#### BEFORE A HEARINGS PANEL APPOINTED BY THE OTAGO REGIONAL COUNCIL

IN THE MATTER OF	the Resource Management Act 1991 ("the Act" or "the RMA")
AND	
IN THE MATTER OF	Applications RM24.184 to the Otago Regional Council (ORC), 201.2024.2373 to the Waitaki District Council (WDC and LUC 2024-126 to the Dunedin City Council (DCC) by Oceana Gold (New Zealand) Limited for various consents relating to the Macraes Phase Four mine expansion

## STATEMENT OF EVIDENCE OF COLIN MACDIARMID ON BEHALF OF OTAGO REGIONAL, WAITAKI DISTRICT, AND DUNEDIN CITY COUNCILS

3 June 2026

## Introduction

- 1 My full name is Colin Macdiarmid. I am a Principal Geotechnical Engineer at GeoSolve Limited, a specialist geotechnical consultancy based in Otago.
- 2 I am a Chartered Professional Engineer and hold the following qualification and memberships.
  - (a) MEng Civil Engineering with Geology, University of Glasgow (1st);
  - (b) Chartered Member of the Institute of Professional Engineers New Zealand (CMEngNZ);
  - (c) Member Institution of Civil Engineers UK (MICE);
  - (d) Chartered Professional Engineer UK and New Zealand (CPEng).
- 3 I have over 25 years' experience as a geotechnical engineer, working in New Zealand, Australia, the United Kingdom and various other countries worldwide.
- I have worked on a number of similar projects, including several assessing slope stability in similar schist terrain across Otago. I have also been geotechnical peer reviewer for the ORC on several other mining and quarrying applications. I have prepared and presented expert geotechnical evidence previously at Council hearings and various courts.
- 5 I have visited the site on the 11<sup>th</sup> June 2024 and viewed all the proposed pit extensions and the proposed waste rock stack locations.

## Code of Conduct Statement

6 Although this is not a hearing before the Environment Court, I record that I have read and agree to and abide by the Environment Court's Code of Conduct for Expert Witnesses as specified in the Environment Court's Practice Note 2023. This evidence is within my area of expertise, except where I state that I rely upon the evidence of other expert witnesses as presented to this hearing. I have not omitted to consider any material facts known to me that might alter or detract from the opinions expressed.

#### Scope of Evidence

- 7 My evidence will address the following in relation to the consent items:
  - (a) Stability of the open pit extensions proposed under static and seismic loading and the potential for long term instability beyond the slope crests.
  - (b) Stability of the waste rock stacks proposed under static and seismic loading.
  - (c) Stability of the proposed tailings storage facility within the disused Fraser's Pt.
  - (d) Erosion and sediment control.
- 8 My evidence is based on review of the following documents supplied by the applicant:
  - (a) AEE
  - (b) PSM (2024a) Project Element 4.3.2: Open Pit Extensions updated report dated 15 August 2024.
  - (c) WSP (2024) Frasers Backfill Stage 2 Design To Support Resource Consent Application
  - (d) PSM (2024b) Project Element 4.3.2: Open Pit Stability Assessment For Frasers TSF
  - (e) EGL (2024a) Oceana Gold (New Zealand) Limited Frasers Tailings Storage Facility – Stage 1 And Stage 2 Tsf Peer Review Comments
  - (f) EGL (2023) Golden Bar Waste Rock Stack Stage 2 Design Report
  - (g) EGL (2024b) Trimbells Waste Rock Stack Closure Stability Report
  - (h) EGL (2024c) Erosion and Sediment Control Report
  - (i) PSM RFI Response dated 15 August 2024
  - (j) EGL RFI Response dated 23 August 2024
- 9 I have supplied 2 reports on the consent application, an initial audit of the above documents in June 2024 and then a further review of the RFI

responses in November 2024. These documents should be read in conjunction with this evidence.

