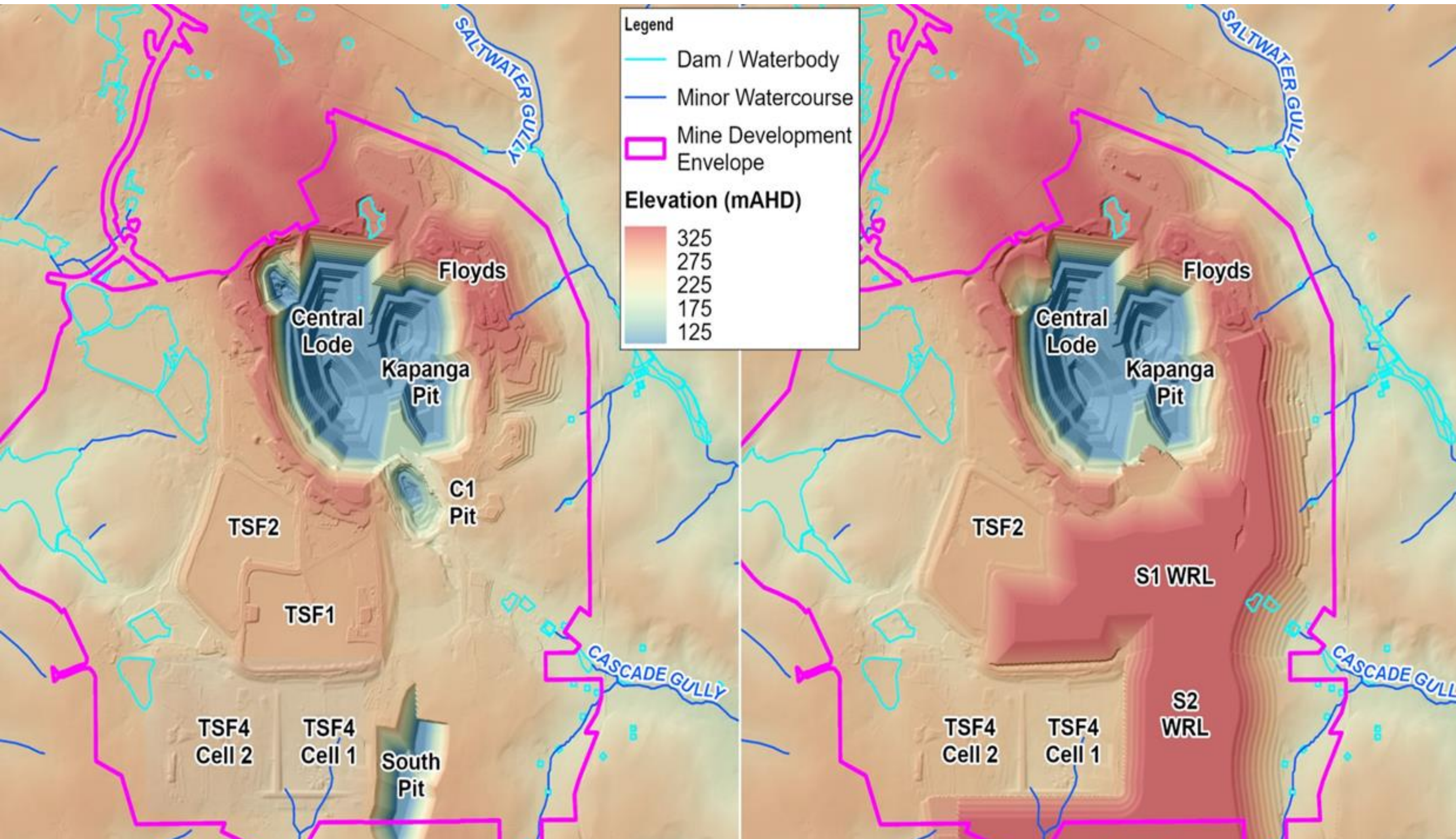
S2 and S7 Waste Rock Landforms Hydrology Study

Surface Water and Mass Balance Modelling

Talison Lithium Pty Ltd

05 March 2025

→ **The Power of Commitment**



Project name	S2 and S7 Waste Rock Landforms Hydrology Study
Document title	S2 and S7 Waste Rock Landforms Hydrology Study | Surface Water and Mass Balance Modelling
Project number	12604929
File name	12604929-REP-0-Eastern Catchments Study - Water Balance Modelling - S2 and S7x.docx

Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S3	A	M Gebauer L Yoong	W Schafer	On File	F Hannon	On File	24 Oct 2024
S4	0	M Gebauer	W Schafer		F Hannon	Fionnuala Hannon	24 Feb 2025
[Status code]							
[Status code]							
[Status code]							

GHD Pty Ltd | ABN 39 008 488 373
999 Hay Street, Level 10
Perth, Western Australia 6000, Australia
T +61 8 6222 8222 | **F** +61 8 6222 8555 | **E** permail@ghd.com | **ghd.com**

The Power of Commitment

Contents

1. Introduction **1**

1.1 Background 1

1.2 Study Area 3

1.3 Purpose of this Report 3

1.4 Scope and Limitations 3

1.4.1 General Limitations 3

1.4.2 Model Limitations 3

1.5 Assumptions and Limitations 5

2. Model Set-up **6**

2.1 Overview 6

2.2 Model Configuration 6

2.3 Climate 9

2.4 Catchment Runoff 11

2.4.1 Catchment Areas 11

2.4.2 AWBM Calibration 12

2.5 Facilities 13

2.5.1 WRLs 13

2.5.2 Salt Water Gully Dam 13

2.6 Contaminants of Potential Concern 13

2.6.1 Water Quality Guidelines 13

2.6.2 Contaminant Sources 14

2.6.3 Monitoring Data 15

2.7 Groundwater Interaction 15

2.7.1 Groundwater Discharges and Quality 15

2.7.2 Seepage from SWG Dam 20

2.8 Surface Water Quality 20

3. Predictive Modelling **23**

3.1 Approach 23

3.2 Interpretation of Results 23

3.3 Salt Water Dam Balance 23

3.4 Receiving Catchments 24

3.4.1 Streamflow 24

3.4.2 Lithium Concentrations 25

3.4.3 Arsenic Concentrations 27

3.4.4 Sulphate Concentrations 28

3.4.5 Nitrate Concentrations 30

4. Conclusions **32**

5. References **33**

Table index

Table 2.1: Summary of Surface Runoff Catchments 12
Table 2.2: AWBM Calibration Parameters 13
Table 2.3: Summary of differences between groundwater modelling stages 16
Table 2.4: Initial CoPC Concentrations 20
Table 3.1: Statistics of Simulated Flows (ML/day) at Reporting Sites from 2025 to 2063 24
Table 3.2: Statistics of Simulated Lithium Concentrations in mg/L (2025 to 2063) 25
Table 3.3: Statistics of Simulated Arsenic Concentrations in mg/L (2025 to 2063) 27
Table 3.4: Statistics of Simulated Sulphate Concentrations in mg/L (2025 to 2063) 28
Table 3.5: Statistics of Simulated Nitrate Concentrations in mg/L (2025 to 2063) 30

Figure index

Figure 1.1: Proposed 2052 Landform 2
Figure 1.2: Surface Water Model Domain 4
Figure 2.1: Schematic Configuration of Streamflow Routes 7
Figure 2.2: Model Reporting Locations 8
Figure 2.3: Schematic Configuration of AWBM (Boughton, 2004) 9
Figure 2.4: Conceptualisation of Interface Between Groundwater Model Outputs and WBM Inputs 10
Figure 2.5: Annual Climate Variables 11
Figure 2.6: WRL Footprint Progression for Capping 14
Figure 2.7 Comparison of Arsenic Concentrations in Groundwater Discharges 18
Figure 2.8 Comparison of Lithium Concentrations in Groundwater Discharges 19
Figure 2.9: Surface Water Monitoring Sites 21
Figure 2.10: Average Annual Lithium Concentrations at Source 22
Figure 2.11: Average Annual Arsenic Concentrations at Source 22
Figure 2.12: Average Annual Sulphate Concentrations at Source 22
Figure 2.13: Average Annual Nitrate Concentrations at Source 22
Figure 3.1: Results Interpretation (Simulations to Probability Distribution) 23
Figure 3.2: Ranges of Simulated Lithium Concentrations (2025 to 2063) 26
Figure 3.3: Ranges of Simulated Arsenic Concentrations (2025 to 2063) 28
Figure 3.4: Ranges of Simulated Sulphate Concentrations (2025 to 2063) 29
Figure 3.5: Ranges of Simulated Nitrate Concentrations (2025 to 2063) 31

Appendices

Appendix A Modelled Surface Water Catchments
Appendix B Lithium Concentrations Adopted in Baseflows
Appendix C Arsenic Concentrations Adopted in Baseflows
Appendix D Sulphate Concentrations Adopted in Baseflows
Appendix E Nitrate Concentrations Adopted in Baseflows
Appendix F SWG Dam Water Balance Results
Appendix G Simulated Streamflow
Appendix H Simulated Lithium Concentrations
Appendix I Simulated Arsenic Concentrations
Appendix J Simulated Sulphate Concentrations
Appendix K Simulated Nitrate Concentrations

1. Introduction

1.1 Background

GHD Pty Ltd (GHD) was engaged by Talison Lithium Australia Pty Ltd (Talison) to undertake a study (the Study) of the streamflow and water quality impacts on the surface water receiving environment resulting from additional proposed open pits and Waste Rock Landforms (WRLs). The Study includes hydrological and hydrogeological modelling of the proposed facilities and subsequent preliminary assessments of the environmental and human health risks arising from these facilities. The Study is focussed on the following facilities:

– Expansion of existing open cut pits and development of new open cut pits.
– Establishment of the new Floyds Stage 2 (S2) and Stage 7 (S7) WRLs.

The current planned landform of the proposed facilities at closure in circa 2052 is presented in **Figure 1.1**.

Assessments of the southern and eastern parts of the mine site and the receiving catchments have been undertaken through the *TSF4 Seepage Assessment* (Woljenup Creek) and *Eastern Catchments Hydrology Study* (Hester Brook and its tributaries Salt Water Gully and Cascades Creek). The following reports are therefore referred to in the Study:

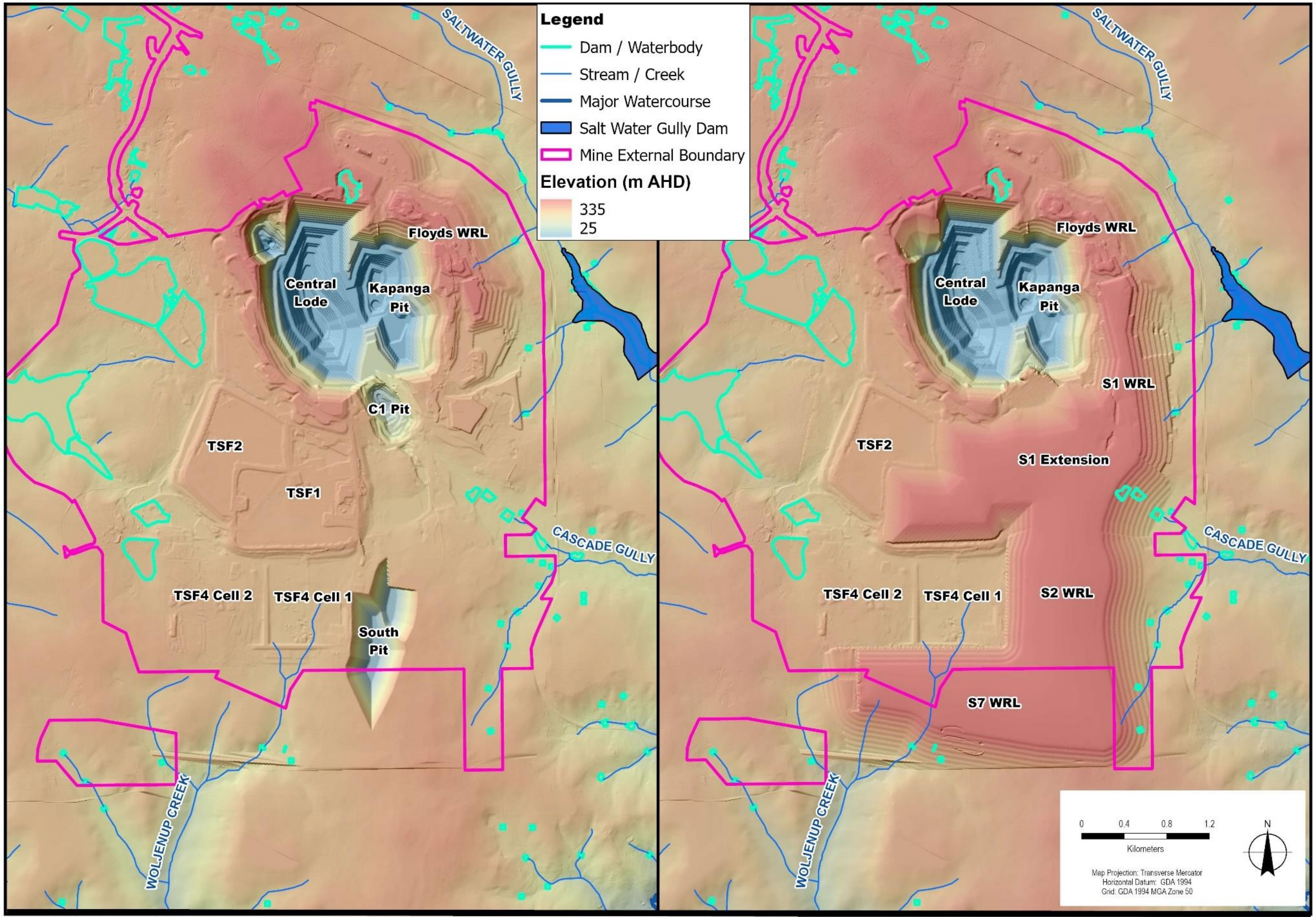
– TSF4 Seepage Assessment: Conceptual Hydrogeological Model (GHD, 2023a).
– TSF4 Seepage Assessment: Groundwater Model Update and Site Assessment (GHD, 2023b).
– TSF4 Seepage Assessment: Human Health and Environmental Risk Assessment (GHD, 2023c).
– TSF4 Seepage Assessment: Seepage Monitoring and Management Plan (GHD, 2023d).
– TSF4 Seepage Assessment: Woljenup Creek Hydrological Assessment. (GHD, 2023e).
– Eastern Catchments Study: Gap Analysis Report (GHD, 2023f).
– Eastern Catchments Study: Conceptual Hydrogeological Model (GHD, 2023g).
– Eastern Catchments Study: Surface Water and Mass Balance Modelling Report (GHD, 2023h).
– Eastern Catchments Study: Groundwater Modelling Report (GHD, 2023i).
– Eastern Catchments Study: Preliminary Risk Assessment Report (GHD, 2023j).
– Eastern Catchments Study: Monitoring Plan (GHD, 2023k).
– TSF1 Seepage Assessment: Human Health and Environmental Risk Assessment (GHD, 2023l).

The purpose of this Study is to complete a baseline investigation and preliminary risk assessment of the proposed facilities to understand the efficacy of existing management and monitoring of the existing and approved facilities as well as the proposed S2 and S7 WRLs and expanded pits. The Study is also intended inform the need for management measures for incorporation into the proposed facility designs; the findings will be considered and incorporated into various Environmental Management Plans as appropriate. In doing so, the Study will support applications for various environmental approvals for the facilities.

The Study deliverables are:

– Gap Analysis (GHD, 2024a).
– Conceptual Hydrogeological Model (GHD, 2024b)
– Water Resources Monitoring Plan (GHD, 2024c).
– Groundwater Modelling (GHD, 2024d).
– Surface Water and Mass Balance Modelling (this report).
– Preliminary Risk Assessment (GHD, 2024e).

This report documents the water and mass balance modelling of key Contaminants of Potential Concern (CoPCs) emanating from the proposed facilities within the surface water. The model was configured to simulate the water and mass balance of four key CoPCs (lithium, arsenic, sulphate, and nitrate) for the surface water flows throughout the Hester Brook and Woljenup Creek catchments.



\\Ghdnet\ghd\AU\Perth\Projects\61\12604929\GIS\Maps\Working\SurfaceWaterMaps\Talison_Figures_S2_S7\Talison_Figures_S2_S7.aprx - 8 Landform 2052
Print date: 20 Feb 2025 - 15:45

Data source: GHD - Mine Facilities/ Landform Boundaries (2024). Talison Lithium - Mine External Boundary (2023); Mine Act Tenure Boundary (2024). Elevation (2022); 2052 WRL and Pit Shells Surface (2023) (GHD Edited 2024). Landgate - Dam / Waterbody, Major Watercourse, Stream / Creek (2020), Elevation (2020). Created by: hzhang4

Figure 1.1: Proposed 2052 Landform

1.2 Study Area

The surface water model domain encompasses the planned footprints of the expanded pits, the S2 and S7 WRLs, the upstream contributing catchment areas, and the downstream receiving environment. This includes Woljenup Creek and Hester Brook and their tributaries up to the confluence with Blackwood River. A plan of the surface water model domain is provided in **Figure 1.2**. The domain also includes the proposed Salt Water Gully (SWG) Dam.

1.3 Purpose of this Report

The purpose of this report is to document and interpret the results of the water and mass balance modelling to predict the potential flows and ranges in CoPC concentrations in the receiving surface water environment under a base case and impact scenarios. The modelling results will be used to inform the subsequent preliminary risk assessment investigating the impacts of the proposed facilities on the receiving environment during operation and post-closure.

1.4 Scope and Limitations

1.4.1 General Limitations

This report has been prepared by GHD for Talison and may only be used and relied on by Talison for the purpose agreed between GHD and Talison as set out in **Section 1.3** of this report.

GHD otherwise disclaims responsibility to any person other than Talison arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer **Section 1.5** of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Talison and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1.4.2 Model Limitations

GHD has developed the water and mass balance model (“Model”) for, and for the benefit and sole use of, Talison to support the assessment of the relative impact of the proposed establishment of the S2 and S7 WRLs on the surface water receiving environment and must not be used for any other purpose or by any other person.

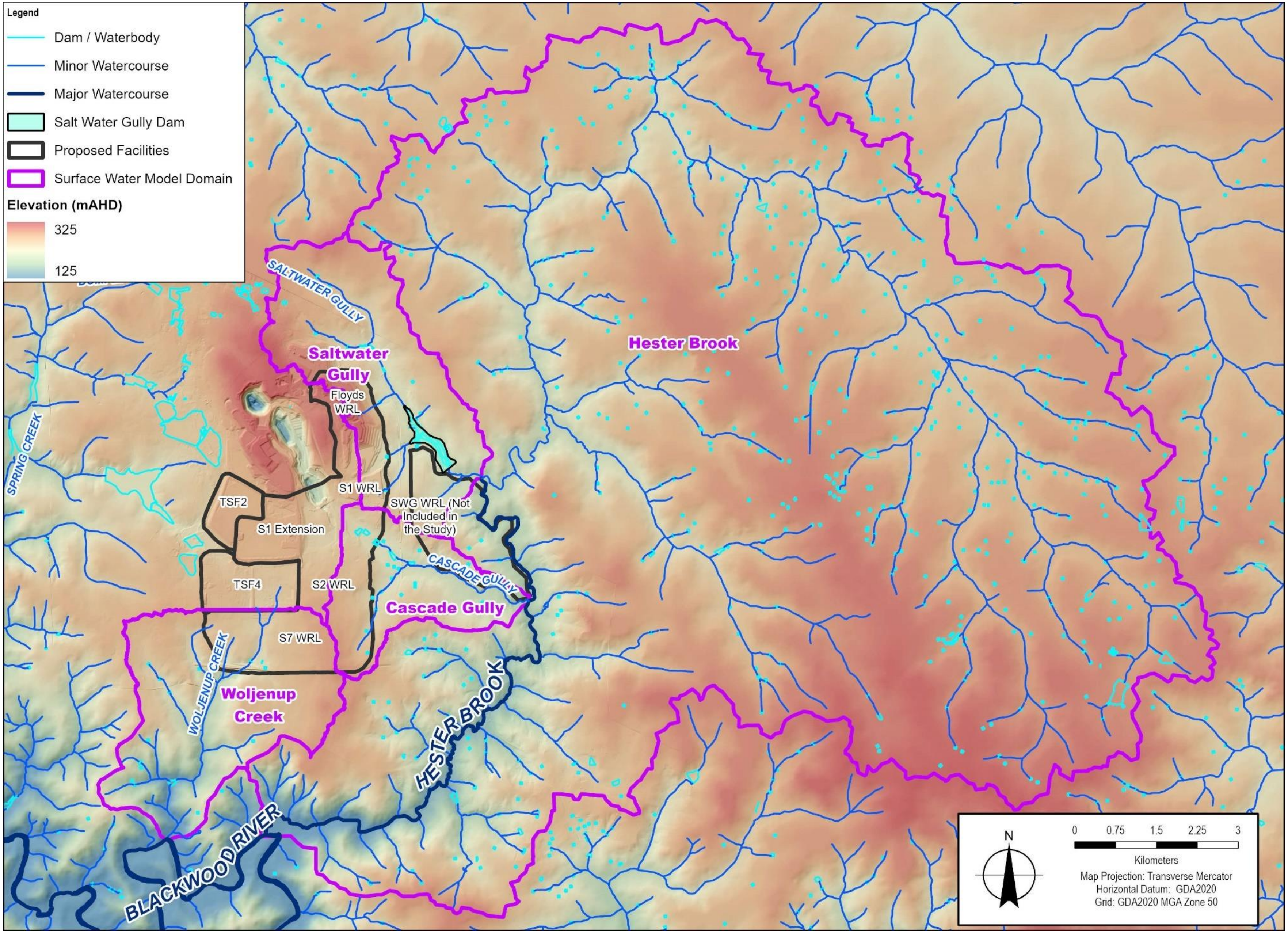


Figure 1.2: Surface Water Model Domain

The Model is a representation only and does not reflect reality in every aspect. The Model contains simplified assumptions to derive a modelled outcome. The actual variables will inevitably be different to those used to prepare the Model. Accordingly, the outputs of the Model cannot be relied upon to represent actual conditions without due consideration of the inherent and expected inaccuracies. Such considerations are beyond GHD's scope.

The information, data, and assumptions ("Inputs") used as inputs into the Model are from publicly available sources or provided by or on behalf of the Talison, (including possibly through stakeholder engagements). GHD has not independently verified or checked Inputs beyond its agreed scope of work. GHD's scope of work does not include review or update of the Model as further Inputs becomes available.

The Model is limited by the mathematical rules and assumptions that are set out in the Report or included in the Model and by the software environment in which the Model is developed.

The Model is a bespoke customised model and not intended to be amended in any form or extracted to other software for amending. Any change made to the Model, other than by GHD, is undertaken on the express understanding that GHD is not responsible, and has no liability, for the changed Model including any outputs.

1.5 Assumptions and Limitations

The following assumptions and limitations apply to the water and mass balance modelling:

– The mass balance assumes that the CoPCs are conservative substances that do not decay over time or react with the other substances (i.e., only subject to concentration or dilution).
– All water storages are assumed to be well mixed and always contain a homogenous mixture (i.e., stratification not considered). This can result in "artificially" elevated CoPC concentrations at low dam levels and flows in the receiving environment.
– The facilities are modelled in staged construction of the landforms through linear interpolation between the 10-year periods of landform milestones.
– Future climate scenarios were not assessed in this report as it's outside the agreed scope of work.

2. Model Set-up

2.1 Overview

The Water Balance Model (WBM) was developed using GoldSim, which is a probabilistic simulation software package for modelling and visualisation of dynamic and complex systems. The WBM involves dynamic simulation of the hydrological processes (water balance) in the receiving environment, including Woljenup Creek and Hester Brook as the key tributaries of Cascade Gully and Salt Water Gully.

In addition to the water balance, the WBM also performs a mass balance of the key CoPCs, namely arsenic and lithium. These metals are representative of strongly and weakly attenuated CoPCs, the adsorption characteristics of which can be used to reliably infer the distribution of other CoPCs (i.e. sulphate and nitrate).

The mass balance assumes that the CoPCs are conservative substances that do not decay over time or react with the other substances (i.e., only subject to concentration or dilution). All water storages are assumed to be well mixed and always contain a homogenous mixture (i.e., stratification not considered).

The WBM does not interact with the site wide WBM of Talison's Mine Water Circuit previously developed by GHD (2023m), although it has been built to enable easier inclusion in the future.

2.2 Model Configuration

The WBM simulates the hydrology of Hester Brook and Woljenup Creek (including tributaries) and SWG dam for the following two scenarios:

– **Base Case**: Existing site and operations, including the approved expansion of Floyds WRL (S1).
– **Impact Case**: Base Case plus the proposed pits, S2 and S7 WRLs, and SWG Dam.

The establishment and capping of the new WRLs will alter the catchment areas and consequently flows discharging off the site. Accordingly, the WBM is configured to simulate the streamflow from the various sub-catchments that were delineated from the natural topography and proposed WRLs. The extents and progressions of the catchment areas are shown in five-year increments in **Appendix A** for conditions from 2025 (baseline) to 2053 (year that waste dumping to WRLs is proposed to cease).

Runoff from each sub-catchment is simulated using the Australian Water Balance Model (AWBM), which is a module in GoldSim and which is the same rainfall-runoff model adopted in previous water balance work by GHD (2023m). Sub-catchment runoff is routed downstream by simple addition of flows as indicated in the schematic diagram shown in **Figure 2.1**. The model reporting locations are depicted in **Figure 2.2** and are as follows:

– Salt Water Gully Outlet to Hester Brook, including discharges from the Mine Services Area (MSA), Floyds and S1 WRLs for the Base Case and Impact Scenarios, and SWG Dam for Impact Case.
– Cascade Gully Outlet to Hester Brook, including discharges from the S1 WRL for the Base Cases and Impact Case, and from S2 and S7 WRLs for Impact Case.
– Hester Brook Upstream of Cascade Gully Confluence, including discharges from the from Salt Water Gully Outlet to Hester Brook and the external catchment of Hester Brook Upstream of Salt Water Gully Confluence.
– Hester Brook Upstream of Salt Water Gully Confluence, which does not include any mine impacted discharges and is the same for all simulated scenarios.
– Hester Brook Downstream of Cascade Gully Confluence, including discharges from all the catchments described in the above points.
– Hester Brook at Hester Hill, including the discharges described in the above points.
– Upper Woljenup Creek, including nil development discharges from S7 WRL for the Base Case and discharges from S7 WRL for the Impact Case (discharges from TSF1/TSF4 included in both Base and Impact Cases).
– Middle Woljenup Creek, including all discharges from the Upper Woljenup Creek.
– Lower Woljenup Creek to the Blackwood River, including all discharges from the Upper and Middle Woljenup Creek.

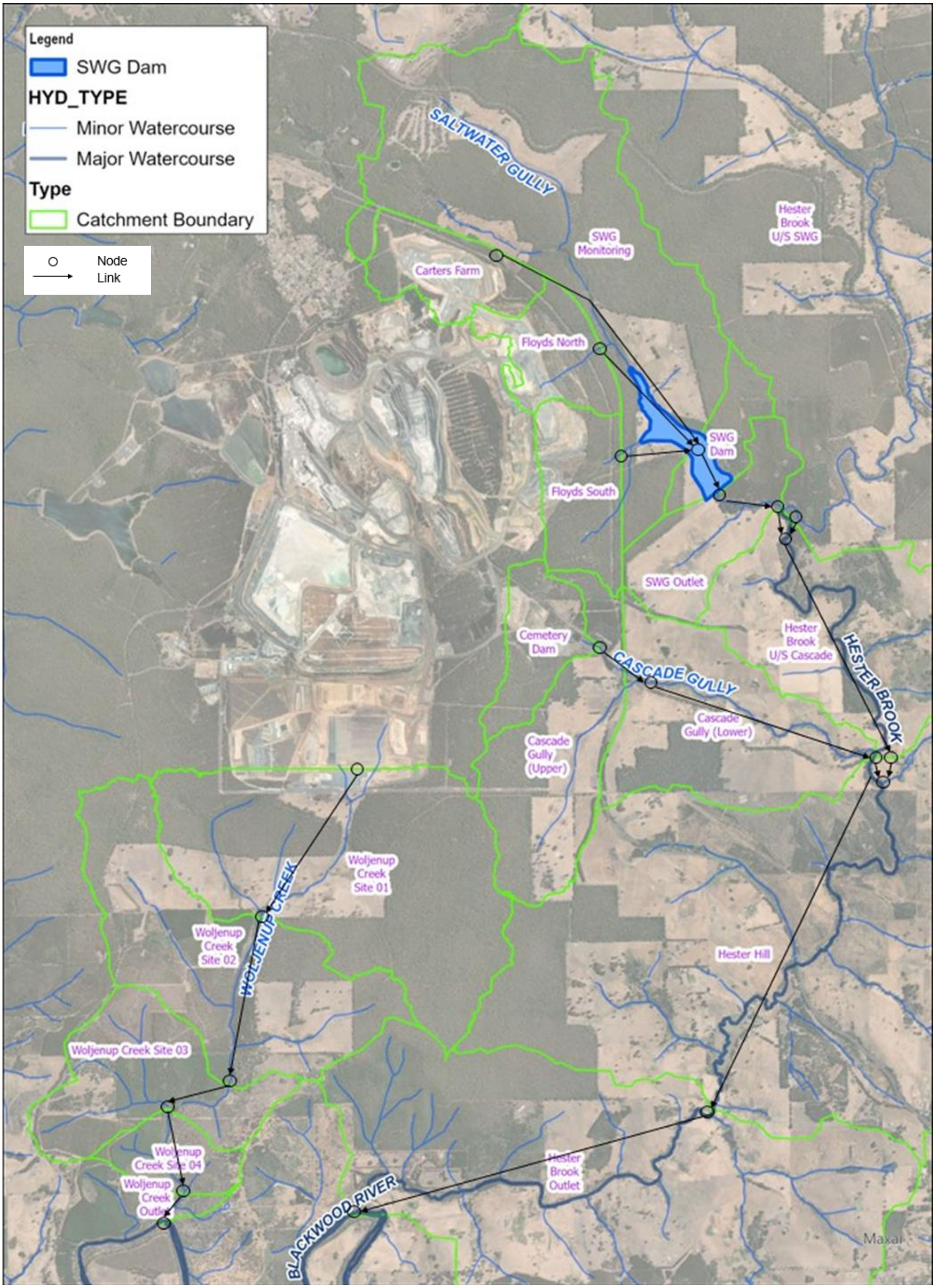
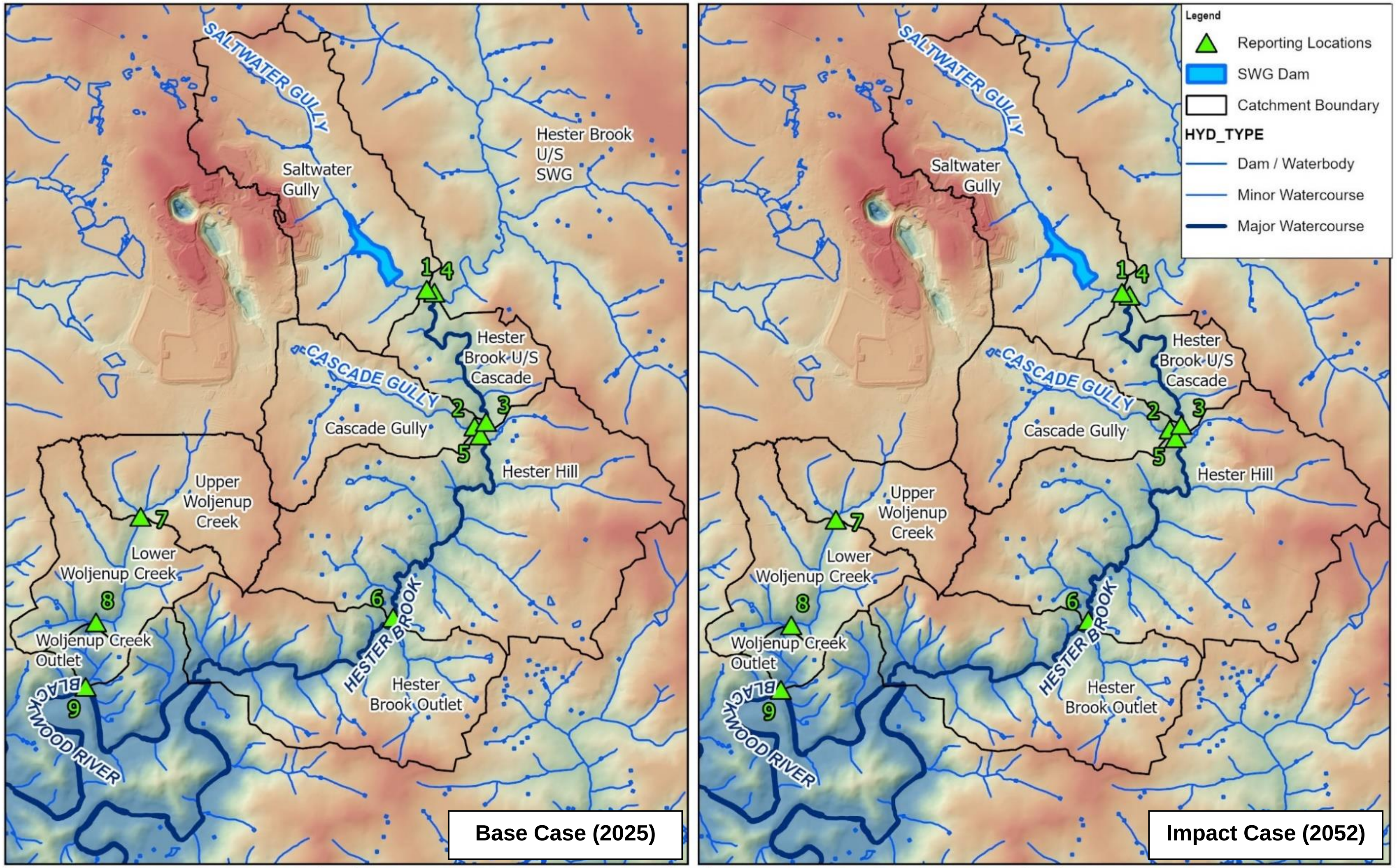


Figure 2.1: Schematic Configuration of Streamflow Routes



id	Name
1	Saltwater Gully Outlet
2	Cascade Gully Outlet
3	Hester Brook U/S Cascade Gully

id	Name
4	Hester Brook U/S Saltwater Gully
5	Hester Brook D/S Cascade Gully
6	Hester Hill

id	Name
7	Upper Woljenup Creek
8	Lower Woljenup Creek
9	Woljenup Creek Outlet to Blackwood River

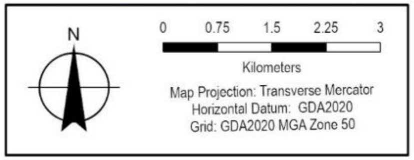


Figure 2.2: Model Reporting Locations

The AWBM simulates both surface runoff and baseflow as detailed in the schematic diagram in **Figure 2.3**. The CoPC loads in the groundwater discharge to surface water were determined by groundwater modelling (GHD, 2024d) and are simulated as inputs to the WBM. The CoPC loads are converted to concentrations using the baseflows simulated by the AWBM model. A conceptualisation of the interface between the groundwater modelling outputs and WBM inputs is presented in **Figure 2.4.**

SWG Dam is configured in the WBM (Impact Scenario), the water balance of which is simulated as follows:

- Incidental rainfall over the full dam area.
- Evaporative losses over the dam water surface area.
- Catchment runoff from the contributing catchment area.
- Seepage losses over the dam water surface area.
- Outflows (i.e., passing flows and transfers).
- Overflows of stored water exceeding the spillway level.

The WBM operates at a daily time step performing a water balance at the dam and sub-catchments.

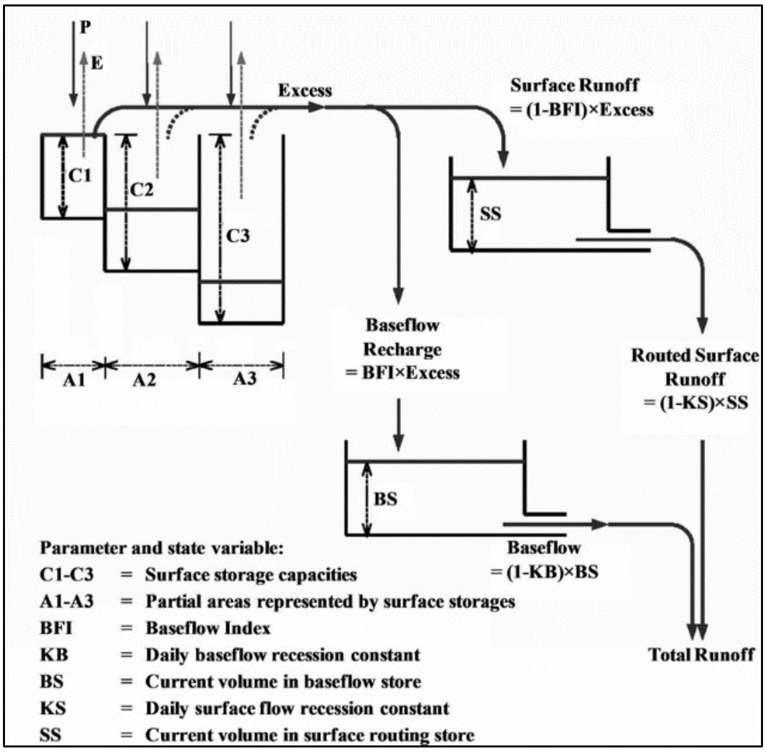


Figure 2.3: Schematic Configuration of AWBM (Boughton, 2004)

2.3 Climate

Historical climate data, including both rainfall and evaporation, was sourced from the Scientific Information for Land Owners (SILO)[1] database (Queensland Department of Environment and Science and Bureau of Meteorology, 2024). The annual averages of these climate variables are presented in **Figure 2.5**.

The drying climate at the site is noted by the declining slope of the linear trend depicted in **Figure 2.5**. Whilst future climate scenarios sit outside the agreed scope of work, the following is noted:

- Future climate scenarios cannot account for the effects of future land use changes, which could offset the effects of climate change (e.g., cleared areas could generate higher runoff despite less rainfall).

[1] SILO is a database of Australian climate data from 1889 to the present, hosted by the Queensland Department of Environment and Science (DES) constructed from observational data obtained from BoM and other suppliers.

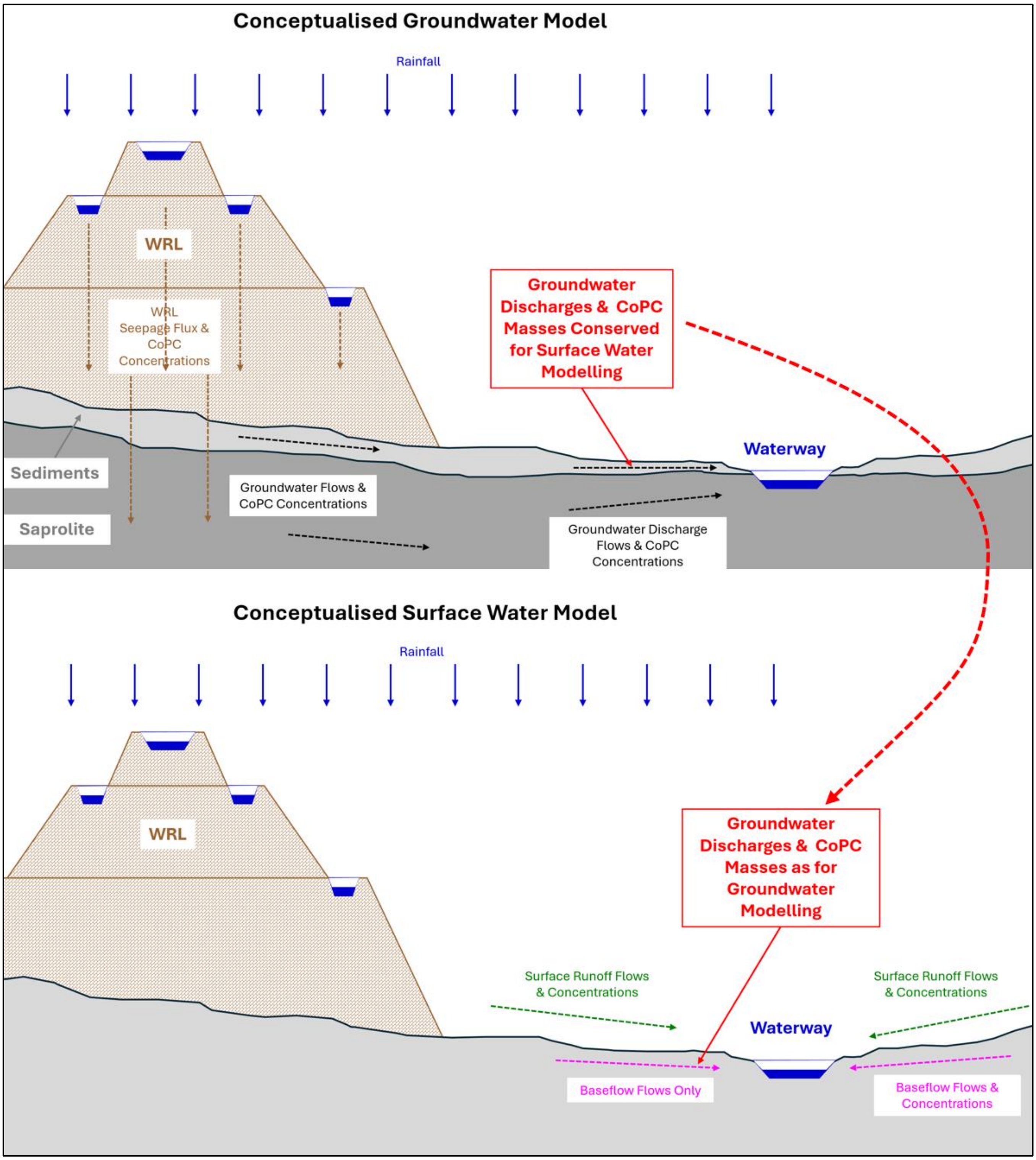


Figure 2.4: Conceptualisation of Interface Between Groundwater Model Outputs and WBM Inputs

– The water quality values adopted in the modelling are based on historical data, which already shows elevated CoPC concentrations. Whilst a reduction in rainfall and discharges may result in changes in the CoPC concentrations, the assessment results demonstrate if the concept will satisfy regulatory requirements under the “best of scenarios”.
– Future climate scenarios were assessed in the *TSF4 Seepage Assessment: Woljenup Creek Hydrological Assessment* (GHD, 2023e), whereby the climate sequences used in the water balance simulations adopted those from the Bureau of Meteorology (2022). The projections were provided for the sixteen future climate sequences for two Representative Concentration Pathways (RCP), namely RCP 4.5 and RCP 8.5. The simulated discharge results for the RCP 4.5 scenario (the moderate pathway) displayed a relatively flat long-term trend over the simulation period.

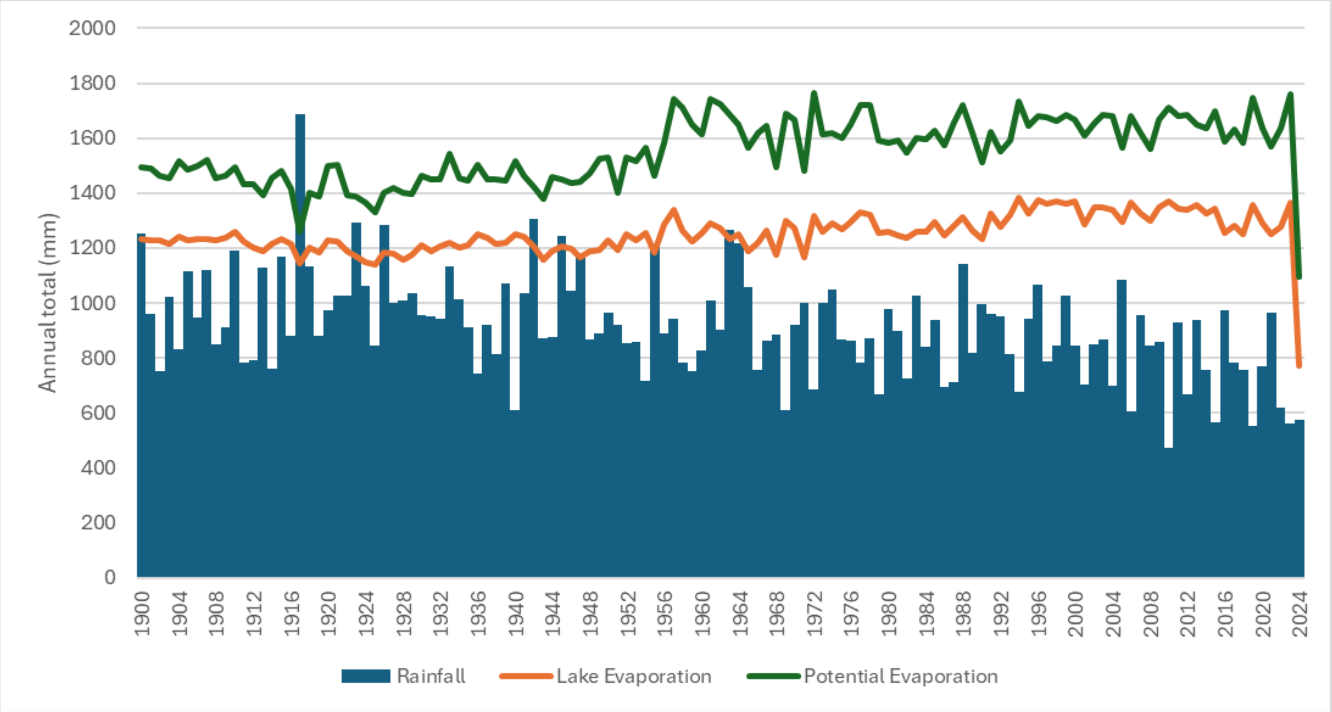


Figure 2.5: Annual Climate Variables

2.4 Catchment Runoff

2.4.1 Catchment Areas

Catchments of the key areas draining the mine site were delineated for the Base Case and Impact Case scenarios using the following information:

– A combination of LiDAR survey of the overall mine development area (produced by Talison in May 2022) and regional 5 m contours from Landgate.
– Future WRL and open pit designs (provided by Talison).

The resulting catchment areas are shown in **Appendix A** and summarised in **Table 2.1**. Catchments defined for 2027 conditions have been applied from 1 January 2025.

Table 2.1: Summary of Surface Runoff Catchments

Catchment Name	Catchment Areas (Ha)			
	WRL	Other Mine Affected	External	Total
2027				
Salt Water Gully	184.60	5.55	1,004.06	1,194.21
Cascade Gully	57.83	3.26	557.72	618.81
Hester Brook[2]	-	-	16,602.02	16,602.02
Woljenup Creek	-	34.53	1,188.71	1,223.24
Mine Pits	174.30	283.29	60.83	518.42
TSFs	0.23	335.61	8.79	344.63
2032				
Salt Water Gully	184.35	5.54	1,004.07	1,193.96
Cascade Gully	157.80	3.14	428.52	589.46
Hester Brook	-	-	16,602.02	16,602.02
Woljenup Creek	90.25	26.06	1,102.92	1,219.23
Mine Pits	175.11	275.40	56.57	507.08
TSFs	63.49	342.41	2.55	408.44
2042				
Salt Water Gully	182.75	5.50	1,003.98	1,192.23
Cascade Gully	205.82	3.14	407.39	616.34
Hester Brook	-	-	16,602.02	16,602.02
Woljenup Creek	100.08	0.94	980.22	1,081.23
Mine Pits	136.67	278.11	5.04	419.82
TSFs	253.20	342.11	18.01	613.32
2052 (Closure)				
Salt Water Gully	184.76	5.43	1,003.98	1,194.16
Cascade Gully	215.91	3.13	407.32	626.35
Hester Brook	-	-	16,602.02	16,602.02
Woljenup Creek	159.17	0.94	980.18	1,140.29
Mine Pits	191.71	280.13	5.00	476.84
TSFs	243.00	224.03	-	467.03

2.4.2 AWBM Calibration

AWBM parameters (see **Figure 2.3**) were determined for the two primary land uses within the Study Area, namely ‘mine affected’ and ‘external catchment’. The mine affected catchments comprise the WRLs, TSFs, and Mine Services Area. The external catchments comprise natural vegetation, forested and areas cleared for agricultural purposes. The parameters were determined via calibration in the *Eastern Catchments Study: Surface Water and Mass Balance Modelling* (GHD, 2023h) and the adopted parameters are listed in **Table 2.2**.

[2] Excluding Salt Water and Cascade Gullies.

Table 2.2: AWBM Calibration Parameters

AWBM parameter	Mine affected	External catchment[13]
Partial areas A_1 / A_2 / A_3	0.380 / 0.180 / 0.440	0.141 / 0.394 / 0.466
Surface store capacities C_1 / C_2 / C_3 (mm)	45.00 / 155.00 / 320.00	6.19 / 188.27 / 475.60
Baseflow index BFI	0.200	0.558
Baseflow recession constant K_b	0.220	0.964
Surface flow recession constant K_s	0.990	0.489

2.5 Facilities

2.5.1 WRLs

To be consistent with the groundwater modelling (GHD, 2024d), capping of the WRLs is assumed to be progressive and complete on the date of the final dumping. The dates at which the various parts of the WRLs are assumed to be capped are depicted in **Figure 2.6**. Capping of the WRLs is simulated as catch and release covers as outlined in the Conceptual Site Model (GHD, 2024b). This cover would contain all surface runoff, but still allow some recharge to groundwater and baseflows resulting from groundwater discharges to the downgradient creeks. It should be noted that capping of the WRLs was not simulated in the *Eastern Catchments Hydrology Study: Surface Water and Mass Balance Modelling* (GHD, 2023h) so direct comparison of the results is not possible.

The Floyds and S1 WRL are considered complete and capped from the outset in both the Base Case and Impact Case Scenarios (i.e. as of 1 January 2025) to provide consistency between this modelling approach and that for the *Eastern Catchments Hydrology Study:* Surface *Water and Mass Balance Modelling* (GHD, 2023h). The final form of the Floyds and S1 WRLs topography is scheduled for completion in 2027, so the 2027 landforms and catchments have been applied from 1 January 2025.

Planning of the S2 and S7 WRLs is at an early stage and was modelled based on the early indicative designs of these landforms provided by Talison. Due to the progressive staging of the WRL developments, this staged approach has been included in the modelling. The locations of the proposed facilities is provided in **Figure 1.1** and the landform progressions and timings thereof are illustrated in **Appendix A**.

2.5.2 Salt Water Gully Dam

SWG Dam is located on Salt Water Gully, east of the Floyds WRL. Planning of the dam is at a conceptual stage and the assumed completion date is January 2026, which the model incorporates as a step change. The construction phase has not been modelled. Details of the storage characteristics and operating rules of SWG Dam adopted in the *Eastern Catchments Study: Surface Water and Mass Balance Modelling* (GHD, 2023h).

2.6 Contaminants of Potential Concern

2.6.1 Water Quality Guidelines

Water Quality Guidelines (WQGs) for key CoPCs were derived for the downstream beneficial uses in the *TSF4 Seepage Assessment: Site-Specific Water Quality Guidelines* (GHD, 2023n) and have been adopted to assess the CoPCs arising from the construction of S2 and S7 WRLs.

