
**Statement of Jayde Edward Malthus Couper on behalf of Otago Fish and
Game Council (Risks to avifauna – response to MGL’s RFI 11 information)**

8 September 2026

1. My full name is Jayde Edward Malthus Couper.

Qualifications and Experience

2. I am employed as a Fish and Game Officer / Ecologist by the Otago Fish and Game Council, where I have worked since September 2021. Prior to this, I was a Fish and Game Officer with the Central South Island Fish and Game Council from December 2013 to September 2021.
3. Across these roles, I have well over a decade of practical experience working with wetlands, waterfowl populations, and gamebird behaviour. A core part of my role involves managing and analysing annual hunter harvest and satisfaction surveys across Otago, which gives me an in-depth understanding of how hunters use local hunting areas and where gamebirds are harvested.
4. I hold a Bachelor of Science in Environmental Science and Water Science and Technology from Lincoln University. I am currently undertaking a post graduate qualification, having completed course work in freshwater ecology, statistics, and ecological toolkits and principles.
5. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

6. I have been asked by Otago Fish and Game to provide evidence on avifauna (waterfowl and gamebirds) in response to the assessment of ecotoxicity risks and habitat descriptions provided in the applicant's Request for Information 11 (RFI 11) response.
7. In preparing this statement, I have reviewed the RFI 11 Question 9 ecotoxicity report, the joint witness statements on Water Quality and on avifauna and the avifauna values assessment from the original substantive application.

What the Waterbodies Will Look Like and What Will Live There

8. My understanding of the site is that it will feature a mix of waterbodies, including two main pit lakes, a constructed TSF wetland, some natural wetlands and operational collection and tailings ponds.
9. The applicant's ecotoxicity report suggests that because the pit lakes will be steep sided with little to no shallow littoral habitat, waterfowl will be deterred from using them and will prefer natural habitats nearby. While these conditions will help to deter them, in my experience, this is not how waterfowl interact with water, particularly in dry areas.
10. Central Otago is an arid to semi-arid landscape where permanent open water is naturally scarce. Large bodies of open water are a strong visual attractant to passing birds. Waterfowl do not just visit ponds to feed; they use open water and their surroundings for "loafing" (resting, digesting food, and conserving energy safely away from ground predators), drinking, socialising, preening, washing, and collecting grit.

11. This is supported by our staff observations at Macraes Gold Mine. Fish & Game Officer Steven Dixon regularly drives past the mine's tailings ponds and has observed mallards and likely Australasian shoveler (he is unsure due to the distances involved) using these ponds, despite the perceivably poor habitat for waterfowl (pers. comm.).
12. Given the local species in Central Otago, I expect the pit lakes and mine waterbodies will be used by the following Fish and Game managed bird species:
 - a. Mallards, grey ducks, and their hybrids;
 - b. Australasian shoveler;
 - c. Paradise shelduck; and
 - d. Black swans, particularly if macrophyte beds become established.

Moult Sites and Ecological Traps

13. The response to RF11 – Item 9 Ecotoxicology concludes that the impacts on avifauna are relatively low, partly because there are more desirable elsewhere in the region. I disagree with this statement as while there are superior habitats within the region, the pit lakes will make up the majority of habitat in the immediate area, meaning that avifauna will use them particularly for resting and drinking.
14. Waterfowl can be attracted to unsuitable or dangerous habitat for multiple reasons, this is referred to as an ecological trap. A primary attraction for waterfowl is finding open water to moult.
15. Waterfowl undergo an annual moult where they drop all their flight feathers at once, leaving them completely flightless for approximately 4-5 weeks. During this period, birds aggregate on waterbodies for safety and are restricted to whatever food is immediately available.
16. Paradise shelduck regularly moult on artificial waterbodies with very low habitat quality. A local example is the Roxburgh East sewage ponds, which are surrounded by security fencing and conifers with little grazable vegetation, yet during a 2025 moult survey had higher numbers of moulting shelduck than a seemingly superior pond habitat less than 300 metres away (Figure 1).



Figure 1: Satellite view of two sets of ponds with drastically different habitat that both attract moulting paradise shelduck.

