

Water and Load Balance Model Report

Bendigo-Ophir Gold Project

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EXECUTIVE SUMMARY

This report describes the development of a site-wide water and load balance model (WLBM), which will support the Assessment of Environmental Effects (AEE) for the Bendigo-Ophir Gold Project (BOGP) for Matakanui Gold Limited (MGL).

Objectives of this Study

The primary objectives of the modelling exercise were as follows:

- Forecast operational and closure phase water balance conditions for the BOGP.
- Forecast instream water quality at the proposed resource consent compliance locations as compared to proposed water quality limits for the operational and closure phases.
- Forecast changes in stream flows as a result of the BOGP for the operational and closure phases.

Findings

The BOGP operational and post-closure assessment findings are summarised below.

Operational Phase

The Operational Phase calculations suggest the following:

- Water balance calculations suggest that the site will be in a water deficit condition up to Year 8. After this point, dewatering from satellite pits (i.e., SRX¹ and to a lesser extent CIT²) may push the site to a water surplus condition for the last few years of mine life without additional controls. Engineering controls (e.g., construct the water treatment plant prior to closure) are available to manage potential water surpluses, and can be evaluated during detailed design phases. Ongoing site water balance reconciliation for the BOGP will be required to confirm water balance conditions remain in a water deficit condition.
- Based on mine features that will retain water on site and not be discharged to the receiving environment during operations, mean flows at SC01 and RS03 are estimated to be reduced by approximately 17% and 13% respectively, at the full life of mine project footprint. Low flow conditions will also increase, showing the seven day mean annual low flow decreasing by approximately 27% and 15%, for SC01 and RS03 respectively.
- Interpretation of the mixing model results suggests surface water quality at SC01 and RS03 will remain below the proposed compliance limits for both surface and groundwater if groundwater is used for dust suppression.

¹ Srex Pit

² Come in Time Pit

Post-Closure Phase

The Post-Closure WLBM results suggest the following:

- Pit voids will fill with water and discharge mine-impacted water (MIW) at average rates of approximately 6 L/s, 8 L/s and 1.5 L/s, from the RAS³ Pit (via the RAS underground workings), SRX Pit, and CIT Pit, respectively. RAS Pit Lake will reach a stable condition at ~25 years, and SRX and CIT pits will do so in <5 years.
- Of the mine waste storage facilities (MWSFs), using a net percolation rate of 20%, Shepherds engineered landform (ELF) will have the highest average seepage rate of MIW of approximately 4 L/s, followed by the TSF⁴ seepage rate of approximately 2 L/s on average. SRX ELF, WELF⁵, and SCK Fill⁶ all had seepage rates of approximately 1 L/s or less.
- In the post closure phase, creek flows will increase, with average flows increasing by approximately 60% at Shepherds Creek (at SC01) and 50% at Rise and Shine Creek (at RS03). Low flow conditions will also increase, with the seven day mean annual low flow increasing by approximately 530% and 280%, for SC01 and RS03 respectively.
- Model results suggest that active water treatment within the Shepherds Creek catchment will be needed for 50 years, when concentrations of SO₄, Mo, and Sb after passive treatment are below the surface water and groundwater limits, for the base case model scenario.
- Water quality findings for the base case model at RS03 indicate:
 - No limits are exceeded after partial passive treatment of the average flow (8 L/s) from SRX Pit.
 - Active treatment of MIW from SRX Pit and SRX ELF is not required.

Operational Management Recommendations

The following management recommendations are proposed for the Operations Phase:

- Back to back wet years and changes of water balance assumptions (e.g., dust suppression water sources) may move the site into a water surplus condition. As such, detailed water balance modelling by mine stage and that includes rainfall variability is recommended to support detailed mine design and improve confidence in a water deficit being maintained. Development of an adaptive management process related to the site water balance would also support proactive management of identified risks.

³ Rise and Shine Pit

⁴ Tailings Storage Facility

⁵ West ELF

⁶ Shepherds Creek

- A site water balance reconciliation should be completed regularly (e.g., annually or more frequent) to confirm water balance model results are appropriate, and/or make model updates to improve confidence in model results projected into the future.
- Clean water sources (i.e., bore water) should be used for dust suppression.
- Pit sump water could potentially be used for dust suppression early on in mine life. Adaptive management processes should be developed to proactively manage and respond if performance and/or compliance monitoring data suggests use of pit sump water may begin to provide a risk of non-compliance (i.e., potential to cause exceedance of water quality limits at SC01 and RS03).
- Other water management options include the early construction, during operations, of the water treatment plant if prolonged water surplus conditions eventuate.

Closure Management Recommendations

The following management recommendations are proposed for the active- and post- closure phases:

- Active water treatment in the Shepherds Creek catchment through a water treatment plant (WTP) is required until passive treatment systems can achieve the proposed water quality compliance limits.
- Passive treatment of the SRX Pit Lake is required to achieve water quality limits at RS03. Noting that passive treatment is modelled at 8 L/s (average SRX Pit flow rate) with higher flows being untreated.
- Active and passive water treatment systems need to be developed to a detailed design level:
 - For the WTP, these studies need to be completed within the first few years of the mine commencing so that the technology is ready for operations and closure. Early design of the WTP would mean it is ready as part of any adaptive management process for water management.
 - Passive water treatment systems should be designed once the project is operational using actual water quality from the project mine domains to confirm the proposed approach is appropriate.
- The majority of PCOC loads originate from Shepherds ELF and the TSF; therefore, performance monitoring of both flow rates and water quality is recommended at these locations.
- Model results suggest that active water treatment within the Shepherds Creek catchment will be needed for 50 years, when concentrations of SO₄, Mo, and Sb after passive treatment are below the surface water and groundwater limits, for the base case model scenario.
- Diverting Shepherds ELF and TSF seepage to the RAS Pit Lake for dilution was also assessed as a management option. Results indicate that at closure of the BOGP, the proposed water quality limits can be achieved without active treatment. The exception to this is molybdenum.

Active treatment is required until Mo decreases to a concentration that can be managed by passive treatment technologies.

- Performance monitoring is necessary to assess whether treatment is required using these management mechanisms.

Forward Works

The following forward works are proposed:

- A transient operational site wide water and load balance model needs to be developed prior to mine commencing to improve confidence in water accumulation or losses over time and water quality, particularly for seasonal dynamics. Such a model will support detailed design of the TSF.
- Additional ground investigations, groundwater monitoring, and detailed modelling will be required at the detailed design to confirm mine waste storage facility seepage collection systems will achieve anticipated collection requirements.
- The collection of performance monitoring data to improve model input data reliability is required, including:
 - Water quantity and quality data from mine domains and water movement around the site.
 - Water quantity and quality data as compliance locations.
 - Records of pit lake filling levels over time.
- Once the mine is operational, collection of water quantity and quality data (obtained as part of performance monitoring) should be compared to the developed operational site wide water balance model periodically to confirm model results remain reasonable. Model revisions and/or re-calibration may be required if material differences are apparent.
- A cover system trial should be established early on in mine life to demonstrate that a NP of 20% of mean annual rainfall can be achieved. Such a study would provide confidence that water quality closure objectives can be achieved and support closure planning.

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1 INTRODUCTION

This report describes the development of a site-wide water and load balance model (WLBM), which will support the Assessment of Environmental Effects (AEE) for the Bendigo-Ophir Gold Project (BOGP) for Matakaniui Gold Limited (MGL).

1.1 Objectives and Scope

1.1.1 Objectives

The primary objectives of the modelling exercise were as follows:

- Forecast operational and closure water balance conditions for the BOGP.
- Forecast stream water quality at the proposed resource consent compliance locations as compared to proposed water quality limits for the operational and closure phases.
- Forecast changes in stream flows as a result of the BOGP.

1.1.2 Scope of Work

Mine impacted water (MIW) management during the operational phase of mining will involve discharge of only episodic runoff from haul roads and engineered landforms (ELFs) via sediment control structures. All other MIW (e.g., landform seepage from the ELFs and the tailings storage facility (TSF)) will be collected and stored for re-use on site (e.g., processing plant water) or be returned to the TSF impoundment. MIW management in the closure/post-closure phase, will require some seepages to be treated and discharged to the receiving environment. In this analysis, we partition the operational phase and closure/post-closure phase separately as follows:

- Operational phase - spreadsheet based models and associated calculations used to describe average annual water balance and runoff event discharges of MIW (Section 4).
- Closure/post-closure phase – GoldSim models and associated calculations, used to describe the evolution of water-quality over time, that results from the discharge of treated MIW (Section 5).

It is noted that during mine operations there will be the opportunity for proactive management of potential water-quality impacts. This will contrast with long term post-closure water management, where on-site presence is typically limited. The increased model complexity and effort required to describe closure/post-closure conditions is therefore appropriate. It is recommended that future updates to the modelling should expand the GoldSim model to include the operational phase to support mine water management planning.

2 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 project site is located approximately 20 km north of Cromwell and will have a maximum disturbance footprint of 610 hectares.

2.1 Project Background

The total Mineral Resource Estimate for the BOGP using a 0.5 g/t cut-off for open pit and 1.5 g/t for underground is 34.3 Mt at 2.1 g/t for 2.34 M oz (MGL, 2025). The Bendigo-Ophir resources occur in four deposits: Come in Time (CIT), Rise and Shine (RAS), Srex (SRX), Srex East (SRE). The majority of identified mineral resources are located within the RAS deposit. Three primary geological units are recognised at site:

- RSSZ – Rise and Shine Shear Zone.
- TZ3 – Lower Greenschist facies Textural Zone 3 rocks of the Otago Schist.
- TZ4 – Upper Greenschist facies Textural Zone 4 rocks of the Otago Schist.

The resources will be mined by open pit methods at each deposit within the project site, with underground mining methods also proposed to be utilised at RAS to access the deeper gold deposits. The majority of the mining activities, ancillary facilities and associated infrastructure will be located in the Shepherds Valley with non-operational infrastructure located on the adjoining Ardour Terrace. The BOGP also involves the taking of groundwater from the Bendigo Aquifer for use in mining-related activities and the realignment of Thomson Gorge Road via Ardour Station.

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.
- Three ex-pit ELF's – Shepherds ELF, SRX ELF, and West ELF (WELF).
- Two in-pit landforms (backfill) – CIT and SRE⁷.
- Plant and processing area, where CIL extraction technologies will be used as part of the ore recovery process. This includes the Shepherds Creek Fill (SCK Fill).
- A TSF and TSF Embankment.
- Other ancillary support services / structures (e.g., roads, water management infrastructure, water treatment plants, etc).

These facilities will be placed in the catchment of Shepherds and Rise and Shine creeks.

⁷ Note: SRE Pit is backfilled by the SRX ELF.

2.2 Mine Plan

The mine plan for the Bendigo-Ophir site 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. The schedule is also used to inform development of operational phase and closure phase water-management plans.

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)

Key BOGP domains and their footprint area are summarised in Table 2.

Table 2: Key mine domain footprints.

MINE DOMAIN	CATCHMENT	AREA	NOTES
TSF	SC01	608,338 m ²	Maximum TSF footprint.
Shepherds ELF	RS03	1.11 km ²	Maximum ELF footprint.
SRX ELF	RS03	0.15 km ²	Maximum ELF footprint.
WELF	RS03	0.17 km ²	Maximum ELF footprint.
SCK Fill	SC01	0.11 km ²	Maximum footprint.
RAS Pit	SC01/RS03	0.64 km ²	72% in SC01 catchment 28% in RS03 catchment.
CIT Pit	SC01/RS03	0.14 km ²	87% in SC01 catchment 13% in RS03 catchment.
SRX Pit	RS03	0.15 km ²	Maximum footprint.
SRE Pit	RS03	0.10 km ²	Maximum footprint.
Infrastructure Area	SC01	0.05 km ²	Includes Mill and ROM.
Haul Roads	SC01/RS03	0.39 km ²	82% in SC01 catchment 8% in RS03 catchment.

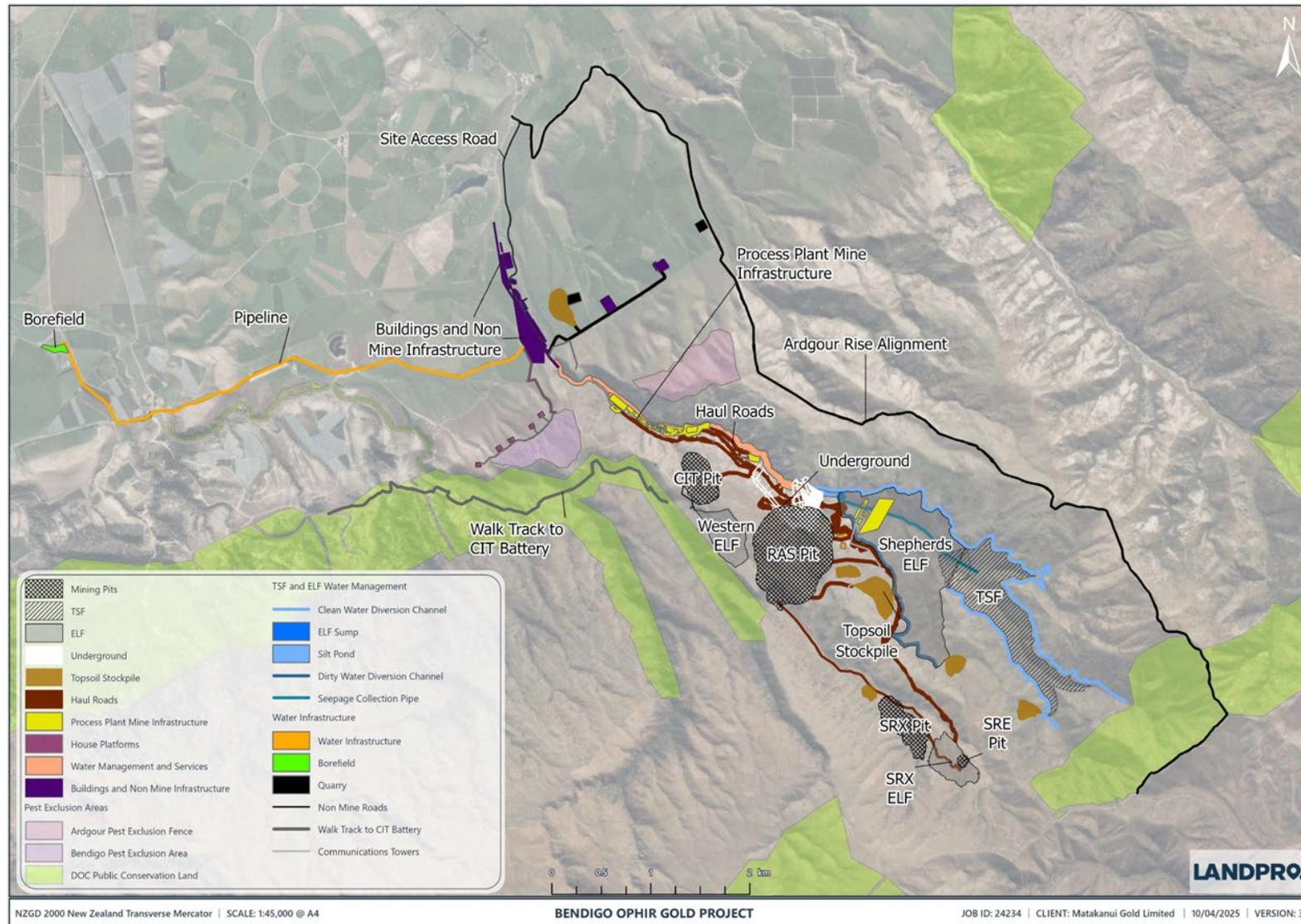


Figure 1: BOGP mine domains.

2.3 Water Management

To help understand the origin and quantity of rainfall and runoff being derived from different infrastructure areas and domains, the site is divided into surface water monitoring locations and their upstream catchment areas (Figure 2). Surface water quantity and quality are referenced with respect to the proposed downstream resource consent compliance monitoring locations at SC01 and RS03. These catchments are shown in Figure 2.

The water management strategy for the BOGP is also divided into operational and closure/post-closure phases:

- **Operational Phase:** most MIW will be retained on site for use (e.g., for process water, dust suppression, etc.), with the only discharge from disturbed areas being surface runoff from haul roads, the infrastructure area, and ELF's via sediment control structures. Seepage from landforms will not be discharged off site.
- **Active Closure and Post Closure phases (Closure Phase):** seepage from ELF's, the TSF, and pit void water will be collected and treated, initially with an active water treatment plant (Shepherds Creek catchment) until loads have reduced such that passive treatment can be utilised to meet water quality objectives.

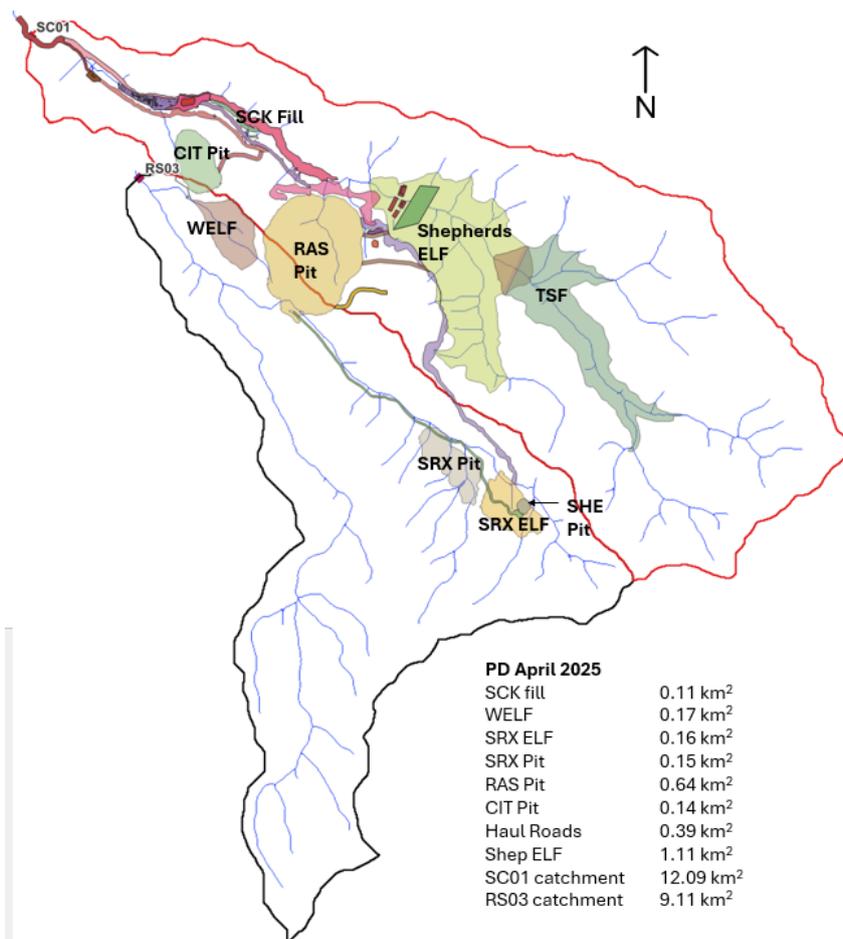


Figure 2: Location and areas of key mine domains within SC01 and RS03 catchments.

The water management approach for each key mine domain element (that has potential to produce MIW) are summarised for operational and closure phases in Table 3. These descriptions form the basis of the water quality and water balance calculations in subsequent sections of this report.

Table 3: MIW management approach for operational and closure phases.

MINE DOMAIN	DESCRIPTION	OPERATIONAL PHASE	CLOSURE PHASE
TSF	Condition	Active tailings deposition.	Rehabilitated.
	Surface Runoff	Runoff retained within facility. Diversion channels established to minimise run-on.	Runoff assumed to be clean and discharges to Shepherds Creek.
	Seepage	TSF seepage collected and conveyed to TSF or used for process water.	TSF seepage collected and conveyed for treatment.
Shepherds ELF	Condition	Active mine rock placement.	Rehabilitated.
	Surface Runoff	Runoff sheeted to sediment pond and then discharged to Shepherds Creek (if water quality is suitable). Otherwise pumped to the mine water circuit for reuse. Diversion channels established to minimise run-on.	Runoff assumed clean and discharged to Shepherds Creek. Diversion channels maintained to minimise run-on (i.e., to reduce seepage flows).
	Seepage	ELF seepage collected and conveyed to TSF or used for process water.	ELF seepage collected and conveyed for treatment.
RAS Pit Void	Condition	Active dewatering of pit.	Dewatering ceases and pit lake development.
	Surface Runoff	Rise and Shine Creek diverted around pit extent. Collected in pit sumps and used for dust suppression if suitable and/or process water	Reports to pit lake.
	Seepage	None.	Pit lake discharges via RAS underground workings portal and conveyed for treatment.
Underground Workings	Condition	Workings actively dewatered. Paste backfilling of stopes.	Workings flooded and provide discharge pathway for RAS pit lake water discharge.
	Surface Runoff	None.	None.
	Seepage	Dewatering used for processing or conveyed to TSF.	Portal discharge collected and conveyed for treatment.
CIT Pit Void	Condition	Pit void actively dewatered.	Void backfilled, rehabilitated and filled with water.
	Surface Runoff	Collected in pit sumps and used for dust suppression.	Runoff assumed clean and discharges to Shepherds Creek.
	Seepage	Collected in pit sumps and used for dust suppression if suitable and/or process water	Backfill seepage collected and conveyed for treatment.

MINE DOMAIN	DESCRIPTION	OPERATIONAL PHASE	CLOSURE PHASE
WELF	Condition	Active mine rock placement.	Rehabilitated.
	Surface Runoff	Runoff sheeted to local sediment pond. Discharged to Rise and Shine Creek (RS03) if water quality is suitable, otherwise conveyed to TSF.	Runoff assumed clean and discharges to Rise and Shine Creek (RS03). Diversion channels maintained to minimise run-on where practicable.
	Seepage	Collected in pit sumps and used for dust suppression if suitable and/or process water	Reports to SC01 via treatment.
Process Plant/Infrastructure Area	Condition	Area operational.	Rehabilitated.
	Surface Runoff	Diversion in place to limit run-on. Runoff sheeted to local sediment ponds and discharged to receiving environment if suitable. Otherwise, conveyed to mine water circuit.	Runoff assumed clean and discharged to Shepherds Creek.
	Seepage	No significant seepage expected.	No significant seepage expected.
Shepherds Creek Valley Fill	Condition	Lower gorge has to be filled, to create sufficient width for services (e.g., infrastructure). Shepherd channel designed to take a 1% AEP event	Valley infill to remain. Channel continues to support 1% annual exceedance probability (AEP). Non-channel area assumed rehabilitated.
	Surface Runoff	Clean water diversions that bypass the TSF and ELF drop into new channel in Shepherds Creek valley until past the mine infrastructure.	Runoff assumed clean and discharged to Shepherds Creek.
	Seepage	Any seepage that expresses at surface to downstream extent of fill will be collected and conveyed to TSF or used for process water.	If water quality is not suitable for discharge, collected and treated. If suitable, then discharged to Shepherds Creek.
SRE Pit Void	Condition	Pit void actively dewatered.	Dewatering stops. Pit void backfilled with SRX ELF overtop and floods.
	Surface Runoff	Collected in pit sumps and used for dust suppression if suitable and/or process water. Diversions in place to minimise run-on.	Reports to SRX Pit Lake.
	Seepage	None.	Reports to SRX Pit Lake.
SRX Pit Void	Condition	Pit void actively dewatered.	Dewatering stops. Pit void floods to develop pit lake and spills to Rise and Shine Creek.
	Surface Runoff	Collected in pit sumps and used for dust suppression if suitable and/or process water Diversions in place to minimise run-on.	Reports to SRX Pit Lake. Partial passive treatment of SRX Pit Lake overflow (8 L/s) is required to achieve the proposed water quality compliance limits at RS03.
	Seepage	None.	Reports to SRX Pit Lake. Partial passive treatment of SRX Pit Lake overflow (8 L/s) is required to achieve the proposed water quality compliance limits at RS03.

MINE DOMAIN	DESCRIPTION	OPERATIONAL PHASE	CLOSURE PHASE
SRX ELF	Condition	Active mine rock placement.	Rehabilitated.
	Surface Runoff	Runoff sheeted to local sediment pond. Discharged to Rise and Shine Creek is water quality if suitable, otherwise conveyed to TSF. Diversion channels established minimise run-on where practicable.	Runoff assumed clean and discharges to Rise and Shine Creek. Diversion channels maintained to minimise run-on where practicable.
	Seepage	Seepage collected at local sump and conveyed to TSF or used for process water.	Reports to SRX Pit Lake. Pit lake spill partially treated (8 L/s).
Haul Roads	Condition	Haul roads operational.	Rehabilitated.
	Surface Runoff	Diversion in place to limit run-on. Runoff sheeted to local sediment ponds and discharged to receiving environment if suitable. Otherwise, conveyed to TSF or used for process water.	Runoff assumed clean and discharged to Shepherds Creek and Rise and Shine Creek.
	Seepage	No significant seepage expected.	No significant seepage expected.

2.4 Proposed Compliance Limits

Proposed compliance limits are described in the BOGP Water Management Plan (MGL, 2025) and tabulated below for surface water (Table 4) and groundwater (Table 5). These limits were used to screen model results against in Sections 4 and 5.

Table 4: Proposed surface water compliance limits.

PARAMETER (units are mg/l unless stated otherwise)	COMPLIANCE LIMIT
pH (unitless)	6.5 - 9.0
Turbidity (NTU)	5 (over a 5-year rolling period, 80% of samples, when flows are at or below median flow, are to meet the limit)
Ammoniacal-nitrogen (NH ₃ -N)	≤0.24 (annual median) <0.4 (annual 95 th percentile)
Nitrate-nitrogen (NO ₃ -N)	<2.4 (annual median) <3.5 (annual 95 th percentile)
Cyanide (CN)	0.011 (un-ionised HCN, measured as [CN], ANZG, 2018)
Sulfate (SO ₄)	A. If hardness is <100 mg/L (CaCO ₃), the sulfate compliance limit = 500 mg/L. B. If chloride is <5 mg/L, the sulfate compliance limit = 500 mg/L C. If the hardness is 100–500 mg/L AND if chloride is 5–<25 mg/L, the sulfate compliance limit is (in mg/L): [$-57.478 + 5.79 \times (\text{hardness mg/L CaCO}_3) + 54.163 \times (\text{chloride mg/L})$] * 0.65 D. If hardness is between 100 and 500 mg/L AND if chloride is between ≥25 and ≤500 mg/L, the sulfate limit is (in mg/L): [$1276.7 + 5.508 \times (\text{hardness mg/L CaCO}_3) + 1.457 \times (\text{chloride mg/L})$] * 0.65 A minimum of 12 samples must be collected over any rolling 12-month period. For compliance limits in A to D, no more than 20% of samples collected over a rolling 12-month period may exceed the relevant compliance limit.

	E. An acute compliance limit = 1,000 mg/L averaged over 4 days and not to be exceeded more than once in a one-year period, OR in more than 10% of samples over a one-year period.
Aluminium (Al) (dissolved)	≤0.08
Antimony (Sb) (total)	0.074 (chronic, the average of 5 (monthly) samples over a 5-month period) 0.250 (acute, not to be exceeded at any time)
Arsenic (As(V)) (dissolved)	≤0.042
Cadmium (Cd) (dissolved)	≤0.0004 See below for adjustment algorithm
Chromium (Cr) (dissolved)	≤0.0033 (CrIII) ≤0.006 (CrVI) See below for adjustment algorithm
Cobalt (Co) (dissolved)	0.001 (chronic) 0.11 (acute, not to exceed) See below for adjustment algorithm
Copper (Cu) (dissolved)	≤0.0018
Molybdenum (dissolved)	≤0.034
Zinc (Zn) (dissolved)	0.015 See below for adjustment algorithm

Adjustments

Cd (dissolved)	$HMTV = TV (H/30)^{0.89}$, where hardness-modified trigger value (HMTV) = (µg/L), trigger value (TV) (µg/L) at a hardness of 30 mg/L as CaCO ₃ ; H, measured hardness (mg/L as CaCO ₃) of a fresh surface water.
Cr (dissolved)	$HMTV = TV (H/30)^{0.82}$, where hardness-modified trigger value (HMTV) = (µg/L), trigger value (TV) (µg/L) at a hardness of 30 mg/L as CaCO ₃ ; H, measured hardness (mg/L as CaCO ₃) of a fresh surface water.
Co (dissolved)	$Cobalt (\mu g/L) = \exp\{(0.414[\ln(\text{hardness } CaCO_3 \text{ mg/L})] - 1.887)\}$
Sb (total)	(chronic) the average of 5 (monthly) samples over a 5-month period (acute) not to be exceeded at any time
Zn (dissolved)	$HMTV = TV (H/30)^{0.85}$, where hardness-modified trigger value (HMTV) = (µg/L), trigger value (TV) (µg/L) at a hardness of 30 mg/L as CaCO ₃ ; H, measured hardness (mg/L as CaCO ₃) of a fresh surface water.

Source: MGL (2025)

HMTV = hardness modified toxicity value.

TV = toxicity value.

H = hardness.

Table 5: Proposed groundwater compliance limits.

PARAMETER (units are mg/L unless stated otherwise)	COMPLIANCE LIMIT
Nitrate-nitrogen (NO ₃ -N)	11.3 (MAV)*
Cyanide (CN-)	0.6 (MAV)
Sulfate (SO ₄)	≤250 (taste threshold)
Aluminium (Al)	1 (MAV)
Antimony (Sb)	0.02 (MAV)
Arsenic (As(V))	0.01 (MAV)
Cadmium (Cd)	0.004 (MAV)
Chromium (Cr)	≤0.05(MAV)

PARAMETER (units are mg/L unless stated otherwise)	COMPLIANCE LIMIT
Cobalt (Co)	<1 (livestock drinking water)
Copper (Cu)	≤0.5
Iron (Fe)	≤0.3
Lead (Pb)	0.01 (MAV)
Manganese (Mn)	0.4 (MAV)
Molybdenum (Mo)	<0.01
Strontium (Sr)	4
Uranium (U)	0.03 (MAV)
Zinc (Zn)	≤1.5

Source: MGL (2025)

MAV = maximum acceptable value – from NZ drinking water standards.

3 CLIMATIC SETTING

This section summarises the climatic data for the BOGP, which provides key inputs to the WLBM.

The site is situated within the Otago semi-alpine region. As a result, the climate is strongly seasonal, comprising of frosts and snow between Autumn and Spring, and dry and hot summer months (with temperatures frequently exceeding 30° C). Rainfall in the region varies spatially, typically decreasing with increasing distance from the Southern Alps (KSL, 2025a). At the BOGP, three meteorological stations have been installed since 2022:

- Lake Clearview (340 m above sea level, asl).
- Come in Time (475 m asl).
- Srex, formerly Shreks Met (753 m asl).

The location of these stations and regional stations is shown in Figure 3.

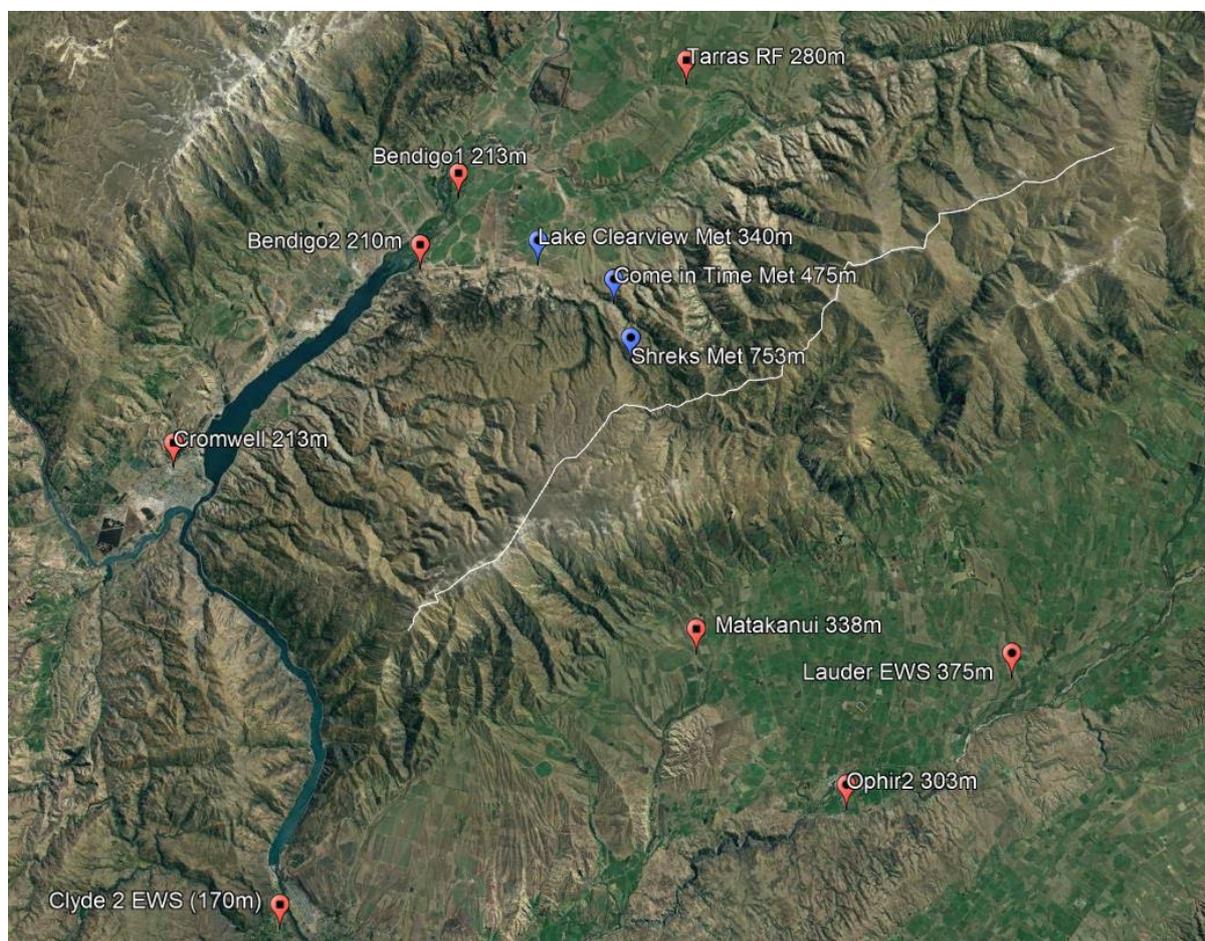


Figure 3 Location of meteorological stations.

Source: Chater (2024a).

Notes: BOGP stations shown in blue, regional stations shown in red. Shreks is now referred to as SRX.

3.1 BOGP Climatic Data

Site recorded data indicates a mean annual rainfall (between November 2022 through January 2025) that ranges from 442 to 506 mm depending on elevation for data collected between (KSL, 2025a), with

Lake Clearview being the lowest and Srex being the highest. An increasing rainfall-altitude relationship is observed. Rainfall remains broadly constant throughout the year ranging from 30 – 50 mm per month except for the months of July and August in which rainfall is notably lower. Dry spells of up to two weeks are also common in these months. Evapotranspiration is strongly seasonal with the reported long-term average ranging from approximately 6 mm in July to 136 mm in January. Due to evapotranspiration exceeding rainfall in the summer months, with the exception of storm events, runoff typically only occurs in the winter months (Santana, 2024).

3.2 BOGP Synthetic Climate Dataset

Synthetic climate datasets were developed to increase the length of climate records beyond the handful of years available from site meteorological stations:

- A synthetic daily rainfall dataset was developed by Chater (2024a). This was scaled to the Srex meteorological station (elevation: 753 m above sea level), based on a relationship between rainfall and elevation derived by Chater (2024b) that was representative of the Shepherds and Rise and Shine Creek catchments. The synthetic rainfall record was developed for the Lake Clearview meteorological station (elevation: 340 m asl) and spanned the period 03/06/1949 through to 16/02/2025 (~75 years). These reference works (Chater, 2024a, 2024b) are provided in Appendix B.
- A synthetic daily potential evapotranspiration (PET) record was developed by establishing a relationship between the Srex meteorological station and the Cromwell EWS (retrieved from <https://cliflo.niwa.co.nz/> October 2024) station potential evaporation data. The relationship was based on overlapping data between 2/12/2022 and 1/12/2024 (~2 years), the following linear regression equation: $S_{rex} PET = 0.715 \times \text{Cromwell EWS PET} + 0.5078$ (Figure 4). The synthetic record established ranged between 7/04/2006 through to 12/12/2024 (~19 years).

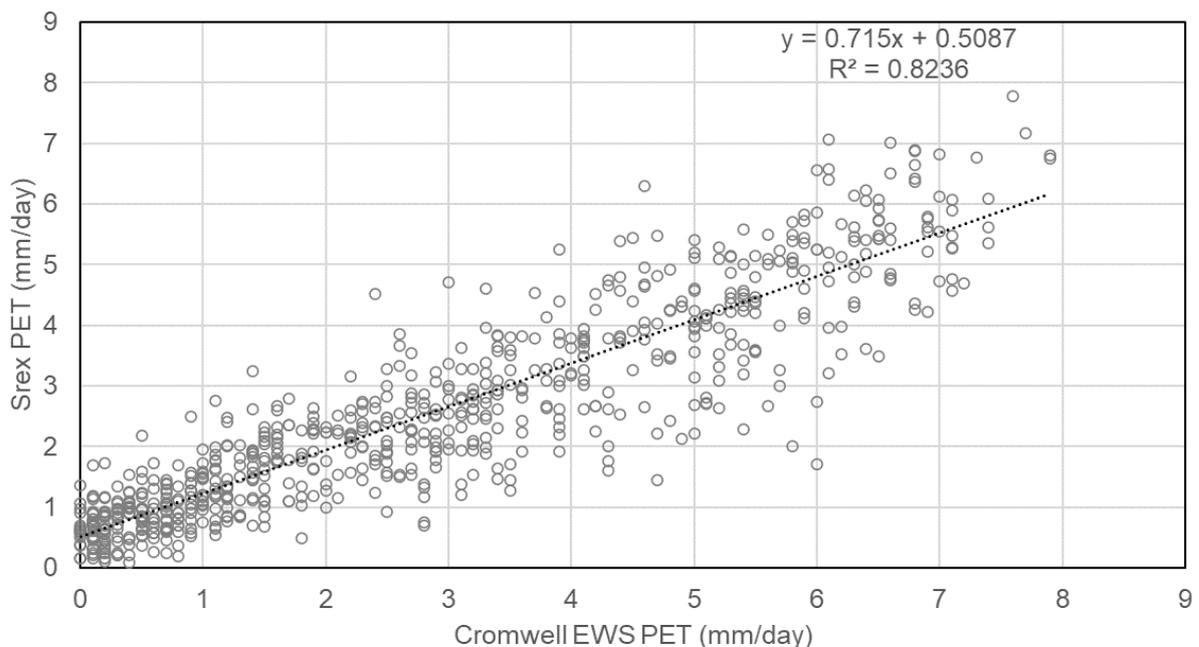


Figure 4: Srex Met vs Cromwell EWS PET.

Annual totals of the synthetic rainfall and PET datasets are shown in Figure 5 and Figure 6, respectively. On average, annual, PET (~930 mm/year) is close to twice that of rainfall (~500 mm/year). The wettest year was 1995, where ~760 mm of rain fell. The average annual synthetic PET compares well with evaporation pan data from NIWA climate stations Bendigo 2, Clyde Dam, and Cromwell 2, multiplied by a typically used conversion factor of 0.7 (average of ~1010 mm/year).

Figure 7 summarises the average monthly climate setting for the synthetic dataset, showing a strong water deficit in the summer months and a slight water surplus in the winter months.

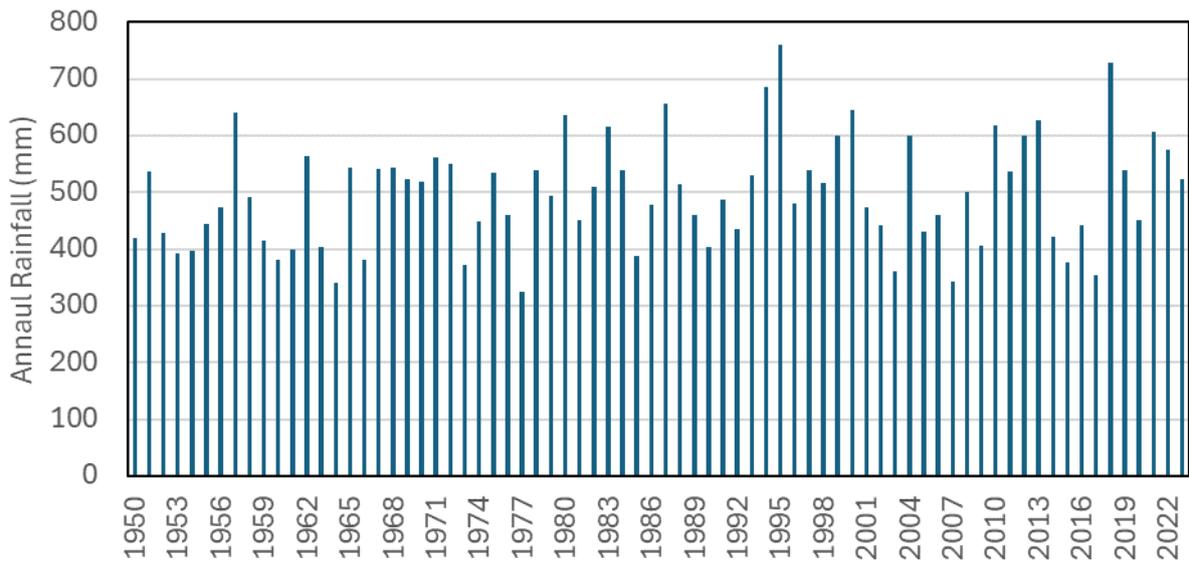


Figure 5: Annual rainfall totals of synthetic rainfall dataset.

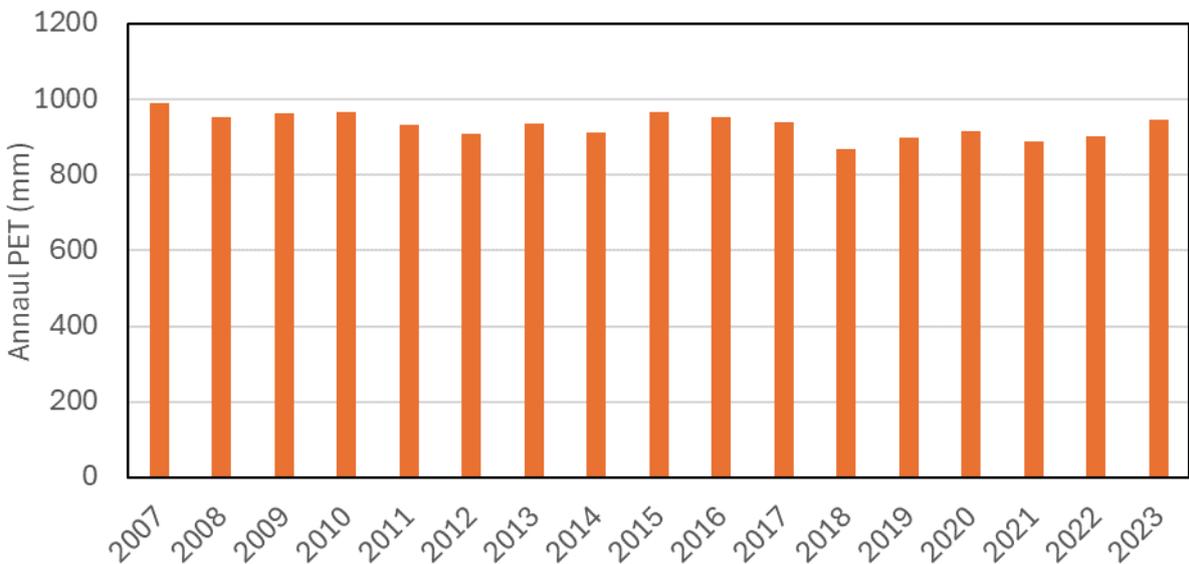


Figure 6: Annual PET totals of synthetic rainfall dataset.

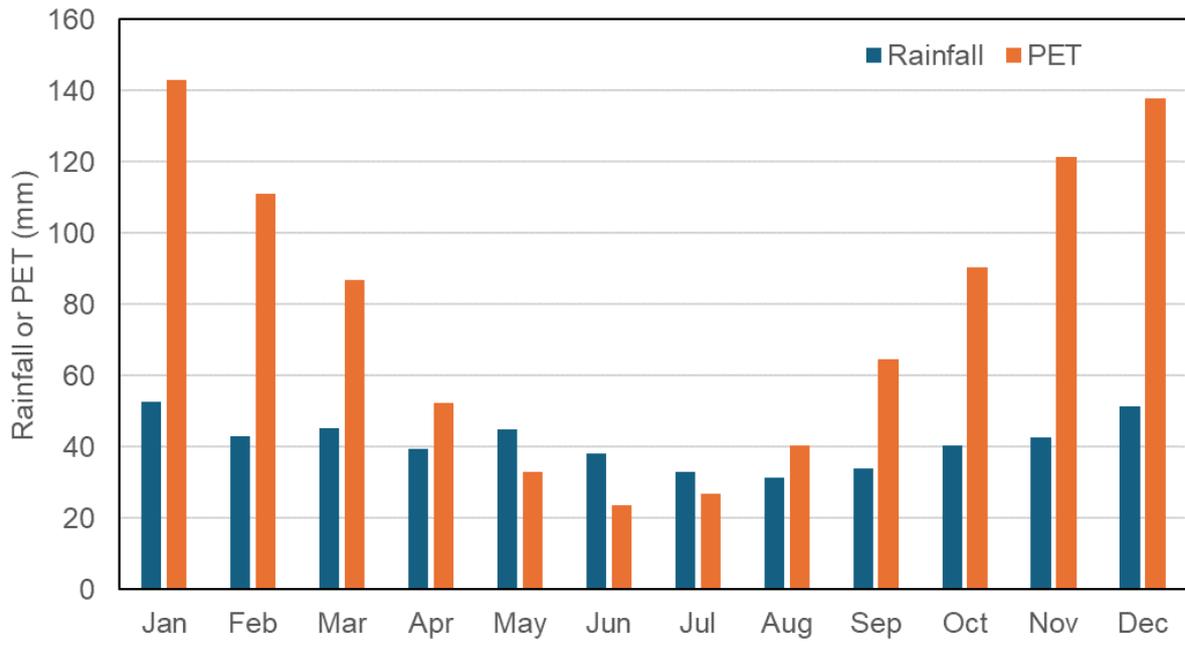


Figure 7: Average monthly synthetic climate data summary.

4 OPERATIONAL PHASE ASSESSMENT

This section assesses the potential effects to the receiving environment during the Operational Phase of the mine.

4.1 Introduction

There are two key water types that need to be managed as part of the BOGP water management strategy:

1. **Internal MIW:** Waters that will be managed internally and will not be discharged during the operational phase of the BOGP. This includes process water, seepage from ELF's, the TSF, water from pit voids, and the underground (Figure 8).
2. **Surficial MIW:** Waters that will be discharged during the operational phase of the BOGP. These waters are derived from routing of runoff from haul roads, infrastructure areas⁸, and ELF surfaces through sediment control structures (ponds and/or sumps) (Figure 8), and subsequent discharge to the receiving streams (Shepherds Creek and Rise and Shine Creek).

4.2 Operational Water Management Risks

As a result, the key MIW risks to downstream water quality for the Operational Phase are:

- **For Internal MIW:** A prolonged site water surplus conditions (under normal operating conditions) could exceed site water storage capacity and result in discharge of Internal MIW to the receiving environment. Additional controls may need to be engaged to prevent direct discharge. Further discussion on this issue is provided in Section 4.3.
- **For Surficial MIW:** Elevated sulfate, potential constituents of concern (PCOC) such as arsenic (As), and suspended sediments concentrations in runoff from haul roads, the infrastructure area, and the ELF surfaces. It is assumed that sediment will be managed by routing runoff from these sources through sediment control structures⁹. These structures are not anticipated to reduce sulfate or PCOC; therefore, non-compliance could potentially occur during and/or following runoff events. Further discussion on this issue is provided in Section 4.4.

⁸ Note: the infrastructure area excludes the process plant area, ore stockpiles, and other areas of impacted water, which will be used for processing, or will be diverted to the TSF.

⁹ This risk is managed by the erosion and sediment control management plan.

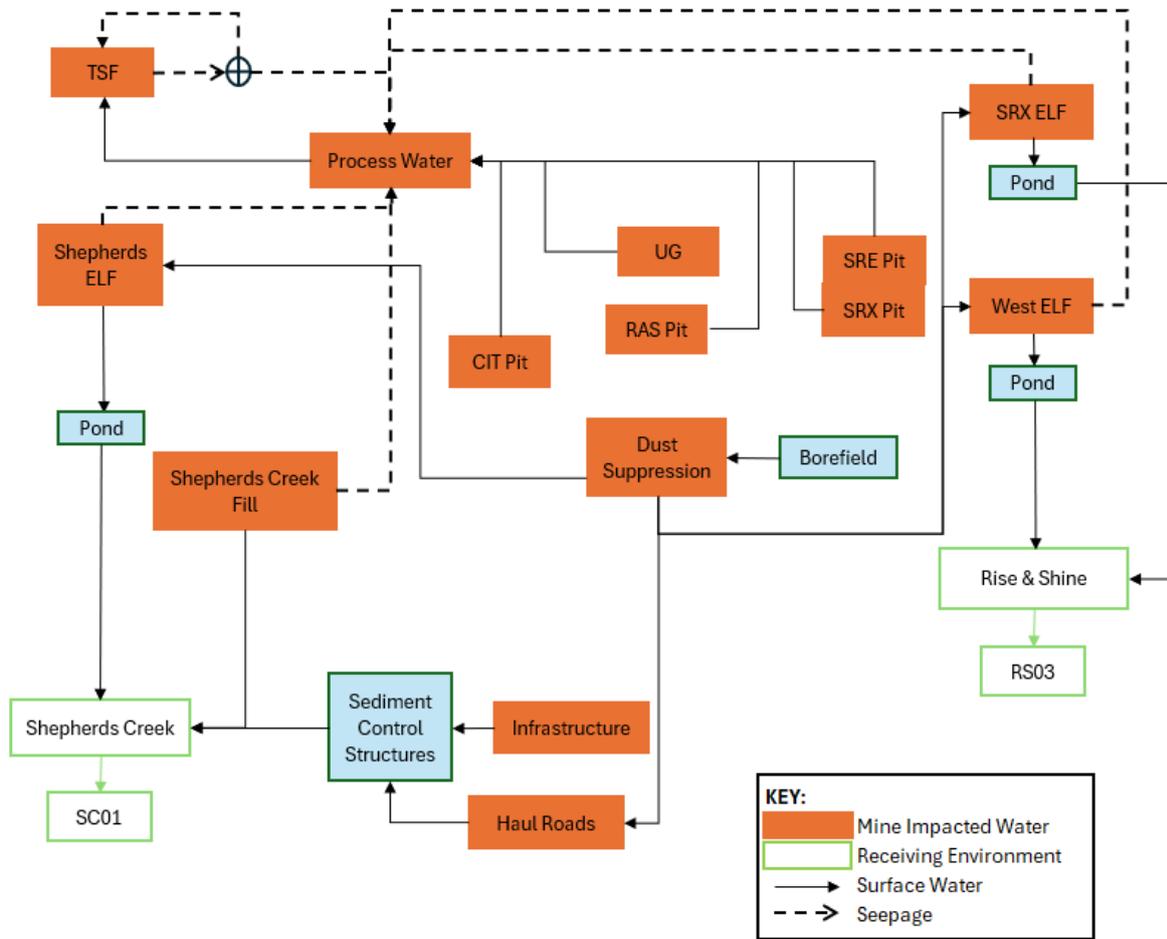


Figure 8: Separation of Internal and Surficial MIW during the operational phase at the BOGP site.

4.3 Internal MIW Water Balance

This section assesses the risks for an Internal MIW water surplus and then subsequent discharge to the receiving environment.

4.3.1 Internal MIW Water Sources and Water Loss

The BOGP Internal MIW water balance is calculated from the annual volumes of water sources and sinks. Sources include, for instance, raw water for processing, rainfall (and subsequent runoff) to the TSF, and pit dewatering, whereas sinks include, for instance, evapotranspiration and water locked up in tailings (Table 4).

Table 6: Internally managed MIW sources and sinks of water.

SOURCES	SINKS
Rainfall directly onto the TSF.	Evaporation from the TSF.
Rainfall runoff from undisturbed areas between diversion channels and the TSF.	Water retained in tailings.
Seepage from the ELFs.	Evaporation of water used for dust suppression.
Runoff from the plant area.	Water used for paste production.
Dewatering from active pits.	
Dewatering from underground workings.	
Raw water input to the processing plant.	

4.3.2 Annual Site Water Balance

A site water balance of the internally managed MIW source and sinks was developed on an annual basis over the operational mine phase from Year 2 through Year 13 (see Table 1 for mine plan schedule). Given the uncertainty in water quality and quantity for some sources, two scenarios were included in the water balance, a Low Case and High Case. These cases show the range in potential water balance conditions for the site. Components of the annual site water balance are described in Table 5. Annual average rainfall and potential evaporation from the synthetic climate dataset described in Section 3 was used. The implication of wetter years on the water balance is discussed alongside the water balance results.

Seepage from the TSF, and any water reclaimed from the TSF pond for ore processing, were not included in the water balance as they will be returned to the TSF and therefore do not contribute to a change in the water balance.

Table 7: Water balance input basis.

COMPONENT	DESCRIPTION	
	LOW CASE	HIGH CASE
WATER SOURCES		
TSF direct rainfall	Adopts maximum TSF footprint of 608,338 m ² .	No change from Low Case.
Runoff to TSF	Adopts an estimated footprint of 300,000 m ² (that represents the undisturbed area reporting to the TSF and not diverted by clean water channels) and a runoff coefficient of 10% (based on synthetic average flows developed for SC01 by KSL [2025a]).	No change from Low Case.
Shepherds ELF seepage	Assumes an ELF footprint of 1,107,928 m ² . Progressive rehabilitation of 5% of this area per year, which equates to 55% at the end of mine life was adopted. For non-rehabilitated areas, a net percolation rate of 60% of annual rainfall was adopted, and 20% for rehabilitated portions (based on MWM 2025a) ^(vii) .	As per Low Case, except net percolation was increased to 80%.
RAS Pit dewatering	The area of the open pit void was increased over time from Year 2, assuming the full footprint (643,390 m ²) was reached by Year 10. A pit wall runoff coefficient of 50% and groundwater inflow of 5 L/s (KSL, 2024) were adopted for the full pit footprint and reduced based on the reduced footprint over time.	As per Low Case, except runoff coefficient was increased to 70%.
Underground dewatering	KSL (2025b) estimated an inflow of 30 L/s that represented the full underground development using the Goodman et al. (1965) equation. However, many examples have shown that the Goodman equation tends to overestimate inflows to tunnels. For example, work by Moon and Fernandez (2009) suggest at depths of 150 m below the phreatic surface, inflows could be only 30% of that calculated by the Goodman equation once drawdown and effective stress around a tunnel is taken into account. Therefore, a groundwater inflow rate for the RAS underground workings 200 m below the phreatic surface would be in the region 9 L/s. Once ventilation losses (5 L/s adopted) are taken into account, the net water source equates to 4 L/s for the water balance assessment.	No change from Low Case.
Process Plant raw water	Estimate provided by MACA Interquip ⁽ⁱⁱⁱ⁾ . Does not vary with average vs wet year condition.	No change from Low Case.

COMPONENT	DESCRIPTION	
	LOW CASE	HIGH CASE
SCK Valley Fill	Assumes a footprint of 111,845 m ² and a net percolation of 20% (based on MWM 2025a) where the fill is rehabilitated from the start of mining.	No change from Low Case.
SRX ELF	Assumes a footprint of 200,799 m ² and a net percolation rate of 60% of annual rainfall (unrehabilitated). Active from Year 12.	No change from Low Case except net percolation increased to 80%.
Western ELF	Assumes a footprint of 200,799 m ² Active from Year 2, then rehabilitated from Year 4 onwards. Net percolation rate of 60% of annual rainfall adopted for unrehabilitated period, and this was reduced to 20% once rehabilitated.	No change from Low Case except net percolation increased to 80% for unrehabilitated period.
CIT Pit dewatering	Given the pit is only operating for ~12 months, it was assumed that water quality would not deteriorate significantly and be suitable for use as dust suppression.	Assumes a footprint of 135,357 m ² and a runoff coefficient of 70%, plus groundwater inflows of 3.5 L/s (KSL, 2024). Only active during Year 9, then backfilled and rehabilitated.
SRX Pit dewatering	Given the pit is only operating for ~24 months, it was assumed that water quality would not deteriorate significantly and be suitable for use as dust suppression.	Assumes a footprint of 135,934 m ² and a runoff coefficient of 70%, plus groundwater inflows of 23 L/s (KSL, 2024). Only active during from Year 12 onwards.
SRE Pit dewatering	Given the pit is only operating for <12 months, it was assumed that water quality would not deteriorate significantly and be suitable for use as dust suppression.	Assumes a footprint of 10,461 m ² and a runoff coefficient of 70%, plus groundwater inflows of 1 L/s (KSL, 2024). Only active during Year 12, then backfilled with SRX ELF.
Plant area runoff.	Adopts an estimated footprint of 300,000 m ² and a runoff coefficient of 10%.	No change from Low Case.
WATER SINKS		
TSF pond evaporation	Adopts a maximum TSF footprint of 608,338 m ² and an open water evaporation estimate of 1,000 mm/year ⁽ⁱⁱⁱ⁾ . Does not vary with average vs wet year condition.	No change from Low Case.
Water retained in tailings	Estimate provided by EGL ^(iv) for 1.5 mega tonne per day nominal processing rate. Does not vary with average vs wet year condition.	No change from Low Case.
Paste production	Estimate of 3 L/s from MGL ^(viii) .	No change from Low Case.

Table Notes:

- i. Average annual rainfall (500 mm) was based on the 73-year synthetic rainfall record developed for the site, scaled to the elevation of the Srex meteorology station.
- ii. C. Warden personal communication 25 November 2024.
- iii. Open-water evaporation estimate based on Srex meteorology station PET (~930 mm/year) multiplied by 1.05 as per Allen et al. (1998).
- iv. E. Torvelainen personal communication 18 November 2024.
- v. R. Redden personal communication 21 November 2024.
- vii. R. Redden personal communication 22 November 2024.
- vii. MWM (2025a) has estimated a net percolation rate of 60-80% for exposed (unrehabilitated ELFs), and 20% for rehabilitated ELFs.
- viii. R. Redden personal communication 22 November 2024.

Results from the water balance are presented graphically in Figure 9, and the total proportion over the mine life from each source and sink is tabulated in Table 6. Results suggest the following:

- For the Low Case, a water deficit condition is maintained, which reduced through time to ~10,000 m³/year from Year 12 onwards.
- The High Case results are similar, except for Year 9 and Year 12 onwards where CIT Pit and SRX Pit dewatering are managed within the MIW circuit.
- The largest water sources include rainfall on the TSF, Shepherds ELF seepage, RAS Pit dewatering, and the process plan raw water demand.

The dominant water-deficit condition for the Low Case is consistent with regional meteorological data which indicates a dry temperate climate (KSL, 2025a). This is characterised by an average annual PET nearly twice that of average annual rainfall.

Although only an annual average rainfall year is used, it is noted that following the wettest year on record (1995, with 760 mm falling), the subsequent three years had close to average annual rainfall (480 mm, 560 mm, and 520 mm), suggesting for the Low Case, that the site could 'recover' from a wet year except potentially towards the end of mine life when the deficit becomes smaller.

The High Case is less promising, where the CIT Pit and SRX Pit dewatering could drive the site into a water surplus condition without any additional controls in place. However, it is noted that the available estimate of groundwater inflow to SRX Pit of 23 L/s (KSL, 2024) is higher than the average creek flow in Rise and Shine Creek by a factor of approximate 3, and therefore highly conservative. The conservative nature of the estimate notwithstanding, if a lower groundwater inflow rate is applied to the High Case of say 3 L/s, a water surplus condition is still reached, but of much less magnitude.

If the site were to enter into a consistent water surplus condition, the following engineering controls could be considered to additional water:

- Use of evaporation cannons to increase evaporative losses.
- Increase water storage capacity on site for additional water storage prior to an active water treatment plant being commissioned.
- Commission the water treatment plant during operations rather than at closure to allow discharge of water surpluses.

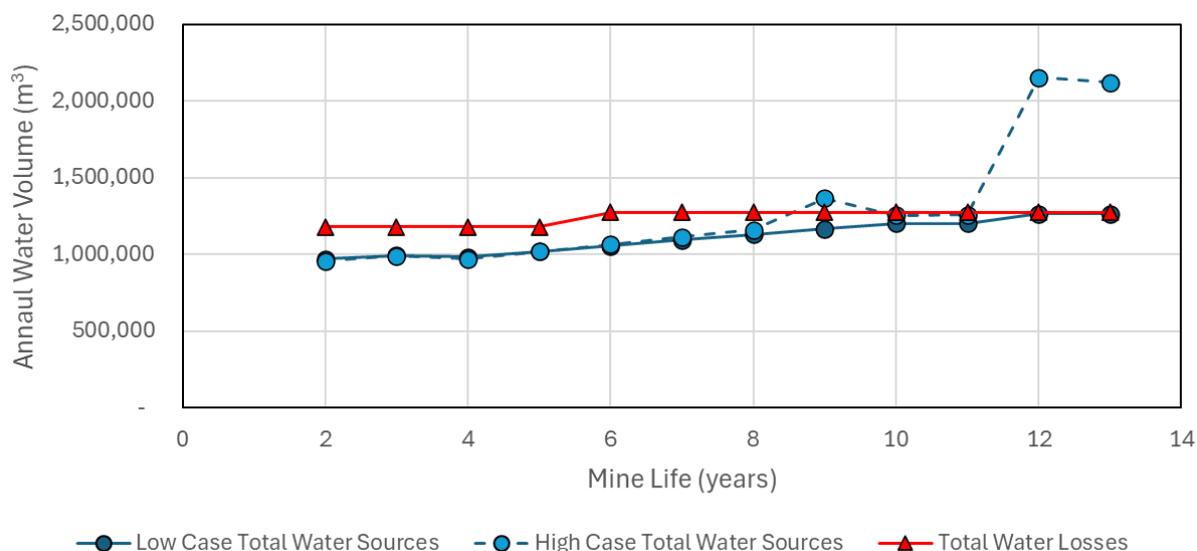


Figure 9: Annual water balance results.

Table 8: Total water balance proportion.

COMPONENT	LOW CASE	HIGH CASE
WATER SOURCES		
TSF direct rainfall	29%	26%
Runoff to TSF	1%	1%
Shepherds ELF seepage	23%	17%
RAS Pit dewatering	20%	21%
Underground dewatering	5%	4%
Process Plant raw water	17%	15%
SCK Valley Fill	1%	1%
SRX ELF	1%	1%
Western ELF	2%	2%
CIT Pit dewatering	0%	1%
SRX Pit dewatering	0%	10%
SRE Pit dewatering	0%	<1%
Plant area runoff.	1%	1%
WATER SINKS		
TSF pond evaporation	53%	As per Low Case.
Water retained in tailings	42%	As per Low Case.
Paste production	5%	As per Low Case.

Note: values are rounded so may not sum to 100% for all sources or sinks.

4.3.3 Internal MIW Water Quality

Internal MIW water quality is not assessed given it will not be discharged to the receiving environment under normal operating conditions.

4.3.4 Changes to Creek Flows

Changes to creek flows were calculated based on the runoff generation described in Section 4.4.2, and reflect the mine footprint at life of mine (i.e., maximum disturbance footprint). Calculation results are presented in Table 7, showing reductions to average flow of 17% and 13% for SC01 and RS03,

respectively. It is noted here that flow changes will be lower at the start of mine life and increase over time as the mine footprint expands.

Table 9: Calculated changes in creek flow summary statistics at end of the operation phase.

	MEAN FLOW (L/s)	MEDIAN FLOW (L/s)	7D MALF (L/s)
SC01 Simulated Baseline	19.2	13.2	4.42
SC01 Simulated LOM	15.9	10.2	3.24
SC01 difference between baseline and LOM	-3.3 (-17%)	-3 (-23%)	-1.18 (-27%)
RS03 Simulated Baseline	14.5	10	3.34
RS03 Simulated LOM	12.6	8.7	2.84
RS03 difference between baseline and LOM	-1.9 (-13%)	-1.3 (-13%)	-0.5 (-15%)

7D MALF = seven day mean annual low flow.

Note flow values are rounded to reflect inferred accuracy.

4.4 Surficial MIW Water Quality

This section assesses the risks for Surficial MIW discharge to the downstream receiving environment during and/or after high rainfall events.

4.4.1 Approach

This section describes the use of conservative solute mixing models (i.e., no geochemical reactions such as mineral precipitation) to assess water quality during the Operational Phase. The models include solute associated with runoff from haul road and infrastructure areas, ELF surfaces, mixed with runoff from the undisturbed parts of a given catchment. Separate models were developed for SC01 and RS03. Life-of-mine footprints were used within the analysis to provide a conservative assessment. The models were run at daily time steps using the 11-year period synthetic rainfall record period, to account for the influence of climatic variability.

Derivation of runoff rates and solute source terms are described in the following sections.

4.4.2 Runoff Generation

Runoff was estimated for each mine area/domain reporting to compliance locations SC01 and RS03. Areal footprints adopted for each mine domain are tabulated in Table 8. The domains are grouped into areas of similar runoff response type (i.e., haul roads, ELF's, infrastructure and undisturbed) but are not necessarily physically connected. All runoff is assumed to report to the relevant compliance location within the same daily timestep that rainfall occurs. Runoff was calculated differently for disturbed and undisturbed areas as follows:

- Daily runoff for undisturbed areas was estimated using an 11-year synthetic daily unit runoff dataset derived by KSL (2025a) for SC01. This approach was used rather than the Runoff Model described in Section 5.2.3 because the Runoff Model does not replicate high flow events well, and this is when runoff from disturbed mine surfaces will be highest. The synthetic daily runoff should represent these dynamics better.

- Runoff from ELF surfaces, haul roads, and the infrastructure area was estimated based on the different runoff coefficients for different daily rainfall totals and the synthetic rainfall dataset spanning the same 11-year period used for estimating runoff for undisturbed areas. The runoff coefficients were based on previous work at the Macraes Mine (Golder, 2011) and are shown in Table 9.

Silt ponds on the site (e.g., Shepherds Silt Pond) will be designed to detain peak flows from 1 in 10-year, storm events. Maximum outflow from such silt ponds will range from 134 to 278 L/s for the 1-hour and 24-hour storm events respectively (EGL personal communication, 2024). Based on the daily runoff coefficients in Table 9, and the synthetic rainfall record, runoff would pass through the silt pond within a day (for 95% of the time). As such, the influence of the silt pond is unlikely to be significant for average daily water quality at compliance locations and is therefore not accounted for in this assessment. The same assumption was made for sediment control structures related to the haul roads or infrastructure areas.

Table 10: Mine domain runoff source areas.

SOURCE TYPE	TOTAL AREA REPORTING TO SC01 (Ha)	TOTAL AREA REPORTING TO RS03 (Ha)	REMARK
Haul roads	32	7	
Infrastructure areas	11	-	All mine infrastructure is within the Shepherds Creek catchment.
ELF surfaces	136 (Shepherds ELF, CIT, and Shepherds Fill)	33 (SRX ELF and WELF)	All engineered landform surfaces assumed to be similar.
Undisturbed areas	871	769	Total SC01 and RS03 catchment area minus areas disturbed by mining.

Further details on mine domain areas are provided in Table 2.

Table 11: Runoff coefficients for different daily totals.

RAINFALL DEPTH (mm/day)	HAUL ROADS AND INFRASTRUCTURE AREAS	ELF SURFACES
0 to 10	0.05	0
10 to 50	0.2	0.05
50 to 90	0.4	0.15
90	0.7	0.4

Source: Golder (2011).

4.4.3 Source Terms

Water running off mine impacted surfaces can be elevated in PCOC. The source of water used for dust suppression on mine impacted surfaces (e.g., haul roads) can also affect the run-off water quality.

Source terms have been developed to represent mine impacted surfaces where aquifer bore water has been used for dust suppression (no additional PCOC load other than that mobilised by water-rock interaction).

Pit sump water is anticipated to increase in solute concentration (e.g., sulfate) over time as the pit wall exposure increases. Application of this water source for dust suppression would elevate dissolved concentrations of runoff from a given surface. By contrast, if groundwater from a dedicated water supply bore is used for dust suppression, then dissolved concentrations of runoff would tend to be lower.

Groundwater source terms for dust suppression scenarios are therefore used in the mixing model to provide a range of resulting surface water quality.

Source terms for baseline surface water and mine impacted surfaces are tabulated in Table 10 based on MWM (2025b).

The source terms for mine impacted surfaces with bore water dust suppression had elevated components such as iron, which are not generally mobile in neutral/alkaline oxidised conditions. This source term was therefore run through PHREEQC¹⁰ with equilibrium phases to provide a more realistic source term.

The TZ4/RSSZ bore water dust suppression source term had lower sulfate concentrations than the mine impacted surfaces dust suppression source term that used the pit water source term. This source term is considered to be conservative since hauls roads and most ELF surfaces will be TZ3, which is a lower geochemical risk material. See MWM (2025b) for further details.

Table 12: Source terms used for the solute mixing model.

PARAMETER	BASELINE SW SC01	BASELINE SW RS03	TZ4 / RSSZ MINE IMPACTED SURFACES -BORE DS ¹
Report reference	J-NZ0475-001-R-Rev0 Table 3	J-NZ0475-001-R-Rev0 Table 4	J-NZ0475-001-R-Rev0 Table 20 run with PHREEQC equilibrium phases.
Alkalinity (mg CaCO ₃ /L)	216	39.1	140.5
pH (pH units)	8.11	7.42	8.4
EC (µS/cm)	488.9	86.4	1,037
Ca	60.8	11.1	90.4
Cl	6.08	1.33	20
F	0.103	0.057	0.83
Mg	21.3	1.99	76.42
Na	20.3	39.5	59
K	2.01	0.578	7.1
TOC	2.08	1.75	-
Al	0.00454	0.00756	0.00016
As	0.00239	0.0085	0
B	0.03304	0	0.104
Cd	0	0.0001	0
Co	0.00026	0.00025	0
Cr	0.00056	0.00059	0
Cu	0.00055	0.00046	0
Fe	0.011	0.0375	0
Hg	0	0	-
Mn	0.00265	0.0095	0.039
Mo	0.00051	0	0.045

¹⁰ A computer program for speciation, batch-reaction, one-dimensional transport, and inverse geochemical calculations. US geological survey techniques and methods, 6(A43), 497 (Parkhurst, D. L., & Appelo, C. A. J., 2013).

PARAMETER	BASELINE SW SC01	BASELINE SW RS03	TZ4 / RSSZ MINE IMPACTED SURFACES -BORE DS ¹
Report reference	J-NZ0475-001-R-Rev0 Table 3	J-NZ0475-001-R-Rev0 Table 4	J-NZ0475-001-R-Rev0 Table 20 run with PHREEQC equilibrium phases.
Ni	0.00035	0.00035	0.003
Pb	0	0	0.003
Sb	0.00053	0	0.14
Se	0.0025	0	0
Sr	0.947	0.136	1.84
Tl	0.00023	0	0
U	0.0051	0.00012	0.016
V	0	0	0
Zn	0.0017	0.00229	0.007
Sulfate	40.5	1.57	320
Ammoniacal-N	0.0103	0.0092	0.012
Nitrate-N	0.083	0.0088	0.094

Note: All units in mg/L unless otherwise stated.

SW = surface water

Note: Green data were <LOR and are included in the source term as '0'.

Source: Orange cells are from OceanaGold (2020a) Blue cells from Golder 2011. Yellow cells reduced from original source term after running with PHREEQC equilibrium phases.

1. Where there is a relationship between sulfate and the constituent for the sulfate concentration of interest, then the TZ3 relationship is used.

4.4.4 Mixing Model Results

The mixing model results for SO₄ concentrations in SC01 for bore water used as dust suppression are presented in Figure 10 through Figure 12, while Figure 13 through Figure 15 presents results for RS03. The mixing model result graphs for analytes where the mine impacted source term is greater than 0 are provided in Appendix C.

Mixing model results where bore water is used for dust suppression are presented in Table 11, with model results presented as maximum daily, and 30-day rolling mean, concentrations. Fixed value proposed compliance limits were used to screen model results against. The percentage of simulated concentrations which exceed proposed compliance limits are also presented. Surface water compliance limits were compared to the daily model results (except for antimony due to the 5-month average compliance condition; 30 day rolling mean results were used instead), while the groundwater limits were compared to a 30-day rolling mean of the model results to account for mixing processes along groundwater flow paths.

The only parameter that showed any potential for exceedance of the proposed compliance limits is molybdenum (Mo), with exceedances up to 2% of the time for surface water, but none for groundwater. However, review of the model results revealed that exceedances only occurred when there was a mismatch between the synthetic flow record and the synthetic rainfall record. For example, when rainfall (and disturbed surface runoff) was high, but the synthetic flow record reported low flows (e.g., 4/02/2013, 21/03/2018, and 29/05/2021). These rare mismatches occurred because the source of each dataset differs in location, with the rainfall based on a relationship to Cromwell, and the flow record based on a relationship to Cluden (~40 km apart). One would expect daily rainfall patterns to differ slight

on occasion. As a result, the apparent Mo exceedance is interpreted to be an artifact of the mixing model limitations rather than pose a real risk of non-compliance.

Overall, interpretation of the mixing model results suggests surface water quality will remain below the proposed compliance results for both surface and groundwater.

Table 13: Mixing model results for bore water dust suppression scenario including the maximum and average concentrations for each analyte and percentage of generated readings which exceed proposed compliance limits.

	PROPOSED COMPLIANCE LIMITS		SC01 - BORE WATER DUST SUPPRESSION			RS03 - BORE WATER DUST SUPPRESSION				
	SW SC01, RS03	GW (MW-101, MW-103, MW-103)	MAXIMUM DAILY CONC. (mg/L)	% EXCEEDING SW COMPLIANCE	MAX 30 DAY MEAN CONC. (mg/L)	% EXCEEDING ^B GW COMPLIANCE	MAXIMUM DAILY CONC. (mg/L)	% EXCEEDING SW COMPLIANCE	MAX 30 DAY MEAN CONC (mg/L)	% EXCEEDING ^B GW COMPLIANCE
Alkalinity (mg CaCO3/L)	-	-	216.0	-	216.0	-	17.52	-	1.7	-
Ca	-	-	90.29	-	65.7	-	89.5	-	12.88	-
Cl	-	-	19.97	-	8.4	-	19.80	-	1.75	-
F	-	-	0.83	-	0.2	-	0.822	-	0.074	-
Mg	-	-	76.25	-	30.4	-	75.59	-	3.66	-
Na	-	-	58.88	-	26.7	-	58.78	-	39.94	-
K	-	-	7.085	-	2.8	-	7.03	-	0.724	-
TOC	-	-	-	-	-	-	-	-	-	-
Al	0.08	1 (MAV)	0.00454	0%	0.0045	0%	0.00756	0%	0.0074	0%
As	0.042	0.01 (MAV)	0.039	0%	0.0085	0%	0.0085	0%	0.0084	0%
B	-	-	0.10	-	0.045	-	0.102	-	0.002	-
Cd ^A	0.0004	0.004 (MAV)	-	-	-	-	-	-	-	-
Co ^A	0.001	1	-	-	-	-	-	-	-	-
Cr (diss) ^A	0.0033 (Cr(III))	0.05 (MAV)	-	-	-	-	-	-	-	-
	0.006 (Cr(VI))		-	-	-	-	-	-	-	-
Cu ^A	0.0018	0.5	-	-	-	-	-	-	-	
Fe ^A	-	0.3	-	-	-	-	-	-	-	
Hg	-	-	-	-	-	-	-	-	-	
Mn	-	0.4 (MAV)	0.0389	-	0.0086	0%	0.0387	-	0.0086	0%
Mo	0.034	0.01	0.045	2.3% ^C	0.0078	0%	0.0445	0.4% ^C	0.0048	0%
Ni	-	-	0.30	-	0.00079	-	0.30	-	0.00062	-

	PROPOSED COMPLIANCE LIMITS		SC01 - BORE WATER DUST SUPPRESSION				RS03 - BORE WATER DUST SUPPRESSION			
	SW SC01, RS03	GW (MW-101, MW-103, MW-103)	MAXIMUM DAILY CONC. (mg/L)	% EXCEEDING SW COMPLIANCE	MAX 30 DAY MEAN CONC. (mg/L)	% EXCEEDING ^B GW COMPLIANCE	MAXIMUM DAILY CONC. (mg/L)	% EXCEEDING SW COMPLIANCE	MAX 30 DAY MEAN CONC (mg/L)	% EXCEEDING ^B GW COMPLIANCE
Pb	–	0.01 (MAV)	0.0031		0.00052	0%	0.0031		0.00032	0%
Sb	0.074 ^B (chronic)	0.02 (MAV)	0.14	0%	0.024	0%	0.14	0%	0.014	0%
	0.250 (acute)			0%						
Se ^A	–	–	–	–	–	–	–	–	–	–
Sr	–	4	1.84	0%	1.09	0%	1.82	0%	0.31	0%
Tl ^A	–	–	–	–	–	–	–	–	–	–
U	–	0.03	0.0161	–	0.0069	0%	0.016	–	0.0018	0%
V ^A	–	–	–	–	–	–	–	–	–	–
Zn	0.015	1.5	0.0070	0%	0.00195	0%	0.0069	0%	0.0023	0%
Sulfate	500	250	319.2	0.0%	86.6	0%	316.5	0.0%	34.3	0%
Amm-N	0.24 (median)	–	0.012	0.0%	0.011	–	0.012	0.0%	0.0095	–
	0.4 (95 th percentile)									
Nitrate-N	2.4 (median)	11.3	0.094	0.0%	0.085	0.0%	0.093	0.0%	0.018	0.0%
	3.5 (95 th percentile)									

Note: Values of 0 result from both surface water and mine impacted water source terms being <LOR. SW = surface water: GW = groundwater

^A mine impacted water source term has a value of 0 for these analytes. ^B based on 30-day rolling mean. ^C due to misalignment between rainfall and flow in mixing model, discussed further in text.

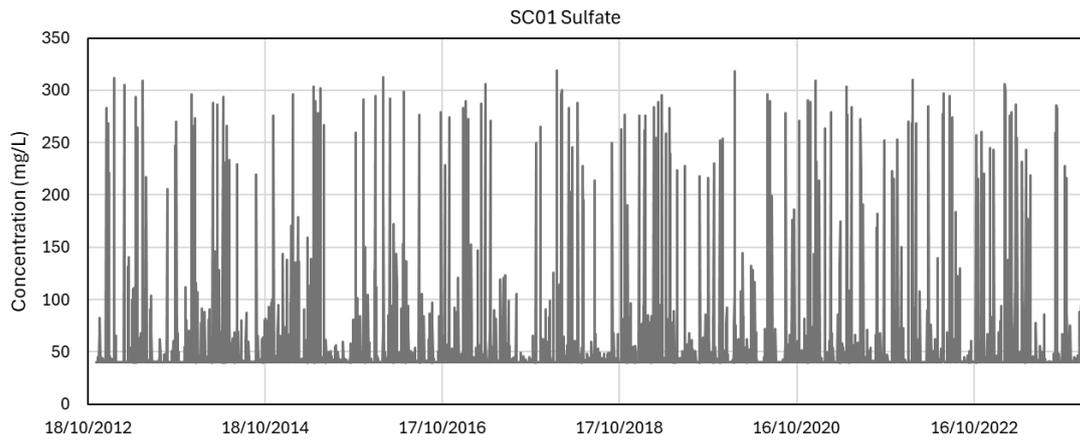


Figure 10: Modelled sulfate concentrations at SC01, where bore water is used for dust suppression.
 Note: dates on graph are representative of the synthetic flow record, not mine life.

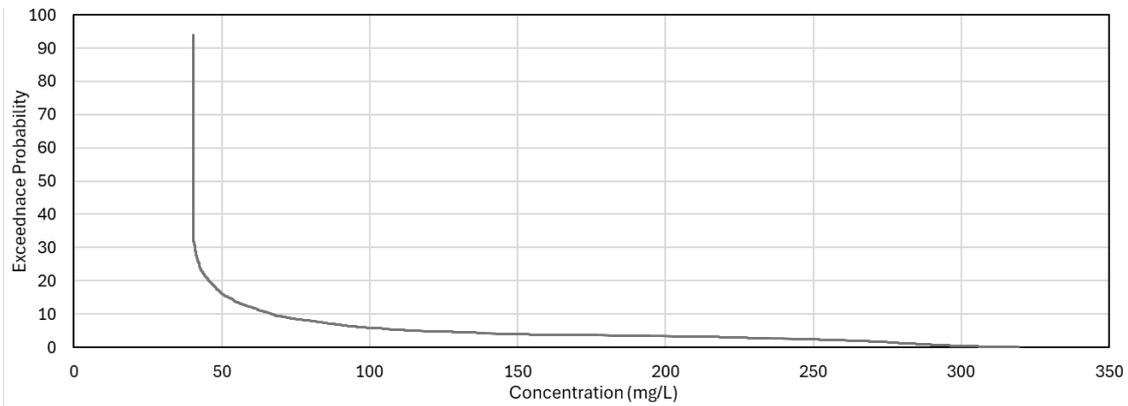


Figure 11: Sulfate exceedance probability in SC01 where bore water is used for dust suppression.

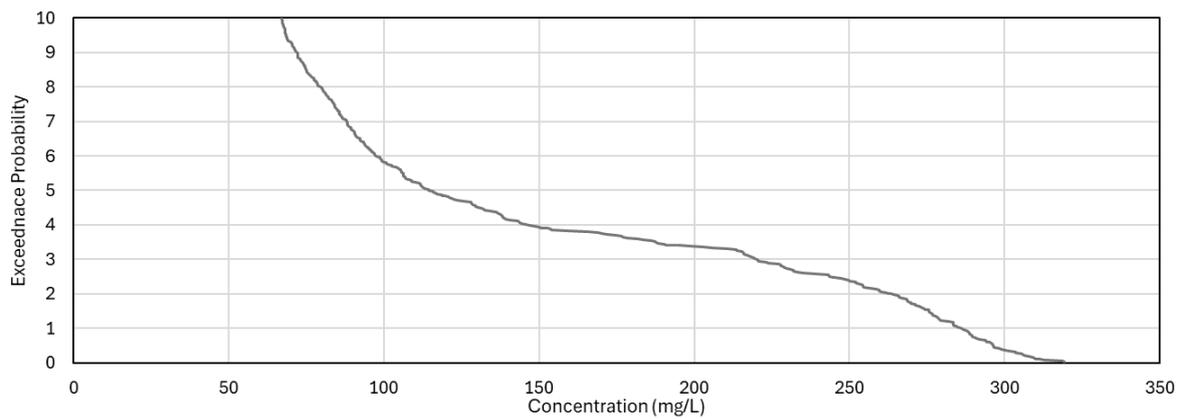


Figure 12: Bottom 10% exceedance probability for sulfate concentrations where bore water is used for dust suppression at SC01.

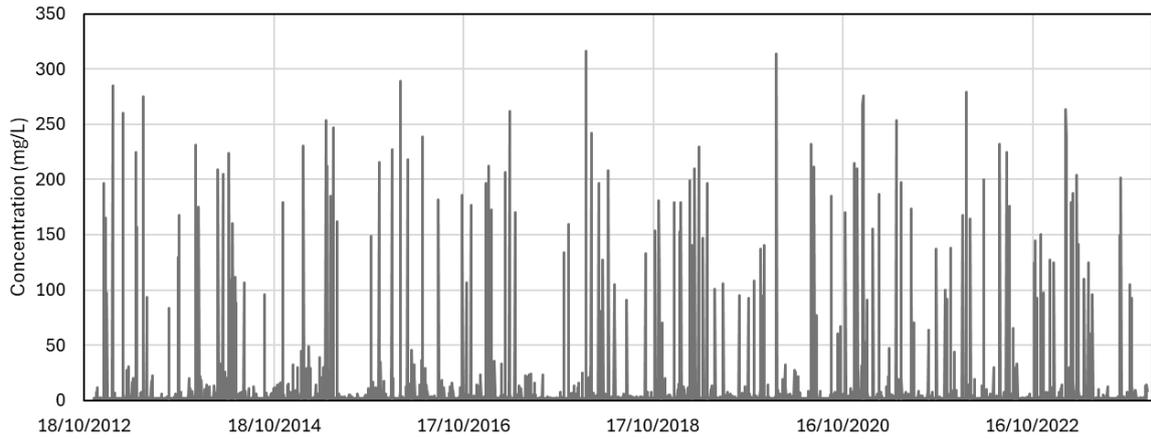


Figure 13: Modelled sulfate concentrations at RS03, where bore water is used for dust suppression.
 Note: dates on graph are representative of the synthetic flow record, not mine life.

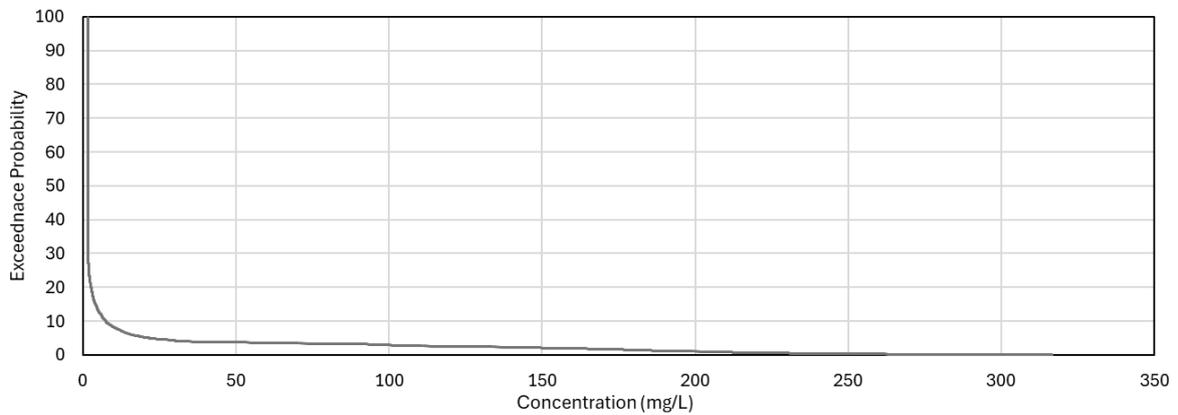


Figure 14: Sulfate exceedance probability at RS03 where bore water is used for dust suppression.

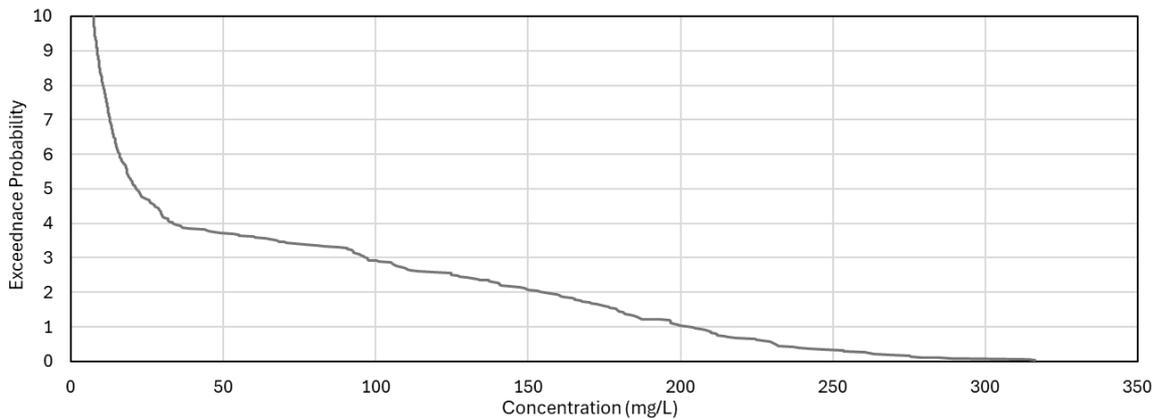


Figure 15: Bottom 10% exceedance probability for sulfate concentrations where bore water is used for dust suppression at RS03.

4.5 Summary

Water balance calculations suggest that the site will be in a water deficit condition up to Year 8. After this point, dewatering from satellite pits (i.e., SRX and to a lesser extent CIT) may push the site to a water surplus condition for the last few years of mine life without additional controls. Engineering controls (e.g., construct the water treatment plant prior to closure) are available to manage potential water surpluses, and can be evaluated during detailed design phases. Ongoing water balance

reconciliation of the site will be required to confirm water balance conditions remain in a water deficit condition.

Creek flows will be reduced by approximately 13 to 17% on average by the life of mine. Reduction would be lower earlier in mine life with a lower disturbance footprint.

Interpretation of the mixing model results suggests surface water quality at SC01 and RS03 will remain below the proposed compliance limits for both surface and groundwater if groundwater is used for dust suppression.

4.6 Recommendations

The following recommendations are provided:

- A transient operational site wide water balance model be developed prior to mine development to improve confidence in water accumulation or losses over time, particularly to understand seasonal dynamics. Such a model will likely be needed to support detailed design of the TSF.
- A site water balance reconciliation be completed regularly (e.g., annually or more frequent) to confirm water balance model results are appropriate, and/or make model updates to improve confidence in model results projected into the future.

Discharge of runoff will be monitored with contingencies in place. Adaptive management processes need to be developed to proactively manage and respond if performance and/or compliance monitoring suggests these discharges provide risk of non-compliance. Contingencies could include for example:

- Use fresh groundwater for dust suppression surfaces that will discharge runoff to the receiving environment. This will lower the sulfate load buildup at surface available for transport via runoff.
- Collect and contain runoff within the mine water circuit.
- Use of evaporation cannons to increase evaporative losses.
- Increase water storage capacity on site.
- Commission the water treatment plant during operations rather than at closure.
- Storage of water within pits or other purpose designed infrastructure.

5 ACTIVE AND POST CLOSURE PHASE ASSESSMENT

This section assesses the potential effects to the receiving environment during the active and post closure phases of the mine.

5.1 Model Description

The objective of the WLBM is to mechanistically model the water management system at the BOGP. Inputs to the model are based on reported or derived values; some inputs were derived empirically. Hydrological, geochemical, and operational processes that influence water quantity and quality on site are represented in the model and calibrated to existing monitoring data. The model is built to simulate future water management scenarios and predict factors and behaviours that will inform decision making for closure.

5.1.1 Overview

The BOGP WLBM was developed using GoldSim dynamic system modelling software used for simulation of mine water and load balances (Version 15). The water balance uses a daily precipitation timeseries generated with a stochastic climate generator based on statistics from long-term climate data series (as described in Section 3).

The model was divided into two surface water catchments: Shepherds Creek and Rise and Shine Creek. Daily precipitation rates were applied to each catchment area to estimate overland runoff flow volume. A runoff coefficient based on montane landcover and topography was then applied to this volume to account for a proportional loss of water to evapotranspiration and infiltration to groundwater.

The load balance is based on a mass balance approach. It calculates loading rates by assigning source term concentrations to the flows determined in the water balance and generates water quality projections for both onsite and downstream locations. Source terms are applied as constant concentration (where concentration is assumed to remain the same over time), or constant load (where concentration is estimated based on dividing a constant load), and the flow rate for that day. The later means that at low flow rates the concentration is higher, and at higher flows, there is more dilution, hence, less concentrated waters.

Mechanisms represented in the model include:

- Runoff from undisturbed catchments, including conveyance via water diversion structures.
- Filling and discharge of open pit voids, including RAS pit water discharging via the underground workings.
- ELF and TSF runoff and seepage.

The model is run on a daily time step. Results can be provided as monthly mean or median values to align with proposed water quality consent conditions. The selection of model output as monthly projections is therefore considered adequate to inform water management decisions. The model projects 200 years forward from closure. A schematic of model representation of mine site key domains and flow of water and sediment load is illustrated in Figure 16.

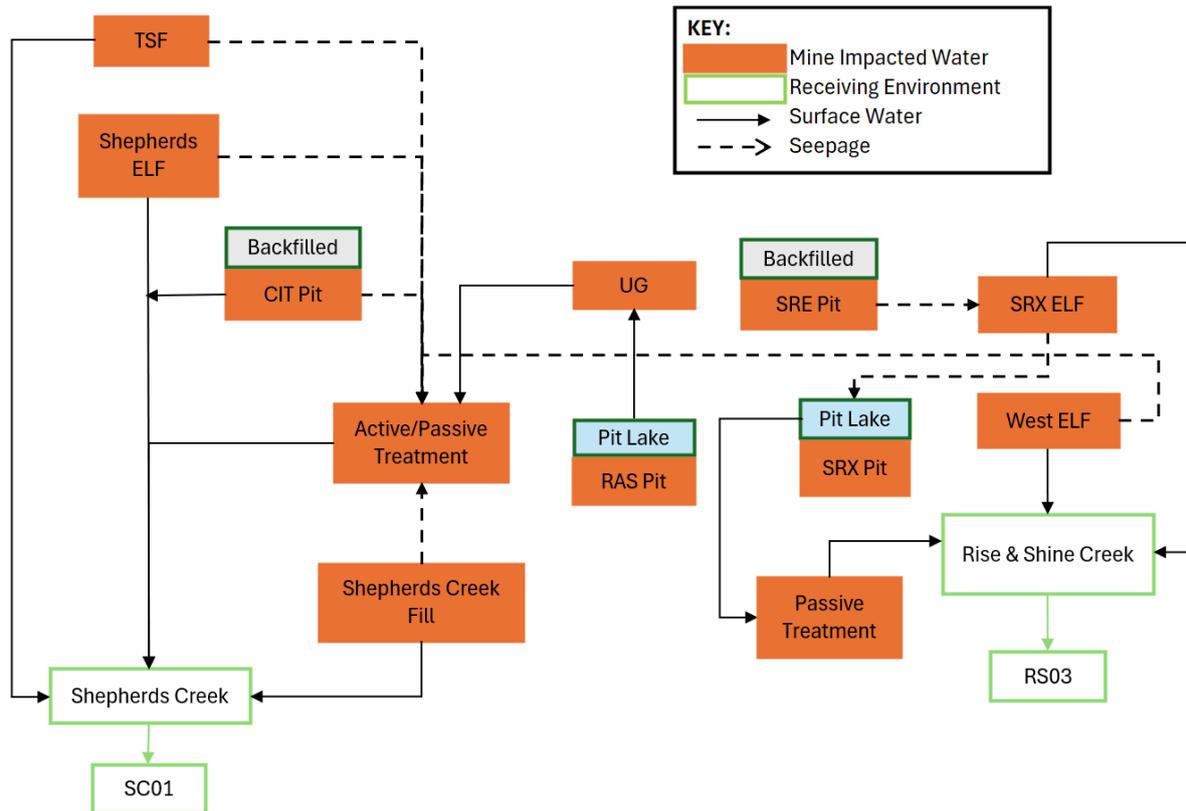


Figure 16: Schematic diagram of MIW and non-impacted rainfall and runoff for the closure phases at the BOGP site.

Note: An active water treatment plant (WTP) is proposed for the Active closure Phase. When PCOC loads decrease sufficiently the WTP will be replaced by passive water treatment systems, which defines the start of the Post Closure Phase (Table 1). Partial passive treatment of the SRX Pit Lake overflow is proposed (8 L/s) to ensure water quality limits are achieved at RS03.

5.2 Water Balance Model Inputs

5.2.1 Climate Inputs

The Stochastic Climate Library (v2.2.0) tool was used to generate future rainfall and PET timeseries using a first-order autoregressive multivariate model condition based on the rainfall state and nested in monthly and annual models. Input data for the model included:

- Synthetic daily rainfall data described in Section 3.
- Synthetic daily PET data described in Section 3.
- A synthetic daily maximum temperature record was developed in the same manner as for PET, following a linear regression equation: $S_{\text{rex Max Temp}} = 0.7554 \times \text{Cromwell EWS Max Temp} - 0.1099$ (Figure 17).

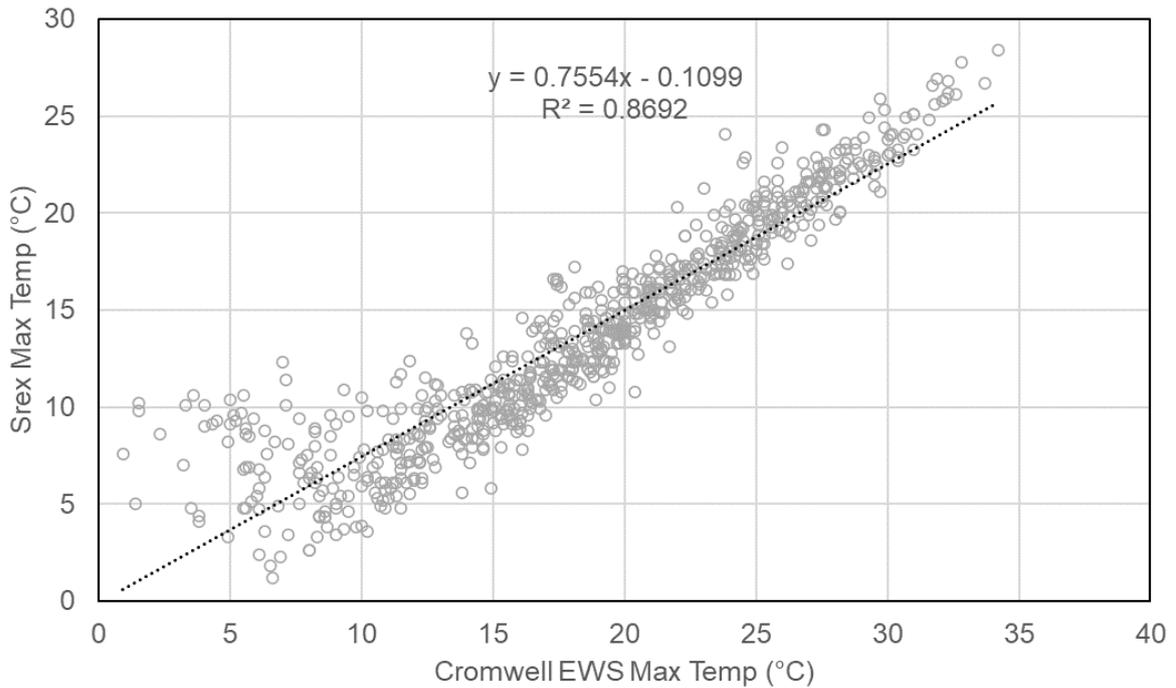


Figure 17: Srex Met vs Cromwell EWS maximum temperature.

Table 12 compares statistical summaries of the synthetic data series with the forward climate realisation, showing a close agreement between annual totals for rainfall and PET.

Table 14: Synthetic vs projected climate summaries.

STATICITICAL DESCRIPTOR	YEARLY RAINFALL (mm)		YEARLY PET (mm)	
	SYNTHETIC DATA SERIES	FORWARD PROJECTION	SYNTHETIC DATA SERIES	FORWARD PROJECTION
Mean	498	505	932	935
Median	493	508	938	933
Standard Deviation	96	108	33	29

Climate data was retrieved for the project for the SSP2-4.5 scenario, for the 1995-2014 base period and for projections for 2080-2099 (<https://map.climatedata.environment.govt.nz/> (accessed 20/01/2025)). Annual climate change factors were applied to the projected climate data to account for changes in future climate as follows:

- Rainfall factor 1.07 (+7% annual rainfall).
- PET factor 1.045 (+4.5% annual PET based on an annual daily average air temperature increase of 1.8 °C applied to the Penman [1946] method).

The factors were applied to increase linearly from 1 at the start of the model to fully reach the above defined factors after 65 years of simulation time, approximately representing 2080-2099. Beyond this period the factors remained the same.

5.2.2 Catchment Delineation

Catchment boundaries were derived based on the topographic watershed divides using QGIS open-source topographic maps (QGIS, 2025). Mine area footprints provided by MGL (such as pits, ELFs, and

TSF) were removed from the total catchment areas to derive the undisturbed surface areas. Areas of topsoil deposits were included within the undisturbed footprints. Surface areas were calculated based on areal footprints. The catchments and undisturbed surface area inputs used in the model are summarised in Table 13 below.

Table 15: Catchment delineations and undisturbed surface areas.

CATCHMENT DELINIATION	DESCRIPTION	MINE DOMAINS	UNDISTURBED SURFACE AREA (km ²)
Rise and Shine Creek Catchment	Rise and Shine Creek sources in the central and southeastern extent of the mine area and flows northeast. Includes Clearwater Creek.	SRX Pit SRX ELF RAS Pit <i>(28% of footprint)</i> CIT Pit <i>(13% of footprint)</i> WELF Monitoring location RS03 – this marks location of outflows from RS03 out of model.	7.60
Shepherds Creek Catchment	Extends across the northern half of the mine area. Shepherds Creek flows southeast across the catchment extent.	TSF Shepherds ELF RAS Pit <i>(72% of footprint)</i> CIT Pit <i>(87% of footprint)</i> Shepherds Creek Valley Fill Monitoring location SC01 – marks location of outflows from SC01 out of model.	9.79

5.2.3 Runoff Model

The Runoff Model utilised for generating flows from undisturbed surface water areas (Table 13) was based on modifications to the Snow Melt Runoff Model by Martinec et al. (2008). For the purpose of this model the influence of snow melt was assumed negligible. Daily discharge (runoff) is calculated by superimposing daily rainfall on calculated recession and baseflow using the following equation:

$$Q_{n+1} = C \times R \times A \times (1 - k_{n-1}) + Q_n \times k_{n-1}$$

Where:

- Q is the average daily discharge.
- C is the runoff coefficient.
- R is the rainfall contributing to runoff.
- k is the recession coefficient.
- A is the area of the catchment.

The input parameters used for each flow source are summarised in Table 14, with the runoff coefficient varying by month. Selection of parameters was based on professional judgment and attaining a reasonable fit with observed flows at SC01. See Section 5.4.2 for further description on undisturbed runoff model calibration.

Table 16: Runoff coefficients for the water balance model.

	PARAMETER	VALUE
Runoff Coefficient (C)	January	0.02
	February	0.02
	March	0.03
	April	0.04
	May	0.08
	June	0.15
	July	0.3
	August	0.3
	September	0.12
	October	0.06
	November	0.06
	December	0.03
Recession Coefficient (k)		0.955

5.2.4 Pit Voids

Pit voids were represented in the model as pool elements, accounting for inflows, outflows, and changes in water storage within the pit void. Model inputs are summarised in Table 15.

Table 17: Pit void model summary.

MODEL FEATURE	DESCRIPTION
Post-closure setting	<ul style="list-style-type: none"> RAS Pit: Open void and pit lake develops. Connected to underground workings via fractured rock mass associated with crown pillar. SRX Pit: Open void and pit lake develops. CIT Pit: Backfilled void with both saturated and unsaturated mine rock.
Pit void dimensions, including volume/surface area stage relationship, and spill points elevation.	<p>Provided by MGL in file RAS2503_FTA_ST5 volumes.xlsx.</p> <p>Spill points were defined by the pit crest low points as follows:</p> <ul style="list-style-type: none"> RAS Pit: 610 meters above sea level (m asl). SRX Pit: 755 m asl. CIT Pit: 510 m asl. <p>For the RAS Pit, the volume of underground workings was assumed negligible compared to the pit void volume.</p> <p>For the backfilled CIT pit, a mine rock porosity value of 0.3 was adopted based on the expectation that the mine rock will be relatively coarse with little fines (MWM, 2025a).</p>
Direct rainfall onto pit lake (when present)	Only relevant for RAS and SRX. Forward rainfall projection as described in Section 5.2.1 of this report. Pit lake surface area dynamically calculated based on provided stage-surface relationship.
Pit wall runoff	<p>Only relevant for RAS and SRX. Daily climatic water balance (rainfall-PET) suggested 80% of rainfall was available to generate runoff, while at a monthly scale, only 45% was available. Given the pit walls of exposed rock are likely to have little capacity for infiltration or water storage that can be evaporated at a future time, a runoff coefficient of 60% of rainfall was adopted as the approximate mid-point between the daily and monthly available rainfall. This value was applied uniformly in time, with no differentiation between winter vs summer given insufficient data to define such seasonal variation.</p> <p>Exposed pit wall footprint dynamically calculated based on provided stage-surface relationship.</p>
Groundwater inflow	Based on numerical groundwater model results reported in (KSL, 2024). Inflows rates were defined to decrease linearly as void water level increases over time and hydraulic gradient decreases.

MODEL FEATURE	DESCRIPTION																					
	<ul style="list-style-type: none"> RAS Pit: 3 L/s when pit empty, dropping to 1 L/s when water level stabilised as higher level. SRX Pit: 25 L/s when pit empty, dropping to 5 L/s when water level stabilised as higher level. CIT Pit: 3.5 L/s when pit empty, dropping to 1 L/s when water level stabilised as higher level. 																					
Run-on from undisturbed upstream sources	<ul style="list-style-type: none"> RAS Pit: assumed negligible. SRX Pit: defined based on Runoff Model described in Section 5.2.3. CIT Pit: assumed negligible. 																					
Backfill seepage	Only relevant for CIT. Described in Section 5.2.5																					
Pit lake evaporation	Only relevant of RAS and SRX. The forward PET projection as described in Section 5.2.1 of this report. Pit lake surface area dynamically calculated based on provided stage-surface relationship.																					
Groundwater outflow	Based on Darcy's law assuming horizontal outflow only. Not significant for SRX as lower hydraulic gradient to Rise and Shine Creek (spill point elevation close to creek level) than other pits.																					
	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>CIT</th> <th>RAS</th> </tr> </thead> <tbody> <tr> <td>Hydraulic conductivity</td> <td>10⁻⁸ m/s, based on bulk rock mass.</td> <td>10⁻⁵ m/s, based on zone of enhanced fracturing.</td> </tr> <tr> <td>Discharge to discharge point</td> <td>250 m, distance between outflow zone and Shepherds Creek.</td> <td>50 m, based on approximate lateral thickness of zone of enhanced fracturing between pit wall and closest underground workings.</td> </tr> <tr> <td>Discharge head</td> <td>430 m asl, nearby Shepherds Creek elevation.</td> <td>490 m asl, approximate underground portal elevation.</td> </tr> <tr> <td>Pit lake head</td> <td colspan="2">Calculated dynamically as pit void water level changes.</td> </tr> <tr> <td>Outflow width</td> <td>200 m, based on approximate lateral width of pit shell at discharge zone.</td> <td>200 m, based on approximate lateral width underground workings at discharge zone.</td> </tr> <tr> <td>Outflow thickness</td> <td>Calculated dynamically as pit void water level changes.</td> <td>50 m, based on approximate thickness of zone of enhanced fracturing.</td> </tr> </tbody> </table>	PARAMETER	CIT	RAS	Hydraulic conductivity	10 ⁻⁸ m/s, based on bulk rock mass.	10 ⁻⁵ m/s, based on zone of enhanced fracturing.	Discharge to discharge point	250 m, distance between outflow zone and Shepherds Creek.	50 m, based on approximate lateral thickness of zone of enhanced fracturing between pit wall and closest underground workings.	Discharge head	430 m asl, nearby Shepherds Creek elevation.	490 m asl, approximate underground portal elevation.	Pit lake head	Calculated dynamically as pit void water level changes.		Outflow width	200 m, based on approximate lateral width of pit shell at discharge zone.	200 m, based on approximate lateral width underground workings at discharge zone.	Outflow thickness	Calculated dynamically as pit void water level changes.	50 m, based on approximate thickness of zone of enhanced fracturing.
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Outflow thickness	Calculated dynamically as pit void water level changes.	50 m, based on approximate thickness of zone of enhanced fracturing.																				

5.2.5 Mine Waste Storage Facilities

Mine Waste Storage Facilities (MWSFs) represented in the model included the:

- Shepherds ELF.

- SRX ELF.
- Western ELF.
- CIT backfilled pit void.
- TSF.

The SCK Fill was also represented as a MWSF. From near the top of the valley, clean water diversions will be used to allow clean water to bypass the TSF and Shepherds ELF. The diversions will drop onto a constructed channel in the lower SCK Fill that will extend to the Run of Mine (ROM) at least (the natural creek may need to be lifted past the process area). Areas below the ROM where there is minimal ore exposure will be channelled via silt retention ponds to Shepherds channel (or possibly the natural creek). The lower gorge has to be filled to create sufficient width for services. The Shepherd channel shall be formed through this section to take a 1% AEP event (D. Stretch, MGL, personal communication, 16 April 2025).

Run off from the Shepherds ELF is directed to the Shepherds Silt Pond and then discharged through a decant to the Shepherds channel after settling. In a large storm event, the silt pond can discharge directly by spill way to the Shepherds channel. Run off from the valley below the silt pond shall also be captured in sediment treatment ponds and discharged into Shepherds channel.

Mechanistically, the MWSFs were represented in a similar manner, with runoff being calculated as a proportion of daily rainfall, net percolation into the facility also calculated as a proportion of daily rainfall, and seepage out of a facility calculated as a function of water storage within the facility with a reservoir element. Model inputs are summarised in Table 16.

Table 18: MWSF model input parameter summary.

MODEL FEATURE	DESCRIPTION												
Post-closure setting.	The cover system established at closure is anticipated to perform similarly across all MWSFs (MWM, 2025a).												
Runoff	<p>Defined as a proportion of daily rainfall, with runoff coefficients increasing as rainfall depth increased, as follows:</p> <table border="1"> <thead> <tr> <th>DAILY RAINFALL</th> <th>RUNOFF COEFFICIENT</th> </tr> </thead> <tbody> <tr> <td><5 mm</td> <td>0</td> </tr> <tr> <td>≥ 5 mm but < 10 mm</td> <td>0.05</td> </tr> <tr> <td>≥ 10 mm but < 50 mm</td> <td>0.1</td> </tr> <tr> <td>≥ 50 mm but < 90 mm</td> <td>0.15</td> </tr> <tr> <td>> 90 mm</td> <td>0.2</td> </tr> </tbody> </table> <p>Modified from previous work at Macraes Mine (Golder, 2011) to achieve an average runoff yield similar, but slightly lower, than Shepherds Creek yield of ~10% of average rainfall. The values adopted achieved a yield of ~7% of average rainfall.</p> <p>Applies to all MWSFs.</p>	DAILY RAINFALL	RUNOFF COEFFICIENT	<5 mm	0	≥ 5 mm but < 10 mm	0.05	≥ 10 mm but < 50 mm	0.1	≥ 50 mm but < 90 mm	0.15	> 90 mm	0.2
DAILY RAINFALL	RUNOFF COEFFICIENT												
<5 mm	0												
≥ 5 mm but < 10 mm	0.05												
≥ 10 mm but < 50 mm	0.1												
≥ 50 mm but < 90 mm	0.15												
> 90 mm	0.2												
Net percolation (NP)	<p>20% of daily rainfall, as per MWM (2025a).</p> <p>Applies to all MWSFs.</p>												
Initial condition	<p>Varies by MWSF as follows:</p> <ul style="list-style-type: none"> • Shepherds ELFs, SRX ELF, SCK Fill, CIT Backfill: mine rock assumed to be wetted up and at semi-stable seepage rates. • TSF: set to achieve an initial flow rate of approximately 13.4 L/s as per EGL (2025) and then stabilised at rate based on NP. 												

Recession Coefficient (k, -)	Recession equation: MWSF Storage Volume x (1-k). Varies by MWSF as follows: <ul style="list-style-type: none"> Shepherds ELFs, SRX ELF, SCK Fill, and CIT Backfill: set to 0.995 to achieve a relatively stable seepage rate. Translates to 5% of water stored in MWSF discharged as seepage. TSF: set to 0.998 to achieve a relatively stable seepage rate after approximately 5 years of drain down as per EGL (2025).
------------------------------	--

5.2.6 Water Treatment

Active water treatment in the Shepherds Creek catchment is proposed during the Active Closure Phase and passive water treatment systems are proposed for BOGP in the Post Closure Phase (Table 1) for MIW in the Shepherds Creek catchment and for partial treatment of the SRX Pit Lake overflow (8 L/s being the average pit lake overflow rate). Active treatment will run until passive treatment systems can achieve compliance with water quality compliance limits. The model did not account for any hydrological influence of such systems (i.e., water passes through them within the daily timestep).

Further details on active and passive water treatment are provided in MWM (2025d). Passive treatment efficiencies are also provided in Table 25.

5.3 Load Balance Inputs

Each of the water balance components shown in Figure 16 are associated with the water quality source terms as presented in Table 17 and Table 18. The derivation of the data in these tables is described in detail in the *Source Term Definition Report* by MWM (2025b).

Table 19. Source Term Water Quality Part 1 of 2.

SOURCE TERM	ELF_RO_ST	PW_RO_ST	TSF_RO_ST	CC01_UND_ST
DESCRIPTION	Rehabilitated ELF Runoff Water Quality	Pit Walls Runoff	Rehabilitated TSF Runoff	Surface water quality for Clearwater Creek
MWM (2025b) REPORT SECTION	Section 8.3. Table 20 Source terms: Mine Impacted Surfaces and Rehabilitated Surfaces Brown Rock	Section 6.4.1. Table 16 BOGP Pit Wall Runoff Source Term	Section 8.3. Table 20 Source terms: Mine Impacted Surfaces and Rehabilitated Surfaces Brown Rock	Section 4.1.2 Table 4 Surface Water Quality Source Terms for Bendigo Creek (CC01)
UNITS / PARAMETER	mg/L	mg/L	mg/L	mg/L
Al	0.155	0.114	0.155	0.01231
Alkalinity	140.5	61.3	140.5	14.7
As	0.02	0.093	0.02	0.001
B	0.064	0.046	0.064	0.0175
Ca	15.68	55	15.68	3.88
Cd	0.0001	0.0001	0.0001	0.00009
Cl	3.1	13	3.1	0.794
Co	0.0005	0.0005	0.0005	0.00021
Cr	0.0005	0.0005	0.0005	0.00056

SOURCE TERM	ELF_RO_ST	PW_RO_ST	TSF_RO_ST	CC01_UND_ST
Cu	0.001	0.0034	0.001	0.00043
DOC	2.01	0	2.01	1.23
F	0.34	0.21	0.34	0.055
Fe	0.14	9.1	0.14	0.0293
Hg	-	-		0.00024
K	8.66	39	8.66	0.335
Mg	1.95	37	1.95	0.844
Mn	0.0115	0.014	0.0115	0.0009
Mo	0.147	0.023	0.147	0.00033
NO3-N + Amm-N	0.4	40	0.4	0.0096
Na	32.88	33	32.88	2.35
Ni	0.0005	0.0009	0.0005	0.00056
Pb	0.00019	0.004	0.00019	0.00022
Sb	0.049	0.027	0.049	0.00044
Se	0.00025	0.00025	0.00025	0.0022
SO ₄	470	160	470	0.843
Sr	0.67	0.91	0.67	0.042
Tl	0.00025	0.00025	0.00025	0.00019
TOC	2.01	0	2.01	1.23
CN	0	0	0	0
U	0.053	0.0106	0.053	0.00009
V	0.0005	0.0005	0.0005	0.0005
Zn	0.001	0.002	0.001	0.00161
pH	8.4	8.2	8.4	7.03

In addition, the seepage water quality forecast for five waste rock domains (Shepherds ELF, SRX ELF, WELF, CIT Backfill, and SCK Fill) were developed in detail in the *Engineered Landform Water Quality Forecast Model Report* (MWM, 2025c). Four of the five domains are assumed to start generating seepage 11 years before closure (assuming that BOGP takes 11 years to be completed). Therefore, peak concentrations for WELF, SCK Fill, and SRX ELF occur during operation. Peak concentration for Shepherds ELF occurs in Active Closure phase, same as CIT ELF Backfill, as it is assumed the latter will be backfilled at closure. These model outputs with time are presented in Figure 18 and Figure 19.

