BEFORE AN EXPERT PANEL **FTAA-2504-1048**

UNDER	the Fast Track Approvals Act 2024
IN THE MATTER	of a substantive application for marine consents that would otherwise be applied for under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
BY	Trans-Tasman Resources Limited

SUPPLEMENTARY EVIDENCE OF DARRAN HUMPHESON (ACOUSTICS) ON BEHALF OF TRANS-TASMAN RESOURCES LIMITED IN RESPONSE TO DR MATT PINE'S PEER REVIEW

21 NOVEMBER 2025

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EXECUTIVE SUMMARY

1. This supplementary evidence addresses the underwater acoustics matters raised by Dr Matt Pine in his Peer Review dated 9 November 2025. Dr Pine was appointed as a technical advisor by the Taranaki VTM Expert Panel.

2. I maintain that the underwater noise assessment supporting TTR's application is fit for purpose, both for setting enforceable limits and for informing TTR's marine mammal effects specialist, Dr Simon Childerhouse.

3. In summary:

   (a) Source levels: Project noise sources will be engineered to meet the 177 dB design target within a managed noise budget, and TTR is committed to achieving this. Given ongoing advances in noise control technology, I am confident this target is both realistic and attainable.

   (b) Dynamic positioning (DP) and support vessels: Since 2014, core noise modelling has focused on the IMV and crawler due to their unique operational and acoustic characteristics, and because compliance monitoring for these sources is straightforward. Sensitivity modelling for other sources, such as DP and support vessels, has also been carried out. The core modelling approach, which assesses realistic operational scenarios rather than an absolute worst-case where all sources operate simultaneously, is robust, reliable, and consistent with the intent of Condition 11 and published marine mammal guidance (NMFS 2024).

   (c) Propagation modelling: My 2024 and 2025 assessments use a split-solver approach—dBSeaModes for low frequencies (≤250 Hz) and dBSeaRay for high frequencies (≥500 Hz), which aligns with best practice conditions for the South Taranaki Bight. This clarification addresses Dr Pine's concerns regarding the crossover frequency.

(d) NMFS (2024) guidance: I have correctly adopted and interpreted the NMFS 2024 auditory weighting and thresholds and use of the SEL 24 hour accumulated exposure level.

(e) Baseline soundscape: Conditions 11 and 12 set absolute limits, not ambient referenced thresholds. TTR's predicted emissions are broadly comparable to current ambient levels in the South Taranaki Bight, with additional noise confined to the mining area. My opinion remains unchanged: the project will not significantly alter the wider soundscape.

(f) Conditions and monitoring: In my October 2025 Evidence I recommend adding an advisory note tying measurement to ISO 17208-3 and an implementation protocol for the cumulative modelling/verification. I maintain that conditions 11 to 18 remain appropriate subject to the minor addition of the advice note.

INTRODUCTION

4. My full name is Darran Humpheson. I am a Technical Director of Acoustics at Tonkin & Taylor Limited (T+T).

5. My qualifications, experience, and prior involvement are set out in my Evidence dated 13 October 2025 (October Evidence). I adopt that evidence and terminology.

6. I repeat the confirmation given at paragraph 8 of my October Evidence that I have read the Code of Conduct for Expert Witnesses and agree to comply with it.

7. This supplementary evidence responds to the underwater acoustics matters raised by Dr Matt Pine in his Peer Review dated 9 November 2025. Dr Pine was appointed on 3 November as a technical advisor by the Taranaki VTM Expert Panel.

SCOPE OF EVIDENCE

8. I address the following themes raised by Dr Pine:

   (a) Source levels & support vessel operations;

   (b) Propagation loss modelling – choice of calculation procedure and modelling assumptions;

   (c) Cumulative modelling & worst-case scenarios;

   (d) Interpretation and application of NMFS (2024)[1] cumulative exposure;

   (e) Baseline soundscape / long-term change; and

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1 National Marine Fisheries Service. 2024. Update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0): Underwater and In-Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-71, 182 p.

(f) Conditions 11–12 and measurement standards – including origin of the 130/135 dB threshold.

