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12 June 2023

TiGA Minerals and Metals Ltd
100 Mackay Street
Greymouth 7840

Attention: Kate McKenzie

3261 Coast Road, Barrytown – Response to request for further information

The following letter responds to ecological matters raised in the request for information received for the proposed mineral sand mine located at 3261 Coast Road, Barrytown.

Item 23

Please provide information on the vegetation at the coastal lagoon, PUN-W034 SNA, and any other adjacent indigenous vegetation/habitat, including an assessment of the vulnerability of plant communities (or individual species' populations) to hydrological changes.

Please refer to Section 5.2 of the Assessment of Ecological Effects report for an aerial photograph and description of the vegetation in the coastal lagoon area adjacent to the site.

The coastal edges of the lagoon had dense patches of oioi (*Apodasmia similis*), Sinclair's sedge (*Carex sinclarii*), and soft rush (*Juncus effusus*) with tailed-seeded rush (*Juncus canadensis*), lotus (*Lotus penduculatus*), swamp sedge (*Carex virgata*), *Isolepis prolifera,* and Yorkshire fog (*Holcus lanatus*) spread throughout. During the first site visit a band of turf vegetation was observed above the waterline on the coastal side of the lagoon. This vegetation was mostly indigenous and included species such as *Myriophyllum triphyllum*, *Potamogeton suboblongus*, *Centella unfilora*, bachelor's button (*Cotula coronopifolia*) and *Lobelia anceps*. The extent of this turf vegetation in particular, is probably affected to a high degree by the dynamic nature of the lagoon and the regular (daily, seasonal) changes in the water level.

Mixed gorse and native shrubs occurred to the north and east of the lagoon, but were less extensive in the south. The most common species in the northern and eastern parts of the lagoon were gorse (*Ulex europaeus*), mahoe (*Melicytus ramiflorus*), mikimiki (*Coprosma linariifolia*), bracken (*Pteridium esculentum*), pōhuehue (*Muehlenbeckia australis*), wheki (*Dicksonia squarrosa*) and blackberry (*Rubus fruticosus* agg.).

Inland, including at the site, harakeke (*Phormium tenax*) dominated, with raupō extending into the lagoon. Other vegetation present included blackberry (*Rubus fruticosus* agg.) and swamp kiokio (*Parablechnum minus*).

Immediately north of the site was an area of vegetation consisting of lowland-forest and flaxland. Gorse and blackberry were common among the flaxland.

Little is known about the specific vegetation of the other wetlands and areas of indigenous vegetation, although Gardner (1992) undertook a survey of Maher Swamp, located to the north of the site, and described it as "by no means a pristine wetland" due to previous diversion of Lawson's Creek and Maher Creek, both of which previously supplied Maher

Swamp, as well as other human disturbance. Nonetheless, Gardner recorded three noteworthy plant species within Maher Swamp including *Myriophyllum robustum* (stout water milfoil), which is not currently of conservation concern, but has been in the past (de Lange 2023a), swamp millet (*Isachne globosa*), which is not widespread in the South Island, and water brome (*Amphibromus fluitans*), another species which is not currently of conservation concern, but has been in the past (de Lange 2023b). Maher Swamp was originally set aside as a flax reserve for the flax cutting industry at Barrytown (Gardner 1992). Norton (1991) recorded six additional plants of conservation concern from Maher Swamp, five myrtaceous species (threatened by myrtle rust), and sand coprosma (*Coprosma acerosa*). Maher Swamp includes both Schedule 1 and Schedule 2 wetland areas identified in the West Coast Regional Council Land and Water Plan.

With respect to vulnerability of the plant communities present, Beca (2008) defined the potential risk of ecological change associated with changes in water levels in wetlands as follows:

- Low – <0.2 m change in median water level and patterns of water level seasonality (summer vs. winter levels) remain unchanged from the natural state.
- Medium – > 0.2 m and < 0.3 m change to median water level and patterns of water level seasonality show a reverse from the natural state (summer relative to winter).
- High – >0.3 m change to median water level; and, patterns of water level seasonality show a reverse from the natural state (summer relative to winter).

