

EPBC ACT REFERRAL – ATTACHMENT 2: SUPPORTING INFORMATION ON HYDROLOGY AND HYDROGEOLOGICAL STUDIES HEMI GOLD PROJECT

12 MAY 2023

REVISION HISTORY

Rev	Description	Date
0	Hydrology and Hydrogeological Studies	12 May 2023

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1. INTRODUCTION

This attachment has been prepared to provide additional hydrological information to support the referral of the Hemi Gold Project (the Project) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It complements the information in, and should be read in conjunction with, the EPBC Act Referral Form (Referral Form).

The owner and proponent of the Project is De Grey Mining Limited (De Grey).

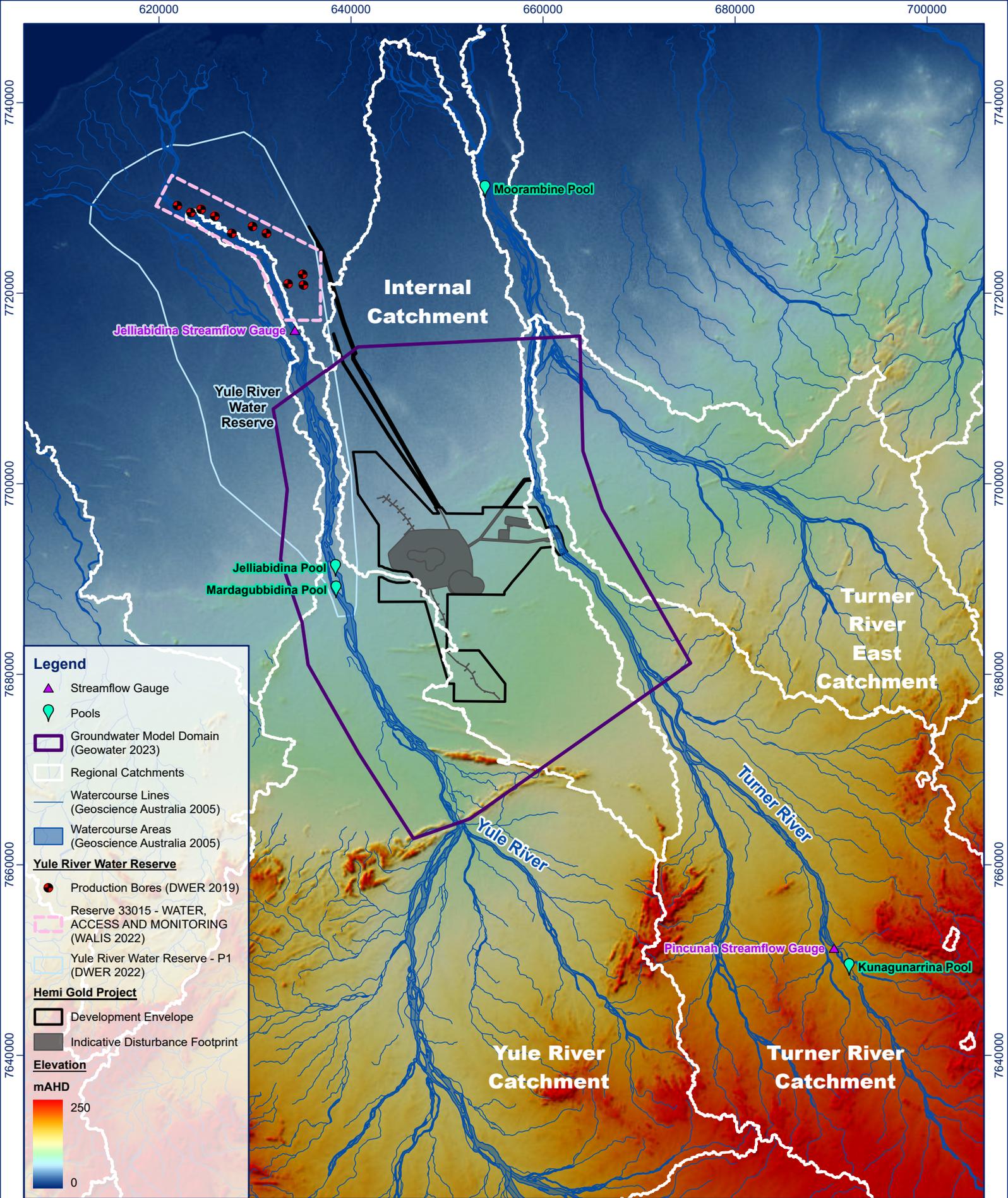
2. HYDROLOGICAL AND HYDROGEOLOGICAL INFORMATION

The Project is located in an internal surface water catchment between the Yule River and Turner River Catchments, see Figure 2-1. The mine area is 10 km east of the Yule River Water Reserve (YRWR), which is a Public Drinking Water Source Area (PDWSA) and 30 km south of a borefield inside Water Reserve 33015 that supplies Port Hedland with water. The Yule River; YRWR; and Reserve 33015 have been excluded from the Project Development Envelope.