17. Moulting is a social behaviour as once a few birds decide to land, their presence draws others looking for safety in numbers during a time where they are particularly vulnerable to predation.
18. Fish and Game moult surveyors frequently note large accumulations of moulting birds “missing” on a traditional moult site only to find them on nearby, previously unused or newly constructed waterways.
19. Outside of moulting, waterfowl will utilise the ponds for other reasons and even a small number of waterfowl can attract larger groups due to their generally social nature.
20. Relative to other waterfowl, mallards are prolific breeders with large clutch sizes and the ability to renest multiple times if a clutch fails. In good breeding seasons, local populations build rapidly. This high productivity means that territorial pressure and competition for space and resources will push birds, particularly surplus juveniles out of optimal habitats into less favourable, marginal habitats like mine waterbodies.
21. Pit lakes are likely to act as "ecological traps". This happens when an artificial feature (like a large open water surface) signals good habitat to flying birds, but the reality is a toxic or poor-quality environment that harms their condition, disrupts their breeding, or kills them. Waterfowl may land on these lakes to rest or wait out weather, and even if they don't find food, they may stay extended periods.
22. Waterfowl will be exposed to environmental toxicants in several ways: inhaling dust, drinking the water, absorption through skin, preening contaminated water off their feathers, eating sediments, algae or macroinvertebrates, and ingesting grit.
23. Grit intake is a potentially overlooked exposure pathway. Waterfowl do not have teeth and must ingest small stones and coarse mineral grit into their gizzard to grind up their food. This grit breaks down over time through grinding and stomach acid. Studies on lead shot ingestion¹ show that mineral particles break down quickly in the gizzard and

¹ Gibb, & Katie. (2018). *Heavy metal concentrations in mallards in New Zealand - Master's Thesis.*

enter the bloodstream. I acknowledge this is accentuated by lead's softness, but I expect it will occur with other metals and metalloids to some degree. Shorelines on the mine site will provide an accessible source of mineral grit potentially containing concentrated heavy metals.

Ecotoxicity Risks and ANZG Guidelines

24. I have read and applied the ANZG guidelines and relevant individual assessment of the relevant pollutants. It is important to recognise that ANZG DGVs are derived to protect aquatic life including macroinvertebrates and algae. The guidelines state that they do not cover wildlife drinking water, nor do they protect against secondary poisoning through the food chain. The guidelines also state that "It is important to note that toxicant DGVs derived using the current method are not intended to specify species-protection concentrations for air-breathing animals that inhabit aquatic ecosystems and prey on aquatic organisms."
25. The applicant's ecotoxicological assessment relies on meeting ANZG (2018) Default Guideline Values (DGVs) at an 80% species protection level. The ANZG guidelines suggest that this level is used for "highly disturbed systems."
26. Highly disturbed systems are described as "Ecosystems that are measurably degraded by human activity and are of lower ecological value." Examples provided of highly degraded systems include:
 - a. shipping ports and sections of harbours serving coastal cities
 - b. urban streams receiving road and stormwater runoff, or rural streams receiving runoff from intensive horticulture.
 - c. streams heavily impacted by land clearing, including the loss of the riparian zone.
 - d. streams heavily impacted by industrial discharges (e.g. acid mine drainage, untreated or poorly treated sewage).
27. I do not consider this low level of protection appropriate, when considering the current state of the Bendigo local environment. The applicant has noted that the wetlands will higher and varying levels of protection, however the concentrations are predicted to exceed the 80% guidelines for some analytes, particularly uranium.
28. Based on the ANZECC guidelines² which I understand the ANZG guidelines were derived from, it is recommended that guideline trigger values for slightly-moderately disturbed systems (95% species protection) also be applied to highly disturbed ecosystems wherever possible. It also recommends that these protection levels should be viewed as interim targets with the long-term aim of improving water quality.
29. Applying an 80% aquatic guideline does not mean the water is safe for birds as the guidelines are not intended for birds and the 80% protection is considered highly

² Australian and New Zealand Agriculture and Resource Environment and Conservation Council. (2000). *Australian and New Zealand guidelines for fresh and marine water quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

degraded. This lack of protection is compounded by the applicant predicting that these low thresholds will be exceeded and by a significant margin for some pollutants.