---

[3] External catchment refers to natural vegetation, forested and cleared for agricultural

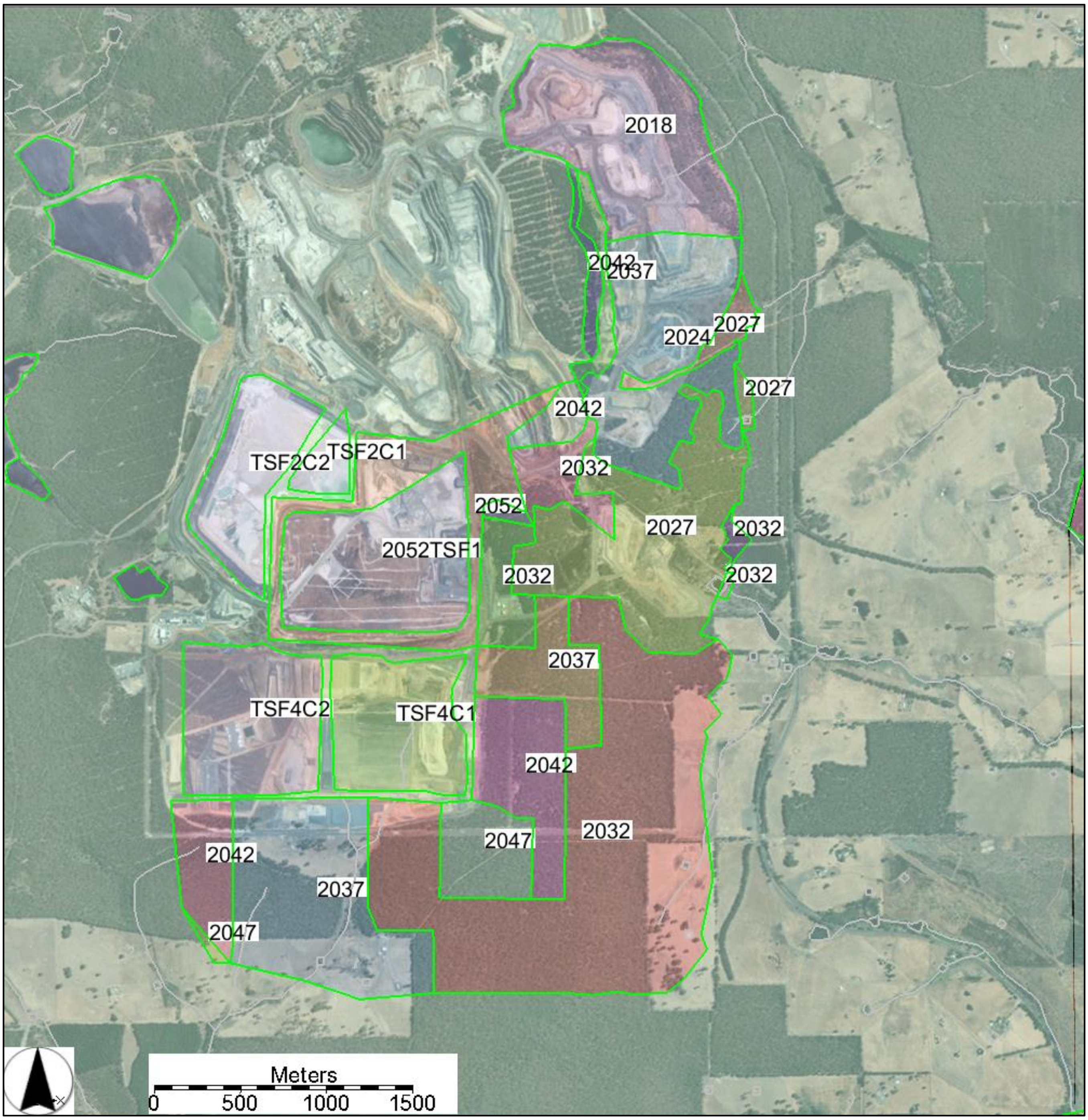


Figure 2.6: WRL Footprint Progression for Capping

2.6.2 Contaminant Sources

Impacted sources of seepage and discharge from the WRLs may be derived from the four potential sources, these being:

- Decant tailings slurry waters used to deposit the tailings.
- Leaching from tailings solids via rainfall infiltration.
- Leaching from waste rock, via rainfall infiltration.
- Historical discharge from Floyds WRL.

An initial screening of the monitoring data and that reported in previous studies against the above WQGs indicates the following initial list of CoPCs:

- A total of 15 metals exceed one or more of the adopted WQGs (Al, Sb, As, Cd, Cu, Cs, Cu Cr, Li, Mn, Mo, Ni, Rb, Th, U, Vn).
- NO_3 and SO_4 exceed one or more of the published guidelines and, based on long term monitoring data, are likely to be chemicals to pose a potential risk arising from the construction of S2 and S7 WRLs.

Further details of the initial screening of the CoPCs are provided in the Preliminary Risk Assessment Report (GHD, 2024e).

2.6.3 Monitoring Data

Talison has numerous surface water discharge monitoring sites around the eastern boundary of the mine site and has collected data on metals, anions, and physical stressors (e.g., pH, TDS) from as far back as 1997. Refer to the *Eastern Catchments Hydrological Study: Water and Mass Balance Modelling* (GHD, 2023h) for information on the CoPC monitoring data.

2.7 Groundwater Interaction

2.7.1 Groundwater Discharges and Quality

The groundwater modelling (GHD, 2024d) simulates the volumes and CoPC concentrations (and therefore loads) of the groundwater discharged to the downgradient surface water systems (e.g., creeks, dams, rivers). It is noted that the groundwater modelling considers the attenuation of CoPCs within the underlying strata and migration of the seepage with groundwater flow.

The AWBM accounts for groundwater discharges through the simulation of a baseflow store “container” (see **Figure 2.3**). The groundwater discharges simulated in the groundwater modelling (GHD, 2024d) were therefore not adopted in the WBM as these are already included in the AWBM baseflow component. It is noted that the groundwater modelling discharges and the AWBM baseflows are not directly comparable due to different modelling approaches and timesteps. To address this discrepancy, the AWBM base flow estimates were scaled accordingly to match the groundwater discharge modelling estimates and the CoPC concentrations from the groundwater model were concerved (see **Figure 2.4**).

To account for the CoPCs simulated in the discharges by the groundwater model, and to conserve mass, the associated CoPC loads were input to the WBM and multiplied by the baseflows simulated in the AWBM module to determine the relative CoPC concentrations. The baseflow concentrations adopted in the WBM are presented for the various model reporting locations in **Appendix B** to **Appendix E** for lithium, arsenic, sulphate, and nitrate respectively. Note that the sulphate and nitrate concentrations were derived as ratios against the lithium concentrations, which is discussed further in **Section 2.7**.

This approach is considered appropriate given there is typically less variability in the baseflows and concentrations relative to that simulated in the AWBM the runoff component which is directly influenced by rainfall. The baseflow concentrations presented in **Appendix B** to **Appendix E** indicate a rapid increase in concentration in the years immediately following construction of the WRLs with the rate of increase dropping off significantly thereafter.

The groundwater modelling approaches adopted in the *Eastern Catchments Hydrological Study: Groundwater Modelling* (GHD, 2023i) and for this Study (GHD, 2024d) differ substantially therefore the results are not directly comparable. Key differences in the groundwater modelling approaches are summarised in the **Table 2.3**. This is demonstrated by the comparisons in the simulated groundwater discharge concentrations presented in **Figure 2.7** and **Figure 2.8** for arsenic and lithium respectively.

Table 2.3: Summary of differences between groundwater modelling stages

	SWG and S8 WRLs (GHD, 2023i)	S2 and S7 WRLs (GHD, 2024d)
Model Grid	– Cells were refined to restrict adjacent dimension changes to less than a factor of 1.5 and maintain aspect ratios lower than 10:1.	– Cells were refined to restrict adjacent dimension changes to less than a factor of 1.5 and maintain aspect ratios lower than 10:1.
Boundary Conditions	– Recharge variable over time but consistent over all areas. – Surface discharge modelled as drain cells along streamlines.	– MODFLOW Seepage Face Package used to model surface drainage with seepage polygons matching the final surface water catchments. – Seepage to surface water accounted for in the groundwater model and discussion on the preferential pathways is documented in the Conceptual Site Model (GHD, 2024b). This simplified post processing.
	– Pit shells that were available at the time of modelling were used. – Only allowed coarse time steps.	– Updated pit shells including adding more steps to the historical and proposed pit drain elevations.
	– Post closure pit water level allowed to rebound as confined aquifer (underestimates recovery time but simple and not critical for SWG WRL modelling)	– MODFLOW Lake Package used to simulate post-closure northern pit lake levels, which were transferred to the MODFLOW Drain Package for transport simulation.
	– Increases in concentration and recharge rates were applied to the footprints of the WRL from the commencement of deposition (non-progressive).	– Increases in concentration and recharge rates were applied to the progressive footprints of the WRLs, as the changes to landforms were much more complex.
	– Transient monthly recharge rates were used for the base case prior to 2023, which were based on calibrated rates from previous pit lake and inflow models as a percentage of rainfall. Post 2023 recharge rates were constant based on the average percentage of rainfall for the period 1980 to 2022.	– Transient recharge rates simulated prior to 2023 were based on calibrated rates from previous pit lake and inflow models as a percentage of historical rainfall. Post 2023 transient recharge rates, at daily time steps, were based on seepage rates modelled for the WRL design covers, using climate data for the 50th percentile of predicted rainfall climate change scenarios, which are documented in the Conceptual Site Model (GHD, 2024b). – The same 50th percentile data, adjusted to match the average percentage of rainfall recharge for the period 1980 to 2022, was used in monthly time steps for undeveloped areas from 2023 to 2122. The model interpolated the recharge data to fit the stress periods, which were monthly until 2100, yearly from 2100 until 2120, then 10-yearly thereafter.
	– Recharge rates for the impact case were maintained at the base case rate (i.e., no landform design or capping allowed for).	– Capping of the WRLs was modelled and the progression of the change from background to capped WRLs is show in Figure 3.2 of GHD (2024d).
Predictive Modelling Approach	– Historical Model up to 2023 which fed into the Base Case and Impact Case Models	– Historical Model (1980 to 2023) was configured to include the flow and transport sources of the progressive development of the opencut, existing TSFs and water storage dams, the existing Floyds WRL, and the MSA embankment.
	– Base Case Model from 2023 to 2913 was configured to include the flow and transport sources of the existing TSFs, the existing Floyds WRL, and the MSA embankment.	– Future Mining Model (2023 to 2053) – Base Case with expanded pits, approved WRLs and SWG Dam – Impact Case with expanded pits, approved WRLs, SWG Dam and proposed S2 and S7 WRLs

	SWG and S8 WRLs (GHD, 2023i)	S2 and S7 WRLs (GHD, 2024d)
	– Impact Case Model from 2024 to 2300 was the same as the base case model with the reuse of TSF1, establishment of SWG WRL, and construction of SWG Dam configured in the model run.	– Post-Closure Model (2053 to ~2100) with capping – Base Case with pit lake recovery, approved WRLs and SWG Dam – Impact Case with pit lake recovery, approved WRLs, SWG Dam and proposed S2 and S7 WRLs
SWG Dam	– The SWG Dam was not modelled in the base case as that was part of the investigation for the impact case.	– SWG Dam has been included in both base case and impact case modelling for the S2 and S7 groundwater modelling.

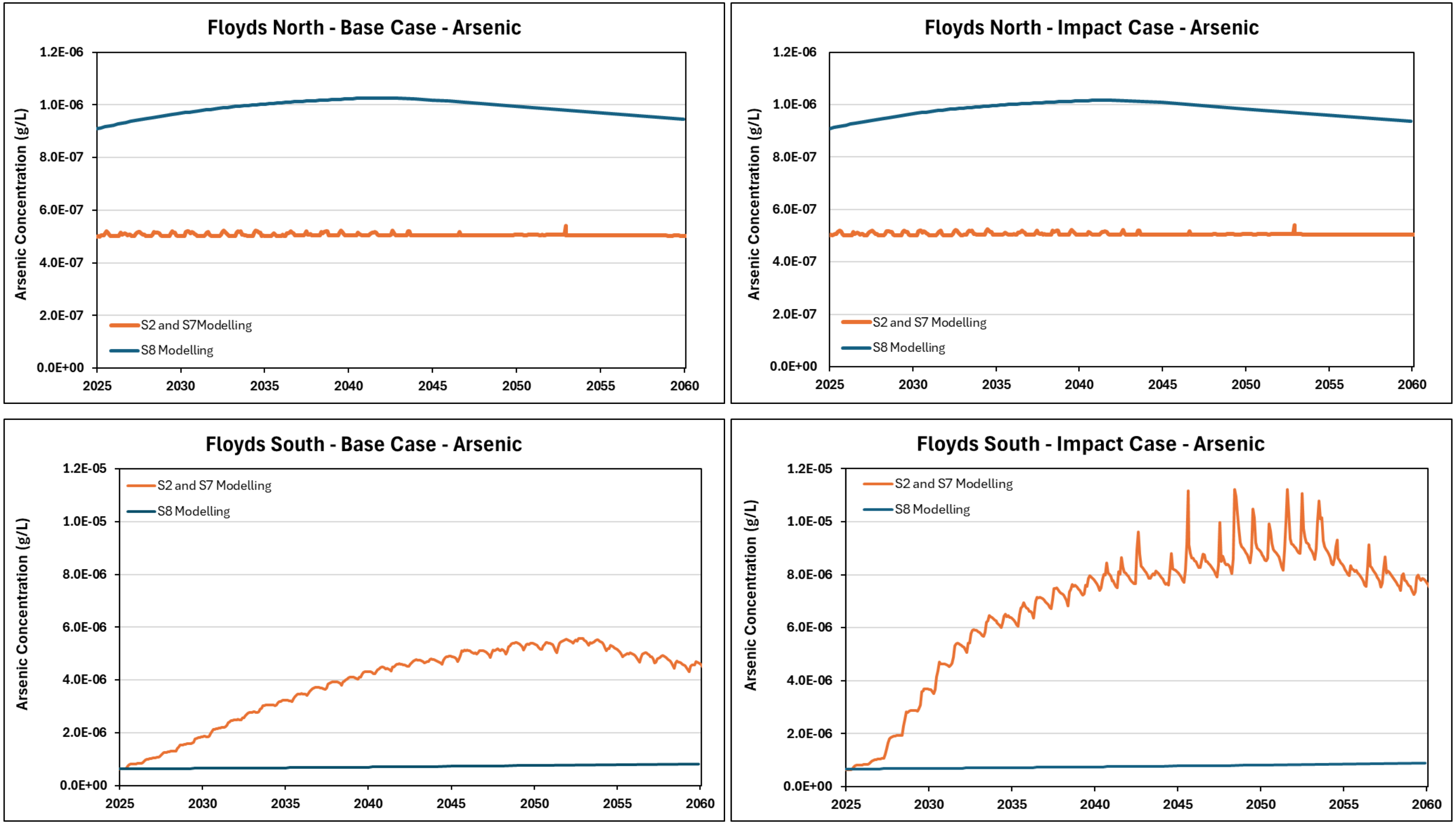


Figure 2.7 Comparison of Arsenic Concentrations in Groundwater Discharges

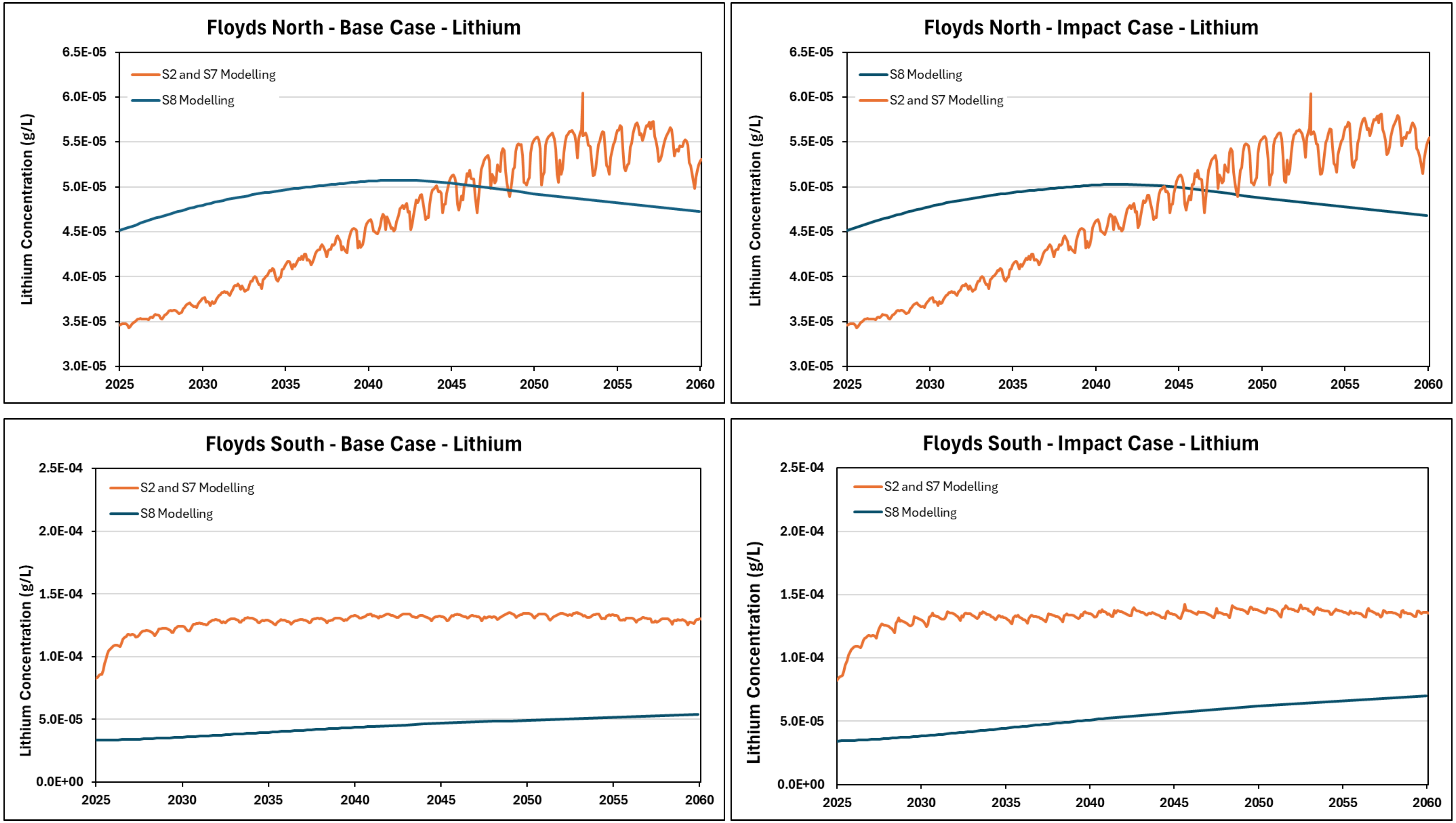


Figure 2.8 Comparison of Lithium Concentrations in Groundwater Discharges

2.7.2 Seepage from SWG Dam

The seepage loss from SWG dam was assumed to be a constant 2 mm/day in lieu of calibrated data. This rate is consistent with other dams in the MWC and is the same as that adopted

2.8 Surface Water Quality

The WBM is configured to perform mass balances of the various CoPCs at each time step. As noted above, the CoPC loads simulated in the groundwater model (GHD, 2024d) were input to the WBM model to establish the CoPC concentrations in the baseflow component. The CoPC concentrations in the runoff component were determined from a review of the surface water monitoring data.

The following assumptions were made for the simulation of the CoPC concentrations in the runoff component:

– CoPC concentrations simulated in the surface runoff from the mine affected areas were based on the average concentrations recorded at Carters Farm, D8, D8-4, Floyds North, and Floyds South monitoring sites (see **Figure 2.9**). These sites were selected as they are the only sites to the east of the mine site that have reasonable monitoring record lengths. The average recorded concentrations from 2016 to 2023 are shown in **Figure 2.10** to **Figure 2.13** for lithium, arsenic, sulphate, and nitrate respectively. It should be noted that monitoring data post 2021 were only available at some locations for lithium and arsenic only. Adopted concentrations were based on 2021 results as this is the latest date with results at all monitoring points.

– CoPC concentrations for the external catchment runoff were based on:

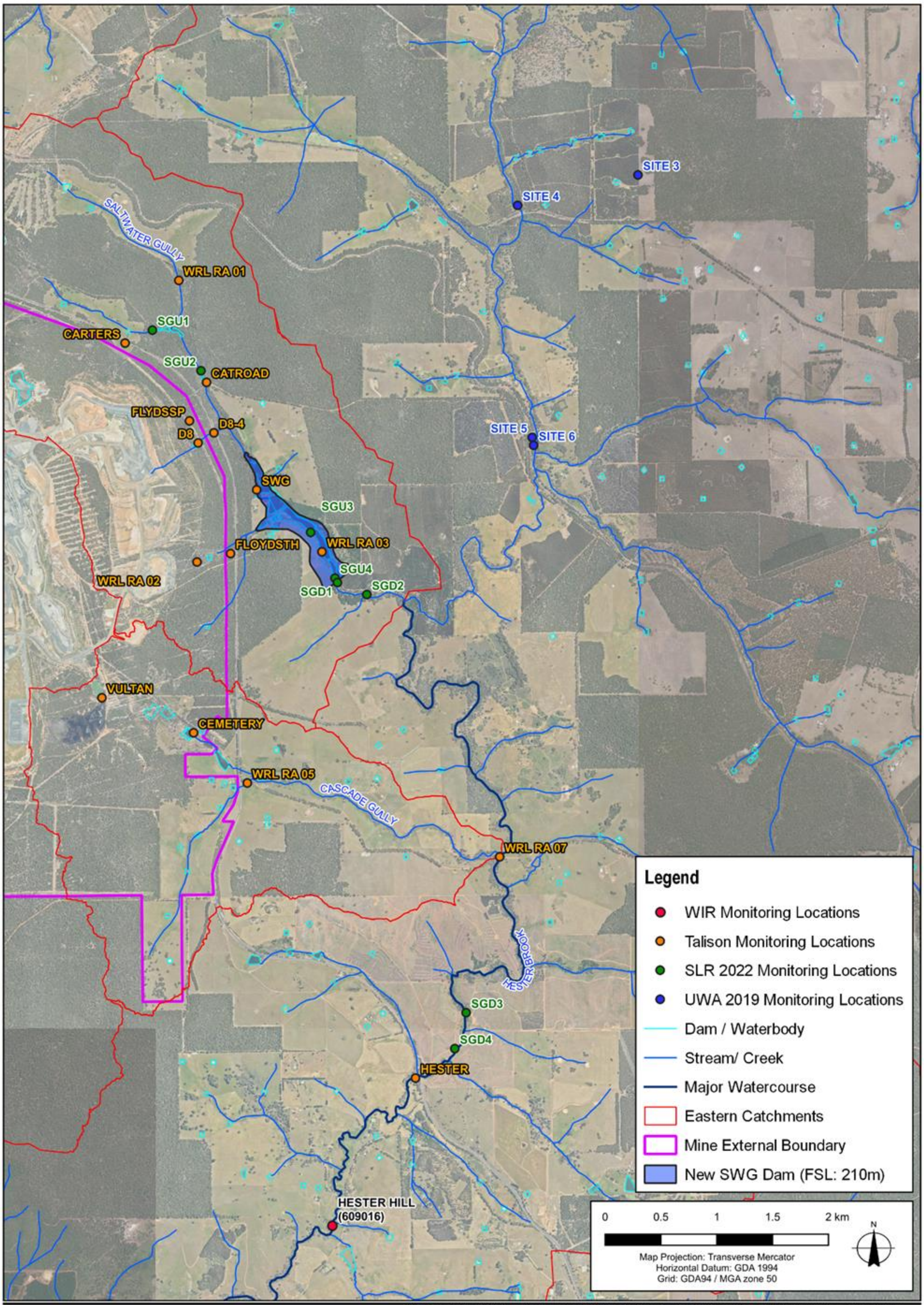
  - For lithium and arsenic, the initial concentrations were based on the *2019 Ecological Assessment Study* (University of Western Australia, 2019). The concentrations were typically less than 0.001 mg/L for arsenic and 0.01 mg/L for lithium and were therefore assumed to be undetected (i.e., 0 mg/L).
  - Sulphate and nitrate values were based on WRL 01 monitoring location, which has a one-off sample from 2020. This monitoring location is upstream of the mine along Salt Water Gully and, whilst outside of the influence of the mine, may present slightly elevated concentrations relative to upstream of Hester Brook as Salt Water Gully is known to have naturally high salt levels.

– As the simulation of SWG Dam starts empty, there was no need to apply an initial concentration.

The CoPC concentrations adopted in the modelling at the sources are summarised in **Table 2.4**.

Table 2.4: Initial CoPC Concentrations

Storage/ catchment	CoPC Concentration (mg/L)			
	Lithium	Arsenic	Sulphate	Nitrate
Mine affected runoff	1.1	0.004	732	17.9
External catchment runoff	0.0	0.0	16.0	0.7
Groundwater discharge	As per **Appendix B.**	As per **Appendix C.**	As per **Appendix D.**	As per **Appendix E**.



Data Source: GHD - New SWG Dam, Eastern Catchments (2023). Talison - Mine External Boundary (2023). Landgate - Dam / Waterbody, Major Watercourse, Minor Watercourse, Stream / Creek (2020). WA Landgate SLIP - Background Aerial Imagery.

Figure 2.9: Surface Water Monitoring Sites

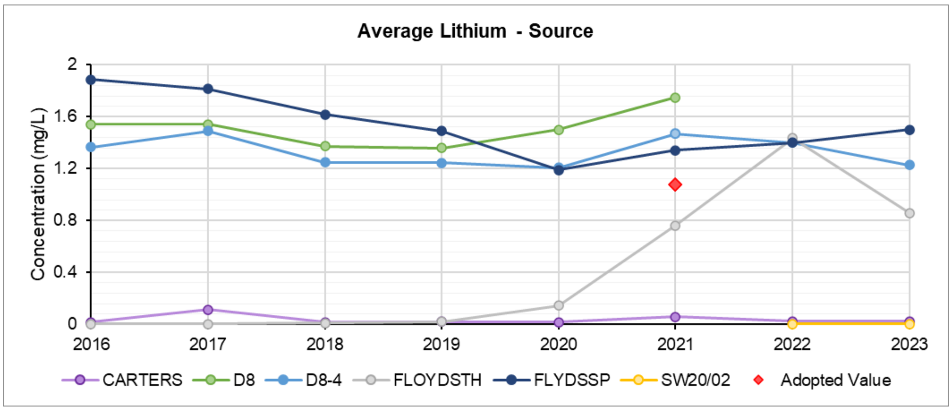


Figure 2.10: Average Annual Lithium Concentrations at Source

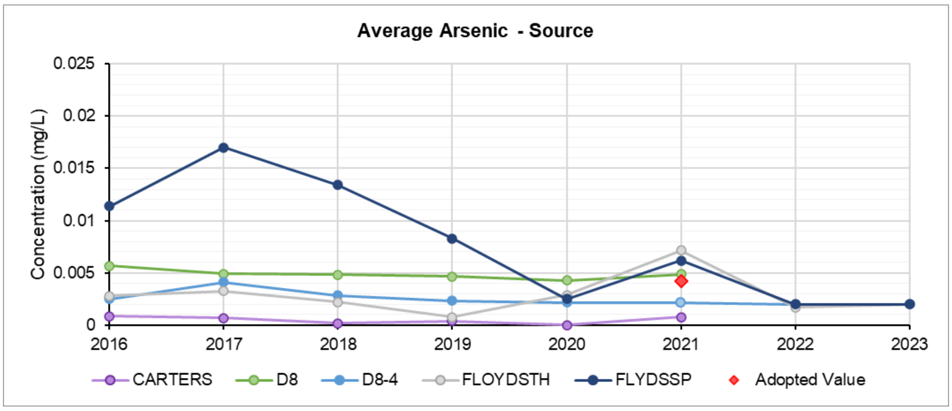


Figure 2.11: Average Annual Arsenic Concentrations at Source

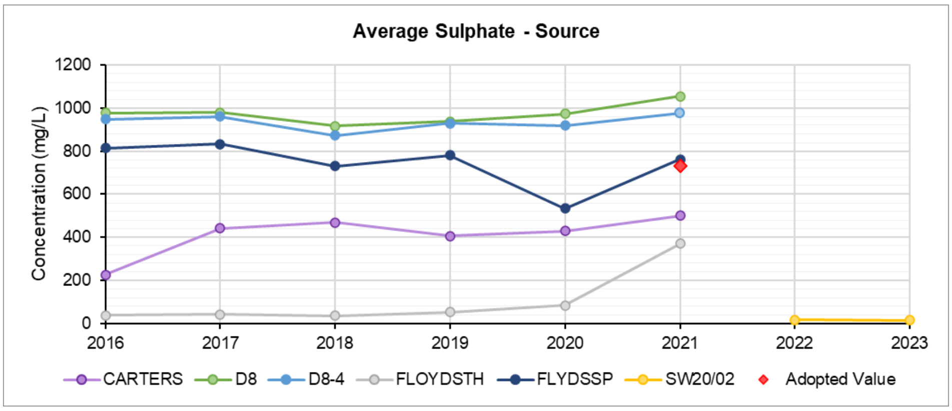


Figure 2.12: Average Annual Sulphate Concentrations at Source

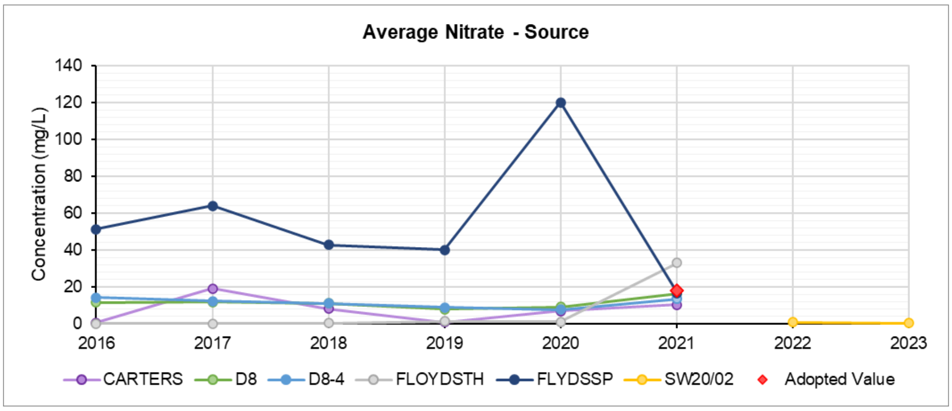


Figure 2.13: Average Annual Nitrate Concentrations at Source

3. Predictive Modelling

3.1 Approach

The WBM was simulated over a 40-year period from January 2025 and extends 8 years post mine closure, which is expected to occur in 2052. The model was simulated 500 times with each simulation adopting a unique climate sequence (of rainfall and evaporation) that was sampled from historical climate records. Simulations were undertaken for two scenarios, namely the Base Case and Impact Case scenarios as discussed in **Section 2.2**.

3.2 Interpretation of Results

Each of the 500 simulations is equally likely and represents one possible path the system could follow through time based on the unique sampled climate sequence. The results of each simulation are assembled into probability distributions of possible outcomes as shown in **Figure 3.1**. The results are therefore represented as probability distributions opposed to a single value. By way of example the 10th percentile result represents the value at which 10% of the modelled outputs were less than this value. Similarly, the 90th percentile represents the value at which 90% of the modelled outputs were less than this value.

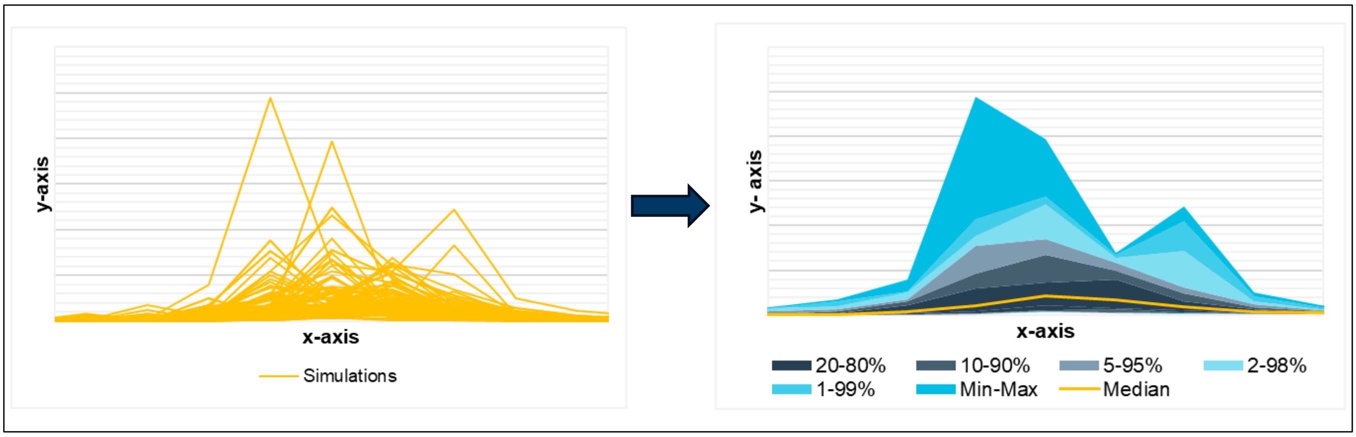


Figure 3.1: Results Interpretation (Simulations to Probability Distribution)

It is important to note that the percentile results do not directly relate to a “wet” or “dry” climate sequences (i.e. 90th percentile does not correspond to a “wet” climate and the 10th percentile does not correspond to a “dry” climate). For example, a 90th percentile water volume would relate to a wetter period, but a 90th percentile CoPC concentration would relate to a dryer period, when there is less dilution.

3.3 Salt Water Dam Balance

The simulated water levels, volume, spill events and seepage flows in SWG Dam are presented in **Appendix F** along with the simulated CoPC concentrations in SWG dam for lithium, arsenic, sulphate, and nitrate. The simulation results indicate the following:

- The median volume in the dam is constant at the Low Operating Level (LOL) of ~140 ML. The storage is maintained at this level due to the high transfer capacity of 600 m^3/hr.
- Spills are unlikely, only occurring in the 98th and higher percentiles with only 14 periods of spills predicted in that percentile in the modelling period.
- The simulated CoPC concentrations increase rapidly during initial filling of the dam.
- Apart from arsenic, there is a small increase in the CoPC concentrations over the simulation period until final closure in 2052, whereafter the rate of increase rises very slightly.
- The simulated arsenic concentrations trends increase at a more rapid rate than the other CoPCs and appears to drop off to become flat after closure.

3.4 Receiving Catchments

3.4.1 Streamflow

A statistical summary of the simulated daily catchment runoff flows is provided in **Table 3.1** for the reporting locations depicted in **Figure 2.2** and for each of the scenarios simulated. Plots depicting the simulated daily streamflow at the reporting locations are provided in **Appendix G**.

Table 3.1: Statistics of Simulated Flows (ML/day) at Reporting Sites from 2025 to 2063

Location	Salt Water Gully Outlet to Hester Brook		Cascade Gully Outlet to Hester Brook		Hester Brook Upstream of Salt Water Gully Confluence	
Statistic[4]	Base	Impact	Base	Impact	Base	Impact
5%	0.56	0.18	0.31	0.25	7.11	7.11
20%	1.40	0.45	0.78	0.64	17.59	17.59
50%	2.67	0.85	1.47	1.23	33.01	33.01
80%	5.00	1.57	2.69	2.43	59.14	59.14
95%	9.55	2.99	5.12	4.77	112.87	112.87
Location	Hester Brook Upstream of Cascade Gully Confluence		Hester Brook Downstream of Cascade Gully Confluence		Hester Brook at Hester Hill	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	7.88	7.49	8.20	7.77	9.25	8.82
20%	19.50	18.54	20.28	19.20	22.89	21.81
50%	36.64	34.80	38.12	36.09	43.01	40.98
80%	65.80	62.38	68.48	64.82	77.25	73.58
95%	125.49	119.04	130.59	123.60	147.32	140.32
Location	Upper Woljenup Creek		Middle Woljenup Creek		Lower Woljenup Creek	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.29	0.23	0.62	0.55	0.66	0.60
20%	0.72	0.56	1.52	1.36	1.63	1.47
50%	1.36	1.05	2.84	2.56	3.06	2.77
80%	2.45	2.01	5.11	4.68	5.49	5.06
95%	4.65	3.86	9.72	8.87	10.44	9.59

The simulated flows indicate the following:

- Streamflow in Hester Brook upstream of the Salt Water Gully confluence remains unchanged for all scenarios since this is not impacted by the proposed facilities.
- Streamflow at the Salt Water Gully outlet to Hester Brook reduces by an average of ~68% in the Impact Case, reflecting the impact of SWG Dam.
- Streamflow at the Cascade Gully outlet to Hester Brook decreases by an average of ~13% in the Impact Case, reflecting the changes in catchment areas and runoff characteristics due to the S2 WRL.
- Streamflow in Hester Brook upstream of the Cascade Gully confluence decreases by an average of~5% in the Impact Case, reflecting the impact of SWG Dam.
- Streamflow in Hester Brook downstream of the Cascade Gully Confluence and in Hester Brook at Hester Hill gauging site both decrease by an average of ~5% in the Impact Case, reflecting the impact of SWG Dam and the changes in catchment areas and runoff characteristics due to the establishment of S2 WRL.

[4] Exceedances probabilities, which are the probabilities of the flows equaling or exceeding given rates.

– Streamflow in Upper Woljenup Creek reduces by an average of ~20% in the Impact Case, reflecting the changes in catchment areas and runoff characteristics due to the establishment of S7 WRL.
– Streamflow in Middle Woljenup Creek reduces by an average of ~10% on average in the Impact Case reflecting the impact of the change in catchment area and runoff characteristics brought about by S7 WRL.
– Streamflow in Lower Woljenup Creek reduces by an average of ~9% on average in the Impact Case reflecting the impact of the change in catchment area and runoff characteristics brought about by S7 WRL.

3.4.2 Lithium Concentrations

Statistical summaries of the simulated lithium concentrations in the stream flows are provided in **Table 3.2** for the reporting locations depicted in **Figure 2.2**. Exceedances of the respective WQGs are depicted in this table through colour coding of the values. Plots of the ranges of simulated concentrations are depicted graphically in **Figure 3.2**.

Table 3.2: Statistics of Simulated Lithium Concentrations in mg/L (2025 to 2063)[5]

Location	Salt Wa\\er Gully Outlet to Hester Brook		Cascade Gully Outlet to Hester Brook		Hester Brook Upstream of Salt Water Gully Confluence	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.0338	0.0253	0.0202	0.0415	0.0003	0.0003
20%	0.0345	0.0259	0.0273	0.0553	0.0003	0.0003
50%	0.0362	0.0275	0.0404	0.0762	0.0003	0.0003
80%	0.0400	0.0314	0.0569	0.1011	0.0003	0.0003
95%	0.0453	0.0374	0.0757	0.1263	0.0003	0.0003
Location	Hester Brook Upstream of Cascade Gully Confluence		Hester Brook Downstream of Cascade Gully Confluence		Hester Brook at Hester Hill	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.0029	0.0012	0.0035	0.0027	0.0036	0.0028
20%	0.0029	0.0012	0.0040	0.0036	0.0040	0.0037
50%	0.0031	0.0013	0.0051	0.0061	0.0050	0.0059
80%	0.0036	0.0015	0.0075	0.0110	0.0071	0.0103
95%	0.0046	0.0020	0.0115	0.0189	0.0108	0.0175
Location	Upper Woljenup Creek		Middle Woljenup Creek		Lower Woljenup Creek	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.0287	0.0757	0.0167	0.0383	0.0171	0.0375
20%	0.0485	0.1141	0.0277	0.0612	0.0276	0.0591
50%	0.0825	0.1650	0.0503	0.0991	0.0491	0.0957
80%	0.1201	0.2119	0.0799	0.1400	0.0778	0.1358
95%	0.1572	0.2540	0.1125	0.1796	0.1098	0.1749

5 Red - Above all guidelines, irrigation is highest value (2.5 mg/L).
Blue - Above aquatic environment (2.0 mg/L), Livestock (0.82 mg/L), non-potable (0.14 mg/L) & drinking (0.007 mg/L) guidelines.
Green - Above Livestock (0.82 mg/L), non-potable (0.14 mg/L) & drinking water (0.007 mg/L) guidelines.
Purple - Above non-potable (0.14 mg/L) & drinking water (0.007 mg/L) guidelines.
Orange - Above drinking water (0.007 mg/L) guidelines.
Black - Below all guidelines.

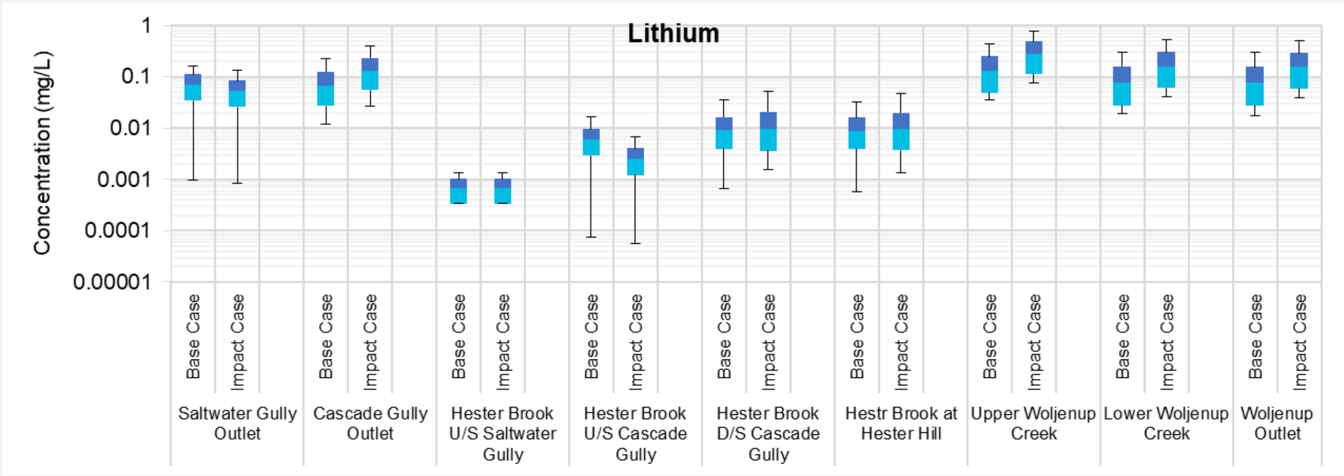


Figure 3.2: Ranges of Simulated Lithium Concentrations (2025 to 2063)

The simulated lithium concentrations indicate the following:

- Concentrations are above the drinking water guideline in Salt Water Gully and Cascade Gully all the time for both the Base and Impact Cases, but do not exceed this guideline in the reach of Hester Brook between Salt Water Gully and Cascade Gully for either Case.
- The 80th percentile concentrations exceed the drinking water guideline in the reaches of Hester Brook downstream of the Cascade Gully confluence and downstream of the Hester Hill gauging point for both the Base and Impact Cases.
- No other guidelines are exceeded in Hester Brook and its tributaries for either Case.
- Concentrations are above the drinking water guideline in all reaches of Woljenup Creek for both the Base and Impact Cases.
- The 95th percentile concentration exceeds the non-potable guideline in the Upper Woljenup Creek for the Base Case, and the 50th percentile concentration exceeds this guideline for the Impact Case.
- The non-potable guideline is not exceeded in the Middle and Lower Woljenup Creek reaches for the Base Case, but the 80th percentile concentration exceeds this guideline for the Impact Case.
- Concentrations in Hester Brook upstream of the Salt Water Gully confluence remain unchanged for both cases since this is not impacted by the proposed facilities.
- Concentrations in Salt Water Gully at the Hester Brook confluence decrease by an average of ~21% in the Impact Case due to SWG capturing and returning a significant load.
- Concentrations in Hester Brook between Salt Water Gully confluence and Cascade Gully confluence decrease by an average of ~59% due to SWG capturing and returning a significant load.
- Concentrations in Cascade Gully at the Hester Brook confluence increase by an average of ~84% in the Impact Case.
- Concentrations in Hester Brook downstream of the Cascade Gully confluence increase by an average of ~18% in the Impact Case.
- Concentrations in Hester Brook downstream of Hester Hill gauging site increase by an average of ~19% in the Impact Case.
- Concentrations in the Upper Woljenup Creek increase by an average of ~113% in the Impact Case.
- Concentrations in the Middle Woljenup Creek increase by an average of ~94% in the Impact Case.
- Concentrations in the Lower Woljenup Creek increase by an average of ~88% in the Impact Case.

3.4.3 Arsenic Concentrations

Statistical summaries of the simulated arsenic concentrations in the stream flows are provided in **Table 3.3** for the reporting locations depicted in **Figure 2.2**. Plots of the ranges of simulated concentrations are depicted graphically in **Figure 3.3**.

Table 3.3: Statistics of Simulated Arsenic Concentrations in mg/L (2025 to 2063)[6]

Location	Salt Water Gully Outlet to Hester Brook		Cascade Gully Outlet to Hester Brook		Hester Brook Upstream of Salt Water Gully Confluence	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.00084	0.00074	0.00022	0.00085	0.00001	0.00001
20%	0.00084	0.00074	0.00025	0.00090	0.00001	0.00001
50%	0.00086	0.00076	0.00030	0.00102	0.00001	0.00001
80%	0.00092	0.00089	0.00038	0.00133	0.00001	0.00001
95%	0.00103	0.00114	0.00050	0.00172	0.00001	0.00001
Location	Hester Brook Upstream of Cascade Gully Confluence		Hester Brook Downstream of Cascade Gully Confluence		Hester Brook at Hester Hill	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.00007	0.00003	0.00007	0.00005	0.00007	0.00006
20%	0.00007	0.00003	0.00008	0.00006	0.00008	0.00006
50%	0.00007	0.00003	0.00008	0.00007	0.00008	0.00007
80%	0.00008	0.00003	0.00010	0.00011	0.00010	0.00010
95%	0.00010	0.00004	0.00013	0.00018	0.00013	0.00017
Location	Upper Woljenup Creek		Middle Woljenup Creek		Lower Woljenup Creek	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.00016	0.00057	0.00013	0.00030	0.00015	0.00031
20%	0.00024	0.00072	0.00017	0.00038	0.00019	0.00039
50%	0.00037	0.00091	0.00026	0.00053	0.00027	0.00053
80%	0.00051	0.00109	0.00037	0.00069	0.00038	0.00069
95%	0.00066	0.00125	0.00050	0.00085	0.00051	0.00085

The simulated arsenic concentrations indicate the following:

– Concentrations are below all guidelines for both Base and Impact Cases.
– Concentrations in Hester Brook upstream of the Salt Water Gully confluence remain unchanged for both cases since this is not impacted by the proposed facilities.
– Concentrations in Salt Water Gully at the Hester Brook confluence increase by an average of ~1% in the Impact Case.
– Concentrations in Hester Brook between Salt Water Gully confluence and Cascade Gully confluence decrease by an average of ~57%.
– Concentrations in Cascade Gully at the Hester Brook confluence increase by an average of ~264% in the Impact Case.

---

6 Red - Above all guidelines, livestock is highest value (0.5 mg/L).
Blue - Above non-potable (0.2 mg/L), irrigation (0.1 mg/L), aquatic environment (0.013 mg/L), & drinking (0.010 mg/L) guidelines.
Green - Above irrigation (0.1 mg/L), aquatic environment (0.013 mg/L), & drinking (0.010 mg/L) guidelines.
Purple - Above aquatic environment (0.013 mg/L), & drinking (0.010 mg/L) guidelines.
Orange - Above drinking water (0.010 mg/L) guidelines.
Black - Below all guidelines

- Concentrations in Hester Brook downstream of the Cascade Gully confluence increase by an average of ~3% in the Impact Case.
- Concentrations in Hester Brook downstream of Hester Hill gauging site increase by an average of ~4% in the Impact Case.
- Concentrations in the Upper Woljenup Creek increase by an average of ~178% in the Impact Case.
- Concentrations in the Middle Woljenup Creek increase by an average of ~102% in the Impact Case.
- Concentrations in the Lower Woljenup Creek increase by an average of ~87% in the Impact Case.

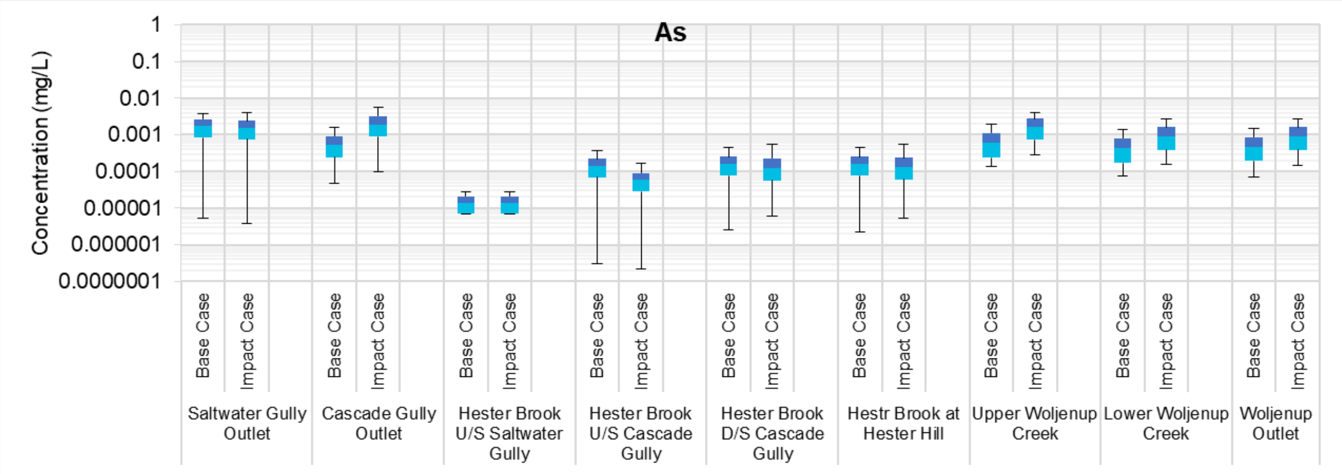


Figure 3.3: Ranges of Simulated Arsenic Concentrations (2025 to 2063)

3.4.4 Sulphate Concentrations

Statistical summaries of the simulated sulphate concentrations in the stream flows are provided in **Table 3.4** for the reporting locations depicted in **Figure 2.2**. Plots of the ranges of simulated concentrations are depicted graphically in **Figure 3.4**.

Table 3.4: Statistics of Simulated Sulphate Concentrations in mg/L (2025 to 2063)[7]

Location	Salt Water Gully Outlet to Hester Brook		Cascade Gully Outlet to Hester Brook		Hester Brook Upstream of Salt Water Gully Confluence	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	23.04	17.25	13.75	28.23	0.23	0.23
20%	23.49	17.65	18.56	37.65	0.23	0.23
50%	24.67	18.74	27.50	51.89	0.23	0.23
80%	27.23	21.34	38.71	68.84	0.23	0.23
95%	30.85	25.48	51.50	85.95	0.23	0.23

[7] Red - Above all guidelines, livestock is highest value (1000 mg/L).
Blue - Above aquatic environment (429 mg/L), & drinking (250 mg/L) guidelines.
Green - Above drinking (250 mg/L) guidelines.
Black - Below all guidelines.
NB Irrigation and non-potable guidelines not required.

Location	Hester Brook Upstream of Cascade Gully Confluence		Hester Brook Downstream of Cascade Gully Confluence		Hester Brook at Hester Hill	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	1.95	0.79	2.42	1.82	2.45	1.92
20%	1.98	0.82	2.70	2.46	2.70	2.49
50%	2.09	0.89	3.47	4.15	3.39	3.99
80%	2.44	1.05	5.09	7.47	4.83	6.99
95%	3.15	1.35	7.85	12.88	7.33	11.92
Location	**Upper Woljenup Creek**		**Middle Woljenup Creek**		**Lower Woljenup Creek**	
Statistic	**Base**	**Impact**	**Base**	**Impact**	**Base**	**Impact**
5%	19.54	51.51	11.34	26.10	11.67	25.53
20%	32.99	77.69	18.87	41.63	18.75	40.23
50%	56.13	112.33	34.24	67.45	33.42	65.15
80%	81.75	144.22	54.39	95.27	52.95	92.42
95%	107.04	172.88	76.61	122.25	74.76	119.08

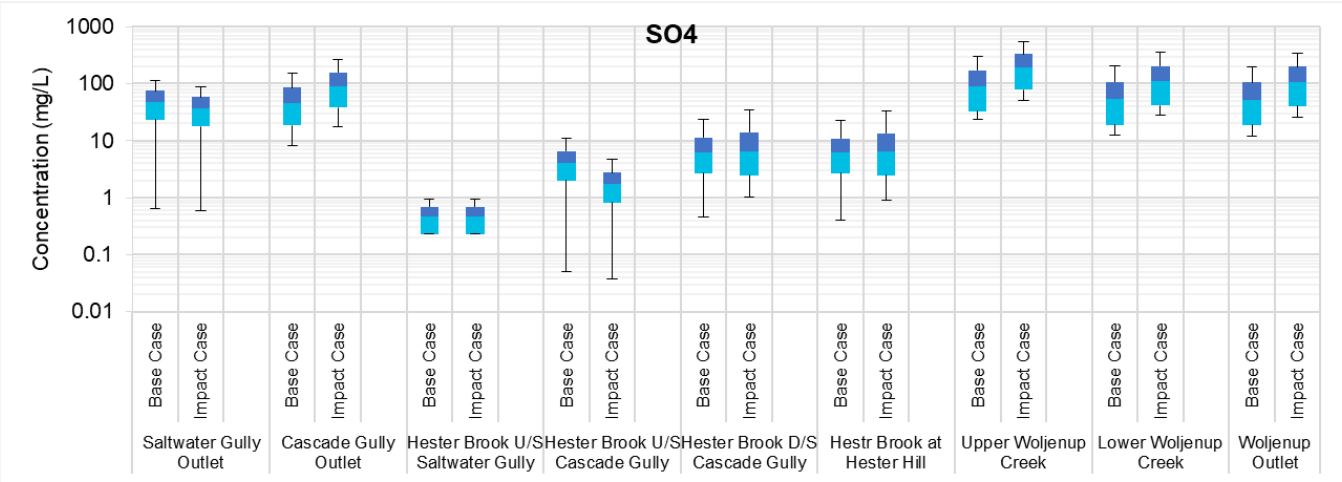


Figure 3.4: Ranges of Simulated Sulphate Concentrations (2025 to 2063)

The simulated sulphate concentrations indicate the following:

– Concentrations are below all guidelines for both Base and Impact Cases.
– Concentrations in Hester Brook upstream of the Salt Water Gully confluence remain unchanged for both cases since this is not impacted by the proposed facilities.
– Concentrations in Salt Water Gully at the Hester Brook confluence decrease by an average of ~21% in the Impact Case due to SWG capturing and returning a significant load.
– Concentrations in Hester Brook between Salt Water Gully confluence and Cascade Gully confluence decrease by an average of ~59% due to SWG capturing and returning a significant load.
– Concentrations in Cascade Gully at the Hester Brook confluence increase by an average of ~84% in the Impact Case.
– Concentrations in Hester Brook downstream of the Cascade Gully confluence increase by an average of ~18% in the Impact Case.
– Concentrations in Hester Brook downstream of Hester Hill gauging site increase by an average of ~19% in the Impact Case.
– Concentrations in the Upper Woljenup Creek increase by an average of ~113% in the Impact Case.

