



MEMORANDUM

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Date: 20 October 2025
Cc:
Document Number: J-H-NZ0235-002-M-Rev0
Document Title: BOGP Flow Augmentation Strategy

Hydro Geochem Group Limited (HGG) were retained by Matakanui Gold Limited (MGL) to develop a stream flow augmentation strategy for the Bendigo-Ophir Gold Project (BOGP). The primary objective of the strategy is to ensure there is no derogation of creek flows as a result of the BOGP.

HGG understand that Otago Regional Council have requested further details under Section 30 of the Fast Track Approvals Act related to what the strategy will look like. This memo serves to provide these further details sought, including:

- A description of how and where the proposed flow augmentation will occur.
- The proposed flow augmentation rates.
- Proposed monitoring to ensure the strategy is working as anticipated.
- Adaptive management considerations.

The focus of the strategy is in (i) Shepherds Creek (at location SC01) and (ii) Rise and Shine Creek and Clearwater Creek (at location RS03) (refer to Figure 1). Augmentation for smaller tributaries to these main stem creeks is not planned.

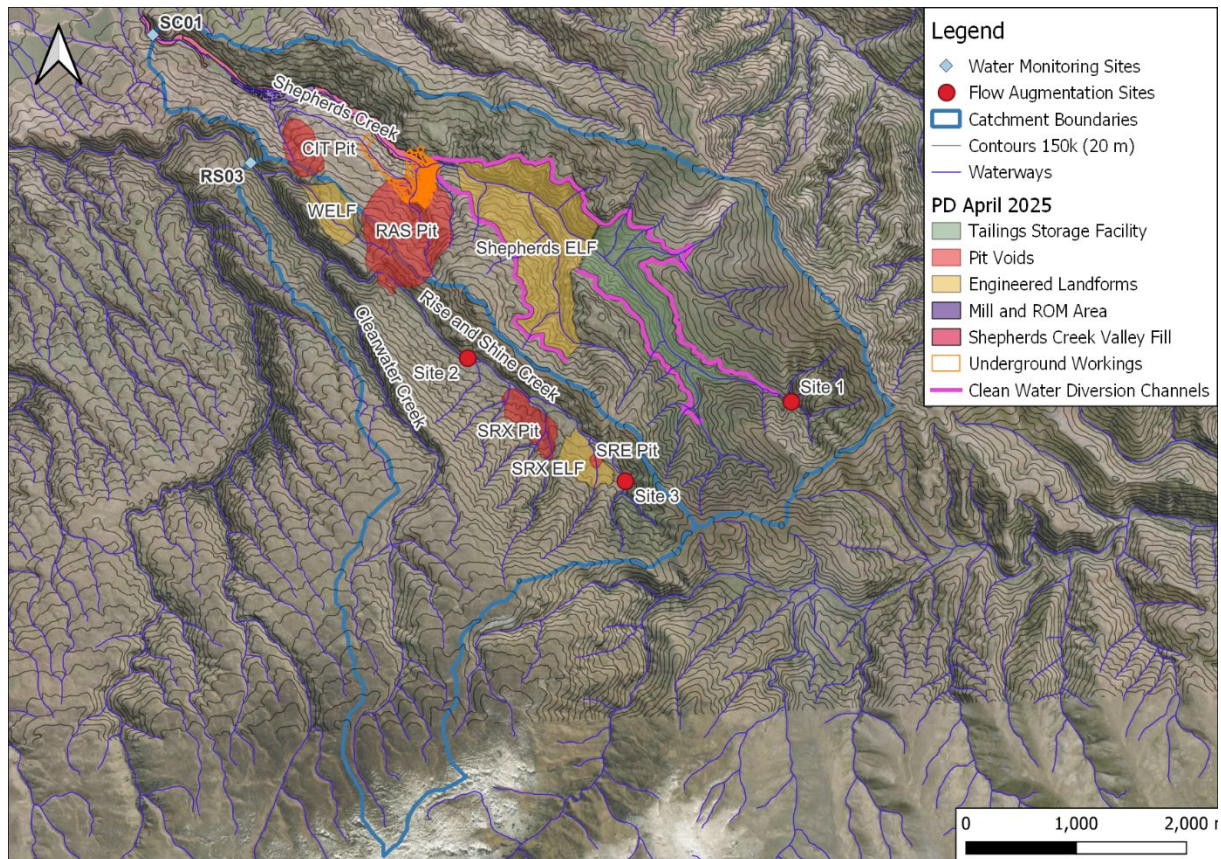


Figure 1: Location and areas of key mine domains within SC01 and RS03 catchments.

