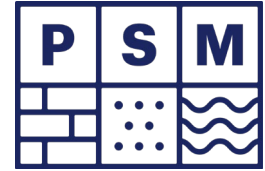


# MEMORANDUM



Company:	OceanaGold
Attention:	Andre Alipate
Our Ref:	PSM5423-008M REV1
From:	Adam Irvine Daniel Strang
Date:	14 February 2024

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## RE: WAIHI NORTH PROJECT - WILLOWS PRELIMINARY BOX CUT DESIGN

### 1. Introduction

This memorandum presents the Willows preliminary box cut design recommended for the underground mine of the Waihi North Project (WNP).

This preliminary design is provided in advance of the prefeasibility level (PFS) assessment and design recommendations to assist OceanaGold New Zealand Limited (OGNZL) with their Fast-track Approvals Act application. This memorandum does not present details of the input data, geotechnical model, shear strength parameters, stability analyses or box cut support requirements. We intend to provide these details in future detailed geotechnical design reports.

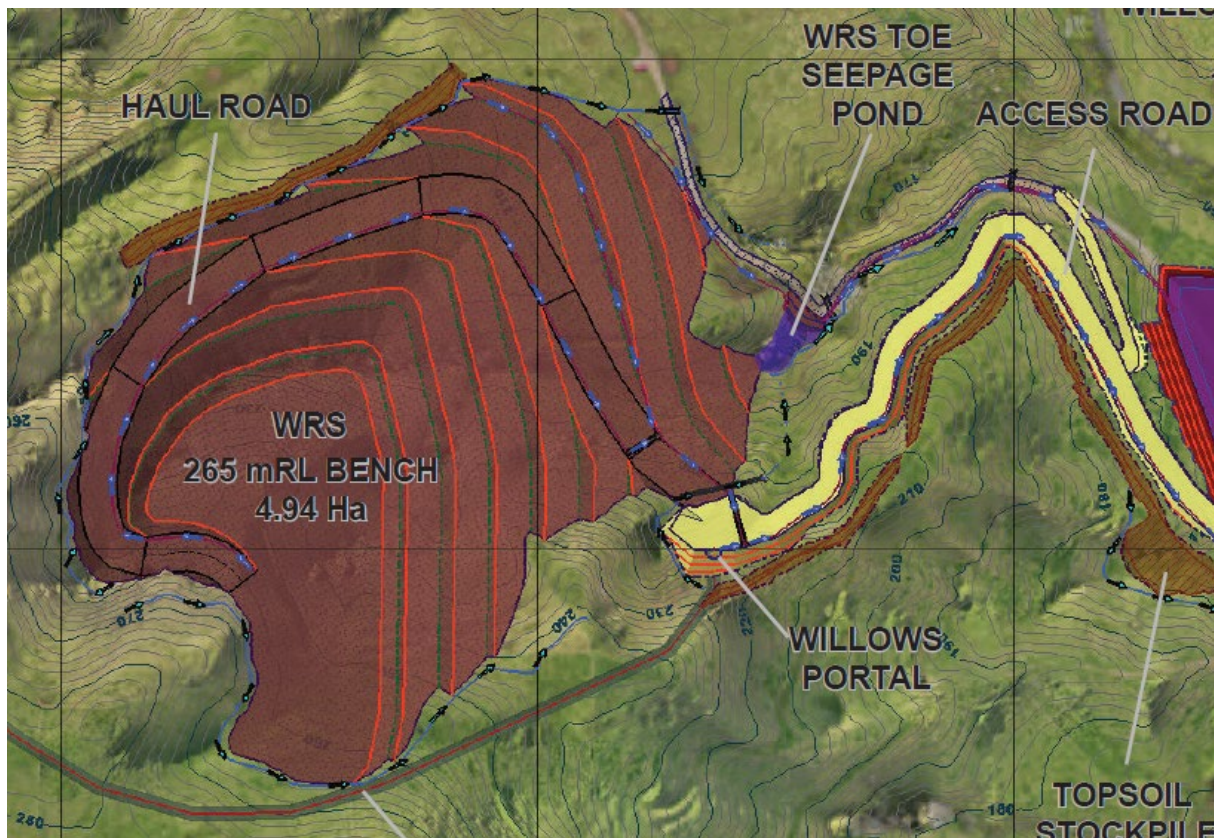
It is important to highlight that geotechnical site investigations and laboratory testing are ongoing at the time of writing and the final design of the box cut will be optimised following completion of the site investigation phase. The box cut geometry has been formulated using data available at the time of reporting.