– Concentrations in the Middle Woljenup Creek increase by an average of ~94% in the Impact Case.
– Concentrations in the Lower Woljenup Creek increase by an average of ~88% in the Impact Case.

3.4.5 Nitrate Concentrations

Statistical summaries of the simulated sulphate concentrations in the streamflows are provided in **Table 3.5** for the reporting locations depicted in **Figure 2.2**. Plots of the ranges of simulated concentrations are depicted graphically in **Figure 3.5**.

Table 3.5: Statistics of Simulated Nitrate Concentrations in mg/L (2025 to 2063)[8]

Location	Salt Water Gully Outlet to Hester Brook		Cascade Gully Outlet to Hester Brook		Hester Brook Upstream of Salt Water Gully Confluence	
Statistic	Base	Impact	Base	Impact	Base	Impact
5%	0.56	0.42	0.34	0.69	0.006	0.006
20%	0.58	0.43	0.45	0.92	0.006	0.006
50%	0.60	0.46	0.67	1.27	0.006	0.006
80%	0.67	0.52	0.95	1.69	0.006	0.006
95%	0.76	0.62	1.26	2.10	0.006	0.006
Location	**Hester Brook Upstream of Cascade Gully Confluence**		**Hester Brook Downstream of Cascade Gully Confluence**		**Hester Brook at Hester Hill**	
Statistic	**Base**	**Impact**	**Base**	**Impact**	**Base**	**Impact**
5%	0.05	0.02	0.06	0.04	0.06	0.05
20%	0.05	0.02	0.07	0.06	0.07	0.06
50%	0.05	0.02	0.09	0.10	0.08	0.10
80%	0.06	0.03	0.12	0.18	0.12	0.17
95%	0.08	0.03	0.19	0.32	0.18	0.30
Location	**Upper Woljenup Creek**		**Middle Woljenup Creek**		**Lower Woljenup Creek**	
Statistic	**Base**	**Impact**	**Base**	**Impact**	**Base**	**Impact**
5%	0.48	1.26	0.28	0.64	0.29	0.63
20%	0.80	1.90	0.46	1.02	0.46	0.99
50%	1.37	2.75	0.84	1.65	0.81	1.60
80%	2.00	3.53	1.33	2.33	1.30	2.26
95%	2.62	4.23	1.88	2.99	1.83	2.92

The simulated nitrate concentrations indicate the following:

– Concentrations in Hester Brook and its tributaries are below all guidelines for both Base and Impact Cases.
– The 95th percentile concentration in the Upper Woljenup Creek exceeds the drinking water guideline for the Base Case, and the 50th percentile concentration exceeds this guideline for the Impact Case.
– Concentrations in the Middle and Lower Woljenup Creek are below all guidelines for the Base Case, but the 95th percentile concentration exceeds the drinking water guideline.
– Concentrations in Hester Brook upstream of the Salt Water Gully confluence remain unchanged for both cases since this is not impacted by the proposed facilities.

8 Red - Above all guidelines, livestock is highest value (90 mg/L).
Blue - Above drinking (50 mg/L) & aquatic environment (2.4 mg/L) guidelines.
Green - Above aquatic environment (2.4 mg/L) guideline.
Black - Below all guidelines.
NB Irrigation guideline not required and non-potable guideline not undertaken.

– Concentrations in Salt Water Gully at the Hester Brook confluence decrease by an average of ~21% in the Impact Case due to SWG capturing and returning a significant load.
– Concentrations in Hester Brook between Salt Water Gully confluence and Cascade Gully confluence decrease by an average of ~59% due to SWG capturing and returning a significant load.
– Concentrations in Cascade Gully at the Hester Brook confluence increase by an average of ~84% in the Impact Case.
– Concentrations in Hester Brook downstream of the Cascade Gully confluence increase by an average of ~18% in the Impact Case.
– Concentrations in Hester Brook downstream of Hester Hill gauging site increase by an average of ~19% in the Impact Case.
– Concentrations in the Upper Woljenup Creek increase by an average of ~113% in the Impact Case.
– Concentrations in the Middle Woljenup Creek increase by an average of ~94% in the Impact Case.
– Concentrations in the Lower Woljenup Creek increase by an average of ~88% in the Impact Case.

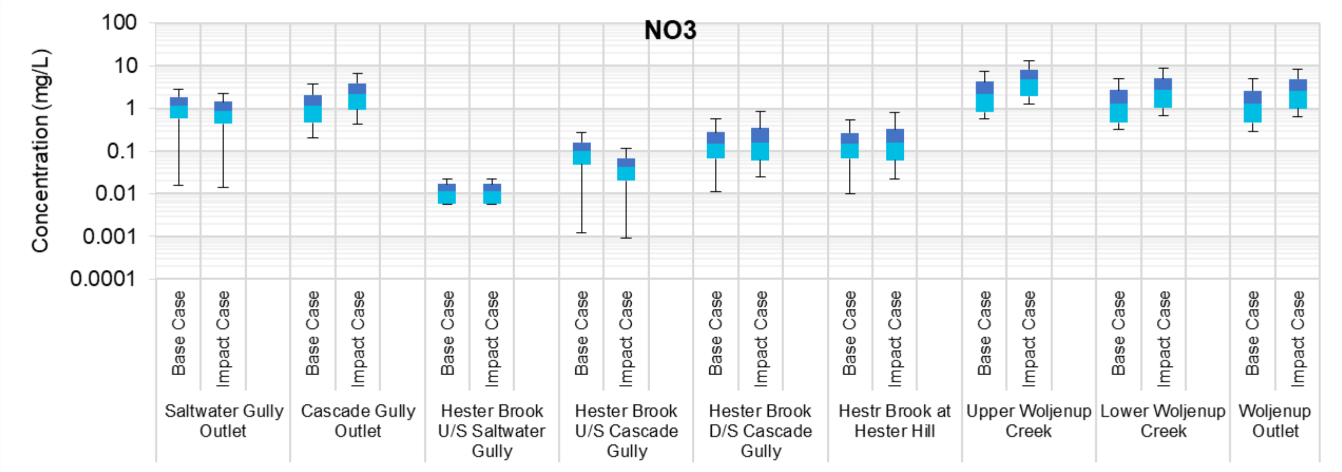


Figure 3.5: Ranges of Simulated Nitrate Concentrations (2025 to 2063)

It should be noted that the concentrations at the low exceedance probabilities (e.g., 5%) generally coincide with high flow periods, and those at the high exceedance probabilities (e.g., 95%) generally coincide with low flow periods.

The baseline CoPC concentrations will differ from the monitored water quality data due to the following reasons:

– Limitations of the model. CoPCs are assumed to be conservative substances that do not decay over or react with other substances. In the WBM they are only subject to concentration or dilution.
– Monitoring of CoPCs in the catchment only occurs when there is sufficient flow. The modelled results are based on a range of flows and, due to dilution and concentration, will vary significantly depending on the volume of water in the creeks (e.g., concentrations inflated at very low flows).

4. Conclusions

The water and mass balance modelling for the Base Case indicates that the Floyds and S1 WRLs could result in an increase in CoPC concentrations discharging from Salt Water Gully into Hester Brook if not controlled. At Hester Hill, the increase in CoPC concentrations is less significant given the dilution from the upstream non-disturbed catchment flows. The modelling of the Impact Case indicates that SWG Dam removes some of the CoPC loads generated from Floyds and S1 WRLs.

CoPC concentrations in Cascade Gully at the Hester Brook confluence increase significantly from the Base Case to the Impact Case , poentially due to the S1 and S2 WRLs, but the increase in concentrations reduce in the downstream reaches of Hester Brook as a result of dilution from the upstream non-disturbed catchment flows

Increases in CoPC concentrations are noted in Woljenup Creek. A large portion of this catchment is not currently impacted by mining activities and the establishment of S7 WRL may impact this catchment.

Concentrations of lithium are simulated to be above the drinking water guideline in Salt Water Gully and Cascade Gully for the Base and Impact Cases, but do not exceed this guideline in the reach of Hester Brook between Salt Water Gully and Cascade Gully for either Case. The 80th percentile lithium concentrations exceed the drinking water guideline in the reaches of Hester Brook downstream of the Cascade Gully confluence and downstream of the Hester Hill gauging point for both the Base and Impact Cases.

Concentrations of lithium are above the drinking water guideline in all reaches of Woljenup Creek for both the Base and Impact Cases. The 95th percentile lithium concentration exceeds the non-potable guideline in the Upper Woljenup Creek for the Base Case, and the 50th percentile concentration exceeds this guideline for the Impact Case. The non-potable guideline is not exceeded in the Middle and Lower Woljenup Creek reaches for the Base Case, but the 80th percentile concentration exceeds this guideline for the Impact Case.

Concentrations of arsenic and sulphate at all reporting locations are below all guidelines for both Base and Impact Cases.

Concentrations of nitrate in Hester Brook and its tributaries are below all guidelines for both Base and Impact Cases. The 95th percentile nitrate concentration in the Upper Woljenup Creek exceeds the drinking water guideline for the Base Case, and the 50th percentile concentration exceeds this guideline for the Impact Case. Nitrate concentrations in the Middle and Lower Woljenup Creek are below all guidelines for the Base Case, but the 95th percentile concentration exceeds the drinking water guideline.

Streamflow discharging from Salt Water Gully to Hester Brook reduces by ~67% on average from the Base Case to Impact Case, reflecting the impact of SWG Dam. Streamflow discharging from Cascade Gully to Hester Brook reduces by ~13% on average from the Base Case to the Impact Case, reflecting the change in catchment area and runoff characteristics brought about by the S2 WRLs. Streamflow in Hester Brook downstream of the confluence with Cascade Gully and at Hester Hill gauging site reduces by ~5% on average from the Base Case to the Impact Case, reflecting the impact of SWG Dam and change in catchment area and runoff characteristics brought about by the S2 WRL. Streamflow discharging from Woljenup Creek to the Blackwood River reduces by ~9% on average reflecting the change in catchment area and runoff characteristics brought about by S7 WRL.

5. References

Boughton, W. (2004). *The Australian Water Balance Model. Environmental Modelling & Software 19 (2004) 943–956.*

Bureau of Meteorology. (2022). *National Hydrological Projections - Design and Methodology. Bureau Research Report – BRR061, ISBN: 978-1-925738-37-7.*

GHD. (2023a). *TSF4 Seepage Assessment : Conceptual Hydrogeological Model. Report for Talison Lithium Pty Ltd . February 2023. Ref 12575610.*

GHD. (2023b). *TSF4 Seepage Assessment : Groundwater Model Update and Site Assessment. Report for Talison Lithium Pty Ltd . April 2023. Ref 12575610.* Perth: GHD Pty Ltd.

GHD. (2023c). *TSF4 Seepage Assessment : Human Health and Environmental Risk Assessment. Report for Talison Lithium Pty Ltd . October 2023. Ref 12575610.*

GHD. (2023d). *TSF4 Seepage Assessment: Seepage Monitoring and Management Plan. Report for Talison Lithium Pty Ltd. December 2023. Ref 12575610.*

GHD. (2023e). *TSF4 Seepage Assessment : Woljenup Creek Hydrological Assessment. Report for Talison Lithium Pty Ltd . September 2023. Ref 12575610.*

GHD. (2023f). *Eastern Catchments Study: Gap Analysis Report. Repoprt for Talison Lithium Pty Ltd. October 2023. Ref 12604929.* Perth: GHD PTY Ltd.

GHD. (2023g). *Eastern Catchments Study: Conceptual Site Model Report. Repoprt for Talison Lithium Pty Ltd. October 2023. Ref 12604929.*

GHD. (2023h). *Eastern Catchments Study: Surface Water and Mass Balance Modelling. Report for Talison Lithium Pty Ltd. November 2023. Ref 12604929.*

GHD. (2023i). *Eastern Catchments Study: Groundwater Modelling Report. Repoprt for Talison Lithium Pty Ltd. December 2023. Ref 12604929.*

GHD. (2023j). *Eastern Catchments Study: Preliminary Risk Assessment. Report prepared for Talison Lithium Pty Ltd. Decemer 2023. Ref 12604929.* Perth: GHD Pty Ltd.

GHD. (2023k). *Eastern Catchments Study: Monitoring Plan. Report prepared for Talison Lithium Pty Ltd. November 2023. Ref 12604929.*

GHD. (2023l). *TSF1 Seepage Assessment : Human Health and Environmental Risk Assessment. Draft Report for Talison Lithium Pty Ltd . August 2023. Ref 12575610.*

GHD. (2023m). *Water Dam Raises – Water Balance and Risk Assessment, Report prepared for Talison Lithium Pty Ltd, March 2023, Ref 12585275.*

GHD. (2023n). *TSF4 Seepage Assessment: Site-Specific Water Quality Guidelines, Repport prepared for Talison Lithium Pty Ltd, March 2023, Ref 12575610.*

GHD. (2024a). *S2 and S7 WRLs Hydrological Study: Gap Analysis. Draft report prepared for Talison Lithium Pty Ltd. June 2024. Ref 12604929.*

GHD. (2024b). *S2 and S7 WRLs Hydrological Study: Conceptual Site Model. Dratf report prepared for Talison Lithium Pty Ltd. April 2024. Ref 12604929.*

GHD. (2024c). *S2 and S7 WRLs Hydrological Study: Monitoring Plan. Report to be prepared for Talison Lithium Pty Ltd. Undated. Ref 12604929.*

GHD. (2024d). *S2 and S7 WRLs Hydrological Study: Groundwater Modelling. Draft report prepared for Talison Lithium Pty Ltd. August 2024. Ref 12604929.*

GHD. (2024e). *S2 and S7 WRLs Hydrological Study: Preliminary Risk Assessment. Report to be prepared for Talison Lithium Pty Ltd. Undated. Ref 12604929.*

Queensland Department of Environment and Science and Bureau of Meteorology. (2024, 08 29). *SILO Australian Climate Database*. Retrieved from https://www.longpaddock.qld.gov.au/silo/

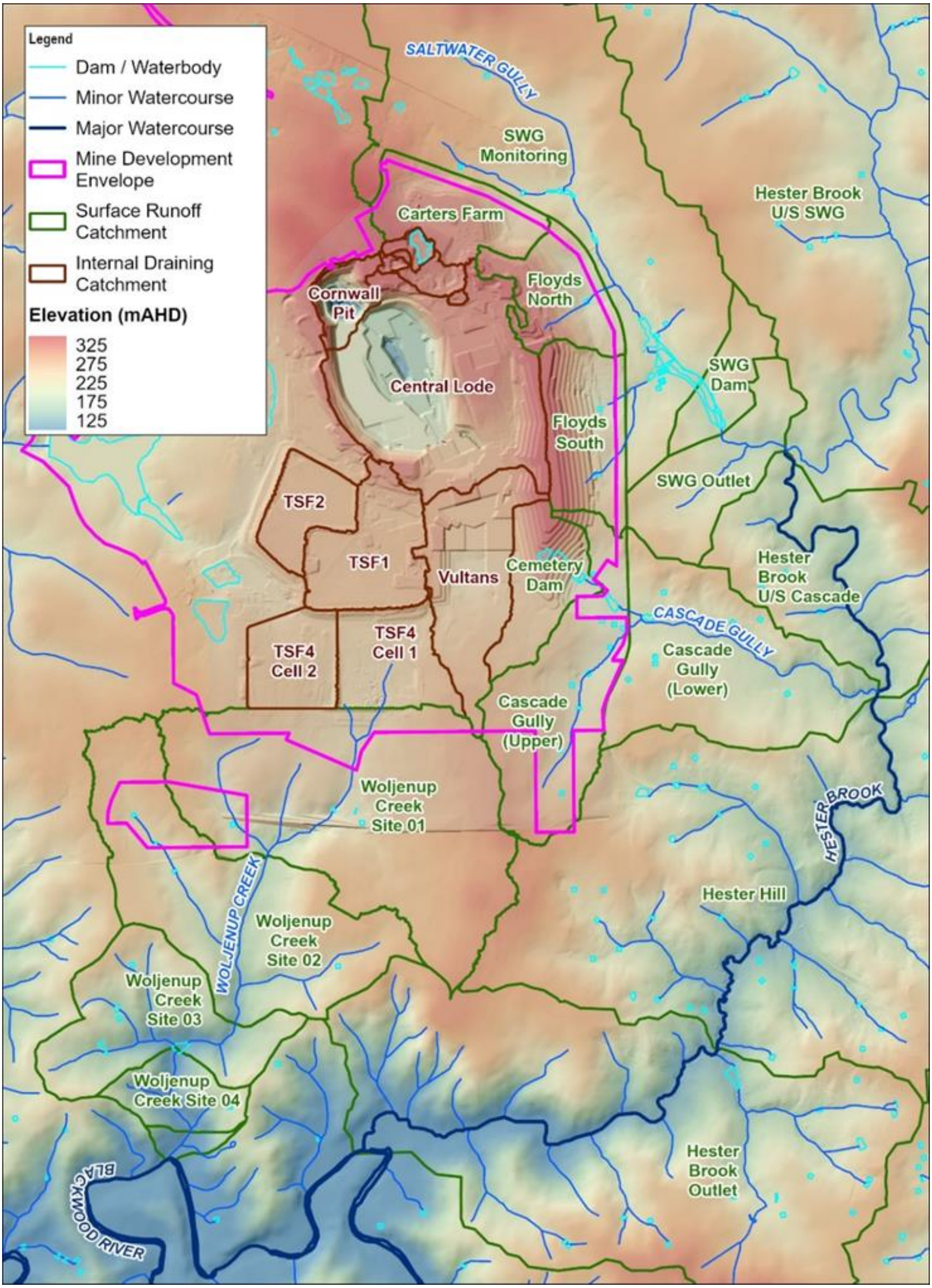
University of Western Australia. (2019). *2019 Ecological Assessment Study for Cowan and Norilup Brook at the Talison Lithium Mine, Greenbushes, Western Australia. Report prepared for Talison Lithium Pty Ltd.*

Appendices

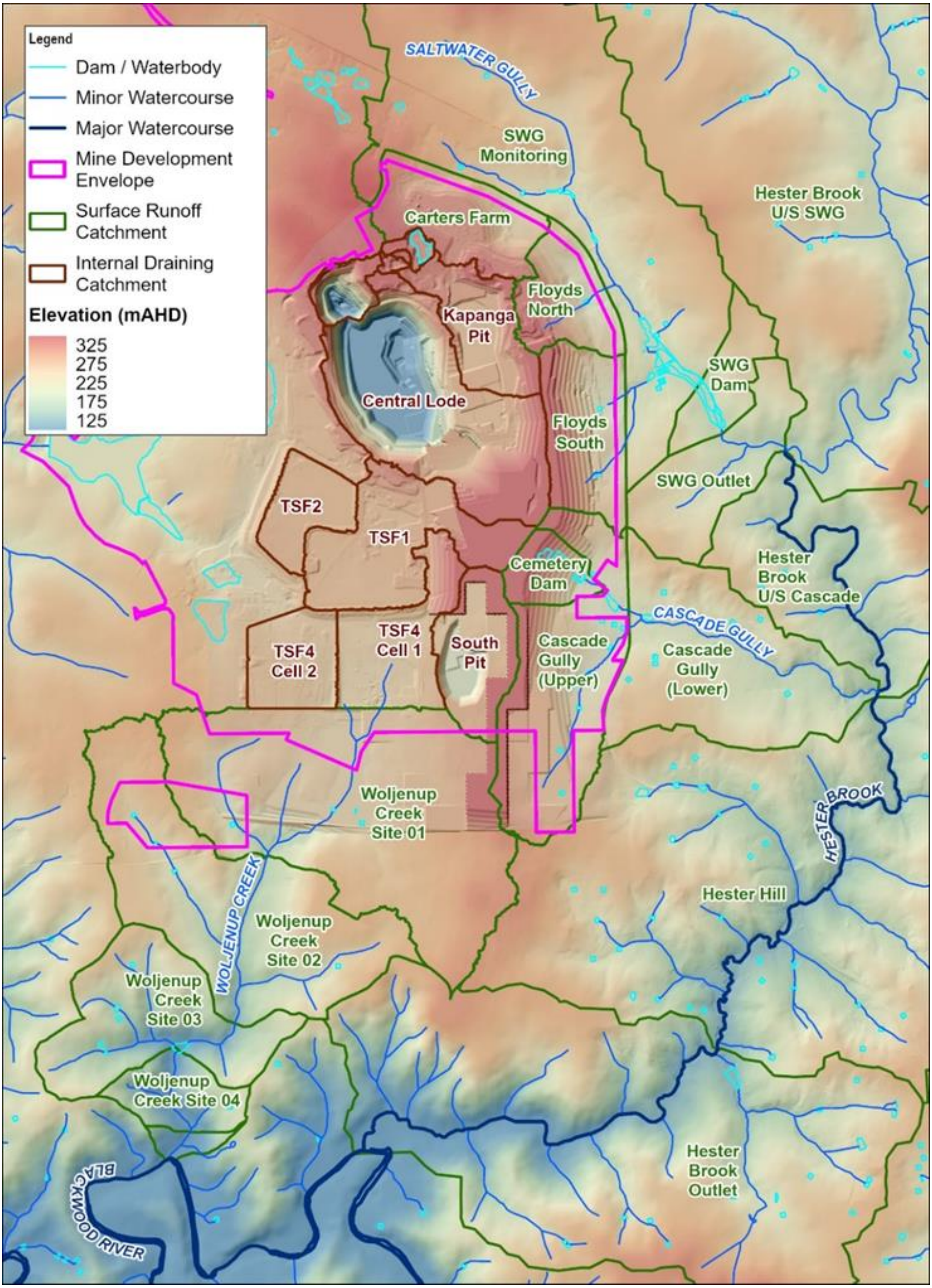
Appendix A

Modelled Surface Water Catchments

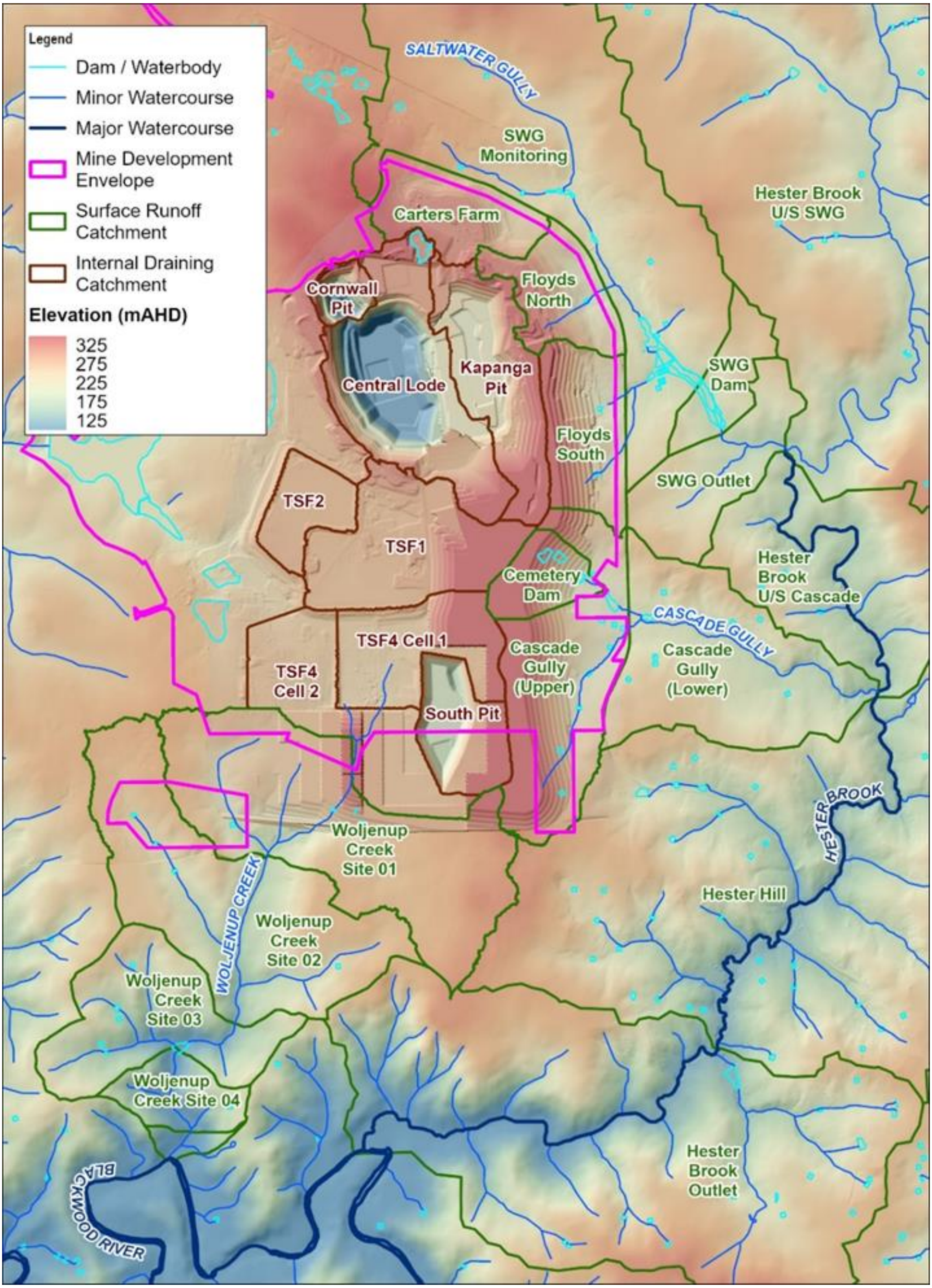
Surface Water Catchment Areas in 2025



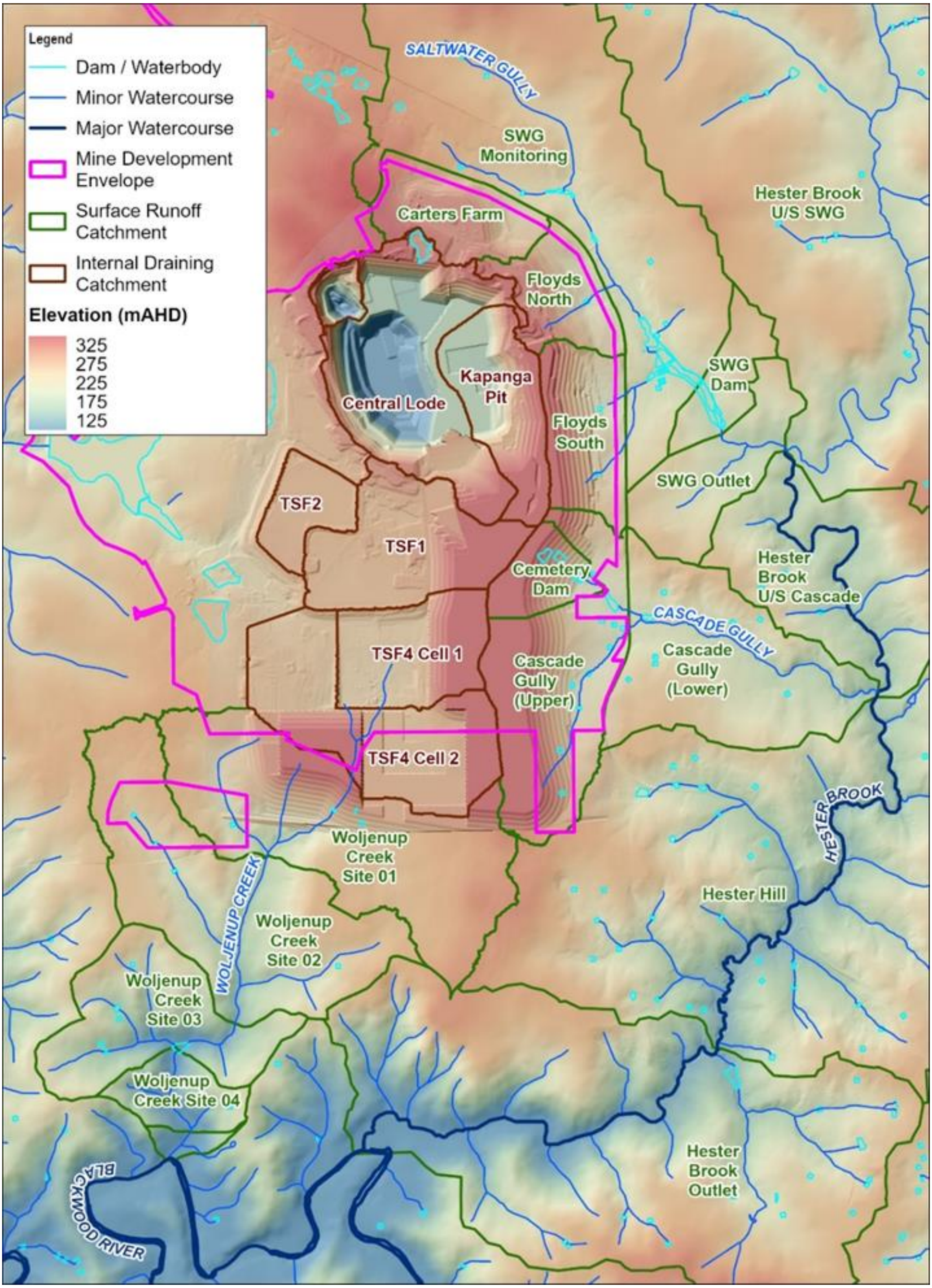
Surface Water Catchment Areas in 2032



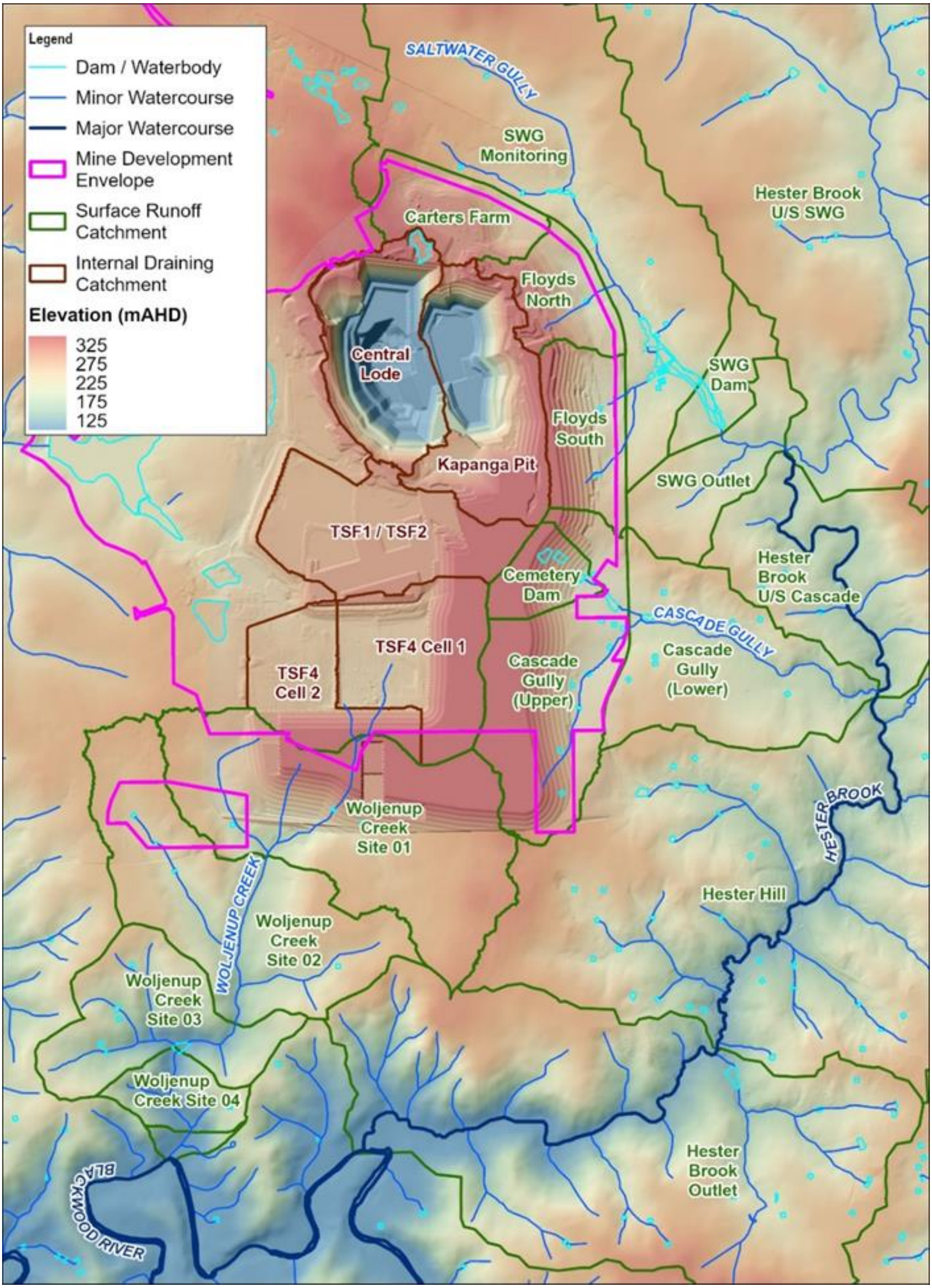
Surface Water Catchment Areas in 2037



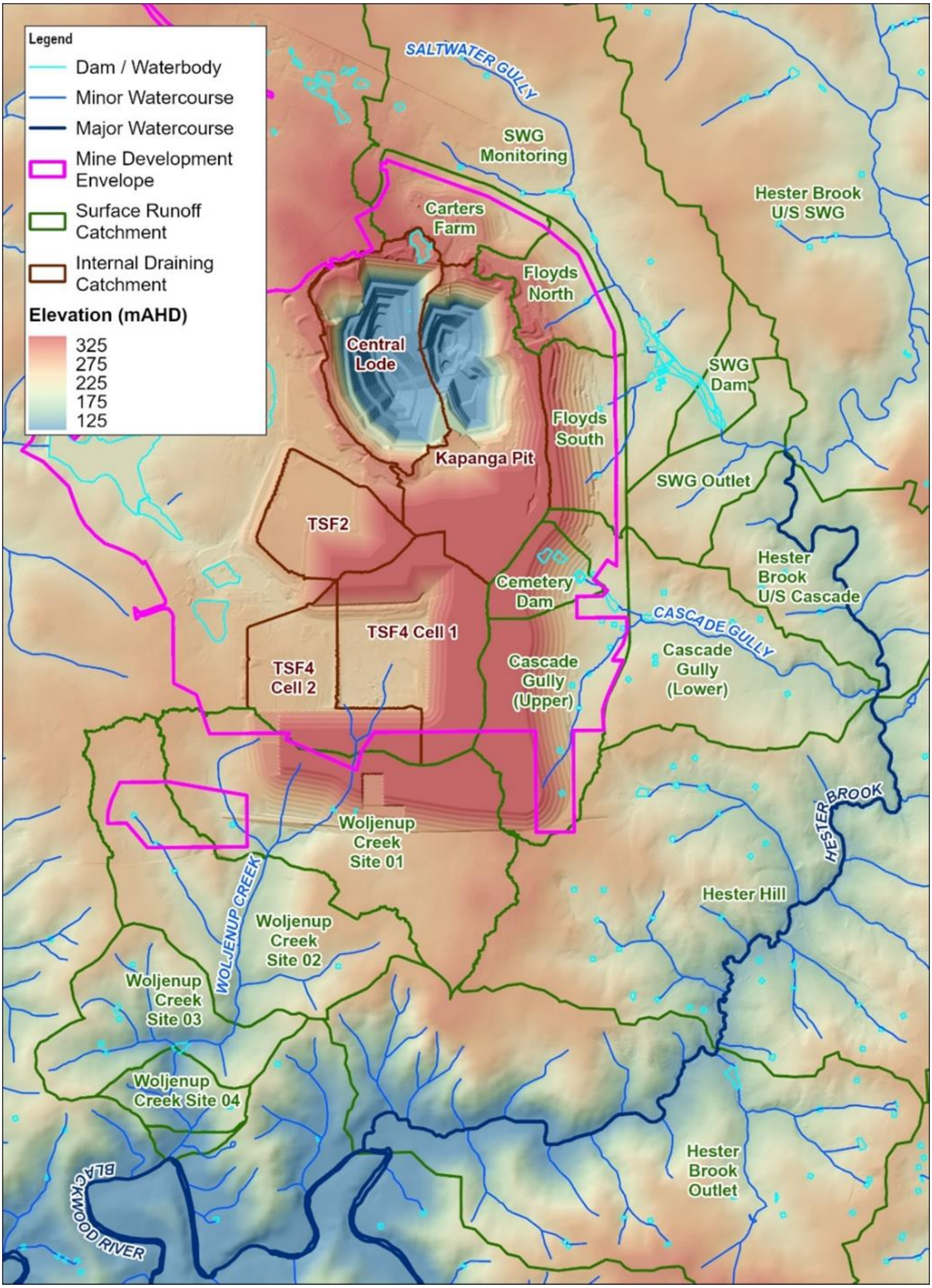
Surface Water Catchment Areas in 2042



Surface Water Catchment Areas in 2047

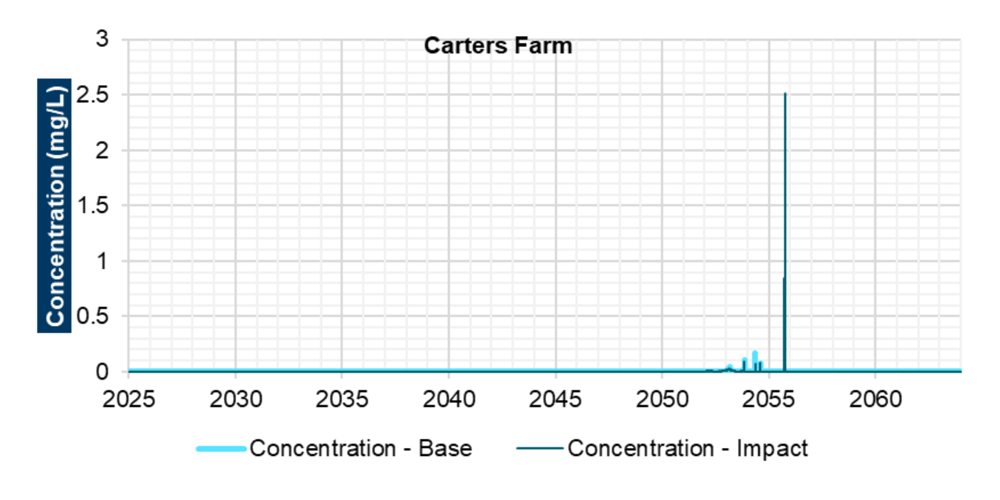


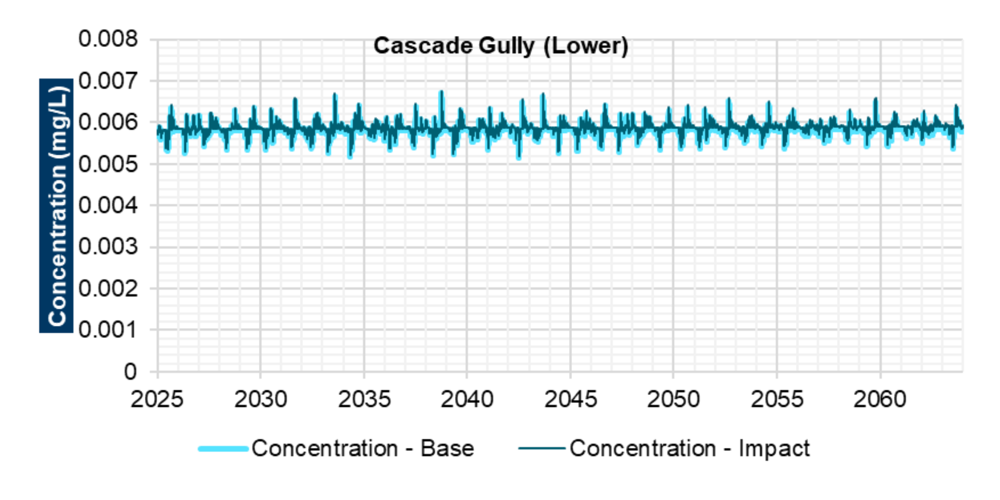
Surface Water Catchment Areas in 2052

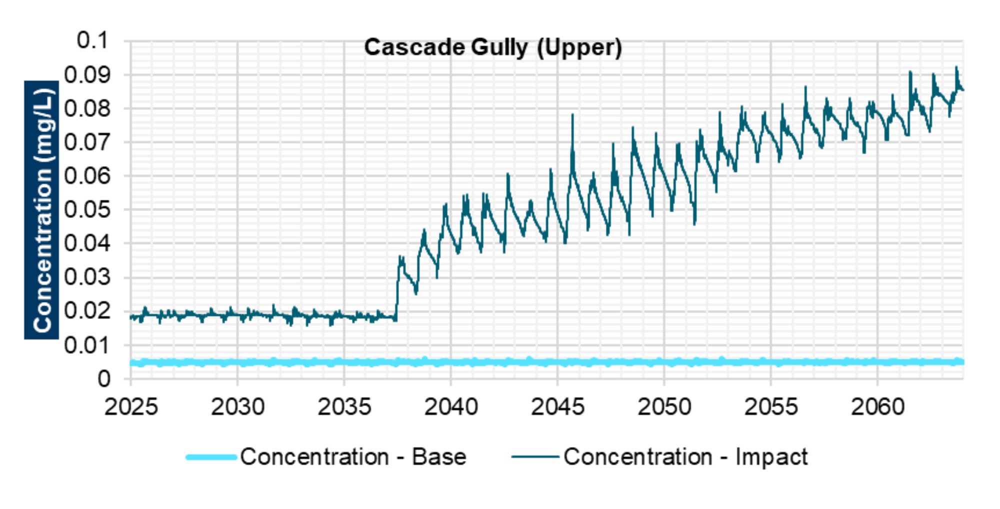


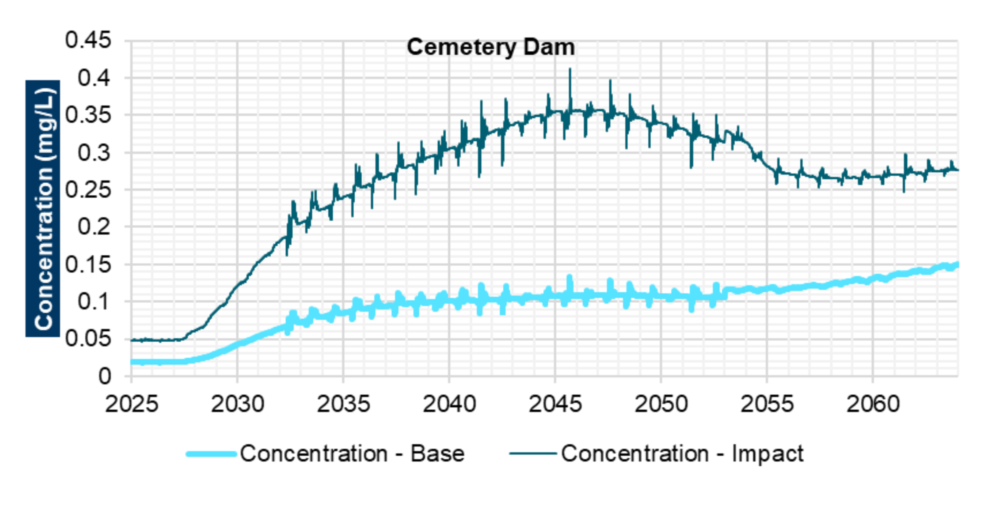
Appendix B

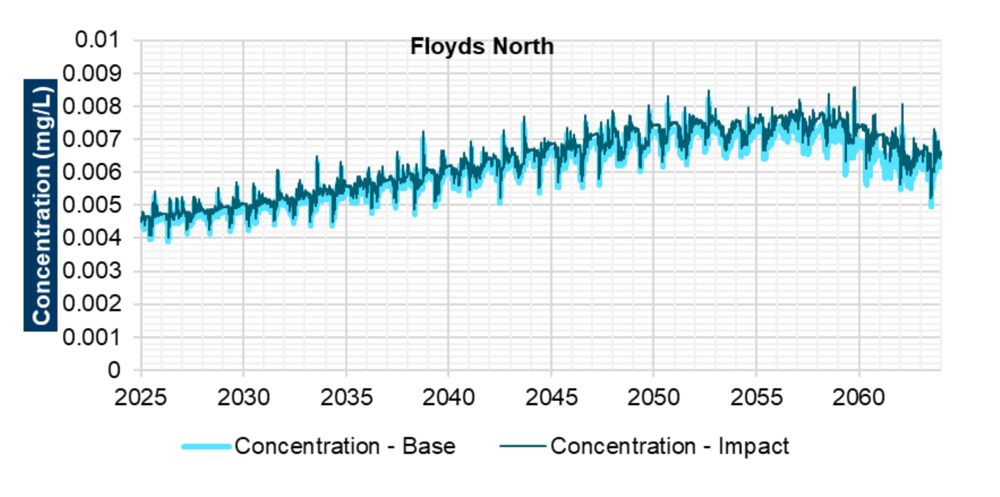
Lithium Concentrations Adopted in Baseflows

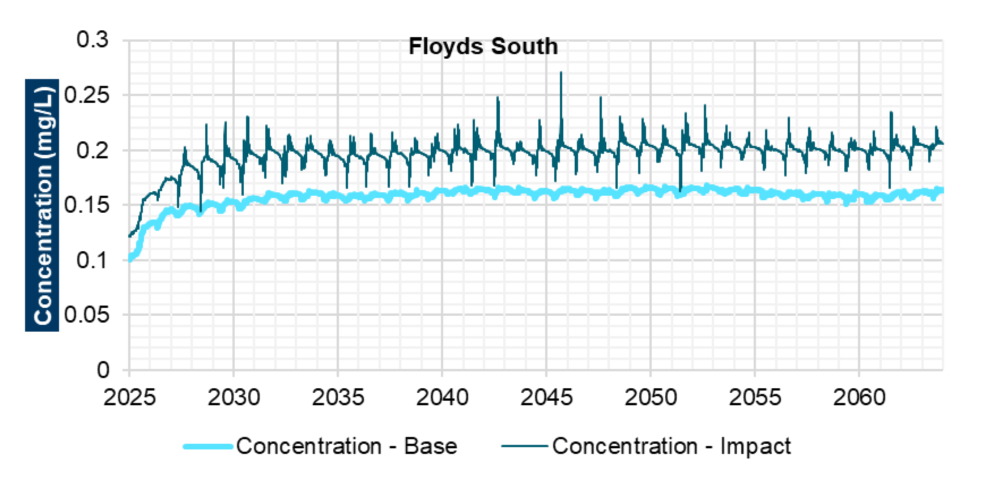

Carters Farm
Concentration (mg/L)
Concentration - Base
Concentration - Impact

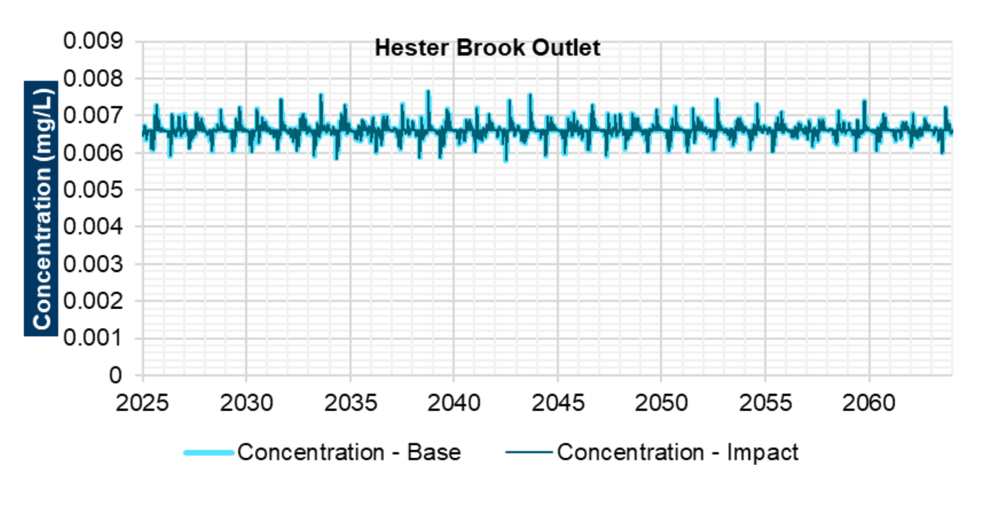

Cascade Gully (Lower)
Concentration (mg/L)
Concentration - Base
Concentration - Impact

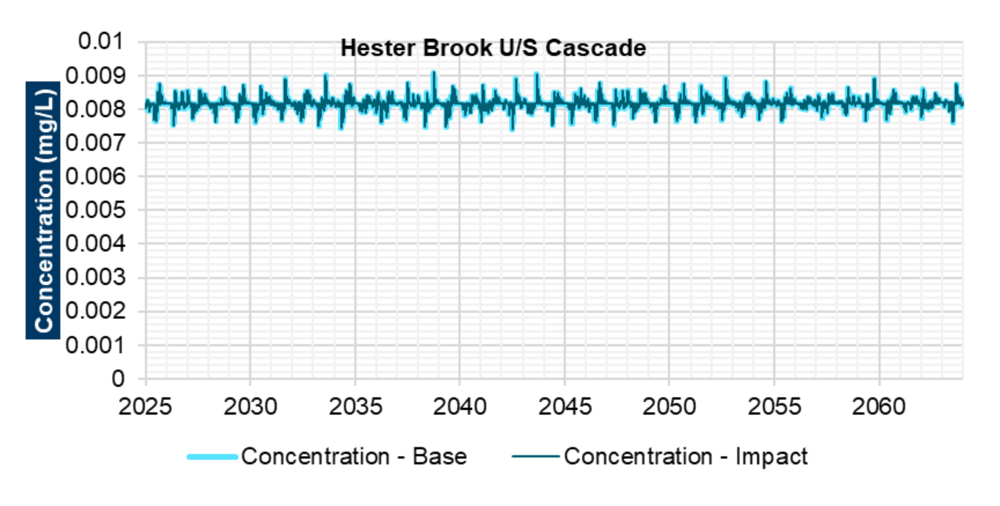

Cascade Gully (Upper)
Concentration (mg/L)
Concentration - Base
Concentration - Impact