9. I understand from Minute 22 of the Expert Panel that Dr Pine was referred to the following documents:

(a) The application document (especially Section 5.9 "Noise Effects");

(b) Report 28 – 2014 Hegley Acoustic Consultants Assessment of noise effects;

(c) 2017 AECOM Report; and

(d) Report prepared by JASCO, titled Trans-Tasman Resources Limited's FastTrack Application - Taranaki VTM, 2025 - Scientific Peer Review in Relation to Underwater Noise and Marine Mammals (2025 JASCO Report).

10. Having read Dr Pine's Peer Review he has also considered the following reports:

(a) 2024 T+T report (CAN-001) - appended to Dr Simon Childerhouse's January 2024 Rebuttal Evidence and my February 2024 Evidence;

(b) 2025 T+T report (CAN-002) – appended to my October 2025 Evidence; and

(c) Curtin University Review of the 2017 AECOM Report.

11. Where relevant I also refer to the same documents list in my October 2025 Evidence and the October 2025 evidence of Dr Childerhouse. I also refer to other documents as appropriate.

SOURCE LEVELS

12. Dr Pine states the adopted source levels (referencing historic De Beers datasets) may be too low.[2] My position remains:

(a) In the absence of manufacturers data, proxying from the closest empirical datasets is standard practice, and was adopted in each of my assessments (2014, 2017, 2024 and 2025).

(b) The nominal broadband source levels used for noise contour mapping are not design guarantees; they inform the marine mammal assessment.

(c) Actual compliance is determined by Condition 12, which sets a design target of no greater than 177 dB re 1µPa at 1m combined for the IMV and crawler. This translates into a measurement target in Condition 11 of ≤135 dB re 1µPa unweighted at 500 metres, and ≤130 dB re 1µPa in specified low, mid, and high frequency bands.

13. Dr Pine makes comparisons of different vessels in his report[3] and he considers that the assumed sources are not reliable [his paragraph 32].

14. It is important to note that all noise sources (crawler, IMV, FSO, etc.) do not currently exist. They will be designed and built in accordance with a specification that includes the sound level design target of Condition 12 for the combined noise from the IMV and crawler. The 177 dB source level will serve as the project's 'noise budget', with an engineering 'headroom' allowance. Each item of noise-generating plant or equipment will have a share of this budget, and the individual

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2 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 24p

3 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 32p

contributions will only be known once a contractor is commissioned and detailed engineering design is undertaken. This process is similar to implementing the best practicable option (BPO) to minimise noise effects from any noise-generating activity, as required under environmental management frameworks.

15. The concerns raised by Dr Pine are not new and have been raised by numerous parties, including myself at the 2014 Hearing (for the EPA). For example, there have been criticisms that outdated De Beers information has been used, and that source levels for other vessels such as the IMV (FPSO) and FSO are too low, especially when benchmarking against vessels used for other projects. [4] These comparisons overlook the fact that none of the TTR vessels (and crawler) are operational.

16. This is the second project to my knowledge that has set a design limit for a new vessel, rather than applying retrospective noise control to existing vessels. [5] Many of the vessels used as benchmarks for TTR's assumed source levels have likely never been required to comply with an acoustic design target. This is evident from the wide range of source levels presented in Figure 3 of my October 2025 Evidence. For example, there is a significant source level difference of over 20 dB between two very similar bulk container ships, Buxlink and Maersk Batur. The source level of other vessels is highly variable; for instance, HMNZS Wellington is much quieter than the former University of Auckland research vessel Hawere. This variability underscores the importance of setting project-specific design targets rather than relying solely on benchmarks from other vessels. I have practical experience of

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4 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 32p

5 Design limit for a new LNG tanker visiting South Hook Terminal in Milford Haven, Wales, UK from Quatar. The limit related to the in air noise from the reliquefaction plant compressors.

this, having previously assisted with the acoustic design of UK naval vessels. With good design and engineering, noise control measures can be incorporated to minimise noise emissions.

17. TTR has committed to achieving the design target of Condition 12, and I have high confidence that the source level of 177 dB re 1µPa at 1m is achievable, especially considering ongoing improvements in engineering noise control technology.