PROJECT DESCRIPTION

MGL is proposing to establish the BOGP, which comprises gold mining operations, processing operations, ancillary facilities and environmental mitigation measures on Bendigo and Ardour Stations in the Dunstan Mountains of Central Otago. The BOGP site is located approximately 20 km north of Cromwell and will have a maximum disturbance footprint of 610 hectares.

The following mine facilities are proposed (Figure 1):

- Open pits targeting the RAS, SRX, SRE, and CIT deposits.
- An underground mine targeting the RAS deposit (RAS UG).
- Three ex-pit Engineered Landforms (ELFs) – Shepherds ELF, SRX ELF, and West ELF (WELF).
- Two in-pit landforms (backfill) – CIT and SRE¹.
- Plant and processing/run of mine (ROM) area.
- The Shepherds Creek Fill (SCK Fill).
- A Tailings Storage Facility (TSF) and TSF Embankment.

¹ Note: SRE Pit is backfilled by the SRX ELF.

- Other ancillary support services / structures (e.g., roads, water management infrastructure, water treatment plants, etc).

These facilities will be placed in the catchments of Shepherds Creek and Rise and Shine Creek.

Mine Plan

The mine plan for the BOGP is outlined in Table 1. The schedule describes the timing of construction of different mine-site infrastructure and water-management components (illustrated in Figure 1), and subsequent mining operations.

Table 1: BOGP mine plan schedule.

MONTH	YEAR	MINING PHASE	DESCRIPTION OF PHASE
Pre-startup			Detailed design phase
0 to 6	0 to 0.5	Startup	Pioneering / RAS Pre-Strip, Initial Jean Creek Silt Pond, earthworks at process plant.
6 to 24	0.5 to 2	Project Development	Construction of process plant, TSF, Shepherds Silt Pond, North Diversion Channel, Commissioning, mining RAS pre-strip (Pre-strip ends month 19). Construction of the WELF begins.
Operations			
25 to 54	2 to 4.5	RAS pit mining on its own	Operations (pit ore production in month 20. UG Development begins month 54). WELF construction complete.
54 to 72	4.5 to 5	RAS pit with UG development	Operations (UG Ore production begins month 70)
72 to 132	6 to 11	RAS pit plus RAS UG	Operations (UG Ore production months 70 to 150)
		RAS Pit plus RAS UG plus CIT Pit	Operations (CIT Pit mined months 102 to 114)
		RAS Pit plus RAS UG, plus CIT backfilled, plus SRX	Operations (SRX Pit mined months 145 onwards)
120 - 160	10 to 13.3	RAS UG continues on its own with CIT and SRX open pit feeds	Operations (all mining halted month 160)
Closure			
160 - 372	11 to 31	Active Closure ¹	All mining halted. Active closure of pits, TSF, and wider site, plus setup of active water treatment plant (option).
372 -	31 onwards	Post-Closure	Passive treatment and maintenance

UG = Underground

1. Presented as two decades as part of the Pre-feasibility Mine Plan.

Source: BOGP_high_level_schedule_PFSconsent.xlsx (Santana, 2025)

Mine Water Management

The water management strategy of the BOGP will vary by phase as follows (MGL, 2025):

- During the Operational Phase, most mine impacted water (MIW) will be retained on site for use (e.g., for process water), with the only discharge from disturbed areas being surface runoff from haul roads, the infrastructure area, and ELF's, all via sediment control structures. Seepage from mine waste storage facilities (i.e., ELF's and TSF) will not be discharged off site. Clean water diversion channels will be established to convey clean water around mine domains (e.g., the TSF), thereby minimising the amount of water that can interact with mine waste material.
- During the Closure and Post-Closure Phases, seepage from ELF's, the TSF, and pit void water will be collected and treated, initially with an active water treatment plant (in the Shepherds Creek catchment) until contaminant loads have reduced such that passive treatment can be utilised to meet water quality objectives.

