BEFORE THE INDEPENDENT ADVISORY PANEL FOR THE DRAFT NATIONAL POLICY STATEMENT FOR FRESHWATER MANAGEMENT AND THE PROPOSED NATIONAL ENVIRONMENTAL STANDARDS FOR FRESHWATER

IN THE MATTER OF of the Resource Management Act 1991

AND

IN THE MATTER OF The Draft National Policy Statement for Freshwater Management and the Proposed National Environmental Standards for Freshwater

AFFIDAVIT OF GAVIN JAMES LEE

2019
I, **Gavin James Lee** of Dunedin swear:

1. **QUALIFICATIONS AND EXPERIENCE**

1.1 I am the Community and Environment Manager at the Macraes Mine, owned and operated by Oceana Gold (New Zealand) Limited (**OGNZL**).

1.2 I have worked at Macraes Mine since November 2016. In my Environment capacity I am responsible for site environmental related matters including heritage, ecology, consent monitoring, rehabilitation, regulatory reporting and management plans. In my Community capacity I am responsible for facilitating ongoing community and stakeholder engagement.

1.3 I have a Bachelor of Engineering (Mechanical) from the University of Western Australia and a Graduate Diploma of Energy Studies from Murdoch University, Australia.

1.4 For the 24 years prior to joining OGNZL I have worked in Environmental and Social Management in the extractive’s history. My experience includes all phases of the mining cycle (Development, Construction, Operations and Closure) in precious metals and base metals. My career has taken me from Perth to Queensland (7 years), and to Indonesia (15 years).

2. **SCOPE OF EVIDENCE**

2.1 In my evidence I will provide a background of the Macraes Mine and factors influencing the operation of the mine and its efficiencies. I will explain the limitations that could be imposed by the 2019 draft National Policy Statement for Freshwater Management (**Draft NPS**) and the proposed National Environmental Standards for Freshwater (**Proposed NES**) and the opportunities that could arise from the Draft NPS & Proposed NES as a result of the continuation of the Macraes Mine.

2.2 My evidence will cover:
2.2.1 A summary of the history of mining in the Macraes area and the recent history associated with Macraes Mine and a description of the environmental setting.

2.2.2 An explanation of the mining process at Macraes, some of the challenges faced and the efficiencies that have been driven by those challenges.

2.2.3 An explanation of how the Draft NPS and Proposed NES will affect the Macraes Mine.

2.2.4 A description of the implementation of the effects management hierarchy at the Macraes Mine, and the outcomes of the use of this tool.

2.2.5 A brief description of overall sustainability performance at the Macraes Mine.

3. BACKGROUND TO THE HISTORY OF MACRAES MINE & THE ENVIRONMENTAL SETTING - OVERVIEW

3.1 The Macraes Mine is located about 30 kilometres (km) to the northwest of Palmerston, in East Otago. The mining operation is located 1 to 2 km to the east of the Macraes village and is predominantly surrounded by farmland. All mining takes place on land OGNZL owns.

3.2 Gold was first discovered in the Macraes Flat locale in 1862. Since then there have been a series of gold rushes in the area between 1870s and 1930s, from both hard rock and alluvial mining. In the years leading up to World War II, Macraes became an important source of tungsten (sheelite) for the war effort.

3.3 In addition to mining operations, large parts of the area had been designated as pastoral runs in the 1850s. As mining declined in the first half of the 20th Century land was given over to farming in the later part of the century.
3.4 Today mining operations at Macraes Mine continue using open pit methods, combined with an Underground Mine which has been operating since 2006. Annualised gold production is around 160,000 ounces split between about 75% open pit production and about 25% production from underground mining. While OGNZL continues to explore both open pit and underground potential at Macraes, it is unlikely that Macraes will ever be exclusively an underground mine. The location and form of the gold deposits at Macraes mean the mine is, and is expected to continue as, primarily an open pit operation.

3.5 Like the Waihi mine, the combined gold production to date and known remaining resources at Macraes place the mine in the category of a “world class” gold deposit, of which there are comparatively few in production worldwide. In July of 2019 OGNZL poured the fifth millionth ounce of gold from the Macraes operation. Remaining known gold resources stood at over 4 million ounces as at 31st December 2018. As OGNZL’s single biggest producing mine, Macraes is expected to continue operating within its known “line-of-strike” for decades to come, if resource consenting allows.

3.6 OGNZL currently provides about 577 jobs for employees and contractors at the Macraes operation, and a further 25 staff are engaged in the Dunedin office.

