

Before the Waikato Regional  
and Hauraki District Councils

---

Under the Resource Management Act 1991 (**RMA**)

In the matter of An application for resource consents to extend the Waihi Gold Mine via underground and open pit mining methods known as Project Martha

By **Oceana Gold (New Zealand) Limited**  
Applicant

---

**Statement of evidence of Ian Kenneth Grant Boothroyd  
for Oceana Gold (New Zealand) Limited**

29 October 2018

---

**Counsel:**  
Stephen Christensen  
Project Barrister  
PO Box 1251, Dunedin Metro 9054  
P 027 448 2325  
stephen@projectbarrister.nz

## Qualifications and experience

- 1 My name is Ian Kenneth Grant Boothroyd.
- 2 I hold the qualifications of BSc (Hons) Zoology (University of Manchester, UK), MSc Applied Hydrobiology (University of Wales, UK), and DPhil Freshwater Ecology (University of Waikato, NZ).
- 3 I am a Senior Principal and Team Leader Ecology at Boffa Miskell Ltd., Auckland.
- 4 I have over 30 years' experience of assessing ecological and resource management matters in New Zealand and overseas. I am an elected Fellow of the Royal Society of Biology (FRSB), a Certified Environmental Practitioner (CEnvP) and a member and immediate Past-President of the New Zealand Chapter of the Environmental Institute of Australia and New Zealand (EIANZ). I am also a former President of the NZ Freshwater Sciences Society.
- 5 I am a member of the Royal Society of New Zealand (MRSNZ) and a former elected Councillor of the RSNZ. Previously I have worked for the University of Auckland, Golder Associates (NZ) Ltd, National Institute of Water and Atmospheric Research as well as the Hawke's Bay and the Waikato Regional Councils.
- 6 My areas of expertise are in ecology, the assessment of impacts of developments on aquatic and terrestrial resources, assessments of the value of and significance of freshwater and terrestrial environments, and the restoration and mitigation of any environmental effects.
- 7 I have experience in working across a range of freshwater ecological resources from large rivers to small streams and wetlands throughout the North and South Islands.
- 8 I have provided advice on several mining and mineral extraction projects, including the establishment of instream water quality limits. I have developed and implemented monitoring programmes to measure the effects of discharges on aquatic ecosystems. I have published book chapters on the subject of assessing the effects of mining on New Zealand waterways<sup>1</sup>.
- 9 I have undertaken assessments of freshwater resources and riparian management throughout New Zealand. I have led and conducted scientific research on the benefits of riparian planting to stream and river biodiversity, and I have published

---

<sup>1</sup> Boothroyd, I. K. G.; Goldstone, A.; Fitzpatrick, M.; Gilvaray, R. 2005: Criteria for the protection of aquatic ecological values at Golden Cross Mine: a case study. In: Metal Contaminants in New Zealand: Moore, T.A.; Black, A.; Centeno, J. A.; Harding, J. S.; Trumm, D. A. eds. Resolutionz Press, Christchurch, NZ. Harding, J. M.; Boothroyd, I. K. G. 2005: Impacts of Mining. In Freshwaters of New Zealand. Harding, J.; Mosley, P.; Pearson, C; Sorrell, B. eds. New Zealand Hydrological Society and New Zealand Limnological Society, Christchurch.

a number of scientific papers on the subject of the benefits of riparian planting to aquatic ecosystems<sup>2</sup>.

- 10 In addition, I have co-authored several national protocols for aquatic management and assessments including instream monitoring<sup>3</sup>, and instream habitat assessments (including riparian assessments)<sup>4</sup>. Most recently I have co-authored the 'Guidelines for Ecological Impact Assessment in New Zealand', published by the Environment Institute of Australia and New Zealand.
- 11 I am also familiar with frameworks and criteria used for the assessments of the significance of ecological values and their application to biodiversity management and enhancement.
- 12 I have prepared and presented evidence in Council hearings and before the Environment Court on behalf of clients covering a number of development projects as well as policy development.
- 13 I have visited the site and the waterways on many occasions from 1987 to the present day.
- 14 In preparing this evidence I have reviewed:
  - (a) The reports and statements of evidence of other experts giving evidence relevant to my area of expertise, including:
    - (i) Project Martha, Surface Water Hydrology, GHD Limited (evidence presented by Ms Sioban Hartwell)
    - (ii) Project Martha, Geochemistry, AECOM 2018 (evidence presented by Mr Ian Jenkins).
  - (b) The parts of the section 42A report relevant to my area of expertise.
  - (c) Submissions relevant to my area of expertise.

---

<sup>2</sup> Boothroyd, I. K. G., Harding, J. S., Death, R. 2002: Guide to the selection of reference sites for Environment Monitoring in New Zealand Rivers and Streams; New Zealand Macroinvertebrate Working Group Report No. 2. Prepared for the Ministry for the Environment; Boothroyd, I. K. G., Quinn, J. M., Langer, E. R., Steward, G. Costley, K. 2004: Riparian buffers mitigate effects of pine plantation logging on New Zealand streams: 1. Riparian vegetation structure, stream geomorphology and periphyton. Forest Ecology and Management 194: 199-213; Quinn, J. M., Boothroyd, I. K. G., Smith, B. 2004: Riparian buffers mitigate effects of pine plantation logging on New Zealand streams 2. Invertebrate communities. Forest Ecology and Management 191: 129-146; Rowe, D. K., Smith, J., Quinn, J., Boothroyd, I. 2002: Effects of logging with and without riparian strips on fish species abundance, mean size, and the structure of native fish assemblages in Coromandel, New Zealand, streams. New Zealand Journal of Marine and Freshwater Research 36: 67-79.

<sup>3</sup> Stark, J. D., Boothroyd, I. K. G., Harding, J. S., Macted, J. R., Scarsbrook, M. R. 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment.

<sup>4</sup> Harding, J., Clapcott, J.E., Quinn, J.M., Hayes, J.W., Joy, M.K., Storey, R.G., Greig, H.S., Hay, J., James T., Beech, M.A., Ozane, R., Meredith, A.S., Boothroyd, I.K.G. 2009: Stream Habitat Assessment Protocols for Wadeable Rivers and Streams of New Zealand. University of Canterbury.

- 15 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence has been prepared in accordance with it and I agree to comply with it. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

### **Scope of evidence**

- 16 I have been asked by Oceana Gold (New Zealand) Limited (OGNZL) to prepare evidence in relation to the aquatic ecological effects of Project Martha. This includes:
- (a) A description of the existing water quality and aquatic and riparian ecology of the Ohinemuri River and Mangatoetoe Stream in the area affected by the mine.
  - (b) An assessment of the effects of water abstraction from the Ohinemuri River for the purpose of Project Martha.
  - (c) An assessment of the likely ecological issues related to the Martha pit lake and associated outlet discharge.
- 17 I confirm that my evidence relates to the proposal known as Project Martha as described in Chapter 3 of the Assessment of Environmental Effects dated 25 May 2018 (AEE).
- 18 I confirm that I am the author of a report dated 25 May 2018 entitled Project Martha Assessment of Freshwater Ecological Effects attached as Appendix J to the AEE, and also the version dated 10 August that was prepared in response to the WRC further information request received 11 July 2018.

### **Executive summary**

- 19 The existing water quality and aquatic and riparian ecology of the Ohinemuri River and Mangatoetoe Stream was assessed using several sources of monitoring and survey information.
- 20 For the most part water quality variables met the WRC 'Excellent' category for the physico-chemical components (pH, dissolved oxygen, turbidity) of water quality within the Ohinemuri River. Not all attributes monitored by WRC are the equivalent of those used in the National Policy Statement Freshwater Management (NPS-FM) categories listed but the median value for total phosphorus suggests at least satisfactory quality (WRC water quality categories).
- 21 The aquatic ecological values in the vicinity of the proposed abstraction are moderate and values increase towards the headwaters. The Ohinemuri River and its tributaries also has a valuable trout fishery, especially in its lower reaches.

- 22 A voluntary programme of riparian planting has been undertaken by Waihi Gold Ltd. (antecedent mining organisation to OGNZL) along all riparian areas adjacent to land it owns or obtained permission to plant from the adjacent owner (primarily that land is owned or managed by local authorities or central government bodies), including tributaries. the result is a mature riparian vegetation that contributes greatly to the ecological values of the Ohinemuri River (as well as natural character and amenity values).
- 23 I based my assessment of effects of the proposed abstraction on a FRE3 analysis, recommendations for flow requirements for physical habitat for fish and aquatic invertebrates in the Ohinemuri River, and my knowledge of the river and its fauna.
- 24 In my opinion, the life-supporting capacity of the river, including water quality, of the Ohinemuri River will be safeguarded and there will be little to no measurable adverse effects resulting from the proposed modifications to the abstraction.
- 25 The 2xMALF threshold for abstraction means that river flows after the proposed abstraction (at 2xMALF) will always meet at least 90% optimum habitat flows (or greater) for all fish species (including trout spawning and trout rearing). The threshold flow below which habitat declines sharply is also met for all fish species, as a result of the 2xMALF threshold for the proposed abstraction.
- 26 In my opinion, there will be no meaningful impact on the natural flow variability and thus no impact on the wetland values and function associated with the proposed abstraction.
- 27 In my opinion, the increase in proposed abstraction will have a less than minor impact on useable habitat for spawning, juvenile raising, and feeding of fishes; and no meaningful changes in areas suitable for desirable macroinvertebrates, periphyton and macrophytes.
- 28 During the filling of the pit lake, the water quality is expected to be consistent with a eutrophic lake, and the extent of primary production during filling will be limited by the availability of phosphorus in the source waters.
- 29 After filling, the internal cycling of nutrients is likely to dominate nutrient availability and both physical and biogeochemical mechanisms will control nutrient availability resulting in a likely reduction in the trophic status of the lake.
- 30 Unless specifically provided for, there is unlikely to be extensive habitat for fish or benthic aquatic organisms in the pit lake. I do not expect the water quality and habitat within the pit lake to be suitable for trout (which are not climbing fish).
- 31 In my opinion, provision should be made for passage for eels to and from the lake at its outlet, as habitat for other fish is likely to be limited within the pit lake.

- 32 Once full, the lake water will discharge to Mangatoetoe Stream. I am confident that the discharge will not result in any adverse effects on the aquatic ecology of the Mangatoetoe Stream as 30 years of water quality and biological monitoring within the Ohinemuri River has demonstrated that the water quality standards applied in the current consent have proved very effective at protecting the aquatic ecology of the river. These standards are protective of aquatic life and therefore remain appropriate as water quality standards to be met in the Mangatoetoe Stream, and no changes are recommended.
- 33 In summary I do not expect the proposed change to the abstraction from the Ohinemuri River for lake filling, or the discharge from the lake once full will result in any adverse effects greater than minor on the Ohinemuri River or its tributary, the Mangatoetoe Stream.