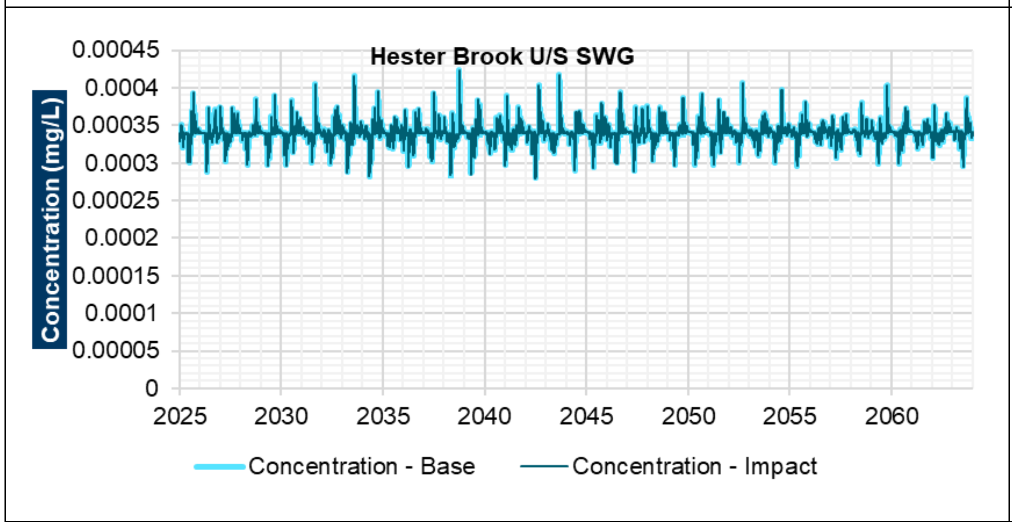

Cemetery Dam
Concentration (mg/L)
Concentration - Base
Concentration - Impact

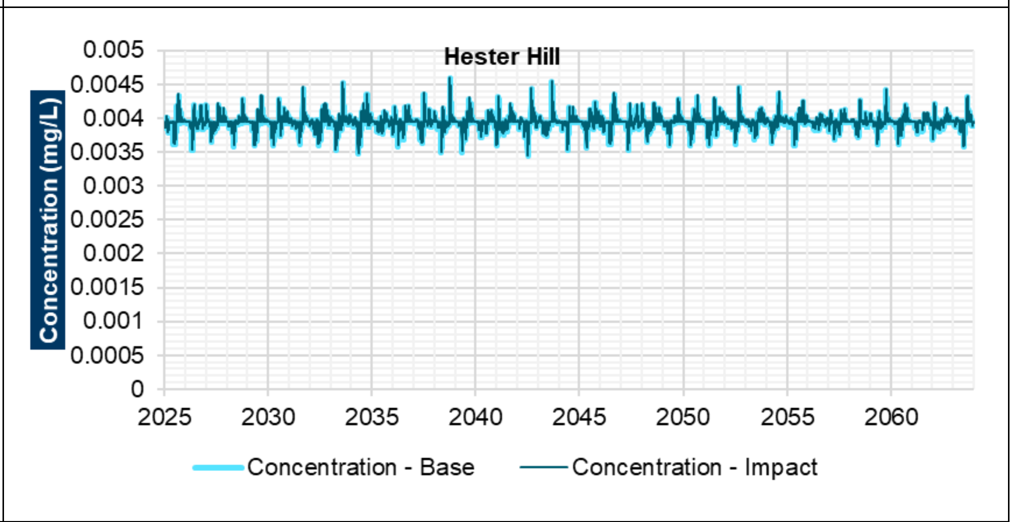

Floyds North
Concentration (mg/L)
Concentration - Base
Concentration - Impact

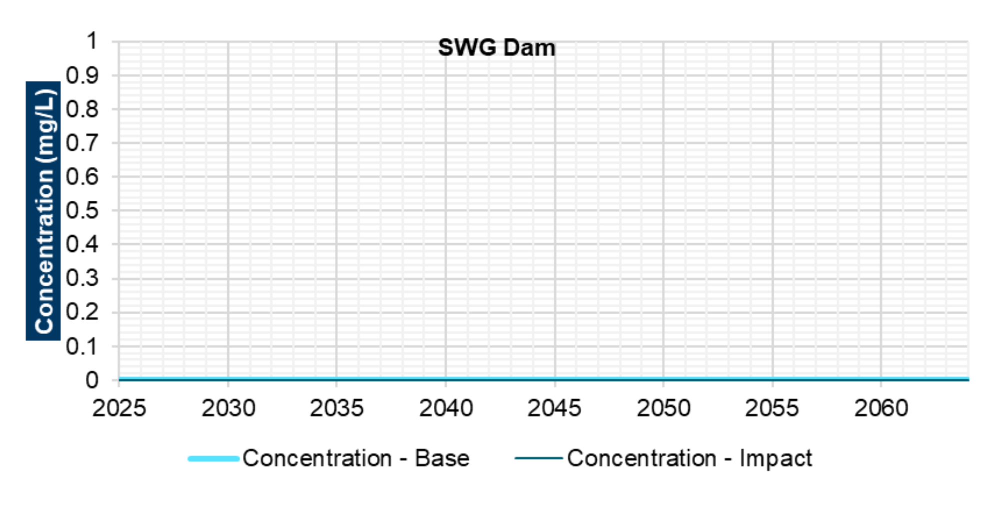

Floyds South
Concentration (mg/L)
Concentration - Base
Concentration - Impact

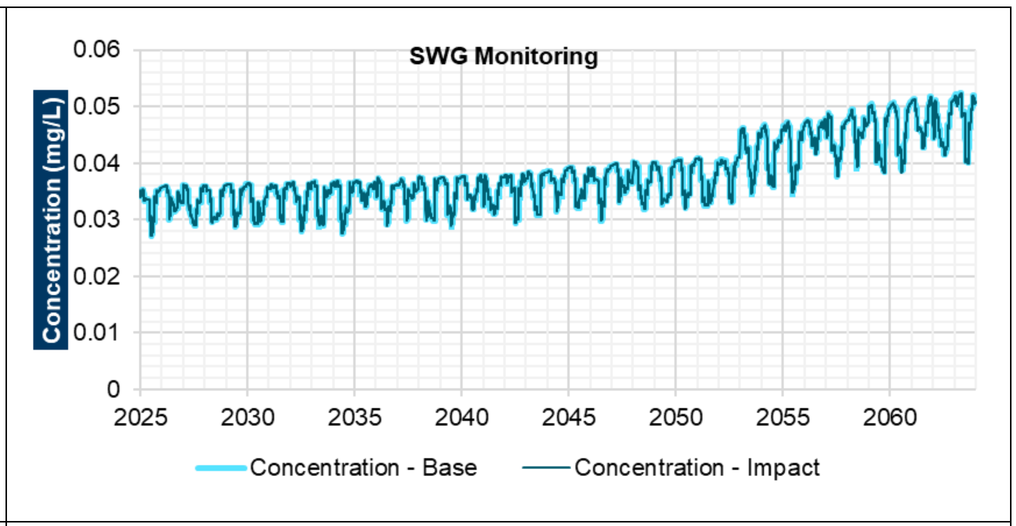

Hester Brook Outlet
Concentration (mg/L)
Concentration - Base
Concentration - Impact

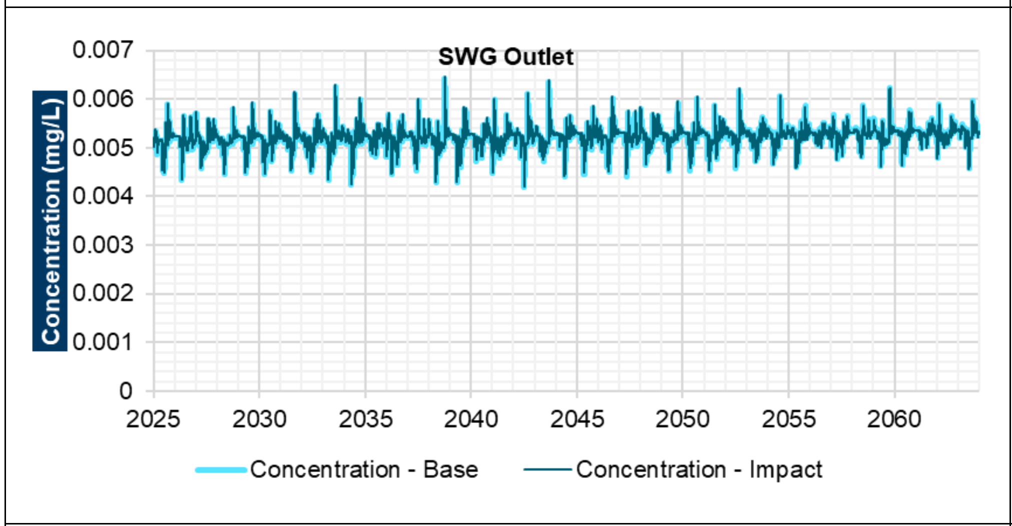

Hester Brook U/S Cascade
Concentration (mg/L)
Concentration - Base
Concentration - Impact

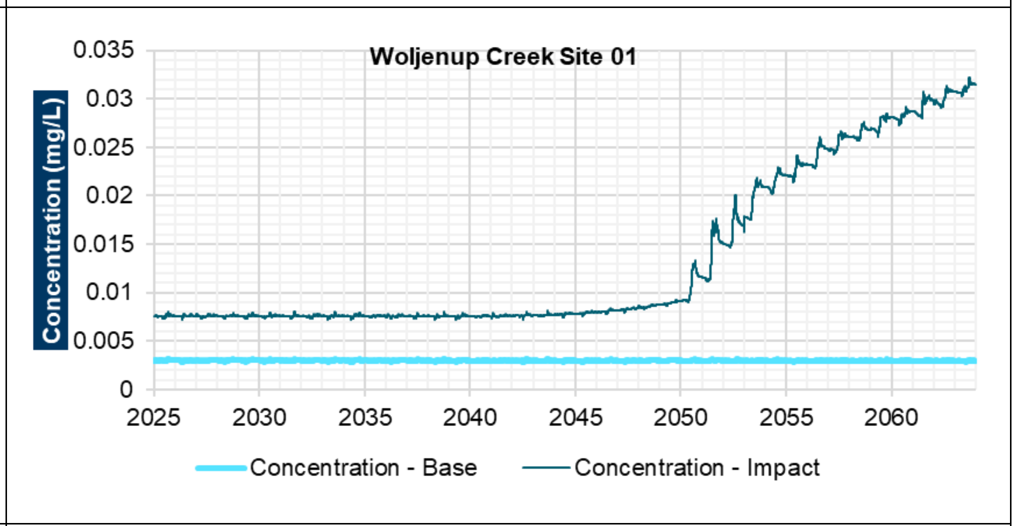

Hester Brook U/S SWG
Concentration (mg/L)
Concentration - Base
Concentration - Impact

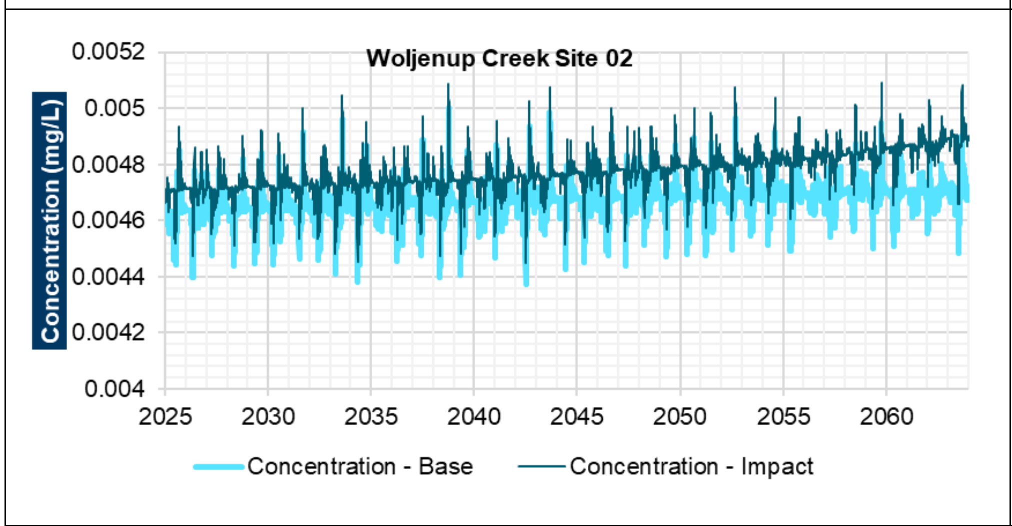

Hester Hill
Concentration (mg/L)
Concentration - Base
Concentration - Impact

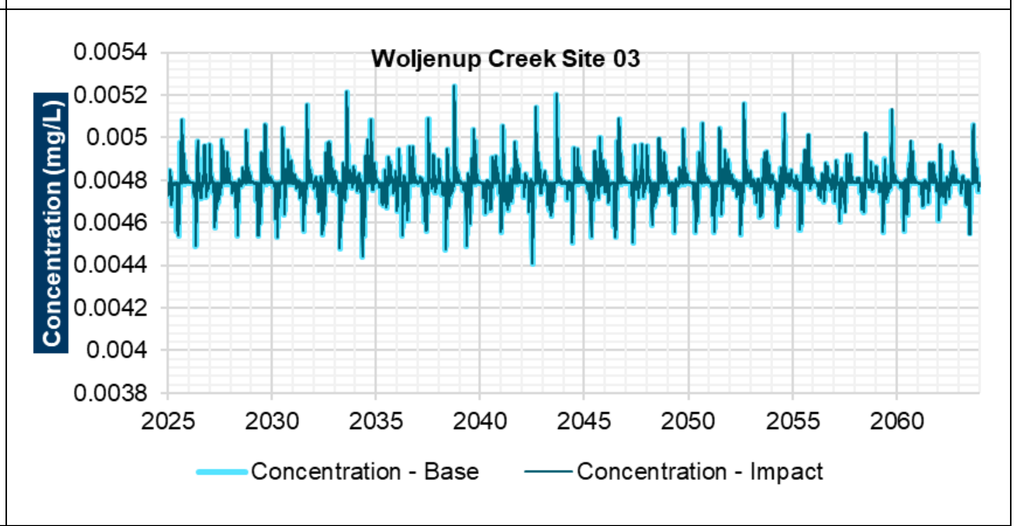

SWG Dam
Concentration (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

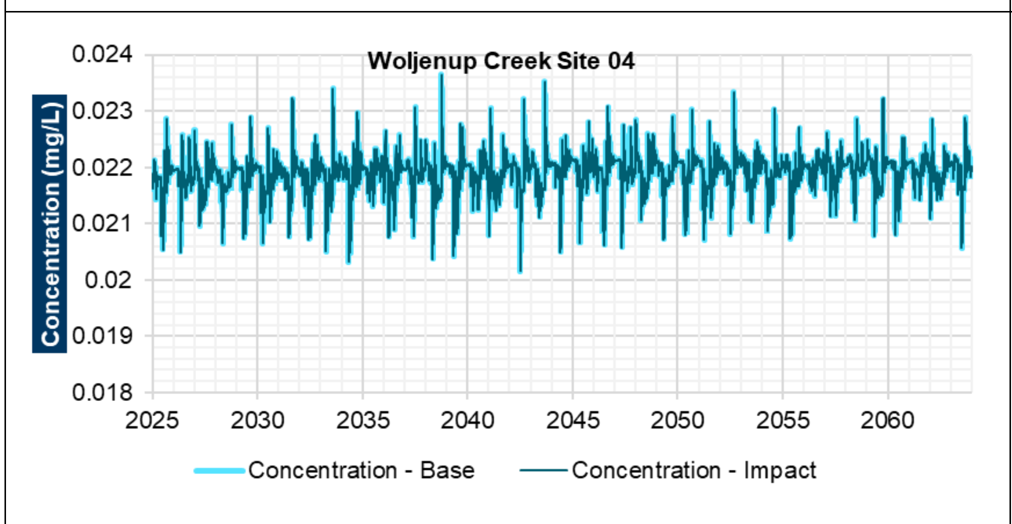

SWG Monitoring
Concentration (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

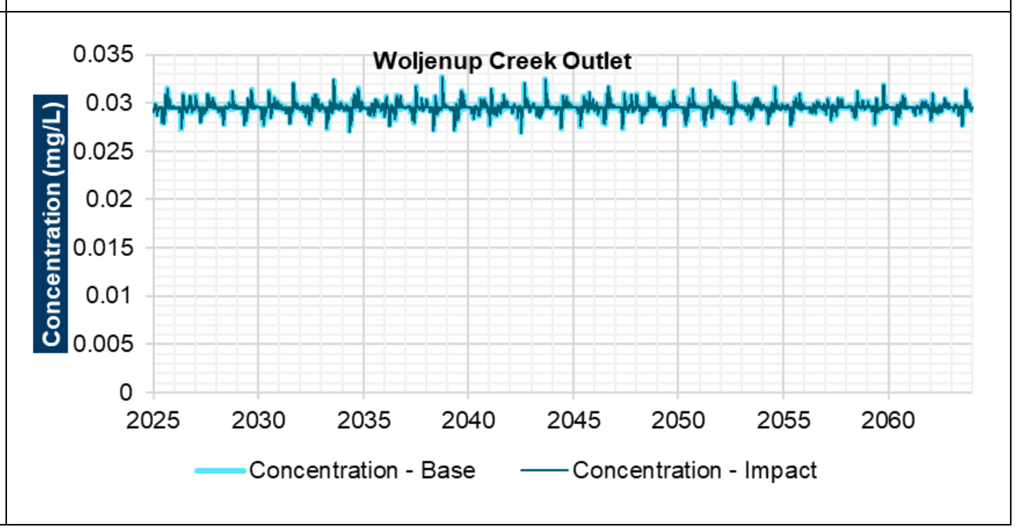

SWG Outlet
Concentration (mg/L)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Site 01
Concentration (mg/L)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Site 02
Concentration (mg/L)
0.0052
0.005
0.0048
0.0046
0.0044
0.0042
0.004
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

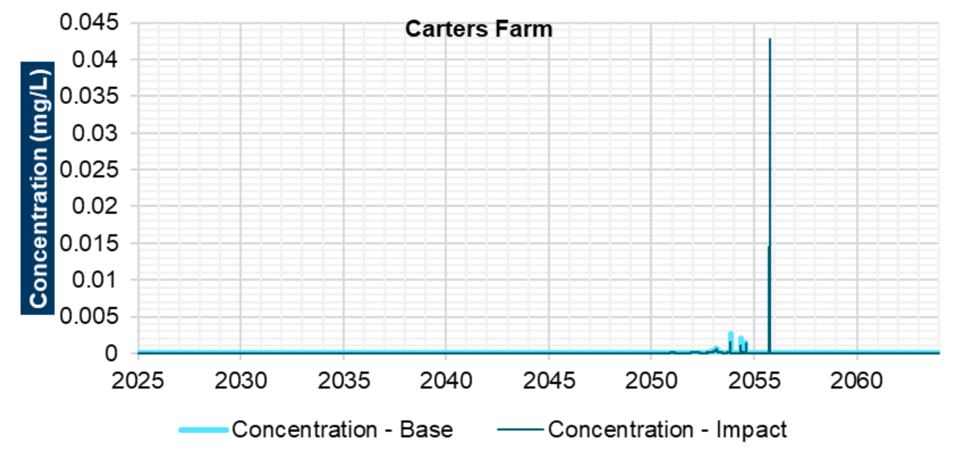

Woljenup Creek Site 03
Concentration (mg/L)
0.0054
0.0052
0.005
0.0048
0.0046
0.0044
0.0042
0.004
0.0038
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

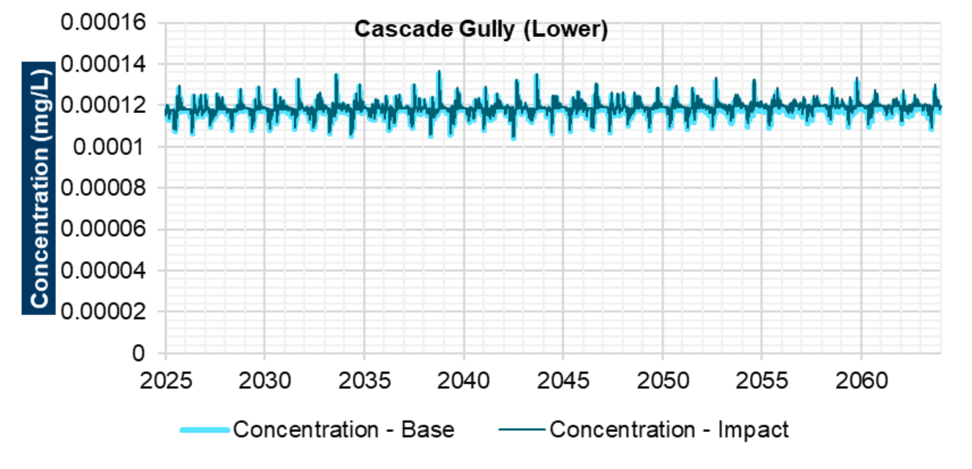

Woljenup Creek Site 04
Concentration (mg/L)
0.024
0.023
0.022
0.021
0.02
0.019
0.018
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

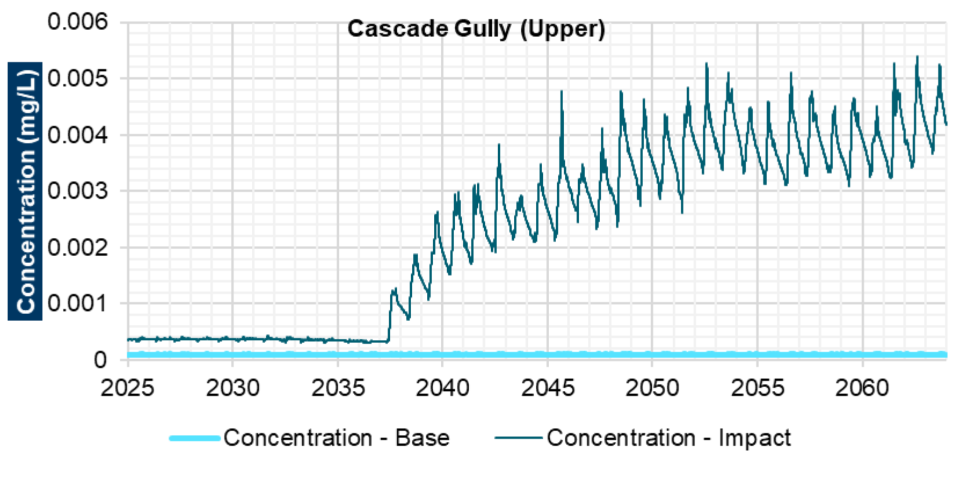

Woljenup Creek Outlet
Concentration (mg/L)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

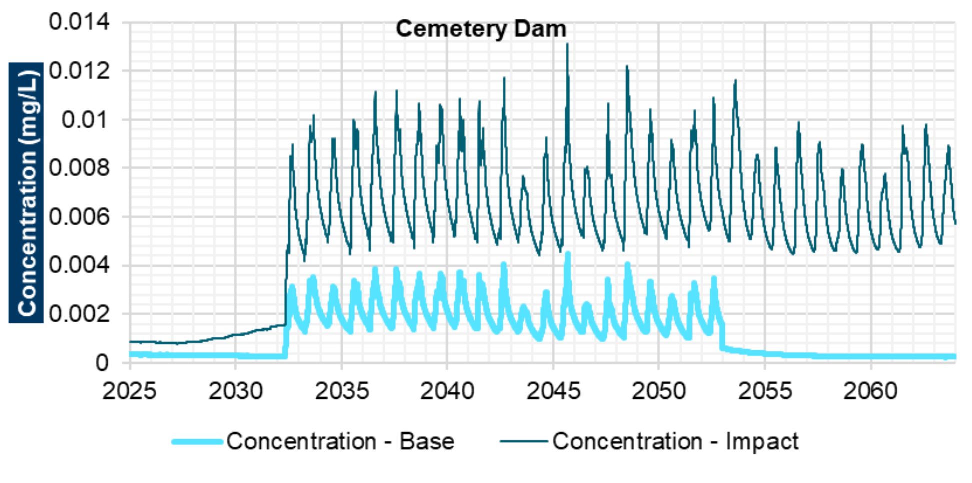
Appendix C

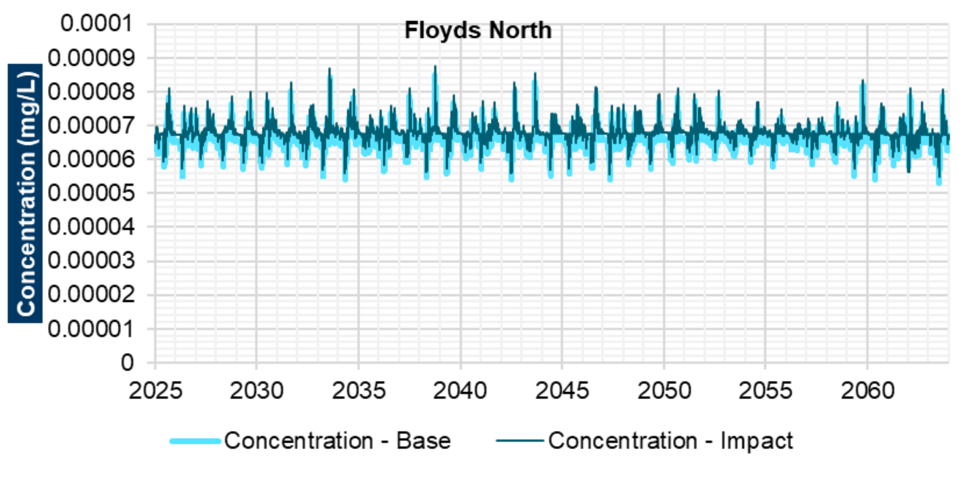
Arsenic Concentrations Adopted in Baseflows

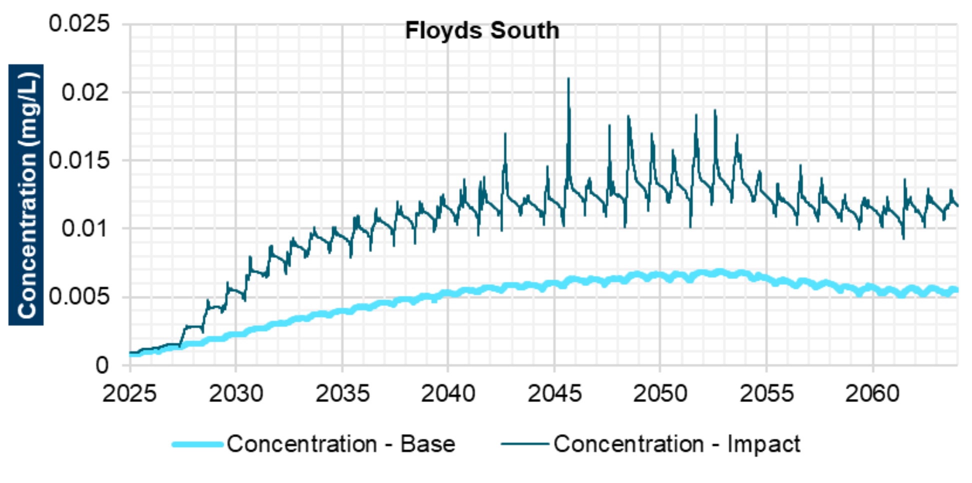

Carters Farm
Concentration (mg/L)
0.045 0.04 0.035 0.03 0.025 0.02 0.015 0.01 0.005 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

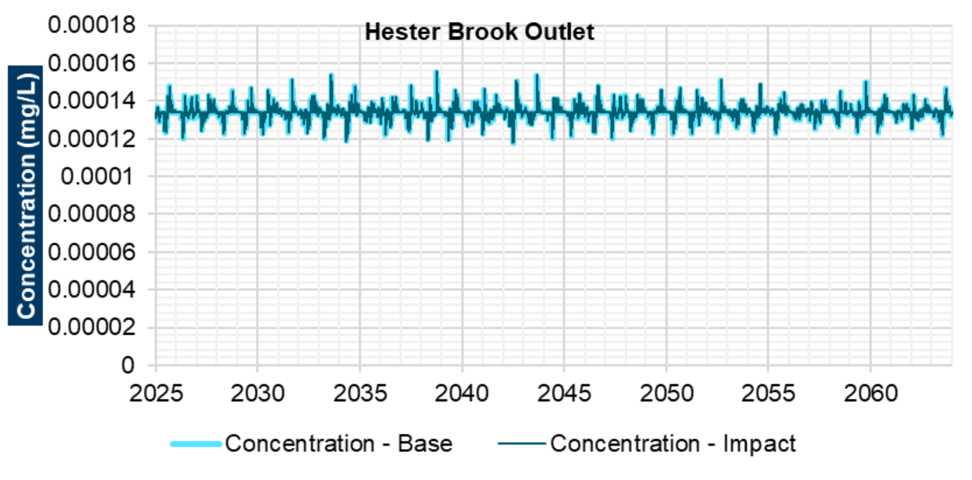

Cascade Gully (Lower)
Concentration (mg/L)
0.00016 0.00014 0.00012 0.0001 0.00008 0.00006 0.00004 0.00002 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

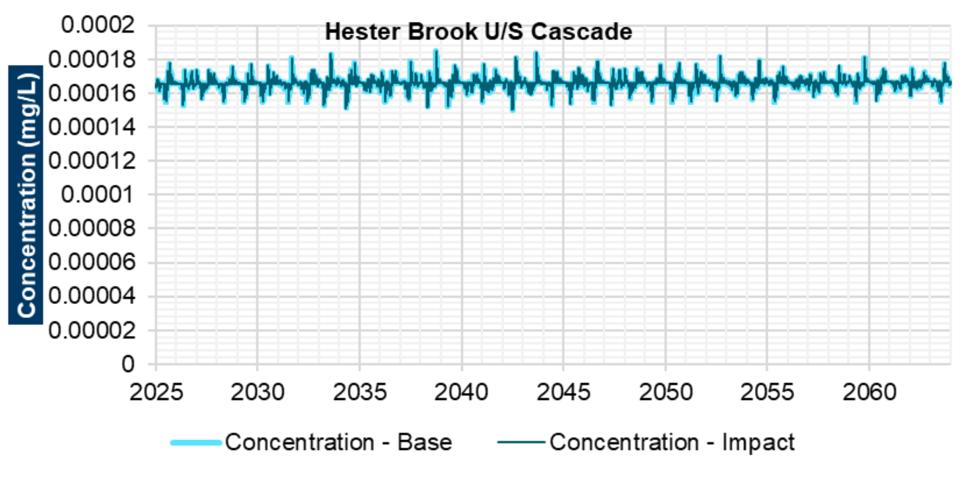

Cascade Gully (Upper)
Concentration (mg/L)
0.006 0.005 0.004 0.003 0.002 0.001 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

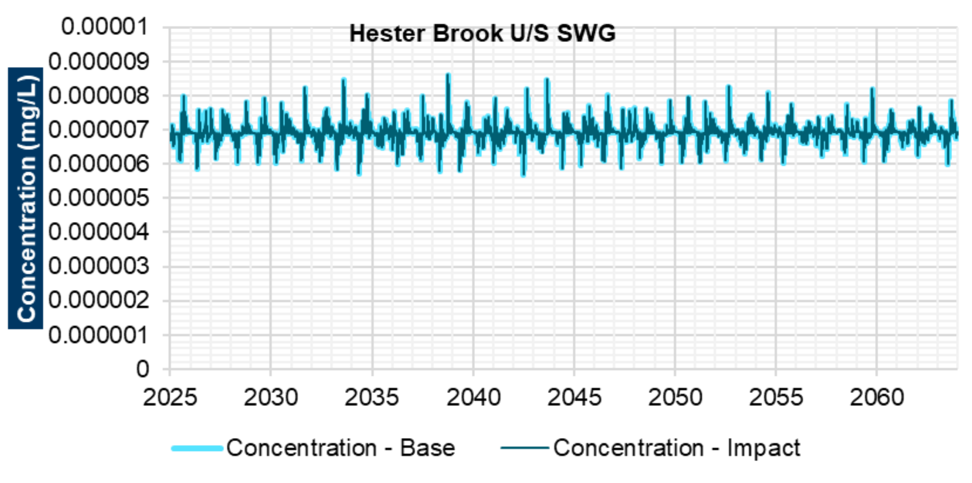

Cemetery Dam
Concentration (mg/L)
0.014 0.012 0.01 0.008 0.006 0.004 0.002 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

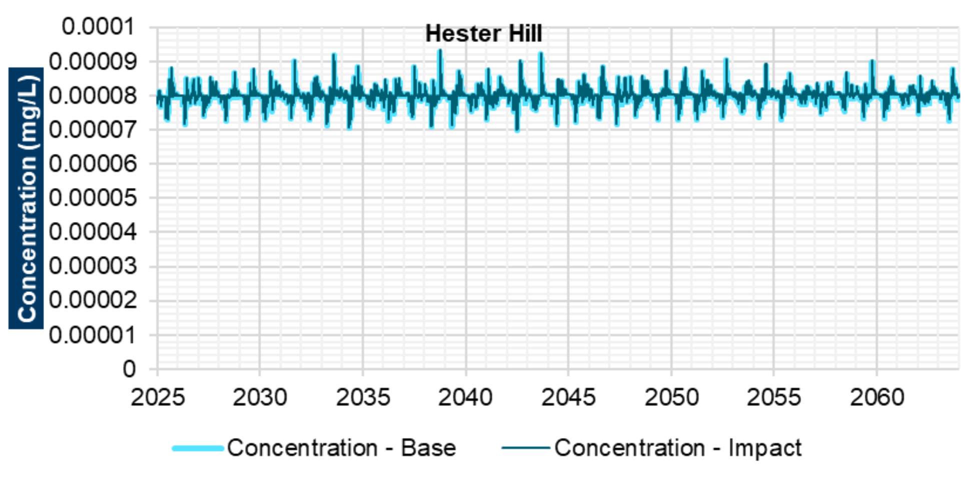

Floyds North
Concentration (mg/L)
0.0001 0.00009 0.00008 0.00007 0.00006 0.00005 0.00004 0.00003 0.00002 0.00001 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

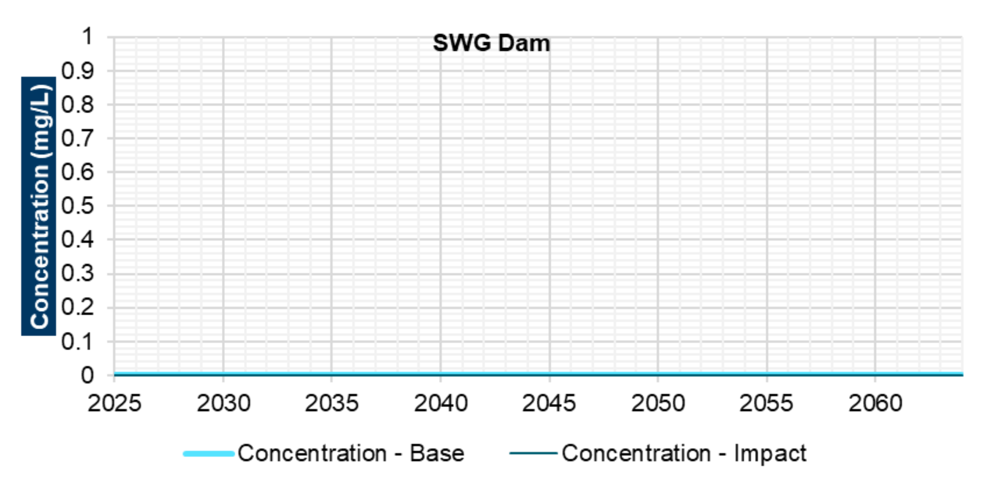

Floyds South
Concentration (mg/L)
0.025 0.02 0.015 0.01 0.005 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

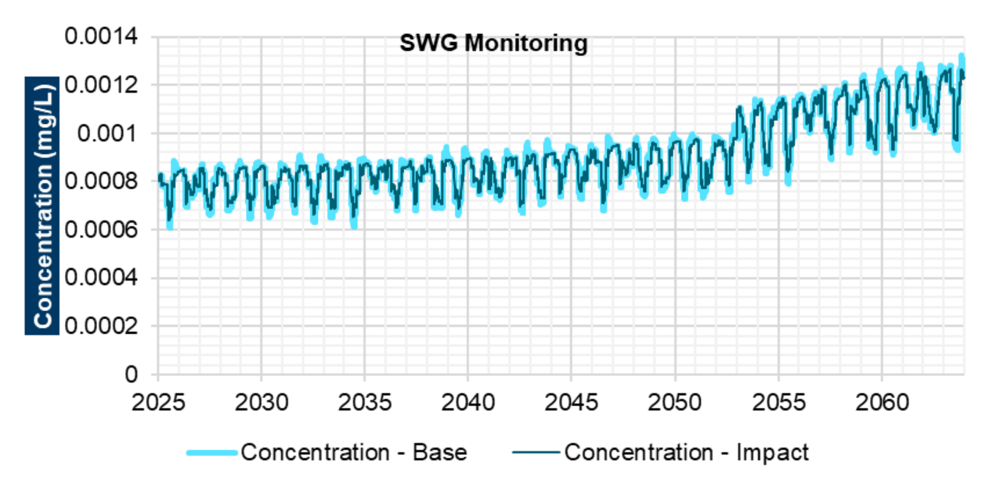

Hester Brook Outlet
Concentration (mg/L)
0.00018 0.00016 0.00014 0.00012 0.0001 0.00008 0.00006 0.00004 0.00002 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

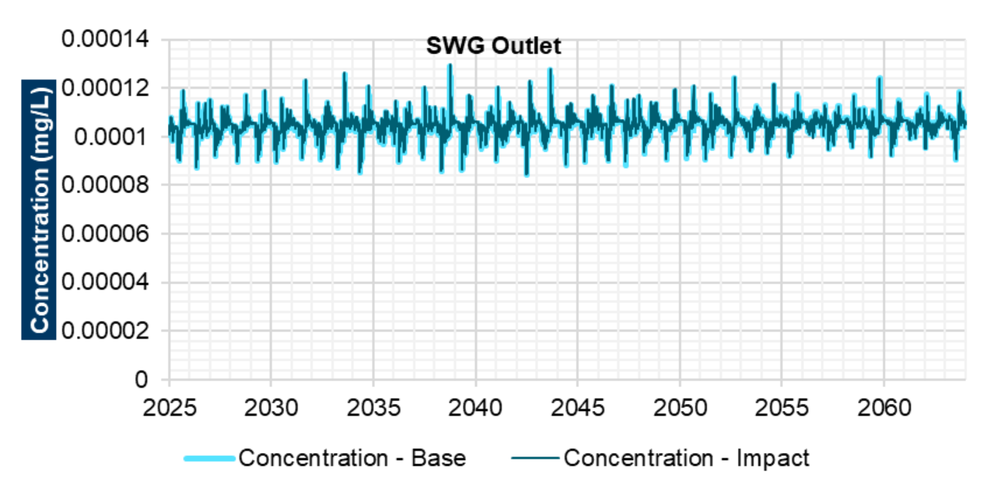

Hester Brook U/S Cascade
Concentration (mg/L)
0.0002 0.00018 0.00016 0.00014 0.00012 0.0001 0.00008 0.00006 0.00004 0.00002 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

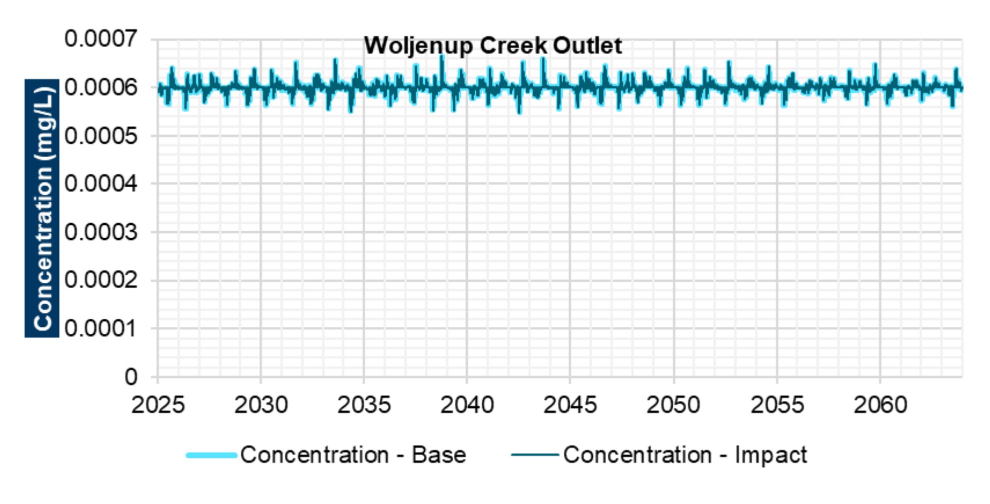

Hester Brook U/S SWG
Concentration (mg/L)
0.00001 0.000009 0.000008 0.000007 0.000006 0.000005 0.000004 0.000003 0.000002 0.000001 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

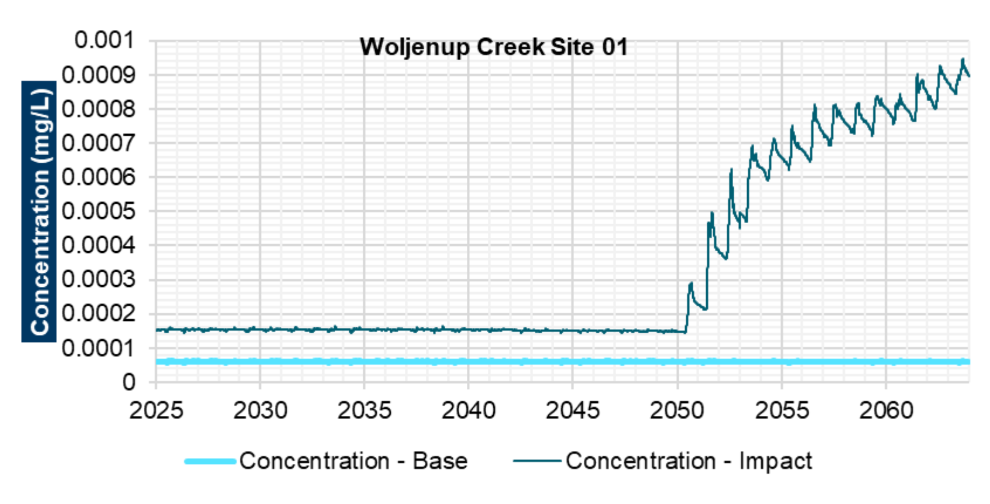

Hester Hill
Concentration (mg/L)
0.0001 0.00009 0.00008 0.00007 0.00006 0.00005 0.00004 0.00003 0.00002 0.00001 0
2025 2030 2035 2040 2045 2050 2055 2060
Concentration - Base
Concentration - Impact

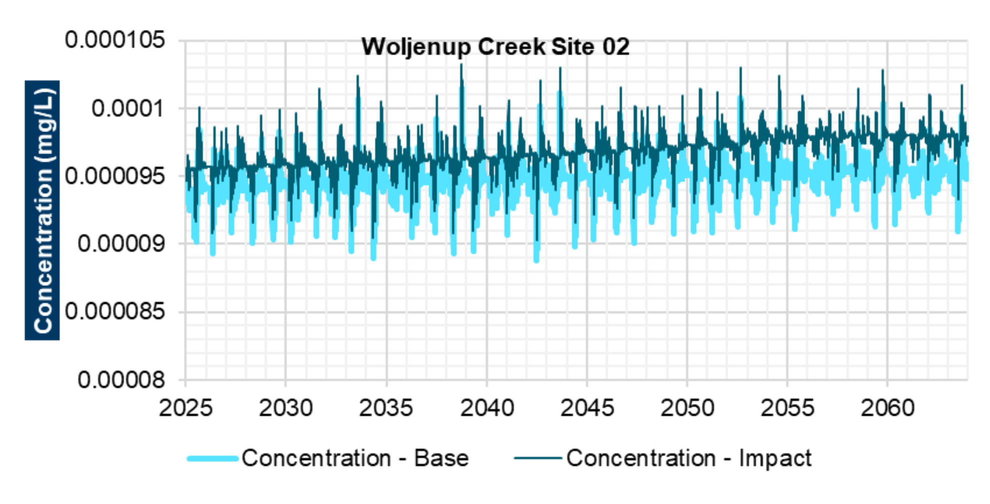

SWG Dam
Concentration (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

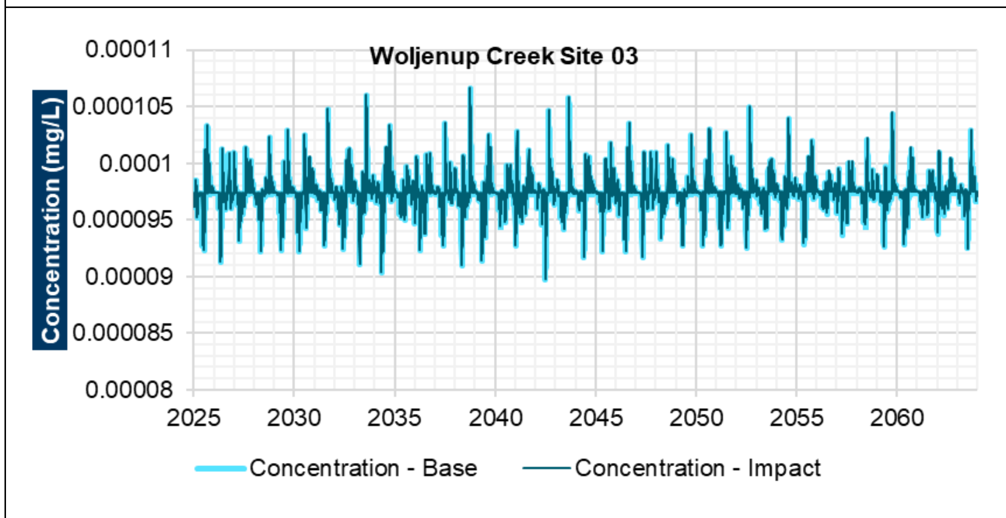

SWG Monitoring
Concentration (mg/L)
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

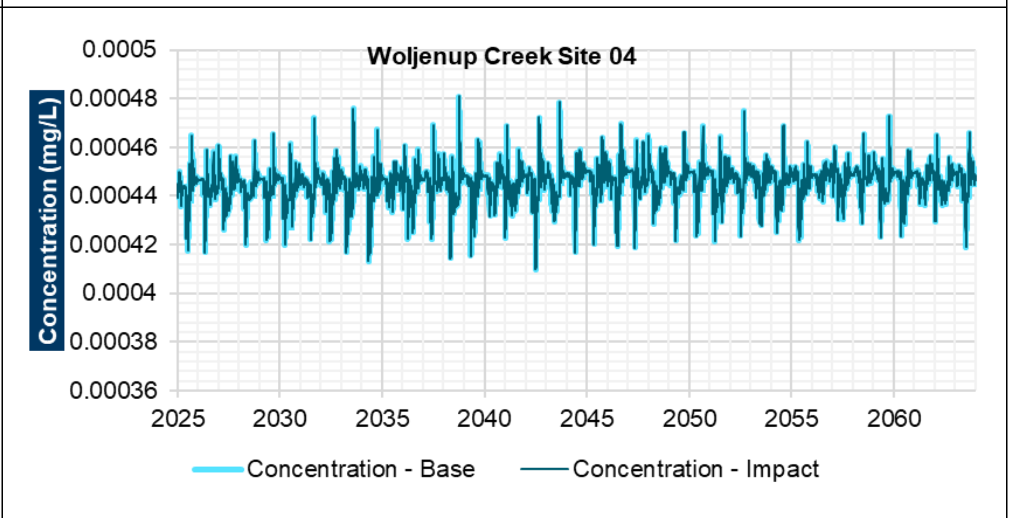

SWG Outlet
Concentration (mg/L)
0.00014
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Outlet
Concentration (mg/L)
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Site 01
Concentration (mg/L)
0.001
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

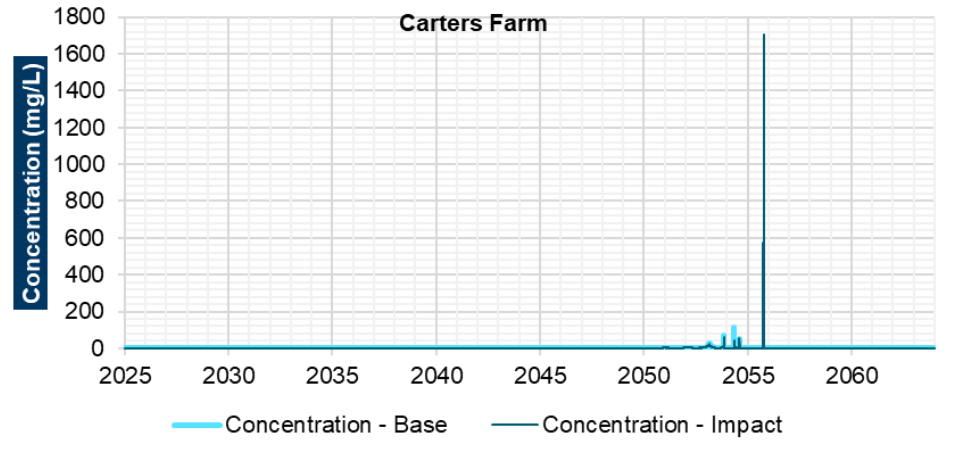

Woljenup Creek Site 02
Concentration (mg/L)
0.000105
0.0001
0.000095
0.00009
0.000085
0.00008
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

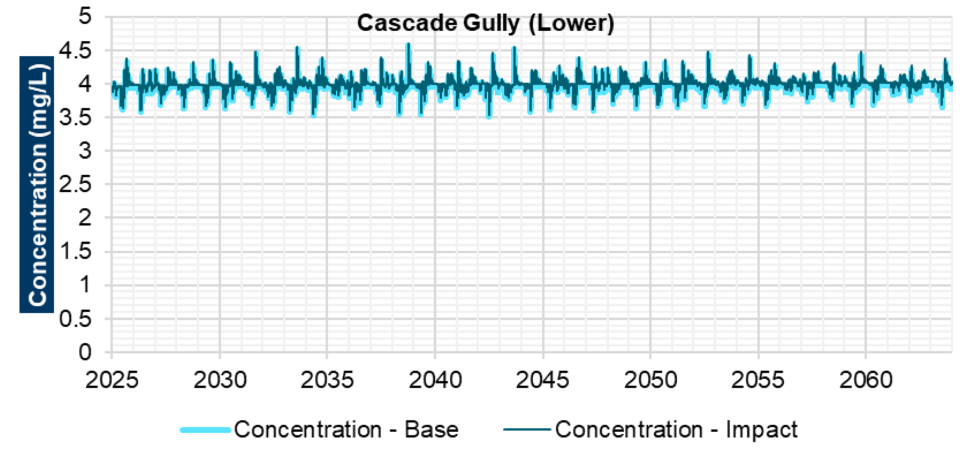

Woljenup Creek Site 03
Concentration (mg/L)
0.00011
0.000105
0.0001
0.000095
0.00009
0.000085
0.00008
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

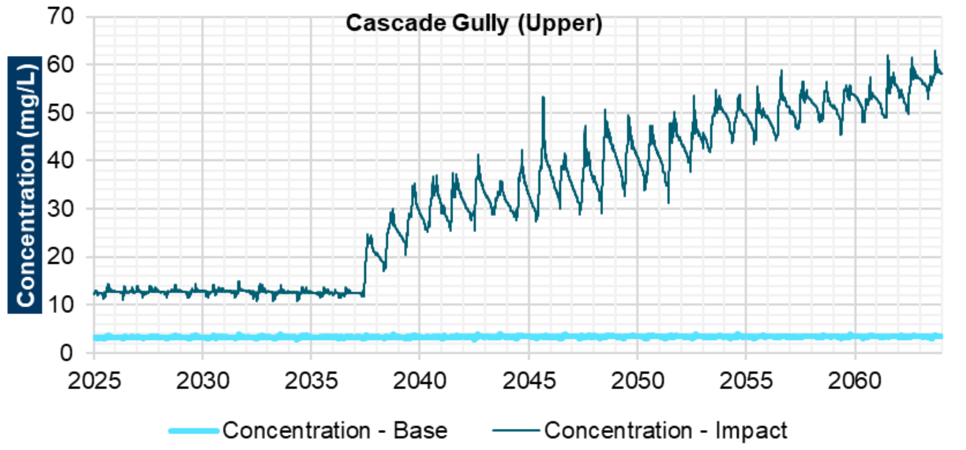

Woljenup Creek Site 04
Concentration (mg/L)
0.0005
0.00048
0.00046
0.00044
0.00042
0.0004
0.00038
0.00036
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

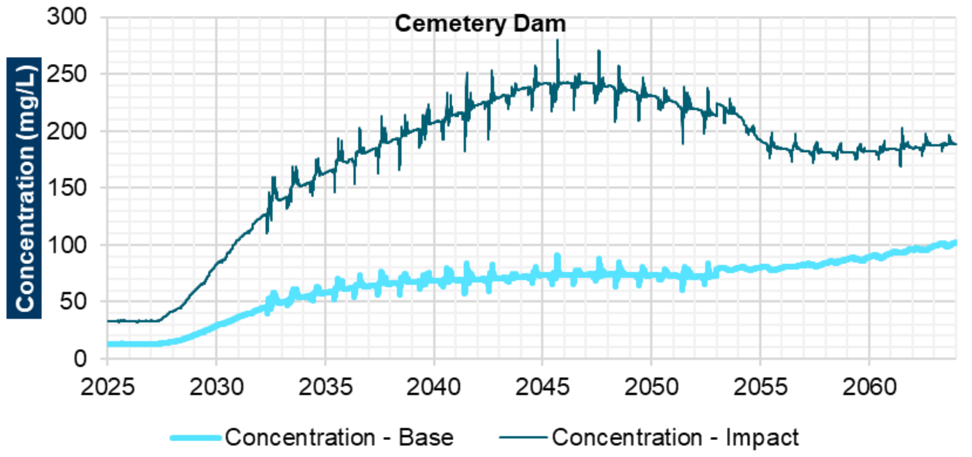
Appendix D

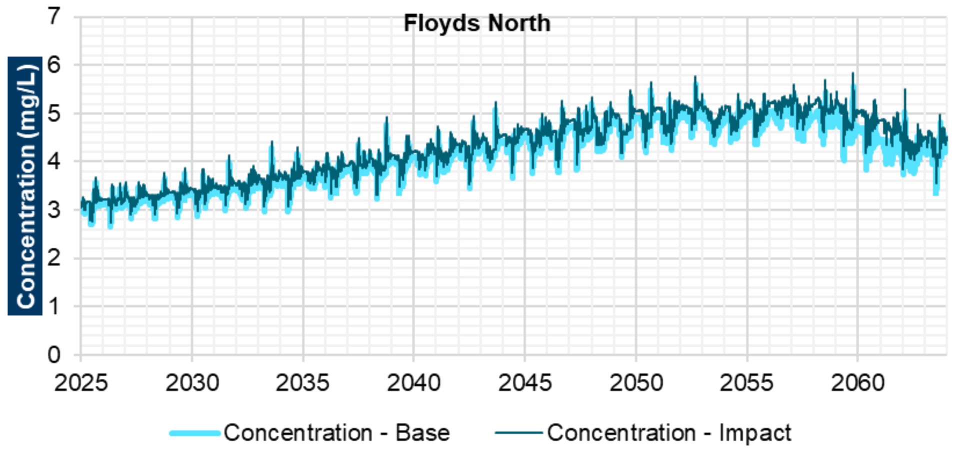
Sulphate Concentrations Adopted in Baseflows