Groundwater modelling by Geowater (2023) predicts that the proposed dewatering drawdown and managed aquifer reinjection (MAR) will not impact either the Yule or Turner Rivers. Mounding caused by MAR will be limited to no less than 2 m below ground level, such that no impacts to vegetation are anticipated (Umwelt, 2023). Furthermore, dewatering is not predicted to impact the YRWR for the life of the mine.

The groundwater model domain is shown in Figure 2-1 and predicted drawdown and mounding in Figure 2-2. The Project's detailed hydrogeological modelling assessment includes a conceptual water balance for the model's domain, which estimates that it has a long-term average inflow and outflow rate of 8.65 GL/year.

Total abstraction of ~179 GL has been modelled for the Project, this is ~15% of the ~1,873 GL of water stored in the alluvial aquifer in the model domain.



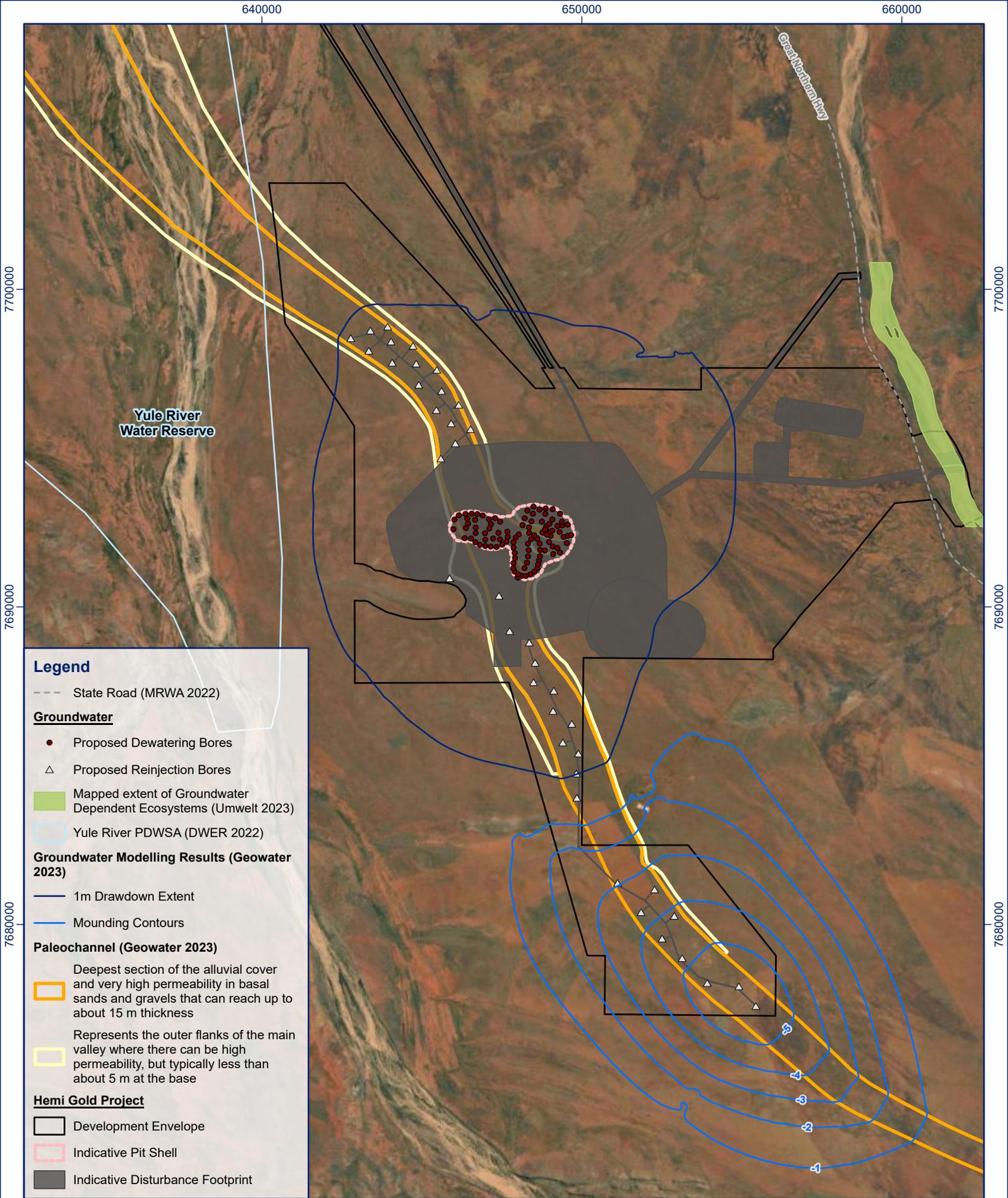
© 2005 Geoscience Australia, SRTM data from U.S. Geological Survey