### **Freshwater environments at Waihi**

- 34 The site location and description of the project have been provided in the Assessment of Environmental Effects (AEE) accompanying the applications for resource consents.
- 35 The Ohinemuri River<sup>5</sup> is a large tributary of the Waihou River, and arises in the Waihi Basin, at the base of the Coromandel Peninsula in the northeast of the Waikato Region. The Ohinemuri River catchment is some 287 km<sup>2</sup>, with an average annual rainfall near 2700mm in the north, but closer to 1500mm in the south<sup>6</sup>.
- 36 The Ohinemuri River catchment is not identified as a priority catchment or as an outstanding freshwater body (although the Waihou River at Whites Road is listed to be included as outstanding) in the WRPS (section 8.2.1).

### **Water quality and ecological values of the Ohinemuri River**

- 37 There have been numerous programmes and reports detailing the water quality and ecology of the Ohinemuri River, from the early 1980's through to the present day. I have relied on this existing information as evidence and to inform my opinion on the effects of the proposed Project Martha on the Ohinemuri River.
- 38 The most relevant, recent, and long-term water and ecological monitoring programmes are held and reported by OGNZL (annual compliance monitoring since 1987), NIWA (National Rivers programme), and the Waikato Regional

---

<sup>5</sup> The full name is Te Waitangi-o-Hinemuri: literally "the weeping water of Hinemuri, the youngest daughter". In Maori legend the river and floodplain were formed by the tears of Hinemuri. She was the youngest daughter of the Hauraki chief who turned away her many suitors because her older sisters remained unwed until finally the suitors fell away and she was left alone and disconsolate. Her copious tears formed the river and floodplain (see fn 2 below).

<sup>6</sup> <https://www.niwa.co.nz/freshwater-and-estuaries/freshwater-and-estuaries-update/no01-2002/freshwater-feature-ohinemuri-river-coromandel>

Council (State of the environment monitoring). All of the programmes include sampling of water quality and of ecological attributes of the river.

- 39 In my opinion the overall water quality condition of the Ohinemuri River is best informed from the Waikato Regional Council monitoring data, as it covers the river above and below the Martha Mine site, and the sampling contains a range of water quality variables related to the impacts of the broader land use in the catchment.
- 40 In my opinion, the ecological values of the Ohinemuri River in the vicinity of Martha Mine are best informed by the consent monitoring undertaken by OGNZL. The OGNZL data is focused on the reaches of the Ohinemuri River most relevant to Project Martha, and in the vicinity of the proposed abstraction, and the data is relevant to the effects of all land use in the catchment.

#### *Water quality*

- 41 I have looked at how the water quality of the Ohinemuri River compares to relevant water quality standards. The most relevant water quality standards are:
- National Policy Statement Freshwater Management (NPS-FM).
  - Waikato Regional Council Water Quality Categories.
- 42 It is not my intention to detail all aspects of these monitoring programmes here. My evidence is based mostly on recent monitoring data (2013 – 2018) obtained from the Waikato Regional Council, and information provided on the ‘Land, Air, Water, Aotearoa’ (LAWA) website. I have provided a summary of this data in Appendix A, and in the same table show the respective water quality standards. I have also provided a map showing the water quality sampling sites as Appendix B of my evidence.
- 43 For the most part water quality variables met the WRC ‘Excellent’ category for the physico-chemical components (pH, dissolved oxygen, turbidity) of water quality within the Ohinemuri River. Not all attributes monitored by WRC are the equivalent of those used in the NPS\_FM categories listed but the median value for total phosphorus suggests at least satisfactory quality (WRC water quality categories).
- 44 LAWA<sup>7</sup> reports the water quality of the Ohinemuri River at SH25 and Karangahake Gorge (respectively upstream and downstream of both the proposed abstraction point, and the existing treated water treatment plant discharge) as within Category A NPS-FM attribute state for dissolved oxygen, ammoniacal nitrogen, TON and E.coli but that trends were declining (for TON and DRP) or improving (especially total phosphorus). I note that at the Queens Head site (downstream of the

---

<sup>7</sup> [www.lawa.org.nz/explore-data/waikato-region/river-quality/waihou-river](http://www.lawa.org.nz/explore-data/waikato-region/river-quality/waihou-river)

proposed abstraction site), the LAWA site reports E. coli, TON and ammoniacal nitrogen (annual median) also as meeting NPS Category A, but the annual maximum for ammoniacal nitrogen also as Category A and listed as degrading. I note that the discharge from the HDC oxidation ponds occurs just upstream of the Masonry Dam, but downstream of OGNZL's activities.

- 45 Water quality within the Ohinemuri River has elevated levels of nitrogen (satisfactory – unsatisfactory) but lower levels of phosphorus (~satisfactory-excellent). Biological indicators of water quality (cf; periphyton, MCI and QMCI) show a poor to moderate water quality condition of the Ohinemuri River within the Waihi Basin, and indicative of moderate nutrient enrichment (LAWA<sup>8</sup>, Golder 2017), mostly resulting from landuse activity within the catchment.

#### *Ecology*

- 46 The OGNZL ecological monitoring programme requires that habitat, algae, macroinvertebrates and fish are surveyed at regular intervals. The most recent survey data is provided in Golder (2017), but reports on baseline studies and regular monitoring extend back to 1983.
- 47 In the mid-lower reaches of the Ohinemuri River, indicators of ecological values suggest moderate ecological values, and values increase towards the headwater areas. Golder (2017) concluded that there is no evidence that discharges associated with mining activities at Waihi have an adverse impact on the ecological values of the Ohinemuri River.
- 48 The Ohinemuri River, especially in its downstream reaches, has a valuable trout fishery,

#### *Riparian vegetation*

- 49 It is worth noting that extensive plantings have been undertaken by OGNZL at the Martha Mine site. In total some 467,500 plants have been planted between 1991 and 2016, for a mix of riparian, swamp, gully and hillside enhancements.
- 50 This riparian planting was a voluntary initiative undertaken by Waihi Gold Ltd. (antecedent mining organisation to OGNZL) along all riparian areas adjacent to land it owns or obtained permission to plant from the adjacent owner (primarily that land is owned or managed by local authorities or central government bodies).
- 51 Available records show that some 91,600 plants covering 18.8 ha of riverbank were planted along the margins of the Ohinemuri River mainstem in the vicinity of the Martha Mine site between 1995 and 2005. Given the length of time that has passed

---

<sup>8</sup> [https://www.lawa.org.nz/explore-data/waikato-region/river-quality/waihou-river/ohinemuri-river-at-sh25-br-mci\\_swq/](https://www.lawa.org.nz/explore-data/waikato-region/river-quality/waihou-river/ohinemuri-river-at-sh25-br-mci_swq/)

since even the last of these plantings, the result is a mature riparian vegetation that contributes greatly to the ecological values of the Ohinemuri River (as well as natural character and amenity values).

- 52 In addition to these plantings some 107,000 plants (covering 10 ha) have been planted alongside a number of tributaries to the Ohinemuri River, including over 70,000 plants (covering 5.9 ha) alongside the Ruahorehore Stream; likewise contributing to the ecological health and values of the river system as a whole.
- 53 The benefits of retaining and planting the riparian areas of rivers and streams are well documented and include:
- Providing shade for the reduction of water temperatures.
  - Providing shade to waterways preventing excessive aquatic plant and algal growth.
  - Providing leaves and branch material to the stream.
  - Providing habitat for terrestrial fauna that falls into the waterway.
  - Reduces bank erosion and sediment intrusion to waterways.

#### **Effects of water abstraction on the Ohinemuri River**

##### *The proposed amendment to the water abstraction*

- 54 Resource consent 971287<sup>9</sup> authorises the take of surface water from the Ohinemuri River for the purposes of:
- Accelerating the flooding of the underground workings on completion of Golden Link Project; and
  - Accelerating the filling of the pit lake on completion of the Golden Link Project.
- 55 The current consented abstraction point is located in the vicinity of the second WTP discharge (E2) as shown in Appendix B, and provides for:
- a take of up to 15,000 cubic metres of water per day;

---

<sup>9</sup> Resource consent 971287 was granted for the Martha Mine Extended Project and expires on 13<sup>th</sup> October 2021. Resource consent 121417 was granted for the Trio Mine and expires on 12 October 2025. Resource consent 121695 was granted for the Trio Mine and expires on 13<sup>th</sup> October 2015. Resource consent 121417 was granted for the Golden Link application and expires on 4 December 2012. Each provides for the one activity as relating to each of the projects.

- a restriction of take to times when river flows are more than twice the 7-day mean annual low flow (MALF)<sup>10</sup> at the point of abstraction;
- The maximum rate of abstraction shall not exceed 10% of the river flow at the point of abstraction; and
- The maximum abstraction rate for the Ohinemuri River of 175 l/s.

- 56 It is worth clarifying here that the MALF for the Ohinemuri River as calculated at the Frenodrups site upstream of the proposed abstraction point is 0.3 m<sup>3</sup>/s (median flow is 0.91 m<sup>3</sup>/s). In her evidence, Ms Hartwell, states that the 2xMALF value at the point of abstraction is estimated to be 0.85 m<sup>3</sup>/s.
- 57 The Project Martha proposal is to increase the amount of water that can be taken from the Ohinemuri River for the purpose of accelerating the filling of the Martha Pit and the flooding of the underground areas at the cessation of mining. It is worth noting that OGNZL already holds consent to take water from the Ohinemuri River at the same location when river flows are more than twice the annual low flow at the point of abstraction, but the maximum rate of abstraction from the Ohinemuri River shall not exceed 10% of the river flow.
- 58 It is my understanding that, because the filling of the lake once mining ends is a consent requirement it is practically certain that the existing consent will be exercised if the applied for consent is not granted. The application for the new consent is therefore principally concerned with understanding the effects of the proposed increase in the rate/volume of take above 175 l/s.
- 59 The proposal is to take up to 20% of the river flow at the point of abstraction when the flow is at or greater than twice MALF at a maximum instantaneous net rate of 270 litres per second. This will enable an annual average abstraction of 15,000m<sup>3</sup>/day and has been calculated to mean that the pit lake should fill to the overflow level (with a resulting commencement of discharge to the Mangatoetoe Stream) about 10 years after pumping commences.
- 60 It is readily apparent that the proposed increase in take (and as for the current consent conditions) will only affect the river when flows are at or elevated above 2xMALF, and the proposal will not affect the river flows at lower flows, when the effects of abstraction on ecological function and biodiversity are likely to be higher. However, the abstraction will occur at times when flows are less than median flows in the river. Therefore, it is important to understand the effects that the draw off of

---

<sup>10</sup> For the purpose of my evidence and for the application, I use the term MALF which refers to the 7 day MALF. 7 day MALF (or MALF) is the 7 consecutive day low flow averages for each year on record, and then averaged over years available

water during 2xMALF might have on the overall characteristics of river and ecological function of the Ohinemuri River.