4. OVERVIEW OF THE MACRAES MINE ACTIVITIES

4.1 The almost 30 year mine life of the Macraes Mine has been an extraordinary journey of efficiency, innovation and adaptation. Due to the low grade and shallow mineralization associated with the geology, the Mine can only exist as an open pit operation that is supplemented by underground operations. The most recent Aurum Analytics Australasian gold mine survey ranked Macraes as 40th highest gold-grade out of the 46 operations in the survey¹. Of the six operations with lower gold grades, three had copper as a by-

product\(^2\), one consisted mostly of low-grade stockpiles\(^3\), and the other two were low grade open pits\(^4\). Macraes was the lowest grade gold-only operation which includes an underground mine as a primary ore source. The average grade over the life of the mine has been between one and two grams a tonne of ore.

4.2 The low grade has driven investment in new and innovative technology and engineering combined with efficiencies in mining operations which sets Macraes apart from many other mines globally. When ranked in comparison with the S & P Global Market Intelligence Metals and Mining Property database for 231 international mining operation, Macraes Mine was in the top 14% of mines for the lowest unit cost for open pit mining\(^5\).

4.3 The low unit costs remain essential for Macraes Mine as the ratio between the amount of ore dug to the amount of rock dug which is not ore is one to ten (also known as the stripping ratio). So, to put this in perspective, in order to obtain one to two grams of gold, the open pit mining operation must move 11 tonnes of rock.

4.4 The geology has also added complexity to the processing of the low grade ore. Gold at Macraes is known as ‘refractory ore’, which means that it is ultra-fine and resistant to the typical cyanide leach process, typical of most gold processing plants. This refractory nature of the ore led to inefficiencies in recovering the gold from ore. A series of innovations in late 1990s and early 2000s involving significant capital expenditure and significant risk (including the installation of Autoclave and a series of floatation cells) managed to achieve an increase in gold recovery of 15%\(^6\). In addition to the innovation

\(^2\) Boddington, Telfer and Ernest Henry all process significant quantities of copper. In the survey, copper revenues are credited against gold production costs to report a gold cost/oz. This means the equivalent gold grade is higher than the pure gold grade.

\(^3\) Edna May, UG grades at 3.72g/t blended with low grade stockpiles to give a milled grade of 0.71g/t

\(^4\) Ravenswood and Dalgaranga are both low grade open pit only operations.

\(^5\) Source: S&P Global Market Intelligence – Metals & Mining Property Database

\(^6\) Gold recovery at Macraes is now between 83 – 86%
associated with improving the recovery of gold, the amount of ore processed has increased from 1.5 million tonnes per year to 6 million tonnes per year.

4.5 Possibly the most amazing part of the Macraes story is that it has remained operating continuously for the last 29 years. Beyond the low grade, the stripping ratio and the metallurgical complexity of the ore, the Mine has had to manage it’s operation with a fluctuating gold price (between US$252/oz and US$1,880/oz), where other richer mines have faulted. The longevity of the Macraes Mine is a true celebration of Kiwi ingenuity and resilience.

4.6 The mine is set to continue its long history of continuous improvement, innovation and significant capital investment off the back of $100s millions of investment to date in existing infrastructure and exploration if conditions, including the regulatory environment, allow.

5. **FRESHWATER REFORM AND THE MACRAES MINE**

5.1 The freshwater reform being proposed would almost certainly lead to the cessation of future development of much of the unmined gold resources at Macraes and be very constraining for current operations. The impact could be the early closure of the mine, with resulting employment and economic consequences at local, regional and national levels; and the foregoing of opportunities for the mining company to continue to invest in conservation projects in the Macraes area. The aspects of the reform that are of particular concern are the limitations placed on managing impacts to wetlands, and disturbance of streams, and the potential inability to use offsetting and compensation to address residual adverse effects.

5.2 As outlined in Dr Thorsen’s evidence, wetlands of varying size and quality are dispersed across a significant area and are found uniformly across the Macraes Ecological District. Many of the wetlands found around the Macraes Mine site have generally been found to have been degraded by either farming or through weed infestation. Examples of the some of the wetlands found at Macraes Ecological District are shown in figures 1 and 2.
5.3 Dr Ryder’s evidence accepts that mining at Macraes will inevitably lead to impacts on streams due to the deeply dissected landscape with small gullies and streams. Dr Ryder also states that populations of the indigenous Taieri flathead galaxiid remain abundant within Deepdell Creek, the main water shed of the Macraes mine.