Cumulative noise

18. Dr Pine considers that modelling using a worst-case scenario is best practice.[6] While I agree that this is appropriate for typical underwater projects in New Zealand, such as piling for new wharves or berths, I would not use an absolute worst-case for projects that generate noise continually over many years, such as the Taranaki VTM project. For such projects, assessing a realistic operational scenario, supplemented by sensitivity testing to establish the range of effects, provides a more accurate representation of potential impacts than an absolute worst-case scenario, which may overstate effects.

19. In my October 2025 Evidence (paragraphs 45 to 50), I addressed the issue of cumulative noise. In my 2017 assessment, the IMV and crawler were defined as the two main sources due to their unique operating characteristics—mining operations versus normal vessel noise, on site 24/7, and their relatively stationary presence within the mining area. All other sources are variable and will come and go from the mining area, resulting in temporal variations in noise. This differentiation is similar to assessing noise from a petroleum drill rig, where regulators have requested a focus on continuous

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6 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 34p

drill rig activities rather than support vessel noise, as the latter is no different from general shipping noise.

20. As I explain later in my evidence there are practicable compliance difficulties assessing noise from sources other than the crawler and IMV, and when undertaking exposure modelling (NMFS 2024 guidance). These issues further support the core assessment approach I have adopted.

Summary

21. Dr. Pine's concerns about source levels being too low are unfounded. In the absence of manufacturer data, using the closest empirical datasets is standard industry practice and has been consistently applied in all my assessments. The core noise sources of the IMV and crawler will be engineered to meet the 177 dB design target of Condition 12, and TTR is committed to achieving this. I am confident this target is realistic and attainable.

22. For cumulative noise, I applied a robust, realistic approach with sensitivity testing, rather than an absolute worst-case scenario. I maintain that this approach is appropriate.

PROPAGATION LOSS MODELLING

23. Dr Pine raises two concerns: the appropriateness of the dBSea noise modelling calculation algorithm ('solver') and the choice of sediment properties for the seabed.

Solver model

24. Dr Pine considers that I have used the incorrect approach when modelling underwater sound levels in my 2024 and 2025 assessments.

25. In my 2017 AECOM Report I considered the different solver solutions available in the dBSea software. These solutions originate from the Curtin University underwater acoustic

propagation modelling software – AcTUP V2.2L.[7] During the 2017 Hearing I provided further context in my memo to the 2017 DMC (22 May 2017)[8].

26. Unlike the 2017 assessment, I used a split solver for the 2024 and 2025 assessments (CAN-001 and CAN-002). This approach follows good modelling practice, i.e. different solvers for the low and high frequency ranges - dBSeaModes for the low frequency range and dBSeaRay for the high.

27. When producing Table 2.2 in CAN-002 I may have added some confusion to Dr Pine's interpretation of the crossover point between the two 'split-solvers'; dBSeaModes (Normal mode solver) and dBSeaRay (ray tracing solver).

28. As source level data is defined in single octave bands (CAN-002 Table 2.1 data), the calculations were also performed in single octave bands from 31.5 Hz to 128 kHz.[9] The cross-over used in the 2024 and 2025 assessments is the first octave band greater than 250 Hz, i.e. 500 Hz. This meant that Dr Pine assumed the cross-over started at 250 Hz rather than ending at 250 Hz. A better description for Table 2.2 of CAN-002 would have been:

> "dBSeaModes (normal modes) for octave bands 31.5 Hz to 250 Hz (inclusive), and dBSeaRay (ray tracing) for octave bands 500 Hz to 128 kHz (inclusive)"

29. This misunderstanding stems from CAN-001; the same table and wording was carried over to CAN-002. I have included a screenshot of the dBSea setting to support the above.