This document was requested by OGNZL, and we understand this memorandum will be used as supporting documentation for their Fast-track Approvals Act application.

### 2. Background

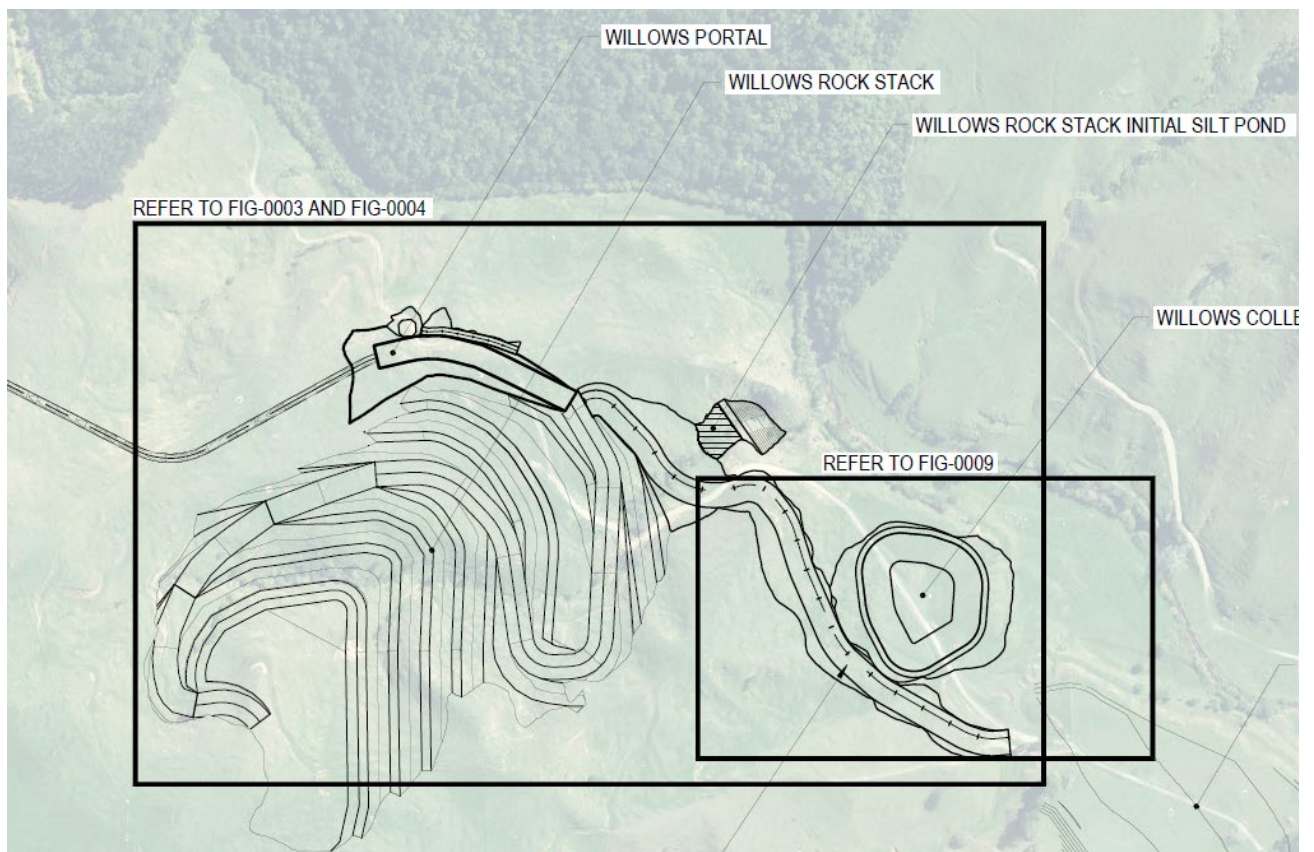
The original box cut, portal, and decline layout submitted for previous resource consent is presented in Inset 1, and is summarised as follows:

- Located to the south of the Waste Rock Stack (WRS)
- Three bench faces, termed herein:
  - Portal end wall
  - South-western side wall
  - South-southeast side wall.
- One continuous bench face angle of 60°
- Bench heights ranging up to a maximum of 20 m, but typically < 15 m
- A portal dimension of 5.0 mw x 6.0 mh commencing at ~205 m RL
- Box cut operating floor width of 22 m.



**Inset 1: Original OGNZL proposed site layout.**

For constructability the preferred box cut, portal and decline locations have been repositioned by OGNZL to the north of the WRS, Inset 2.



**Inset 2: Revised design showing box cut, portal and decline located to the north of the WRS.**

To investigate the revised location, OGNZL and Engineering Geology Limited (EGL) have designed and are currently executing a site investigation program to investigate ground conditions associated with this box cut, portal, and decline location.

PSM has been assisting OGNZL in geotechnical design of the box cut, portal, and decline utilising both the historic and new (2024) data being collected by EGL. Under our engagement PSM has undertaken the following:

- Geotechnical Assessment of the Proposed Portal and Waster Rock Stack (PSM5423-002R, dated 6 September 2024):
  - Desktop study to review previous reports and undertake an options assessment for the purposes of locating the portal and waste rock stack (WRS)
  - PSM evaluated several different alternate portal locations, however due to the range of available data, OGNZL had a preference to adopt the proposed layout presented in Inset 2.
- Selected Portal Option (PSM5423-006M, dated 30 September 2024):
  - Following PSM5423-002R, OGNZL requested PSM review the available data at the time to assess any geotechnical concerns that would preclude the proposed OGNZL box cut, and portal location
  - Based on the available data, PSM did not identify any adverse geotechnical conditions that would warrant relocating the box cut, portal or decline from this location.

Subsequently, the revised box cut, portal and decline located north of the WRS (Inset 2) was adopted for design.

The proposed box cut geometry is presented in Section 3 for Fast-track Approvals Act application purposes. At present, there are no geotechnical concerns that would prevent portal access at this location for the life of the project. Interaction with the WRS will be addressed in future design phases.

It is important to highlight that drilling is ongoing and the final geometry and ground support design (i.e., rock bolts and shotcrete) of the box cut will be optimised in future design phases.

3. Preliminary Box Cut Geometry

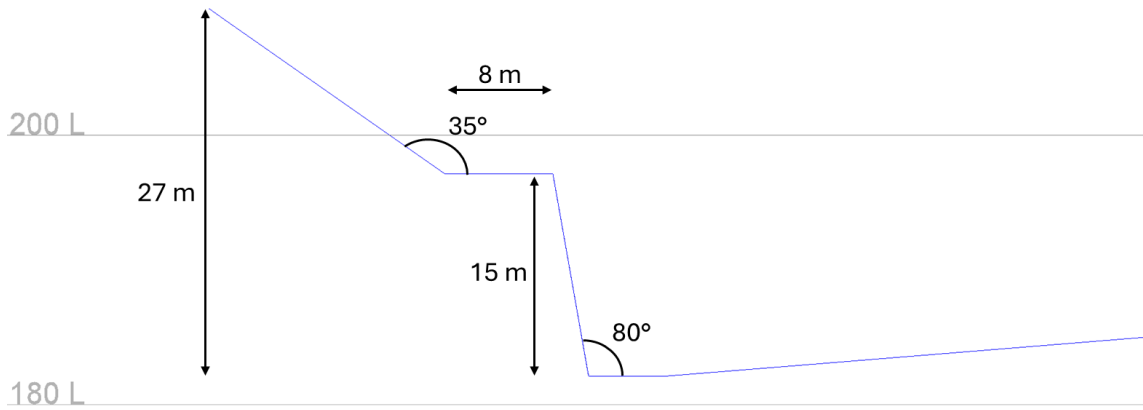
The recommended box cut design is presented in Table 1. The design is also presented graphically in Inset 3 for the portal end wall and in Inset 4 for the southern side wall. The location of the schematic sections is presented in Inset 5.