*Effects on hydrological characteristics*

- 61 In order to understand any changes in the hydrological characteristics of the Ohinemuri River, I have used the FRE3 metric. The FRE3 flow statistic is a useful metric for understanding the frequency of disturbance that a river (biota) is subject to, i.e., the regime of floods and freshes.
- 62 Clausen and Biggs (1996, 1997) identified the average annual frequency at which flows exceed three times the median (FRE3) as the most useful flow statistic for classifying rivers according to the habitat for benthic biota (periphyton and invertebrates). The statistic FRE3 is derived by calculating three times the median flow, counting the number of occasions that this was exceeded in the flow record and dividing this number by the number of years of record.
- 63 In other words, FRE3 is an indicator of flood or fresh events that cause ecological disturbance, such that a low FRE3 value (e.g., FRE3 <5) indicates a stable flow regime (e.g., a spring or lake-fed river); and rivers with higher FRE3 (e.g., FRE3 > 10) tend to drain high rainfall areas that may have a high base flow but also have frequent floods that disturb the river bed. I have provided the results of our FRE3 analysis as Appendix C of my evidence.
- 64 The FRE3 statistic for all scenarios places the disturbance regime of the Ohinemuri River catchment in a 'low relief country' flow regime (MFE 1998). The difference between the no-extraction (FRE3 = 14.16) to the proposed peak extraction (FRE3 = 13.59) shows a small and insignificant reduction (a FRE3 of 0.57 or approximately 4%) in the FRE3 value.
- 65 Thus, the Ohinemuri River will retain its overall hydrological disturbance regime with the proposed abstraction regime in place. That is because the FRE3 statistic varies little when the proposed abstraction regime is applied and retains the 'low relief country' flow regime.

*Effects on ecological characteristics and function*

- 66 In addition, there are unlikely to be any significant changes to the biological character and values of the river as a result of the proposed new abstraction regime because the frequency of high water flow events (as defined by 3xmedian flows) will not vary to any great extent.
- 67 The freshes and floods that typically move bed materials, flush algae from the substrate and re-suspend sediment will still occur within the natural regime for the river. This means that even at low flows when the river substrate can be subject

to extensive periphyton growths, the natural flushing regime of higher flows will remain and still provide the flushing capacity.

- 68 The effects of elevated levels of nutrients generally manifest themselves during low flows, particularly during summer, when a combination of low flows, higher temperatures, greater light penetration, nutrient enrichment and suitable habitat can result in excessive growth of algae and macrophytes, which can influence the aquatic biota communities.
- 69 At elevated flows, the flows play a role in removing the algae and macrophytes (through movements of the bed substrates, uplifting roots and abrasion from movement of bed materials), but also introduce increased volume of sediments and nutrients as direct run-off from the land. For the most part, under such higher flow conditions, the additional nutrients and sediments will be washed downstream and settle once flows recede. Although some nutrient enriched water and sediment load will be removed as part of the abstraction, the proportion is not likely to change the downstream water quality or ecological characteristics of the river.
- 70 At low flows there can be a reduction in the streambed habitat area or wetted area available for aquatic life to persist. This generally means that the river water can:
- retreat from its margins (thus exposing and drying out the margins, and decreasing the wetted area of substrate available as habitat).
  - be shallower (less depth).
  - can warm up more rapidly.
  - plant and algal growth can fill the water column thus reducing space available for aquatic life.

When these circumstances occur, there is:

- less useable habitat for spawning or as nursery areas for juvenile fish.
  - less area for macroinvertebrates (which are also food for fish) to live and carry out their life cycles.
  - Increased water temperatures can result in direct and indirect impacts on the fauna.
- 71 The proposed modification to the take will not result in this situation occurring as it is not intended to abstract when the river reaches these low flow conditions.

*Effects on physical habitat*

- 72 The Waikato Regional Council<sup>11</sup> commissioned NIWA to investigate flow requirements for fish in the Ohinemuri River and its tributaries. In this report on the '*Flow requirements for fish habitat in the Ohinemuri River, Waihou River and selected tributaries*', Jowett (2014) considers the effects of flows on habitat availability for fish, and for the production of food for fish (i.e., benthic macroinvertebrates).
- 73 In the report, the author, Mr Ian Jowett, provides tables of suggested flow requirements for fish and fish food habitat for sections of the Ohinemuri River and selected tributaries, including a section of the Ohinemuri River upstream of the proposed abstraction site (Golden Valley Road Bridge). I have used the suggested flow requirements for the Ohinemuri River at the Golden Valley Road Bridge to assess the effects of the proposed modified abstraction on physical habitat availability for aquatic life within the river.
- 74 The flow requirements for fish habitat for the Ohinemuri River at the Golden Valley Road Bridge suggested by Jowett (2014) are provided in Table 1 below.
- 75 River flows after the proposed abstraction (at 2xMALF) will always be at least 90% optimum habitat flows (or greater) for all fish species (including trout spawning and trout rearing). The threshold flow below which habitat declines sharply is also met for all fish species, as a result of the proposed abstraction.
- 76 Jowett (2014) also includes torrentfish in his assessment, but he notes in the report that this fish is known from the tributary sites, and only possibly from the main stem of the Ohinemuri River. I note that the annual compliance monitoring has not recorded torrentfish from the main stem of the Ohinemuri River during the last five years of sampling reports that I have viewed.
- 77 Jowett (2014) also suggested flow requirements for surface water width (0.15 m<sup>3</sup>/s) and benthic macroinvertebrates (0.8 m<sup>3</sup>/s). The proposed abstraction at 2xMALF will never effect the suggested flow for surface water width and provides for the flow recommended for good invertebrate habitat.

---

<sup>11</sup> Waikato Regional Council 2014: '*Flow requirements for fish habitat in the Ohinemuri River, Waihou River and selected tributaries*'. Waikato Regional Council Technical Report 2014/12. Report prepared by Ian Jowett (NIWA) for Waikato Regional Council.

Table 1: Suggested flow requirements for selected fish species in the Ohinemuri River (from Jowett 2014).

Habitat	Flow (m <sup>3</sup> /s) that provides for				Flow (m <sup>3</sup> /s) below which habitat declines sharply
	optimum	90% of optimum	80% of optimum	70% of optimum	
Rainbow trout spawning	1.4	0.75	0.55	0.35	0.6
Rainbow trout rearing	1.0	0.7	0.55	0.45	0.65
Longfin eel	0.3	0.7	0.55	0.45	0.65
Shortfin eel	0.5	<0.1	<0.1	<0.1	<0.1
Common bully	0.3	0.18	0.12	0.1	0.25

- 79 In my opinion, the flow recommendations reported by Jowett (2014) are a sound basis for informing the effects of the proposed abstraction on the physical habitat of the Ohinemuri River downstream from the take point.
- 80 In my opinion, the increase in proposed abstraction will have a less than minor impact on useable habitat for spawning, juvenile raising, and feeding of fishes; and no meaningful changes in areas suitable for desirable macroinvertebrates, periphyton and macrophytes.
- 81 Based on the FRE3 analysis, the suggested flow requirements for physical habitat in the Ohinemuri River, it is my opinion that the life-supporting capacity, including water quality, of the Ohinemuri River will be safeguarded and there will be little to

no measurable adverse effects resulting from the proposed modifications to the abstraction.

*Effects on wetlands and significant indigenous areas*

- 82 Natural flow variability is also important for sustaining wetlands associated with rivers and streams. The periodic inundation of wetland areas from elevated flows, and the connection that groundwater has with the natural river levels, are essential components of wetland function.
- 83 Wetland areas occur along the margins of the Ohinemuri River, both within the vicinity of the Martha Mine site, and downstream. These wetland areas vary in size and for the most part are highly modified; however, these wetlands can have significant values for terrestrial fauna (e.g., marsh birds) and aquatic biota (e.g., feeding grounds for eels). Wetlands have important functions in retaining water and the slow release of water for baseflow of waterways, trapping and retaining sediments (and other contaminants), denitrification, and retaining carbon.
- 84 As outlined above, the flow regime of the Ohinemuri River resulting from the proposed increase in abstraction remains largely unchanged and retains its natural flow characteristics. It is worth reiterating here that the proposal is to take only 20% of the river flow at the point of abstraction when the flow is equal to or greater than 2xMALF (thus not all of the elevated flow volume). Thus there will continue to be substantial elevated flood waters to periodically inundate the wetland areas, and the abstraction proposal will not impact these. The FRE3 analysis I have detailed in my evidence above supports this view.
- 85 As a result, in my opinion, there will be no meaningful impact on the natural flow variability and thus no impact on the wetland values and function associated with the proposed abstraction.

*Effects on fish passage and migration*

- 86 Several of the native fish species of New Zealand are 'diadromous' or 'sea run', which means that they migrate between freshwater and saltwater during some part of their life cycle. Species such as longfin and shortfin eels, require migration to the sea for breeding; others such as banded kokopu require passage for young larva to the sea for growth purposes. The migration (and spawning) periods are often associated with specific environmental conditions such as rainfall, river flows, temperature, lunar cycles and tidal regimes. Elevated river flows have been considered as a cue for migration upstream. The Ohinemuri River is also an important rainbow trout fishery, with spawning grounds in the river tributaries.
- 87 As the abstraction is restricted and provides for flows to continue downstream of a similar character and timeliness (as outlined above), and is restricted to 20% of

elevated flows at or above 2xMALF, in my opinion, the proposed increase in maximum water take from the Ohinemuri River is unlikely to result in any changes to fish migration regimes (or fish passage). The proposed abstraction will not create any impediments to upstream or downstream migration, nor changes to water quality that could affect species that need to move through the area.

- 88 It is worth noting that the existing consent requires screening of the intake at the abstraction point and it is intended that any new consent will require the same level of protection to prevent fish fatalities at the extraction point.