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7 https://cmst.curtin.edu.au/products/underwater/

8 Written answers to questions from Forest & Bird, 3 pages, dated 22 May 2017

9 Octave bands being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz…etc

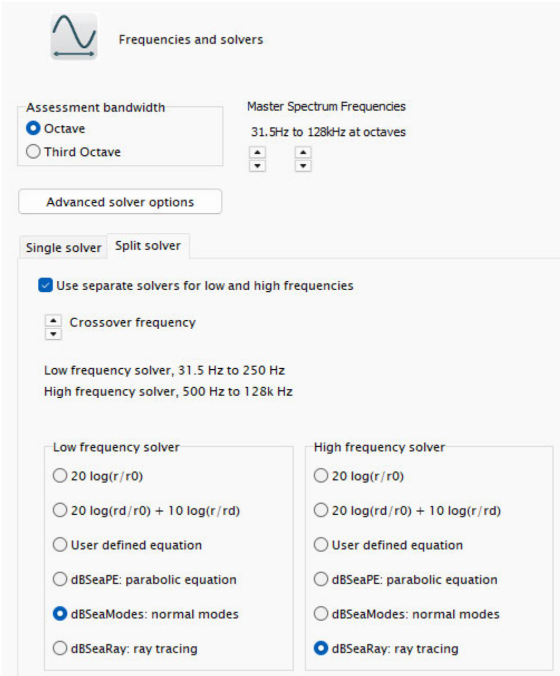

Figure 1 : TTR dBSea solver details

30. I agree with Dr Pine's general rule of thumb[10] for the cross-over point (D>10λ, where D=depth in metres and λ=wavelength in metres). The technical documentation for dBSea states that the typical crossover frequency for a two solver solution (dBSeaModes / dBSeaRay) is D>8λ. Table 1 below simplifies these 'rules' based on a conservative sound speed (c) of 1,525 m/s. The depths highlighted in bold relate to the minimum depths that a ray tracing solver, such as dBSeaRay, is appropriate.

Table 1 : Recommended minimum water depths for dBSeaRay solver

Octave band frequency	125 Hz	250 Hz	500 Hz	1,000 Hz
Wavelength λ	12.2 m	6.1 m	3.05 m	1.525 m
Depth=10λ	122 m	61 m	**31 m**	15 m
Depth=8 λ	98 m	49 m	**24 m**	12 m

31. Based on the depth of water in the STB being in the range 30-40 metres, a ray tracing solver (dBSeaRay) starting at 500 Hz is appropriate. I can understand Dr Pine's reservations if the

10 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 51p

dBSeaRay solver included the 250 Hz octave band. This is not the case as I have explained above.

32. To further demonstrate the sensitivity of receiver levels to different cross-over frequencies I have generated a similar distance-reduction analysis to that provided to the 2017 Hearing[11]. This analysis uses the latest TTR dBSea model with a combined source level of 177 dB re 1µPa at 1m (Condition 12), and the outputs of six solver solutions:

(a) Geometric calculations of:

i. 10log.R=3 dB reduction for each doubling of distance (cylindrical reduction)

ii. 20log.R=6 dB reduction for each doubling of distance (spherical reduction)

iii. 15log.R=4.5 dB reduction for each doubling of distance (half way between the two)

(b) Solvers:

i. Single solver - dBSeaModes

ii. Split solver – 2024/2025 dBSeaModes (<=250 Hz)/ dBSeaRay (>=500 Hz).

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11 Written answers to requests for clarification from the 2017 DMC, dated 22 May 2017: Memo to Vicki Morrison-Shaw, 1 page, Subject: TTRL - Distance Reduction Data