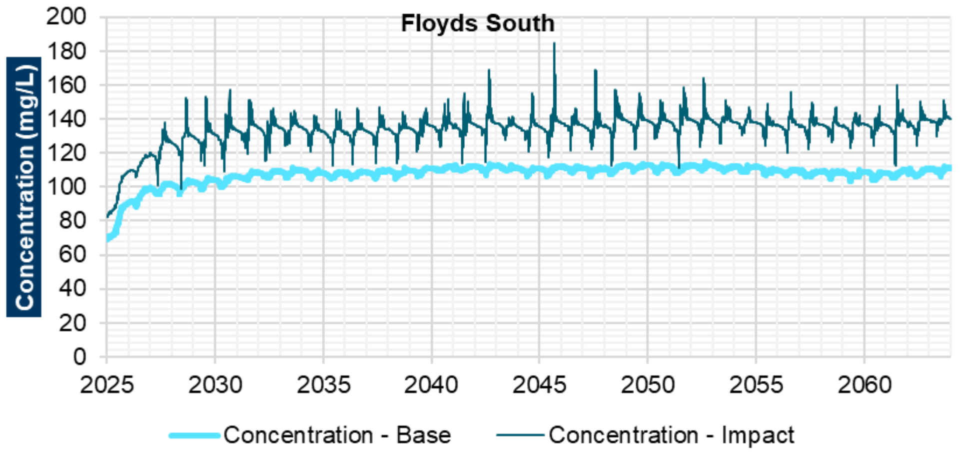

Carters Farm
Concentration (mg/L)
Concentration - Base
Concentration - Impact

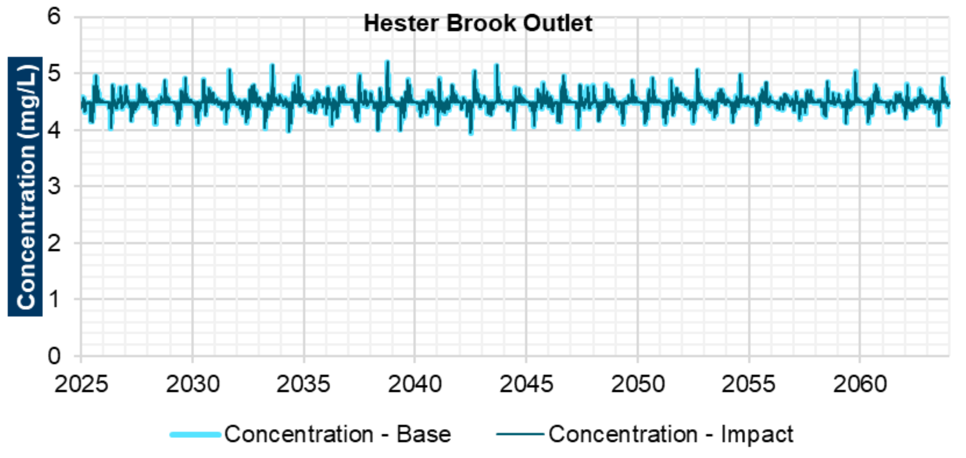

Cascade Gully (Lower)
Concentration (mg/L)
Concentration - Base
Concentration - Impact

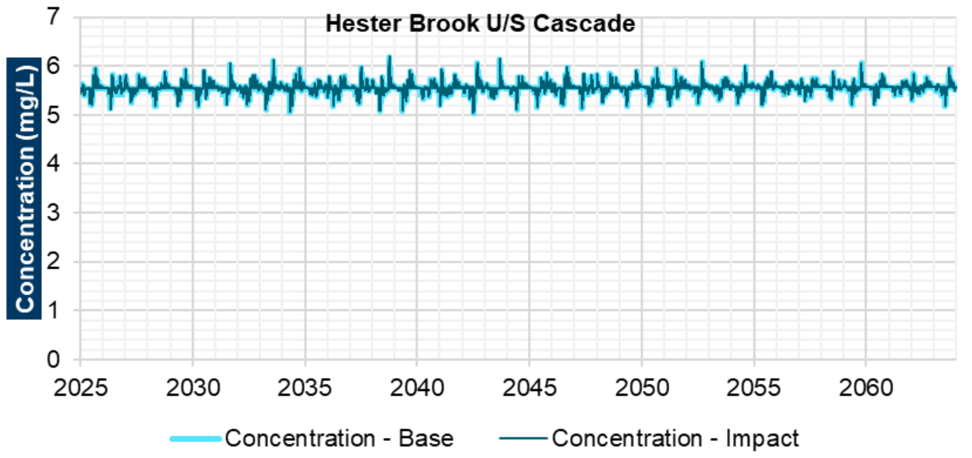

Cascade Gully (Upper)
Concentration (mg/L)
Concentration - Base
Concentration - Impact

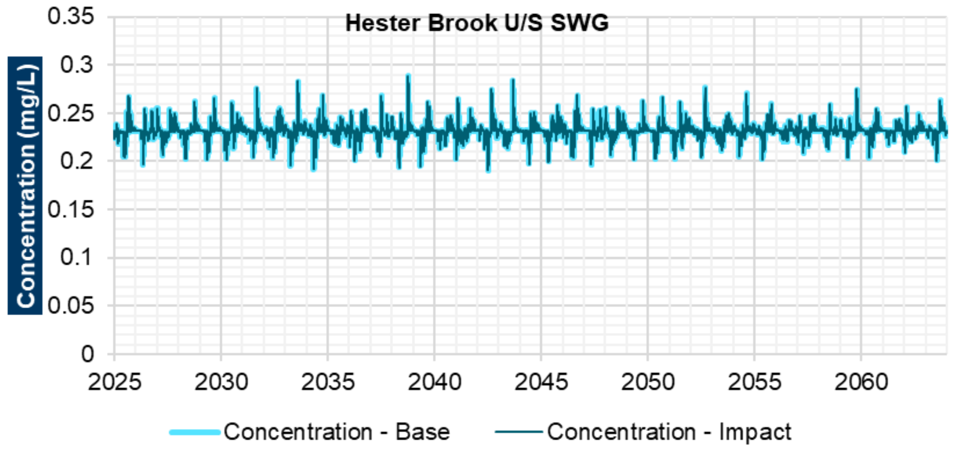

Cemetery Dam
Concentration (mg/L)
Concentration - Base
Concentration - Impact

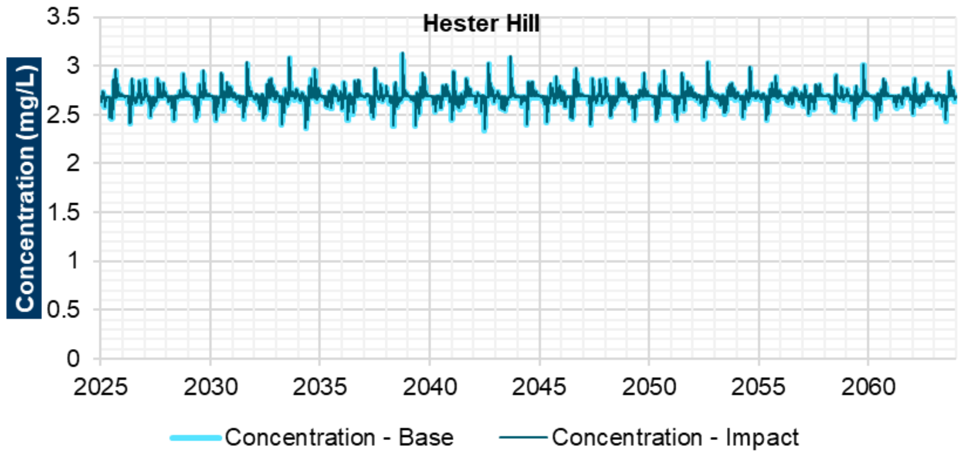

Floyds North
Concentration (mg/L)
Concentration - Base
Concentration - Impact

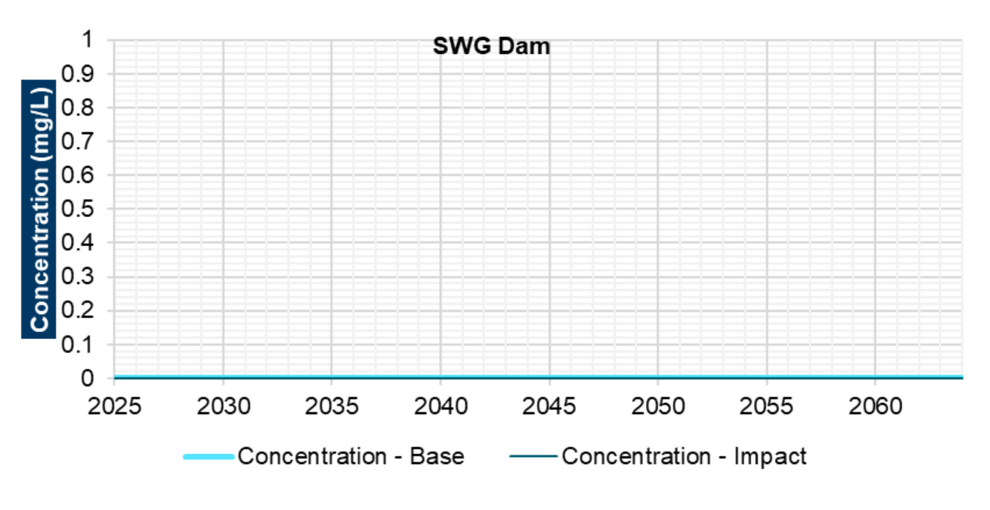

Floyds South
Concentration (mg/L)
Concentration - Base
Concentration - Impact

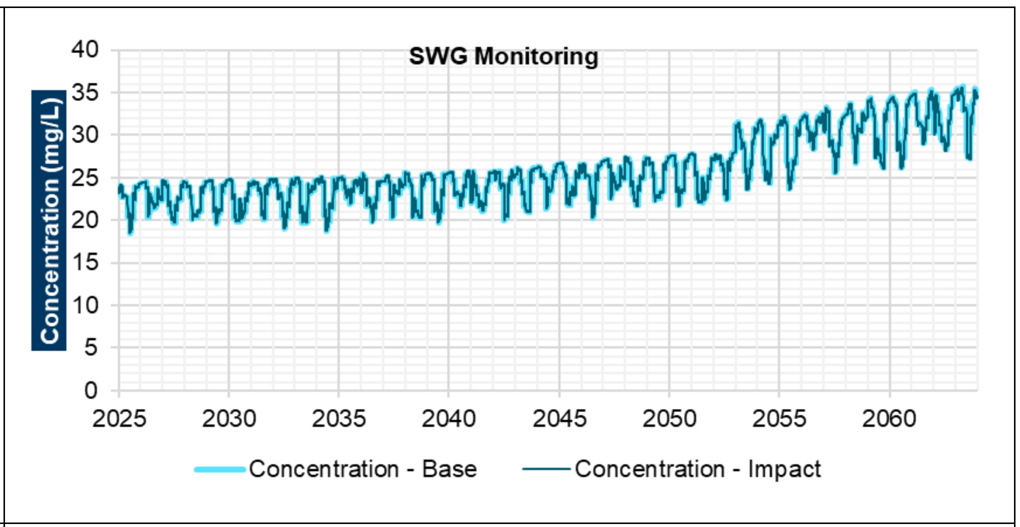

Hester Brook Outlet
Concentration (mg/L)
Concentration - Base
Concentration - Impact

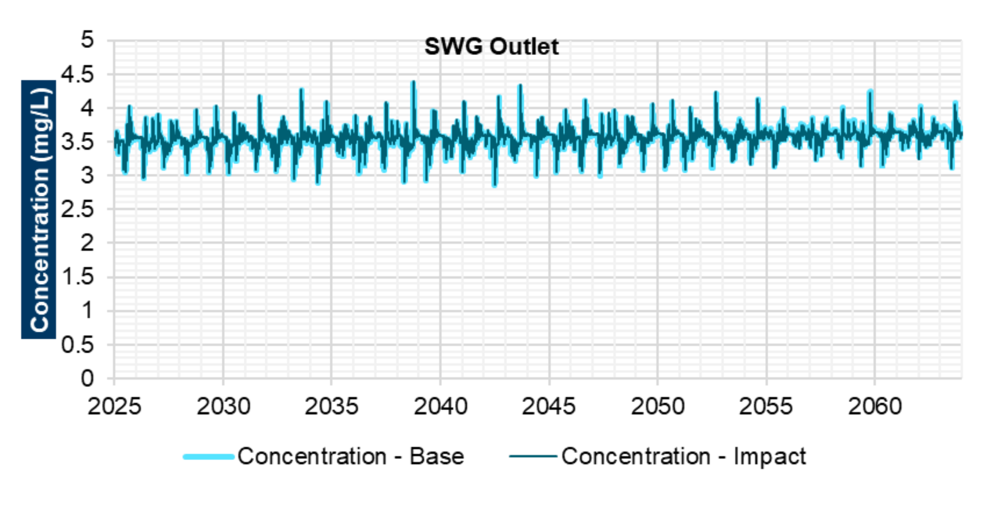

Hester Brook U/S Cascade
Concentration (mg/L)
Concentration - Base
Concentration - Impact

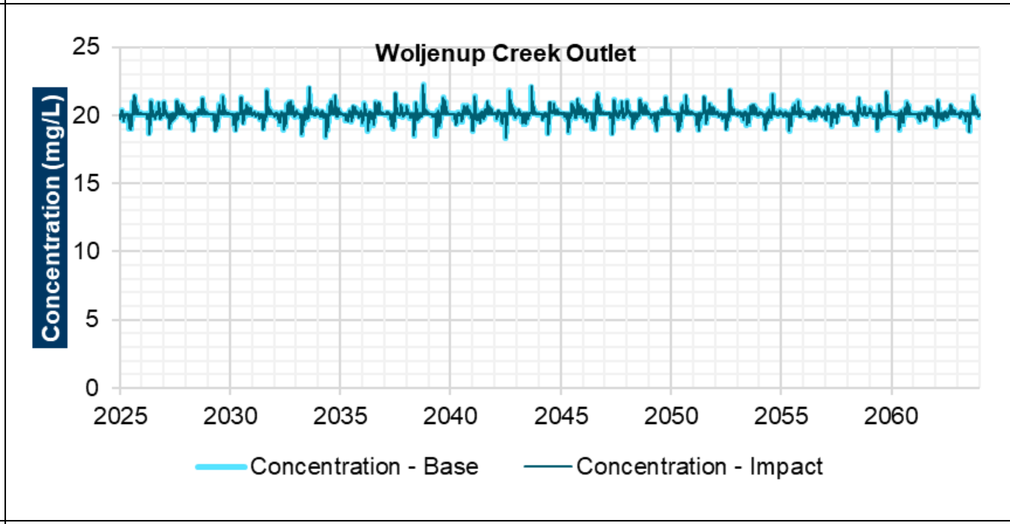

Hester Brook U/S SWG
Concentration (mg/L)
Concentration - Base
Concentration - Impact

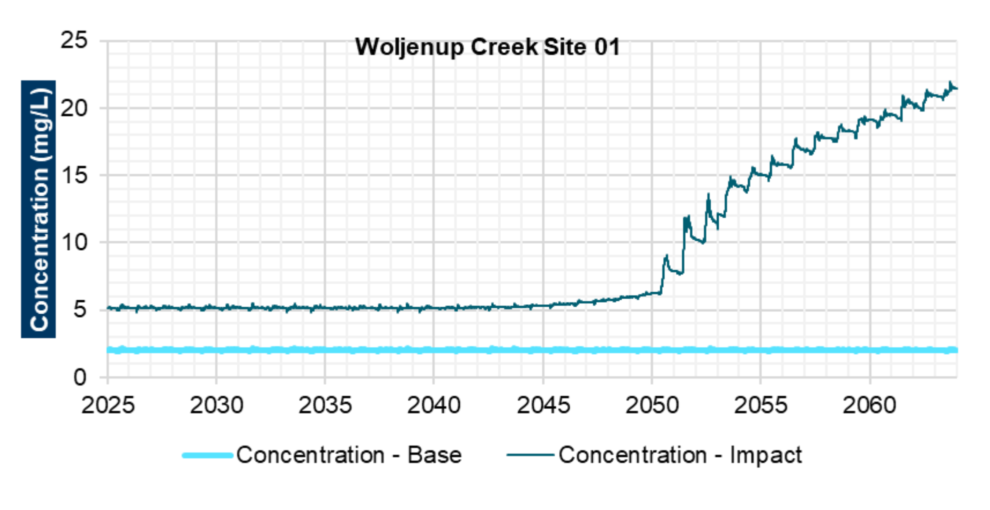

Hester Hill
Concentration (mg/L)
Concentration - Base
Concentration - Impact

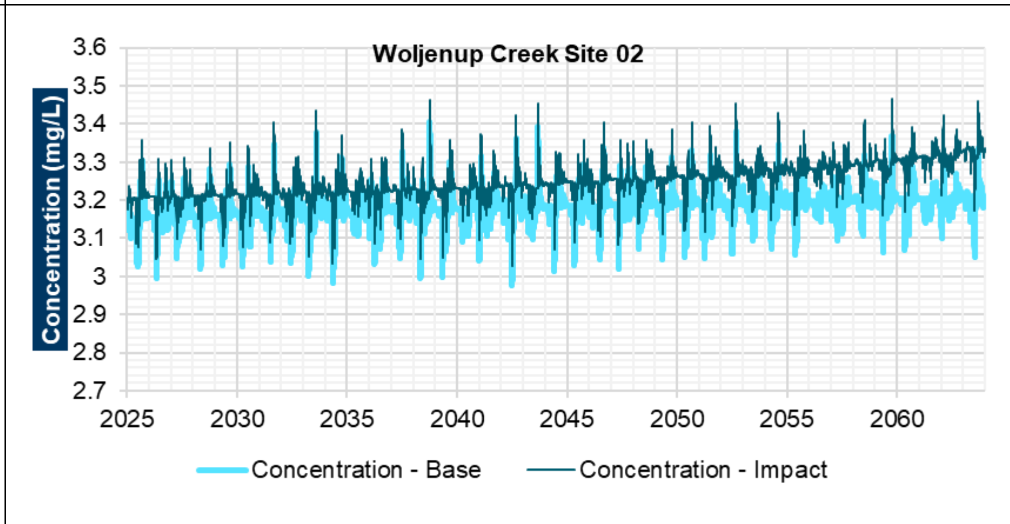

SWG Dam
Concentration (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

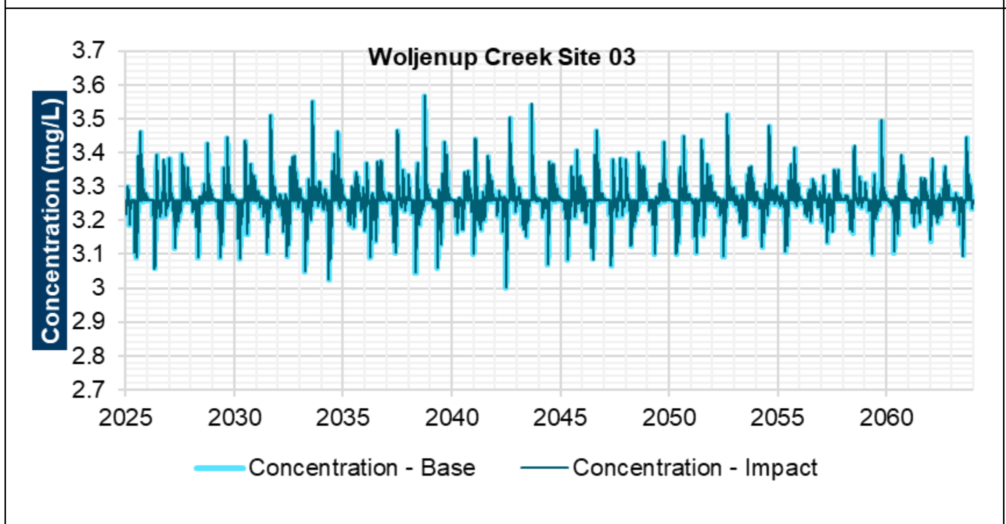

SWG Monitoring
Concentration (mg/L)
40
35
30
25
20
15
10
5
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

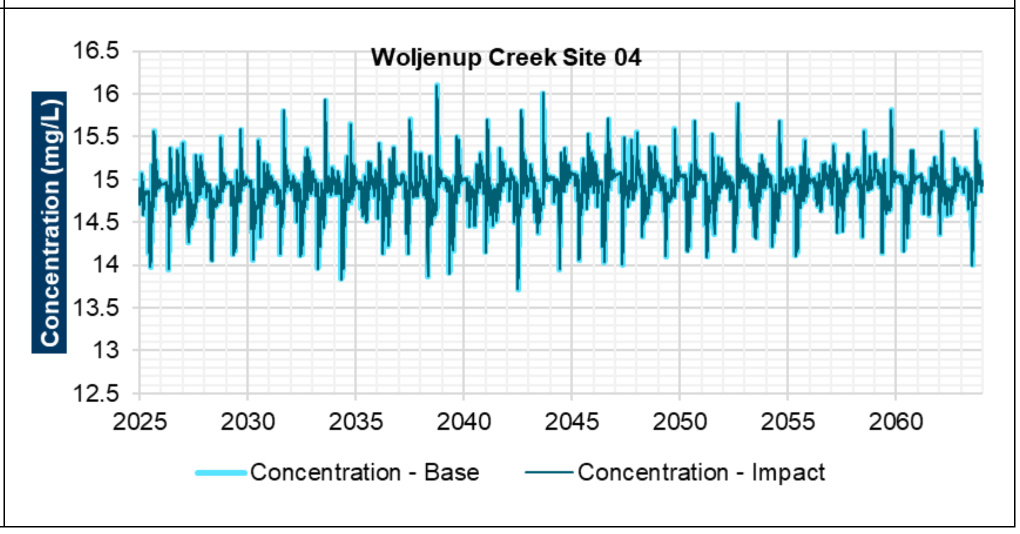

SWG Outlet
Concentration (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Outlet
Concentration (mg/L)
25
20
15
10
5
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Site 01
Concentration (mg/L)
25
20
15
10
5
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

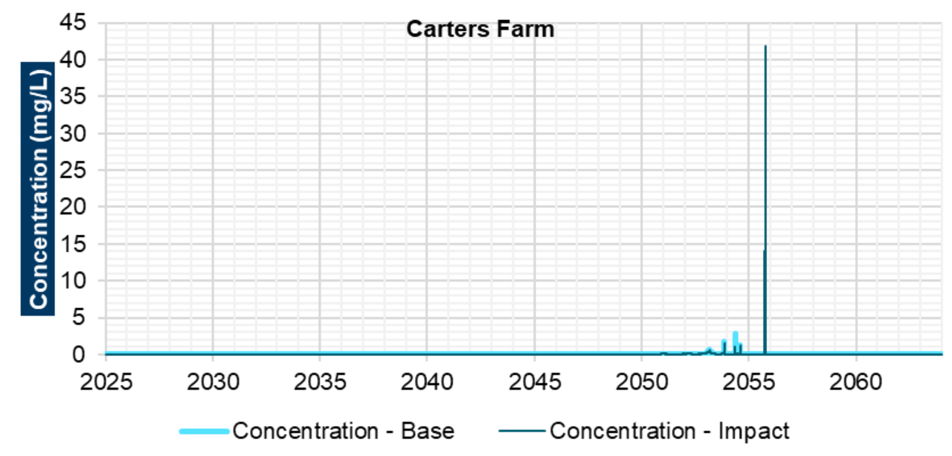

Woljenup Creek Site 02
Concentration (mg/L)
3.6
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

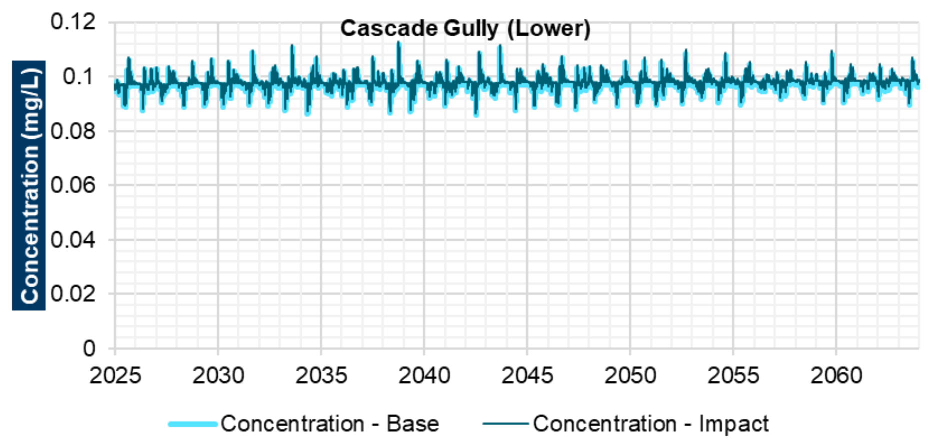

Woljenup Creek Site 03
Concentration (mg/L)
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

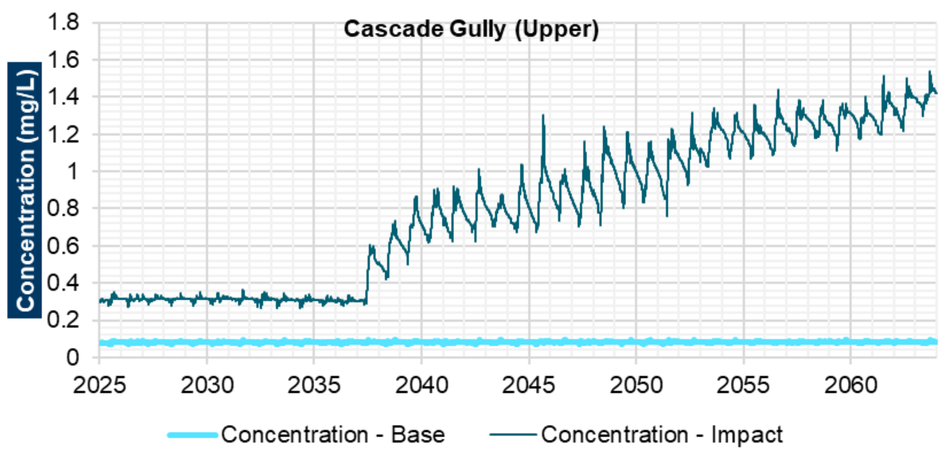

Woljenup Creek Site 04
Concentration (mg/L)
16.5
16
15.5
15
14.5
14
13.5
13
12.5
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

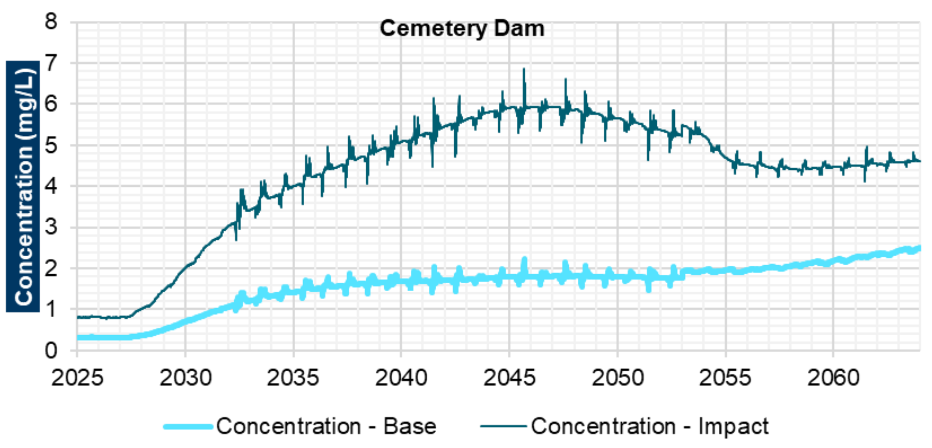
Appendix E

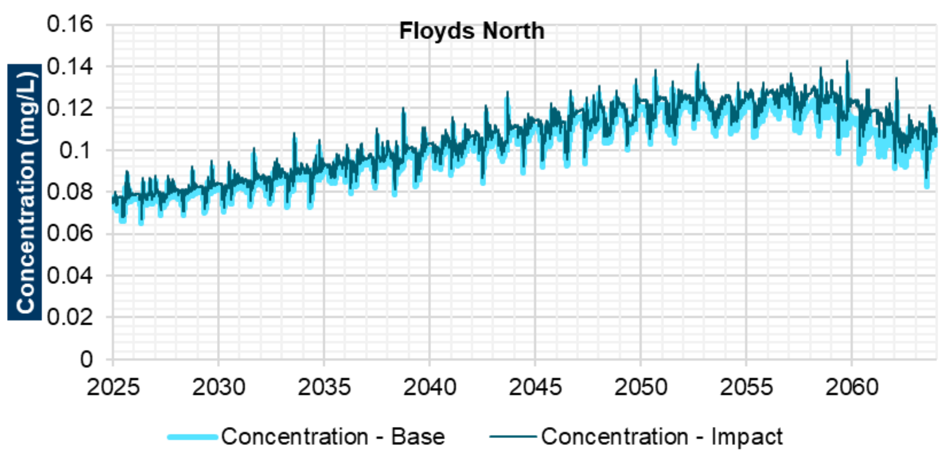
Nitrate Concentrations Adopted in Baseflows

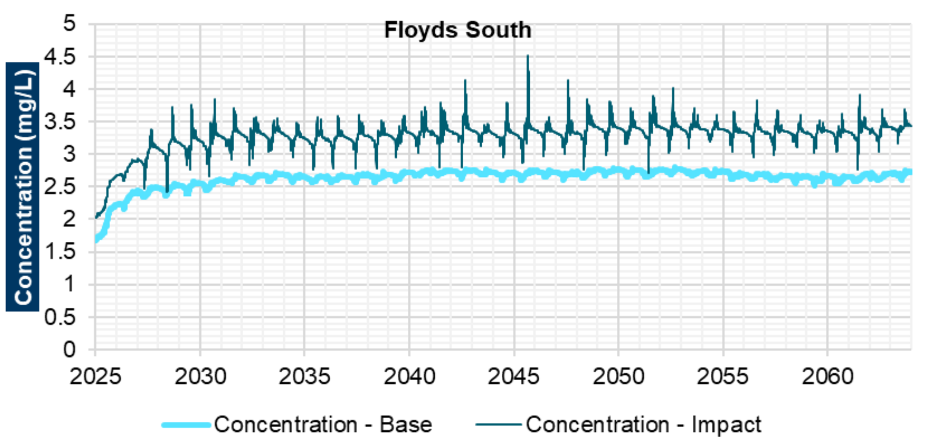

Carters Farm
Concentration (mg/L)
45
40
35
30
25
20
15
10
5
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

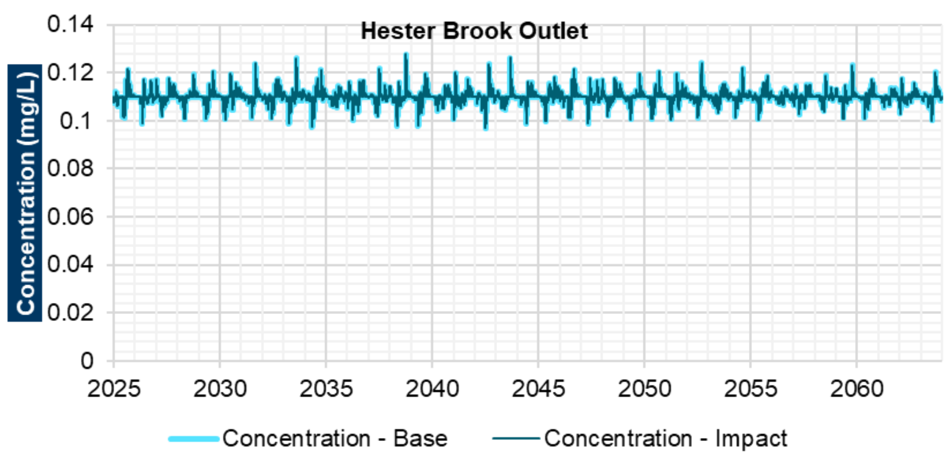

Cascade Gully (Lower)
Concentration (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

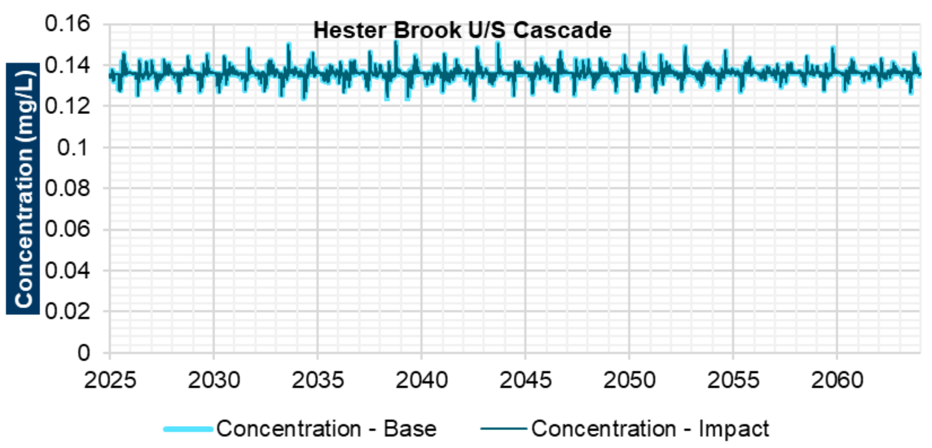

Cascade Gully (Upper)
Concentration (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

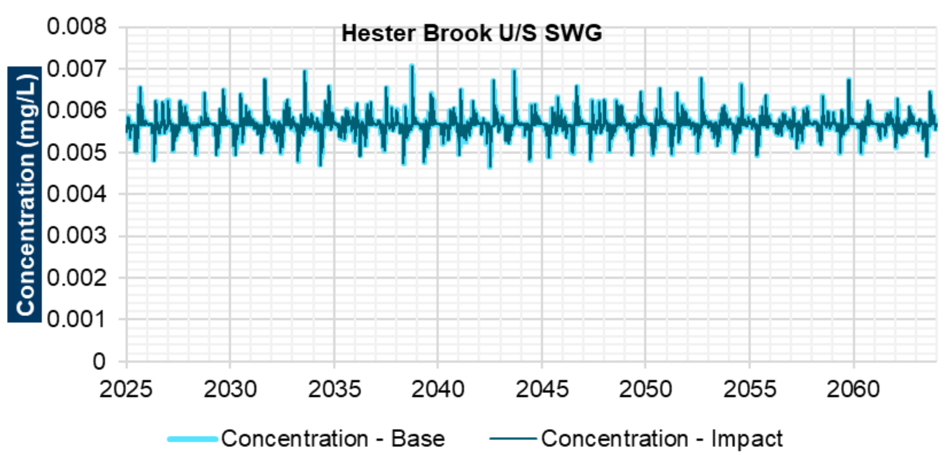

Cemetery Dam
Concentration (mg/L)
8
7
6
5
4
3
2
1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

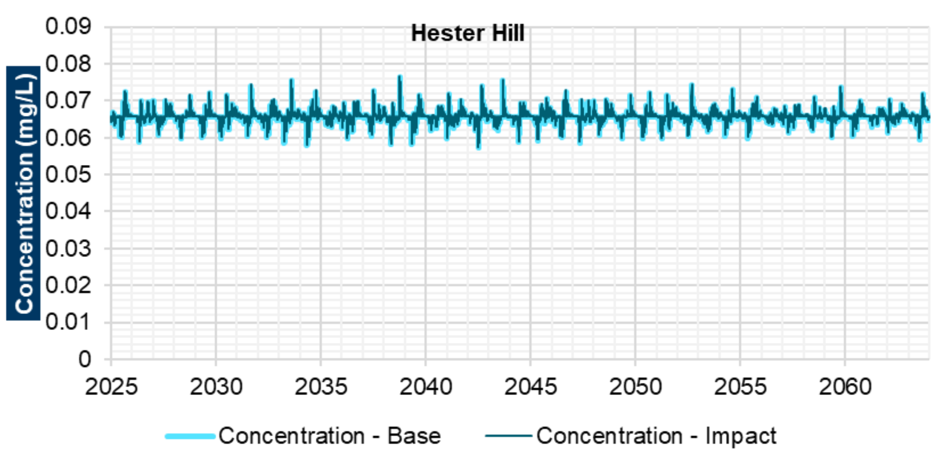

Floyds North
Concentration (mg/L)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

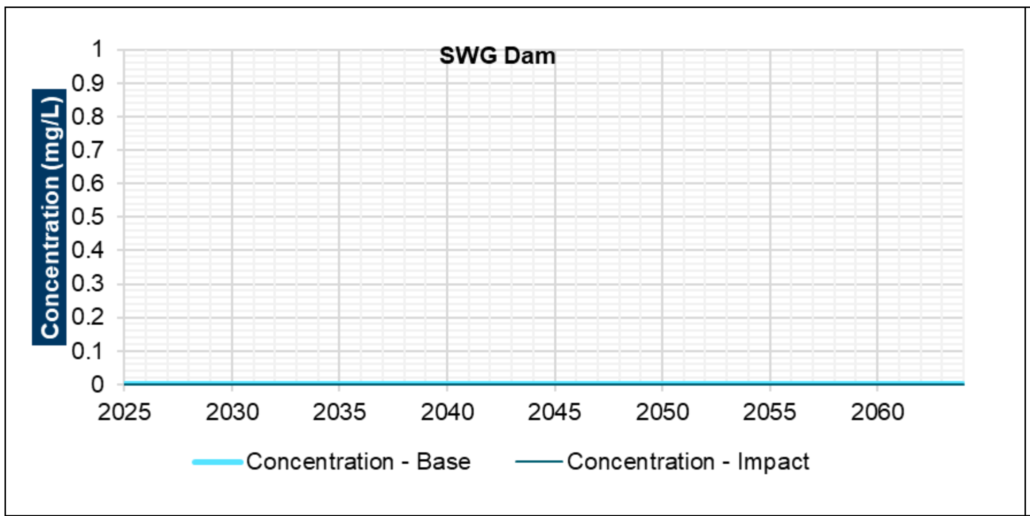

Floyds South
Concentration (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

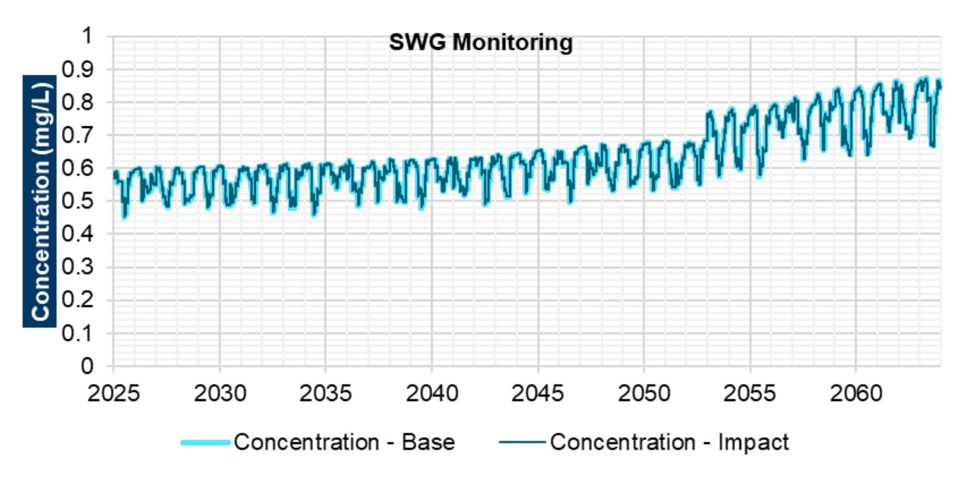

Hester Brook Outlet
Concentration (mg/L)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

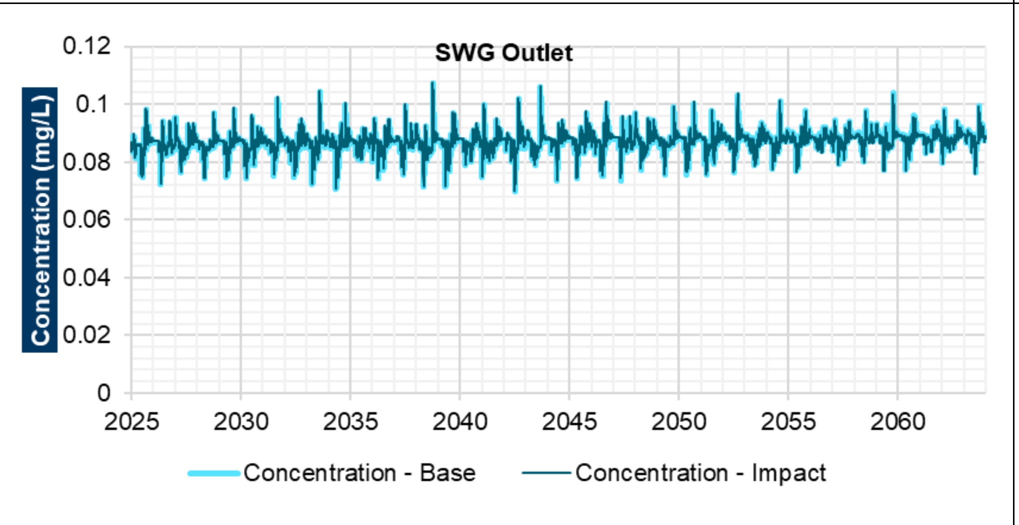

Hester Brook U/S Cascade
Concentration (mg/L)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

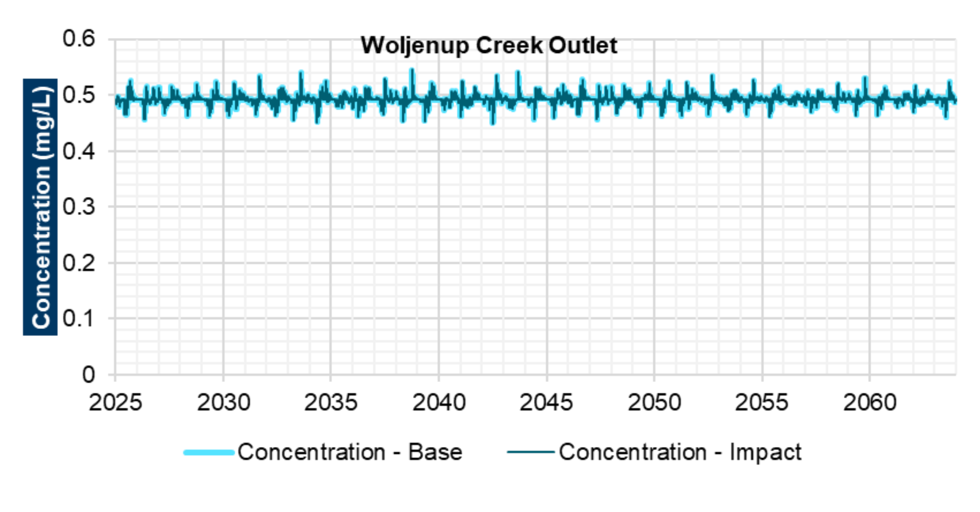

Hester Brook U/S SWG
Concentration (mg/L)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

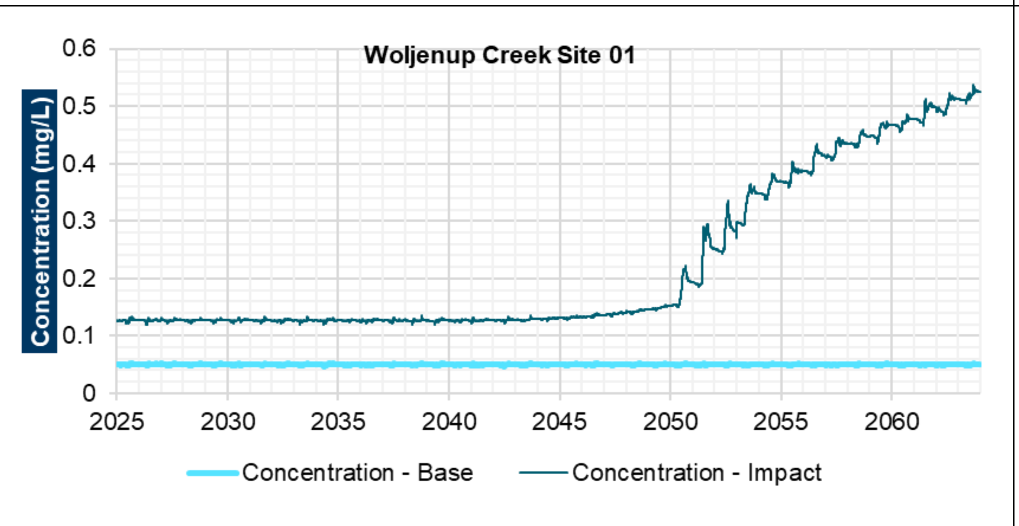

Hester Hill
Concentration (mg/L)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

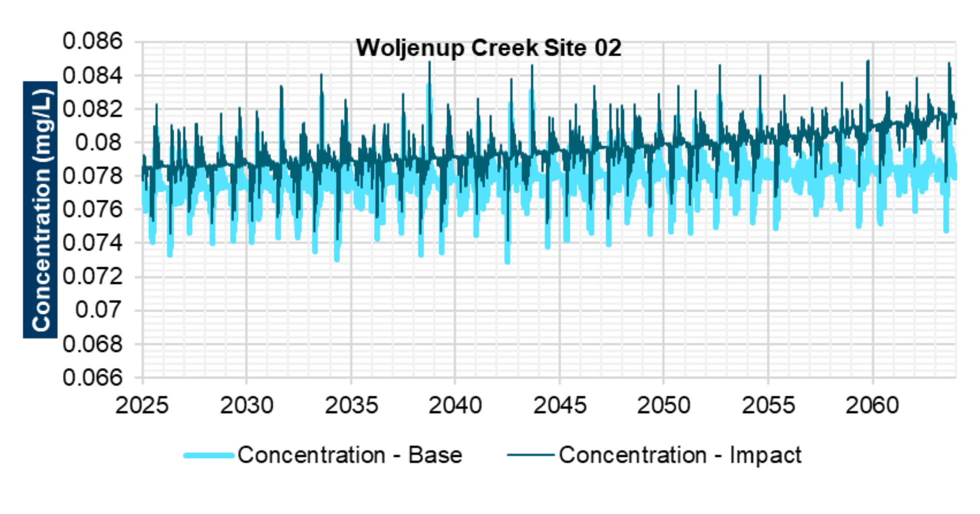

SWG Dam
Concentration (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

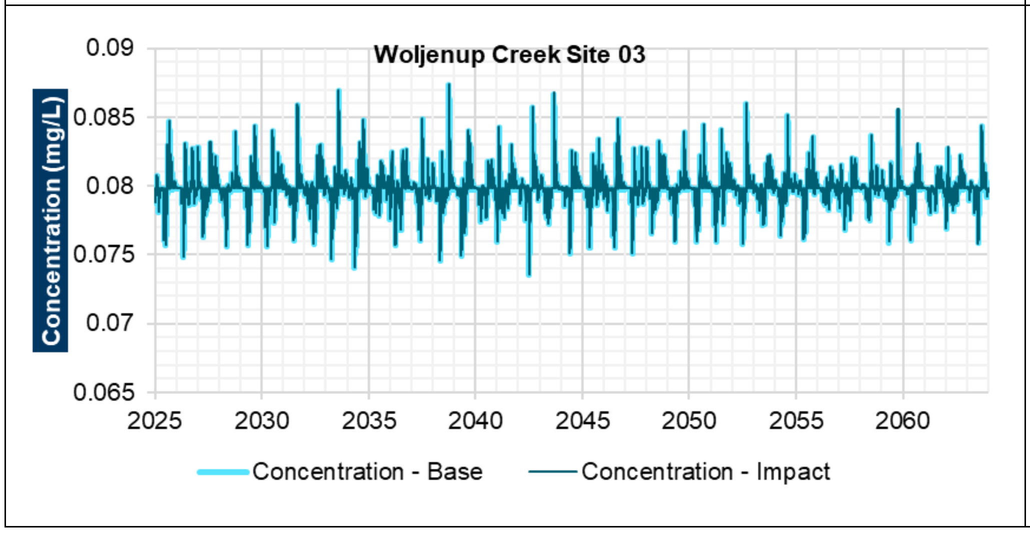

SWG Monitoring
Concentration (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

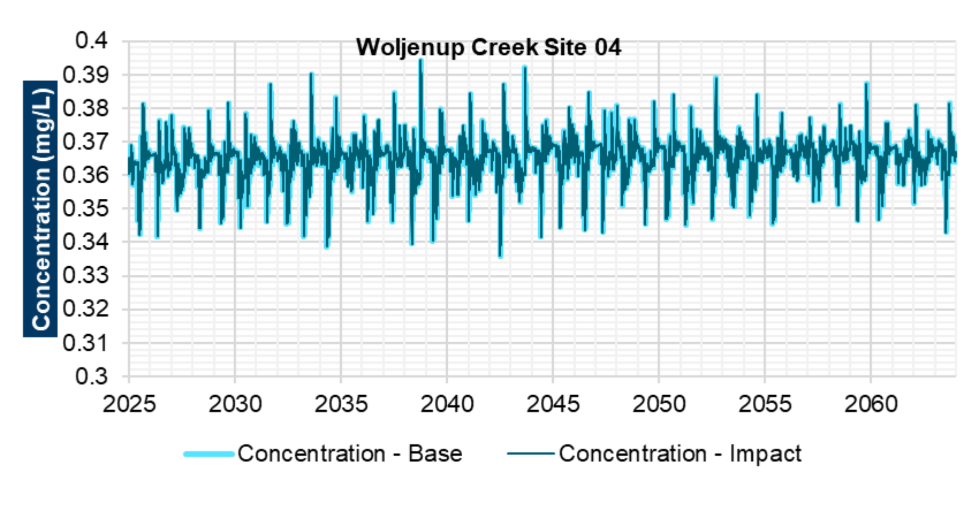

SWG Outlet
Concentration (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Outlet
Concentration (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Site 01
Concentration (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Site 02
Concentration (mg/L)
0.086
0.084
0.082
0.08
0.078
0.076
0.074
0.072
0.07
0.068
0.066
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

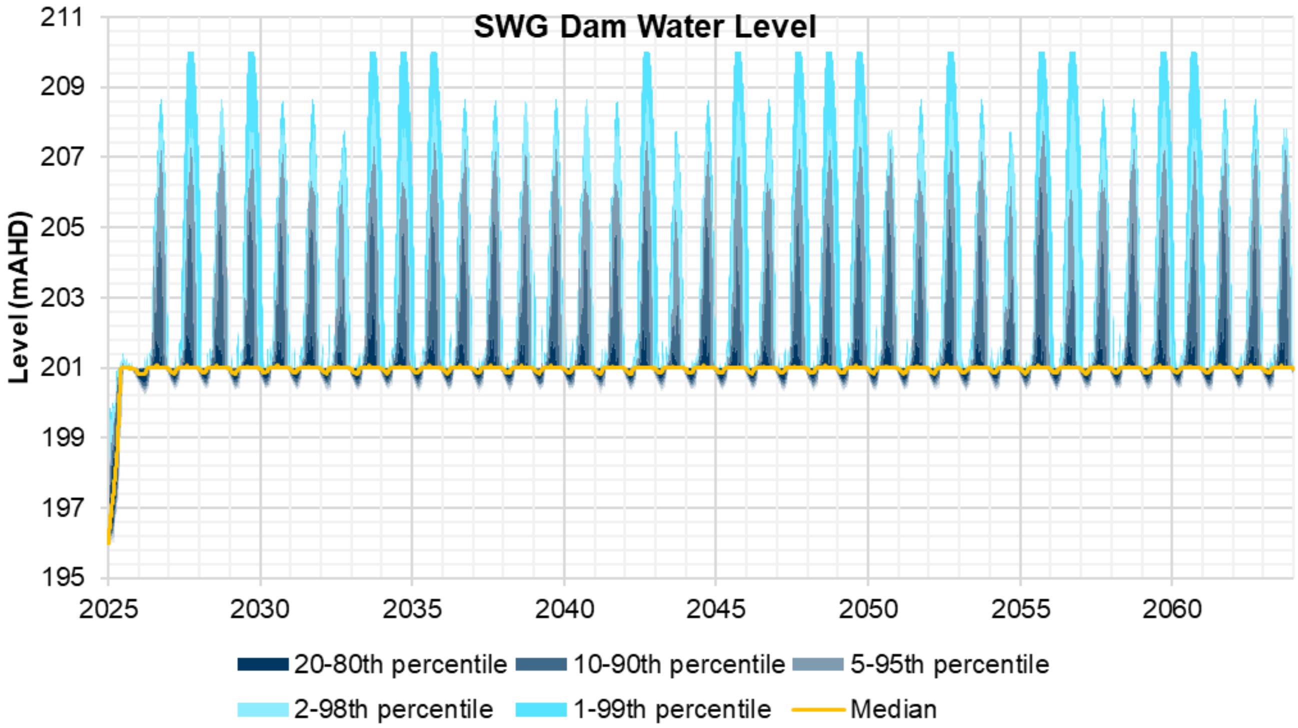

Woljenup Creek Site 03
Concentration (mg/L)
0.09
0.085
0.08
0.075
0.07
0.065
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact


Woljenup Creek Site 04
Concentration (mg/L)
0.4
0.39
0.38
0.37
0.36
0.35
0.34
0.33
0.32
0.31
0.3
2025
2030
2035
2040
2045
2050
2055
2060
Concentration - Base
Concentration - Impact

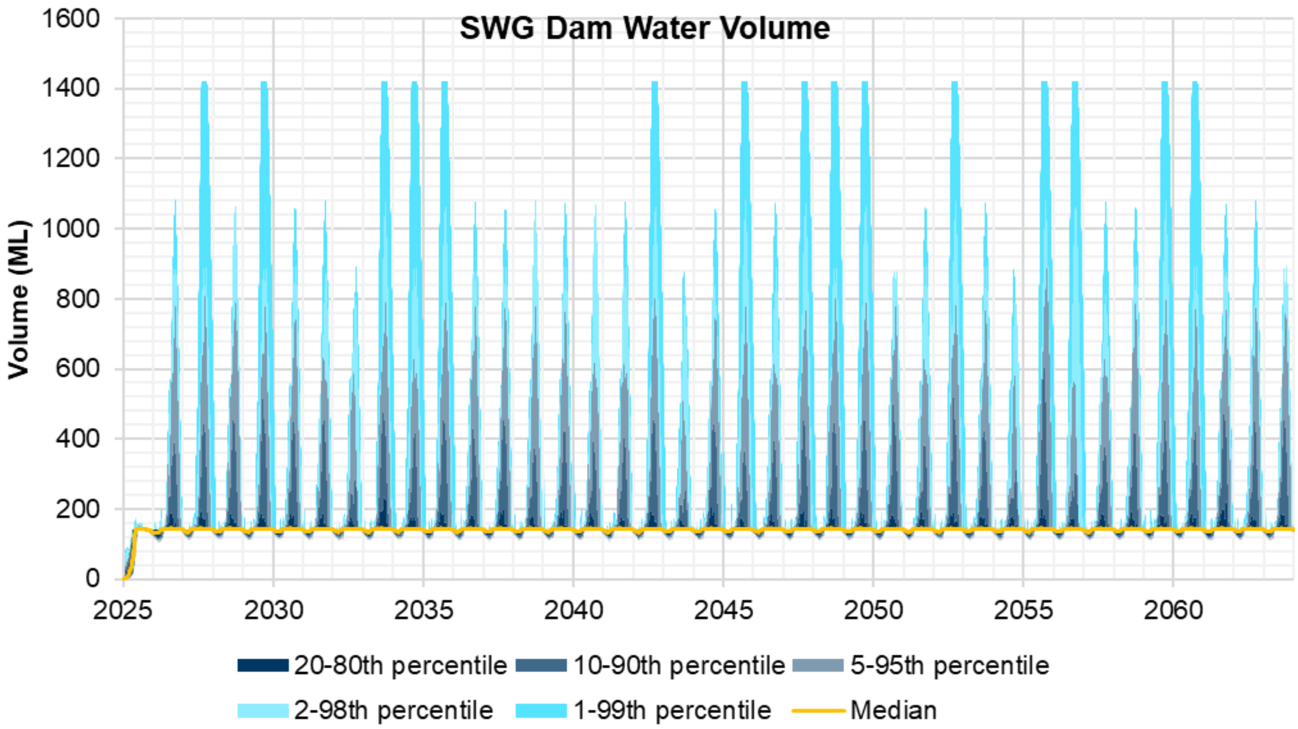
Appendix F

SWG Dam Water Balance Results

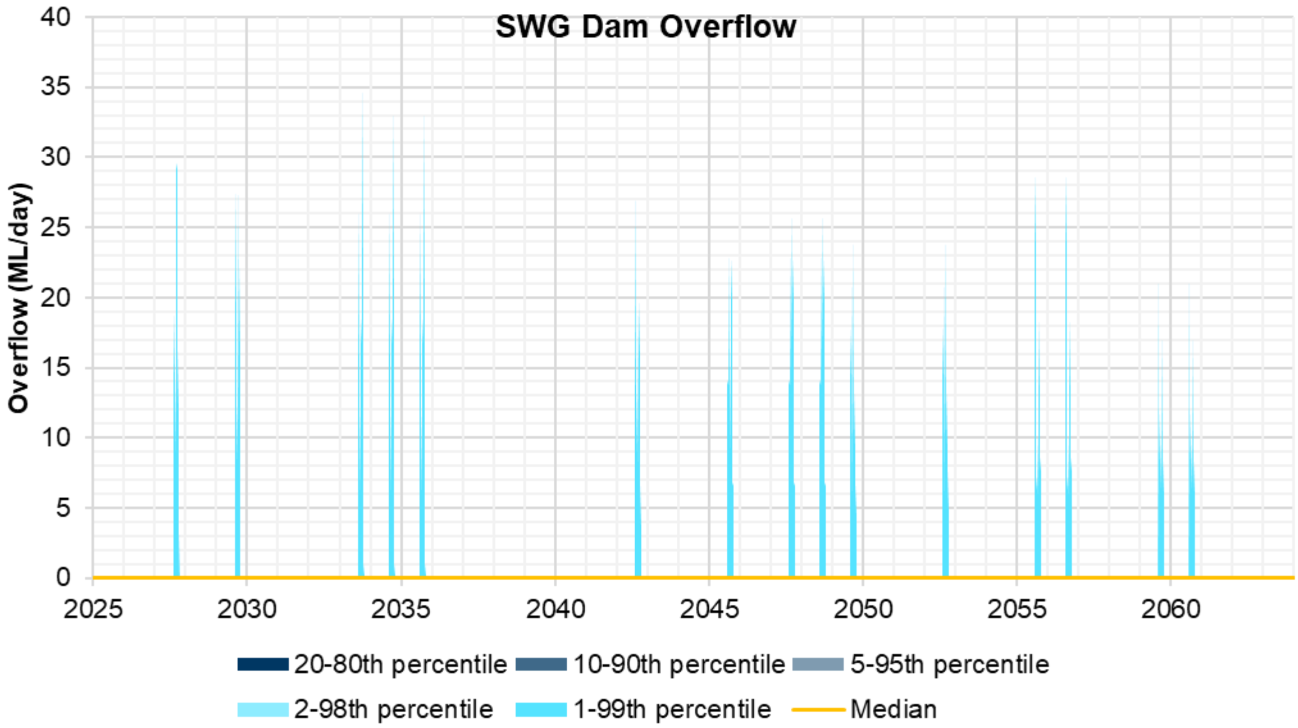
Simulated Daily Water Levels in SWG Dam



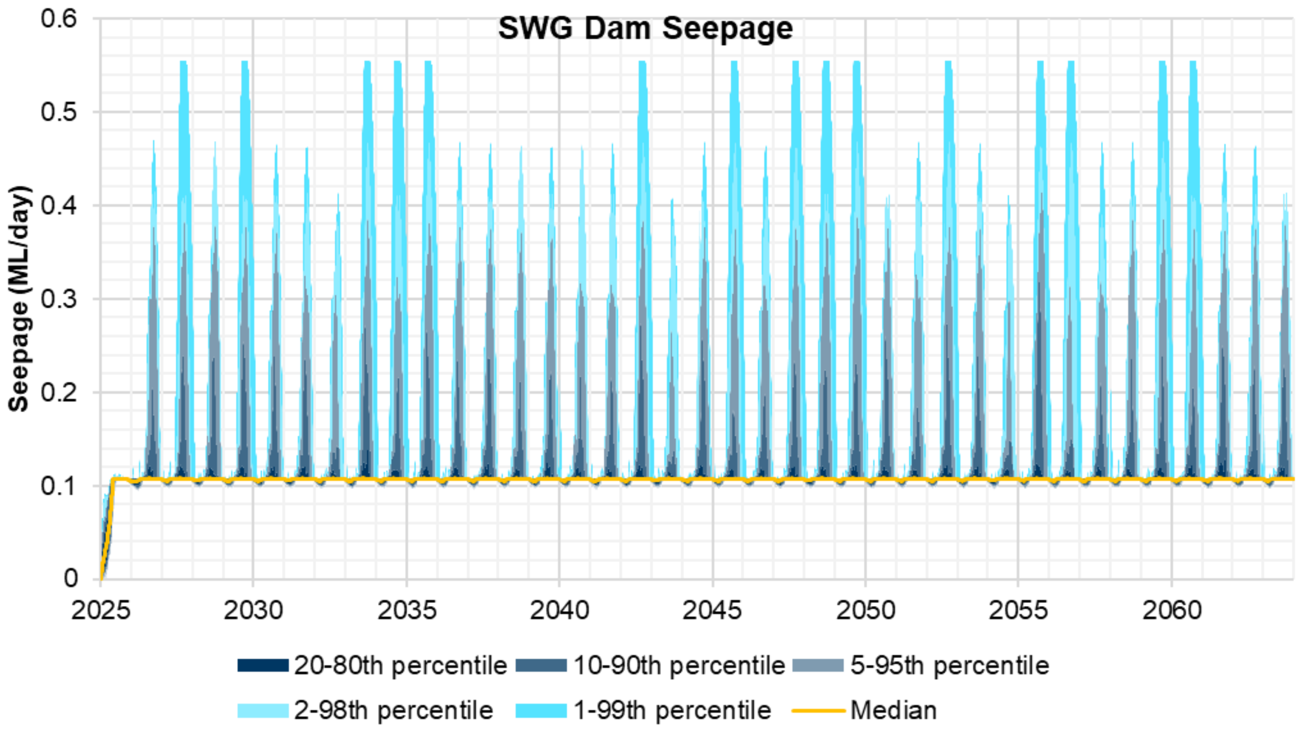
Simulated Daily Water Volumes in SWG Dam



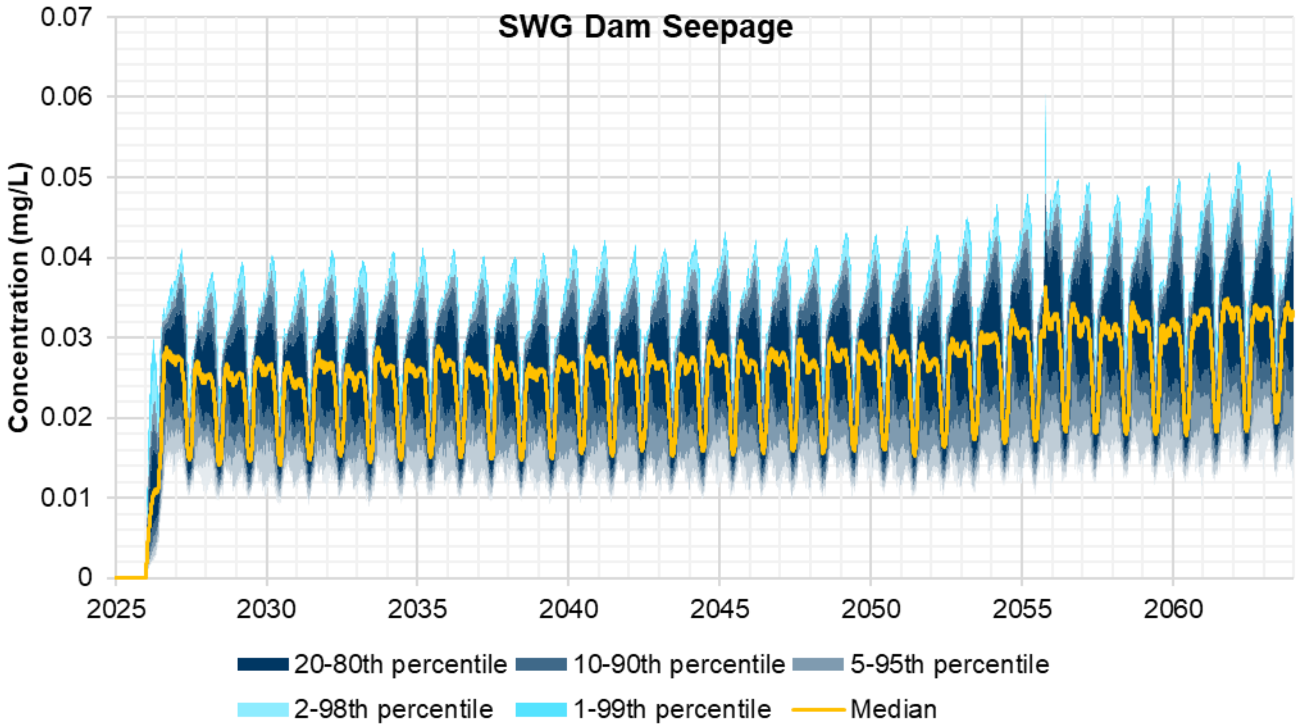
Simulated Daily Spills from SWG Dam



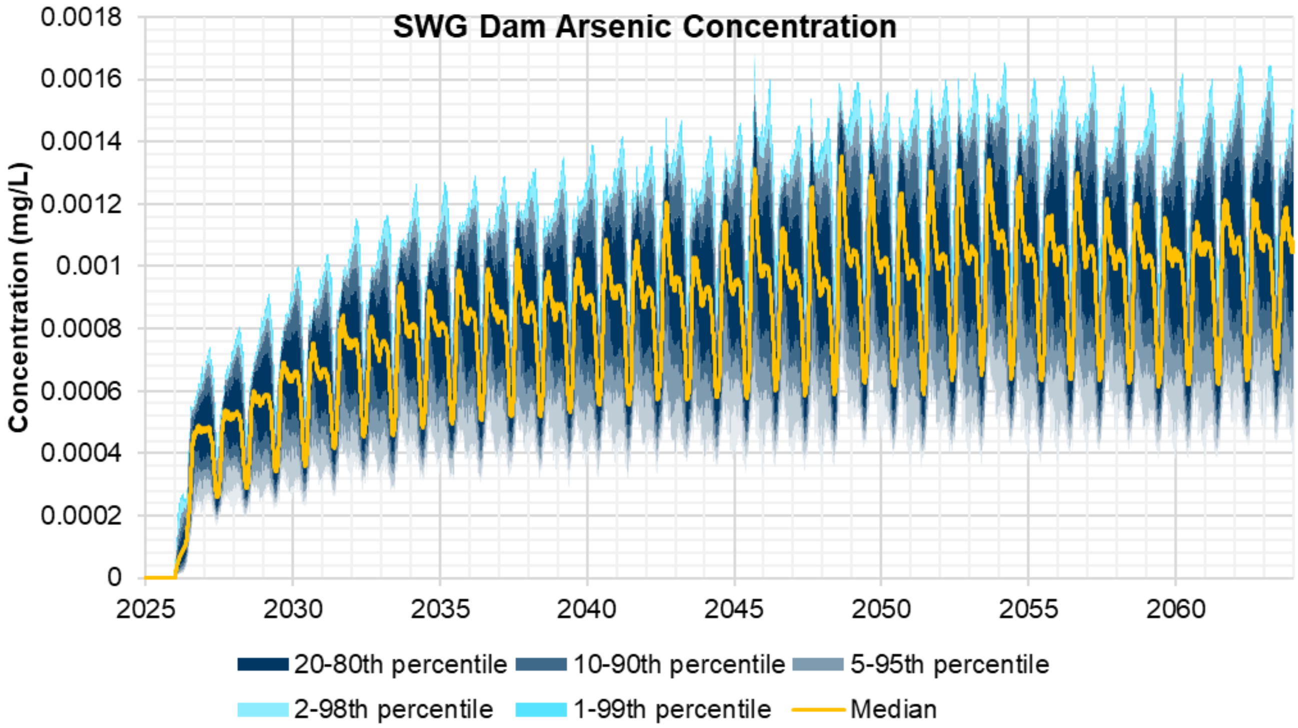
Simulated Daily Seepage Flows from SWG Dam



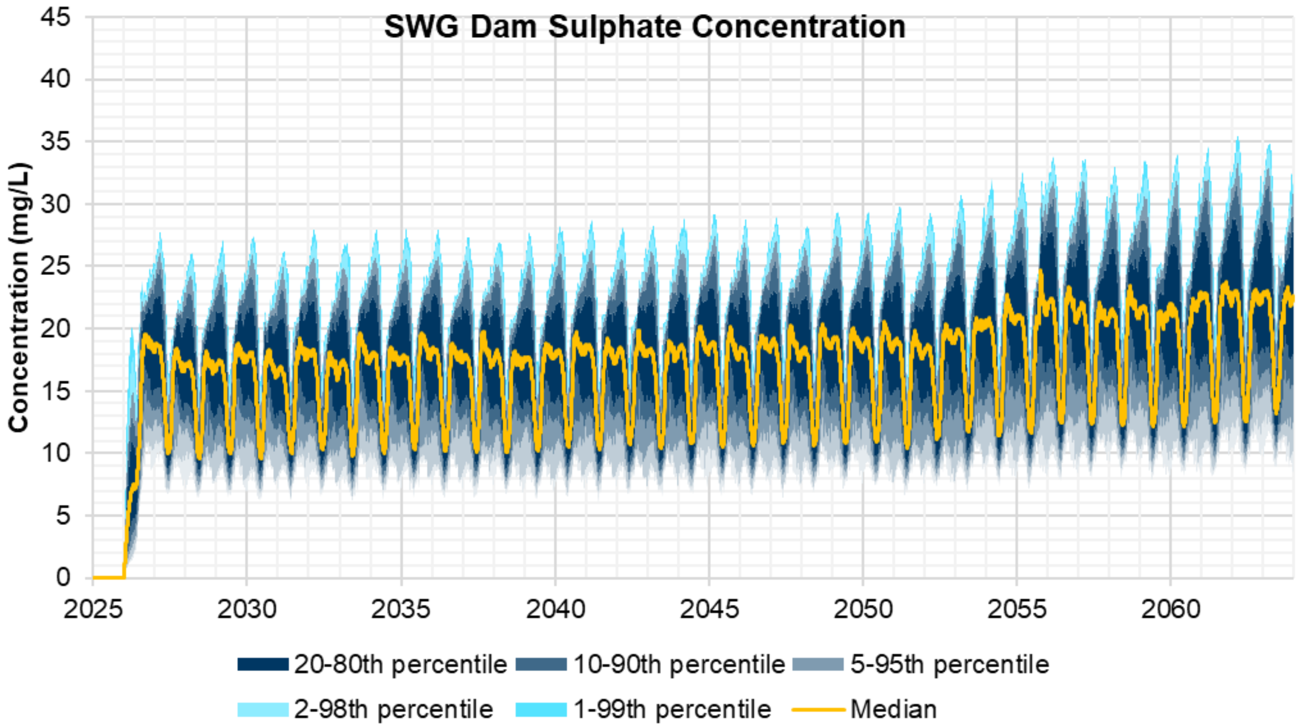
Simulated Lithium Concentrations in SWG Dam



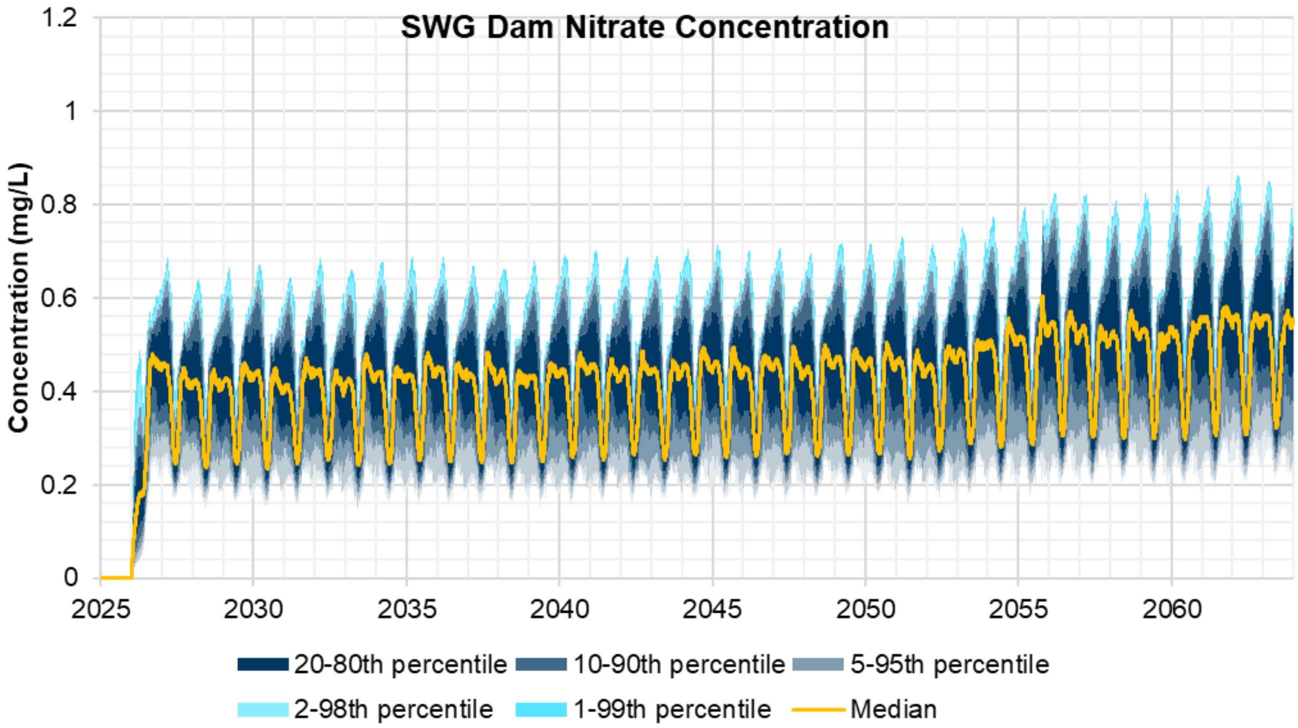
Simulated Arsenic Concentrations in SWG Dam



Simulated Sulphate Concentrations in SWG Dam

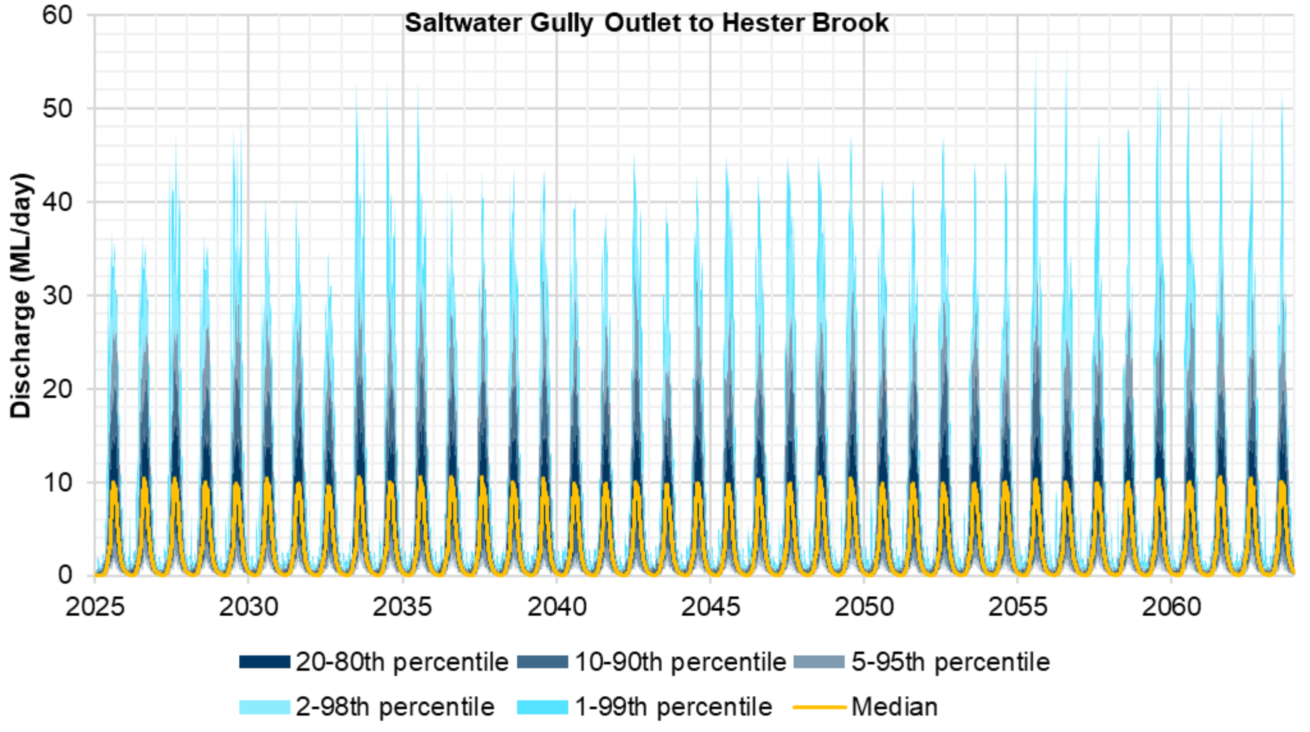
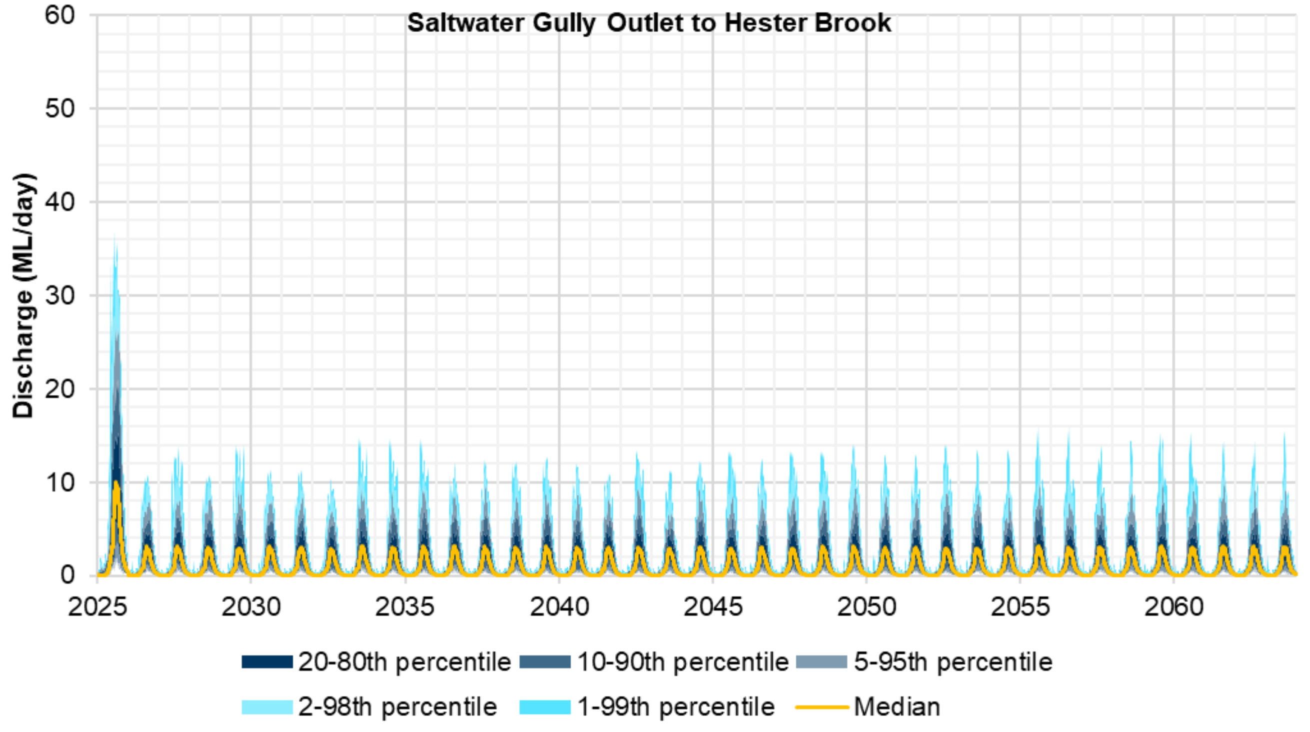
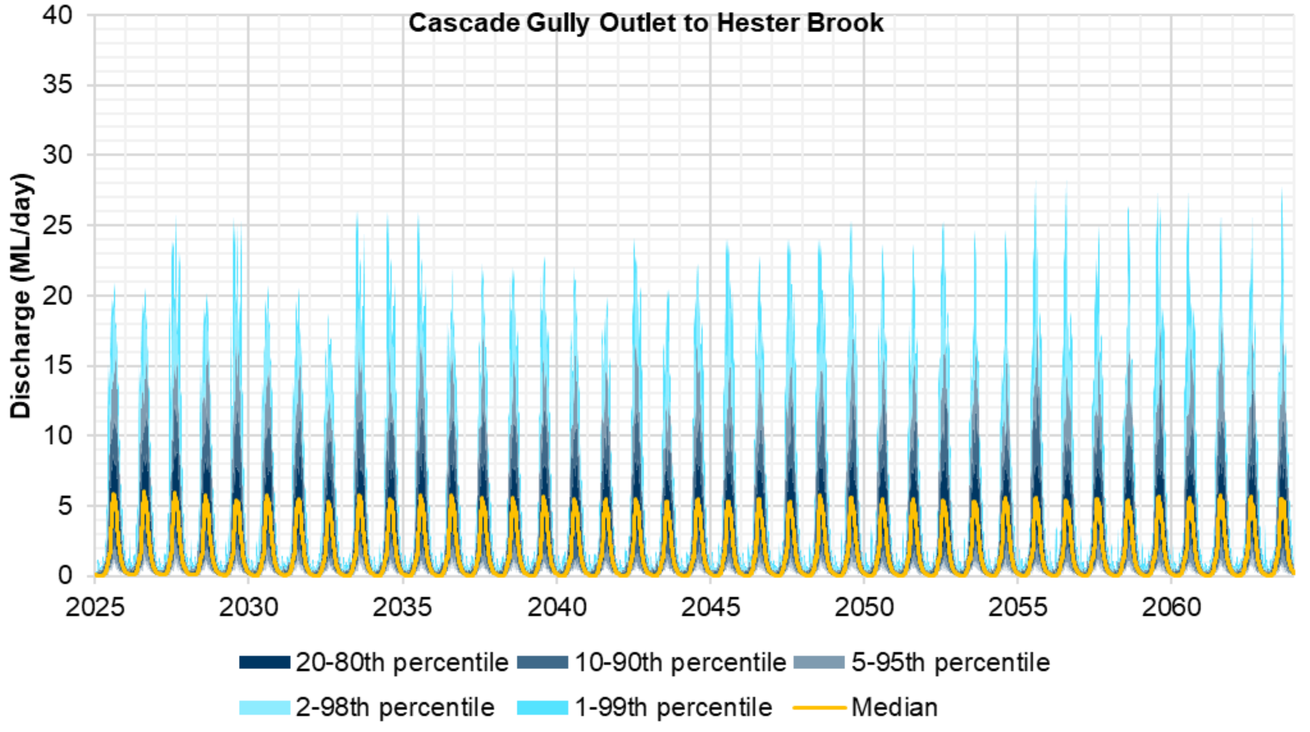
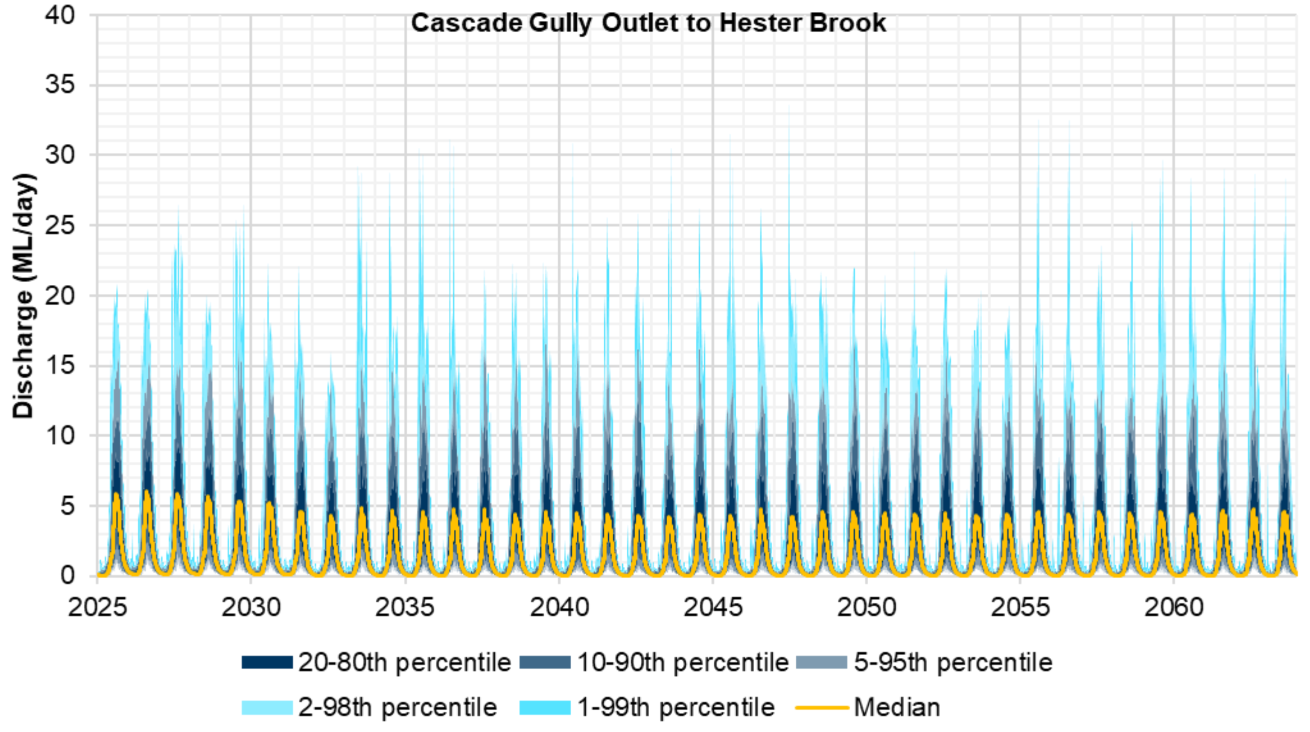


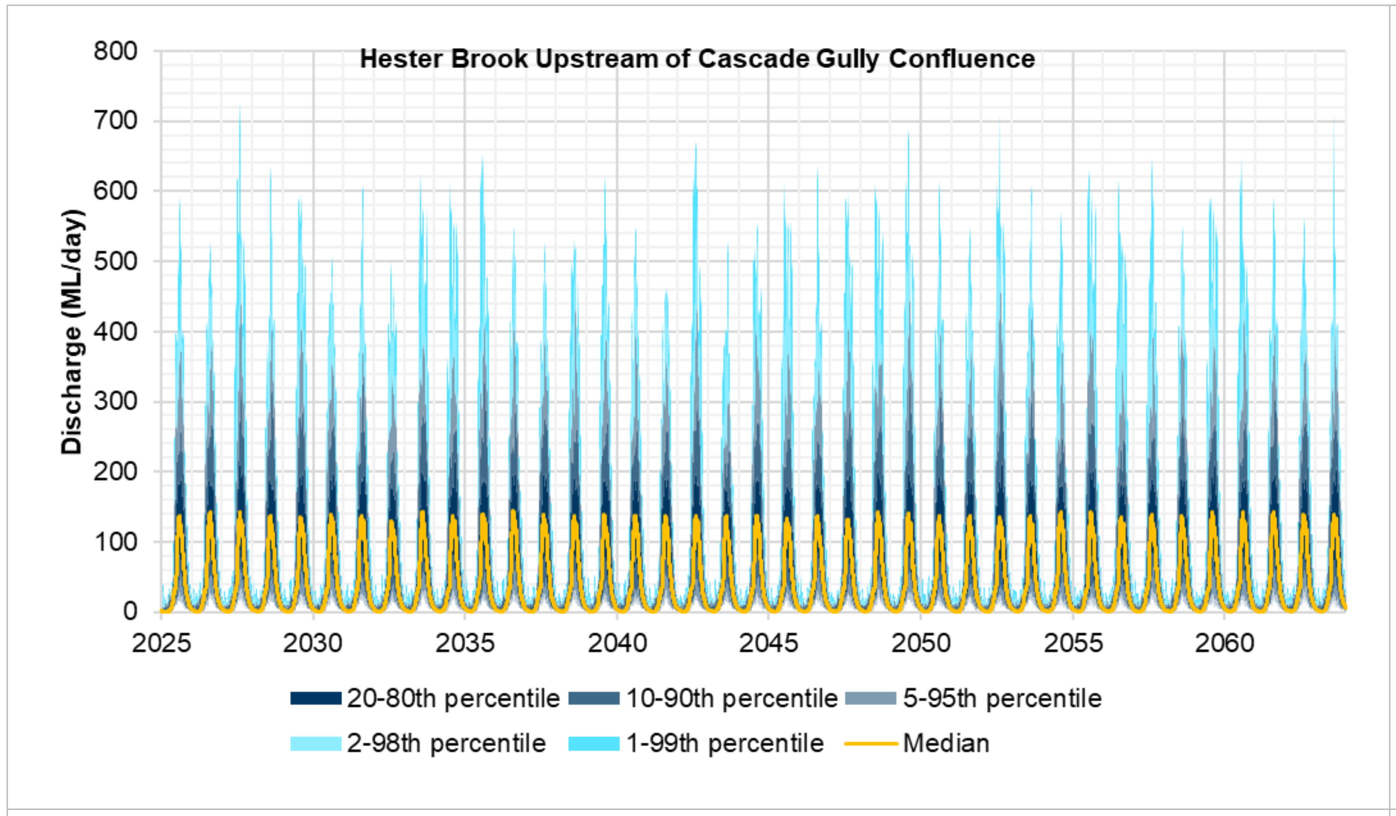
Simulated Nitrate Concentrations in SWG Dam

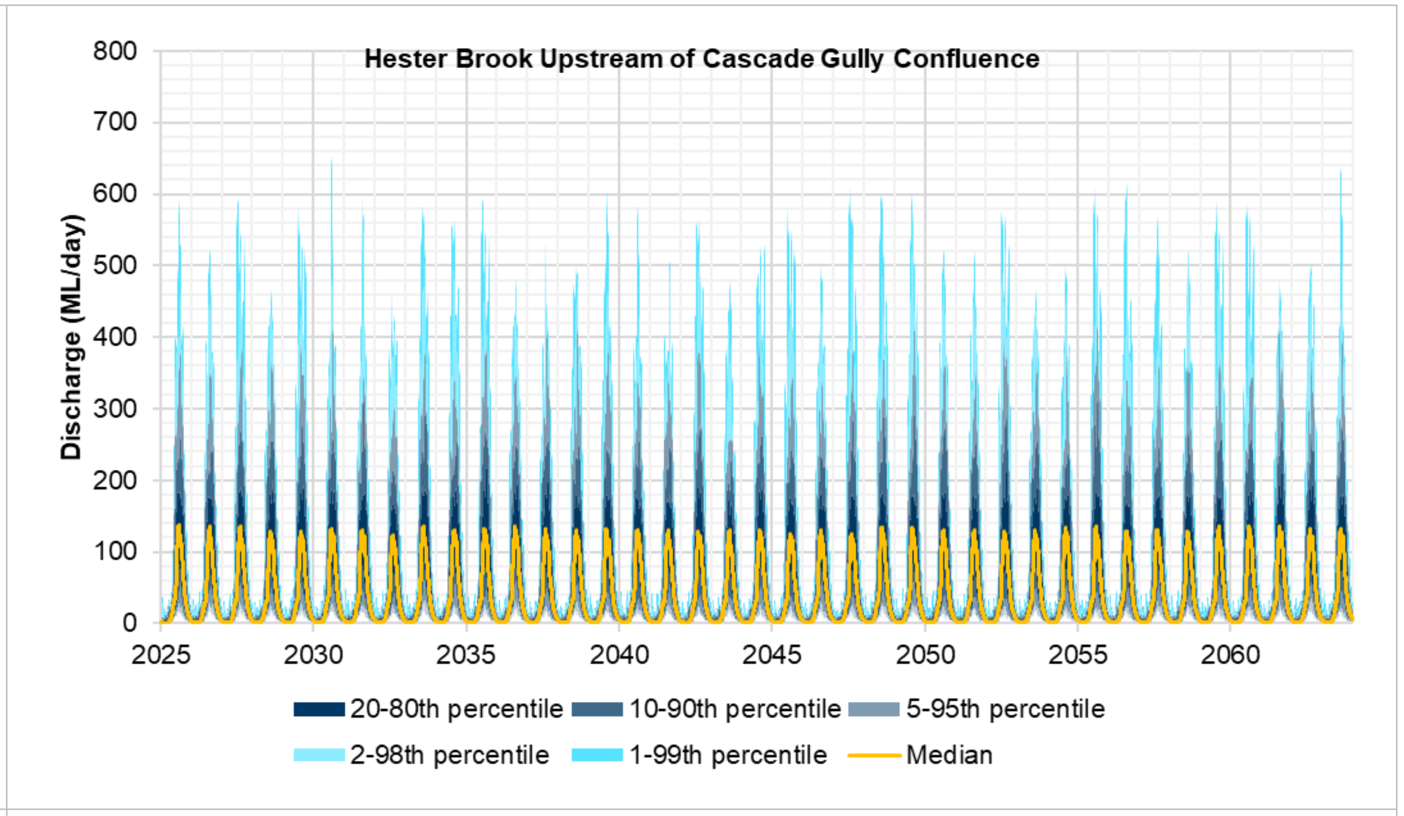


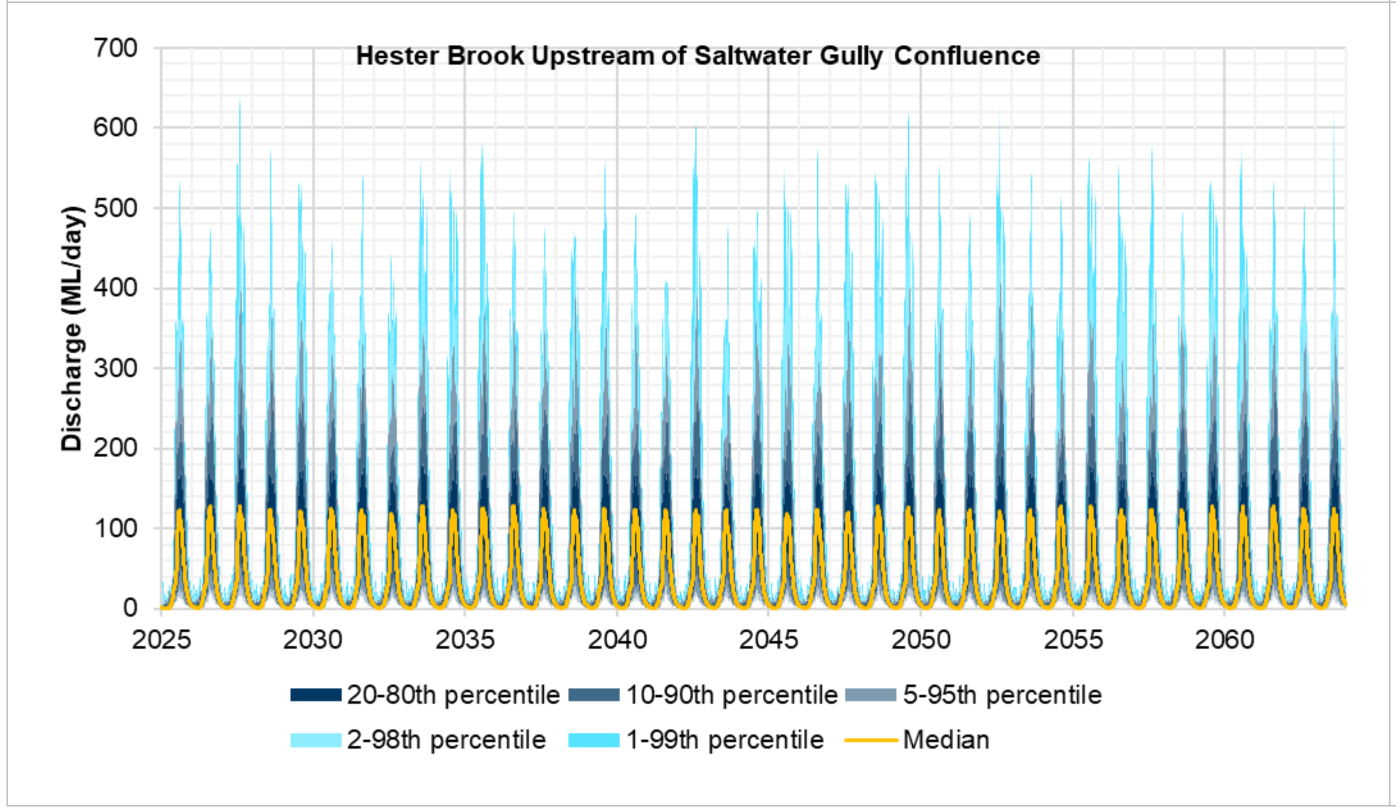
Appendix G

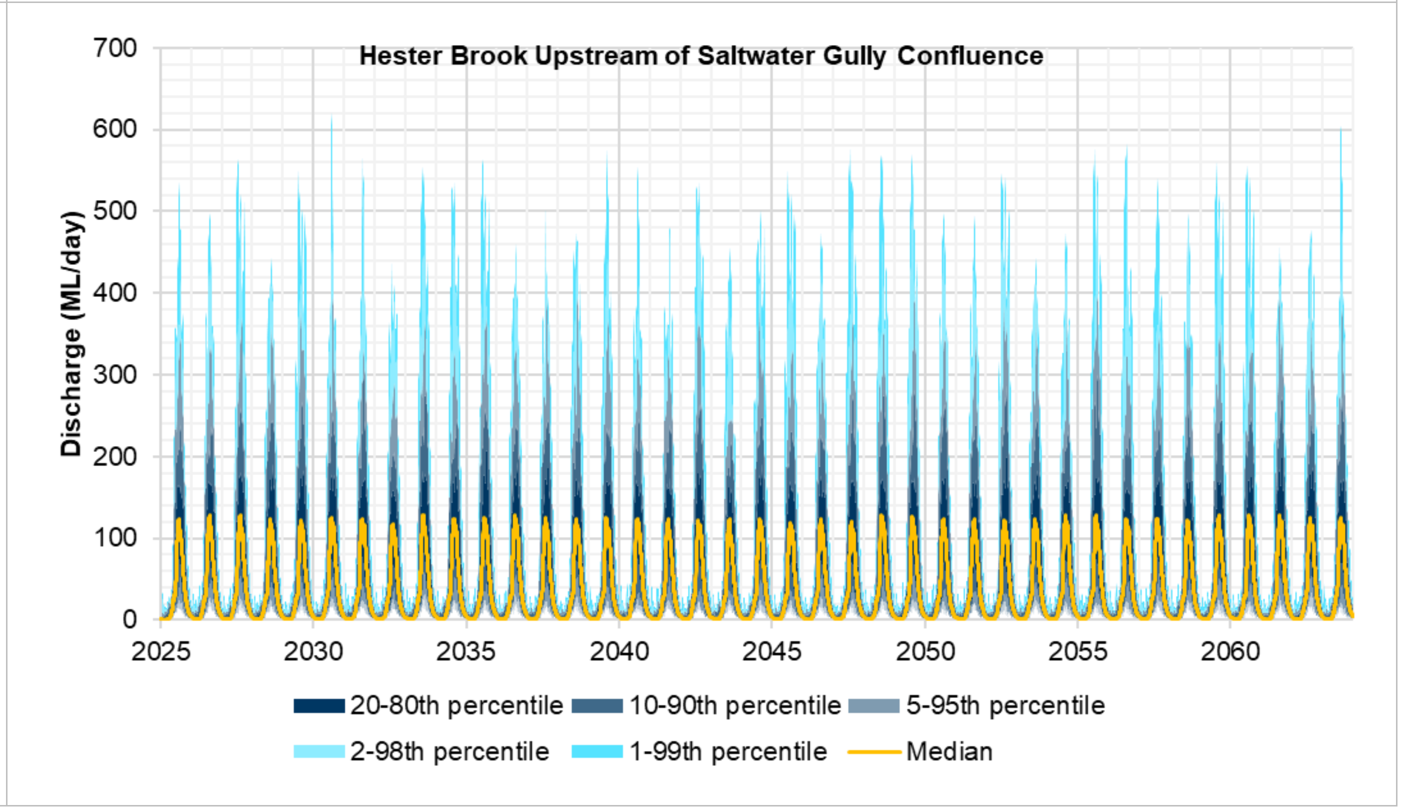
Simulated Streamflow

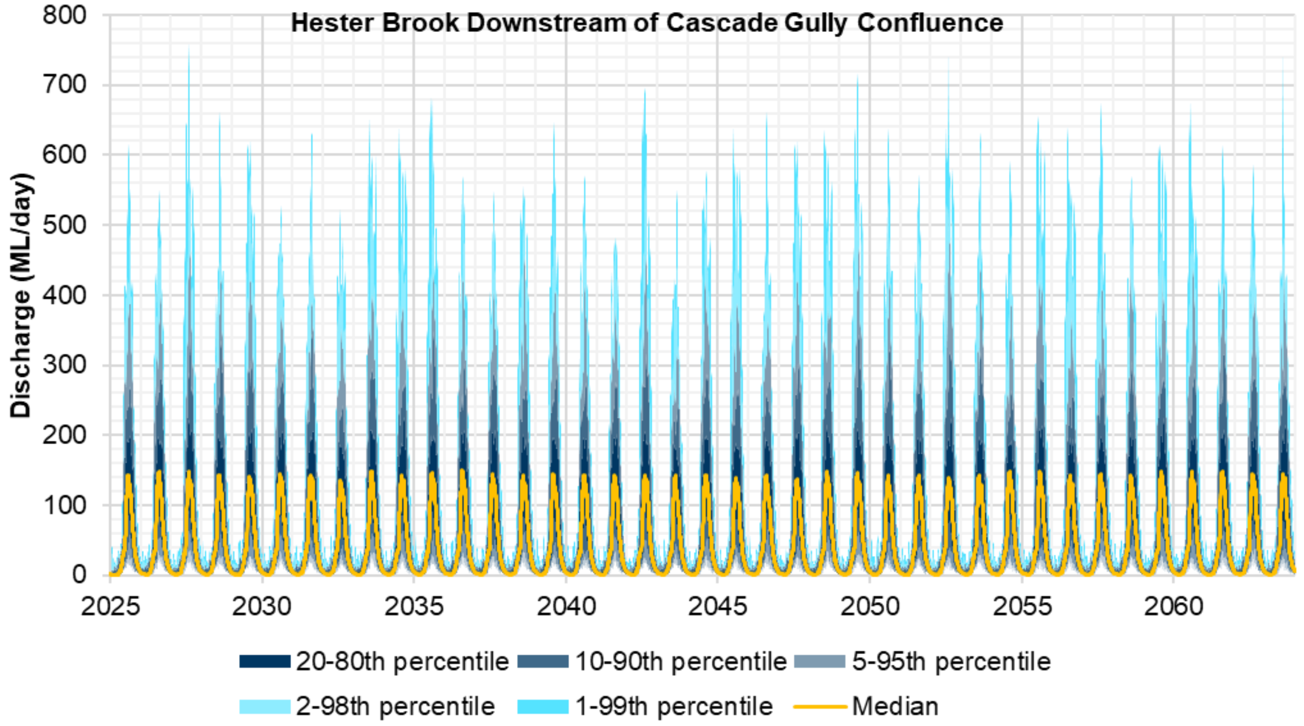
Base Case	Impact Case
	
	