During the Operational Phase, average creek flows are anticipated to decline and require augmentation due to:

- The reduction in catchment area reporting to a given creek.
- Changes in the runoff processes of disturbed areas compared to undisturbed areas (i.e., ELF surface runoff).
- Creek flow losses as a result of groundwater drawdown associated with dewatering of pit voids.

During the Closure/Post-Closure Phase, creek flows are anticipated to increase due to the release of treated MIW.

ENVIRONMENTAL SETTING

Topography and Drainage

The BOGP is situated within the Shepherds Creek and Bendigo Creek catchments in the Dunstan Mountains. The creek channels are deeply incised into the bedrock terrain in the valley bottom. Both creeks drain to the Clutha River system.

The pre-mining catchment areas reporting to SC01 and RS03 (Figure 1) are 12.09 km² and 9.11 km², respectively.

Climate and Hydrology

MWM (2025) describe the climate setting for the BOGP, with monthly data shown in Figure 2. They make the following observations:

- Based on the Köppen-Geiger classification, the climate can be characterised as temperate, without a dry season, and as having a warm summer (Cfb). Mean annual air temperature is 8 °C.
- On an annual basis, precipitation (P) is approximately 510 mm while Potential Evaporation (PE) is approximately 815 mm.
- The climate is relatively dry, with a strong energy surplus ($PE > P$) present between September through March, and an energy deficit ($PE < P$) over the remainder of the year, most notably over winter.

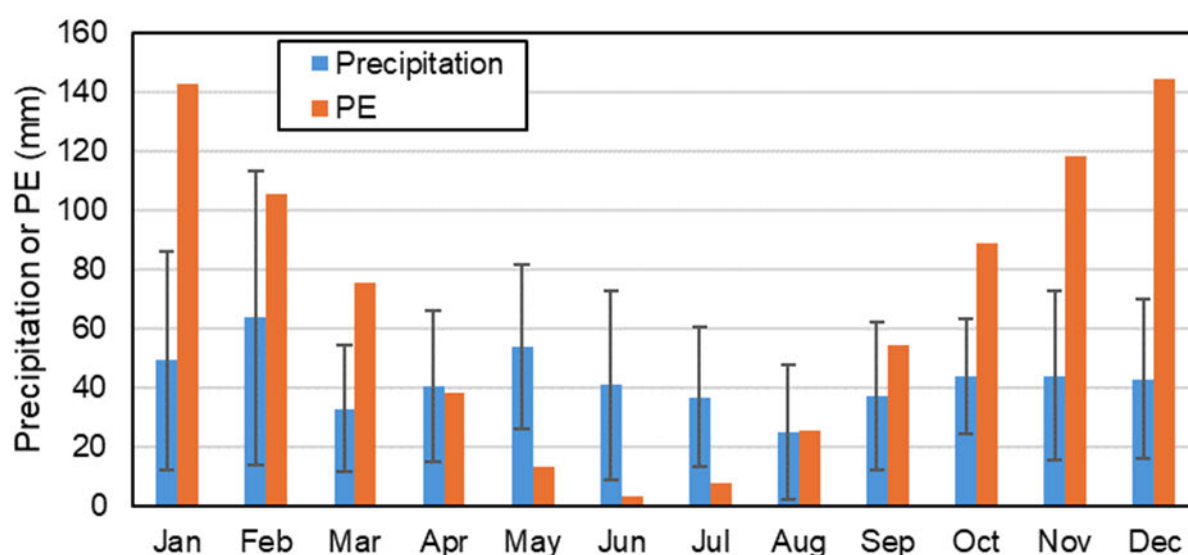


Figure 2: Monthly precipitation and PE summary.

