$30 million. Which figure is correct?
			Origin Energy Resources Kupe NZ Ltd	AE3	When is TTR intending to develop its contingency procedures, including but not limited to the Collision (Loss of Position) Contingency Management Plan?
				AE4	Is TTR still willing to enter into a SIMOPS agreement with Origin in accordance with the conditions and criteria outlined in the IMCA Guidelines for Simultaneous Operations?
				AE5	Is TTR willing to work with Origin (and the Kupe Joint Venture Parties) to resolve the detailed technical concerns and queries raised by Origin during TTR's first consent application and subsequent interactions?
				AE6	Is TTR willing to extend its baseline and ongoing environmental monitoring programmes to specifically include areas around the Kupe wellhead platform and pipeline?
				AE7	Is TTR willing to include a representative from the Kupe Joint Venture Parties in the Technical Review Group?
				AE8	Will TTR indemnify the Kupe Joint Venture Parties for all losses, including indirect and consequential losses, following any damage to Kupe infrastructure caused by the impact of any vessel (or other object) associated with TTR's operation, and the Kupe infrastructure?
				AE9	Will TTR indemnify the Kupe Joint Venture Parties for all losses, including indirect and consequential losses, resulting from any uncontrolled hydrocarbon release from Kupe infrastructure following the impact of any vessel (or other object) associated with TTR's operation, and the Kupe infrastructure?
B	Mr Shawn Thompson	TTRL	The Fisheries Submitters	ST1	Proposed condition 59 requires that re-deposition mounds at the start of each mining lane are no higher than nine (9) metres. If the maximum elevation for the discharge of the de-ored sediment is 4 metres above the seabed (proposed condition 55), how is it possible to get 9m high mounds?
				ST2	At paragraphs [59] to [66] of the Operational Description in describing the trajectory of an "un-mitigated and uncontrolled" release of 100mt of 380cst HFO, you state at paragraphs [63] and [64] that spill events are likely to result in a beaching outcome, with the maximum concentration on shore being found around Wanganui. Has TTR done any analysis of a "worst case" oil spill for quantities of HFO and MGO exceeding 100mt? Further, has the physical and biological impact of an oil spill on fish stocks and/or surf clams been considered?
				ST3	The Impact Assessment at paragraph [2.3.3.2] and Subsea Sediment Extraction, at Figure 2.7 shows that the crawler can be as far from the deposition pipe as 350m. This will generate large mounds ($\leq 9m$) and hollows ($\leq 11m$). Has consideration been given to the effect of changing natural tidal flows on the movement of sediment? Further, given that the mound will be primarily composed of fine sediments (being a de-ored sediment slurry, with mud of <4%) will the mud component be more mobile and moved by the tidal flows? Why was the bore data removed from the previous application and not included in the current application? What volume of water is added to the suction line of the crawler, to transport the excavated sand to the IMV?
			Karen Pratt	ST4	Evidence presented on the impact of Sulphur Dioxide on the ocean was described by Jenny Simpson as 'The project emissions are similar in scale to a single, very large cruise ship'. How is this possible when page 543 of my submission shows #2,432 vessels consuming 273,000 tonnes and TTR's one vessel consuming 156,000 tonnes per annum?