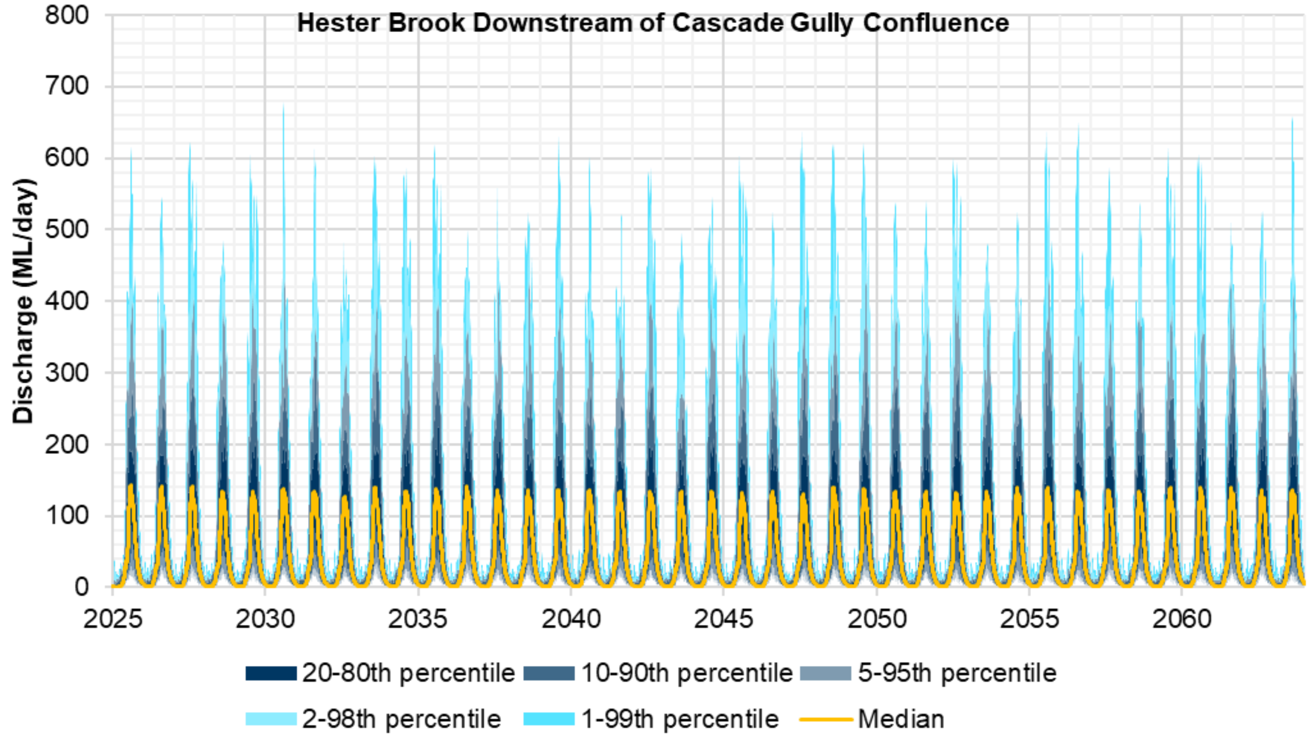

Hester Brook Upstream of Cascade Gully Confluence
Discharge (ML/day)
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

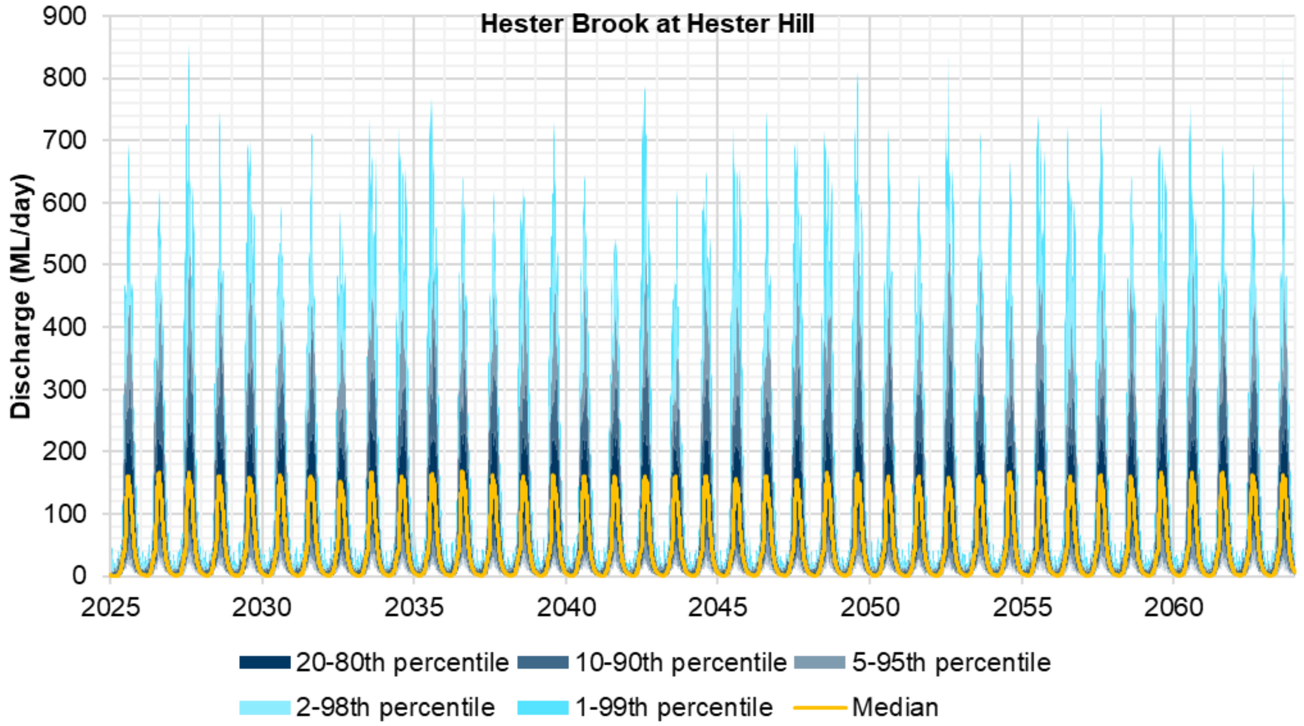

Hester Brook Upstream of Cascade Gully Confluence
Discharge (ML/day)
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

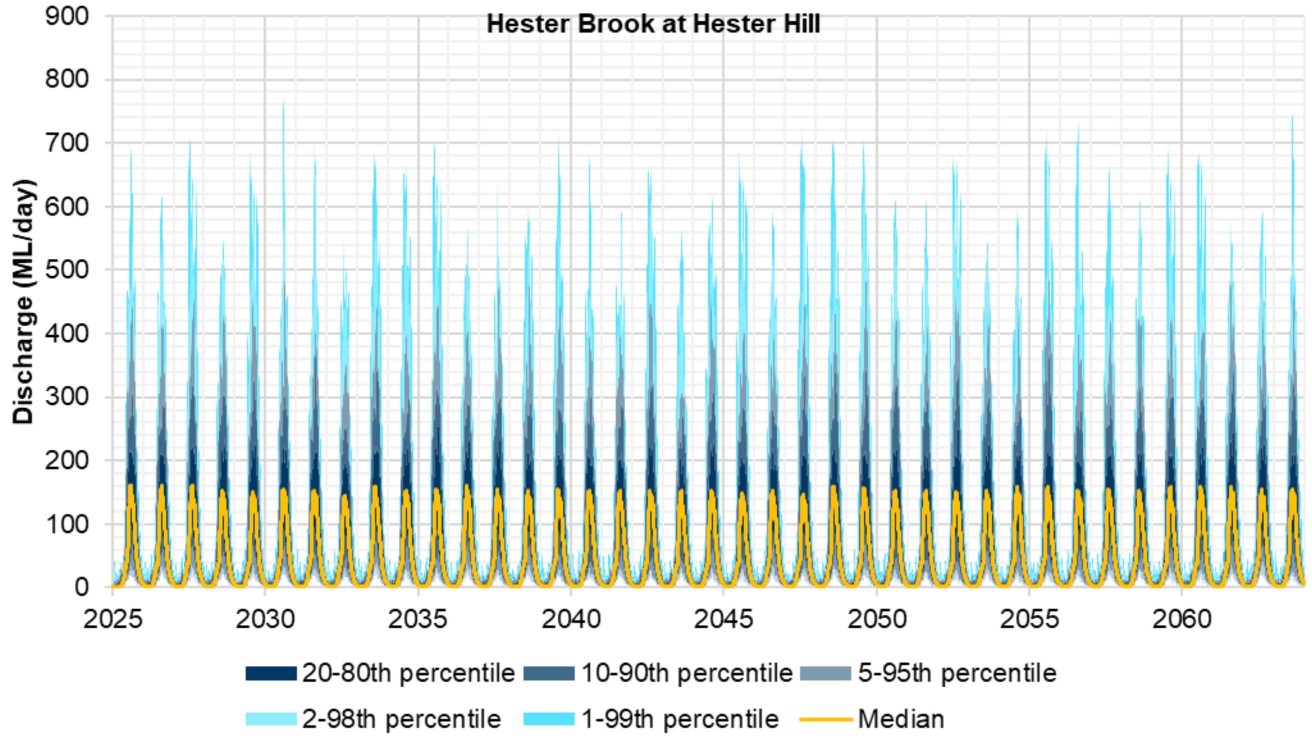

Hester Brook Upstream of Saltwater Gully Confluence
Discharge (ML/day)
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

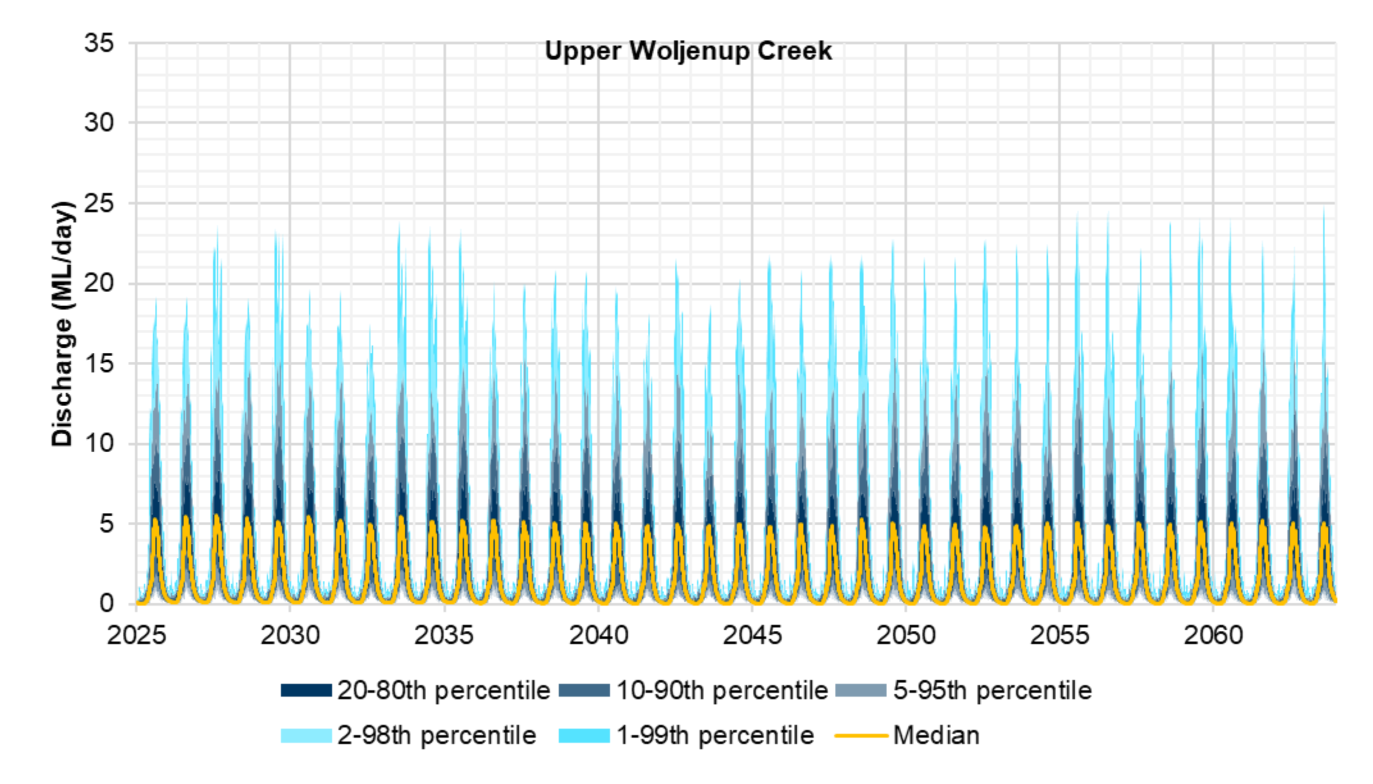

Hester Brook Upstream of Saltwater Gully Confluence
Discharge (ML/day)
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

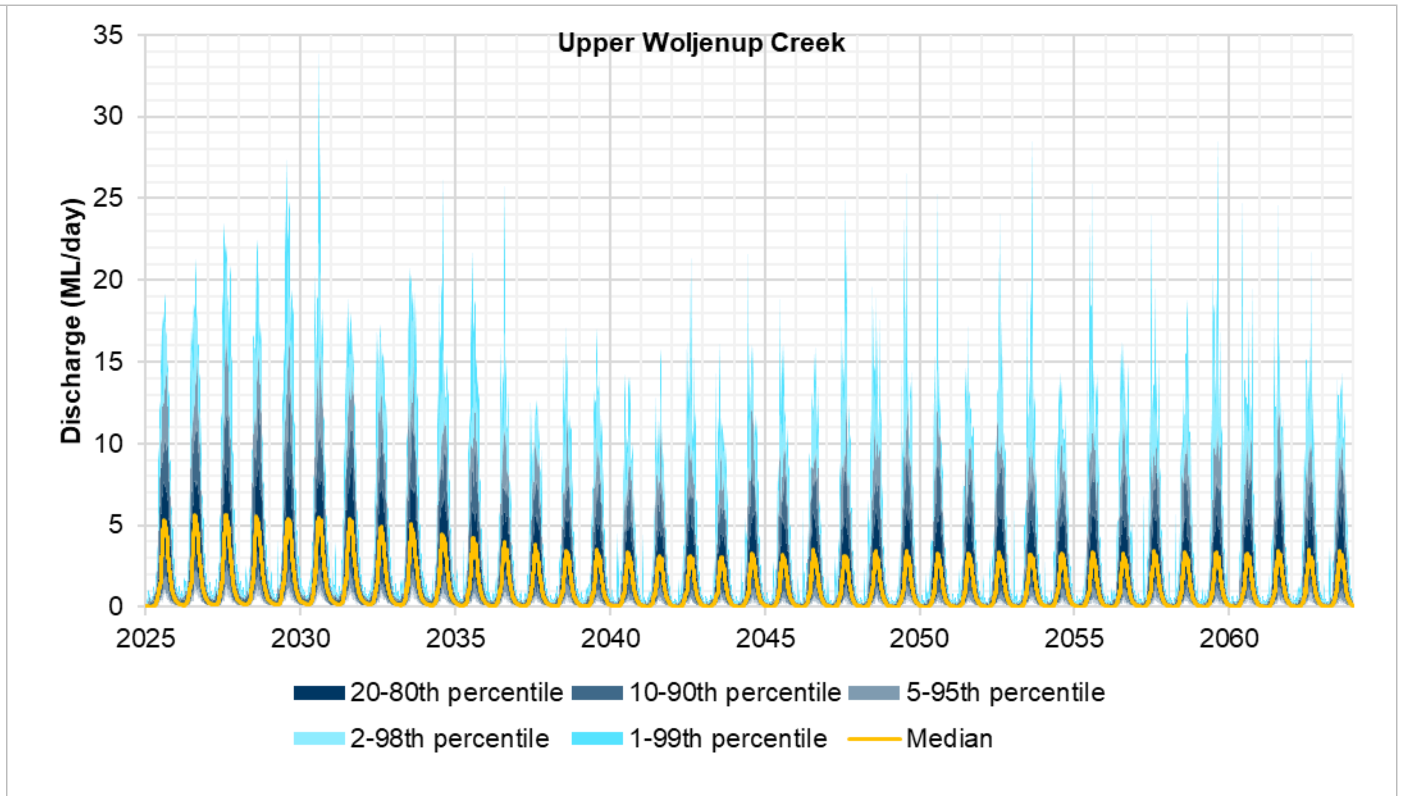

Hester Brook Downstream of Cascade Gully Confluence
Discharge (ML/day)
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

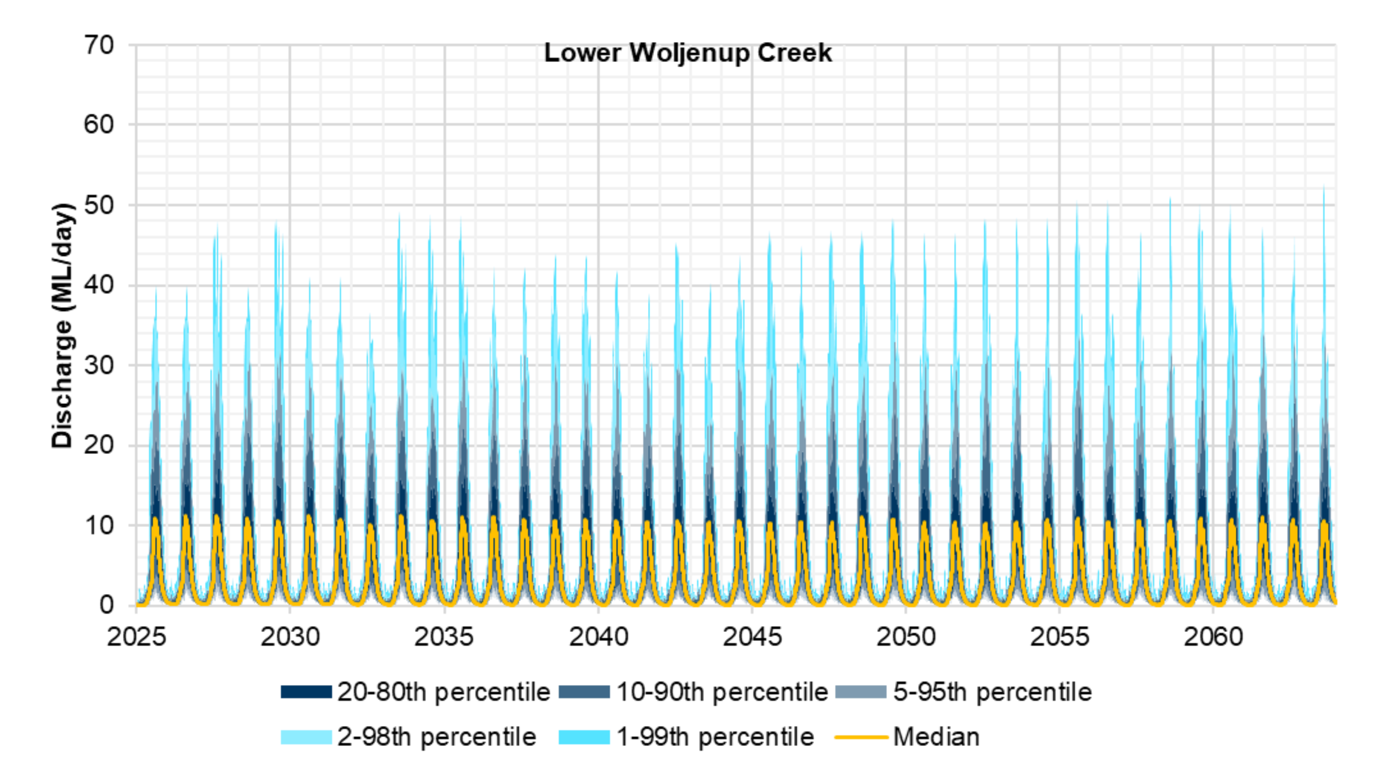

Hester Brook Downstream of Cascade Gully Confluence
Discharge (ML/day)
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

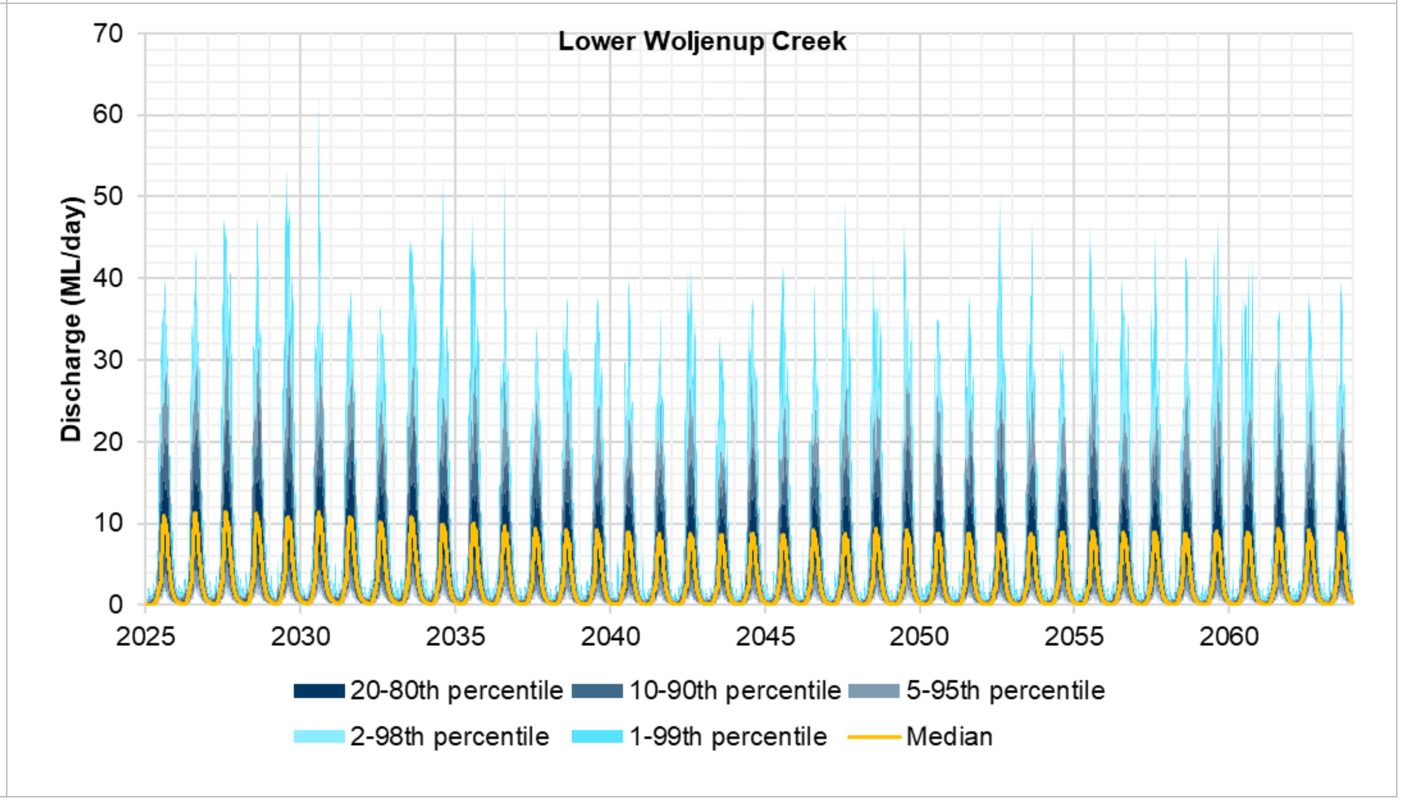

Hester Brook at Hester Hill
Discharge (ML/day)
900
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

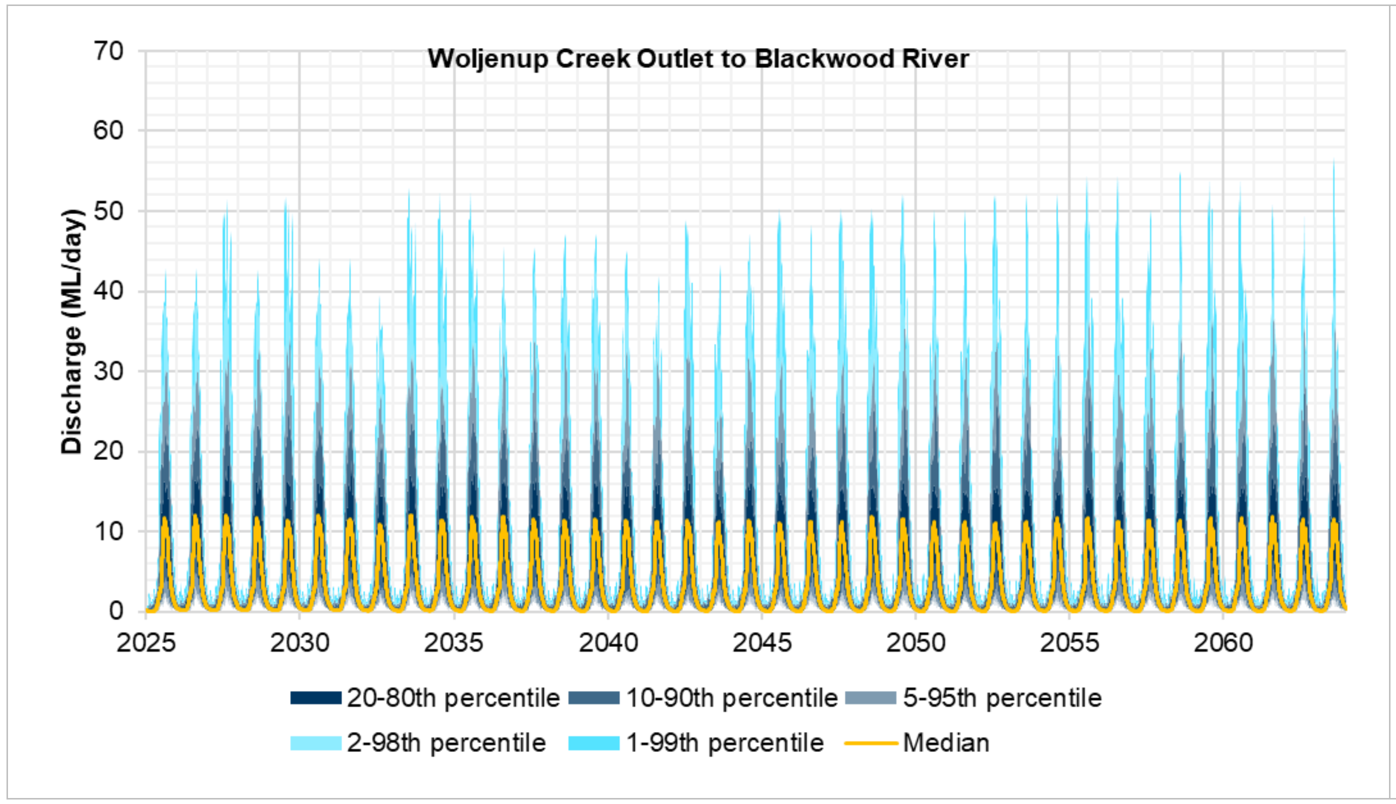

Hester Brook at Hester Hill
Discharge (ML/day)
900
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

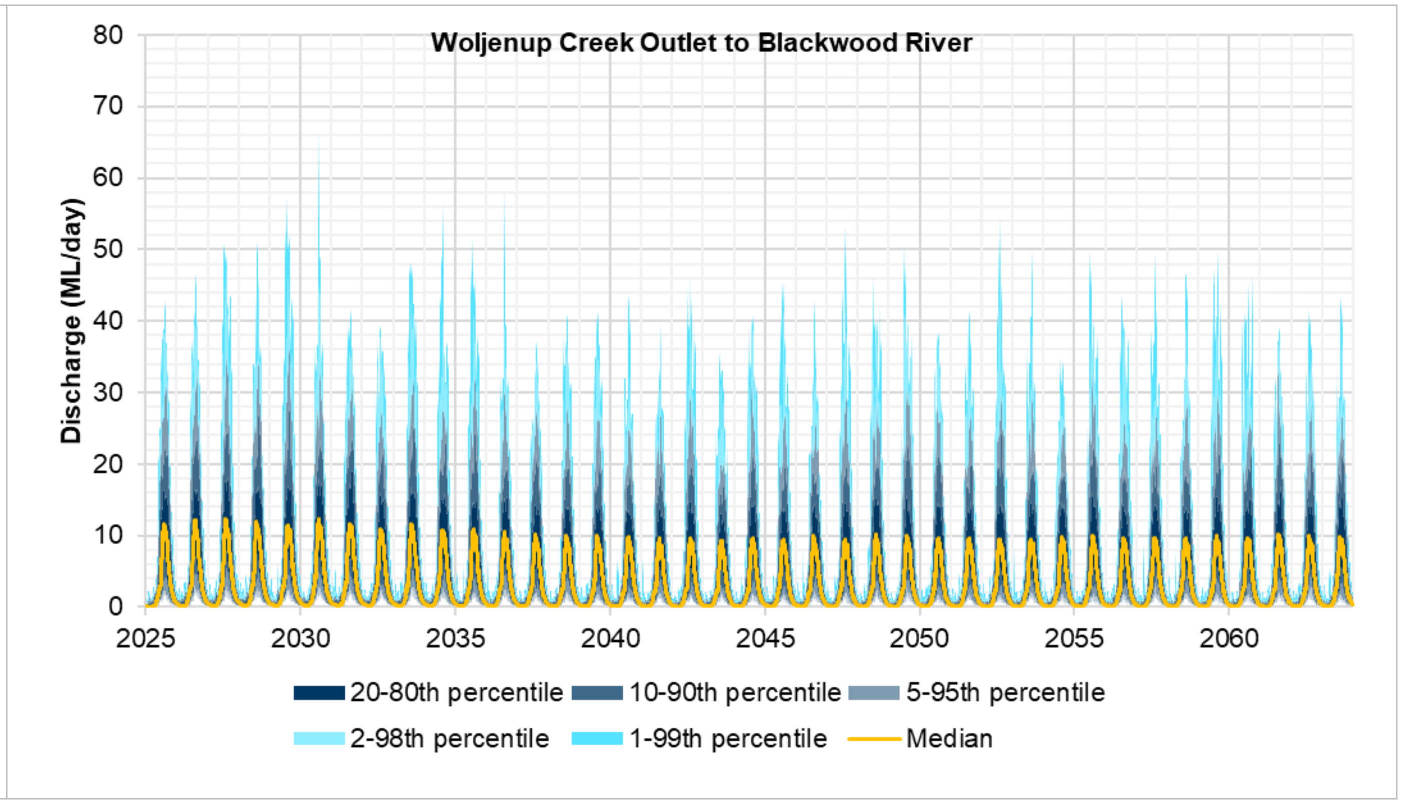

Upper Woljenup Creek
Discharge (ML/day)
0
5
10
15
20
25
30
35
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Upper Woljenup Creek
Discharge (ML/day)
0
5
10
15
20
25
30
35
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Lower Woljenup Creek
Discharge (ML/day)
0
10
20
30
40
50
60
70
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Lower Woljenup Creek
Discharge (ML/day)
0
10
20
30
40
50
60
70
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

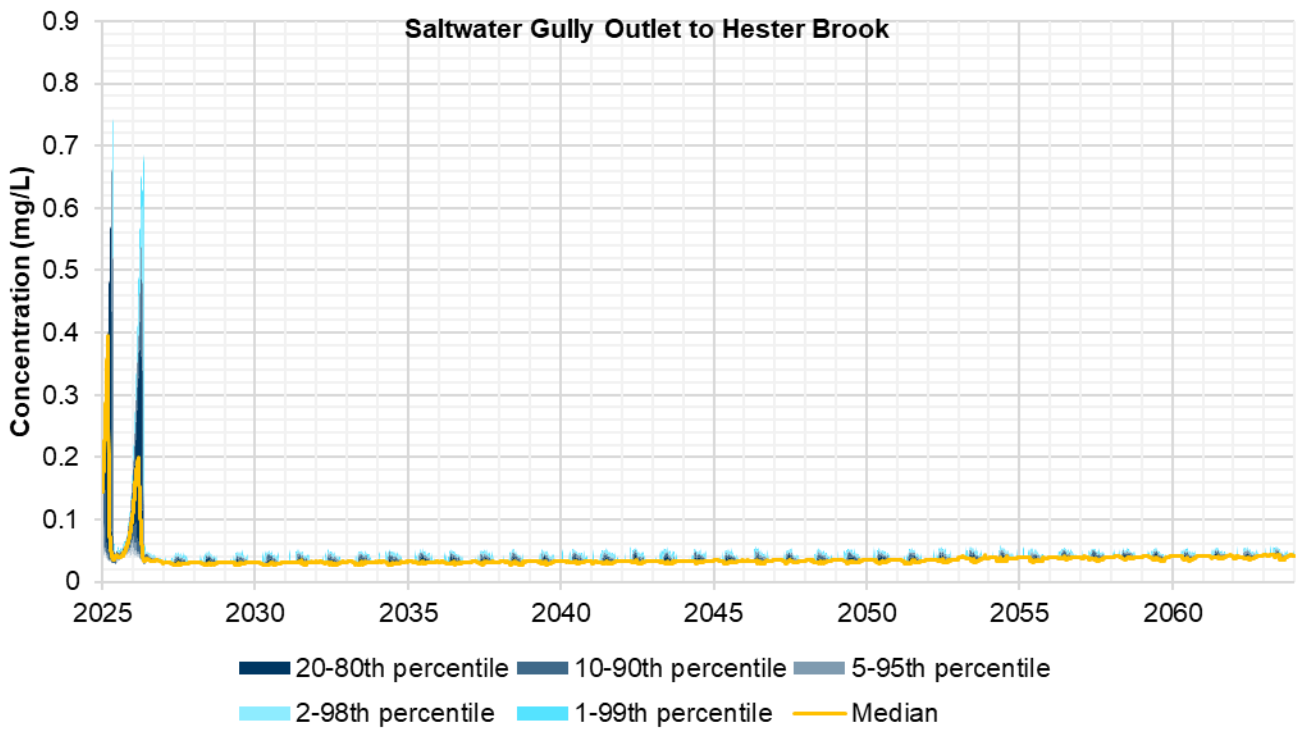

Woljenup Creek Outlet to Blackwood River
Discharge (ML/day)
0
10
20
30
40
50
60
70
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

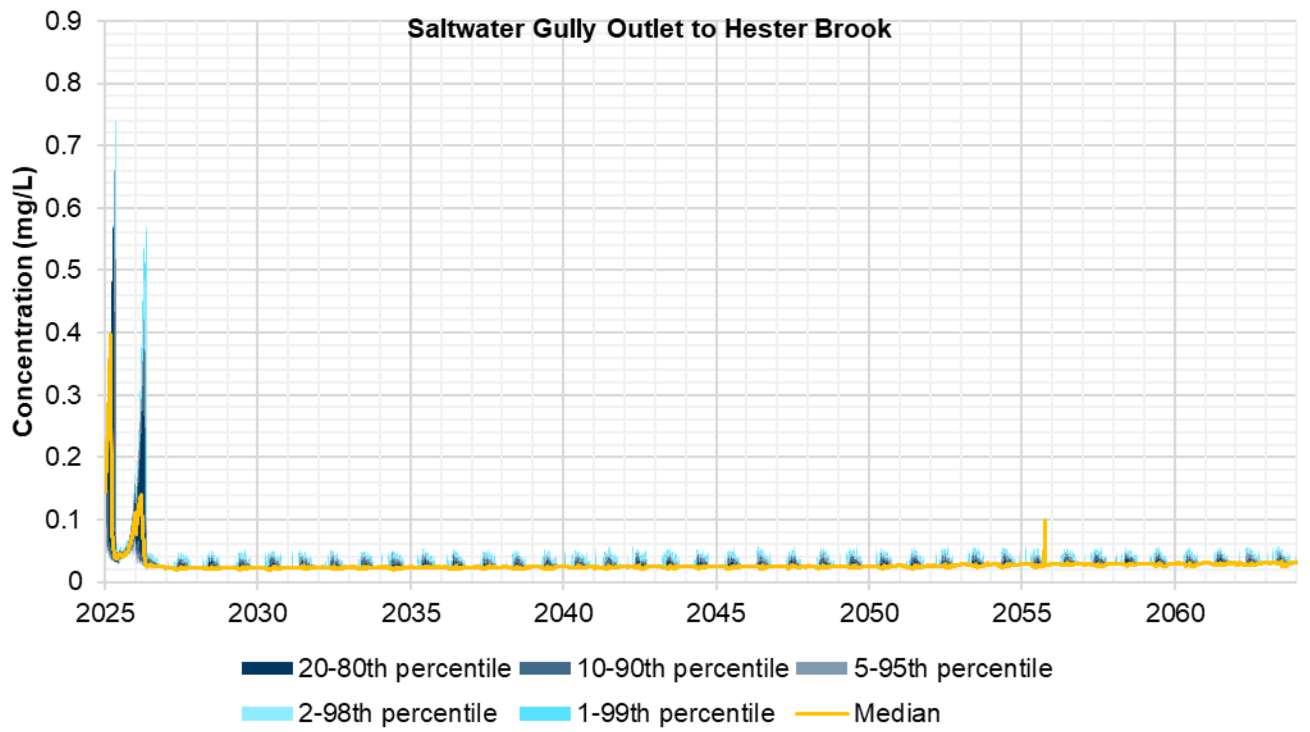

Woljenup Creek Outlet to Blackwood River
Discharge (ML/day)
0
10
20
30
40
50
60
70
80
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