30. The modern guidelines state “Highly disturbed systems should not be regarded as ‘pollution havens.’ The concepts of adaptive management and continual improvement should always be promoted, to maximise future options for a waterway.”
31. Several analytes are predicted to be present at heavily elevated concentrations relative to the 80% “highly degraded” guidelines, including arsenic, cobalt, molybdenum, antimony, and uranium³. Uranium is of particular concern, with runoff into the TSF wetland predicted to exceed the 80% guideline levels by two orders of magnitude. This is a serious issue because the TSF wetland is intentionally designed to look like a natural wetland, which will attract waterfowl.
32. The suggestion in the RFI 11 response that species may naturally adapt to these elevated levels cannot be applied to waterfowl. Waterfowl are mobile birds that move across catchments and regions; they do not have generations of localised genetic adaptation to high heavy metal levels
33. Bioaccumulation also needs to be considered. Contaminants such as mercury, selenium, and cadmium accumulate up the food web and in bird tissue, leading to reduced health, lower breeding success, and potentially death.
34. Waterbird mortality on mine pit lakes is a widely documented conservation challenge. On the Berkeley Pit in Montana, a six-year study (2018–2023) of 54 visiting waterbird species identified a significantly elevated relative risk of mortality for several taxa, notably the year-round resident mallard and migrating diving ducks like the canvasback⁴.
35. Even in neutral or alkaline Western Australian pit lakes where terminal groundwater sinks are utilized to contain toxic plume migration, evapo-concentration was found to progressively degrade water quality over time, accumulating toxic metalloids in food webs and threatening visiting waterfowl with chronic sub-lethal harm⁵.
36. In New Zealand, modelling of the proposed Martha gold mine pit lake demonstrated that while targeted passive remediation could successfully raise the lake's pH and lower copper levels, zinc concentrations would persistently exceed aquatic life protection guidelines in all closure scenarios⁶.
37. Other South Island mine voids present similar persistent post-closure management challenges. For instance, decommissioning the water treatment plant at Reefton's Globe Progress Pit Lake carries a modelled risk of sediment arsenic remobilisation,

³ Response To RFI 11 – Fast Track Approvals Application Fta-2507-1089 – Item 9 Ecotoxicology – Tables 3 & 4.

⁴ Capoccia, S., Balmer, B., Starr, K., & Autenrieth, D. (2025). Relative risk of waterbird species on the Berkeley Pit: a mortality assessment of 18 taxa. *Wildlife Society Bulletin*, 49(2). <https://doi.org/10.1002/wsb.1587>

⁵ McCullough, C. D., Marchand, G., & Unseld, J. (2013). Mine Closure of Pit Lakes as Terminal Sinks: Best Available Practice When Options are Limited? *Mine Water and the Environment*, 32(4), 302–313. <https://doi.org/10.1007/s10230-013-0235-7>

⁶ Castendyk, D. N., & Webster-Brown, J. G. (2006). *Geochemical Prediction and Remediation Options For The Proposed Martha Mine Pit Lake, New Zealand*.

which could elevate lake concentrations up to 0.45 mg/L⁷, significantly above all ANZGG aquatic life protection guidelines.

How Far Birds Move and Dispersal to Hunting Grounds

38. Long-term bird banding datasets managed by the Department of Conservation and Fish and Game demonstrate that New Zealand waterfowl move over considerable distances⁸:

- a. Australasian shoveler show the widest dispersal of any native waterfowl. Banding records show modal movements of 0–100 km in their first year and 101–200 km in later years. Shovelers banded during the moult in Otago and Southland have been recovered over 1,000 km away in the North Island (Taupō, Waikato, Northland) within 3 to 4 months (Figure 2).

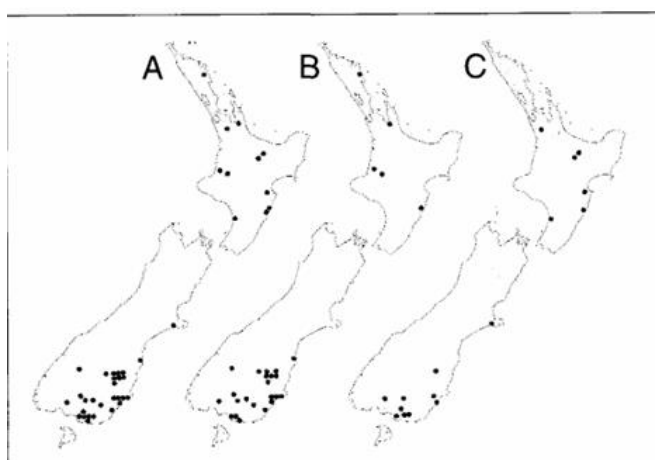


Fig. 4 Locations (10' × 10' latitude-longitude squares) in which adult Australasian shoveler (*Anas rhynchos*), banded at Ram Island Lagoon, Otago, 1972-79, were recovered: A, all recoveries; B, recoveries made in the year-of-banding; C, recoveries made 1 or more years after banding.

Figure 2: Final harvest location of Australasian shoveler banded in coastal Otago. Sourced from Williams 2024.