The magnitude of effects expected for wetland vegetation adjoining the coastal lagoon is at the low end of the Beca scale, particularly when considered against the normally highly dynamic nature of the coastal lagoon. Effects would vary with particular species and at particular locations. In general terms, such changes in water level would probably be tolerated by robust native species (such as raupō or rautahi), and those native species adapted to either a wide range of moisture levels (*Juncus* spp.) or fluctuating conditions (swamp sedge), but they may put more sensitive species, such as small wetland herbs such as *Centella uniflora* or other turf species which are adapted to occasional inundation and alternating exposure, at risk of being outcompeted by exotic plants if the changing water levels result in more prolonged exposure. The water management plan is predicated on avoiding effects for these species by providing timely responses to maintain water levels. In addition, species which are already of conservation concern would likely be at more risk than common species, in part because they are rarer and more susceptible to stochastic events, often have a restricted or localised distribution and because their environmental tolerances are likely to be naturally more restricted than common species. No species of conservation concern have been detected in the coastal lagoon area and none of the species detected at Maher Swamp are expected to be vulnerable to fluctuations in groundwater level. On that basis the plant communities and species' populations are not considered vulnerable to the types of hydrological changes expected.

We understand that particular concern has been expressed about any "bog and cushion vegetation" which might be present on adjoining properties or in the lagoon area which we have not been able to access. As articulated in the ecological report, we have assumed that wetlands are present on adjoining properties, and have recommended that ground and surface water levels be managed to avoid effects on wetland values. We have not made any assumptions about the type of vegetation present in those wetlands, but have assumed that they will be significant because of their rarity value and that the ecological values will be on a continuum from low to very high.

Cushion plants that are compact, low-growing, mat-forming plants that are usually found in low nutrient or otherwise harsh environments, including at high altitude. The most likely location for cushion plants to occur is surrounding the coastal lagoon (forming what we have

referred to as ‘turf vegetation’ above), but we note that the highly dynamic nature of that location means that the continued persistence of such species in that environment is uncertain for a variety of reasons including coastal processes, and removal and recolonisation by appropriate species over time is expected to be a feature of that dynamic environment. Given that livestock continue to have access to most of the potential wetland areas on adjoining properties, the presence of cushion vegetation is probably unlikely there because cushion species would likely be removed by pugging and trampling. Cushion vegetation may be present elsewhere and our earlier comments in relation to maintaining water levels and avoiding adverse effects would apply.

With respect to bog vegetation, bogs are infertile wetlands found on flat land or shallow basins. They have acid soils and their main source of water is from rain, which is one of the reasons they are infertile (i.e., because there are no nutrient inputs from runoff). Since they are predominantly rain-fed, plants growing in bogs would be unlikely to be affected by fluctuations in ground and surface water levels due to the proposed activities.

We consider that the best defence against indigenous biodiversity loss as a consequence of fluctuating water levels are the same actions necessary to prevent biodiversity loss due to ongoing pressures of pests, weeds, and land use change. Thus, a focus on planting and weed control to maintain representativeness, ecological intactness, resilience, community resistance and indigenous dominance is likely the best approach to reducing effects due to minor hydrological changes.

Item 24

Please provide information on the local populations (and habitat use) of cryptic/secretive bird species that are hard to detect and therefore may have been missed by on-site surveys, in particular: fernbird; bittern; reef heron; little blue penguin; marsh crake; and spotless crake.

As described in Section 3.1.2 of the Assessment of Ecological Effects report, the list of birds potentially using the site was derived from four seasonal field surveys undertaken at the site in April 2022 (autumn), September 2022 (late winter), December 2022 (early spring/summer) and January 2023 (summer), as well as observations recorded in the eBird database and downloaded April 2023. The boundary of these observations is shown in Figure 1. Each of the six species specifically mentioned in Item 24 are discussed in more detail below using eBird and Birds New Zealand records to inform the assessment. We note that all six of these species are territorial and we would expect that given the amount of time spent at the site and the use of acoustic recorders (which record data continuously in the absence of observers and were left in place for several days during each survey) that had these birds been present, the chances of detecting them was maximised by our survey approach.