	ST5	What is the cost to TTR to transfer to a lower sulphur fuel? I calculated \$43 million AUD. (page 532 of my submission).
KASM and Greenpeace	ST6	If TTR intend to undertake the mining itself, would there be other partners involved?
	ST7	How many people will TTR actually employ?
	ST8	Has TTR undertaken a full video and survey of the area? Can it guarantee that there are no unidentified areas of coral and other vulnerable marine ecosystems in the area that may be affected?
	ST9	You have said the IMV will be New Zealand flagged. What flag will the transshipment and other vessel used fly?
	ST10	Why did TTR not carry out a hydrodynamically driven model of phytoplankton and microphytobenthos production as requested by EPA (see Mead para 40)
	ST11	Do you accept that is a significant difference in the particle size distribution between discharged and extracted sediment? (Mead para. 39.1)
	ST12	Would shell debris be destroyed as part of the mining operations or screened and returned to the surface layer of the seabed as a hash as previous? (Mead para. 39.1)
Origin Energy Resources Kupe NZ Ltd	ST13	What was the basis for TTR specifying the proposed mooring system for the IMV? Specifically: a. What design metocean criteria were used? b. What workability analyses have been completed and have these specifically considered the bi-modal seas that are common in the South Taranaki Bight? c. Have the workability analyses accounted for the multi directional nature of the environment in the Cook Strait, given the fixed heading assumed for the moored IMV? d. How does the proposed 4-leg configuration satisfy ABS requirements in the single leg failure mode?
	ST14	What is the basis for TTR considering the IMV a temporary, rather than a permanent, mooring system, given the proposed operation will last for 20 years?
	ST15	Why was TAM ABS classification selected (rather than XTAM-R) as a minimum for the thruster assisted mooring?
	ST16	Given its safety critical nature, has TTR considered including the addition of the ✠ (Maltese Cross) to the TAM notation for the IMV, which signifies the requirement for ABS to review and approve the design and construction activities of the TAM system?
	ST17	Has TTR considered making the IMV a DP2 vessel? If so, why was this discounted? If not, would TTR consider this addition? Why hasn't the additional notation SKP been specified?
	ST18	If TTR is to remain with a moored positioning system for the IMV, what procedures and protocols do TTR intend to put in place for the installation and pre-tensioning of each mooring leg? How will these be verified? How will compliance with ABS FPI be assessed?
	ST19	What inspection methods will be adopted in respect of mooring lines and ropes of the IMV, and how often will these be carried out?
	ST20	What calculations have been performed, procedures developed and associated Class approvals sought for the intended IMV operating modes in severe weather - specifically the weathervaning mode on a single anchor and then the survival mode? How will anchor pullout and drag be prevented under the weathervaning mode given the unidirectional holding functionality of the proposed Stevpris anchors?

ST21	What work has TTR performed to satisfy themselves that the thruster assist system will respond quickly enough to the failure of one (of the currently proposed four) mooring lines to prevent a loss of position and potential failure of the remaining mooring lines? Have thruster interaction effects with the hull, seabed features and other thrusters been properly accounted for in determining the directional capability of the TAM system?
ST22	What measures are proposed should any aspect of the thruster system and all its associated systems be rendered out of service by accident or planned maintenance? Will such mitigation measures be immediately available in the event of a mooring leg failure and be suitable to prevent a loss of position of the IMV?
ST23	What consideration has been given to mooring line impact by other TTR vessels due to the shallow water mooring line profile?
ST24	The TTR functional specifications specify anchor handling operations in conditions up to Hs of 4 m. What safety and workability analyses have been performed to demonstrate that this limit is achievable?
ST25	What procedures will be used to demonstrate the anchors achieve the required anchor holding capacity after each move of the mooring spread and what independent verification will be performed?
ST26	How will the IMV operate within 5km of the Kupe Wellhead Platform given TTR have previously agreed with Origin it will not weathervane within this area?
ST27	What is the intended response to significant weather events for the IMV, FSO and other vessels involved in the mining operations?
ST28	Given the potential consequence of an HFO fuel spill, has TTR considered other fuel sources for the IMV?
ST29	When does TTR intend to finalise the design specifications for the IMV, FSO and other vessels involved in the mining operations?
ST30	What will this design finalisation process involve?
ST31	Will TTR involve independent experts with experience with operations in the South Taranaki Bight?
ST32	TTR has stated in previous correspondence ¹ to Origin that "DP capability will be required by all TTR vessels". What DP capability is being specified for all vessels involved in supporting the IMV operations?

13. Environmental Monitoring and Environmental Risk

	Witness	Party Represented	Question from	Reference number	Question
A	Mr Daniel Govier	TTRL	The Fisheries Submitters	DG1	Please confirm whether the FSO vessel (height above water level) has also been included in the BPIP-PRIME simulation? <i>Note question asked to Daniel Govier and Shawn Thompson</i>
				DG2	Why has sufficient baseline data to quantify the sensitivity of the receiving environment not been undertaken as part of the impact assessment process? How does this lack of baseline data affect the level of certainty in the predicted level of environmental effects?
				DG3	What happens if the BEMP identifies sensitive areas or additional endangered species within and outside the proposed mining area, and as a result that mining should not proceed? How is this scenario addressed under the proposed consent conditions and what reviews will be put in place to ensure transparency of results and findings from the proposed BEMP programme?

