BEFORE THE Proposed District Plan Hearings Panel of Thames Coromandel District Council **UNDER** the Resource Management Act 1991

AND

IN THE MATTER of the Proposed Thames Coromandel District Plan

EVIDENCE OF ROGER V. GRACE, PHD, QSM ON BEHALF OF COROMANDEL WATCHDOG INCORPORATED

Qualifications and relevant experience

1. My name is Roger Vernon Grace. I have a B.Sc., M.Sc. (Hons.) and Ph.D. in Zoology (marine biology) from the University of Auckland (1972), and have carried out marine ecological studies for about 43 years. I am a life member of the New Zealand Marine Sciences Society, and was awarded a Queen's Service Medal (QSM) for public service in 2005. I am self-employed with my own consultancy business.

2. My undergraduate and graduate research concentrated on the ecology of the entrance to the Whangateau Harbour just north of Warkworth. My Ph.D. studies were multidisciplinary and investigated the benthic ecology, hydrology, sediments, and community structure of animals on the seabed, and their relationship to environmental parameters.

3. I am a committee member of the Mid-North Branch of Forest & Bird, and a life member of the NZ Underwater Association. I am a foundation member and past Chair of the Mountains to Sea Conservation Trust, the umbrella organization to two community and school engagement programmes involved with marine conservation, Experiencing Marine Reserves, and freshwater ecology, The Whitebait Connection. I was recently Co-Chair of the Omaha Shorebird Protection Trust. I am a member and past Chair of the Whangateau HarbourCare Group, which carries out shellfish monitoring and other studies in the Whangateau Harbour.

4. For a few years in the late 1970's I was employed part time by a biological consulting firm in Auckland, during which time I gained experience in many estuaries and coastal areas mainly in the Auckland Region. This work included benthic ecology and studies of bird use of intertidal areas.

5. I established my own consultancy in the early 1970's with clients in Government Departments, Local Government Authorities, and the private sector, and various NGO's involved in environmental matters, in New

Zealand and overseas. I have written many client reports, and authored or co-authored a few scientific papers.

6. My major projects of relevance to coastal processes and ecology over the years include sand extraction at Parengarenga, Mangawhai and Pakiri, and several locations in the Kaipara Harbour. The latter has involved long-term studies since 1990. These studies have been helpful in Council and Environment Court proceedings. I have also prepared and presented evidence in relation to several proposed marinas, such as Sandspit, whangamata.

7. I have also been involved with long-term studies at the Port of Tauranga, for their various channel deepening and widening, and spoil disposal operations offshore, since 1988, including Council and Environment Court hearings. Over the years these studies involved working closely with coastal processes experts including the late Professor Terry Healy and Dr Willem de Lange of the University of Waikato.

8. I have visited the Coromandel Peninsula many times and travelled around all of its coastline. I have dived in several locations on the east coast, and over several years camped on five of its offshore islands carrying out marine biological research as part of a scientific team from the Offshore Islands Research Group.

9. I am presently a member of the Biodiversity and Biosecurity Round Table group of the Marine Spatial Planning process for the Hauraki Gulf Marine Park. We are about to report to the next tier in the hierarchy, the Stakeholder Working Group, on our recommendations over biodiversity matters relating to the Gulf including pollution and sedimentation issues in the Firth of Thames.

10. In preparing this evidence I have generally reviewed the following:

    a. Councils s 32 reports (as these relate to mining); and

b. Councils s 42 Hearing Report; and
c. Coromandel Watchdog's Submission; and
d. the evidence of Graeme Lawrence; and
e. the evidence of Phillip Bishop; and
f. the evidence of Di Lucas; and
g. the background evidence of Di Lucas relating to catchment areas; and
h. The affidavit of associate professor Chris Hendy on the proposed New Talisman mine in the Karangahake Gorge dated 25 November 2011; and
i. some reported sediment contamination results for Coromandel Harbour; and
j. the State of our Gulf reports for 2011 and 2014 also report and discuss sediment contamination results for the southern and eastern Firth of Thames.

11. I confirm that I have read the *Code of Conduct for Expert Witnesses* contained in the Environment Court Practice Note and agree to comply with it. I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express. Except where specifically noted this evidence is within my area of expertise.

Scope of Evidence

12. My evidence addresses the following matters:

a. Downstream effects on the coastal marine area of mining activities on the land.
b. Historic contamination of sediments.
c. Climate change complications.
d. Biological and ecosystem impacts of sediments and heavy metals.
e. Bioaccumulation of heavy metals.

Evidence

Downstream effects

13. My particular concerns are for downstream effects on the coastal marine area of any exploration or mining activities on the land, and in this respect these effects are cross-boundary effects.

14. In the evidence of Di Lucas, she refers to the catchment areas of the Coromandel which all feed directly into the Hauraki Gulf marine area. In the *Attachment to the evidence of Di Lucas re Coromandel Peninsular within the Thames Coromandel District December, 2014,* page 7 shows these catchment areas.

15. Page 14 in the *Attachment to the evidence of Di Lucas* sets out areas of high prospectivity. Notably, most of the areas of high prospectivity are located either in close proximity to the marine environment or clustered along ridgelines.

16. Because of the catchment areas and the location of high prospectivity areas, any run-off from mining activities will easily find it's way downstream and into the marine environment. Much of the Coromandel also includes steep terrain, and being a peninsula is rather narrow, especially further North which will increase the speed at which run-off makes it way to the sea.

17. These effects would therefore be of concern to Waikato Regional Council and Department of Conservation, and be subject to the Hauraki Gulf Marine Park Act 2000 and the New Zealand Coastal Policy Statement 2010.