Fernbird

The West Coast region generally is a stronghold for mātātā/fernbird, in part because of the abundance of dense, low wetland vegetation there which they prefer. Fernbird are absent from most of the east coast of the South Island (Robertson et al. 2007). There are few published estimates of population abundance for mātātā, and only one from the West Coast (at Tiropahi, south of Charleston and north of the site). Mātātā there were recorded in densities of approximately three birds per hectare (Miskelly 2013). Mātātā are common in the Buller District, including at Blackburn pakihi, Te Kuha and German Terrace (G Bramley pers. obs.). The density at all three sites exceeded the published estimate for Tiropahi (G. Bramley unpub. data).

There are 38 records of mātātā occurring within 10 km of the site, including one record falls inside the boundary of the proposed mineral sand mine. The observation was recorded in 2021. There are a further two records of birds utilising habitat adjacent to the site. One

record is from 1977 where a single bird was recorded in the lagoon area. The other record is from 2021 and immediately north of the site in the vegetation consisting of flax and lowland-forest with small pockets of wetland. The remaining near records all occur in the Paparoa Ranges. Mātātā live in dense vegetation and are poor fliers, so a record from the middle of the site is surprising and there would not be sufficient habitat to sustain birds there permanently, although occasional records of birds in places far from known populations do occur (Miskelly 2013). These are presumably juveniles dispersing from their natal area.

Australasian Bittern

Bittern are found throughout New Zealand, as well as parts of Australia and New Caledonia. In New Zealand they are most common from the Waikato north. Bittern were not commonly recorded on the West Coast between 1999 and 2004, with the records mostly being south of approximately Lake Brunner, although there is one record from north of Greymouth. (Robertson et al. 2007). Bitterns typically utilise a network of local wetlands seasonally (Williams 2013). Sites regularly visited included raupō-fringed lakes, spring-fed creeks with cover and areas of rank-grass along paddock/drain edges. Bittern numbers throughout New Zealand are low (thought to be less than 1,500 worldwide, Williams 2013). Northland and Waikato are particular strongholds and there are likely only a small number of bittern present in the West Coast region.

There are five records of Australasian bittern within 10 km of the site. One record, adjacent to the site, is from 1979, whereby a single bittern was utilising the lagoon area which now forms part of the SNA. The remaining four records are from the 1970s and all occur approximately 5 km north of the site at Pakiroa Beach. Bittern have been observed using the lagoon area historically and will forage in a variety of habitats but tend to prefer dense reeds for breeding. In our experience, the rāupo, flaxland and other foraging habitat on the fringes of the lagoon is very suitable for bittern, but may not be sufficiently dense for breeding.

Pacific reef heron

Pacific reef herons are widely distributed through eastern Asia, the tropical Pacific islands, Australia and New Zealand. The New Zealand reef heron population is estimated at only 300-500 birds, but they are regularly seen at the sites where they occur, and those populations surveyed appear to have been stable over the past 40 years (Adams 2013). They are widespread and abundant elsewhere in their range.

No reef heron were recorded in the bird surveys which informed the 1999 – 2004 atlas of bird distribution (Robertson et al. 2007). There is one observation of reef heron within 10 km of the site within the eBird database, however it is located further north than the proposed sand mine. This record is from 1978 and the bird was observed near the Punakaiki River at Pakiroa Beach. In addition, a pair of reef heron was seen on the beach near the coastal lagoon in 2020 during field work for this project. There is little habitat suitable to support individuals or populations of reef heron near the site. Reef heron prefer rocky shores, where they forage in the tidal pools and small rivulets of water that may carry fish. Occasionally they may be seen wading in the shallow waves of sandy beaches. They breed in dark places, fairly low to the ground of which usually consists of rocky caverns or under old bridges (Adams 2013). It is unlikely reef heron would reside permanently near the site due to the lack of suitable habitat.