				DG4	<p>Your evidence at paragraph [60] states that cadmium (Cd) mercury (Hg), copper (Cu) and nickel (Ni) are to be tested for in water.</p> <p>Appendix 1 of your evidence does not specify which contaminants are to be tested for in sediments.</p> <p>This potentially leaves a gap in the understanding of any linkages between sediment resuspension and changes in water quality.</p> <p>Do you consider along with Cd, Hg, Cu and Ni that lead (Pb), chromium (Cr VI & CrIII) and zinc (Zn) along with tributyl tin (TBT) and arsenic (As) should also be screened for in water and sediment in order to determine if sand mining is having any influence on the ambient concentrations in the PPA and surrounding areas?</p>
			Nga Motu Marine Reserve Society	DG5	<p>If photoadaptation occurs in response to reduced light levels, will chlorophyll a act as a reliable proxy for biomass taking into account changes in chlorophyll a:biomass ratios?</p> <p>Note Question also asked to Dr Lawrence Cahoon and Daniel Govier</p>
				DG6	<p>TTRL do not intend to measure primary production or use a modelling approach to assess the impact of the plume on primary producers. Is the proposed monitoring adequate for detecting impacts on primary producers from a food web perspective?</p> <p>Note Question also asked to Dr Lawrence Cahoon and Daniel Govier</p>
				DG7	<p>What monitoring is planned to identify the location of reefs present within the area of the sediment plume?</p>
B	Mr Shawn Thompson	TTRL	The Fisheries Submitters	ST33	<p>Please confirm whether the FSO vessel (height above water level) has also been included in the BPIP-PRIME simulation?</p> <p>Note question asked to Daniel Govier and Shawn Thompson</p>
				ST34	<p>Why has Report 21 – Tonkin & Taylor Ltd – Air Dispersion Modelling Studies on Gas Turbine Discharges been included as a supporting report in the application when the IA clearly states that reciprocating engines will be used?</p>
				ST35	<p>What are the changes in discharges to air of combustion gases between the FPSO option as modelled and the IMV and FSO option as presented in the IA. Why has this not been assessed in a revised air dispersion modelling report?</p>
				ST36	<p>How were the other combustion emission sources (vessels including all auxiliary engines) assessed in the air quality assessment?</p>
				ST37	<p>Why were the cumulative effects of all combustion sources including all the vessels and the flares from the nearby Kupe platform not assessed, and what changes to the air quality effects might these have?</p>
				ST38	<p>Why have the changes in sulphur content in the HFO not been assessed, and, as a result of this change, the air dispersion modelling report revised?</p>
				ST39	<p>Please explain why background concentrations have not been considered in the assessment and what the resulting effects on air quality will be when they are added to the discharges from the iron sands mining operation?</p>
				ST40	<p>Why has a copy of the report prepared by Naval Architect, Vuyk Engineering Rotterdam BV not been provided and what does it state?</p>

ST41	Can the Applicant supply a risk assessment report that describes the processes used to determine credible accident scenarios which could result in the oil spillages into the seas and the impacts of those scenarios?
ST42	Has TTR commissioned or prepared a report which sets out the methodology and provides details on how the operational risk review was conducted, the results of the analysis, the level of risk determined and what standard was followed?
ST43	<p>In relation to pits and mound that will be formed by the mining operation:</p> <p>In regards to risk management, has the depth/draft of the IMV (12m) been correctly factored in when it is anticipated that it will be working in 20-30 metres depth of water?</p> <p>Should the IMV be working in 20-30 m depths, this would allow for a minimum under keel clearance (UKC) of 8-18 m. This would not include the height of the crawler. If you add a 4 to 7 m swell (which occurs frequently in the STB), how is it proposed that TTR will maintain a 4 m above seabed discharge whilst operating? Is it possible that the UKC will be insufficient for the operation of the crawler? (Refer to Figure 2.1 on page 15 of TTR's Impact Assessment).</p> <p>Is the 12-m draft on IMV its maximum draft when fully fuelled and when TTR starts the first cycle of dredging? To what extent will the draught of the vessel be increased by the weight of the un-processed and processed iron sand and water used in processing on the vessel? Has this additional draught been factored in when determining UKC?</p> <p>The mining vessel is 345 m LOA. If the discharge occurs at the bow of the vessel, and the mining activity is at the stern, it follows that when mining commences, the discharge pipe will be at least 300 meters away. When mining commences, there will be no pit, so de-ored sediment will not be able to be deposited into a pit. Rather, the mining will create mounds of 5 to 9 m in height. Will the UKC at the bow of the IMV will be sufficient?</p> <p>Once mining is completed in one area and the vessel moves to a further area, there will be a trench varying in depth from 11 m deep and an adjacent mound of sand /sediment 5 to 9m high. Will there be any attempt to level these pits and mounds given the risk they pose to trawlers and their gear?</p>