18. Effects in the area below mean high water spring are outside the jurisdictional boundary of the Thames Coromandel District Council but the

marine effects are clearly generated within the area covered by the Proposed District Plan.

Historic contamination

19. There is a legacy of historic heavy metal contamination in the Coromandel marine coastal area from early mining activities (HGF 2011, Kim 2007). Of particular concern are levels of mercury and arsenic which exceed recommended environmental guidelines in places.

20. Mercury and arsenic levels in sediments next to the wharf in Coromandel Harbour were found to exceed ANZECC guidelines (Foote and Rumsby 2012). *[13 of 21 samples for arsenic (12 – 38mg/kg) exceeded the ISQG – low guideline value. Nearly all samples for mercury (0.73 – 3.1mg/kg) exceeded the ISQG – low guideline value, and 3 samples taken below 0.3m exceeded the ISQG – high guideline value.]*

21. These results indicate that the sediments may be considered as contaminants and potentially hazardous under the Waikato Regional Council Coastal Management Plan (Foote and Rumsby 2012).

22. Coromandel Wharf is just over 200 metres from the nearest of several oyster farms in McGregor Bay north of the wharf.

23. Monitoring carried out by the Waikato Regional Council in 2013 found that mercury concentrations exceed the relatively high level PEL guideline value (0.70 mg/kg) in Kuranui Bay near Thames (HGF 2014).

24. Contamination of sediments by mercury and arsenic near Thames and Coromandel appears to be related to runoff from contaminated mining sites, and indicates the clear potential for similar additional contamination from future mining activity.

Climate change

25. Predicting the effects of climate change is constantly evolving however some of the effects of climate change on New Zealand can be stated with growing confidence (PMCSA 2013). One of the biggest causes of increased flooding and slips will likely be a change in the frequency and intensity of extreme rainfall.

26. In a report by Dr Mike Hilton, Hilton looks at the effects of climate change to Coromandel East Coast Beaches (Hilton 2012). Hilton refers to a period in 1978 where successive storms and major cyclones occurred only weeks apart from each other. The likelihood of such a scenario occurring again only increases with climate change.

27. Such increasing severity and frequency of storms and heavy rainfall events as predicted in climate change scenarios will put at increasing risk of failure any structures built to contain toxic wastes, such as tailings dams and other containment structures, especially if these are located on or near unstable or steep landscapes.

28. This increases the future risk of catastrophic failure of structures and release of toxic contaminants into waterways and ultimately the sea.

Biological and Ecosystem impacts

29. Mining activities can release heavy metals, acid leachate and sediment into the surrounding environment. All are regarded as serious contaminants in the marine environment. This is addressed in Associate Professor Chris Hendy's affidavit evidence.

30. Heavy metal and acid leachate contamination is essentially a unique problem associated with mining activity, whereas sediment contamination

can come from many sources. The likely scale of mining operations, however, suggests mining could be a significant source of sediment contamination if allowed to resume.

31. Suspended sediments in the water column can have several effects on benthic life. It can reduce light levels for photosynthesis in benthic algae and in planktonic micro-algae. It can stress filter feeders such as many shellfish, sponges and ascidians, by directly clogging their gills, or by causing them to lose condition because of extra energy wasted trying to expel the sediment. In serious cases benthic life can simply be smothered by settling sediment.

32. Aquatic organisms take up heavy metals from surrounding environments which accumulate in their body tissues (Fukunaga and Anderson 2011). Heavy metal contaminants in suspension or in sediments have a range of harmful effects on sealife. The interactive nature of the combined effects of multiple heavy metals complicates studies of the effects of individual metals, because they are seldom found individually in contaminated environments. Heavy metals can accumulate in very complex ways, sometimes dependent upon the co-occurrence of one metal with another.

33. Heavy metals released from mining activities (eg. mercury, cadmium) are some of the most dangerous contaminants of shellfish and other marine life, and present the greatest risk to humans if they eat contaminated shellfish.

34. Western Coromandel has a large number of oyster farms and mussel farms, and it is likely in future there will also be fin-fish farms. If mining were to recommence on the Coromandel Peninsula there is a risk some of these farms could become contaminated with heavy metals.

35. The impacts of acid leachate on aquatic life will be discussed in the evidence of Professor Chris Hendy in March 2015.

Bioaccumulation

36. Heavy metals suspended in the water accumulate in the tissues of marine organisms such as filter-feeding oysters, mussels, cockles and scallops.

37. Heavy metals trapped in sediments accumulate in the tissues of deposit feeders such as some crabs, wedge shells, nut shells and window shells.

38. These shellfish are then eaten by carnivores such as some crabs, fish and birds, and directly by humans. Concentrations of metals tend to accumulate up the food chain, becoming highest in predators such as flounder, snapper, stingrays, kingfish and dogfish.

39. Top-end predators such as dolphins and orca have been found with very high levels of heavy metals in their flesh. What happens to dolphins if they have higher heavy metal intake.

40. Can we include one last paragraph about what are the potential effects of increasing heavy metal intake in marine life or in humans, health of the marine life, can it be fatal to shellfish.

References

Foote, C. and Rumsby, A. 2012 Sediment Quality Assessment at Coromandel Wharf. Report by Pattle Delamore Partners Ltd. for Thames Coromandel District Council.

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Hilton, M 2012 *Comments on a report by FOCUS (2012): Coromandel East Coast Beaches: Potential Impacts of Projected Climate Change on Coastal Erosion over the Next Century and Review of Associated Coastal Setback* (22 August 2013).

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