Kororā

Kororā are widely distributed around the coast of New Zealand islands and are relatively common on the West Coast, although there were few records listed there in the 1999 – 2004 atlas of bird distribution, mostly from near Westport (Robertson et al. 2007). Small numbers of kororā are known to be present in the Barrytown flats area with both breeding and mortality records (I. Perkins, West Coast Penguin Trust pers. comm. 19 April 2023). Data held by the West Coast Penguin Trust from between 2013 and 2015 includes 14 penguin tracks crossing the Barrytown Flats beach recorded in 2013, 16 tracks in 2014, and 17 in 2015. Penguin counts have not been undertaken at Barrytown more recently (I Perkins, West Coast Penguin Trust, pers. comm. 19 April 2023). Two records of kororā are held within eBird from within 10 km of the site. One record is from 2022 where a little penguin was observed utilising the lagoon area in the SNA slightly north west of the site. The other record is approximately 5 km north of the site at Pakiroa Beach. A dead kororā was observed at the end of Burke Road during the field work for this project in 2020. Kororā are nocturnal on land and may nest in the area, probably in low numbers. Breeding occurs in colonies or as single pairs. Nests are close to the sea in burrows, caves, rock crevices, or under logs or buildings. Kororā also use purpose built nesting boxes at some locations.

Crake Species

Pūweto (spotless crakes) are rare in the South Island, and are widely, though patchily distributed throughout the North Island. Robertson et al. (2007) show records at only five locations in the South Island, none near Barrytown, although they acknowledge this probably reflects a lack of proper searching. Spotless crake were detected using acoustic recorders at Silverstream wetland (near Cape Foulwind) in February 2023, but were not detected there in other seasonal surveys during 2022 (Ecological Solutions Limited, unpublished data). There are probably only low numbers of spotless crake on the West Coast. Pūweto are birds of dense emergent vegetation and would not use the habitats within the site, but may use the habitats within the adjoining SNA.

Kotoreke (marsh crake) are sparsely distributed throughout the country, with few records on the West Coast between 1999 and 2004, and none near Barrytown (Robertson et al. 2007). Marsh crakes inhabit dense wetland vegetation similar to that adjoining the site, and are very secretive, usually being detected via their night time calling.

Although the habitat appears suitable within the SNA and adjoining wetland areas, including the coastal lagoon, there are no records for marsh or spotless crake within 10 km of the site and our acoustic recorder surveys have failed to detect them. Although the raupō within the lagoon provides suitable habitat for foraging and breeding for both species, on the balance of probabilities it seems unlikely that they are present.