## Review of the Stability of Open Pit Extensions at Innes Mills Pit, Coronation Pit, Golden Bar Pit, Coronation North Pit and Frasers Pit

- 10 PSM (2024a) (2024b) provide an assessment of the stability of the open pit extensions proposed.
- 11 I provided initial comments on the report and the assessment of effects in my report dated 18<sup>th</sup> Jun2 2024.
- 12 PSM responded to my comments in their RFI response.
- 13 Overall, I had no concerns around the modelling of pit stability carried out by PSM and their general conclusions and recommendations.
- 14 There is a risk of instability in areas beyond the pit crest in all the pits post-closure and this risk is proposed to be mitigated through the creation of exclusion zones to ensure the factor safety (FOS) is 1.5 outside the exclusion zone. This FOS is appropriate as slopes with FOS above this have an acceptably low risk of failure. The exclusion zones are to be confirmed at a later stage, but are likely to range from 100 to 150 m. From a geotechnical perspective this is a reasonable mitigation (although the practicalities of this in perpetuity should be considered by others e.g. ongoing maintenance of any fences, signage etc.).
- 15 It should be noted that the pit stability could be improved considerably by buttressing the pit walls on completion with waste rock. This is proposed for the Coronation North pit and to a lesser extent for the Coronation and Golden Bar pits and there is no technical reason this could not be adopted for the other pits.
- 16 We note that additional assessment is recommended to assess the exclusion zone once additional investigations and review of batter stability during operations has been carried out.
- 17 It is worth noting that 2 public roads are within 100 m of the pits, which is within the preliminary offset distance. As these roads are used by the public, my view is that these roads should ideally have a minimum FOS of 1.5 at all times during the operation of the mine and this should be reflected in the consent conditions. The applicant has proposed a condition on this matter, which I discuss below.
- 18 There is significant ongoing instability in the existing Coronation North pit that extends several hundred meters from the pit. The proposed

backfill of the pit should buttress any unstable ground on mine closure. I raised some queries around this aspect which PSM responded to in their RFI response with additional comment and analysis. To ensure the long term stability of this pit a minimum level of backfill is required at the time of closure.

19 Overall, the assessments carried out are robust and any geotechnical effects can be mitigated. I have provided comment on the applicants proposed conditions later in this evidence.

## Waste Rock Stacks

- 20 EGL have provided assessments of the proposed Golden Bar and Trimbell Waste Rock Stacks.
- 21 On review of the initial reporting, I had some queries around aspects of the seismic loading used for the analysis and also regarding some of the soil strength parameters used for the analysis.
- 22 EGL provided a detailed responses to my queries which justified the inputs used in their analysis and resolved any concerns I had.
- 23 The Trimbell WRS will provide some damming of the water in the Coronation Pit, however as the WRS is very wide, I have no concerns that seepage through the WRS could result in an instability through internal erosion. A drain is proposed at the toe to control this seepage and I would concur that this is sensible precaution.
- 24 Overall, the geotechnical assessments carried out to date are robust and any geotechnical effects can be mitigated. I have provided comments on the applicants proposed conditions later in this evidence.

## Frasers Tailings Storage Facility

- 25 The proposal is to raise the currently consented tailings storage facility within the disused Fraser's Pit. WSP have provided an assessment of this storage facility.
- 26 The report fully explains all data inputs and they are considered appropriate.
- 27 Seepage and stability analysis are carried out. Both are considered appropriate.

- 28 The dam has been designed in accordance with current good practice. The dam has been categorised as low PIC, which seems reasonable given that it is contained entirely within a pit.
- 29 A full risk assessment has been carried out for the lifetime of the dam and there are no credible geotechnical failure modes. It should be noted that there is a risk identified that water stored within the dam is lost to the historic FRUG (underground mine). This should be considered by the groundwater expert.
- 30 Post closure the dam will be fully submerged within the pit, hence there are no external geotechnical effects.
- 31 The design and report have been peer reviewed by EGL.
- 32 Overall, the geotechnical assessments carried out for this facility are considered appropriate and robust.

## **Erosion and Sediment Control**

- 33 An ESC assessment is provided in the EGL report. The report is at a high level and recommends that detailed ESCPs are developed during the construction of the MP4 works where required.
- 34 I have reviewed the consent conditions for the various elements where erosion and sediment control could be an issue and am satisfied that these aspects are adequately covered by the proposed conditions.

## **Response to Submitters**

- 35 I have reviewed the submissions on the consent. Most submitters have not mentioned geotechnical issues.
- 36 Fish and Game have similar concerns to those I have raised above regarding the maintenance of the slope stability exclusion zone in perpetuity.

## **Review of Proposed Consent Conditions**

37 I have been provided a copy of the applicants draft consent conditions which I have reviewed with respect to geotechnical matters.