Scale: 1:500,000
Projection: GDA2020 MGA Zone 50
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0 2.5 5 10 15 km

RPMGLOBAL

PROJECT		CLIENT
Hemi Gold Project Proposal		
Catchments and Topography		
Figure 2-1	ADV-AU-00241	May 2023



© 2023 Umwelt, © 2023 Geowater, © 2022 Main Roads Western Australia, © 2022 Department of Water and Environmental Regulation

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0 2.5 5 km

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PROJECT		CLIENT
Hemi Gold Project Proposal		
Dewatering Drawdown Zone		
Figure 2-2	ADV-AU-00241	May 2023

The Department of Water and Environmental Regulation (DWER) maintains a gauging station at Pincunah with publicly available monthly flow data. De Grey has used this data to compare natural flows to proposed surplus water discharge. The highest total monthly flow of the Turner River (adjusted for the location of the Hemi discharge point) for each year from 1986 to 2021 is compared to proposed surplus water discharge in Chart 2-1. Natural monthly flows exceed the predicted total annual surplus discharge frequently and often significantly. Note that Chart 2-1 does not show the total annual flow of the river, only the highest monthly flow in each given year. For most months of the year, the river is dry.

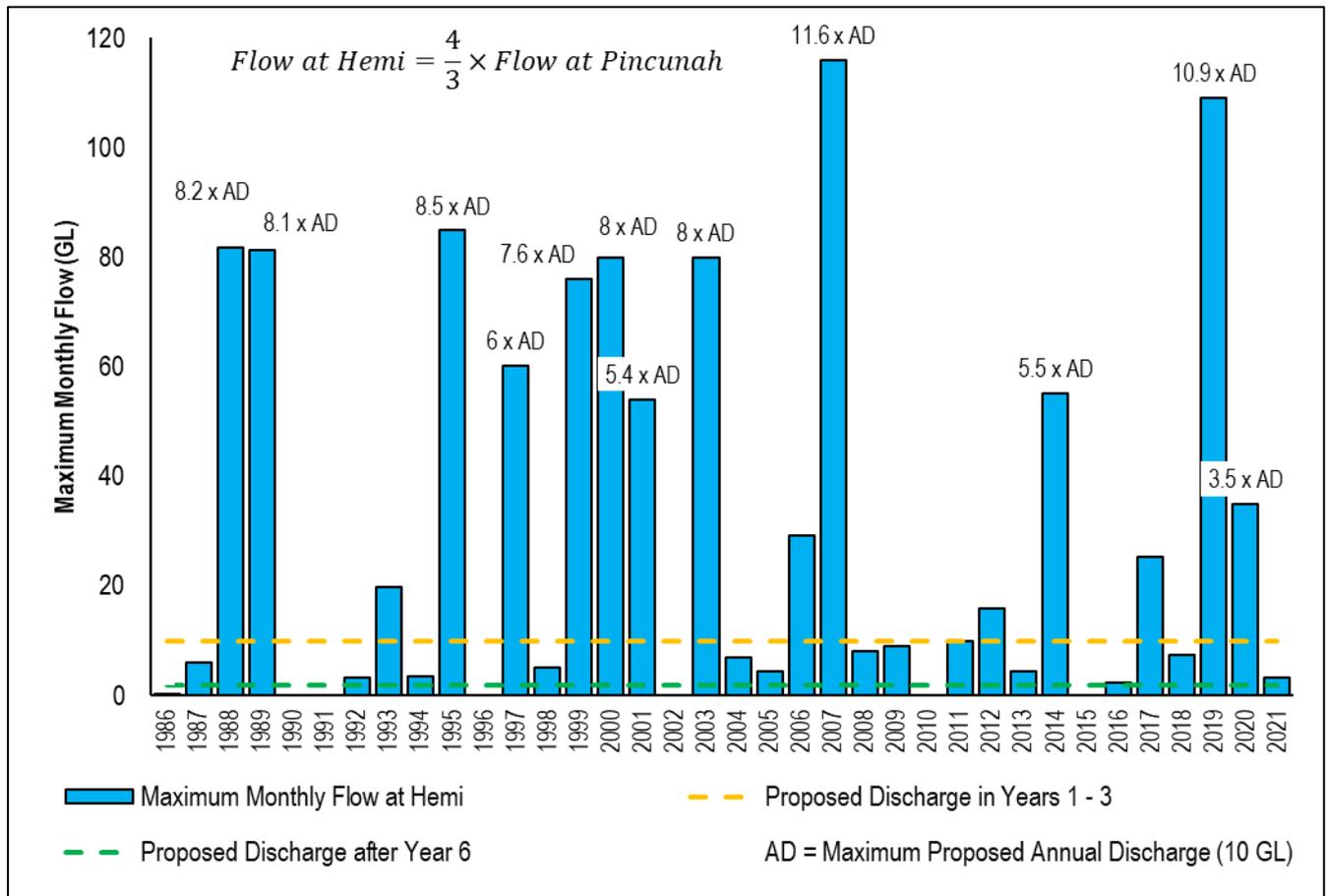
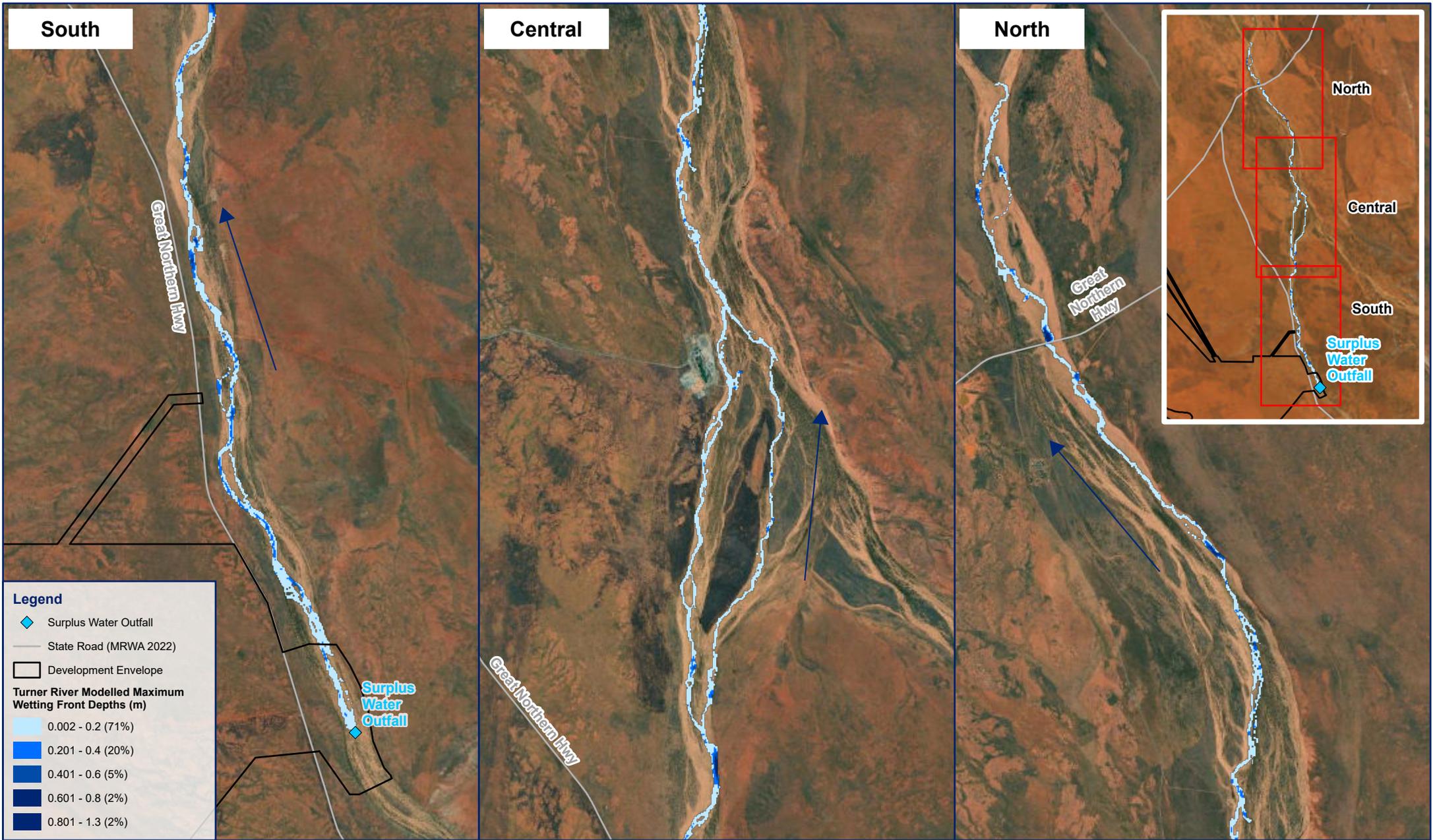