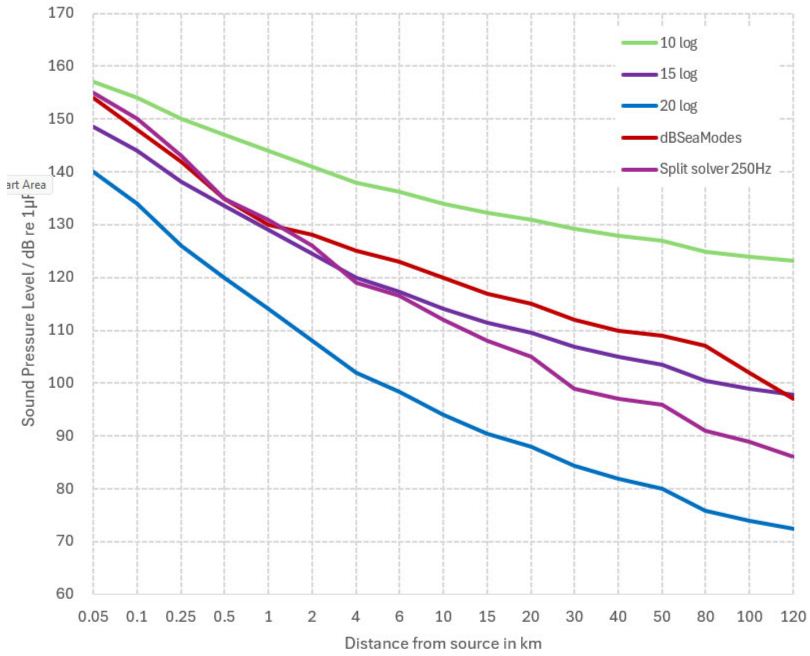

Figure 2 : Distance reduction relationship between different solutions

33. In my 2017 assessment, I evaluated the propagation algorithms available within dBSea (dBSeaPE, dBSeaModes, and dBSeaRay) and determined that dBSeaModes provided the most conservative estimate of receiver noise levels and was the most appropriate solution for the local conditions of the STB. This choice was based on its ability to account for sandy sediment characteristics, its suitability for low source frequencies, and the shallow water depth typical of the study area. At that time, unweighted sound exposure levels were used.[12]

34. For the 2024 assessment, the methodology required a significant update. At the request of Dr. Childerhouse, the acoustic data was weighted according to the five marine mammal hearing groups using the frequency response relationships described in Southall et al. (2019)[13]. Because

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12 As explained in Section 4.1 of my 2017 AECOM Report

13 Southall B L, Finneran J J, Reichmuth C, Nachtigall P E, Ketten D R, Bowles A E, Ellison W T, Nowacek D P, Tyack P L (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals 2019, 45(2), 125-232, DOI 10.1578/AM.45.2.2019.125

frequency weighting introduces sensitivity across a broader range of frequencies, it was important to select a propagation approach that accurately represents both low-frequency and high-frequency transmission characteristics. To achieve this, I adopted a split-solver approach:

(a) dBSeaModes was retained for low-frequency components, where its treatment of sediment and shallow-water conditions remains highly accurate.

(b) dBSeaRay was introduced for high-frequency components, as ray-based models provide better resolution and accuracy at higher frequencies where modal solutions become less reliable.

35. This combined approach ensures that the sound propagation modelling reflects the most accurate transmission loss behaviour across the full frequency spectrum relevant to marine mammal hearing. It is important to note that this method results in slightly greater transmission loss at longer ranges (> 1km) compared to a single-solver approach (as shown in Figure 2 above), due to the differences in how each solver handles energy propagation. However, I considered this trade-off acceptable because the primary objective was to improve accuracy for frequency-weighted assessments rather than maintain the conservative bias of the earlier unweighted analysis. This change also explains why Dr Pine identified differences in the noise contours between 2017 and 2025.[14] These differences are a direct result of the change in calculation algorithm and not for any other reason.

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14 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 56-57p

Sediment layer

36. For the 2024 assessment I constructed a new TTR dBSea model (this model was unchanged for the 2025 assessment). The model included the same bathymetry data used in the 2017 assessment. However, a greater resolution was used when interpolating the imported data points. In addition, a more defined boundary between land and water (LINZ digital terrain data) was generated in ArcPro prior to importing the combined land and water dataset into dBSea. Therefore, slight differences exist between the 2017 and 2024 models – for example mining location changing from 45 m water depth to a shallower depth of 35 m in the new TTR dBsea model due to the improved bathymetry interpolation and changes to the coast line (more defined). The only other change was extending the sediment layer depth from 15 m to infinity.

37. Dr Pine has identified this change in sediment properties as a source of uncertainty. This observation was also raised at the 2017 Hearing and I responded to the query in my response to Forest and Birds written questions (22 May 2017). dBSea can only model one homogenous sediment layer across the whole study area at a time. Therefore, areas of different sediment types cannot be modelled – e.g. sand in one area and clay / rock in another. My 2017 AECOM report commented on how each solver considers sound energy transfer into the sediment. The calculation area for the dBSeaModes extends lower than the water column, to a total depth of three times the depth of the water column. Hence the reason the sediment depth was extended beyond 15 m to infinity in the 2024 dBSea model – a modelling refinement representing best practice.