14. Conditions and Planning					
	Witness	Party Represented	Question from	Reference number	Question
A	Dr Phillip Mitchell	TTRL	Nga Motu Marine Reserve Society	PM1	<p>Quantitative response limits and consent limits have been provided for suspended sediment concentrations. Should quantitative response limits and consent limits also be provided for sedimentation? If not, why not?</p> <p>Note question asked to Dr Michael Dearnaley, Dr Mark James and Phillip Mitchell</p>
			Te Kaahui o Rauru	PM2	Can he please explain in more detail his statement in para 95 that there is no need to favour caution. The information provided might be the best available but that doesn't mean that there is no uncertainty in it, especially in respect of an activity in the sea, that has never been done before in NZ.

				<p>PM3</p> <p>Relating to question 1, given that TTR's experts have relied almost entirely on computer models and simulations to identify and predict likely effects, can he also explain how, from a scientific perspective, it can be said that there is no uncertainty given that:</p> <p>(a) The scientific models themselves, and in particular their ability to accurately and comprehensively represent and replicate the receiving ecosystem, are based entirely on existing knowledge of the receiving ecosystem (i.e. the model itself is only as complete and accurate as our current knowledge allows); and</p> <p>(b) As the receiving ecosystem is a highly complex and replete with innumerable connections, dependencies and relationships other relationships, and because the activity in question has never been conducted before:</p> <p>(i) the pre-existing knowledge upon which the model is based is extremely limited as we currently know very little about the receiving ecosystem, and as such are, unaware of and/or don't yet understand, many of the ecological interactions that the model may need to include;</p> <p>(ii) it is widely accepted amongst scientists that establishing the role of an ecological component is not currently understood, demands long-term detailed on-site observation and experimental manipulation (i.e. cannot be identified via modeling);</p> <p>(iii) the model is unable to incorporate all relevant ecosystem components and relationships even if they were known – i.e. it can only include a finite number of ecological variables and interactions;</p> <p>(iv) the model is underpinned by many assumption, many of which may be incorrect;</p> <p>(c) as seafloor mining has never been conducted in this space we have never had an opportunity to observe how key ecological components and connections will respond to such an activity.</p>
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15. Nga Kaihautū Tikanga Taiao Report					
	Witness	Party Represented	Question from	Reference number	Question
A	Nga Kaihautū Tikanga Taiao Report	EPA	Te Kaahui o Rauru	NKTT1	Does the Board (Nga Kaihautū Tikanga Taiao) realise that Nga Rauru also has mana whenua over the application area and, if it were to be recognized in the Board's report, what difference would that make to the report and its recommendations?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