5.4 Thus, interaction with wetlands and streambeds are inevitable at the Macraes Mine.

5.5 The current wording of the Draft NPS requires that regional policy statements must state that ‘The loss or degradation of all or any part of natural inland wetland is avoided’ or other words to that effect. The Proposed NES then essentially makes any activity – not related to wetland restoration, flood control or nationally significant infrastructure – a non-complying activity for vegetation destruction or earth disturbance. Effects on wetlands from mining activities may comprise direct loss of the wetland or disruption of the hydrology of the wetland and are generally assessed as more than minor. The non-complying status of the activity and the inability to meet the new objective of the regional policy statement as required by the Draft NPS, would mean that if wetlands are affected by mining, the activity would not be able to pass the gateway test under section 104D(1)(a) of the Resource Management Act 1991 (RMA).

5.6 In relations to streams, the Draft NPS requires that regional policies and plans must ensure infilling of rivers beds is avoided except for restoration of natural values, flood control and nationally significant infrastructure. The Proposed NES then identifies stream infilling as a discretionary activity for those activities outlined in the Draft NPS. Other activities in which stream infilling is proposed are deemed non-complying. Again, mining would be unable to pass the gateway test under section 104D(1)(a) RMA.
Figure 1 Example of an ephemeral wetland within the proposed Deepdell North footprint.

Figure 2 A second example of an ephemeral wetland within the proposed Deepdell North footprint.
5.7 In both cases associated with impacts to wetlands and from stream infill, nationally significant infrastructure is given access to the Effects Management Hierarchy. As I will explain in the following section, OGNZL has a record of using the full extent of the Effects Management Hierarchy in order to achieve net positive outcomes.

5.8 It is important that I stress that the nature and location of the gold-bearing rock at Macraes is such that it is not at all realistic to access the ore while avoiding more than minor adverse effects on wetlands and streams in the area. There are so many of these features present in the landscape that overlaps with the ore are certain to arise for most open pit development. At the same time, the nature and location of the ore means that open pit development is the only mining method suitable for recovering most of the gold.

6. APPLYING THE EFFECTS MANAGEMENT HIERARCHY

6.1 Since 2011, OGNZL has undertaken a series of developments which have incorporated the Effects Management Hierarchy (EMH) into the Project Design, in order to address the effects on the biological and physical environment. This EMH approach has resulted in residual impacts to stream and wetlands (i.e. following avoid, remedy, mitigate steps) being either offset or compensated for. Through experience gained with the EMH, OGNZL has been able to show in recent Project Development, net positive outcomes from its activities and this has been recognised by key stakeholders.

6.2 In 2011 OGNZL lodged a consent application for the Macraes Phase III Project, which included Open Pit Development, Waste Rock Stacks and a new Tailings Storage Facility. The preliminary Project Design suggested an initial loss of 0.5ha wetlands and 10.2 km of streambed through infill either for the construction of waste rock stacks or Open Pit development. The ultimate mitigation package developed and accepted for Macraes Phase III included:

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7 Note that at this stage only 5.12km of streambed has been lost.
6.2.1 the avoidance of direct loss of wetlands and informal protection, through stock exclusion, of 11.66ha across seven wetlands in close proximity to the Project. An example of one of the avoided wetlands is shown in figure 3.

6.2.2 Creation of a number of ecological covenants (Cranky Jims Shrubland, Deepdell Tussock and Highlay Creek) with formal legal protection with a total area of 155ha and containing a combined stream bed length of 3.38km. These covenants are now registered with the QEII Trust.

6.2.3 Creation of a freshwater dam to ensure low flows are maintained downstream of the new tailings storage facility.

6.2.4 A commitment to construct a further freshwater storage within the main catchment of the mining area, if water quality from mine seepage flows was to deteriorate over time.

Figure 3 Ephemeral wetland avoided during road construction under informal protection.

6.3 In 2013, OGNZL lodged a consent application for the Coronation Project. Although smaller in scale than the Macraes Phase III and only comprising a
single Pit and Waste Rock Stack, the EMH was again utilised to its full extent. The Project led to the loss of 0.56ha of wetland and approximately 1.39km of streambed through infill. The mitigation package developed for Coronation Project included:

6.3.1 Translocation of target aquatic species (Taieri Flathead Galaxiid and Koura) from streambed within the waste rock stack footprint.