Chart 2-1: Maximum Monthly Flow in the Turner River and Proposed Surplus Water Discharge

Modelling of the surplus water discharge into the Turner River has been undertaken by SWS (2022). Modelling of no-natural-flow conditions indicates that at the surplus water discharge rates predicted during the Project’s first three years, the wetting front will progress from the outfall at approximately 5 km per month. The wetting front is not anticipated to extend beyond 50 km downstream of the outfall. This extent will be maintained for 14 months before discharge volumes decline and the wetting front begins to recede.

The modelled maximum extent of the wetting front is shown in Figure 2-3 and visually compared to photos of a natural flow at the proposed discharge outfall approximately 2.5 times greater than the proposed maximum discharge in Figure 2-4 and to natural flow at Indee causeway (2.1 km downstream) in Figure 2-5.



Legend

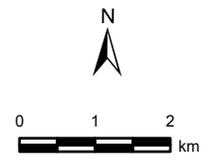
- ◆ Surplus Water Outfall
- State Road (MRWA 2022)
- ▭ Development Envelope

Turner River Modelled Maximum Wetting Front Depths (m)

0.002 - 0.2 (71%)
0.201 - 0.4 (20%)
0.401 - 0.6 (5%)
0.601 - 0.8 (2%)
0.801 - 1.3 (2%)

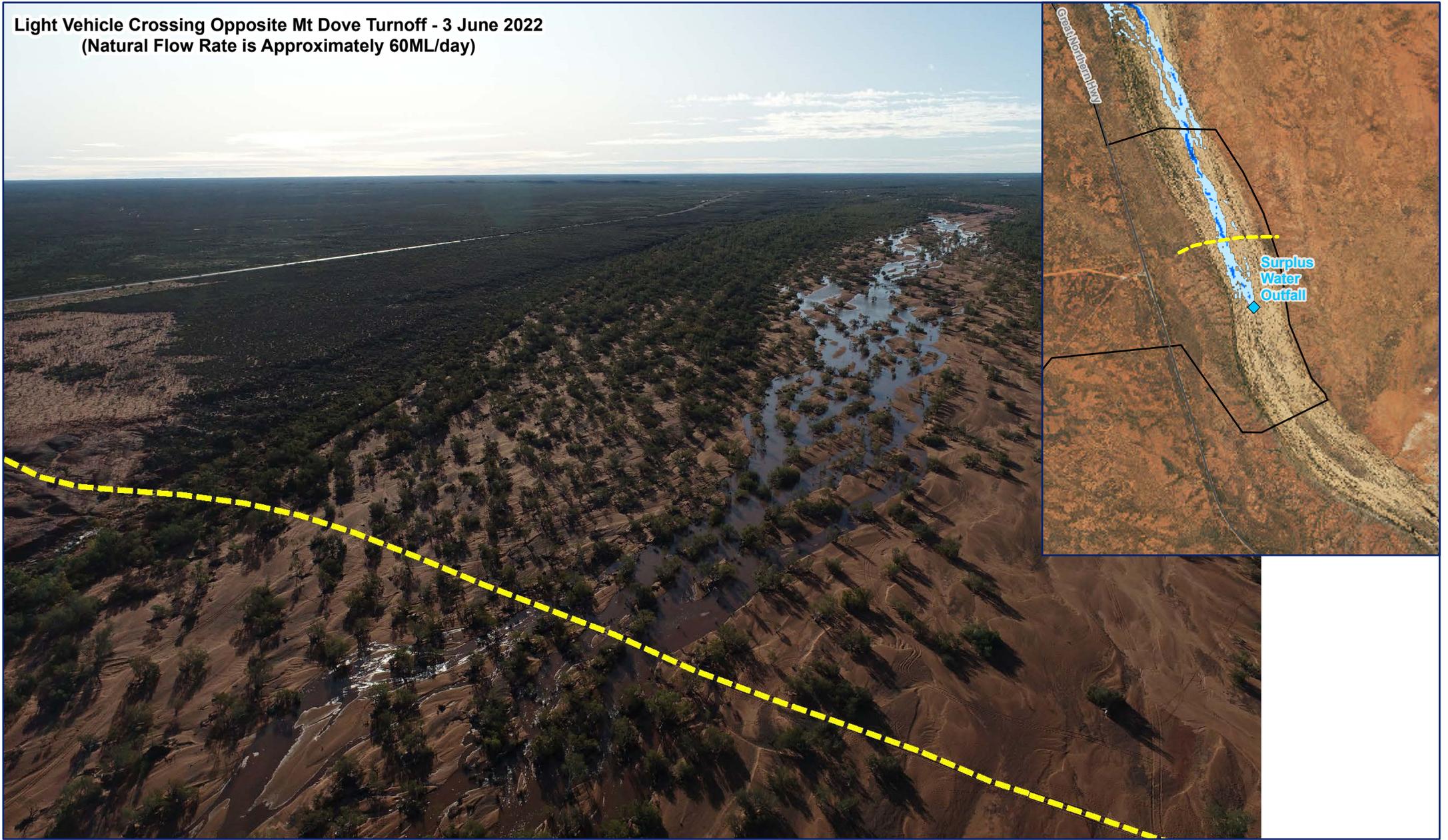
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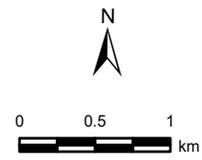
PROJECT		CLIENT
May 2023	Hemi Gold Project Proposal	
Figure 2-3		
ADV-AU-00241	Surplus Water Discharge Wetting Front Extent	