PE=Potential Evaporation. Bars show monthly averages while error bars show rainfall standard deviation over the period of record.

Source: MWM (2025)

Creek flow has been monitored at BOGP since 2022. Figure 1 shows the locations of two flow monitoring sites, SC01 and RS01, which have mean flows of 15.6 L/s and 8.80 L/s, respectively (KSL, 2025a). Flow records shown in Figure 3 and Figure 4 indicate a strong seasonal flow pattern, with higher flows in the wetter winter months and lower flows in the drier summer months.

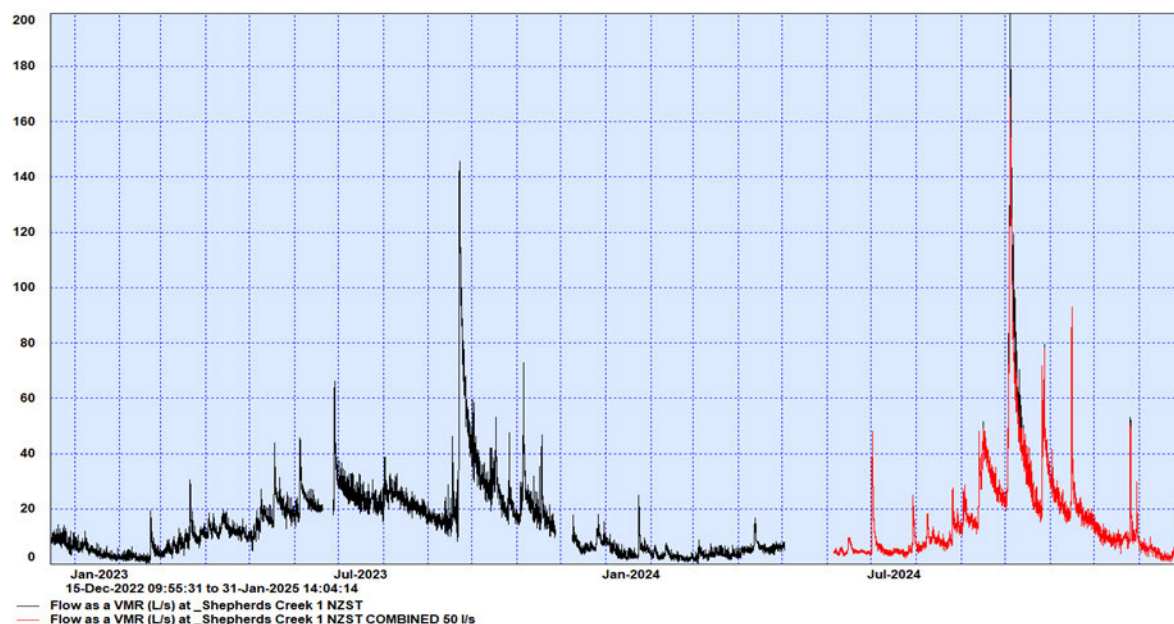


Figure 3: SC01 flow record.

Source: (KSL, 2025a).