6.3.2 Establishing the Cranky Jim’s Wetland ecological covenant with an area of 97.29ha and a specific focus on the protection of 14 wetlands with a combined total of 7.39ha. This covenant also includes 2.15km of streambed. Cranky Jim’s Wetland Covenant is now registered with the QEII Trust. An example of one of the wetlands is shown in figure 4.

![Image](image.jpg)

*Figure 4 One of the wetlands under formal protection in Cranky Jims Wetland Covenant*

6.4 In 2016, a consent application for the Coronation North Project was lodged. This Project included an open pit extension to Coronation, a new open Pit, a redesign of the waste rock stack for Coronation, and a new waste rock stack.
Overall the losses estimated from the Project Design included 0.4ha of direct loss of wetlands and a further 4.6ha area of wetlands hydraulically impacted by mining activities, and a net loss of 7.59km of streambed. The mitigation package developed for Coronation North Project included:

6.4.1 Translocation of target aquatic species (Taieri Flathead Galaxiid and Koura) from streambed within the open pit and waste rock stack footprint.

6.4.2 Salvaging of threatened wetland plant species from wetlands within the mining footprint.

6.4.3 Working with the Department of Conservation (DoC) on establishing fish barriers to exclude trout from streams inhabited by threatened galaxiid species.

6.4.4 Investigating the toxicity of mine water seepage on the Taieri Flathead Galaxiid.

6.4.5 Establishment of two ecological covenants (Island Block and Highlay Hill Covenant) which include similar wetland forms to those impacted by mining operation and a total streambed length of 7.09km.

6.4.6 A payment of $250,000 into a Habitat Enhancement Fund for disbursement by the territorial authorities for biodiversity projects.

6.5 In 2019, following confirmation of additional gold resources to the east of the Coronation North Pit, OGNZL undertook a further redesign of the Coronation North/Coronation development. The redesign, which included significant changes to the waste rock stack and backfilling of the open pit, ultimately led to the avoidance of approximately 1.48ha of ephemeral wetlands and 2.00km

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8 Taking into account the avoidance of some streambed as part of the modifications to the Coronation waste rock stack.

9 Waitaki District Council and Dunedin City Council
of streambed that had earlier been authorised for incorporation into the mine footprint\(^\text{10}\).

6.6 In the last two instances, OGNZL has worked closely with DoC to establish net positive outcomes for ecology and biodiversity, including for wetland and stream values. This has been recognised by DoC in formally agreeing to the mitigation packages and in collaborating with the company to ensure the best results possible from implementation of the agreed packages.

6.7 In addition to the implementation of the EMH, OGNZL has also recognised that not all sectors of society understand the importance of undertaking measures to preserve the natural environment. In 2017, representatives of the Macraes community appealed against the decision granting consents for the Coronation North Project. High amongst their concerns was the ongoing establishment of compensation for effects to ecological values in the form of restrictive covenants designed to avert the risk of future ecological loses in the covenant areas through mining or more intensive farming. While the land over which the covenants are registered is owned by OGNZL, once the mine is closed it will revert to farmland, and in the meantime the company leases out land that is not immediately required for mine purposes to farmers in the area to be used for grazing and other agricultural purposes. Although agreement with the local community representatives was reached through mediation and their appeal was withdrawn, they remain concerned about ongoing efforts to preserve remnant ecological values in the Macraes Ecological District, and the effect this will have on the viability of farming activities in the future.

6.8 In order to better understand and explore these concerns and the expectations of other stakeholders in relation to the underlying values associated with different land uses in the Macraes area, OGNZL commissioned the University of Otago to undertake a stakeholder study in 2018. The Common Ground Study undertook interviews with the various stakeholders (including the local authorities, DoC, Iwi, the Macraes

\(^{10}\) The redesign also led to avoidance of over 50ha of land within a DoC Recommended Area for Protection.
Community and OGNZL). The study found that although three distinct value states exist (i.e. producing value from the land, regulating value from the land, and managing the land), stakeholders were not necessarily fixed to one value state, and this becomes the opportunity to work towards establishing common ground. Further work is required to establish understanding and consensus on issues of conservation and land use, and OGNZL is committed to progressing this amongst the various stakeholders.