### **The pit lake**

#### *Pit lakes*

- 89 Details of the pit lake water chemistry are provided in the evidence of Mr Jenkins. Pit lakes form when open-cut mining operations cease and the remnant pit fills with ground, surface and rain water. Mine pits, and therefore pit lakes, tend to have high depth-to-surface-area ratios with steep sides (in order to minimise resource extraction costs).
- 90 As far back as the time of the granting of the original resource consents (water rights under the Water and Soil Conservation Act 1967 at the time of issue) and Mining Licence, the post-mining Martha Mine pit has been planned as a lake, with amenity areas and access available to the local community.
- 91 Pit lakes are a common feature of mine rehabilitation world-wide and in quarried and mined areas of New Zealand. Because these lakes are typically deep, relative to their area, pit lakes are prone to stratification. Therefore, pit lake water quality, and the effects of discharges from these lakes into receiving environments, cannot be assumed based on conservative mixing of the likely source waters.
- 92 Instead, pit lake chemistry has been modelled to account for changes in geochemistry, such as changes as a result of de-oxygenation and water quality changes at the water-sediment interface, taking stratification into account. The lake chemistry of the proposed Martha Mine Pit Lake (hereafter the lake) has been modelled and the results of water mixing in the lake, nutrient levels, and likely trophic state are provided in the evidence of Mr Jenkins.
- 93 Resource consent for the Golden Link project (124863) authorises the take of surface water from the Ohinemuri River for the purposes of accelerating the flooding of the underground workings on completion of Golden Link Project; and accelerating the filling of the pit lake on completion of the mining.

94 The effects of the water take on the Ohinemuri River are discussed in my evidence above. In the following section of my evidence, I consider the pit lake filling and the water quality and ecology of the lake.

#### *Lake filling*

95 Four water sources contribute to the filling of the pit lake:

- Groundwater; natural re-watering of the pit on cessation of pumping.
- Net rainfall: allowing for rainfall and evaporation of water to and from the lake surface.
- Pit wall runoff: rainfall on pit walls travelling overland to the pit lake.
- Ohinemuri River: water diverted from the river to supplement filling of the lake.

96 A potential fifth option as a water source for lake infilling is from the WTP.

97 The proportion of each of the above water source components will vary as the lake fills, and the details of lake filling is presented in the evidence of Mr Jenkins.

98 The time to fill the pit lake from the commencement of pumping from the Ohinemuri River under the abstraction consent being applied for by OGNZL has been calculated by GHD to be 9.4 years +/- 0.7 years at the 90th%ile confidence level (GHD 2018). This is discussed further in the evidence of Ms Hartwell.

#### *Lake water quality*

99 AECOM (2018) has modelled the potential water quality of the pit lake focussed on several different stages of both the lake filling, and of the lake post-filling, and is detailed in the evidence of Mr Jenkins.

100 Lake water quality will be affected by the pit wall lithology, mineralogy and the subsequent runoff into the lake, which will reduce the pH in particular without mitigation. It is my understanding that potential improvements to lake water quality can be achieved by reducing the relative contribution that pit wall run-off makes to the lake volume, and also by adding alkalinity to the river water to buffer against the acidity of the pit wall runoff. This is discussed further in the evidence of Mr Jenkins.

101 In his evidence, Mr Jenkins makes it clear that the treatment within the lake means that the overflow will meet the discharge resource consent conditions after mixing. I further discuss the discharge consent conditions in my evidence below.

102 Appendix V to the AEE, presents HydroNumeric's modelling of the water quality of the lake and its likely effects on primary production. External inputs of nitrogen will

be the dominant source into the lake during filling and will come from the river water (as nitrate and nitrite). Phosphorus levels from the river water are expected to be a low contributor to the lake water quality, and other sources such as pit wall runoff are expected to dominate. HydroNumerics conclude that during filling the nutrient availability is sufficient to suggest productivity consistent with a eutrophic lake, and the extent of primary production during filling will be limited by the availability of phosphorus in the source waters.

- 103 After filling, HydroNumerics go on to state that the internal cycling of nutrients is likely to dominate nutrient availability and both physical and biogeochemical mechanisms will control nutrient availability in the epilimnion, hence reducing the trophic status (and following observations in other pit lakes) to potentially oligotrophic with low productivity. After filling, loss of nitrogen from the lake due to denitrification in the anoxic waters may lead to a shift towards nitrogen limitation, therefore increasing the potential risk of cyanobacterial growth.

*Trophic status and ecology of the pit lake*

- 104 HydroNumerics concludes that the most relevant factors affecting the trophic status of the lake are light penetration, lake water disturbance and movement, lake stratification and nutrient availability.
- 105 Whether such algal blooms do occur once the lake is filled (recognising that during filling the lake will have restricted access for the public), their extent, and whether they will impact on the recreational use of the lake to any great extent are all uncertain. However, this uncertainty exists at present, and in my opinion, the proposed amendments of Project Martha are unlikely to alter the likelihood of algae blooms occurring between the existing consented conditions and the proposed amendments.
- 106 Over time, if the lake moves to a lesser trophic status, and the potential for high nutrient availability is decreased, the frequency of potential algal bloom events is likely to decrease.
- 107 At the time of the Golden Link Project, it was considered that the pit lake would be suitable for freshwater aquatic organisms, especially in the uppermost (20 m) layer, and it is my view that following the pit expansion and filling, the lake will remain suitable for colonisation and habitation by freshwater aquatic organisms.
- 108 In my opinion, I expect that with nutrient inputs from the river during filling, inputs of nutrients will decrease significantly following completion of the filling, and following an initial period of high productivity, the quality and trophic status of the lake is likely to improve in the longer term. I note that HydroNumerics reaches the same conclusion.

- 109 Nevertheless, typical open water invertebrates can be expected to colonise the lake, and zooplankton and algae will occur in the water column. Water birds are likely to visit the lake, and some may remain resident where conditions along the margins permit. However, the lake is not expected to have extensive habitat for birds.
- 110 As much as possible, provision for a littoral zone as part of the mine closure plan, that creates conditions for emergent and submerged aquatic plants (aquatic macrophytes) will provide additional habitat for aquatic organisms and birds, and contribute to the biotic productivity of the lake. The ability to provide riparian planting (especially for shading) is limited, but will assist in the provision of organic (allochthonous) material to the lake.

#### *Fish passage*

- 111 I note that the existing resource consent requires that passage to and from the lake for native fish is provided for. From my understanding of the design of the lake outlet structure, it is likely that only the hardiest climbers will reach the lake, such as eels and possibly banded kokopu. Unless specifically provided for, there is unlikely to be extensive habitat or refugia for fish or benthic aquatic organisms in the pit lake. I do not expect the water quality and habitat within the pit lake to be suitable for trout (which are not climbing fish).
- 112 I note that recent (currently unreported) sampling from the Mangatoetoe Stream did not record any banded kokopu (longfin and shortfin eels, common and Cran's bullies were recorded).
- 113 I recommend that the resource consent condition be amended to provide for fish passage for eels, as habitat for other fish is likely to be limited within the pit lake.

#### **Pit lake outlet discharge to the Mangatoetoe Stream**

- 114 Resource consent 971293 authorises the discharge of overflow from the pit lake via an outlet structure and channel to the Mangatoetoe Stream. The consent provides for:
- The outlet channel to be designed to provide for the passage of migratory fish.
  - Minimal disturbance to the bed of the Mangatoetoe Stream during construction of the outlet structure.
  - Receiving water quality standards for the Mangatoetoe Stream after mixing.
  - Monitoring of the Pit Lake water quality.
  - Monitoring of the water quality of Mangatoetoe Stream.

- 115 The consent requires that the quality of the Mangatoetoe Stream is equal to or better than the receiving water standards defined in Table 1 of the consent. The consent with the receiving water standards is included as Appendix D of my evidence. I note that the receiving water standards are from the USEPA (1985) standards.
- 116 In his evidence, Mr Jenkins confirms that the lake discharge water quality will meet the existing Mangatoetoe Stream receiving water quality standards (USEPA 1985, consent 971293). In my opinion, the quality of the discharge will ensure that these standards are met for the Mangatoetoe Stream.
- 117 I am confident that the discharge will not result in any adverse effects on the aquatic ecology of the Mangatoetoe Stream as 30 years of water quality and biological monitoring within the Ohinemuri River has demonstrated that these standards are very effective at protecting the aquatic ecology of the river. These standards are protective of aquatic life and therefore remain appropriate as water quality standards to be met in the Mangatoetoe Stream, and no changes are recommended.

### **Response to submissions**

- 118 I note that many of the submissions to the application by OGNZL refer to similar issues and concerns. As a consequence, rather than refer to each submission I will respond first to the submission from Fish and Game New Zealand (F&G) dated 13 September 2018.
- 119 In their submission, F&G raise a number of concerns regarding the effects of the proposed increase in the abstraction on:
- Instream water temperature downstream of the proposed take location.
  - Reduction in the available physical habitat.

#### *Instream water temperature*

- 120 In their submission, F&G state that temperatures greater than 19<sup>0</sup>C are not habitable by trout; and that temperatures of 25<sup>0</sup>C is the limit for indigenous fish. They go on to state that the proposed application will likely exacerbate the existing elevated river temperatures.
- 121 The Ohinemuri River is classified under the Waikato Regional Plan as both 'Significant Indigenous Fisheries and Fish Habitat' and 'Significant Trout Fisheries and Trout Habitat'. Amongst other standards for these classes, each has a temperature standard:

- Significant Indigenous Fisheries and Fish Habitat: The temperature of the water shall not be caused to exceed 25 degrees Celsius as a result of added heat and shall not adversely affect the passage or spawning of fish (standard 3.2.4.5 a vi).
- Significant Trout Fisheries and Trout Habitat: shall not exceed 20 degrees Celsius at any time. Where spawning occurs the temperature shall not be caused to exceed 12 degrees Celsius between May and September (standard 3.2.4.5 b iv).

122 F&G refer to the existing elevated temperatures of the river, and here I draw attention to the available data from records from the Ohinemuri River, upstream of the proposed intake location (at the 'Frendrups' location) and the treated water discharge.

123 The pattern of instream temperature with river flows at the Frendrups site during the summer months is shown in Appendix E of my evidence. For most of the time the instream temperature was below 25°C but spiked above that temperature on occasions,

124 The data shows that the river temperature already exceeds 19°C for about 20% of the record length, but of that time 76% (or about 15% of time) of the occurrences are recorded when the flow is low and the proposed abstraction would not be operating. The remaining time the river (from this same record) is at 19°C during which time abstraction could occur is limited to about 5% of the time. I consider that at 5% of the time, this would be insignificant, and will not result in adverse effects greater than minor on the aquatic ecology of the river.