38. For dBSeaRay, rays are not split and traced into the seafloor. Instead, a reflection coefficient is calculated which is representative of the underlying layers, and this coefficient is applied to the ray at the point of seafloor reflection. While a homogenous sand layer has been used there is no difference

between the sediment layer extending further than 15 m, i.e. to infinity.

39. Detailed seabed conditions (true thickness and properties of sediment and rock layers within the seabed) are generally only applicable for very low frequencies (<10 Hz). At high frequencies, the sea bed composition is only required for the upper metres or tens of metres.[15] Constructing a detailed geo-acoustic model of the seafloor is very resource intensive, and therefore an approximation is sufficient for modelling purposes - noting that dBSea cannot model location specific seabed conditions.

40. To provide added assurance I completed a sensitivity test with dBSea and changed the seabed properties to those in the 2017 assessment – there was no change in calculated receiver levels (RLs). I also changed the seabed properties to a homogeneous gravel / sand layer across the whole of the study area, i.e. a layer which can be considered more reflective. This resulted in a slight reduction in receiver levels within 2.8 km of the sound source and an increase of 1-2 dB at greater distances. This is consistent with the observations I made in my 2017 response to written questions from Ruby Haazen.[16]

Summary

41. My description in CAN-001 and CAN-002 has led to some unfounded confusion. In my 2024 and 2025 assessments, I adopted a split-solver approach using dBSeaModes for low frequencies (≤250 Hz) and dBSeaRay for high frequencies (≥500 Hz), aligning with best practice. The use of sand rather

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15 Computational Ocean Acoustics, Jensen et. al. Springer, 2011 (section 1.6).

16 Written answers to questions from Ruby Haazen, by Memo to Vicki Morrison-Shaw, 3 pages, Subject: TTRL – Questions, dated 23 May 2017

than other material such as silt, gravels, etc, as the sediment layer is not a modelling uncertainty.

42. I maintain that the propagation loss modelling is robust.

APPLICATION OF NMFS (2024)

43. Contrary to Dr Pine's statement[17] I have not misinterpreted the NMFS guidance and what the SEL metric means. The 24 hour SEL ($L_{E,p,24h}$) is the accumulated sound level exposure level over a 24 hour period. For example, a source level of 171 dB would equate to an accumulated $L_{E,p,24h}$ of ~220 dB if the source was operating continuously and the exposure duration was 24 hours. The 24 hour SEL therefore takes into account the received level and duration of exposure.

44. For the weighted contours in CAN-002, the accumulated 24 hour SEL was used. As explained above, I did not include other sources as their characteristics are dissimilar to the crawler and IMV not simply because they are not present and operating all the time. This is an important observation as noted in Section 2.3.2.1 of the NMFS 2024 Guidelines, which states (my emphasis added):

> *"The recommended application of the weighted SEL24h metric is for individual activities/sources (e.g., See NMFS Optional User Spreadsheet Tool).* ***It currently is not intended for accumulating sound exposure from multiple activities occurring within the same area or over the same time or to estimate the impacts of those exposures to an animal occurring over various spatial or temporal scales****. Current data available for deriving criteria using this metric are based on exposure to only a single source and may not be appropriate for situations where exposure to multiple sources is occurring. As more data become available, the use of this metric can be re-evaluated, in terms of appropriateness, for application of exposure from multiple activities occurring in space and time."*

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17 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 72p, 76p

45. Section 2.3.2.1 of NMFS 2024 acknowledges that that there are notable differences in how exposure is determined for stationary sources compared to moving sources. For example, the accumulation time for stationary sources, i.e. similar to the IMV and crawler, being determined by the characteristics of the receiver (swim speed and location) rather than the characteristics of the source (vessel speed and location). The NMFS 2024 guidance does not provide detailed guidance on exposure modelling but relies on the proponent to determine the most appropriate methodology that best represents their activity.

46. I therefore do not agree with Dr Pine's position regarding my interpretation of the NMFS 2024 guidance and my exclusion of the mobile sources.