Table 1 – Recommended Box Cut Geometry

Box cut wall	Bench	Maximum Bench Height (m)	Bench Face Angle (°)	Berm Width (m)
Portal End Wall	Top Bench	19 <sup>(1)</sup>	35	8
	Lower Bench	15	80	
Southern Side Wall	Top Bench	17 <sup>(1)</sup>	35	
	Lower Bench	15	50	
Northern side wall	Lower Bench	12	50	

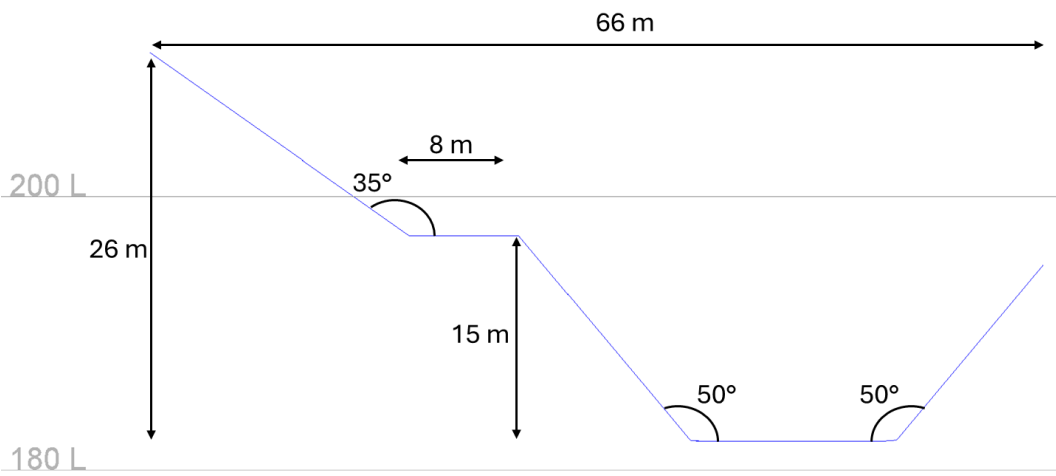
(1) Normal to cut slope.