125 This highlights that, even without the proposed abstraction, at times, water temperatures within the Ohinemuri River are elevated beyond the stated temperature threshold for trout habituation. What is evident is that trout continue to survive and reproduce in the Ohinemuri River, despite the elevations in temperature.

126 For the more critical temperature of 25°C for indigenous fish, as I have stated above, most of the time the river temperature was below this threshold.

127 In his report on '*Flow requirements for fish habitat in the Ohinemuri River, Waihou River and selected tributaries*', Jowett (2014), considers the effects of flows on water temperature and states:

*'Flow can also affect water temperature and dissolved oxygen and in some circumstances should be taken into account in assessing minimum flow requirements. Usually, changes in water temperature are small and*

*confined to increased daily variation and dissolved oxygen is only a problem in slow flowing streams dominated by macrophytes.'*

- 128 This view of small changes in water temperature with flow is also shared by Dr John Hayes, who in his evidence for a proposed water take from the Hakataramea River in the South Island<sup>12</sup> states:

*'these high temperatures are largely driven by climate, as water temperature is fairly insensitive to flow change. In my opinion, effects of surface water abstraction on water temperature are likely to be small and will not significantly affect fish and invertebrates in the Hakataramea River.'*

- 129 I acknowledge that the report cited above (Jowett 2014) is about flow setting in the Ohinemuri River, which is not the purpose of this application. However, the recommended flows are useful in determining the effects of the proposed abstraction on the life-supporting capacity of the river, including temperature, and physical habitat, which I have discussed above??.

#### *Physical habitat*

- 130 In its submission, F&G raise the issue of reduction in the available physical habitat within the Ohinemuri River. In my evidence above, I have commented on the effects of low flows on the habitat availability for life-supporting capacity within the Ohinemuri River.
- 131 In my opinion the proposed take will not result in any effects greater than minor on the life-supporting capacity and ecological function of the Ohinemuri River.

#### **Response to Waikato Regional Council S42A Report**

- 132 I have read the sections of the Waikato Regional Council S42A report relevant to aquatic ecology.

#### *Proposed abstraction*

- 133 In section 6.2 the staff officer refers to the submitters concerns about adverse effects on fishery values in the Ohinemuri River e.g., a reduction in habitat and impact from the volume of water to fill the pit upon the completion of mining. The report goes on to state that taking of the water during 2xMALF will reduce residual river flow rate and potentially habitat during these times.

---

<sup>12</sup> Infinity Investment Group Holding Limited vs Canterbury Regional Council in the matter of an appeal under section 120 of the Resource Management Act 1991

- 134 I have addressed these matters in my evidence above and conclude that, in my opinion, the proposed abstraction will not result in any effects greater than minor on the fishery values of the Ohinemuri River.
- 135 In particular, the staff officer refers to 'the reduction in the residual river flow rate'. I have referred to the flow requirements for fish and invertebrates in my evidence above and in my opinion the proposed abstraction does not result in any reduction in the residual flow rate or measurable adverse effects on the life-supporting capacity of the Ohinemuri River. I reiterate that the proposal is to abstract only 20% of river flows at or above 2xMALF; retaining 2xMALF continues to protect the life-supporting capacity and fishery values of the Ohinemuri River.
- 136 The staff officer has recommended a condition of resource consent that requires the preparation of a restoration or riparian plan for the river or a part of the river to create/enhance additional habitat to offset any impact the water take may have. I agree that waterways generally benefit from riparian planting, and in my evidence above, I have referred to the voluntary riparian planting of the Ohinemuri River and its tributaries that OGNZL has already undertaken.
- 137 I do not consider that such a condition is necessary as in my opinion, the proposed abstraction is unlikely to result in adverse effects greater than minor on the life-supporting capacity and ecological function of the Ohinemuri River.
- 138 I support the inclusion of a condition of consent that prevents any abstraction of river water when the instream water temperature reaches 25°C.

### **Conclusions**

- 139 Indicators of ecological values suggest moderate ecological values in the mid-lower reaches of the Ohinemuri River, in the vicinity of Martha Mine site. Water quality within the Ohinemuri River has elevated levels of nitrogen but lower levels of phosphorus. Biological indicators of water quality show a poor to moderate water quality condition of the Ohinemuri River within the Waihi Basin, and indicative of moderate nutrient enrichment.
- 140 The effect of increasing the take during elevated flows has minimal effect on the flow disturbance regime (as measured by FRE3). Based on an examination of flow requirements for aquatic biota fish, in my opinion the proposed abstraction will have little to no adverse effect on the life-supporting capacity and ecological function of the Ohinemuri River; and thus the life-supporting capacity of the river will be safeguarded.
- 141 During pit lake filling and for some years post-filling the lake is likely to resemble eutrophic status, and the extent of primary production during filling will be limited by the availability of phosphorus in the source waters. Over time, I expect the lake

to move to a lesser trophic status, and as the potential of high nutrient availability is decreased, the likelihood of potential algal bloom events is likely to decrease.

- 142 The extent and potential influence on contact recreation of algal blooms that may occur once the lake is filled is uncertain. However, this uncertainty exists at present, and in my opinion, Project Martha will not will alter the likelihood of algae blooms occurring.
- 143 The discharge quality of water from the filled lake will meet the existing consented water quality standards (based on USEPA 1985 criteria) for Mangatoetoe Stream. These standards are protective of aquatic life and therefore remain appropriate as water quality standards to be met in the Mangatoetoe Stream, and no changes to the discharge water quality standards are recommended.

A handwritten signature in black ink, appearing to read 'I. K. Boothroyd', written in a cursive style.

**Ian Boothroyd**

29 October 2018

## References

Clausen, B., and B. J. F. Biggs 1996. A flow index for classifying rivers as habitats for benthic biota. *Water and Atmosphere* 4(2):21-22.

Clausen, B., and B. J. F. Biggs 1997. Relationships between benthic biota and flow indices in New Zealand rivers. *Freshwater Biology* 38: 327-342.

GHD 2018. Project Martha: Water Management. Prepared for Oceana Gold New Zealand Limited, May 2018.

HydroNumerics 2018. Project Martha. Martha Phase 4 Extension. Pit Lake Limnology: Scoping Study of Water Quality – Nutrients and Primary Production. Prepared by HydroNumerics for Oceana Gold New Zealand Ltd., 22 May 2018.

Jowett, I 2014. '*Flow requirements for fish habitat in the Ohinemuri River, Waihou River and selected tributaries*'. Waikato Regional Council Technical Report 2014/12.

USEPA 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. Office of Research and Development Environmental Research Laboratories, United States Environmental Protection Agency, PB85-227049.

USEPA 1986. Quality criteria for water 1986. Office of Regulation and Standards, United States Environmental Protection Agency EPA 440/5-86-001.

## Appendix A

Summary statistics for water quality at selected sites along the Ohinemuri River and relevant water quality guidelines. Data provided courtesy of Waikato Regional Council. Data shows median values, with range in parentheses, followed by the number of samples. All units g/m<sup>3</sup> except where otherwise stated.

Site	SH25	Queen's Head	Karangahake Gorge	Trigger level (ANZECC 2000) <sup>#</sup>	NPSFM Attribute State (for rivers)	WRC Water Quality Categories <sup>§</sup>
Sample period	01/2013-01/2018	01/2013-01/2018	01/1994-02/2015			
Dissolved Oxygen	10.5 (8.8-11.7), 61	10.4 (8-13) 61	10.3 (9.7-10.8) 6		A=>8.0	E=>90% S=80-90% U=<80%*
pH (pH units)	7.2 (6.4-7.8), 61	7.1 (6.7-8.3) 61	7.2 (7.0-7.8) 6	7.2-7.8		E=7-8 S=6.5-7 or 8-9 U=<6.5 or >9
Turbidity (NTU)	1.04 (0.55-41), 61	1.1 (0.4-16.6) 61	1.48 (0.74-2.1) 6			E=<2 S=2-5 U=>5
Ammonia (NH <sub>4</sub> )	0.023 (0.01-0.049), 61	0.071 (0.011-0.29) 61	0.03 (0.015-0.037) 6	0.021	A=<0.03 B=>0.03- <0.24	
TKN	0.13 (0.06-1.02), 61	0.25 (0.09-0.79) 31	0.19 (0.13-0.28) 6			
TON (NNN)	0.45 (0.067-0.97), 61	0.95 (0.042-1.84) 61	0.68 (0.182-0.84) 6			
Total Phosphorus	0.011 (0.004-0.162), 13	0.01 (0.004-0.076) 61	0.009 (0.004-0.011) 6	0.033		E=<0.01 S=0.01-0.04 U=>0.04
DRP	0.005 (0.004-0.031), 61	0.005 (0.004-0.015) 61	0.0045 (0.004-0.005) 6	0.001		

<sup>#</sup> Default trigger levels for physical and chemical stressors in New Zealand for slightly to moderately disturbed ecosystems (ANZECC, 2000); <sup>§</sup>E=Excellent, S=Satisfactory, U=Unsatisfactory. <sup>§</sup> For Dissolved oxygen the WRC guidelines are expressed in percent saturation, and the monitoring results as g/L. The conversion of empirical units to percent saturation for dissolved oxygen in water is dependent on the water temperature and elevation at the site. However, median dissolved oxygen levels of >10 g/L would be expected to be >90% saturated and therefore be in the Excellent category.

## Appendix B

### Sampling site locations, Ohinemuri River and Mangatoetoe Stream



## Appendix C

144 For the Ohinemuri River, based on 94 years of flow, and considering 3xmedian flows alone:

- At the abstraction point the 3xmedian flow = 327,435 m<sup>3</sup>/d (3,790 L/s)
- Without abstraction this flow is exceeded 16.86% of the time.
- Under current consent conditions (peak extraction of 175 L/s and 10% take above 2\*7DMALF) the portion of days exceeding 3xmedian flow reduces to 15.77%.
- With peak extraction increased to 270 L/s (15,000 m<sup>3</sup>/d pump) and 20% take (above 2\*7DMALF) the portion of days exceeding 3xmedian reduces to 15.17%

145 For the FRE3 statistic<sup>13</sup>:

- Without abstraction FRE3 = 14.16 (exceedances/year)
- Under current consent conditions (peak abstraction of 175 L/s and 10% take above 2x7DMALF), FRE3 = 14.02
- With peak abstraction increased to 270 L/s (15,000 m<sup>3</sup>/d pump) and 20% take above 2x7DMALF), FRE3 = 13.59

---

<sup>13</sup> Note that the analysis is based on daily flow data so could miss short term fluctuations in flow, and one exceedance is counted from the point at which 3xMedian is exceeded until the daily flow drops below this again.