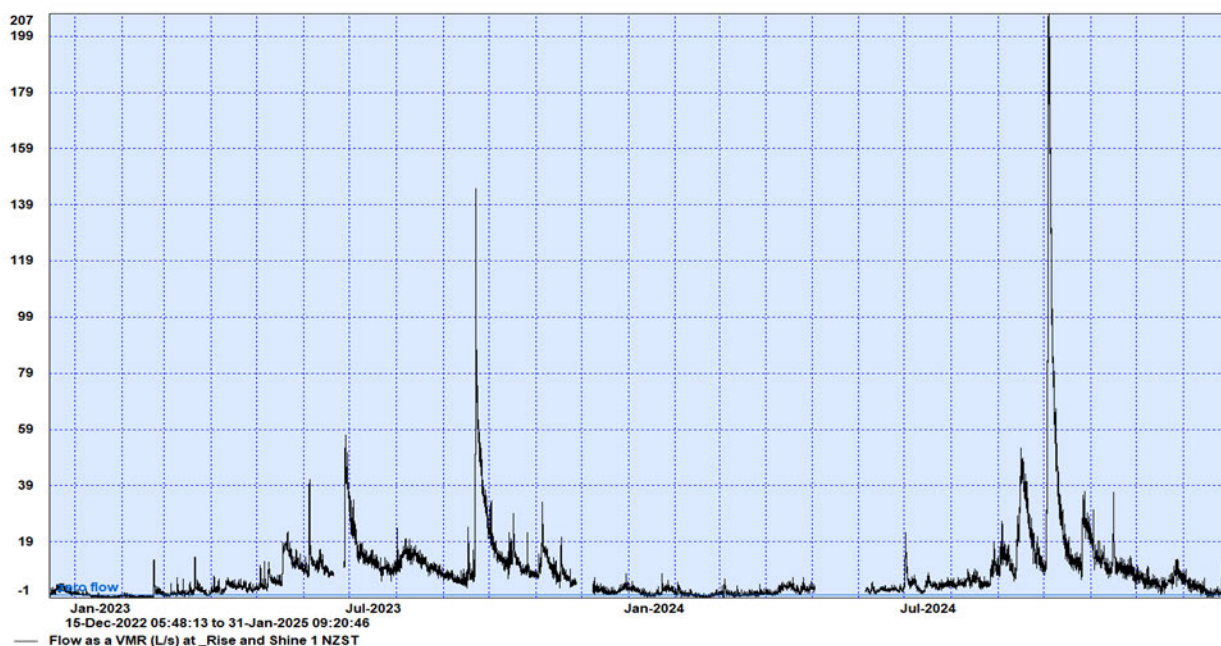


Figure 4: RS01 flow record.

Source: (KSL, 2025a).

KSL (2025a) developed a synthetic flow record for SC01 by establishing a relationship between recorded flows at SC01 and flow records at Cluden Stream @ Stockyards: $SC01 \text{ flow} = 0.03974838 \times \text{Cluden Stream flow} - 0.25974622$. The synthetic flow record timespan covered 23/11/2012 through 31/01/2023 (~11 years) and is shown below in Figure 5 for SC01. Adopting the catchment areas for SC01 and RS03, the mean monthly flows for each location are tabulated in Table 2 based on this synthetic flow record.