FISHERIES

Witness	Evidence Reference	Question
ANDERSON, Helen	Paragraph [48]	Given that an oil spill contingency plan is required to be submitted and approved under the Maritime Transport Act, would you consider certification under that legislation to be sufficient?
	Paragraphs [73] – [74]	Do you consider maximum sedimentation < 0.05-0.1 mm of deposition of fine material will have an adverse effect, and if so, what level of effect do you expect?
	Various	<p>Could you explain your understanding of what monitoring TTR has undertaken to establish the existing environment?</p> <p>Could you explain whether you consider baseline monitoring for compliance purposes, serves a different function to that seeking to describe the existing environment?</p> <p>Could you explain when baseline monitoring to determine parameter values for compliance purposes should be undertaken and the impacts this timing will have on compliance monitoring?</p> <p>In what situations would you consider it appropriate to leave some baseline monitoring to after the grant of consent?</p>
	Various	With regard to Fishing Industry Meetings you state that a clearer framework of obligations and undertakings is required – what would this involve?
	Various	Given that any revisions to SSC limits are simply to update the numerical values following completion of the baseline survey, what value would further consultation and public notification achieve?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
	Various	Given your concerns about potential legacy issues, why are you not satisfied that the condition requiring TTR to hold \$100,000,000 in public liability insurance (which includes covering the costs of environmental restoration required as a result of an unplanned event) is sufficient to address legacy effects?
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
BARBARA, Greg	Paragraph [20]	Can you explain what active sonar is and whether that would assist these dolphins in being able to detect the presence of the vessels and crawler if they entered the mining area? What is the likely response from dolphins to the presence of such vessels?
	Paragraph [24]	What is the difference in the ranges over which you can detect vocalisations for blue whales and dolphins? What impact does this have in terms of locations of detectors?
	Paragraph [28]	What is the rationale for shutting down if a marine mammal appears in the area after operations have started? What is the likely response from marine mammals that find themselves in the mining area after operations are underway? How would you determine whether a marine mammal is undergoing stress or erratic behaviour?
	Paragraph [50]	In your view does audibility of noise for marine mammals mean there will be adverse impacts or do the impacts depend on the degree of audibility, location from source etc.?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
	Paragraph [49]	Would changes in sediment chemistry from anoxic to oxic reduce or enhance the ability of organisms to recolonise redeposited sediments?
	Paragraphs [55] – [57]	What evidential foundation do you have to support your view that a localised biological hotspot could be created by mining operations?
	Paragraph [60]	<p>What evidence do you have to support the statement that “...the extremes of temperature, pH and salinity changes along with low oxygen and lack of light are ideal conditions for selecting for algal cysts as well as more robust marine organisms capable of exploiting new areas”?</p> <p>Would you agree that certain species may be better able to survive degraded conditions that develop in ballast water?</p>
	Paragraph [61]	<p>What is your view of the adequacy or otherwise of the current and proposed future New Zealand biosecurity measures?</p> <p>If you consider these measures inadequate, what would you propose?</p> <p>What is your understanding of where TTR's mining proposal takes place and where ballast water is proposed to be discharged?</p>
	Paragraph [64]	If STB waters are typically nutrient limited, how would harmful algal blooms be supported in the vicinity of the proposed mining area – given the physical dynamics in the area?
	Paragraph [78]	If catch data (research or commercial) is not in your view, appropriate for use in the models, what data is?
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
CLARKE, Bruce	Paragraphs [19] – [25]	<p>Could you explain your understanding of what monitoring TTR has undertaken to establish the existing environment?</p> <p>Could you explain whether you consider baseline monitoring for compliance purposes, serves a different function to that seeking to describe the existing environment?</p> <p>Could you explain when baseline monitoring to determine parameter values for compliance purposes should be undertaken and the impacts this timing will have on compliance monitoring?</p> <p>In what situations would you consider it appropriate to leave some baseline monitoring to after the grant of consent?</p>
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
HELSON, Jeremy	Paragraphs [8] and [9]	Could you please clarify who you are employed by and whether you consider you meet the requirements of an independent expert witness under the Code of Conduct?
	Paragraphs [78] – [92]	<p>Could you explain how the existing oil and gas and other activities in the marine area impacted New Zealand's reputation for fisheries purposes?</p> <p>What do you consider there is about the proposed mining activity that is different to the existing activities which would have a different and potentially more adverse effect on New Zealand's reputation?</p> <p>Could you clarify where New Zealand seafood is collected from and what rough percentage would be from within the proposed mining area?</p>

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
	Various	Could you identify what meetings you were invited to between TTR and Sanford and which of those you attended?
	Various	Could you clarify what direction was given by you to TTR in relation to how they should consult with fisheries interests?
	Various	Of the information you received from TTR through meetings and correspondence, how much of this was passed on to the fisheries interests, which companies was it given to, and when?
JORISSEN, Joris	Paragraph [22]	Could you explain/quantify what you mean by "some" fine sediment will be subject to flocculation?
	Paragraph [25]	What is your understanding of the reasons why HR Wallingford adopted the average value rather than the more conservative NIWA value? What is your view of the reasonableness of that approach?
	Paragraph [29]	Can you explain what you mean by "more significant effects on the plume"?
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
PIPER, Anthony	Various	How far is the known surf clam fishery from the boundary of TTR's permit area?
		What are the existing background sediment levels at the surf clam fishery?
SAUNDERS-LODER, Douglas	Paragraph [33]	What is the size of the FMA8 versus the size of the proposed mining area?
SMITH, Andrew	Paragraphs [10] – [12]	Could you please clarify who you are employed by and whether you consider you meet the requirements of an independent expert witness under the Code