Table 20. Source Term Water Quality Part 2 of 2.

SOURCE TERM	RS03_UND_ST	RS04_UND_ST	SC03_UND_ST	GW_MDD015_ST	Rain_ST	TSF_Seepage_ST
MWM (2025b) REPORT SECTION	Section 4.1.2 Table 4 Surface Water Quality Source Terms for Bendigo Creek (RS03)	Section 4.1.2 Table 4 Surface Water Quality Source Terms for Bendigo Creek (RS04)	Section 4.1.1 Table 3 Surface Water Quality Source Terms for Shepherds Creek (RS04)	Section 4.2.1 Table 6 Water Quality Source Terms for Groundwater (MDD015)	Section 3.1.1. Table 2. Rainfall Quality Source Term Data.	Section 9.3.2. Table 23 Process Water Quality and Tailings Seepage Water
PARAMETER/UNITS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Al	0.00756	0.00686	0.0064	0.0061	-	0.01
Alkalinity	39.1	72.8	136.2	201.6	0.81	73.21
As	0.0085	0.001	0.00079	0.024	-	2.05
B	0.0188	0.011	0.028	0.0331	-	0.825
Ca	11.1	23.3	40.9	38.9	0.11	297
Cd	0.0001	0.00003	0.00011	0.00008	-	0.0002
Cl	1.33	1.96	2.74	9.42	0.31	804
Co	0.00025	0.00013	0.00029	0.00019	-	0.053
Cr	0.00059	0.00026	0.00062	0.0005	-	0.0055
Cu	0.00046	0.00083	0.00055	0.0003	-	1.598
DOC	1.75	2.75	2.01	0.3	-	0
F	0.057	0.059	0.119	0.162	-	1.93
Fe	0.0375	0.068	0.0215	0.0147	-	15.3
Hg	0.00026	0.00011	0.0003	0.0002	-	0
K	0.578	1.18	1.43	1.44	0.88	50.8
Mg	1.99	3.74	10.2	16.2	0.09	99
Mn	0.0095	0.006	0.00357	0.0068	-	0.59
Mo	0.00033	0.00022	0.00044	0.0004	-	0.14
NO3-N + Amm-N	0.0088	0.0033	0.1507	0.0051	0.06	2.005
Na	39.5	5.15	36.2	43.6	0.32	848
Ni	0.00035	0.00049	0.00036	0.0003	-	0.678

SOURCE TERM	RS03_UND_ST	RS04_UND_ST	SC03_UND_ST	GW_MDD015_ST	Rain_ST	TSF_Seepage_ST
Pb	0.00025	0.00008	0.00029	0.0002	-	0.0275
Sb	0.0005	0.00017	0.00058	0.0004	-	0.18
Se	0.0025	0.0008	0.0029	0.0018	-	0.003
SO ₄	1.57	2.8	14.4	10.3	0.18	954
Sr	0.136	0.315	0.675		-	4.4
Tl	0.00023	0.00005	0.00027	0.0003	-	0
TOC	1.75	2.75	2.01	0.3	-	0
CN	0	0	0	0	0	0.35
U	0.00012	0.0003	0.0022	0.001	-	0.028
V	0.0005	0.0005	0.0005	0.0005	-	0.004
Zn	0.00229	0.00142	0.0015	0.0015	-	0.0296
pH	7.42	7.51	7.88	8.1	5.2	6.41

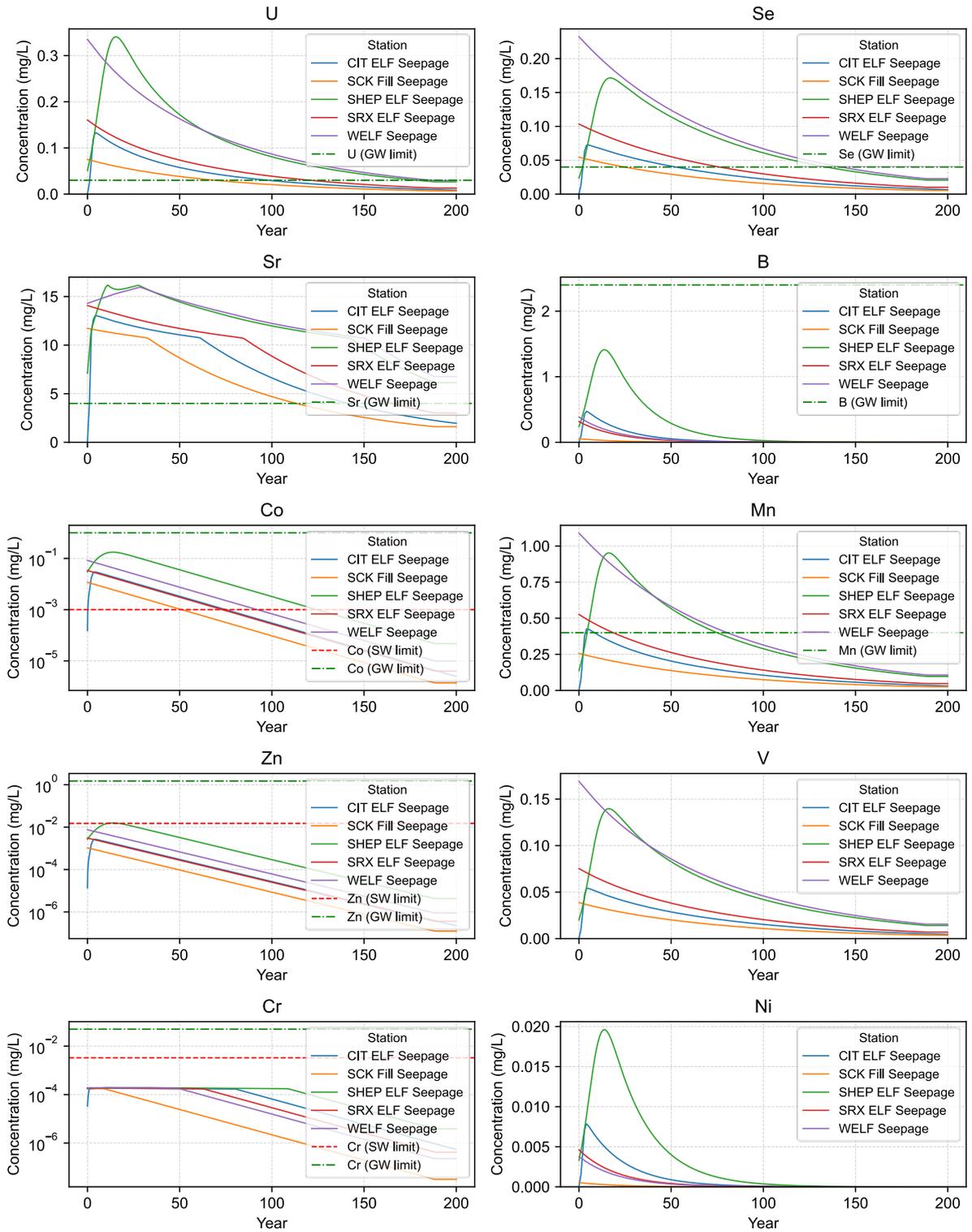


Figure 18. Seepage Water Quality for Waste Rock Domains at the BOGP. Part 1 of 2.

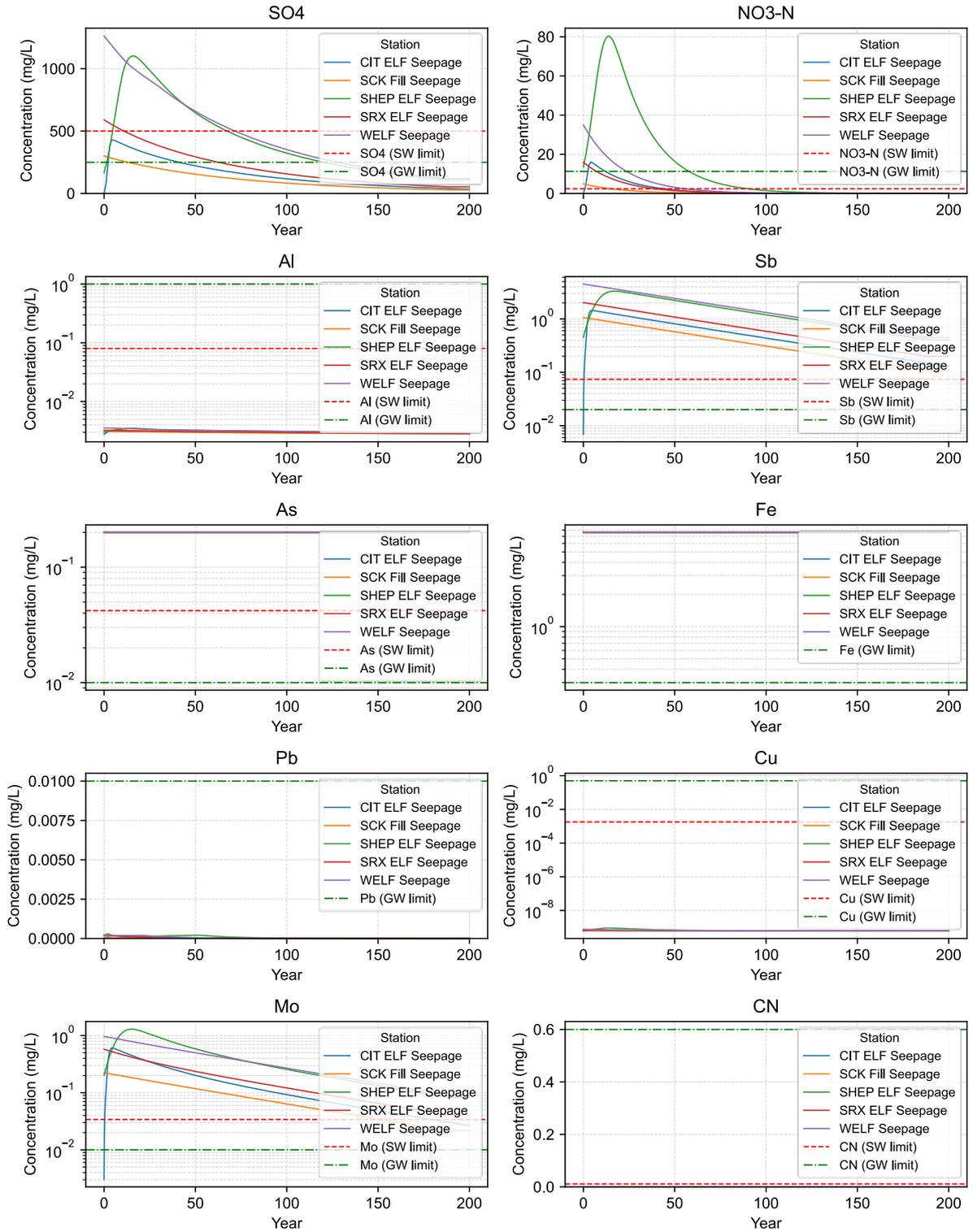


Figure 19. Seepage Water Quality for Waste Rock Domains at the BOGP. Part 2 of 2.

CN = Cyanide.

5.4 Model Evaluation

5.4.1 Model QA/QC¹¹.

The WLBM was reviewed as part of internal QA/QC and this included the following steps:

- Checking that data sources are documented.
- Verification that storages, inflows, and outflows are correctly located and allocated to the right source and sink.
- Cross checking of flows to ensure they are not duplicated or missed.
- Verification of model functions and expressions to ensure they are working as intended.
- For the calibration period, predictions were evaluated through comparison to monitoring data.
- Using professional judgement and experience to evaluate if results reflect the understanding of the project and model inputs.

5.4.2 Model Calibration

The Runoff Model was history matched against a synthetic flow record for SC01. The synthetic record was developed based on the relationship established between SC01 and Cluden Stream @ Stockyards (KSL, 2025a): $SC01 \text{ flow} = 0.03974838 \times \text{Cluden flow} - 0.25974622$. The synthetic flow record timespan covered 23/11/2012 through 31/01/2025 (~12 years). History matching to the Rise and Shine Creek data was considered not worthwhile due to water takes of unknown volume and timing from this creek for drilling purposes. The Runoff Model was driven by the synthetic rainfall record described in Section 5.2.1.

Initially, the Australian Water Balance Model was used in an attempt to reproduce the synthetic flow record, but model performance was found to be poor. Thus, the Runoff Model was utilised as described in Section 5.2.3. History matching with the Runoff Model was completed using a manual trial and error approach, with a focus on balancing the match between:

- Daily average simulated and observed stream flow rates (Figure 20 and Figure 21).
- Flow exceedance probability (Figure 22).
- Cumulative water volume (Figure 23).

Findings from the history matching were as follows:

- History matching was unable to achieve a satisfactory fit to both high and low flow conditions; a trade-off between fitting one or the other was apparent. One of the main causes behind this was the use of synthetic rainfall and flow records from two different physiographic locations, namely a low valley bottom setting for the Cromwell EWS station and a mountainous terrain catchment reporting to Cluden @ Stockyards. Although the synthetic records are reasonable approximations of average conditions at Bendigo, they are unlikely to represent well individual storm/rainfall events which drive high flow conditions. On balance, the fit to the lower flow

¹¹ Quality Assurance / Quality Control

conditions was prioritised as there is less dilutive capacity during these conditions, so the risk of exceeding in stream water quality objectives is higher (i.e., a conservative choice).

- Low flow conditions were slightly under predicted (e.g., Figure 21), which all else being equal, would conservatively result in higher modelled instream water quality concentrations.
- Average flow statistics were reasonably well matched (Table 19), while the 7 day mean annual low flow was under predicted.
- The overall fit to daily average flow data, flow exceedance probability, and cumulative water volume is considered reasonable for representing conditions at the spatial scale of the Project. Mismatch to observed data is typically a result of under predicting higher flow conditions.

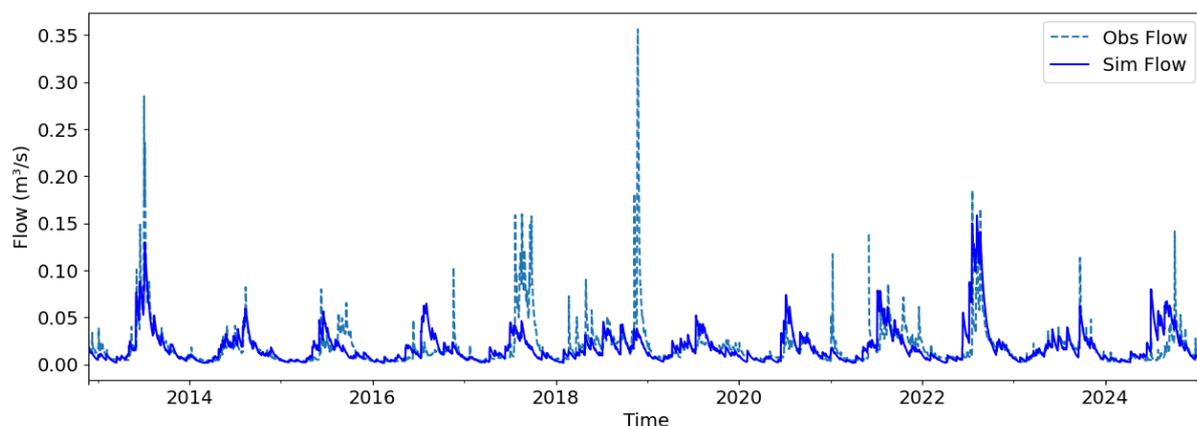


Figure 20: Daily flow rate comparison.

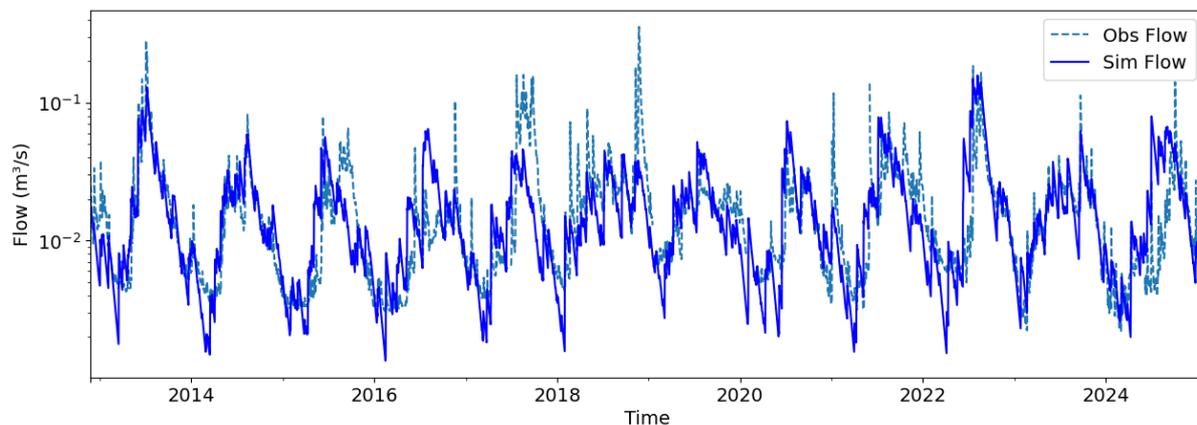


Figure 21: Daily flow rate comparison (log scale).

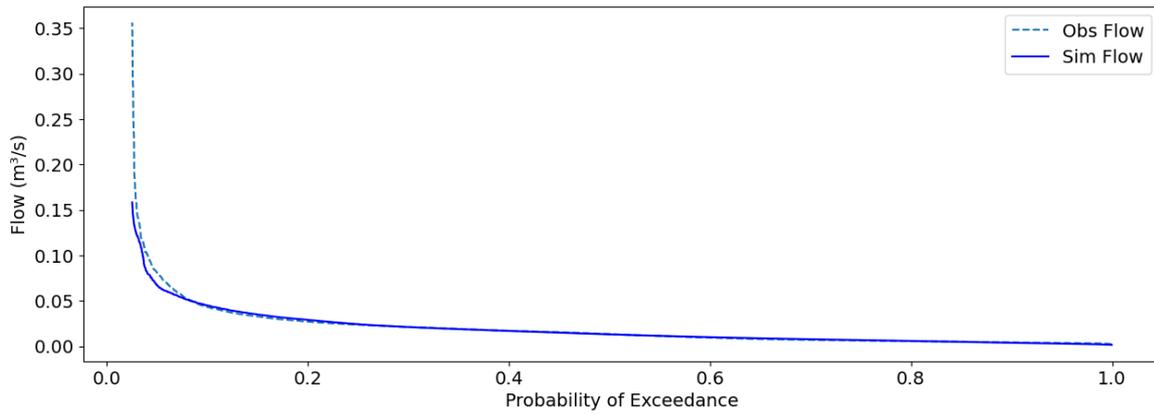


Figure 22: Flow exceedance comparison.

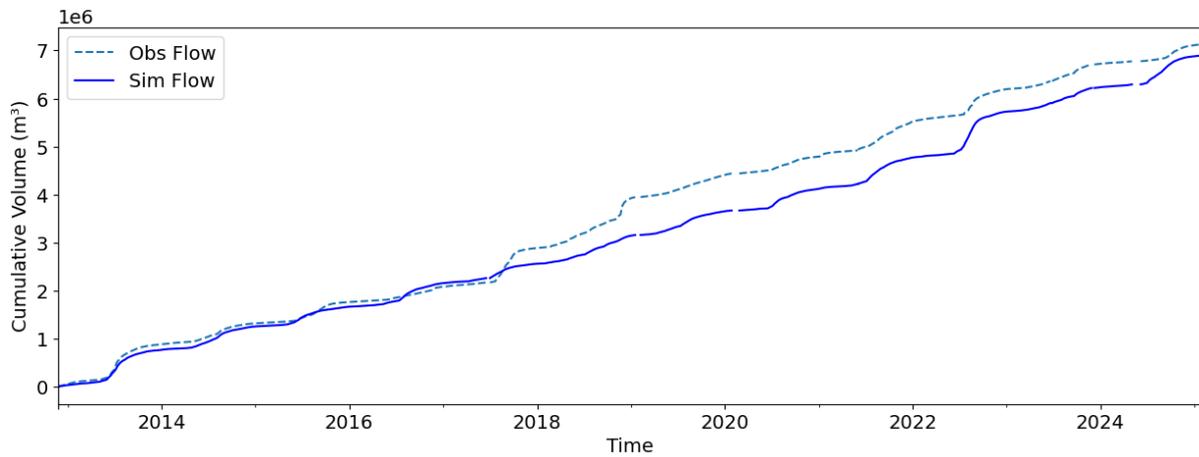


Figure 23: Cumulative water volume comparison.

Table 21: SC01 flow statistic comparison.

METRIC	SYNTHETIC RECORD	MODEL RESULTS
Mean flow (L/s)	19.0	18.1
Median flow (L/s)	12.7	12.3
7-day MALF (L/s)	4.5	2.40

MALF = mean annual low flow.

5.4.3 Model Limitations

5.4.3.1 Water Balance

As discussed in Section 5.4.2, the Runoff Model did not provide a strong match to high or (daily average) peak flow conditions. In addition, peak flows typically occur at a finer temporal scale than the modelled daily time step. As such, the Runoff Model, and by extension the wider Water Balance Model results are not appropriate to inform engineering design criteria that are sensitive peak flows.

The Runoff Model was history matched to SC01 flows, which spatially average flow generation over the entire catchment. However, higher elevation sub-catchments (e.g., area reporting to SC03) are known to have higher unit flow yields (KSL, 2025a). As such, the Runoff Model may not be reliable at forecasting flows at smaller, lower elevation portions of the Project area.

Pit lake evaporation was derived based on the SRX climate station record. It is known that deep lakes (e.g., >5 m) can display different patterns in lake evaporation than PET derived from land-based weather stations, where radiation energy can be stored within the in warmer months and released in colder months (Jenson and Allen, 2016). In addition, PET from land-based weather stations may not reflect well wind, water temperature, and pit wall shading effects specific to pit lake evaporation (McJannet et al., 2019). This is a noted uncertainty in the model, particularly for the pit voids, but no more uncertain than other model elements.

Model inputs and outputs to the mine domain components of the WLBM were not calibrated and typically informed by experience at mine sites in similar settings (e.g., Macraes Mine, etc.). Performance monitoring during operations and post-closure will be essential to confirm model results are reasonable.

Seepage collection systems are assumed to collect and recover 100% of load associated with mine waste storage facilities. Additional ground investigations, groundwater monitoring, and detailed modelling will be required at detailed design.

5.4.3.2 Load Balance

Load balance limitations are outlined below:

- **Conservative transport assumption:** The model assumes that all parameters are transported downstream without accounting for geochemical reactions. This means that processes such as precipitation (e.g., formation of hydroxy-sulfates) and adsorption are not represented. As a result, elements known to be removed from solution, such as Al, Fe, and As, are likely overestimated. Other trace metals (e.g., Co, Mo, V), may also be affected. These processes can occur within pit lakes or along flow pathways.
- **Nitrate decay in pit lakes:** A decay rate has been applied to nitrate to reflect biological denitrification processes, as observed in pit lakes at Macraes (Navarro-Valdivia et al., 2023). This accounts for partial natural attenuation of nitrate concentrations within the receiving water bodies.
- **Nitrogen:** Nitrogen speciation is not modelled (e.g., ammoniacal nitrogen, nitrite, nitrate). Total nitrogen concentrations are used in the model, however they are presented as Nitrate-N, as it is assumed that is the predominant nitrogen species in typical oxic MIW.
- **pH:** pH is expected to remain neutral to alkaline in this load balance. To account for “pH transport,” the hydrogen ion concentration (estimated from the source terms using the equation $\text{pH} = -\log_{10}[\text{H}^+]$) is used instead. It remains relatively stable, but this does not account for carbonate speciation, which is likely to control and buffer pH at neutral levels due to the high alkalinity expected from the dissolution of carbonate minerals in the schists.
- **Source terms assumptions:** The model applies average water quality conditions across the simulation period. This limits its ability to capture short-term water quality variability, such as the ones caused by storm events, seasonal dry periods, which can influence contaminant mobility and concentrations. As more information becomes available, additional processes, such as decaying concentrations of pit walls or load contributions from rehabilitated areas, can be incorporated.

- **Pit lake full mixing approach:** The model does not simulate physical processes such as density-driven stratification or mixing within pit lakes or water bodies. In reality, thermal stratification can influence redox conditions, nutrient cycling, and the timing and depth of contaminant release (e.g. from bottom layers). The current approach assumes full mixing of the pit lake. It is assumed that some stratification may occur, but annually this stratification would break down in winter.
- **No biogeochemical processes:** Whilst a nitrate decay rate is included for water bodies, other biologically mediated processes (e.g., sulfate reduction, organic matter degradation, iron reduction) are not explicitly represented. These processes can significantly influence redox-sensitive elements (e.g. Fe, Mn, U, As) and could result in either attenuation or remobilisation depending on conditions.

5.5 Model Results

Model results for water balance and load balance are described separately in this section.

5.5.1 Water Balance Results

Water balance model results are described separately for mine domains (e.g., RAS Pit water level) and creek flows (e.g., SC01) in the following subsections.

5.5.1.1 Mine Domains

Model results for RAS Pit Void are shown in Figure 24 and Figure 25, and suggest:

- Stabilisation of the pit lake rebound in approximately 25 years, with a water level around 492 m asl (slightly above the adopted portal elevation of 490 m asl).
- Model results do not suggest the pit lake will spill over the pit crest low point (565 m asl).
- Discharge of pit lake water via the underground portal will start once the pit lake water level is above 490 m asl, and typically range between 4 to 7 L/s, with an average of about 6 L/s.

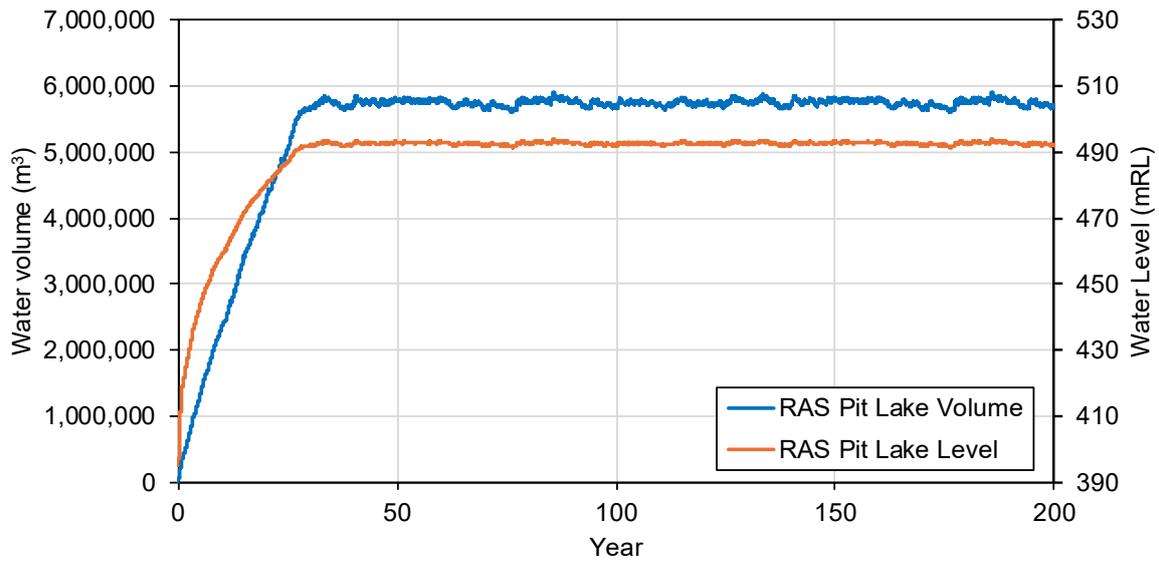


Figure 24: RAS Pit Void model results – water volume and level.

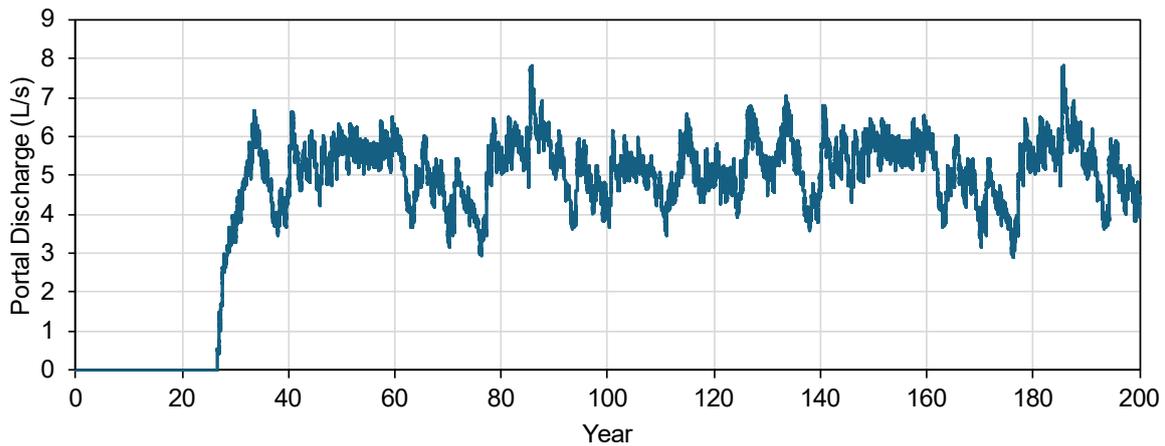


Figure 25: RAS Pit Void model results – underground portal discharge.

Model results for SRX Pit Void are shown in Figure 26 and Figure 27, and suggest:

- The pit void will fill and spill quickly (~ 6 months) owing to the low pit crest elevation and high groundwater inflow rate.
- The variability in overflow rate from the pit lake is higher than other pit voids due to the contribution of runoff from undisturbed areas reporting to the pit. Periodic high outflow rates are predicted, 120 L/s or higher, but average outflow rate is approximately 8 L/s.

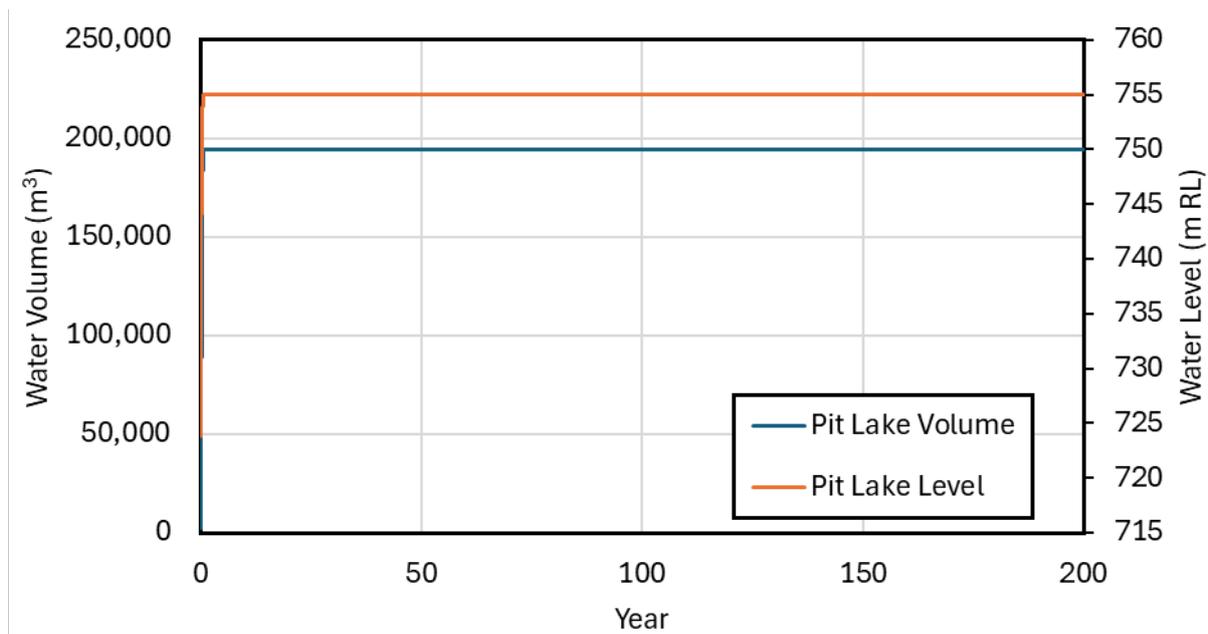


Figure 26: SRX Pit Void model results – water volume and level.

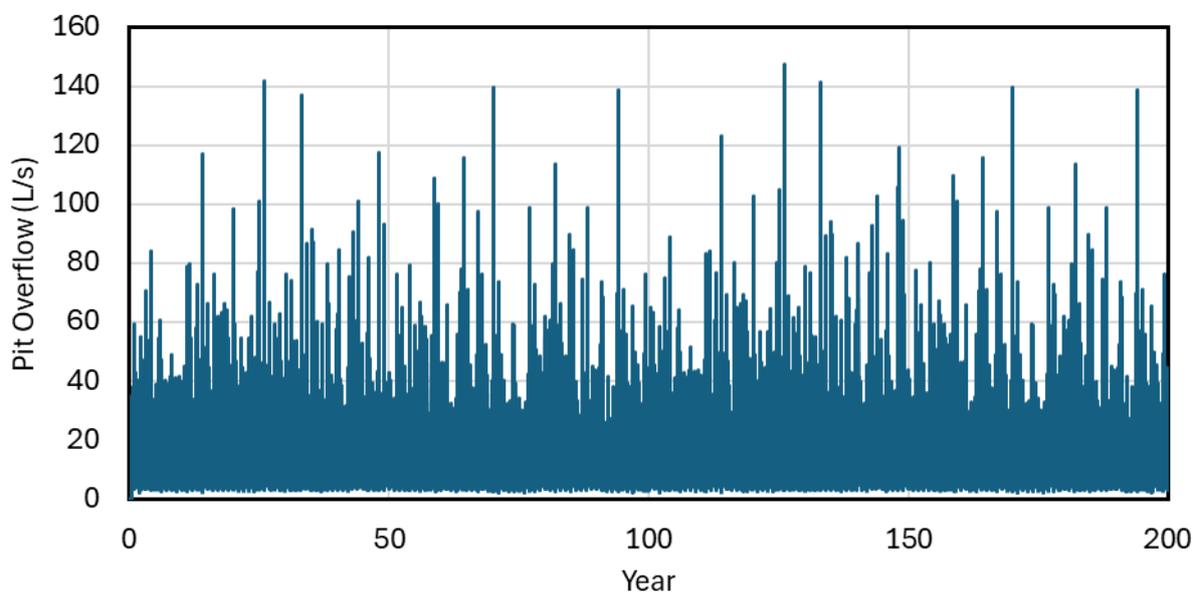


Figure 27: SRX Pit Void model results - overflow rate.

Model results for CIT Pit Void are shown in Figure 28 and Figure 29, and suggest:

- The backfilled pit void will fill and spill at around 3.5 years.
- Outflow rates via groundwater pathways are low <0.1 L/s, with the majority of outflow via spilling at the pit crest at an average of approximately 1.5 L/s.

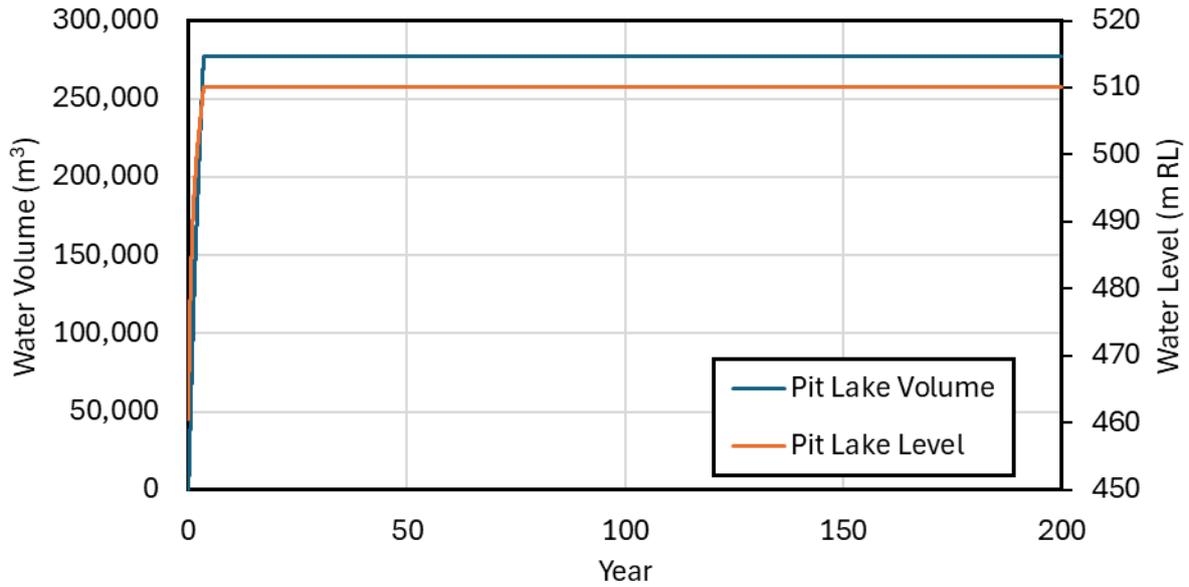


Figure 28: CIT Pit Void model results – water volume and level.

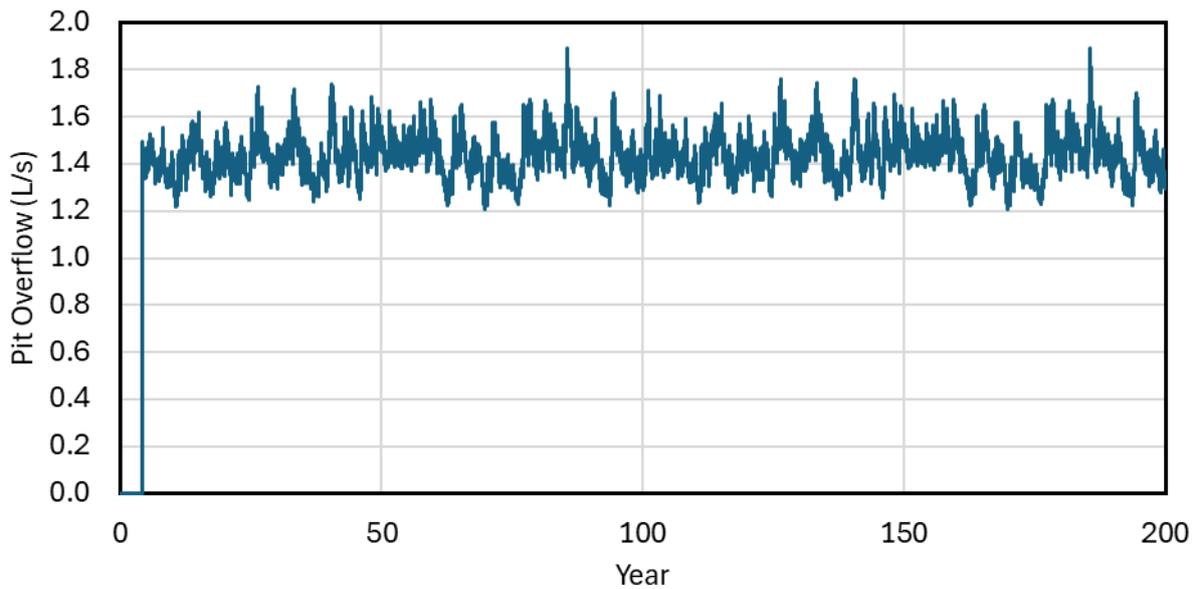


Figure 29: CIT Pit Void model results – outflow rates.

Model results for seepage flow rates from the ELF's and TSF are shown in Figure 30, and suggest:

- Average flow rates for the Shepherds ELF's of approximately 4 L/s, with flow rates typically varying between 2 and 6 L/s. Seepage flow rates from SRX ELF, WELF, and SCK Fill approximately 0.5 L/s or less on average.
- TSF seepage decays through the drain down period in accordance with input described in Section 5.2.5, with average long term seepage flow rates of approximately 2 L/s. Flow rates typically vary between 1 and 3 L/s in the long term.

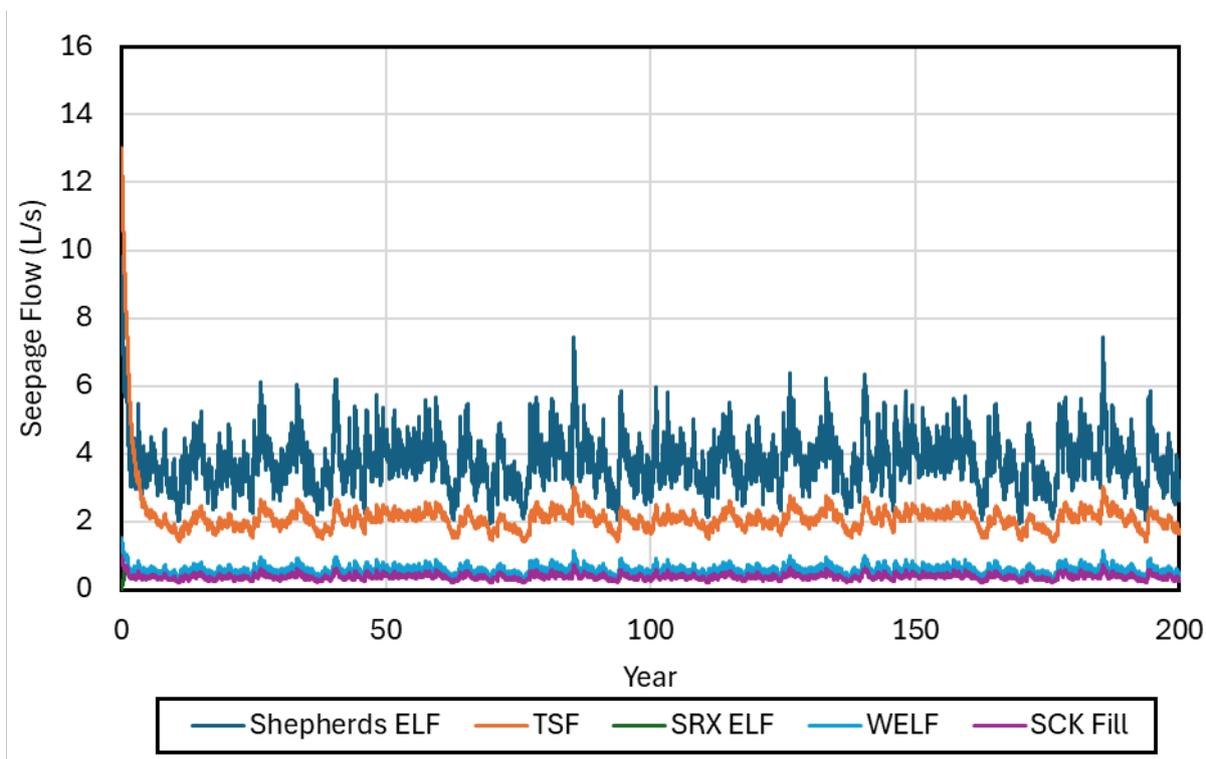


Figure 30: ELF and TSF seepage flow rates.

Note: SRX ELF seepage flow rate is similar to the WELF, so plots behind this trace.

5.5.1.2 Creek Flows

Forecasted changes to the Shepherds Creek flow regime (at SC01) are shown in Figure 31, while Clearwater Creek changes (at RS03) are shown in Figure 32. Summary statistics are presented in Table 20. Forecast baseline conditions, based off the Runoff Model (See Section 5.2.3), are shown for comparison.

Overall model results suggest the project will increase the water flow passing through the compliance points. Average and median flows increase between 50 and 60%, while low flows increase more significantly, ranging between increases of appropriately 280 to 530%. The main cause in flow increase, especially for lower flow conditions, is the increased seepage from ELFs and TSFs. The RAS pit lake storage and outflow dynamics are also a contributing factor, albeit less influential.

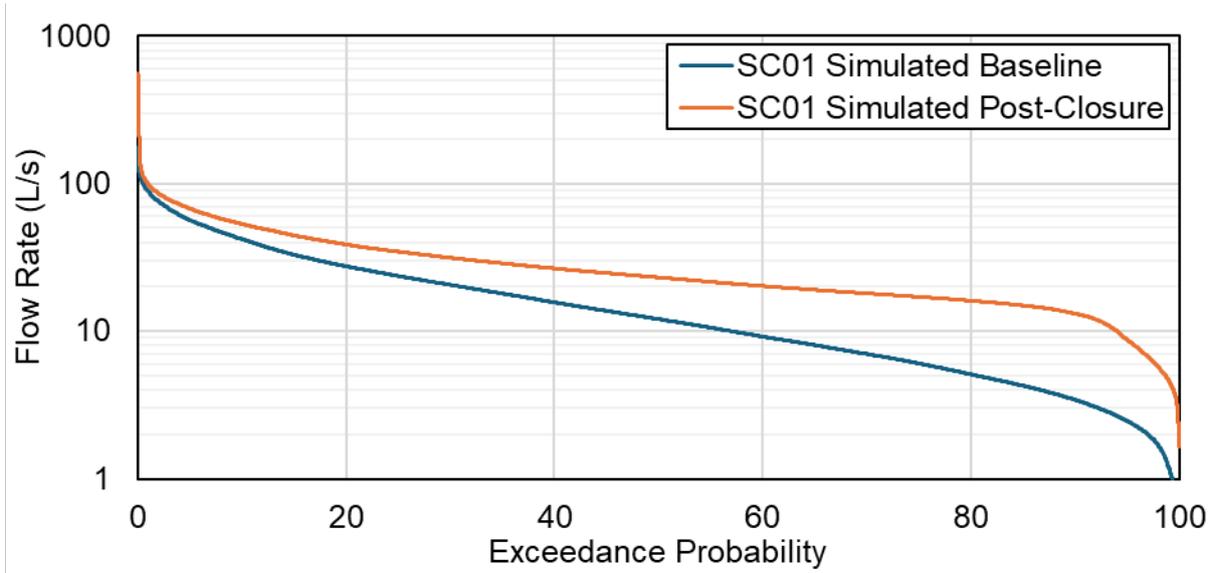


Figure 31: SC01 forecasted flows regime.

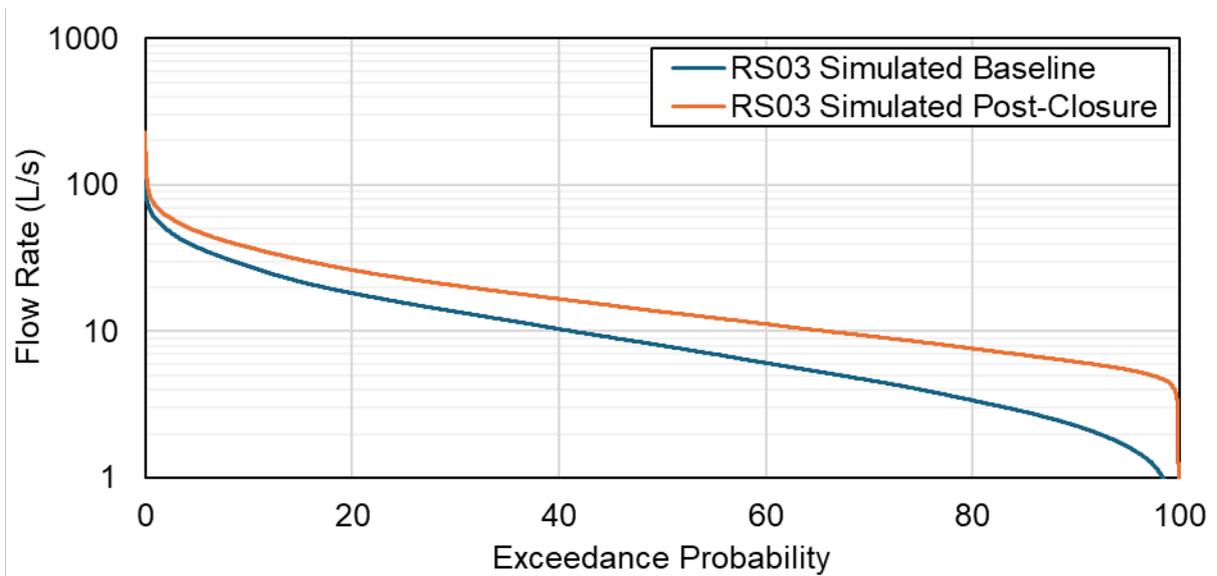


Figure 32: RS03 forecasted flows regime.

Table 22: Forecast creek flow summary statistics.

	PEAK FLOW (L/s)	MEAN FLOW (L/s)	MEDIAN FLOW (L/s)	7D MALF (L/s)	5YR-7D LF (L/s)
SC01 Simulated Baseline	176	18	12	2	1
SC01 Simulated Post-Closure	563	29	23	13	11
Change	387 (+220%)	11 (+59%)	11 (+92%)	11 (+535%)	10 (+787%)
RS03 Simulated Baseline	117	12	8	1	1
RS03 Simulated Post-Closure	229	18	14	5	5
Change	113 (+97%)	6 (+52%)	6 (+70%)	4 (+282%)	4 (+426%)

7D MALF = seven day mean annual low flow.

5YR-7D LF is the lowest weekly average flow that has a reoccurrence interval of 1 in 5 years.

Note flow values are rounded to reflect inferred accuracy.

5.5.2 Load Balance Results

This section discusses the load components of the WLBM.

5.5.2.1 Introduction

This section presents the WLBM results for the load balance:

- Yearly average tabulated results, covering up to 200 years, are provided in Table 21.
- Relevant components of the WLBM are presented including Shepherds Creek (SC01) and Rise and Shine Creek (RS03).
- Results for SC01 and RS03 are screened against recommended surface water and groundwater limits from the proposed compliance water quality standards (Ryder, 2025) as shown in Table 21.

Table 23: Summary of used reference limits for screening.

PARAMETER	SURFACE WATER LIMIT (mg/L)	GW LIMIT (mg/L)	SOURCE SW LIMIT / GW LIMIT
Al	0.08	1	Ryder (2025)
As	0.042	0.01	Ryder (2025)
B	-	2.4	ANZG (2018) 90% Protection
Cyanide (CN)	0.011	0.6	Ryder (2025)
Cd	0.0004 ⁵	0.004	Ryder (2025)
Co	0.001 ^{2,5}	1	SW Chronic; Ryder (2025)
Cr	0.0033 ^{3,5}	0.05	SW Cr(III); Ryder (2025)
Cu	0.0018	0.5	Ryder (2025)
Fe	-	0.3	Ryder (2025)
Mn	-	0.4	Ryder (2025)
Mo	0.034	0.01	Ryder (2025)
NO ₃ -N	2.4	11.3	SW Annual Median Ryder (2025)
Pb	-	0.01	Ryder (2025)
SO ₄	500 ¹	250	Ryder (2025)

PARAMETER	SURFACE WATER LIMIT (mg/L)	GW LIMIT (mg/L)	SOURCE SW LIMIT / GW LIMIT
Sb	0.074 ⁴	0.02	Ryder (2025)
Se	-	0.02	Ryder (2025)
Sr	-	4	Ryder (2025)
U	-	0.03	Ryder (2025)
Zn	0.015 ⁵	1.5	Ryder (2025)

1. No modification has been applied to this limit and a set value of 500 mg/L is used for assessment purposes.
2. Where the lower chronic limit has been applied 0.001 mg/L.
3. Where Cr(III) limits are used as proposed by Ryder (2025) being the lower limit for Cr (i.e., Cr(VI) is 0.006 mg/L).
4. The lower chronic limit (total) has been applied (0.074 mg/L) as a fixed value for annual data.
5. Where hardness modification has not been applied as a conservative approach

5.5.2.2 RAS Pit Lake

RAS Pit Lake receives input from three inflows: groundwater, pit wall runoff, and rainfall. Of these, only groundwater and pit wall runoff contribute significant loads. Rainfall is included in the water balance, but it only provides dilution and contributes minor loads of sulfate and nitrate-N.

The water quality results for selected parameters are show in Figure 33 and Figure 34. Results show that compared to the reference limits, parameters are mostly lower. Parameters that are above at least one of the reference limits are: NO₃-N, Al, Sb, As, Fe, Cu and Mo.

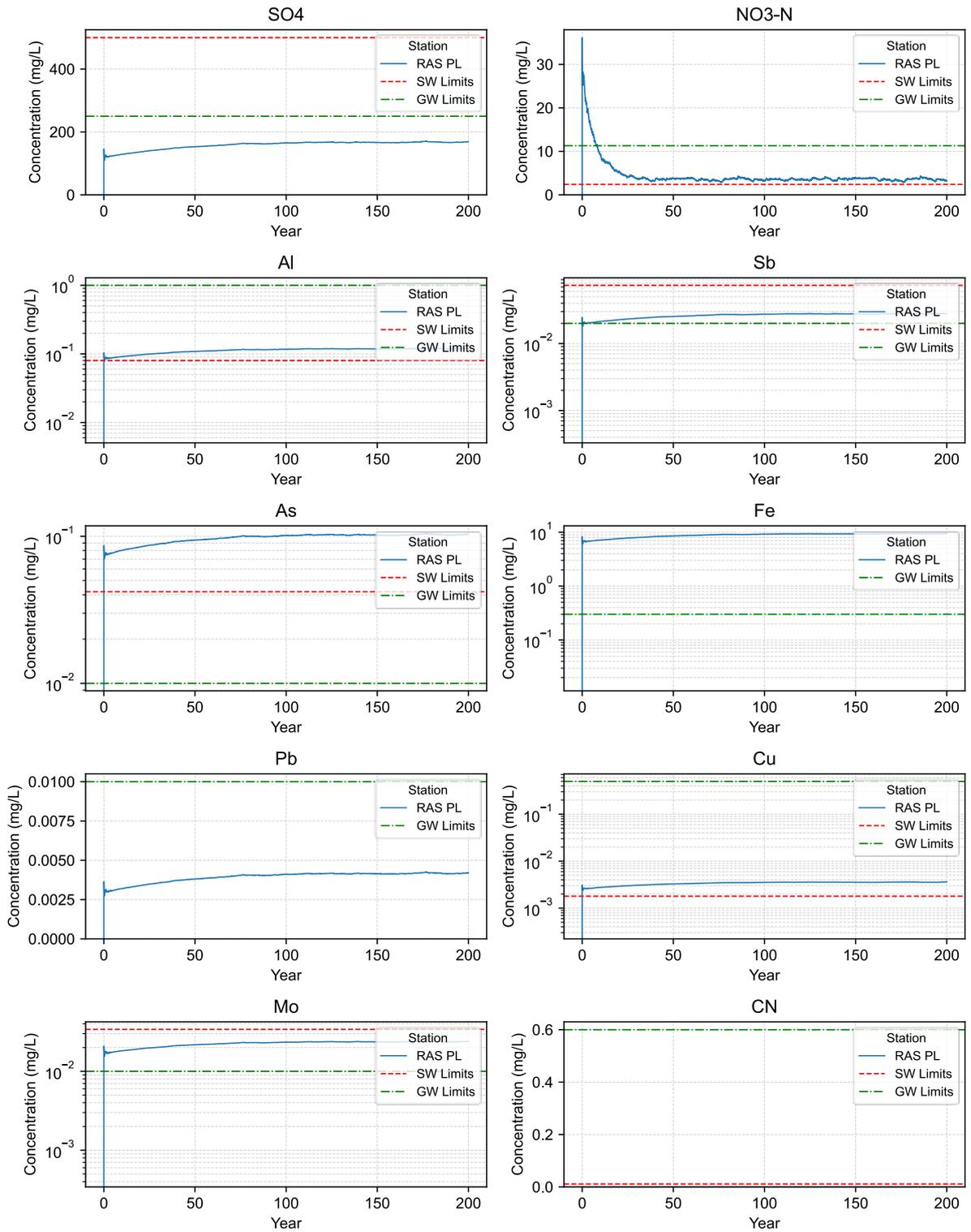


Figure 33. RAS Pit Lake water quality results. Part 1 of 2.

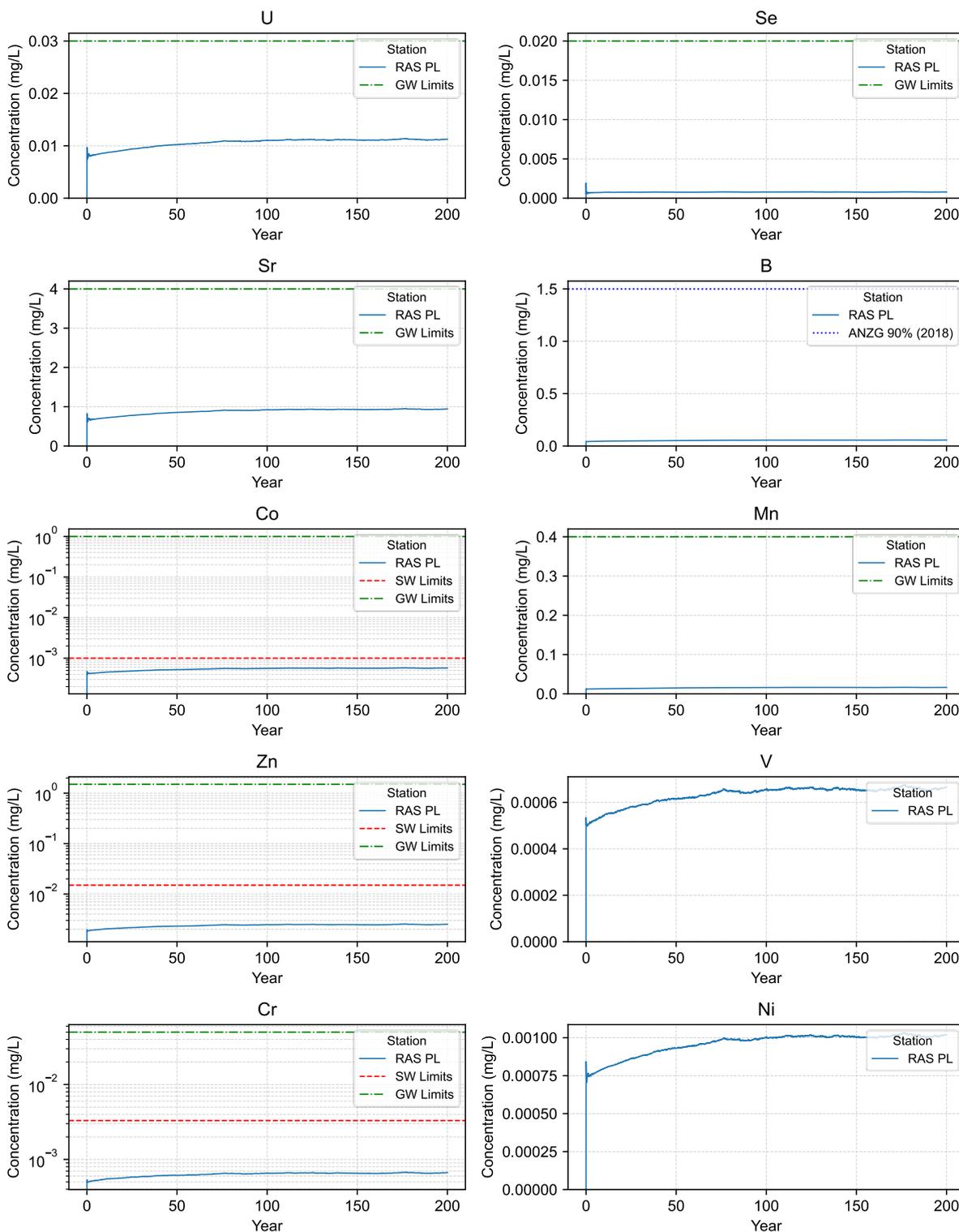


Figure 34. RAS Pit Lake water quality results. Part 2 of 2.

The average inflow loads to the RAS Pit Lake are shown on Table 22. The data show that pit wall runoff is the dominant source of contaminants, responsible for nearly all the assessed parameters.

Groundwater Inflow: Groundwater is the dominant source of Se (89 g/year, 68% of the total Se load). It also contributes significantly to boron (17%), chromium (23%), vanadium (23%), manganese (12%),

and zinc (18%). Whilst its influence is limited, groundwater still accounts for the majority of selenium reaching the lake.

Pit Wall Runoff

Pit wall runoff is the main driver of load for 17 of the 18 parameters assessed, contributing more than 98% of the load for elements such as Al, Fe, Mo, NO₃-N, Pb, Sb, SO₄, Sr, and U. Copper and arsenic are also largely derived from pit wall contributions, exceeding 93%. Nitrate loads are high, associated with blasting residues. There is a 25% yearly decay of nitrogen due to bacterial activity based on empirical evidence (Navarro-Valdivia et al., 2023).

Table 24. Average annual Inflow Loads to RAS Pit Lake.

PARAMETER	GW INFLOW	PIT WALL	RAINFALL	TOTAL
Al (kg/yr)	0.30 (1.5%)	19.3 (98.5%)	0 (0%)	19.6
As (kg/yr)	1.2 (7.0%)	15.8 (93.0%)	0 (0%)	17.0
B (kg/yr)	1.6 (17.4%)	7.8 (82.6%)	0 (0%)	9.4
Co (g/yr)	9.4 (10.0%)	84.8 (90.0%)	0 (0%)	94.2
Cr (g/yr)	24.8 (22.6%)	84.8 (77.4%)	0 (0%)	109.6
Cu (g/yr)	14.9 (2.5%)	576.3 (97.5%)	0 (0%)	591.2
Fe (kg/yr)	0.73 (0.0%)	1,543 (100.0%)	0 (0%)	1,543
Mn (g/yr)	337.2 (12.4%)	2,373 (87.6%)	0 (0%)	2,710
Mo (kg/yr)	0.02 (0.5%)	3.9 (99.5%)	0 (0%)	3.9
NO ₃ -N (kg/yr)	0.25 (0.0%)	6,780 (99.9%)	3.7 (0.1%)	6,784
Pb (g/yr)	9.9 (1.4%)	678.0 (98.6%)	0 (0%)	688.0
Sb (kg/yr)	0.02 (0.4%)	4.6 (99.6%)	0 (0%)	4.6
Se (g/yr)	89.3 (67.8%)	42.4 (32.2%)	0 (0%)	131.6
SO ₄ (kg/yr)	510.8 (1.8%)	27,121 (98.1%)	11.1 (0.0%)	27,643
Sr (kg/yr)	0 (0%)	154.3 (100.0%)	0 (0%)	154.3
U (g/yr)	49.6 (2.7%)	1,797 (97.3%)	0 (0%)	1,846
V (g/yr)	24.8 (22.6%)	84.8 (77.4%)	0 (0%)	109.6
Zn (g/yr)	74.4 (18.0%)	339.0 (82.0%)	0 (0%)	413.4

It is assumed in the WLBM that the RAS Pit Lake water flows to the Shepherds Creek via the underground workings, being an input to the SC01 monitoring point.

5.5.2.3 SRX Pit Lake

SRX Pit Lake receives input from four sources: groundwater inflow, pit wall runoff, SRX ELF seepage, and undisturbed runoff. Rainfall is present in the water balance but is mostly a dilution process, with no significant load.

The water quality results for selected parameters are shown in Figure 35 and Figure 36. Compared to the reference limits, most parameters are below the water quality limits. Parameters that exceed at least one of the reference limits include NO₃-N, As, Co, Sb, Fe, and Mo. Other elements are below the reference limits. Partial passive treatment of the SRX Pit Lake overflow is proposed (8 L/s) to ensure compliance with regards to water quality objectives at RS03.

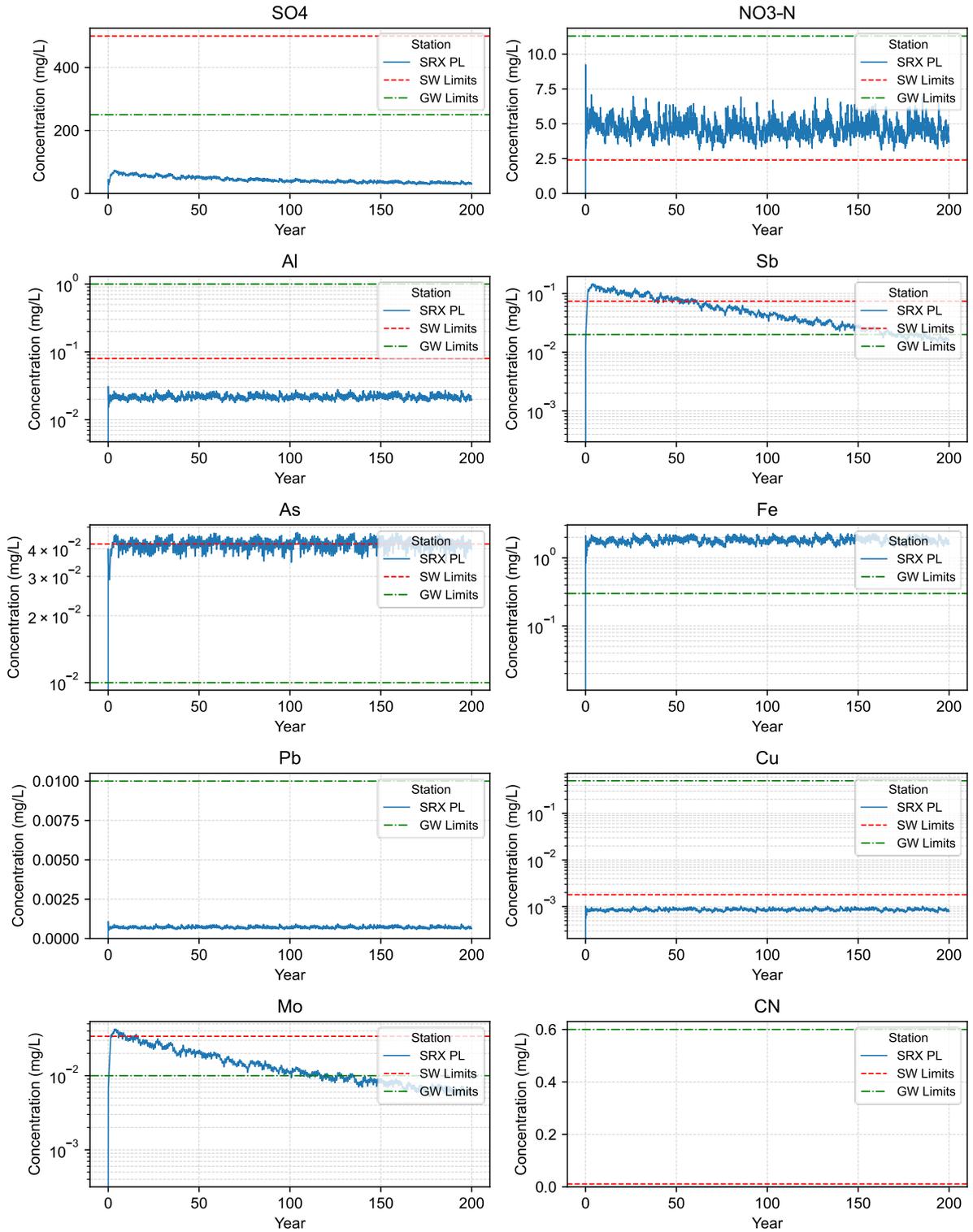


Figure 35. SRX Pit Lake water quality results. Set 1 of 2.

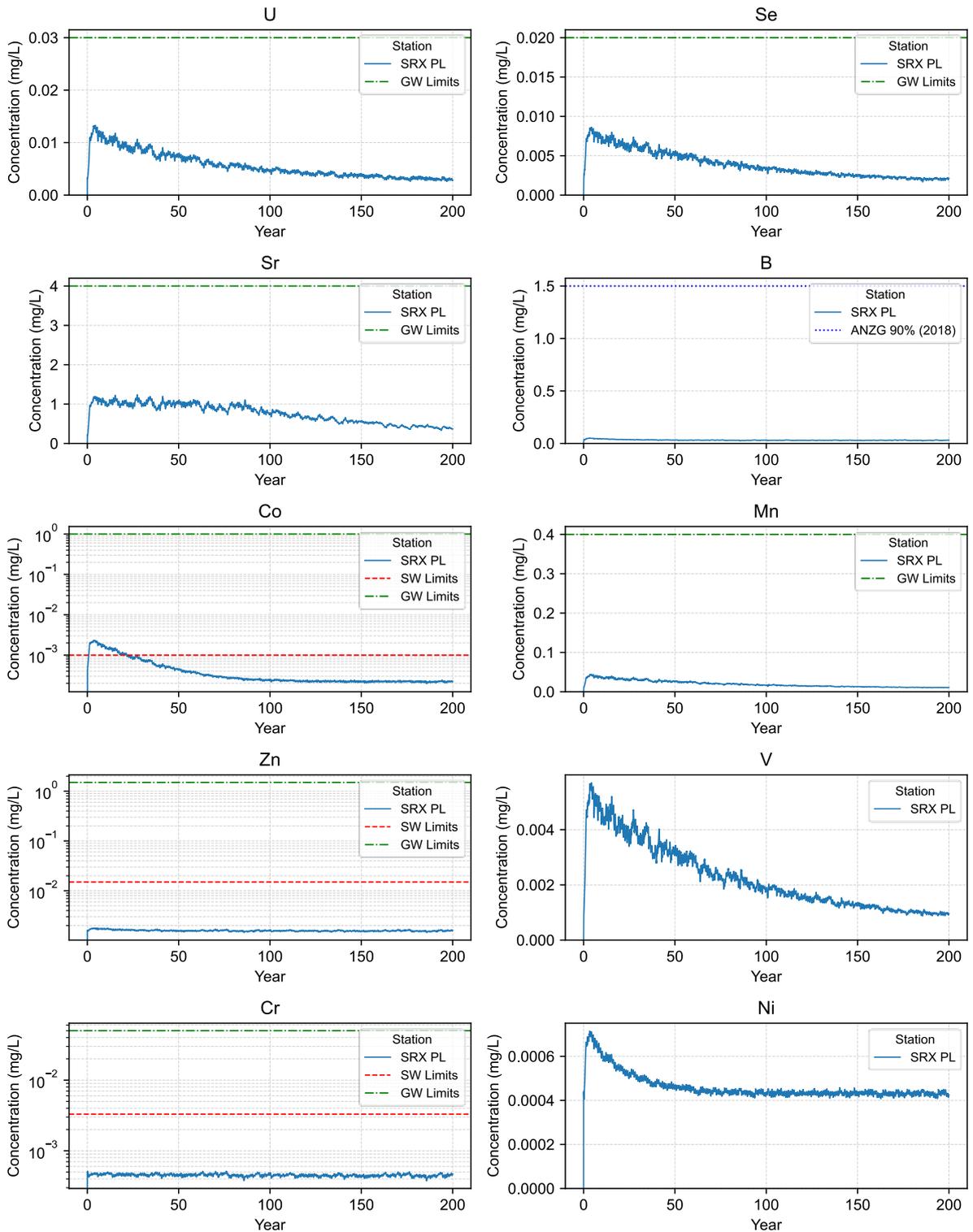


Figure 36. SRX Pit Lake water quality results. Set 2 of 2.

The average inflowing loads for the SRX Pit Lake are shown in Table 23. The data indicate that SRX ELF seepage contributes the greatest load for a wide range of PCOC. Pit wall runoff and groundwater also play key roles, each dominating a smaller group of parameters.

Groundwater Inflow: Groundwater is the primary source for the following parameters:

- Selenium (285 g/year, 84%).

- Boron (5.2 kg/year, 70%).
- Chromium (79 g/year, 71%).
- Vanadium (79 g/year, 63%).
- Zinc (237 g/year, 61%).
- Manganese (,56%).
- Cobalt (30 g/year, 54%).

Pit Wall Runoff: Pit wall runoff is elevated for five parameters:

- Aluminium (4.1 kg/year, 75%).
- Copper (122.4 g/year, 56%).
- Iron (327.6 kg/year, 71%).
- Nitrate-N (1,440 kg/year, 99.8%).
- Lead (144 g/year, 80%).

This reflects the metal mobilisation of the exposed pit walls and nitrate contributions due to blasting residues.

SRX ELF Seepage: SRX ELF seepage is elevated for ten parameters:

- Arsenic (3.3 kg/year, 32%).
- Cobalt (111 g/year, 67%).
- Manganese (6 kg/year, 76%).
- Molybdenum (5.5 kg/year, 86%).
- Sulfate (6,600 kg/year, 47%).
- Antimony (24.5 kg/year, 96%).
- Selenium (1,248 g/year, 79%).
- Strontium (279.2 kg/year, 85%).
- Uranium (1.7 kg/year, 75%).
- Vanadium (868 g/year, 87%).

These results reflect the significant impact of the ELF on the pit lake.

Undisturbed Runoff: Runoff from undisturbed areas contributes modest but non-negligible loads for several parameters such as:

- Cu (47.9 g/year; 22%).
- Zn (82 g/year; 20%).
- Cr (15 g/year; 13%).

- B (640 g/year; 7%).
- Al (400 g/year; 7%).
- Sr (18.2 kg/year; 6%).

For most other elements, the contribution from undisturbed areas remains below 5%, indicating a generally minor role in overall contaminant loads.

Table 25: Average annual inflow loads to SRX Pit Lake.

PARAMETER	GW INFLOW	PIT WALL	RAINFALL	SRX ELF SEEPAGE	UNDISTURBED. RUN-OFF	TOTAL
Al (kg/yr)	0.96 (17.5%)	4.1 (74.4%)	0 (0%)	0.05 (0.9%)	0.40 (7.2%)	5.5
As (kg/yr)	3.8 (36.1%)	3.3 (31.8%)	0 (0%)	3.3 (31.6%)	0.06 (0.5%)	10.5
B (kg/yr)	5.2 (65.1%)	1.7 (20.6%)	0 (0%)	0.52 (6.4%)	0.64 (7.9%)	8
Co (g/yr)	30.1 (27.1%)	18.0 (16.2%)	0 (0%)	55.5 (49.9%)	7.5 (6.8%)	111
Cr (g/yr)	79.1 (69.8%)	18.0 (15.9%)	0 (0%)	1.2 (1.1%)	15.0 (13.2%)	113.3
Cu (g/yr)	47.5 (21.8%)	122.4 (56.2%)	0 (0%)	0 (0%)	47.9 (22.0%)	217.8
Fe (kg/yr)	2.3 (0.5%)	327.6 (71.2%)	0 (0%)	126.3 (27.4%)	3.9 (0.9%)	460.2
Mn (g/yr)	1,076 (21.8%)	504.1 (10.2%)	0 (0%)	2,998 (60.9%)	346.4 (7.0%)	4,924
Mo (kg/yr)	63.3 (1.7%)	828.1 (22.5%)	0 (0%)	2,769 (75.4%)	12.7 (0.3%)	3,673
NO3-N (kg/yr)	0.81 (0.1%)	1,440 (98.1%)	1.2 (0.1%)	26.1 (1.8%)	0.19 (0.0%)	1,468
Pb (g/yr)	31.6 (17.5%)	144.0 (79.7%)	0 (0%)	0.36 (0.2%)	4.6 (2.6%)	180.6
Sb (g/yr)	0.06 (0.5%)	0.97 (7.3%)	0 (0%)	12.2 (92.1%)	0.01 (0.1%)	13.3
Se (g/yr)	284.7 (29.5%)	9.0 (0.9%)	0 (0%)	624.2 (64.7%)	46.2 (4.8%)	964.1
SO4 (kg/yr)	1,629 (14.9%)	5,761 (52.8%)	3.7 (0.0%)	3,350 (30.7%)	161.7 (1.5%)	10,905
Sr (kg/yr)	0 (0%)	32.8 (17.2%)	0 (0%)	139.6 (73.3%)	18.2 (9.5%)	190.5
U (g/yr)	158.2 (11.2%)	381.6 (27.1%)	0 (0%)	849.9 (60.4%)	17.3 (1.2%)	1,407
V (g/yr)	79.1 (14.1%)	18.0 (3.2%)	0 (0%)	434.3 (77.5%)	28.9 (5.2%)	560.2
Zn (g/yr)	237.3 (59.9%)	72.0 (18.2%)	0 (0%)	5.0 (1.3%)	82.0 (20.7%)	396.3

5.5.2.4 CIT Backfill

The CIT Backfill Pit Void functions as a backfilled pit that temporarily stores water like a high-permeability reservoir and eventually overflows. It receives inflows from groundwater and CIT Backfill seepage, which together account for all PCOC loads. Rainfall is not part of the load balance as there is no direct precipitation to a pit lake surface, as it enters the system through the backfill material, as seepage.

The water quality results for selected parameters are shown in Figure 37 and Figure 38. Compared to the reference limits, most parameters are below the thresholds. Parameters that exceed the reference limits include Sb, As, Fe, Mo, U, Se, and Co. Other elements are below the reference limits.

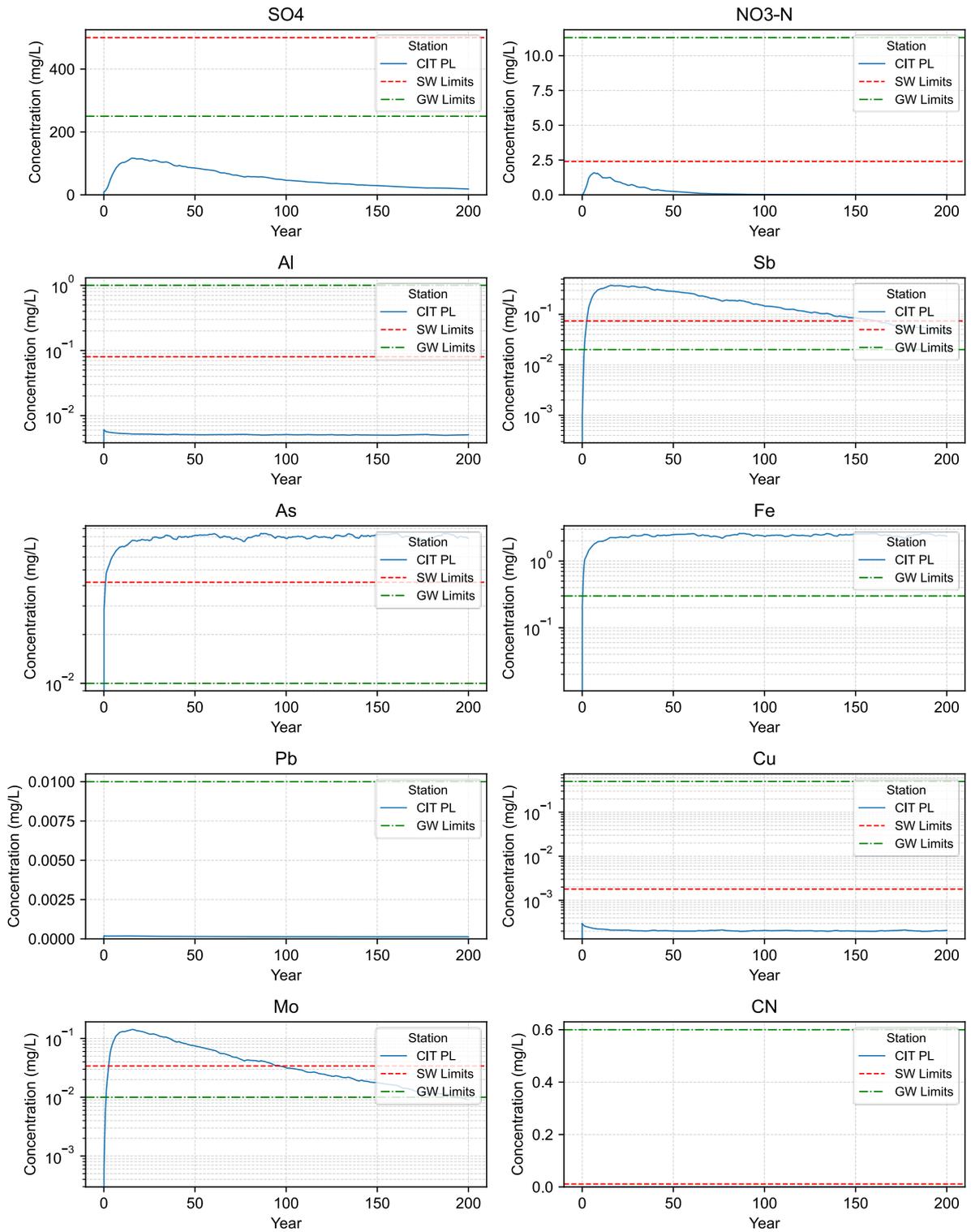


Figure 37. CIT Backfilled Void water quality results. Part 1 of 2.

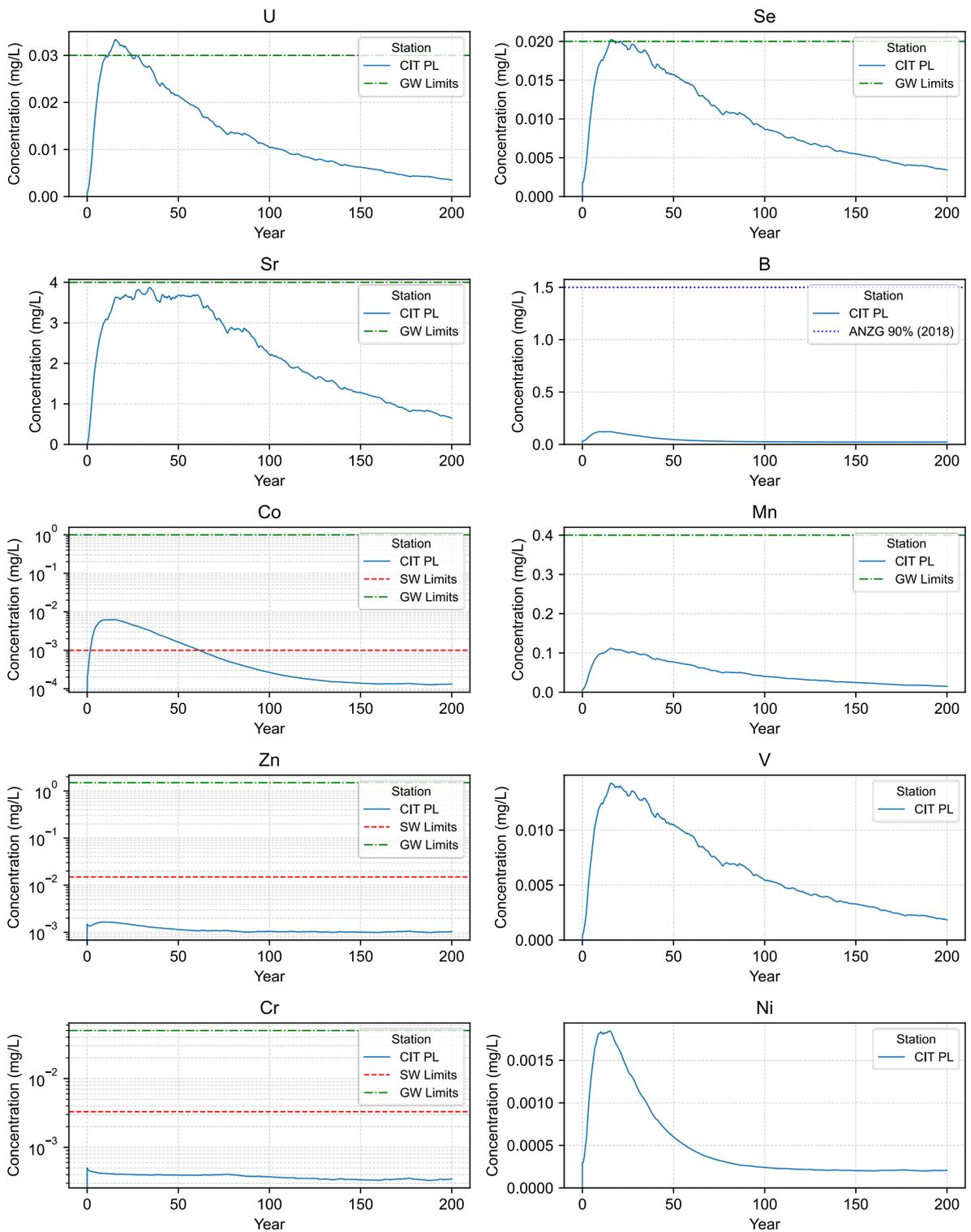


Figure 38. CIT Backfilled Void water quality results. Part 2 of 2.

The average inflowing loads for the CIT Backfill are shown on Table 24.

Groundwater Inflow: Groundwater is the primary contributor for five parameters:

- Cu – 9.6 g/year (100%).

- Pb – 6.4 g/year (91%).
- Cr – 16 g/year (86%).
- Zn – 48 g/year (84%).
- Al – 195 g/year (69%).

CIT Backfill Seepage: Seepage from the CIT Backfill dominates the load for the other 13 parameters as shown on Table 24. This pattern reflects significant mobilisation from within the backfill, due to oxidation of reactive materials and short-term solute release.

Table 26: Average annual inflow Loads to CIT Backfilled Void.

PARAMETER	CIT BACKFILL SEEPAGE	GW INFLOW	TOTAL
Al (g/yr)	43.6 (18.2%)	195.3 (81.8%)	238.9
As (kg/yr)	2.9 (79.3%)	0.77 (20.7%)	3.7
B (g/yr)	785.9 (42.6%)	1,060 (57.4%)	1846.0
Co (g/yr)	49.3 (89.0%)	6.1 (11.0%)	55.4
Cr (g/yr)	1.3 (7.5%)	16.0 (92.5%)	17.3
Cu (g/yr)	0 (0%)	9.6 (100%)	9.6
Fe (kg/yr)	111.9 (99.6%)	0.47 (0.4%)	112.4
Mn (kg/yr)	2.0 (90.4%)	0.22 (9.6%)	2.3
Mo (kg/yr)	2.2 (99.4%)	0.01 (0.6%)	2.2
NO3-N (kg/yr)	26.8 (99.4%)	0.16 (0.6%)	26.9
Pb (g/yr)	0.32 (4.7%)	6.4 (95.3%)	6.7
Sb (kg/yr)	8.0 (99.8%)	0.01 (0.2%)	8.0
Se (g/yr)	403.8 (87.5%)	57.6 (12.5%)	461.5
SO4 (kg/yr)	2,200 (87.0%)	329.8 (13.0%)	2,529
Sr (kg/yr)	103.8 (100.0%)	0 (0%)	103.8
U (g/yr)	586.9 (94.8%)	32.0 (5.2%)	618.9
V (g/yr)	283.7 (94.7%)	16.0 (5.3%)	299.7
Zn (g/yr)	4.4 (8.5%)	48.0 (91.5%)	52.5

5.5.2.5 Shepherds Creek (SC01)

SC01 is the proposed compliance monitoring location at the outlet of the Shepherds Creek catchment, which integrates flows from multiple sources, including the TSF, RAS Pit Lake, Shepherds ELF, CIT Backfill Pit Lake, WELF, SCK Fill, and several runoff areas. This location represents the combined load of all upstream activities within the catchment and reflects the cumulative impact of seepage and surface pathways.

During the Active Closure Phase, it is assumed all mine impacted waters are treated by the WTP (Process Flow, 2025; MWM, 2025d) and that active treatment continues until passive treatment system can be installed and achieve compliance with the proposed water quality closure criteria. The post-closure model intentionally excludes the active WTP to evaluate whether closure criteria can be met without it, and to determine for how long active treatment would be required if implemented.

A passive treatment system is included in the WLBM using removal efficiencies detailed on the *Water Treatment Study* (MWM, 2025d). Both untreated and treated cases are presented in the figures below

to represent the impact of the passive treatment on mine-impacted waters and demonstrate the time period required for active treatment. The PCOC treatment efficiencies are shown in Table 25.

Table 27: Removal efficiencies for the passive treatment system.

PARAMETER	REMOVAL EFFICIENCIES (%)
Arsenic	99
Calcium ¹	-43.2
Magnesium	8
Aluminium	83.3
Iron	99.1
Nickel	97.9
Zinc	99.8
Manganese	86.4
Cadmium	85.2
Cobalt	98.4
Copper	85.6
Uranium	74
Vanadium	90
Sulfate	30
Cyanide	90
Nitrogen (Amm-N and NO ₃ -N)	99
Other metals	98

A negative value means Ca increases following treatment.

Source: MWM (2025d).

The mine-impacted waters that are treated by the passive treatment system at SC01 include six components: TSF seepage, Shepherds ELF seepage, groundwater flow from the RAS Pit Lake (via the underground workings), overflow from the CIT Backfill, WELF seepage, and seepage from the SCK Fill.

Some sources are not considered to be captured by the treatment system and may contribute additional load downstream of the treatment system but aren't considered to be significant contributors to loads. These include the portion of CIT Backfill outflow that reaches SC01 via groundwater, as well as runoff from the CIT Backfill, Shepherds ELF, TSF, and SCK Fill.

The water quality results for selected parameters are shown in Figure 39 and Figure 40 for untreated and treated simulations. Compared to the surface water and groundwater quality limits, most parameters are below the thresholds. Parameters that exceed at least one of the water quality limits at SC01 include:

- Untreated: SO₄, NO₃-N, Sb, As, Co, Fe, Mo, CN, Se, and Sr.
- After passive treatment: SO₄, Sb, and Mo.

Hence, active treatment is required for CN, SO₄, Sb, and Mo if no other water management option is applied. CN is expected to naturally (not included in the model) so performance monitoring should monitor the decay of CN. Active treatment would still be required for SO₄ up to year 35, Sb up to year 20, and Mo up to year 50.

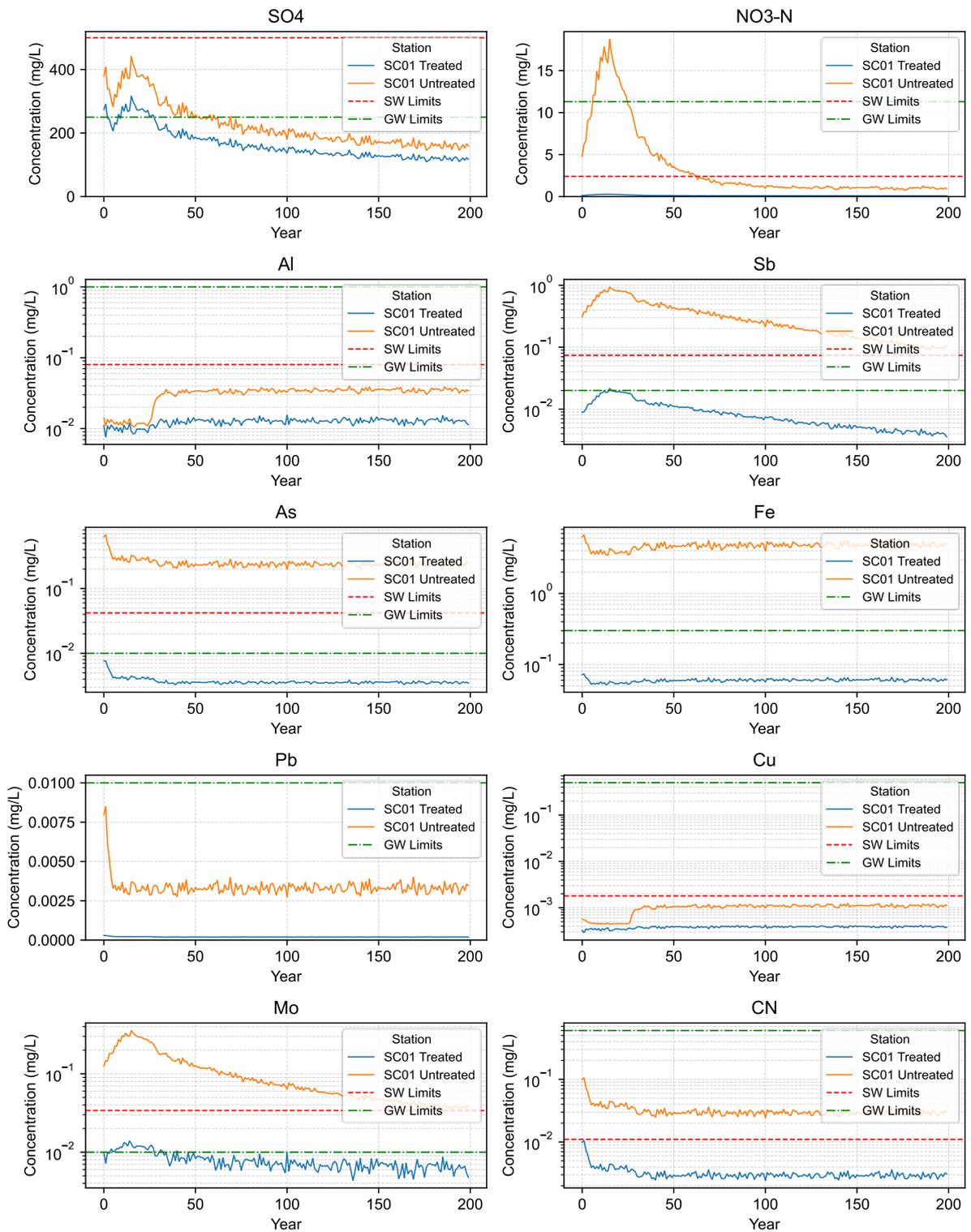


Figure 39. Yearly average water quality results at Shepherds Creek (SC01) treated and untreated scenarios. Part 1 of 2.

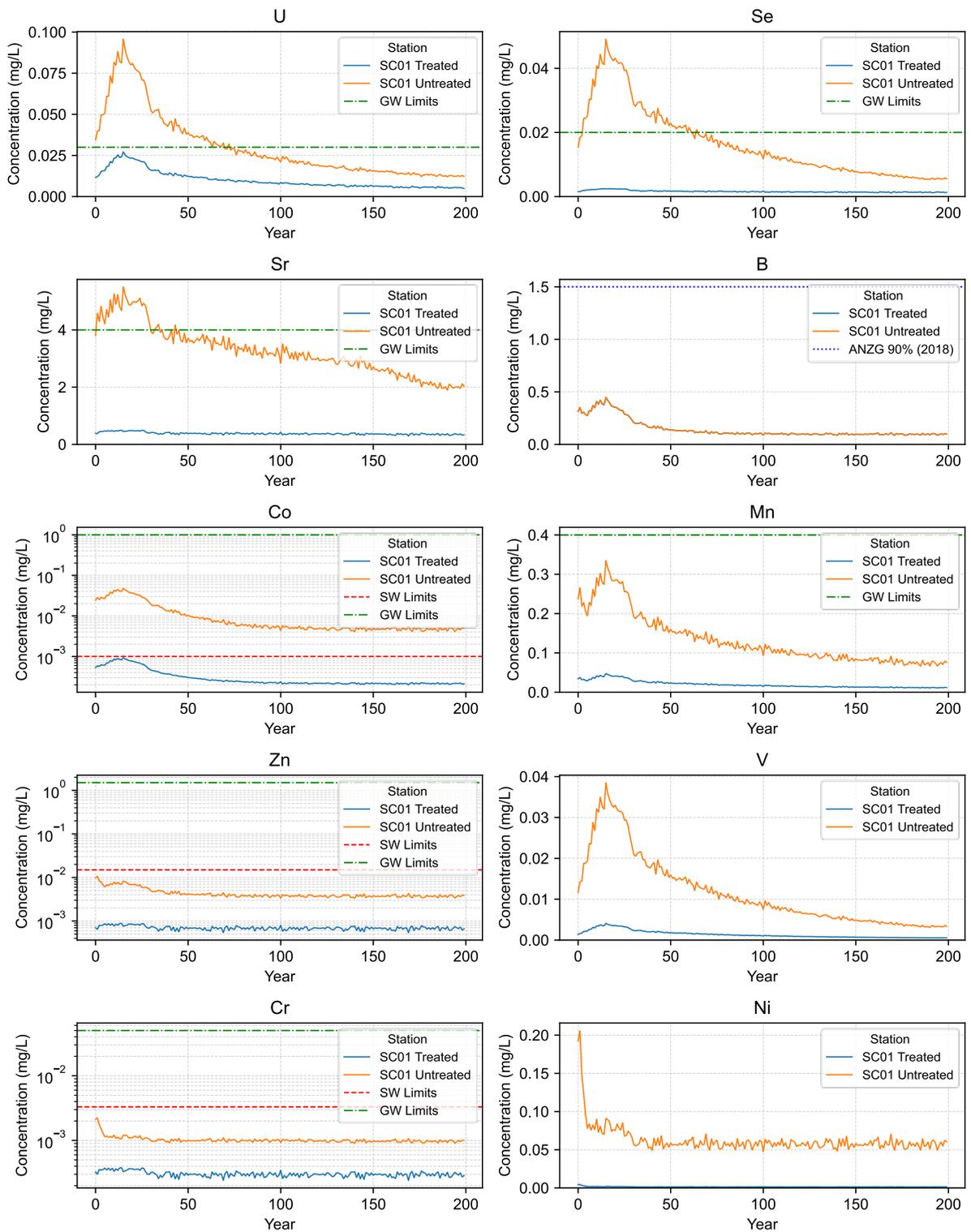


Figure 40. Yearly average water quality results at Shepherds Creek (SC01) treated and untreated scenarios. Part 2 of 2.

The load balance for the untreated SC01 shows that TSF Seepage and Shepherds ELF Seepage are the primary contributors for most parameters, with some notable influence from RAS Pit Lake outflow and other sources. The load profile reflects the cumulative water quality impacts of seepage, runoff, and groundwater pathways from multiple facilities.

TSF Seepage: TSF seepage is the dominant source for 9 parameters:

- CN (23.6 kg/year, 100%).
- As (138.9 kg/year, 73.7%).
- Pb (1,862 g/year, 71.6%).
- Zn (1,999 g/year, 57.1%).
- B (55.7 kg/year, 50%).
- Cr (429.6 g/year, 48.4%).
- Co (3,580 g/year, 48.3%).
- SO₄ (64,438 kg/year, 33.3%).
- Fe (1,037 kg/year, 29.0%).

Shepherds ELF Seepage: Shepherds ELF seepage has 8 parameters that are elevated:

- V (6,232 kg/year, 73.9%).
- Sb (165.2 kg/year, 72.2%).
- Se (8.5 kg/year, 68.0%).
- NO₃-N (1,525 kg/year, 64.7%).
- Mo (45.8 kg/year, 57.1%).
- Sr (1,387 kg/year, 53.8%).
- U (13.3 kg/year, 52.9%).
- Co (3,343 g/year, 45.1%).
- Mn (42.7 kg/year, 43.4%).

These two inflows collectively account for the majority of loading for nearly all parameters at SC01. In many cases, both sources contribute significantly to the same element. For example:

- Co is split between TSF seepage (3.58 kg/year, 48.3%) and Shepherds ELF seepage (3.34 kg/year, 45.1%).
- Fe receives notable contributions from both TSF seepage (1,037 kg/year, 29%) and Shepherds ELF seepage (905.5 kg/year, 25.3%).

RAS Pit Lake Groundwater Outflow: RAS Pit Lake outflow is the main contributor for two parameters:

- Al (16.2 kg/year, 48.7%).
- Cu (488.9 g/year, 53.8%).

The individual components that contribute to the overall load (t/yr) at SC01 are presented in Figure 41 and Figure 42. Results indicate that the key loads are derived from the TSF and Shepherds ELF.

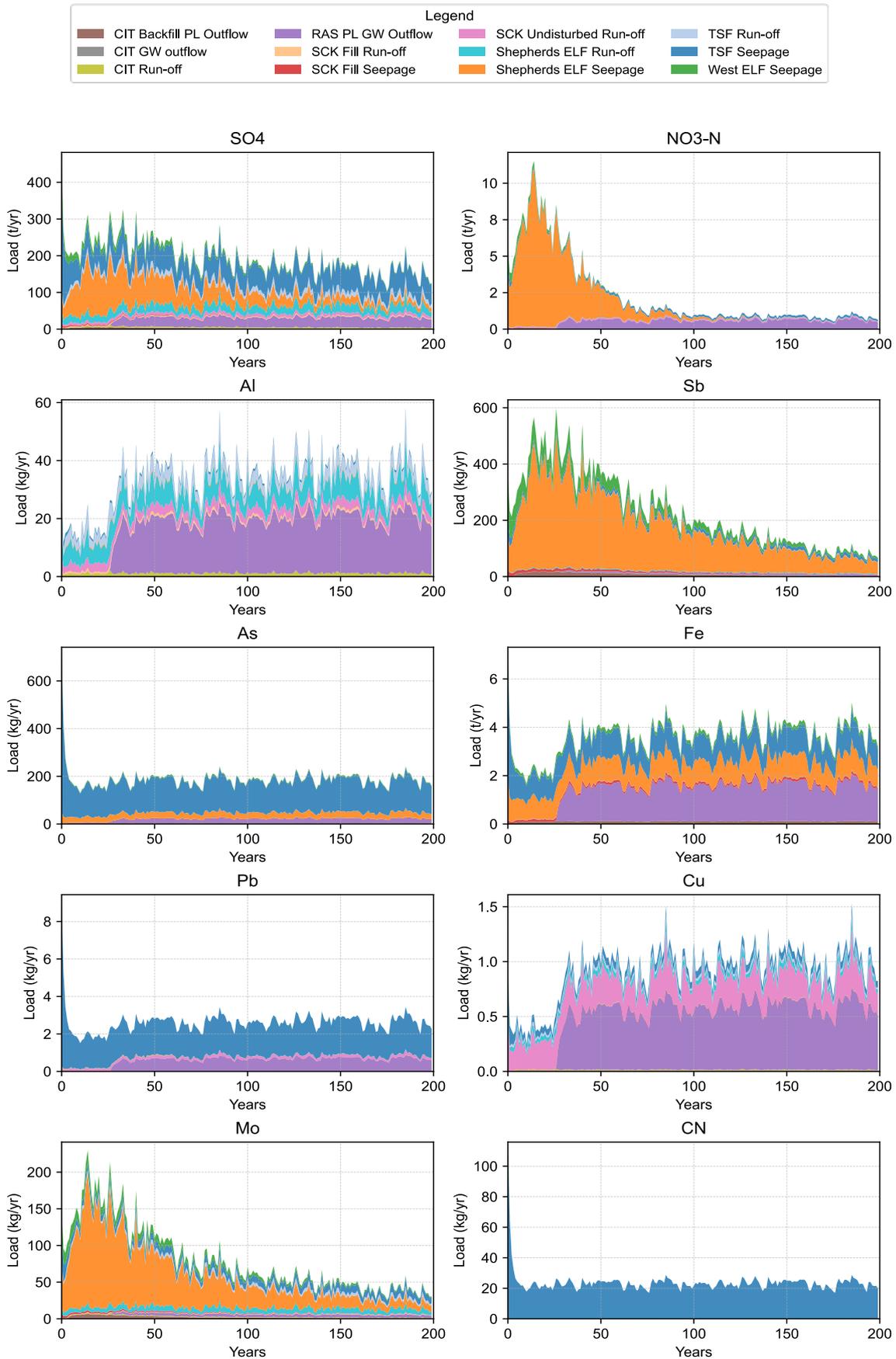


Figure 41. Stacked yearly average inflow load contributions to SC01 for selected parameters (Set 1 of 2).

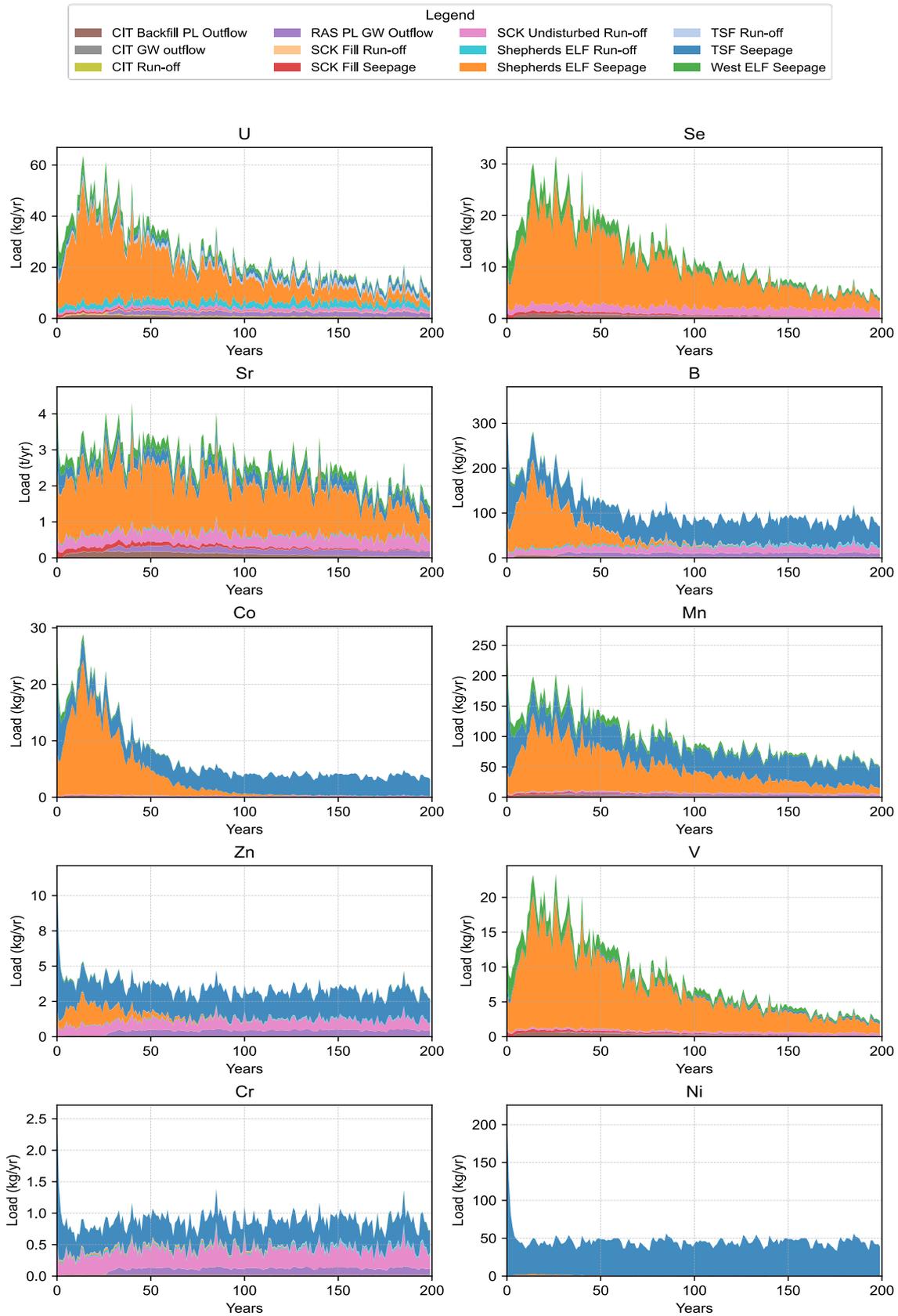


Figure 42. Stacked yearly average inflow load contributions to SC01 for selected parameters (Set 2 of 2).

5.5.2.6 Rise and Shine Creek (RS03)

RS03 receives inflows from multiple sources, including natural run-off catchments (upper and lower), undisturbed areas (CC Creek), and the SRX Pit Lake Overflow (which includes the SRX ELF) and the SRX ELF run-off. Among these, SRX Pit Lake overflow is the dominant contributor for a wide range of parameters, indicating a substantial impact on downstream water quality.

The water quality results for selected parameters are shown in Figure 43 and Figure 44 for untreated and treated simulations. All PCOC are low and below the water quality limits except for As, Fe, and NO₃. Partial passive treatment of SRX Pit Lake overflow (8 L/s) reduces concentrations to below surface water and groundwater limits.

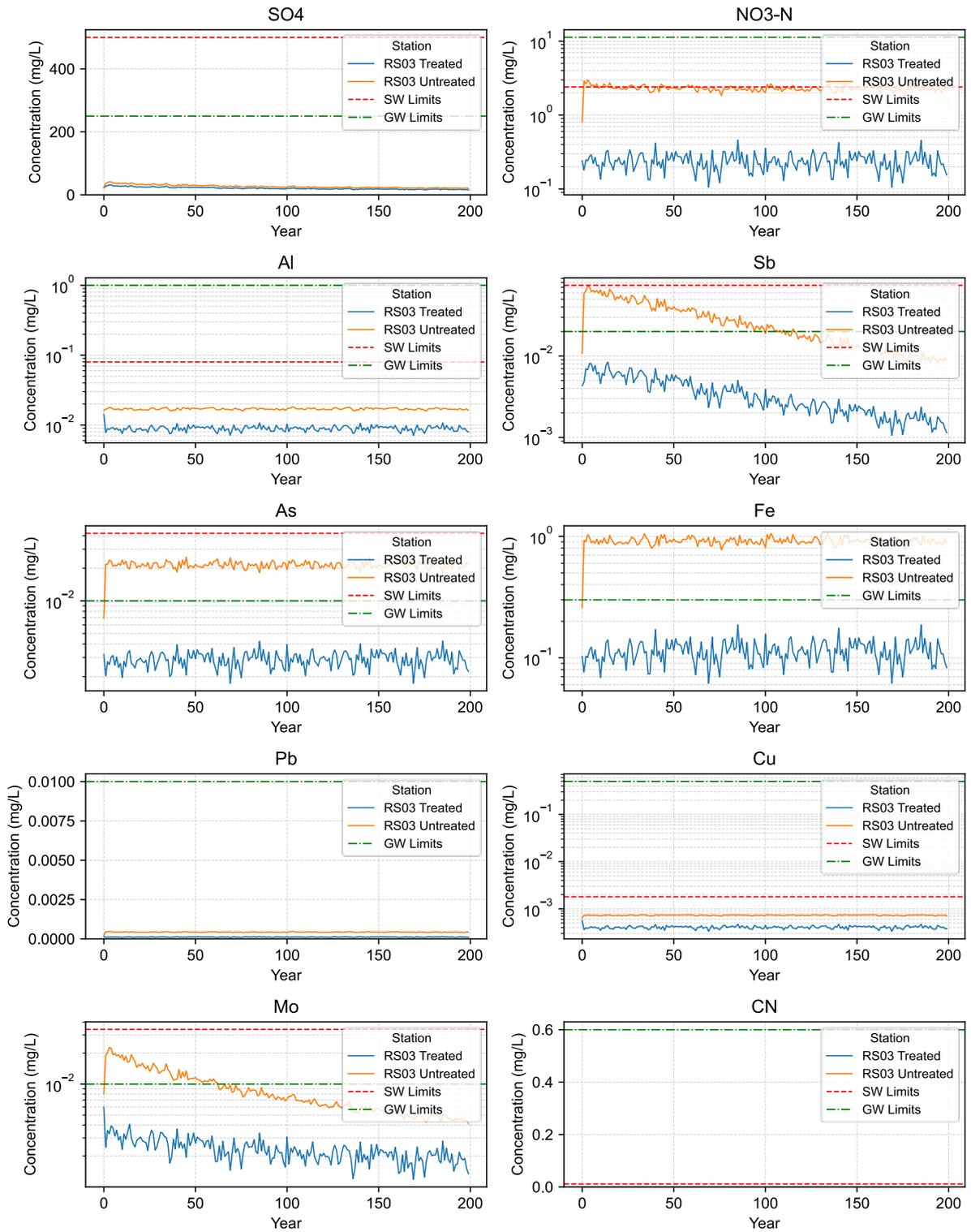


Figure 43. Yearly average water quality results at Rise and Shine Creek (RS03). Part 1 of 2.

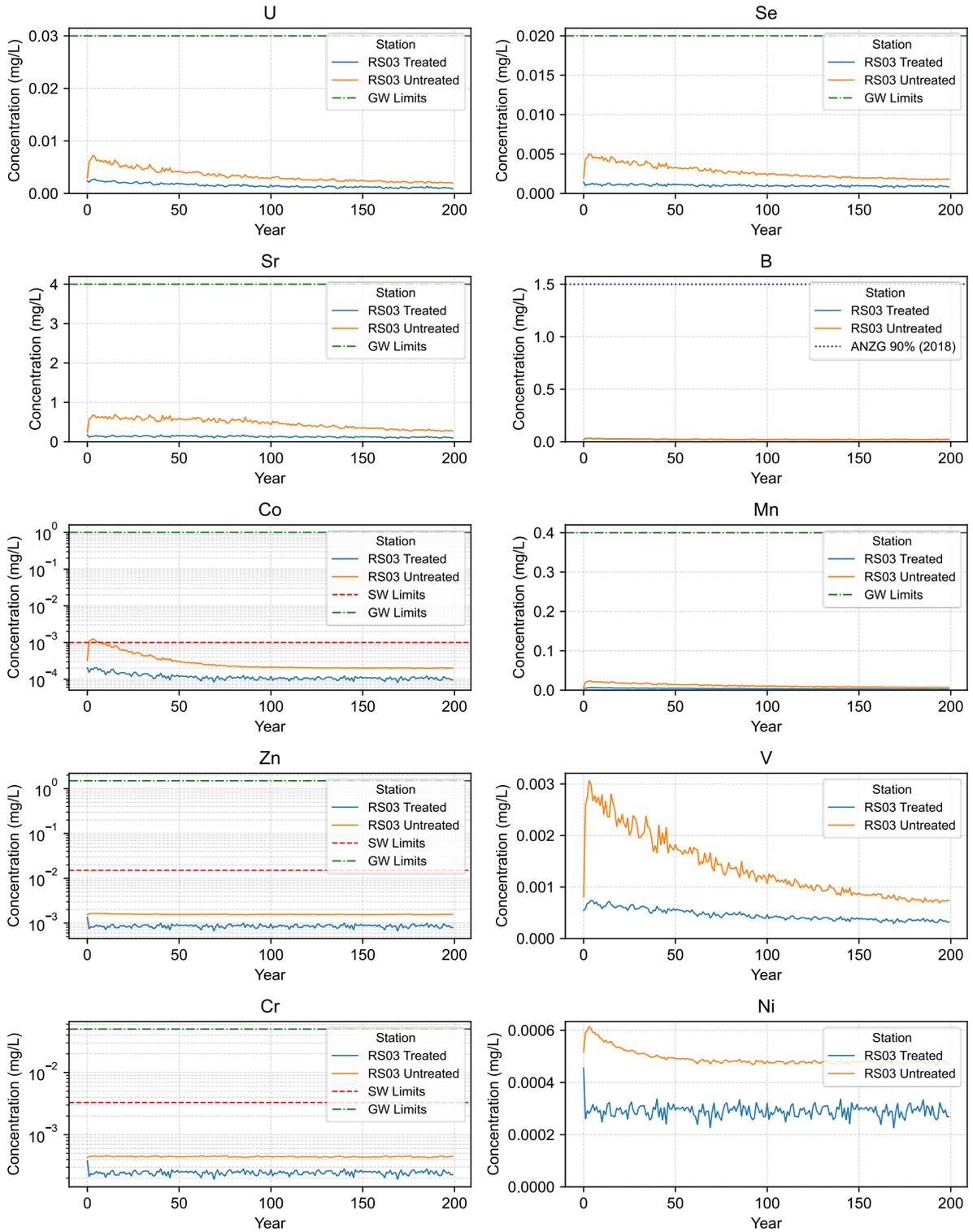


Figure 44. Yearly average water quality results at Rise and Shine Creek (RS03). Part 2 of 2.

Primary Contributor to Water Quality at RS03: SRX Pit Lake Overflow

This inflow is the main source of loading for 18 parameters, and it has to be noted that the pit lake receives water inflows from the SRX ELF (seepage and runoff), highlighting its critical role in the downstream chemistry. Notable contributions include:

- As: 10.5 kg/year (93.8%).

- Fe: 457.2 kg/year (96.4%).
- NO₃-N: 1,184 kg/year (99.4%).
- Sb: 13.3 kg/year (94.5%).
- Mn: 4.9 kg/year (79.3%).
- SO₄: 10,855 kg/year (61%).
- Sr: 190.2 kg/year (75.2%).
- U: 1,404 g/year (64.4%).
- V: 560 g/year (76.9%).