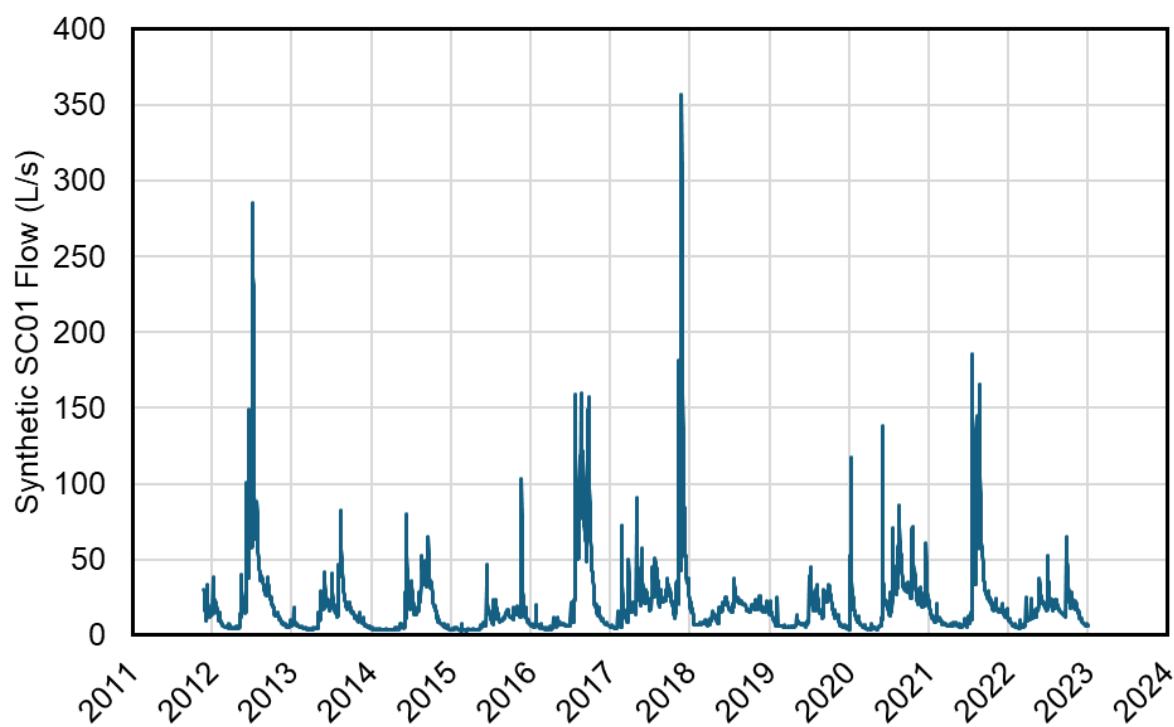


Figure 5: SC01 synthetic flow record.

Table 2: Estimated mean monthly creek flow rate.

MONTH	SC01	RS03
January	10.8	8.1
February	7.0	5.3
March	6.6	5.0
April	7.6	5.7
May	12.8	9.7
June	21.9	16.5
July	32.1	24.2
August	39.7	29.9
September	31.8	24.0
October	21.7	16.4
November	24.4	18.4
December	14.3	10.8

Note: all values are L/s.

Hydrogeology

HGG (2025) review available hydrogeological data for the BOGP and previous studies for the Macraes Mine situated in a similar hydrogeological setting. They summarise the hydrogeological setting at the BOGP as follows:

- Otago Schist is the main hydrogeological unit to be intercepted by mine domains (i.e., pit voids and underground workings). Thin alluvium and colluvium are locally present in valley bottoms but not anticipated to be hydrogeological significance based on available data (e.g., KSL, 2025b).
- Bulk permeability of the schist is generally low but enhanced near surface due to weathering:
 - Weathered Schist, with a $K=10^{-7}$ m/s, approximately 30 m thick.
 - Unweathered Schist, with a $K=10^{-8}$ m/s, >200 m thick.
- Groundwater is conceptualised to typically discharge and feed creeks and springs. Interactions with surface water are likely to be complex in both space and time, varying along creek reaches and seasonally. However, detailed information on groundwater-surface water interactions is not currently available to characterise interactions beyond a higher-level conceptualisation.

ESTIMATED CREEK FLOW CHANGES

Total changes to creek flows during mining operations were estimated based on (i) forecasted creek flow changes reported in MWM (2025), and (ii) forecasted groundwater discharge reduction reported in KSL (2025b). Estimated monthly changes to flows are tabulated in Table 3 for surface water/runoff (SW) and groundwater (GW) driven processes. How each of these forecasts were used is described further below.

For **SW**, MWM (2025) estimated the change in creek flow in response to changes in catchment areas reporting to SC01 and RS03, and changes to land-surface characteristics and resulting runoff. Note that these estimates represent the maximum life of mine footprint and do not take into account the smaller disturbance footprint earlier in mine life. Their results suggest:

- SC01 – 17% reduction of mean flows, and 27% reduction in low flows.
- RS03 – 13% reduction of mean flows, and 15% reduction in low flows.

These results were applied to the estimated mean monthly flows reported in Table 2 as follows:

- SC01, for higher flow months (i.e., June through November), the mean flow reduction was applied, while for lower flow months (i.e., December through May), the low-flow reduction was applied (as shown in Table 3 under SW columns).
- RS03, the same approach was applied, but the reductions were halved to reflect the fact that the estimates from MWM (2025) assume the SRX mine domains are active, when according to the mine plan (Table 1), they are not active until towards the end of mine life (Month 145) and only for a relative short period of time (15 months) prior to closure. The SRX mine domains account for approximately half the pit and ELF related disturbance area in the RS03 catchment.