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
		of Conduct?
	Paragraph [36]	What is your view on the time series contained in Dr Mark James evidence that show peaks and medians will only be slightly higher temporarily and are not continuous at high levels?
	Paragraph [44]	<p>What evidence do you have to support the statement that “<i>Many of the anti-foul systems used by large cargo vessels from China and Asia are substandard systems that cannot be used in New Zealand or Australia</i>”?</p> <p>Could you clarify whether you consider the requirement in the consent conditions and biosecurity management plan to ensure the best available management practices are in place would be adequate to address your concerns around biosecurity?</p>
	Paragraph [45]	Could you please clarify what “poisons” you are referring to that may be introduced as a result of TTR vessel operations?
	Various	Could you explain your company’s relationship with Aquaculture NZ?
	Various	What meetings, facilitated by Sanford and/or Aquaculture NZ, were you invited to, regarding TTR’s proposal?
	Paragraph [78]	If catch data (research or commercial) is not in your view, appropriate for use in the models, what data is?
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
TODD, Derek	Paragraph [27]	What would be the purpose of undertaking additional coastal stability data collection and assessment given your conclusions in paragraph [27]?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
	Various	<p>Could you explain your understanding of what monitoring TTR has undertaken to establish the existing environment?</p> <p>Could you explain whether you consider baseline monitoring for compliance purposes, serves a different function to that seeking to describe the existing environment?</p> <p>Could you explain when baseline monitoring to determine parameter values for compliance purposes should be undertaken and the impacts this timing will have on compliance monitoring?</p> <p>In what situations would you consider it appropriate to leave some baseline monitoring to after the grant of consent?</p>

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

FOREST AND BIRD

Witness	Evidence Reference	Question
SITARZ, Natasha	Paragraph [5]	Could you please clarify who you are employed by and whether you consider you meet the requirements of an independent expert witness under the Code of Conduct?
	Paragraphs [24] to [28]	<p>Could you explain your understanding of what monitoring TTR has undertaken to establish the existing environment?</p> <p>Could you explain whether you consider baseline monitoring for compliance purposes, serves a different function to that seeking to describe the existing environment?</p> <p>Could you explain when baseline monitoring to determine parameter values for compliance purposes should be undertaken and the impacts this timing will have on compliance monitoring?</p> <p>In what situations would you consider it appropriate to leave some baseline monitoring to after the grant of consent?</p>
	Paragraph [33]	What is your view on TTR's proposed condition 12 and the degree of protection it will provide to marine mammals in the area?
	Paragraph [207]	Could you please clarify how marine mammal stranding records can be used to define cetacean use of the mining area or area affected by the plume (rather than the wider region)?
	Various	Given your concerns about potential legacy issues, why are you not satisfied that the condition requiring TTR to hold \$100,000,000 in public liability insurance (which includes covering the costs of environmental restoration required as a result of an unplanned event) is sufficient to address legacy effects?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
VAN HELDON, Anton	Paragraph [1]	What does being a marine advocate entail?
	Paragraph [13]	Could you please clarify who you are employed by and whether you consider you meet the requirements of an independent expert witness under the Code of Conduct?
	Paragraphs [15], [19] – [21] (and various other places)	Of all the species you have reported as being present in region, how many have actually ever been reported as being present in the proposed mining area, including from dedicated marine mammal surveys undertaken by TTR? Which species do you think are found in the proposed mining area, why is it important to them and on what basis do you draw these conclusions?
	Paragraphs [16] – [17]	Your evidence notes that blue whales may be able to detect noise over 10s of kilometres but what evidence is there demonstrating that blue whales will actually be adversely impacted by these sounds at these distances from this activity? What are your views on Dr Childerhouse' s impact assessment which found that behavioural disturbance from noise will only occur up to 2km from the operational site?
	Paragraph [28]	Could you please identify where in the Marine Mammals Protection Act 1978 it states that all physical or habitat disturbances to marine mammals must be avoided or mitigated?
	Paragraphs [28] – [35]	Could you please clarify how marine mammal stranding records can be used to define cetacean use of the mining area or area affected by the plume