220 L



**Inset 3: Schematic portal end wall design geometry.**

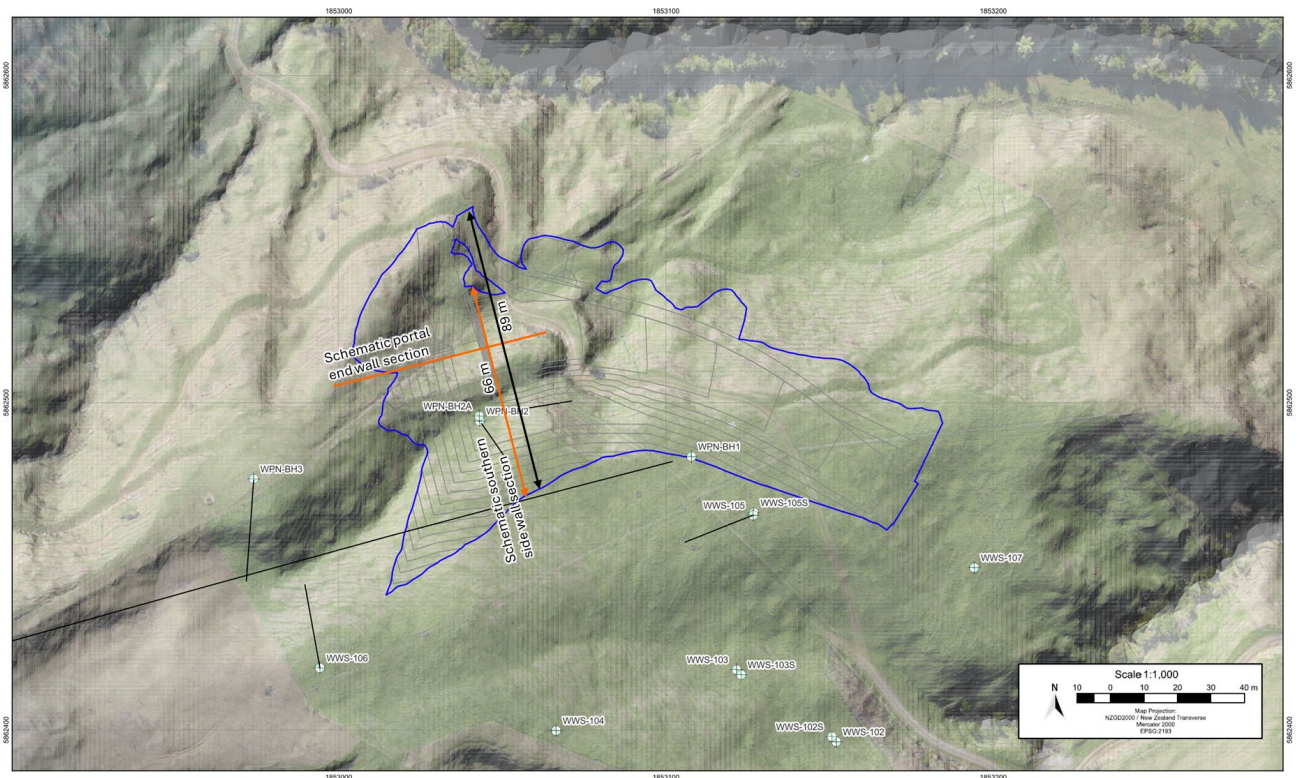
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**Inset 4: Schematic southern side wall design geometry.**

The recommended box cut geometry has been used to formulate the box cut footprint for Fast-track Approvals Act application purposes which is presented graphically in Inset 5.





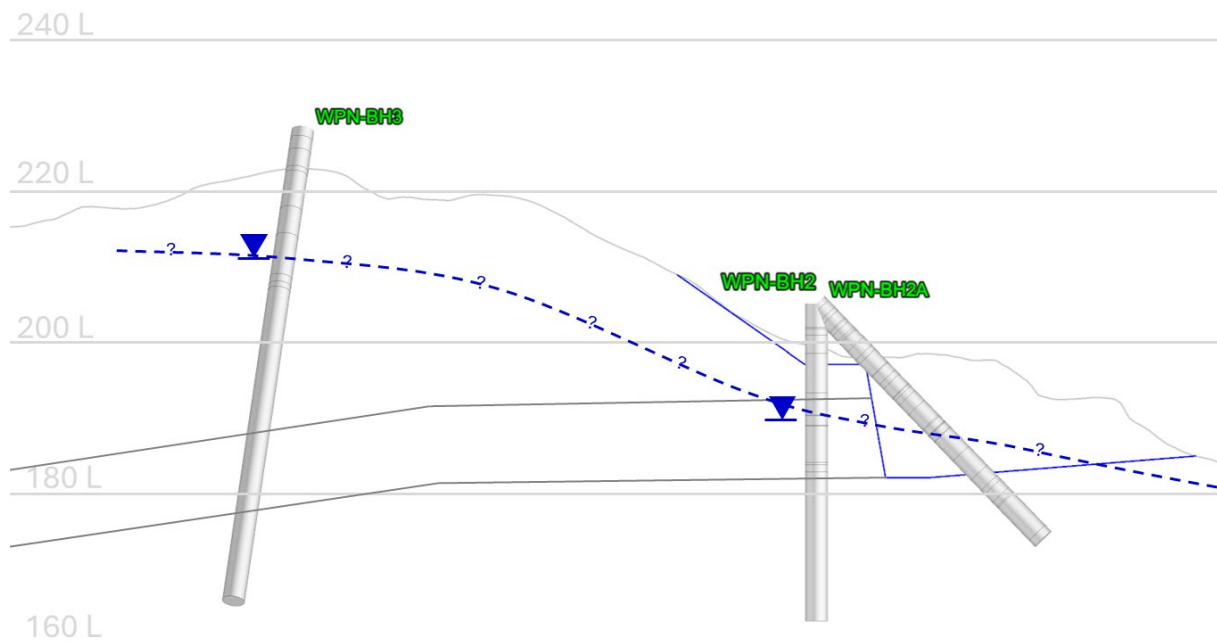
**Inset 5: Updated box cut footprint with location of schematic section and dimensions.**