The influence of SRX mine domains on creek flow reduction and how they will be managed are discussed separately.

It is noted that post-closure, SC01 creek flows are forecast to increase from baseline (i.e., pre-mining) by approximately 60% on average, while RS03 creek flow may increase by approximately 50%.

For **GW**, KSL (2025b), estimated creek flow losses as a result of pit void dewatering; their assessment did not assess the potential for the underground workings to reduce creek flows. For the purposes of estimating augmentation flow rates, these estimated creek flow reductions are assumed to be relatively constant in time and not vary seasonally. Their model results were:

- SC01 – Creek flow reduction for RAS Pit 3.5 L/s and CIT Pit 1.7 L/s.
- RS03 – Creek flow reduction for RAS Pit 2.0 L/s and SRX 15.3 L/s.

MWM (2025) estimate groundwater inflow into the RAS UG to be approximately 10 L/s. As noted in the mine plan, the RAS UG will start mid-way through mine life.

As previously noted, the SRX, CIT, and RAS UG mine domains feature later in the mine life and for a shorter duration compared to RAS Pit. As such, only influences from RAS Pit are accounted for in Table 3 for GW. Additional losses due to other mine domains can be added to the augmentation as they become active.

Post-closure, pit voids and underground workings will flood, reducing creek losses from groundwater sources. Although no formal assessment of potential post-closure changes to groundwater discharge to creeks has been made, the substantial increase in surface flows suggested by MWM (2025) will likely outweigh any residual reductions in groundwater discharge.

Table 3: Estimated creek flow reduction summary.

MONTH	SC01			RS03		
	SW	GW	TOTAL	SW	GW	TOTAL
January	2.9 (-27%)	3.5	6.4	0.6 (-7.5%)	2	3.2
February	1.9 (-27%)	3.5	5.4	0.4 (-7.5%)	2	2.8
March	1.8 (-27%)	3.5	5.3	0.4 (-7.5%)	2	2.7
April	2.0 (-27%)	3.5	5.5	0.4 (-7.5%)	2	2.9
May	3.5 (-27%)	3.5	7.0	0.7 (-7.5%)	2	3.5
June	3.7 (-17%)	3.5	7.2	1.1 (-6.5%)	2	4.1
July	5.5 (-17%)	3.5	9.0	1.6 (-6.5%)	2	5.1
August	6.7 (-17%)	3.5	10.2	1.9 (-6.5%)	2	5.9
September	5.4 (-17%)	3.5	8.9	1.6 (-6.5%)	2	5.1
October	3.7 (-17%)	3.5	7.2	1.1 (-6.5%)	2	4.1
November	4.1 (-17%)	3.5	7.6	1.2 (-6.5%)	2	4.4
December	3.9 (-27%)	3.5	7.4	0.8 (-7.5%)	2	3.6

All figures are reported in L/s, unless otherwise stated. SW reductions represent those as a result of to changes in catchment areas and changes to runoff processes. GW reductions are from dewatering of RAS and CIT pit voids and underground workings.

PROPOSED CREEK FLOW AUGMENTATION

The proposed flow augmentation is summarised in Table 4, with sites located upstream of potential effect areas (locations are shown on Figure 1). Proposed augmentation rates are based on the

estimated creek flow reductions (Table 3), with increases in augmentation rates aligned with when mine domains become active as per the mine plan (e.g., RAS UG starts around Year 5). It should be noted that this is a conservative approach because the estimated creek flow changes represent the response to maximum mine domain development and drawdown conditions. In reality, any creek flow reductions will occur more gradually as footprints expand, and drawdown conditions evolve over time.

Anticipated augmentation infrastructure will include:

- A pipeline from the borefield location to the flow augmentation location.
- Tank at the discharge locations to smooth discharge.
- A variable flow valve to alter flow rates as needed.
- Pipe outlet to the creek channel.
- An in-line flow meter to record augmentation volumes and flow rate.