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
		(rather than the wider region)?
	Paragraph [93]	Could you please advise what size area the figures in this table are drawn from, what years the strandings cover, and whether the numbers of mammals stranded are reflected in the table?
	Paragraph [135]	How much louder is a standard seismic source from the maximum noise estimated for the TTR operation? What relevance do seismic surveys have to investigating potential impacts from the TTR operation?
	Various	How would you describe the South Taranaki Bight / western end of the greater Cook Strait, in terms of its shipping traffic volumes, seismic surveying, drilling and production activities and consequent noise levels? What impact have these activities had to date on the abundance and diversity of marine mammals in the South Taranaki Bight / western end of the greater Cook Strait?
	Paragraph [149]	What is your view on TTR's proposed condition 12 and the degree of protection it will provide to marine mammals in the area?
	Paragraphs [225] – [236]	Given DOC is satisfied that the conditions and marine mammal plan, are sufficient to protect marine mammals, on what basis do you consider additional or amended conditions are required? If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

KASM/GREENPEACE

Witness	Evidence Reference	Question
BINNEY, Jim	Various	Would you agree that in deciding to grant the mining permit the Government has already determined that the taxes and royalty revenue is a significant national economic benefit?
	Paragraph [7]	What are your reasons for disagreeing with the conclusions set out in the independent peer review report by GHD which concludes that the economic impact of TTR's proposal is likely to be positive?
	Paragraph [22]	What other similar projects are you aware of that have used an economic analysis approach which has included social cost considerations?
	Paragraph [38]	What is your view on the statement in the EPA key issues report, that the DMC should not double count environmental costs by assessing them against the Act's criteria and then attempting to subtract these costs from the positive economic benefits elsewhere?
GREER, Dougal	Paragraph [12]	What other matters can affect model results?
		What do you think would be the impact of including consideration of physical effects and more detailed information on the relevant processes in the model?
	Paragraph [17]	What is your understanding of the reasons why HR Wallingford adopted the average value rather than the more conservative NIWA value? What is your view of the reasonableness of that approach?
Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?	

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
MEAD, Shaw	Paragraphs [1] – [5]	In paragraphs [1] to [5] you outline your qualifications and relevant experience, could you please confirm whether you appeared in the last TTR hearing and if so, who you appeared for, and whether you supported or opposed the application?
	Paragraph [26]	What is your view on the time series contained in Dr Mark James evidence that show peaks and medians will only be slightly higher temporarily and are not continuous at high levels?
	Paragraphs [34] – [36]	What relevant tolerance studies have you compared the predicted levels to?
	Paragraph [39]	Would you agree that physical variability and the results it drives are important in the sediment model domain? What is your view on the importance of background or existing sources of suspended sediment and the impacts these have on resulting optical effects?
	Paragraph [40]	Could you explain whether you consider P-E (the relationship between light flux and production) modelling coupled with primary productivity modelling is feasible and why?
	Paragraph [42]	What evidence do you have the recovery would take in excess of 10 years?
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
SLOOTEN, Liz	Paragraph [15]	What is your view on TTR's proposed condition 12 and the degree of protection it will provide to marine mammals in the area?
	Paragraph [18.1]	Can you explain what effects turbidity has on suitable habitat for Maui and Hector dolphins?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
	Various	<p>Given DOC is satisfied that the conditions and marine mammal plan, are sufficient to protect marine mammals, on what basis do you consider additional or amended conditions are required?</p> <p>If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?</p>
TORRES, Leigh	Paragraph [7]	What is your view on the evidence provided by Dr Childerhouse on marine mammals?
	Paragraph [12]	<p>If blue whales are so sensitive to noise and therefore likely to avoid or be displaced by such noises, why are there so many sightings from the immediate area around the seismic surveys mentioned in this paragraph?</p> <p>Given seismic surveys are between 1,000 and 100,000 times louder than the maximum estimated noise from the TTR operation why do you expect that there will be adverse impacts from the TTR operation?</p>
	Paragraph [14]	<p>Why do you consider that the proposed mining area is important to blue whales given so few have ever been seen there from dedicated systematic marine mammal surveys?</p> <p>Can you tell us how many blue whale sightings have been recorded within 50kms of the proposed mining area from all surveys records including Cawthorn's?</p>
	Paragraph [16]	What is the relative importance of the proposed mining area as blue whale habitat given that 97% of all sightings have occurred in waters deeper than the proposed mining area?
	Paragraph [20]	Could you explain how you would go about back calculating estimated