- b. Paradise shelduck were found to generally migrate between 41 km and 60 km from lowland moult sites, and 0–20 km in hill country. While they are usually settled on breeding territories, their seasonal moult migrations can cover significant ground.
- c. Mallards regularly move between catchments. While extreme long-distance movements occur, such as Canterbury-banded birds recovered in New Caledonia⁹, local flights are very routine. GPS tracking data from Southland and Waikato¹⁰ show mallards moving up to 19.2 km in 48 hours. Given the more scattered nature of wetlands in Central Otago, I would expect birds to travel even further to find food and open water.

⁷ Navarro, L., Hayton, S., Williams, M., & Weber, P. (n.d.). *Globe Progress Lake-Closure Performance Monitoring and Adaptive Management*.

⁸ Most banding data sourced from: Williams, Murray. 2024. A synopsis of game bird banding in New Zealand to year 2000. Ornithological Society of New Zealand

⁹ <https://www.doc.govt.nz/Documents/our-work/bird-banding/banding-newsletter-apr-2018.pdf>

¹⁰ Bartel, R. D., Sheppard, J. L., Lovas-Kiss, Á., & Green, A. J. (2018). Endozoochory by mallard in New Zealand: What seeds are dispersed and how far? *PeerJ*, 2018(5). <https://doi.org/10.7717/peerj.4811>

39. In my opinion, mallards and other waterfowl using the mine waterbodies will regularly travel within a 25 km or greater radius over short timeframes, assuming that they are not subject to acute toxicity affects.
40. A 25 km radius from the site takes in several significant hunting areas, including Lake Dunstan, the Bendigo Wildlife Management Reserve, the Tarras basin, the Omakau area, and the mid-reaches of the Manuherekia River.
41. Based on Otago Fish and Game hunter harvest surveys between 2014 and 2025, hunting grounds within this 25 km radius account for roughly 6% of all mallard harvest in the Otago Region. In terms of annual bird takes, this area accounts for an estimated harvest of approximately 3,700 mallards annually, as well as significant numbers of paradise shelduck and a small number of Australasian shoveler.

Risks to Human Consumption and Management Limitations

42. Waterfowl harvested in Otago are taken by recreational hunters and landowners for food.
43. Heavy metals and metalloids accumulate in waterfowl meat and especially in the liver¹¹. If ducks spend time resting, feeding, preening, or collecting grit on the mine waterbodies, they will accumulate these metals and are then very likely to disperse into surrounding valleys, where they may be harvested and consumed by hunters, landowners, and their families.
44. If the analytes identified in the RFI 11 Question 9 ecotoxicity report reach the expected levels, I do not see any practical way to manage the risks to hunters:
- a. Contaminated ducks may look completely identical to healthy ducks in the field.
 - b. Closing hunting across a 25 km or greater radius is completely impractical. If it could be implemented, it would lock hunters out of popular public reserves like Bendigo Wildlife Management Reserve. In my opinion this would be a significant impact on recreational hunting. . This would also not eliminate the risk of hunters harvesting potentially contaminated waterfowl.
45. I have experience with using deterrent systems such as gas guns to move gamebirds away from areas. Deterrent systems have limitations. Birds quickly become used to automated scare devices, so they cannot keep birds off large waterbodies indefinitely. There may be potential in scaring early moulting birds to avoid attracting more, however, hazing cannot be used once moulting has begun, as birds physically cannot fly away and will simply be subjected to stress while remaining trapped on the contaminated water. A wildlife permit is required for the use of these devices.

Summary

46. In my opinion, the applicant's ecotoxicity assessment underestimates the real risk to both waterfowl and hunters by assuming birds will simply avoid the site. In an arid landscape like Central Otago, open water is scarce and birds will inevitably use it.

¹¹ Gibb, & Katie. (2018). *Heavy metal concentrations in mallards in New Zealand - Master's Thesis*.

47. As the risks to waterfowl are well established at other sites, I am also concerned that the assessment relies on standard aquatic guidelines at the lowest 80% species protection levels, guidelines that were never designed to protect semi-terrestrial wildlife, while also appearing not to properly account for dietary bioaccumulation.
48. If the effects of high contaminant levels in waterbodies do not cause mortality or prevent birds from leaving the site, there is a good chance that they will be consumed by members of the local community. I cannot see any practical way to manage this risk.

Jayde Edward Malthus Couper

Fish and Game Officer

Otago Fish and Game Council

8 September 2026