It also supplies the highest loads for several other metals, such as Cu (217 g/year, 50.8%), Zn (395 g/year, 43.4%), and Al (5.5 kg/year, 51.1%), though in these cases, other inflows also contribute significantly.

Some parameters receive important secondary contributions from other sources, even though SRX Pit Lake Overflow remains dominant. These include:

- Boron (B): 8 kg/year (58.8%) from SRX Pit Lake, with 2.9 kg/year (21.6%) from the Clearwater Creek (C. Creek); 1.6 kg/year (11.4%) from Undisturbed Upper Runoff.
- Cr: 112.9 g/year (43.7%) from SRX Pit Lake, but 94 g/year (36.4%) from C. Creek.
- Zn: 495 g/year (43.4%) from SRX Pit Lake, with relevant contributions from Undisturbed Upper: 201 g/year (22%) and C. Creek: 271 (29.7%).

Whilst the pit lake dominates total mass loading, natural catchments and undisturbed areas also play a relevant role for some trace metals, especially for Cr and Zn.

Table 28: Average annual inflow loads to RS03.

PARAMETER	SRX ELF RUNOFF	SRX PIT LAKE OVERFLOW	C. CREEK UNDIST.	UNDIST. RUNOFF UPPER	UNDIST. RUNOFF LOWER	WELF RUNOFF	TOTAL
Al (kg/yr)	1.0 (9.3%)	5.5 (51.1%)	2.1 (19.3%)	0.97 (9.1%)	0.10 (0.9%)	1.1 (10.3%)	10.7
As (kg/yr)	0.13 (1.2%)	10.5 (93.8%)	0.17 (1.5%)	0.14 (1.3%)	0.11 (1.0%)	0.14 (1.3%)	11.2
B (kg/yr)	0.41 (3.0%)	8.0 (58.8%)	2.9 (21.6%)	1.6 (11.4%)	0.25 (1.8%)	0.45 (3.3%)	13.6
Co (g/yr)	3.2 (1.8%)	110.8 (63.5%)	35.3 (20.2%)	18.4 (10.6%)	3.3 (1.9%)	3.5 (2.0%)	174.6
Cr (g/yr)	3.2 (1.2%)	112.9 (43.7%)	94.2 (36.4%)	36.9 (14.3%)	7.7 (3.0%)	3.5 (1.4%)	258.5
Cu (g/yr)	6.5 (1.5%)	216.5 (50.8%)	72.3 (17.0%)	117.7 (27.6%)	6.0 (1.4%)	7.1 (1.7%)	426.1
Fe (kg/yr)	0.90 (0.2%)	457.2 (96.4%)	4.9 (1.0%)	9.6 (2.0%)	0.49 (0.1%)	0.99 (0.2%)	474.2
Mn (g/yr)	0.07 (1.2%)	4.9 (79.3%)	0.15 (2.4%)	0.85 (13.7%)	0.12 (2.0%)	0.08 (1.3%)	6.2
Mo (g/yr)	949.2 (16.5%)	3,668 (63.8%)	55.5 (1.0%)	31.2 (0.5%)	4.3 (0.1%)	1,044 (18.1%)	5,752
NO ₃ -N (kg/yr)	2.6 (0.2%)	1,184 (99.4%)	1.6 (0.1%)	0.47 (0.0%)	0.11 (0.0%)	2.8 (0.2%)	1,191

PARAMETER	SRX ELF RUNOFF	SRX PIT LAKE OVERFLOW	C. CREEK UNDIST.	UNDIST. RUNOFF UPPER	UNDIST. RUNOFF LOWER	WELF RUNOFF	TOTAL
Pb (g/yr)	1.2 (0.5%)	179.4 (76.8%)	37.0 (15.8%)	11.3 (4.9%)	3.3 (1.4%)	1.3 (0.6%)	233.5
Sb (g/yr)	0.32 (2.3%)	13.3 (94.5%)	0.07 (0.5%)	0.02 (0.2%)	0.01 (0.0%)	0.35 (2.5%)	14.1
Se (g/yr)	1.6 (0.1%)	963.5 (65.0%)	370.1 (25.0%)	113.4 (7.6%)	32.6 (2.2%)	1.8 (0.1%)	1,483
SO4 (kg/yr)	3,035 (17.1%)	10,855 (61.0%)	141.8 (0.8%)	397.0 (2.2%)	20.5 (0.1%)	3,337 (18.8%)	17,786
Sr (kg/yr)	4.3 (1.7%)	190.2 (75.2%)	7.1 (2.8%)	44.7 (17.7%)	1.8 (0.7%)	4.8 (1.9%)	252.8
U (g/yr)	342.2 (15.7%)	1,404 (64.4%)	15.1 (0.7%)	42.5 (1.9%)	1.6 (0.1%)	376.3 (17.2%)	2,182
V (g/yr)	3.2 (0.4%)	560.0 (76.9%)	84.1 (11.5%)	70.9 (9.7%)	6.5 (0.9%)	3.5 (0.5%)	728.4
Zn (g/yr)	6.5 (0.7%)	394.8 (43.4%)	270.9 (29.7%)	201.3 (22.1%)	29.9 (3.3%)	7.1 (0.8%)	910.5

The individual components that contribute to the overall load (t/yr) at RS03 are presented in Figure 45 and Figure 46. Load derived from the SRX Pit Lake is the dominant source of PCOC.

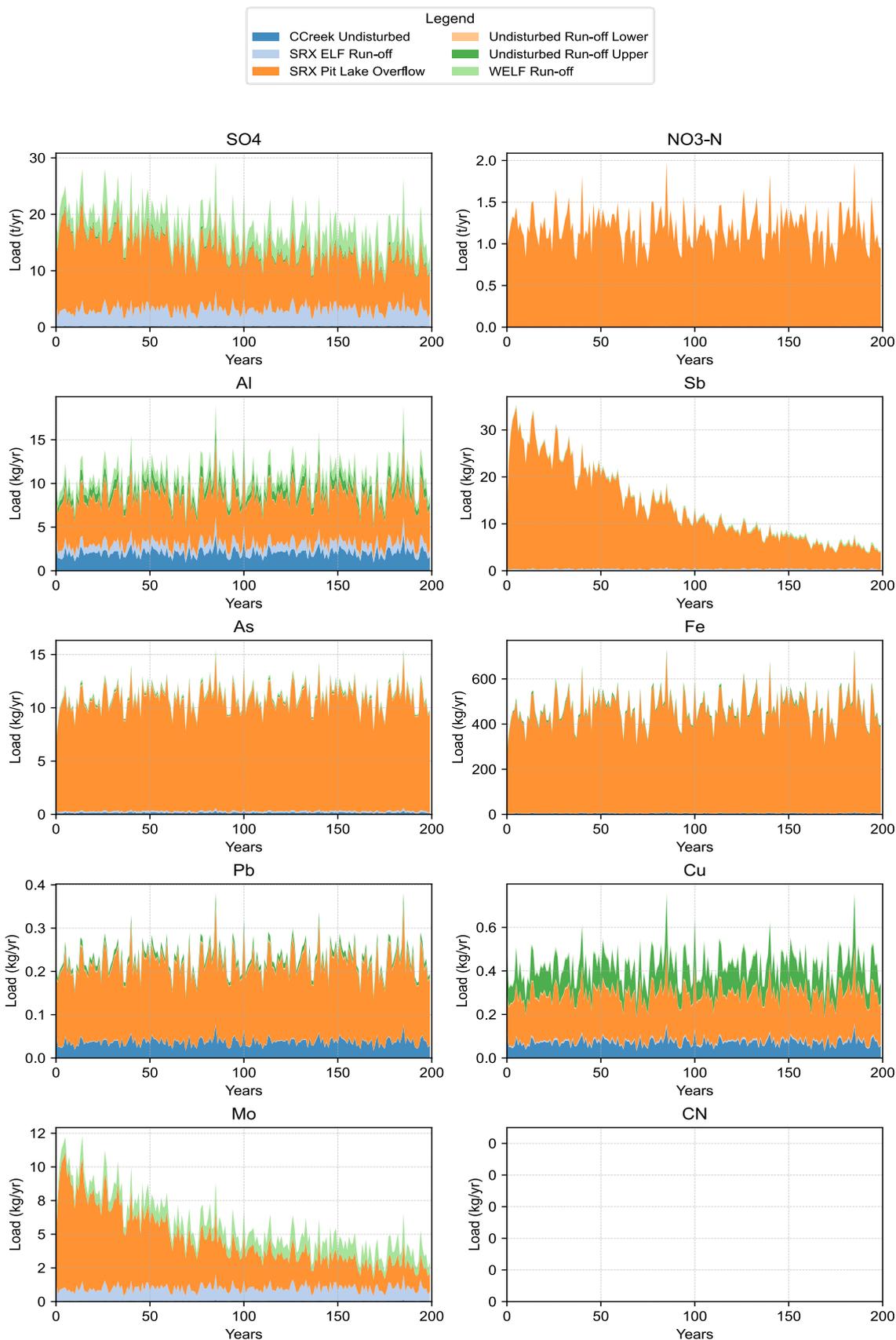


Figure 45. Stacked yearly average inflow load contributions to RS03 for selected parameters (Set 1 of 2).

No Cyanide (CN) is used in this catchment, so the CN load is zero.

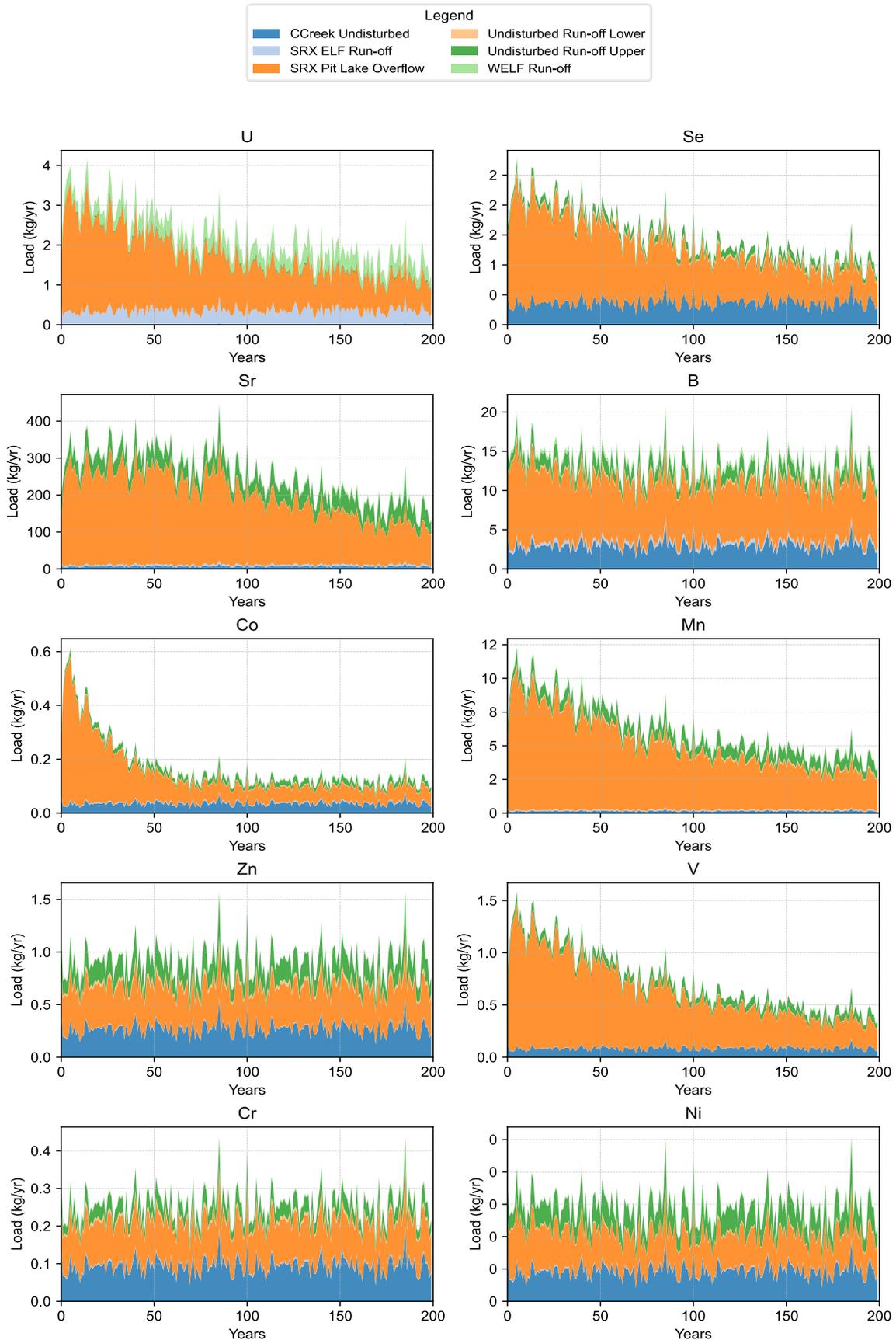


Figure 46. Stacked yearly average inflow load contributions to SC01 for selected parameters (Set 2 of 2).

5.5.2.7 Assessment SC01: Surface Water Quality Compliance

Using yearly average concentrations at SC01 (both untreated and treated), a summary table (Table 27) was prepared to compare the effect of passive treatment against the water quality reference limits.

The following observations can be made:

- Always below the limit: Al, Cr, Cu, Mn, SO₄, and Zn remained consistently below the limits both before and after treatment.
- Improved to below the limit after passive treatment: Co, CN, Sb, As, Mo, NO₃-N, and SO₄, shifted from exceeding the surface water (SW) limits in untreated conditions to being below the limit after treatment.

Table 29. Yearly average water quality (SC01) before and after passive treatment against the SW reference limits.

ELEMENT	STATUS	% ¹ YEARS GREATER THAN THE SW LIMIT	
		BEFORE	AFTER
Co	Improved	100	0
CN	Improved	100	0
Sb	Improved	100	0
As	Improved	100	0
Mo	Improved	100	0
NO ₃ -N	Improved	31.5	0
SO ₄	Always Below the Limit	0	0
Al	Always Below the Limit	0	0
Cu	Always Below the Limit	0	0
Mn	Always Below the Limit	0	0
Zn	Always Below the Limit	0	0
Cr	Always Below the Limit	0	0

1. Percent is calculated on the total 200 year of the model.

Elements not assessed are Ni, Fe, Pb, U, Se, Sr, B, and V, as no surface water limits are defined.

5.5.2.8 Assessment SC01: Groundwater Quality Compliance

The water quality results at SC01 before and after passive treatment were screened against the groundwater quality limits (Table 28). Results indicated:

- Always below the limit: Al, Mn, Pb, Cu, B, Co, Zn, Cr, and CN.
- Improved elements to below the GW limit are: As, Fe, U, Sr, Se, NO₃-N.
- Persistent elements that, whilst improved, still remain above the groundwater (GW) limit for a number of years: SO₄, Mo, and Sb.

Table 30: Comparison of yearly averages for SC01 before and after passive treatment against the GW Limits. Percent is calculated on the total 200 years of the model.

ELEMENT	STATUS	% ¹ YEARS GREATER THAN THE GW LIMIT	
		BEFORE	AFTER
Mo	Persistent	100	13.5
SO4	Persistent	27	10.5
Sb	Persistent	100	1
As	Improved	100	0
Fe	Improved	100	0
U	Improved	35.5	0
Se	Improved	30	0
Sr	Improved	17	0
NO3-N	Improved	9.5	0
Mn	Always Below the Limit	0	0
Al	Always Below the Limit	0	0
Pb	Always Below the Limit	0	0
Cu	Always Below the Limit	0	0
CN	Always Below the Limit	0	0
B	Always Below the Limit	0	0
Co	Always Below the Limit	0	0
Zn	Always Below the Limit	0	0
Cr	Always Below the Limit	0	0

1. Percent is calculated on the total 200 year of the model.

5.5.2.9 Assessment RS03: Surface Water and Groundwater Quality Compliance

For RS03, a comparison against both GW and SW limits is provided in Table 30 and Table 30. The results indicate that there are no exceedances after passive treatment.

Table 31: Comparison of yearly averages for RS03 before and after passive treatment against the SW Limits. Percent is calculated on the total 200 years of the model.

ELEMENT	STATUS	% ¹ YEARS GREATER THAN THE SW LIMIT	
		BEFORE	AFTER
NO3-N	Improved	15	0
Sb	Always Below the Limit	0	0
Co	Always Below the Limit	0	0
Mo	Always Below the Limit	0	0
SO4	Always Below the Limit	0	0
Al	Always Below the Limit	0	0
As	Always Below the Limit	0	0
Cu	Always Below the Limit	0	0
CN	Always Below the Limit	0	0
Zn	Always Below the Limit	0	0
Cr	Always Below the Limit	0	0

1. Percent is calculated on the total 200 year of the model.

Table 32: Comparison of yearly averages for RS03 before and after passive treatment against the GW Limits. Percent is calculated on the total 200 years of the model.

ELEMENT	STATUS	% ¹ YEARS GREATER THAN THE GW LIMIT	
		BEFORE	AFTER
As	Improved	99.5	0
Fe	Improved	99.5	0
Sb	Improved	54.5	0
Mo	Improved	31	0
SO ₄	Always Below the Limit	0	0
NO ₃ -N	Always Below the Limit	0	0
Al	Always Below the Limit	0	0
Pb	Always Below the Limit	0	0
Cu	Always Below the Limit	0	0
CN	Always Below the Limit	0	0
U	Always Below the Limit	0	0
Se	Always Below the Limit	0	0
Sr	Always Below the Limit	0	0
B	Always Below the Limit	0	0
Co	Always Below the Limit	0	0
Mn	Always Below the Limit	0	0
Zn	Always Below the Limit	0	0
Cr	Always Below the Limit	0	0

1. Percent is calculated on the total 200 year of the model.

5.5.2.10 Water Quality Compliance Summary: SC01 and RS03

A summary table of model exceedances (as a percent of years over the 200 years of the model) for SC01 after treatment and RS03 is shown in Table 31.

Table 33: Summary table of exceedances screened against reference surface water (SW) and groundwater (GW) limits for SC01 and RS03.

PARAMETER	SC01 - TREATED		RS03 - TREATED	
	SW Limits	GW Limits	SW Limits	GW Limits
As	-	-	-	-
U	-	-	-	-
Co	-	-	-	-
SO ₄	-	10.5%	-	-
Mo	-	13.5%	-	-
Sb	-	1%	-	-
Fe	-	-	-	-
NO ₃ -N	-	-	-	-
Cu	-	-	-	-
CN	-	-	-	-

The following observations and findings summarise key water quality outcomes at monitoring points SC01 and RS03. They focus on the duration and extent of exceedances relative to groundwater and surface water limits.

Water quality findings at SC01:

- Groundwater limits are exceeded even after passive treatment for SO₄ (to Year 35), Mo (to Year 50), and Sb (to Year 20). For surface waters, all parameters are predicted to remain below the limits after passive treatment.
- Exceedances are linked to peak concentrations from Shepherds ELF seepage.

Water quality findings at RS03:

- All PCOC are predicted to be below the groundwater and surface water quality limits after partial passive treatment of the SRX Pit Lake overflow (8 L/s).

5.6 Scenario Modelling – Water Management Opportunities

Scenario modelling was undertaken to understand management opportunities.

5.6.1 Model Background

A PCOC load analysis for SC01 indicates that the dominant sources are the TSF seepage and Shepherds ELF seepage. It was noted that:

- Model analysis associated with minor inflows have negligible influence on SC01 water quality outcomes.
- Net percolation rates have a strong effect on the duration of active treatment using the WTP.

To evaluate water management options for the Shepherds ELF and TSF an additional scenario was modelled and compared to the base case model (NP20) presented in previous sections. This is an alternative management scenario in which the TSF and ELF seepage is redirected into the RAS Pit Lake to promote dilution and a generate a time lag before discharge, decreasing peak concentrations.

5.6.2 Model Results

Parameters that were above the groundwater limit for the NP20 base case scenario are shown in Figure 47 where it can be observed that Mo surpasses the GW limit in some years. Other results are presented in Figure 48 and Figure 49. Groundwater limits are used at SC01 to confirm that compliance can be achieved without dilution within the downgradient aquifer.

Diverting Shepherds ELF and TSF seepage to RAS Pit Lake results in lower peak concentrations at SC01. This is attributed to the pit lake providing dilution and a temporal load sink. A portion of the contaminant mass is retained within the pit, effectively delaying release and smoothing concentration peaks. By decreasing the peak concentrations, some of exceedances are avoided for SO₄, Mo, and Sb, although Mo still remains elevated over the yearly time steps.

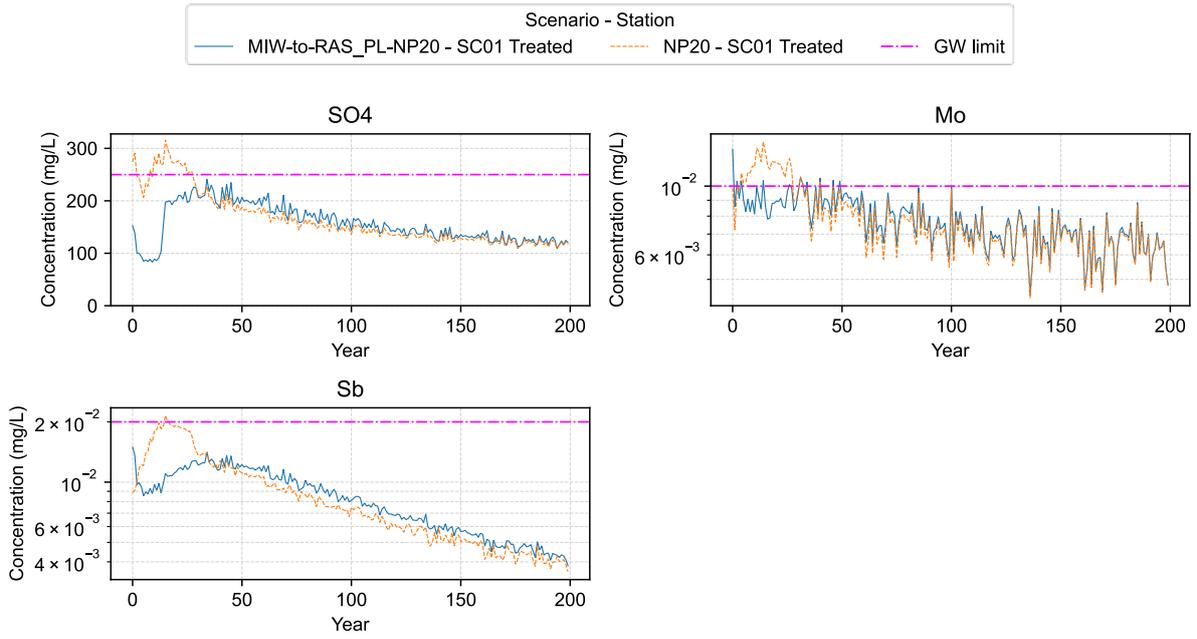


Figure 47. Scenarios results for parameters above the GW Limit for the base case scenario.

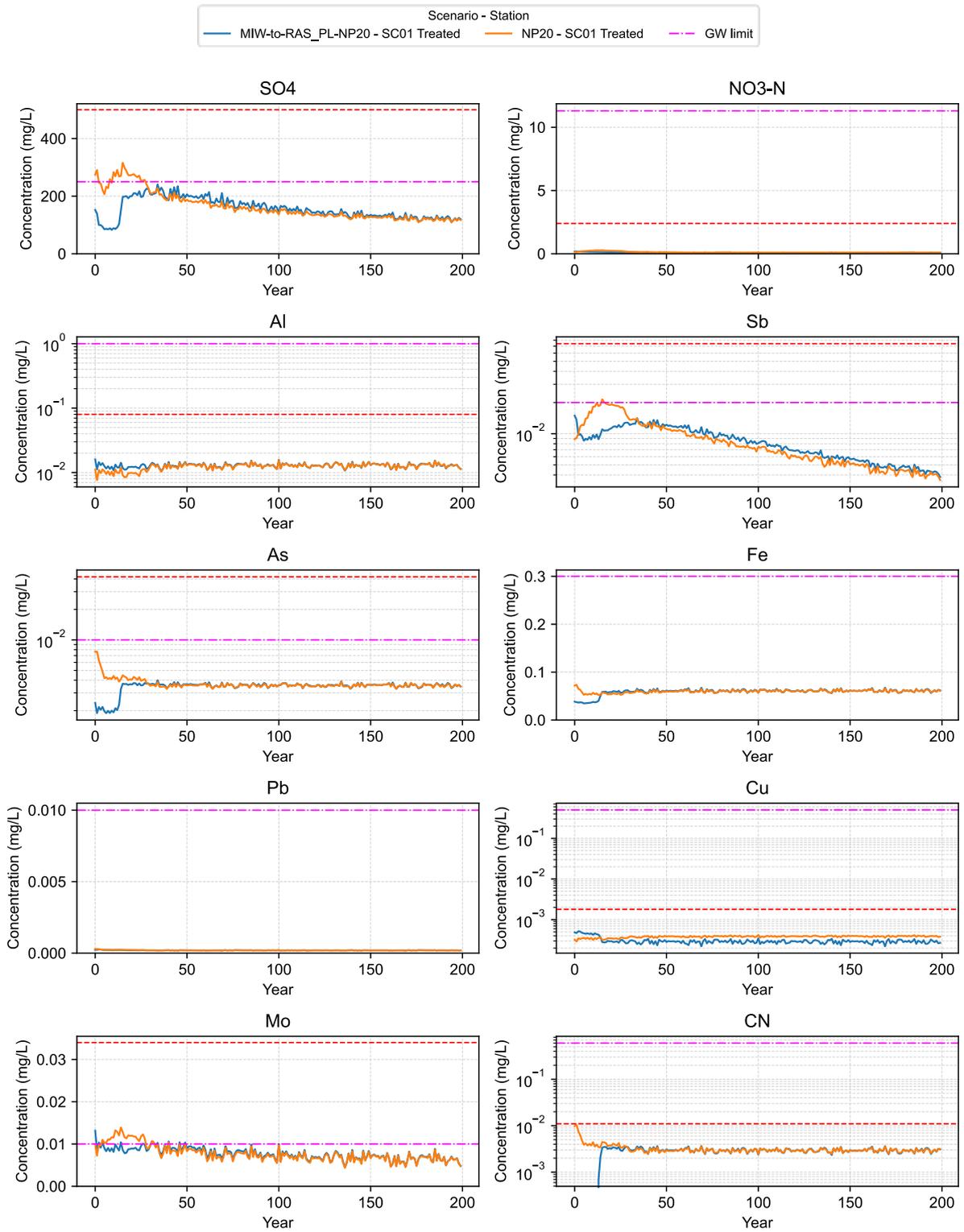


Figure 48. Scenario model results at SC01. Part 1 of 2.

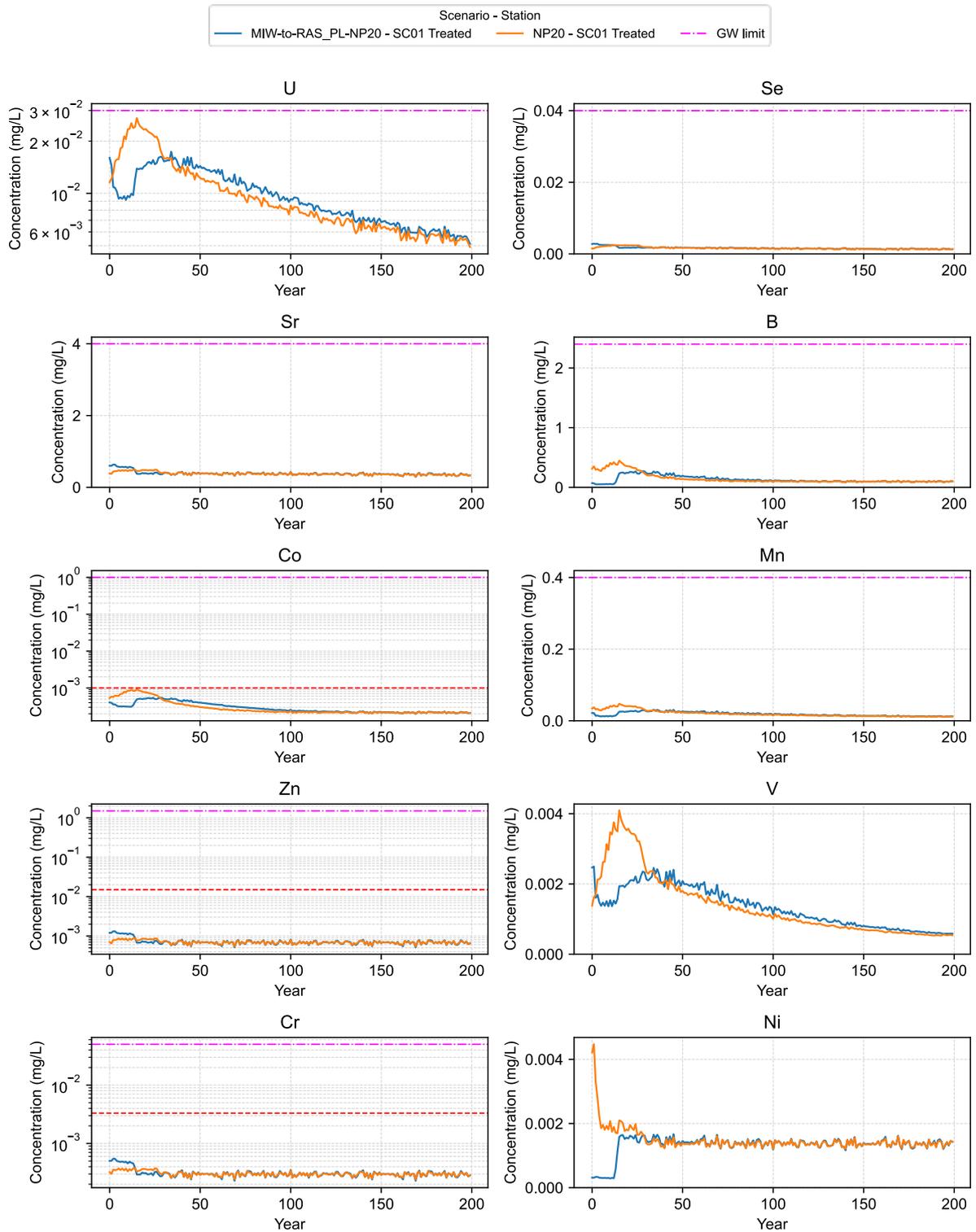


Figure 49. Scenario model results at SC01. Part 2 of 2.

6 SUMMARY AND RECOMMENDATIONS

6.1 Summary

The BOGP operational and post-closure assessment findings are summarised below.

6.1.1 *Operational Phase Model Results*

The Operational Phase calculations suggest the following:

- Water balance calculations suggest that the site will be in a water deficit condition up to Year 8. After this point, dewatering from satellite pits (i.e., SRX and to a lesser extent CIT) may push the site to a water surplus condition for the last few years of mine life without additional controls. Engineering controls (e.g., construct the water treatment plant prior to closure) are available to manage potential water surpluses, and can be evaluated during detailed design phases. Ongoing site water balance reconciliation of the site will be required to confirm water balance conditions remain in a water deficit condition.
- Based on mine features that will retain water on site and not be discharged to the receiving environment during operations, creek flows at SC01 are estimated to be reduced by approximately 17% on average at the full life of mine, while RS03 reduced by 13%. 7D MALF will reduce by 27% and 15% at SC01 and RS03, respectively.
- Interpretation of the mixing model results suggests surface water quality at SC01 and RS03 will remain below the proposed compliance limits for both surface and groundwater if groundwater is used for dust suppression.

6.1.2 *Post-Closure Phase Model Results*

The Post-Closure WLBM results suggest the following:

- Pit voids will fill with water and discharge MIW at average rates of approximately 6 L/s, 8 L/s, 1.5 L/s, from the RAS Pit, SRX Pit, and CIT Pit, respectively. RAS Pit Lake will reach a stable condition at ~25 years, with SRX and CIT pits will do so in <5 years.
- Of the MWSFs, Shepherds ELF, using a net percolation rate of 20%, will have the highest average seepage rate of MIW of approximately 4 L/s, followed by the TSF seepage rate of approximately 2 L/s on average. SRX ELF, WELF, and SCK Fill all had seepage rates of approximately 0.5 L/s or less.
- Creek flows will increase, with average flows increasing by approximately 60% and 50% at Shepherds Creek (at SC01) and Rise and Shine Creek (at RS03), respectively. Low flow conditions also increased, showing 7D MALF increasing by approximately 530% and 280%, respectively. These increases are mainly attributed to:
 - The higher infiltration and NP rates of the ELFs resulting in more stable seepage hydrodynamics.
 - The storage and discharge water filled pit voids.

- Without active water treatment, water quality findings for the base case model at SC01, based on yearly time steps indicate:
 - Groundwater limits are exceeded after passive treatment has been implemented for molybdenum (Mo) (to Year 50), SO₄ (to Year 35), and Sb (to Year 20).
 - Surface water limits are not exceeded after passive treatment is implemented.
 - Exceedances, especially for SO₄ and Sb are related to peak concentrations from Shepherds ELF seepage. This indicates that for the base case model that active water treatment is required for up to 50 years.
- Water quality findings for the base case model at RS03 indicate:
 - No limits are exceeded after passive treatment.
 - Active treatment of MIW from SRX Pit and SRX ELF is not required.

6.2 Operational Management Recommendations

The following management recommendations are proposed for the Operations Phase:

- Prolonged wet years and changes of water balance assumptions (e.g., dust suppression water sources) may move the site into a water surplus condition. As such, detailed water balance modelling by mine stage and that includes rainfall variability is recommended to support detailed mine design and improve confidence in a water deficit being maintained. Development of an adaptive management process related to the site water balance would also support proactive management of identified risks.
- A site water balance reconciliation be completed regularly (e.g., annually or more frequent) to confirm water balance model results are appropriate, and/or make model updates to improve confidence in model results projected into the future.
- Pit sump water can potentially be used for dust suppression early on in mine life. An adaptive management process should be developed to proactively manage and respond if performance and/or compliance monitoring data suggests use of pit sump water may begin to provide a risk of non-compliance.
- Accordingly, plan for use of clean water sources (i.e., bore water) for dust suppression. Calculations suggests later in mine life that the use of pit sump water for dust suppression could have the potential to cause exceedance of compliant limits at SC01 and RS03.
- Other water management options include the early construction, during operations, of the water treatment plant if prolonged water surplus conditions eventuate.

6.3 Closure Management Recommendations

The following management recommendations are proposed for the active closure and post closure phases:

- Active water treatment in the Shepherds Creek catchment through a WTP is required until passive treatment systems can achieve the proposed water quality compliance limits at SC01.

- Passive treatment of the SRX Pit Lake is required to achieve water quality limits at RS03. Noting that passive treatment is modelled at 8 L/s (average SRX Pit flow rate) with higher flows being untreated.
- Active and passive water treatment systems need to be developed through to a detailed design level:
 - For the WTP, these studies need to be completed within the first few years of the mine commencing so that the technology is ready for operation and closure (if needed). Early design of the WTP would mean it is ready as part of any adaptive management process for water management.
 - Passive water treatment systems should be designed once the project is operational using actual water quality from the project mine domains to confirm the proposed approach is appropriate.
- The majority of PCOC loads originate from Shepherds ELF and the TSF; therefore, performance monitoring of both flow rates and water quality is recommended at these locations.
- Modelled outcomes indicate that active water treatment will be required for approximately 50 years. This duration reflects the time needed for concentrations of Mo, SO₄ and Sb to reduce - following passive treatment - to levels that comply with applicable surface water and groundwater quality limits for the base case model scenario.
- Other management option is diverting Shepherds ELF and TSF seepage to the RAS Pit Lake for dilution which according to the modelling, decreases concentrations of SO₄ and Sb to below GW limits. Mo can reach elevated concentrations at times, with exceedances occurring intermittently until year 50.
- Performance monitoring is necessary to confirm management mechanisms.

6.4 Forward Works

The following forward works are proposed:

- A transient operational site wide water and load balance model needs to be developed prior to mine commencing to improve confidence in water accumulation or losses over time and water quality, particularly for seasonal dynamics. Such a model will support detailed design of the TSF.
- Additional ground investigations, groundwater monitoring, and detailed modelling will be required at the detailed design to confirm mine waste storage facility seepage collection systems will achieve anticipated collection requirements.
- The collection of performance monitoring data to improve model input data reliability is required, including:
 - Water quantity and quality data from mine domains and water movement around the site.
 - Water quantity and quality data at compliance locations.
 - Records of pit lake filling levels over time.

- Once the mine is operational, collection of water quantity and quality data (obtained as part of performance monitoring) should be compared to the developed operational site wide water balance model periodically to confirm model results are reasonable. Model revisions and/or calibration may be required if a material difference is apparent.
- A cover system trial should be established early on in mine life to demonstrate that a NP of 20% of mean annual rainfall can be achieved. Such a study would provide confidence that water quality closure objectives can be achieved and support closure planning.
- Additional scenario modelling to understand opportunities and threats including:
 - Higher rainfall.
 - Lower and higher net percolation rates.
 - Variance to the proposed passive water treatment efficiencies.
- The closure WLBM needs to be updated once sufficient data are available to calibrate the model (e.g., cover system performance and net percolation rates; source terms; water treatment efficiencies, etc).

7 LIMITATIONS

Attention is drawn to the document “Limitations”, which is included in Appendix E of this report. The statements presented in this document are intended to provide advice on what the realistic expectations of this report should be, and to present recommendations on how to minimise the risks associated with this project. The document is not intended to reduce the level of responsibility accepted by Mine Waste Management, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in doing so.

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APPENDIX A ABBREVIATIONS

ABBREVIATION	EXPLANATION
AEE	Assessment of environmental effects
AEP	Annual exceedance probability
BOGP	Bendigo-Ophir Gold Project
CCreek	Clearwater Creek
CIL	Carbon-in-leach
CIT	Come in Time
ELF	Engineered Landform
GW	Groundwater
LOM	Life of mine
LOR	Limit of reporting
MAV	Maximum acceptable value
MIW	Mine-impacted water
MGL	Matakanui Gold Limited
MWM	Mine Waste Management Ltd
MWSF	Mine waste storage facility
NAF	Non-acid forming
NAPP	Net acid production potential
NP	Net percolation
PCOC	Potential constituents of concern
PET	Potential evapotranspiration
PSD	Particle size distribution
QA/QC	Quality assurance and quality control
ROM	Run of mine
Srex	SRX
Srex East	SRE
SW	Surface waters
TSF	Tailings storage facility
UG	Underground
WELF	West ELF
WLBM	Water and Load Balance Model
WTP	Water Treatment Plant

APPENDIX B CLIMATE ANALYSIS

MEMORANDUM

TO	Hamish McLauchlan, Santana Minerals
FROM	Mandy Chater, Hydrology Consultant ¹
DATE	19 February 2023
SUBJECT	Development of synthetic rainfall time series, Bendigo Project
<p>Matakanui Gold Ltd requested that synthetic rainfall record be created, for the purpose of water balance assessment, water treatment considerations, and model development at their Bendigo Project site.</p> <p>Also, an assessment of data availability for rainfall frequency analysis was requested. This is for design purpose. Comment was sought as to what work is required, and whether further data collection is needed to undertake the analysis.</p> <p>This memo provides detail on the approach and outcomes, in fulfilment of these requests.</p>	

Contents:

1. Task Brief
2. Collation of Data Inputs
3. Data Quality Assurance (QA)
4. Data comparisons and initial regressions
5. Finalized regression and consideration of wind direction
6. Model script and generation of synthetic rainfall record
7. Test model data against actual; reliability and shortcomings
8. Applications of the synthetic data
9. Model refinement and data assessment for frequency analysis

1. Mandy Chater, MSc (Geography). 20+ years' experience in hydrological analysis and environmental science (NIWA, ECAN, West Coast Regional Council, Solid Energy/Bathurst Resources)

1 Task Brief

Long term rainfall estimates are required for the development of a GoldSim model, to be used for water management purposes at Matakanui Gold's 'Bendigo Project' site.

It was requested that "synthetic" rainfall record, at a daily interval, to be developed for a period of ten years or more. The actual length of synthetic record being dependent on the availability of data suitable for generating reliable rainfall estimates.

The availability of data for storm design purposes was also to be sought, and recommendations for further data collection and work around this be made.

The following documents the approach to developing the daily synthetic rainfall record.

2 Collation of Data Inputs

Figures 1 below shows the location of the Bendigo Project in the context of New Zealand's lower South Island. Figure 2, at a closer scale, shows the location of the three Matakanui Gold meteorological stations, for which rainfall record is to be extended. The terrain is obvious in its complexity, but also noteworthy is that the study area is at the most inland point of New Zealand, and therefore the climate has a far more continental tendency than other parts of the country.

A full suite of meteorological parameters is measured at each of the meteorological sites (Figure 2) , at ten minute interval . The sites are telemetered using Harvest Technology cell phone communication and the data (unvalidated) can be easily downloaded from a user portal. Records begin in November 2022 and are available up to date.

In terms of extending the 14 months of record (available at the time of this analysis) all available recorded rainfall in the vicinity the Matakanui Gold gauges was considered. The availability of these surrogate (or predictor) sites was investigated via the following channels:

- **CliFlo** – New Zealand's National Climate Database (managed by NIWA, and from which data can be downloaded by any subscribed user). The data pool here is large and varied. Many sites include only daily observations. Rainfall sites within a 50 km radius of the Matakanui Gold gauges, that had daily record or better, were initially considered. Records that were incomplete were disregarded. From here records were grouped by whether or not they overlapped with the Matakanui Gold record (therefore current). Those that didn't overlap could be used in a "secondary regression" (i.e regressed with a third site which did overlap with the Matakanui Gold record), but such gauges were given less preference due to inaccuracies introduced by using a secondary regression.
 - **Otago Regional Council (ORC):** rainfall for water resource management purposes is widely collected by Regional Councils and not necessarily fed through to the CliFlo database. The Otago Regional Council (ORC) provides a very good online environmental database, and the data is easily accessible. Available ORC records were all from sites further from the Matakanui Gold gauges than the closest gauges found in CliFlo. However the ORC gauges record at ten minute interval, where many of the nearer CliFlo sites have only daily record. The ORC sites are therefore important where design rainfall estimates are concerned – as for the relatively small catchment areas concerned, rainfall intervals of much less than one day will be relevant.
 - **"Land Air Water Aotearoa" (LAWA):** No extra rainfall information, beyond that available on CliFlo and ORC websites, was found on the LAWA website.
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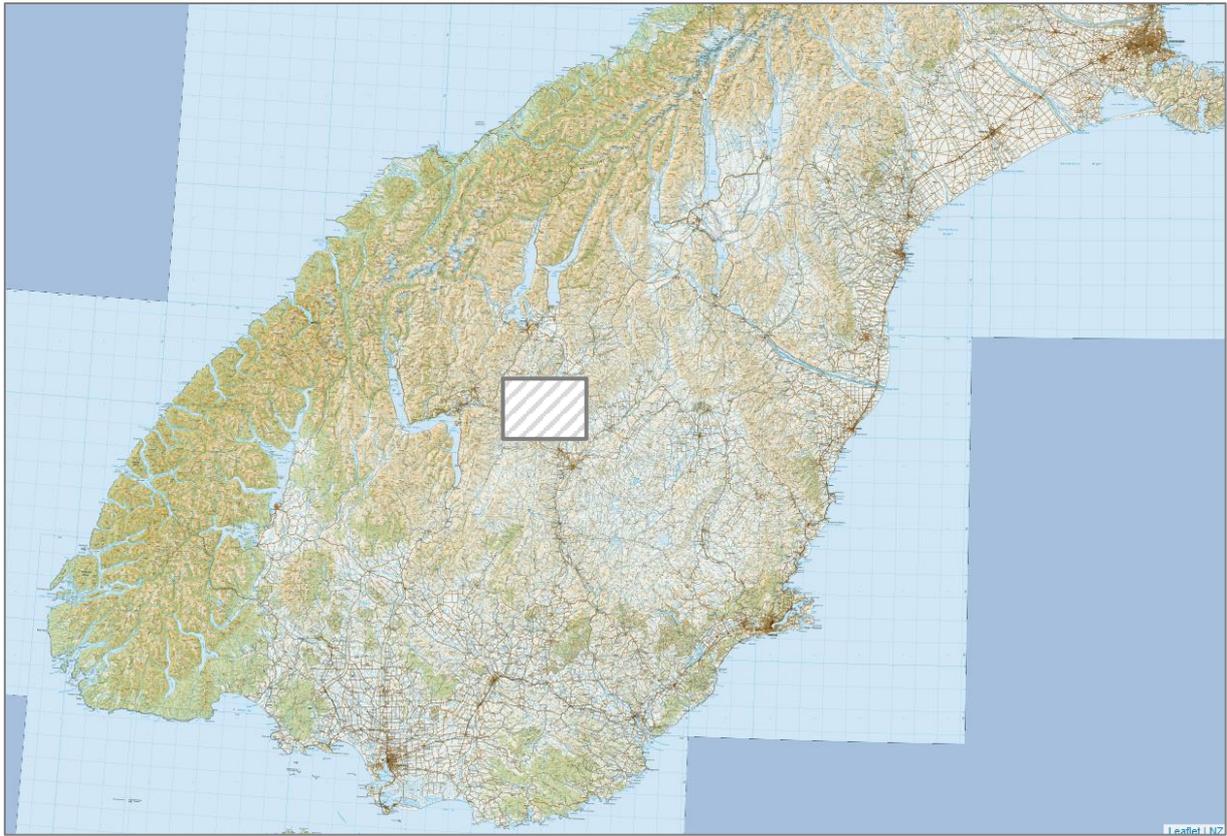


Figure 1: Study location with respect to respect to lower half of New Zealand's South Island



Figure 2: Matakanui Gold Meteorological (Met) sites at the Bendigo Project area, flanked by Dunstan Mountains to the east, and the Clutha River Valley and Pisa Range to the north-west.

Table 1 details the Cliflo sites within 30 kilometres of the Lake Clearview Met Station, and highlights sites that are potentially most useful as predictor sites for generating synthetic records at the Bendigo Project site. Figure 3 gives the location of these potentially useful sites.

Table 2 details the ORC and Clif Flo sites that would be useful for gaining an understanding of the occurrence of extreme rainfall at the Matakanui Gold sites, as a means of providing design rainfall estimates for the latter. The location of the most promising gauges with short interval record can be seen in Figure 4.

Table 1: Sites with daily rainfall record in near vicinity to Matakanui Gold gauges - Cliflo database

Sites with daily rainfall record in near vicinity to Matakanui Gold gauges - Cliflo database

denotes potential primary regression site - data overlaps with Matakanui Gold records (Nov 2022 onwards).
 denotes secondary site of interest due to vicinity or length of record

Agent Number	Name	Start Date	End Date	Percent Complete	Dist km (from Lake Clearview Met)
5243	Bendigo 2	1/05/1978	31/05/1992	100	3.3
5242	Bendigo 1	1/01/1956	30/06/1979	100	3.6
5241	Mt Pisa Station	1/05/1908	31/05/1924	90	6.1
5233	Lochar	1/04/1947	31/03/1956	80	6.8
5234	Queensbury Ews	1/11/1978	31/05/1992	100	6.9
5236	Tarras	1/01/1902	31/07/1986	80	12.2
5528	Northburn	1/11/1978	31/05/1992	100	12.5
5228	Willowbank	1/11/1953	30/06/1963	90	16.1
26381	Cromwell Ews	6/04/2006	17/01/2024	100	16.7
5529	Cromwell 2	1/07/1984	31/07/2007	100	16.8
5526	Cromwell M.W.D.	1/06/1949	30/06/1985	100	16.8
5524	Cromwell Sub Stn	1/04/1976	31/10/2023	20	19.3
5530	Matakanui	1/05/1947	31/12/2021	100	19.6
5523	Ripponvale	1/09/1925	31/03/1961	100	20.5
5225	Luggate	30/06/1913	28/02/2006	90	22
5240	Upper Meg Power Stn	1/05/1953	31/05/2013	100	23.3
7426	Wanaka Aero Aws	30/04/1992	16/01/2024	100	24
5227	Lagoon Valley	1/01/1949	31/08/1964	100	25.4
5231	Merrivale	21/04/1953	31/05/1963	100	25.4
5224	Mt Barker	1/01/1967	31/01/2011	90	26.1
5232	Cardrona	1/01/1948	31/12/2014	100	26.2
5542	Clyde	1/08/1973	31/10/1977	90	26.4
5229	Lindis Pass	1/11/1947	31/08/1948	100	27.4
5522	Waitiri Stn	1/01/1954	31/12/1968	70	28
5540	Bannockburn	1/07/1971	30/04/2018	90	28.7
5544	Ophir 2	1/04/1924	30/11/2023	90	28.9
5223	Wanaka	1/09/1927	31/08/1990	100	29.1
5230	Geordie Hill	1/05/1987	31/01/1990	80	29.1
5546	Ophir 1	1/11/1914	31/01/1931	20	29.2
5543	Clyde Dam	1/05/1978	30/06/2007	100	29.4
5535	Lauder Ews	20/08/1985	17/01/2024	100	29.6
43486	Lauder Raine Ews	29/04/2016	4/12/2023	100	29.6
5537	Lauder Flat	1/01/1945	30/11/2023	100	29.6
5249	Lauder Station	1/01/1987	31/01/1990	100	29.6
5541	Clyde, Fraser St	1/08/1896	30/09/1989	90	29.6
5216	Albert Town	1/12/1970	11/08/1972	100	29.6
41237	Wanaka Cws	29/10/2015	15/01/2024	100	29.7
5532	Lauder Pel	1/08/1981	31/05/1986	100	29.7
5531	Lauder	1/11/1947	31/03/1965	100	30
5217	Wanaka, Park Hq	5/09/1990	31/01/1994	100	30.1
39564	Clyde 2 Ews	25/05/2011	17/01/2024	100	30.8
5220	Maungawera	1/10/1915	30/04/1944	90	30.8
26567	Lauder 2	1/01/2000	31/03/2023	100	31.1

Table 2: Rain gauge sites with short duration record, for extreme event analysis, in near vicinity to Matakanui Gold gauges

Rain gauge sites with short duration rainfall in near vicinity to Matakanui Gold gauges

denotes the most likley useful sites, on the basis of vicinity/geography and length of record.

Cliflo data base

Agent Number	Name	Start Date	End Date	Altitude (m)	Dist km (from Lake Clearview Met)
26381	Cromwell Ews	5-Apr-06	7-Feb-24	213	14
41237	Wanaka Cws	28-Oct-15	7-Feb-24	331	28.9
39564	Clyde 2 Ews	17-May-12	7-Feb-24	170	30
5535	Lauder Ews	31-Dec-95	7-Feb-24	375	32.1
43486	Lauder Raine Ews	27-Apr-16	4-Dec-23	375	32.2
43904	Alexandra Ews	18-Apr-19	7-Feb-24	132	36.2
41331	Queenstown Ews	24-Feb-16	7-Feb-24	322	51.5
40257	Mt Larkins Ews	4-Nov-21	7-Feb-24	1900	64.9
18593	Ranfurly Ews	21-Nov-00	7-Feb-24	450	66.1
35098	Albert Burn	21-Apr-10	7-Feb-24	1280	68.1
18437	Middlemarch Ews	30-Aug-00	4-Feb-24	213	92.1

Otago Regional Council

Name	Start Date	End Date	Altitude (m)	Dist km (from Lake Clearview Met)
Cluden Stream at Stockyards	25/05/2021	current	357	19.1
Manuherikia at Tunnel Hill	18/03/2008	current	807	41.7
Lauder Creek at Lauder Basin	26/01/2022	current	1520	25.9
Ida Burn at Hills Creek	1/01/1988	current	580	41.4
Tairei at Ranfurly (NIWA)	21/11/2000	current	427	63
Poolburn at Merino Ridges	21/04/2009	current	440	39.3
Dunstan Peaks (ECAN)	26/08/2017	current	575	53.6

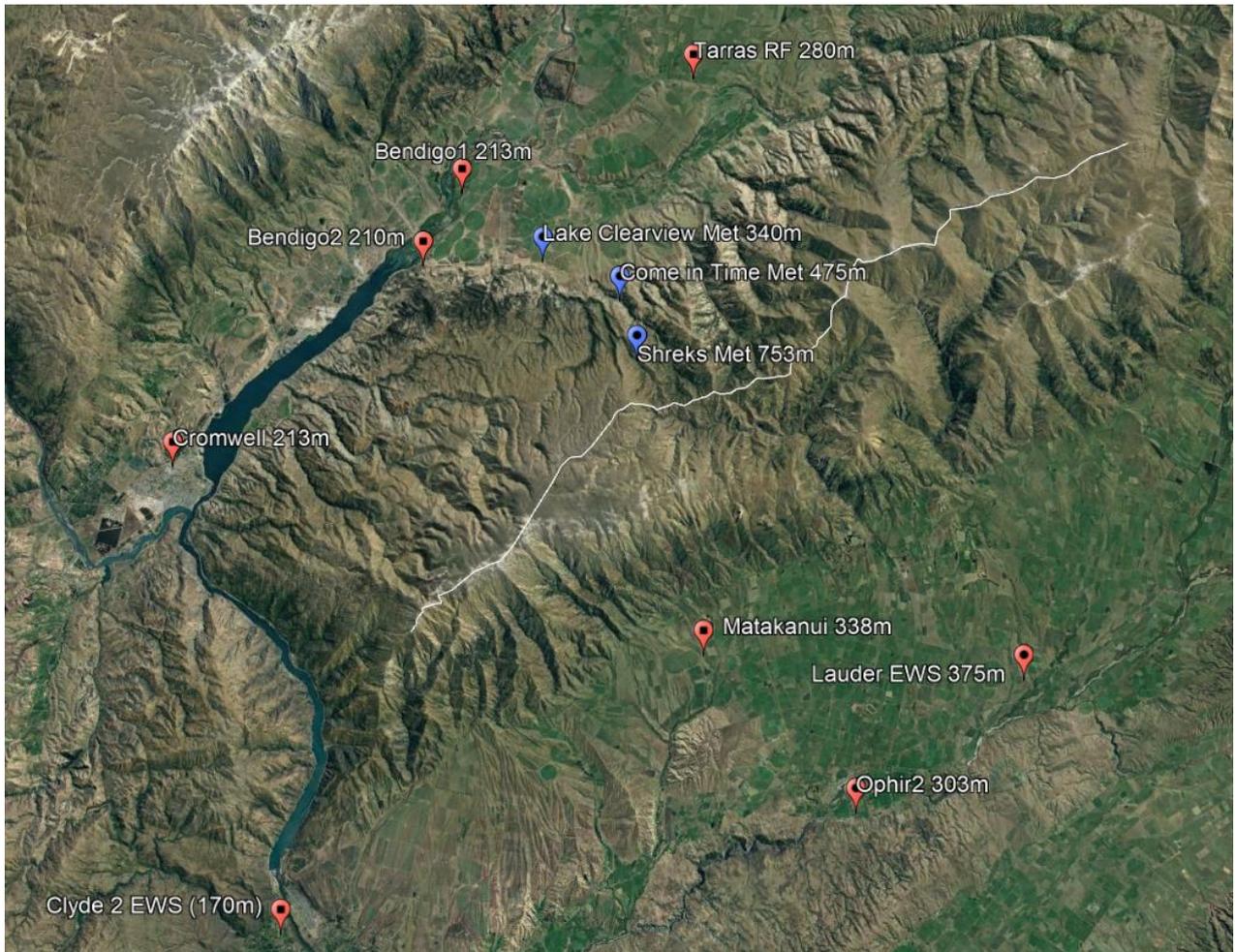


Figure 3: Potentially most useful predictor sites (red) for generating synthetic rainfall record at the Bendigo project site (Wanaka EWS excluded)

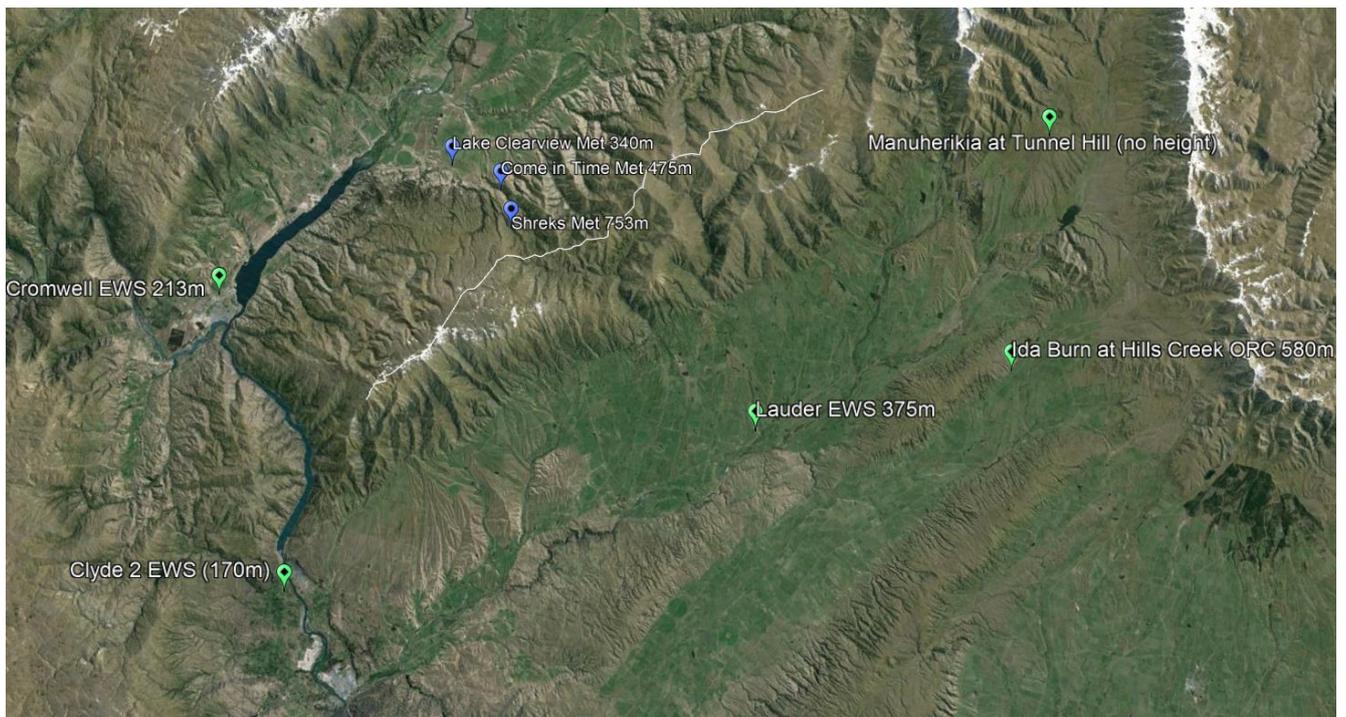


Figure 4: Location of the most promising sites for making rainfall intensity estimates (green) at the Bendigo Project site.

3 Data Quality Assurance (QA)

All relevant rainfall data was downloaded from the Matakanui Gold harvest portal and the NIWA climate data base. The Harvest data is available Pacific/Auckland or UTC time zones only (UTC being 12 hour behind NZ standard time). All climate station data is logged in NZ standard time (i.e does change for daylight saving) or UTC. Thus all records were downloaded in UTC as that was the only time unit to make the records temporally compatible.

The data was then loaded into Hilltop Software which provides tools for managing and analysing time series data.

The Matakanui Gold data was overplotted cumulatively and showed good overall agreement – with the higher gauges receiving slightly more rainfall as would be expected (Figure 5).

The cumulative comparison was then combed at a ten-day timestep to highlight any discrepancies in any of the records. Several discrepancies appeared, and, alongside the Cromwell EWS rainfall, were investigated. When considering temperature and wind direction data, it could be seen that most of the data discrepancies are likely to relate to snowfall at the higher elevation.

There remains one large unexplained anomaly in the Lake Clearview record on 21/22 February 2023, and this can be seen in Figure 5. Lake Clearview received 6.2mm of rainfall over this time, whereas adjacent sites Come in Time, Shreks, Cromwell, and Lauder received 43.8mm, 42.6mm, 38.6mm, and 57.6 mm respectively. This shortfall of rainfall at Lake Clearview was hugely anomalous compared to the rainfall relationships throughout the rest of the record. The storm event involved high air temperatures preceding a (cold) frontal passage, and a complicated wind pattern. At the time of writing this report comment is still being sought as to whether the gauge may have been blocked or similar at the time. However, as the relationships either side of the anomaly remain “as expected”, it’s unlikely there was recorder error at Lake Clearview on 21/22 February 2023, and so the discrepancy is in fact real. It is unknown with what frequency such a disparity would occur, but it is assumed rarely , in that it is not seen elsewhere in the record. Therefore it was chosen to treat the event as an outlier going forwards (essentially discard), as it is way outside the expected rainfall pattern.

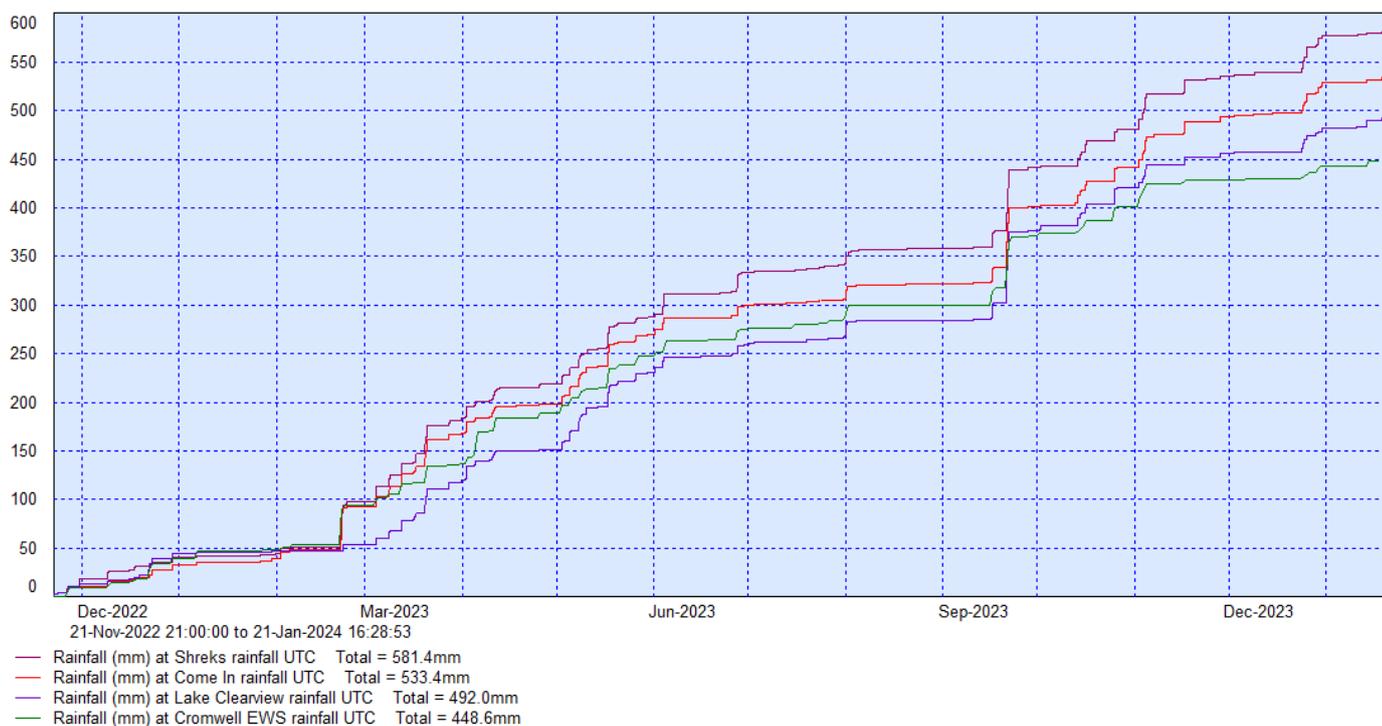


Figure 5: Cumulative rainfall at the three Matakanui Gold gauges and Cromwell EWS, November 2022 to date

There was a large body of rainfall data downloaded from the Climate database. Data from the Climate database has already had checks undertaken, therefore it was decided only the surrogate data adopted in the final regressions needed to be combed for further quality assurance.

4 Data Comparisons and Initial regressions

Rainfall was compared, proportionally, between gauges to get an initial feel for the rainfall distributions. Box and Whisker plots nicely summarised where the rainfall records sit with respect to one another, in terms of amount and variability.

Firstly the three Matakanui Gold gauges, one for which we are wanting to extend rainfall record, were considered. Figure 5 shows the relationship of Lake Clearview and Shreks rainfall, as a proportion of that received at the middle rain gauge “Come In Time”. The Clearview distribution has a median of 1, is well centred, and has few outliers. The “Shreks” median is naturally higher at 1.1; but with more variability shown in the data. Figure 5 suggests the “Come in Time” rainfall is actually very similar to that of Lake Clearview. This was confirmed when the cumulative rainfall plot in Figure 4 was started on 1/03/2023 (beyond the discussed February 2023 anomaly).

Of the three Matakanui Gold gauges the Lake Clearview site, is of most similar altitude to the potential surrogate sites Bendigo1, Bendigo2, Tarras, Cromwell, Matakanui, Lauder and Ophir (Figure 3). Further to that, in comparison to the higher two gauges, the Lake Clearview gauge likely suffers less from snow, freezing, and wind (undercatch). Therefore, of the three Matakanui Gold rainfall sites **Lake Clearview was chosen as the key “hinge” site - to regress with adjacent predictor sites.** (Record extension at “Come In Time” and “Shreks” could be carried out subsequently - based on their close relationship with Lake Clearview).

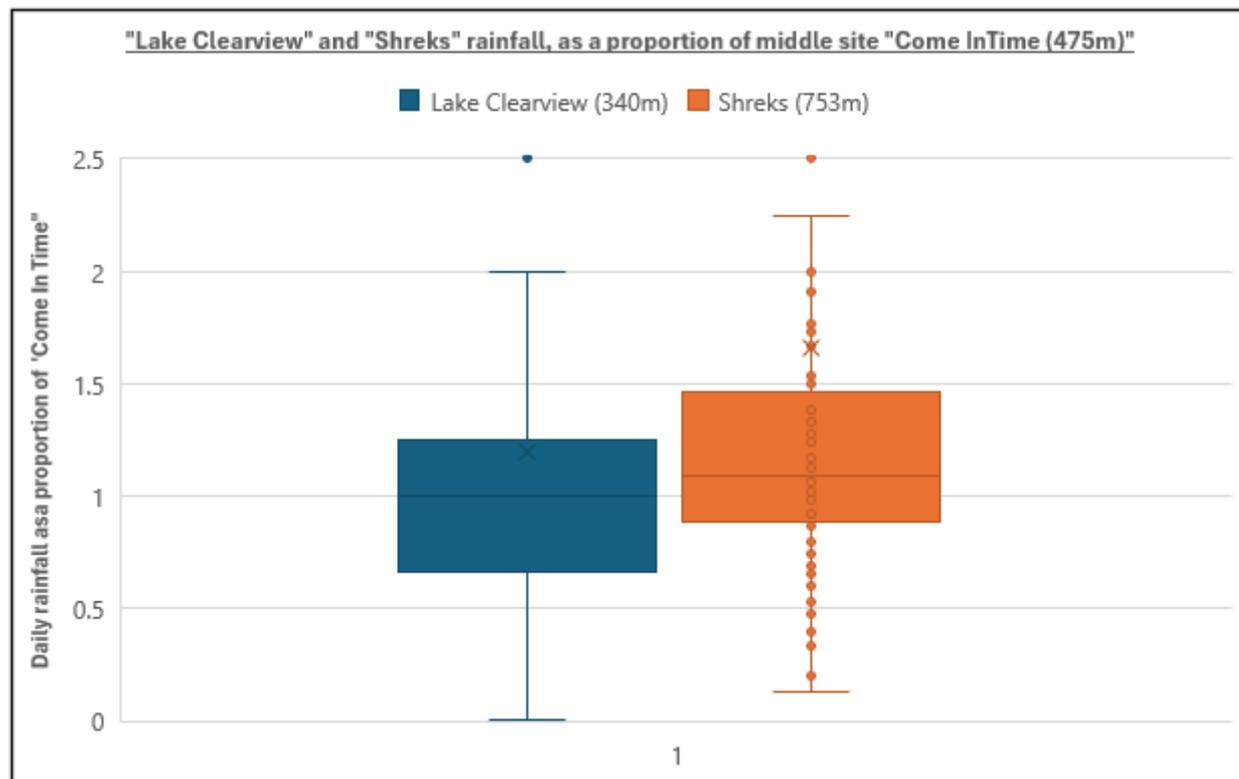


Figure 5: Box and Whisker plots of comparative rainfall between the 3 Matakanui Gold Sites (refer Figure 2)

With the “hinge” site chosen, the most suitable surrogate sites for producing synthetic record at that hinge site were then considered. Cromwell and Lauder offered the two best options, due to their overlapping record with Lake Clearview (Table 1). Any other sites, bar Ophir2, would require ‘secondary’ regressions. Ophir2 and Lauder are of similar location, but with Lauder being an ‘atmospheric research station’ it was logical to use this (likely more reliable) data over the Ophir2 record. A general comparison showed that Lake Clearwater rainfall is about 118% of that received at Cromwell, and similar to slightly more of that that received at Lauder.

Figures 6 and 7 show initial regressions for Lake Clearview rainfall with Cromwell and Lauder, respectively, for the time the Lake Clearview site has been running. The regression for the “Lake Clearview versus Cromwell EWS” comparison is obviously tighter. Although Lake Clearview receives similar overall amounts of rainfall to Lauder, Figure 7 suggests that this rain is not necessarily concurrent. Noticeable also is the number of days where it was raining at Lauder but no, or little, rain occurred at Lake Clearview. The slope of the regression with Lauder is influenced (flattened) by the lower limit (zero) for rainfall, and a regression with Lauder would produce a number of ‘false rain days’ for Lake Clearview.

At this stage, as another check, “Shreks” Met was also regressed against Lauder. The “Shreks versus Lauder” regression did produce a stronger relationship than that of “Lake Clearview versus Lauder”. However, the regression still contained more scatter than the “Lake Clearview versus Cromwell EWS” regression. **This validated the use of that Lake Clearview as the key “hinge’ site; and the use of Cromwell rainfall record for extending the of Lake Clearview record.**

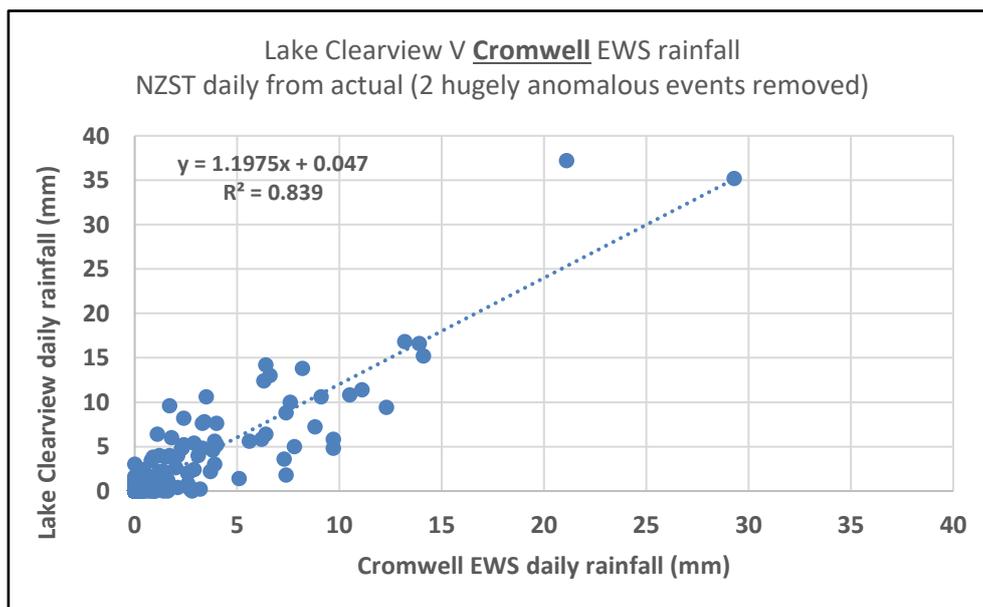


Figure 6: Initial regression between Lake Clearview (lowest Matakanui Gold site) rainfall and that at potential surrogate site Cromwell EWS.

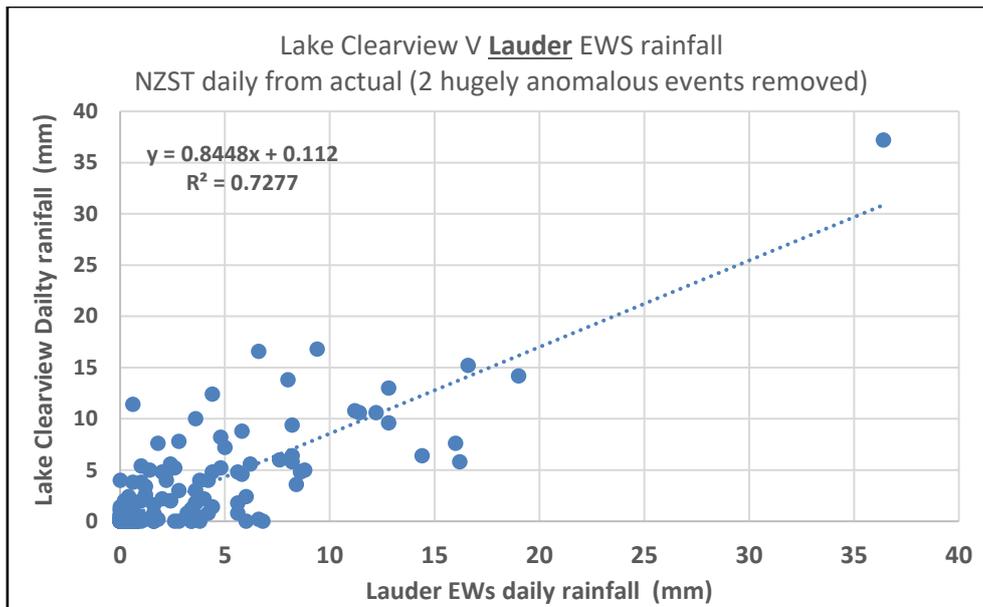


Figure 7: Initial regression between Lake Clearview (lowest Matakauai Gold site) rainfall and that at potential surrogate site Lauder EWS

5 Finalised regression and consideration of wind direction

A QA check on the chosen surrogate rainfall site of Cromwell EWS was then undertaken. The Cromwell EWS rainfall was plotted cumulatively with concurrent data from NIWA's Lauder climate centre. The comparison showed a consistent relationship (Figure 8). This comparative plot was then fine combed at a 30-day interval. Although there were inevitable discrepancies, none of them would constitute as erroneous data. A script was run to check if there was any missing record across the entire dataset (i.e time step of over one hour between values), and none was found.

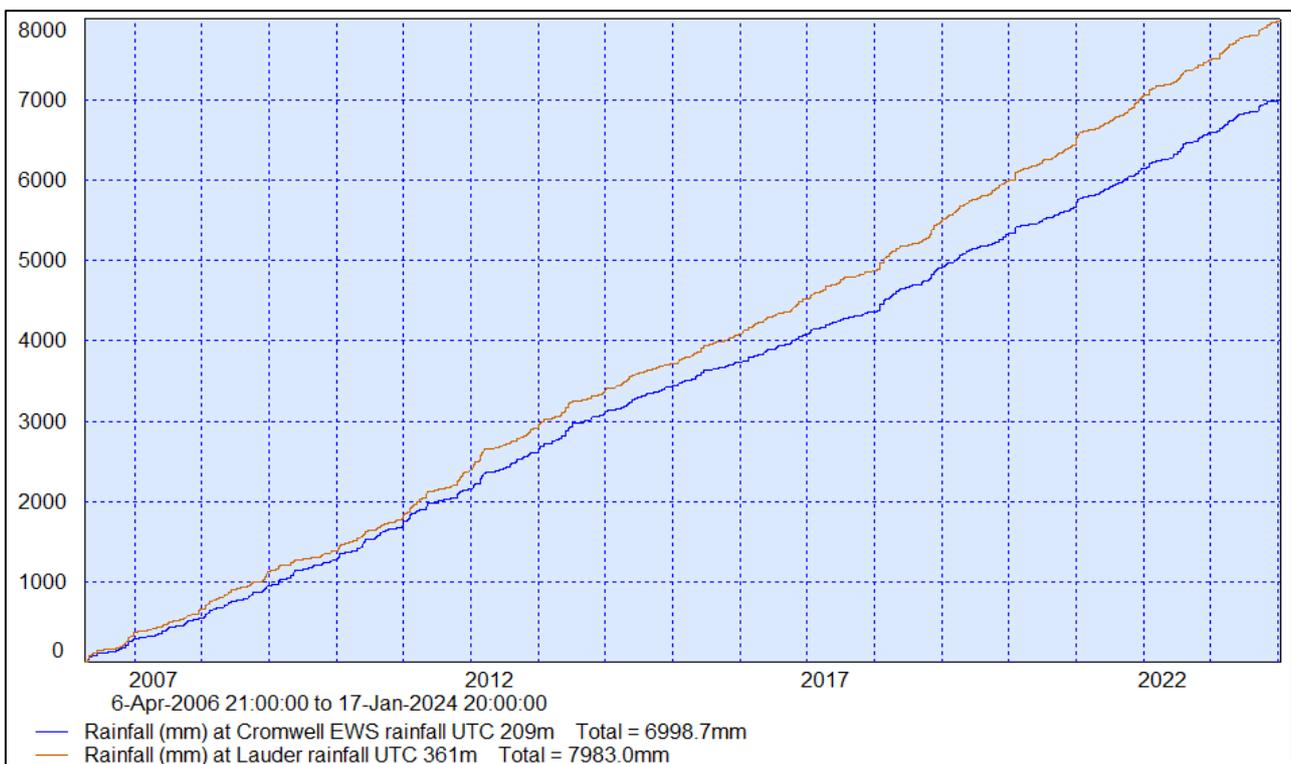


Figure 8: Cromwell EWS rainfall verses Lauder - April 2006 to January 2024

The regression between Cromwell EWS and Lake Clearview in Figure 6 shows perhaps a diverging into 2 different relationships, as rainfall increases. Rainfall in the area is typically pre-frontal (from the north-west quarter) or post-frontal (from the south/southeast quarter) in the area. Because of the way the different air streams interact with the topography it was hypothesised that the relationship between Cromwell and Lake Clearview rainfall could be dependent on these prevailing wind directions. (It is acknowledged that rainfall can also be associated with widespread low pressure systems over the South island – but the “directional” effect would remain). Wind direction data from Cromwell EWS was therefore used to isolate rainfall according to those predominant north-west and south-east quarter flows. The windrose for Cromell EWS is given in Figure 9. With consideration of windspeeds, and the channelling effects of the terrain surrounding Cromwell , “south-east quarter flows were actually considered as any direction from 100 through to 235 degrees , and “north-west” quarter flows any directions logged between 235 and 99 degrees.

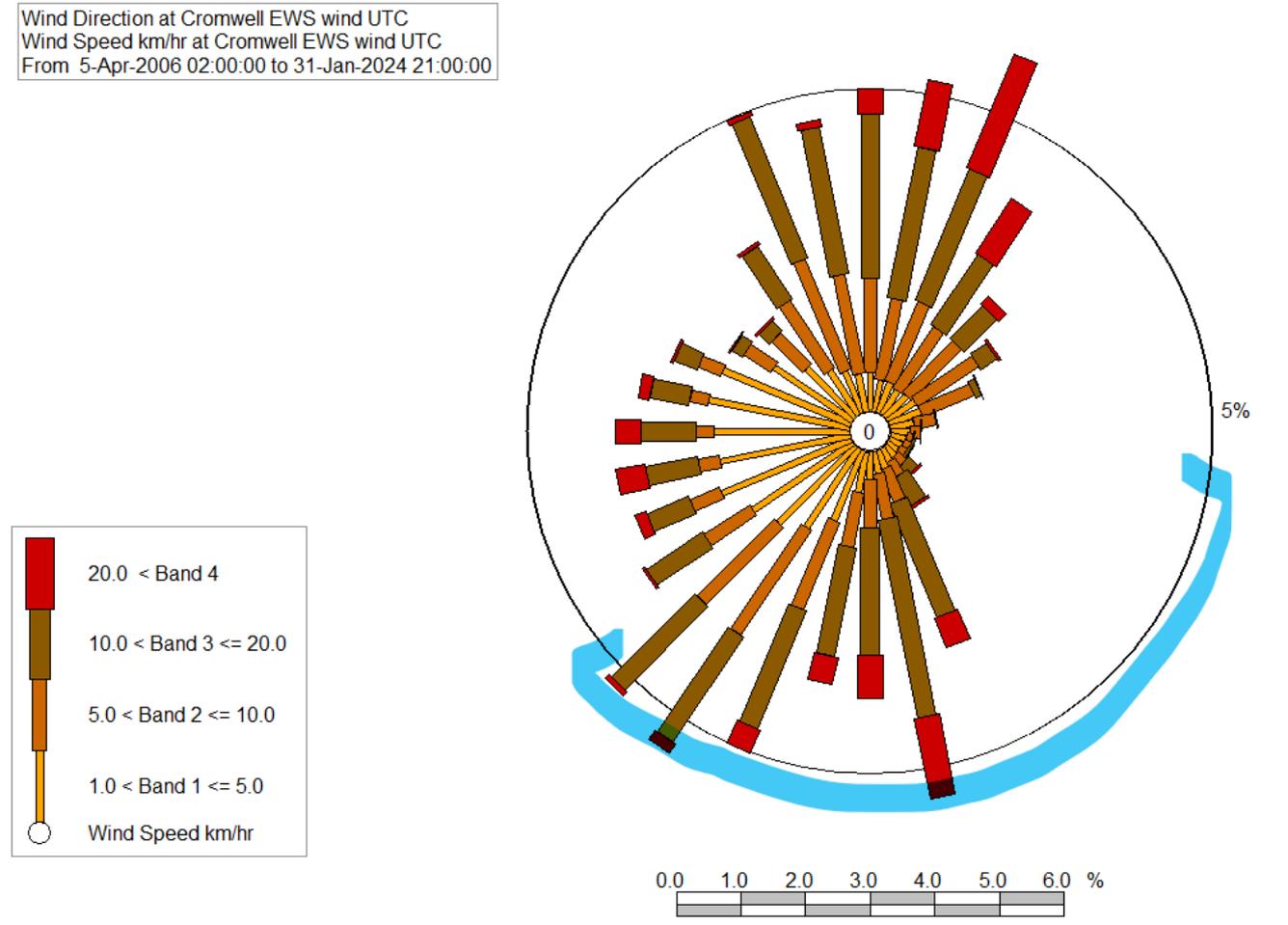


Figure 9: Wind rose for Cromwell EWS Met Station. Wind directions between 100 and 235 degrees (as highlighted blue) being considered “south-east quarter” events. All other directions were considered “north-west quarter” events.

The Clearview versus Cromwell EWS paired data was coupled with both the “average daily” and the “end of day” wind direction at Cromwell EWS. Obviously there are limitations in categorising daily rainfall as “northwest” or “southeast”, due to wind direction often changing within a day. It was found that the data split into two more discrete regressions when the subsets were defined by the “end of day” wind direction. Inevitably there were some outliers – and these were investigated. Three data points were removed where it was obvious that rain was borne from both the northwest and the southeast direction, within the same day.

Figure 10 shows the two direction dependent regressions. There is quite a lot of scatter across both regression and the application of the two regressions actually produce a similar long-term amount of rainfall as the single regression in Figure 6 . However it is felt that, storm by storm, the match between modelled and actual rainfall will improve by applying the two different regressions . Due to its vicinity, and sheltering effects of the Pisa range, it is logical that the Clearview gauge, would receive more rainfall from southeast quarter than from north-west quarter storms - relative to Cromwell. This which is what the regressions reflect.

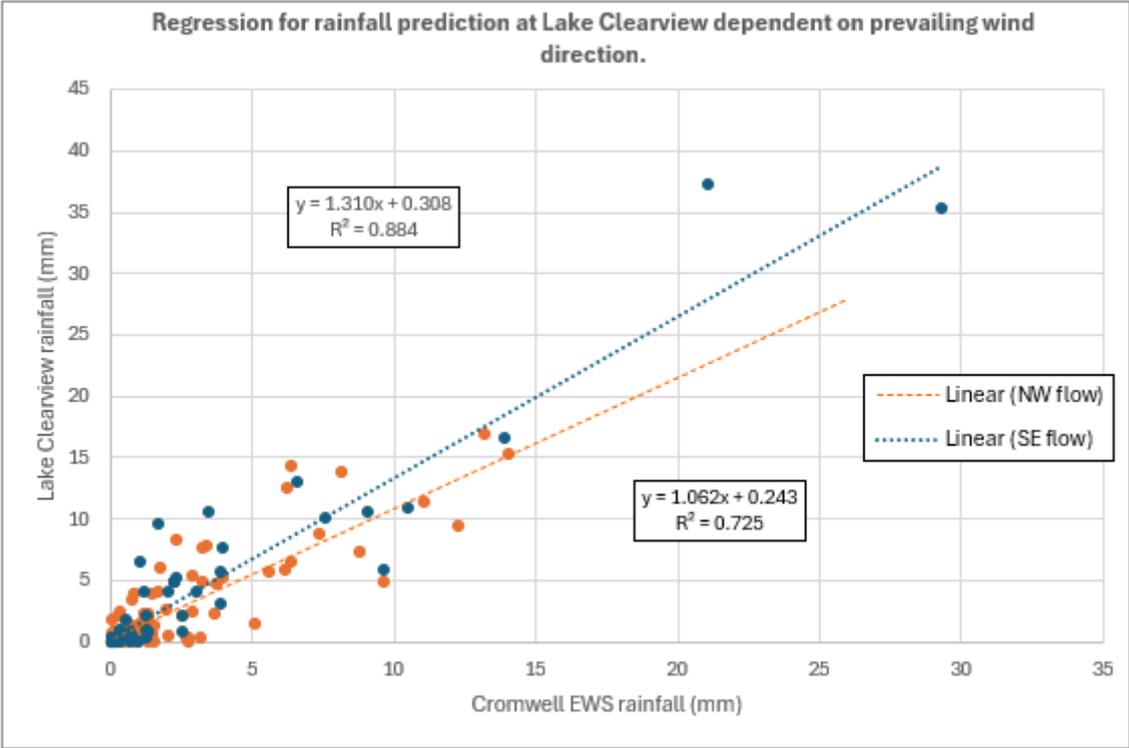


Figure 10: Cromwell EWS verses Lake Clearview daily rainfall, by wind direction

6 Model Script and generation of synthetic rainfall record

It can be seen in Table 1 that the Cromwell EWS rainfall site was a successor to Cromwell MWD and Cromwell2. Grid locations show all these sites to be within 100m of one another. There is overlap between each of the records.

Where they overlap, the Cromwell MWD and Cromwell2 records are exactly the same. However the Cromwell2 rainfall proves to be slightly, though consistently, higher than that of Cromwell EWS. The Cromwell EWS rainfall data is collected via an automated gauge and the record is logged electronically. It is assumed that the Cromwell EWS data is the more accurate record of the two sites.

On this basis of the above was **it was decided to generate synthetic record for Clearview based on Cromwell EWS record alone, for the following reasons:**

- 18 years of reliable synthetic record could be produced from Cromwell EWS, where the brief requested that ten years or more of reliable daily record, for model and water management purposes, be developed.
- Cromwell EWS rainfall showed to have a good workable correlation to that Lake Clearview, but the record from Cromwell EWS was not consistent with the predecessor sites Cromwell MWD and Cromwell2.
- Wind direction record at Cromwell starts in April 2006, the same time as the Cromwell EWS record begins.

QA checks on the Cromwell wind direction data were at this point undertaken. A period of obviously erroneous data (anomaly 1), and a period of missing direction data (anomaly 2), were found. These anomalies were dealt with in the following way:

Anomaly 1: Wind vane stuck about 330 though to 30 degrees mid October to end November 2019 (yellow highlight Figure 11). On this basis of wind direction at other sites, most of the rainfall during this time was actually borne out of the north west quarter, so the “330 to 30 degree” record sufficed. There was one exception where rainfall was obviously from the south, so for the purposes of the model direction was changed to 180 degrees for 2 days (9th and 10th November, green highlight in Figure 11).

Anomaly 2: Missing wind direction record mid May to mid August 2020. On the basis of higher rainfall at eastern sites Matakanui and Lauder for the major rainfall events over this periods, it is assumed that the wind direction during rainfall events was predominately from the southeast quarter . There is one small event at the end of the period for which this is likely not the case but this will have minimal effect on the final synthetic record. The wind direction at Cromwell was therefore set to 180 degrees for this period for which there is missing wind direction record.

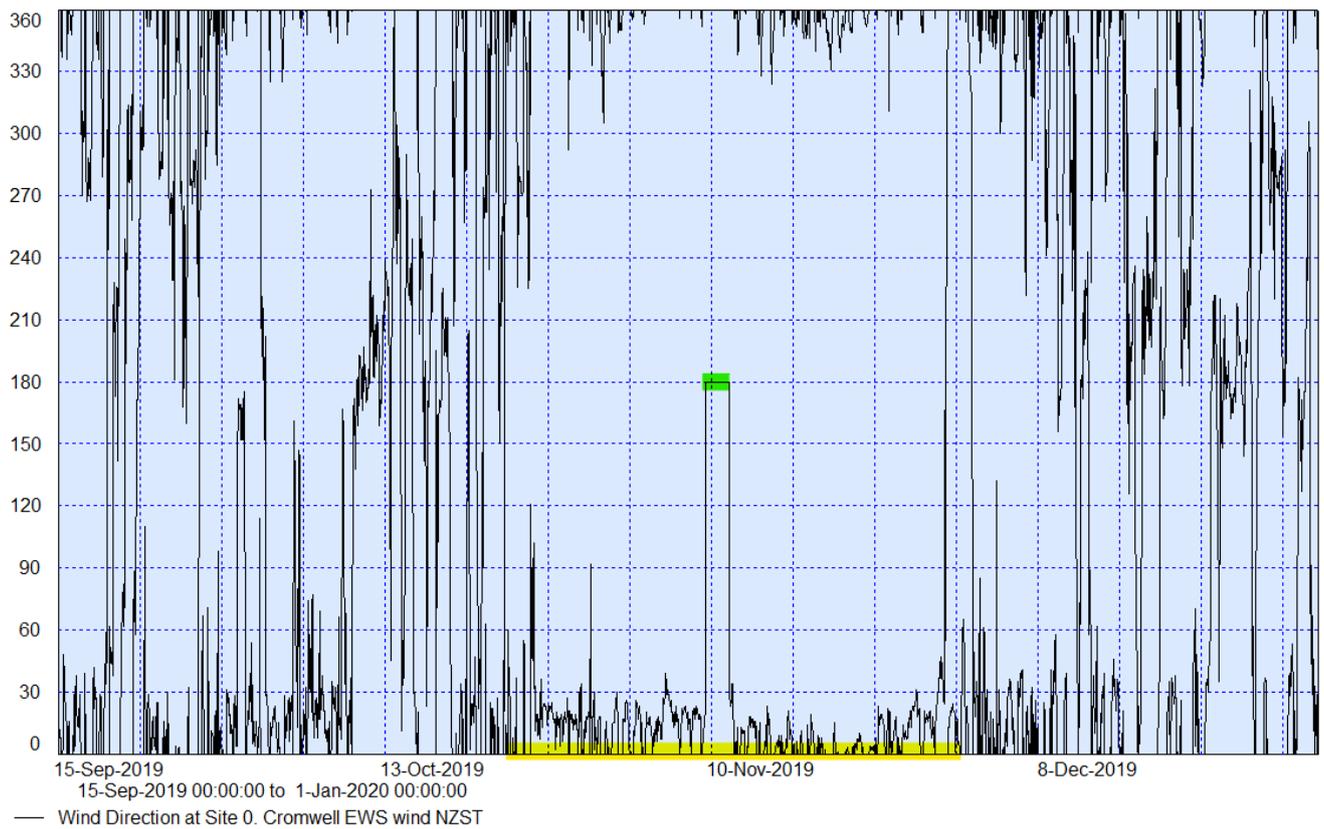


Figure 11: Period of erroneous wind direction data at Cromwell EWS mid October to end November 2019.

With all the check and balances carried on the data inputs a script was written to generate estimated rainfall at Lake Clearview from Cromwell EWS. The script considers the prevailing wind direction at any given time to adopt the applicable regression. As the model is run on hourly rainfall and wind direction data, it changes from one regression to another immediately as wind direction changes. Figure 13 shows the entire synthetic rainfall record for Lake Clearview, plotted cumulatively. The period for which actual Clearview record is available highlighted green. The synthetic rainfall record can be readily exported to excel at a daily timestep.

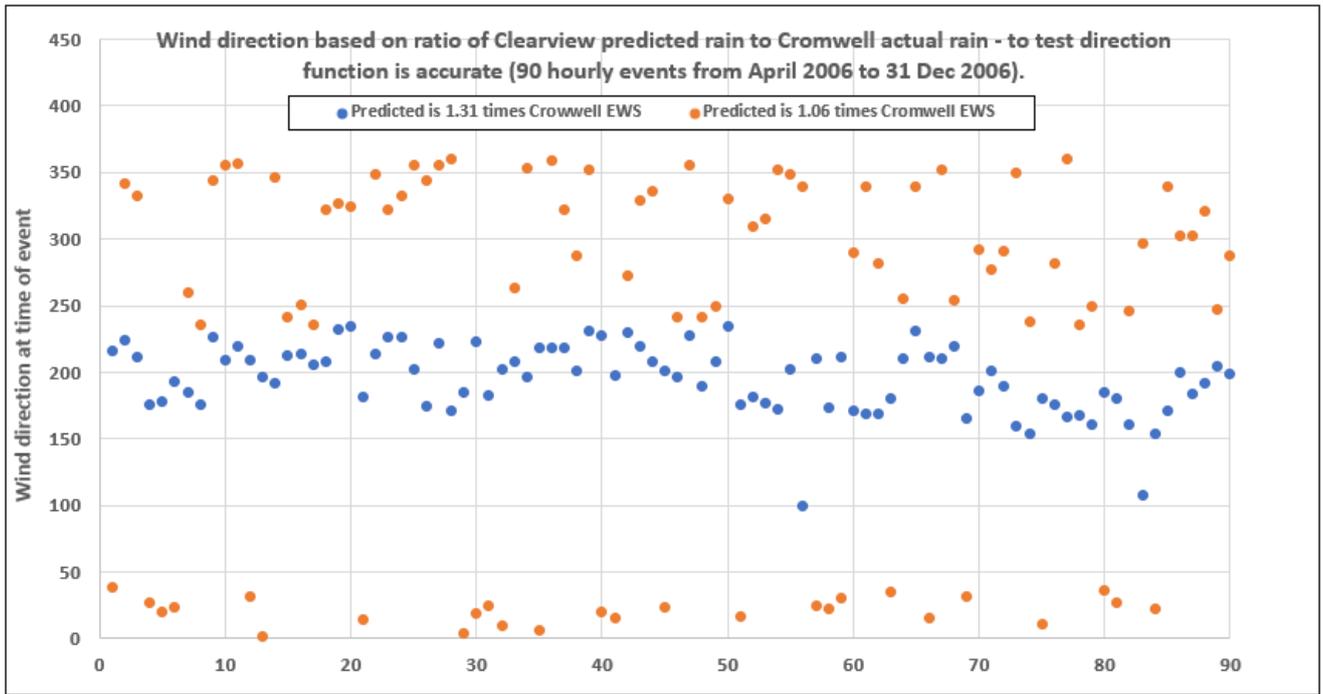


Figure 12: Graph confirming the direction function in the model is working and sensible.

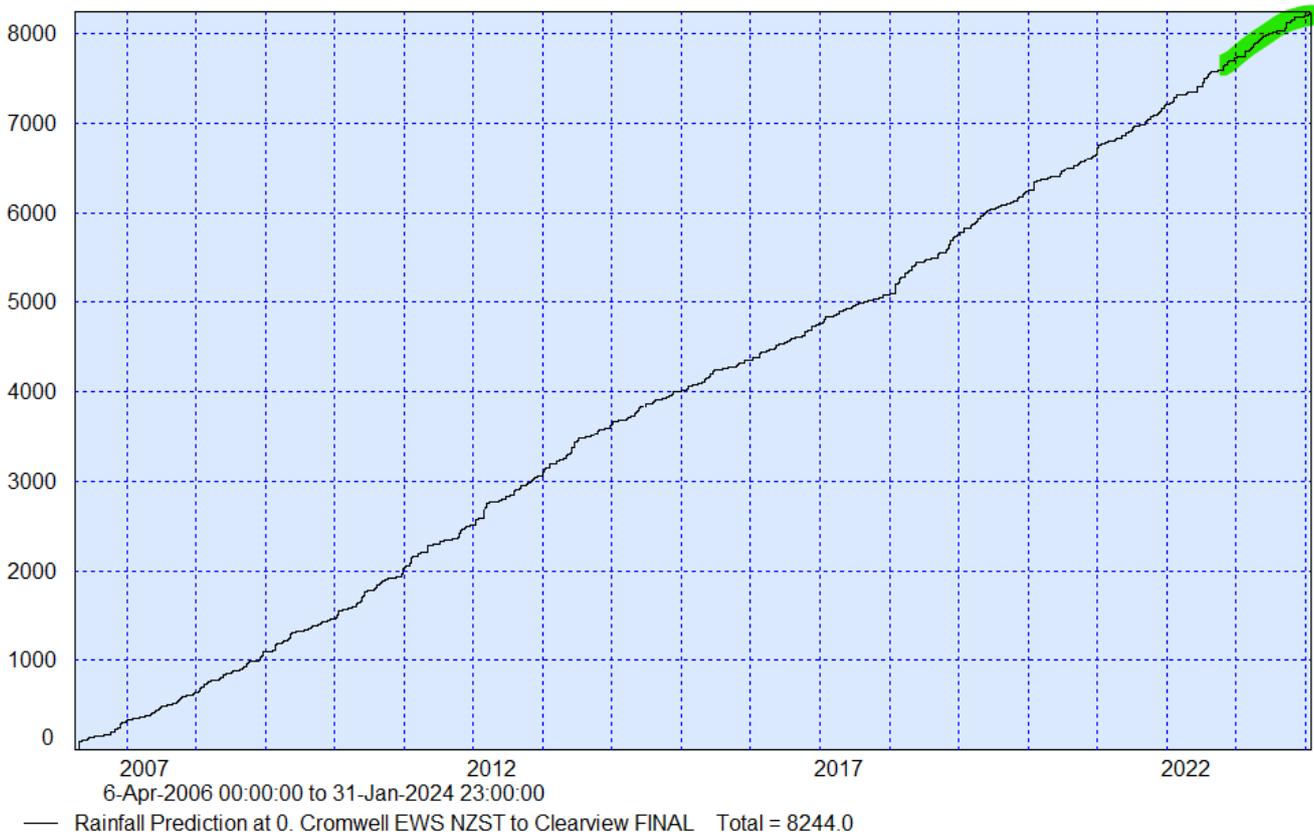


Figure 13: Modelled rainfall data for Lake Clearview. Green highlight is period for which actual Like Clearview data exists.

7 Test model data against actual; reliability and shortcomings

The regression between Cromwell EWS and Lake Clearview rainfall showed the relationship to have some inconsistency, at a daily interval. This is not surprising given the complexity of the surrounding terrain and variable directions of rain bearing wind. So two separate relationships were fitted to the data, according to wind direction, to try and alleviate some of this temporal inconsistency. It was opted not to incorporate other adjacent gauges in a multiple regression approach, as such a model would still be specific to wind direction, would be harder to replicate, and shortcomings in the model output would be harder to account for. Cromwell EWS was used over the next most applicable predictor site, Lauder, due the daily relationship with Lauder being more inconsistent than with Cromwell. With the “Cromwell EWS” regressions then applied, there are number of ways we can test the model output displayed in Figure 13:

1. Overplot of modelled rainfall at Clearview with actual recorded data:

Figure 14 shows the modelled against actual record from November 2022, and Figure 15 from 1st March 2023, so to exclude the February 2023 outlier event. The comparison is good, but obviously complicated by the February 2023 outlier. Modelled rainfall is significantly more than actual in Figure 14, and slightly less than actual in Figure 15. As the February 2023 appears to be far outside the expected norms (as detailed in Section3), little weight was given to matching the modelled record to this event. The model versus actual rainfall match in Figure 15 is considered a better measure of the model accuracy.

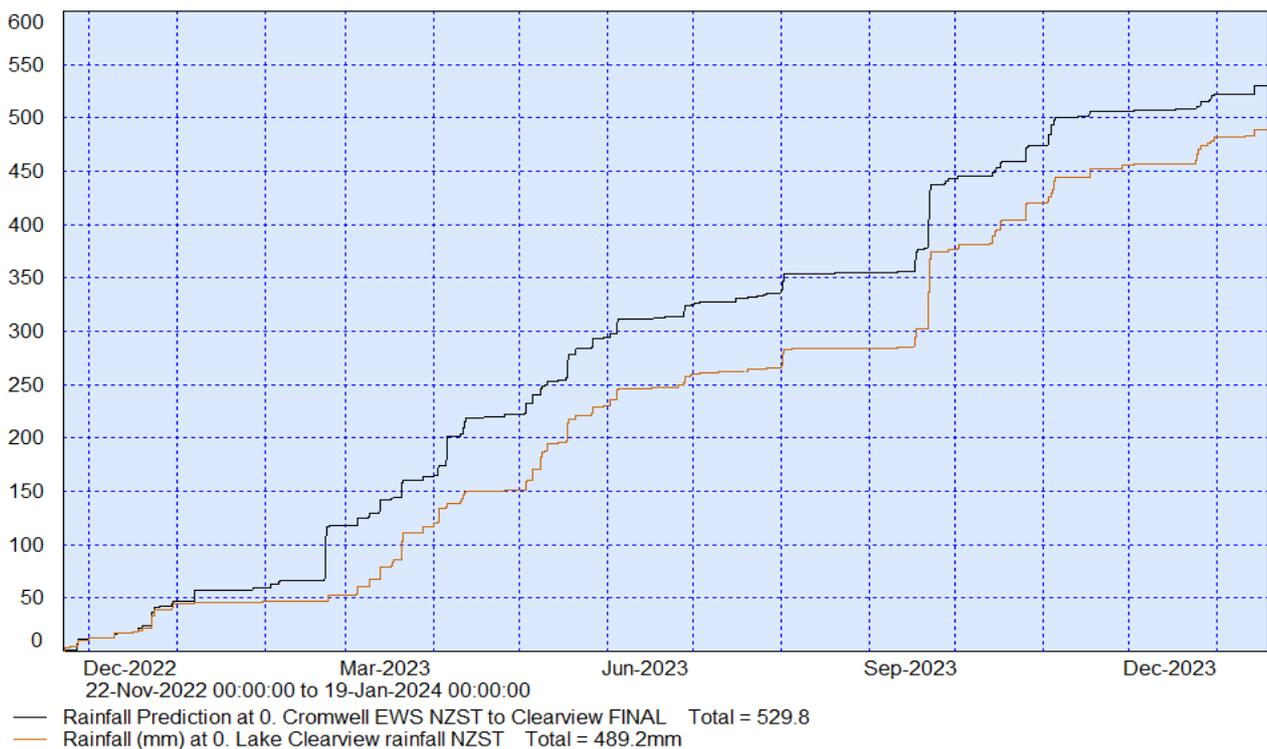


Figure 14: Modelled cumulative rainfall at Lake Clearview (black) with actual recorded data (brown) for the entire period there is concurrent data. (includes large rainfall anomaly in February 2023)

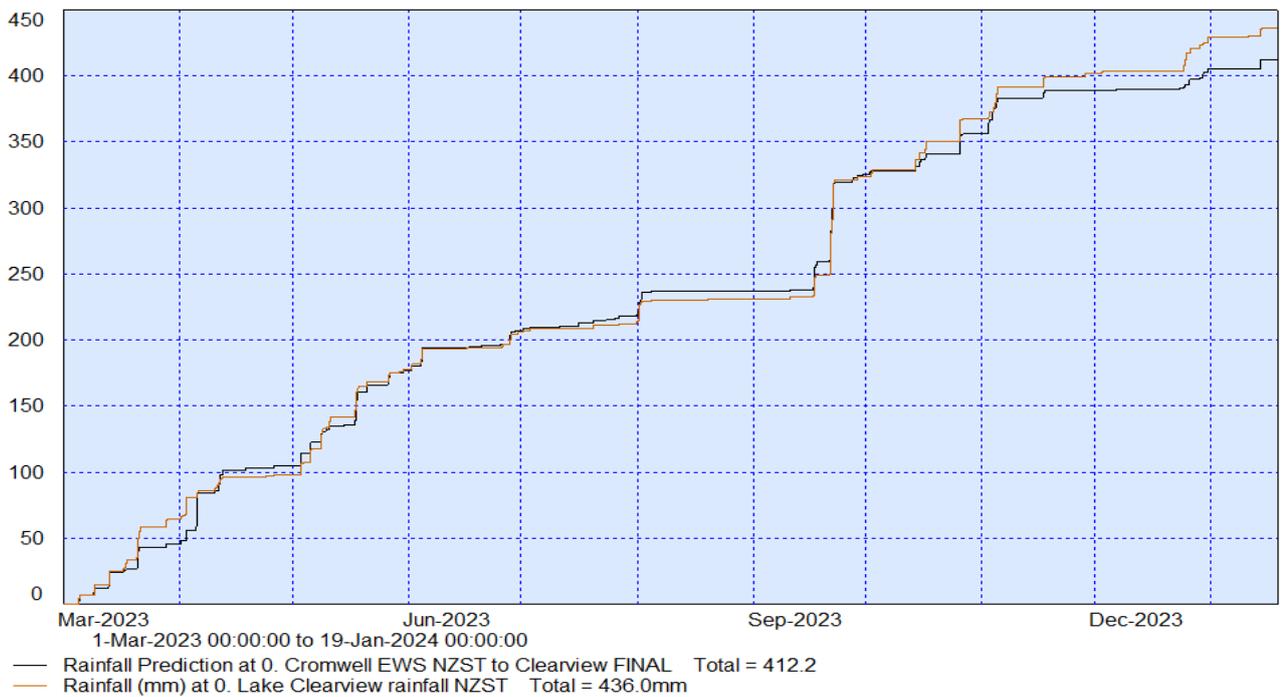


Figure 15: Modelled cumulative rainfall at Lake Clearview (black) with actual recorded data (brown) from 1/03/2023 to January 2024 – to exclude the large, likely misleading, anomaly in February 2023.

2. Regional comparison of average annual rainfall for Lake Clearview synthetic record with other sites in the vicinity, (to ensure the synthetic record is sensible with respect to location and altitude)

Figure 16 uses Box and Whisker plots to compare actual Lake Clearview rainfall, with that from gauges in closest vicinity. This is done the basis of each gauge’s relationship to Cromwell. Cromwell record spans over a long time, and so overlaps with all these gauges at different points in time. It is acknowledged here that there is a slight disparity between the current Cromwell EWS site and the former Cromwell sites, but the below comparison is still considered useful . Figure 16 suggest that in the longer term we would expect Lake Clearview cumulative rainfall (dark green) to be less than Tarras and Matakanui, similar to Bendigo 1 (the closest gauge to Clearview), and more than Bendigo2 and Lauder.

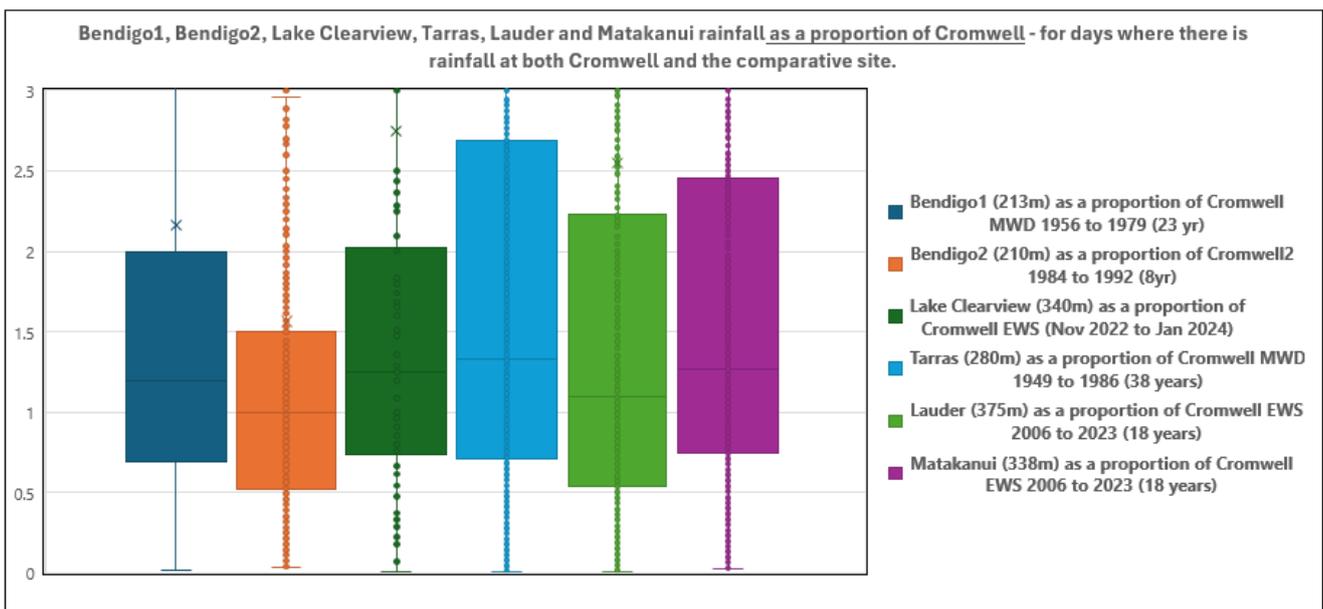


Figure 16: Box and Whisker plots of rainfall in the vicinity of Lake Clearview, expressed as a proportion of that received at in Cromwell.

The mean annual rainfall for the predicted Clearview record (2006 to 2024) is consistent in rank, to that which is expected (Table3). Therefore the model, over time, is not generating bulk rainfall totals at Lake Clearview that are inconsistent with adjacent sites. Where Figures 14 and 15 compared the modelled rainfall against actual, the comparison in Table 3 validates the 18 years of modelled rainfall in a more regional type context.

Table 3: Mean annual rainfall for gauges within vicinity of Lake Clearview.

<u>Mean annual rainfall for gauges within vicinity of Lake Clearview:</u>		
	Rainfall (mm)	Altitude:
Cromwell EWS	394	213m
Bendigo2	418	210m
Bendigo1	445	213m
Lauder EWS	452	375m
Predicted Lake Clearview (2006 to date)	463	340m
Tarras	472	280m
Matakanui (windward)	516	338m

3. Analysis of individual storm events should show the modelled data to be aligned with actual lake Clearview data.

This often was the case, but for some rainfall events the difference between modelled and actual was quite significant. This of course reflects the scatter of data points around the relationship used. This needs to be recognised as one of the **shortcomings of the model** - it replicates rainfall at a monthly and annual interval well, but **cannot be assumed to be 100% accurate day by day**. In terms of water management outcomes the model provides a robust estimate of the rainfall input into the catchment over time. Inaccuracies at a daily timestep must be assumed. However the inaccuracies are not considered positively or negatively biased (Figure 17)

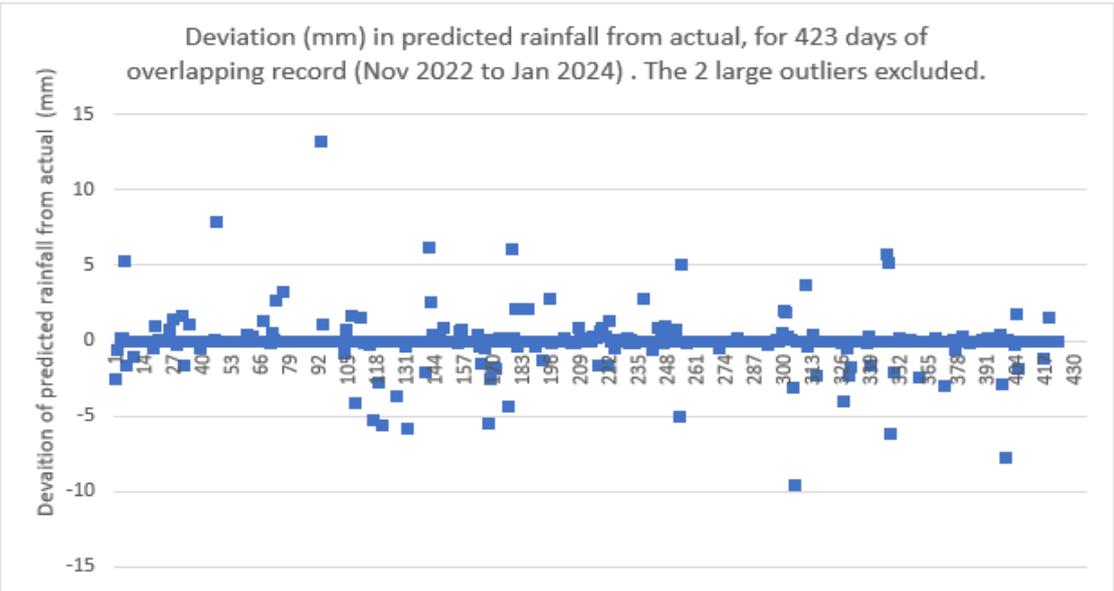


Figure 17: Millimetre difference between predicted and actual Lake Clearview rainfall.

8 Application of the synthetic data

The modelled data has been generated in Hilltop software at an hourly timestep and can be exported and supplied at any interval greater than this. It represents at-site daily rainfall estimates from 2006 to date at the Lake Clearview recorder site.

The estimate of catchment wide rainfall over the entire area of the Bendigo Project site is beyond the scope of this report. To date no delineation of the mine catchment area, and that area which is requiring water treatment, has been provided. However the Lake Clearview gauge shows a solid relationship to the higher two gauges (“Come In Time” and “Shreks”). Thus extrapolation of the synthetic Lake Clearview record across the entire catchment would be viable, and reasonably accurate.

It is noted here that the record from nearby Bendigo1 (see Figure 3) appeared to be closely aligned to that of Lake Clearview, albeit perhaps slightly less. Bendigo 1 record, which spans from 1956 to 1979, may be quite useful in terms of indicating likely number of annual rain days, rainfall variability etc. Climate change considerations would need to be kept at the forefront here though.

Unfortunately as only at a daily timestep the Bendigo1 record wouldn't be overly useful for extreme rainfall analysis, as storm durations of 12 hours or less are likely the most relevant with the small catchment area concerned.

9 Model refinement and data assessment for frequency analysis.

The predicted rainfall record for Lake Clearview can be further validated as more actual rainfall for Lake Clearview is collected. Documenting any site visits, issues with the gauge, change of calibration etc would be very useful. Then data can be more easily validated, and there would be better grounds for including or excluding outlier data. It may be that model could be improved by including more regressions based around wind direction; but it's questionable how many gains would be made by doing so.

The brief for this project also requested that a data assessment be made for storm analysis and design purposes at the Bendigo Project site. At the moment there is insufficient rainfall record to carry out rainfall frequency analysis directly on the Lake Clearview, “Come In Time” or “Shreks” rainfall record. At least ten years of data is really required here. However, there are other sites in the region that could be used to normalise the rainfall intensities that have been recorded thus far at the Matakanui Gold gauges. The location of these gauges can be found in Figure 4. Normalised estimates of rainfall intensity and frequency could still only be considered “indicative”, although the reliability of the estimates would improve as time goes on.