Infrastructure design will be advanced during the detailed design phase.

Table 4: Proposed flow augmentation strategy.

	SHEPHERDS CREEK	CLEARWATER/RISE AND SHINE CREEK
Water Source	Groundwater from the Bendigo Aquifer. The proposed borefield is at the approximate coordinates: E5019500, N1310613, approximately 5 km west of SC01 near Bendigo Creek. KSL (2025) indicate this bore can supply approximately 110 L/s.	
Discharge Location	In Shepherds Creek, upstream of the clean water diversion channel intake (Site 1, see Figure 1).	See Figure 1: • Option 1: Midwater along Rise and Shine Creek (Site 2) prior to SRX development, then move upstream to above SRX development once active (Site 3). • Option 2: start augmentation at Site 3 above SRX development.
Timing	• Start: From the start of Project Development Phase (Month 6 onwards). • End: At an appropriate time, post-closure once anticipated creek flow increases have occurred.	
Quantity	• As shown for SC01 in Table 3 from Start. • Increase by 10 L/s for all months once RAS UG started. • Increase by 1.7 L/s for all months once CIT started.	• As shown for RS03 in Table 3 from Start. • Increase by 15.3 L/s for all months once SRX started.

PROPOSED ADAPTIVE MANAGEMENT AND MONITORING

A number of uncertainties exist that could change the actual augmentation rates required, such as model assumptions and real world complexity of groundwater-surface interactions. Adaptive management supported by performance monitoring will therefore be required to confirm that proposed augmentation flow rates remain appropriate and are not too high nor too low relative to observed creek flow. Regular review of monitoring data, and development of a trigger action response plan is recommended.

In particular, the following performance monitoring is recommended to support adaptive management:

- Record volumes and flow rates of water discharged for flow augmentation.
- Install automated creek flow gauging sites:
 - RS03 on Clearwater Creek. This site will monitor flow changes in Clearwater Creek and Rise and Shine Creek.
 - Another site on Clearwater Creek upstream of the confluence with Rise and Shine Creek to serve as a background monitoring site. Such a site will prove valuable to help distinguish between potential influences from the BOGP and natural flow variability.

SC01 may need to be replaced due to valley fill. This site will monitor flow changes in Shepherds Creek. Where possible, monitoring overlap with SC01 will be beneficial to leverage the existing SC01 flow record.
- Install groundwater level monitoring at selected locations to provide early warning of potential creek flow losses due to drawdown. Pressure transducers with dataloggers should be deployed to characterise temporal changes in groundwater levels. Locations should include:
 - Between dewatered mine domains and creek channels. These could be either standpipe piezometers or fully grouted vibrating wire piezometers.
 - In the RS03 catchment, where ground conditions allow (i.e., not bedrock creek channels), adjacent to creek channels to characterise vertical hydraulic gradients between creeks groundwater. Understanding these vertical gradients will provide a strong line of evidence to evaluate potential creek flow losses to groundwater. Direct push type standpipe piezometers are a useful option for this type of monitoring.

CLOSING REMARKS

Please do not hesitate to contact Ryan Burgess at +64 21 284 3999 or ryan.burgess@hydrogeochem.com.au should you wish to discuss our memorandum in greater detail.

REFERENCES

Hydro Geochem Group (HGG), 2025. BOGP Wetland Drawdown Assessment. RN: J-H-NZ0235-001-M-RevC. Dated 10 October 2025.

Kōmanawa Solutions Ltd (KSL), 2025a. Rise & Shine Gold Project – Surface Water & Catchment Existing Environment & Effects Assessment. Report for Matakanui Gold Limited. RN: Z24002BOG2-Rev2. Dated 19 August 2025.

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Matakanui Gold Limited (MGL), 2025. BOGP Water Management Plan. Dated 25 September 2025.

Mine Waste Management (MWM), 2025. BOGP Water and Load Balance Model Report. RN: J-NZ0233-016-R-Rev1. Dated 10 October 2025.