6.9 Finally, for the last two years OGNZL has been preparing a consent application for the Deepdell North Project. The application, which will be lodged in November 2019, includes a Project Design which has undertaken a number of iterations including avoidance of significant stream infill. Incorporated into the design is a biodiversity offset, prepared using a recognised method for calculation of biodiversity losses and gains\(^{11}\), for residual impacts to wetlands and streambeds. Examples of the kinds of wetland habitat found within the Deepdell North footprint are shown in figures 1 and 2.

7. **MACRAES MINE SUSTAINABILITY PERFORMANCE**

7.1 In its 29 years of continuous operations, Macraes Mine has been at the forefront of responsible mining and sustainability issues. OGNZL produced its first publicly available Sustainability Report covering governance, the environment, community engagement, and health and safety in December 2009. Ten years on, the Sustainability Report has evolved and now also includes specific sections on Responsible Mining, and People and Diversity. Data is now presented in accordance with the Global Reporting Index, a standard international format, to allow OGNZL to be compared with other mining companies and industries.

7.2 Some of the highlights in sustainability performance include:

7.2.1 Safety: Creating a safe and healthy working environment for all employees is a priority. In 2017, Macraes launched a behavioral-based safety programme which has played a significant role in reducing the number of injuries to employees and contractors. Between 2013 and 2018 the total recordable injury frequency rate (TRIFR) has dropped from 14.15 to 4.39.12

7.2.2 Employment: Between 2013 and 2018, employee numbers increased from 470 to 573 fulltime employees. In addition, Macraes utilizes contractors for specialized tasks, and can have up to 200 contractors on site at any one time. Total expenditure on salaries in 2018 was $59,594,529.

7.2.3 Diversity: 2018 saw Macraes set a target to achieve 20% female representation in the workforce by 2023. A Women In Mining committee was established to better understand the barriers to women entering the mining workforce and leadership roles within Macraes. In order to assist in creating actions and procedures to remove those barriers in 2019 we are piloting a flexible workhours programme and are developing a ‘lunch roster’ for the Open Pit operations to facilitate the (re)entry of mothers into the workforce.

7.2.4 Community: In the period between 2013 and 2018 total contributions towards community sponsorship and donations were $1,279,537. The sponsorship programme focuses community resilience, health, education and conservation. In addition, in 2015 the company made a payment to the Macraes Community Development Trust of $1,558,393 to support development of the Macraes Village beyond mining.

7.2.5 Partnerships: Macraes Mine has developed a number of important partnerships with local organisations such as Fish & Game in connection with the operations of the Macraes Trout Hatchery which

liberates over 8,000 rainbow trout fingerlings to DoC-approved reservoirs around Otago, and University of Otago in conducting research on aspects associated with the mine including biodiversity, social and geological research. In addition, OGNZL has recently signed a Protocol of Engagement with the tangata whenua in which Macraes mine operates.

7.2.6 Revenue: For 2018 alone, Macraes made $2,268,410 in payments to local, regional and central government (i.e. taxes, royalties and rates) and $131,389,718 to local and national suppliers.

8. CONCLUSION

8.1 OGNZL recognises the importance of the water reform measures being proposed by the Government. The company also understands that impacts to freshwater are not fungible. Effects to aquatic habitats cannot be traded for financial or social benefits. However, as I have shown above, we believe that mining at Macraes has the technical and financial capability to ensure that net positive impacts can be achieved for the environment and for broader society if given the opportunity.

8.2 It is particularly gratifying to know that the work we are doing ensures the developments the mine undertakes are creating net positive outcomes for wetland, stream and biodiversity values; creating well paid jobs and worthwhile opportunities for our staff and contractors; and delivering significant economic and social benefits at local, regional and national levels.

8.3 The positive outcomes we are achieving for wetlands and streams are recognised and supported by key stakeholders including DoC and Iwi and are reflected in the encouragement we receive from our independent ecological advisors.

8.4 Perhaps most gratifying of all is the fact that you can see the difference our actions in mitigating, offsetting and compensating have made, and are continuing to make, to ecological values. Particularly in the case of wetlands, many of the areas impacted by mine development have contained wetlands
of very low ecological value due to the effects of weed infestation and farming impacts. While these low value wetlands have been lost, we have been able to invest in protection and enhancement of other similar wetlands in the area that have greater existing value, and much greater potential for improvement. I am excited by the material active role we are playing in finding the balance between development and conservation and I am hopeful that the new regime in the Draft NPS and Proposed NES will provide us with the ability to continue this great work.

Sworn at Dunedin )
by Gavin James Lee )
This day of 2019 )
Before me: ).................................................................

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A Solicitor of the High Court of New Zealand