There are no further data requirements for storm design estimates, as the catchment is already well monitored. However an assessment of rainfall “concentration times”, using the current Matakanui Gold rainfall and flow data, is needed. By doing so intensity /frequency estimates can be made for durations that are likely to be the most damaging to infrastructure.

MEMORANDUM

TO	Hamish McLauchlan, Santana Minerals
FROM	Mandy Chater, Hydrology Consultant
CC	Ryan Burgess
DATE	4 th April 2024
SUBJECT	Estimated rainfall-altitude relationship, Bendigo Project Area
<p>Matakanui Gold Ltd requested that a relationship between rainfall and altitude at their Bendigo Project Area be established. This is for the purpose of integrating rainfall over entire catchment areas, and so requiring rainfall estimates for areas beyond the vicinity of the actual gauges.</p> <p>A relationship has been established based on rainfall from the 3 Bendigo project gauges, and on the Otago Regional Council's Cluden and Lauder Basin gauges for extending to higher altitudes.</p>	

In November 2022 three automated rain gauges were established in the Bendigo Project Area. Work has already been undertaken to create an estimated ten-year daily rainfall record for the lowest gauge (Lake Clearview). The likely expression of this ten year rainfall higher up in the catchment can be established from concurrent data for the 3 Bendigo gauges; and for the very highest portion of the catchment through the relationship between the nearby Cluden (357m) and Lauder Basin (1502m) gauges, which are run by Otago Regional Council. See Figure 1 for gauge locations.

Regression analysis showed that on a daily timestep the rainfall relationship between the respective Bendigo sites is inconsistent. The regressions tend to be clustered by non-rainfall days, and are susceptible to days where there is only rainfall at one site, or times when rain may fall as snow. Also, it could be seen that the temporal distribution of rainfall is inconsistent. Particularly, longer term rainfall totals at the higher sites tend to depend on a few anomalous storms where the rainfall at altitude is substantially higher (as opposed to a relationship which is constant across all rainfall events).

To establish the overall rainfall relationship between the respective Bendigo sites, monthly and annual running rainfall totals were calculated, to step away from the daily and weekly anomalies. Even monthly running totals were reasonably volatile, when compared to one another, still being affected by the daily inconsistencies discussed above. Therefore annual running total rainfall calculations were utilised. The annual running totals excluded the 21st and 22nd February 2023 record. Over these days all gauges in the region recorded significant rainfall (45mm+), but Lake Clearview only received 6mm. With its inclusion, this event dominated the subsequent ratio calculations for an entire year, and thus detracted from the likely rainfall relationships. The annual running rainfall totals for the 3 Bendigo sites are shown in Figure 2. The Shreks and "Come In Time" running totals are then expressed as a portion of the Lake Clearview running total in Figure 3.

The median value of the the Shreks/Lake Clearview running total is 1.11, and the median value for "Come In time"/"Lake Clearview" running total is 1.01. Encouragingly these values are very similar to the monthly running total calculations – where (since 1 April 2023) the median value for the Shreks/Cleaview ratio is 1.11 and the median value for the "Come In time"/Clearview is ratio 0.98. Being only 135m higher than Lake Clearview, the "Come In Time" gauge appears to receive little if any additional rainfall. Being 413m higher, the Shreks gauge shows a definite increase in rainfall rates.

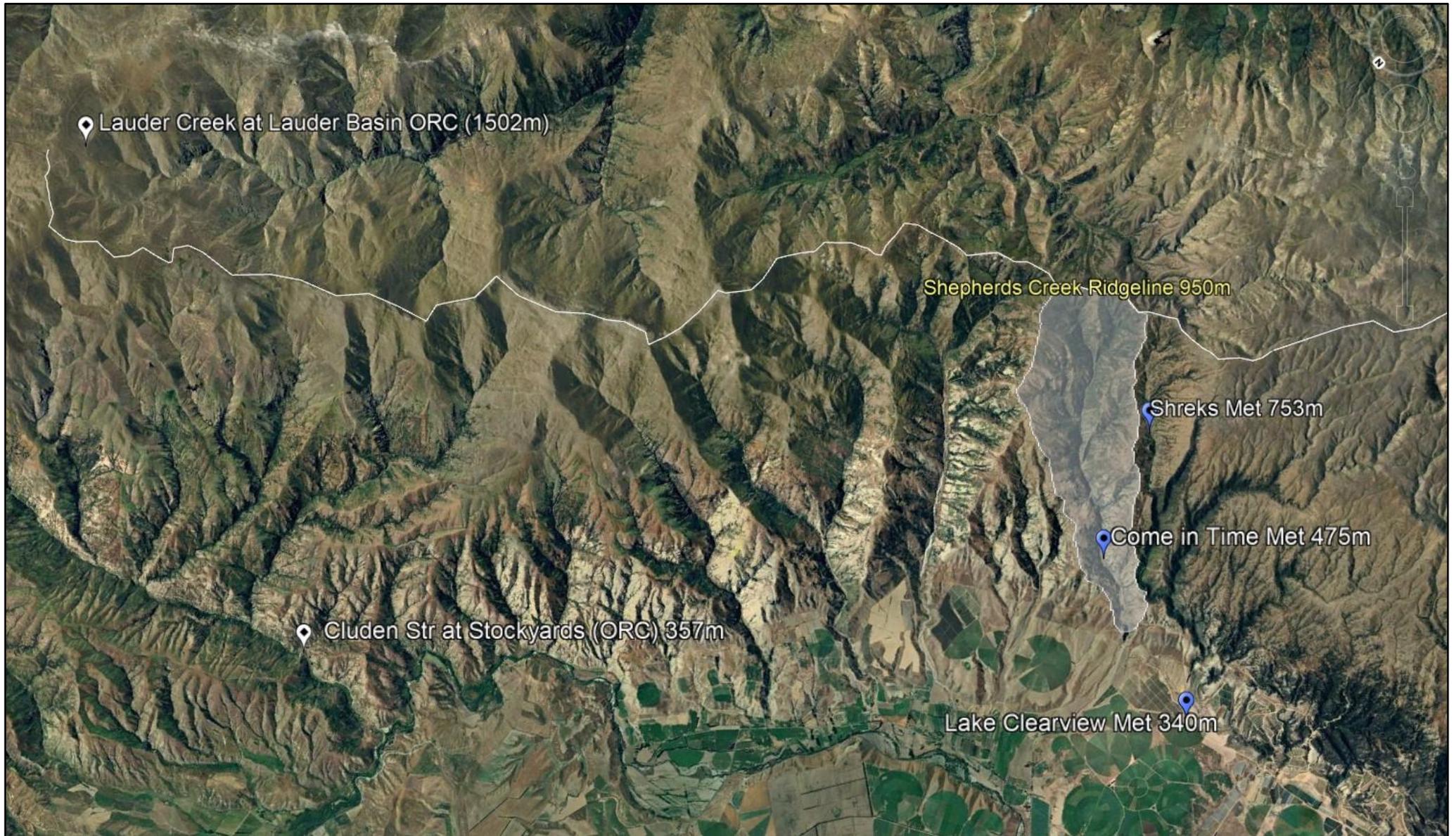


Figure 1: Location of Bendigo Project gauges, along with Otago Regional Council's "Cluden" and "Lauder Basin" gauges. The Bendigo Project catchment area extends to 950m.

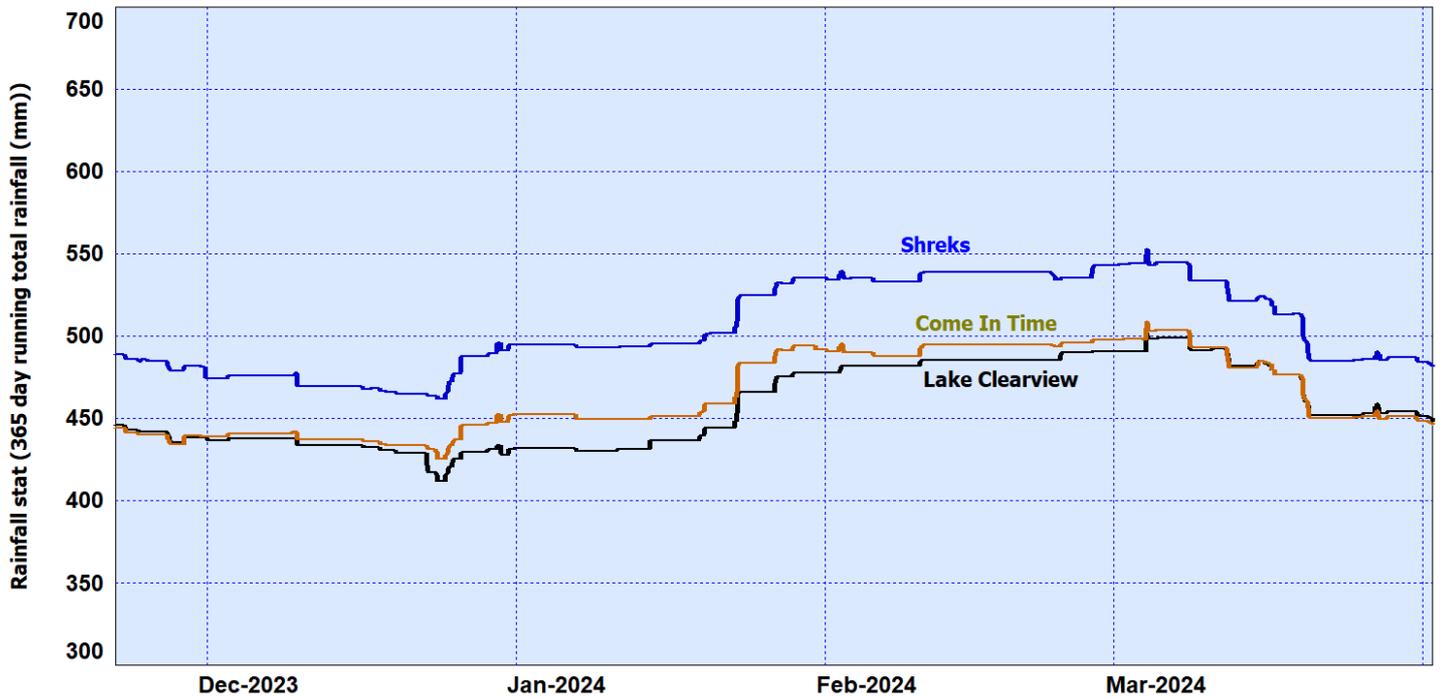


Figure 2: Annual running rainfall totals for 3 Bendigo project gauges.

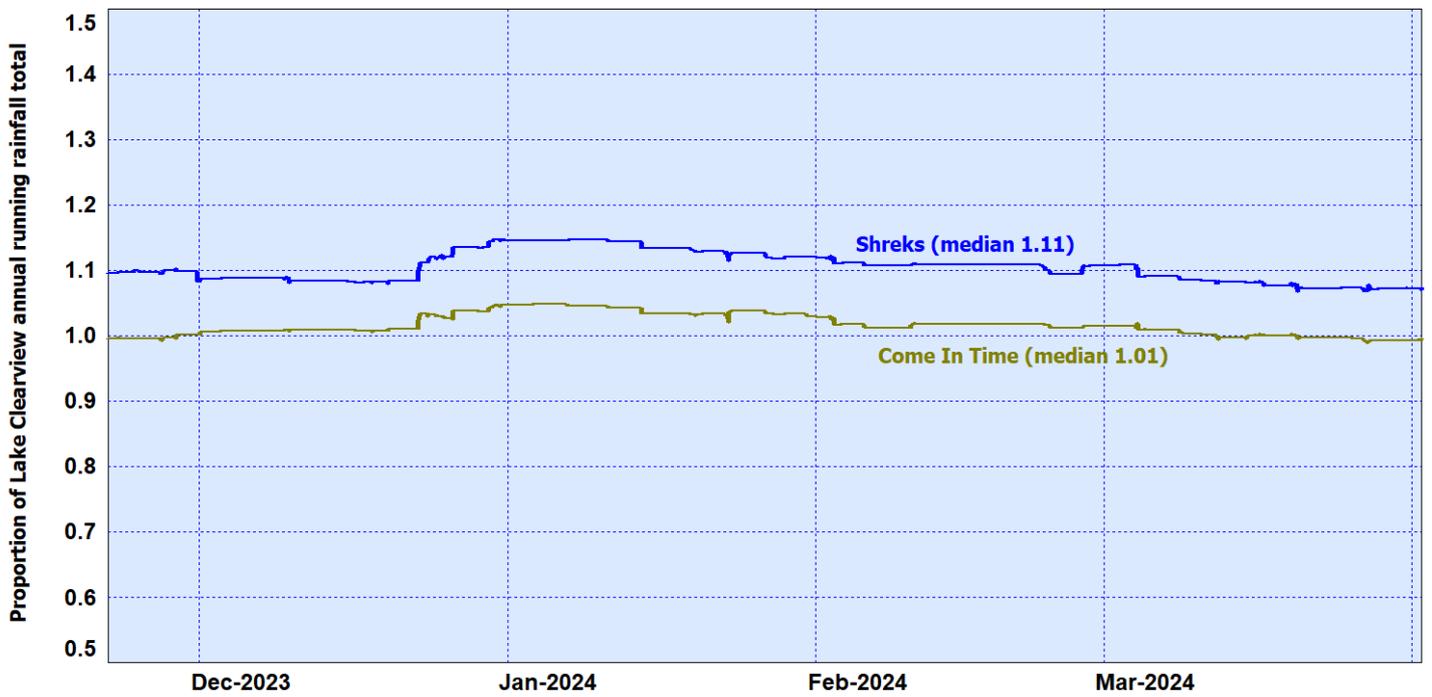


Figure 3: Shreks and “Come In Time” running annual rainfall totals, expressed at a proportion of Lake Clearview running annual rainfall total.

With the Cluden rain gauge (357m) being of very similar height to that of Lake Clearview gauge (540m), it could be compared to the much higher Lauder Basin gauge as way of extending the rainfall-altitude relationship above the Shreks gauge (753m). Cluden and Lauder Basin gauges are located about 18km to the north-east of the Bendigo gauges, but still within the Dunstan Mountain range. There is likely some disparity in the Cluden-Lauder Basin rainfall relationship, to that in the Bendigo Project Area, due to localised topographic effects. However the Cluden to Lauder Basin relationship is only needed to help to extend the relationship from Shreks gauge to the top of the Bendigo project catchment area (950m) – so is considered useful in this case.

The same annual and monthly running total approach was taken – with Lauder Basin then being expressed as a proportion of Cluden. The respective median values of those comparisons were 1.51 and 1.58. The traces did show more fluctuation, which is to be expected due to the larger altitudinal difference, and the sites being offset horizontally but about 5km. For this reason daily rainfall correlation was also considered. In this snowfall was obvious by a number of days in winter where rainfall occurred at Cluden not at Lauder Basin. June to September months were removed, along with non-rainfall days and the correlation was repeated. The paired data showed a lot of scatter, but a fitted linear regression indicated Lauder basin rainfall to be approximately 1.198 times that of Cluden. It is thought here that, again, a few large isolated storms have a large bearing on the overall totals received at Lauder Basin – explaining the lower ratio (to Cluden) produced by daily regression.

Of these 3 separately derived ratios the highest (1.58) and lowest (1.198) were added to the plot in Figure 4, along with an average value of 1.389. This was done to support (or otherwise) a linear fit through the Bendigo Project data alone (Clearview, Come In Time and Shreks). The polynomial curve, fitted through all the available data points, was used to calculate a likely amount of rainfall at ridgeline (950m). This calculation is shown as a green dot in Figure 4 and is fairly consistent with linear regression at 950m.

It is recommended that that the polynomial equation in Figure 4 be adopted as a means of calculating rainfall at different altitudes across the Bendigo Project area. Due to storm variability the relationship cannot always be considered accurate for a daily or lesser intervals.

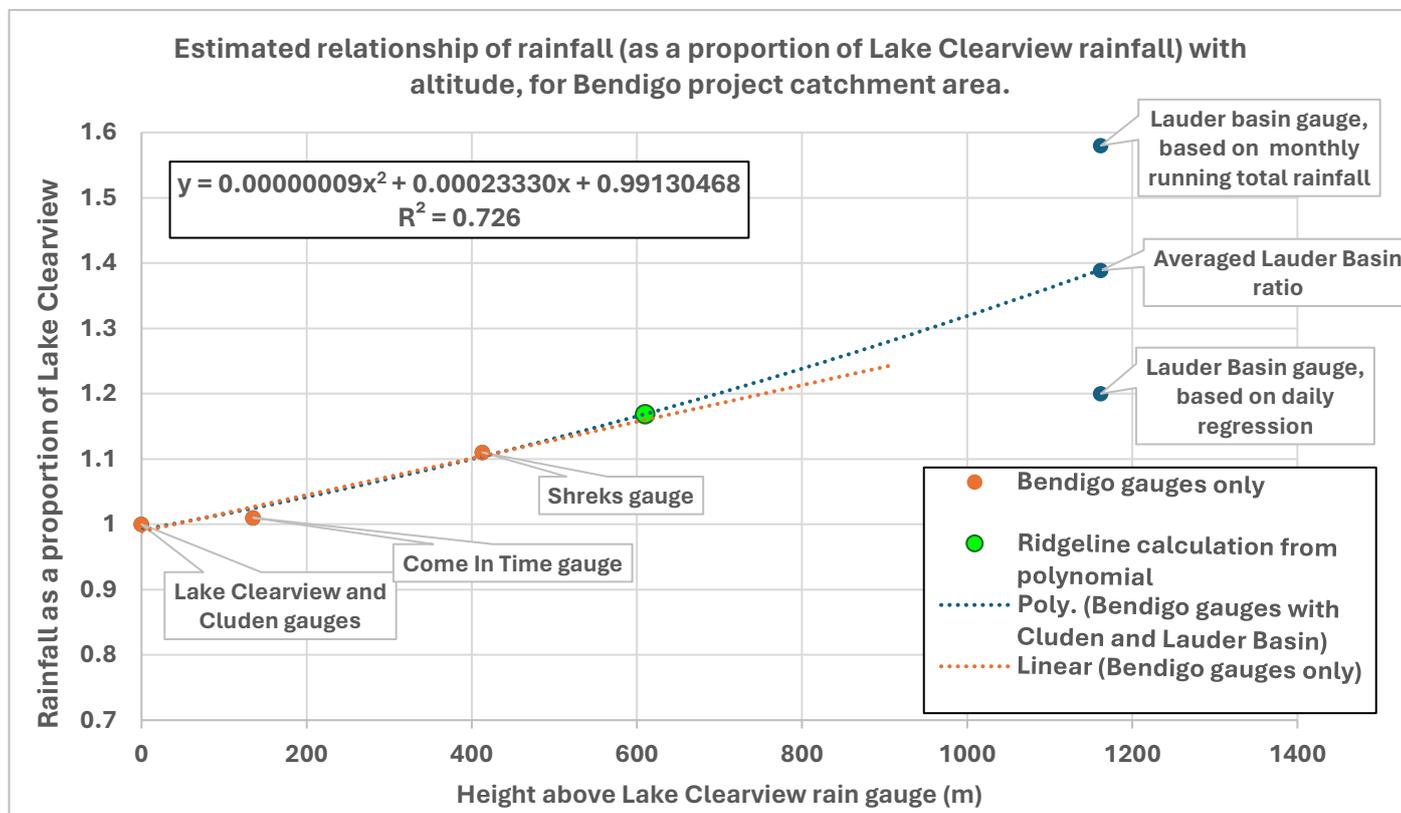


Figure 4: Estimated rainfall-altitude relationship in the Bendigo project area.

MEMORANDUM

TO	Hamish McLauchlan, Santana Minerals
FROM	Mandy Chater, Hydrology Consultant ¹
DATE	August 2024
SUBJECT	Extension of synthetic rainfall time series, Bendigo Project

Synthetic rainfall for the Bendigo ‘Lake Clearview Site’ has been extended back to 1949. This follows an initial extension of the data back to 2006 using rainfall and wind direction from “Cromwell EWS”. The procedure for this initial extension is documented in “Development of a synthetic rainfall database at Bendigo”.

The extension back to 1949 uses slightly less reliable rainfall inputs, and does not consider wind direction like the “back to 2006” extension. However, comparison with long term rainfall records in the region indicate the synthetic rainfall back to 1949 is sensible, and consistent with patterns at other gauges. This is especially where monthly or annual rainfall is concerned. Predicted rainfall on any given day though has less reliability.

This memo details how the record was extended back from 2006 to 1949, and builds on the detail already supplied the “Development of a synthetic rainfall database at Bendigo” memo.

1. Mandy Chater, MSc (Geography). 20+ years’ experience in hydrological analysis and environmental science (NIWA, Environment Canterbury, West Coast Regional Council, Solid Energy/Bathurst Resources)

1 Data Inputs

Figure 1 and Table 1 below recap the use of Cromwell rainfall for creating synthetic rainfall data at Lake Clearview; based on vicinity and data availability.

The initial extension was limited back to 2006 only for the following reasons;

- 18 years of reliable synthetic record could be produced from Cromwell EWS, where the brief requested that ten years or more of reliable daily record, for model and water management purposes, be developed.
- Cromwell EWS rainfall showed to have a good workable correlation to that at Lake Clearview, but the record from "Cromwell EWS" was not consistent with the predecessor sites "Cromwell MWD" and "Cromwell 2".
- Wind direction record at Cromwell starts in April 2006, the same time as the Cromwell EWS rainfall record begins.

With a longer length of record now requested, it was chosen to continue with the use of Cromwell rainfall as a surrogate, but the points on the availability of wind direction data, and the inconsistency between the Cromwell gauges, needed to be addressed.

The 2006 to 2023 synthetic rainfall data was generated from 2 regressions - which were applied to the Cromwell data depending on wind direction. The slope of the regressions proved to be different depending on storm direction, so the use of the wind direction allowed rainfall to be supposedly predicted with better accuracy (on a day to day basis). The regression in Figure 2, which is on all "Cromwell EWS versus Lake Clearview" daily rainfall (so no storm direction consideration), has a slope of 1.1975. The slope of the south-east storm regression was 1.310 and of the north-west storm regression was 1.062. Therefore the application of the "all data" slope of 1.1975 did produce overall rainfall totals similar to those produced by the two "direction dependent" regressions. So for the purpose of deriving rainfall totals it was deemed that excluding the direction component was appropriate; but recognising that the predicted record prior to 2006 was likely to be less accurate on a day to day basis.

A relook at the rainfall data confirmed the inconsistency between the Cromwell EWS and Cromwell 2 rainfall data – where they overlap (April 2006 to July 2007). Grid locations show the Cromwell MWD, Cromwell 2 and Cromwell EWS sites to be within 100m of one another. As it is available at hourly time steps, the Cromwell EWS (electronic weather station) data is obviously from an automated gauge; whereas MWD and Cromwell 2 data is very likely from manual daily readings. For this reason, the Cromwell EWS data is considered the more accurate record. (The Cromwell 2 and earlier Cromwell MWD data, where they overlap, is virtually the same)

Figure 3 below expresses the Cromwell EWS rainfall as a proportion of Cromwell 2 – showing the former to read slightly lower than the latter most of the time. The largest discrepancies are for daily rainfall less than 3mm, where the discrepancy is inflated and not of great relevance from a water resource point of view. However, even for the larger events there is a bias in the data comparison. This bias needed to be addressed to make a continuous surrogate dataset, to which the Cromwell EWS V Lake Clearview regression could then be applied. **The Cromwell2 and Cromwell MWD rainfall record was therefore multiplied by 0.9** – as this correction resulted in the total Cromwell 2 data matching the total Cromwell EWS data – for the period which they overlap.



Figure 1: Gauges that were considered for the initial development of “Lake Clearview” synthetic rainfall record.

Table 1: Sites with daily rainfall record in near vicinity to Bendigo Project gauges - CliFlo database

denotes potential primary regression site - data overlaps with Matakanui Gold records (Nov 2022 onwards).
 denotes secondary site of interest due to vicinity or length of record

Agent Number	Name	Start Date	End Date	Percent	Dist km	Agent Number	Name	Start Date	End Date	Percent	Dist km
				Complete	(from Lake Clearview Met)					Complete	(from Lake Clearview Met)
5243	Bendigo 2	1/05/1978	31/05/1992	100	3.3	5229	Lindis Pass	1/11/1947	31/08/1948	100	27.4
5242	Bendigo 1	1/01/1956	30/06/1979	100	3.6	5522	Waitiri Stn	1/01/1954	31/12/1968	70	28
5241	Mt Pisa Station	1/05/1908	31/05/1924	90	6.1	5540	Bannockburn	1/07/1971	30/04/2018	90	28.7
5233	Lochar	1/04/1947	31/03/1956	80	6.8	5544	Ophir 2	1/04/1924	30/11/2023	90	28.9
5234	Queensbury Ews	1/11/1978	31/05/1992	100	6.9	5223	Wanaka	1/09/1927	31/08/1990	100	29.1
5236	Tarras	1/01/1902	31/07/1986	80	12.2	5230	Geordie Hill	1/05/1987	31/01/1990	80	29.1
5528	Northburn	1/11/1978	31/05/1992	100	12.5	5546	Ophir 1	1/11/1914	31/01/1931	20	29.2
5228	Willowbank	1/11/1953	30/06/1963	90	16.1	5543	Clyde Dam	1/05/1978	30/06/2007	100	29.4
26381	Cromwell Ews	6/04/2006	17/01/2024	100	16.7	5535	Lauder Ews	20/08/1985	17/01/2024	100	29.6
5529	Cromwell 2	1/07/1984	31/07/2007	100	16.8	43486	Lauder Raine Ews	29/04/2016	4/12/2023	100	29.6
5526	Cromwell M.W.D.	1/06/1949	30/06/1985	100	16.8	5537	Lauder Flat	1/01/1945	30/11/2023	100	29.6
5524	Cromwell Sub Stn	1/04/1976	31/10/2023	20	19.3	5249	Lauder Station	1/01/1987	31/01/1990	100	29.6
5530	Matakanui	1/05/1947	31/12/2021	100	19.6	5541	Clyde, Fraser St	1/08/1986	30/09/1989	90	29.6
5523	Ripponvale	1/09/1925	31/03/1961	100	20.5	5216	Albert Town	1/12/1970	11/08/1972	100	29.6
5225	Luggate	30/06/1913	28/02/2006	90	22	41237	Wanaka Cws	29/10/2015	15/01/2024	100	29.7
5240	Upper Meg Power Stn	1/05/1953	31/05/2013	100	23.3	5532	Lauder Pel	1/08/1981	31/05/1986	100	29.7
7426	Wanaka Aero Aws	30/04/1992	16/01/2024	100	24	5531	Lauder	1/11/1947	31/03/1965	100	30
5227	Lagoon Valley	1/01/1949	31/08/1964	100	25.4	5217	Wanaka, Park Hq	5/09/1990	31/01/1994	100	30.1
5231	Merrivale	21/04/1953	31/05/1963	100	25.4	39564	Clyde 2 Ews	25/05/2011	17/01/2024	100	30.8
5224	Mt Barker	1/01/1967	31/01/2011	90	26.1	5220	Maungawera	1/10/1915	30/04/1944	90	30.8
5232	Cardrona	1/01/1948	31/12/2014	100	26.2	26567	Lauder 2	1/01/2000	31/03/2023	100	31.1
5542	Clyde	1/08/1973	31/10/1977	90	26.4						

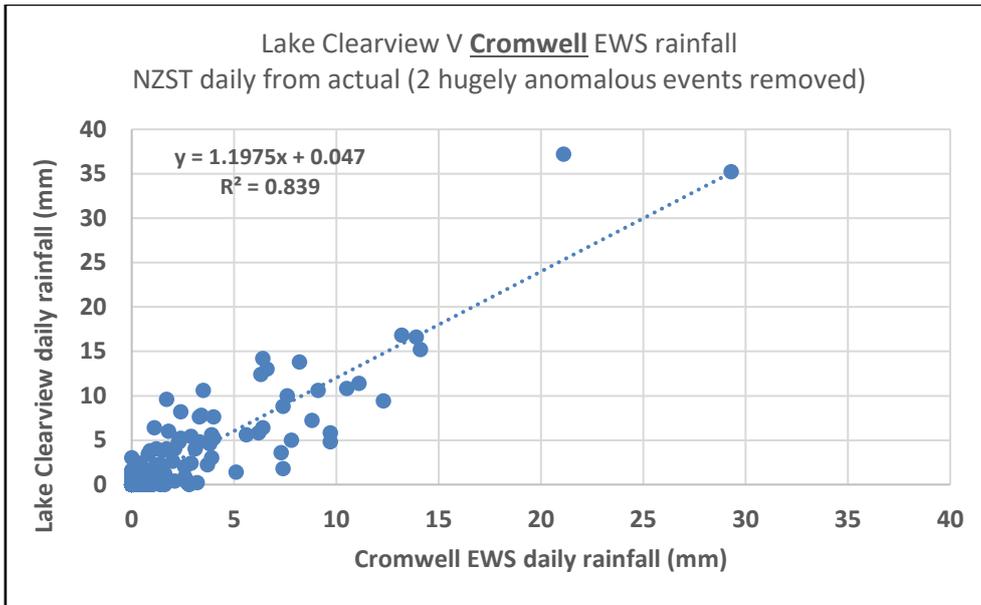


Figure 2: Regression between Lake Clearview and Cromwell EWS rainfall (All data)

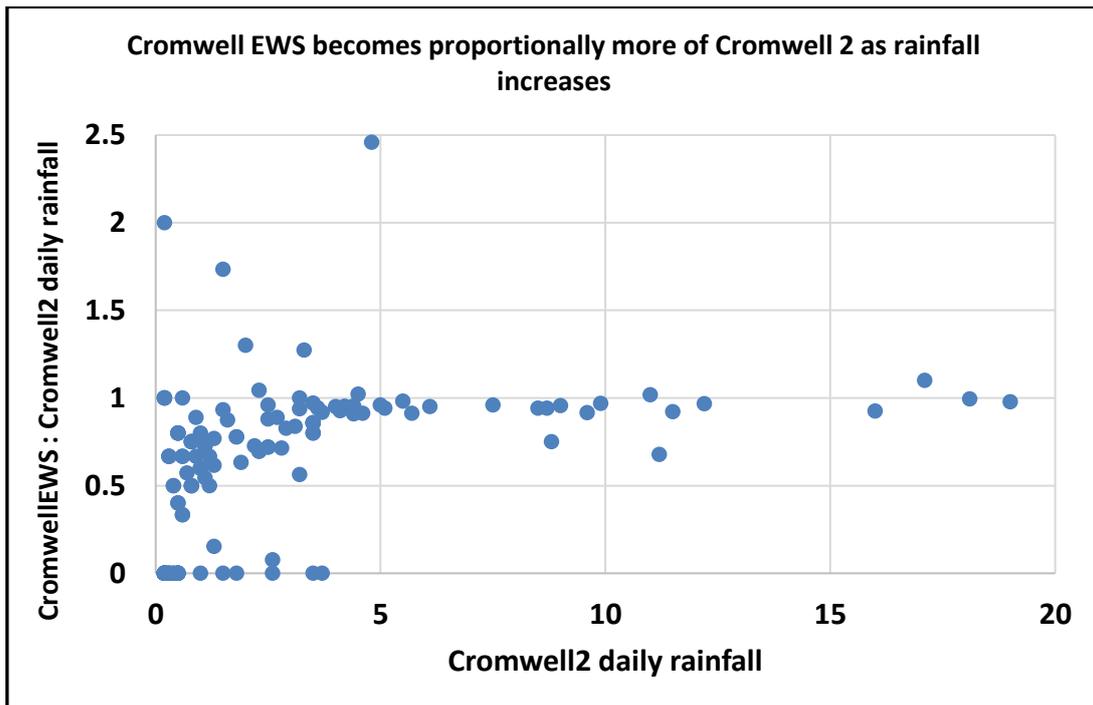


Figure 3: Cromwell EWS rainfall expressed as a proportion of Cromwell2 rainfall (for overlapping data, April 2006 to July 2007)

2 Data Quality Assurance (QA)

A QA check on Cromwell2 and Cromwell MWD was undertaken across their length of record. Rainfall from these stations was plotted cumulatively with concurrent data from Tarras, Matakanui and Lauder Flat. The comparison showed consistent relationships (Figures 4 and 5). The comparative plots were then fine combed at a 6-month interval. Although there were inevitable discrepancies, none of them would constitute as erroneous data. A script was run to check if there was any missing record across the entire dataset (i.e time step of over one day between values). A few missing days were found at Cromwell 2 - but by which time the gauge was running concurrently with Cromwell EWS.

The QA check incidentally highlighted quite a lot of missed daily readings at the other comparative sites (Lauder Flat and Tarras). This further validates the continued use of Cromwell data - being from a gauge that appears to have been read very consistently by staff at Ministry of Works and Development, and its' successors.

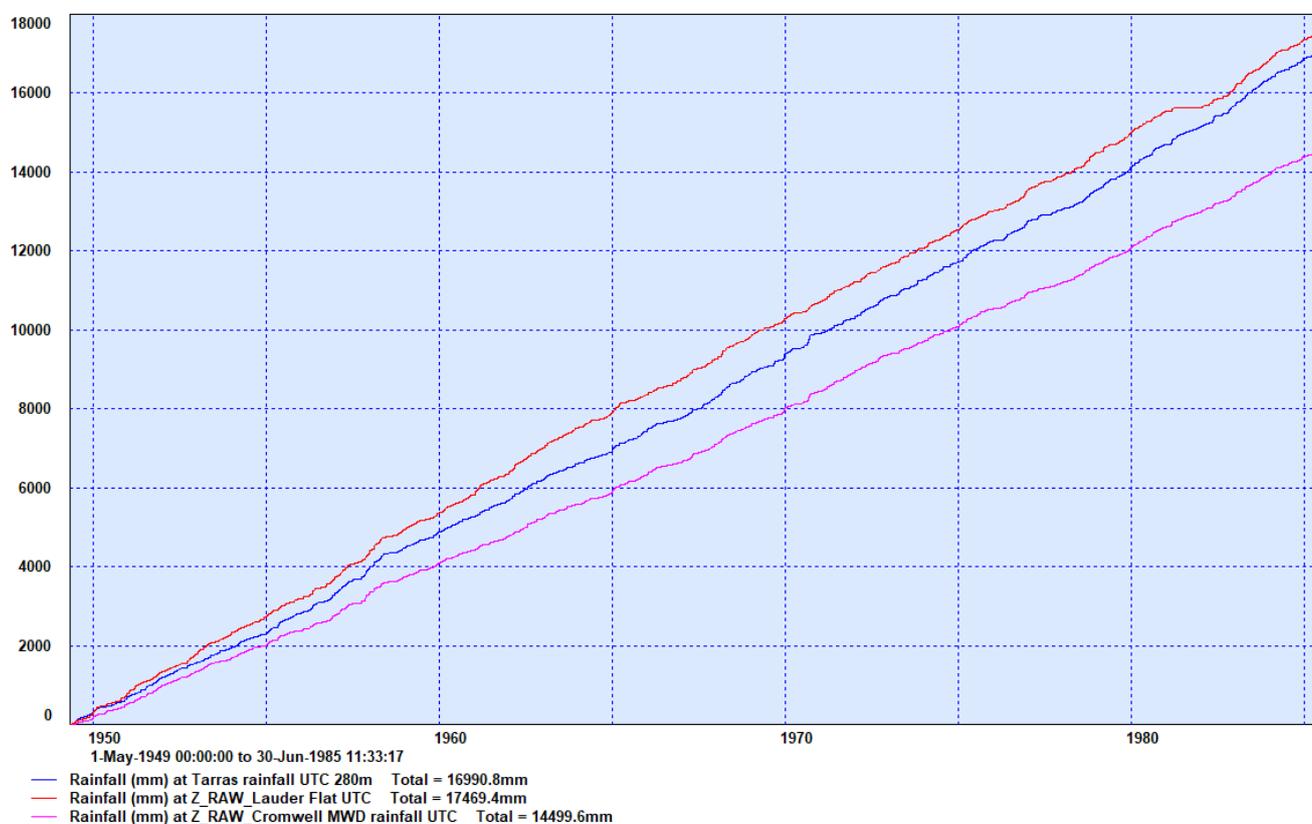


Figure 4: Cromwell MWD rainfall plotted cumulatively with Tarras and Lauder Flat (a period of missing record at Lauder Flat in 1981 presents as a flat line)

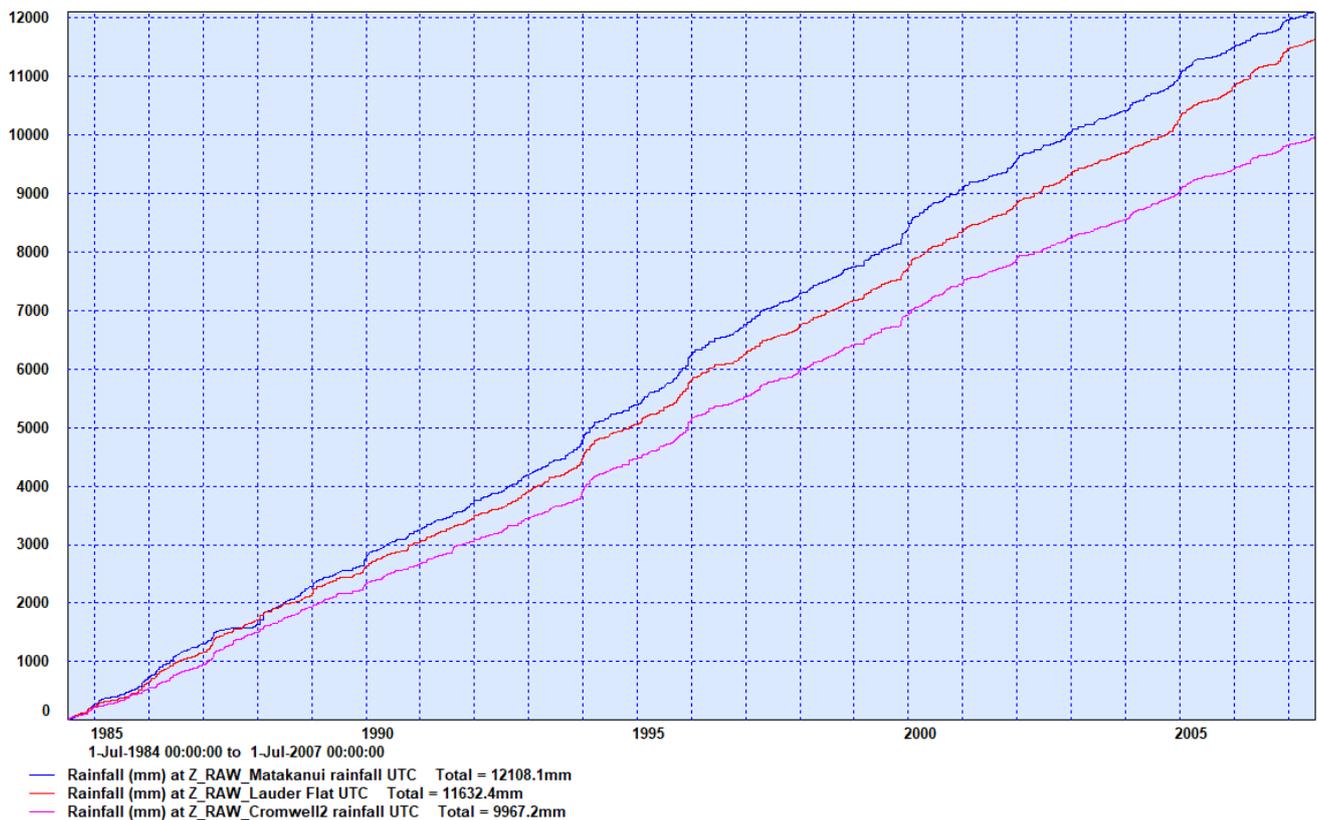


Figure 5: Cromwell2 rainfall plotted cumulatively with Matakanui and Lauder Flat

3 Generation of synthetic rainfall record

With the QA checks proving Cromwell data back to 1949 to be complete record, the regression slope of 1.1975 was applied to the “Cromwell MWD x 0.9” and “Cromwell 2 x 0.9” data - to generate estimated daily record for Lake Clearview. The predicted records for Lake Clearview were then amalgamated into one continuous data record. Record generated from Cromwell EWS was used as a priority over that generated from Cromwell 2 (for the period that both gauges were running); and the record derived from Cromwell EWS was that using the 2 different regressions dependent on wind direction (April 2006 to 2023)

Figure 6 shows the entire synthetic rainfall record for Lake Clearview, plotted cumulatively. This synthetic rainfall record can be readily exported to excel at a daily timestep, or greater.

Table 3 shows there has been little change in the mean annual rainfall of the predicted data whether the initial 2006 to 2023, or the extended 1950 to 2023 record is used. Lauder Flat, like “Clearview predicted”, also produces a lower mean annual rainfall value using the 1950 to 2023 record. (That trend at Matakanui is the opposite, but being windward to southeast storms Matakanui may not be representative of trends at Lake Clearview).

Ten-year return period estimates of annual rainfall minima, calculated from the two respective lengths of record, were found to be similar. However annual rainfall maxima results did show a bit of difference (specifics beyond the scope of this memo). What is noticeable is the larger variability in annual rainfall, at Cromwell, and so in the Lake Clearview predicted record, since about the mid 1990s . See Figure 7.

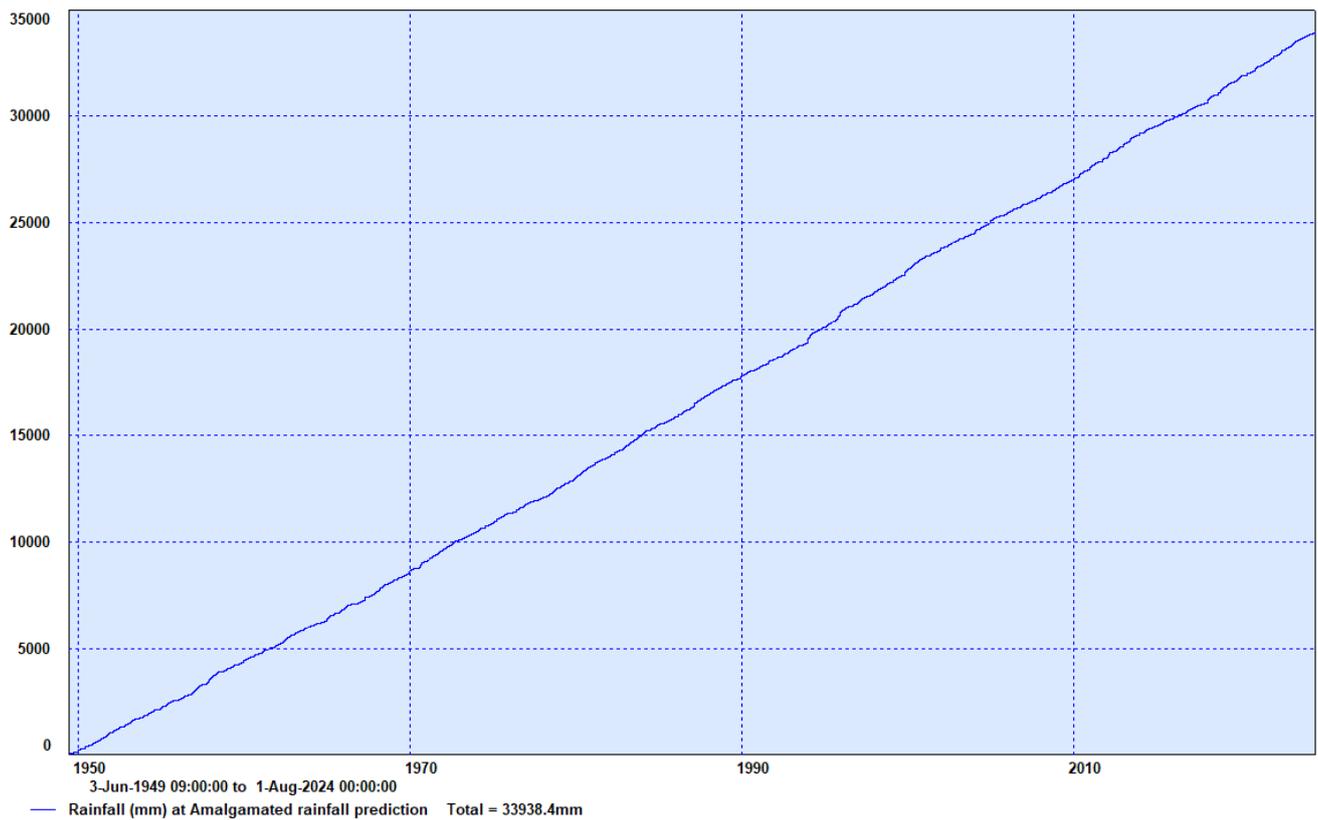


Figure 6: Modelled rainfall data for Lake Clearview 1949 to 2023

Table 3: Mean annual rainfall for gauges within vicinity of Lake Clearview.

<u>Mean annual rainfall for gauges within vicinity of Lake Clearview:</u>		
	Rainfall (mm)	Altitude:
Cromwell EWS	394	213m
Bendigo2	418	210m
Bendigo1	445	213m
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Predicted Lake Clearview (2006 to 2023)	463	340m
Predicted Lake Clearview (1950 to 2023)	450	340m
Matakanui (windward)	516	338m

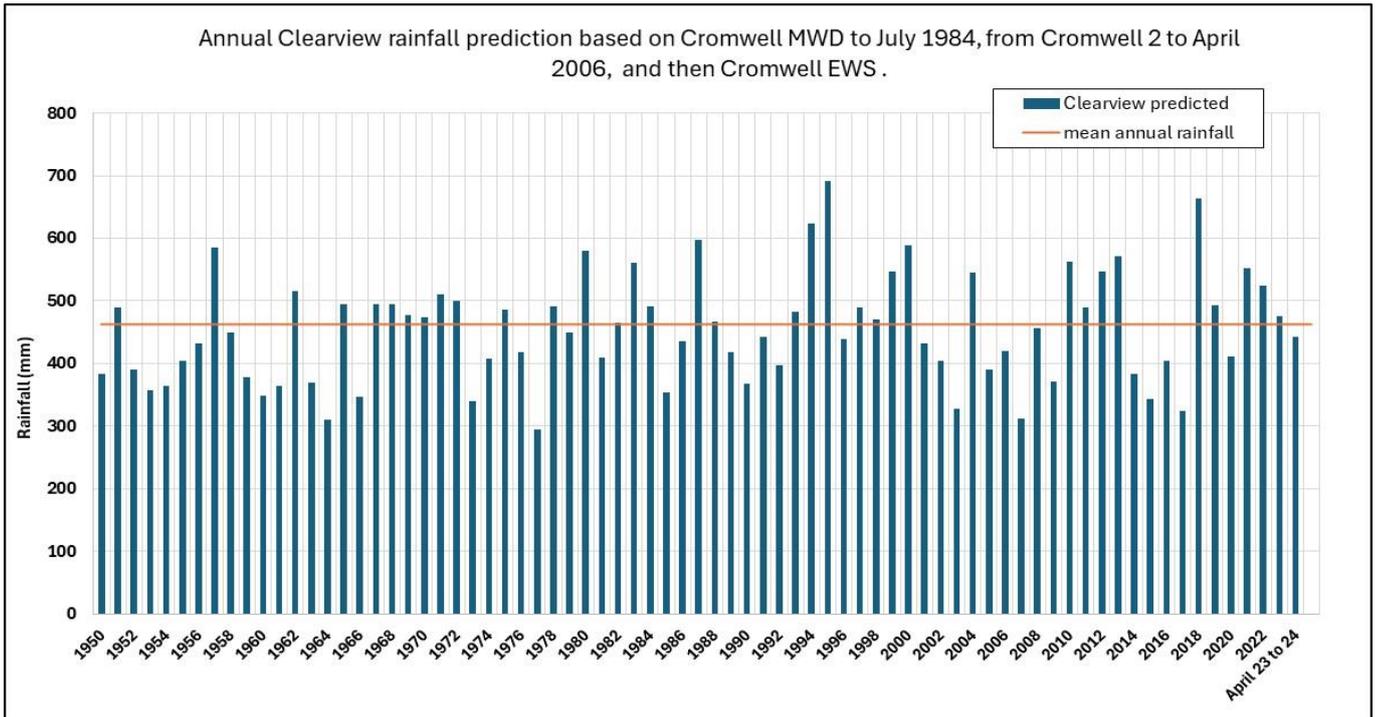


Figure 7: Annual Lake Clearview rainfall estimates from successive Cromwell gauge sites.

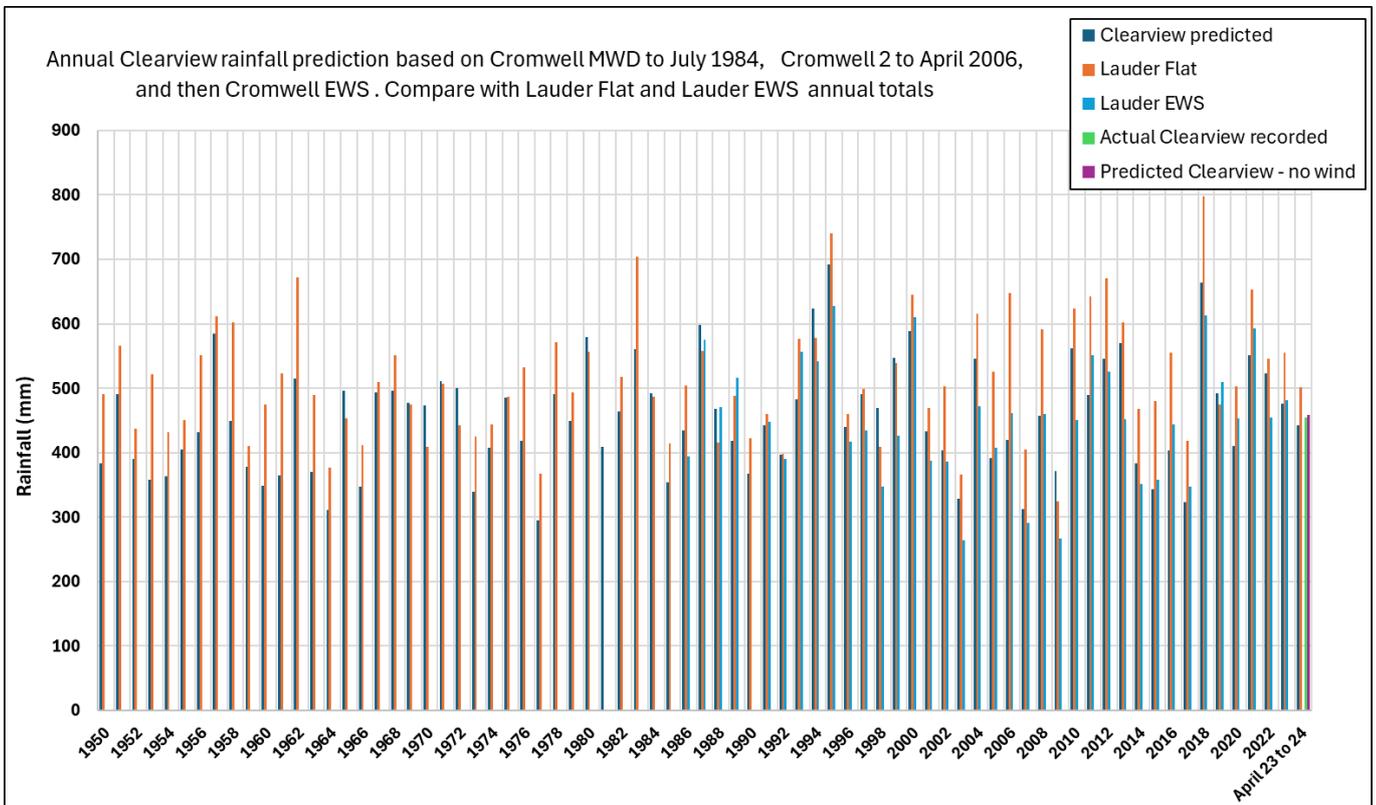


Figure 8: Annual Lake Clearview rainfall estimates from successive Cromwell gauge sites, with adjacent gauges at Lauder

APPENDIX C SURFICIAL MIW WATER QUALITY MODEL RESULTS

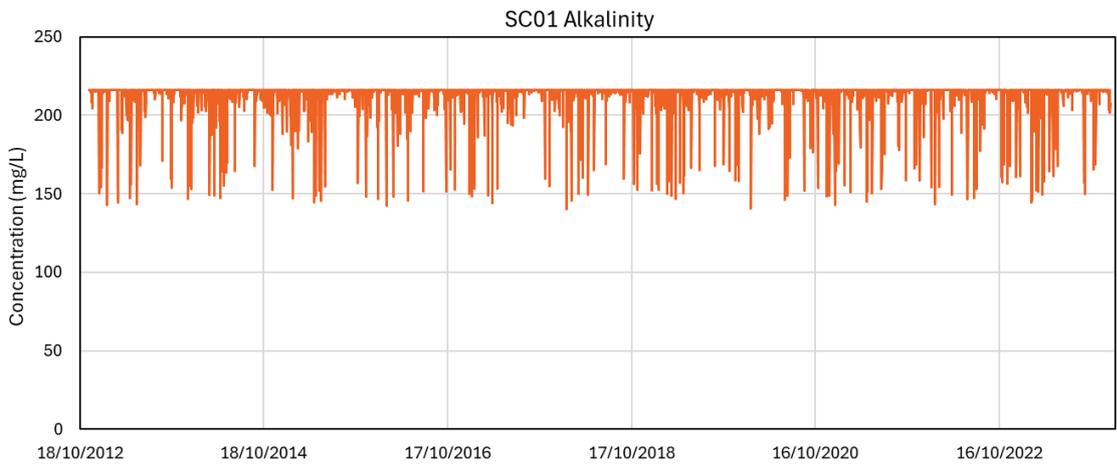


Figure 1: Calculated alkalinity concentrations for SC01. Note Bore water and pit sump water dust suppression have the same source term.

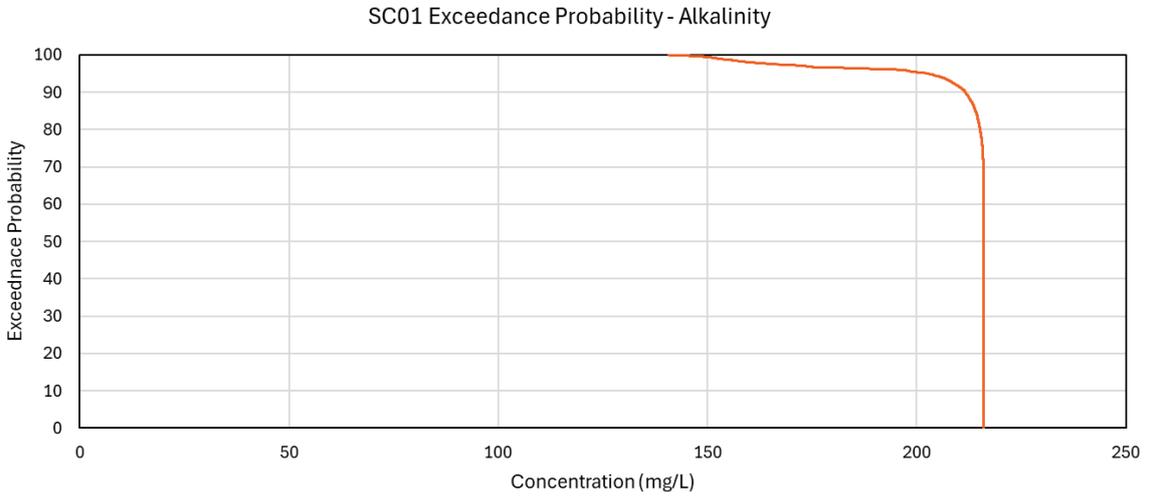


Figure 2: Exceedance probability – alkalinity in SC01.

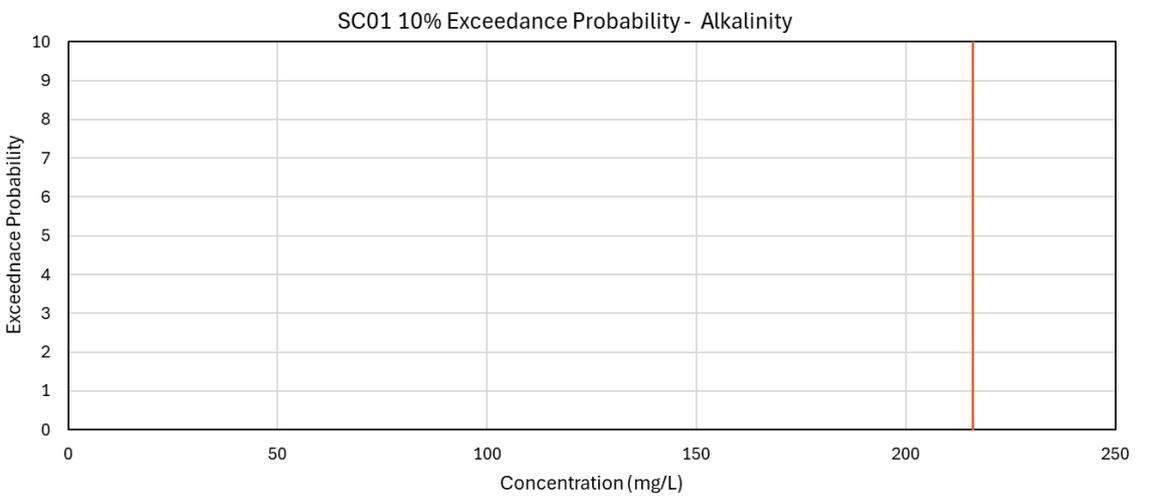


Figure 3: Top 10% exceedance probability for alkalinity in SC01.

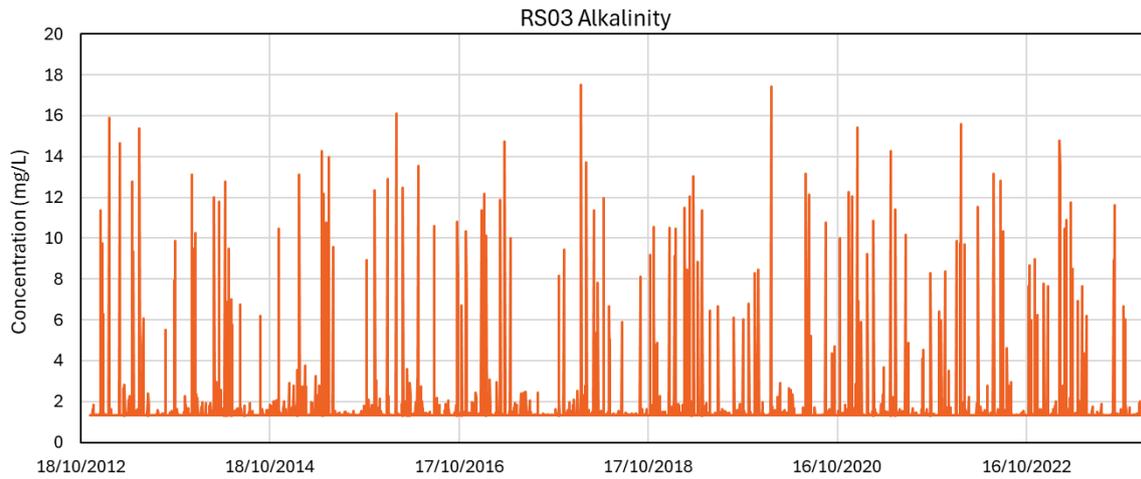


Figure 4: Calculated alkalinity concentrations for RS03. Note Bore water and pit sump water dust suppression have the same source term.

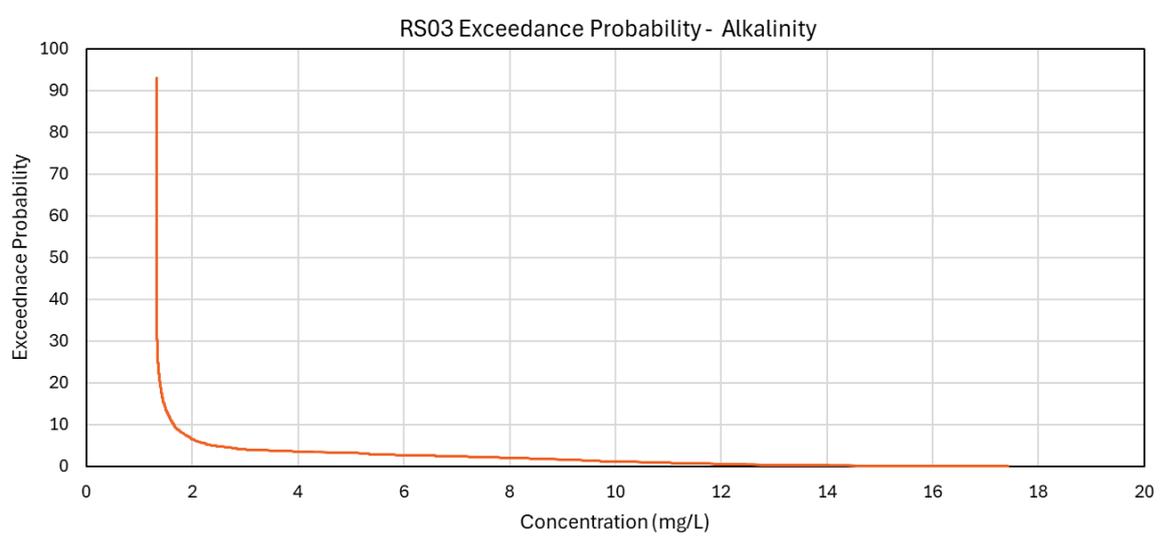


Figure 5: Exceedance probability – alkalinity in RS03.

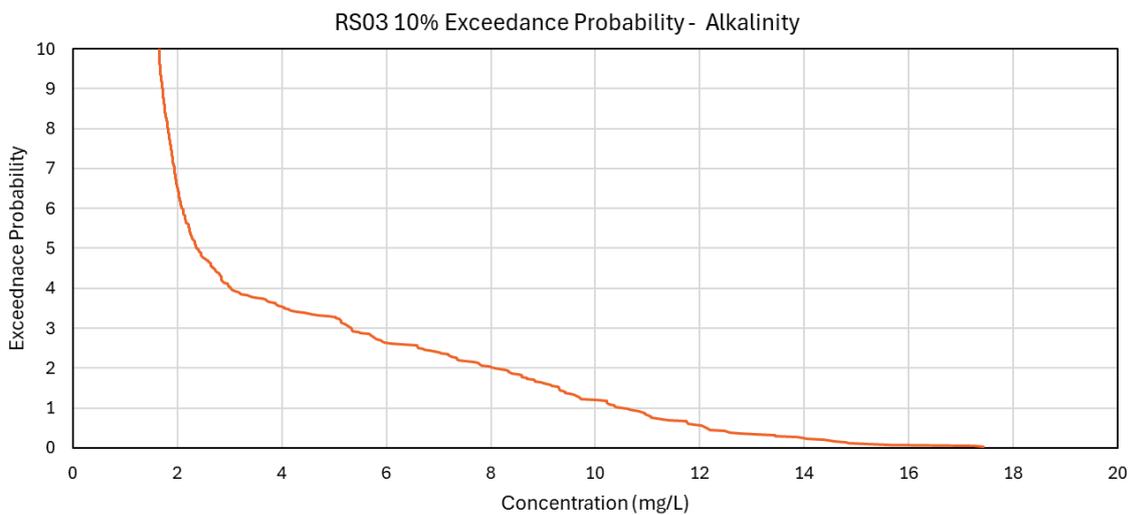


Figure 6: Top 10% exceedance probability for alkalinity in RS03.

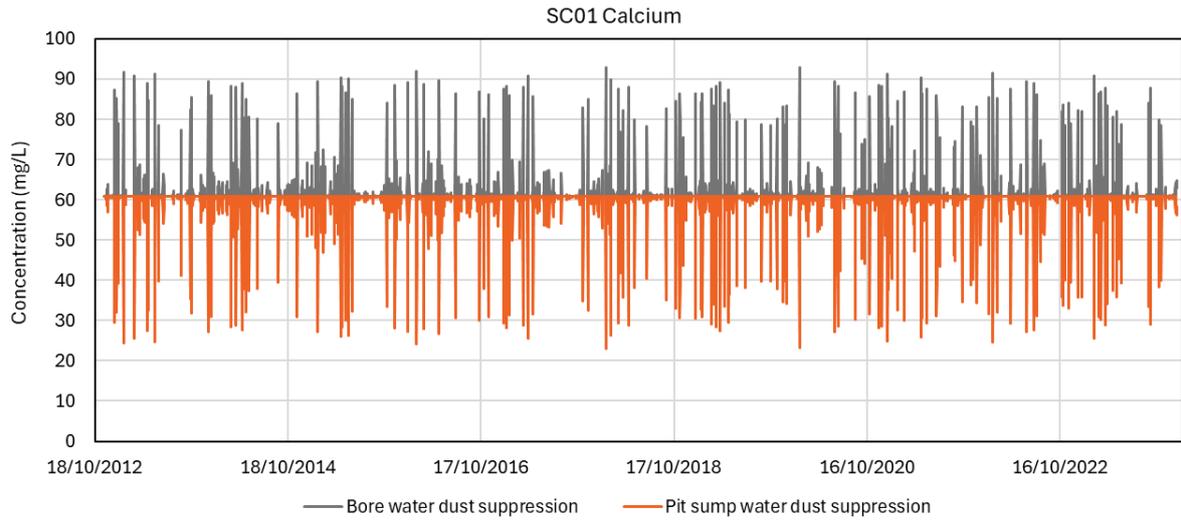


Figure 7: Simulated calcium concentrations in SC01 for bore water and pit water dust suppression scenarios.

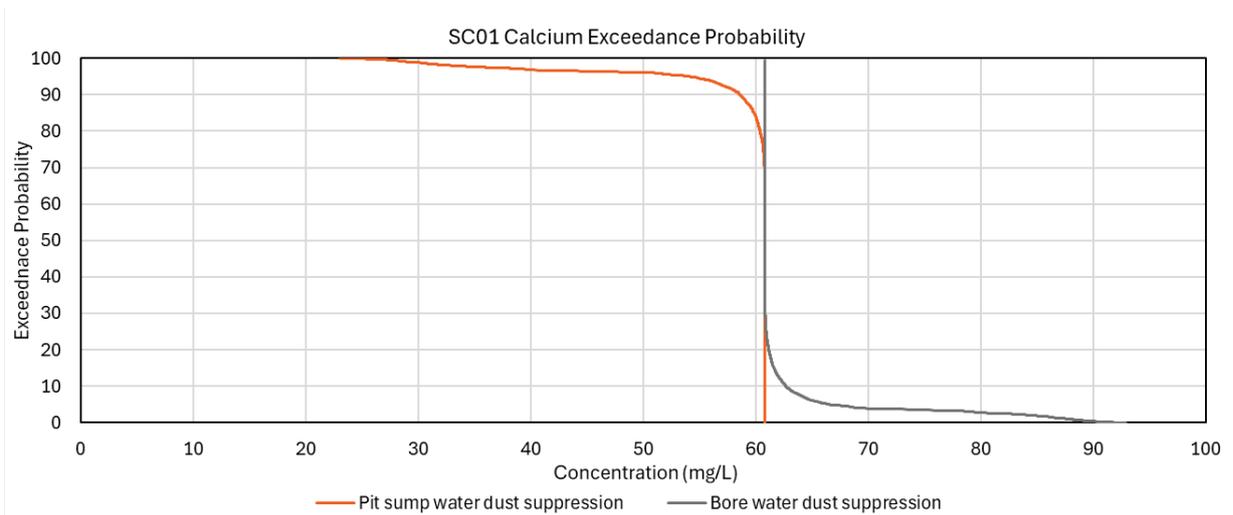


Figure 8: Exceedance probability – calcium in SC01.

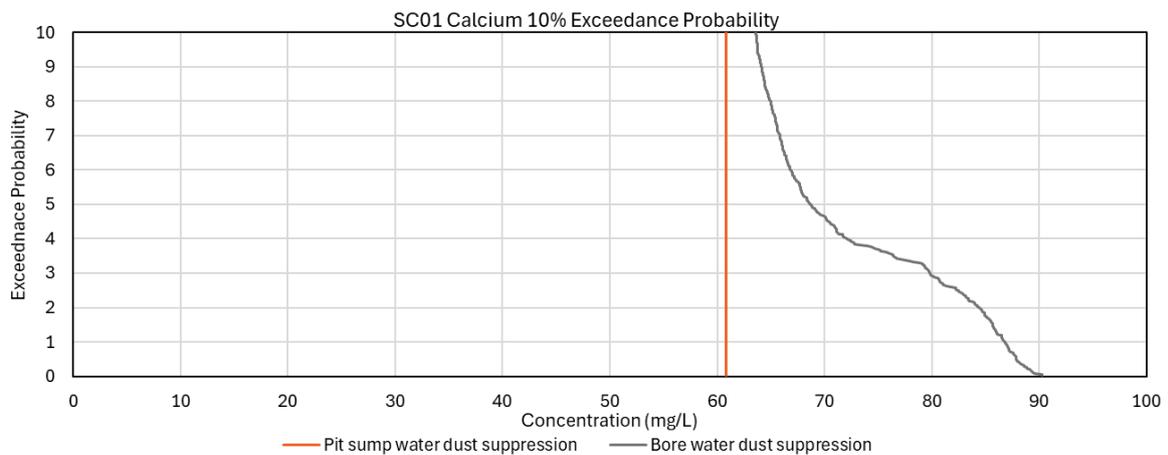


Figure 9: Top 10% exceedance probability for calcium in SC01.

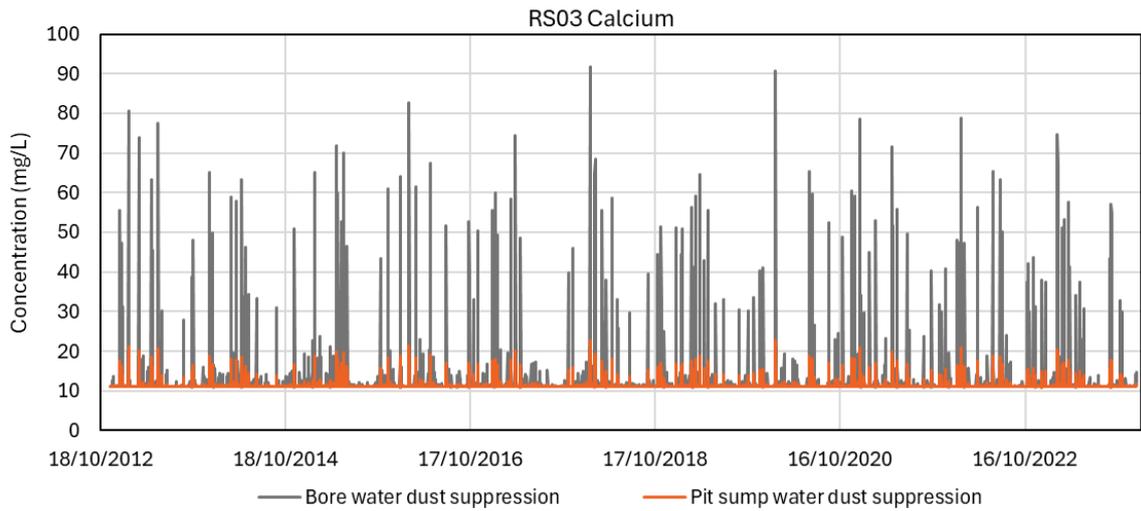


Figure 10: Simulated calcium concentrations in RS03 for bore water and pit water dust suppression scenarios.

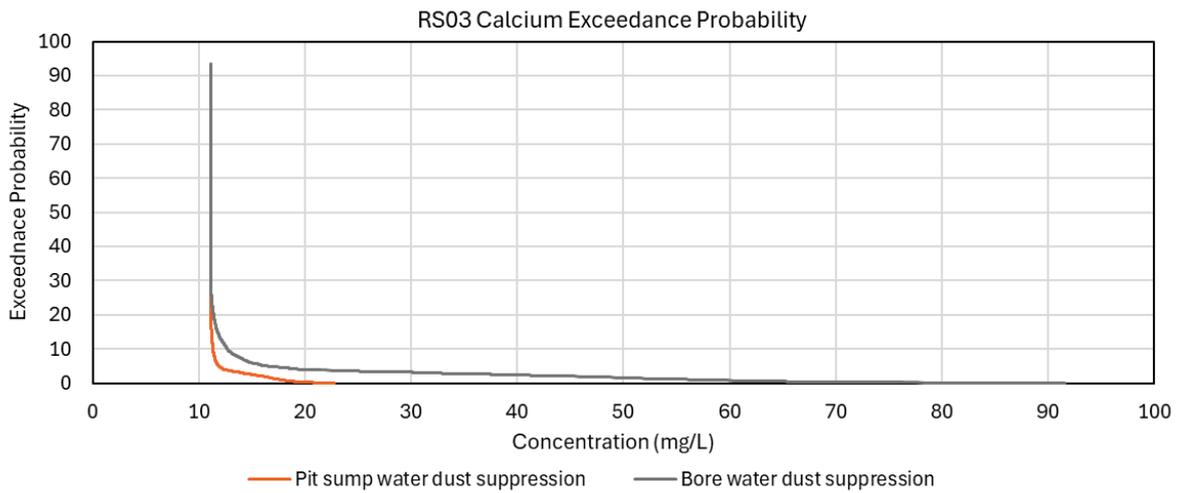


Figure 11: Exceedance probability – calcium in RS03.

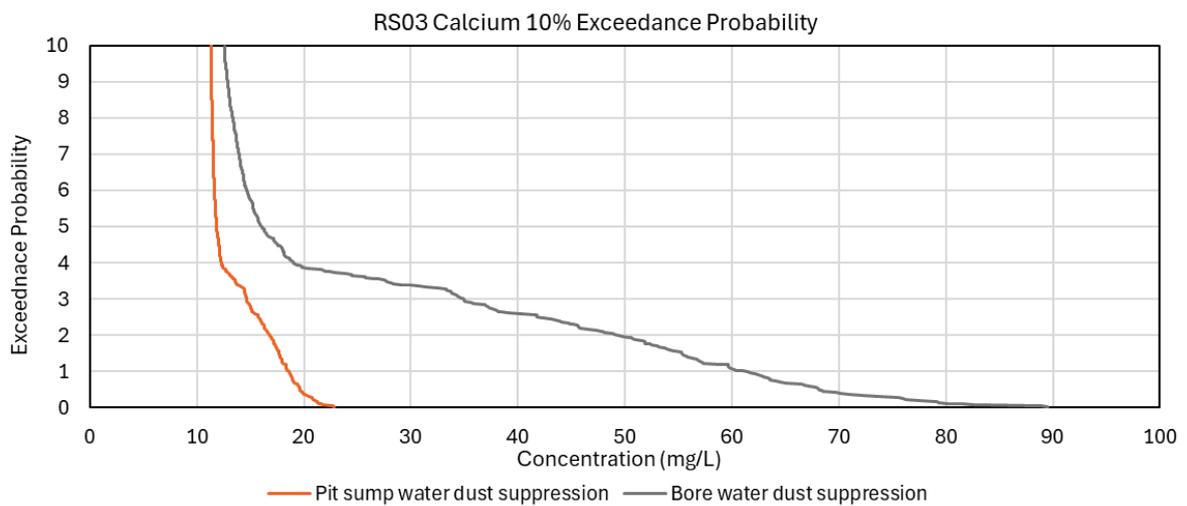


Figure 12: Top 10% exceedance probability for calcium in RS03.

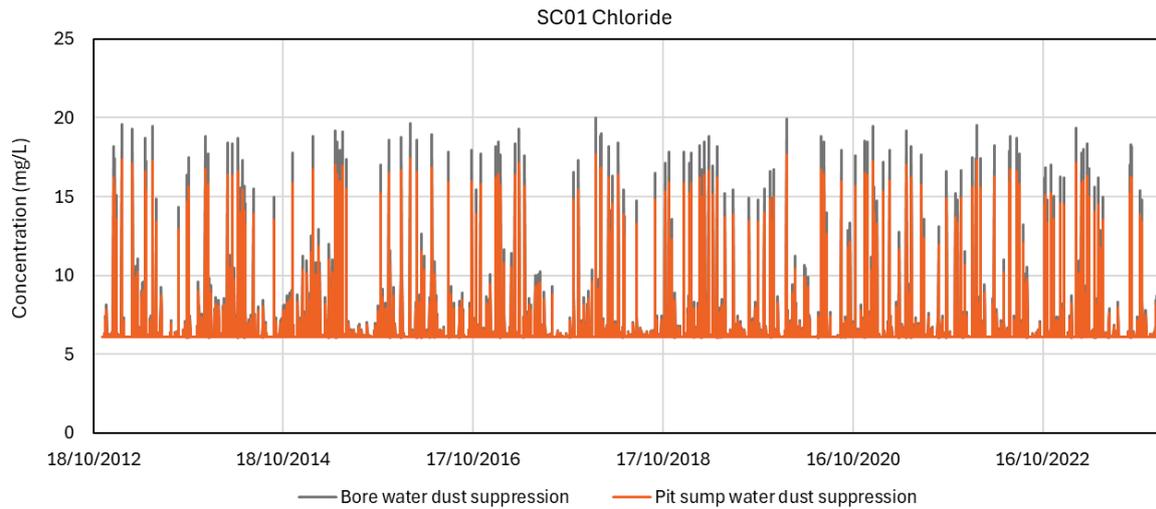


Figure 13: Simulated chloride concentrations in SC01 for bore water and pit water dust suppression scenarios.

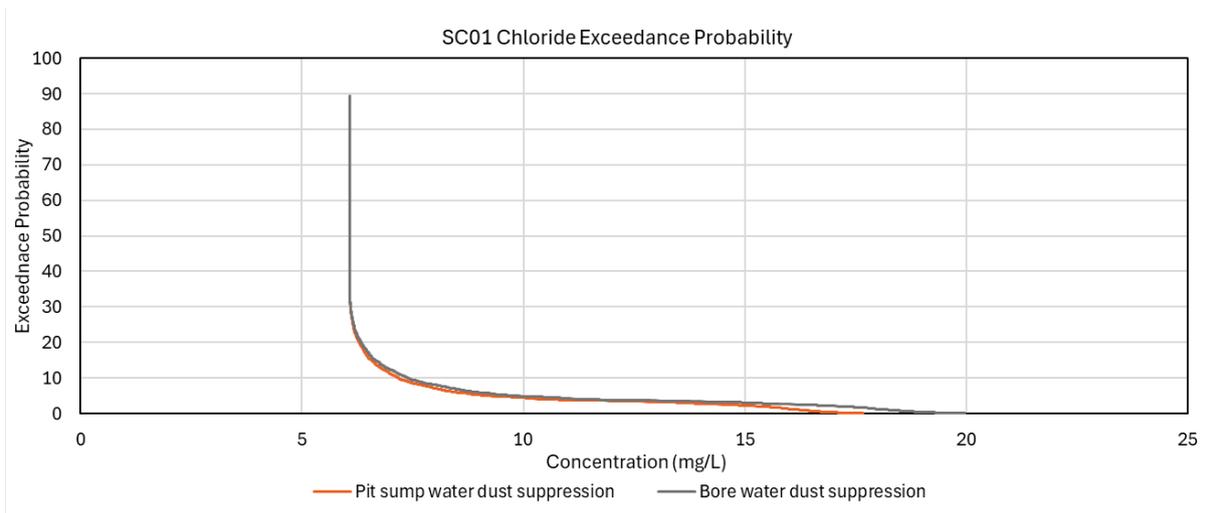


Figure 14: Exceedance probability – chloride in SC01.

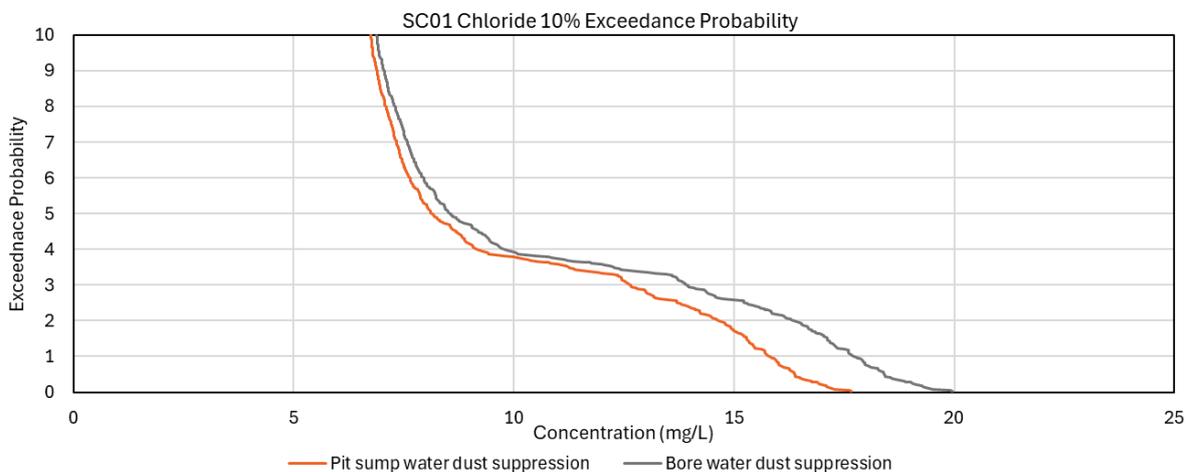


Figure 15: Top 10% exceedance probability for chloride in SC01.

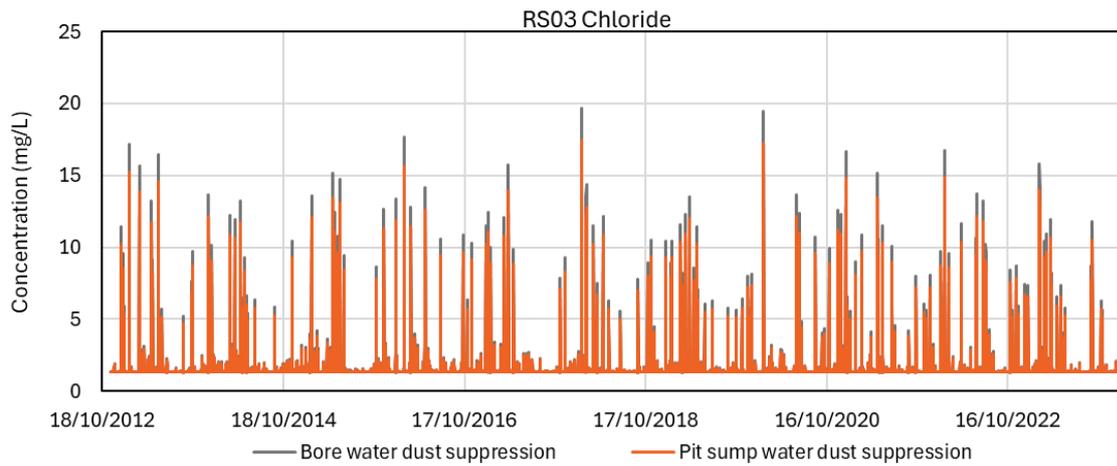


Figure 16: Simulated chloride concentrations in RS03 for bore water and pit water dust suppression scenarios.

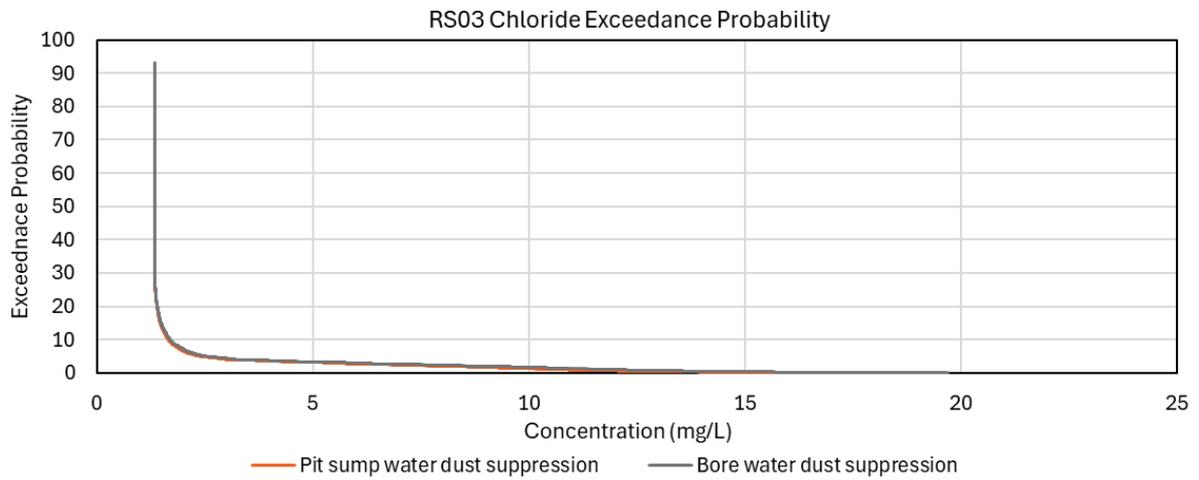


Figure 17: Exceedance probability – chloride in RS03.

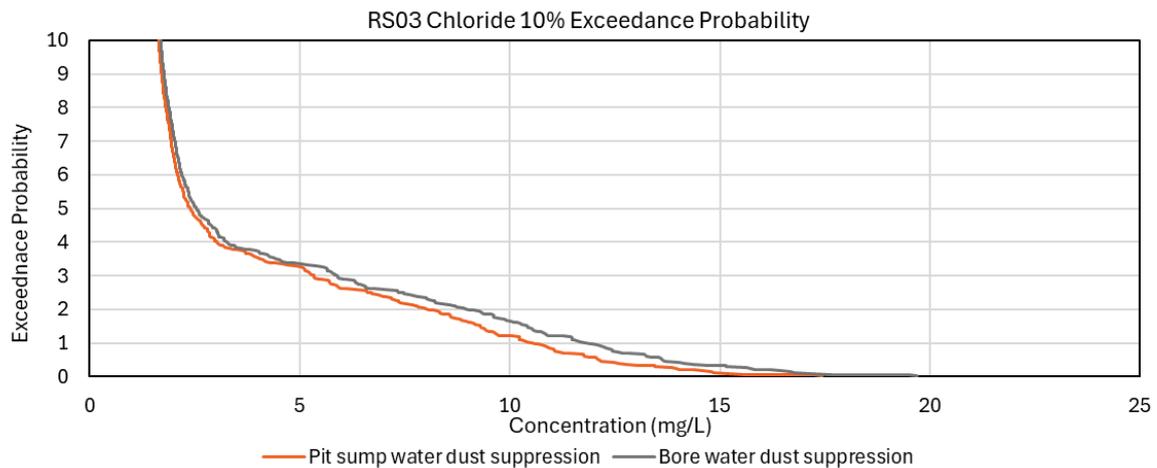


Figure 18: Top 10% exceedance probability for chloride in RS03.

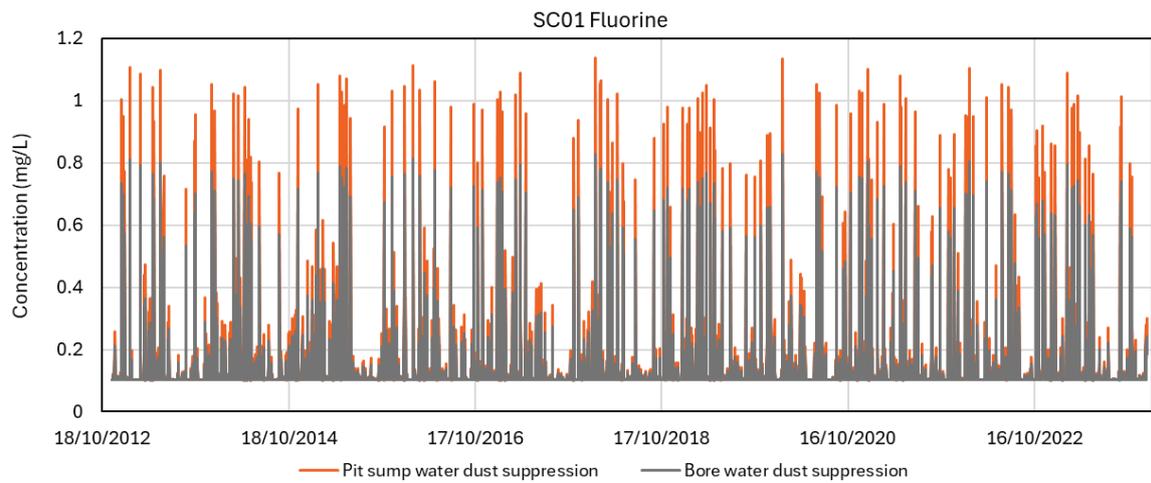


Figure 19: Simulated fluorine concentrations in SC01 for bore water and pit water dust suppression scenarios.

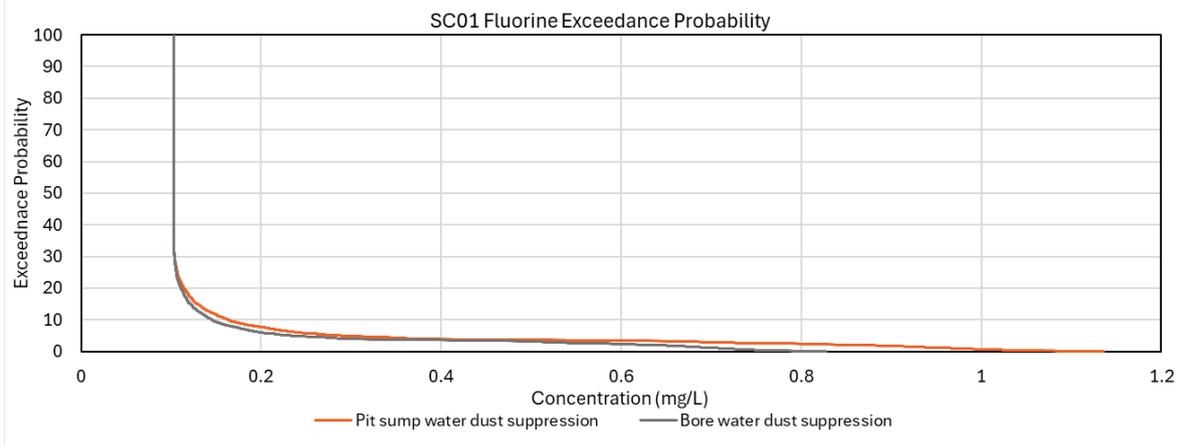


Figure 20: Exceedance probability – fluorine in SC01.

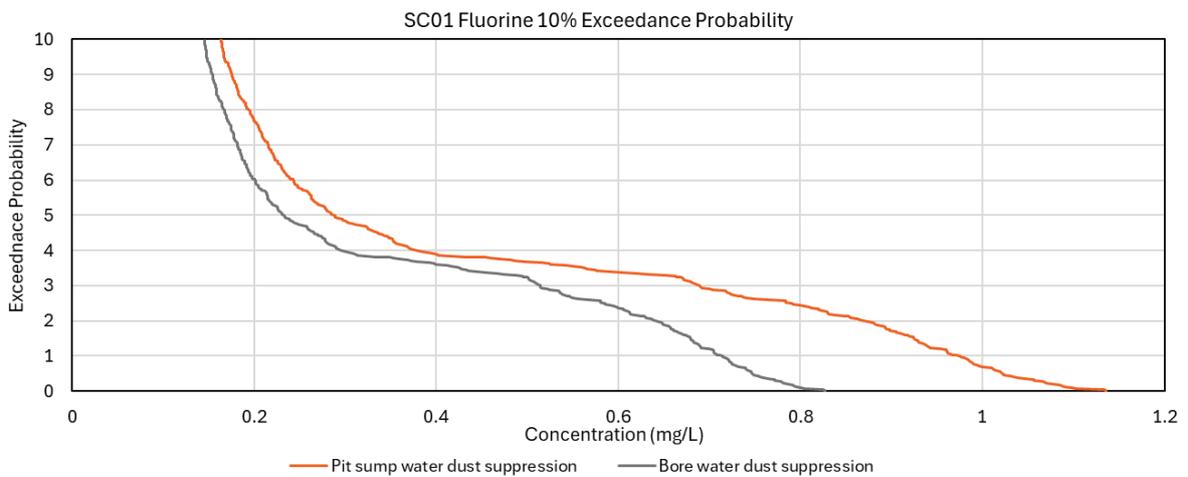


Figure 21: Top 10% exceedance probability for fluorine in SC01.

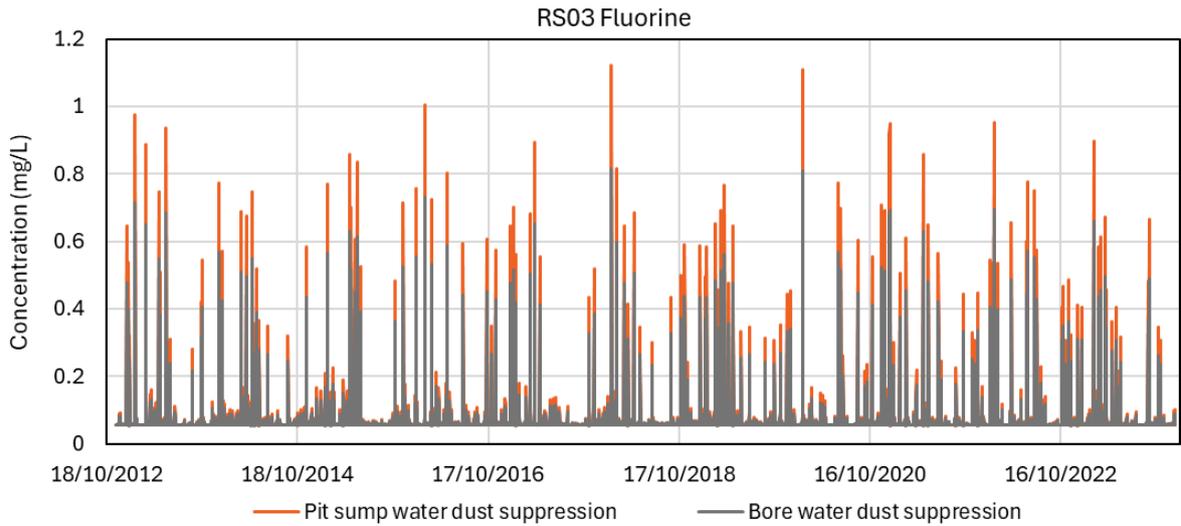


Figure 22: Simulated fluorine concentrations in RS03 for bore water and pit water dust suppression scenarios.

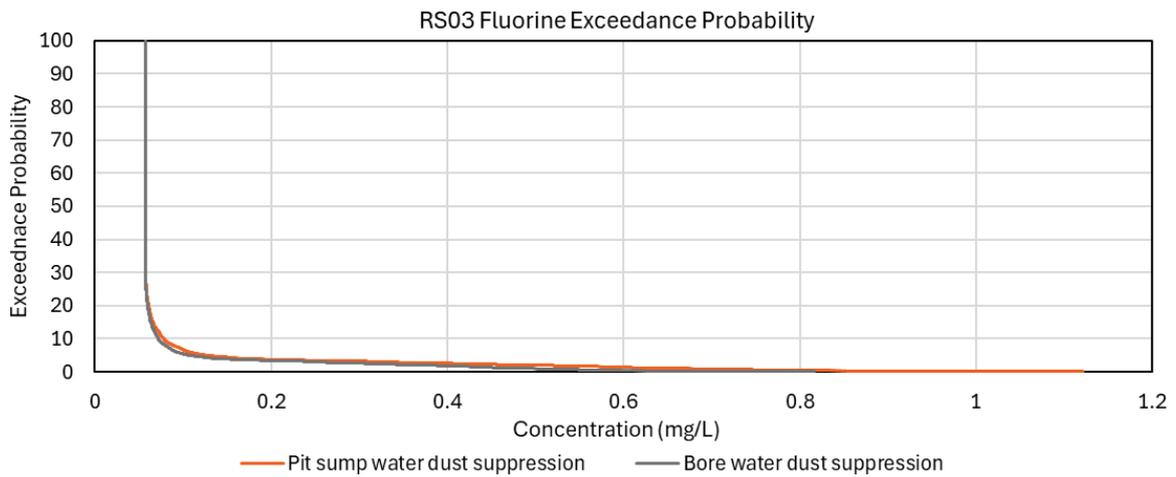


Figure 23: Exceedance probability – fluorine in RS03.

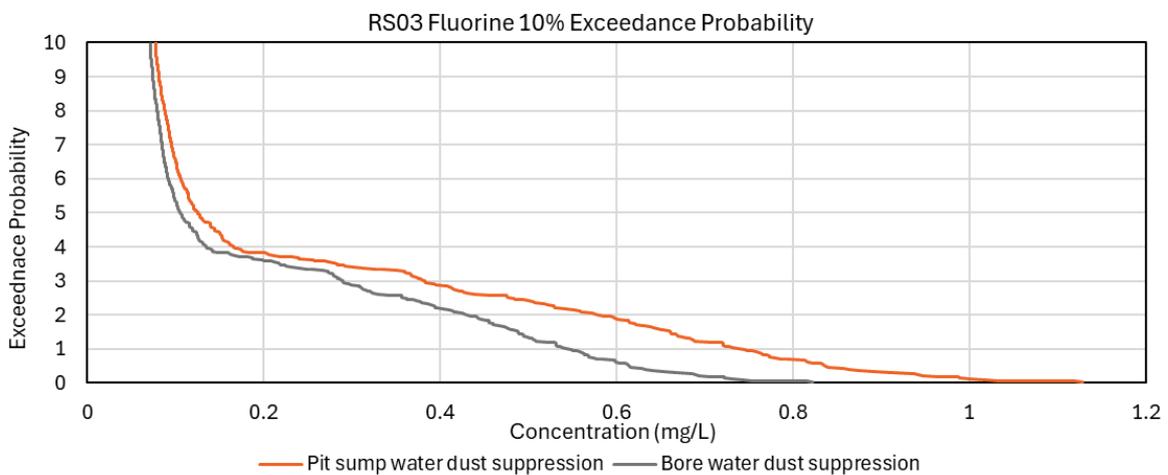


Figure 24: Top 10% exceedance probability for fluorine in RS03.

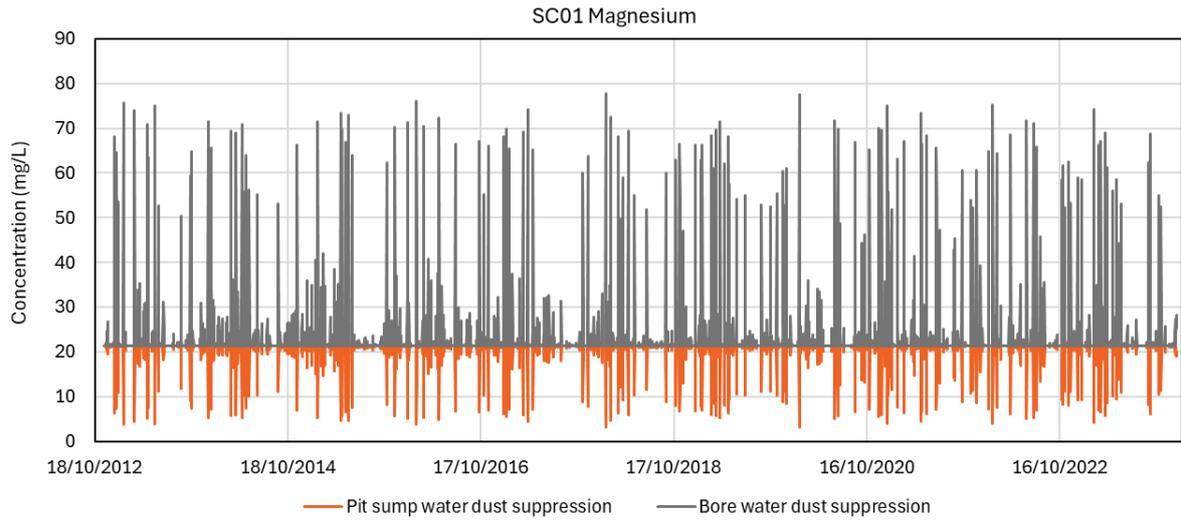


Figure 25: Simulated magnesium concentrations in SC01 for bore water and pit water dust suppression scenarios.

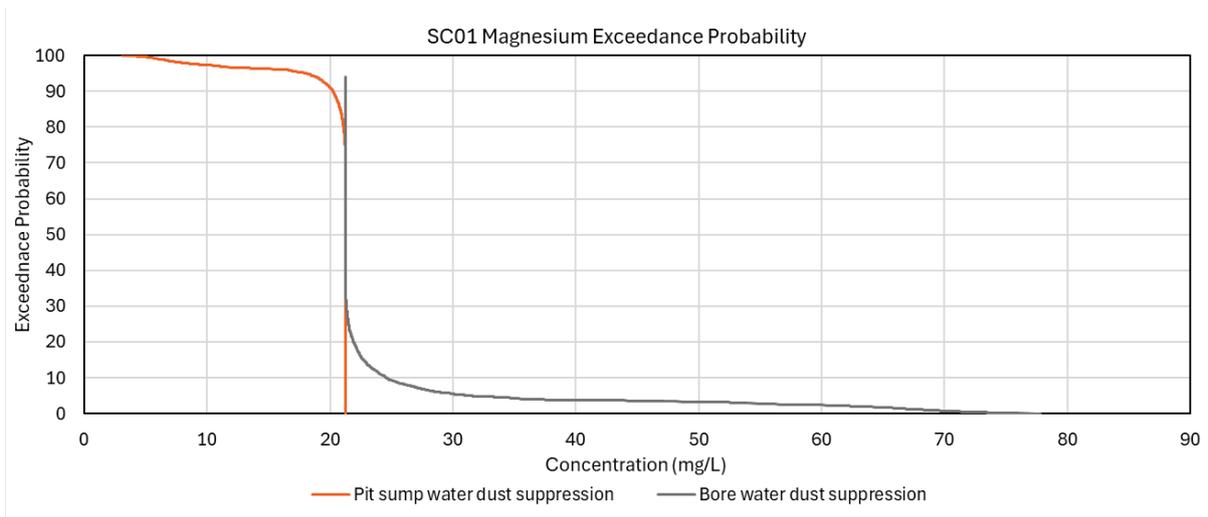


Figure 26: Exceedance probability – magnesium in SC01.

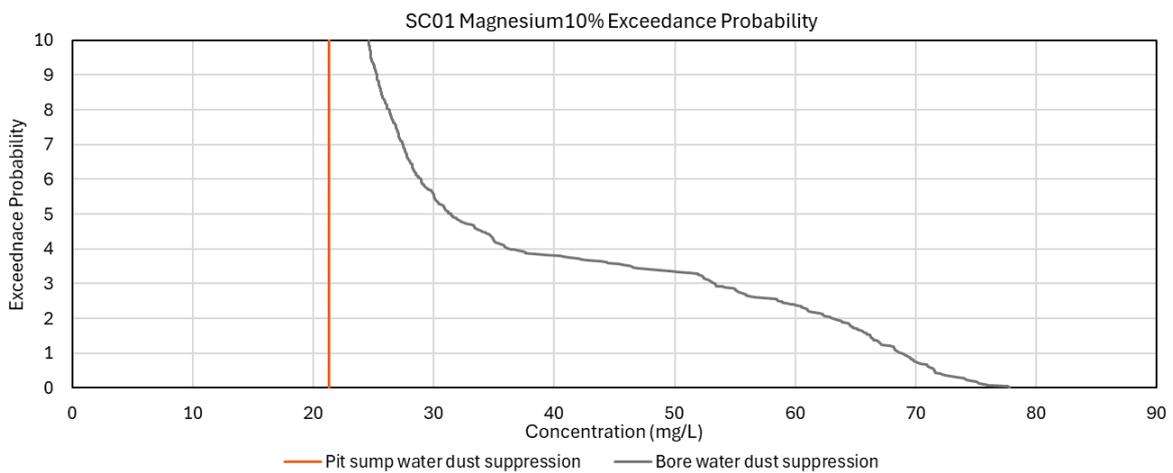


Figure 27: Top 10% exceedance probability for magnesium in SC01.

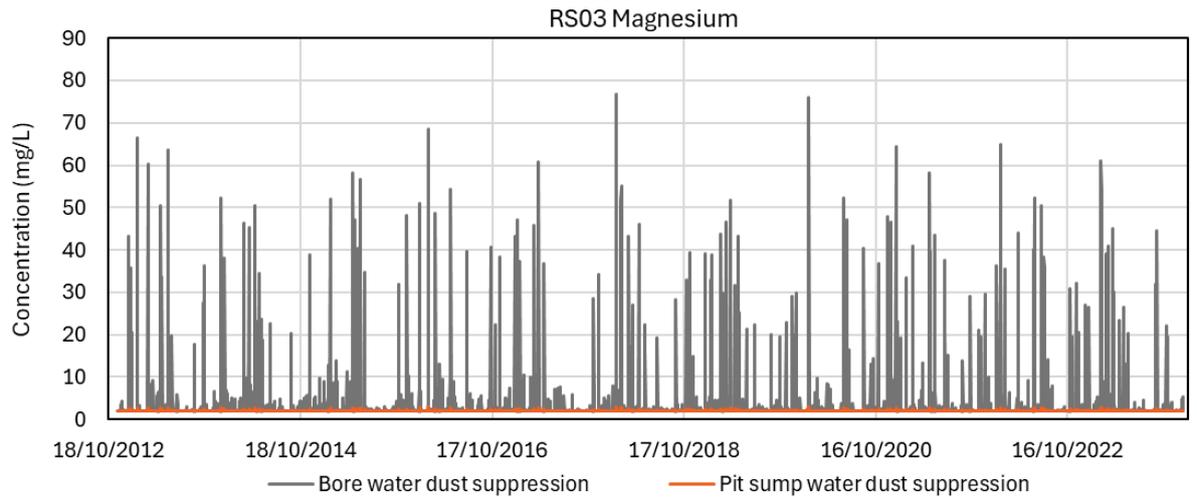


Figure 28: Simulated magnesium concentrations in RS03 for bore water and pit water dust suppression scenarios.

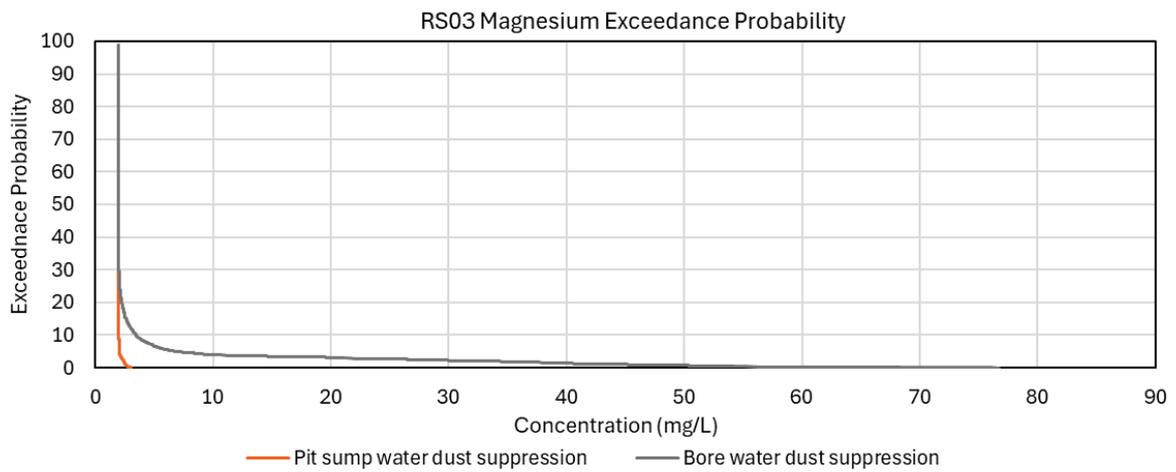


Figure 29 Exceedance probability – magnesium in RS03.

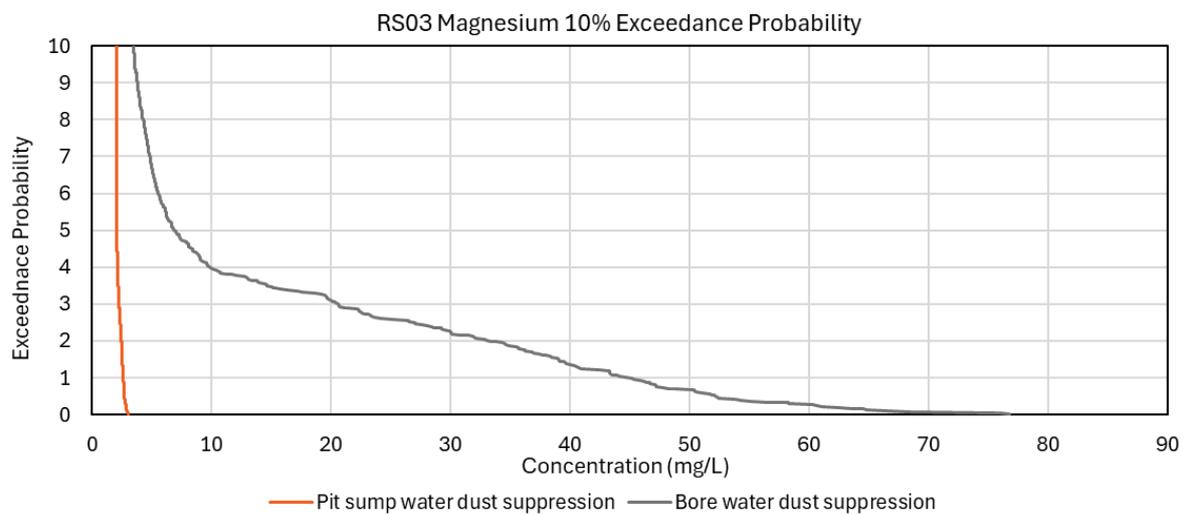


Figure 30: Top 10% exceedance probability for magnesium in RS03.

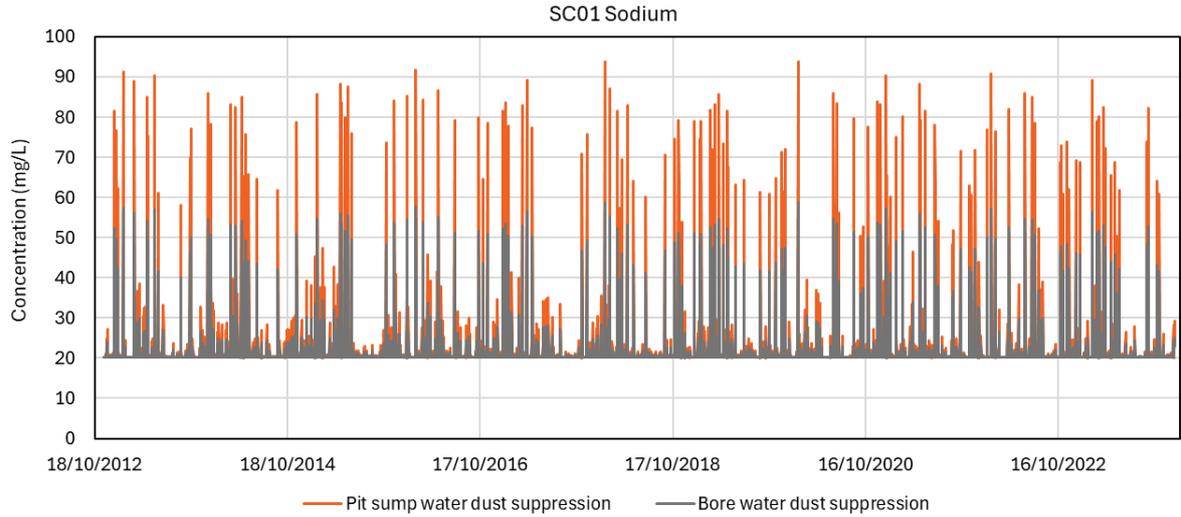


Figure 31: Simulated sodium concentrations in SC01 for bore water and pit water dust suppression scenarios.

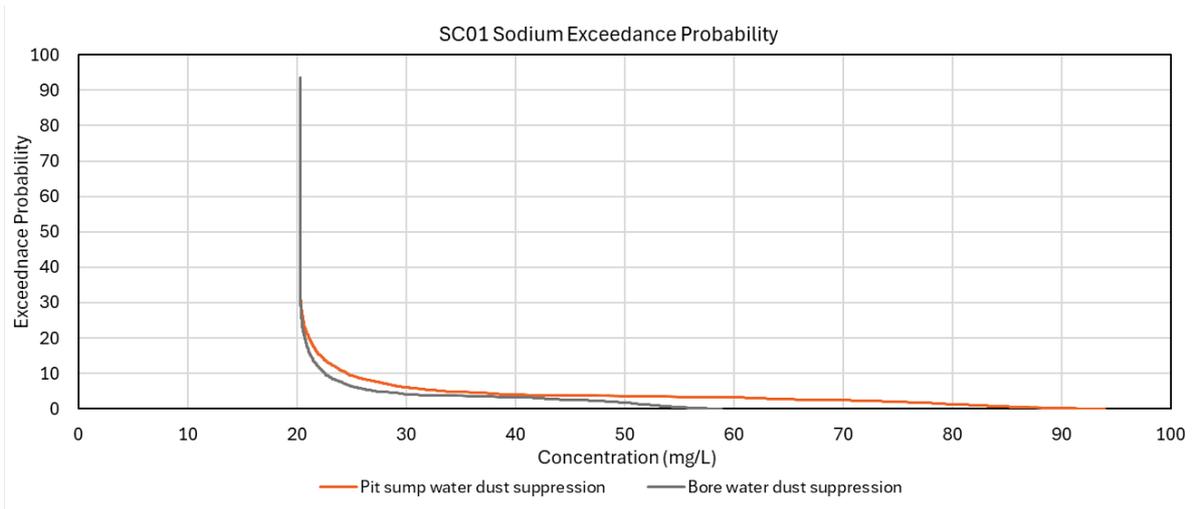


Figure 32: Exceedance probability – sodium in SC01.

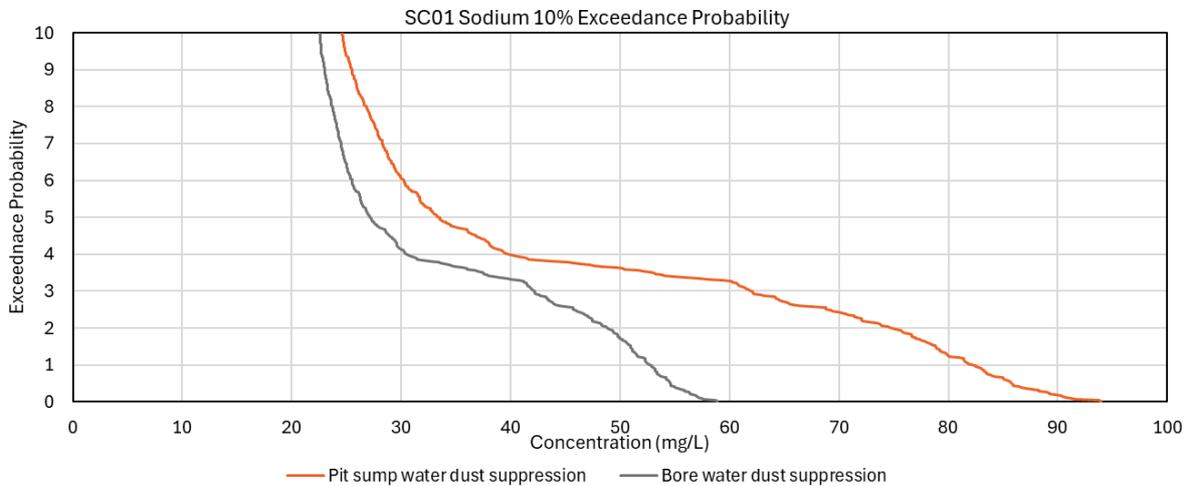


Figure 33: Top 10% exceedance probability for sodium in SC01.