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
		<p>source level from received sound level and whether this would require taking account of depth, bathymetry, temperature, salinity, thermoclines, type of vocalisation and orientation of the whale when vocalising?</p> <p>What process did you use to estimate transmission loss and therefore estimated source level? How accurate is this estimate likely to be and are you able to provide confidence intervals for your estimate?</p>
	Figure 2	Could you clarify what Figure 2 shows in terms of the distribution of whales and the relative distance of the whales from the proposed mining area?
	Paragraphs [39] – [43]	What is your view on TTR's proposed condition 12 and the degree of protection it will provide to marine mammals in the area?
	Paragraph [50]	What further modelling do you think was required given the modelling undertaken included both the deposition and re-suspension of sediments?
	Various	<p>How would you describe the South Taranaki Bight / western end of the greater Cook Strait, in terms of its shipping traffic volumes, seismic surveying, drilling and production activities and consequent noise levels?</p> <p>What impact have these activities had on the abundance and diversity of marine mammals in these areas?</p>
	Various	<p>Given DOC is satisfied that the conditions and marine mammal plan, are sufficient to protect marine mammals, on what basis do you consider additional or amended conditions are required?</p> <p>If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?</p>

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

NGATI RUANUI

Witness	Evidence Reference	Question
YOUNG, Graham	Paragraph [10]	Could you please clarify who you are employed by and whether you consider you meet the requirements of an independent expert witness under the Code of Conduct?
	Paragraph [13]	What is the seaward boundary of the takiwa? What is the boundary of the statutory acknowledgments contained in the Treaty settlement?
	Paragraph [59]	How would such recognition normally occur? Would recognition of iwi statutory acknowledgments normally involve seeking to engage with the iwi and recognition of these acknowledgements in the subsequent application? What else could TTR have done to better recognise these statutory acknowledgments?
	Paragraph [60]	Which groups did you notify about your customary marine title and rights application? Could you please clarify what the seaward boundary of your application for customary marine title and rights is?
	Paragraph [65]	Could you please confirm what process was followed to confirm opposition to the TTR proposal from Ngati Ruanui marae, hapu and iwi?
	Paragraph [69]	Could you explain what obligations iwi have under the best practice guidelines produced by Ngati Ruanui for the Ministry of Business Innovation and

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
		Employment? Could you explain the recommended approach outlined in those guidelines for an applicant where an iwi refuses to engage?
	Paragraph [70]	What information would you routinely expect to receive in initial discussions on an application? Would you expect that level of information to increase as the relationship is established, engagement proceeds, and the application is refined?
	Paragraph [76] – [78]	When you are asked to prepare a cultural impact assessment, what level of information do you routinely require? In what circumstances would you prepare a cultural impact assessment in advance of receiving the full application?
	Paragraph [80]	Could you please advise whether Ngati Ruanui has received copies of the other entire draft EEZ marine consent applications either prior to or at the time the applications are sent to the EPA for a completeness check?
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?
CASHMORE, Maria	Paragraphs [39], [66] – [68]	How does mud (i.e. fine particles) get deposited in the STB in the first place? What role does biofouling play?
	Paragraph [80]	In your view, would the predicted level of sedimentation which is less than 0.1mm/year downstream adversely impact biota?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

Witness	Evidence Reference	Question
	Paragraphs [112] – [114]	What customary use was made of the proposed mining site?
	Paragraphs [127] – [133]	What impact does a refusal to engage have on the DMC's ability to grant consent?
	Paragraph [159]	In what way have the cultural values would have changed since the 2013 application? In the absence of engagement of iwi, would it be fair in your opinion to look at other sources to determine impacts – including previous submissions?
	Various	Could you explain what a seabed mining proposal would need to include for you to support it?
	Various	If consent is granted, how would you suggest that the conditions be amended to address the matters raised in your evidence?

TRANS TASMAN RESOURCES LIMITED - LIST OF QUESTIONS FOR WITNESSES

ORIGIN ENERGY

Witness	Evidence Reference	Question
ALWYWARD, Martin	Paragraph [5.4]	What would be your position on the TTR application if a co-ordination agreement was in place between Origin and TTR and if the TTR conditions incorporated the technical recommendations outlined in the AMOG report?
CARRA, Christopher	Paragraph [5.4]	Why would you not expect the matters raised in your report to be part of the detailed design process when it is being undertaken by an experienced international naval architect and vessel construction company?
	Various	What information would you have expected Origin to have provided to TTR in order for TTR to be aware of and be able to address Origin's concerns?
CURRILL, Iain	Appendix	What is your view on the appropriateness of applying the "Kupe Metocean Design criteria" included in Mr Iain Curril's evidence to the TTR project area?