The key changes from the original OGNZL design presented in Section 2 are described as follows:

- The box cut has been relocated to the north of the WRS
- The single bench design has been revised to a two bench design with an 8 m berm
- The top bench comprising ash, residual soil and completely weathered rock, is laid back to improve stability
- A berm has been added to reduce the slope height and provide catch capacity for any local failures that may occur in the upper soil. It may also provide additional protection from rockfall above, though this should not be the primary control of rockfall originating from the WRS
- The lower bench of the portal end wall is designed at 80° to facilitate construction of the portal. The steepened portal face would be supported by rock bolts and shotcrete
- The result of the geometry change has increased the footprint of the box cut. This enlarged footprint is recommended to be used for Fast-track Approvals Act application purposes only. We envisage the PFS design to fit within this preliminary footprint
- Inset 5 has been designed such that the southern side wall cut crest has been fixed as to not encroach on the WRS.

#### 4. Groundwater

Groundwater observations during drilling and nearby groundwater monitoring indicates groundwater will be intersected at approximately 190 m RL, Inset 6. We expect some minor, short term seepage to occur below this portal is level. Once the established, we expect only limited seepage to originate from the box cut.



**Inset 6: Observed groundwater levels near box cut.**

## 5. Future Work

It is recommended the box cut design is optimised following completion of the site investigation. This includes design of ground support, and this is likely to result in modification of the slope angles presented in Table 1. We expect any modification of design angles to fit within the preliminary design footprint presented in Inset 5.

We also recommend additional investigation is undertaken for detailed design. The following bullet points present proposed additional boreholes:

- One borehole oriented into the portal and portal end wall
- One borehole oriented into the southern side wall
- Both boreholes to have full televiewer (Acoustic and Optical) survey
- Samples collected for additional geomechanical laboratory testing.

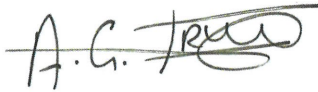
## 6. Box Cut Closure

It is understood OGNZL will backfill and recontour the box cut following completion of mining at WNP, such that the landform will be reinstated similar to the existing landform. Backfilling is likely to comprise placed and compacted high quality, free draining, rock fill to provide for geotechnical stability which will be confirmed in the next design phase.

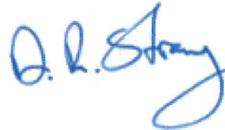
**7. Closure**

We trust this memorandum meets your immediate requirements. Please do not hesitate to contact the undersigned with any questions or comments.

**Yours Sincerely**

A handwritten signature in black ink, appearing to read "A.G. Irvine", with a stylized flourish at the end.

**ADAM IRVINE  
ASSOCIATE ENGINEERING GEOLOGIST**

A handwritten signature in blue ink, appearing to read "D. R. Strang", with a stylized flourish at the end.

**DANIEL STRANG  
PRINCIPAL ENGINEERING GEOLOGIST**