## **Appendix D**

Resource Consent 971293

# Resource Consent



HAMILTON OFFICE  
401 Grey Street  
PO Box 4010, Hamilton East  
Telephone 07 856 7184  
Facsimile 07 856 0551

File Number: 60 59 02M  
Resource Consent Number: 971293

**Pursuant to the Resource Management Act 1991, the Waikato Regional Council hereby grants consent to:**

Waihi Gold Company Limited  
P O Box 190  
WAIHI

A handwritten signature in black ink, appearing to be a stylized 'A' or similar character.

25/2/05

(hereinafter referred to as the Consent Holder)

**Consent type:** Discharge Permit  
**Consent subtype:** Discharge to Water

**Activity authorised:** To discharge overflow from the lake via an outlet structure and channel to the Mangatoetoe Stream at a maximum rate of 2,700 litres per second and at an average rate of 13 litres per second

**Location:** Area I (as identified on Waihi Gold Company Plan No.T70725A dated 25 July 1997)  
**Map Reference:** NZMS260 T13 : 614-197

**Term:** 35 years from date of commencement  
**Lapse Period:** 2 years from date of commencement  
**Date of commencement of consent:** 22 years from date of grant provided that the consent holder may by notification in writing to the Council nominate an earlier commencement date

**Subject to the following conditions:**

**CONDITIONS**

- 1 This consent is subject to each of the conditions set out in Schedule 1.
- 2 The consent holder shall be responsible for the structural integrity and maintenance of the works associated with the exercise of these consents and for any erosion control and energy dissipation works which become necessary as a consequence of the exercise of these consents.

**Ohinemuri River Intake**

- 3 The consent holder's design for the location and construction of the intake shall be submitted to the Waikato Regional Council for approval prior to construction.
- 4 The intake shall be provided with a screen designed such that the intake velocity at the screen surface does not exceed 0.3 m/s.
- 5 The intake screen mesh aperture size shall not exceed 5 mm dimension and the intake screen shall be located parallel to the river flow.
- 6 Disturbance to the stream bed during installation of the intake structure shall be minimised.
- 7 Water abstraction from the Ohinemuri River shall be restricted to times when river flows are more than twice the annual low flow at the point of abstraction.
- 8 The maximum rate of abstraction from the Ohinemuri River shall not exceed 10% of the river flow at the point of abstraction.
- 9 The maximum abstraction rate from the Ohinemuri River shall be 175 litres per second.
- 10 The consent holder shall establish and maintain river gauging facilities for the purpose of determining the Ohinemuri River flow at the point of abstraction. These facilities shall be located, installed and operated to the satisfaction of the Waikato Regional Council.
- 11 The consent holder shall determine and record daily the flow in the Ohinemuri River at the point of abstraction and shall measure and record the volume of water abstracted from the river. Those measurements shall be reported to Waikato Regional Council at annual intervals.

**Outlet to Mangatoetoe Stream**

- 12 The pit lake outlet shall be at or about RL104 m above mean sea level (RL1104 m above mine datum).
- 13 The pit outlet structure and channels shall be designed in such a manner that provides for passage of migratory fish species.
- 14 Disturbance to the Mangatoetoe Stream bed during installation of the outlet structure shall be minimised.
- 15 The consent holder shall retain a person or persons with recognised documented experience in the design of such structures (the Designer). All aspects of the design of this outlet structure shall be undertaken under the supervision of the Designer, who shall prior to the exercise of this consent provide to Waikato Regional Council written confirmation that all aspects of the design of this structure have been suitably investigated and properly and safely designed in accordance with currently accepted engineering practise.

- 16 The outlet structure and channel construction works shall be implemented under the supervision of persons with appropriate experience in the supervision of civil engineering construction works.
- 17 Following completion of the construction of this outlet structure the Designer shall supply to Waikato Regional Council further written confirmation that construction has been completed according to the design.
- 18 Prior to commencing discharge from Pit Lake the consent holder shall complete, to the satisfaction of Waikato Regional Council, a report that clearly details the likely incremental impact that this discharge will have on the flood routing capacity of the Mangatoetoe Stream.

The consent holder shall then prepare a plan of works designed to mitigate the impacts of this discharge on any potentially affected properties or public utilities in the Mangatoetoe Stream catchment.

Subject to the grant of any necessary consents, and at least 6 months prior to commencing discharge from Pit Lake, the consent holder shall implement those measures to the satisfaction of the Waikato Regional Council.

- 19 Discharge from the pit lake shall not commence until the discharge, after reasonable mixing, is able to meet the receiving water criteria specified in Table 1, and the consent holder has received written approval from the Waikato Regional Council for the discharge to commence.

#### **Pit Lake**

- 20 The consent holder shall, in consultation with the Waikato Regional Council, develop and undertake a monitoring programme to assess :
  - (a) Pit Lake water quality (at a range of depths) during filling. This programme shall commence within one month of cessation of dewatering or when the first water from Ohinemuri River is discharged to Pit Lake, whichever occurs first. Monitoring shall continue for a minimum period of five years after Pit Lake first overflows. This programme is for the purposes of comparing actual quality to the lake water quality predictions provided in the evidence of Mr M. Logsdon to the joint hearing committee and detailed in Appendix A of that evidence.

This monitoring programme shall include an assessment of the quality of the run-off from the pit wall, and an assessment of the aquatic life found in the lake.
  - (b) Mangatoetoe Stream water quality after discharge from Pit Lake commences. The consent holder shall monitor the effect of Pit Lake discharge on the Mangatoetoe Stream for a minimum period of five years after the lake first overflows. This programme is for the purposes of confirming that as a result of Pit Lake discharge (and after reasonable mixing) the quality of the Mangatoetoe Stream is equal to or better than the receiving water standards defined in Table 1.
  - (c) Springs arising from Pit Lake filling. The consent holder shall, in consultation with the Waikato Regional Council, develop and undertake a monitoring programme during lake filling and for a period of up to 5 years after filling for the purpose of locating any springs that may be reactivated or result from connections from Pit Lake.

This monitoring programme shall be submitted by the consent holder to the Waikato Regional Council whose approval shall be received prior to implementation of monitoring. Any updates required to the monitoring programme shall also be submitted to Council for approval.

- 21 The results of the monitoring programmes referred to in condition 20 shall be reported to the Waikato Regional Council on at least an annual basis from the date of commencement of lake filling. The reports shall discuss at least the following matters :
- (a) Pit Lake water quality;
  - (b) filling progress (e.g. percentage filled and predicted 'lake full' date);
  - (c) Mangatoetoe Stream water quality;
  - (d) what, if any, springs have been identified, the effect (actual and predicted) on Pit Lake water levels and the impact of the springs on the area at which they occur;
  - (e) any water quality trends that are apparent from the results of the monitoring programme undertaken;
  - (f) what, if any, contingency measures have been implemented in the previous 12 months and a prediction of what, if any, contingency measures may be required in the following 12 months.

- 22 Should the monitoring programme demonstrate that :
- (a) Pit Lake water quality is of a standard lower than that predicted by Mr Logsdon in his technical report and evidence given to the joint hearings committee; and / or,
  - (b) as a result of Pit Lake discharge (and after reasonable mixing) the quality of the Mangatoetoe Stream does not meet the receiving water criteria defined in Table 1; and/or,
  - (c) a spring is, or springs are, identified,

then Waikato Regional Council may serve written notice on the consent holder to prepare and implement at its own cost, appropriate contingency/remedial measures to the satisfaction of Waikato Regional Council.

- 23 The discharges authorised by this consent, in combination with all other discharges authorised for this site, shall not cause a significant adverse environmental effect on the receiving water, or on users of that resource, or in the case of surface water, on aquatic biota. To that end any discharge to the Mangatoetoe Stream, either separately or in combination with other discharges, shall not cause the receiving water standards in Table 1 to be breached.

**Table 1 : Mangatoetoe Receiving Water Quality Standards**

Parameter (g/m <sup>3</sup> unless otherwise stated)	Receiving Water Concentration <sup>(2)</sup>	
	Hardness 20 g/m <sup>3</sup> CaCO <sub>3</sub>	Hardness 100 g/m <sup>3</sup> CaCO <sub>3</sub>
Temperature	less than 3°C increase	less than 3°C increase
pH	6.5 to 9.0	6.5 to 9.0
suspended solids	For upstream concentrations of less than or equal to 100g/m <sup>3</sup> the increase shall be no greater than 10g/m <sup>3</sup> . For upstream concentrations of greater than 100g/m <sup>3</sup> the increase shall be no greater than 10%	For upstream concentrations of less than or equal to 100g/m <sup>3</sup> the increase shall be no greater than 10g/m <sup>3</sup> . For upstream concentrations of greater than 100g/m <sup>3</sup> the increase shall be no greater than 10%
Cyanide (CN <sub>WAD</sub> ) <sup>(1)</sup>	0.093	0.093
Iron	1.0	1.0
Manganese	2.0	2.0
Copper	0.003	0.011
Nickel	0.040	0.160
Zinc	0.027	0.100
Silver <sup>1</sup>	0.0002	0.0024
Total Ammonia	Refer Table 2	Refer Table 2
Antimony	0.030	0.030
Arsenic	0.190	0.190
Selenium	0.005	0.005
Mercury	0.000012	0.000012
Cadmium	0.0003	0.001
Chromium (VI)	0.010	0.010
Lead	0.0004	0.0025

**Notes :**

- (1) Site specific derived criteria using US EPA (1985) methodology.
- (2) Monitoring of metals shall be based on the soluble test method, defined as the concentration of dissolved metals measured in that fraction which passes through a 0.45 µm filter, except for mercury (Hg) which shall be based on acid soluble concentrations determined on unfiltered samples.

- (3) Current analytical procedures for mercury have a practical quantification limit (PQL) of 0.0005 ppm. This PQL is acceptable for the purposes of reporting mercury concentrations. The reporting 'limit' for mercury concentrations shall be reviewed annually by the consent holder and shall be adjusted in line with improvements in analytical technology.