# MacRaes Phase 4 Project – Proposed District Council Land Use Consent Conditions

I would suggest that an additional condition be added to draft condition5.3. The landslide at the Coronation North pit that has been triggered

by previous mining and extends a significant distance from the pit and further regression of this slip could happen over time if it is not adequately stabilised during the backfilling. Therefore, in my opinion an exclusion zone is not considered appropriate in this instance. The backfill level of 600 mRL proposed by the applicant is sufficient to stabilise the landslide, but a lower backfill level may also be appropriate. I would suggest that an additional requirement for the Site Decommissioning Plan is is added to Condition 5.3

- (a) Peer-reviewed findings of a geotechnical assessment that indicates the minimum backfill level required within the Coronation North pit required to achieve a minimum Factor of Safety for the southwest pit slope of 1.0 under Maximum Design Earthquake seismic loading and a minimum Factor of Safety for the southwest pit slope of 1.5 under static loading.
- 39 Draft conditions 12.1 and 12.2 relate to the stability of waste rock stacks.
- 40 For condition 12.1 I suggest that a minimum Factor of Safety of 1.5 under static loading is a requirement of the consent as the current condition is open to interpretation in particular what constitutes a "catastrophic failure". Suggested revised condition 12.1:
  - (a) Waste rock stacks and waste rock pit backfills must be designed in accordance with industry best-practice, and to withstand a 1in-2500 annual-exceedance-probability earthquake without catastrophic failure, noting that some deformation is allowable provided the structure retains a state of long-term stability post event. Additionally, all waste rock stacks must be designed to have a minimum factor of safety of 1.5 under static loading.
- 41 I would recommend that proposed condition 12.2 be extended to include situations where additional rock is proposed onto existing waste rock stacks i.e. A design report shall be prepared for each new waste rock stack, for any modifications to existing waste rock stacks and for waste rock pit backfill by a suitably qualified geotechnical engineer or engineering geologist......
- 42 Draft conditions 13.1 and 13.2 relate to the Frasers tailings storage facility. I would suggest that a peer review of the design report referred to in draft condition 13.2 is made a condition of consent. The feasibility report provided with the application has been peer reviewed and it seems appropriate to continue this level of review for the detailed design of the structure given its size and relative complexity.

- 43 Draft conditions 14.1 to 14.3 relate to the pit lakes. Clause 14.2 (c) relates to the long term pit wall stability. I would suggest that the requirements in relation to this are expanded. Suggested revised clause 14.2(c):
  - (a) Details of the long term pit wall stability including definition of an exclusion zone around the pit where the factor of safety at the time of closure is less than 1.5. The stability assessment should be carried out by a suitable qualified engineer and subject to peer review.
- 44 Draft conditions 15.8 to 15.12 relate to road stability. I would suggest the following changes to these conditions:
  - (a) For Condition 15.8, The following should be added "the stability assessment should be carried out by a suitably qualified and experienced geotechnical engineer. The Consent Holder should contact WDC immediately if there are any areas of the public road where the existing Factor of Safety is less than 1.5 to agree immediate steps to be taken." My view is that given the road is accessible to the public if the current factor of safety is less than 1.5, the risk is unacceptable and some immediate mitigation is required e.g. daily visual monitoring, movement alarms etc.
  - (b) For Condition 15.10 I would remove the requirement to have the GSMP triggered by a calculated factor of safety i.e. delete the first part of the condition up to 1.0. Given the proximity of the public roads to a deep pit and the inherent uncertainty in slope stability analysis, in my opinion some form of management plan is required for the public roads irrespective of the analysis results. The complexity of the management plan can be related to the factor of safety i.e. where the calculated factor of safety is relatively high the management plan can be relatively simple.

## Coronation North

45 RM24.184.11 Proposed condition 8: Add text "All final slopes of the Coronation North and Trimbells Waste Rock Stack must have a minimum factor of safety against instability of 1.5 under static loading." This is to be in line with the EGL assessment reports provided in the application.

## Coronation Pit Extension

46 RM24.184.08 draft condition 8: Add text "*All final slopes of the Coronation Rock Stack must have a minimum factor of safety against instability of 1.5 under static loading.*" This is to be in line with the EGL assessment reports for other waste rock stacks provided in the application.

## Fraser Tailings Storage Facility and Innes Mills Pit

47 RM24.184.03 draft condition 4. I would suggest that the design of the tailings dam be subject to a peer review as this is in line with the application reporting and good practice for such a structure.

## Golden Bar Pit and Waste Rock Stack

48 RM24.184.23 Proposed condition 9: Add text "All final slopes of the Golden Bar Waste Rock Stack must have a minimum factor of safety against instability of 1.5 under static loading." This is to be in line with the EGL assessment reports provided in the application.

-EMardram

## **Colin Macdiarmid**

3rd June 2025