Light Vehicle Crossing Opposite Mt Dove Turnoff - 3 June 2022
 (Natural Flow Rate is Approximately 60ML/day)



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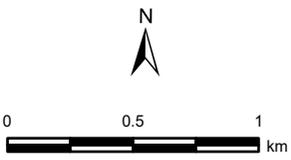
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May 2023	Hemi Gold Project Proposal	
Figure 2-4		
ADV-AU-00241	Discharge Modelling and Comparable River Flow Near Discharge Point	

Indee Causeway - 31 May 2022



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PROJECT		CLIENT
May 2023	Hemi Gold Project Proposal	
Figure 2-5		
ADV-AU-00241	Discharge Modelling and Comparable River Flow At Indee Causeway (2.1 km Downstream of Discharge Outfall)	

The expected depth range of the area of surplus water discharge in the Turner River is provided in Table 2-1. The majority of the surplus water discharge area is expected to be shallow with 71% less than 20 cm deep and 91% less than 40 cm deep. The maximum expected depth is 130 cm in pools or depressions, however only 2% of the discharge area is expected to exceed 80 cm in depth. In comparison, a 10% AEP event spreads across more than 80% of the river at a depth of approximately 3.5m.

Table 2-1: Modelled Depth Range of Surplus Water Discharge in the Turner River

Depth (cm)	Percentage of Surface Area	Cumulative Percentage
0.2 – 20	71%	71%
20 - 40	20%	91%
40 – 60	5%	96%
60 – 80	2%	98%
80 – 130	2%	100%

The proposed surplus water discharge to the Turner River will cause a temporary shift from seasonal to continual flows. Cross sections of the Turner River are provided at the outfall in Chart 2-2, 4 km downstream in Chart 2-3 and 12 km downstream in Chart 2-4. Due to the width of the Turner River at these locations (circa 1.5 km), the charts’ horizontal scale (width) is very compressed relative to the vertical scale (depth).

At the 4 km and 12 km locations the modelled high and low-flow surplus water discharge conditions are compared to flow events, expressed as Annual Exceedance Probabilities (AEP). The discharge will not cover the entire riverbed (approximately 1.5 km), being principally contained within the river’s low flow channel estimated to be 10% of the average width of the Turner River.

The modelled flow depth at the outfall shown in Chart 2-2 is approximately 25 cm in a river channel that is approximately 9 m deep. Chart 2-3 shows that the modelled depth 4 km downstream of the outfall is approximately 25 cm in a river channel that is approximately 7 m deep.

The discharge area is significantly narrower than the riverbed and shallower than natural flood events, and is not anticipated to have any long term impacts to river morphology.