**Table 2 : Criteria For Total Ammonia**

Chronic Criterion - g/m <sup>3</sup> as Ammonia							
Temp °C \ pH	0	5	10	15	20	25	30
6.50	3.0	2.8	2.7	2.5	2.5	2.5	2.4
6.75	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.00	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.25	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.50	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.75	2.8	2.6	2.5	2.4	2.3	2.3	2.4
8.00	1.82	1.70	1.62	1.57	1.55	1.55	1.59
8.25	1.03	0.97	0.93	0.90	0.90	0.91	0.94
8.50	0.58	0.55	0.53	0.53	0.53	0.55	0.58
8.75	0.34	0.32	0.31	0.31	0.32	0.35	0.38
9.00	0.19 5	0.18 9	0.18 9	0.19 5	0.21	0.23	0.27

**Note:** To convert these values to mg/l as nitrogen, multiply by 0.822.

Dated at Hamilton this **13** day of **October 1999**

For and on behalf of the  
Waikato Regional Council

.....  
for Secretary

## 13.0 SCHEDULE 1

### 1.0 Interpretation

**Annual Work Programme** means the Annual Work Programme described in condition 6 of this Schedule.

**Panel** means the Peer Review Panel described in condition 8 of this Schedule.

**Plan** means the Rehabilitation and Closure Plan described in condition 9 of this Schedule.

**Site** means areas A, B, C, D, E, F, H and I as identified on Waihi Gold Company plan number T70725A dated 25 July 1997.

- 2.0 The consent holder shall notify the Waikato Regional Council in writing at least two weeks in advance of the first exercise of this consent.
- 3.0 The consent holder shall pay to the Waikato Regional Council any administrative charge fixed in accordance with section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under section 360 of that Act.
- 4.0 The Waikato Regional Council may serve notice on the consent holder of its intention to review the conditions of this resource consent within one month after the first anniversary of the commencement of this consent, and within one month after each subsequent anniversary, for the following purposes :
- (i) to review the effectiveness of the conditions of this resource consent in avoiding or mitigating any adverse effects on the environment from the consent holder's activities and, if considered appropriate by the Waikato Regional Council, to deal with such effects by way of further or amended conditions;
  - (ii) to review the adequacy of and the necessity for monitoring undertaken by the consent holder.

Such a review shall be commenced only after consultation between the Waikato Regional Council and the consent holder. Actual and reasonable costs associated with the undertaking of each review shall be borne by the consent holder.

- 5.0 The consent holder may apply to change or cancel any condition of this resource consent other than a condition as to the duration of the consent, within one month after the first anniversary of the commencement of this consent, and within one month after each subsequent anniversary.

### 6.0 Annual Work Programme

The consent holder shall, within six months after the commencement of this consent and annually thereafter, prepare and submit to Council for information, an Annual Work Programme that outlines the anticipated activities to be performed during the following year and the management systems under which those activities will be undertaken. The Annual Work Programme shall include the following :

- (i) Mining operations proposed for the forthcoming year.
- (ii) Description of the sequencing of works, and description of the environmental procedures to be adopted during construction and the maintenance and management of facilities.
- (iii) Proposed progressive rehabilitation and revegetation of the active areas of the mine operation.

The Annual Work Programme may also include any other information that the consent holder wishes, and may be combined with any other document which the consent holder is required to produce.

## **6.0A Annual Consultation Reports**

The consent holder shall forward to the Council a report annually, covering the period to 1 June of each year, that details the discussions and outcomes of ongoing consultation with Ngati Tamatera in relation to the spiritual and cultural interests of Ngati Tamatera. Each report shall be produced in conjunction with Ngati Tamatera and forwarded to the Council within 3 months of the end of the 12 month period to which the particular report relates.

## **7.0 Complaints**

The consent holder shall report in writing at six monthly intervals to the Waikato Regional Council summarising the following :

- all complaints received during the previous six month period, action taken by the consent holder and the resolution, if any;
- any other matters of concern raised by the public;
- any mediation entered into by the consent holder and others with respect to operational matters and the outcome (unless the parties have agreed to keep such outcome confidential).

## **8.0 Peer Review**

8.1 The consent holder shall engage, at its cost, a peer review panel (“the Panel”). The members of this Panel shall be fully independent of the planning, design, and construction of the Martha mine and all its associated facilities.

8.2 The primary functions of the Panel are to ensure that the conditions of design, construction, operation and maintenance of Storage 1A are met and that such work is undertaken by appropriately qualified personnel in accordance with good practice; and to assess and review the plans for the rehabilitation and closure of the Site.

8.3 The panel shall comprise technical specialists who between them have demonstrated expertise in the following fields :

- Geochemistry, with recognised experience in management of acid rock drainage
- Geotechnical engineering, with recognised experience in design and construction of tailings storage facilities
- Hydrogeology
- Rehabilitation, with experience in mine revegetation, rehabilitation, and closure

Note that there may be any number of individuals on the Panel, so long as the necessary areas of expertise are covered.

8.4 The members of the Panel, and their defined field(s) of expertise, shall be approved by the Waikato Regional Council prior to appointment to the Panel.

8.5 Each member of the Panel, when acting as a Peer Reviewer, shall act only in his/her area of expertise, but the full Panel shall review all rehabilitation/closure plans.

8.6 The Panel may co-opt other specialist members to assist in any of its functions for specified tasks and periods, subject to the prior approval of the Waikato Regional Council.

8.7 The consent holder shall provide the Panel with all records, plans, designs, etc, that the Panel requests, and shall afford the Panel full access to the Site at all reasonable times.

- 8.8 The Panel may be the same panel as that which undertakes peer review as required by any other consent (including authorisations issued prior to the Resource Management Act) at this Site.
- 8.9 The Panel shall report directly to the Waikato Regional Council in writing on all matters which are submitted to it for review, other than draft proposals submitted to it by the consent holder and which are superceded.

## **9.0 Rehabilitation/closure Plan**

9.1 Prior to commencement of construction of the tailings storage facility (Storage 1A), the consent holder shall prepare a concept plan ("the Plan") describing the proposed method of rehabilitation and closure of the Site. The objective of this Plan shall be to ensure rehabilitation and closure of the Site in such a manner that in the long term the Site, and any structures on it, will remain stable; and any water discharging from the Site, and any groundwater under the Site, will be of a quality such that it will not adversely affect aquatic life, or other users of the water resource.

9.2 The Plan shall be in two parts :

- Part A shall describe the programme of progressive rehabilitation (including revegetation) that is proposed for the Site for the following twelve months, should closure not be proposed during that period; and shall report on any such works undertaken during the previous year
- Part B shall :
  - (a) describe the proposed method of final rehabilitation and closure should closure occur within the following twelve months
  - (b) include an assessment of any residual risk that the Site would pose to the environment and the neighbouring community should closure occur within the following 12 months
  - (c) include a programme for monitoring of the Site following closure, and list all maintenance works likely to be necessary at the closed Site for the foreseeable future.

9.3 Review

The Plan shall be reviewed and updated annually and the concepts shall be described in more detail as appropriate.

The consent holder shall submit the Plan, and each annual review and update thereof, to the Panel for its review.

The consent holder shall then submit the peer reviewed Plan to the Waikato Regional Council for approval.

9.4 Implementation

The consent holder shall progressively implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

## **10.0 Bond and Trust Fund**

10.1 Prior to the exercise of this consent the consent holder shall provide and maintain in favour of Waikato Regional Council and Hauraki District Council ("the Councils") a rehabilitation bond to :

- (a) secure compliance with the conditions of this consent and to enable any adverse effect on the environment resulting from the consent holder's activities and not authorised by a resource consent to be avoided, remedied, or mitigated;
- (b) secure the completion of rehabilitation and closure in accordance with the approved Plan;

- (c) ensure the performance of any monitoring obligations of the consent holder under this consent;
  - (d) enable the Councils to undertake monitoring and management of the Site until completion of closure of the Site; and
  - (e) enable the Councils in the event of the bonds being called upon, to purchase Industrial and Special Risk Insurance in the sum of \$12 million (1998 dollars) and Public Liability Insurance in the sum of \$5 million (1998 dollars).
- 10.2 The rehabilitation bond shall be in a form approved by the Councils and shall, subject to these conditions, be on the terms and conditions required by the Councils.
- 10.3 The rehabilitation bond shall provide that the consent holder remains liable under the Resource Management Act 1991 for any breach of the conditions of consent which occurs before expiry of this consent and for any adverse effects on the environment which become apparent during or after the expiry of the consent.
- 10.4 Section 109(1) of the Resource Management Act 1991 shall apply to the rehabilitation bond and the rehabilitation bond shall be registered under the Land Transfer Act 1952 by the consent holder at its expense against the certificates of title of the properties comprising Areas C and D owned by the consent holder or its subsidiaries, and as identified on Waihi Gold Company Plan no. T70725A dated 25 July 1997.
- 10.5 Unless the rehabilitation bond is a cash bond, the performance of all of the conditions of the bond shall be guaranteed by a guarantor acceptable to the Councils. The guarantor shall bind itself to pay for the carrying out and completion of any condition in the event of any default of the consent holder, or any occurrence of any adverse environmental effect requiring remedy.
- 10.6(a) The amount of the rehabilitation bond shall be fixed at the commencement of the extended project and ~~every anniversary~~ thereafter at least annually by the Councils who shall take into account any calculations and other matters submitted in the Plan, or otherwise, by the consent holder which are relevant to the determination of the amount. The amount of the rehabilitation bond shall be advised in writing to the consent holder at least one month prior to the review date.
- (b) The amount of the rehabilitation bond, to achieve the purposes set out in 10.1 above, shall include :
- (i) the estimated costs (including any contingencies necessary) of rehabilitation and closure in accordance with the conditions of the consent, on completion of the mining operations proposed for the next year and described in the Plan;
  - (ii) any further sum which the Councils consider necessary to allow for remedying any adverse effect on the environment that may arise from the exercise of the consent;
  - (iii) the estimated costs of monitoring, in accordance with the monitoring conditions of the consent, until the consent expires; and
  - (iv) any further sum which the Councils consider necessary for monitoring any adverse effect on the environment that may arise from the exercise of the consent including monitoring anything which is done to avoid, remedy, or mitigate an adverse effect.
- 10.7 Should the consent holder not agree with the amount of the rehabilitation bond fixed by the Councils then the matter shall be referred to arbitration in accordance with the provisions of the Arbitration Act 1996. Arbitration shall be commenced by written notice by the consent holder to each of the Councils advising that the amount of the rehabilitation bond is disputed, such notice to be given by the consent holder within two weeks of notification of the amount of the rehabilitation bond. If the parties cannot agree upon an arbitrator within a week of receiving the notice from the

consent holder, then an arbitrator shall be appointed by the President of the Institute of Professional Engineers of New Zealand. Such arbitrator shall give an award in writing within 30 days after his or her appointment, unless the consent holder and the Councils agree that time shall be extended. The parties shall bear their own costs in connection with the arbitration. In all other respects, the provisions of the Arbitration Act 1996 shall apply. Pending the outcome of that arbitration, and subject to condition 10.8, the existing bond shall continue in force. That sum shall be adjusted in accordance with the arbitration determination.