47. I agree with Dr Pine when he states that the 24 hours is an accumulation period, not a required exposure duration.[18] My CAN-002 includes a table of comparative exposure levels ranging from 10 seconds to 24 hours and for different distances from 500 to 2,000 metres for each of the five marine mammal hearing groups. This information addresses Dr Pine's comment when he states that:

"The LE,p,24hr threshold can be exceeded well inside 24 hours if the cumulative exposure required to achieve TTS is reached."

48. Meaning that at closer distances to a source, the required exposure duration to reach a TTS threshold is less than if the exposure was accumulated at a greater distance (lower received sound level).

[18] Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 77p

Summary

49. Dr. Pine's claim that I misinterpreted NMFS guidance is incorrect.

50. I have not assessed the 24-hour SEL ($L_{E,p,24h}$) for all noise sources for the reason I explained previously. I have focused on those sources that would be present all of the time (IMV and crawler) because of their unique operating and noise characteristics. This approach is consistent with the NMFS 2024 guidance.

BASELINE SOUNDSCAPE / LONG-TERM CHANGE

51. Conditions 11 and 12 set absolute limits, not ambient-referenced thresholds. However, I recognise the value of comparing predicted noise levels to the existing environment, as recommended by Dr Pine.[19]

52. My October Evidence addressed the issue of the baseline soundscape [paragraphs 45 to 50 and 63]. I concluded that:

"TTR's predicted noise emissions are broadly comparable to existing ambient noise levels in the STB, although noise will be introduced into a new area of the STB. The extent of this additional noise is limited, as demonstrated by the weighted sound level contours in Figures 1–3 of .. CAN-002… *My previous opinion remains unchanged: I do not consider that the project will significantly increase the existing ambient soundscape outside the mining area."*

53. In his 2025 evidence, Dr Childerhouse identifies studies published in 2013, 2017, 2019 and 2021 which provide estimates of background, ambient underwater noise levels in

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19 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048) 9 October 2025, 93-98p

the STB region.[20] I have reviewed the scope of these studies and referenced the 2017 JASCO study in paragraph 47 of my October 2025 evidence. While TTR has not undertaken similar scaled surveys, the studies referenced by Dr Childerhouse are in my opinion sufficient to understand the spatial and temporal variation in underwater noise levels in the STB.

54. Dr Childerhouse further comments on this matter in his evidence.[21] This includes TTR committing to an extensive pre-commencement monitoring programme, as defined in Condition 47 to 51, including marine mammal monitoring for 3 years prior to operation, which could include passive acoustic monitoring (PAM) as a way of establishing the presence of marine mammals. This would be similar to other projects – including one for Lyttelton Port Company, which involved input from Dr Pine and myself. PAM typically involves deploying logging units for 6 months or more to record underwater sounds. The devices can help identify various sources of noise both anthropogenic and those sounds generated by marine mammals, including the identification of the species by their vocalisations.

55. For the reasons explained in my October 2025 Evidence and the 2025 evidence of Dr Childerhouse, I do not consider the absence of ambient noise data acquired by TTR to undermine the robustness of the assessment.

Summary

56. Conditions 11 and 12 set absolute limits, not ambient-referenced thresholds. TTR's predicted emissions are broadly comparable to current ambient levels in the STB, with

[20] Childerhouse, S. (2025). Evidence of Simon Childerhouse (Marin Mammals) on behalf of Trans-Tasman Resources Limited in Response to Comments Received, 13 October 2025, 38p.

[21] Childerhouse, S. (2025). Evidence of Simon Childerhouse (Marin Mammals) on behalf of Trans-Tasman Resources Limited in Response to Comments Received, 13 October 2025, 123-159p.

additional noise confined to the mining area. My opinion remains unchanged: the project will not significantly alter the wider soundscape.

CONDITIONS 11–12

57. Dr Pine states that he is unable to find any explanation where the 130 dB and 135 dB thresholds originate from in Condition 11b and 11c respectively.

58. Dr Childerhouse in his 2025 evidence provides the necessary details.[22] In summary, the 130 dB re 1µPa limit in each of the low, medium and high frequency bands was proffered by Professor B Würsig (marine mammal expert for Department of Conservation) in 2014 and was accepted by all parties at that time. The 135 dB linear limit is the logarithmic summation across all three frequency bands.[23] There were subsequent minor changes to the suite of noise conditions in 2017, but the core decibel values, and only including the IMV and crawler, remained unchanged.