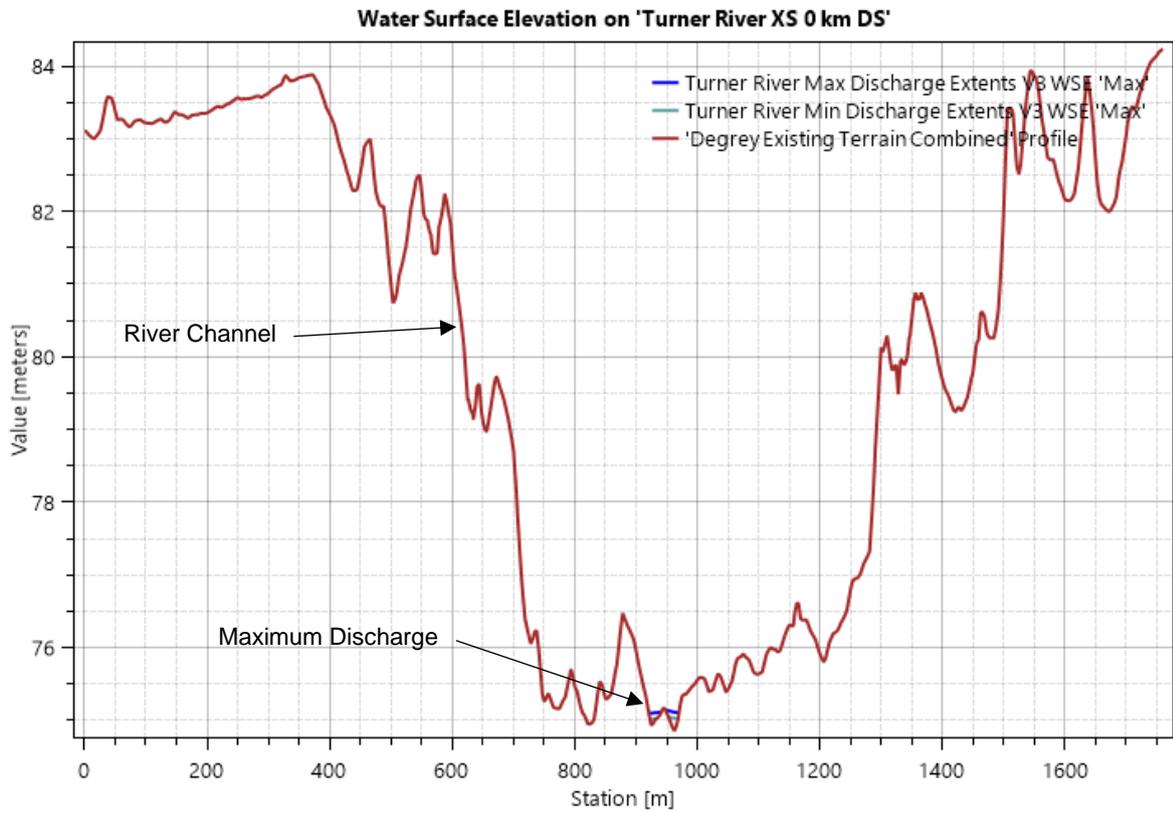


Chart 2-2: Cross section of Turner River at the Outfall

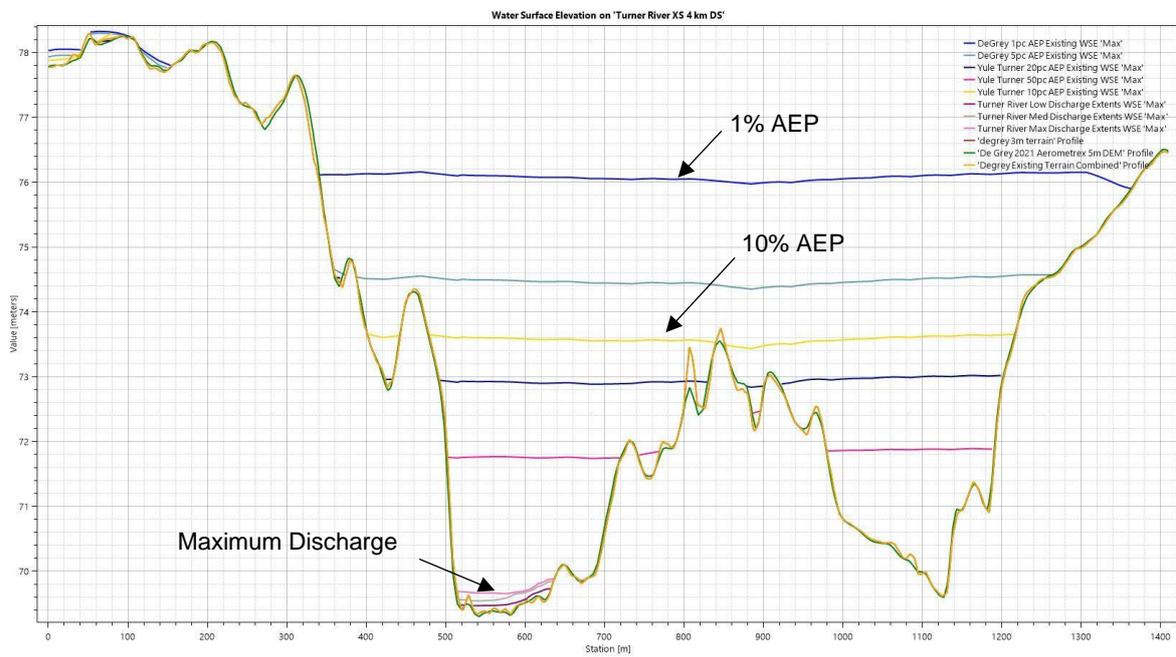


Chart 2-3: Cross Section of Turner River 4 km downstream of the Outfall

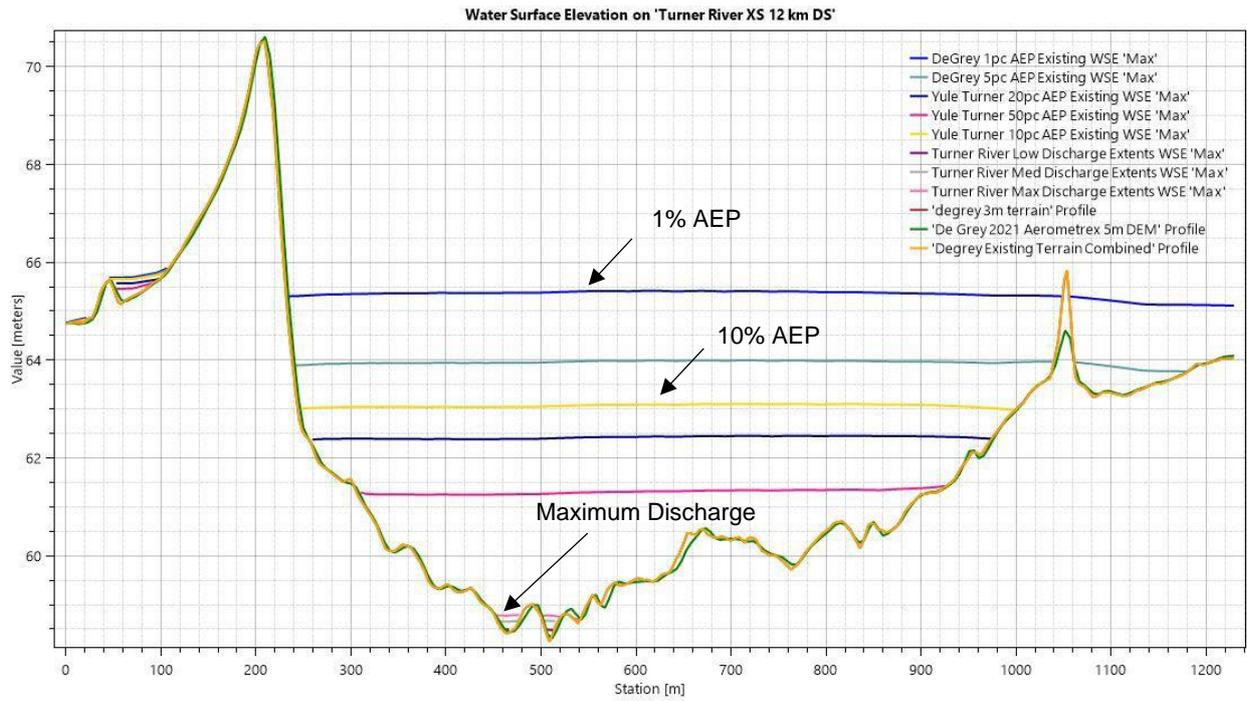


Chart 2-4: Cross Section of Turner River 12 km Downstream of the Outfall

3. REFERENCES

- Geowater. (2023). *Hemi gold project – Feasibility Study Report: Groundwater and Surface Water Assessment*.
- SWS. (2022). *De Grey Hemi Deposit Surface Water Hydrology Memorandum*.
- Umwelt. (2023). *Hemi Gold Deposit: Baseline Flora and Vegetation Assessment*.