10.8 If, for any reason other than default of the Councils, the decision of the arbitrator is not made available by the 30<sup>th</sup> day referred to above, then the amount of the bond shall be the sum fixed by the Councils, until such time as the arbitrator does make his/her decision. At that stage the new amount shall apply. The consent holder shall not exercise this consent if the variation of the existing bond or new bond is not provided in accordance with this condition.

10.9 The rehabilitation bond may be varied, cancelled, or renewed at any time by agreement between the consent holder and the Councils provided that cancellation will not be agreed to unless a further or new rehabilitation bond acceptable to the Councils is available to replace immediately that which is to be cancelled (subject however to the condition below as to release of the rehabilitation bond on the completion of closure of the site – as that phrase is elsewhere defined – to the Councils' satisfaction).

10.10 The Councils shall release the rehabilitation bond on the completion of closure of the Site.

"Completion of closure of the Site" means when the rehabilitation objective as defined in condition 9.1 of this Schedule has been demonstrated by the consent holder, to the satisfaction of the Councils, to have been met.

10.11 All costs relating to the rehabilitation bond shall be paid by the consent holder.

10.12 This consent shall not become operative unless and until the consent holder provides the rehabilitation bond to the Councils.

10.13 As soon as practicable after the grant of this consent and in any event prior to the placement of PAF waste into Storage 1A, the consent holder, in consultation with the Councils, shall establish a trust ("the Trust") (charitable if possible) whose purposes and powers shall be :

- after completion of the closure of the Site to take legal title to the land on which Storage 2 and Storage 1A are located, (as shown in Appendix A). The Trust shall have no power of sale of the land;
- after completion of the closure of the Site to take legal title to the park to be formed at Junction Road (as shown in Appendix A);
- after completion of the closure of the Site to take legal title to the land upon which the Water Treatment Plant is located (as shown in Appendix A);
- to monitor and maintain these facilities in perpetuity, and to be responsible for such monitoring and maintenance as to ensure that Storage 2 and Storage 1A and the park (and proposed pit lake if acceptable to LINZ) remain in a stable, self- sustaining, rehabilitated state;
- to obtain any resource consents that may be required after completion of the closure of the Site and the expiration or surrender of this consent;
- without limiting the above, to take out insurance cover against unexpected risks;
- to reimburse the Councils for any costs incurred by them in monitoring or maintaining Storage 2 and Storage 1A, the park, and proposed pit lake;
- to invest any funds held to generate the necessary income to pay for the above purposes.

These purposes and powers shall be recorded in a Trust Deed approved by the Councils.

The Trust Deed shall provide :

- that the Councils shall have the power to appoint two trustees each to the Trust;
- for the appointment by the Councils, after consultation with Ngati Tamatera, of one additional trustee representing Ngati Tamatera; and
- for the appointment by Te Runanga a Iwi o Ngati Tamatera Incorporated of one advisory trustee representing Ngati Tamatera.

10.14 The consent holder shall be responsible for all costs associated with the establishment of the Trust. The solicitor appointed to act for the Trust shall be independent of the solicitors acting for the consent holder and shall be approved of by the Councils.

10.15 The consent holder shall execute an irrevocable deed of transfer in favour of the Trust of the land upon which Storage 2 and 1A are sited, and shall provide the executed transfer together with the certificates of title (as soon as they are issued) to be held in escrow subject to condition 10.18 by the solicitor acting for the Trust.

10.16 The consent holder shall execute an irrevocable deed of transfer in favour of the Trust of the land upon which the park at Junction Road is to be sited, and shall provide the executed transfer together with the certificates of title (as soon as they are issued) to be held in escrow subject to condition 10.18 by the solicitor acting for the Trust.

10.17 The consent holder shall execute an irrevocable deed of transfer in favour of the Trust of the land upon which the Water Treatment Plant is sited and shall provide the executed transfer together with the certificates of title (as soon as they are issued) to be held in escrow subject to condition 10.18 by the solicitor acting for the Trust.

10.18 The Trust Deed shall provide that upon the completion of closure of the Site to the satisfaction of the Councils, the transfers of land will be completed by the trustees registering the transfers on the relevant certificates of title, and the trustees shall undertake their responsibilities with respect to the park, proposed pit lake and surrounds, and tailings storage facilities. The Water Treatment Plant shall be in good working condition at the time the transfer of it to the Trust is completed.

10.19 Prior to the exercise of this consent the consent holder shall provide and maintain in favour of the Councils a capitalisation bond to secure the settlement on the Trust of the required capital sum to fund the Trust to carry out its obligations.

10.20 The capitalisation bond shall be in a form approved by the Councils and, subject to these conditions, shall be on the terms and conditions required by the Councils.

10.21 Unless the capitalisation bond is a cash bond, the performance of all of the conditions of the capitalisation bond shall be guaranteed by a guarantor acceptable to the Councils.

10.22 The amount of the capitalisation bond shall be fixed annually by the Councils and shall cover :

- the estimated costs of dealing with any adverse effect on the environment which may become apparent after the surrender or expiry of this consent. This sum may include (without limitation) provision to deal with structural instability or failure, land and/or water contamination, and failure of rehabilitation. Such estimated costs shall include the costs of investigation, prevention, and remediation of any adverse effect
- the estimated costs of monitoring for and of any adverse effect and of measures taken to avoid, remedy, or mitigate any adverse effect
- the estimated costs of long-term monitoring and maintenance of the area to be owned or managed by the Trust, following completion of closure of the Site
- provision for contingencies

- provision for the reasonable remuneration of the trustees having regard to their duties and responsibilities as trustees

and be based on the residual risk assessment dated 20 July 1998 prepared by the consent holder and provided to the Councils. Such residual risk assessment shall be updated annually.

The amount of the reviewed bond shall be advised to the consent holder at least one month prior to the annual review date.

The amount of the bond shall be reduced by the capital amounts settled on the Trust from time to time by the consent holder.

- 10.23 Should the consent holder not agree with the amount of the capitalisation bond fixed by the Councils then the matter shall be referred to arbitration in accordance with the procedures set out in conditions 10.7 and 10.8. Subject to condition 10.8, that sum shall be adjusted in accordance with the arbitration determination. The consent holder shall not exercise this consent if the variation of the existing capitalisation bond or new capitalisation bond is not provided in accordance with this condition.
- 10.24 The capitalisation bond may be varied, cancelled, or renewed at any time by agreement between the consent holder and the Councils.
- 10.25 The capitalisation bond shall expire upon the settlement on the Trust by the consent holder of the required capital sum.
- 10.26 All costs relating to the capitalisation bond shall be paid by the consent holder.
- 10.27 ~~The consent holder shall throughout the term of this consent maintain at least the following insurance cover as set out in the evidence of Bruce Farren Price to the Hearings Committee (para 23) :~~
- ~~(a) Global property package cover (limit of liability \$A250 million) which provides for the rebuilding of any damaged tailings storage facility and the cleanup of pollution and/or contamination arising therefrom;~~
  - ~~(b) Liability package (limit of liability \$A150 million) which provides coverage for damage to property, and injuries to third parties following a sudden and accidental pollution and/or contamination incident.~~
  - ~~(c) Environment impairment liability (limit of liability \$A5 million) which provides coverage for a pollution event, excluded by the liability package, that is not sudden, accidental, or unexpected.~~

~~The consent holder shall upon request provide evidence to the Waikato Regional Council that such insurance cover is in place.~~

In addition to the insurance cover required for the Rehabilitation Bond in condition 10.1(e), the consent holder shall throughout the term of this consent be able to demonstrate to the satisfaction of the Waikato Regional Council that it holds sufficient funds, insurances or other financial instruments ("cover") to enable any adverse effect on the environment resulting from the consent holder's activities and not authorised by a resource consent to be promptly avoided, remedied or mitigated.

The consent holder shall provide evidence to the Council annually, or such other period as may be subsequently agreed with the Council in writing that sufficient cover is in place. This evidence shall be provided to Council at the same time as the Annual Work Programme is submitted as required by condition 6 of this Schedule.

Should the consent holder and the Council not agree on the sufficiency of the level of cover, the matter shall be referred to arbitration in accordance with the provisions of the Arbitration Act 1996. Arbitration shall be commenced by written notice by the Council advising that the amount of the cover is disputed, such notice to be given by the Councils within two weeks of notification of the amount of the cover. If the parties cannot agree upon an arbitrator within a week of receiving the notice from the consent holder, then an arbitrator shall be appointed by the President of the Institute of Professional Engineers in New Zealand. Such arbitrator shall give an award in writing within 30 days after his or her appointment, unless the consent holder and the Councils agree that time shall be extended. The parties shall bear their own costs in connection with the arbitration. In all other respects, the provisions of the Arbitration Act 1996 shall apply. Pending the outcome of that arbitration, the existing cover shall continue in force. The sum of the cover shall be adjusted in accordance with the arbitration determination

 09/04/2010

10.28 These conditions form an integrated whole and are not severable.

**Note:** This condition is complementary to the requirements of condition 3.31 of the land use consent granted by the Hauraki District Council.

In reply please quote 60 59 02M  
Enquiries to Ruth Hutchinson

13 October 1999

Waihi Gold Company  
P O Box 190  
WAIHI

Dear Sir/Madam

**RESOURCE CONSENT NUMBER 971293**

Please find enclosed the certificate detailing the terms and conditions of your resource consent recently granted by the Waikato Regional Council. Please keep this important document in a safe place for easy reference during the term of the consent.

Please note the following:

- (i) Only the holder of the consent or their agent may exercise this consent, and then only for the purpose specifically authorised by the consent.
- (ii) Those exercising the consent must comply with the conditions of the consent at all times.
- (iii) The majority of consent holders will incur annual charges for holding consents, and may also incur costs associated with monitoring, inspecting and reporting on the exercise of this consent.
- (iv) If the consent has not been exercised within two years from the commencement date of the consent, the consent will lapse unless approval has been obtained from the Regional Council to extend the period.
- (v) Should you no longer wish to perform the activities authorised by the consent, you may wish to apply to surrender the consent, giving reasons for the surrender. In addition should you sell the property or the operation to which this consent applies, you may wish to transfer the consent to the new owner. If you wish to undertake either of these actions, please forward the resource consent certificate to this office with advice of the action you require to be taken.

Should you have any further queries on these matters, or any other issues relating to the exercise of this resource consent, please do not hesitate to contact the Hamilton office quoting the above reference.

Yours faithfully

Ruth Hutchinson  
**Administration Officer, Resource Use**

## Appendix E