59. I concur with Dr Childerhouse's observation (p122 of his evidence) that:

"Condition 11 is the first of its kind in New Zealand that I am aware of for constraining underwater noise from an activity to a level so as to avoid significant impacts on marine mammals."

60. Dr Pine makes no similar comment as to the appropriateness of these levels. However, he does comment that he supports

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22 Childerhouse, S. (2025). Evidence of Simon Childerhouse (Marin Mammals) on behalf of Trans-Tasman Resources Limited in Response to Comments Received, 13 October 2025, 41-43p, 119-122p.

23 $130 \text{ dB} + 130 \text{ dB} + 130 \text{ dB} = 130 \text{ dB} + 10.\log(3) = 130 \text{ dB} + 4.8 \text{ dB} \approx 135 \text{ dB}$

the recommendations of the JASCO review[24] regarding measurement procedures. In my October 2025 Evidence I recommend adding an advisory note tying compliance measurement procedures to ISO 17208-3[25] and an implementation protocol for the cumulative modelling/verification, without altering the already clear and enforceable limit framework of Conditions 11–18.

61. Dr Pine considers it likely that the 135 dB re 1μPa limit in Condition 11 will be exceeded. This is because noise from FSO and CEV offloading operations, as well as transfers from the IMV to the FSO, has not been accounted for.[26] However, in his paragraph [66], Dr Pine acknowledges that Condition 11 applies only to noise from the IMV and crawler.

62. Condition 11, drafted in 2014, has always applied solely to the combined noise from the IMV and crawler. The 135 dB re 1μPa limit is based on the source level limit in Condition 12, plus an engineering allowance (IMV and crawler only). Including other sources would require revising all noise limits. This is not a simple adjustment: measurement conditions would also need to change (distance, depth, vessel orientation relative to the IMV) to ensure specificity.

63. As I explained in paragraph [58] above, the noise limits of Conditions 11 and 12 only include the noise contribution of the IMV and crawler, which is consistent with the NMFS 2024 guidance for exposure modelling (unchanged from previous

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24 JASCO, Trans-Tasman Resources Limited's Fast-Track Application - Taranaki VTM, 2025 Scientific Peer Review in Relation to Underwater Noise and Marine Mammals, 29 August 2025.

25 ISO 17208-3:2025 Underwater acoustics — Quantities and procedures for description and measurement of underwater sound from ships Part 3: Requirements for measurements in shallow water

26 Pine, M. (2025). Review of information on underwater generated noise from the Taranaki VTM Project (FTAA-2504-1048), 9 October 2025, 67p.

versions of the guidance). Noise from other vessels was excluded back in 2014 for the following additional reasons[27]:

(a) transient nature of other ships;

(b) how compliance would be efficiently determined as ships could be more than 1 km apart; and

(c) not the predominant ongoing noise sources.

Summary

64. Dr Pine has only questioned the origin of the 130 dB and 135 dB thresholds; he has not suggested that they are wrong or offered alternatives. I therefore maintain that the noise limits in conditions 11 and 12 are appropriate (and that only noise from the IMV and crawler is considered) subject to the addition of an advisory note linking compliance measurements to ISO 17208-3 and an implementation protocol for cumulative modelling and verification. This recommendation directly addresses Dr Pine’s concerns regarding monitoring procedures.

CONCLUSION

65. I maintain that the underwater noise assessment supporting TTR’s application is robust, fit for purpose, and consistent with best practice.

66. The modelling approach, source level assumptions, and application of NMFS (2024) guidance have been appropriately applied, with realistic scenarios and sensitivity testing undertaken.

67. The recommended noise limits and monitoring protocols are suitable to ensure effective management of underwater noise

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27 Hegley. N. (2104. (EEZ000004-TTR). Summary of Evidence of Nevil Hegley on behalf of Trans Tasman Resources Ltd. 29 March 2014, p22.

effects, and the project is not expected to significantly alter the wider soundscape of the South Taranaki Bight.

68. I remain confident that the proposed conditions will safeguard marine mammals and the acoustic environment.

Darran Humpheson

21 November 2025