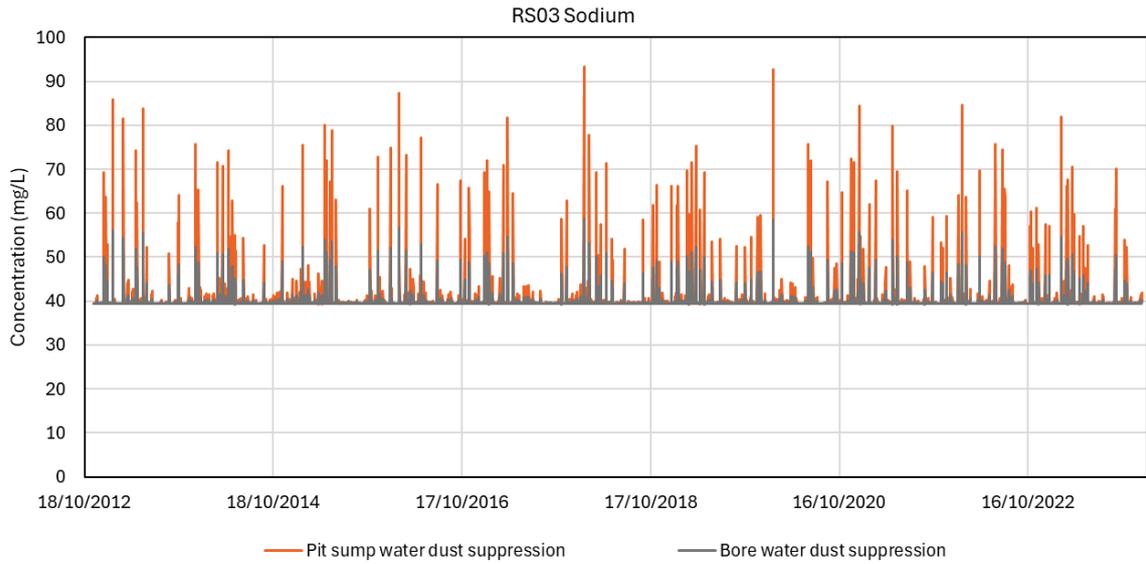


Figure 34: Simulated sodium concentrations in RS03 for bore water and pit water dust suppression scenarios.

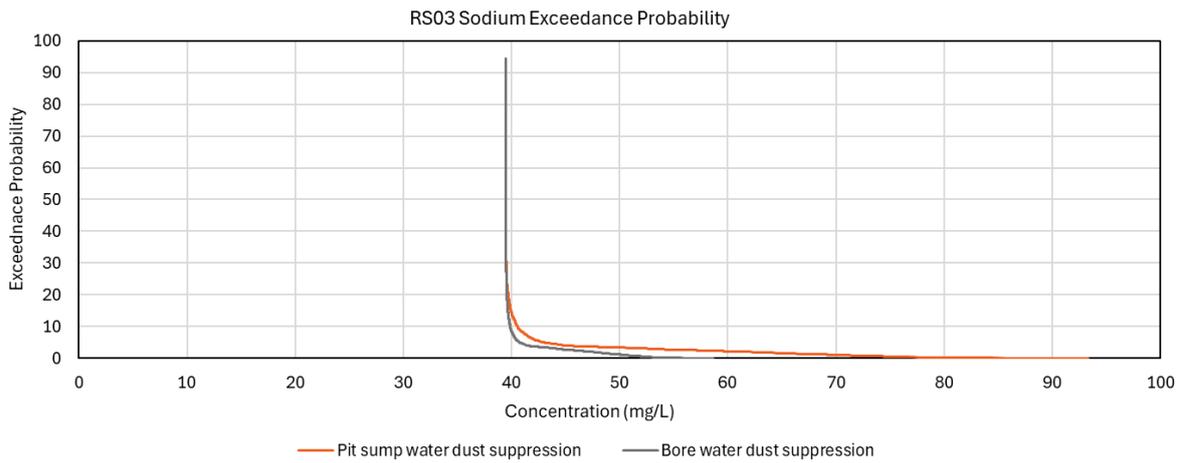


Figure 35: Exceedance probability – sodium in RS03.

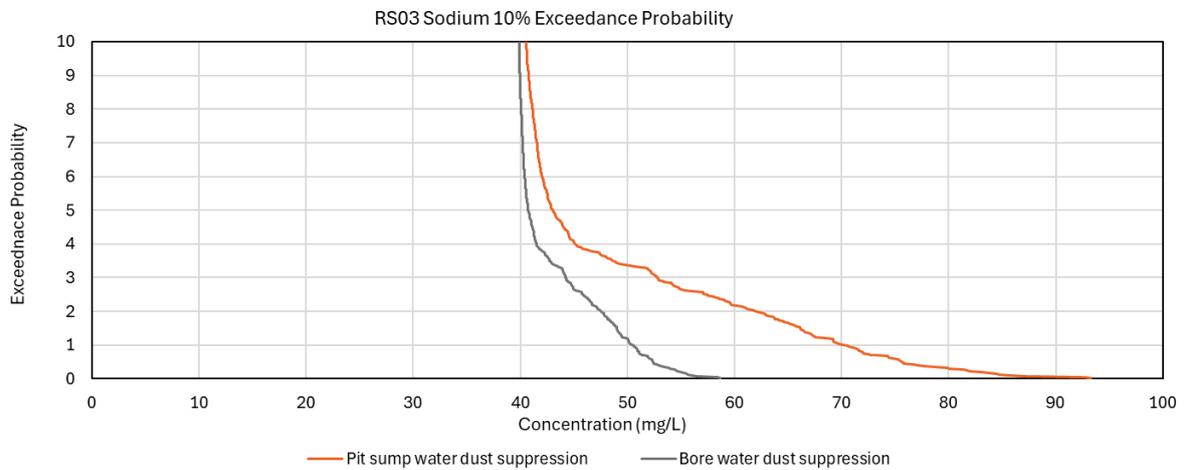


Figure 36: Top 10% exceedance probability for sodium in RS03.

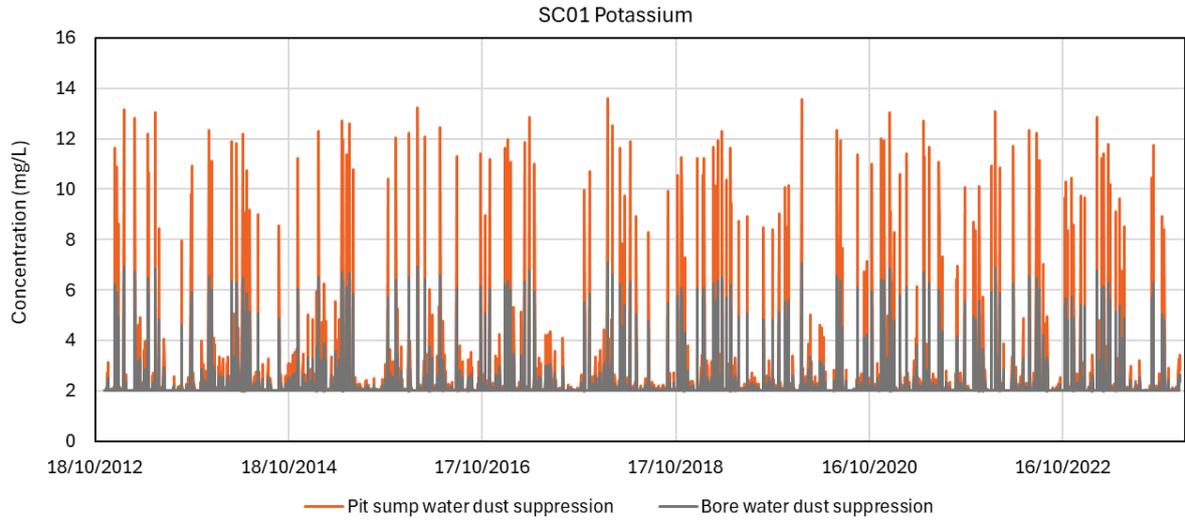


Figure 37: Simulated potassium concentrations in SC01 for bore water and pit water dust suppression scenarios.

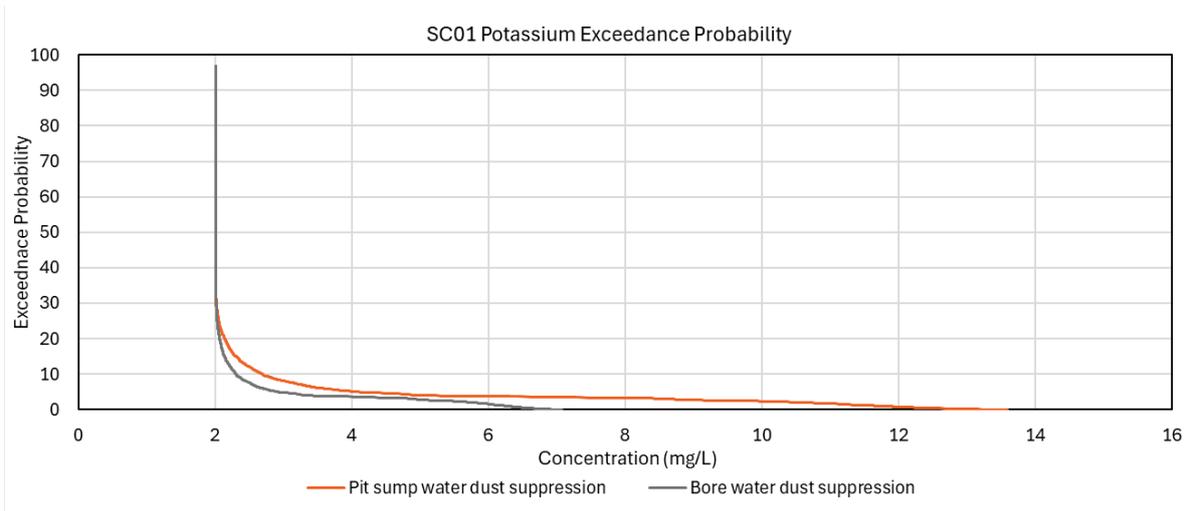


Figure 38: Exceedance probability – potassium in SC01.

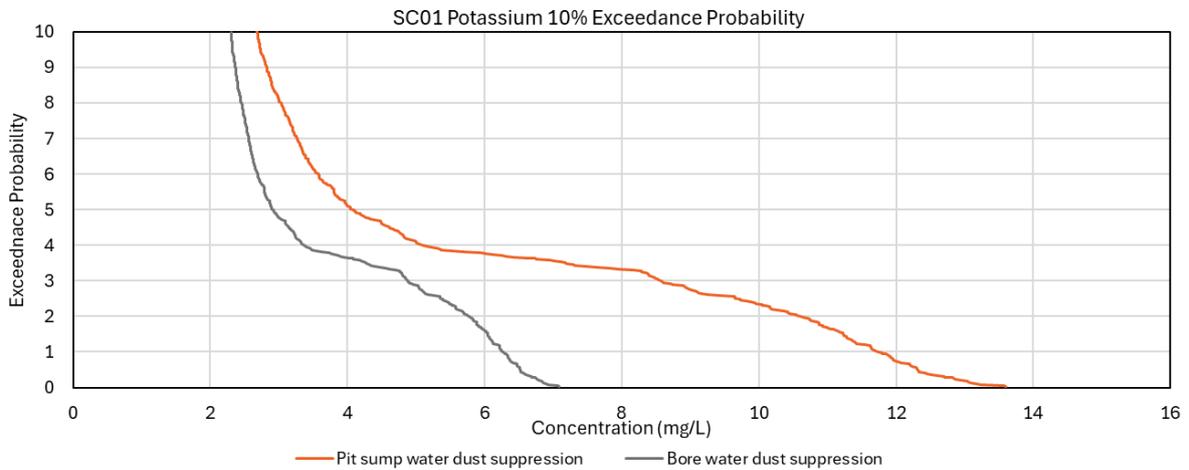


Figure 39: Top 10% exceedance probability for potassium in SC01.

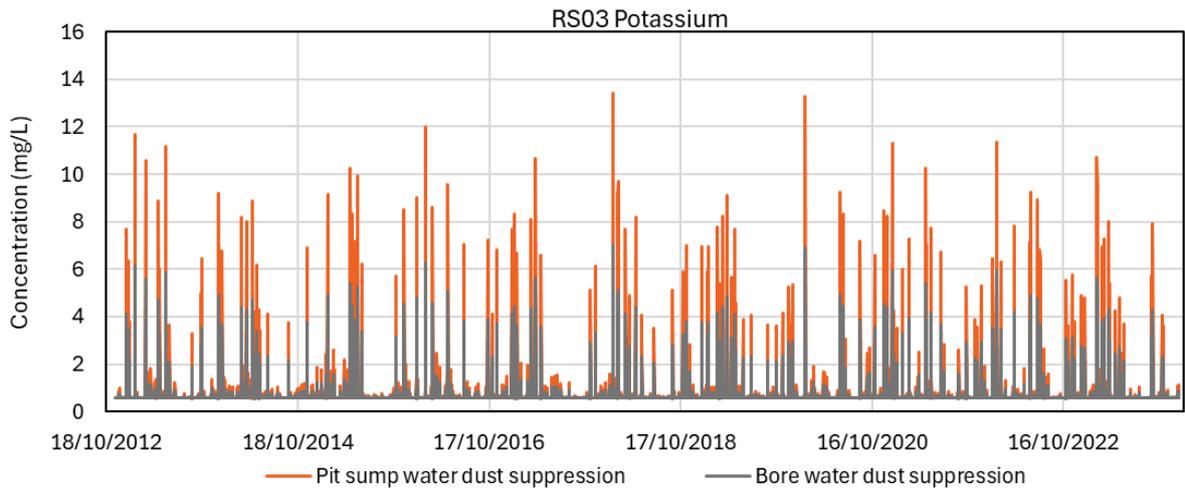


Figure 40: Simulated potassium concentrations in RS03 for bore water and pit water dust suppression scenarios.

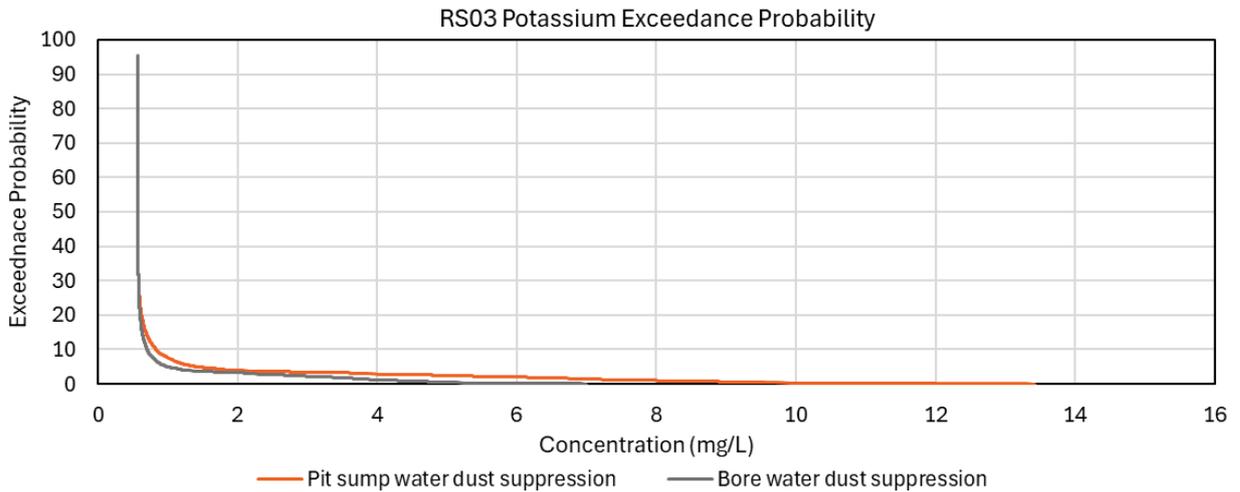


Figure 41: Exceedance probability – potassium in RS03.

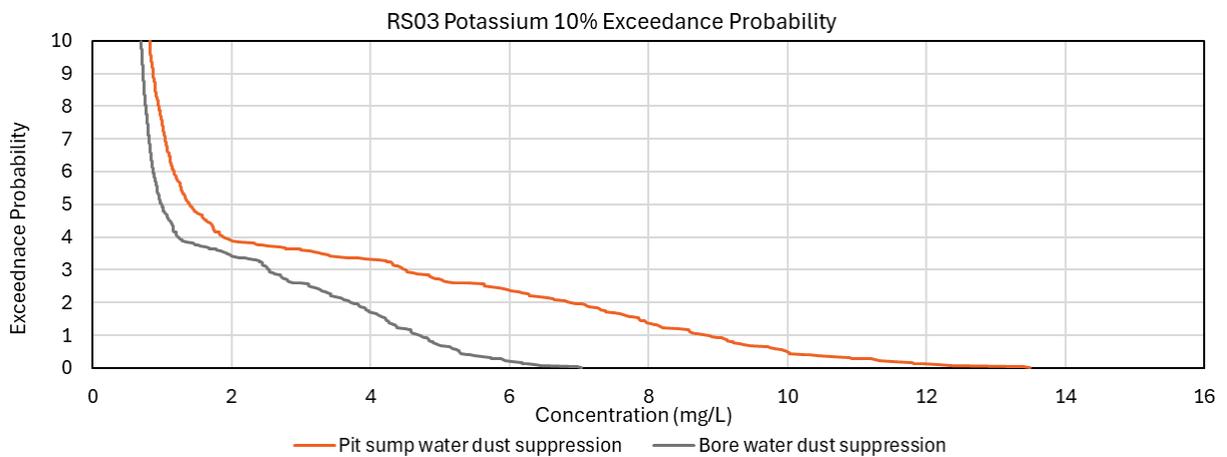


Figure 42: Top 10% exceedance probability for potassium in RS03.

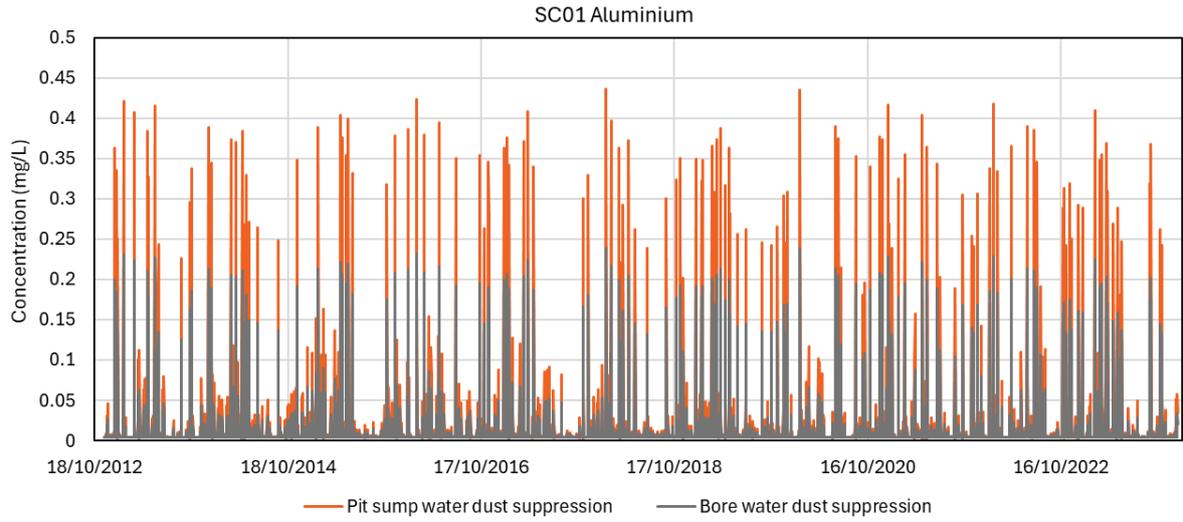


Figure 43: Modelled aluminium concentrations in SC01 over time.

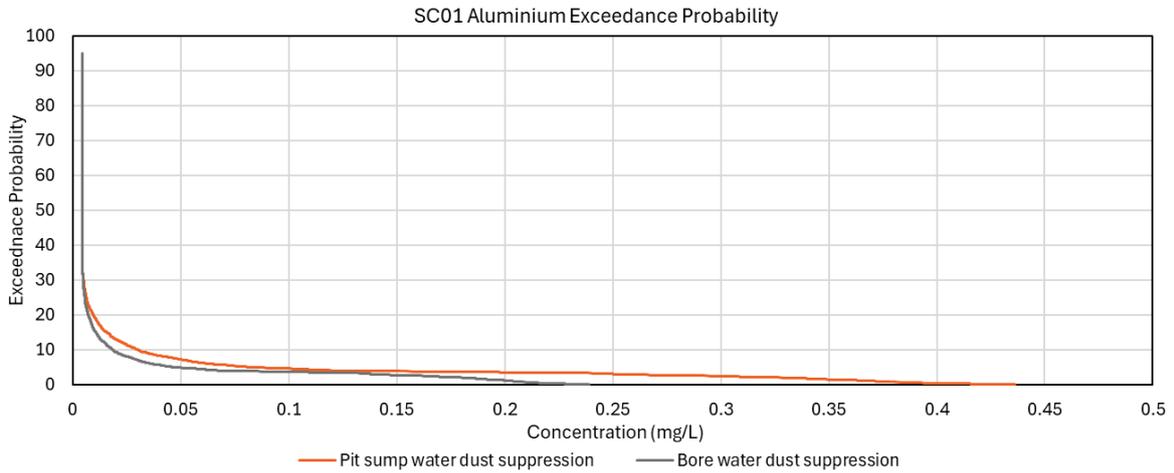


Figure 44: SC01 exceedance probability - aluminium.

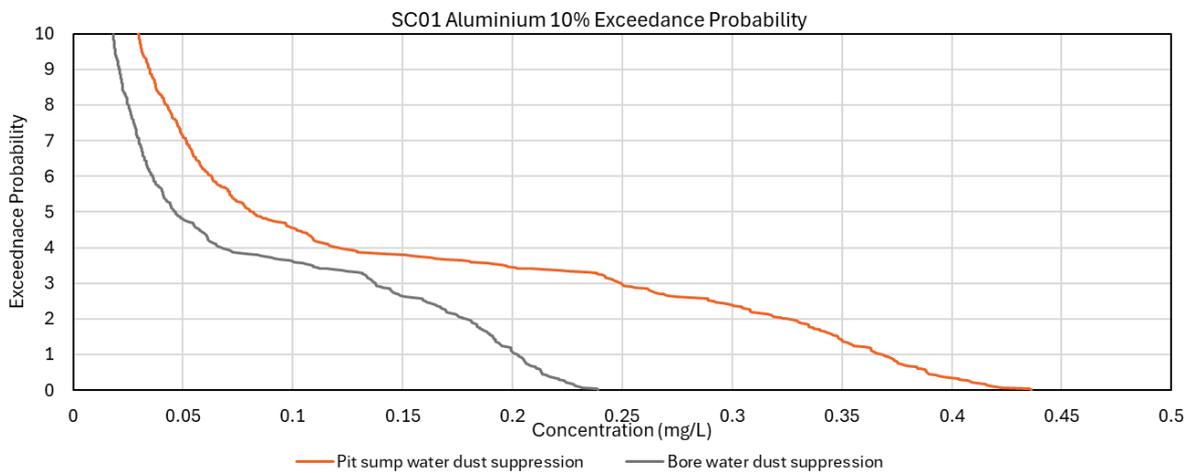


Figure 45: SC01 10% exceedance probability - aluminium.

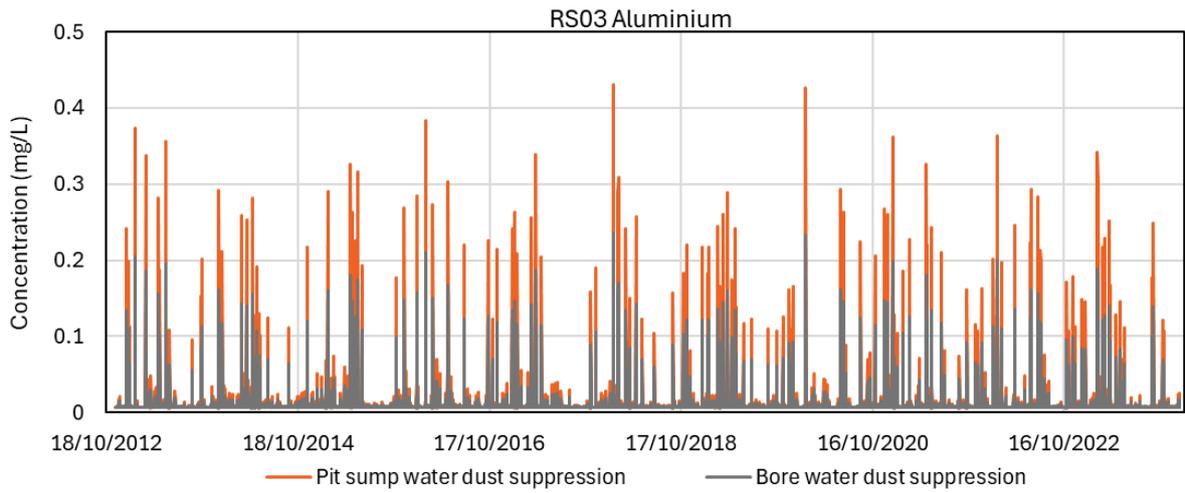


Figure 46: Modelled aluminium concentrations in RS03 over time.

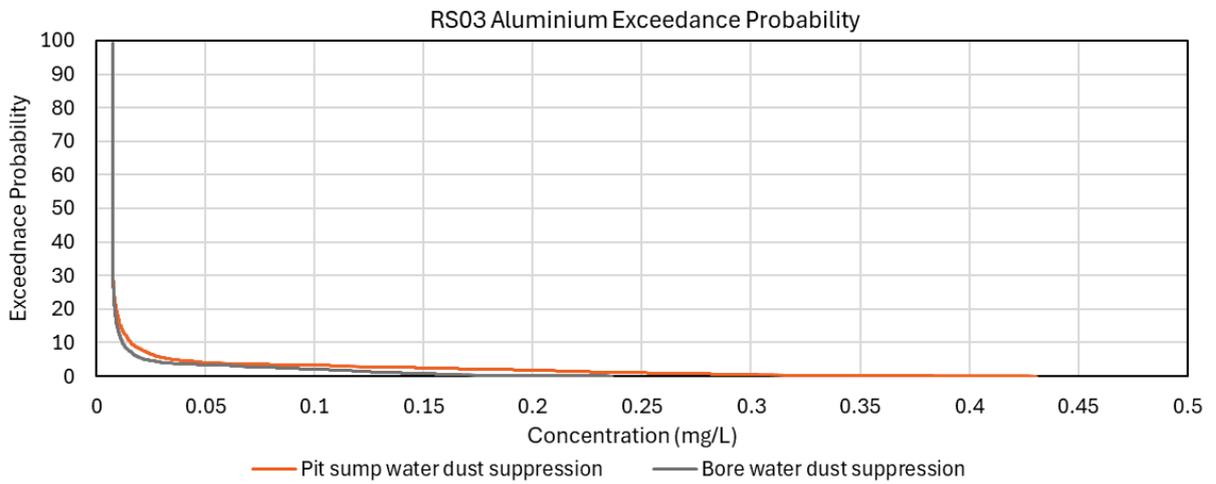


Figure 47: RS03 exceedance probability - aluminium.

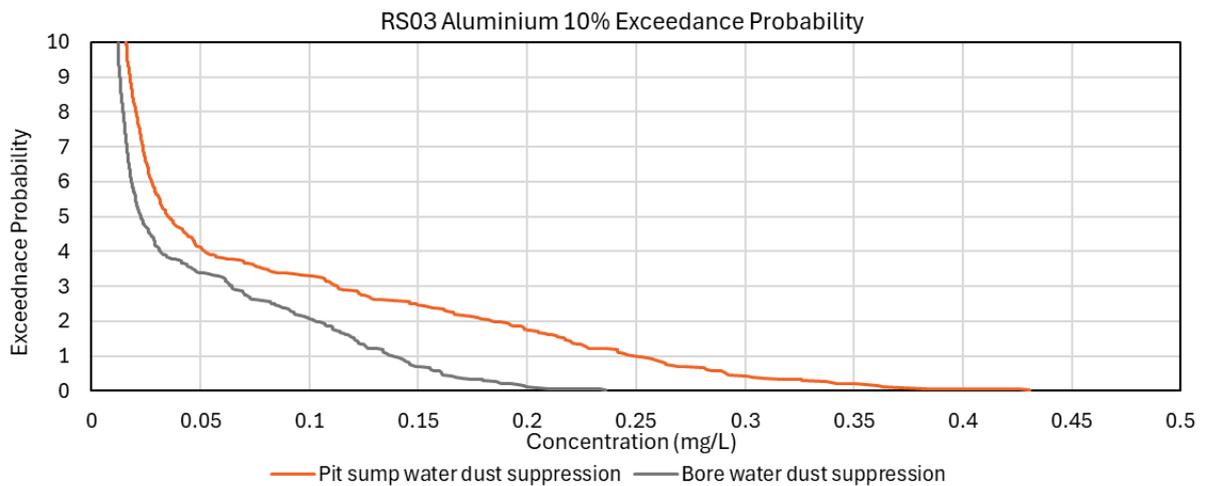


Figure 48: RS03 10% exceedance probability - aluminium.

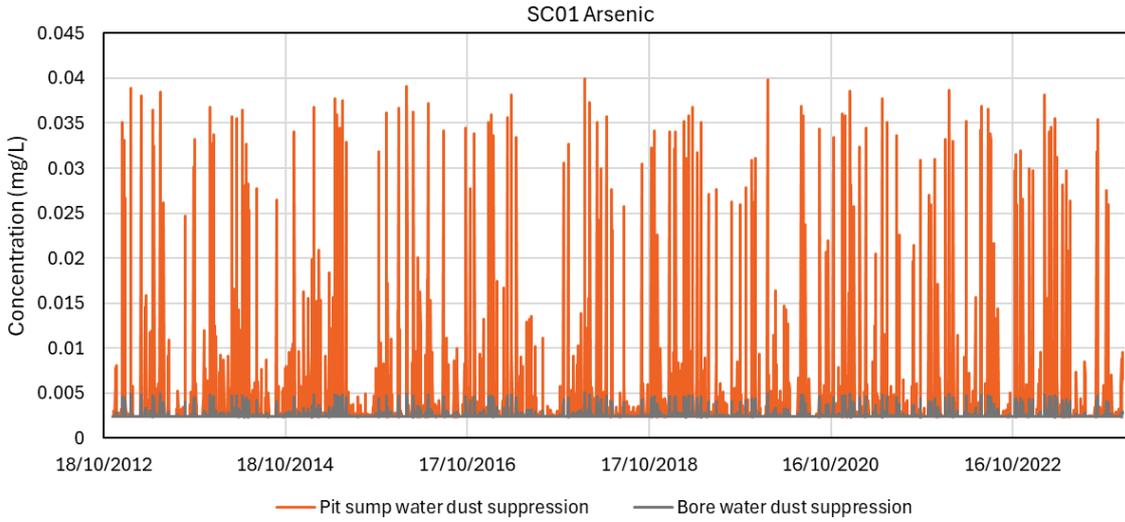


Figure 49: Modelled arsenic concentrations in SC01 over time.

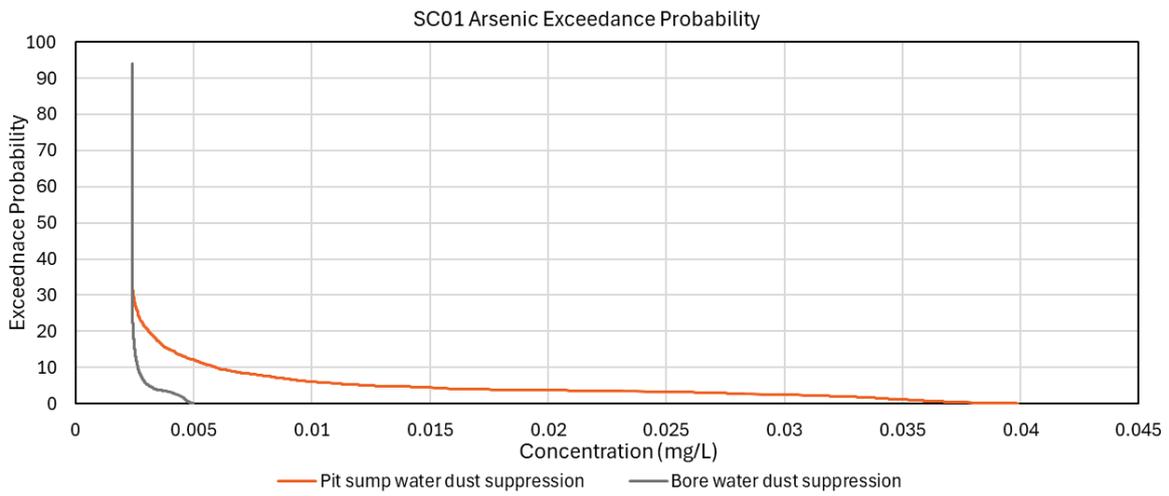


Figure 50: SC01 exceedance probability - arsenic.

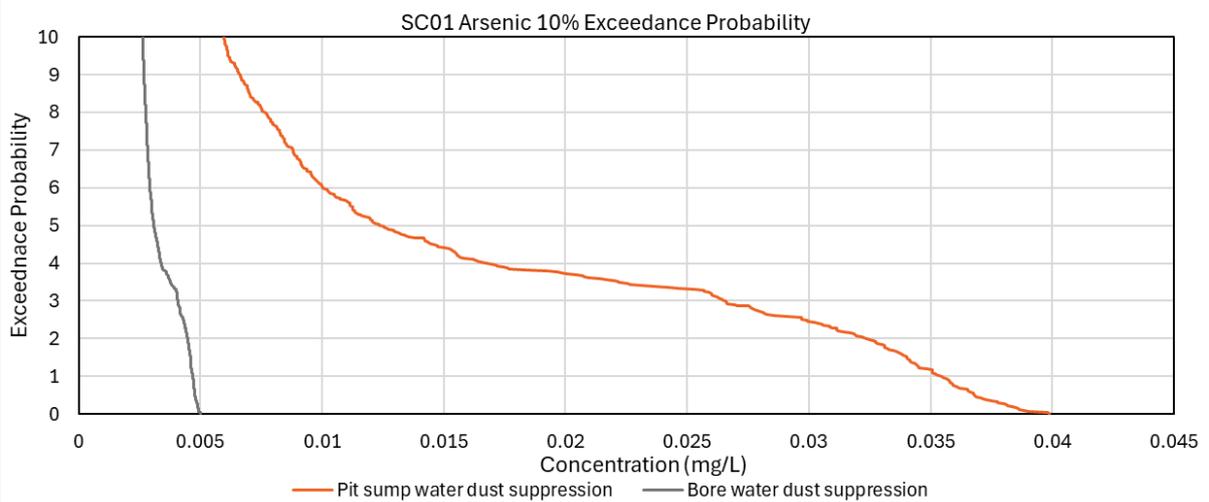


Figure 51: SC01 10% exceedance probability - arsenic.

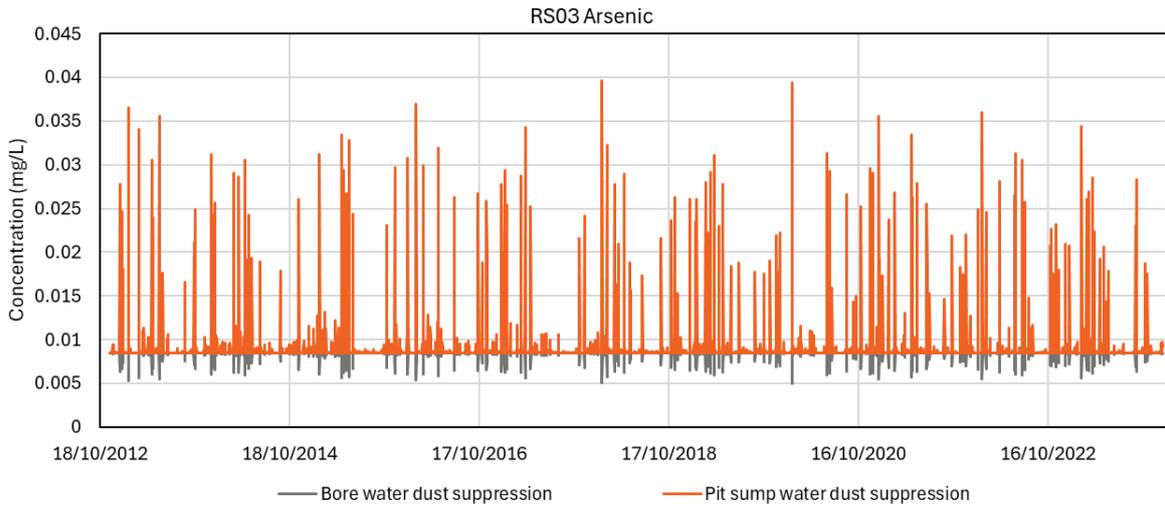


Figure 52: Modelled arsenic concentrations in RS03 over time.

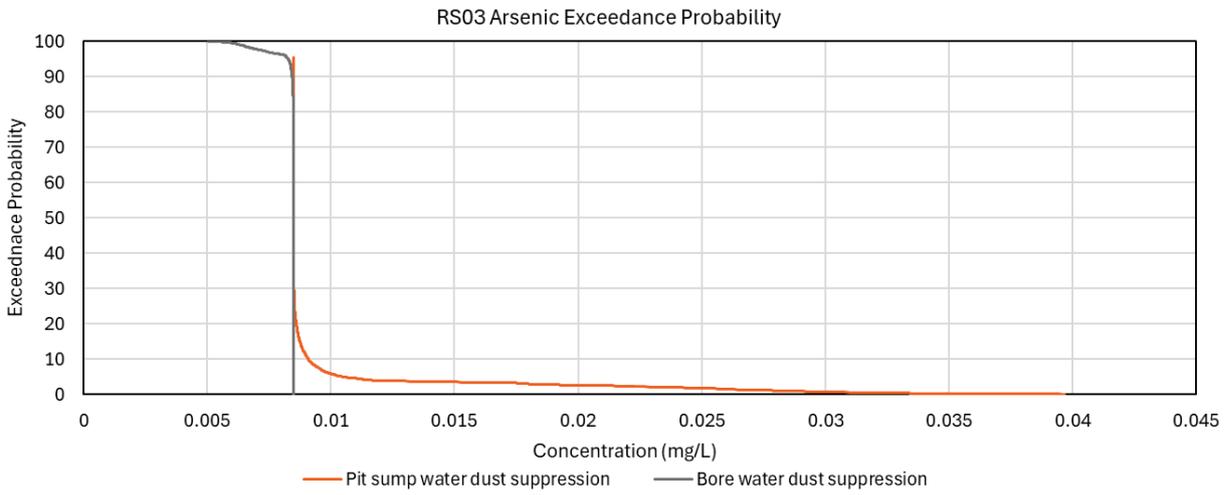


Figure 53: RS03 exceedance probability - arsenic.

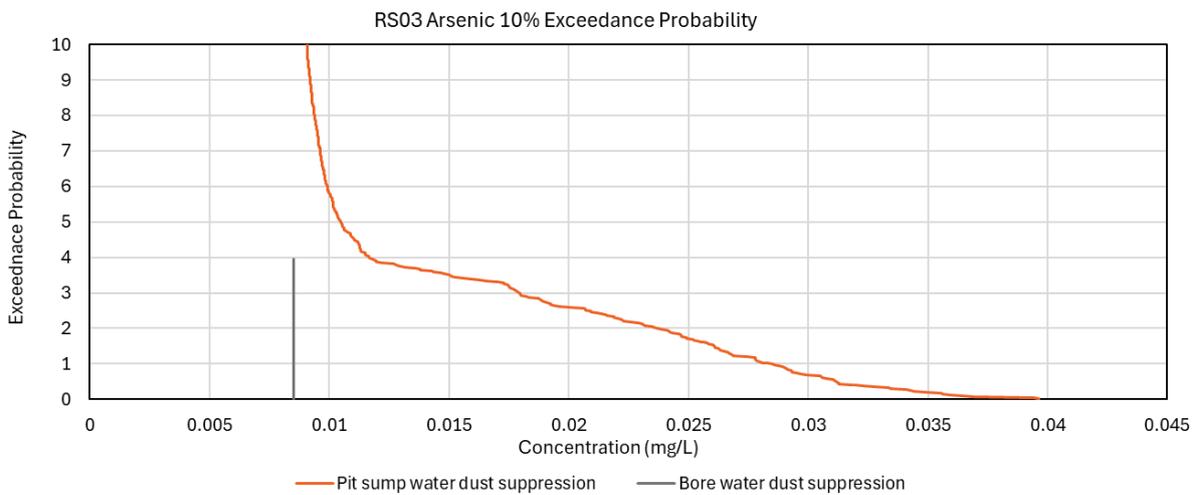


Figure 54: RS03 10% exceedance probability - arsenic.

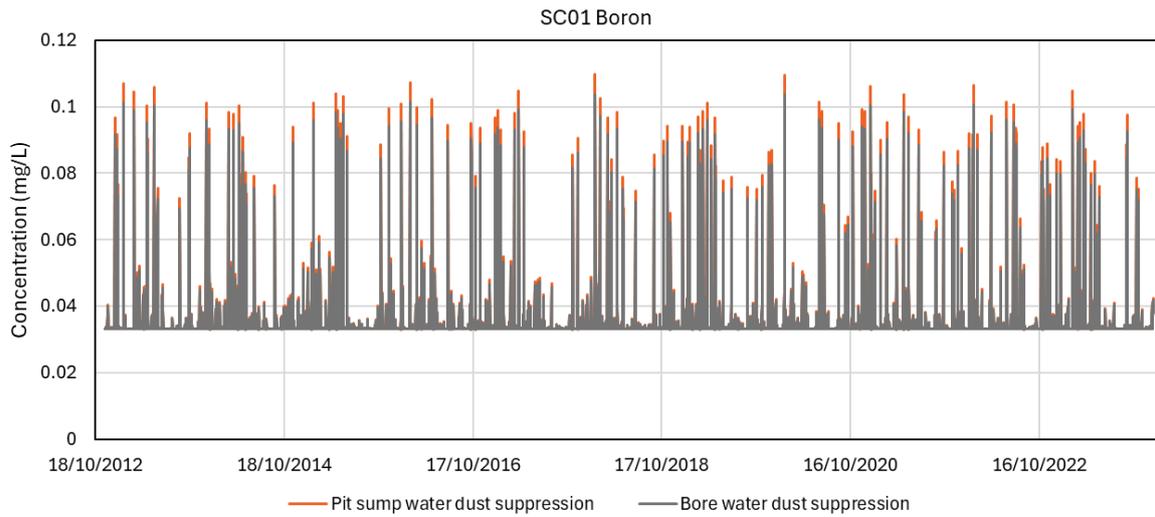


Figure 55: Modelled boron concentrations in SC01 over time.

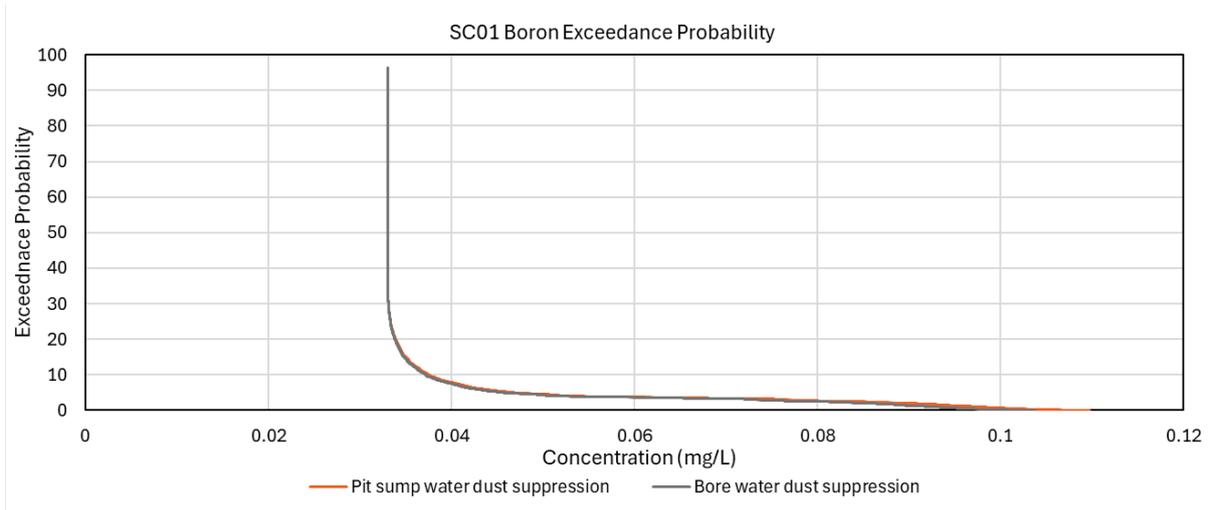


Figure 56: SC01 exceedance probability - boron.

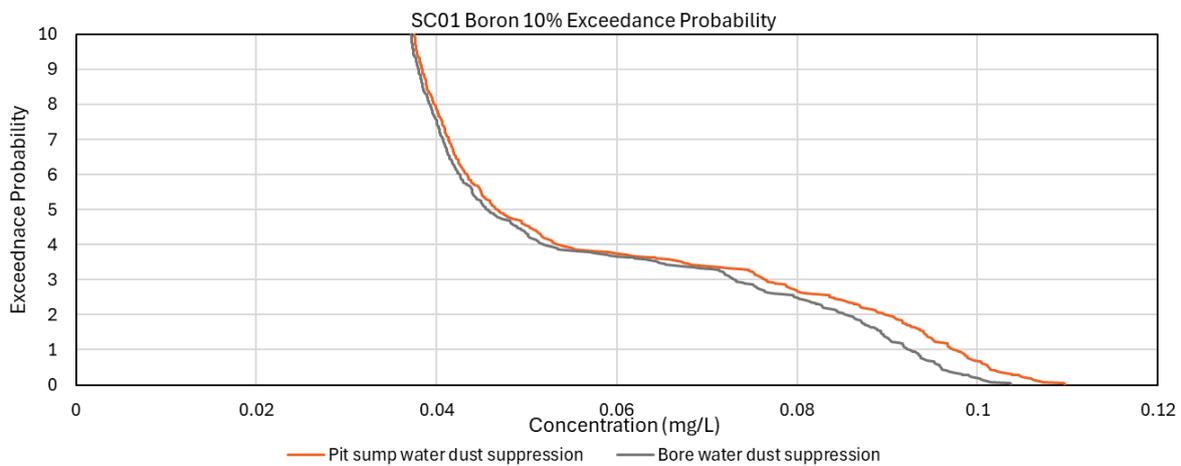


Figure 57: SC01 10% exceedance probability - boron.

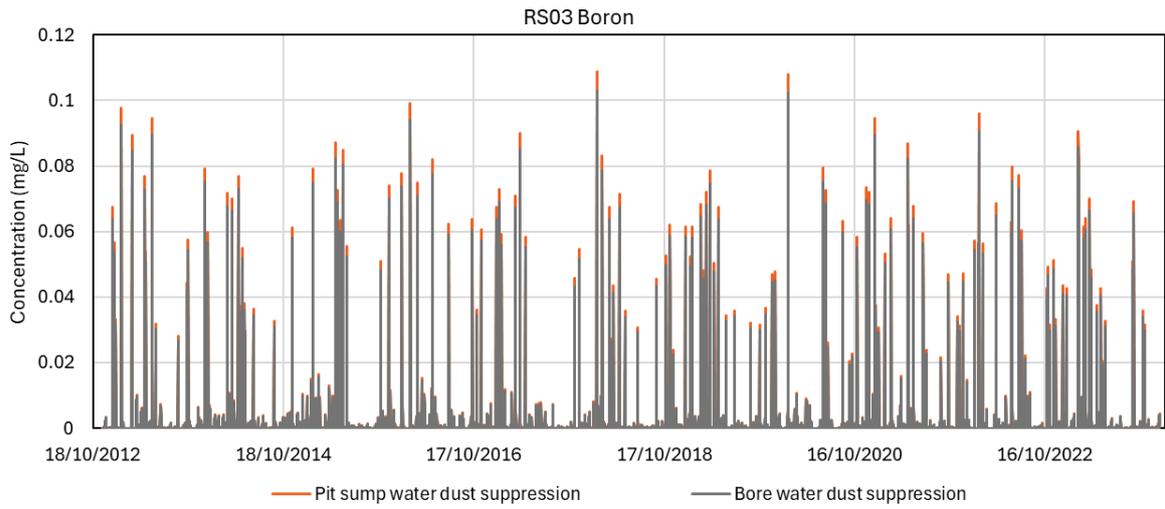


Figure 58: Modelled boron concentrations in RS03 over time.

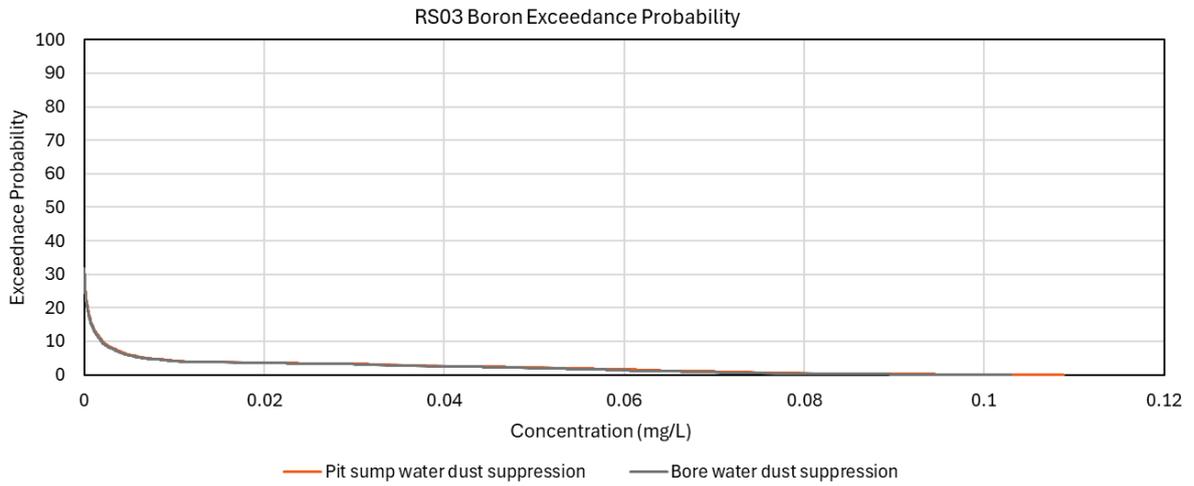


Figure 59: RS03 exceedance probability - boron.

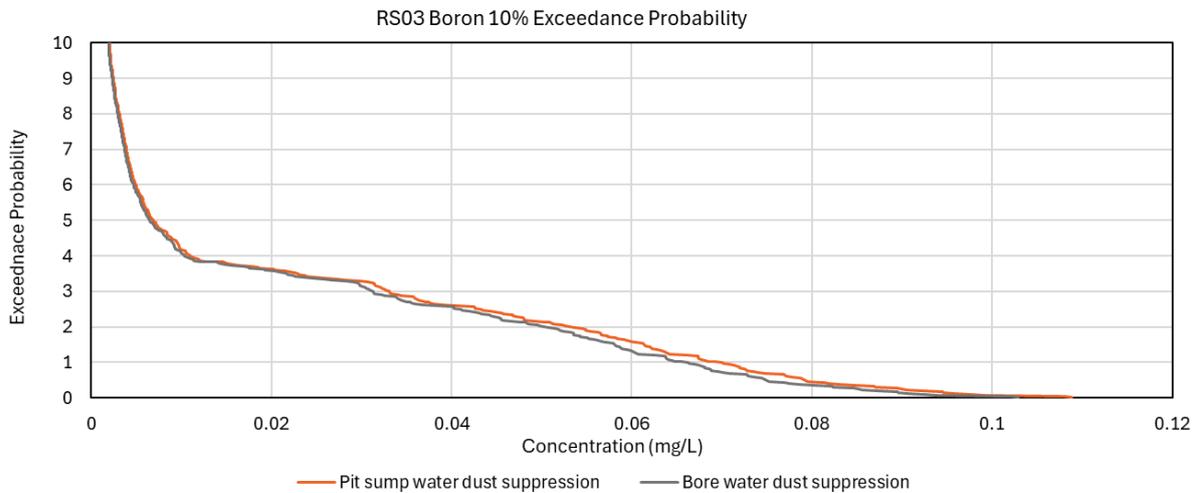


Figure 60: RS03 10% exceedance probability - boron.

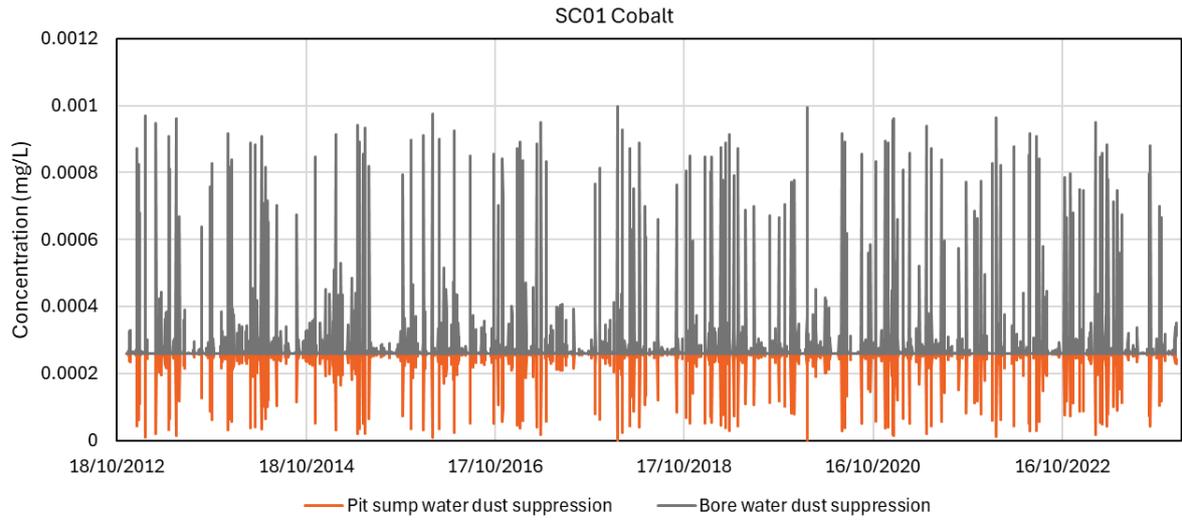


Figure 61: Modelled cobalt concentrations in SC01 over time.

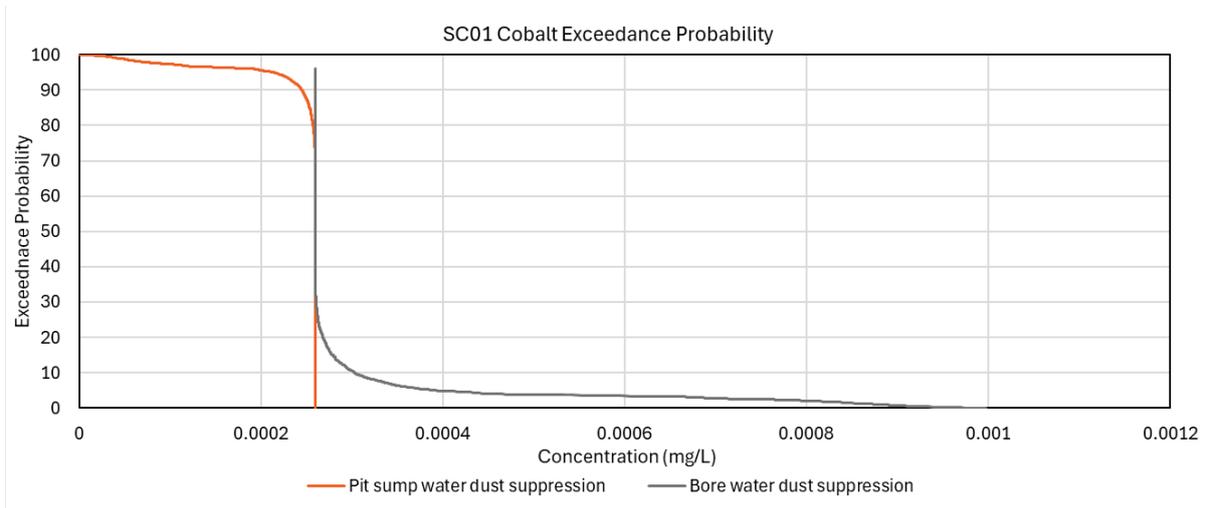


Figure 62: SC01 exceedance probability - cobalt.

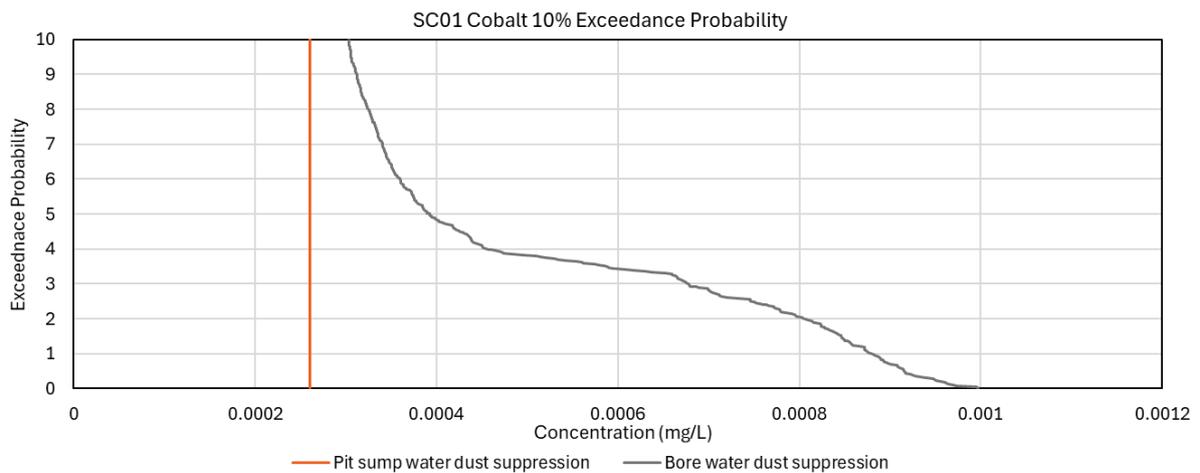


Figure 63: SC01 10% exceedance probability - cobalt.

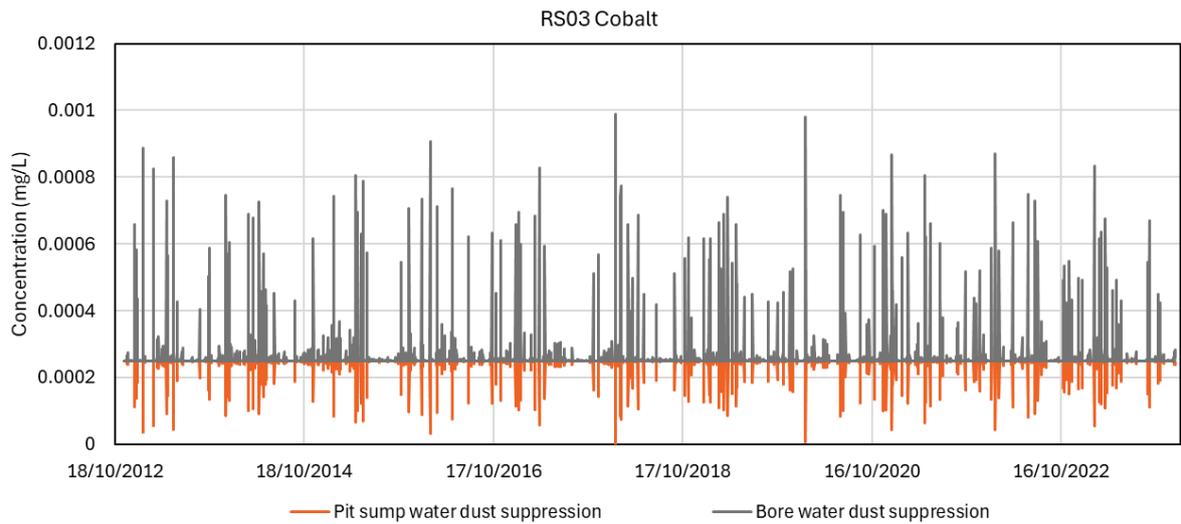


Figure 64: Modelled cobalt concentrations in RS03 over time.

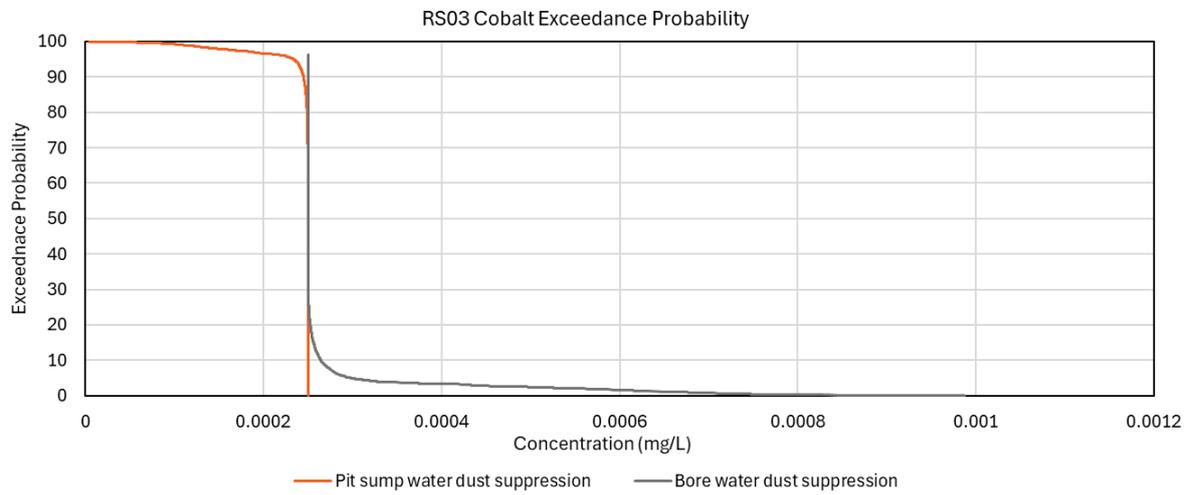


Figure 65: RS03 exceedance probability - cobalt.

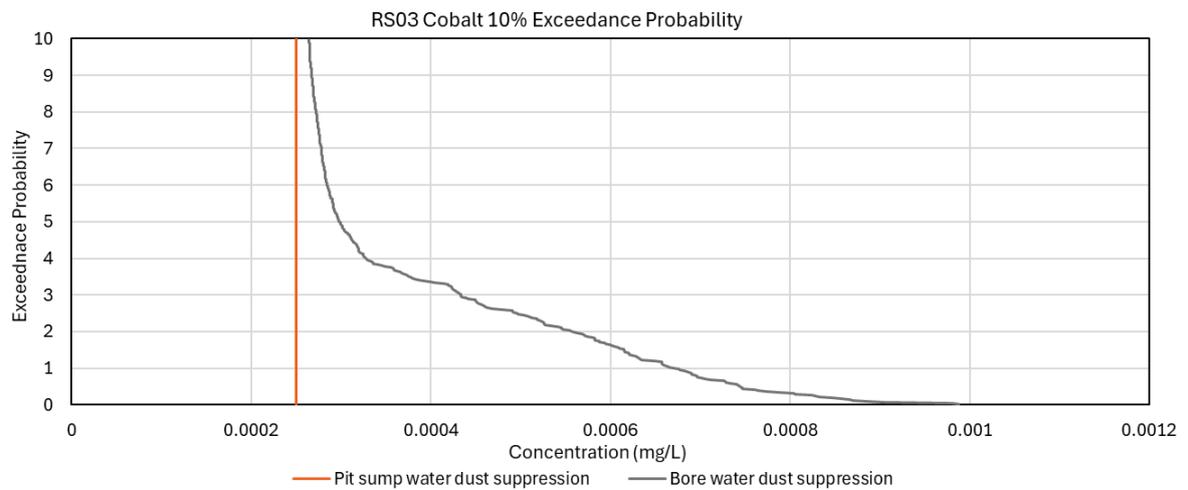


Figure 66: RS03 10% exceedance probability - cobalt.

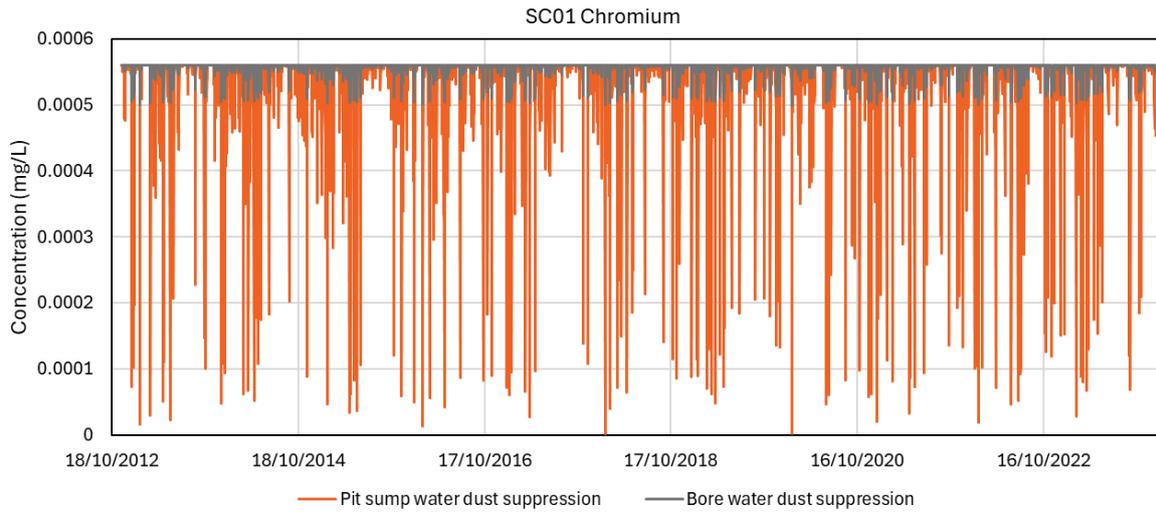


Figure 67: Modelled chromium concentrations in SC01 over time.

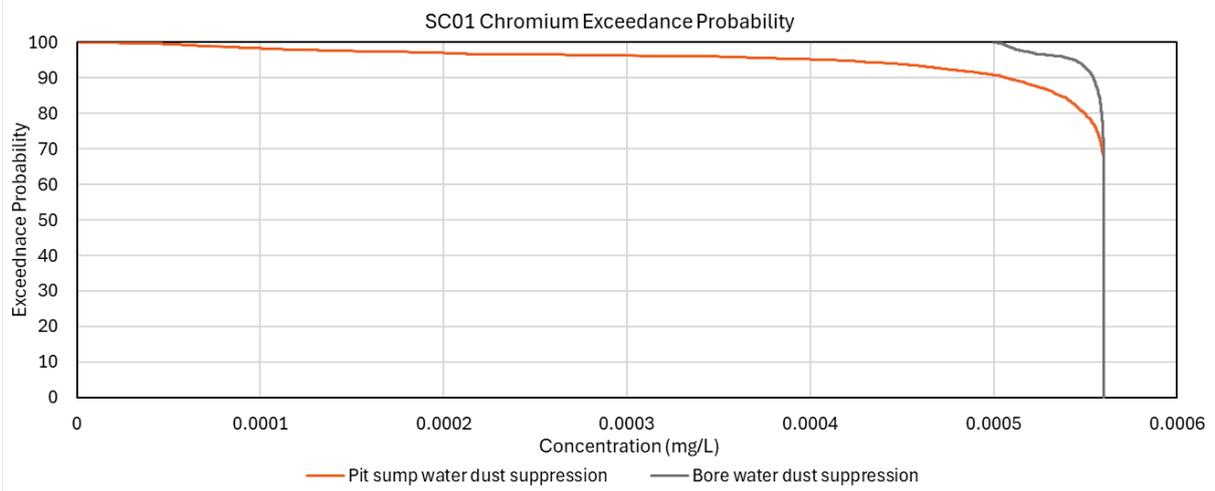


Figure 68: SC01 exceedance probability - chromium.

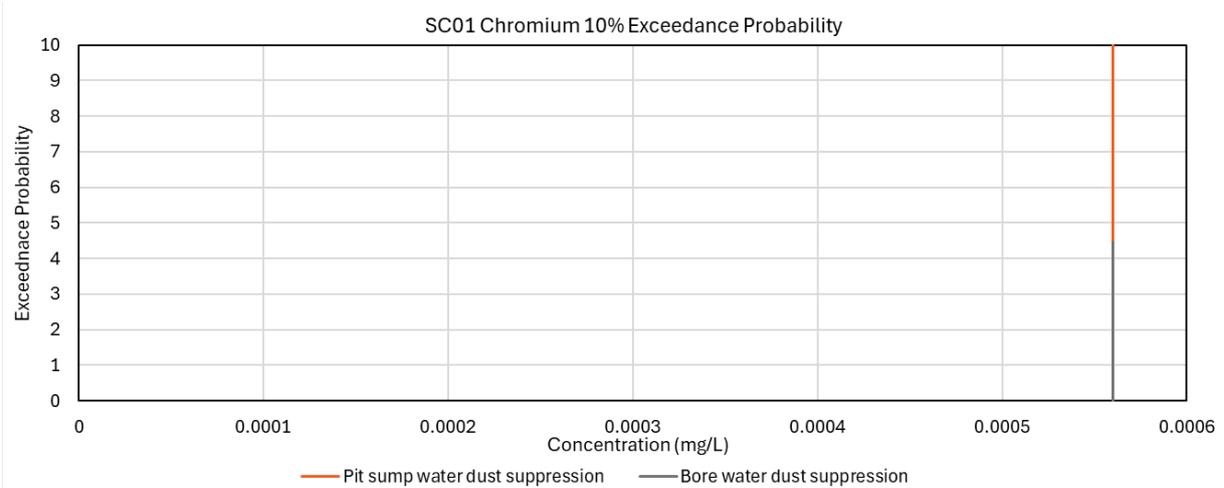


Figure 69: SC01 10% exceedance probability - chromium.

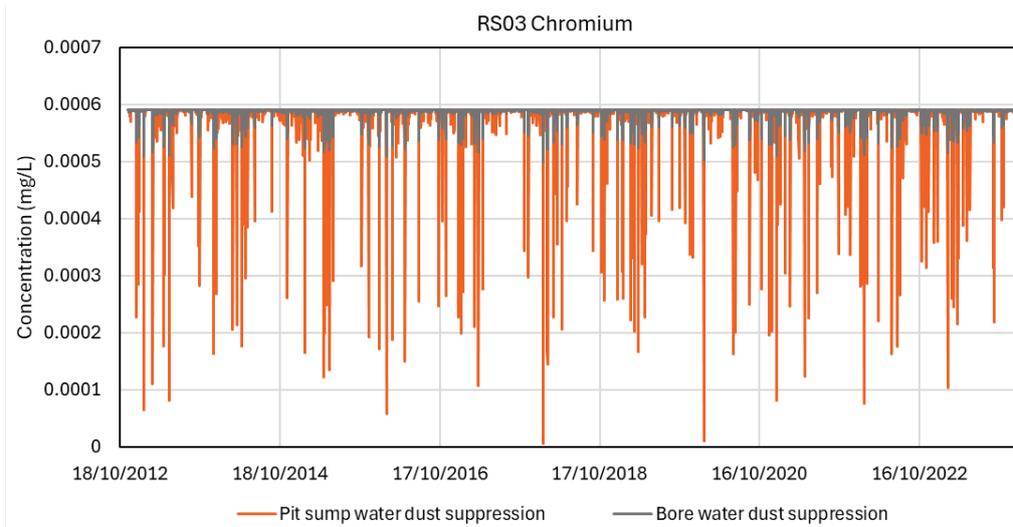


Figure 70: Modelled chromium concentrations in RS03 over time.

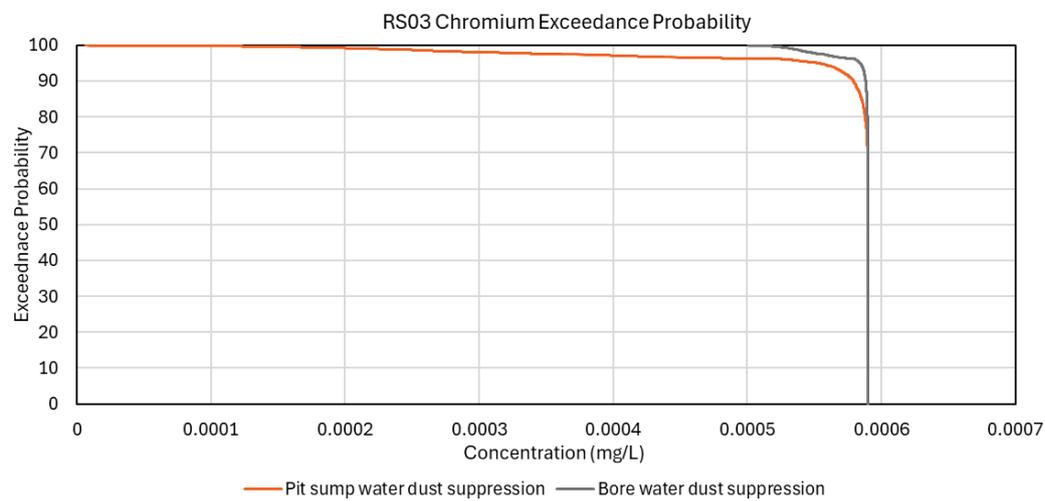


Figure 71: RS03 exceedance probability - chromium.

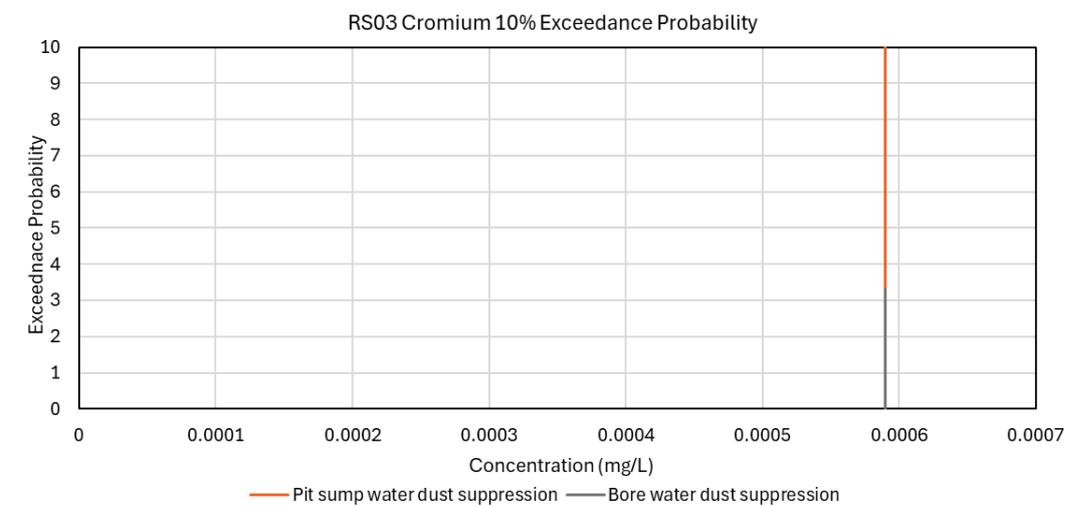


Figure 72: RS03 10% exceedance probability - chromium.

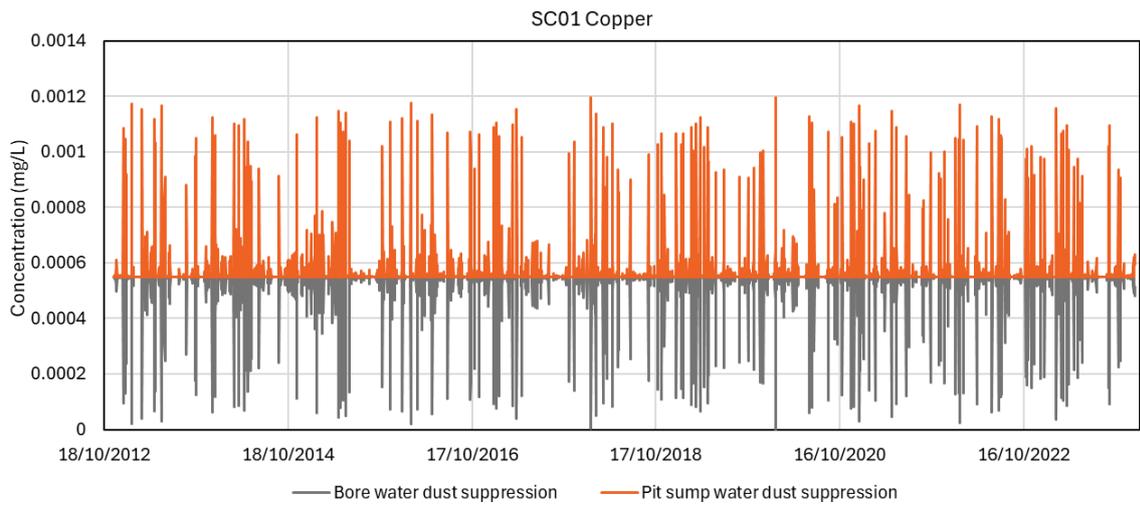


Figure 73: Modelled copper concentrations in SC01 over time.

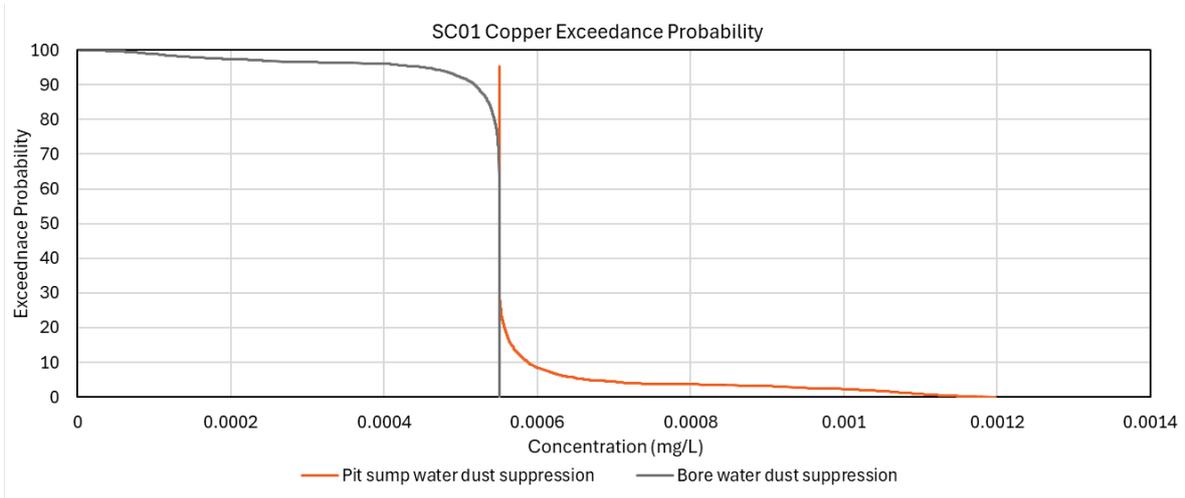


Figure 74: SC01 exceedance probability - copper.

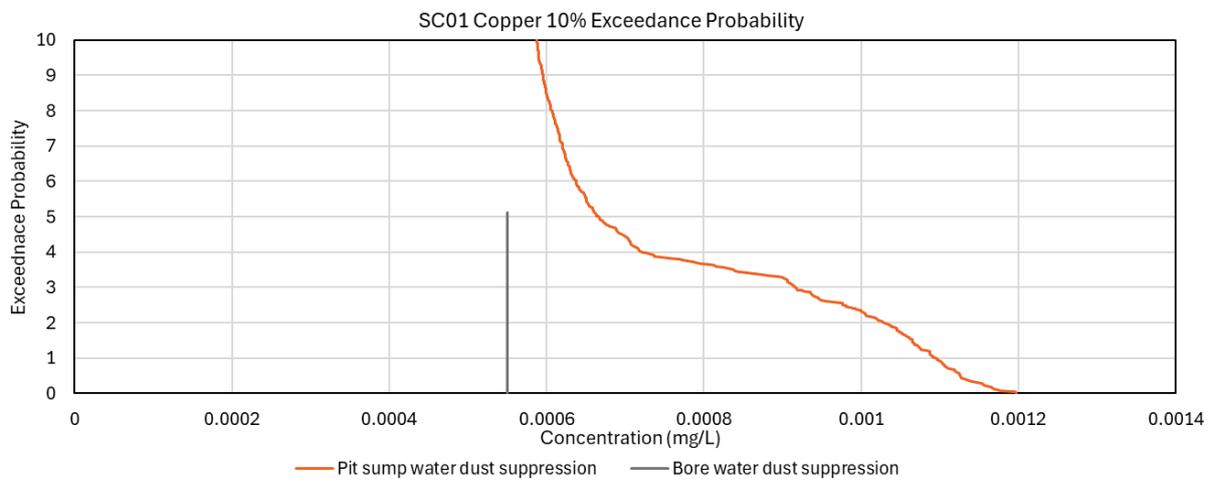


Figure 75: SC01 10% exceedance probability - copper.

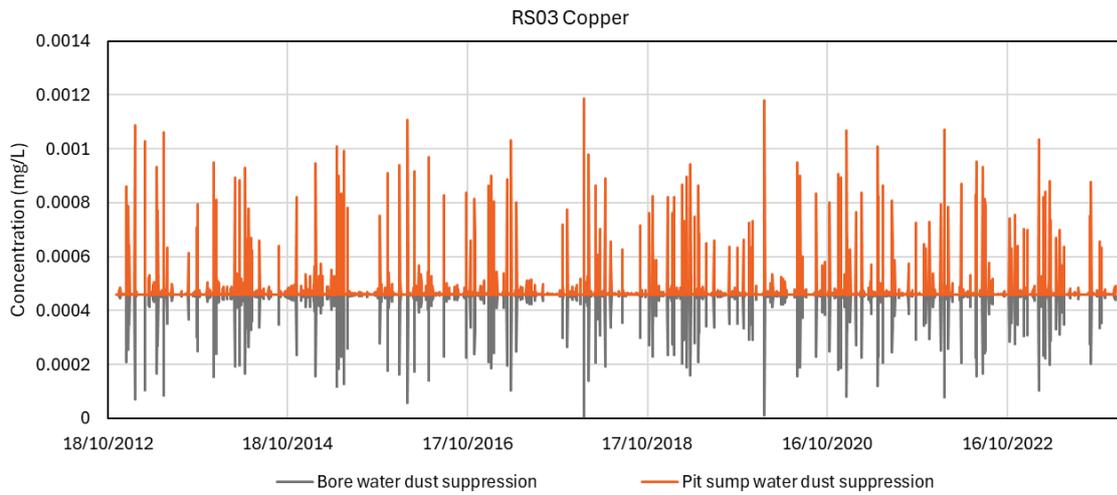


Figure 76: Modelled copper concentrations in RS03 over time.

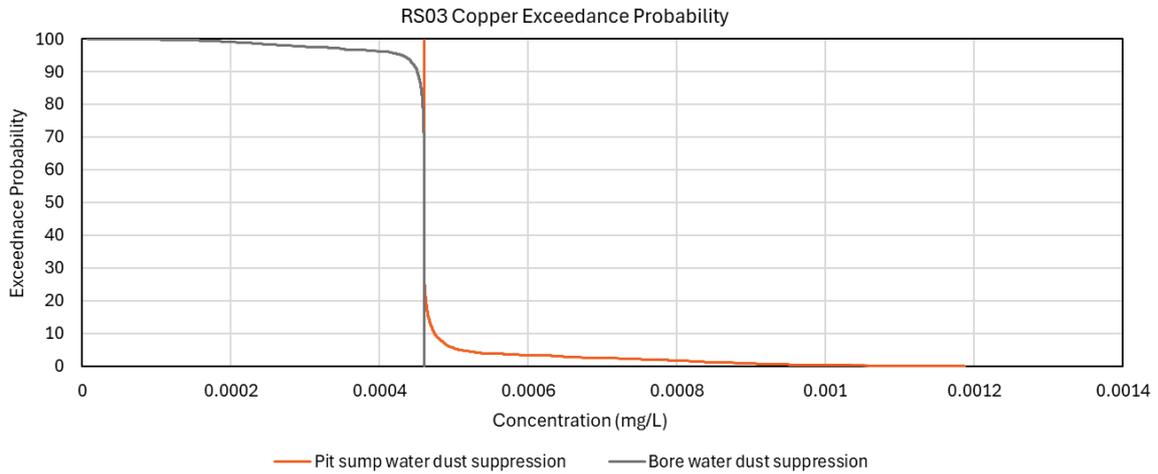


Figure 77: RS03 exceedance probability - copper.

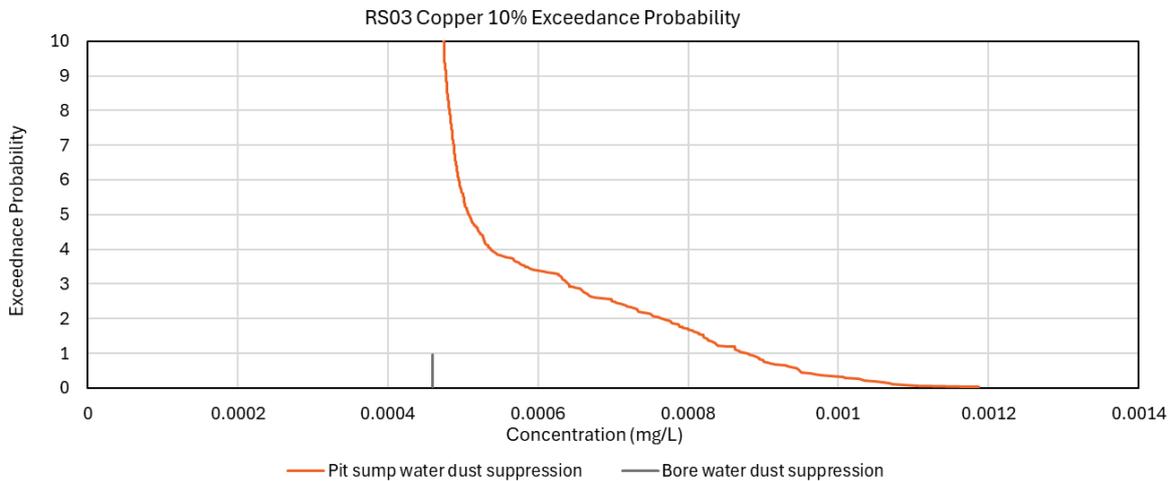


Figure 78: RS03 10% exceedance probability - copper.

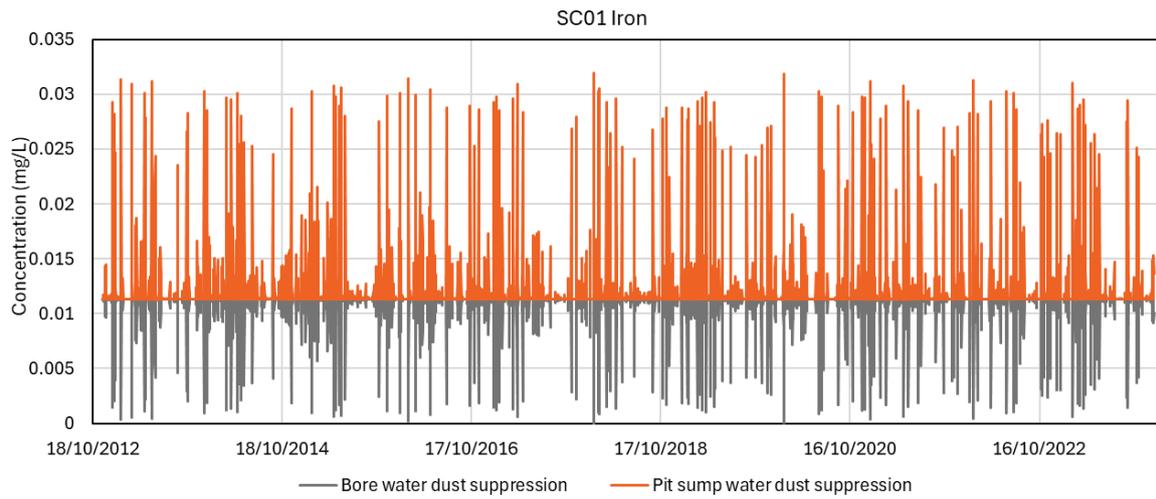


Figure 79: Modelled iron concentrations in SC01 over time.

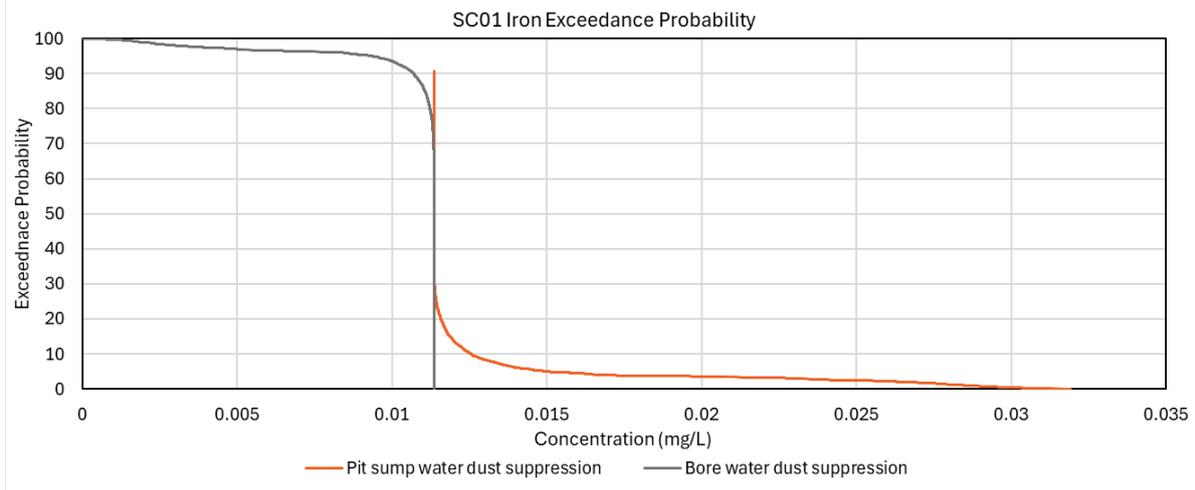


Figure 80: SC01 exceedance probability - iron.

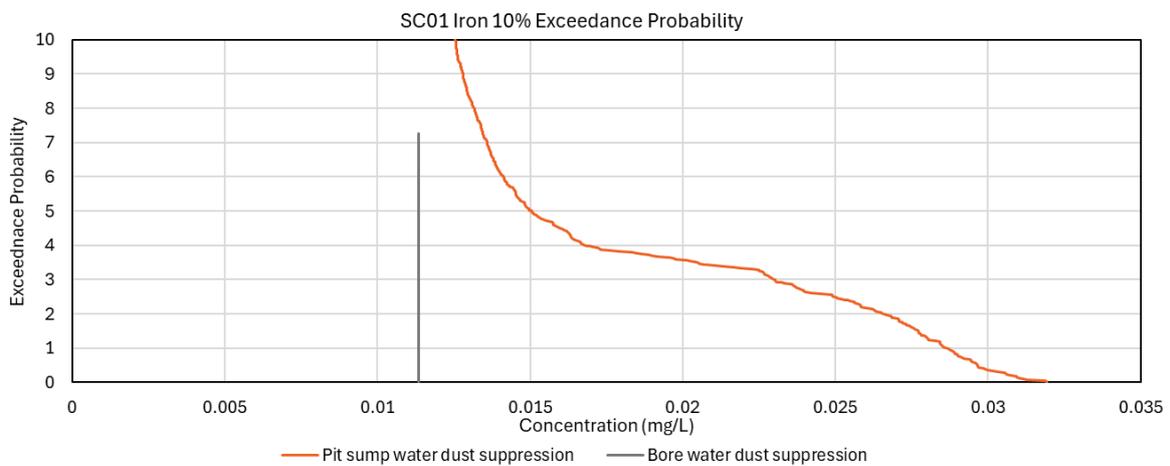


Figure 81: SC01 10% exceedance probability - iron.

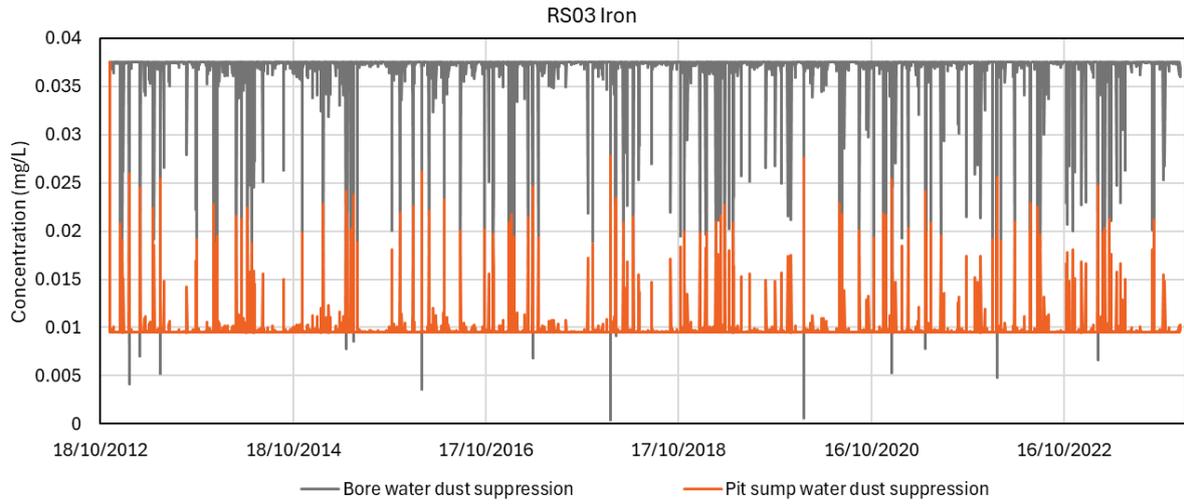


Figure 82: Modelled iron concentrations in RS03 over time.

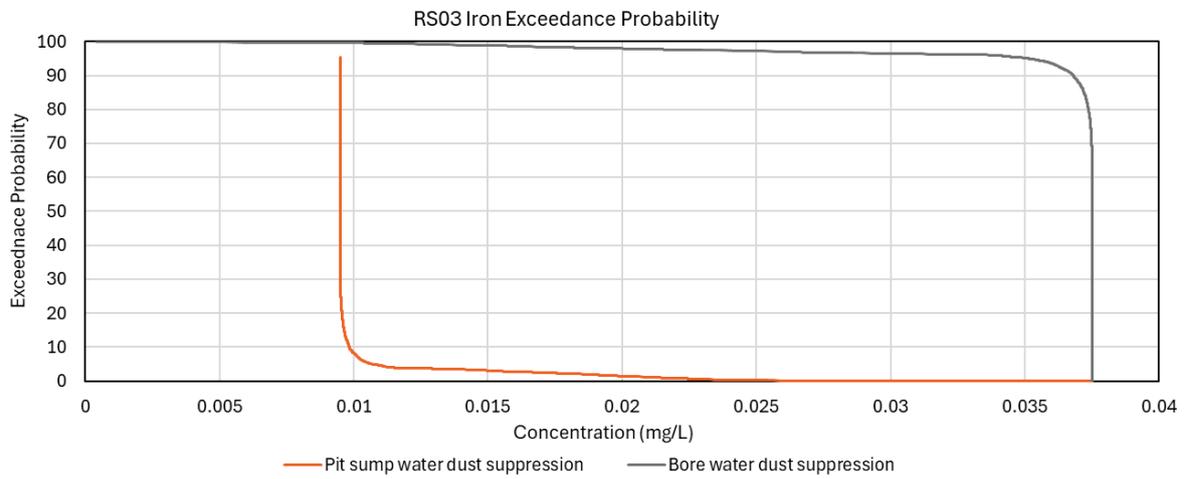


Figure 83: RS03 exceedance probability - iron.

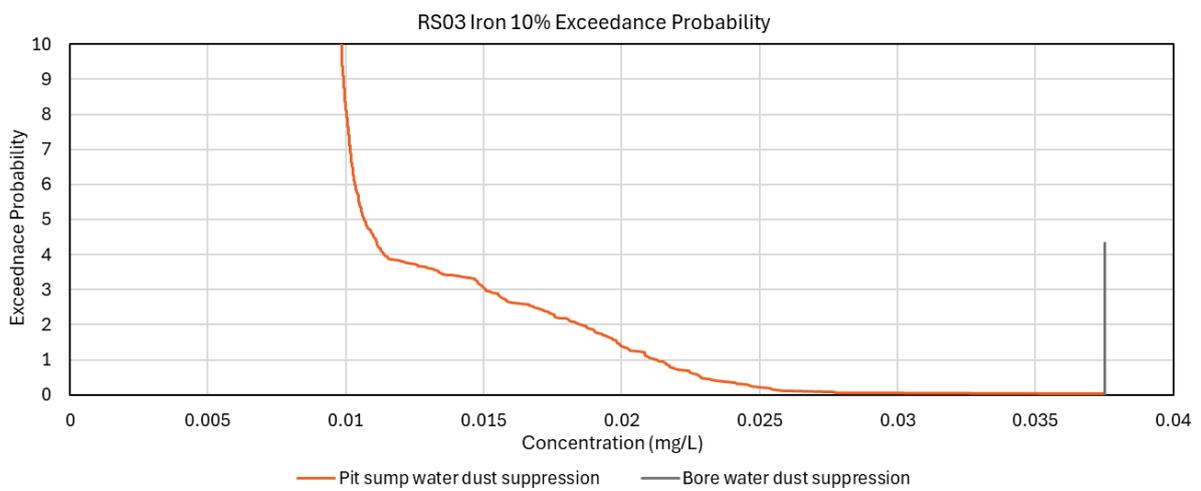


Figure 84: RS03 10% exceedance probability - iron.

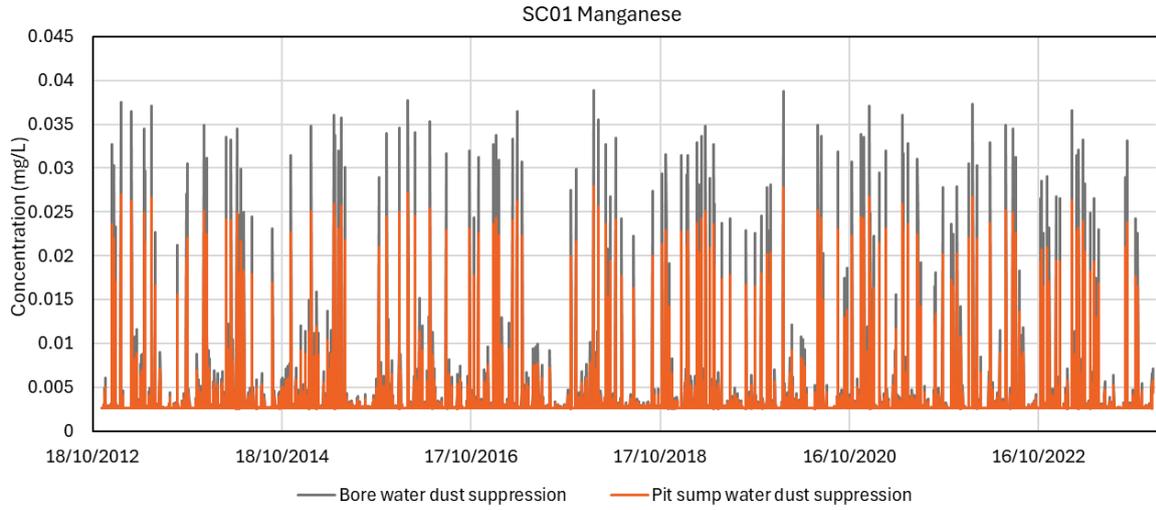


Figure 85: Modelled manganese concentrations in SC01 over time.

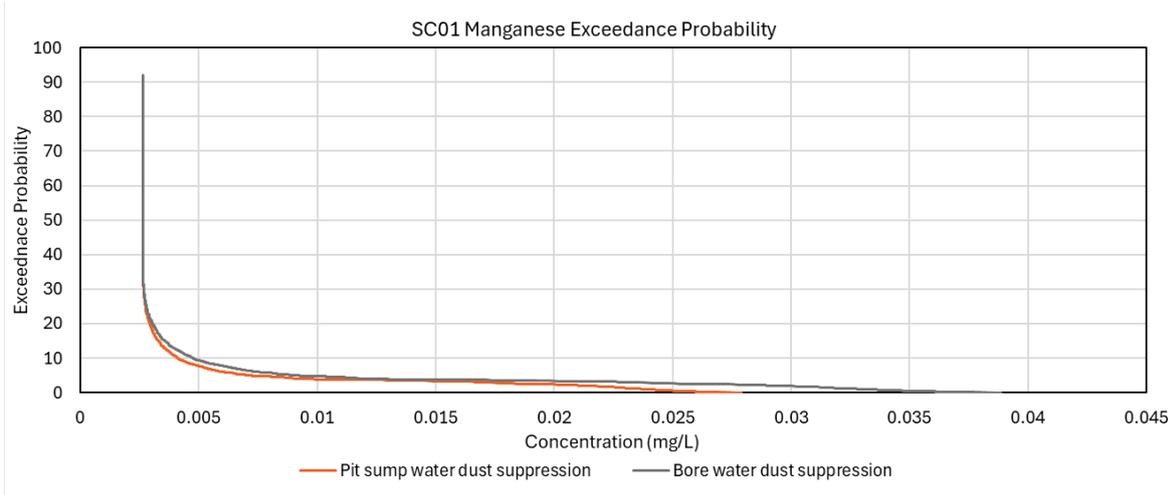


Figure 86: SC01 exceedance probability - manganese.

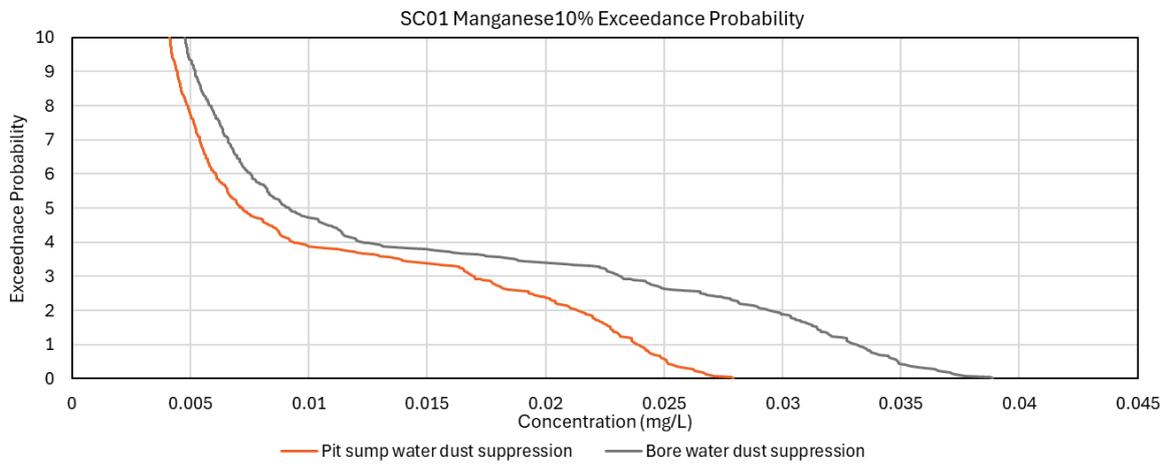


Figure 87: SC01 10% exceedance probability - manganese.

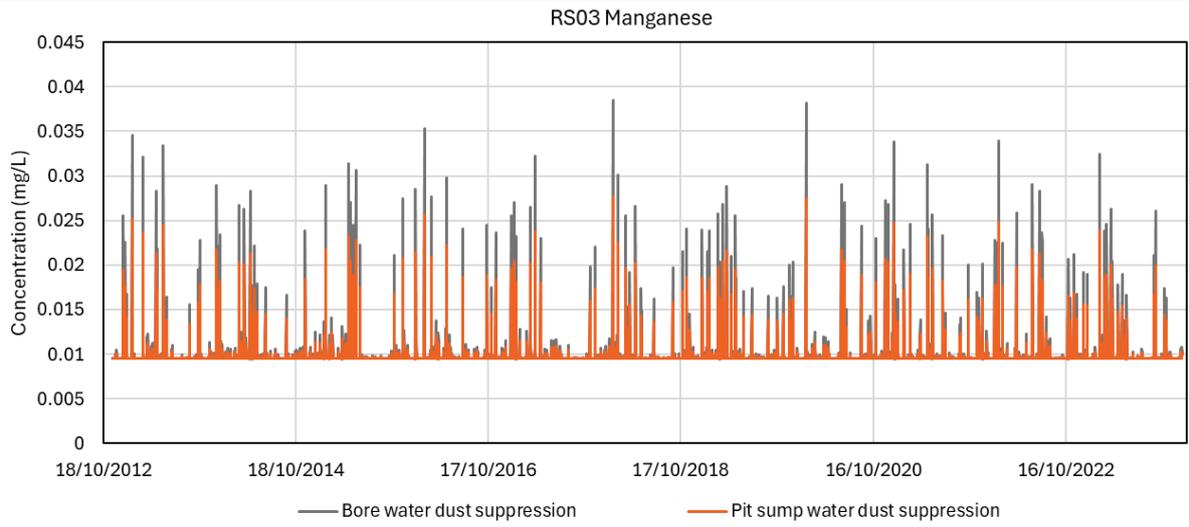


Figure 88: Modelled manganese concentrations in RS03 over time.

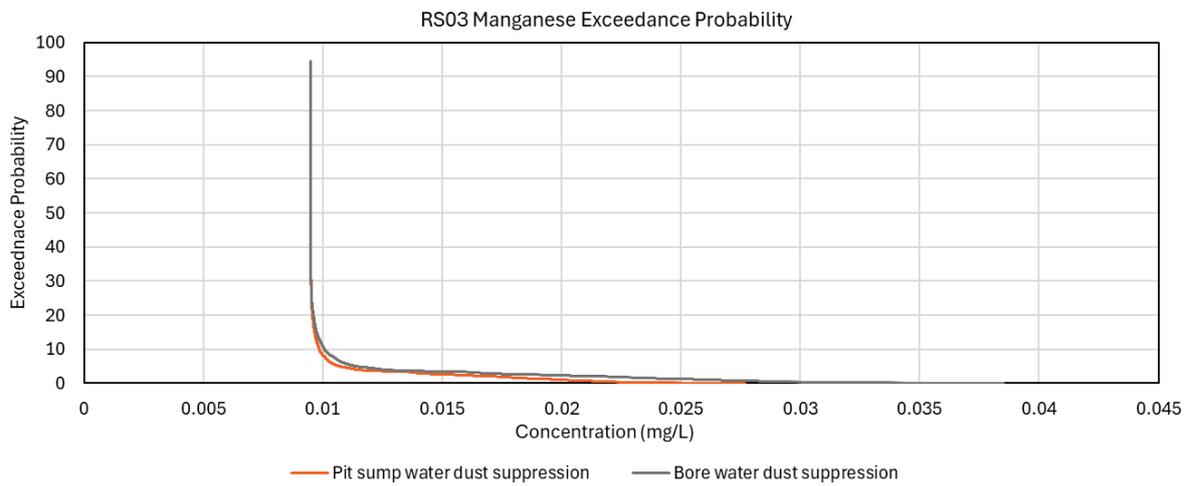


Figure 89: RS03 exceedance probability - manganese.

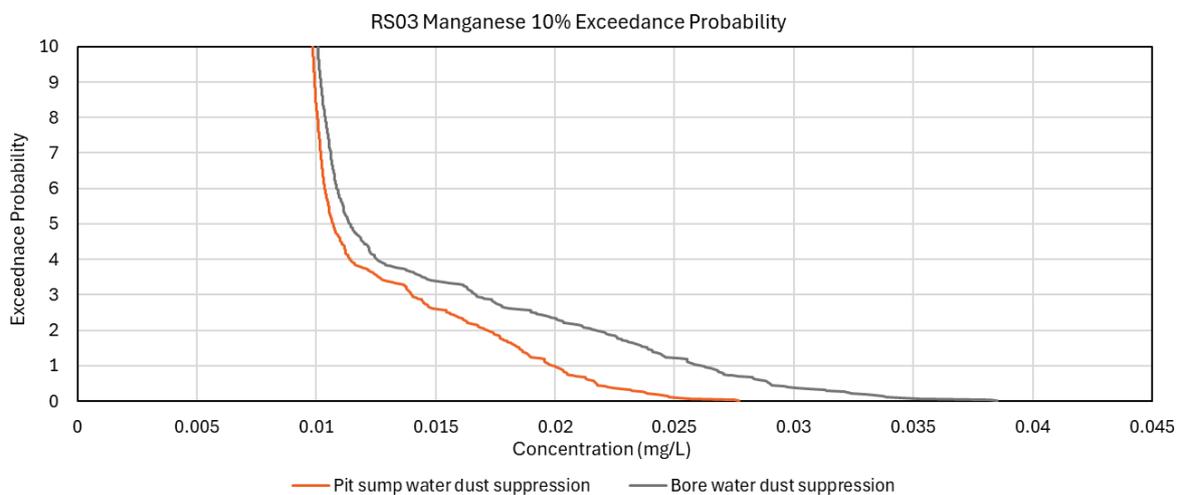


Figure 90: RS03 10% exceedance probability - manganese.

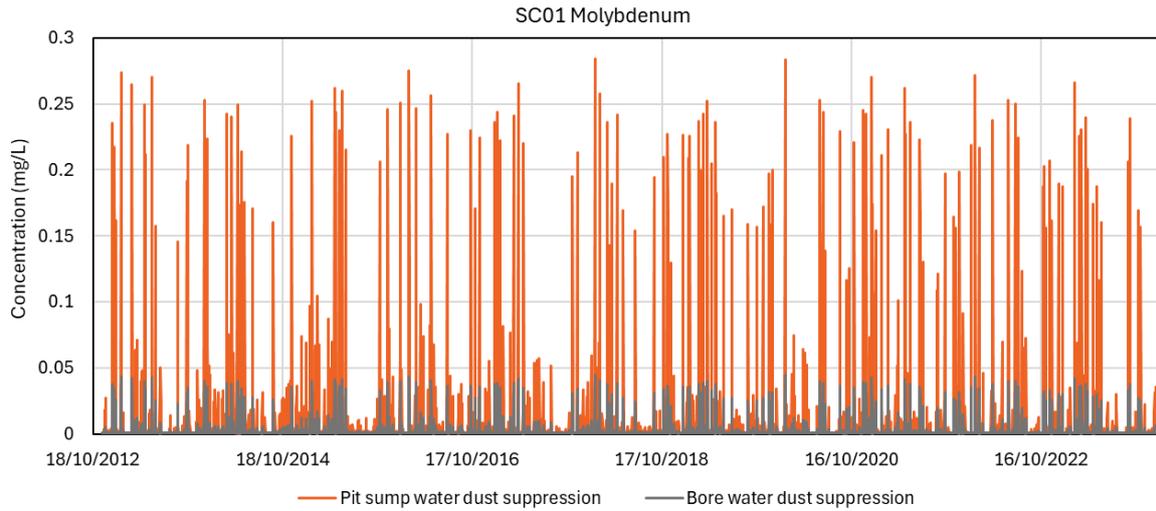


Figure 91: Modelled molybdenum concentrations in SC01 over time.

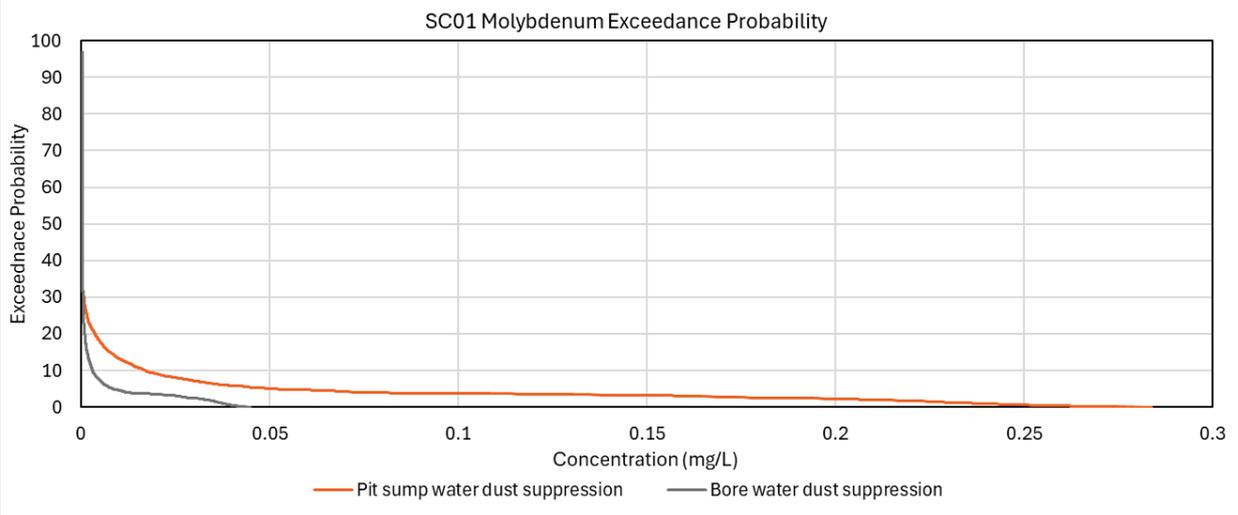


Figure 92: SC01 exceedance probability - molybdenum.

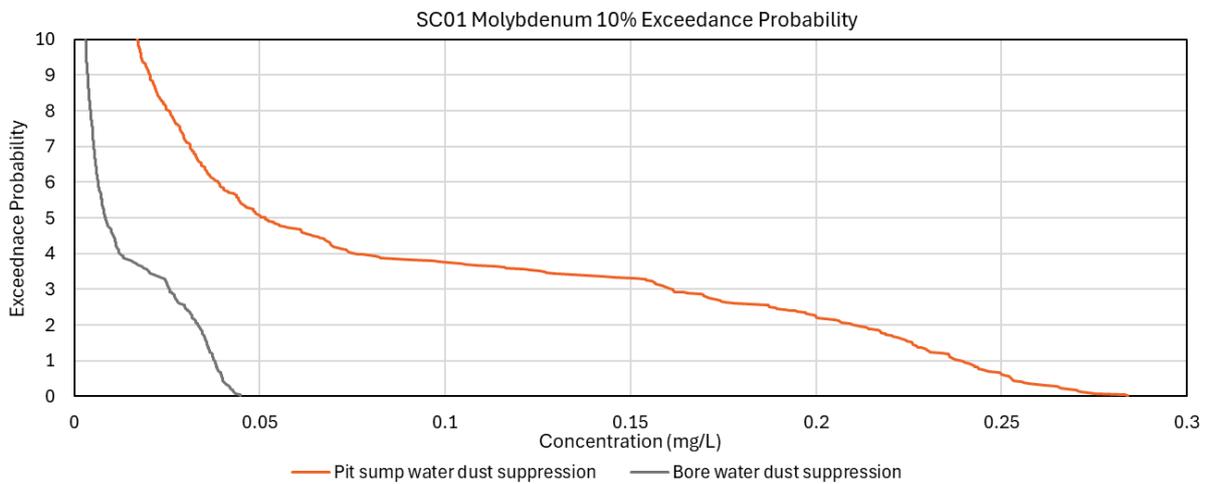


Figure 93: SC01 10% exceedance probability - molybdenum.