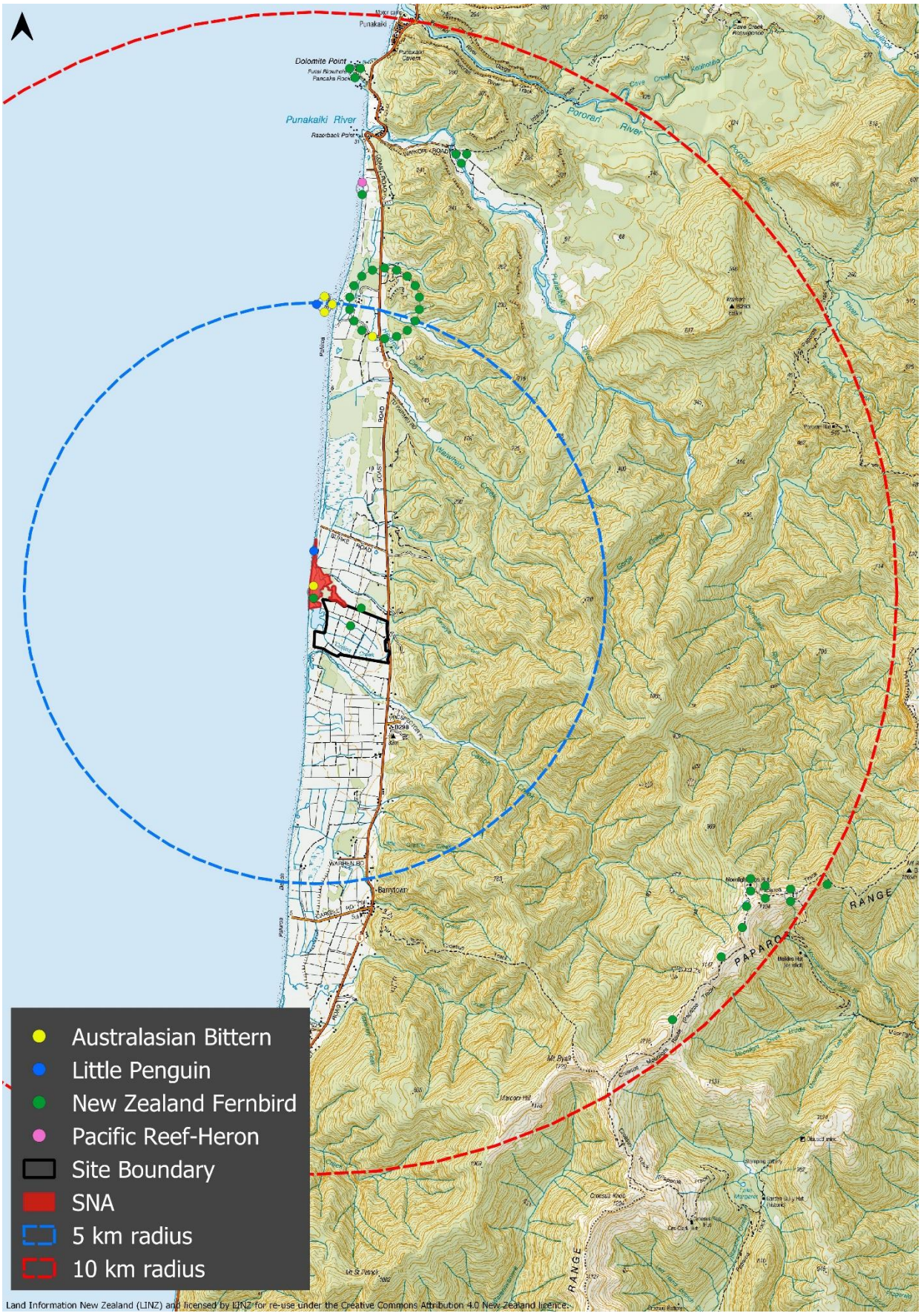


Figure 1: Cryptic/Secretive bird species within 10 km of 3261 Coast Road, Barrytown

Item 25

The information required under items 23 and 24 may require your ecologist to visit neighbouring properties. However, you may not be able to obtain landowner permission to visit those properties. Council may be able to obtain landowner permission to make that assessment. In that case, please agree to the commissioning of a report in relation to those matters under section 92(2) of the RMA.

In preparing the assessment of ecological effects which accompanied the application we have been conservative in our assumptions, including that wetlands are present adjoining the site and that bird species may be using the adjoining areas. This conservatism is appropriate and also means that we do not need to visit neighbouring properties because we have assumed the areas have ecological values which need protecting and provided for that protection as part of our recommended management actions.

Concluding Statement

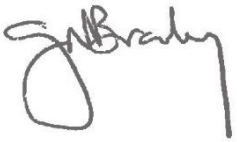
The changes in water level anticipated would most likely be tolerated by robust native species and those native species adapted to either a wide range of moisture or fluctuating conditions, but they may put more sensitive species, such as small wetland herbs or other turf species which are adapted to occasional inundation and alternating exposure, at risk of being outcompeted by exotic plants if the changing water levels result in more prolonged exposure. The water management plan is predicated on avoiding effects for these species. In addition, species which are already of conservation concern would likely be at more risk than common species. No species of conservation concern have been detected in the coastal lagoon area and those present at Maher Swamp (north of the site) are not expected to be vulnerable to varying groundwater levels. On that basis the plant communities and species' populations are not considered vulnerable to the types of hydrological changes expected. A focus on planting and weed control to maintain representativeness, ecological intactness, resilience, community resistance and indigenous dominance is proposed as being likely the best approach to reducing effects due to minor hydrological changes.

All of the secretive bird species present are territorial and could be expected to have been detected (even at low levels) in the seasonal bird surveys undertaken for the project which included use of several acoustic recorders for approximately 7 – 10 days each survey. With the exception of mātātā and kororā, these species are not common on the West Coast. The suitable habitats for these species are in the wetlands adjoining the proposed mine site and none would be expected to use the exotic pasture within the mine footprint. The use of physical setbacks, planting, seasonal surveys for the life of mining (to detect any birds that may arrive as mining proceeds) and timing of mining near the sensitive areas are all proposed to reduce effects on birds (including common birds) using the adjoining habitats.

We have assumed that adjoining habitats that we could not access have ecological values that must be protected and have provided for that protection as part of the recommended management actions, particularly with respect to water management at the site.

Please don't hesitate to contact me if you have any further questions.

Ngā mihi mahana



Dr Gary Bramley

Ecologist

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