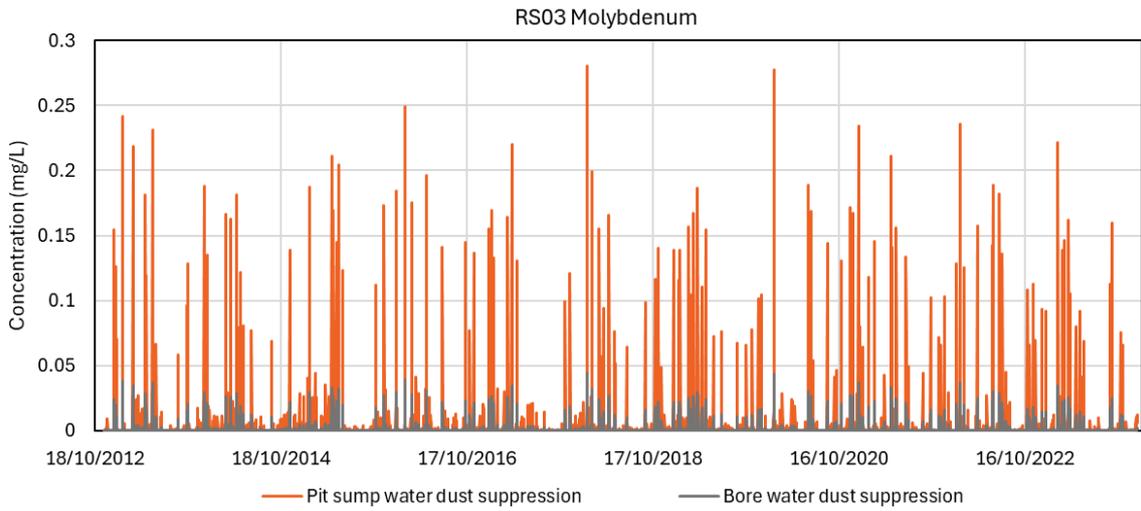


Figure 94: Modelled molybdenum concentrations in RS03 over time.

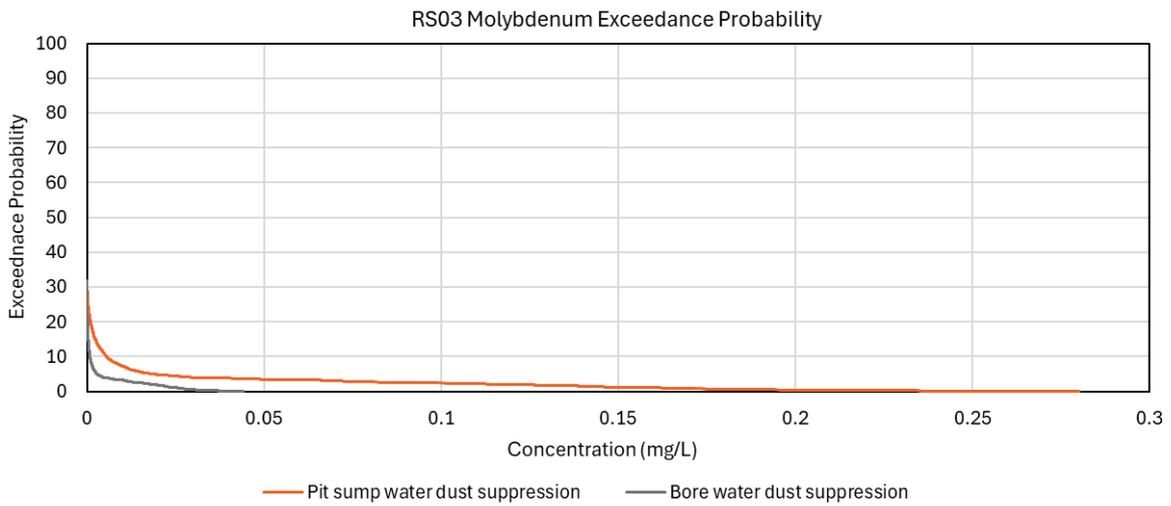


Figure 95: RS03 exceedance probability - molybdenum.

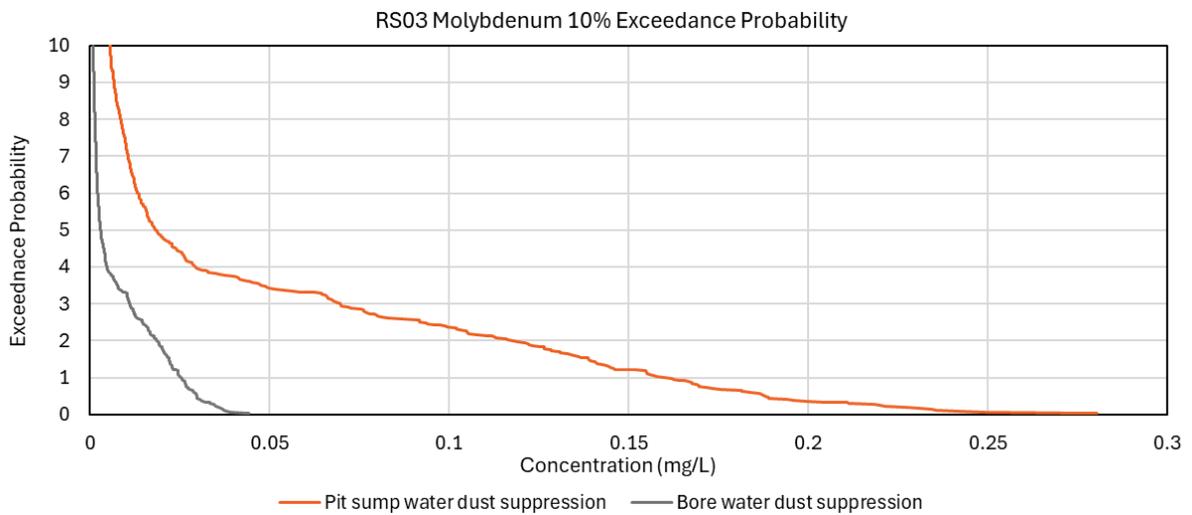


Figure 96: RS03 10% exceedance probability - molybdenum.

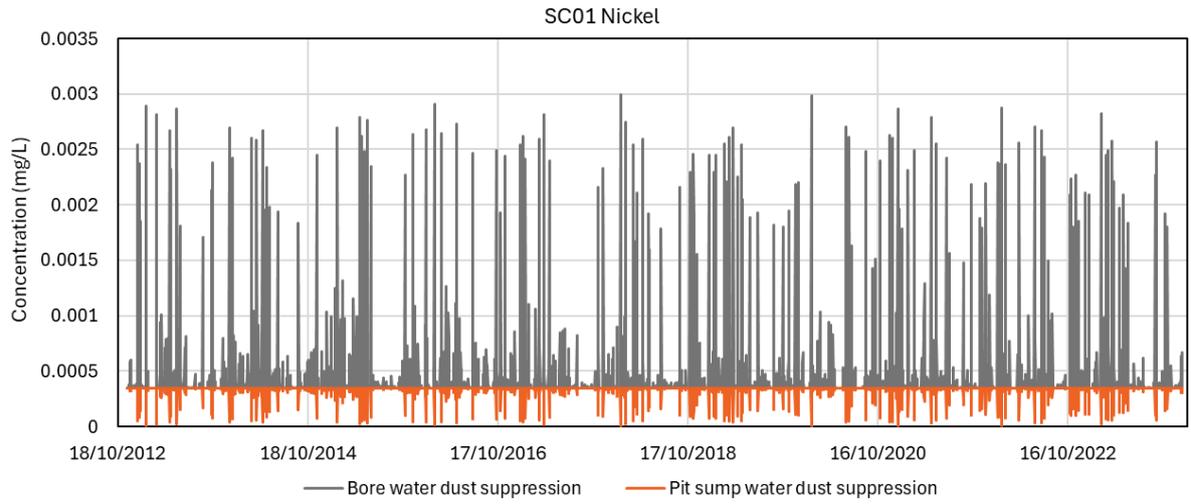


Figure 97: Modelled nickel concentrations in SC01 over time.

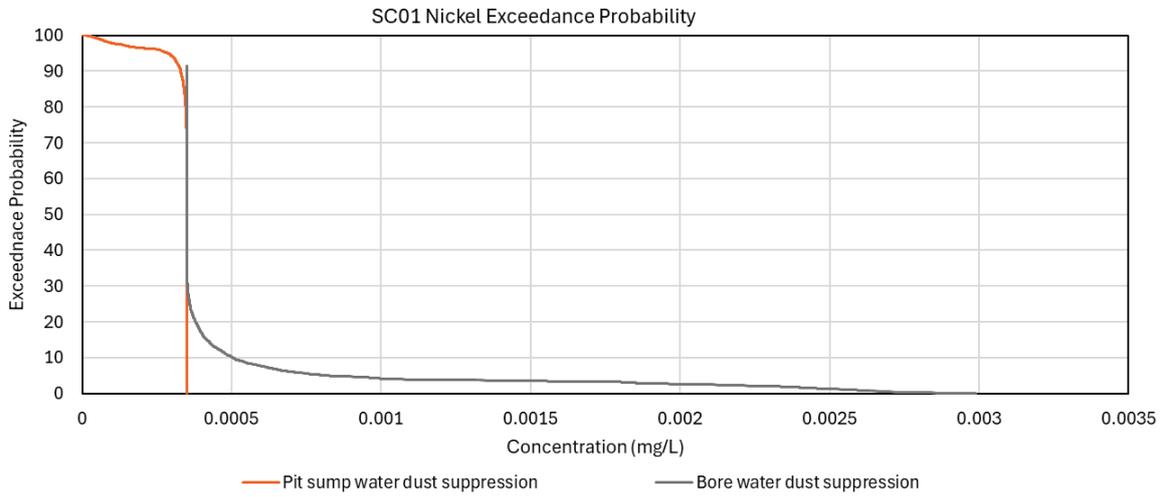


Figure 98: SC01 exceedance probability - nickel.

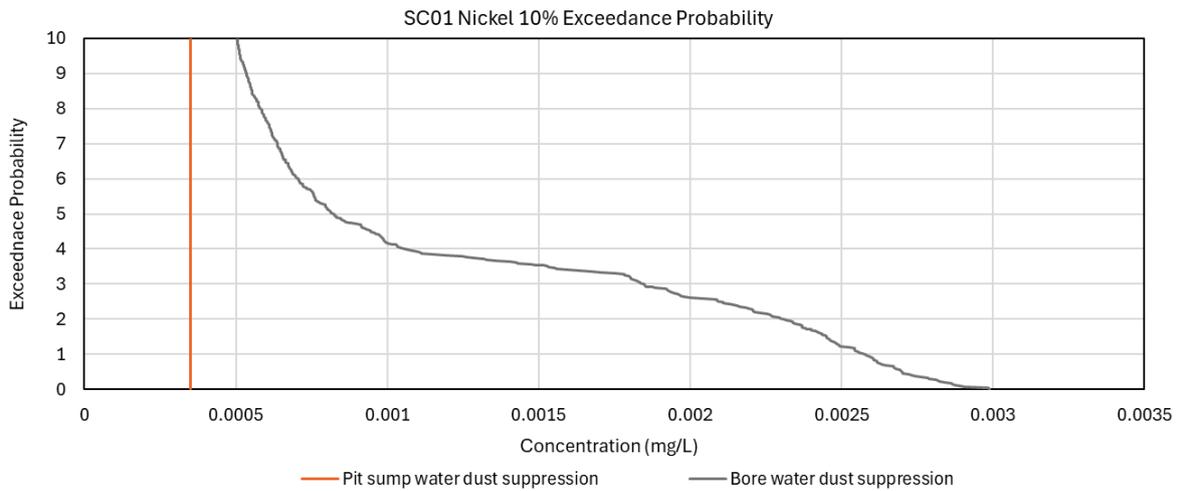


Figure 99: SC01 10% exceedance probability - nickel.

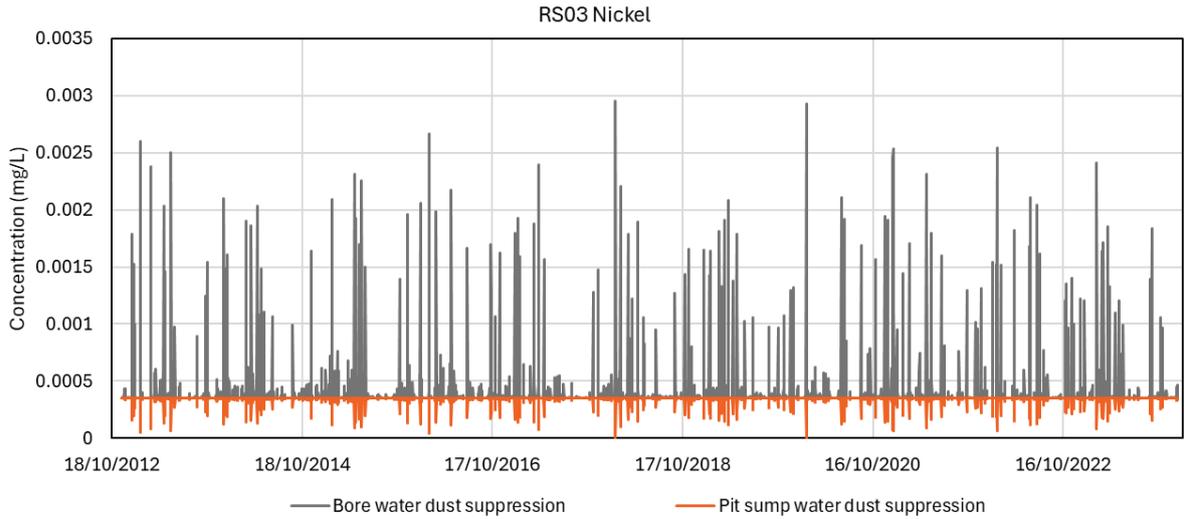


Figure 100: Modelled nickel concentrations in RS03 over time.

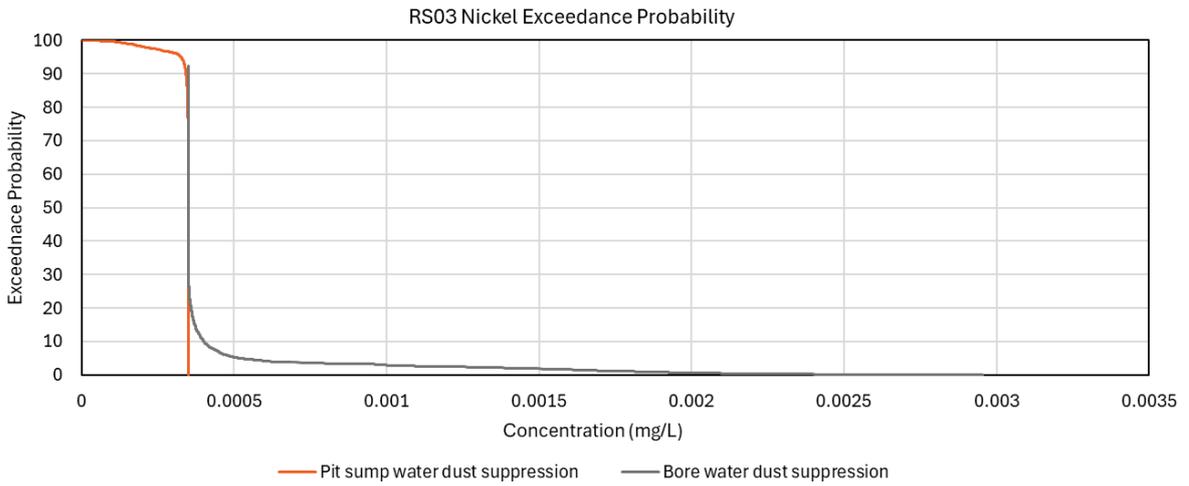


Figure 101: RS03 exceedance probability - nickel.

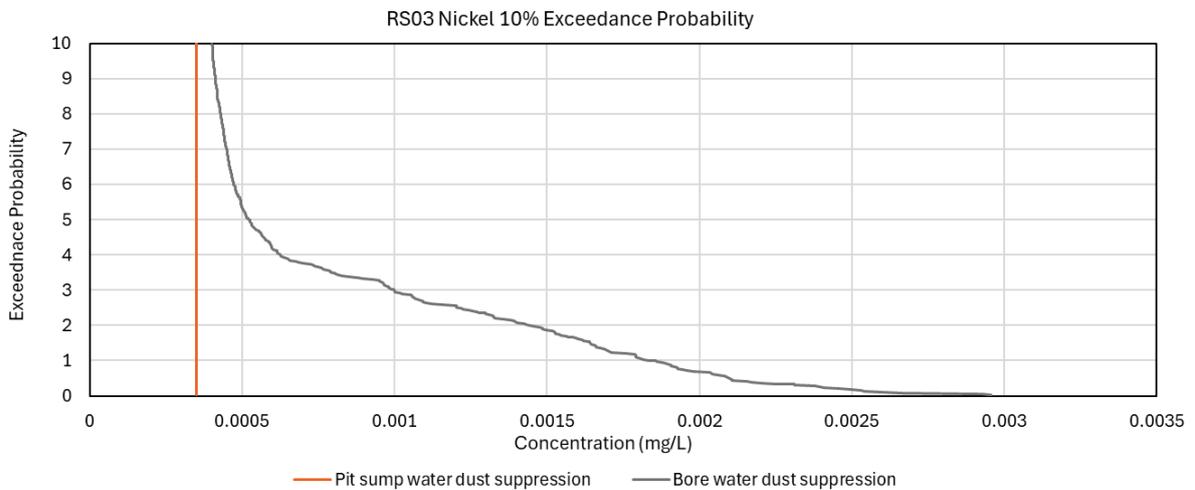


Figure 102: RS03 10% exceedance probability - nickel.

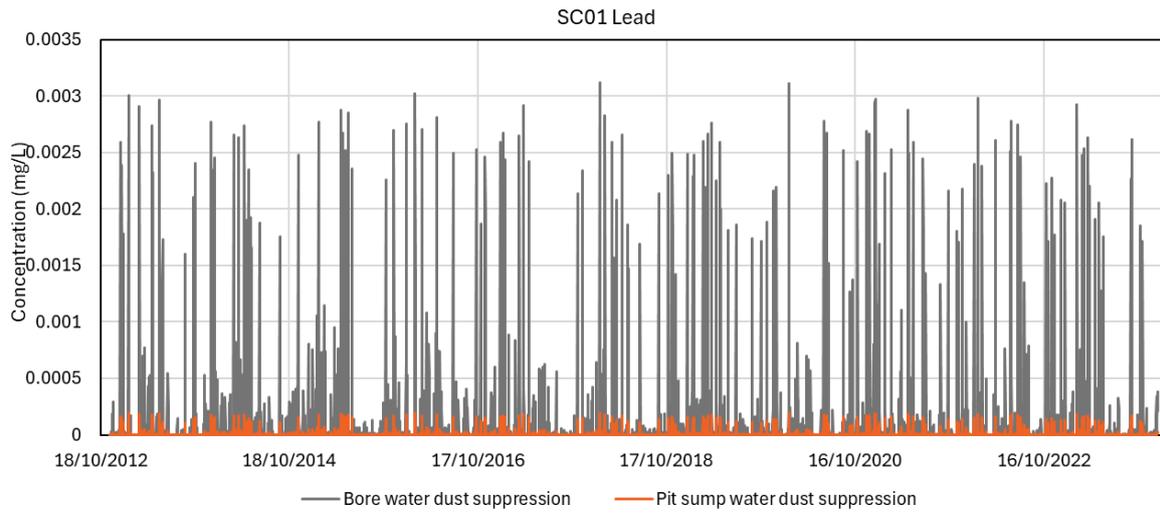


Figure 103: Modelled lead concentrations in SC01 over time.

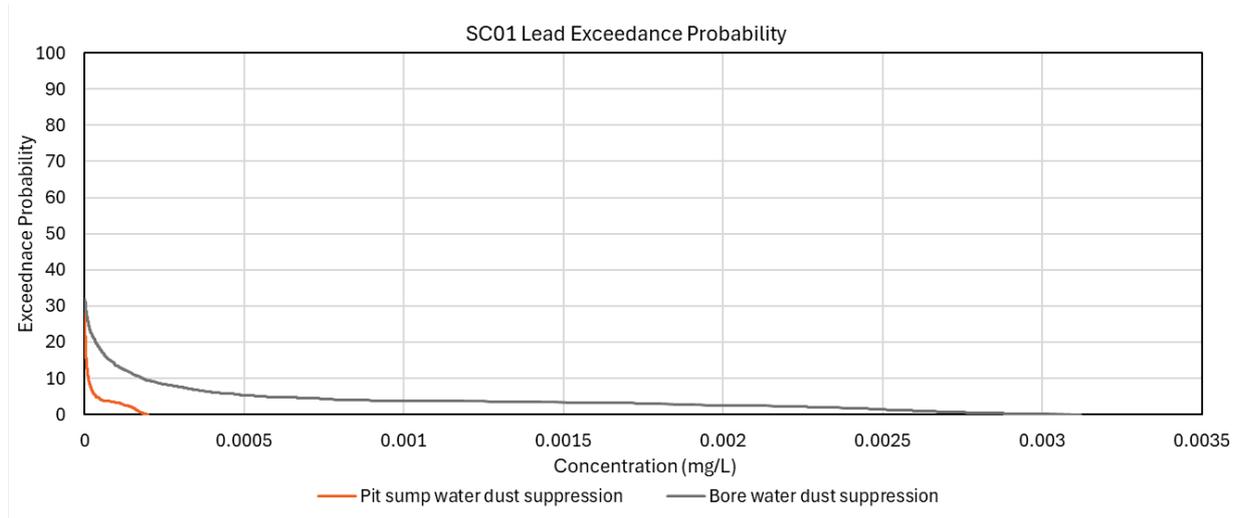


Figure 104: SC01 exceedance probability - lead.

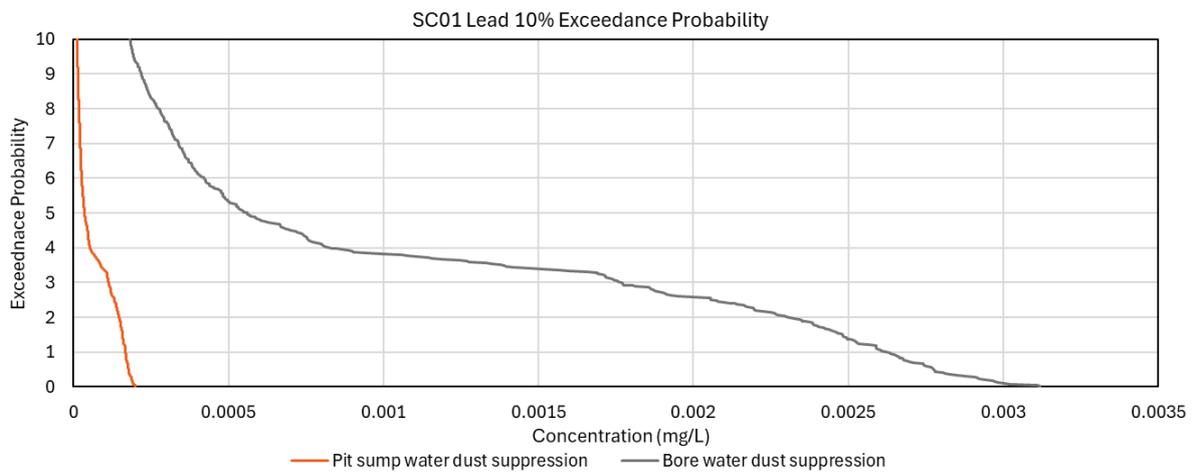


Figure 105: SC01 10% exceedance probability - lead.

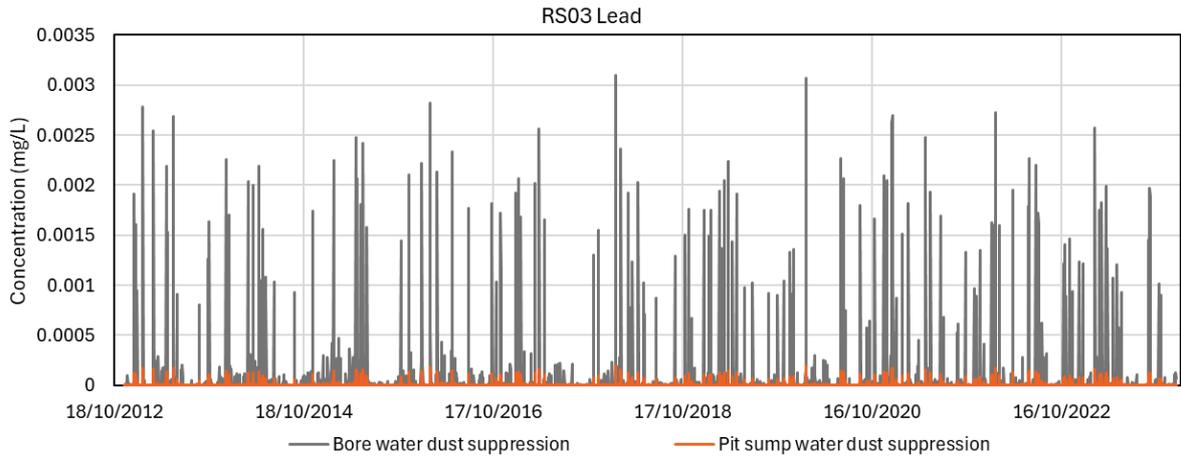


Figure 106: Modelled lead concentrations in RS03 over time.

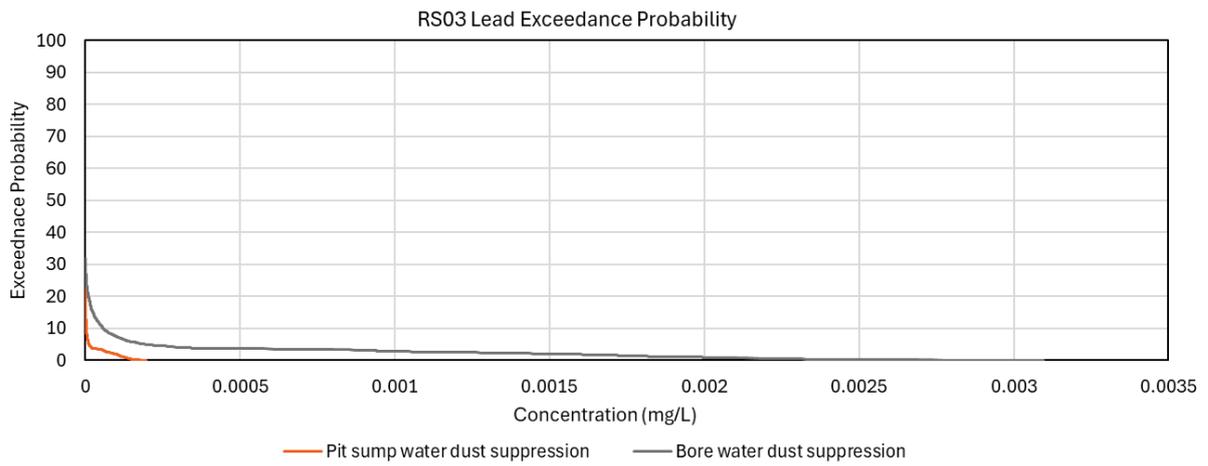


Figure 107: RS03 exceedance probability - lead.

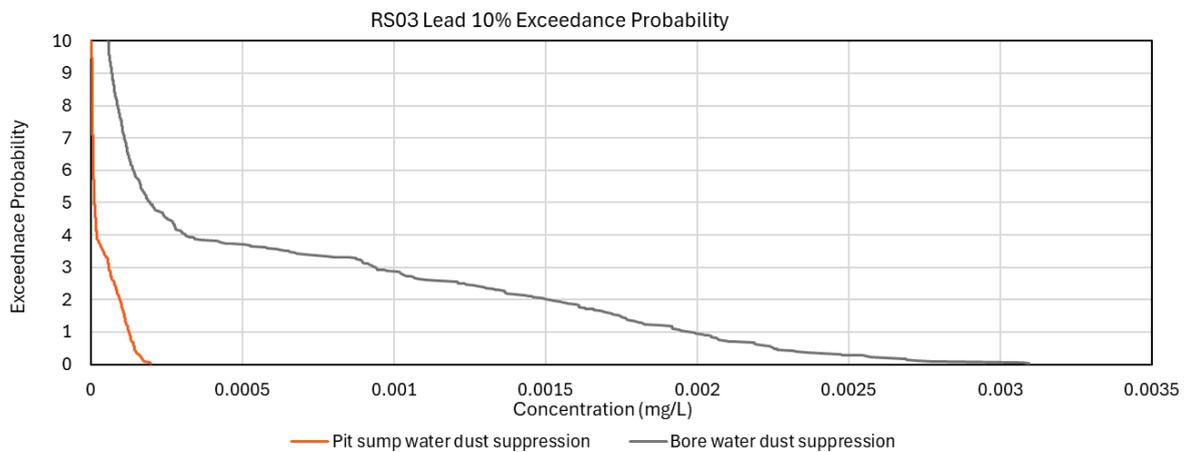


Figure 108: RS03 10% exceedance probability - lead.

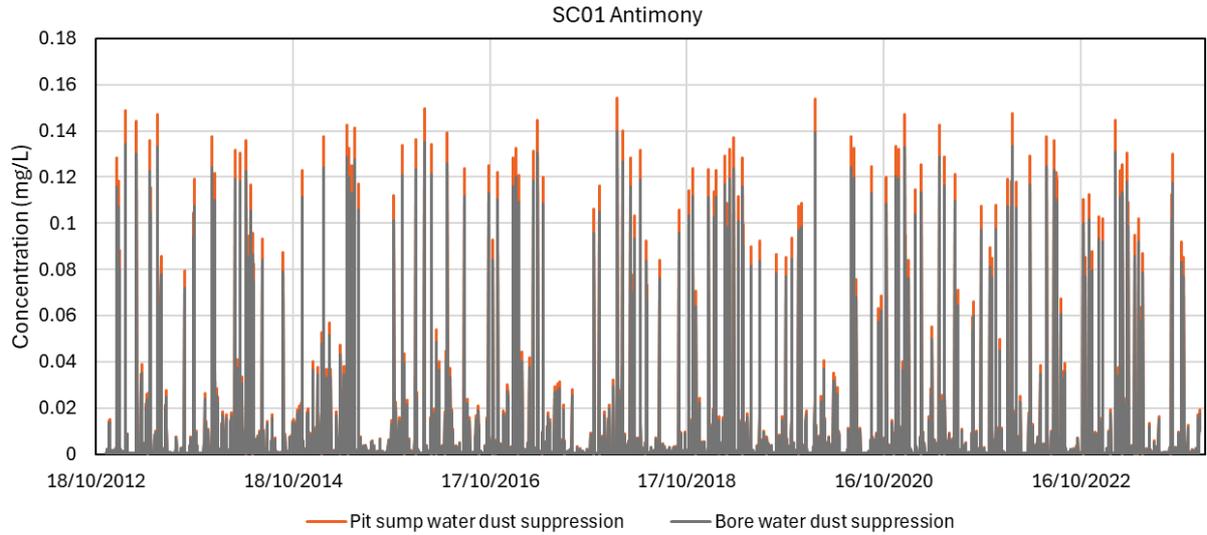


Figure 109: Modelled antimony concentrations in SC01 over time.

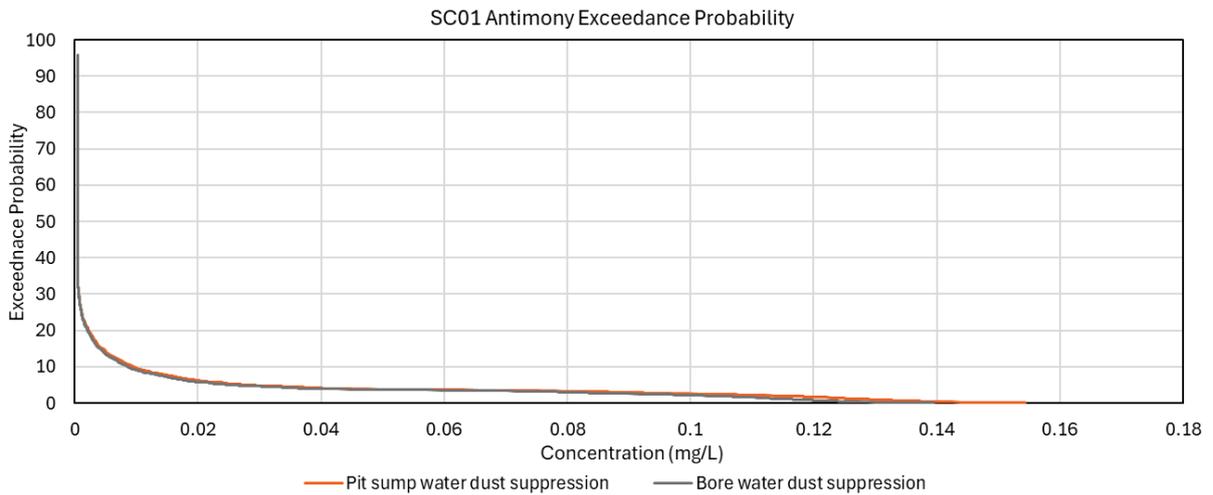


Figure 110: SC01 exceedance probability - antimony.

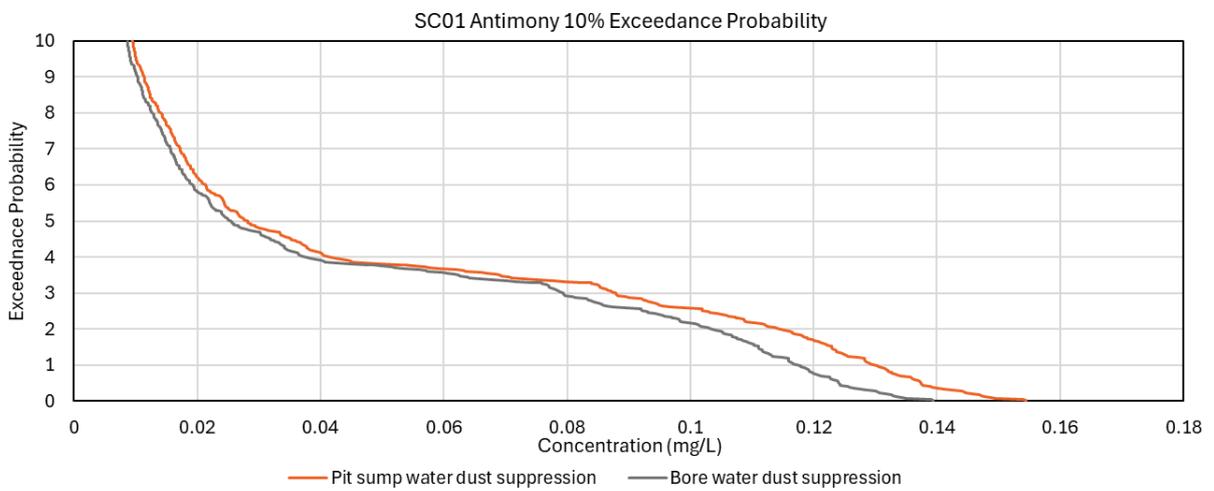


Figure 111: SC01 10% exceedance probability - antimony.

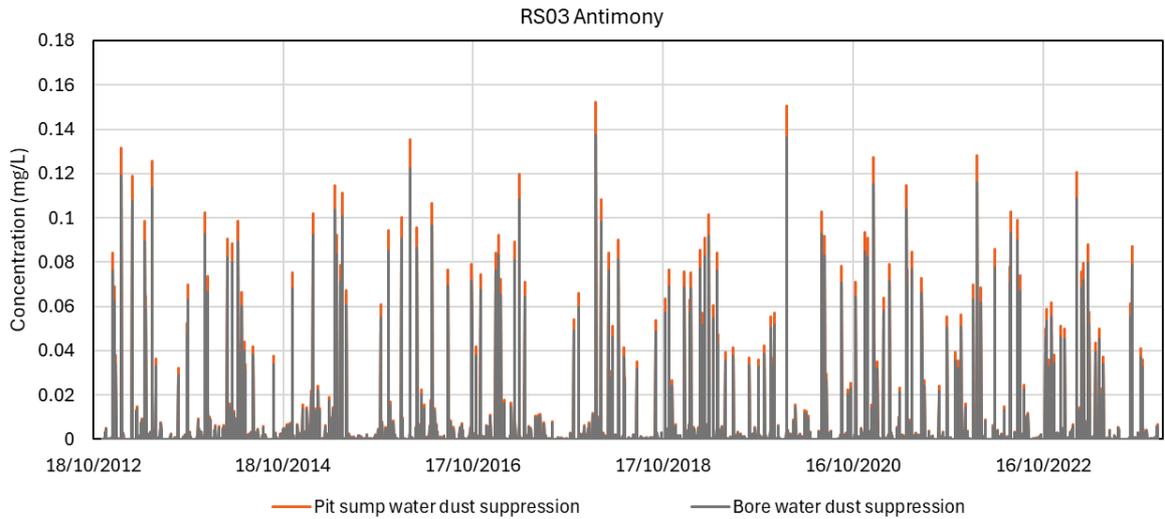


Figure 112: Modelled antimony concentrations in RS03 over time.

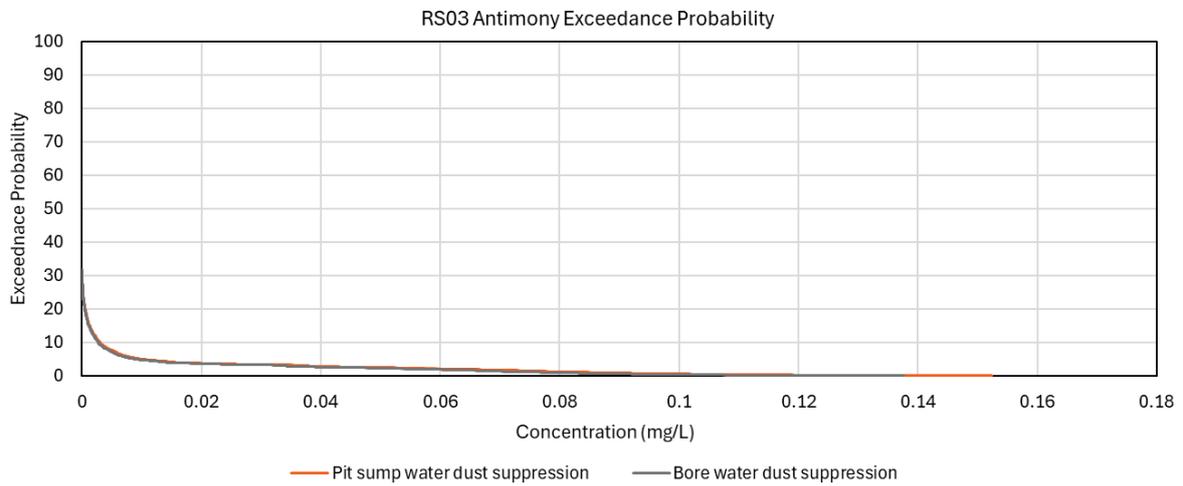


Figure 113: RS03 exceedance probability - antimony.

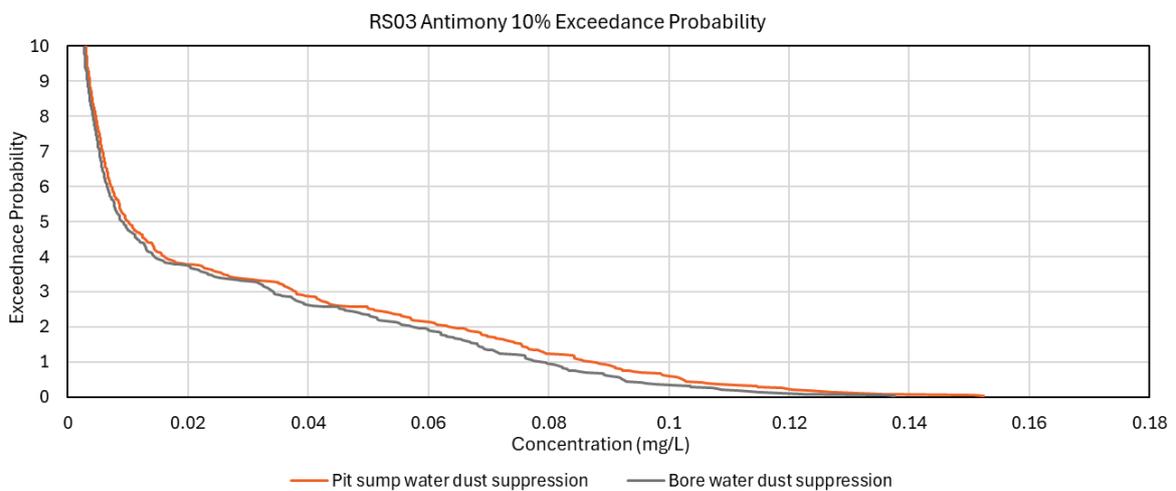


Figure 114: RS03 10% exceedance probability - antimony.

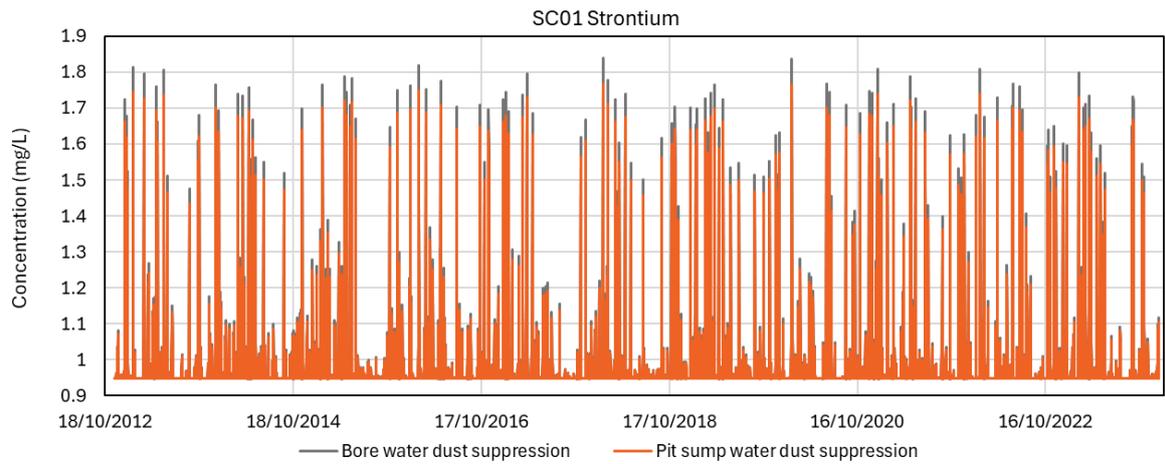


Figure 115: Modelled strontium concentrations in SC01 over time.

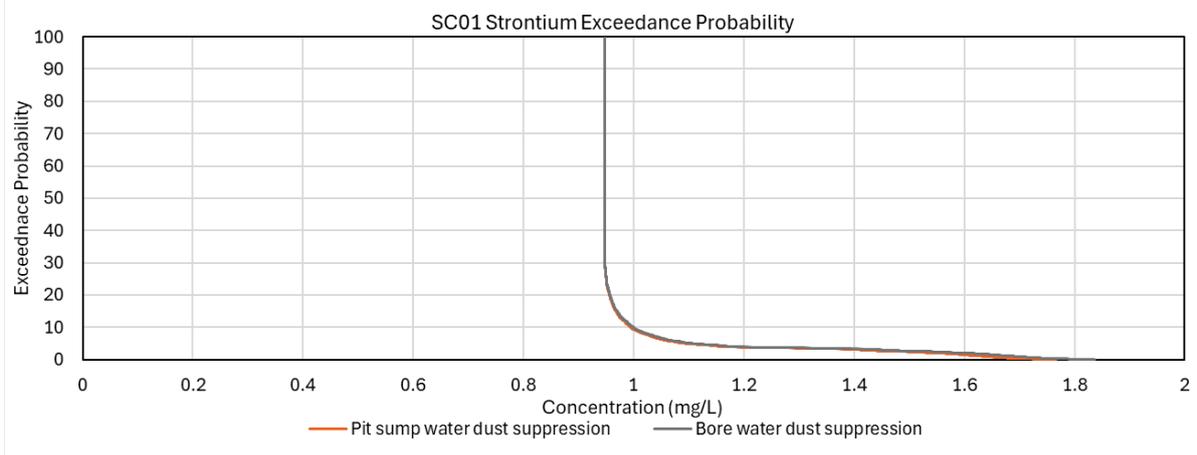


Figure 116: SC01 exceedance probability - strontium.

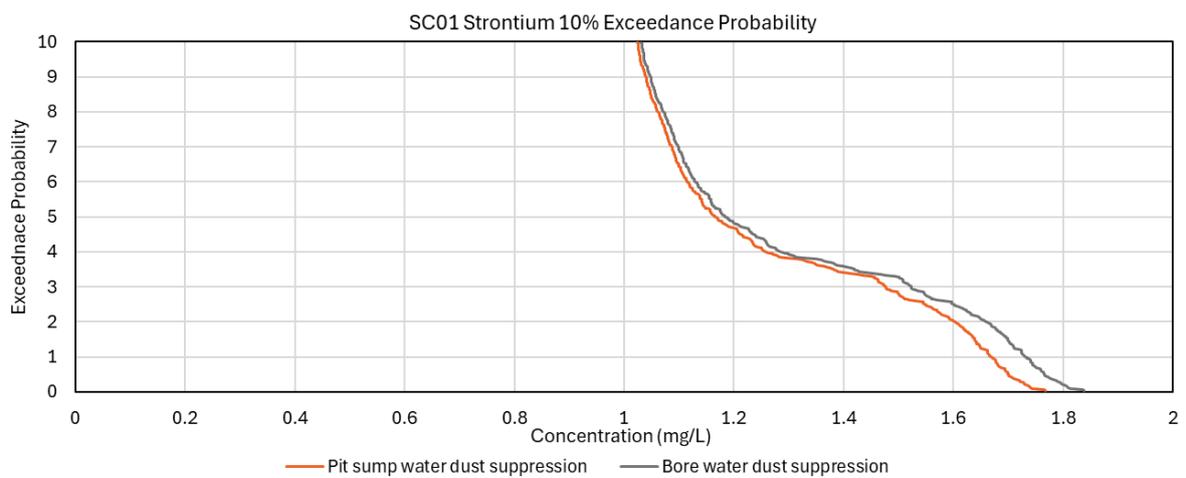


Figure 117: SC01 10% exceedance probability - strontium.

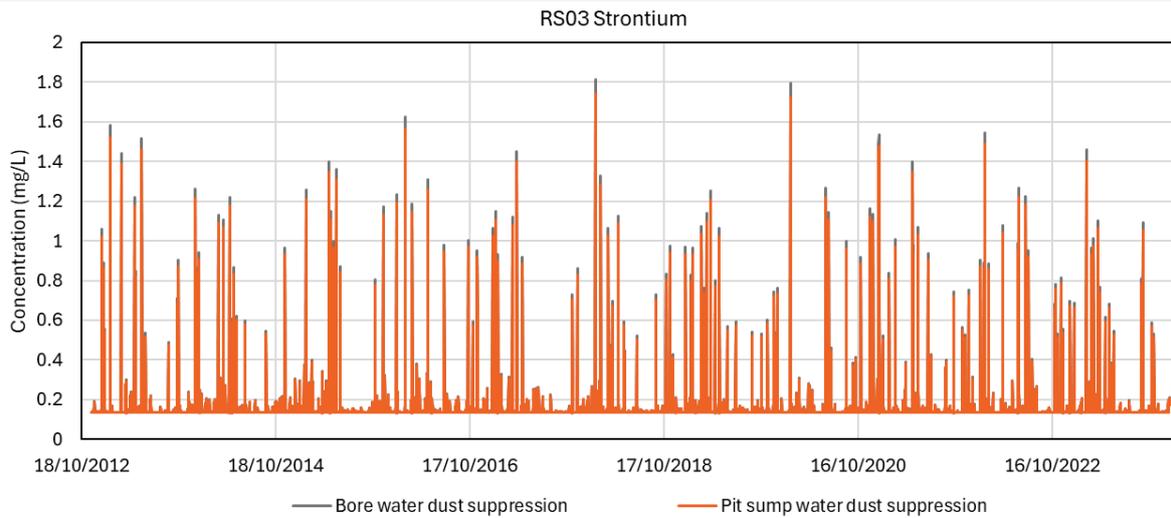


Figure 118: Modelled strontium concentrations in RS03 over time.

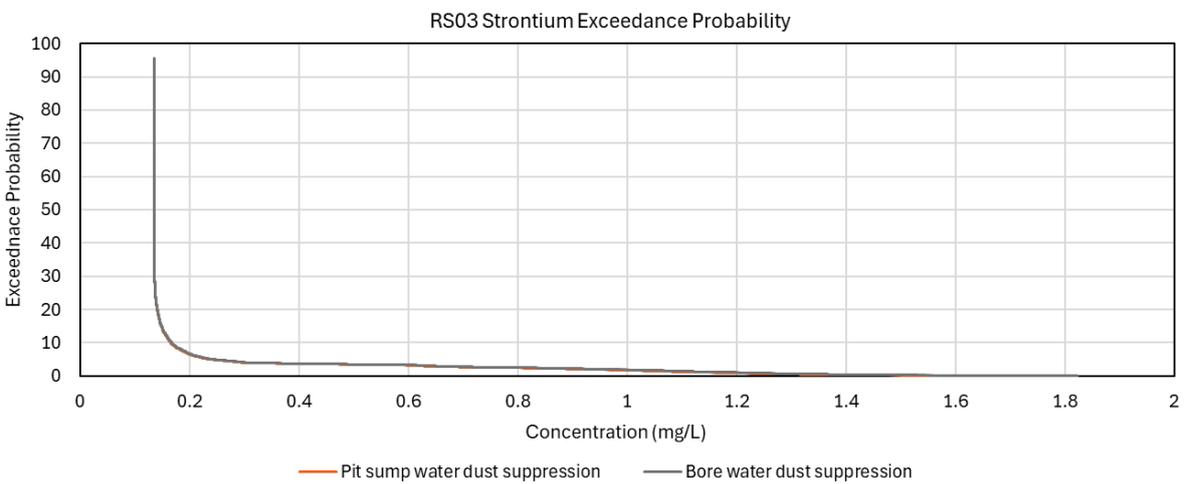


Figure 119: RS03 exceedance probability - strontium.

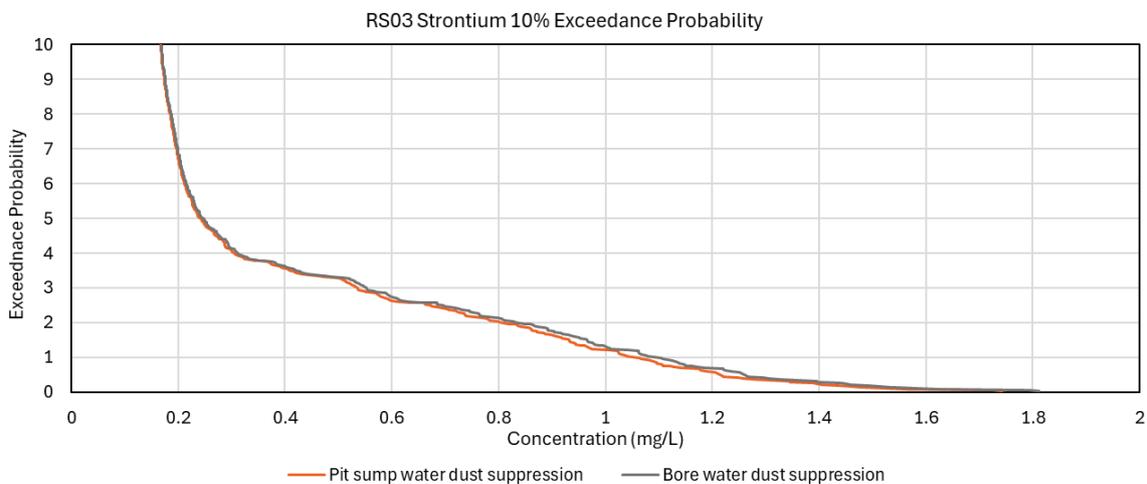


Figure 120: RS03 10% exceedance probability - strontium.

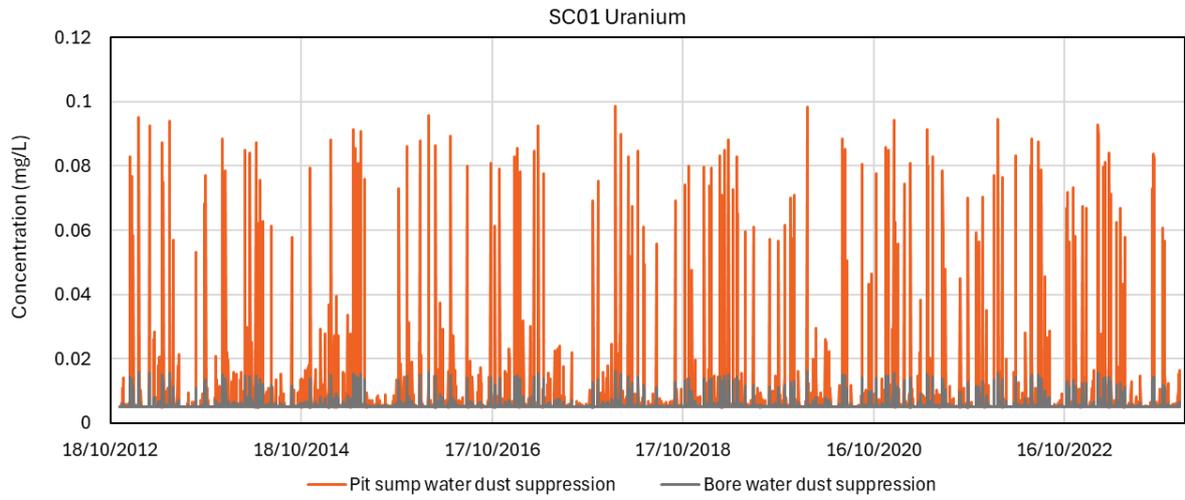


Figure 121: Modelled uranium concentrations in SC01 over time.

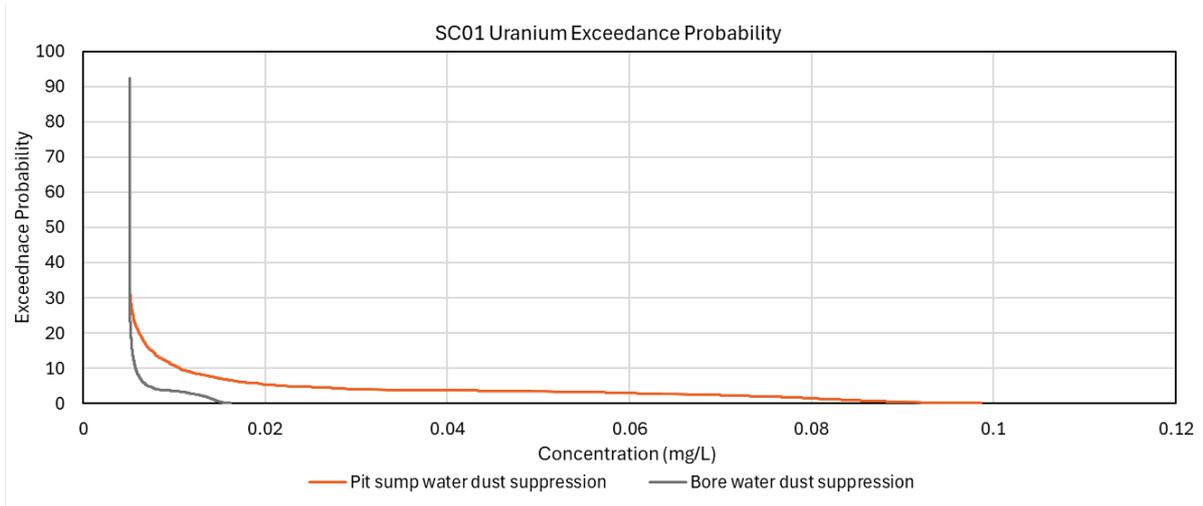


Figure 122: SC01 exceedance probability - uranium.

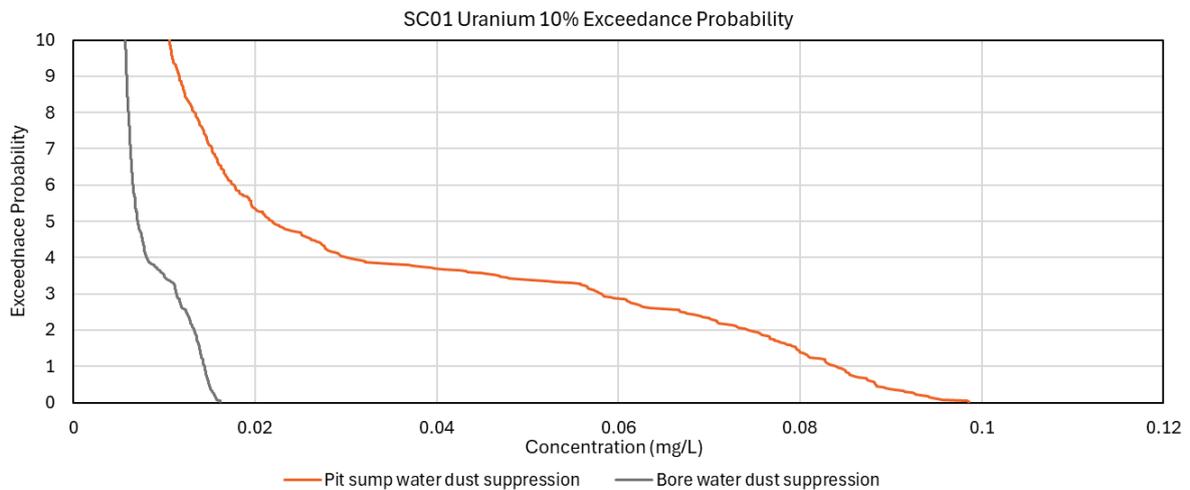


Figure 123: SC01 10% exceedance probability - uranium.

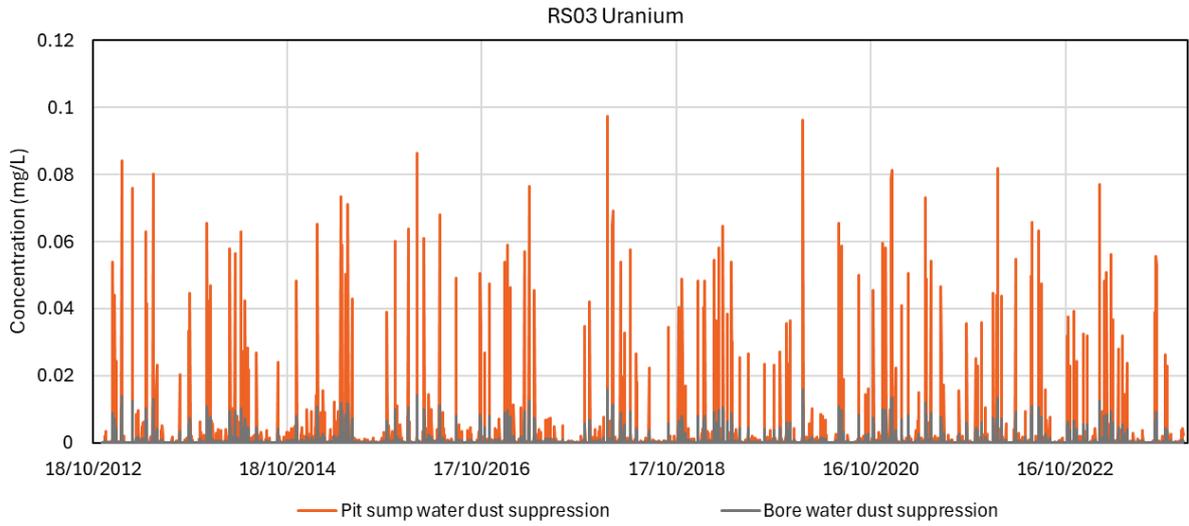


Figure 124: Modelled uranium concentrations in RS03 over time.

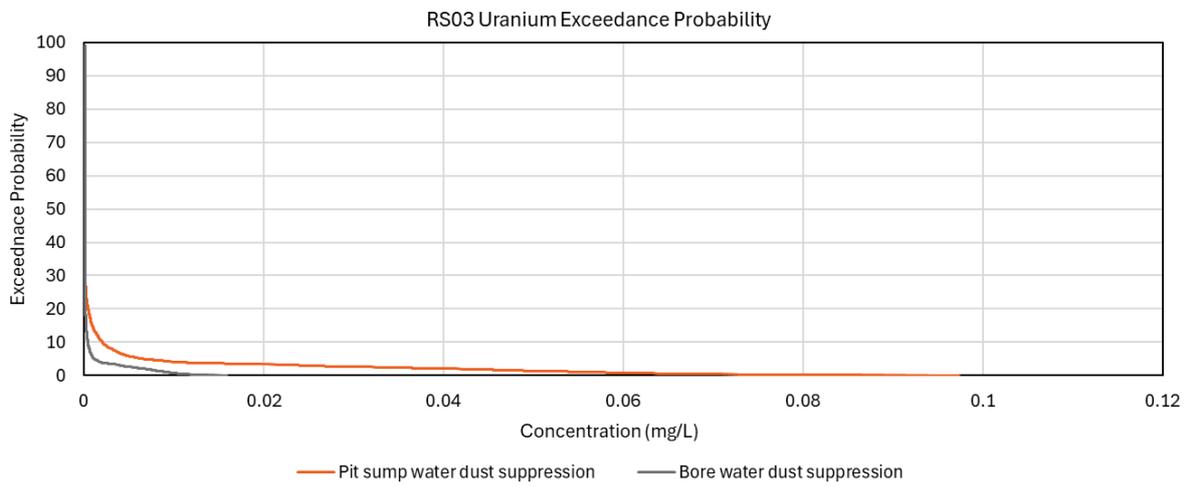


Figure 125: RS03 exceedance probability - uranium.

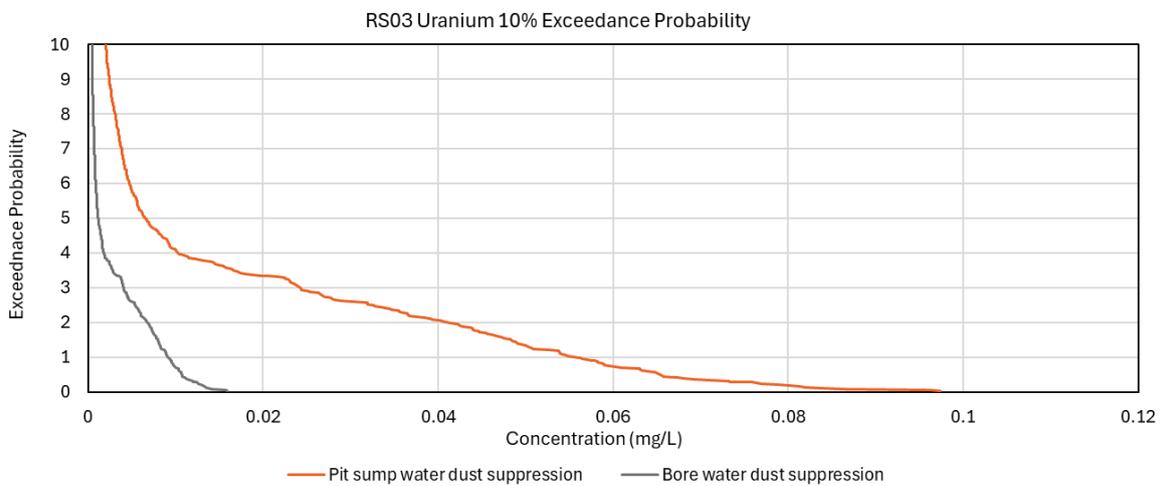


Figure 126: RS03 10% exceedance probability - uranium.

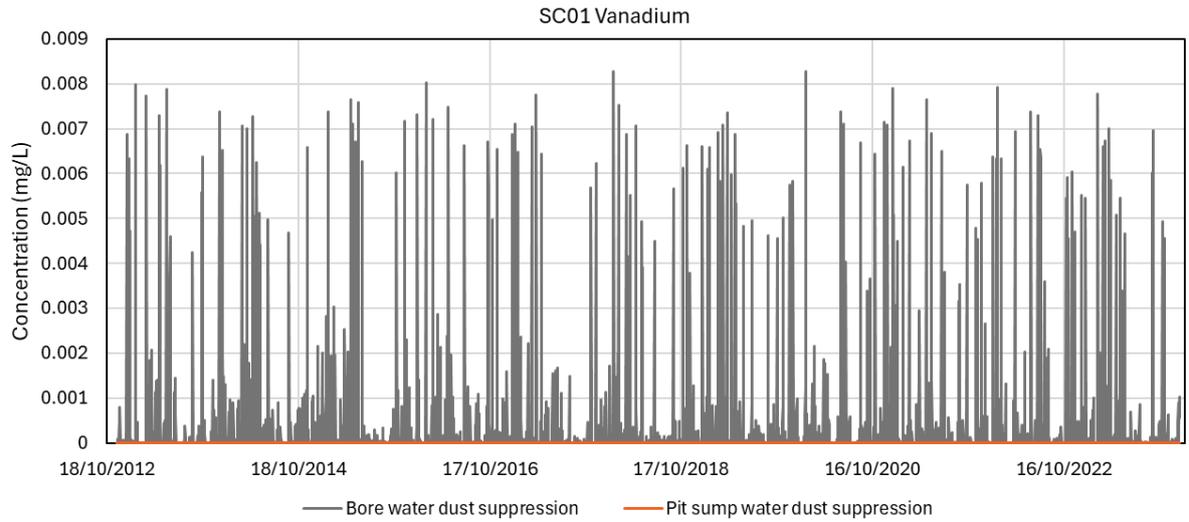


Figure 127: Modelled vanadium concentrations in SC01 over time.

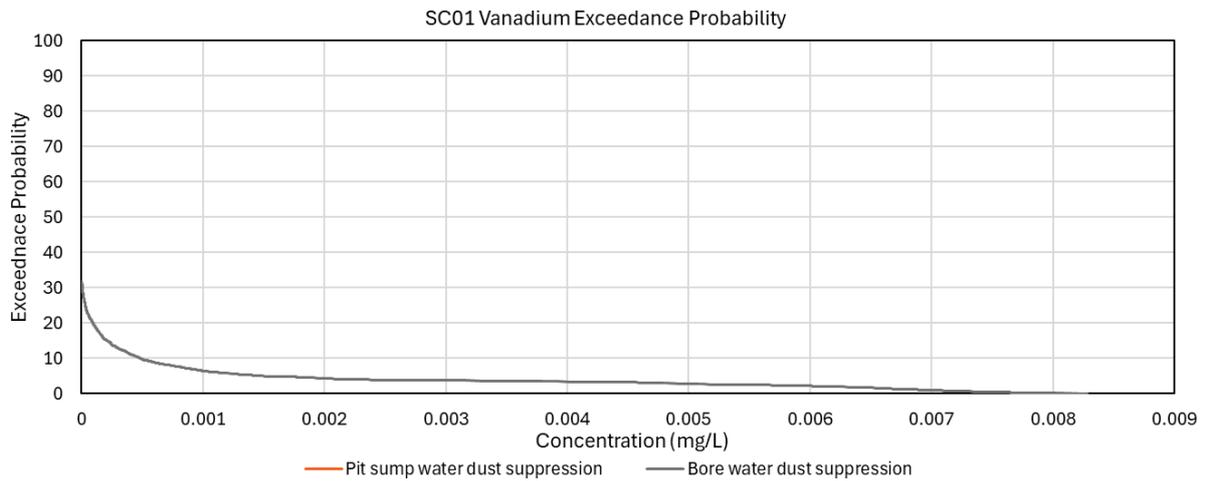


Figure 128: SC01 exceedance probability - vanadium.

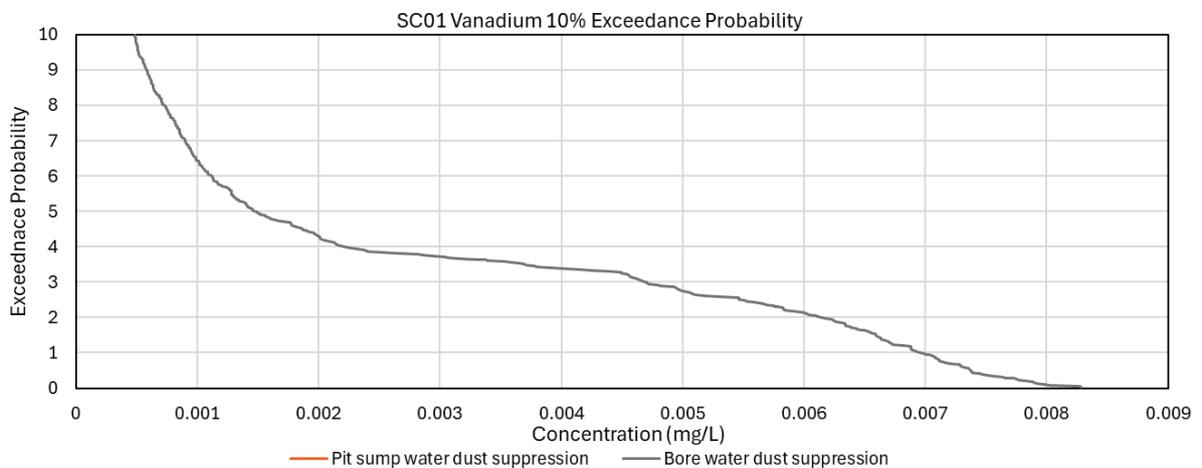


Figure 129: SC01 10% exceedance probability - vanadium.

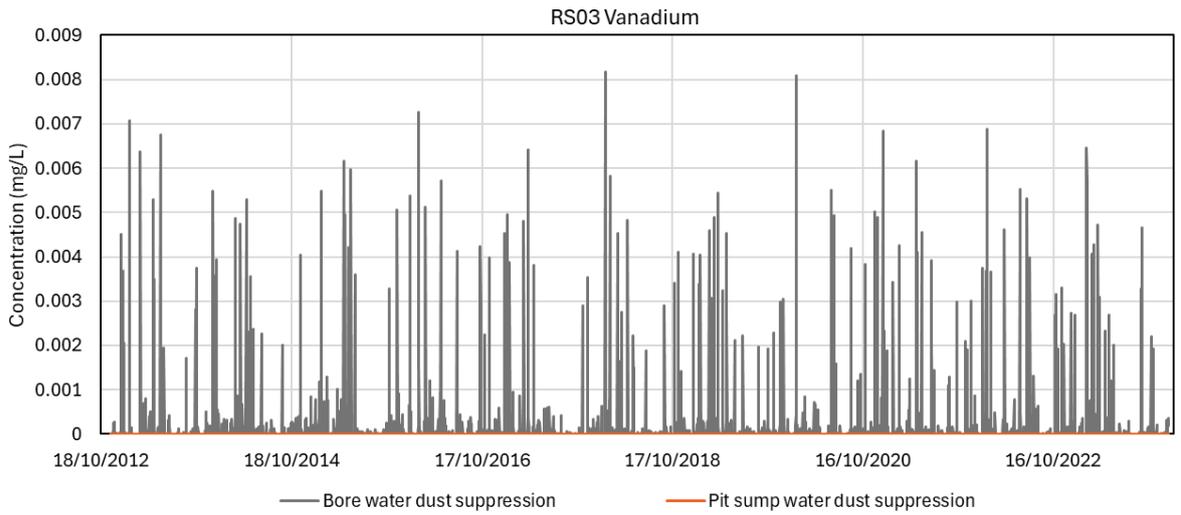


Figure 130: Modelled vanadium concentrations in RS03 over time.

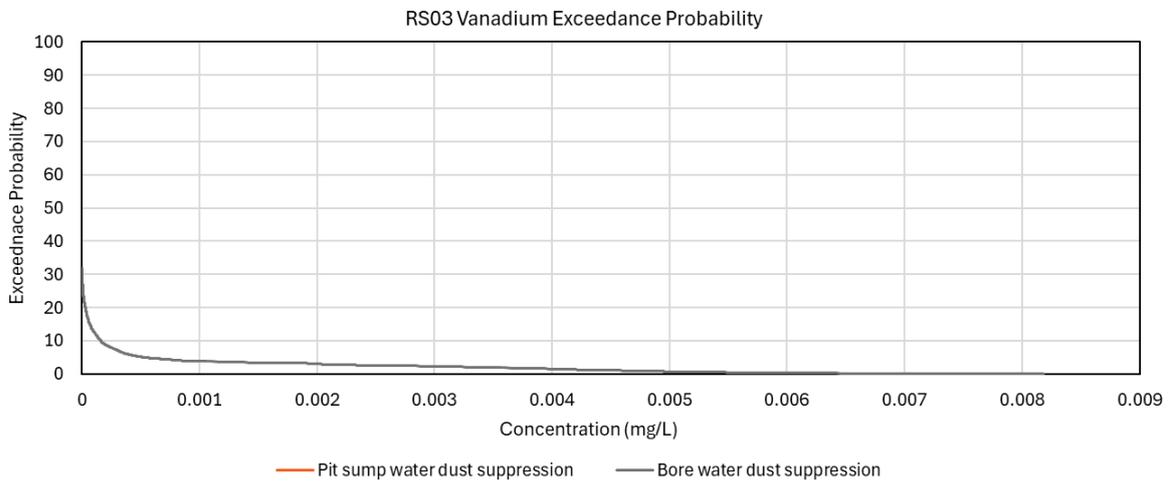


Figure 131: RS03 exceedance probability - vanadium.

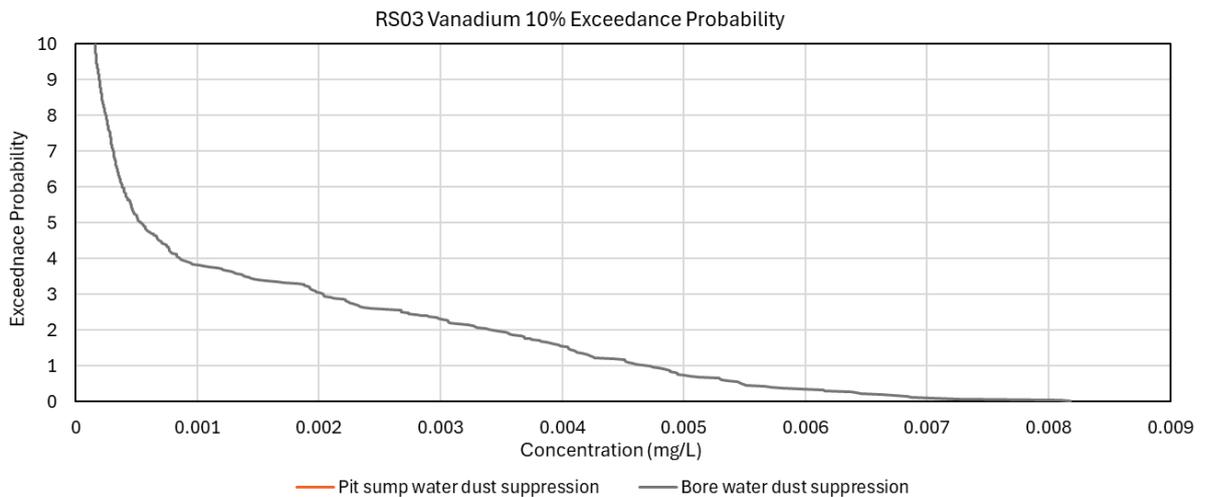


Figure 132: RS03 10% exceedance probability - vanadium.

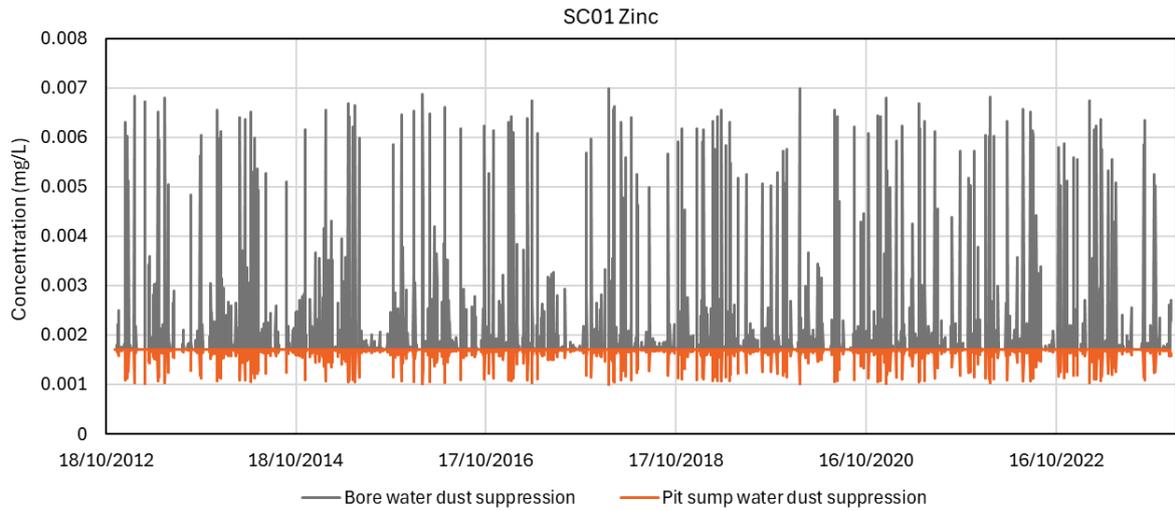


Figure 133: Modelled zinc concentrations in SC01 over time.

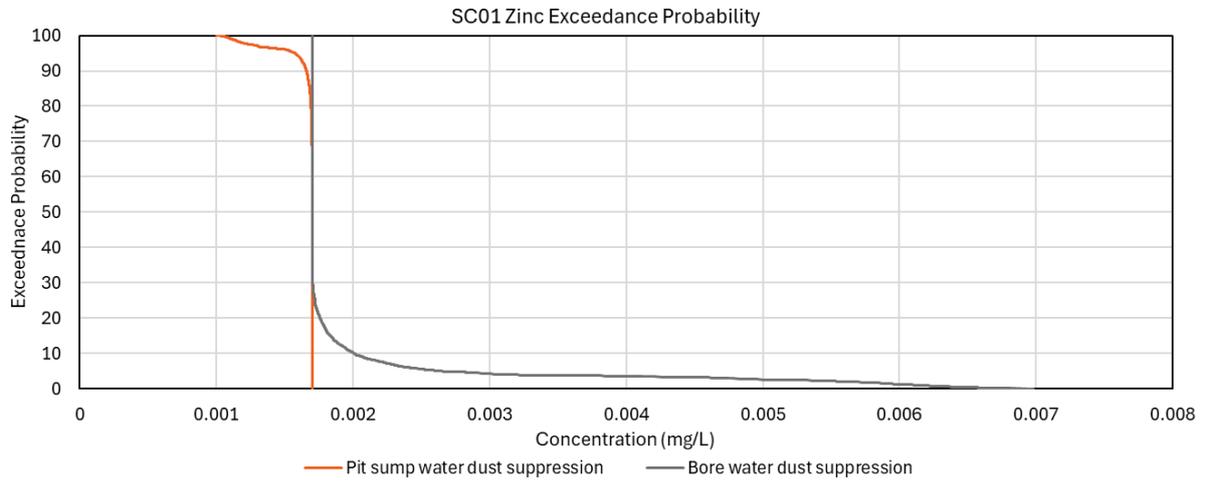


Figure 134: SC01 exceedance probability - zinc.

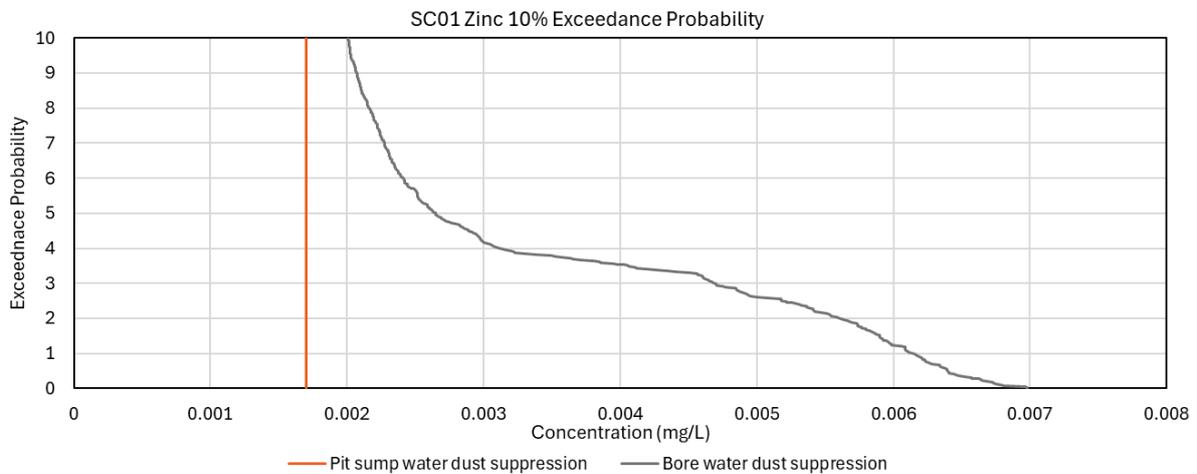


Figure 135: SC01 10% exceedance probability - zinc.

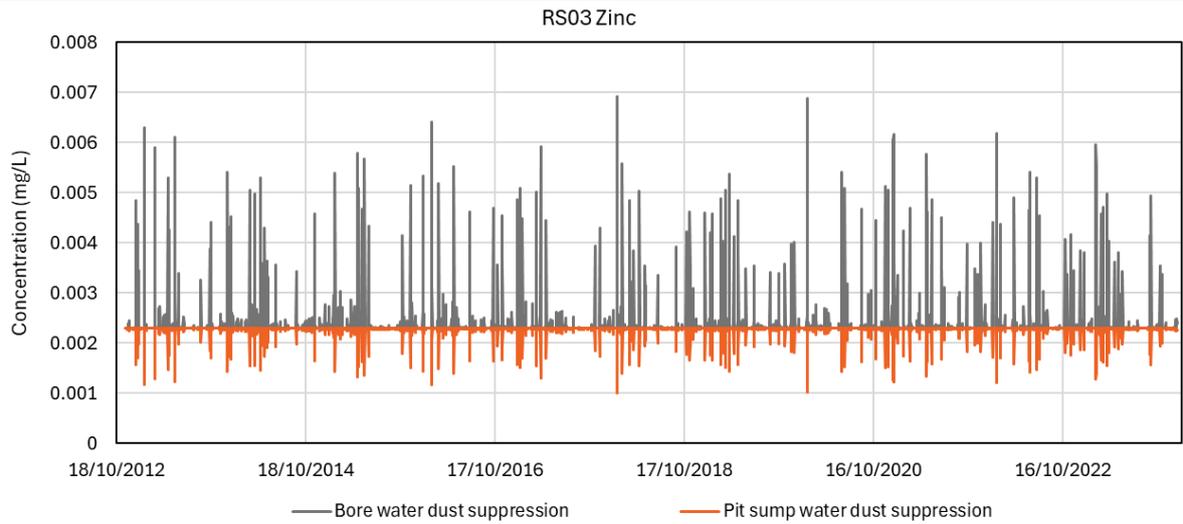


Figure 136: Modelled zinc concentrations in RS03 over time.

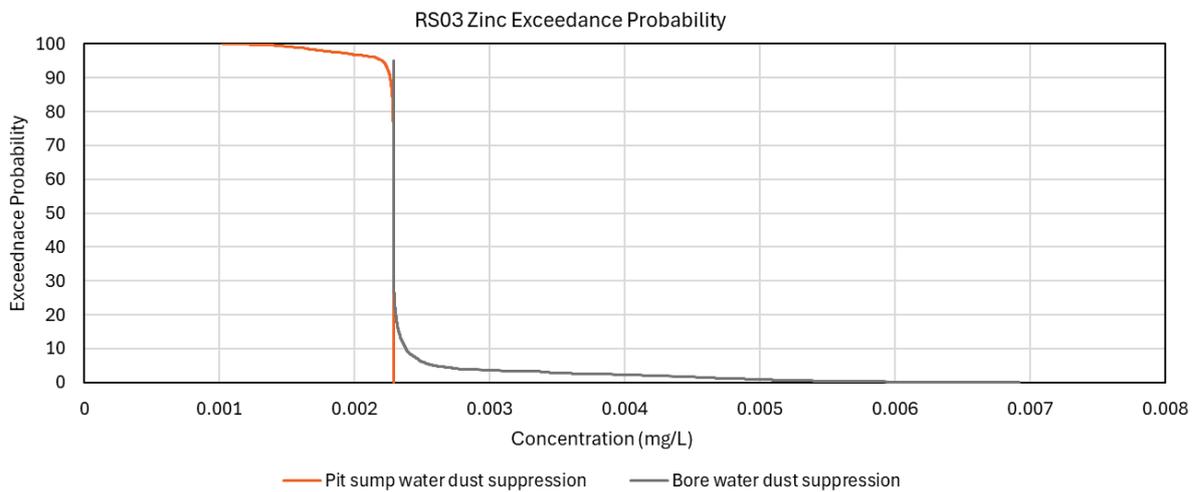


Figure 137: RS03 exceedance probability - zinc.

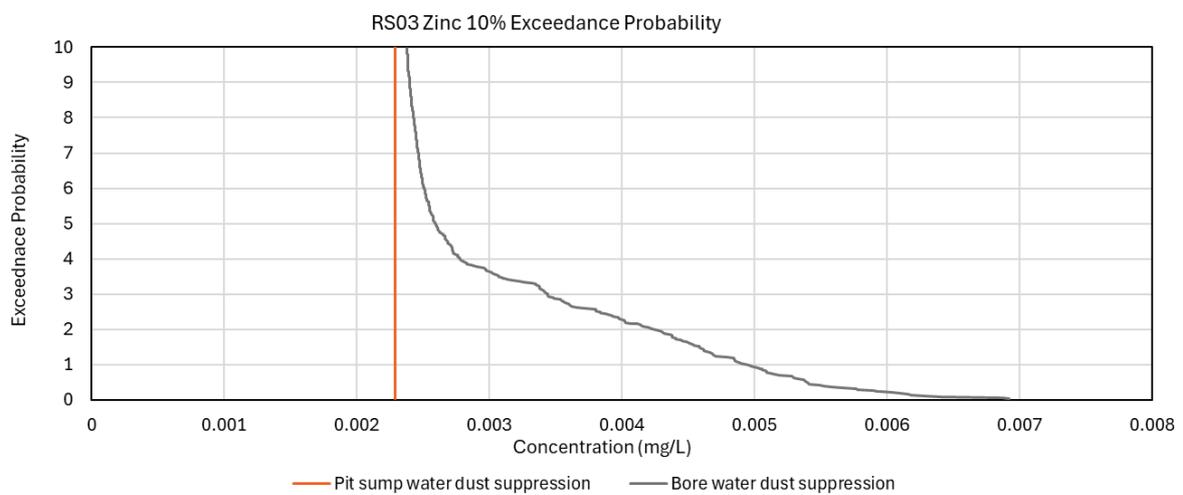


Figure 138: RS03 10% exceedance probability - zinc.

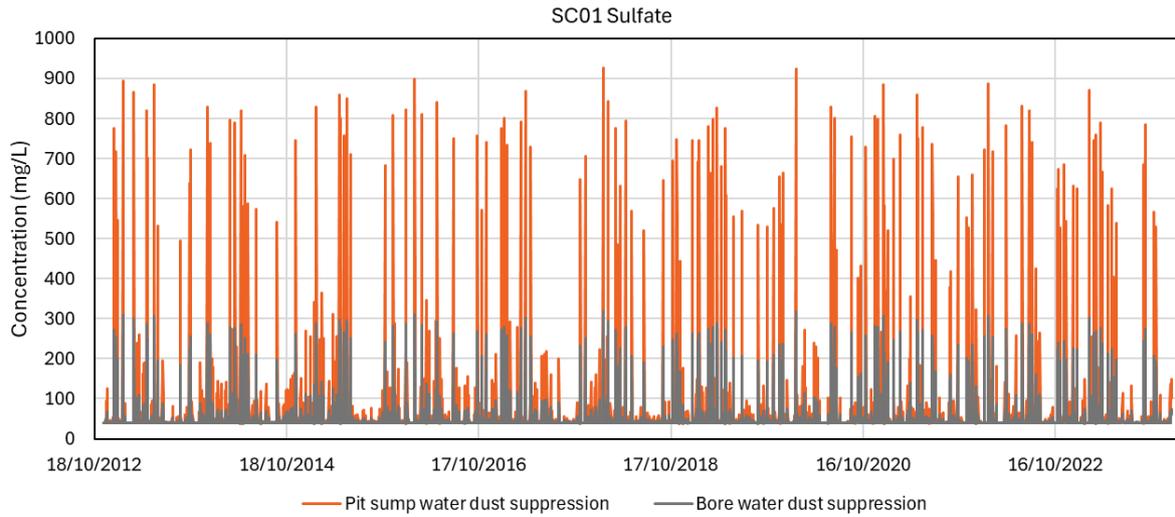


Figure 139: Modelled sulfate concentrations in SC01 over time.

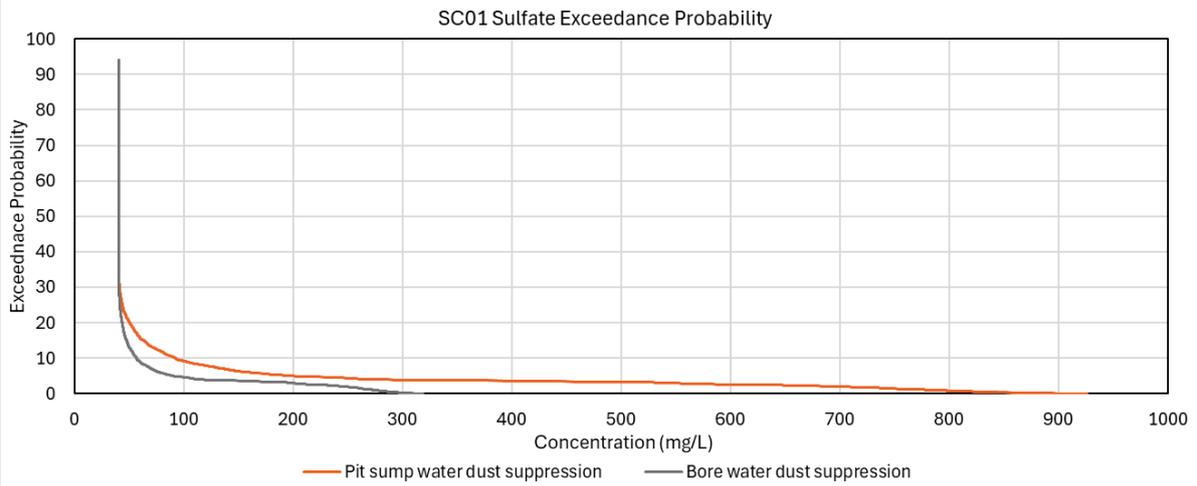


Figure 140: SC01 exceedance probability - sulfate.

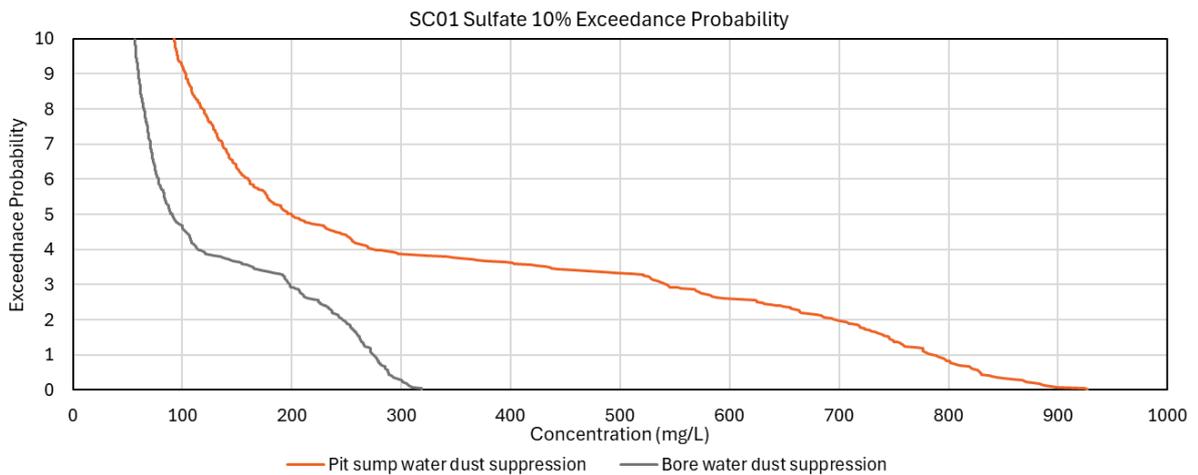


Figure 141: SC01 10% exceedance probability - sulfate.

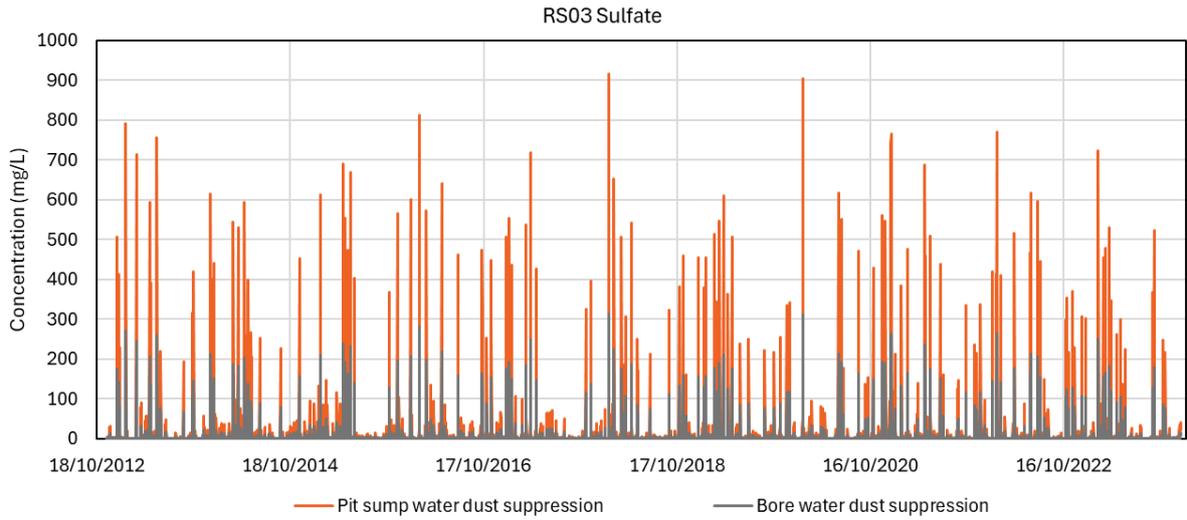


Figure 142: Modelled sulfate concentrations in RS03 over time.

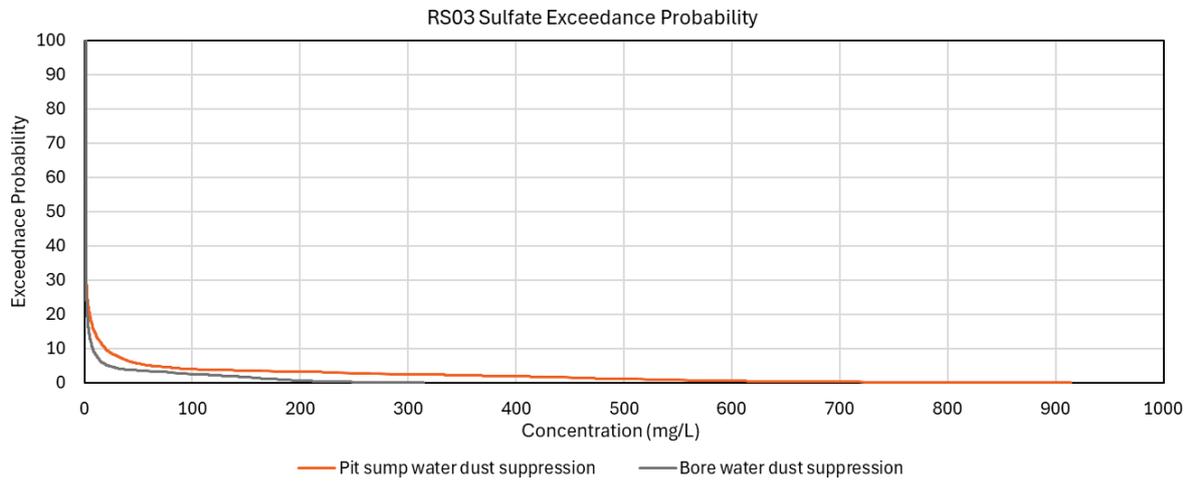


Figure 143: RS03 exceedance probability - sulfate.

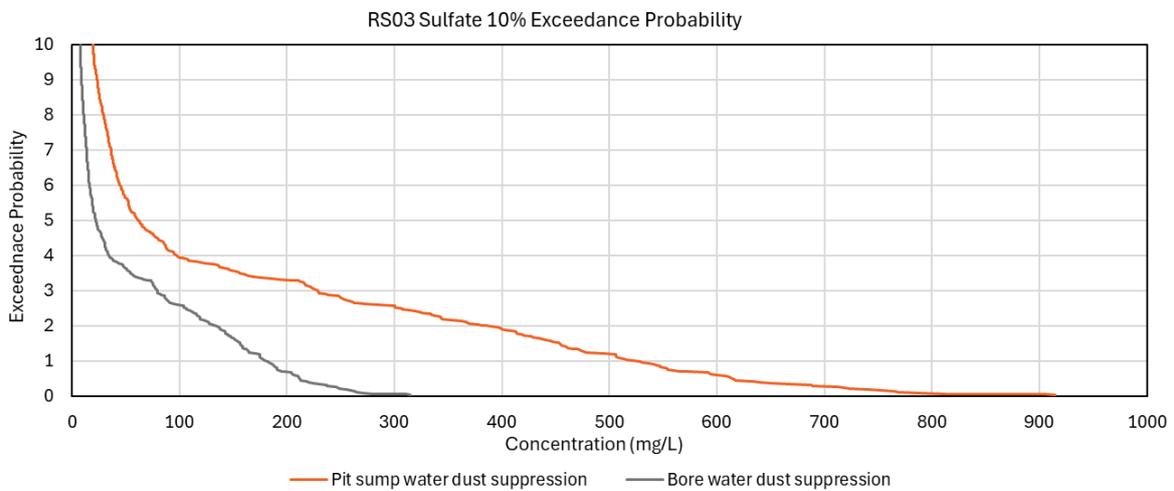


Figure 144: RS03 10% exceedance probability - sulfate.

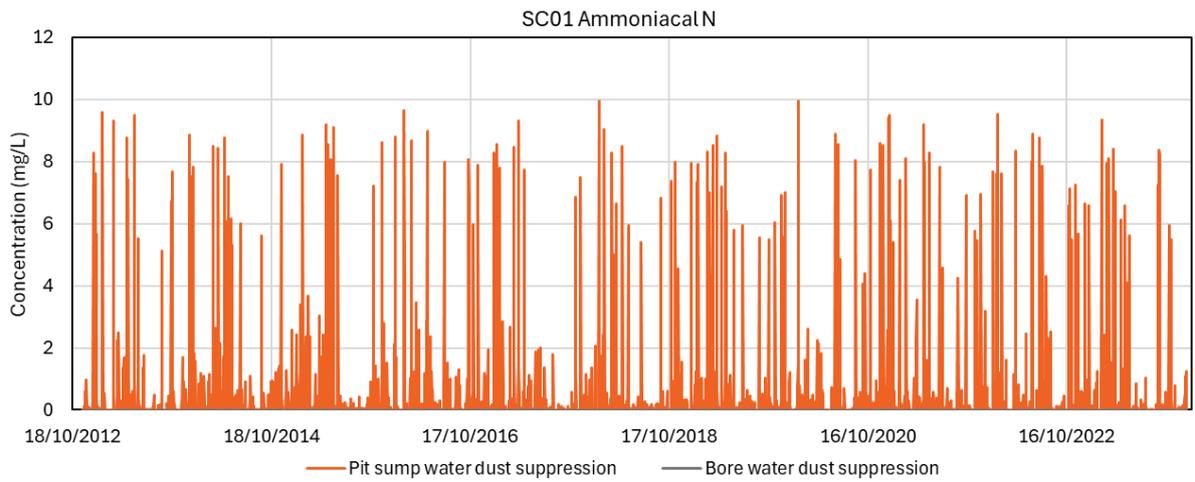


Figure 145: Modelled ammoniacal N concentrations in SC01 over time.

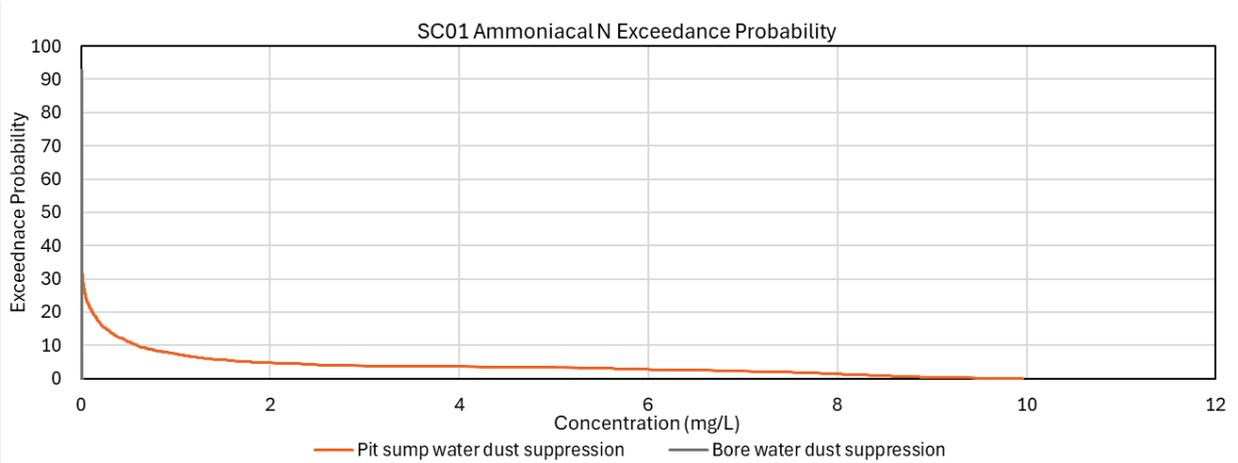


Figure 146: SC01 exceedance probability - ammoniacal N.

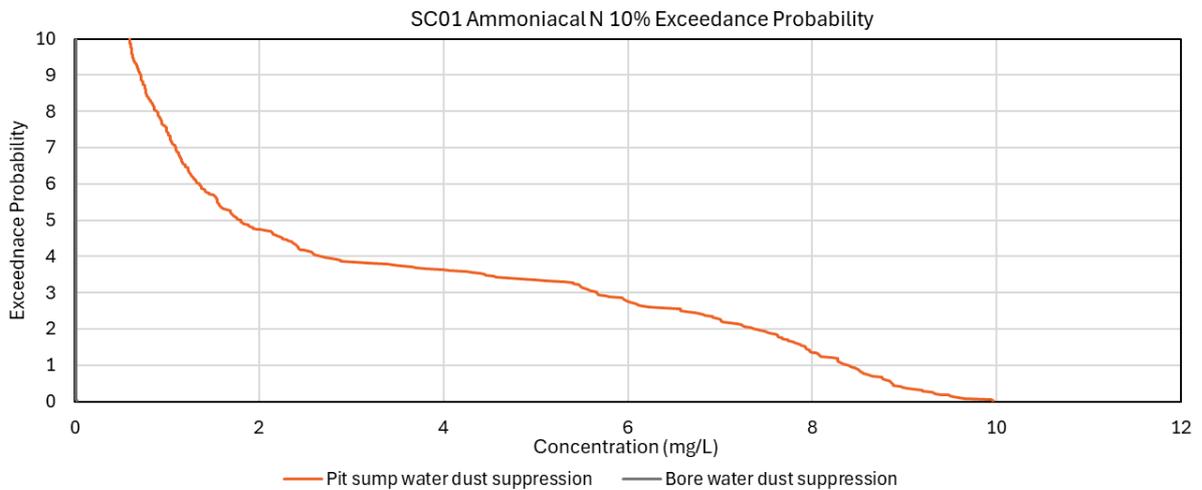


Figure 147: SC01 10% exceedance probability - ammoniacal N.

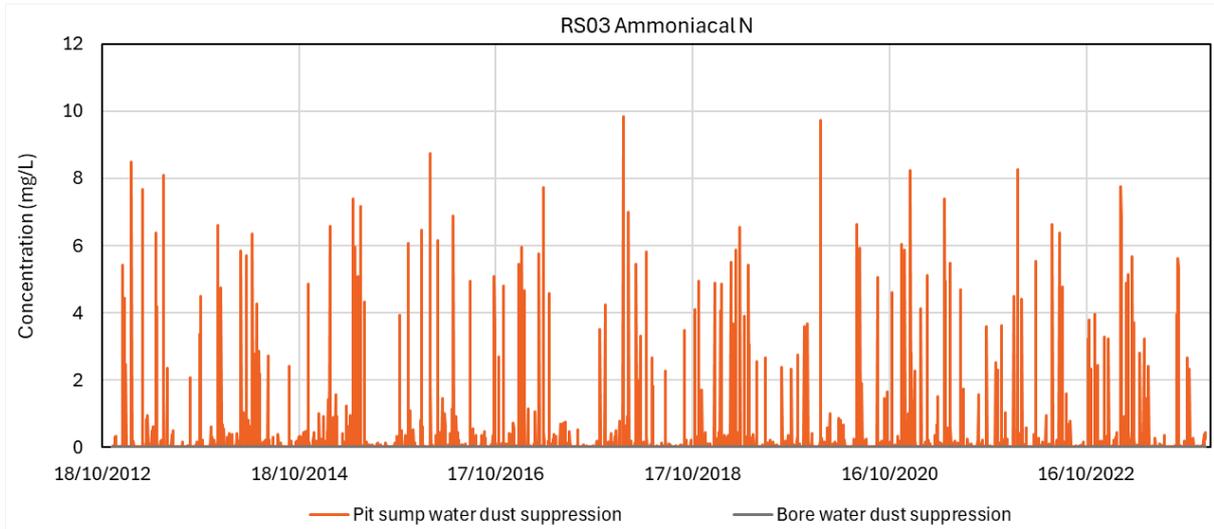


Figure 148: Modelled ammoniacal N concentrations in RS03 over time.

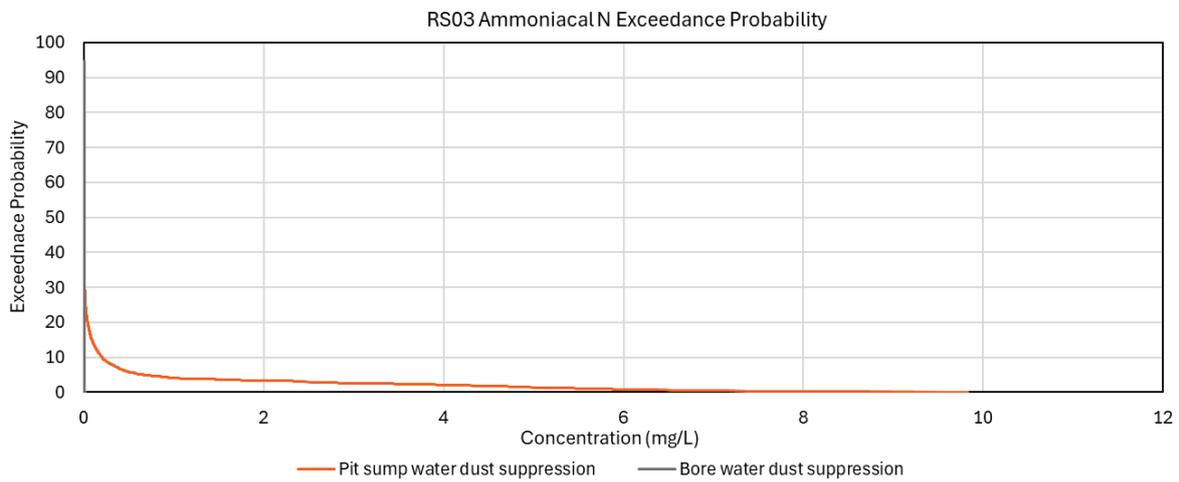


Figure 149: RS03 exceedance probability - ammoniacal N.

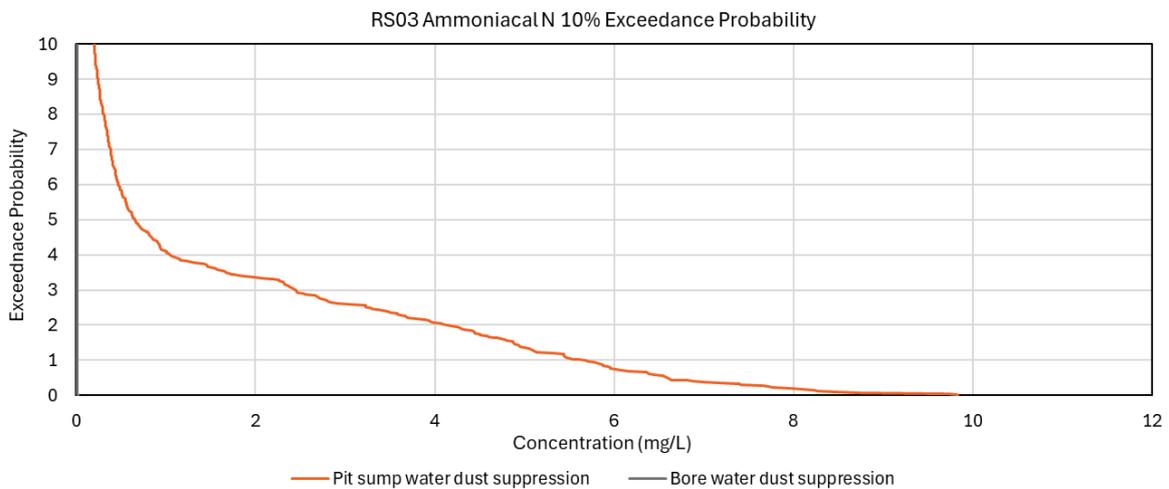


Figure 150: RS03 10% exceedance probability - ammoniacal N.

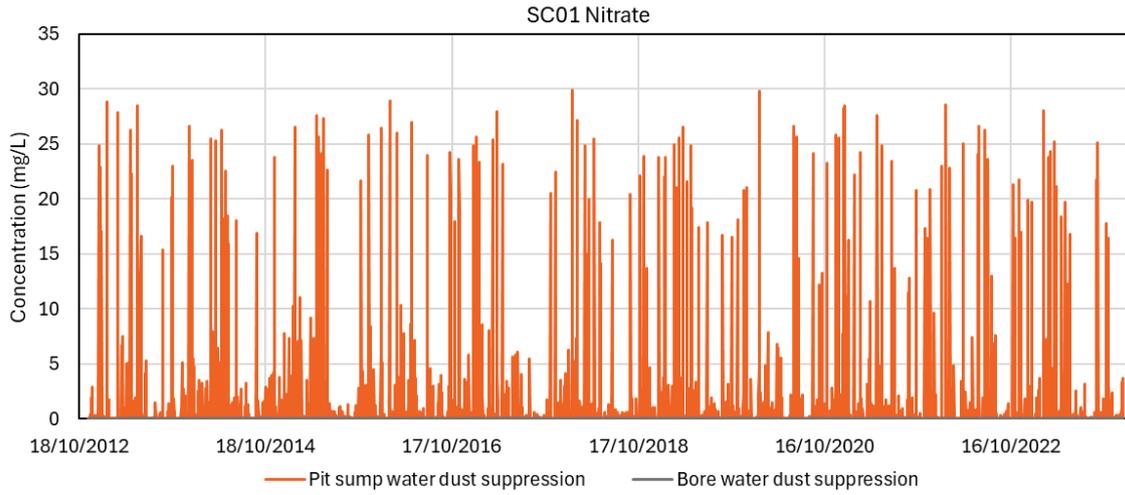


Figure 151: Modelled nitrate concentrations in SC01 over time.

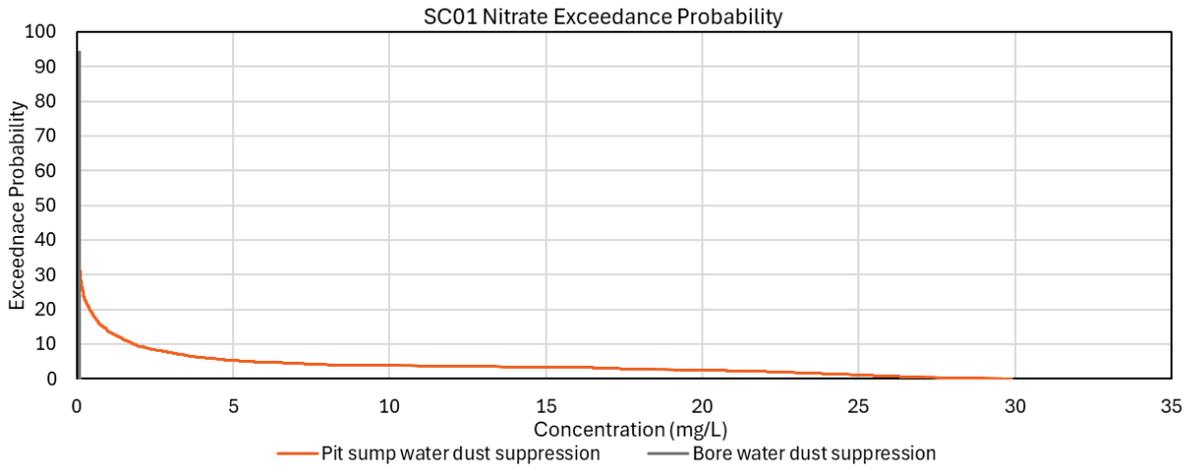


Figure 152: SC01 exceedance probability - nitrate.

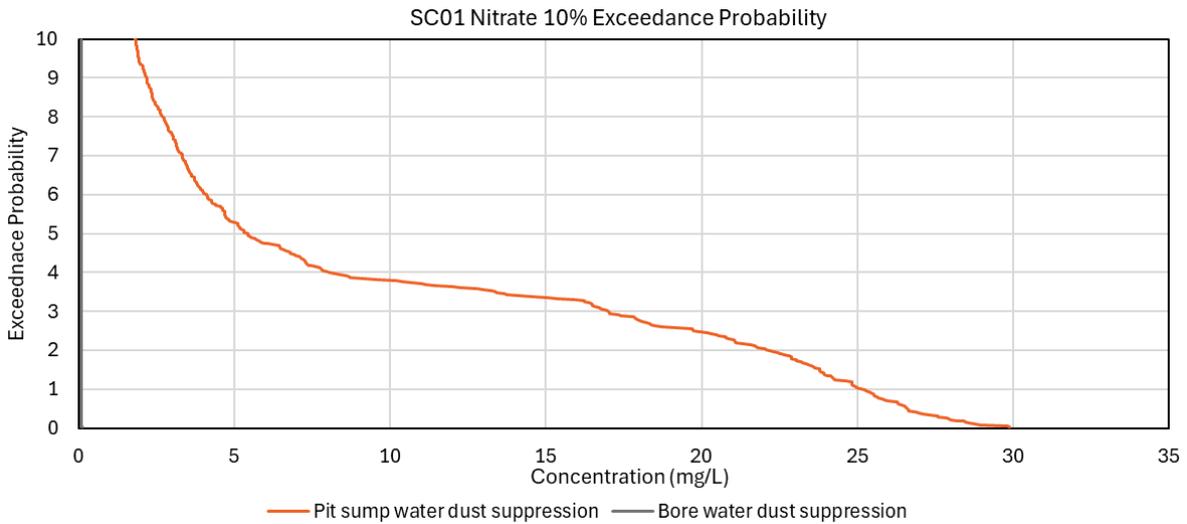


Figure 153: SC01 10% exceedance probability - nitrate.

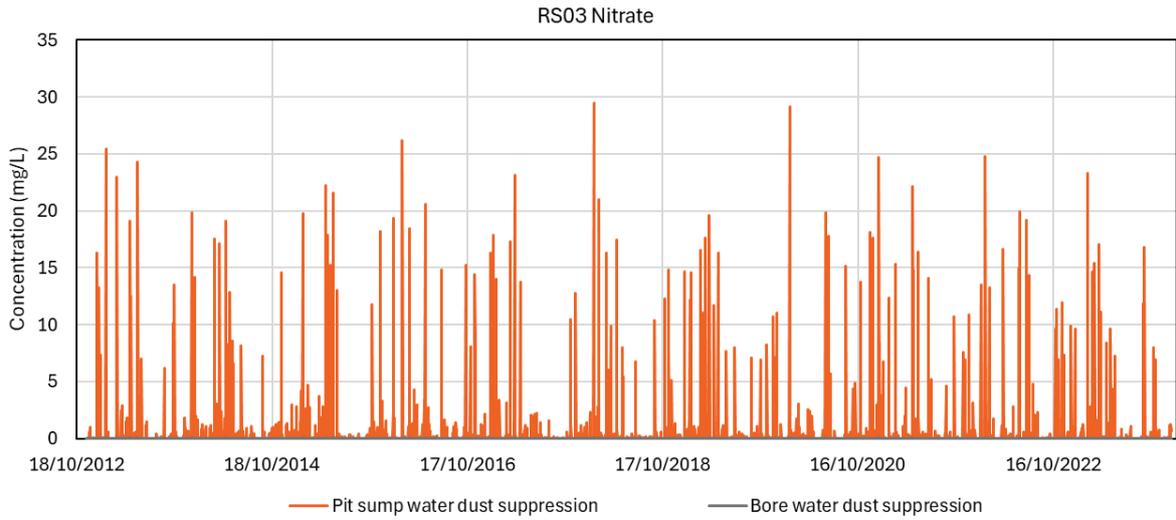


Figure 154: Modelled nitrate concentrations in RS03 over time.

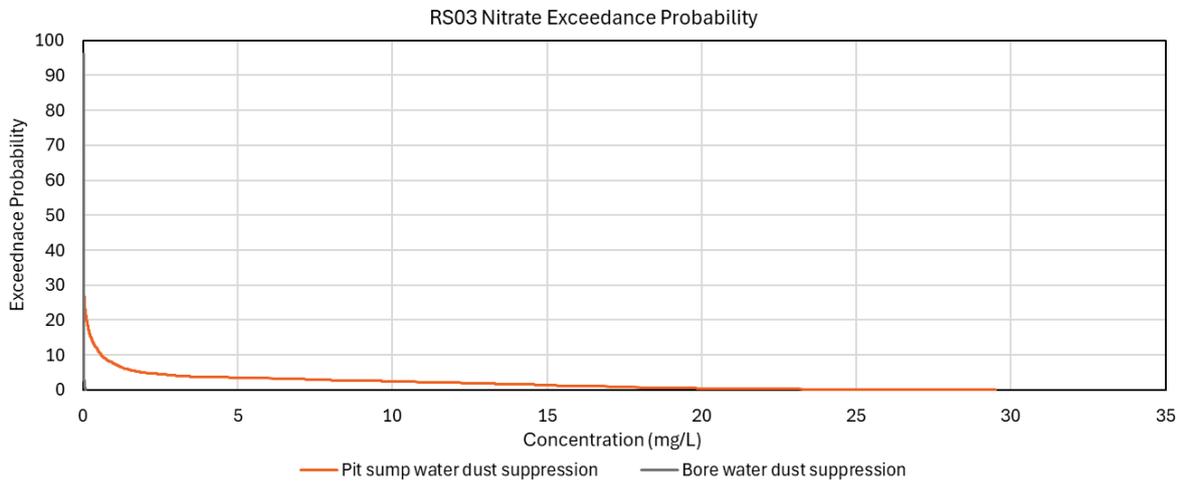


Figure 155: RS03 exceedance probability - nitrate.

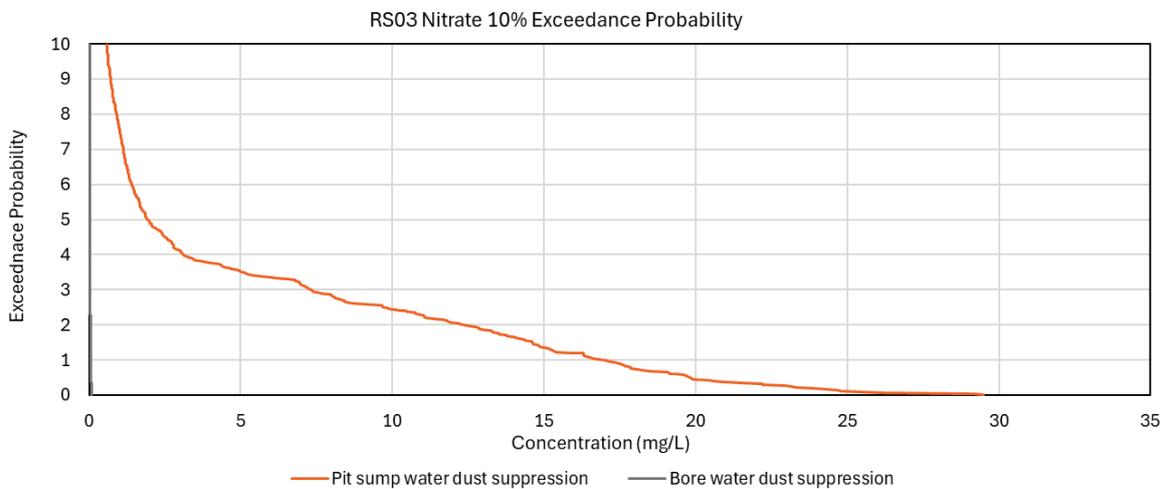


Figure 156: RS03 10% exceedance probability - nitrate.

APPENDIX D CLOSURE MODEL RESULTS AT SC01 AND RS03

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
0	MW-to-RAS_PL-NP20	SC01 Untreated	29.88	7.92	156	0.00	145.8	0.0164	0.0372	0.0696	39.7	0.00009	9.7	0.00881	0.00054	0.00049	1.66	1.08	1.36	0.00023	116.4	13.9	0.14	0.1287	4.14	164.2	0.00074	0.00026	0.55442	0.03058	199	2.89	0.0002	1.5570	0.0000	0.0461	0.0210	0.0021
1	MW-to-RAS_PL-NP20	SC01 Untreated	13.25	7.91	160	0.00	146.0	0.0177	0.0377	0.0674	40.5	0.00009	9.7	0.00881	0.00054	0.00049	1.64	1.10	1.40	0.00023	118.0	14.2	0.14	0.1258	4.05	165.7	0.00074	0.00026	0.56176	0.03110	186	2.96	0.0002	1.5889	0.0000	0.0470	0.0213	0.0021
2	MW-to-RAS_PL-NP20	SC01 Untreated	13.61	7.91	149	0.00	144.1	0.0148	0.0222	0.0503	39.7	0.00010	6.6	0.00586	0.00057	0.00052	1.80	0.67	0.80	0.00025	66.2	12.1	0.08	0.0751	2.24	107.4	0.00052	0.00027	0.31285	0.01839	126	1.96	0.0002	1.2509	0.0000	0.0256	0.0120	0.0018
3	MW-to-RAS_PL-NP20	SC01 Untreated	12.77	7.91	151	0.00	142.2	0.0133	0.0238	0.0515	40.5	0.00010	6.8	0.00543	0.00057	0.00051	1.78	0.72	0.87	0.00025	70.9	12.4	0.08	0.0785	2.31	112.3	0.00058	0.00027	0.33511	0.01818	127	2.08	0.0002	1.7152	0.0000	0.0267	0.0128	0.0018
4	MW-to-RAS_PL-NP20	SC01 Untreated	16.15	7.92	150	0.00	146.6	0.0147	0.0254	0.0517	39.5	0.00010	6.8	0.00460	0.00056	0.00050	1.66	0.67	0.85	0.00024	61.2	12.6	0.07	0.0728	1.93	101.8	0.00060	0.00026	0.38544	0.01685	119	1.93	0.0002	1.5767	0.0000	0.0267	0.0109	0.0017
5	MW-to-RAS_PL-NP20	SC01 Untreated	25.40	7.92	151	0.00	147.4	0.0133	0.0249	0.0514	39.7	0.00010	6.7	0.00415	0.00056	0.00049	1.63	0.65	0.82	0.00024	56.2	12.6	0.07	0.0679	1.72	96.5	0.00062	0.00026	0.26006	0.01566	107	1.86	0.0002	1.5656	0.0000	0.0235	0.0100	0.0017
6	MW-to-RAS_PL-NP20	SC01 Untreated	16.25	7.92	153	0.00	148.3	0.0124	0.0275	0.0539	39.8	0.00009	7.1	0.00445	0.00055	0.00048	1.60	0.71	0.92	0.00024	62.1	13.0	0.07	0.0742	1.81	102.9	0.00066	0.00026	0.28699	0.01683	111	2.03	0.0002	1.5370	0.0000	0.0252	0.0110	0.0017
7	MW-to-RAS_PL-NP20	SC01 Untreated	21.23	7.92	151	0.00	147.4	0.0133	0.0255	0.0527	39.7	0.00009	6.7	0.00395	0.00056	0.00049	1.63	0.67	0.85	0.00024	56.4	12.7	0.07	0.0692	1.58	96.4	0.00064	0.00026	0.25935	0.01550	106	1.92	0.0002	1.5604	0.0000	0.0235	0.0099	0.0016
8	MW-to-RAS_PL-NP20	SC01 Untreated	15.57	7.92	154	0.00	148.6	0.0122	0.0289	0.0548	39.9	0.00009	7.2	0.00437	0.00055	0.00047	1.58	0.75	0.97	0.00024	64.7	13.1	0.08	0.0776	1.72	105.3	0.00068	0.00026	0.29602	0.01746	113	2.14	0.0002	1.5220	0.0000	0.0260	0.0113	0.0017
9	MW-to-RAS_PL-NP20	SC01 Untreated	17.93	7.92	151	0.00	147.6	0.0131	0.0259	0.0529	39.7	0.00009	6.6	0.00371	0.00055	0.00049	1.62	0.68	0.86	0.00024	55.7	12.7	0.07	0.0691	1.43	95.4	0.00066	0.00026	0.25505	0.01527	104	1.95	0.0002	1.5530	0.0000	0.0231	0.0097	0.0016
10	MW-to-RAS_PL-NP20	SC01 Untreated	11.28	7.93	155	0.00	150.4	0.0118	0.0314	0.0569	39.9	0.00009	7.5	0.00431	0.00054	0.00046	1.52	0.80	1.05	0.00023	67.0	13.4	0.08	0.0814	1.62	107.7	0.00072	0.00025	0.30708	0.01786	114	2.25	0.0002	1.4645	0.0000	0.0266	0.0116	0.0016
11	MW-to-RAS_PL-NP20	SC01 Untreated	17.46	7.93	151	0.00	147.5	0.0144	0.0263	0.0513	39.6	0.00009	6.6	0.00352	0.00055	0.00049	1.62	0.69	0.87	0.00024	56.1	12.6	0.07	0.0701	1.33	95.2	0.00064	0.00026	0.25708	0.01533	107	2.00	0.0002	1.5438	0.0000	0.0235	0.0098	0.0016
12	MW-to-RAS_PL-NP20	SC01 Untreated	15.36	7.93	154	0.00	149.2	0.0129	0.0308	0.0541	39.8	0.00009	7.2	0.00400	0.00054	0.00047	1.55	0.79	1.04	0.00023	66.2	13.2	0.08	0.0803	1.50	106.1	0.00068	0.00026	0.30459	0.01772	117	2.26	0.0002	1.4888	0.0000	0.0265	0.0115	0.0016
13	MW-to-RAS_PL-NP20	SC01 Untreated	27.37	7.39	180	0.02	147.5	0.0163	0.0301	0.0846	45.8	0.00010	23.7	0.00672	0.00056	0.00059	1.51	0.80	1.61	0.00023	63.5	15.8	0.09	0.0839	1.85	120.7	0.01441	0.00094	0.28060	0.01628	134	2.29	0.0002	1.4465	0.0070	0.0265	0.0108	0.0024
14	MW-to-RAS_PL-NP20	SC01 Untreated	30.55	6.73	235	0.06	148.5	0.0260	0.1673	0.1583	57.7	0.00010	58.6	0.01377	0.00088	0.00082	1.26	1.01	3.07	0.00019	77.3	22.0	0.12	0.1170	3.00	171.9	0.02420	0.00231	0.32011	0.01763	203	2.76	0.0002	1.1911	0.0211	0.0342	0.0127	0.0040
15	MW-to-RAS_PL-NP20	SC01 Untreated	25.60	6.52	291	0.10	152.4	0.0307	0.2577	0.2438	69.2	0.00010	91.2	0.02159	0.00107	0.00100	1.05	1.34	4.62	0.00015	105.6	28.7	0.17	0.1632	4.28	267.7	0.04235	0.00355	0.42804	0.02259	273	3.54	0.0002	0.8982	0.0337	0.0456	0.0171	0.0055
16	MW-to-RAS_PL-NP20	SC01 Untreated	26.33	6.30	296	0.12	153.0	0.0308	0.2844	0.2448	70.5	0.00010	94.2	0.02258	0.00109	0.00103	0.94	1.34	4.71	0.00015	105.7	29.2	0.18	0.1684	3.38	243.6	0.04724	0.00370	0.42804	0.02259	273	3.54	0.0002	0.9034	0.0350	0.0464	0.0171	0.0058
17	MW-to-RAS_PL-NP20	SC01 Untreated	26.49	6.49	298	0.12	153.0	0.0311	0.2853	0.2493	70.8	0.00010	94.8	0.02307	0.00110	0.00104	0.94	1.34	4.73	0.00015	106.8	29.4	0.18	0.1699	3.42	243.6	0.04724	0.00370	0.42804	0.02259	273	3.54	0.0002	0.9034	0.0350	0.0464	0.0171	0.0058
18	MW-to-RAS_PL-NP20	SC01 Untreated	29.68	6.50	284	0.11	152.2	0.0306	0.2419	0.2325	67.8	0.00010	86.4	0.02146	0.00105	0.00100	1.02	1.27	4.38	0.00016	102.6	27.8	0.17	0.1669	3.44	230.3	0.06354	0.00338	0.41347	0.02198	265	3.38	0.0002	0.9748	0.0316	0.0448	0.0167	0.0054
19	MW-to-RAS_PL-NP20	SC01 Untreated	29.07	6.46	290	0.12	153.0	0.0315	0.2511	0.2438	69.1	0.00010	89.8	0.02266	0.00107	0.00103	0.99	1.31	4.54	0.00015	107.4	28.6	0.18	0.1689	3.49	239.6	0.06605	0.00351	0.43238	0.02288	275	3.48	0.0002	0.9425	0.0329	0.0468	0.0175	0.0056
20	MW-to-RAS_PL-NP20	SC01 Untreated	31.30	6.45	288	0.12	153.1	0.0315	0.2464	0.2422	68.5	0.00010	88.0	0.02260	0.00105	0.00103	1.00	1.32	4.51	0.00015	109.3	28.4	0.18	0.1708	3.45	239.6	0.06608	0.00344	0.44184	0.02339	276	3.50	0.0002	0.9508	0.0321	0.0475	0.0178	0.0055
21	MW-to-RAS_PL-NP20	SC01 Untreated	28.81	6.43	299	0.13	154.3	0.0328	0.2631	0.2566	70.7	0.00010	94.3	0.02437	0.00109	0.00107	0.94	1.38	4.79	0.00015	115.3	29.7	0.19	0.1815	3.47	253.5	0.06924	0.00368	0.46385	0.02441	291	3.64	0.0002	0.8975	0.0344	0.0501	0.0188	0.0058
22	MW-to-RAS_PL-NP20	SC01 Untreated	28.89	6.42	296	0.13	154.3	0.0327	0.2581	0.2563	70.1	0.00010	92.4	0.02407	0.00108	0.00106	0.96	1.37	4.73	0.00015	115.8	29.4	0.19	0.1814	3.29	252.5	0.06768	0.00361	0.46720	0.02460	290	3.63	0.0002	0.9075	0.0336	0.0502	0.0189	0.0058
23	MW-to-RAS_PL-NP20	SC01 Untreated	31.47	6.44	290	0.13	154.2	0.0315	0.2467	0.2467	68.8	0.00010	88.2	0.02314	0.00105	0.00104	0.99	1.34	4.57	0.00015	114.0	28.7	0.18	0.1767	3.12	245.5	0.06432	0.00345	0.46159	0.02440	281	3.58	0.0002	0.9475	0.0320	0.0491	0.0186	0.0056
24	MW-to-RAS_PL-NP20	SC01 Untreated	24.79	6.38	305	0.15	162.1	0.0332	0.2689	0.2678	71.8	0.00010	96.3	0.02531	0.00100	0.00109	0.91	1.44	4.96	0.00014	122.8	30.5	0.20	0.1910	3.19	263.8	0.07042	0.00376	0.49607	0.02602	302	3.79	0.0002	0.8691	0.0350	0.0527	0.0200	0.0060
25	MW-to-RAS_PL-NP20	SC01 Untreated	32.27	6.44	279	0.13	153.7	0.0314	0.2279	0.2203	66.5	0.00010	81.3	0.02145	0.00101	0.00101	1.06	1.28	4.27	0.00016	109.4	27.4	0.17	0.1687	2.76	232.9	0.05892	0.00320	0.44533	0.02366	270	3.45	0.0002	1.0009	0.0282	0.0473	0.0179	0.0052
26	MW-to-RAS_PL-NP20	SC01 Untreated	36.06	6.42	277	0.13	153.3	0.0321	0.2249	0.2278	66.0	0.00010	80.0	0.02122																								

Year	Scenario	Station	Flow Rate (Us)	pH	Hardness (mg CaCO3/L)	Acidity (mg CaCO3/L)	Alkalinity (mg CaCO3/L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO3-N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO4 (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
86	MW-to-RAS_PL-NP20	SC01 Untreated	30.73	6.21	304	0.22	156.0	0.0379	0.2684	0.1344	71.1	0.00010	86.6	0.00890	0.00106	0.00119	0.83	1.39	5.47	0.00013	92.7	30.7	0.15	0.1110	1.93	194.6	0.06524	0.00374	0.38651	0.02004	254	3.80	0.0002	0.7825	0.0332	0.0343	0.0138	0.0044
87	MW-to-RAS_PL-NP20	SC01 Untreated	37.91	6.29	279	0.19	153.0	0.0356	0.2298	0.1188	66.3	0.00010	74.3	0.00752	0.00099	0.00110	1.00	1.20	4.68	0.00015	78.6	27.5	0.13	0.0961	1.63	170.3	0.05979	0.00323	0.33271	0.01731	225	3.34	0.0002	0.9357	0.0284	0.0301	0.0118	0.0039
88	MW-to-RAS_PL-NP20	SC01 Untreated	33.91	6.26	284	0.20	153.4	0.0348	0.2370	0.1198	67.2	0.00010	76.6	0.00762	0.00100	0.00111	0.97	1.22	4.82	0.00015	80.1	28.1	0.13	0.0961	1.66	170.3	0.05761	0.00333	0.33254	0.01759	225	3.41	0.0002	0.9175	0.0294	0.0300	0.0119	0.0040
89	MW-to-RAS_PL-NP20	SC01 Untreated	30.12	6.24	297	0.21	154.8	0.0365	0.2578	0.1272	68.2	0.00010	83.3	0.00817	0.00104	0.00116	0.98	1.30	5.22	0.00014	85.4	29.7	0.14	0.1020	1.71	184.2	0.05290	0.00360	0.35022	0.01853	240	3.17	0.0002	0.8355	0.0271	0.0317	0.0127	0.0042
90	MW-to-RAS_PL-NP20	SC01 Untreated	35.38	6.31	274	0.18	152.2	0.0338	0.2183	0.1110	64.3	0.00010	70.5	0.00682	0.00097	0.00107	1.05	1.12	4.43	0.00016	72.4	26.6	0.12	0.0877	1.44	160.6	0.05286	0.00360	0.30069	0.01688	210	3.17	0.0002	0.9884	0.0270	0.0277	0.0108	0.0038
91	MW-to-RAS_PL-NP20	SC01 Untreated	25.97	6.21	299	0.22	155.2	0.0359	0.2624	0.1264	70.3	0.00010	84.4	0.00805	0.00105	0.00116	0.85	1.30	5.32	0.00014	85.6	30.1	0.14	0.1008	1.69	184.8	0.06381	0.00366	0.35602	0.01857	238	3.66	0.0002	0.8142	0.0326	0.0313	0.0127	0.0042
92	MW-to-RAS_PL-NP20	SC01 Untreated	22.72	6.20	302	0.22	155.9	0.0372	0.2678	0.1283	70.9	0.00010	86.3	0.00813	0.00106	0.00118	0.84	1.31	5.40	0.00013	85.7	30.4	0.14	0.1018	1.61	186.5	0.06537	0.00373	0.35605	0.01850	244	3.67	0.0002	0.7912	0.0334	0.0317	0.0127	0.0043
93	MW-to-RAS_PL-NP20	SC01 Untreated	23.03	6.24	292	0.21	155.3	0.0358	0.2505	0.1213	68.9	0.00010	80.3	0.00753	0.00103	0.00113	0.91	1.22	5.04	0.00014	79.5	29.0	0.13	0.0949	1.41	175.9	0.06111	0.00350	0.32982	0.01731	230	3.47	0.0002	0.8624	0.0312	0.0297	0.0118	0.0041
94	MW-to-RAS_PL-NP20	SC01 Untreated	35.74	6.34	261	0.17	151.8	0.0320	0.2023	0.1015	62.7	0.00010	74.6	0.00596	0.00093	0.00102	1.10	1.03	4.15	0.00016	66.1	25.3	0.11	0.0797	1.29	148.7	0.04844	0.00284	0.27468	0.01486	195	3.02	0.0002	1.0381	0.0247	0.0254	0.0098	0.0035
95	MW-to-RAS_PL-NP20	SC01 Untreated	37.37	6.31	276	0.19	153.2	0.0338	0.2267	0.1102	65.8	0.00010	72.6	0.00661	0.00098	0.00108	1.00	1.12	4.63	0.00015	72.2	27.2	0.12	0.0859	1.47	161.2	0.05427	0.00318	0.29943	0.01584	211	3.25	0.0002	0.9050	0.0279	0.0272	0.0107	0.0038
96	MW-to-RAS_PL-NP20	SC01 Untreated	31.33	6.27	288	0.20	154.7	0.0357	0.2461	0.1171	68.2	0.00010	78.9	0.00710	0.00102	0.00113	0.93	1.18	4.99	0.00014	76.6	27.7	0.13	0.0909	1.53	170.7	0.05975	0.00344	0.31692	0.01668	224	3.42	0.0002	0.8779	0.0305	0.0286	0.0113	0.0040
97	MW-to-RAS_PL-NP20	SC01 Untreated	30.73	6.20	275	0.18	153.4	0.0339	0.2243	0.1084	65.6	0.00010	71.9	0.00640	0.00108	0.00108	1.02	1.09	4.56	0.00016	69.7	28.0	0.12	0.0832	1.38	158.1	0.05427	0.00315	0.28824	0.01539	227	3.18	0.0002	0.9655	0.0277	0.0264	0.0103	0.0038
98	MW-to-RAS_PL-NP20	SC01 Untreated	23.98	6.22	296	0.21	155.9	0.0358	0.2575	0.1193	69.7	0.00010	82.2	0.00722	0.00104	0.00115	0.87	1.22	5.23	0.00014	78.9	29.6	0.13	0.0923	1.57	175.4	0.06235	0.00358	0.32658	0.01709	228	3.54	0.0002	0.8314	0.0318	0.0290	0.0116	0.0041
99	MW-to-RAS_PL-NP20	SC01 Untreated	25.61	6.25	292	0.21	155.6	0.0345	0.2508	0.1166	69.1	0.00010	80.4	0.00699	0.00103	0.00113	0.91	1.17	5.07	0.00014	75.6	29.1	0.13	0.0880	1.45	170.8	0.06095	0.00350	0.31215	0.01645	220	3.43	0.0002	0.8730	0.0311	0.0277	0.0111	0.0041
100	MW-to-RAS_PL-NP20	SC01 Untreated	42.56	6.40	255	0.16	151.5	0.0336	0.1946	0.0988	61.6	0.00010	62.3	0.00538	0.00093	0.00101	1.15	0.95	3.96	0.00017	59.3	24.5	0.10	0.0735	1.18	139.6	0.04681	0.00275	0.24448	0.01333	190	2.83	0.0002	1.0696	0.0239	0.0238	0.0087	0.0034
101	MW-to-RAS_PL-NP20	SC01 Untreated	26.38	6.22	299	0.22	156.3	0.0362	0.2637	0.1190	70.1	0.00010	83.7	0.00713	0.00104	0.00117	0.84	1.22	5.39	0.00013	79.2	30.1	0.14	0.0917	1.66	176.2	0.06587	0.00365	0.32728	0.01707	230	3.61	0.0002	0.7988	0.0325	0.0288	0.0118	0.0042
102	MW-to-RAS_PL-NP20	SC01 Untreated	26.70	6.24	286	0.20	154.7	0.0365	0.2438	0.1125	67.5	0.00010	77.8	0.00655	0.00101	0.00113	0.94	1.13	4.96	0.00014	72.1	28.4	0.12	0.0860	1.51	164.3	0.05891	0.00340	0.29725	0.01565	220	3.35	0.0002	0.8742	0.0301	0.0273	0.0105	0.0039
103	MW-to-RAS_PL-NP20	SC01 Untreated	26.38	6.21	284	0.21	155.6	0.0371	0.2571	0.1161	69.2	0.00010	81.7	0.00682	0.00103	0.00116	0.87	1.18	4.26	0.00014	75.7	28.4	0.12	0.0890	1.64	170.8	0.06209	0.00357	0.31222	0.01631	227	3.51	0.0002	0.8149	0.0317	0.0261	0.0110	0.0041
104	MW-to-RAS_PL-NP20	SC01 Untreated	28.47	6.25	286	0.20	154.6	0.0367	0.2447	0.1116	67.7	0.00010	77.8	0.00644	0.00103	0.00113	0.93	1.11	4.98	0.00014	71.0	28.4	0.12	0.0844	1.54	163.0	0.05911	0.00341	0.29184	0.01536	219	3.34	0.0002	0.9073	0.0302	0.0268	0.0110	0.0039
105	MW-to-RAS_PL-NP20	SC01 Untreated	38.06	6.32	273	0.18	152.9	0.0338	0.2219	0.1032	65.1	0.00010	70.7	0.00580	0.00097	0.00108	1.03	1.01	4.52	0.00016	64.0	26.7	0.11	0.0759	1.42	150.4	0.05354	0.00312	0.26250	0.01409	199	3.09	0.0002	0.9752	0.0273	0.0243	0.0093	0.0037
106	MW-to-RAS_PL-NP20	SC01 Untreated	28.37	6.24	288	0.21	154.6	0.0356	0.2469	0.1110	68.1	0.00010	78.4	0.00636	0.00102	0.00113	0.92	1.10	5.03	0.00014	70.2	28.6	0.12	0.0821	1.57	162.5	0.05633	0.00344	0.28797	0.01519	215	3.35	0.0002	0.8723	0.0305	0.0261	0.0102	0.0040
107	MW-to-RAS_PL-NP20	SC01 Untreated	33.28	6.30	276	0.19	153.3	0.0344	0.2276	0.1044	65.8	0.00010	72.4	0.00583	0.00099	0.00109	1.01	1.01	4.63	0.00015	64.0	27.1	0.11	0.0759	1.42	151.7	0.05000	0.00319	0.26207	0.01402	201	3.12	0.0002	0.9545	0.0281	0.0243	0.0093	0.0038
108	MW-to-RAS_PL-NP20	SC01 Untreated	27.35	6.24	289	0.21	154.8	0.0355	0.2489	0.1106	68.3	0.00010	79.9	0.00628	0.00102	0.00114	0.91	1.09	5.08	0.00014	69.5	28.0	0.12	0.0808	1.56	161.9	0.05606	0.00346	0.28442	0.01500	214	3.36	0.0002	0.8653	0.0307	0.0257	0.0101	0.0040
109	MW-to-RAS_PL-NP20	SC01 Untreated	29.20	6.28	279	0.19	153.8	0.0346	0.2330	0.1056	66.5	0.00010	74.2	0.00588	0.00100	0.00110	0.99	1.01	4.72	0.00015	64.0	27.5	0.11	0.0755	1.40	153.0	0.05645	0.00327	0.26108	0.01393	203	3.15	0.0002	0.9378	0.0288	0.0242	0.0092	0.0038
110	MW-to-RAS_PL-NP20	SC01 Untreated	21.36	6.20	303	0.22	156.9	0.0372	0.2712	0.1178	71.2	0.00010	86.1	0.00676	0.00107	0.00119	0.83	1.15	4.58	0.00013	73.1	30.4	0.13	0.0846	1.53	171.5	0.06588	0.00377	0.29857	0.01555	226	3.53	0.0002	0.7848	0.0337	0.0267	0.0105	0.0042
111	MW-to-RAS_PL-NP20	SC01 Untreated	27.83	6.29	275	0.19	154.0	0.0348	0.2277	0.1078	65.6	0.00010	72.1	0.00562	0.00098	0.00108	1.00	0.99	4.63	0.00015	62.0	27.0	0.11	0.0739	1.31	149.1	0.05477	0.00317	0.25339	0.01355	200	3.11	0.0002	0.9411	0.0280	0.0238	0.0089	0.0037
112	MW-to-RAS_PL-NP20	SC01 Untreated	26.07	6.25	285	0.20	155.2	0.0355	0.2435	0.1073	67.5	0.00010	76.9	0.00595	0.																							

Year	Scenario	Station	Flow Rate (Us)	pH	Hardness (mg CaCO3/L)	Acidity (mg CaCO3/L)	Alkalinity (mg CaCO3/L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO3-N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO4 (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
172	MW-to-RAS_PL-NP20	SC01 Untreated	23.42	6.21	290	0.22	153.9	0.0372	0.2614	0.1041	68.4	0.00010	80.8	0.00524	0.00101	0.00117	0.86	0.69	5.32	0.00013	41.1	28.9	0.09	0.0499	1.53	132.9	0.06295	0.00362	0.15027	0.00801	183	2.72	0.0002	0.8048	0.0323	0.0163	0.0051	0.0040
173	MW-to-RAS_PL-NP20	SC01 Untreated	28.20	6.29	272	0.19	152.1	0.0348	0.2307	0.0955	65.1	0.00010	71.7	0.00486	0.00097	0.00109	1.00	0.62	4.68	0.00015	36.1	26.8	0.08	0.0448	1.32	121.2	0.05562	0.00322	0.13119	0.00731	166	2.45	0.0002	0.8409	0.0285	0.0149	0.0045	0.0037
174	MW-to-RAS_PL-NP20	SC01 Untreated	23.80	6.25	282	0.20	153.5	0.0356	0.2473	0.1002	67.0	0.00010	76.7	0.00497	0.00100	0.00113	0.92	0.65	5.01	0.00014	38.3	27.8	0.09	0.0469	1.36	127.2	0.05968	0.00344	0.13891	0.00757	174	2.56	0.0002	0.8719	0.0306	0.0154	0.0048	0.0038
175	MW-to-RAS_PL-NP20	SC01 Untreated	20.42	6.22	290	0.21	154.5	0.0319	0.2503	0.1032	68.6	0.00010	80.2	0.00519	0.00102	0.00115	0.88	0.68	5.23	0.00014	39.5	28.8	0.09	0.0467	1.36	131.3	0.06248	0.00358	0.14275	0.00773	175	2.63	0.0002	0.8411	0.0320	0.0162	0.0049	0.0040
176	MW-to-RAS_PL-NP20	SC01 Untreated	29.33	6.35	280	0.17	151.7	0.0319	0.2092	0.0862	62.9	0.00010	65.2	0.00424	0.00094	0.00104	1.09	0.56	4.23	0.00017	32.2	25.1	0.07	0.0400	1.08	112.7	0.05402	0.00394	0.11567	0.00743	151	2.24	0.0002	0.8383	0.0258	0.0132	0.0040	0.0035
177	MW-to-RAS_PL-NP20	SC01 Untreated	36.22	6.35	256	0.17	151.0	0.0324	0.2046	0.0870	61.8	0.00010	63.1	0.00410	0.00092	0.00103	1.09	0.55	4.20	0.00016	31.9	24.7	0.07	0.0403	1.20	110.2	0.04867	0.00286	0.11519	0.00670	151	2.23	0.0002	0.8331	0.0249	0.0136	0.0040	0.0034
178	MW-to-RAS_PL-NP20	SC01 Untreated	36.33	6.31	260	0.18	150.8	0.0335	0.2114	0.0892	62.6	0.00010	65.3	0.00424	0.00093	0.00105	1.07	0.56	4.35	0.00016	32.6	25.2	0.07	0.0413	1.35	112.5	0.05047	0.00296	0.11711	0.00672	155	2.26	0.0002	0.8629	0.0258	0.0139	0.0041	0.0035
179	MW-to-RAS_PL-NP20	SC01 Untreated	28.50	6.24	283	0.21	153.0	0.0369	0.2495	0.1009	67.2	0.00010	77.2	0.00483	0.00097	0.00115	0.92	0.63	5.08	0.00014	37.4	28.0	0.08	0.0464	1.54	126.5	0.06020	0.00348	0.13382	0.00727	176	2.50	0.0002	0.8092	0.0308	0.0153	0.0048	0.0039
180	MW-to-RAS_PL-NP20	SC01 Untreated	30.63	6.27	273	0.19	151.9	0.0352	0.2328	0.0980	66.2	0.00010	72.2	0.00468	0.00097	0.00111	0.99	0.59	4.74	0.00015	34.8	26.7	0.08	0.0435	1.43	120.1	0.05611	0.00326	0.12402	0.00691	166	2.36	0.0002	0.9327	0.0287	0.0145	0.0043	0.0037
181	MW-to-RAS_PL-NP20	SC01 Untreated	32.28	6.26	278	0.20	152.2	0.0359	0.2420	0.0961	66.1	0.00010	74.6	0.00483	0.00098	0.00113	0.94	0.61	4.96	0.00014	36.0	27.4	0.08	0.0447	1.54	122.8	0.05806	0.00337	0.12639	0.00705	170	2.42	0.0002	0.8838	0.0297	0.0148	0.0044	0.0038
182	MW-to-RAS_PL-NP20	SC01 Untreated	37.66	6.29	268	0.19	151.0	0.0353	0.2265	0.0940	64.2	0.00010	70.1	0.00454	0.00096	0.00109	1.01	0.58	4.63	0.00015	33.5	26.2	0.08	0.0427	1.47	117.0	0.05443	0.00317	0.11894	0.00668	163	2.29	0.0002	0.9484	0.0279	0.0143	0.0041	0.0036
183	MW-to-RAS_PL-NP20	SC01 Untreated	30.58	6.24	283	0.21	152.2	0.0360	0.2498	0.1004	67.1	0.00010	77.2	0.00489	0.00100	0.00115	0.91	0.61	5.10	0.00014	36.3	28.0	0.08	0.0445	1.61	125.2	0.06019	0.00348	0.12869	0.00702	172	2.44	0.0002	0.8626	0.0308	0.0146	0.0044	0.0039
184	MW-to-RAS_PL-NP20	SC01 Untreated	36.22	6.29	272	0.19	151.0	0.0337	0.2312	0.0952	65.2	0.00010	71.8	0.00464	0.00097	0.00110	1.00	0.57	4.71	0.00015	33.4	26.6	0.08	0.0409	1.46	118.4	0.05582	0.00324	0.11750	0.00664	159	2.28	0.0002	0.9513	0.0286	0.0136	0.0040	0.0037
185	MW-to-RAS_PL-NP20	SC01 Untreated	51.53	6.37	254	0.17	149.1	0.0343	0.2037	0.0871	61.3	0.00010	62.9	0.00408	0.00091	0.00104	1.10	0.52	4.18	0.00016	29.8	24.4	0.07	0.0398	1.39	107.6	0.04868	0.00287	0.10500	0.00611	153	2.09	0.0002	0.9279	0.0249	0.0135	0.0036	0.0034
186	MW-to-RAS_PL-NP20	SC01 Untreated	30.73	6.20	293	0.23	152.3	0.0379	0.2679	0.1056	68.9	0.00010	82.7	0.00533	0.00102	0.00119	0.83	0.63	5.48	0.00013	37.9	29.2	0.09	0.0464	1.82	130.6	0.06463	0.00372	0.13328	0.00708	181	2.50	0.0002	0.8724	0.0331	0.0151	0.0045	0.0040
187	MW-to-RAS_PL-NP20	SC01 Untreated	37.91	6.28	269	0.19	149.9	0.0356	0.2294	0.0948	64.4	0.00010	71.0	0.00460	0.00096	0.00110	1.00	0.56	4.68	0.00015	32.5	26.3	0.08	0.0418	1.54	116.5	0.05530	0.00322	0.11359	0.00637	164	2.22	0.0002	0.9356	0.0283	0.0140	0.0039	0.0037
188	MW-to-RAS_PL-NP20	SC01 Untreated	33.91	6.26	274	0.20	150.1	0.0348	0.2366	0.0966	65.4	0.00010	78.8	0.00515	0.00101	0.00116	0.88	0.60	5.22	0.00014	33.1	26.9	0.08	0.0412	1.57	119.0	0.05713	0.00331	0.11539	0.00645	163	2.25	0.0002	0.9175	0.0283	0.0137	0.0039	0.0037
189	MW-to-RAS_PL-NP20	SC01 Untreated	30.38	6.23	286	0.22	151.4	0.0368	0.2576	0.1029	67.3	0.00010	79.8	0.00515	0.00101	0.00116	0.88	0.60	5.22	0.00014	35.4	28.4	0.08	0.0437	1.62	126.3	0.06293	0.00339	0.12326	0.00668	174	2.36	0.0002	0.8853	0.0320	0.0143	0.0042	0.0039
190	MW-to-RAS_PL-NP20	SC01 Untreated	35.38	6.31	263	0.18	149.3	0.0336	0.2180	0.0913	63.2	0.00010	67.6	0.00438	0.00094	0.00107	1.05	0.53	4.44	0.00016	30.2	25.5	0.07	0.0388	1.37	111.9	0.05256	0.00306	0.10504	0.00606	154	2.10	0.0002	0.9393	0.0269	0.0131	0.0036	0.0035
191	MW-to-RAS_PL-NP20	SC01 Untreated	25.97	6.21	289	0.22	151.7	0.0359	0.2620	0.1036	68.3	0.00010	81.0	0.00521	0.00101	0.00116	0.85	0.60	5.33	0.00014	35.7	28.8	0.08	0.0431	1.61	127.4	0.06334	0.00364	0.12395	0.00670	172	2.38	0.0002	0.9142	0.0325	0.0140	0.0042	0.0040
192	MW-to-RAS_PL-NP20	SC01 Untreated	22.72	6.20	292	0.22	152.5	0.0372	0.2675	0.1058	69.0	0.00010	82.9	0.00534	0.00103	0.00118	0.84	0.61	5.40	0.00013	36.0	29.1	0.09	0.0444	1.53	129.3	0.06491	0.00371	0.12474	0.00667	178	2.38	0.0002	0.8711	0.0333	0.0145	0.0042	0.0040
193	MW-to-RAS_PL-NP20	SC01 Untreated	23.03	6.24	282	0.21	152.0	0.0358	0.2502	0.1010	67.1	0.00010	77.7	0.00501	0.00100	0.00113	0.91	0.58	5.04	0.00014	33.6	27.8	0.08	0.0420	1.34	123.2	0.06070	0.00348	0.11607	0.00638	169	2.26	0.0002	0.8624	0.0311	0.0138	0.0040	0.0039
194	MW-to-RAS_PL-NP20	SC01 Untreated	35.74	6.34	253	0.17	149.1	0.0320	0.2021	0.0859	61.2	0.00010	62.1	0.00402	0.00091	0.00102	1.10	0.50	4.15	0.00016	28.0	24.3	0.07	0.0364	1.24	105.4	0.04813	0.00283	0.09708	0.00578	144	1.98	0.0002	0.9380	0.0246	0.0124	0.0034	0.0034
195	MW-to-RAS_PL-NP20	SC01 Untreated	37.37	6.31	268	0.19	150.3	0.0338	0.2265	0.0933	64.2	0.00010	69.9	0.00451	0.00095	0.00108	1.00	0.53	4.63	0.00015	30.8	26.2	0.07	0.0388	1.41	114.1	0.05438	0.00316	0.10623	0.00606	156	2.12	0.0002	0.9504	0.0279	0.0130	0.0037	0.0036
196	MW-to-RAS_PL-NP20	SC01 Untreated	31.33	6.27	279	0.20	151.6	0.0357	0.2458	0.0984	66.5	0.00010	76.1	0.00490	0.00099	0.00113	0.93	0.57	4.99	0.00014	32.8	27.5	0.08	0.0413	1.47	121.0	0.05940	0.00343	0.11305	0.00625	167	2.22	0.0002	0.8779	0.0304	0.0136	0.0038	0.0038
197	MW-to-RAS_PL-NP20	SC01 Untreated	30.73	6.30	267	0.19	150.6	0.0339	0.2241	0.0930	64.0	0.00010	69.3	0.00448	0.00095	0.00108	1.02	0.53	4.56	0.00016	30.1	26.0	0.07	0.0385	1.33	113.2	0.05396	0.00314	0.10343	0.00594	155	2.08	0.0002	0.9654	0.0276	0.0129	0.0036	0.0036
198	MW-to-RAS_PL-NP20	SC01 Untreated	23.98	6.22	287	0.21	152.6	0.0358	0.2573	0.1022	67.9	0.00010	79.3	0																								

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
58	MW-to-RAS PL-NP20	SC01 Treated	29.69	6.24	351	0.21	156.3	0.0124	0.0037	0.1784	93.8	0.00010	86.6	0.00036	0.00027	0.00026	0.87	1.49	0.06	0.00014	116.2	28.3	0.03	0.0081	0.09	228.8	0.00149	0.00019	0.01189	0.00163	205	0.36	0.0002	0.8278	0.0032	0.0136	0.0020	0.0006
59	MW-to-RAS PL-NP20	SC01 Treated	37.36	6.31	326	0.18	154.1	0.0142	0.0036	0.1596	87.9	0.00010	76.9	0.00035	0.00021	0.00030	1.00	1.34	0.06	0.00015	102.5	26.1	0.02	0.0096	0.10	205.4	0.00136	0.00020	0.01136	0.00173	190	0.40	0.0002	0.9377	0.0028	0.0131	0.0018	0.0007
60	MW-to-RAS PL-NP20	SC01 Treated	27.91	6.22	354	0.21	156.3	0.0131	0.0038	0.1762	94.6	0.00010	87.9	0.00035	0.00027	0.00026	0.85	1.51	0.06	0.00013	115.9	28.6	0.03	0.0087	0.09	225.5	0.00151	0.00019	0.01206	0.00159	206	0.38	0.0002	0.8038	0.0033	0.0137	0.0020	0.0006
61	MW-to-RAS PL-NP20	SC01 Treated	27.83	6.23	357	0.21	156.4	0.0110	0.0035	0.1749	95.4	0.00010	88.7	0.00035	0.00027	0.00025	0.95	1.50	0.06	0.00014	114.5	28.8	0.03	0.0096	0.09	227.7	0.00163	0.00019	0.01259	0.00162	201	0.38	0.0002	0.8216	0.0033	0.0129	0.0020	0.0006
62	MW-to-RAS PL-NP20	SC01 Treated	21.52	6.19	373	0.23	158.4	0.0118	0.0038	0.1852	98.8	0.00010	95.7	0.00035	0.00024	0.00024	1.78	1.59	0.07	0.00013	120.7	30.2	0.03	0.0074	0.08	240.3	0.00163	0.00018	0.01236	0.00152	214	0.33	0.0002	0.7364	0.0036	0.0136	0.0021	0.0005
63	MW-to-RAS PL-NP20	SC01 Treated	32.01	6.34	318	0.17	154.0	0.0135	0.0035	0.1466	85.4	0.00010	75.4	0.00033	0.00032	0.00031	1.05	1.27	0.06	0.00016	93.8	25.5	0.02	0.0088	0.10	192.3	0.00132	0.00020	0.01047	0.00177	177	0.41	0.0002	0.9602	0.0027	0.0120	0.0017	0.0007
64	MW-to-RAS PL-NP20	SC01 Treated	30.64	6.30	331	0.19	155.2	0.0111	0.0033	0.1512	88.8	0.00010	77.7	0.00033	0.00030	0.00028	0.97	1.36	0.06	0.00015	101.1	26.6	0.02	0.0065	0.09	202.8	0.00137	0.00020	0.01029	0.00172	180	0.39	0.0002	0.9308	0.0029	0.0117	0.0018	0.0007
65	MW-to-RAS PL-NP20	SC01 Treated	33.00	6.31	313	0.17	153.4	0.0137	0.0035	0.1394	84.2	0.00010	71.0	0.00032	0.00030	0.00032	1.05	1.27	0.06	0.00016	92.4	25.0	0.02	0.0090	0.10	187.4	0.00128	0.00020	0.01039	0.00176	174	0.41	0.0002	0.9313	0.0026	0.0117	0.0017	0.0008
66	MW-to-RAS PL-NP20	SC01 Treated	26.89	6.24	348	0.21	156.3	0.0118	0.0036	0.1595	93.3	0.00010	84.7	0.00033	0.00028	0.00027	0.89	1.45	0.06	0.00014	106.1	28.0	0.02	0.0071	0.09	213.6	0.00147	0.00019	0.01084	0.00163	192	0.37	0.0002	0.8531	0.0032	0.0123	0.0018	0.0006
67	MW-to-RAS PL-NP20	SC01 Treated	30.07	6.29	331	0.19	155.0	0.0122	0.0034	0.1470	88.9	0.00010	77.0	0.00032	0.00030	0.00029	0.98	1.35	0.06	0.00015	97.5	26.5	0.02	0.0074	0.09	198.3	0.00138	0.00020	0.01029	0.00170	180	0.39	0.0002	0.9317	0.0029	0.0117	0.0017	0.0007
68	MW-to-RAS PL-NP20	SC01 Treated	32.44	6.30	331	0.19	155.0	0.0123	0.0034	0.1451	88.8	0.00010	77.7	0.00032	0.00030	0.00029	0.98	1.35	0.06	0.00015	96.7	26.5	0.02	0.0075	0.09	197.0	0.00138	0.00020	0.01024	0.00170	179	0.39	0.0002	0.9302	0.0029	0.0116	0.0017	0.0007
69	MW-to-RAS PL-NP20	SC01 Treated	19.24	6.17	381	0.24	159.8	0.0111	0.0038	0.1735	101.8	0.00010	97.2	0.00032	0.00023	0.00022	0.73	1.63	0.07	0.00012	117.8	30.7	0.03	0.0066	0.08	235.4	0.00165	0.00018	0.01158	0.00145	211	0.32	0.0002	0.6978	0.0037	0.0129	0.0020	0.0005
70	MW-to-RAS PL-NP20	SC01 Treated	27.85	6.30	326	0.18	155.3	0.0124	0.0034	0.1395	87.7	0.00010	75.7	0.00031	0.00031	0.00030	1.00	1.31	0.06	0.00016	92.2	26.0	0.02	0.0076	0.10	190.4	0.00135	0.00020	0.00996	0.00171	174	0.39	0.0002	0.9559	0.0028	0.0113	0.0017	0.0007
71	MW-to-RAS PL-NP20	SC01 Treated	36.69	6.37	301	0.16	153.0	0.0145	0.0035	0.1239	81.1	0.00010	65.9	0.00031	0.00034	0.00034	1.12	1.18	0.06	0.00017	81.7	23.9	0.02	0.0095	0.11	170.5	0.00122	0.00021	0.00977	0.00180	163	0.43	0.0002	0.9497	0.0025	0.0112	0.0015	0.0008
72	MW-to-RAS PL-NP20	SC01 Treated	23.42	6.22	353	0.21	157.8	0.0130	0.0038	0.1522	94.6	0.00010	86.1	0.00030	0.00027	0.00026	0.86	1.48	0.06	0.00013	104.3	28.4	0.02	0.0082	0.09	210.5	0.00150	0.00019	0.01105	0.00154	195	0.35	0.0002	0.8051	0.0033	0.0123	0.0018	0.0006
73	MW-to-RAS PL-NP20	SC01 Treated	28.20	6.29	328	0.19	155.5	0.0133	0.0036	0.1365	88.1	0.00010	76.2	0.00030	0.00026	0.00026	1.00	1.31	0.06	0.00015	91.0	26.2	0.02	0.0083	0.10	185.5	0.00136	0.00020	0.01038	0.00168	176	0.39	0.0002	0.9408	0.0029	0.0114	0.0016	0.0007
74	MW-to-RAS PL-NP20	SC01 Treated	23.80	6.25	342	0.20	157.1	0.0130	0.0037	0.1429	91.7	0.00010	81.5	0.00030	0.00028	0.00028	0.92	1.39	0.06	0.00014	96.4	27.4	0.02	0.0090	0.09	198.3	0.00144	0.00019	0.01042	0.00160	184	0.37	0.0002	0.8721	0.0031	0.0117	0.0017	0.0007
75	MW-to-RAS PL-NP20	SC01 Treated	20.42	6.23	352	0.21	158.3	0.0113	0.0038	0.1465	94.4	0.00010	85.1	0.00029	0.00027	0.00028	0.98	1.43	0.06	0.00014	99.4	28.0	0.02	0.0084	0.08	204.3	0.00148	0.00019	0.01012	0.00158	188	0.36	0.0002	0.8413	0.0033	0.0113	0.0017	0.0006
76	MW-to-RAS PL-NP20	SC01 Treated	29.33	6.36	311	0.17	154.7	0.0127	0.0033	0.1231	83.8	0.00010	69.1	0.00029	0.00034	0.00032	1.09	1.18	0.06	0.00017	80.3	24.6	0.02	0.0076	0.10	171.2	0.00127	0.00021	0.00906	0.00178	159	0.42	0.0002	0.9385	0.0026	0.0103	0.0015	0.0008
77	MW-to-RAS PL-NP20	SC01 Treated	36.22	6.36	306	0.17	154.1	0.0135	0.0034	0.1187	82.3	0.00010	66.8	0.00029	0.00034	0.00032	1.09	1.18	0.06	0.00017	80.0	24.3	0.02	0.0084	0.10	168.1	0.00123	0.00020	0.00927	0.00177	159	0.42	0.0002	0.9332	0.0025	0.0105	0.0015	0.0008
78	MW-to-RAS PL-NP20	SC01 Treated	36.33	6.32	311	0.17	153.9	0.0138	0.0034	0.1208	83.7	0.00010	69.0	0.00029	0.00033	0.00032	1.07	1.20	0.06	0.00016	81.3	24.7	0.02	0.0086	0.10	170.9	0.00126	0.00020	0.00939	0.00173	163	0.41	0.0002	0.9308	0.0026	0.0107	0.0015	0.0008
79	MW-to-RAS PL-NP20	SC01 Treated	28.50	6.24	342	0.21	156.6	0.0136	0.0037	0.1370	91.9	0.00010	81.6	0.00029	0.00028	0.00028	0.92	1.37	0.06	0.00014	92.9	27.4	0.02	0.0084	0.09	193.2	0.00144	0.00019	0.01021	0.00157	183	0.37	0.0002	0.8631	0.0031	0.0114	0.0016	0.0007
80	MW-to-RAS PL-NP20	SC01 Treated	30.63	6.28	328	0.19	155.2	0.0135	0.0036	0.1283	89.3	0.00010	76.1	0.00028	0.00031	0.00030	0.99	1.28	0.06	0.00015	86.1	26.2	0.02	0.0083	0.10	181.5	0.00137	0.00020	0.00964	0.00164	172	0.39	0.0002	0.9329	0.0029	0.0109	0.0015	0.0007
81	MW-to-RAS PL-NP20	SC01 Treated	32.28	6.26	335	0.20	155.7	0.0133	0.0036	0.1301	90.0	0.00010	78.6	0.00028	0.00029	0.00028	0.94	1.32	0.06	0.00014	89.2	26.8	0.02	0.0082	0.09	186.1	0.00140	0.00019	0.00984	0.00159	176	0.37	0.0002	0.8839	0.0030	0.0110	0.0016	0.0007
82	MW-to-RAS PL-NP20	SC01 Treated	37.66	6.30	322	0.19	154.2	0.0141	0.0036	0.1208	86.6	0.00010	73.7	0.00028	0.00031	0.00031	1.01	1.24	0.06	0.00015	82.5	25.7	0.02	0.0088	0.10	175.0	0.00134	0.00020	0.00953	0.00165	169	0.39	0.0002	0.9485	0.0028	0.0107	0.0015	0.0007
83	MW-to-RAS PL-NP20	SC01 Treated	30.58	6.24	342	0.21	155.7	0.0126	0.0036	0.1130	81.7	0.00010	81.1	0.00027	0.00028	0.00027	0.91	1.33	0.06	0.00014	89.5	27.4	0.02	0.0074	0.09	188.0	0.00144	0.00019	0.00960	0.00156	177	0.37	0.0002	0.8628	0.0031	0.0107	0.0016	0.0006
84	MW-to-RAS PL-NP20	SC01 Treated	36.22	6.29	327	0.19	154.2	0.0122	0.0034	0.1233	87.9	0.00010																										

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
144	MW-to-RAS PL-NP20	SC01 Treated	32.34	6.27	316	0.19	151.7	0.0128	0.0035	0.0961	85.2	0.00010	71.7	0.00022	0.00030	0.00029	0.98	0.76	0.06	0.00015	46.2	25.0	0.01	0.0066	0.09	131.1	0.00133	0.00020	0.00569	0.00146	131	0.37	0.0002	0.9336	0.0028	0.0068	0.0008	0.0007
145	MW-to-RAS PL-NP20	SC01 Treated	24.04	6.18	358	0.24	155.2	0.0118	0.0038	0.1126	96.4	0.00010	88.7	0.00021	0.00033	0.00023	1.77	0.89	0.07	0.00013	55.0	28.6	0.02	0.0054	0.08	153.2	0.00158	0.00018	0.00590	0.00120	150	0.31	0.0002	1.7339	0.0035	0.0069	0.0009	0.0005
146	MW-to-RAS PL-NP20	SC01 Treated	35.26	6.31	299	0.18	150.5	0.0147	0.0036	0.0906	80.9	0.00010	65.7	0.00023	0.00030	0.00032	1.07	0.70	0.06	0.00016	41.8	23.6	0.01	0.0085	0.10	122.2	0.00125	0.00020	0.00599	0.00153	128	0.40	0.0002	1.0005	0.0026	0.0072	0.0008	0.0008
147	MW-to-RAS PL-NP20	SC01 Treated	35.23	6.30	316	0.19	151.6	0.0124	0.0036	0.0960	85.2	0.00010	71.7	0.00022	0.00031	0.00030	1.00	0.74	0.06	0.00015	44.5	25.0	0.01	0.0092	0.09	129.7	0.00194	0.00020	0.00583	0.00148	128	0.38	0.0002	0.9417	0.0028	0.0065	0.0008	0.0007
148	MW-to-RAS PL-NP20	SC01 Treated	32.28	6.25	322	0.20	152.2	0.0134	0.0036	0.0987	86.5	0.00010	74.5	0.00022	0.00028	0.00029	0.94	0.76	0.06	0.00014	46.3	25.6	0.01	0.0071	0.09	133.2	0.00137	0.00019	0.00583	0.00139	135	0.36	0.0002	0.8890	0.0029	0.0070	0.0008	0.0007
149	MW-to-RAS PL-NP20	SC01 Treated	35.34	6.29	305	0.18	150.6	0.0146	0.0036	0.0920	82.5	0.00010	68.2	0.00023	0.00032	0.00032	1.04	0.70	0.06	0.00015	42.0	24.1	0.01	0.0084	0.10	124.2	0.00129	0.00020	0.00594	0.00149	130	0.39	0.0002	0.9714	0.0027	0.0072	0.0008	0.0007
150	MW-to-RAS PL-NP20	SC01 Treated	30.10	6.24	326	0.20	151.9	0.0131	0.0036	0.1000	87.8	0.00010	76.0	0.00022	0.00029	0.00028	0.93	0.76	0.06	0.00014	46.0	25.8	0.01	0.0068	0.09	134.1	0.00140	0.00019	0.00567	0.00137	135	0.36	0.0002	0.8795	0.0030	0.0068	0.0008	0.0007
151	MW-to-RAS PL-NP20	SC01 Treated	39.52	6.30	316	0.19	151.2	0.0137	0.0036	0.0966	85.3	0.00010	72.4	0.00022	0.00030	0.00030	0.99	0.72	0.06	0.00015	43.4	25.0	0.01	0.0074	0.10	128.8	0.00135	0.00020	0.00569	0.00143	132	0.37	0.0002	0.9264	0.0029	0.0069	0.0008	0.0007
152	MW-to-RAS PL-NP20	SC01 Treated	36.08	6.28	319	0.20	151.2	0.0138	0.0036	0.0977	86.0	0.00010	73.6	0.00022	0.00030	0.00029	0.97	0.73	0.06	0.00015	43.9	25.2	0.01	0.0075	0.10	130.0	0.00137	0.00019	0.00575	0.00140	134	0.37	0.0002	0.9050	0.0029	0.0069	0.0008	0.0007
153	MW-to-RAS PL-NP20	SC01 Treated	34.37	6.28	319	0.20	151.1	0.0135	0.0036	0.0977	86.1	0.00010	73.6	0.00022	0.00030	0.00029	0.97	0.72	0.06	0.00015	43.9	25.2	0.01	0.0071	0.10	129.6	0.00137	0.00020	0.00575	0.00141	132	0.37	0.0002	0.9129	0.0029	0.0068	0.0008	0.0007
154	MW-to-RAS PL-NP20	SC01 Treated	33.78	6.28	315	0.19	150.9	0.0135	0.0036	0.0961	85.1	0.00010	72.1	0.00022	0.00030	0.00030	0.98	0.70	0.06	0.00015	42.3	24.9	0.01	0.0072	0.10	127.4	0.00134	0.00020	0.00555	0.00142	130	0.37	0.0002	0.9248	0.0029	0.0067	0.0008	0.0007
155	MW-to-RAS PL-NP20	SC01 Treated	29.77	6.25	324	0.20	151.5	0.0130	0.0036	0.0962	87.3	0.00010	75.4	0.00022	0.00029	0.00028	0.94	0.72	0.06	0.00014	43.8	25.7	0.01	0.0066	0.09	131.4	0.00139	0.00019	0.00544	0.00143	133	0.36	0.0002	0.8836	0.0030	0.0067	0.0008	0.0007
156	MW-to-RAS PL-NP20	SC01 Treated	36.60	6.29	314	0.19	150.9	0.0134	0.0036	0.0957	84.9	0.00010	71.8	0.00022	0.00030	0.00030	0.98	0.69	0.06	0.00015	41.6	24.9	0.01	0.0071	0.10	126.4	0.00134	0.00020	0.00545	0.00142	129	0.37	0.0002	0.9273	0.0028	0.0067	0.0008	0.0007
157	MW-to-RAS PL-NP20	SC01 Treated	31.63	6.26	319	0.20	151.1	0.0136	0.0036	0.0973	86.0	0.00010	73.6	0.00022	0.00030	0.00029	0.96	0.70	0.06	0.00014	42.3	25.3	0.01	0.0073	0.09	128.3	0.00136	0.00019	0.00553	0.00138	132	0.36	0.0002	0.8982	0.0029	0.0067	0.0008	0.0007
158	MW-to-RAS PL-NP20	SC01 Treated	29.92	6.22	335	0.22	152.1	0.0124	0.0036	0.1028	90.1	0.00010	79.6	0.00021	0.00027	0.00026	0.87	0.74	0.06	0.00014	45.1	26.6	0.01	0.0060	0.09	135.6	0.00145	0.00019	0.00530	0.00129	139	0.34	0.0002	0.8267	0.0032	0.0064	0.0008	0.0006
159	MW-to-RAS PL-NP20	SC01 Treated	37.61	6.29	311	0.19	150.4	0.0142	0.0036	0.0949	84.1	0.00010	70.8	0.00022	0.00031	0.00030	1.00	0.67	0.06	0.00015	39.9	24.6	0.01	0.0079	0.10	123.9	0.00133	0.00020	0.00555	0.00143	126	0.37	0.0002	0.8657	0.0028	0.0068	0.0007	0.0007
160	MW-to-RAS PL-NP20	SC01 Treated	28.08	6.21	338	0.22	152.0	0.0131	0.0038	0.1044	90.9	0.00010	81.1	0.00021	0.00027	0.00028	0.85	0.74	0.06	0.00013	45.1	26.8	0.01	0.0067	0.09	136.7	0.00147	0.00019	0.00549	0.00125	139	0.33	0.0002	0.8016	0.0032	0.0065	0.0008	0.0006
161	MW-to-RAS PL-NP20	SC01 Treated	28.00	6.22	340	0.22	152.2	0.0111	0.0038	0.1048	91.7	0.00010	82.0	0.00021	0.00027	0.00028	0.85	0.73	0.06	0.00013	44.6	27.1	0.01	0.0047	0.08	137.2	0.00149	0.00019	0.00549	0.00128	133	0.33	0.0002	0.8205	0.0033	0.0059	0.0008	0.0006
162	MW-to-RAS PL-NP20	SC01 Treated	21.62	6.18	357	0.24	154.0	0.0118	0.0038	0.1117	96.0	0.00010	88.8	0.00021	0.00024	0.00024	0.77	0.77	0.07	0.00013	47.2	28.4	0.02	0.0054	0.08	145.2	0.00159	0.00018	0.00518	0.00116	143	0.31	0.0002	0.7350	0.0036	0.0063	0.0008	0.0005
163	MW-to-RAS PL-NP20	SC01 Treated	32.10	6.33	305	0.18	150.5	0.0135	0.0035	0.0922	82.4	0.00010	68.1	0.00022	0.00032	0.00031	1.05	0.63	0.06	0.00016	36.8	24.0	0.01	0.0072	0.10	119.2	0.00129	0.00020	0.00510	0.00149	122	0.39	0.0002	0.9889	0.0027	0.0064	0.0007	0.0007
164	MW-to-RAS PL-NP20	SC01 Treated	30.69	6.28	317	0.19	151.4	0.0123	0.0035	0.0921	85.6	0.00010	72.1	0.00021	0.00030	0.00028	0.97	0.66	0.06	0.00015	39.3	25.1	0.01	0.0048	0.09	124.4	0.00134	0.00019	0.00549	0.00142	120	0.36	0.0002	0.9298	0.0029	0.0067	0.0007	0.0007
165	MW-to-RAS PL-NP20	SC01 Treated	33.03	6.30	300	0.18	150.0	0.0137	0.0035	0.0899	81.2	0.00010	66.1	0.00022	0.00032	0.00032	1.05	0.61	0.06	0.00016	36.1	23.7	0.01	0.0074	0.10	116.5	0.00126	0.00020	0.00512	0.00149	120	0.39	0.0002	0.9902	0.0026	0.0064	0.0007	0.0007
166	MW-to-RAS PL-NP20	SC01 Treated	26.90	6.23	333	0.21	152.4	0.0118	0.0035	0.1021	89.8	0.00010	79.0	0.00021	0.00028	0.00027	0.89	0.69	0.06	0.00014	41.6	26.4	0.01	0.0054	0.09	132.0	0.00145	0.00019	0.00548	0.00131	130	0.34	0.0002	0.8523	0.0031	0.0060	0.0007	0.0006
167	MW-to-RAS PL-NP20	SC01 Treated	30.08	6.28	317	0.19	151.4	0.0122	0.0034	0.0961	85.7	0.00010	72.7	0.00022	0.00030	0.00029	0.98	0.64	0.06	0.00015	38.2	25.1	0.01	0.0058	0.09	124.0	0.00135	0.00020	0.00542	0.00142	123	0.36	0.0002	0.9311	0.0029	0.0059	0.0007	0.0007
168	MW-to-RAS PL-NP20	SC01 Treated	32.44	6.29	317	0.19	151.4	0.0123	0.0034	0.0959	85.6	0.00010	72.6	0.00022	0.00030	0.00029	0.98	0.64	0.06	0.00015	38.0	25.1	0.01	0.0059	0.09	123.6	0.00135	0.00020	0.00541	0.00141	123	0.36	0.0002	0.9297	0.0029	0.0059	0.0007	0.0007
169	MW-to-RAS PL-NP20	SC01 Treated	19.24	6.16	364	0.24	155.4	0.0111	0.0038	0.1136	97.9	0.00010	91.0	0.00020	0.00023	0.00022	0.73	0.76	0.07	0.00012	46.3	29.0	0.02	0.0046	0.07	146.0	0.00162	0.00018	0.00482	0.00110	142	0.29	0.0002	0.6973	0.0036	0.0059	0.0007	0.0005
170	MW-to-RAS PL-NP20	SC01 Treated	27.85	6.29	313	0.19	151.8	0.0124	0.0034	0.0945	84.																											

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	
30	MW-to-RAS	PL-NP20	RS03 Untreated	17.98	6.58	104	0.08	106.0	0.0166	0.0202	0.0248	25.9	0.00007	5.2	0.00044	0.00045	0.00072	1.40	0.23	0.85	0.00017	12.3	9.7	0.02	0.0127	2.18	28.5	0.00051	0.00041	0.04339	0.00357	31	0.55	0.0002	1.3750	0.0000	0.0045	0.0020	0.0016
31	MW-to-RAS	PL-NP20	RS03 Untreated	20.10	6.57	104	0.09	105.1	0.0171	0.0202	0.0247	25.5	0.00007	5.1	0.00043	0.00045	0.00073	1.41	0.23	0.86	0.00017	12.4	9.6	0.02	0.0131	2.24	28.3	0.00051	0.00042	0.04367	0.00357	32	0.56	0.0002	1.3868	0.0000	0.0046	0.0020	0.0016
32	MW-to-RAS	PL-NP20	RS03 Untreated	19.95	6.54	103	0.09	103.0	0.0175	0.0207	0.0244	25.5	0.00007	5.0	0.00043	0.00044	0.00075	1.41	0.24	0.93	0.00016	13.0	9.6	0.02	0.0135	2.24	28.2	0.00051	0.00044	0.04364	0.00364	33	0.59	0.0002	1.3856	0.0000	0.0048	0.0020	0.0016
33	MW-to-RAS	PL-NP20	RS03 Untreated	20.61	6.53	103	0.10	106.1	0.0176	0.0208	0.0249	25.1	0.00007	4.9	0.00043	0.00044	0.00075	1.42	0.24	0.98	0.00016	13.3	9.5	0.02	0.0136	2.55	27.7	0.00051	0.00044	0.04360	0.00368	33	0.68	0.0002	1.3877	0.0000	0.0048	0.0021	0.0016
34	MW-to-RAS	PL-NP20	RS03 Untreated	13.90	6.50	112	0.10	112.2	0.0180	0.0240	0.0257	27.3	0.00007	5.6	0.00047	0.00044	0.00074	1.31	0.27	1.05	0.00017	15.3	10.7	0.02	0.0157	2.63	32.3	0.00051	0.00047	0.05571	0.00414	37	0.68	0.0002	1.2925	0.0000	0.0055	0.0024	0.0016
35	MW-to-RAS	PL-NP20	RS03 Untreated	21.02	6.54	111	0.10	112.2	0.0171	0.0228	0.0254	27.2	0.00007	5.5	0.00043	0.00045	0.00074	1.33	0.25	0.97	0.00017	13.9	10.5	0.02	0.0138	2.42	31.0	0.00051	0.00045	0.04949	0.00387	33	0.62	0.0002	1.3174	0.0000	0.0049	0.0022	0.0016
36	MW-to-RAS	PL-NP20	RS03 Untreated	14.56	6.56	114	0.09	116.7	0.0162	0.0230	0.0255	28.0	0.00007	5.7	0.00042	0.00045	0.00072	1.33	0.25	0.93	0.00017	13.5	10.8	0.02	0.0131	2.25	31.7	0.00050	0.00043	0.04846	0.00384	31	0.62	0.0002	1.3163	0.0000	0.0047	0.0021	0.0016
37	MW-to-RAS	PL-NP20	RS03 Untreated	14.68	6.60	115	0.08	119.3	0.0159	0.0221	0.0257	28.2	0.00007	5.7	0.00039	0.00048	0.00071	1.33	0.24	0.84	0.00017	12.1	10.8	0.02	0.0119	2.01	31.1	0.00050	0.00041	0.04266	0.00359	29	0.56	0.0002	1.3157	0.0000	0.0043	0.0019	0.0016
38	MW-to-RAS	PL-NP20	RS03 Untreated	18.61	6.59	105	0.08	108.0	0.0165	0.0197	0.0243	26.1	0.00007	5.1	0.00035	0.00045	0.00072	1.40	0.21	0.80	0.00017	10.6	9.7	0.01	0.0109	2.05	27.2	0.00050	0.00040	0.03606	0.00322	29	0.51	0.0002	1.3761	0.0000	0.0040	0.0017	0.0016
39	MW-to-RAS	PL-NP20	RS03 Untreated	21.17	6.59	107	0.08	109.2	0.0162	0.0204	0.0243	26.5	0.00007	5.2	0.00036	0.00045	0.00072	1.40	0.22	0.83	0.00017	11.2	9.9	0.01	0.0111	2.09	28.0	0.00050	0.00041	0.03884	0.00337	28	0.54	0.0002	1.3708	0.0000	0.0040	0.0018	0.0016
40	MW-to-RAS	PL-NP20	RS03 Untreated	26.22	6.55	96	0.09	94.3	0.0176	0.0185	0.0225	23.9	0.00007	4.5	0.00033	0.00043	0.00075	1.49	0.20	0.87	0.00016	10.7	8.7	0.01	0.0112	2.40	23.8	0.00051	0.00042	0.03589	0.00312	30	0.53	0.0002	1.4645	0.0000	0.0041	0.0017	0.0015
41	MW-to-RAS	PL-NP20	RS03 Untreated	16.77	6.54	110	0.10	110.4	0.0170	0.0231	0.0243	27.1	0.00007	5.4	0.00039	0.00044	0.00075	1.38	0.25	1.00	0.00016	14.1	10.4	0.02	0.0138	2.43	30.4	0.00050	0.00044	0.05066	0.00389	33	0.67	0.0002	1.4641	0.0000	0.0049	0.0022	0.0016
42	MW-to-RAS	PL-NP20	RS03 Untreated	21.51	6.60	104	0.08	105.6	0.0163	0.0202	0.0236	25.8	0.00007	5.0	0.00034	0.00044	0.00072	1.42	0.22	0.84	0.00017	11.3	9.6	0.01	0.0114	2.06	27.2	0.00050	0.00040	0.03967	0.00338	29	0.56	0.0002	1.4032	0.0000	0.0042	0.0018	0.0016
43	MW-to-RAS	PL-NP20	RS03 Untreated	14.39	6.51	115	0.10	115.3	0.0177	0.0208	0.0250	27.9	0.00007	5.6	0.00036	0.00045	0.00075	1.32	0.25	1.03	0.00016	13.4	10.9	0.02	0.0131	2.62	30.7	0.00049	0.00047	0.04656	0.00368	33	0.63	0.0002	1.2981	0.0000	0.0048	0.0020	0.0016
44	MW-to-RAS	PL-NP20	RS03 Untreated	18.51	6.52	105	0.10	104.2	0.0176	0.0214	0.0237	25.7	0.00007	5.1	0.00034	0.00044	0.00075	1.37	0.22	0.96	0.00017	12.0	9.8	0.01	0.0118	2.52	27.3	0.00050	0.00045	0.04087	0.00340	31	0.58	0.0002	1.3477	0.0000	0.0043	0.0018	0.0016
45	MW-to-RAS	PL-NP20	RS03 Untreated	13.04	6.53	120	0.10	122.3	0.0172	0.0253	0.0258	29.0	0.00007	6.0	0.00036	0.00045	0.00073	1.26	0.26	1.04	0.00017	13.9	11.5	0.02	0.0134	2.45	33.0	0.00049	0.00046	0.04937	0.00387	33	0.66	0.0002	1.2411	0.0000	0.0049	0.0022	0.0016
46	MW-to-RAS	PL-NP20	RS03 Untreated	21.08	6.55	101	0.09	101.4	0.0175	0.0199	0.0233	25.0	0.00007	4.8	0.00031	0.00044	0.00074	1.41	0.20	0.88	0.00017	10.7	9.4	0.01	0.0110	2.31	25.5	0.00050	0.00043	0.03569	0.00315	30	0.53	0.0002	1.3795	0.0000	0.0041	0.0017	0.0016
47	MW-to-RAS	PL-NP20	RS03 Untreated	21.62	6.57	106	0.09	106.5	0.0167	0.021	0.0236	26.1	0.00007	5.1	0.00032	0.00045	0.00073	1.40	0.20	0.90	0.00017	11.6	9.8	0.01	0.0113	2.21	27.4	0.00050	0.00042	0.04004	0.00339	29	0.58	0.0002	1.3755	0.0000	0.0041	0.0018	0.0016
48	MW-to-RAS	PL-NP20	RS03 Untreated	18.13	6.54	104	0.09	103.8	0.0174	0.0209	0.0232	25.7	0.00007	5.0	0.00031	0.00044	0.00075	1.42	0.21	0.93	0.00016	11.4	9.7	0.01	0.0114	2.40	26.4	0.00049	0.00044	0.03873	0.00328	30	0.58	0.0002	1.3953	0.0000	0.0042	0.0018	0.0016
49	MW-to-RAS	PL-NP20	RS03 Untreated	20.66	6.55	101	0.09	101.0	0.0175	0.0202	0.0230	25.0	0.00007	4.8	0.00030	0.00044	0.00074	1.42	0.21	0.90	0.00016	11.0	9.3	0.01	0.0113	2.29	25.6	0.00049	0.00042	0.03473	0.00322	30	0.56	0.0002	1.3962	0.0000	0.0042	0.0017	0.0015
50	MW-to-RAS	PL-NP20	RS03 Untreated	16.92	6.54	106	0.09	105.8	0.0173	0.0217	0.0234	26.0	0.00007	5.1	0.00031	0.00044	0.00074	1.38	0.22	0.95	0.00016	11.8	9.9	0.01	0.0116	2.38	27.3	0.00049	0.00044	0.04051	0.00338	31	0.60	0.0002	1.3602	0.0000	0.0043	0.0018	0.0016
51	MW-to-RAS	PL-NP20	RS03 Untreated	24.18	6.56	104	0.09	104.9	0.0172	0.0209	0.0232	25.8	0.00007	5.0	0.00030	0.00044	0.00074	1.41	0.21	0.91	0.00017	11.1	9.7	0.01	0.0111	2.27	26.4	0.00049	0.00043	0.03754	0.00324	30	0.57	0.0002	1.3924	0.0000	0.0041	0.0017	0.0016
52	MW-to-RAS	PL-NP20	RS03 Untreated	21.53	6.56	103	0.09	103.6	0.0171	0.0206	0.0229	25.6	0.00007	4.9	0.00029	0.00044	0.00074	1.43	0.21	0.90	0.00016	11.0	9.5	0.01	0.0110	2.26	25.9	0.00049	0.00042	0.03722	0.00321	30	0.57	0.0002	1.4091	0.0000	0.0041	0.0017	0.0015
53	MW-to-RAS	PL-NP20	RS03 Untreated	20.60	6.57	104	0.09	104.7	0.0168	0.0206	0.0230	25.7	0.00007	4.9	0.00029	0.00044	0.00074	1.43	0.21	0.89	0.00017	10.8	9.6	0.01	0.0107	2.20	26.0	0.00049	0.00042	0.03658	0.00319	29	0.57	0.0002	1.4064	0.0000	0.0040	0.0017	0.0016
54	MW-to-RAS	PL-NP20	RS03 Untreated	19.75	6.56	102	0.09	102.8	0.0171	0.0203	0.0228	25.4	0.00007	4.8	0.00028	0.00044	0.00074	1.44	0.20	0.89	0.00017	10.5	9.4	0.01	0.0104	2.28	25.3	0.00049	0.00042	0.03482	0.00310	29	0.55	0.0002	1.4158	0.0000	0.0039	0.0016	0.0016
55	MW-to-RAS	PL-NP20	RS03 Untreated	16.93	6.54	106	0.09	106.7	0.0173	0.0217	0.0234	26.2	0.00007	5.1	0.00028	0.00044	0.00074	1.39	0.21	0.95	0.00017	11.1	9.9	0.01	0.0108	2.38	26.7	0.00049	0.00044	0.03723	0.00322	30	0.58	0.0002	1.3667	0.0000	0.0040	0.0017	0.0016
56	MW-to-RAS	PL-NP20	RS03 Untreated	22.05	6.55	105	0.09	104.9	0.01																														

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)	
116	MW-to-RAS	PL-NP20	RS03 Untreated	18.65	6.56	110	0.09	112.6	0.0168	0.0228	0.0232	27.1	0.00007	5.2	0.00021	0.00044	0.00073	1.34	0.16	0.95	0.00017	7.5	10.4	0.01	0.0066	2.27	24.1	0.00047	0.00044	0.02003	0.00236	24	0.45	0.0002	1.3269	0.0000	0.0028	0.0011	0.0016
117	MW-to-RAS	PL-NP20	RS03 Untreated	17.76	6.58	111	0.09	114.4	0.0164	0.0203	0.0234	27.4	0.00007	5.2	0.00021	0.00045	0.00073	1.35	0.16	0.90	0.00017	7.1	10.4	0.01	0.0063	2.13	24.3	0.00047	0.00042	0.01872	0.00232	23	0.43	0.0002	1.3389	0.0000	0.0026	0.0010	0.0016
118	MW-to-RAS	PL-NP20	RS03 Untreated	19.63	6.57	102	0.09	104.1	0.0167	0.0200	0.0233	25.5	0.00007	4.7	0.00020	0.00044	0.00073	1.42	0.14	0.86	0.00017	6.5	9.4	0.01	0.0060	2.17	21.5	0.00048	0.00042	0.01622	0.00217	23	0.40	0.0002	1.4007	0.0000	0.0025	0.0010	0.0016
119	MW-to-RAS	PL-NP20	RS03 Untreated	19.12	6.57	106	0.09	107.0	0.0167	0.0210	0.0226	26.0	0.00007	4.9	0.00020	0.00044	0.00073	1.40	0.15	0.89	0.00017	6.8	9.7	0.01	0.0062	2.17	22.4	0.00048	0.00042	0.01753	0.00224	23	0.41	0.0002	1.3797	0.0000	0.0026	0.0010	0.0016
120	MW-to-RAS	PL-NP20	RS03 Untreated	20.08	6.55	102	0.09	102.7	0.0171	0.0204	0.0221	25.3	0.00007	4.7	0.00020	0.00044	0.00074	1.42	0.14	0.90	0.00017	6.7	9.4	0.01	0.0062	2.29	21.3	0.00048	0.00043	0.01689	0.00218	24	0.41	0.0002	1.4031	0.0000	0.0025	0.0010	0.0015
121	MW-to-RAS	PL-NP20	RS03 Untreated	18.74	6.57	109	0.09	111.6	0.0166	0.0220	0.0231	26.9	0.00007	5.1	0.00020	0.00044	0.00073	1.38	0.15	0.91	0.00017	7.0	10.1	0.01	0.0064	2.13	23.4	0.00047	0.00042	0.01822	0.00228	24	0.42	0.0002	1.3611	0.0000	0.0027	0.0011	0.0016
122	MW-to-RAS	PL-NP20	RS03 Untreated	18.74	6.58	107	0.09	109.4	0.0166	0.0211	0.0229	26.4	0.00007	5.0	0.00020	0.00044	0.00073	1.39	0.15	0.87	0.00017	6.6	9.9	0.01	0.0061	2.12	22.8	0.00048	0.00042	0.01674	0.00221	23	0.40	0.0002	1.3710	0.0000	0.0026	0.0010	0.0016
123	MW-to-RAS	PL-NP20	RS03 Untreated	20.67	6.57	105	0.09	106.2	0.0167	0.0207	0.0225	25.9	0.00007	4.8	0.00020	0.00044	0.00074	1.41	0.14	0.89	0.00017	6.5	9.7	0.01	0.0059	2.22	21.9	0.00048	0.00042	0.01614	0.00217	23	0.39	0.0002	1.3898	0.0000	0.0025	0.0010	0.0016
124	MW-to-RAS	PL-NP20	RS03 Untreated	15.77	6.58	113	0.09	116.4	0.0164	0.0226	0.0236	27.7	0.00007	5.3	0.00021	0.00045	0.00073	1.35	0.15	0.90	0.00017	6.8	10.6	0.01	0.0061	2.11	24.4	0.00047	0.00042	0.01759	0.00227	23	0.41	0.0002	1.3954	0.0000	0.0026	0.0010	0.0016
125	MW-to-RAS	PL-NP20	RS03 Untreated	21.05	6.56	102	0.09	102.8	0.0171	0.0200	0.0233	25.2	0.00007	4.7	0.00020	0.00044	0.00074	1.42	0.14	0.88	0.00017	6.3	9.4	0.01	0.0060	2.27	21.0	0.00048	0.00043	0.01507	0.00210	23	0.38	0.0002	1.3561	0.0000	0.0025	0.0009	0.0016
126	MW-to-RAS	PL-NP20	RS03 Untreated	22.10	6.53	97	0.09	96.1	0.0177	0.0197	0.0215	24.2	0.00007	4.4	0.00020	0.00043	0.00075	1.45	0.14	0.92	0.00016	6.5	8.9	0.01	0.0063	2.42	19.6	0.00049	0.00044	0.01587	0.00210	24	0.40	0.0002	1.4297	0.0000	0.0026	0.0009	0.0015
127	MW-to-RAS	PL-NP20	RS03 Untreated	21.26	6.54	104	0.10	104.3	0.0177	0.0222	0.0222	25.7	0.00007	4.8	0.00020	0.00043	0.00075	1.39	0.15	0.90	0.00016	7.2	9.7	0.01	0.0068	2.44	21.8	0.00048	0.00045	0.01845	0.00223	25	0.43	0.0002	1.3732	0.0000	0.0026	0.0010	0.0015
128	MW-to-RAS	PL-NP20	RS03 Untreated	14.99	6.53	107	0.10	108.1	0.0171	0.0224	0.0227	26.3	0.00007	4.9	0.00020	0.00044	0.00074	1.37	0.15	0.97	0.00017	7.0	10.0	0.01	0.0062	2.36	22.6	0.00048	0.00044	0.01778	0.00223	24	0.42	0.0002	1.3500	0.0000	0.0026	0.0010	0.0015
129	MW-to-RAS	PL-NP20	RS03 Untreated	18.01	6.55	109	0.09	111.6	0.0168	0.0224	0.0232	26.9	0.00007	5.1	0.00020	0.00044	0.00073	1.34	0.15	0.94	0.00017	6.8	10.3	0.01	0.0060	2.24	23.3	0.00047	0.00043	0.01687	0.00221	23	0.40	0.0002	1.3288	0.0000	0.0026	0.0010	0.0016
130	MW-to-RAS	PL-NP20	RS03 Untreated	18.49	6.57	102	0.09	104.3	0.0168	0.0201	0.0224	25.4	0.00007	4.7	0.00020	0.00044	0.00073	1.41	0.14	0.85	0.00017	6.1	9.4	0.01	0.0058	2.12	21.3	0.00048	0.00041	0.01462	0.00209	23	0.37	0.0002	1.3859	0.0000	0.0025	0.0009	0.0016
131	MW-to-RAS	PL-NP20	RS03 Untreated	20.66	6.57	102	0.09	103.5	0.0172	0.0202	0.0224	25.3	0.00007	4.7	0.00020	0.00044	0.00073	1.42	0.14	0.87	0.00017	6.2	9.4	0.01	0.0061	2.17	21.1	0.00048	0.00042	0.01479	0.00209	24	0.37	0.0002	1.3694	0.0000	0.0026	0.0009	0.0016
132	MW-to-RAS	PL-NP20	RS03 Untreated	20.49	6.54	101	0.09	101.4	0.0177	0.0207	0.0221	25.1	0.00007	4.6	0.00020	0.00043	0.00075	1.42	0.14	0.93	0.00016	6.5	9.4	0.01	0.0063	2.39	20.7	0.00048	0.00044	0.01545	0.00209	24	0.39	0.0002	1.3853	0.0000	0.0026	0.0009	0.0015
133	MW-to-RAS	PL-NP20	RS03 Untreated	21.17	6.52	100	0.10	101.7	0.0177	0.0207	0.0217	24.7	0.00007	4.5	0.00020	0.00043	0.00078	1.43	0.14	0.96	0.00016	6.6	9.2	0.01	0.0062	2.48	20.1	0.00048	0.00044	0.01577	0.00209	24	0.39	0.0002	1.4066	0.0000	0.0026	0.0009	0.0015
134	MW-to-RAS	PL-NP20	RS03 Untreated	14.20	6.50	110	0.10	110.4	0.0181	0.0240	0.0231	26.8	0.00007	5.1	0.00021	0.00043	0.00075	1.33	0.15	0.96	0.00016	7.4	10.4	0.01	0.0069	2.55	23.2	0.00047	0.00047	0.01853	0.00223	26	0.43	0.0002	1.3029	0.0000	0.0029	0.0010	0.0015
135	MW-to-RAS	PL-NP20	RS03 Untreated	21.53	6.54	109	0.10	110.6	0.0173	0.0228	0.0231	26.7	0.00007	5.1	0.00021	0.00044	0.00074	1.34	0.15	0.98	0.00017	6.8	10.3	0.01	0.0060	2.36	23.0	0.00048	0.00045	0.01652	0.00218	24	0.40	0.0002	1.3268	0.0000	0.0026	0.0010	0.0016
136	MW-to-RAS	PL-NP20	RS03 Untreated	14.87	6.56	112	0.09	115.1	0.0163	0.0229	0.0233	27.6	0.00007	5.3	0.00020	0.00044	0.00073	1.34	0.15	0.94	0.00017	6.6	10.6	0.01	0.0054	2.20	23.8	0.00047	0.00043	0.01603	0.00218	22	0.39	0.0002	1.3270	0.0000	0.0024	0.0010	0.0016
137	MW-to-RAS	PL-NP20	RS03 Untreated	14.97	6.59	113	0.08	117.7	0.0160	0.0221	0.0239	27.8	0.00007	5.3	0.00021	0.00045	0.00071	1.34	0.15	0.85	0.00017	6.0	10.5	0.01	0.0052	1.97	24.2	0.00047	0.00041	0.01427	0.00214	22	0.36	0.0002	1.3263	0.0000	0.0023	0.0009	0.0016
138	MW-to-RAS	PL-NP20	RS03 Untreated	19.03	6.59	103	0.08	106.6	0.0166	0.0196	0.0228	25.7	0.00007	4.8	0.00020	0.00045	0.00072	1.41	0.13	0.80	0.00017	5.5	9.5	0.01	0.0054	2.01	21.4	0.00048	0.00040	0.01242	0.00201	22	0.33	0.0002	1.3849	0.0000	0.0023	0.0009	0.0016
139	MW-to-RAS	PL-NP20	RS03 Untreated	21.62	6.59	105	0.08	107.9	0.0163	0.0204	0.0228	26.1	0.00007	4.9	0.00020	0.00045	0.00072	1.41	0.14	0.84	0.00017	5.8	9.7	0.01	0.0051	2.06	21.8	0.00048	0.00041	0.01318	0.00205	21	0.35	0.0002	1.3891	0.0000	0.0022	0.0009	0.0016
140	MW-to-RAS	PL-NP20	RS03 Untreated	26.78	6.55	94	0.09	93.1	0.0176	0.0184	0.0211	23.6	0.00007	4.2	0.00020	0.00043	0.00075	1.50	0.12	0.87	0.00016	5.7	8.5	0.01	0.0058	2.36	18.2	0.00049	0.00042	0.01254	0.00192	23	0.35	0.0002	1.4715	0.0000	0.0024	0.0008	0.0015
141	MW-to-RAS	PL-NP20	RS03 Untreated	17.08	6.54	108	0.10	109.0	0.0171	0.0231	0.0225	26.7	0.00007	4.9	0.00020	0.00043	0.00075	1.39	0.15	0.91	0.00016	6.9	10.1	0.01	0.0060	2.37	22.3	0.00047	0.00044	0.01683	0.00216	24	0.41	0.0002	1.3720	0.0000	0.0026	0.0010	0.0015
142	MW-to-RAS	PL-NP20	RS03 Untreated	21.92	6.59	102	0.08	104.4																															

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
2	MW-to-RAS PL-NP20	RS03 Treated	14.78	6.56	137	0.09	112.4	0.0029	0.0002	0.0322	38.8	0.00007	5.9	0.00002	0.00001	0.00001	1.32	0.28	0.01	0.00017	17.1	9.7	0.00	0.0004	0.03	36.3	0.00001	0.00001	0.00126	0.00009	27	0.01	0.0002	1.3019	0.0000	0.0017	0.0003	0.0000
3	MW-to-RAS PL-NP20	RS03 Treated	13.99	6.50	142	0.10	115.2	0.0030	0.0002	0.0339	39.9	0.00007	6.2	0.00002	0.00001	0.00001	1.27	0.31	0.01	0.00017	19.5	10.2	0.00	0.0005	0.03	39.1	0.00001	0.00001	0.00145	0.00010	29	0.01	0.0002	1.2557	0.0000	0.0019	0.0003	0.0000
4	MW-to-RAS PL-NP20	RS03 Treated	15.81	6.53	140	0.10	114.4	0.0030	0.0002	0.0326	39.5	0.00007	6.1	0.00002	0.00001	0.00001	1.29	0.31	0.01	0.00017	18.8	10.0	0.00	0.0004	0.03	38.3	0.00001	0.00001	0.00141	0.00010	29	0.01	0.0002	1.2659	0.0000	0.0018	0.0003	0.0000
5	MW-to-RAS PL-NP20	RS03 Treated	22.92	6.57	131	0.09	106.8	0.0028	0.0002	0.0304	37.4	0.00007	5.6	0.00002	0.00001	0.00001	1.38	0.28	0.01	0.00017	16.6	9.1	0.00	0.0004	0.02	34.2	0.00001	0.00001	0.00123	0.00009	28	0.01	0.0002	1.3635	0.0000	0.0016	0.0003	0.0000
6	MW-to-RAS PL-NP20	RS03 Treated	15.66	6.55	134	0.09	109.0	0.0028	0.0002	0.0306	38.3	0.00007	5.7	0.00002	0.00001	0.00001	1.39	0.29	0.01	0.00017	17.2	9.4	0.00	0.0004	0.03	35.1	0.00001	0.00001	0.00129	0.00009	28	0.01	0.0002	1.3703	0.0000	0.0017	0.0003	0.0000
7	MW-to-RAS PL-NP20	RS03 Treated	19.79	6.57	133	0.09	109.4	0.0028	0.0002	0.0301	38.1	0.00007	5.7	0.00002	0.00001	0.00001	1.38	0.28	0.01	0.00017	16.3	9.3	0.00	0.0004	0.02	34.4	0.00001	0.00001	0.00121	0.00009	25	0.01	0.0002	1.3648	0.0000	0.0016	0.0003	0.0000
8	MW-to-RAS PL-NP20	RS03 Treated	15.21	6.54	137	0.09	111.3	0.0029	0.0002	0.0303	38.9	0.00007	5.8	0.00002	0.00001	0.00001	1.36	0.30	0.01	0.00017	17.2	9.6	0.00	0.0004	0.03	35.4	0.00001	0.00001	0.00127	0.00009	26	0.01	0.0002	1.3424	0.0000	0.0016	0.0003	0.0000
9	MW-to-RAS PL-NP20	RS03 Treated	17.17	6.58	136	0.08	112.1	0.0027	0.0002	0.0297	38.7	0.00007	5.7	0.00001	0.00001	0.00001	1.36	0.28	0.01	0.00017	15.9	9.5	0.00	0.0004	0.02	34.5	0.00001	0.00001	0.00118	0.00009	25	0.01	0.0002	1.3420	0.0000	0.0015	0.0003	0.0000
10	MW-to-RAS PL-NP20	RS03 Treated	11.91	6.56	148	0.09	123.8	0.0028	0.0002	0.0314	41.9	0.00007	6.4	0.00002	0.00001	0.00001	1.27	0.31	0.01	0.00017	17.4	10.6	0.00	0.0004	0.02	38.4	0.00001	0.00001	0.00130	0.00009	26	0.01	0.0002	1.2601	0.0000	0.0016	0.0003	0.0000
11	MW-to-RAS PL-NP20	RS03 Treated	16.41	6.55	138	0.09	114.8	0.0029	0.0002	0.0295	39.3	0.00007	5.9	0.00001	0.00001	0.00001	1.31	0.28	0.01	0.00017	15.1	9.8	0.00	0.0003	0.02	34.2	0.00001	0.00001	0.00110	0.00008	25	0.01	0.0002	1.2914	0.0000	0.0015	0.0002	0.0000
12	MW-to-RAS PL-NP20	RS03 Treated	14.97	6.53	142	0.10	116.4	0.0029	0.0002	0.0300	40.1	0.00007	6.0	0.00001	0.00001	0.00001	1.30	0.30	0.01	0.00017	16.9	10.1	0.00	0.0004	0.03	36.0	0.00001	0.00001	0.00124	0.00009	26	0.01	0.0002	1.2783	0.0000	0.0016	0.0003	0.0000
13	MW-to-RAS PL-NP20	RS03 Treated	23.17	6.56	129	0.09	104.3	0.0028	0.0002	0.0274	36.9	0.00007	5.3	0.00001	0.00001	0.00001	1.40	0.27	0.01	0.00017	14.8	8.9	0.00	0.0003	0.02	31.2	0.00001	0.00001	0.00108	0.00008	24	0.01	0.0002	1.3816	0.0000	0.0014	0.0002	0.0000
14	MW-to-RAS PL-NP20	RS03 Treated	21.90	6.57	125	0.09	100.4	0.0029	0.0002	0.0267	35.9	0.00007	5.1	0.00001	0.00001	0.00001	1.45	0.27	0.01	0.00016	14.7	8.5	0.00	0.0003	0.02	30.1	0.00001	0.00001	0.00108	0.00008	24	0.01	0.0002	1.4231	0.0000	0.0014	0.0002	0.0000
15	MW-to-RAS PL-NP20	RS03 Treated	16.50	6.52	138	0.10	111.8	0.0029	0.0002	0.0288	39.3	0.00007	5.8	0.00001	0.00001	0.00001	1.34	0.32	0.01	0.00016	17.8	9.8	0.00	0.0004	0.03	35.4	0.00001	0.00001	0.00133	0.00009	27	0.01	0.0002	1.3280	0.0000	0.0017	0.0003	0.0000
16	MW-to-RAS PL-NP20	RS03 Treated	17.93	6.56	140	0.09	114.9	0.0028	0.0002	0.0286	39.7	0.00007	5.9	0.00001	0.00001	0.00001	1.33	0.30	0.01	0.00017	16.5	9.9	0.00	0.0004	0.02	35.1	0.00001	0.00001	0.00123	0.00009	25	0.01	0.0002	1.3118	0.0000	0.0015	0.0003	0.0000
17	MW-to-RAS PL-NP20	RS03 Treated	17.10	6.58	141	0.09	116.6	0.0027	0.0002	0.0283	40.1	0.00007	5.9	0.00001	0.00001	0.00001	1.34	0.29	0.01	0.00017	15.5	9.9	0.00	0.0003	0.02	34.5	0.00001	0.00001	0.00115	0.00009	24	0.01	0.0002	1.3259	0.0000	0.0014	0.0002	0.0000
18	MW-to-RAS PL-NP20	RS03 Treated	18.87	6.57	130	0.09	106.3	0.0028	0.0002	0.0263	37.5	0.00007	5.2	0.00001	0.00001	0.00001	1.40	0.25	0.01	0.00017	13.6	9.0	0.00	0.0003	0.02	30.2	0.00001	0.00001	0.00098	0.00008	22	0.01	0.0002	1.3880	0.0000	0.0013	0.0002	0.0000
19	MW-to-RAS PL-NP20	RS03 Treated	18.44	6.57	133	0.09	109.2	0.0028	0.0002	0.0269	38.1	0.00007	5.3	0.00001	0.00001	0.00001	1.38	0.27	0.01	0.00017	14.6	9.3	0.00	0.0003	0.02	31.8	0.00001	0.00001	0.00106	0.00008	23	0.01	0.0002	1.3644	0.0000	0.0014	0.0002	0.0000
20	MW-to-RAS PL-NP20	RS03 Treated	19.36	6.55	129	0.09	104.8	0.0028	0.0002	0.0260	37.0	0.00007	5.2	0.00001	0.00001	0.00001	1.41	0.26	0.01	0.00017	14.1	9.0	0.00	0.0003	0.02	30.2	0.00001	0.00001	0.00102	0.00008	23	0.01	0.0002	1.3888	0.0000	0.0013	0.0002	0.0000
21	MW-to-RAS PL-NP20	RS03 Treated	18.10	6.58	138	0.09	113.7	0.0027	0.0002	0.0272	39.3	0.00007	5.7	0.00001	0.00001	0.00001	1.36	0.28	0.01	0.00017	15.0	9.6	0.00	0.0003	0.02	33.1	0.00001	0.00001	0.00111	0.00008	24	0.01	0.0002	1.3469	0.0000	0.0014	0.0002	0.0000
22	MW-to-RAS PL-NP20	RS03 Treated	18.11	6.58	135	0.08	111.5	0.0027	0.0002	0.0265	38.6	0.00007	5.5	0.00001	0.00001	0.00001	1.37	0.26	0.01	0.00017	13.9	9.4	0.00	0.0003	0.02	31.5	0.00001	0.00001	0.00101	0.00008	23	0.01	0.0002	1.3568	0.0000	0.0013	0.0002	0.0000
23	MW-to-RAS PL-NP20	RS03 Treated	19.98	6.57	132	0.09	108.2	0.0028	0.0002	0.0259	37.9	0.00007	5.3	0.00001	0.00001	0.00001	1.39	0.25	0.01	0.00017	13.5	9.2	0.00	0.0003	0.02	30.3	0.00001	0.00001	0.00097	0.00008	22	0.01	0.0002	1.3767	0.0000	0.0013	0.0002	0.0000
24	MW-to-RAS PL-NP20	RS03 Treated	15.30	6.58	142	0.09	118.4	0.0027	0.0002	0.0272	40.5	0.00007	5.9	0.00001	0.00001	0.00001	1.34	0.27	0.01	0.00017	14.6	10.0	0.00	0.0003	0.02	33.6	0.00001	0.00001	0.00107	0.00008	23	0.01	0.0002	1.3211	0.0000	0.0014	0.0002	0.0000
25	MW-to-RAS PL-NP20	RS03 Treated	20.36	6.56	128	0.09	104.6	0.0028	0.0002	0.0252	36.8	0.00007	5.1	0.00001	0.00001	0.00001	1.40	0.24	0.01	0.00017	12.7	8.9	0.00	0.0003	0.02	28.6	0.00001	0.00001	0.00089	0.00007	22	0.01	0.0002	1.3831	0.0000	0.0012	0.0002	0.0000
26	MW-to-RAS PL-NP20	RS03 Treated	21.51	6.53	123	0.09	97.9	0.0029	0.0002	0.0244	35.3	0.00007	4.8	0.00001	0.00001	0.00002	1.44	0.24	0.01	0.00016	13.3	8.5	0.00	0.0003	0.03	27.5	0.00001	0.00001	0.00094	0.00007	23	0.01	0.0002	1.4185	0.0000	0.0013	0.0002	0.0000
27	MW-to-RAS PL-NP20	RS03 Treated	20.52	6.54	132	0.10	106.1	0.0029	0.0002	0.0255	37.6	0.00007	5.3	0.00001	0.00001	0.00001	1.38	0.27	0.01	0.00016	15.2	9.2	0.00	0.0003	0.03	31.1	0.00001	0.00001	0.00111	0.00008	25	0.01	0.0002	1.3620	0.0000	0.0014	0.0002	0.0000
28	MW-to-RAS PL-NP20	RS03 Treated	14.59	6.54	135	0.09	110.0	0.0028	0.0002	0.0258	38.7	0.00007	5.5	0.00001	0.00001	0.00001	1.35	0.27	0.01	0.00017	14.8	9.5	0.00</															

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
88	MW-to-RAS PL-NP20	RS03 Treated	19.56	6.56	125	0.09	101.6	0.0028	0.0002	0.0220	36.0	0.00007	4.7	0.00000	0.00001	0.00001	1.43	0.17	0.01	0.00016	8.3	8.6	0.00	0.0002	0.02	22.7	0.00001	0.00001	0.00049	0.00005	18	0.01	0.0002	1.4124	0.0000	0.0008	0.0001	0.0000
89	MW-to-RAS PL-NP20	RS03 Treated	17.40	6.56	134	0.09	110.7	0.0028	0.0002	0.0221	38.3	0.00007	5.1	0.00000	0.00001	0.00001	1.37	0.18	0.01	0.00017	8.8	9.4	0.00	0.0002	0.02	25.0	0.00001	0.00001	0.00053	0.00005	18	0.01	0.0002	1.3473	0.0000	0.0008	0.0001	0.0000
90	MW-to-RAS PL-NP20	RS03 Treated	21.95	6.58	125	0.08	102.6	0.0028	0.0002	0.0221	36.0	0.00007	4.7	0.00000	0.00001	0.00001	1.43	0.16	0.01	0.00017	7.6	8.5	0.00	0.0001	0.02	22.4	0.00001	0.00001	0.00044	0.00005	17	0.01	0.0002	1.4072	0.0000	0.0008	0.0001	0.0000
91	MW-to-RAS PL-NP20	RS03 Treated	14.21	6.54	133	0.09	109.3	0.0028	0.0002	0.0228	38.5	0.00007	5.1	0.00000	0.00001	0.00001	1.36	0.17	0.01	0.00017	8.5	9.3	0.00	0.0002	0.02	24.5	0.00001	0.00001	0.00050	0.00005	18	0.01	0.0002	1.3474	0.0000	0.0008	0.0001	0.0000
92	MW-to-RAS PL-NP20	RS03 Treated	12.97	6.54	143	0.09	119.9	0.0028	0.0002	0.0243	40.5	0.00007	5.6	0.00000	0.00001	0.00001	1.28	0.18	0.01	0.00017	8.7	10.1	0.00	0.0002	0.02	27.2	0.00001	0.00001	0.00052	0.00005	19	0.01	0.0002	1.2524	0.0000	0.0008	0.0001	0.0000
93	MW-to-RAS PL-NP20	RS03 Treated	13.89	6.58	143	0.09	121.3	0.0027	0.0002	0.0246	40.6	0.00007	5.6	0.00000	0.00001	0.00001	1.28	0.18	0.01	0.00017	8.1	10.1	0.00	0.0001	0.02	27.2	0.00001	0.00001	0.00047	0.00005	18	0.01	0.0002	1.2588	0.0000	0.0008	0.0001	0.0000
94	MW-to-RAS PL-NP20	RS03 Treated	22.05	6.55	123	0.09	100.2	0.0029	0.0002	0.0222	35.4	0.00007	4.6	0.00000	0.00001	0.00001	1.42	0.15	0.01	0.00017	7.3	8.4	0.00	0.0001	0.02	21.6	0.00001	0.00001	0.00040	0.00005	17	0.01	0.0002	1.3986	0.0000	0.0007	0.0001	0.0000
95	MW-to-RAS PL-NP20	RS03 Treated	23.39	6.56	127	0.09	103.1	0.0028	0.0002	0.0222	36.4	0.00007	4.7	0.00000	0.00001	0.00001	1.43	0.16	0.01	0.00017	8.0	8.7	0.00	0.0002	0.02	22.7	0.00001	0.00001	0.00046	0.00005	17	0.01	0.0002	1.4068	0.0000	0.0007	0.0001	0.0000
96	MW-to-RAS PL-NP20	RS03 Treated	19.21	6.59	131	0.08	108.6	0.0027	0.0002	0.0227	37.8	0.00007	4.9	0.00000	0.00001	0.00001	1.43	0.17	0.01	0.00017	7.8	9.0	0.00	0.0001	0.02	23.7	0.00001	0.00001	0.00046	0.00005	17	0.01	0.0002	1.4155	0.0000	0.0007	0.0001	0.0000
97	MW-to-RAS PL-NP20	RS03 Treated	19.21	6.58	130	0.08	107.7	0.0028	0.0002	0.0228	37.5	0.00007	4.9	0.00000	0.00001	0.00001	1.42	0.16	0.01	0.00017	7.5	8.9	0.00	0.0001	0.02	23.3	0.00001	0.00001	0.00042	0.00005	17	0.01	0.0002	1.4052	0.0000	0.0007	0.0001	0.0000
98	MW-to-RAS PL-NP20	RS03 Treated	13.90	6.53	137	0.09	112.8	0.0028	0.0002	0.0233	39.0	0.00007	5.2	0.00000	0.00001	0.00001	1.35	0.17	0.01	0.00017	8.3	9.6	0.00	0.0001	0.02	24.9	0.00001	0.00001	0.00047	0.00005	18	0.01	0.0002	1.3348	0.0000	0.0008	0.0001	0.0000
99	MW-to-RAS PL-NP20	RS03 Treated	15.49	6.57	138	0.09	115.0	0.0027	0.0002	0.0236	39.2	0.00007	5.3	0.00000	0.00001	0.00001	1.33	0.17	0.01	0.00017	7.8	9.6	0.00	0.0001	0.02	25.3	0.00001	0.00001	0.00044	0.00005	17	0.01	0.0002	1.3152	0.0000	0.0007	0.0001	0.0000
100	MW-to-RAS PL-NP20	RS03 Treated	28.74	6.60	126	0.08	104.1	0.0028	0.0002	0.0226	36.2	0.00007	4.7	0.00000	0.00001	0.00001	1.43	0.15	0.01	0.00017	6.9	8.5	0.00	0.0001	0.02	22.1	0.00001	0.00001	0.00038	0.00005	18	0.01	0.0002	1.4044	0.0000	0.0008	0.0001	0.0000
101	MW-to-RAS PL-NP20	RS03 Treated	15.05	6.52	137	0.10	110.9	0.0029	0.0002	0.0229	38.8	0.00007	5.2	0.00000	0.00001	0.00002	1.36	0.17	0.01	0.00016	8.6	9.6	0.00	0.0002	0.03	24.5	0.00001	0.00001	0.00049	0.00005	18	0.01	0.0002	1.3444	0.0000	0.0008	0.0001	0.0000
102	MW-to-RAS PL-NP20	RS03 Treated	15.49	6.53	133	0.09	109.3	0.0029	0.0002	0.0231	37.9	0.00007	5.1	0.00000	0.00001	0.00001	1.35	0.16	0.01	0.00017	7.9	9.3	0.00	0.0002	0.02	24.0	0.00001	0.00001	0.00045	0.00005	18	0.01	0.0002	1.3307	0.0000	0.0008	0.0001	0.0000
103	MW-to-RAS PL-NP20	RS03 Treated	16.44	6.49	137	0.11	112.0	0.0030	0.0002	0.0235	38.8	0.00007	5.3	0.00000	0.00001	0.00002	1.30	0.17	0.01	0.00017	8.6	9.8	0.00	0.0002	0.03	25.0	0.00001	0.00001	0.00048	0.00005	19	0.01	0.0002	1.3275	0.0000	0.0008	0.0001	0.0000
104	MW-to-RAS PL-NP20	RS03 Treated	18.55	6.52	135	0.10	114.4	0.0030	0.0002	0.0235	38.4	0.00007	5.2	0.00000	0.00001	0.00001	1.31	0.17	0.01	0.00017	8.2	9.8	0.00	0.0002	0.02	24.7	0.00001	0.00001	0.00046	0.00005	19	0.01	0.0002	1.2910	0.0000	0.0008	0.0001	0.0000
105	MW-to-RAS PL-NP20	RS03 Treated	24.10	6.56	127	0.09	104.4	0.0028	0.0002	0.0225	36.5	0.00007	4.8	0.00000	0.00001	0.00001	1.40	0.15	0.01	0.00017	7.3	8.9	0.00	0.0001	0.02	22.4	0.00001	0.00001	0.00040	0.00005	17	0.01	0.0002	1.3830	0.0000	0.0007	0.0001	0.0000
106	MW-to-RAS PL-NP20	RS03 Treated	16.37	6.55	130	0.09	106.1	0.0028	0.0002	0.0225	37.2	0.00007	4.9	0.00000	0.00001	0.00001	1.41	0.16	0.01	0.00017	7.6	9.0	0.00	0.0001	0.02	22.8	0.00001	0.00001	0.00042	0.00005	17	0.01	0.0002	1.3912	0.0000	0.0007	0.0001	0.0000
107	MW-to-RAS PL-NP20	RS03 Treated	20.75	6.57	130	0.09	106.7	0.0028	0.0002	0.0227	37.2	0.00007	4.9	0.00000	0.00001	0.00001	1.40	0.16	0.01	0.00017	7.3	8.9	0.00	0.0001	0.02	22.8	0.00001	0.00001	0.00040	0.00005	17	0.01	0.0002	1.3833	0.0000	0.0007	0.0001	0.0000
108	MW-to-RAS PL-NP20	RS03 Treated	15.87	6.53	133	0.10	108.5	0.0029	0.0002	0.0229	37.9	0.00007	5.0	0.00000	0.00001	0.00001	1.38	0.16	0.01	0.00017	7.7	9.3	0.00	0.0001	0.02	23.4	0.00001	0.00001	0.00041	0.00005	17	0.01	0.0002	1.3618	0.0000	0.0007	0.0001	0.0000
109	MW-to-RAS PL-NP20	RS03 Treated	17.94	6.57	132	0.09	109.5	0.0028	0.0002	0.0230	37.8	0.00007	5.0	0.00000	0.00001	0.00001	1.38	0.16	0.01	0.00017	7.1	9.1	0.00	0.0001	0.02	23.4	0.00001	0.00001	0.00039	0.00005	17	0.01	0.0002	1.3607	0.0000	0.0007	0.0001	0.0000
110	MW-to-RAS PL-NP20	RS03 Treated	12.35	6.55	144	0.09	121.0	0.0028	0.0002	0.0243	40.9	0.00007	5.6	0.00000	0.00001	0.00001	1.30	0.17	0.01	0.00017	7.7	10.2	0.00	0.0001	0.02	26.3	0.00001	0.00001	0.00042	0.00005	17	0.01	0.0002	1.2814	0.0000	0.0007	0.0001	0.0000
111	MW-to-RAS PL-NP20	RS03 Treated	17.09	6.55	135	0.09	112.3	0.0029	0.0002	0.0237	38.4	0.00007	5.2	0.00000	0.00001	0.00001	1.33	0.15	0.01	0.00017	7.0	9.4	0.00	0.0001	0.02	24.0	0.00001	0.00001	0.00036	0.00005	18	0.01	0.0002	1.3094	0.0000	0.0007	0.0001	0.0000
112	MW-to-RAS PL-NP20	RS03 Treated	15.56	6.52	138	0.10	113.8	0.0029	0.0002	0.0237	39.1	0.00007	5.3	0.00000	0.00001	0.00001	1.32	0.16	0.01	0.00017	7.7	9.8	0.00	0.0001	0.02	24.6	0.00001	0.00001	0.00041	0.00005	18	0.01	0.0002	1.2962	0.0000	0.0008	0.0001	0.0000
113	MW-to-RAS PL-NP20	RS03 Treated	24.20	6.55	125	0.09	101.9	0.0028	0.0002	0.0221	36.0	0.00007	4.7	0.00000	0.00001	0.00001	1.42	0.15	0.01	0.00017	6.9	8.6	0.00	0.0001	0.02	21.4	0.00001	0.00001	0.00036	0.00004	16	0.01	0.0002	1.3977	0.0000	0.0007	0.0001	0.0000
114	MW-to-RAS PL-NP20	RS03 Treated	22.85	6.56	121	0.09	98.3	0.0029	0.0002	0.0217	35.1	0.00007	4.4	0.00000	0.00001	0.00001	1.46	0.14	0.01	0.00016	6.8	8.2	0.00	0														

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
174	MW-to-RAS_PL-NP20	RS03 Treated	14.50	6.56	139	0.09	116.4	0.0028	0.0002	0.0239	39.6	0.00007	5.3	0.00000	0.00001	0.00001	1.33	0.13	0.01	0.00017	5.4	9.7	0.00	0.0001	0.02	23.1	0.00001	0.00001	0.00021	0.00004	16	0.01	0.0002	1.3126	0.0000	0.0006	0.0001	0.0000
175	MW-to-RAS_PL-NP20	RS03 Treated	12.36	6.56	143	0.09	120.7	0.0027	0.0002	0.0243	40.6	0.00007	5.5	0.00000	0.00001	0.00001	1.28	0.14	0.01	0.00017	5.4	10.1	0.00	0.0001	0.02	24.1	0.00001	0.00001	0.00021	0.00004	15	0.01	0.0002	1.2696	0.0000	0.0005	0.0001	0.0000
176	MW-to-RAS_PL-NP20	RS03 Treated	20.08	6.62	134	0.08	113.6	0.0026	0.0002	0.0236	38.4	0.00007	5.1	0.00000	0.00001	0.00001	1.27	0.13	0.01	0.00018	4.7	9.2	0.00	0.0001	0.02	22.3	0.00001	0.00001	0.00017	0.00004	14	0.01	0.0002	1.3479	0.0000	0.0005	0.0001	0.0000
177	MW-to-RAS_PL-NP20	RS03 Treated	23.27	6.56	122	0.09	96.3	0.0028	0.0002	0.0218	35.2	0.00007	4.4	0.00000	0.00001	0.00001	1.45	0.12	0.01	0.00017	4.9	8.3	0.00	0.0001	0.02	18.9	0.00001	0.00001	0.00019	0.00004	15	0.01	0.0002	1.4284	0.0000	0.0005	0.0001	0.0000
178	MW-to-RAS_PL-NP20	RS03 Treated	22.81	6.56	119	0.09	95.8	0.0029	0.0002	0.0226	34.4	0.00007	4.7	0.00000	0.00001	0.00001	1.47	0.12	0.01	0.00018	5.1	8.0	0.00	0.0001	0.02	18.1	0.00001	0.00001	0.00019	0.00004	15	0.01	0.0002	1.4454	0.0000	0.0005	0.0001	0.0000
179	MW-to-RAS_PL-NP20	RS03 Treated	16.39	6.55	131	0.09	107.8	0.0029	0.0002	0.0226	37.5	0.00007	4.8	0.00000	0.00001	0.00001	1.38	0.13	0.01	0.00017	5.5	9.1	0.00	0.0001	0.02	21.0	0.00001	0.00001	0.00022	0.00004	16	0.01	0.0002	1.3600	0.0000	0.0006	0.0001	0.0000
180	MW-to-RAS_PL-NP20	RS03 Treated	18.30	6.56	128	0.09	105.7	0.0029	0.0002	0.0226	36.8	0.00007	4.7	0.00000	0.00001	0.00001	1.38	0.12	0.01	0.00017	5.2	8.9	0.00	0.0001	0.02	20.5	0.00001	0.00001	0.00020	0.00004	15	0.01	0.0002	1.3634	0.0000	0.0006	0.0001	0.0000
181	MW-to-RAS_PL-NP20	RS03 Treated	18.55	6.52	128	0.10	104.3	0.0030	0.0002	0.0226	36.7	0.00007	4.7	0.00000	0.00001	0.00002	1.38	0.12	0.01	0.00016	5.5	8.9	0.00	0.0001	0.02	20.2	0.00001	0.00001	0.00020	0.00004	16	0.01	0.0002	1.3603	0.0000	0.0006	0.0001	0.0000
182	MW-to-RAS_PL-NP20	RS03 Treated	22.87	6.55	126	0.09	102.7	0.0029	0.0002	0.0222	36.1	0.00007	4.6	0.00000	0.00001	0.00001	1.40	0.12	0.01	0.00016	5.3	8.7	0.00	0.0001	0.02	19.8	0.00001	0.00001	0.00020	0.00004	16	0.01	0.0002	1.3802	0.0000	0.0006	0.0001	0.0000
183	MW-to-RAS_PL-NP20	RS03 Treated	17.56	6.53	130	0.10	105.9	0.0029	0.0002	0.0225	37.2	0.00007	4.8	0.00000	0.00001	0.00001	1.39	0.12	0.01	0.00016	5.5	9.0	0.00	0.0001	0.02	20.5	0.00001	0.00001	0.00020	0.00004	16	0.01	0.0002	1.3685	0.0000	0.0006	0.0001	0.0000
184	MW-to-RAS_PL-NP20	RS03 Treated	22.28	6.57	125	0.09	102.6	0.0028	0.0002	0.0220	36.1	0.00007	4.6	0.00000	0.00001	0.00001	1.43	0.12	0.01	0.00017	5.0	8.6	0.00	0.0001	0.02	19.6	0.00001	0.00001	0.00018	0.00004	14	0.01	0.0002	1.4122	0.0000	0.0005	0.0001	0.0000
185	MW-to-RAS_PL-NP20	RS03 Treated	32.87	6.58	116	0.08	93.7	0.0029	0.0002	0.0210	33.9	0.00007	4.1	0.00000	0.00001	0.00001	1.52	0.11	0.01	0.00016	4.8	7.7	0.00	0.0001	0.02	17.3	0.00001	0.00001	0.00017	0.00003	16	0.01	0.0002	1.4941	0.0000	0.0006	0.0001	0.0000
186	MW-to-RAS_PL-NP20	RS03 Treated	16.91	6.54	132	0.10	106.9	0.0029	0.0002	0.0222	37.7	0.00007	4.8	0.00000	0.00001	0.00002	1.41	0.13	0.01	0.00016	5.7	9.1	0.00	0.0001	0.02	20.5	0.00001	0.00001	0.00022	0.00004	16	0.01	0.0002	1.3896	0.0000	0.0006	0.0001	0.0000
187	MW-to-RAS_PL-NP20	RS03 Treated	22.62	6.56	123	0.09	100.0	0.0029	0.0002	0.0218	35.4	0.00007	4.4	0.00000	0.00001	0.00001	1.44	0.12	0.01	0.00016	5.0	8.4	0.00	0.0001	0.02	19.0	0.00001	0.00001	0.00018	0.00004	15	0.01	0.0002	1.4187	0.0000	0.0006	0.0001	0.0000
188	MW-to-RAS_PL-NP20	RS03 Treated	19.56	6.56	124	0.09	101.2	0.0028	0.0002	0.0218	35.8	0.00007	4.5	0.00000	0.00001	0.00001	1.43	0.12	0.01	0.00016	5.0	8.5	0.00	0.0001	0.02	19.2	0.00001	0.00001	0.00018	0.00004	15	0.01	0.0002	1.4124	0.0000	0.0005	0.0001	0.0000
189	MW-to-RAS_PL-NP20	RS03 Treated	17.40	6.56	134	0.09	110.3	0.0028	0.0002	0.0229	38.1	0.00007	5.0	0.00000	0.00001	0.00001	1.37	0.13	0.01	0.00017	5.3	9.3	0.00	0.0001	0.02	21.4	0.00001	0.00001	0.00019	0.00004	15	0.01	0.0002	1.3473	0.0000	0.0005	0.0001	0.0000
190	MW-to-RAS_PL-NP20	RS03 Treated	21.95	6.58	125	0.08	102.2	0.0028	0.0002	0.0221	35.9	0.00007	4.6	0.00000	0.00001	0.00001	1.43	0.12	0.01	0.00017	4.8	8.5	0.00	0.0001	0.02	19.5	0.00001	0.00001	0.00017	0.00004	15	0.01	0.0002	1.4072	0.0000	0.0005	0.0001	0.0000
191	MW-to-RAS_PL-NP20	RS03 Treated	14.21	6.54	133	0.09	108.9	0.0028	0.0002	0.0222	37.8	0.00007	4.9	0.00000	0.00001	0.00001	1.26	0.12	0.01	0.00017	5.3	9.2	0.00	0.0001	0.02	21.1	0.00001	0.00001	0.00019	0.00004	15	0.01	0.0002	1.3474	0.0000	0.0005	0.0001	0.0000
192	MW-to-RAS_PL-NP20	RS03 Treated	12.97	6.54	142	0.09	119.5	0.0028	0.0002	0.0242	40.3	0.00007	5.4	0.00000	0.00001	0.00001	1.28	0.13	0.01	0.00017	5.3	10.1	0.00	0.0001	0.02	23.7	0.00001	0.00001	0.00020	0.00004	16	0.01	0.0002	1.2670	0.0000	0.0006	0.0001	0.0000
193	MW-to-RAS_PL-NP20	RS03 Treated	13.89	6.58	142	0.09	121.0	0.0027	0.0002	0.0245	40.4	0.00007	5.5	0.00000	0.00001	0.00001	1.28	0.13	0.01	0.00017	5.0	10.0	0.00	0.0001	0.02	24.0	0.00001	0.00001	0.00018	0.00004	15	0.01	0.0002	1.2588	0.0000	0.0005	0.0001	0.0000
194	MW-to-RAS_PL-NP20	RS03 Treated	22.05	6.55	123	0.09	99.9	0.0029	0.0002	0.0221	35.3	0.00007	4.5	0.00000	0.00001	0.00001	1.42	0.12	0.01	0.00017	4.8	8.4	0.00	0.0001	0.02	19.1	0.00001	0.00001	0.00016	0.00004	15	0.01	0.0002	1.2986	0.0000	0.0005	0.0001	0.0000
195	MW-to-RAS_PL-NP20	RS03 Treated	23.39	6.56	126	0.09	102.7	0.0028	0.0002	0.0221	36.2	0.00007	4.6	0.00000	0.00001	0.00001	1.43	0.12	0.01	0.00017	5.1	8.6	0.00	0.0001	0.02	19.6	0.00001	0.00001	0.00018	0.00004	15	0.01	0.0002	1.4068	0.0000	0.0005	0.0001	0.0000
196	MW-to-RAS_PL-NP20	RS03 Treated	19.21	6.59	131	0.08	108.2	0.0027	0.0002	0.0226	37.6	0.00007	4.8	0.00000	0.00001	0.00001	1.43	0.12	0.01	0.00017	4.9	8.9	0.00	0.0001	0.02	20.6	0.00001	0.00001	0.00018	0.00004	15	0.01	0.0002	1.4155	0.0000	0.0005	0.0001	0.0000
197	MW-to-RAS_PL-NP20	RS03 Treated	19.21	6.58	130	0.08	107.4	0.0028	0.0002	0.0227	37.3	0.00007	4.8	0.00000	0.00001	0.00001	1.42	0.12	0.01	0.00017	4.8	8.9	0.00	0.0001	0.02	20.6	0.00001	0.00001	0.00017	0.00004	15	0.01	0.0002	1.4052	0.0000	0.0005	0.0001	0.0000
198	MW-to-RAS_PL-NP20	RS03 Treated	13.90	6.53	136	0.09	112.4	0.0028	0.0002	0.0232	38.3	0.00007	5.1	0.00000	0.00001	0.00001	1.35	0.13	0.01	0.00017	5.3	9.5	0.00	0.0001	0.02	21.9	0.00001	0.00001	0.00019	0.00004	15	0.01	0.0002	1.3348	0.0000	0.0005	0.0001	0.0000
199	MW-to-RAS_PL-NP20	RS03 Treated	15.49	6.57	137	0.09	114.7	0.0027	0.0002	0.0235	39.1	0.00007	5.2	0.00000	0.00001	0.00001	1.33	0.13	0.01	0.00017	5.0	9.6	0.00	0.0001	0.02	22.4	0.00001	0.00001	0.00018	0.00004	14	0.01	0.0002	1.3152	0.0000	0.0005	0.0001	0.0000
0	Base Case (NP20)	SC01 Untreated	46.83	6.98	437	0.00	125.7	0.0142	0.6308	0.3133	111.0	0.00111	23.38	0.02442	0.00212	0.0056	0.95	1.36	6.22	0.00133	72.6	38.9	0.2															

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
60	Base Case (NP20)	SC01 Untreated	27.85	6.31	295	0.17	153.9	0.0363	0.2567	0.1316	69.4	0.00010	83.7	0.00877	0.00103	0.00113	0.86	1.44	5.15	0.00013	97.8	29.6	0.16	0.1168	2.81	197.8	0.06273	0.00358	0.41433	0.02153	257	3.80	0.0002	0.8070	0.0320	0.0361	0.0148	0.0042
61	Base Case (NP20)	SC01 Untreated	27.16	6.31	295	0.17	153.7	0.0364	0.2535	0.1320	69.4	0.00010	83.0	0.00838	0.00104	0.00114	0.88	1.38	5.07	0.00014	92.3	29.5	0.15	0.1082	2.61	191.5	0.06237	0.00357	0.38828	0.02030	243	3.65	0.0002	0.8431	0.0318	0.0335	0.0139	0.0042
62	Base Case (NP20)	SC01 Untreated	20.09	6.28	304	0.18	154.8	0.0366	0.2675	0.1322	71.4	0.00010	88.1	0.00848	0.00107	0.00118	0.83	1.37	5.27	0.00013	90.5	30.4	0.15	0.1069	2.47	193.7	0.06658	0.00379	0.37801	0.01964	250	3.62	0.0002	0.7885	0.0340	0.0331	0.0135	0.0044
63	Base Case (NP20)	SC01 Untreated	31.75	6.44	266	0.13	151.3	0.0314	0.2121	0.1107	63.0	0.00010	69.1	0.00683	0.00096	0.00109	1.06	1.23	4.30	0.00016	79.7	25.9	0.13	0.0958	2.03	167.6	0.05163	0.00319	0.33671	0.01807	216	3.74	0.0002	0.8024	0.0283	0.0322	0.0122	0.0037
64	Base Case (NP20)	SC01 Untreated	31.37	6.38	284	0.15	152.8	0.0306	0.2341	0.1180	65.0	0.00009	75.4	0.00787	0.00098	0.00102	0.94	1.42	4.71	0.00016	92.7	27.8	0.15	0.1078	2.27	185.4	0.05623	0.00319	0.36624	0.02094	233	3.74	0.0002	0.9094	0.0286	0.0336	0.0142	0.0039
65	Base Case (NP20)	SC01 Untreated	34.28	6.39	270	0.14	151.7	0.0323	0.2196	0.1118	64.5	0.00010	70.6	0.00706	0.00096	0.00101	1.01	1.34	4.44	0.00015	86.1	26.9	0.14	0.1023	2.16	174.4	0.05263	0.00301	0.36800	0.01947	226	3.52	0.0002	0.9530	0.0268	0.0322	0.0132	0.0037
66	Base Case (NP20)	SC01 Untreated	26.45	6.32	292	0.17	153.3	0.0341	0.2504	0.1217	69.0	0.00010	81.8	0.00760	0.00104	0.00111	0.91	1.34	4.94	0.00014	85.7	28.9	0.14	0.1003	2.19	183.2	0.06180	0.00351	0.36044	0.01890	235	3.54	0.0002	0.8692	0.0315	0.0314	0.0128	0.0041
67	Base Case (NP20)	SC01 Untreated	30.12	6.37	280	0.15	152.4	0.0323	0.2330	0.1145	66.6	0.00010	75.6	0.00700	0.00099	0.00105	0.97	1.32	4.63	0.00015	83.2	27.5	0.14	0.0975	2.03	175.5	0.05686	0.00323	0.35227	0.01862	225	3.48	0.0002	0.9287	0.0290	0.0306	0.0126	0.0039
68	Base Case (NP20)	SC01 Untreated	32.55	6.38	279	0.15	152.4	0.0325	0.2323	0.1133	66.5	0.00010	75.2	0.00695	0.00099	0.00105	0.97	1.32	4.63	0.00015	82.6	27.5	0.13	0.0966	1.99	174.3	0.05652	0.00322	0.34963	0.01848	224	3.47	0.0002	0.9275	0.0288	0.0304	0.0125	0.0039
69	Base Case (NP20)	SC01 Untreated	32.55	6.25	312	0.19	155.8	0.0365	0.2838	0.1309	73.2	0.00010	92.7	0.00811	0.00110	0.00119	0.77	1.45	5.55	0.00015	90.6	31.4	0.15	0.1047	1.16	194.3	0.07049	0.00396	0.37909	0.01959	253	3.78	0.0002	0.7375	0.0360	0.0325	0.0134	0.0045
70	Base Case (NP20)	SC01 Untreated	27.73	6.39	275	0.15	152.2	0.0314	0.2269	0.1097	65.7	0.00010	73.6	0.00657	0.00099	0.00102	1.01	1.26	4.46	0.00016	77.9	26.9	0.13	0.0914	1.75	168.3	0.05544	0.00314	0.32975	0.01752	216	3.36	0.0002	0.9577	0.0283	0.0289	0.0117	0.0038
71	Base Case (NP20)	SC01 Untreated	37.84	6.45	261	0.13	150.9	0.0313	0.2070	0.1021	62.7	0.00010	66.3	0.00604	0.00094	0.00097	1.08	1.24	4.13	0.00016	76.2	25.9	0.12	0.0909	1.68	160.3	0.04960	0.00282	0.32563	0.01741	210	3.31	0.0002	0.1032	0.0253	0.0290	0.0116	0.0035
72	Base Case (NP20)	SC01 Untreated	23.41	6.30	296	0.17	154.3	0.0354	0.2622	0.1209	69.8	0.00010	84.6	0.00734	0.00105	0.00111	0.86	1.40	5.17	0.00013	87.5	29.6	0.15	0.1020	1.97	166.1	0.06415	0.00361	0.36943	0.01922	243	3.73	0.0002	0.8080	0.0328	0.0320	0.0131	0.0042
73	Base Case (NP20)	SC01 Untreated	28.01	6.38	276	0.15	152.5	0.0329	0.2300	0.1090	66.0	0.00010	74.5	0.00638	0.00099	0.00104	1.00	1.23	4.52	0.00015	75.7	27.1	0.13	0.0891	1.67	166.3	0.05632	0.00319	0.31888	0.01692	217	3.33	0.0002	0.9464	0.0288	0.0283	0.0113	0.0038
74	Base Case (NP20)	SC01 Untreated	23.52	6.34	286	0.16	153.5	0.0338	0.2457	0.1137	67.9	0.00010	79.5	0.00670	0.00102	0.00107	0.93	1.28	4.82	0.00015	79.5	28.2	0.13	0.0930	1.71	174.0	0.06023	0.00339	0.33495	0.01761	227	3.48	0.0002	0.8818	0.0308	0.0294	0.0118	0.0040
75	Base Case (NP20)	SC01 Untreated	19.92	6.31	292	0.17	154.3	0.0329	0.2538	0.1156	69.2	0.00010	82.2	0.00681	0.00104	0.00109	0.90	1.29	4.86	0.00014	79.9	28.9	0.14	0.0918	1.68	176.6	0.06242	0.00351	0.33558	0.01764	226	3.52	0.0002	0.8629	0.0319	0.0289	0.0119	0.0041
76	Base Case (NP20)	SC01 Untreated	29.18	6.45	263	0.13	151.1	0.0296	0.2100	0.1002	63.0	0.00010	69.2	0.00584	0.00096	0.00097	1.10	1.10	4.06	0.00017	67.1	25.9	0.11	0.0799	1.58	152.8	0.05151	0.00291	0.28236	0.01530	196	3.06	0.0002	1.0439	0.0263	0.0253	0.0101	0.0036
77	Base Case (NP20)	SC01 Untreated	38.04	6.42	265	0.13	152.0	0.0311	0.2141	0.1002	63.0	0.00010	67.7	0.00575	0.00094	0.00098	1.04	1.23	4.34	0.00017	67.3	25.9	0.12	0.0888	1.52	160.4	0.05007	0.00291	0.28236	0.01530	209	3.42	0.0002	0.9778	0.0258	0.0284	0.0115	0.0035
78	Base Case (NP20)	SC01 Untreated	37.91	6.37	270	0.15	152.1	0.0329	0.2193	0.1019	64.4	0.00010	69.7	0.00575	0.00096	0.00103	1.02	1.19	4.46	0.00015	73.7	26.4	0.12	0.0860	1.58	159.2	0.05251	0.00303	0.31079	0.01654	210	3.33	0.0002	0.9638	0.0268	0.0276	0.0110	0.0036
79	Base Case (NP20)	SC01 Untreated	28.46	6.29	289	0.18	153.9	0.0365	0.2473	0.1116	68.3	0.00010	79.7	0.00632	0.00103	0.00114	0.92	1.20	4.96	0.00014	74.5	28.6	0.13	0.0870	1.67	168.0	0.06054	0.00348	0.30900	0.01623	224	3.36	0.0002	0.8656	0.0309	0.0277	0.0109	0.0040
80	Base Case (NP20)	SC01 Untreated	30.64	6.33	277	0.17	152.9	0.0345	0.2288	0.1045	65.9	0.00010	73.3	0.00582	0.00099	0.00109	0.99	1.14	4.62	0.00015	70.7	27.2	0.12	0.0825	1.54	158.9	0.05548	0.00321	0.29430	0.01563	211	3.24	0.0002	0.9333	0.0283	0.0265	0.0104	0.0038
81	Base Case (NP20)	SC01 Untreated	33.17	6.31	285	0.18	153.8	0.0355	0.2423	0.1079	67.2	0.00010	76.9	0.00610	0.00100	0.00111	0.91	1.23	4.96	0.00014	77.1	28.3	0.13	0.0890	1.66	167.6	0.05814	0.00336	0.32275	0.01695	223	3.50	0.0002	0.8596	0.0297	0.0284	0.0113	0.0039
82	Base Case (NP20)	SC01 Untreated	38.17	6.35	274	0.17	152.4	0.0349	0.2258	0.1024	65.3	0.00010	72.0	0.00564	0.00098	0.00108	1.00	1.12	4.60	0.00015	69.8	27.0	0.12	0.0817	1.53	165.6	0.05443	0.00316	0.29059	0.01543	210	3.24	0.0002	0.9349	0.0278	0.0263	0.0103	0.0037
83	Base Case (NP20)	SC01 Untreated	30.61	6.29	288	0.18	153.7	0.0355	0.2461	0.1085	68.0	0.00010	78.6	0.00606	0.00102	0.00113	0.91	1.18	5.00	0.00014	73.7	28.6	0.13	0.0845	1.62	165.5	0.05467	0.00344	0.30544	0.01606	219	3.40	0.0002	0.8638	0.0305	0.0270	0.0107	0.0039
84	Base Case (NP20)	SC01 Untreated	36.09	6.35	276	0.17	152.3	0.0332	0.2264	0.1017	65.8	0.00010	72.5	0.00554	0.00099	0.00108	1.00	1.08	4.59	0.00015	66.8	27.1	0.11	0.0766	1.45	150.0	0.05497	0.00319	0.27582	0.01474	201	3.16	0.0002	0.9538	0.0281	0.0247	0.0097	0.0037
85	Base Case (NP20)	SC01 Untreated	53.41	6.41	262	0.15	150.1	0.0341	0.2089	0.0954	62.8	0.00010	66.0	0.00510	0.00094	0.00103	1.06	1.06	4.29	0.00016	65.4	25.5	0.11	0.0776	1.41	146.9	0.04978	0.00290	0.27320	0.01464	200	3.12	0.0002	0.9895	0.0254	0.0252	0.0096	0.0035
86	Base Case (NP20)	SC01 Untreated	30.51	6.25	299	0.20	154.3	0.0380	0.2639	0.1134	70.2	0.00010	84.3	0.00630	0.00105	0.00119	0.84	1.18	5.35	0.00013																		

Year	Scenario	Station	Flow Rate (Us)	pH	Hardness (mg CaCO3/L)	Acidity (mg CaCO3/L)	Alkalinity (mg CaCO3/L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO3-N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO4 (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
146	Base Case (NP20)	SC01 Untreated	36.23	6.33	259	0.17	150.1	0.0342	0.2131	0.0889	62.2	0.00010	65.4	0.00423	0.00092	0.00105	1.04	0.64	4.41	0.00015	38.1	25.2	0.08	0.0475	0.95	117.5	0.05045	0.00295	0.14384	0.00801	164	2.69	0.0002	0.9718	0.0258	0.0159	0.0050	0.0034
147	Base Case (NP20)	SC01 Treated	35.15	6.32	271	0.18	150.7	0.0337	0.2281	0.0946	64.9	0.00010	71.3	0.00461	0.00097	0.00109	1.00	0.64	4.62	0.00015	37.9	26.4	0.08	0.0456	1.00	127.7	0.05029	0.00321	0.13999	0.00779	165	2.65	0.0002	0.9647	0.0283	0.0154	0.0048	0.0037
148	Base Case (NP20)	SC01 Untreated	32.97	6.27	277	0.19	151.6	0.0358	0.2422	0.0978	65.9	0.00010	74.8	0.00482	0.00097	0.00112	0.92	0.69	4.96	0.00015	41.1	27.4	0.09	0.0468	1.00	127.9	0.05086	0.00336	0.15342	0.00830	176	2.84	0.0002	0.9532	0.0293	0.0161	0.0053	0.0038
149	Base Case (NP20)	SC01 Treated	35.94	6.31	284	0.18	150.2	0.0353	0.2205	0.0920	63.4	0.00010	68.3	0.00441	0.00094	0.00108	1.02	0.63	4.33	0.00015	37.2	25.8	0.08	0.0467	1.01	119.1	0.05284	0.00309	0.13782	0.00785	167	2.61	0.0002	0.9642	0.0271	0.0157	0.0049	0.0035
150	Base Case (NP20)	SC01 Untreated	30.11	6.26	278	0.20	151.5	0.0362	0.2410	0.0982	66.2	0.00010	76.3	0.00483	0.00098	0.00114	0.93	0.66	4.94	0.00014	39.4	27.5	0.09	0.0477	1.11	126.3	0.05393	0.00339	0.14358	0.00783	174	2.70	0.0002	0.9813	0.0288	0.0157	0.0049	0.0038
151	Base Case (NP20)	SC01 Treated	39.80	6.32	272	0.19	150.8	0.0355	0.2309	0.0953	64.8	0.00010	71.8	0.00463	0.00096	0.00111	0.98	0.63	4.72	0.00015	37.6	26.0	0.08	0.0464	1.05	122.2	0.05567	0.00325	0.13759	0.00758	170	2.61	0.0002	0.9215	0.0285	0.0154	0.0047	0.0037
152	Base Case (NP20)	SC01 Untreated	36.26	6.29	273	0.19	151.0	0.0362	0.2342	0.0961	65.1	0.00010	72.7	0.00468	0.00097	0.00112	0.96	0.64	4.81	0.00015	38.0	26.9	0.08	0.0469	1.07	123.1	0.05635	0.00329	0.13875	0.00760	172	2.62	0.0002	0.9015	0.0289	0.0156	0.0048	0.0037
153	Base Case (NP20)	SC01 Treated	34.19	6.29	273	0.19	150.8	0.0357	0.2319	0.0958	65.1	0.00010	72.3	0.00466	0.00097	0.00112	0.98	0.62	4.74	0.00015	36.9	26.8	0.08	0.0455	1.05	121.9	0.05606	0.00328	0.13347	0.00737	169	2.55	0.0002	0.9190	0.0287	0.0151	0.0048	0.0037
154	Base Case (NP20)	SC01 Untreated	34.03	6.30	271	0.18	150.5	0.0350	0.2311	0.0947	64.6	0.00010	71.5	0.00461	0.00098	0.00110	0.98	0.63	4.73	0.00015	37.2	26.5	0.08	0.0459	1.03	121.5	0.05549	0.00322	0.13630	0.00752	168	2.59	0.0002	0.9181	0.0284	0.0152	0.0047	0.0037
155	Base Case (NP20)	SC01 Treated	29.80	6.27	277	0.19	151.0	0.0354	0.2411	0.0978	65.9	0.00010	74.8	0.00481	0.00098	0.00112	0.94	0.64	4.92	0.00014	38.1	27.3	0.08	0.0464	1.07	125.0	0.05822	0.00336	0.13880	0.00758	172	2.63	0.0002	0.9834	0.0298	0.0153	0.0048	0.0038
156	Base Case (NP20)	SC01 Untreated	36.84	6.32	270	0.18	150.2	0.0346	0.2315	0.0947	64.6	0.00010	71.6	0.00462	0.00096	0.00109	0.98	0.62	4.71	0.00015	36.7	26.5	0.08	0.0454	1.03	121.2	0.05563	0.00322	0.13431	0.00743	167	2.56	0.0002	0.9218	0.0285	0.0151	0.0046	0.0037
157	Base Case (NP20)	SC01 Treated	32.20	6.28	275	0.19	150.7	0.0356	0.2398	0.0971	65.4	0.00010	74.1	0.00477	0.00097	0.00110	0.94	0.64	4.89	0.00014	37.8	27.1	0.08	0.0467	1.07	124.0	0.05680	0.00333	0.13795	0.00753	172	2.61	0.0002	0.8828	0.0295	0.0154	0.0047	0.0037
158	Base Case (NP20)	SC01 Untreated	30.09	6.24	286	0.20	151.6	0.0364	0.2568	0.1022	67.7	0.00010	79.6	0.00511	0.00100	0.00116	0.87	0.66	5.23	0.00014	39.4	28.4	0.09	0.0474	1.15	129.8	0.06202	0.00357	0.14241	0.00765	178	2.68	0.0002	0.8232	0.0318	0.0155	0.0049	0.0039
159	Base Case (NP20)	SC01 Treated	38.04	6.31	269	0.18	150.0	0.0354	0.2293	0.0945	64.3	0.00010	71.0	0.00458	0.00096	0.00109	0.99	0.60	4.67	0.00015	35.4	26.3	0.08	0.0447	1.04	119.4	0.05519	0.00320	0.12787	0.00709	167	2.46	0.0002	0.9263	0.0283	0.0149	0.0044	0.0036
160	Base Case (NP20)	SC01 Untreated	28.00	6.22	287	0.21	151.8	0.0378	0.2582	0.1030	67.9	0.00010	80.1	0.00514	0.00101	0.00118	0.86	0.65	5.29	0.00013	38.9	28.6	0.09	0.0474	1.18	129.5	0.06239	0.00361	0.13871	0.00741	180	2.62	0.0002	0.8063	0.0320	0.0155	0.0047	0.0039
161	Base Case (NP20)	SC01 Treated	27.32	6.23	288	0.21	151.9	0.0368	0.2548	0.1024	68.2	0.00010	79.6	0.00511	0.00101	0.00118	0.86	0.62	5.20	0.00014	37.2	28.6	0.09	0.0439	1.14	129.9	0.06203	0.00361	0.13056	0.00709	172	2.51	0.0002	0.8425	0.0318	0.0144	0.0045	0.0040
162	Base Case (NP20)	SC01 Untreated	20.17	6.20	297	0.22	153.1	0.0382	0.2690	0.1082	70.5	0.00010	84.9	0.00544	0.00105	0.00123	0.83	0.63	5.41	0.00013	37.4	29.6	0.09	0.0451	1.11	132.6	0.06382	0.00383	0.12888	0.00688	181	2.48	0.0002	0.7877	0.0340	0.0147	0.0044	0.0041
163	Base Case (NP20)	SC01 Treated	31.82	6.37	259	0.18	149.4	0.0329	0.2132	0.0897	62.5	0.00010	66.2	0.00427	0.00093	0.00103	0.98	0.55	4.30	0.00014	31.7	27.5	0.07	0.0403	0.84	112.5	0.05138	0.00298	0.11376	0.00655	154	2.25	0.0002	0.9987	0.0283	0.0136	0.0039	0.0035
164	Base Case (NP20)	SC01 Untreated	31.42	6.31	272	0.18	150.9	0.0319	0.2352	0.0940	64.8	0.00010	71.9	0.00462	0.00095	0.00106	0.94	0.61	4.81	0.00015	36.0	26.7	0.08	0.0426	0.93	120.6	0.05594	0.00321	0.13136	0.00731	159	2.51	0.0002	0.9088	0.0287	0.0141	0.0045	0.0036
165	Base Case (NP20)	SC01 Treated	34.29	6.32	262	0.17	149.5	0.0334	0.2206	0.0905	62.9	0.00010	67.5	0.00435	0.00093	0.00105	1.01	0.58	4.53	0.00015	33.8	25.6	0.08	0.0425	0.94	114.8	0.05237	0.00304	0.12266	0.00691	159	2.38	0.0002	0.9523	0.0288	0.0142	0.0042	0.0035
166	Base Case (NP20)	SC01 Untreated	26.45	6.25	284	0.20	151.3	0.0354	0.2515	0.1018	67.6	0.00010	78.8	0.00506	0.00101	0.00115	0.91	0.60	5.05	0.00014	35.1	28.0	0.08	0.0426	0.95	125.7	0.06154	0.00354	0.12262	0.00672	170	2.39	0.0002	0.8696	0.0315	0.0140	0.0042	0.0039
167	Base Case (NP20)	SC01 Treated	30.13	6.30	272	0.18	150.3	0.0334	0.2340	0.0956	65.1	0.00010	72.7	0.00468	0.00097	0.00108	0.97	0.58	4.72	0.00015	33.5	26.6	0.08	0.0412	0.95	119.2	0.05661	0.00326	0.11882	0.00667	160	2.33	0.0002	0.9283	0.0290	0.0137	0.0041	0.0037
168	Base Case (NP20)	SC01 Untreated	32.55	6.31	272	0.18	150.3	0.0335	0.2332	0.0952	65.0	0.00010	72.3	0.00465	0.00097	0.00109	0.97	0.57	4.73	0.00015	33.4	26.6	0.08	0.0410	0.96	118.6	0.05627	0.00325	0.11803	0.00663	160	2.32	0.0002	0.9272	0.0288	0.0136	0.0041	0.0037
169	Base Case (NP20)	SC01 Treated	18.25	6.19	304	0.23	153.7	0.0378	0.2849	0.1122	71.7	0.00010	89.6	0.00574	0.00107	0.00123	0.77	0.64	5.66	0.00013	37.8	30.5	0.09	0.0452	1.10	136.8	0.07024	0.00400	0.12994	0.00685	185	2.49	0.0002	0.7371	0.0360	0.0146	0.0044	0.0043
170	Base Case (NP20)	SC01 Untreated	27.73	6.33	268	0.17	150.1	0.0324	0.2277	0.0939	64.3	0.00010	70.9	0.00457	0.00096	0.00105	1.01	0.55	4.54	0.00016	31.6	26.0	0.07	0.0396	0.84	116.4	0.05523	0.00316	0.11188	0.00638	156	2.22	0.0002	0.9574	0.0283	0.0132	0.0039	0.0036
171	Base Case (NP20)	SC01 Treated	37.84	6.39	253	0.15	148.7	0.0321	0.2077	0.0870	61.2	0.00010	63.6	0.00411	0.00091	0.00099	1.08	0.54	4.20	0.00016	30.3	24.4	0.07	0.0398	0.81	108.9	0.04939	0.00284	0.10967	0.00636	151	2.18	0.0002	0.1029	0.0253	0.0135	0.0038	0.0034
172	Base Case (NP20)	SC01 Untreated	23.41	6.24	288	0.20	152.0	0.0365	0.2631	0.1044	68.2	0.00010	81.7	0.00524	0.00102	0.00115	0.86	0.61	5.26	0.00013																		

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO3/L)	Acidity (mg CaCO3/L)	Alkalinity (mg CaCO3/L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO3-N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO4 (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
32	Base Case (NP20)	SC01 Treated	33.41	6.55	320	0.10	152.4	0.0132	0.0036	0.2011	85.7	0.00009	78.5	0.00044	0.00031	0.00038	0.99	1.47	0.06	0.00015	130.4	25.8	0.03	0.0102	0.15	244.6	0.00136	0.00019	0.01386	0.00186	214	0.40	0.0002	0.9336	0.0028	0.0160	0.0024	0.0007
33	Base Case (NP20)	SC01 Treated	36.84	6.50	328	0.11	153.0	0.0122	0.0035	0.2009	87.7	0.00009	80.7	0.00043	0.00029	0.00037	0.95	1.51	0.06	0.00015	132.6	26.6	0.03	0.0092	0.15	247.7	0.00137	0.00019	0.01365	0.00182	215	0.39	0.0002	0.9894	0.0029	0.0158	0.0024	0.0007
34	Base Case (NP20)	SC01 Treated	26.14	6.41	353	0.13	154.6	0.0132	0.0038	0.2084	89.3	0.00009	81.1	0.00042	0.00026	0.00036	0.83	1.56	0.06	0.00013	135.0	28.6	0.03	0.0098	0.14	257.4	0.00154	0.00018	0.01403	0.00163	228	0.35	0.0002	0.7716	0.0033	0.0160	0.0024	0.0006
35	Base Case (NP20)	SC01 Treated	34.37	6.49	336	0.12	153.2	0.0144	0.0034	0.1983	90.0	0.00010	83.4	0.00041	0.00028	0.00037	0.93	1.44	0.06	0.00015	129.0	27.1	0.03	0.0078	0.14	237.3	0.00144	0.00019	0.01251	0.00176	205	0.38	0.0002	0.8855	0.0030	0.0143	0.0022	0.0007
36	Base Case (NP20)	SC01 Treated	24.08	6.43	350	0.13	154.3	0.0103	0.0034	0.1913	87.3	0.00010	88.7	0.00039	0.00027	0.00036	0.96	1.47	0.06	0.00014	129.8	28.2	0.03	0.0086	0.13	241.6	0.00151	0.00019	0.01221	0.00169	207	0.36	0.0002	0.8327	0.0033	0.0139	0.0022	0.0006
37	Base Case (NP20)	SC01 Treated	22.80	6.47	334	0.12	153.2	0.0144	0.0035	0.1770	89.7	0.00010	82.8	0.00037	0.00027	0.00037	0.95	1.38	0.06	0.00015	114.1	26.7	0.03	0.0077	0.13	225.7	0.00144	0.00019	0.01188	0.00175	197	0.38	0.0002	0.9057	0.0031	0.0134	0.0020	0.0007
38	Base Case (NP20)	SC01 Treated	29.29	6.54	307	0.10	151.9	0.0132	0.0035	0.1629	82.6	0.00010	71.7	0.00038	0.00033	0.00039	1.06	1.35	0.06	0.00016	111.1	24.6	0.02	0.0096	0.14	212.8	0.00128	0.00020	0.01231	0.00186	190	0.42	0.0002	0.9958	0.0026	0.0139	0.0020	0.0008
39	Base Case (NP20)	SC01 Treated	32.07	6.55	313	0.10	151.9	0.0135	0.0033	0.1629	84.0	0.00010	73.7	0.00037	0.00033	0.00039	1.05	1.35	0.06	0.00016	110.0	24.9	0.02	0.0078	0.13	212.8	0.00131	0.00020	0.01163	0.00188	185	0.41	0.0002	1.0026	0.0027	0.0132	0.0020	0.0008
40	Base Case (NP20)	SC01 Treated	43.49	6.54	302	0.10	151.6	0.0139	0.0035	0.1576	80.9	0.00009	68.7	0.00037	0.00033	0.00040	1.07	1.40	0.06	0.00016	114.6	24.2	0.02	0.0104	0.14	212.7	0.00123	0.00020	0.01278	0.00188	193	0.42	0.0002	0.9998	0.0025	0.0144	0.0021	0.0008
41	Base Case (NP20)	SC01 Treated	28.80	6.40	350	0.14	154.4	0.0105	0.0036	0.1760	93.8	0.00010	88.3	0.00035	0.00023	0.00036	0.86	1.49	0.06	0.00014	120.5	28.2	0.03	0.0076	0.12	234.3	0.00152	0.00019	0.01228	0.00165	207	0.36	0.0002	0.8189	0.0033	0.0137	0.0021	0.0006
42	Base Case (NP20)	SC01 Treated	34.23	6.48	319	0.12	152.1	0.0128	0.0034	0.1520	85.7	0.00010	75.4	0.00034	0.00032	0.00040	1.02	1.30	0.06	0.00016	102.5	25.4	0.02	0.0085	0.13	203.6	0.00134	0.00020	0.01119	0.00178	184	0.40	0.0002	0.9691	0.0028	0.0126	0.0018	0.0007
43	Base Case (NP20)	SC01 Treated	25.90	6.37	353	0.15	155.4	0.0122	0.0037	0.1737	94.3	0.00009	85.8	0.00034	0.00025	0.00036	0.82	1.56	0.06	0.00013	124.5	28.5	0.03	0.0084	0.12	237.4	0.00151	0.00018	0.01289	0.00159	213	0.35	0.0002	0.7728	0.0033	0.0142	0.0022	0.0006
44	Base Case (NP20)	SC01 Treated	32.42	6.43	324	0.13	153.1	0.0123	0.0034	0.1542	86.8	0.00009	76.4	0.00034	0.00030	0.00038	0.96	1.43	0.06	0.00015	112.8	26.1	0.02	0.0083	0.12	214.4	0.00134	0.00019	0.01195	0.00175	193	0.39	0.0002	0.9127	0.0028	0.0133	0.0020	0.0007
45	Base Case (NP20)	SC01 Treated	22.66	6.34	361	0.16	155.6	0.0114	0.0037	0.1675	96.7	0.00010	91.7	0.00032	0.00020	0.00036	0.80	1.49	0.06	0.00013	115.6	29.0	0.03	0.0071	0.11	229.2	0.00157	0.00018	0.01176	0.00154	205	0.34	0.0002	0.7642	0.0035	0.0129	0.0020	0.0006
46	Base Case (NP20)	SC01 Treated	35.54	6.47	308	0.12	152.0	0.0141	0.0035	0.1402	82.7	0.00010	70.1	0.00033	0.00032	0.00040	1.04	1.35	0.06	0.00015	103.4	24.6	0.02	0.0100	0.13	198.1	0.00126	0.00020	0.01179	0.00179	185	0.41	0.0002	0.9722	0.0026	0.0131	0.0019	0.0007
47	Base Case (NP20)	SC01 Treated	34.49	6.45	321	0.13	152.3	0.0120	0.0034	0.1421	86.4	0.00010	75.8	0.00032	0.00031	0.00039	1.00	1.33	0.06	0.00015	105.5	25.6	0.02	0.0077	0.12	199.4	0.00135	0.00020	0.01178	0.00176	180	0.40	0.0002	0.9522	0.0028	0.0120	0.0019	0.0007
48	Base Case (NP20)	SC01 Treated	32.41	6.40	332	0.14	153.5	0.0129	0.0036	0.1483	89.0	0.00009	79.6	0.00032	0.00029	0.00038	0.93	1.45	0.06	0.00014	110.0	26.6	0.02	0.0098	0.12	211.9	0.00139	0.00019	0.01189	0.00167	194	0.38	0.0002	0.8636	0.0030	0.0131	0.0019	0.0007
49	Base Case (NP20)	SC01 Treated	35.37	6.43	314	0.14	152.0	0.0143	0.0034	0.1354	84.4	0.00010	72.5	0.00031	0.00031	0.00040	1.02	1.32	0.06	0.00015	98.4	25.1	0.02	0.0098	0.12	193.4	0.00130	0.00020	0.01130	0.00174	188	0.40	0.0002	0.9546	0.0027	0.0125	0.0018	0.0007
50	Base Case (NP20)	SC01 Treated	29.66	6.37	332	0.15	153.2	0.0128	0.0036	0.1417	89.1	0.00010	79.3	0.00030	0.00029	0.00038	0.93	1.39	0.06	0.00014	102.8	26.6	0.02	0.0083	0.11	203.0	0.00140	0.00019	0.01113	0.00165	187	0.38	0.0002	0.8817	0.0030	0.0123	0.0018	0.0007
51	Base Case (NP20)	SC01 Treated	39.24	6.43	323	0.14	152.5	0.0134	0.0036	0.1352	86.6	0.00010	75.9	0.00030	0.00030	0.00039	0.98	1.34	0.06	0.00015	98.0	25.8	0.02	0.0088	0.11	194.9	0.00135	0.00019	0.01095	0.00169	182	0.39	0.0002	0.9220	0.0028	0.0121	0.0017	0.0007
52	Base Case (NP20)	SC01 Treated	35.76	6.40	326	0.14	152.7	0.0135	0.0036	0.1349	87.5	0.00010	76.7	0.00030	0.00030	0.00039	0.96	1.36	0.06	0.00015	98.7	26.0	0.02	0.0089	0.11	195.9	0.00136	0.00019	0.01103	0.00166	184	0.38	0.0002	0.9203	0.0029	0.0121	0.0017	0.0007
53	Base Case (NP20)	SC01 Treated	33.78	6.40	324	0.14	152.5	0.0133	0.0035	0.1316	87.1	0.00010	76.1	0.00029	0.00030	0.00039	0.98	1.32	0.06	0.00015	94.8	25.9	0.02	0.0085	0.11	191.0	0.00136	0.00019	0.01059	0.00167	179	0.39	0.0002	0.9195	0.0029	0.0117	0.0017	0.0007
54	Base Case (NP20)	SC01 Treated	33.65	6.40	322	0.14	152.4	0.0132	0.0035	0.1303	86.7	0.00010	75.4	0.00029	0.00030	0.00039	0.98	1.36	0.06	0.00015	96.8	25.7	0.02	0.0086	0.11	192.2	0.00135	0.00019	0.01081	0.00168	180	0.39	0.0002	0.9186	0.0028	0.0118	0.0017	0.0007
55	Base Case (NP20)	SC01 Treated	29.48	6.37	331	0.15	153.0	0.0126	0.0036	0.1327	88.9	0.00010	78.8	0.00029	0.00029	0.00038	0.93	1.39	0.06	0.00014	98.6	26.4	0.02	0.0080	0.11	196.5	0.00139	0.00019	0.01072	0.00164	182	0.38	0.0002	0.8838	0.0030	0.0117	0.0017	0.0007
56	Base Case (NP20)	SC01 Treated	36.47	6.41	322	0.14	152.2	0.0131	0.0035	0.1273	86.7	0.00010	75.4	0.00028	0.00030	0.00039	0.98	1.36	0.06	0.00015	95.1	25.7	0.02	0.0084	0.11	190.0	0.00135	0.00019	0.01062	0.00168	178	0.39	0.0002	0.9225	0.0028	0.0116	0.0017	0.0007
57	Base Case (NP20)	SC01 Treated	31.94	6.37	329	0.15	152.8	0.0133	0.0036	0.1293	88.3	0.00010	77.9	0.00028	0.00029	0.00038	0.94	1.40	0.06	0.00014	97.5	26.2	0.02	0.0086	0.11	194.0	0.00138	0.00019	0.01086	0.00163	183	0.38	0.0002	0.8834	0.0029	0.0118	0.0017	0.0007
58	Base Case (NP20)	SC01 Treated	29.87	6.33	343	0.16	153.7	0.0121	0.0036	0.1341	92.2	0.00009	83.4	0.00027	0.00023	0.00037	0.87	1.46	0.06	0.00014	100.8	27.																

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
118	Base Case (NP20)	SC01 Treated	32.63	6.32	313	0.17	151.9	0.0130	0.0035	0.0943	84.5	0.00010	70.6	0.00022	0.00031	0.00039	0.99	0.82	0.06	0.00015	50.2	24.8	0.01	0.0069	0.09	134.2	0.00131	0.00019	0.00623	0.00148	134	0.38	0.0002	0.9360	0.0028	0.0072	0.0009	0.0007
119	Base Case (NP20)	SC01 Treated	30.94	6.31	318	0.18	152.1	0.0127	0.0035	0.0967	86.0	0.00010	72.9	0.00022	0.00030	0.00039	0.98	0.81	0.06	0.00015	49.5	25.2	0.01	0.0066	0.09	135.6	0.00135	0.00020	0.00603	0.00147	134	0.37	0.0002	0.9282	0.0029	0.0071	0.0009	0.0007
120	Base Case (NP20)	SC01 Treated	33.80	6.31	317	0.18	152.0	0.0127	0.0035	0.0965	85.5	0.00010	72.1	0.00022	0.00030	0.00039	0.97	0.82	0.06	0.00015	50.4	25.1	0.01	0.0067	0.09	135.5	0.00135	0.00019	0.00613	0.00146	135	0.37	0.0002	0.9213	0.0028	0.0072	0.0009	0.0007
121	Base Case (NP20)	SC01 Treated	29.98	6.30	326	0.19	152.6	0.0129	0.0036	0.0984	88.2	0.00010	76.5	0.00022	0.00029	0.00039	0.95	0.80	0.06	0.00015	48.5	25.8	0.01	0.0066	0.09	137.7	0.00141	0.00020	0.00581	0.00142	137	0.38	0.0002	0.9027	0.0030	0.0070	0.0008	0.0007
122	Base Case (NP20)	SC01 Treated	30.61	6.31	322	0.18	152.4	0.0129	0.0036	0.0981	86.5	0.00010	74.3	0.00022	0.00030	0.00039	0.96	0.80	0.06	0.00015	48.4	25.4	0.01	0.0068	0.09	135.6	0.00137	0.00019	0.00586	0.00143	135	0.37	0.0002	0.9111	0.0029	0.0070	0.0008	0.0007
123	Base Case (NP20)	SC01 Treated	33.34	6.33	316	0.17	151.9	0.0123	0.0034	0.0960	85.2	0.00010	71.7	0.00022	0.00030	0.00039	0.98	0.79	0.06	0.00015	48.2	25.0	0.01	0.0063	0.09	133.2	0.00133	0.00020	0.00582	0.00147	131	0.37	0.0002	0.9351	0.0028	0.0069	0.0009	0.0007
124	Base Case (NP20)	SC01 Treated	25.31	6.29	331	0.19	153.0	0.0121	0.0035	0.1021	89.5	0.00010	78.6	0.00022	0.00029	0.00038	0.93	0.79	0.06	0.00015	48.1	26.2	0.01	0.0058	0.08	139.1	0.00144	0.00019	0.00562	0.00140	136	0.38	0.0002	0.8860	0.0031	0.0067	0.0008	0.0007
125	Base Case (NP20)	SC01 Treated	34.67	6.35	304	0.16	151.1	0.0132	0.0034	0.0904	82.0	0.00010	70.7	0.00022	0.00030	0.00040	1.03	0.77	0.06	0.00016	46.4	24.0	0.01	0.0072	0.09	127.5	0.00126	0.00020	0.00620	0.00152	128	0.39	0.0002	0.9736	0.0026	0.0071	0.0009	0.0007
126	Base Case (NP20)	SC01 Treated	39.39	6.33	307	0.17	151.1	0.0136	0.0035	0.0916	82.8	0.00010	76.2	0.00022	0.00031	0.00040	1.01	0.78	0.06	0.00016	47.4	24.3	0.01	0.0076	0.09	129.1	0.00128	0.00020	0.00620	0.00148	132	0.38	0.0002	0.9479	0.0027	0.0073	0.0009	0.0007
127	Base Case (NP20)	SC01 Treated	36.37	6.28	325	0.19	152.4	0.0135	0.0036	0.0992	87.7	0.00010	75.5	0.00022	0.00029	0.00039	0.94	0.78	0.06	0.00016	47.8	25.8	0.01	0.0072	0.09	135.4	0.00139	0.00019	0.00599	0.00138	138	0.38	0.0002	0.8804	0.0030	0.0071	0.0008	0.0007
128	Base Case (NP20)	SC01 Treated	26.95	6.23	337	0.21	153.3	0.0120	0.0035	0.1029	90.8	0.00010	79.6	0.00021	0.00028	0.00038	0.98	0.79	0.06	0.00016	46.6	26.8	0.01	0.0055	0.08	139.4	0.00145	0.00019	0.00547	0.00134	137	0.34	0.0002	0.8455	0.0032	0.0065	0.0008	0.0006
129	Base Case (NP20)	SC01 Treated	29.55	6.26	332	0.20	153.1	0.0123	0.0035	0.1014	89.6	0.00010	77.4	0.00021	0.00028	0.00039	0.91	0.77	0.06	0.00016	46.7	26.4	0.01	0.0058	0.08	136.4	0.00142	0.00019	0.00543	0.00136	135	0.35	0.0002	0.8676	0.0031	0.0065	0.0008	0.0006
130	Base Case (NP20)	SC01 Treated	30.80	6.31	309	0.18	151.3	0.0135	0.0035	0.0927	83.4	0.00010	69.0	0.00022	0.00031	0.00040	1.02	0.72	0.06	0.00015	43.4	24.4	0.01	0.0073	0.09	126.0	0.00129	0.00020	0.00572	0.00148	129	0.38	0.0002	0.9572	0.0027	0.0069	0.0008	0.0007
131	Base Case (NP20)	SC01 Treated	34.11	6.33	305	0.17	150.9	0.0144	0.0036	0.0920	82.5	0.00010	68.2	0.00022	0.00030	0.00041	1.03	0.72	0.06	0.00015	43.0	24.1	0.01	0.0082	0.10	125.0	0.00129	0.00020	0.00601	0.00148	130	0.39	0.0002	0.9631	0.0027	0.0072	0.0008	0.0007
132	Base Case (NP20)	SC01 Treated	34.92	6.31	311	0.18	151.2	0.0139	0.0036	0.0936	84.0	0.00010	70.2	0.00022	0.00030	0.00040	0.99	0.74	0.06	0.00016	44.9	24.6	0.01	0.0078	0.09	128.1	0.00131	0.00019	0.00600	0.00144	132	0.38	0.0002	0.9256	0.0028	0.0071	0.0008	0.0007
133	Base Case (NP20)	SC01 Treated	38.37	6.29	319	0.19	151.6	0.0130	0.0035	0.0958	85.3	0.00010	72.7	0.00021	0.00029	0.00039	0.95	0.76	0.06	0.00016	46.1	25.3	0.01	0.0068	0.09	131.1	0.00134	0.00019	0.00574	0.00140	133	0.38	0.0002	0.9534	0.0029	0.0068	0.0008	0.0007
134	Base Case (NP20)	SC01 Treated	27.08	6.23	345	0.22	153.7	0.0139	0.0039	0.1070	92.5	0.00010	83.5	0.00021	0.00028	0.00038	0.83	0.79	0.07	0.00013	48.6	27.5	0.02	0.0073	0.08	142.0	0.00151	0.00018	0.00587	0.00142	146	0.32	0.0002	0.7684	0.0033	0.0071	0.0008	0.0006
135	Base Case (NP20)	SC01 Treated	35.50	6.23	328	0.19	152.1	0.0120	0.0035	0.0968	88.5	0.00010	76.7	0.00021	0.00029	0.00039	0.93	0.73	0.06	0.00016	44.3	26.0	0.01	0.0056	0.09	132.9	0.00141	0.00019	0.00515	0.00138	131	0.35	0.0002	0.8849	0.0030	0.0063	0.0008	0.0007
136	Base Case (NP20)	SC01 Treated	24.83	6.23	343	0.21	153.4	0.0109	0.0035	0.1052	92.4	0.00010	82.2	0.00021	0.00027	0.00037	0.86	0.74	0.06	0.00014	45.3	27.2	0.01	0.0044	0.08	138.5	0.00149	0.00019	0.00478	0.00130	133	0.33	0.0002	0.8112	0.0033	0.0059	0.0008	0.0006
137	Base Case (NP20)	SC01 Treated	23.46	6.29	327	0.19	152.2	0.0119	0.0035	0.1003	88.4	0.00010	77.0	0.00022	0.00029	0.00039	0.95	0.70	0.06	0.00015	41.8	25.8	0.01	0.0055	0.09	131.5	0.00142	0.00020	0.00497	0.00139	129	0.36	0.0002	0.9051	0.0031	0.0061	0.0007	0.0007
138	Base Case (NP20)	SC01 Treated	30.29	6.36	299	0.16	150.2	0.0137	0.0035	0.0894	80.8	0.00010	66.0	0.00022	0.00030	0.00041	1.06	0.67	0.06	0.00016	39.6	23.5	0.01	0.0077	0.10	120.2	0.00126	0.00020	0.00559	0.00152	123	0.40	0.0002	0.9502	0.0026	0.0067	0.0008	0.0008
139	Base Case (NP20)	SC01 Treated	32.95	6.37	304	0.16	150.2	0.0119	0.0033	0.0911	82.3	0.00010	68.2	0.00022	0.00030	0.00040	1.05	0.67	0.06	0.00016	39.4	23.9	0.01	0.0059	0.09	122.1	0.00129	0.00020	0.00497	0.00153	119	0.39	0.0002	0.9025	0.0027	0.0061	0.0008	0.0008
140	Base Case (NP20)	SC01 Treated	44.59	6.38	292	0.15	149.5	0.0143	0.0035	0.0860	78.9	0.00010	62.9	0.00022	0.00030	0.00041	1.07	0.68	0.06	0.00016	40.4	23.0	0.01	0.0083	0.10	117.8	0.00121	0.00020	0.00586	0.00153	123	0.40	0.0002	0.9096	0.0025	0.0070	0.0008	0.0008
141	Base Case (NP20)	SC01 Treated	29.55	6.24	342	0.21	153.0	0.0121	0.0036	0.1055	92.1	0.00010	82.5	0.00021	0.00027	0.00038	0.86	0.74	0.06	0.00014	44.7	27.1	0.01	0.0056	0.08	137.9	0.00150	0.00019	0.00512	0.00128	137	0.33	0.0002	0.8182	0.0033	0.0063	0.0008	0.0006
142	Base Case (NP20)	SC01 Treated	35.06	6.33	311	0.18	150.8	0.0132	0.0035	0.0943	84.2	0.00010	70.6	0.00022	0.00030	0.00041	1.02	0.65	0.06	0.00016	43.8	24.5	0.01	0.0068	0.09	123.5	0.00133	0.00020	0.00509	0.00147	124	0.38	0.0002	0.9889	0.0028	0.0063	0.0007	0.0007
143	Base Case (NP20)	SC01 Treated	26.49	6.22	343	0.21	153.7	0.0127	0.0037	0.1054	92.3	0.00010	82.7	0.00020	0.00025	0.00037	0.82	0.75	0.06	0.00013	46.0	27.3	0.01	0.0063	0.08	138.8	0.00149	0.00018	0.00544	0.00121	140	0.32	0.0002	0.7722	0.0033	0.0065	0.0008	0.0006
144	Base Case (NP20)	SC01 Treated	33.13	6.29	315	0.18	151.3	0.0127	0.0035	0.0940	84.9	0.00010	71.2	0.00021	0.00030	0.00039	0.96	0.																				

Year	Scenario	Station	Flow Rate (Us)	pH	Hardness (mg CaCO3/L)	Acidity (mg CaCO3/L)	Alkalinity (mg CaCO3/L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO3-N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO4 (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
4	Base Case (NP20)	RS03 Untreated	15.81	6.53	114	0.10	114.4	0.0177	0.0232	0.0329	27.6	0.00007	6.1	0.00120	0.00045	0.00073	1.29	0.31	0.98	0.00017	18.8	10.9	0.02	0.0222	2.76	38.3	0.00061	0.00046	0.07039	0.00494	41	0.67	0.0002	1.2699	0.0000	0.0071	0.0030	0.0016
5	Base Case (NP20)	RS03 Untreated	22.92	6.57	106	0.09	106.8	0.0169	0.0208	0.0304	26.1	0.00007	5.6	0.00104	0.00045	0.00073	1.38	0.28	0.88	0.00017	16.6	9.9	0.02	0.0193	2.49	34.2	0.00059	0.00043	0.06148	0.00449	37	0.61	0.0002	1.3635	0.0000	0.0062	0.0027	0.0016
6	Base Case (NP20)	RS03 Untreated	15.86	6.55	109	0.09	109.0	0.0168	0.0204	0.0306	26.7	0.00007	5.7	0.00105	0.00045	0.00073	1.39	0.29	0.91	0.00017	17.2	10.2	0.02	0.0198	2.56	35.1	0.00059	0.00043	0.06427	0.00462	37	0.64	0.0002	1.3703	0.0000	0.0064	0.0028	0.0016
7	Base Case (NP20)	RS03 Untreated	19.79	6.57	108	0.09	108.4	0.0168	0.0210	0.0301	26.5	0.00007	5.8	0.00107	0.00045	0.00073	1.38	0.28	0.88	0.00017	16.3	10.1	0.02	0.0188	2.42	34.4	0.00058	0.00043	0.06058	0.00446	36	0.61	0.0002	1.3646	0.0000	0.0061	0.0026	0.0016
8	Base Case (NP20)	RS03 Untreated	15.21	6.54	111	0.09	111.3	0.0171	0.0221	0.0303	27.1	0.00007	6.0	0.00108	0.00045	0.00074	1.36	0.30	0.95	0.00017	17.2	10.5	0.02	0.0193	2.65	35.4	0.00058	0.00045	0.06370	0.00459	37	0.64	0.0002	1.3424	0.0000	0.0063	0.0027	0.0016
9	Base Case (NP20)	RS03 Untreated	17.17	6.58	110	0.08	112.1	0.0165	0.0213	0.0297	27.0	0.00007	5.7	0.00090	0.00045	0.00072	1.36	0.28	0.86	0.00017	15.9	10.3	0.02	0.0180	2.30	34.5	0.00057	0.00042	0.05911	0.00440	35	0.60	0.0002	1.3420	0.0000	0.0059	0.0026	0.0016
10	Base Case (NP20)	RS03 Untreated	11.91	6.56	120	0.09	123.8	0.0165	0.0238	0.0314	29.3	0.00007	6.4	0.00095	0.00046	0.00072	1.27	0.31	0.93	0.00017	17.4	11.5	0.02	0.0192	2.43	38.4	0.00057	0.00044	0.06481	0.00470	37	0.65	0.0002	1.2901	0.0000	0.0063	0.0028	0.0016
11	Base Case (NP20)	RS03 Untreated	16.41	6.55	112	0.09	114.8	0.0171	0.0218	0.0295	27.5	0.00007	5.9	0.00081	0.00046	0.00072	1.31	0.28	0.88	0.00017	15.1	10.6	0.02	0.0171	2.44	34.2	0.00056	0.00044	0.05503	0.00419	36	0.58	0.0002	1.2614	0.0000	0.0057	0.0024	0.0016
12	Base Case (NP20)	RS03 Untreated	14.97	6.53	115	0.10	116.4	0.0174	0.0232	0.0300	28.0	0.00007	6.0	0.00096	0.00046	0.00074	1.30	0.30	0.97	0.00017	16.9	11.0	0.02	0.0186	2.64	36.0	0.00056	0.00046	0.06208	0.00453	38	0.64	0.0002	1.2783	0.0000	0.0062	0.0027	0.0016
13	Base Case (NP20)	RS03 Untreated	23.17	6.56	104	0.09	104.3	0.0169	0.0203	0.0274	25.7	0.00007	5.3	0.00075	0.00044	0.00073	1.40	0.27	0.89	0.00017	14.8	9.7	0.02	0.0163	2.45	31.2	0.00055	0.00043	0.05405	0.00410	34	0.59	0.0002	1.3816	0.0000	0.0054	0.0024	0.0016
14	Base Case (NP20)	RS03 Untreated	21.90	6.57	101	0.09	104.4	0.0172	0.0217	0.0267	25.1	0.00007	5.1	0.00073	0.00044	0.00074	1.45	0.27	0.87	0.00016	14.7	9.3	0.02	0.0166	2.41	30.1	0.00055	0.00042	0.05397	0.00406	35	0.60	0.0002	1.4231	0.0000	0.0056	0.0024	0.0016
15	Base Case (NP20)	RS03 Untreated	16.50	6.52	112	0.10	111.8	0.0174	0.0233	0.0288	27.4	0.00007	5.8	0.00083	0.00044	0.00075	1.34	0.32	1.02	0.00016	17.8	10.7	0.02	0.0193	2.73	35.4	0.00056	0.00046	0.06631	0.00468	39	0.69	0.0002	1.2280	0.0000	0.0064	0.0028	0.0016
16	Base Case (NP20)	RS03 Untreated	17.93	6.56	113	0.09	114.9	0.0166	0.0229	0.0286	27.7	0.00007	5.9	0.00077	0.00045	0.00073	1.33	0.30	0.94	0.00017	16.5	10.7	0.02	0.0177	2.44	35.1	0.00055	0.00044	0.06146	0.00449	36	0.65	0.0002	1.3118	0.0000	0.0059	0.0026	0.0016
17	Base Case (NP20)	RS03 Untreated	17.10	6.58	114	0.09	116.6	0.0162	0.0224	0.0283	27.9	0.00007	5.9	0.00071	0.00045	0.00072	1.34	0.29	0.89	0.00017	15.5	10.7	0.02	0.0175	2.28	34.5	0.00055	0.00042	0.05727	0.00430	34	0.62	0.0002	1.3229	0.0000	0.0056	0.0025	0.0016
18	Base Case (NP20)	RS03 Untreated	18.87	6.57	105	0.09	106.3	0.0165	0.0201	0.0263	26.0	0.00007	5.3	0.00062	0.00045	0.00073	1.40	0.25	0.85	0.00017	13.6	9.8	0.02	0.0145	2.30	30.2	0.00053	0.00042	0.04892	0.00385	32	0.56	0.0002	1.3860	0.0000	0.0050	0.0022	0.0016
19	Base Case (NP20)	RS03 Untreated	18.44	6.57	108	0.09	109.2	0.0166	0.0211	0.0269	26.8	0.00007	5.5	0.00064	0.00045	0.00073	1.38	0.27	0.88	0.00017	14.6	10.1	0.02	0.0155	2.31	31.8	0.00054	0.00042	0.05324	0.00407	33	0.60	0.0002	1.3644	0.0000	0.0053	0.0023	0.0016
20	Base Case (NP20)	RS03 Untreated	19.36	6.55	105	0.09	104.8	0.0169	0.0205	0.0260	25.9	0.00007	5.0	0.00060	0.00044	0.00074	1.41	0.28	0.89	0.00017	14.1	9.7	0.02	0.0150	2.41	30.2	0.00053	0.00043	0.05036	0.00393	33	0.59	0.0002	1.3858	0.0000	0.0051	0.0022	0.0016
21	Base Case (NP20)	RS03 Untreated	18.10	6.58	112	0.09	111.3	0.0164	0.0221	0.0270	27.4	0.00007	5.7	0.00063	0.00045	0.00072	1.36	0.28	0.89	0.00017	15.0	10.5	0.02	0.0159	2.26	33.1	0.00053	0.00042	0.05549	0.00419	34	0.62	0.0002	1.3469	0.0000	0.0054	0.0024	0.0016
22	Base Case (NP20)	RS03 Untreated	18.11	6.58	109	0.08	111.5	0.0164	0.0212	0.0265	27.0	0.00007	5.5	0.00058	0.00045	0.00072	1.37	0.26	0.86	0.00017	13.9	10.2	0.02	0.0147	2.23	31.5	0.00052	0.00042	0.05062	0.00394	32	0.59	0.0002	1.3568	0.0000	0.0051	0.0022	0.0016
23	Base Case (NP20)	RS03 Untreated	19.98	6.57	107	0.09	108.2	0.0165	0.0208	0.0259	26.4	0.00007	5.3	0.00055	0.00045	0.00073	1.39	0.25	0.88	0.00017	13.5	10.0	0.02	0.0140	2.32	30.3	0.00052	0.00042	0.04857	0.00383	32	0.58	0.0002	1.3767	0.0000	0.0049	0.0022	0.0016
24	Base Case (NP20)	RS03 Untreated	15.30	6.58	115	0.09	118.4	0.0163	0.0226	0.0272	28.3	0.00007	5.9	0.00057	0.00045	0.00072	1.34	0.27	0.89	0.00017	14.6	10.9	0.02	0.0151	2.21	33.6	0.00052	0.00042	0.05340	0.00410	33	0.61	0.0002	1.3211	0.0000	0.0052	0.0023	0.0016
25	Base Case (NP20)	RS03 Untreated	20.36	6.56	104	0.09	104.6	0.0170	0.0201	0.0252	25.7	0.00007	5.1	0.00049	0.00045	0.00073	1.40	0.24	0.87	0.00017	12.7	9.6	0.02	0.0133	2.35	28.6	0.00052	0.00043	0.04467	0.00362	31	0.55	0.0002	1.3831	0.0000	0.0047	0.0020	0.0016
26	Base Case (NP20)	RS03 Untreated	21.51	6.53	99	0.09	97.9	0.0176	0.0198	0.0244	24.6	0.00007	4.8	0.00050	0.00044	0.00075	1.44	0.24	0.92	0.00016	13.3	9.2	0.02	0.0141	2.51	27.5	0.00052	0.00044	0.04713	0.00370	33	0.58	0.0002	1.4185	0.0000	0.0049	0.0021	0.0016
27	Base Case (NP20)	RS03 Untreated	20.52	6.54	107	0.10	106.1	0.0175	0.0222	0.0258	26.2	0.00007	5.3	0.00054	0.00044	0.00075	1.38	0.27	0.99	0.00016	15.2	10.0	0.02	0.0159	2.54	31.1	0.00052	0.00045	0.05569	0.00413	35	0.66	0.0002	1.3620	0.0000	0.0055	0.0024	0.0016
28	Base Case (NP20)	RS03 Untreated	14.59	6.54	110	0.09	110.0	0.0169	0.0225	0.0285	26.9	0.00007	5.5	0.00052	0.00045	0.00074	1.35	0.27	0.97	0.00017	14.8	10.4	0.02	0.0150	2.45	31.7	0.00052	0.00044	0.05395	0.00409	34	0.64	0.0002	1.3379	0.0000	0.0052	0.0023	0.0016
29	Base Case (NP20)	RS03 Untreated	17.52	6.56	112	0.09	113.5	0.0167	0.0225	0.0260	27.4	0.00007	5.6	0.00050	0.00045	0.00073	1.33	0.26	0.93	0.00017	14.1	10.6	0.02	0.0143	2.32	31.8	0.00051	0.00043	0.05095	0.00396	33	0.61	0.0002	1.3165	0.0000	0.0050	0.0022	0.0016
30	Base Case (NP20)	RS03 Untreated	17.98	6.58	104	0.08	106.0	0.0166	0.0202	0.0248	25.9	0.00007	5.2	0.00044	0.00045	0.00072	1.40	0.23	0.85	0.00017	12.3	9.7	0.02	0.0127	2.18	28.5	0.00051	0.00041	0.04339	0.00357	31							

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
90	Base Case (NP20)	RS03 Untreated	21.95	6.58	101	0.08	102.6	0.0168	0.0197	0.0222	25.2	0.00007	4.7	0.00021	0.00044	0.00073	1.43	0.16	0.85	0.00017	7.6	9.3	0.01	0.0074	2.14	22.4	0.00048	0.00041	0.02192	0.00246	25	0.48	0.0002	1.4072	0.0000	0.0029	0.0012	0.0016
91	Base Case (NP20)	RS03 Untreated	14.21	6.54	108	0.09	109.3	0.0168	0.0221	0.0228	26.6	0.00007	5.1	0.00022	0.00044	0.00074	1.36	0.17	0.95	0.00017	8.5	10.1	0.01	0.0077	2.32	24.5	0.00047	0.00044	0.02510	0.00261	25	0.53	0.0002	1.3474	0.0000	0.0031	0.0013	0.0015
92	Base Case (NP20)	RS03 Untreated	12.97	6.54	116	0.09	119.9	0.0169	0.0238	0.0243	28.3	0.00007	5.6	0.00022	0.00045	0.00072	1.28	0.18	0.95	0.00017	8.7	11.0	0.01	0.0080	2.32	27.2	0.00047	0.00044	0.02591	0.00270	27	0.53	0.0002	1.2624	0.0000	0.0032	0.0013	0.0016
93	Base Case (NP20)	RS03 Untreated	13.89	6.58	116	0.09	121.3	0.0165	0.0200	0.0246	23.5	0.00007	5.6	0.00021	0.00046	0.00071	1.28	0.18	0.98	0.00017	8.1	11.0	0.01	0.0075	2.03	27.2	0.00047	0.00043	0.02347	0.00261	25	0.45	0.0002	1.2588	0.0000	0.0031	0.0012	0.0016
94	Base Case (NP20)	RS03 Untreated	22.05	6.55	100	0.09	100.2	0.0173	0.0195	0.0222	24.7	0.00007	4.6	0.00021	0.00044	0.00074	1.42	0.15	0.87	0.00017	7.3	9.2	0.01	0.0071	2.30	21.6	0.00048	0.00043	0.01987	0.00236	25	0.45	0.0002	1.3986	0.0000	0.0029	0.0011	0.0016
95	Base Case (NP20)	RS03 Untreated	23.39	6.56	102	0.09	103.1	0.0169	0.0207	0.0222	25.4	0.00007	4.7	0.00021	0.00044	0.00074	1.43	0.16	0.91	0.00017	8.0	9.5	0.01	0.0075	2.22	22.7	0.00048	0.00042	0.02319	0.00251	25	0.50	0.0002	1.4068	0.0000	0.0030	0.0012	0.0015
96	Base Case (NP20)	RS03 Untreated	19.21	6.59	106	0.08	108.6	0.0164	0.0210	0.0227	26.4	0.00007	4.9	0.00021	0.00044	0.00073	1.43	0.17	0.87	0.00017	7.8	9.8	0.01	0.0074	2.04	23.7	0.00048	0.00041	0.02288	0.00251	24	0.50	0.0002	1.4155	0.0000	0.0030	0.0012	0.0016
97	Base Case (NP20)	RS03 Untreated	19.21	6.58	105	0.08	107.7	0.0167	0.0205	0.0228	26.2	0.00007	4.9	0.00021	0.00045	0.00073	1.42	0.16	0.86	0.00017	7.5	9.7	0.01	0.0070	2.11	23.3	0.00048	0.00041	0.02101	0.00244	24	0.47	0.0002	1.4052	0.0000	0.0029	0.0012	0.0016
98	Base Case (NP20)	RS03 Untreated	13.90	6.53	111	0.09	112.8	0.0170	0.0226	0.0233	27.2	0.00007	5.2	0.00021	0.00044	0.00074	1.35	0.17	0.96	0.00017	8.3	10.4	0.01	0.0074	2.35	24.9	0.00048	0.00044	0.02348	0.00254	25	0.50	0.0002	1.3348	0.0000	0.0030	0.0012	0.0016
99	Base Case (NP20)	RS03 Untreated	15.49	6.57	111	0.09	115.0	0.0163	0.0222	0.0236	27.4	0.00007	5.3	0.00021	0.00045	0.00072	1.33	0.17	0.89	0.00017	7.8	10.5	0.01	0.0069	2.11	25.3	0.00047	0.00042	0.02201	0.00251	24	0.47	0.0002	1.3152	0.0000	0.0028	0.0012	0.0016
100	Base Case (NP20)	RS03 Untreated	28.74	6.60	101	0.08	104.1	0.0170	0.0194	0.0226	25.3	0.00007	4.7	0.00021	0.00044	0.00073	1.43	0.15	0.81	0.00017	6.9	9.3	0.01	0.0071	2.03	22.1	0.00048	0.00040	0.01882	0.00231	25	0.43	0.0002	1.4044	0.0000	0.0029	0.0011	0.0016
101	Base Case (NP20)	RS03 Untreated	15.05	6.52	111	0.10	110.9	0.0175	0.0233	0.0229	27.1	0.00007	5.2	0.00021	0.00043	0.00076	1.36	0.17	1.04	0.00016	8.6	10.5	0.01	0.0076	2.60	24.5	0.00048	0.00046	0.02442	0.00254	26	0.52	0.0002	1.3444	0.0000	0.0031	0.0013	0.0015
102	Base Case (NP20)	RS03 Untreated	15.49	6.53	108	0.09	109.3	0.0174	0.0221	0.0231	26.4	0.00007	5.1	0.00021	0.00044	0.00074	1.35	0.16	0.95	0.00017	7.9	10.1	0.01	0.0076	2.33	24.0	0.00048	0.00044	0.02227	0.00246	26	0.48	0.0002	1.3307	0.0000	0.0031	0.0012	0.0016
103	Base Case (NP20)	RS03 Untreated	14.64	6.49	111	0.11	112.0	0.0182	0.0238	0.0235	27.1	0.00007	5.3	0.00021	0.00044	0.00075	1.30	0.17	1.05	0.00017	8.6	10.6	0.01	0.0080	2.65	25.0	0.00047	0.00048	0.02399	0.00253	28	0.51	0.0002	1.2785	0.0000	0.0032	0.0012	0.0016
104	Base Case (NP20)	RS03 Untreated	16.55	6.52	110	0.10	111.4	0.0179	0.0232	0.0235	26.8	0.00007	5.2	0.00021	0.00045	0.00074	1.31	0.17	1.00	0.00017	8.2	10.4	0.01	0.0078	2.44	24.7	0.00048	0.00046	0.02301	0.00250	27	0.49	0.0002	1.2910	0.0000	0.0032	0.0012	0.0016
105	Base Case (NP20)	RS03 Untreated	24.10	6.56	103	0.09	104.1	0.0171	0.0207	0.0225	25.5	0.00007	4.8	0.00021	0.00044	0.00074	1.40	0.15	0.90	0.00017	7.3	9.5	0.01	0.0069	2.22	22.4	0.00048	0.00043	0.02303	0.00236	24	0.45	0.0002	1.3830	0.0000	0.0028	0.0011	0.0016
106	Base Case (NP20)	RS03 Untreated	18.37	6.57	105	0.09	106.1	0.0170	0.0213	0.0225	26.0	0.00007	4.9	0.00021	0.00044	0.00074	1.41	0.16	0.92	0.00017	7.6	9.8	0.01	0.0070	2.28	22.8	0.00048	0.00043	0.02277	0.00239	25	0.47	0.0002	1.3912	0.0000	0.0028	0.0011	0.0016
107	Base Case (NP20)	RS03 Untreated	20.73	6.57	105	0.09	108.7	0.0170	0.0203	0.0222	26.0	0.00007	4.9	0.00021	0.00044	0.00073	1.40	0.16	0.93	0.00017	7.3	9.7	0.01	0.0069	2.18	22.8	0.00048	0.00042	0.01976	0.00236	24	0.45	0.0002	1.3833	0.0000	0.0028	0.0011	0.0016
108	Base Case (NP20)	RS03 Untreated	15.87	6.53	108	0.10	108.5	0.0173	0.0220	0.0229	26.5	0.00007	5.0	0.00021	0.00044	0.00075	1.38	0.16	0.96	0.00017	7.7	10.1	0.01	0.0069	2.40	23.4	0.00048	0.00045	0.02068	0.00238	25	0.48	0.0002	1.3618	0.0000	0.0028	0.0011	0.0016
109	Base Case (NP20)	RS03 Untreated	17.94	6.57	107	0.09	109.5	0.0166	0.0212	0.0230	26.4	0.00007	5.0	0.00021	0.00045	0.00072	1.38	0.16	0.87	0.00017	7.1	9.9	0.01	0.0066	2.09	23.4	0.00048	0.00042	0.01925	0.00235	24	0.44	0.0002	1.3607	0.0000	0.0027	0.0011	0.0016
110	Base Case (NP20)	RS03 Untreated	12.35	6.55	117	0.09	121.0	0.0167	0.0237	0.0243	28.5	0.00007	5.6	0.00021	0.00045	0.00073	1.30	0.17	0.94	0.00017	7.7	11.1	0.01	0.0068	2.20	26.3	0.00047	0.00040	0.02100	0.00245	25	0.46	0.0002	1.2814	0.0000	0.0029	0.0012	0.0016
111	Base Case (NP20)	RS03 Untreated	17.09	6.55	109	0.09	112.3	0.0173	0.0217	0.0237	26.8	0.00007	5.2	0.00021	0.00045	0.00073	1.33	0.15	0.90	0.00017	7.0	10.3	0.01	0.0067	2.27	24.0	0.00048	0.00044	0.01822	0.00230	25	0.42	0.0002	1.3094	0.0000	0.0028	0.0011	0.0016
112	Base Case (NP20)	RS03 Untreated	15.56	6.52	112	0.10	113.8	0.0176	0.0232	0.0237	27.3	0.00007	5.3	0.00021	0.00045	0.00074	1.32	0.16	0.99	0.00017	7.7	10.6	0.01	0.0070	2.45	24.6	0.00048	0.00046	0.02038	0.00238	26	0.45	0.0002	1.2962	0.0000	0.0029	0.0011	0.0016
113	Base Case (NP20)	RS03 Untreated	24.20	6.55	101	0.09	101.9	0.0170	0.0202	0.0221	25.1	0.00007	4.7	0.00021	0.00044	0.00074	1.42	0.15	0.90	0.00017	6.9	9.4	0.01	0.0064	2.28	21.4	0.00048	0.00043	0.01779	0.00224	24	0.42	0.0002	1.3977	0.0000	0.0026	0.0010	0.0015
114	Base Case (NP20)	RS03 Untreated	22.85	6.56	98	0.09	98.3	0.0174	0.0196	0.0217	24.5	0.00007	4.4	0.00020	0.00043	0.00074	1.46	0.14	0.88	0.00016	6.8	9.0	0.01	0.0068	2.24	20.4	0.00048	0.00042	0.01783	0.00221	25	0.42	0.0002	1.4383	0.0000	0.0028	0.0010	0.0015
115	Base Case (NP20)	RS03 Untreated	17.14	6.52	109	0.10	109.4	0.0176	0.0233	0.0238	26.8	0.00007	5.0	0.00021	0.00043	0.00076	1.36	0.16	1.03	0.00016	8.0	10.3	0.01	0.0072	2.53	23.5	0.00047	0.00046	0.02158	0.00239	26	0.48	0.0002	1.3442	0.0000	0.0030	0.0012	0.0015
116	Base Case (NP20)	RS03 Untreated	18.65	6.56	110	0.09	112.6	0.0168	0.0228	0.0232	27.1	0.00007	5.2	0.00021	0.00044	0.00073	1.34	0.16	0.95	0.00017	7.5	10.4	0.01	0.0066	2.27	24.1	0.00047	0.00044	0.02003									

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
176	Base Case (NP20)	RS03 Untreated	20.08	6.62	108	0.08	113.6	0.0159	0.0204	0.0236	26.8	0.00007	5.1	0.00020	0.00046	0.00070	1.37	0.13	0.77	0.00018	4.7	10.0	0.01	0.0042	1.82	22.3	0.00048	0.00039	0.00867	0.00187	20	0.27	0.0002	1.3479	0.0000	0.0020	0.0007	0.0016
177	Base Case (NP20)	RS03 Treated	23.27	6.56	98	0.09	99.3	0.0170	0.0190	0.0218	24.6	0.00007	4.4	0.00020	0.00043	0.00074	1.45	0.12	0.85	0.00017	4.9	9.0	0.01	0.0046	2.23	18.9	0.00048	0.00042	0.00874	0.00177	21	0.29	0.0002	1.4294	0.0000	0.0021	0.0007	0.0015
178	Base Case (NP20)	RS03 Untreated	22.12	6.56	96	0.09	99.3	0.0171	0.0192	0.0213	24.6	0.00007	4.4	0.00020	0.00043	0.00074	1.47	0.12	0.88	0.00016	5.1	8.7	0.01	0.0049	2.24	18.1	0.00048	0.00042	0.00853	0.00179	22	0.30	0.0002	1.4454	0.0000	0.0021	0.0007	0.0015
179	Base Case (NP20)	RS03 Treated	18.39	6.55	108	0.09	107.8	0.0171	0.0222	0.0226	26.2	0.00007	4.8	0.00020	0.00044	0.00074	1.38	0.13	0.95	0.00017	5.5	9.9	0.01	0.0051	2.24	21.0	0.00047	0.00043	0.00894	0.00187	23	0.31	0.0002	1.3600	0.0000	0.0023	0.0008	0.0015
180	Base Case (NP20)	RS03 Untreated	18.30	6.56	104	0.09	105.7	0.0171	0.0211	0.0226	25.7	0.00007	4.7	0.00020	0.00044	0.00073	1.38	0.12	0.91	0.00017	5.2	9.7	0.01	0.0049	2.23	20.5	0.00048	0.00043	0.00884	0.00184	22	0.30	0.0002	1.3634	0.0000	0.0023	0.0008	0.0015
181	Base Case (NP20)	RS03 Treated	18.55	6.52	104	0.10	104.3	0.0177	0.0216	0.0224	25.6	0.00007	4.7	0.00020	0.00043	0.00075	1.38	0.12	0.98	0.00016	5.5	9.7	0.01	0.0050	2.48	20.2	0.00048	0.00045	0.01014	0.00182	23	0.30	0.0002	1.3603	0.0000	0.0022	0.0008	0.0015
182	Base Case (NP20)	RS03 Untreated	22.87	6.55	102	0.09	102.7	0.0176	0.0211	0.0222	25.2	0.00007	4.6	0.00020	0.00044	0.00074	1.40	0.12	0.94	0.00016	5.3	9.5	0.01	0.0051	2.33	19.8	0.00048	0.00043	0.00999	0.00182	23	0.30	0.0002	1.3802	0.0000	0.0023	0.0007	0.0015
183	Base Case (NP20)	RS03 Treated	17.56	6.53	105	0.10	105.9	0.0173	0.0220	0.0225	26.0	0.00007	4.8	0.00020	0.00044	0.00075	1.39	0.12	0.97	0.00016	5.5	9.8	0.01	0.0048	2.40	20.5	0.00048	0.00044	0.01024	0.00184	22	0.31	0.0002	1.3685	0.0000	0.0022	0.0008	0.0015
184	Base Case (NP20)	RS03 Untreated	22.28	6.57	101	0.09	102.6	0.0165	0.0202	0.0220	25.2	0.00007	4.6	0.00020	0.00044	0.00073	1.43	0.12	0.87	0.00017	5.0	9.3	0.01	0.0043	2.13	19.6	0.00048	0.00041	0.00903	0.00181	20	0.29	0.0002	1.4122	0.0000	0.0020	0.0007	0.0016
185	Base Case (NP20)	RS03 Treated	32.87	6.58	94	0.08	93.7	0.0173	0.0182	0.0210	23.7	0.00007	4.1	0.00020	0.00043	0.00075	1.52	0.11	0.84	0.00016	4.8	8.4	0.01	0.0050	2.18	17.3	0.00049	0.00040	0.00853	0.00172	22	0.29	0.0002	1.4921	0.0000	0.0022	0.0007	0.0015
186	Base Case (NP20)	RS03 Untreated	16.91	6.54	107	0.10	106.9	0.0173	0.0230	0.0222	26.3	0.00007	4.8	0.00020	0.00043	0.00075	1.41	0.13	1.02	0.00016	5.7	9.9	0.01	0.0050	2.41	20.5	0.00047	0.00044	0.01110	0.00184	23	0.32	0.0002	1.3896	0.0000	0.0022	0.0008	0.0015
187	Base Case (NP20)	RS03 Treated	22.62	6.56	99	0.09	100.0	0.0171	0.0200	0.0218	24.7	0.00007	4.4	0.00020	0.00043	0.00074	1.44	0.12	0.89	0.00016	5.0	9.1	0.01	0.0049	2.20	19.0	0.00048	0.00042	0.01014	0.00177	22	0.29	0.0002	1.4187	0.0000	0.0022	0.0007	0.0015
188	Base Case (NP20)	RS03 Untreated	19.56	6.56	100	0.09	101.2	0.0168	0.0204	0.0218	25.0	0.00007	4.5	0.00020	0.00043	0.00074	1.43	0.12	0.90	0.00016	5.0	9.2	0.01	0.0045	2.21	19.2	0.00048	0.00042	0.00908	0.00178	21	0.29	0.0002	1.4124	0.0000	0.0020	0.0007	0.0015
189	Base Case (NP20)	RS03 Treated	17.40	6.56	108	0.09	110.3	0.0169	0.0223	0.0229	26.6	0.00007	5.0	0.00020	0.00044	0.00073	1.37	0.13	0.94	0.00017	5.3	10.1	0.01	0.0046	2.25	21.4	0.00047	0.00043	0.00968	0.00183	22	0.29	0.0002	1.3473	0.0000	0.0021	0.0007	0.0016
190	Base Case (NP20)	RS03 Untreated	21.95	6.58	101	0.08	102.2	0.0168	0.0197	0.0221	25.1	0.00007	4.6	0.00020	0.00044	0.00073	1.43	0.12	0.85	0.00017	4.8	9.2	0.01	0.0045	2.13	19.5	0.00048	0.00041	0.00837	0.00177	21	0.28	0.0002	1.4072	0.0000	0.0020	0.0007	0.0016
191	Base Case (NP20)	RS03 Treated	14.21	6.54	107	0.09	108.9	0.0168	0.0221	0.0227	26.4	0.00007	4.9	0.00020	0.00044	0.00074	1.36	0.12	0.95	0.00017	5.3	10.0	0.01	0.0044	2.32	21.1	0.00047	0.00044	0.00942	0.00181	21	0.29	0.0002	1.3474	0.0000	0.0020	0.0007	0.0015
192	Base Case (NP20)	RS03 Untreated	12.97	6.54	115	0.09	119.5	0.0169	0.0238	0.0242	28.1	0.00007	5.4	0.00021	0.00045	0.00072	1.28	0.13	0.95	0.00017	5.3	10.9	0.01	0.0044	2.23	23.7	0.00047	0.00044	0.00978	0.00187	22	0.29	0.0002	1.2624	0.0000	0.0022	0.0008	0.0016
193	Base Case (NP20)	RS03 Treated	13.80	6.58	115	0.09	121.0	0.0165	0.0233	0.0245	28.2	0.00007	5.5	0.00021	0.00046	0.00074	1.28	0.13	0.88	0.00017	5.0	10.9	0.01	0.0044	2.03	24.0	0.00047	0.00042	0.00902	0.00188	22	0.27	0.0002	1.2586	0.0000	0.0021	0.0007	0.0016
194	Base Case (NP20)	RS03 Untreated	22.05	6.55	99	0.09	99.9	0.0173	0.0195	0.0214	24.6	0.00007	4.5	0.00020	0.00044	0.00074	1.42	0.12	0.87	0.00017	4.8	9.1	0.01	0.0046	2.29	19.1	0.00048	0.00043	0.00814	0.00175	22	0.27	0.0002	1.3988	0.0000	0.0021	0.0007	0.0016
195	Base Case (NP20)	RS03 Treated	23.39	6.56	102	0.09	102.7	0.0169	0.0207	0.0221	25.3	0.00007	4.6	0.00020	0.00044	0.00074	1.43	0.12	0.91	0.00017	5.1	9.4	0.01	0.0046	2.21	19.6	0.00048	0.00042	0.00917	0.00180	21	0.29	0.0002	1.4068	0.0000	0.0021	0.0007	0.0015
196	Base Case (NP20)	RS03 Untreated	19.21	6.59	106	0.08	108.2	0.0164	0.0210	0.0226	26.3	0.00007	4.8	0.00020	0.00044	0.00073	1.43	0.12	0.87	0.00017	4.9	9.7	0.01	0.0045	2.04	20.6	0.00048	0.00041	0.00906	0.00181	21	0.29	0.0002	1.4155	0.0000	0.0020	0.0007	0.0016
197	Base Case (NP20)	RS03 Treated	19.21	6.58	105	0.08	107.4	0.0167	0.0205	0.0227	26.1	0.00007	4.8	0.00020	0.00044	0.00073	1.42	0.12	0.86	0.00017	4.8	9.6	0.01	0.0045	2.11	20.6	0.00048	0.00041	0.00856	0.00180	21	0.28	0.0002	1.4052	0.0000	0.0020	0.0007	0.0016
198	Base Case (NP20)	RS03 Untreated	13.90	6.53	110	0.09	112.4	0.0170	0.0226	0.0232	27.1	0.00007	5.1	0.00020	0.00044	0.00074	1.35	0.13	0.96	0.00017	5.3	10.4	0.01	0.0045	2.35	21.9	0.00047	0.00044	0.00953	0.00183	22	0.29	0.0002	1.3428	0.0000	0.0021	0.0007	0.0016
199	Base Case (NP20)	RS03 Treated	15.49	6.57	111	0.09	114.7	0.0162	0.0222	0.0235	27.3	0.00007	5.2	0.00020	0.00045	0.00072	1.33	0.13	0.89	0.00017	5.0	10.4	0.01	0.0041	2.10	22.4	0.00047	0.00042	0.00898	0.00185	20	0.28	0.0002	1.3152	0.0000	0.0020	0.0007	0.0016
0	Base Case (NP20)	RS03 Treated	23.45	6.57	77	0.02	64.6	0.0207	0.0031	0.0199	24.1	0.00007	2.6	0.00001	0.00001	0.00009	1.73	0.10	0.00	0.00017	3.7	4.1	0.00	0.0002	0.01	12.7	0.00001	0.00000	0.00022	0.00004	17	0.00	0.0001	1.6651	0.0000	0.0008	0.0001	0.0000
1	Base Case (NP20)	RS03 Treated	14.34	6.57	139	0.09	114.1	0.0208	0.0002	0.0318	39.5	0.00007	6.0	0.00002	0.00001	0.00011	1.31	0.27	0.01	0.00017	16.4	9.9	0.00	0.0004	0.03	35.7	0.00001	0.00001	0.00118	0.00009	25	0.01	0.0002	1.2939	0.0000	0.0016	0.0003	0.0000
2	Base Case (NP20)	RS03 Treated	14.78	6.56	137	0.09	112.4	0.0209	0.0002	0.0322	38.9	0.00007	5.9	0.00002	0.00001	0.00010	1.32	0.28	0.01	0.00017	17.1	9.7	0.00	0.0004	0.03	36.3	0.00001	0.00001	0.00126	0.00009								

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO ₃ /L)	Acidity (mg CaCO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO ₃ -N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO ₄ (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
62	Base Case (NP20)	RS03 Treated	12.19	6.56	148	0.09	125.1	0.0027	0.0002	0.0253	41.9	0.00007	6.0	0.00000	0.00001	0.00010	1.25	0.22	0.01	0.00017	11.1	10.6	0.00	0.0002	0.02	30.8	0.00001	0.00001	0.00074	0.00007	20	0.01	0.0002	1.2392	0.0000	0.0010	0.0002	0.0000
63	Base Case (NP20)	RS03 Treated	20.88	6.59	135	0.08	113.3	0.0028	0.0002	0.0241	38.6	0.00007	5.3	0.00000	0.00001	0.00010	1.35	0.19	0.01	0.00017	9.1	9.4	0.00	0.0002	0.02	26.6	0.00001	0.00001	0.00074	0.00006	19	0.01	0.0002	1.3261	0.0000	0.0009	0.0001	0.0000
64	Base Case (NP20)	RS03 Treated	18.96	6.55	132	0.09	107.0	0.0028	0.0002	0.0230	37.6	0.00007	5.1	0.00000	0.00001	0.00011	1.39	0.19	0.01	0.00017	9.8	9.1	0.00	0.0002	0.02	25.4	0.00001	0.00001	0.00062	0.00006	19	0.01	0.0002	1.3755	0.0000	0.0009	0.0001	0.0000
65	Base Case (NP20)	RS03 Treated	19.86	6.54	123	0.09	99.3	0.0029	0.0002	0.0222	35.4	0.00007	4.7	0.00000	0.00001	0.00011	1.43	0.18	0.01	0.00016	9.5	8.5	0.00	0.0002	0.02	23.5	0.00001	0.00001	0.00050	0.00006	19	0.01	0.0002	1.4104	0.0000	0.0009	0.0001	0.0000
66	Base Case (NP20)	RS03 Treated	15.55	6.55	137	0.09	112.3	0.0028	0.0002	0.0236	38.5	0.00007	5.3	0.00000	0.00001	0.00011	1.35	0.21	0.01	0.00017	10.7	9.6	0.00	0.0002	0.02	27.4	0.00001	0.00001	0.00071	0.00006	20	0.01	0.0002	1.3382	0.0000	0.0010	0.0002	0.0000
67	Base Case (NP20)	RS03 Treated	18.02	6.56	132	0.09	109.0	0.0028	0.0002	0.0233	37.8	0.00007	5.1	0.00000	0.00001	0.00011	1.38	0.19	0.01	0.00017	9.6	9.2	0.00	0.0002	0.02	25.8	0.00001	0.00001	0.00061	0.00006	19	0.01	0.0002	1.3605	0.0000	0.0009	0.0001	0.0000
68	Base Case (NP20)	RS03 Treated	20.42	6.56	132	0.09	108.2	0.0028	0.0002	0.0231	37.7	0.00007	5.1	0.00000	0.00001	0.00011	1.38	0.19	0.01	0.00017	9.7	9.2	0.00	0.0002	0.02	25.6	0.00001	0.00001	0.00062	0.00006	19	0.01	0.0002	1.3676	0.0000	0.0009	0.0001	0.0000
69	Base Case (NP20)	RS03 Treated	10.61	6.54	150	0.09	125.9	0.0028	0.0002	0.0251	42.1	0.00007	6.0	0.00000	0.00001	0.00010	1.27	0.22	0.01	0.00017	10.8	10.7	0.00	0.0002	0.02	30.5	0.00001	0.00001	0.00071	0.00006	20	0.01	0.0002	1.2533	0.0000	0.0010	0.0002	0.0000
70	Base Case (NP20)	RS03 Treated	17.26	6.59	136	0.08	113.8	0.0027	0.0002	0.0239	38.7	0.00007	5.3	0.00000	0.00001	0.00010	1.35	0.18	0.01	0.00017	8.8	9.4	0.00	0.0002	0.02	26.3	0.00001	0.00001	0.00055	0.00006	18	0.01	0.0002	1.3320	0.0000	0.0009	0.0001	0.0000
71	Base Case (NP20)	RS03 Treated	23.94	6.57	125	0.08	102.4	0.0029	0.0002	0.0226	36.0	0.00007	4.7	0.00000	0.00001	0.00011	1.44	0.17	0.01	0.00017	8.4	8.5	0.00	0.0002	0.02	23.3	0.00001	0.00001	0.00051	0.00005	19	0.01	0.0002	1.4146	0.0000	0.0009	0.0001	0.0000
72	Base Case (NP20)	RS03 Treated	13.25	6.53	138	0.10	114.0	0.0029	0.0002	0.0238	39.4	0.00007	5.4	0.00000	0.00001	0.00011	1.34	0.20	0.01	0.00017	10.3	9.8	0.00	0.0002	0.02	27.3	0.00001	0.00001	0.00066	0.00006	20	0.01	0.0002	1.3253	0.0000	0.0010	0.0002	0.0000
73	Base Case (NP20)	RS03 Treated	17.65	6.57	135	0.09	111.8	0.0028	0.0002	0.0236	38.4	0.00007	5.2	0.00000	0.00001	0.00010	1.36	0.19	0.01	0.00017	9.2	9.4	0.00	0.0002	0.02	26.1	0.00001	0.00001	0.00058	0.00006	19	0.01	0.0002	1.3403	0.0000	0.0010	0.0002	0.0000
74	Base Case (NP20)	RS03 Treated	14.50	6.56	140	0.09	116.8	0.0028	0.0002	0.0242	39.8	0.00007	5.5	0.00000	0.00001	0.00010	1.33	0.19	0.01	0.00017	9.4	9.8	0.00	0.0002	0.02	27.2	0.00001	0.00001	0.00059	0.00006	19	0.01	0.0002	1.3126	0.0000	0.0009	0.0001	0.0000
75	Base Case (NP20)	RS03 Treated	12.36	6.56	144	0.09	121.1	0.0027	0.0002	0.0246	40.8	0.00007	5.7	0.00000	0.00001	0.00010	1.28	0.19	0.01	0.00017	9.3	10.2	0.00	0.0002	0.02	28.3	0.00001	0.00001	0.00058	0.00006	18	0.01	0.0002	1.2686	0.0000	0.0009	0.0001	0.0000
76	Base Case (NP20)	RS03 Treated	20.08	6.62	135	0.08	113.9	0.0026	0.0002	0.0238	38.6	0.00007	5.3	0.00000	0.00001	0.00010	1.37	0.17	0.01	0.00018	7.9	9.3	0.00	0.0001	0.02	25.7	0.00001	0.00001	0.00048	0.00005	17	0.01	0.0002	1.4379	0.0000	0.0008	0.0001	0.0000
77	Base Case (NP20)	RS03 Treated	23.27	6.56	123	0.09	99.6	0.0028	0.0002	0.0220	35.4	0.00007	4.6	0.00000	0.00001	0.00011	1.45	0.16	0.01	0.00017	8.0	8.3	0.00	0.0002	0.02	22.1	0.00001	0.00001	0.00047	0.00005	18	0.01	0.0002	1.4294	0.0000	0.0008	0.0001	0.0000
78	Base Case (NP20)	RS03 Treated	22.12	6.56	120	0.09	96.1	0.0029	0.0002	0.0215	34.6	0.00007	4.4	0.00000	0.00001	0.00011	1.47	0.17	0.01	0.00016	8.5	8.1	0.00	0.0002	0.02	21.8	0.00001	0.00001	0.00052	0.00005	18	0.01	0.0002	1.4454	0.0000	0.0008	0.0001	0.0000
79	Base Case (NP20)	RS03 Treated	16.39	6.55	132	0.09	108.3	0.0029	0.0002	0.0229	37.7	0.00007	5.0	0.00000	0.00001	0.00011	1.38	0.19	0.01	0.00016	8.6	9.2	0.00	0.0002	0.02	25.3	0.00001	0.00001	0.00061	0.00006	19	0.01	0.0002	1.3600	0.0000	0.0009	0.0001	0.0000
80	Base Case (NP20)	RS03 Treated	18.30	6.56	129	0.09	106.1	0.0029	0.0002	0.0228	37.0	0.00007	4.9	0.00000	0.00001	0.00011	1.38	0.18	0.01	0.00017	8.8	9.0	0.00	0.0002	0.02	24.3	0.00001	0.00001	0.00054	0.00005	19	0.01	0.0002	1.3634	0.0000	0.0009	0.0001	0.0000
81	Base Case (NP20)	RS03 Treated	18.55	6.52	129	0.10	104.7	0.0030	0.0002	0.0226	36.9	0.00007	4.9	0.00000	0.00001	0.00011	1.38	0.18	0.01	0.00016	9.2	9.0	0.00	0.0002	0.02	24.1	0.00001	0.00001	0.00055	0.00005	19	0.01	0.0002	1.3603	0.0000	0.0009	0.0001	0.0000
82	Base Case (NP20)	RS03 Treated	22.87	6.55	127	0.09	103.1	0.0029	0.0002	0.0225	36.3	0.00007	4.8	0.00000	0.00001	0.00011	1.40	0.18	0.01	0.00016	8.9	8.8	0.00	0.0002	0.02	23.6	0.00001	0.00001	0.00055	0.00005	19	0.01	0.0002	1.3802	0.0000	0.0009	0.0001	0.0000
83	Base Case (NP20)	RS03 Treated	17.56	6.53	131	0.10	106.3	0.0029	0.0002	0.0227	37.4	0.00007	5.0	0.00000	0.00001	0.00011	1.39	0.18	0.01	0.00016	9.3	9.1	0.00	0.0002	0.02	24.5	0.00001	0.00001	0.00057	0.00006	19	0.01	0.0002	1.3685	0.0000	0.0009	0.0001	0.0000
84	Base Case (NP20)	RS03 Treated	22.28	6.57	126	0.09	102.9	0.0028	0.0002	0.0222	36.3	0.00007	4.7	0.00000	0.00001	0.00011	1.43	0.17	0.01	0.00017	8.3	8.6	0.00	0.0002	0.02	23.1	0.00001	0.00001	0.00050	0.00005	17	0.01	0.0002	1.4122	0.0000	0.0008	0.0001	0.0000
85	Base Case (NP20)	RS03 Treated	32.87	6.58	117	0.08	94.0	0.0029	0.0002	0.0212	34.0	0.00007	4.2	0.00000	0.00001	0.00011	1.52	0.16	0.01	0.00016	7.7	7.8	0.00	0.0002	0.02	20.4	0.00001	0.00001	0.00045	0.00005	18	0.01	0.0002	1.4941	0.0000	0.0008	0.0001	0.0000
86	Base Case (NP20)	RS03 Treated	16.91	6.54	133	0.10	107.4	0.0029	0.0002	0.0224	37.9	0.00007	5.0	0.00000	0.00001	0.00011	1.41	0.19	0.01	0.00016	9.9	9.2	0.00	0.0002	0.02	24.9	0.00001	0.00001	0.00062	0.00006	20	0.01	0.0002	1.3896	0.0000	0.0009	0.0001	0.0000
87	Base Case (NP20)	RS03 Treated	22.62	6.56	124	0.09	100.4	0.0029	0.0002	0.0219	35.6	0.00007	4.6	0.00000	0.00001	0.00011	1.44	0.17	0.01	0.00016	8.2	8.4	0.00	0.0002	0.02	22.4	0.00001	0.00001	0.00049	0.00005	18	0.01	0.0002	1.4187	0.0000	0.0008	0.0001	0.0000
88	Base Case (NP20)	RS03 Treated	19.56	6.56	125	0.09	101.6	0.0028	0.0002	0.0220	36.0	0.00007	4.7	0.00000	0.00001	0.00011	1.43	0.17	0.01	0.00016	8.3	8.6	0.00	0.0002	0.02	22.7	0.00001	0.00001	0.00049	0.00005	18	0.01						

Year	Scenario	Station	Flow Rate (L/s)	pH	Hardness (mg CaCO3/L)	Acidity (mg CaCO3/L)	Alkalinity (mg CaCO3/L)	Al (mg/L)	As (mg/L)	B (mg/L)	Ca (mg/L)	Cd (mg/L)	Cl (mg/L)	Co (mg/L)	Cr (mg/L)	Cu (mg/L)	DOC (mg/L)	F (mg/L)	Fe (mg/L)	Hg (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Mo (mg/L)	NO3-N (mg/L)	Na (mg/L)	Ni (mg/L)	Pb (mg/L)	Sb (mg/L)	Se (mg/L)	SO4 (mg/L)	Sr (mg/L)	Ti (mg/L)	TOC (mg/L)	CN (mg/L)	U (mg/L)	V (mg/L)	Zn (mg/L)
148	Base Case (NP20)	RS03 Treated	18.37	6.54	127	0.09	102.8	0.0029	0.0002	0.0221	36.3	0.00007	4.6	0.00000	0.00001	0.00011	1.42	0.13	0.01	0.00016	6.0	8.7	0.00	0.0001	0.02	20.5	0.00001	0.00001	0.00027	0.00004	16	0.01	0.0002	1.4010	0.0000	0.0006	0.0001	0.0000
149	Base Case (NP20)	RS03 Treated	20.92	6.55	123	0.09	100.0	0.0029	0.0002	0.0220	35.4	0.00007	4.5	0.00000	0.00001	0.00011	1.43	0.13	0.01	0.00016	5.8	8.4	0.00	0.0001	0.02	19.9	0.00001	0.00001	0.00026	0.00004	17	0.01	0.0002	1.4010	0.0000	0.0006	0.0001	0.0000
150	Base Case (NP20)	RS03 Treated	17.11	6.54	129	0.09	104.8	0.0029	0.0002	0.0224	36.8	0.00007	4.7	0.00000	0.00001	0.00011	1.38	0.14	0.01	0.00016	6.2	8.9	0.00	0.0001	0.02	21.1	0.00001	0.00001	0.00028	0.00004	16	0.01	0.0002	1.3651	0.0000	0.0006	0.0001	0.0000
151	Base Case (NP20)	RS03 Treated	24.47	6.56	127	0.09	103.9	0.0029	0.0002	0.0223	36.5	0.00007	4.7	0.00000	0.00001	0.00011	1.42	0.13	0.01	0.00017	5.9	8.7	0.00	0.0001	0.02	20.7	0.00001	0.00001	0.00026	0.00004	16	0.01	0.0002	1.3689	0.0000	0.0006	0.0001	0.0000
152	Base Case (NP20)	RS03 Treated	21.76	6.56	126	0.09	102.7	0.0029	0.0002	0.0220	36.3	0.00007	4.6	0.00000	0.00001	0.00011	1.44	0.13	0.01	0.00016	5.8	8.6	0.00	0.0001	0.02	20.3	0.00001	0.00001	0.00026	0.00004	16	0.01	0.0002	1.4132	0.0000	0.0006	0.0001	0.0000
153	Base Case (NP20)	RS03 Treated	20.80	6.57	127	0.09	103.8	0.0028	0.0002	0.0221	36.5	0.00007	4.6	0.00000	0.00001	0.00011	1.43	0.13	0.01	0.00017	5.7	8.7	0.00	0.0001	0.02	20.5	0.00001	0.00001	0.00025	0.00004	16	0.01	0.0002	1.4103	0.0000	0.0006	0.0001	0.0000
154	Base Case (NP20)	RS03 Treated	19.92	6.56	125	0.09	102.0	0.0029	0.0002	0.0221	36.0	0.00007	4.6	0.00000	0.00001	0.00011	1.44	0.13	0.01	0.00017	5.7	8.6	0.00	0.0001	0.02	20.0	0.00001	0.00001	0.00024	0.00004	16	0.01	0.0002	1.4193	0.0000	0.0006	0.0001	0.0000
155	Base Case (NP20)	RS03 Treated	17.06	6.54	130	0.09	105.9	0.0029	0.0002	0.0226	37.1	0.00007	4.8	0.00000	0.00001	0.00011	1.39	0.13	0.01	0.00017	6.0	9.0	0.00	0.0001	0.02	21.1	0.00001	0.00001	0.00026	0.00004	16	0.01	0.0002	1.3698	0.0000	0.0006	0.0001	0.0000
156	Base Case (NP20)	RS03 Treated	22.21	6.55	128	0.09	104.1	0.0029	0.0002	0.0224	36.6	0.00007	4.7	0.00000	0.00001	0.00011	1.40	0.13	0.01	0.00017	5.9	8.9	0.00	0.0001	0.02	20.7	0.00001	0.00001	0.00025	0.00004	16	0.01	0.0002	1.3827	0.0000	0.0006	0.0001	0.0000
157	Base Case (NP20)	RS03 Treated	18.39	6.53	127	0.09	103.0	0.0029	0.0002	0.0222	36.4	0.00007	4.6	0.00000	0.00001	0.00011	1.42	0.13	0.01	0.00016	5.9	8.8	0.00	0.0001	0.02	20.3	0.00001	0.00001	0.00025	0.00004	16	0.01	0.0002	1.3992	0.0000	0.0006	0.0001	0.0000
158	Base Case (NP20)	RS03 Treated	16.51	6.51	132	0.10	107.4	0.0030	0.0002	0.0228	37.6	0.00007	4.9	0.00000	0.00001	0.00011	1.35	0.14	0.01	0.00016	6.3	9.3	0.00	0.0001	0.03	21.6	0.00001	0.00001	0.00027	0.00004	17	0.01	0.0002	1.3366	0.0000	0.0006	0.0001	0.0000
159	Base Case (NP20)	RS03 Treated	22.81	6.54	127	0.09	103.9	0.0030	0.0002	0.0224	36.5	0.00007	4.7	0.00000	0.00001	0.00011	1.40	0.13	0.01	0.00017	5.8	8.8	0.00	0.0001	0.02	20.6	0.00001	0.00001	0.00025	0.00004	17	0.01	0.0002	1.3772	0.0000	0.0006	0.0001	0.0000
160	Base Case (NP20)	RS03 Treated	15.32	6.51	134	0.10	109.0	0.0030	0.0002	0.0228	38.0	0.00007	5.0	0.00000	0.00001	0.00011	1.35	0.14	0.01	0.00016	6.3	9.4	0.00	0.0001	0.02	21.9	0.00001	0.00001	0.00027	0.00004	17	0.01	0.0002	1.3258	0.0000	0.0006	0.0001	0.0000
161	Base Case (NP20)	RS03 Treated	16.09	6.54	137	0.10	112.8	0.0028	0.0002	0.0232	38.8	0.00007	5.2	0.00000	0.00001	0.00011	1.31	0.14	0.01	0.00017	6.1	9.7	0.00	0.0001	0.02	22.7	0.00001	0.00001	0.00026	0.00004	15	0.01	0.0002	1.3006	0.0000	0.0006	0.0001	0.0000
162	Base Case (NP20)	RS03 Treated	12.21	6.56	147	0.09	124.5	0.0027	0.0002	0.0247	41.6	0.00007	5.7	0.00000	0.00001	0.00010	1.25	0.14	0.01	0.00017	5.9	10.4	0.00	0.0001	0.02	25.4	0.00001	0.00001	0.00025	0.00004	16	0.01	0.0002	1.2405	0.0000	0.0006	0.0001	0.0000
163	Base Case (NP20)	RS03 Treated	20.91	6.59	134	0.08	112.8	0.0028	0.0002	0.0236	38.3	0.00007	5.1	0.00000	0.00001	0.00010	1.35	0.13	0.01	0.00017	5.2	9.3	0.00	0.0001	0.02	22.5	0.00001	0.00001	0.00020	0.00004	15	0.01	0.0002	1.3269	0.0000	0.0006	0.0001	0.0000
164	Base Case (NP20)	RS03 Treated	19.00	6.55	130	0.09	106.6	0.0028	0.0002	0.0225	37.5	0.00007	4.8	0.00000	0.00001	0.00011	1.39	0.13	0.01	0.00017	5.6	9.0	0.00	0.0001	0.02	20.9	0.00001	0.00001	0.00022	0.00004	15	0.01	0.0002	1.3759	0.0000	0.0006	0.0001	0.0000
165	Base Case (NP20)	RS03 Treated	19.86	6.54	122	0.09	99.0	0.0029	0.0002	0.0218	35.2	0.00007	4.4	0.00000	0.00001	0.00011	1.43	0.12	0.01	0.00016	5.4	8.4	0.00	0.0001	0.02	19.2	0.00001	0.00001	0.00021	0.00004	16	0.01	0.0002	1.4105	0.0000	0.0006	0.0001	0.0000
166	Base Case (NP20)	RS03 Treated	15.88	6.55	135	0.09	111.8	0.0028	0.0002	0.0231	38.6	0.00007	5.1	0.00000	0.00001	0.00011	1.35	0.13	0.01	0.00017	5.8	9.5	0.00	0.0001	0.02	22.2	0.00001	0.00001	0.00024	0.00004	15	0.01	0.0002	1.3382	0.0000	0.0006	0.0001	0.0000
167	Base Case (NP20)	RS03 Treated	18.02	6.56	131	0.09	108.6	0.0028	0.0002	0.0229	37.6	0.00007	4.9	0.00000	0.00001	0.00011	1.38	0.13	0.01	0.00017	5.4	9.1	0.00	0.0001	0.02	21.4	0.00001	0.00001	0.00022	0.00004	15	0.01	0.0002	1.3605	0.0000	0.0006	0.0001	0.0000
168	Base Case (NP20)	RS03 Treated	20.42	6.56	131	0.09	107.8	0.0028	0.0002	0.0227	37.5	0.00007	4.9	0.00000	0.00001	0.00011	1.38	0.13	0.01	0.00017	5.5	9.1	0.00	0.0001	0.02	21.2	0.00001	0.00001	0.00022	0.00004	15	0.01	0.0002	1.3676	0.0000	0.0006	0.0001	0.0000
169	Base Case (NP20)	RS03 Treated	10.61	6.54	149	0.09	125.4	0.0028	0.0002	0.0246	42.1	0.00007	5.7	0.00000	0.00001	0.00010	1.27	0.14	0.01	0.00017	5.9	10.6	0.00	0.0001	0.02	25.3	0.00001	0.00001	0.00024	0.00004	15	0.01	0.0002	1.2533	0.0000	0.0006	0.0001	0.0000
170	Base Case (NP20)	RS03 Treated	17.26	6.59	135	0.08	113.4	0.0027	0.0002	0.0236	38.5	0.00007	5.1	0.00000	0.00001	0.00010	1.35	0.13	0.01	0.00017	5.1	9.3	0.00	0.0001	0.02	22.4	0.00001	0.00001	0.00020	0.00004	15	0.01	0.0002	1.3320	0.0000	0.0006	0.0001	0.0000
171	Base Case (NP20)	RS03 Treated	23.94	6.57	124	0.08	102.1	0.0029	0.0002	0.0223	35.8	0.00007	4.6	0.00000	0.00001	0.00011	1.44	0.12	0.01	0.00017	5.0	8.4	0.00	0.0001	0.02	19.7	0.00001	0.00001	0.00019	0.00004	15	0.01	0.0002	1.4146	0.0000	0.0006	0.0001	0.0000
172	Base Case (NP20)	RS03 Treated	13.25	6.53	137	0.10	113.6	0.0029	0.0002	0.0234	39.1	0.00007	5.1	0.00000	0.00001	0.00011	1.34	0.13	0.01	0.00017	5.8	9.6	0.00	0.0001	0.02	22.5	0.00001	0.00001	0.00023	0.00004	16	0.01	0.0002	1.3253	0.0000	0.0006	0.0001	0.0000
173	Base Case (NP20)	RS03 Treated	17.65	6.57	134	0.09	111.4	0.0028	0.0002	0.0233	38.6	0.00007	5.0	0.00000	0.00001	0.00010	1.36	0.13	0.01	0.00017	5.3	9.3	0.00	0.0001	0.02	22.0	0.00001	0.00001	0.00021	0.00004	15	0.01	0.0002	1.3403	0.0000	0.0006	0.0001	0.0000
174	Base Case (NP20)	RS03 Treated	14.50	6.56	139	0.09	116.4	0.0028	0.0002	0.0239	39.6	0.00007	5.3	0.00000	0.00001	0.00010	1.33	0.13	0.01	0.00017	5.4	9.7	0.00	0.0001	0.02	23.1	0.00001	0.00001	0.00021	0.00004	16	0.01	0.0002	1.3126	0.0000	0.0006	0.0001	0.0000
175	Base Case (NP20)	RS03 Treated	12.36	6.56	143	0.09	120.7	0.0027	0.0002	0.0243	40.6	0.00007	5.5	0.00000	0.00001	0.00010	1.28	0.14	0.01	0.00017	5.4	10.1	0.00	0.0001	0.02	24.1	0.00001	0.00001	0.00021	0.00004	15	0.01	0.0002	1.2696	0.0000	0.0006	0.0001	0.0000
176	Base Case (NP20)	RS03 Treated	20.09	6.62	134	0.08	113.6	0.0028	0.0002	0.0236	38.4	0.00007	5.1	0.00000	0.00001	0.00010	1.37	0.13	0.01	0.00016	4.7	9.2	0.00	0.0001	0.02	22.3	0.00001	0.00001	0.00017	0.00004	14	0.01	0.0002	1.3479	0.0000	0.0006	0.0001	0.0000
177	Base Case (NP20)	RS03 Treated	23.27	6.56	122	0.09	99.3	0.0028	0.0002	0.0218	35.2	0.00007	4.4	0.00000	0.00001	0.00011	1.45	0.12	0.01	0.00017	4.9	8.3																

APPENDIX E LIMITATIONS

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