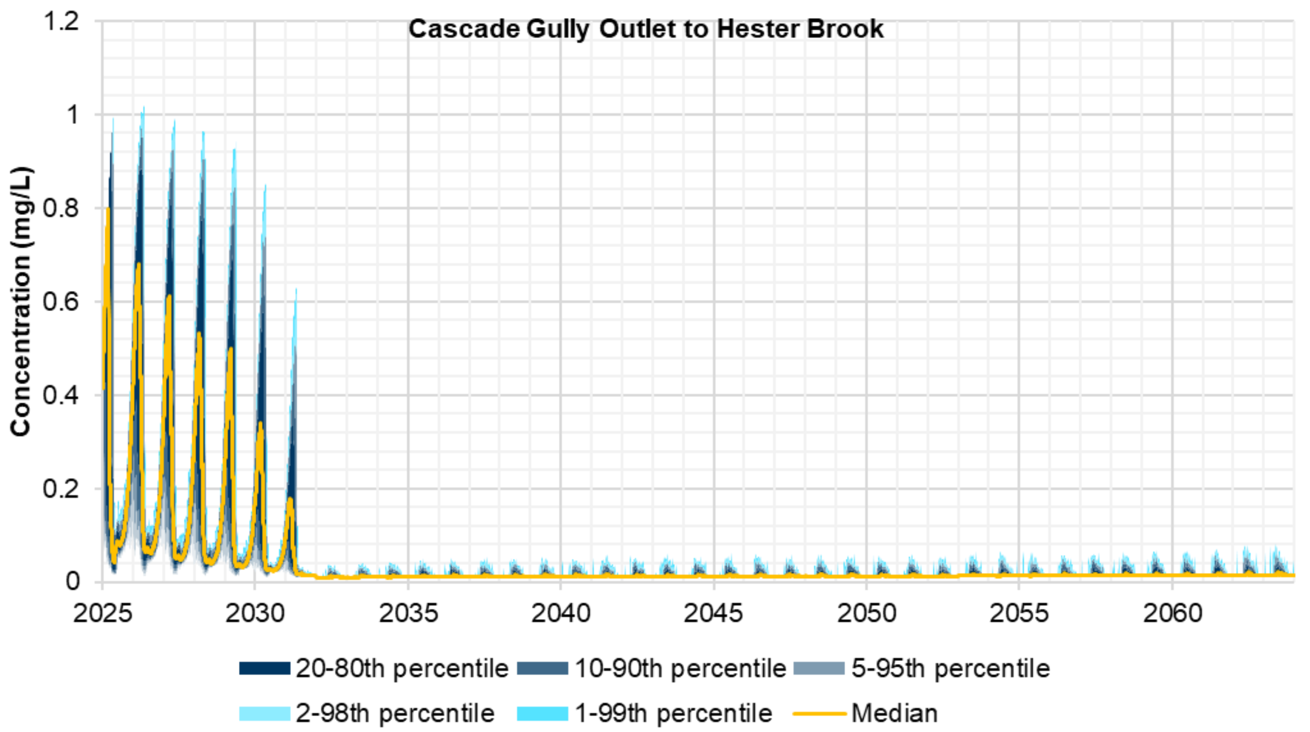
Appendix H

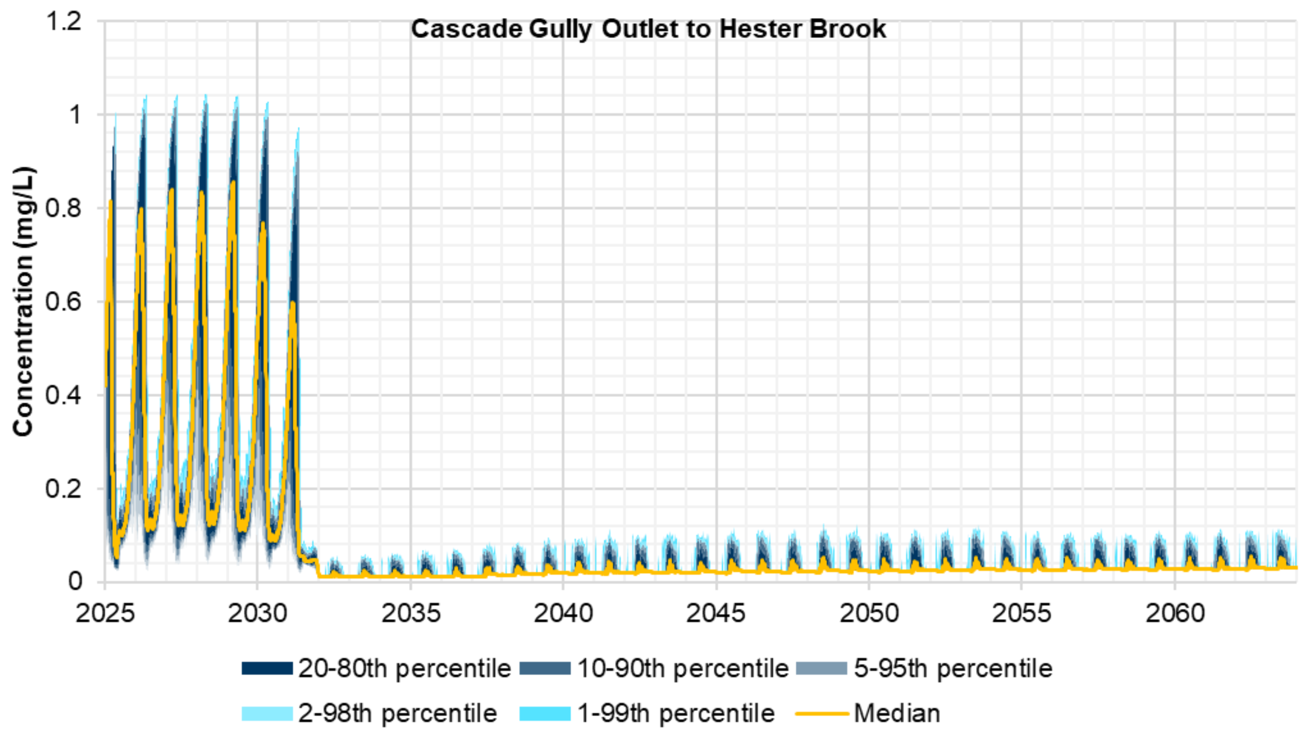
Simulated Lithium Concentrations

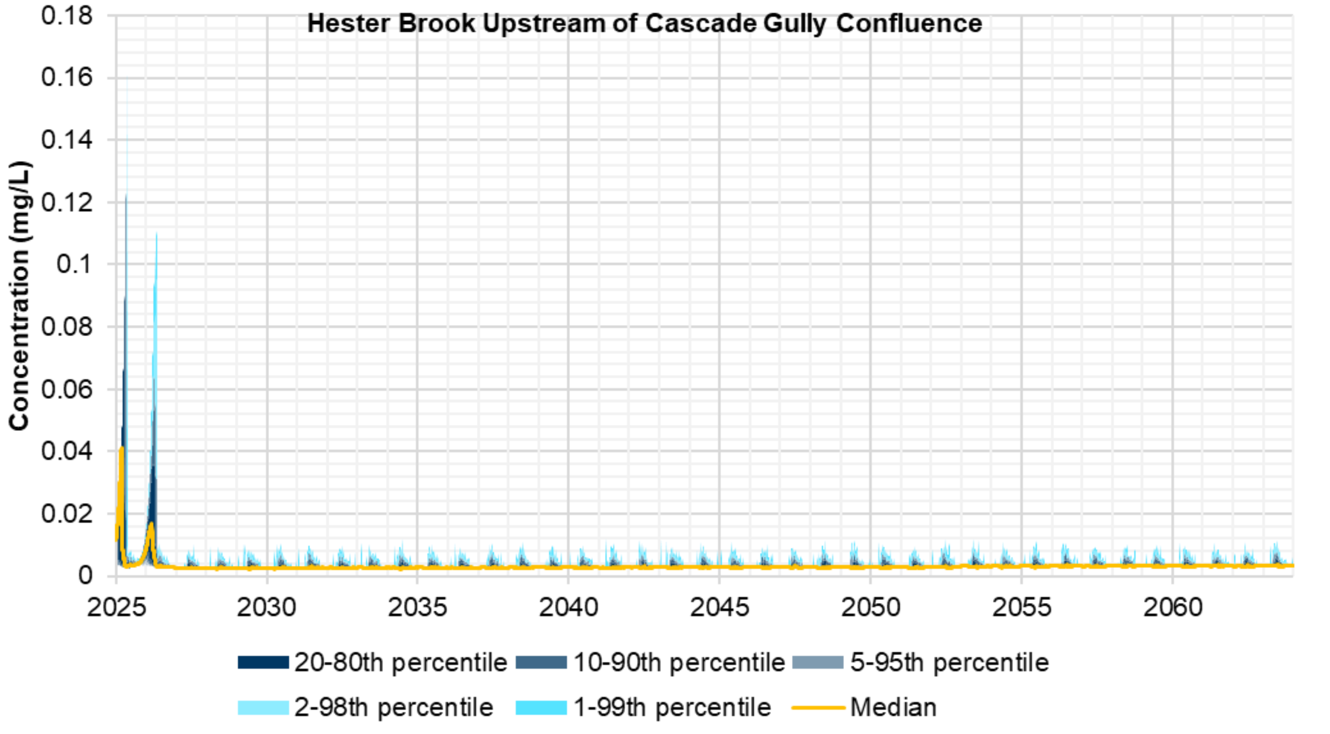
Base Case | **Impact Case**

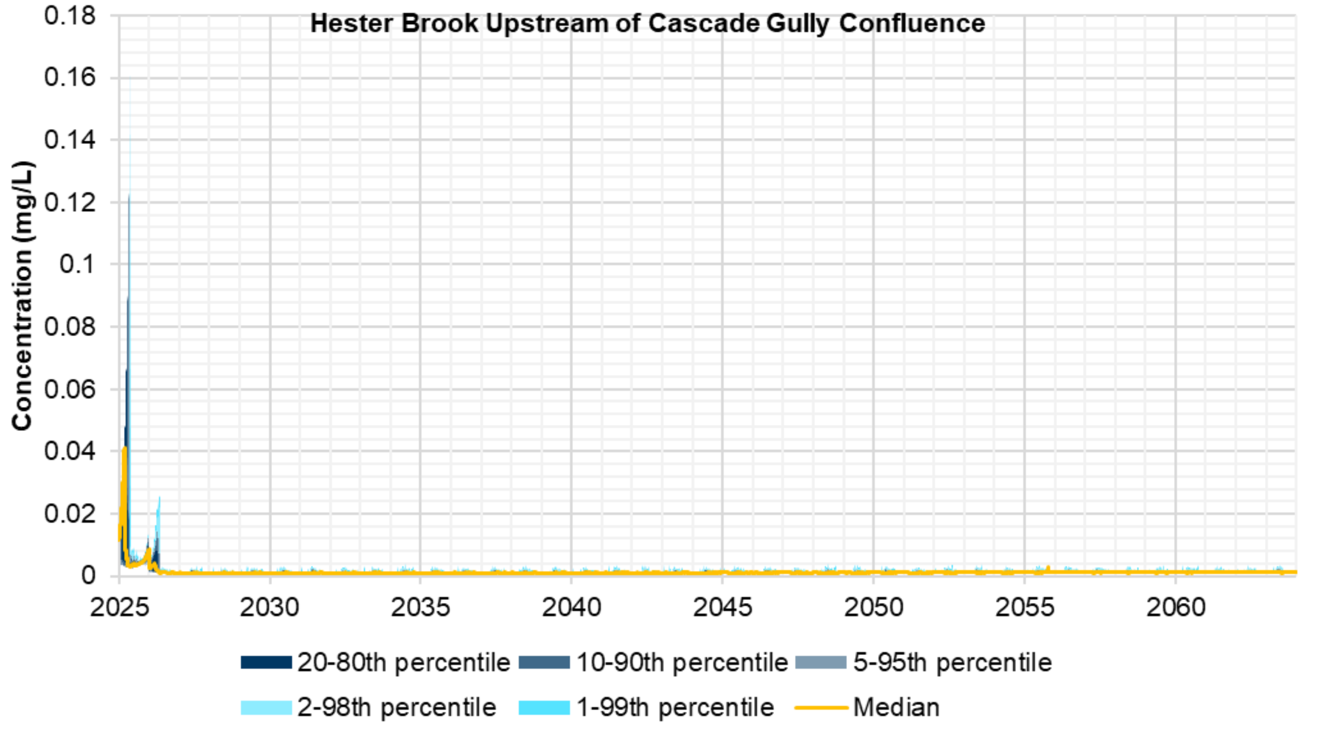


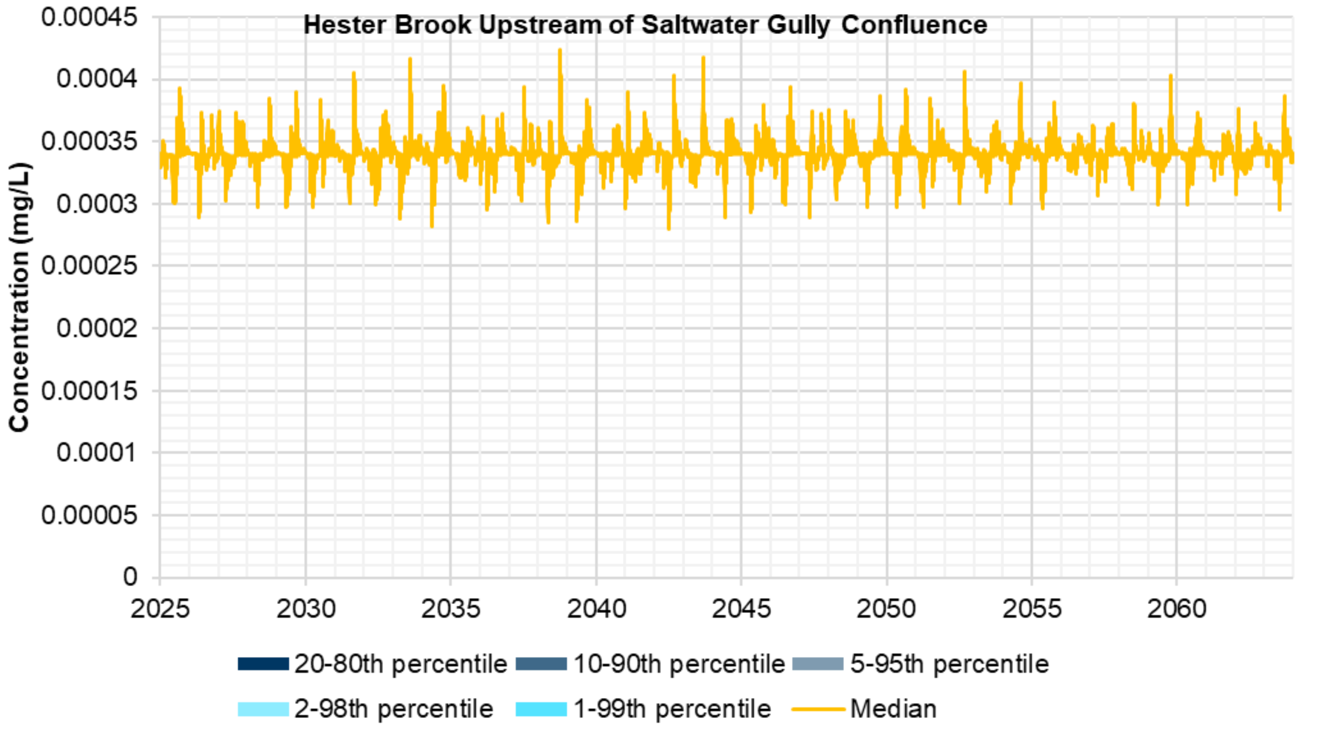


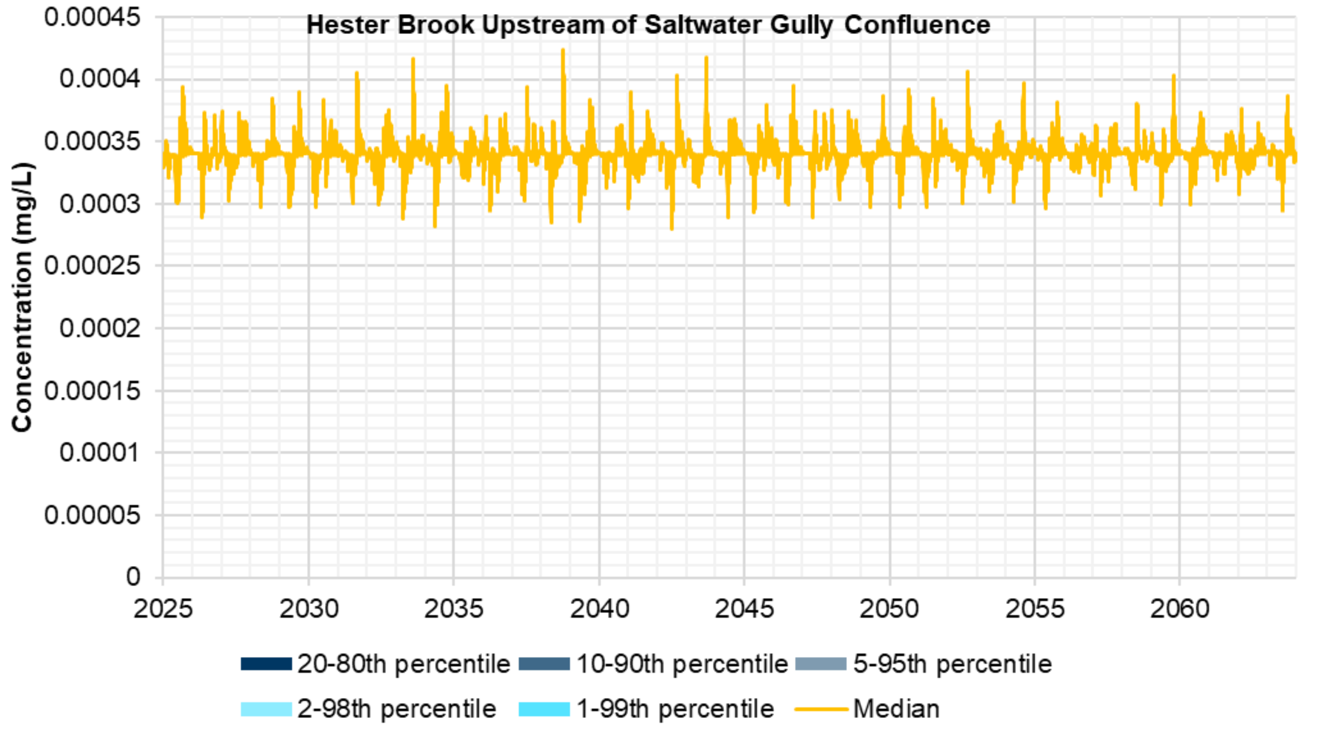


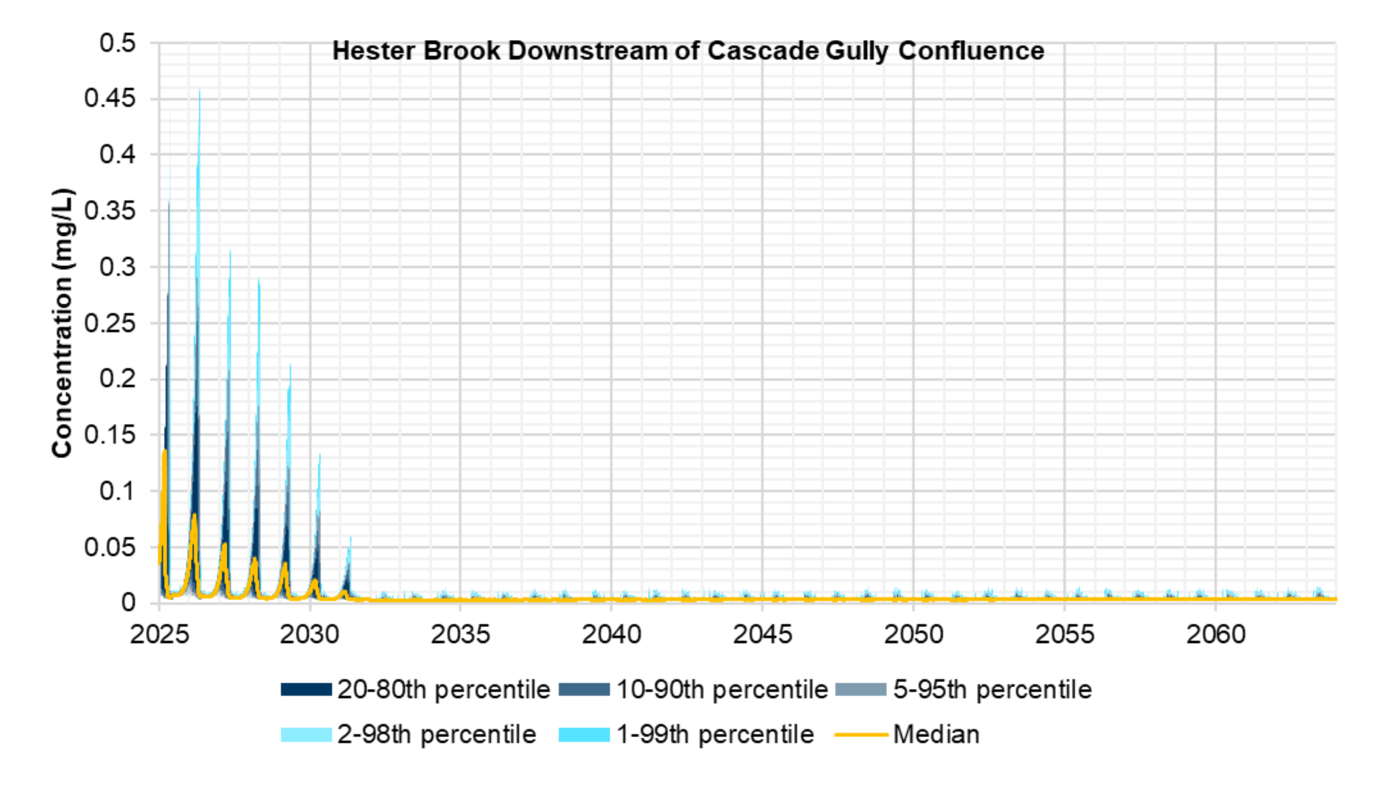


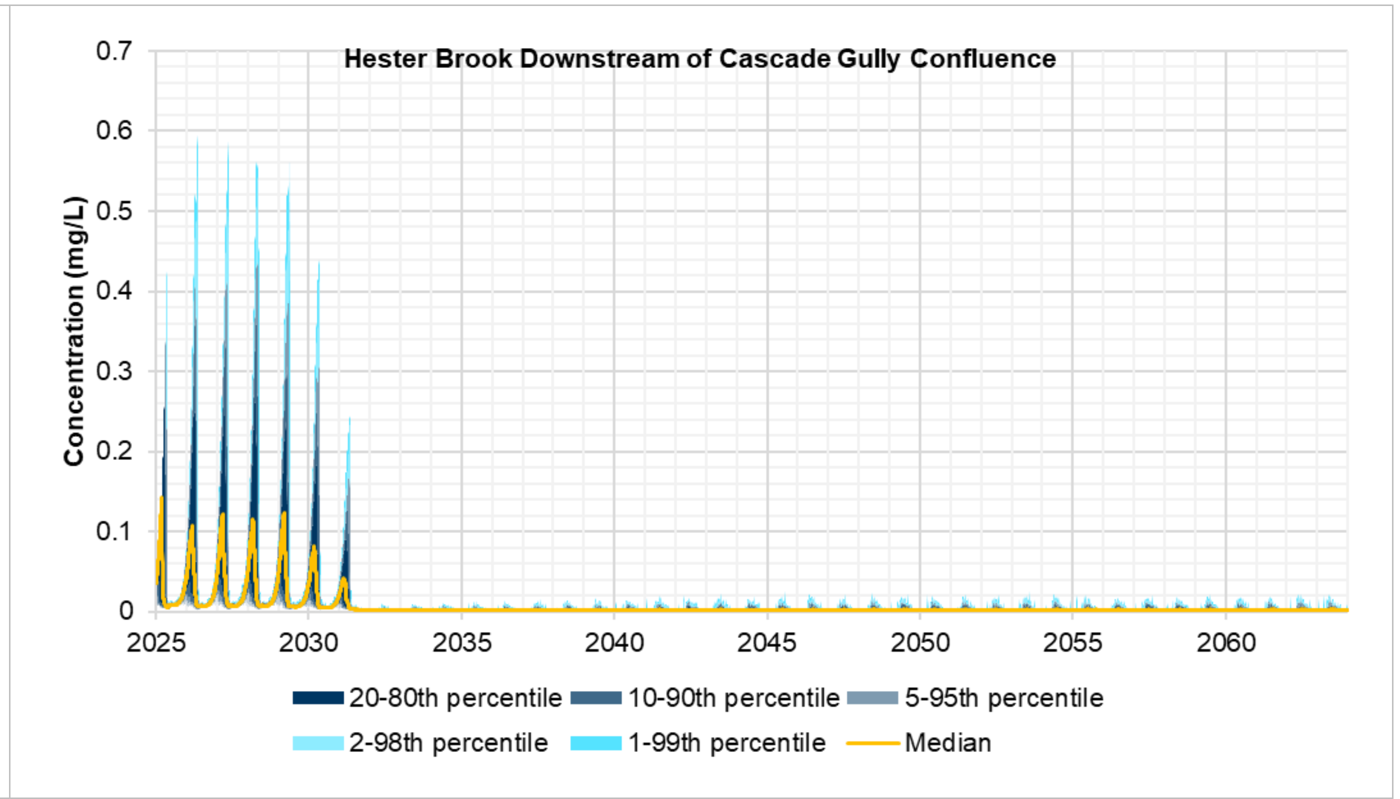

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

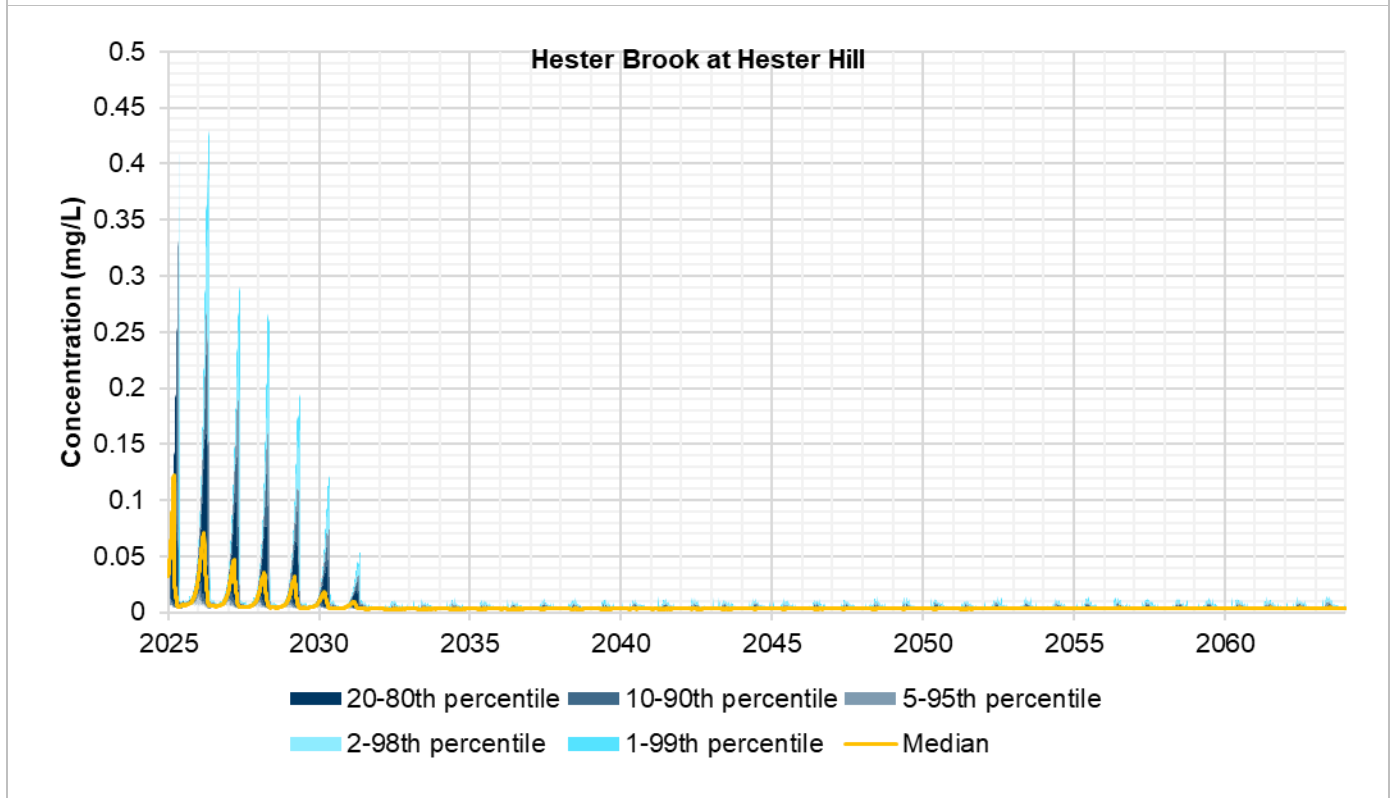

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

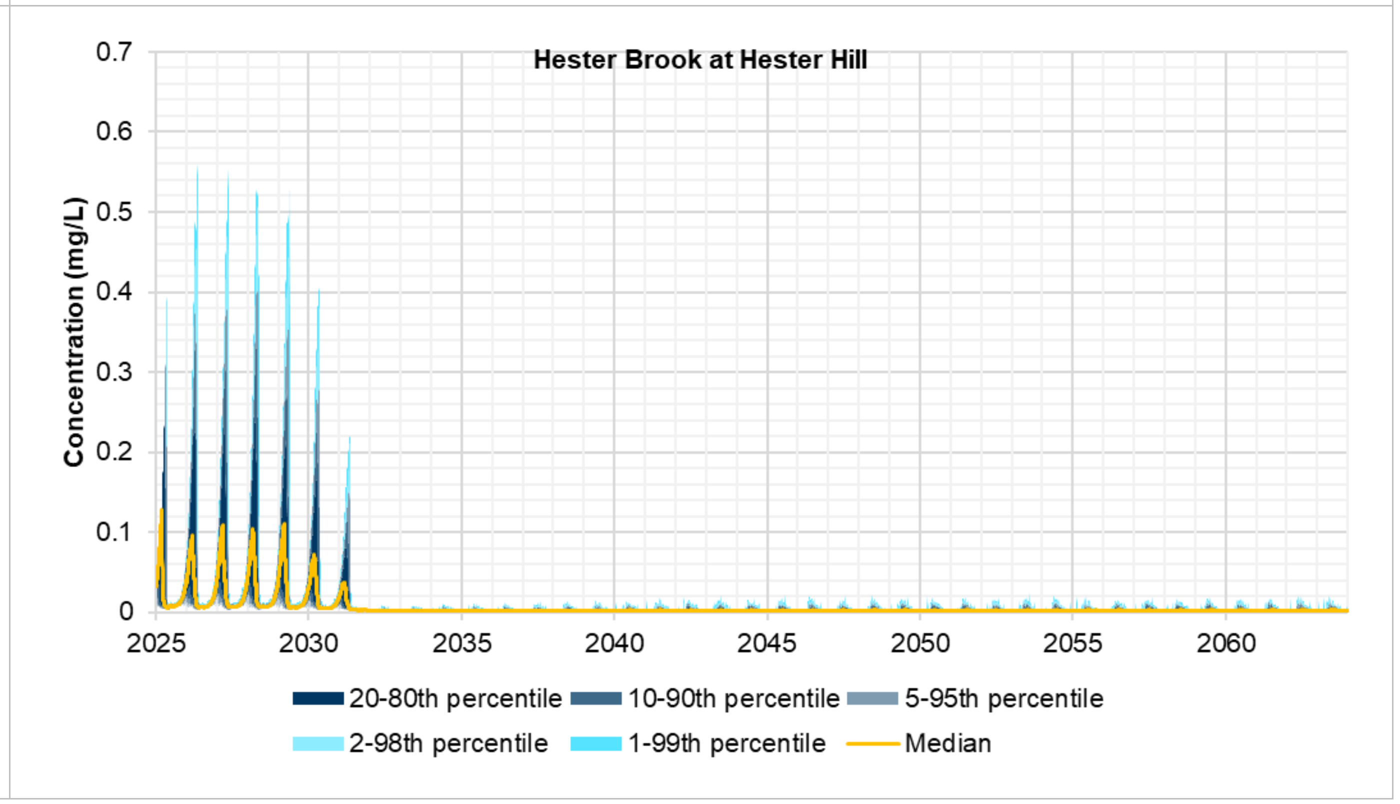

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.00045
0.0004
0.00035
0.0003
0.00025
0.0002
0.00015
0.0001
0.00005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

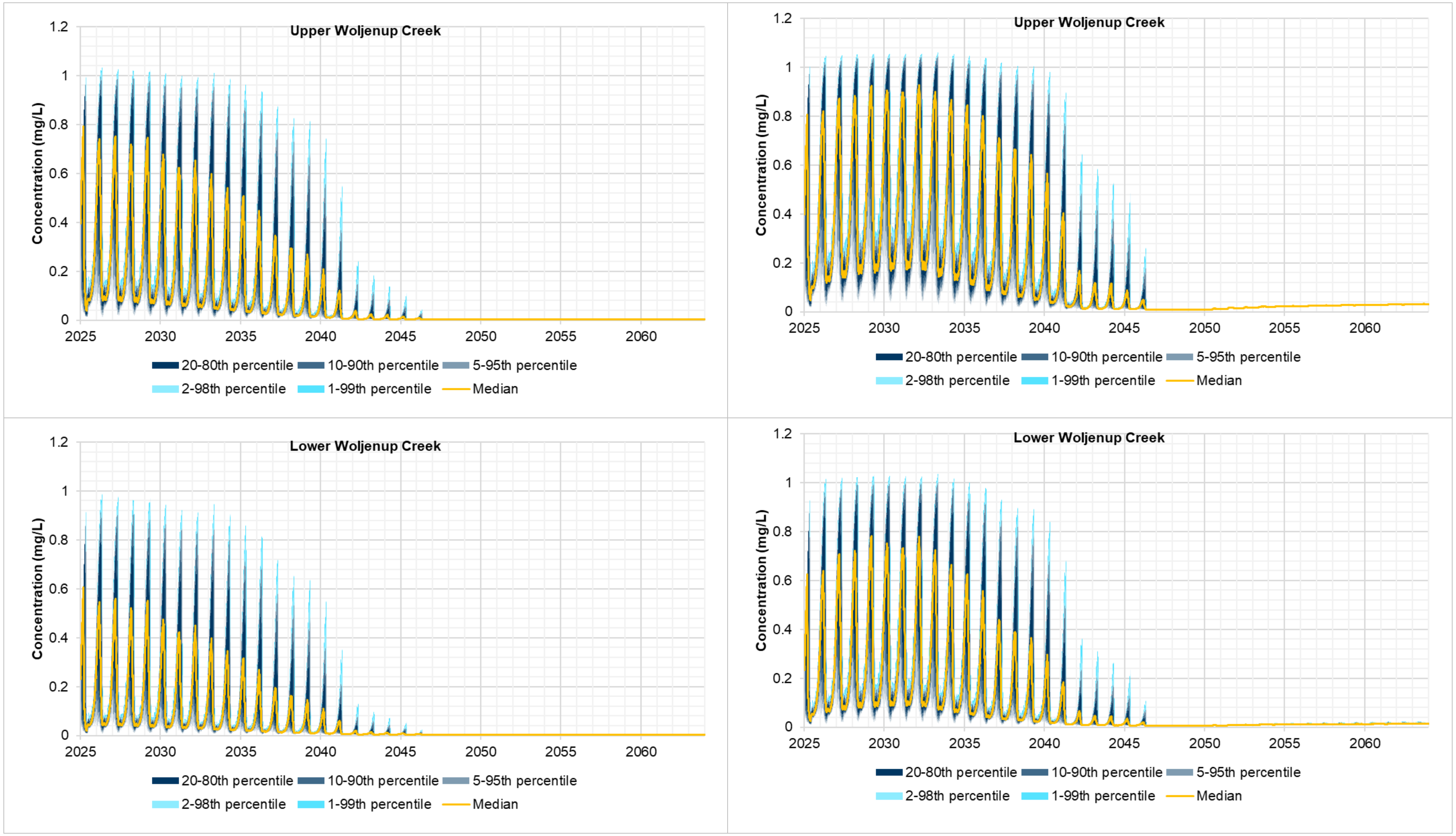

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.00045
0.0004
0.00035
0.0003
0.00025
0.0002
0.00015
0.0001
0.00005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

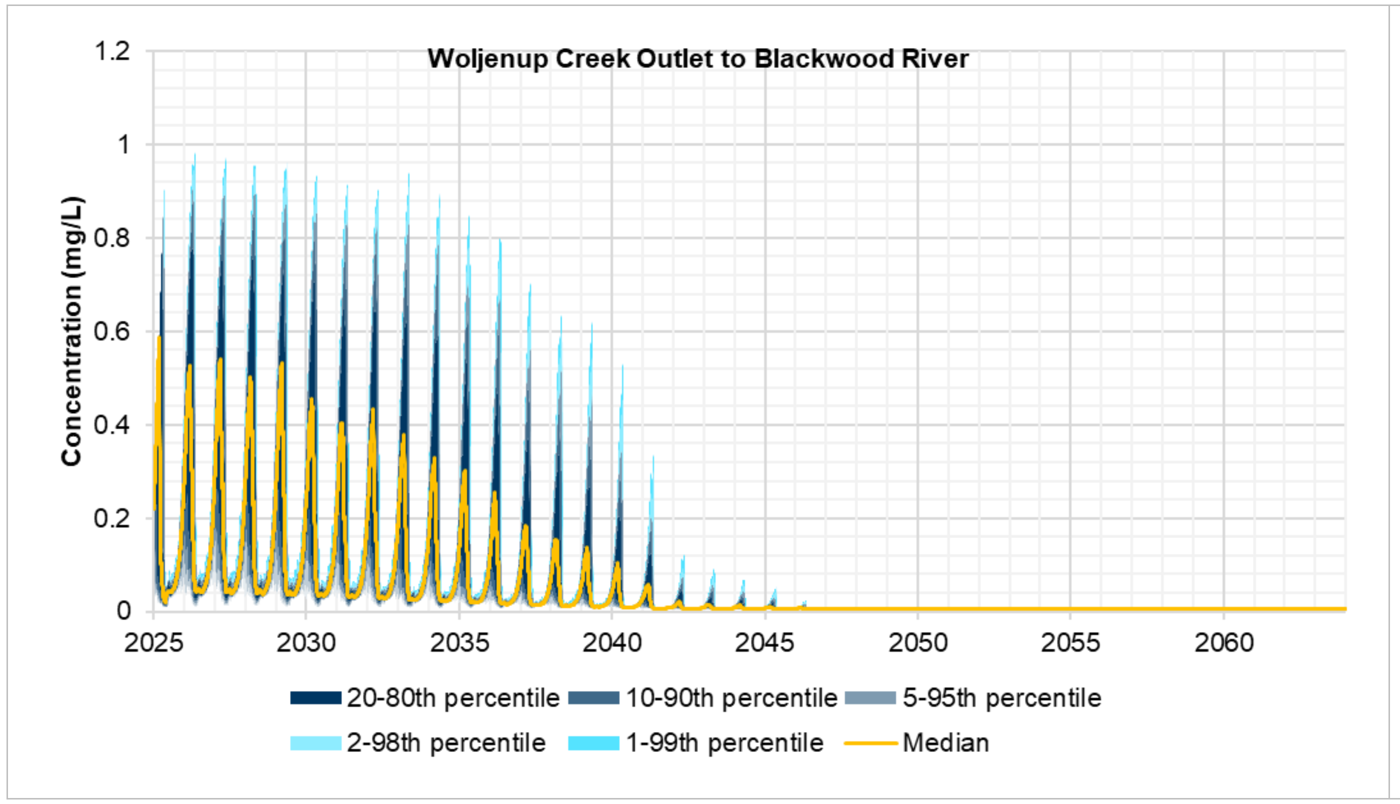

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

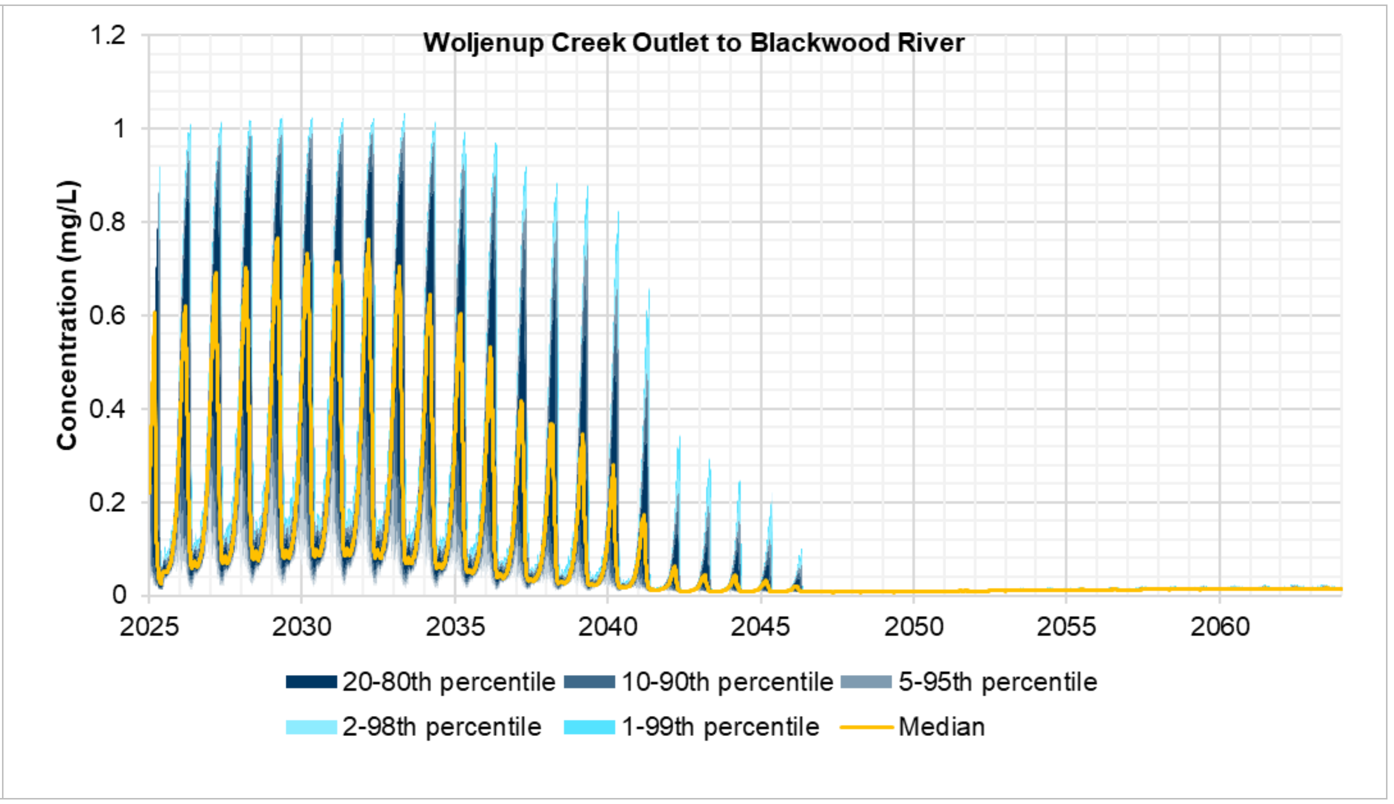

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Hester Brook at Hester Hill
Concentration (mg/L)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Hester Brook at Hester Hill
Concentration (mg/L)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

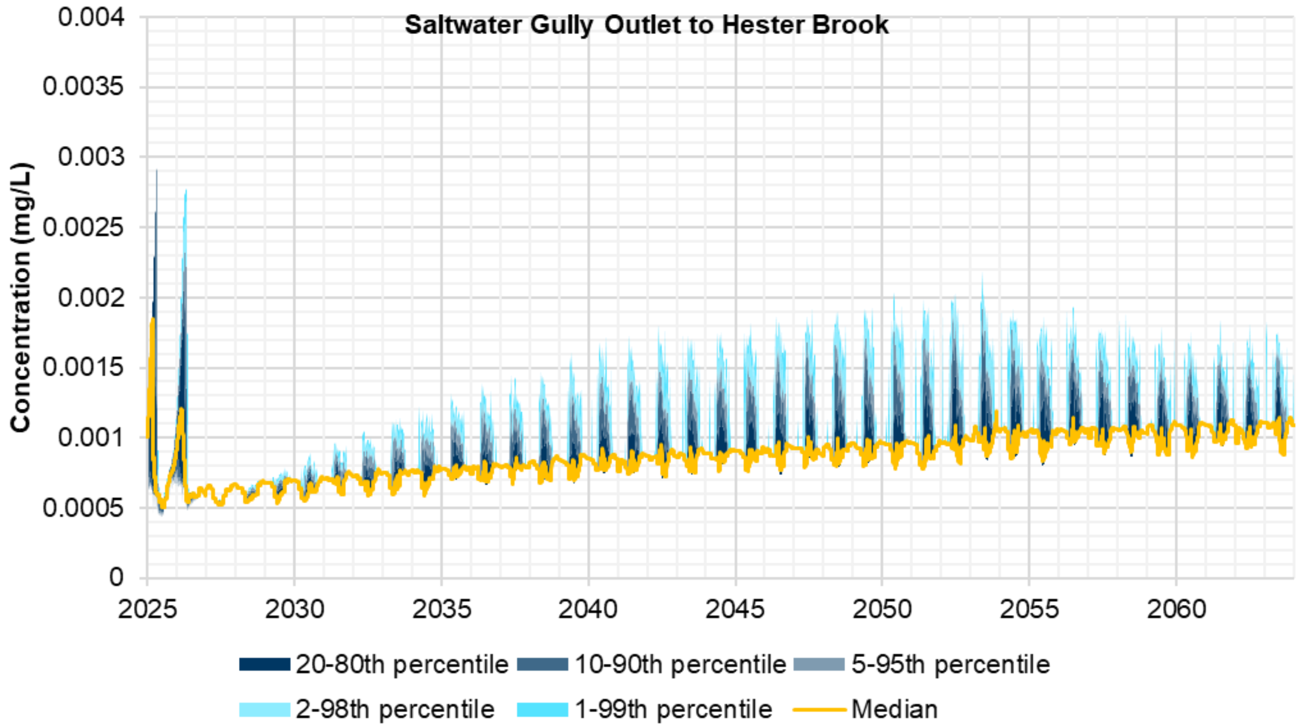

Upper Woljenup Creek
Concentration (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median
Upper Woljenup Creek
Lower Woljenup Creek
Lower Woljenup Creek

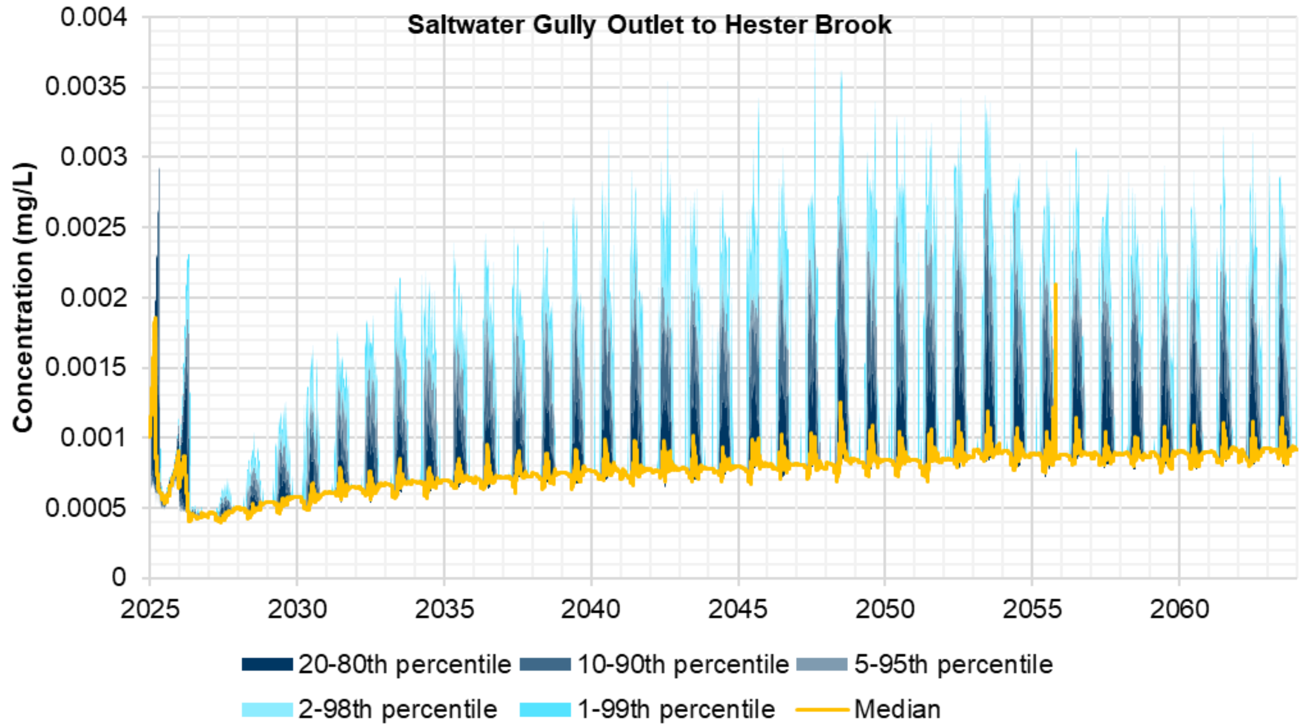

Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

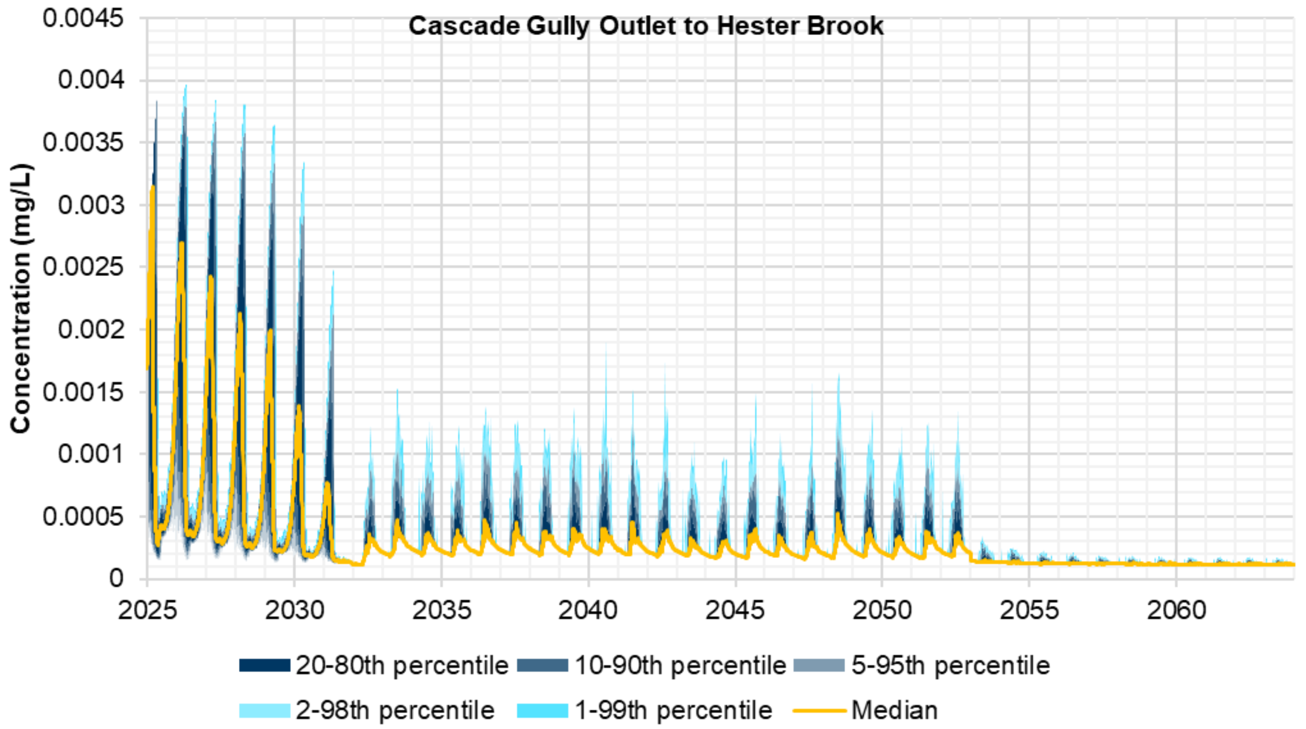

Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

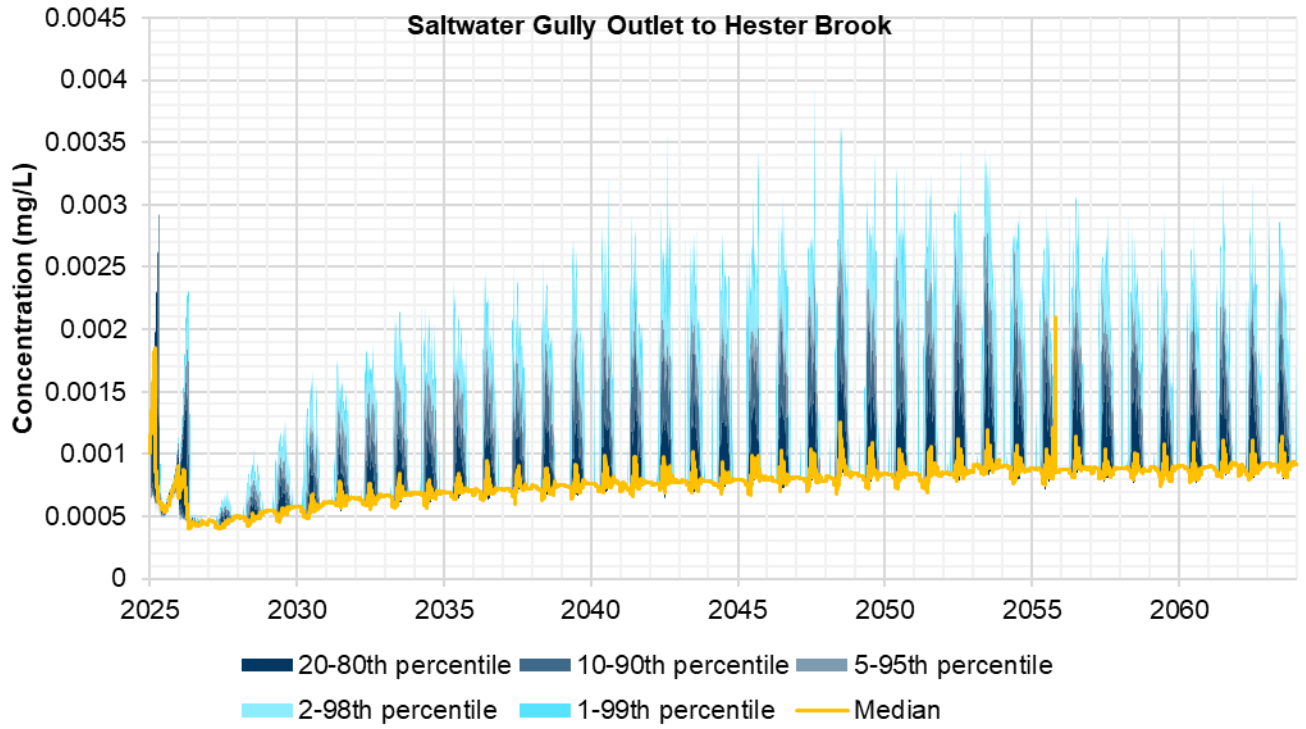
Appendix I

Simulated Arsenic Concentrations

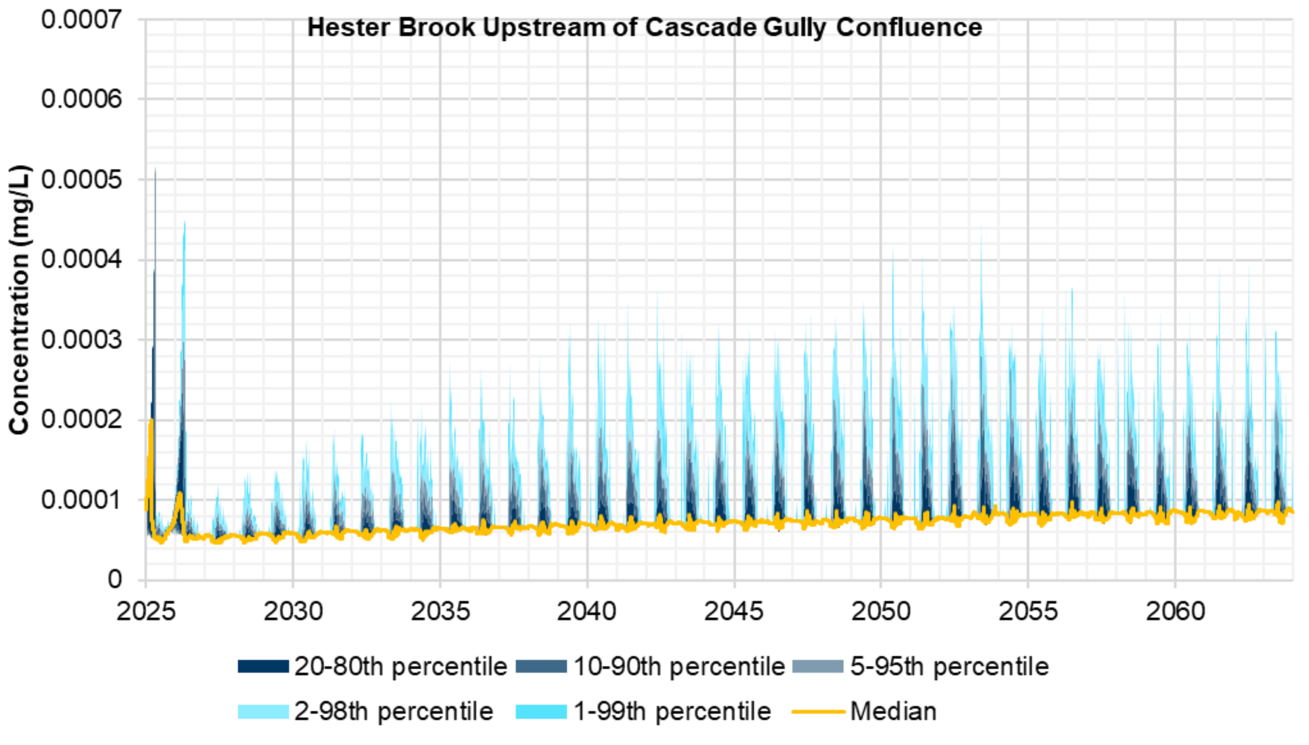
<table>
<tr><th>Base Case</th><th>Impact Case</th></tr>
<tr><td>


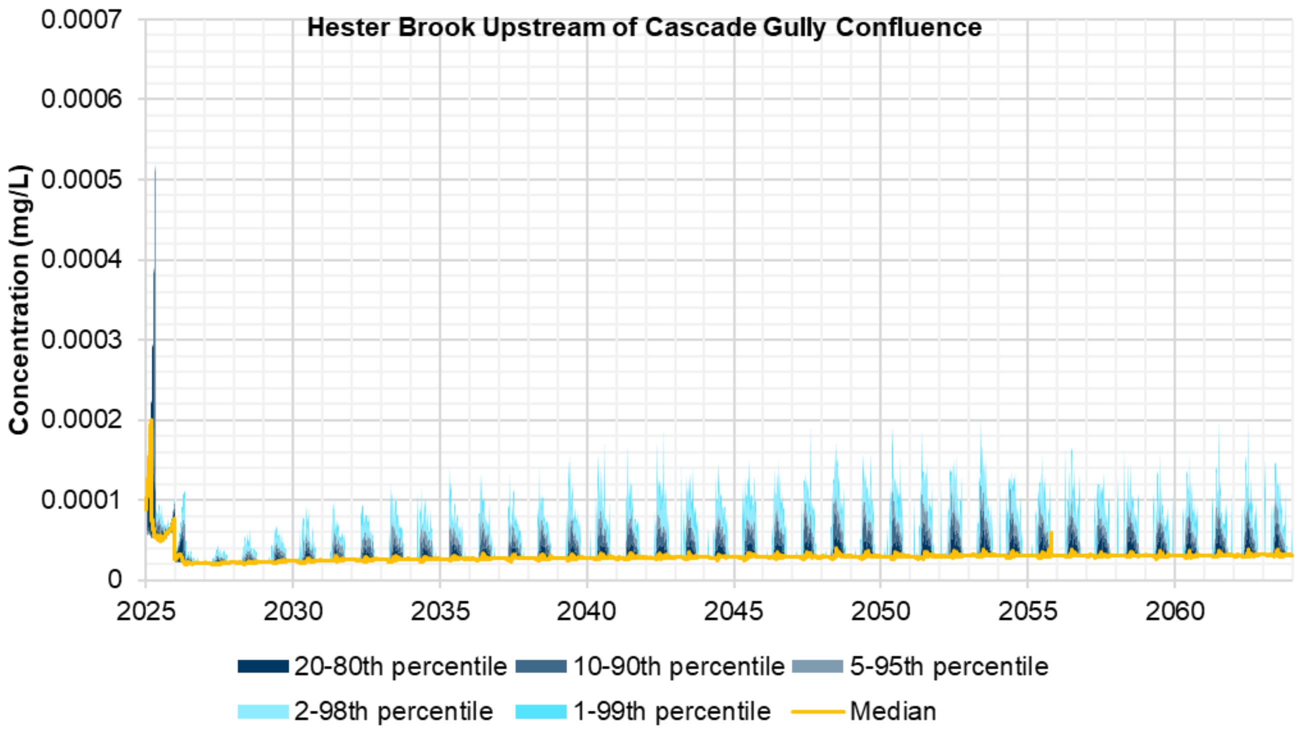
</td><td>


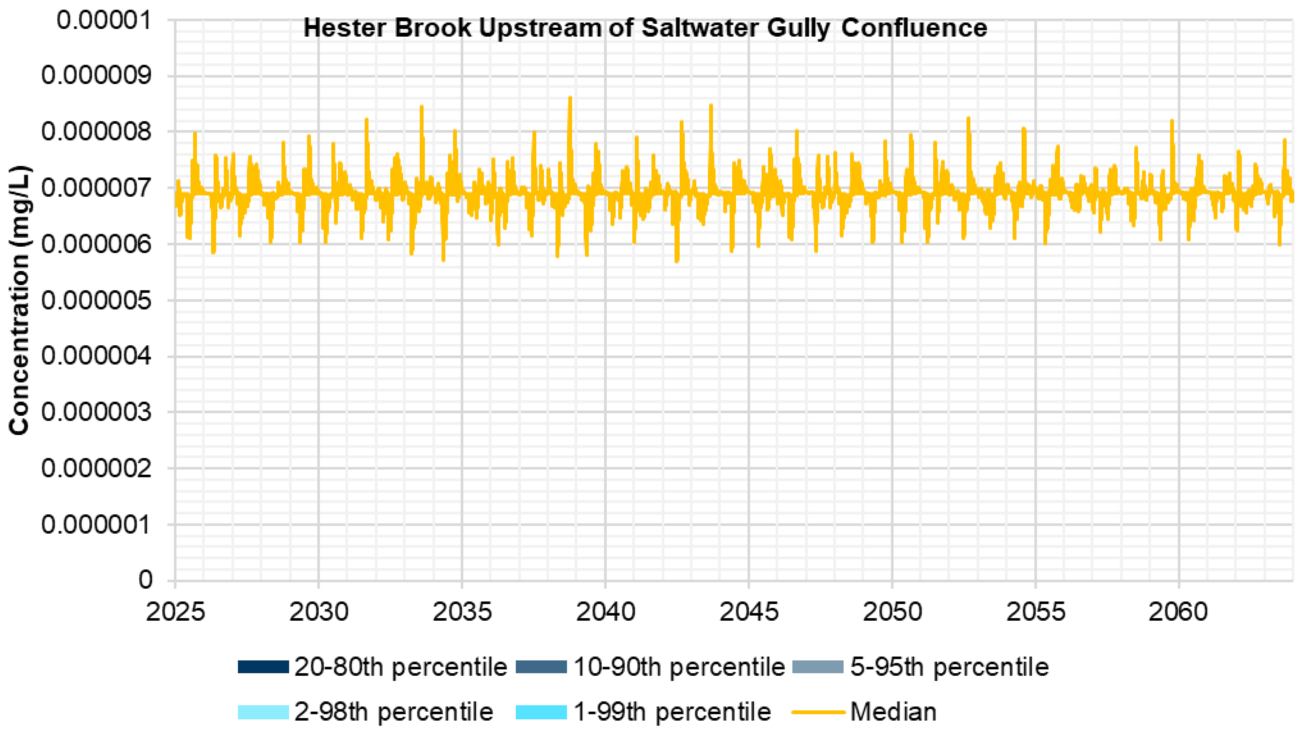
</td></tr>
<tr><td>


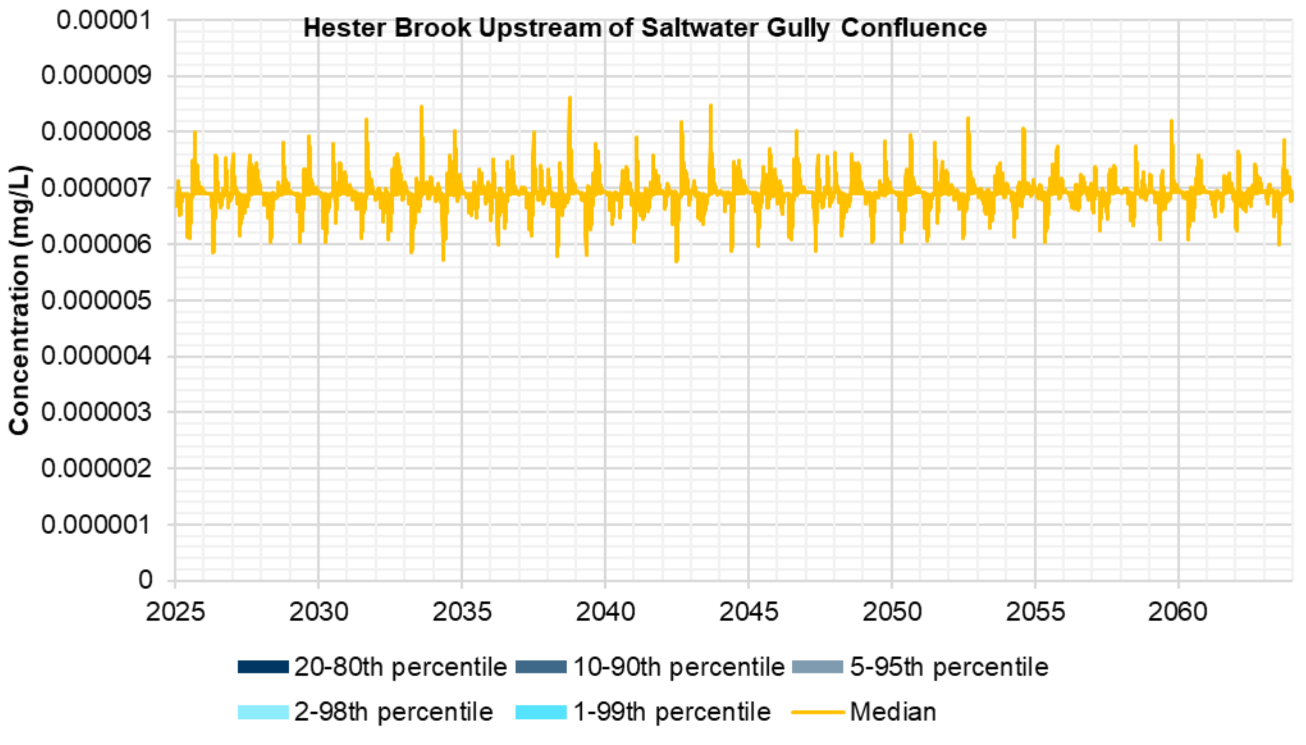
</td><td>


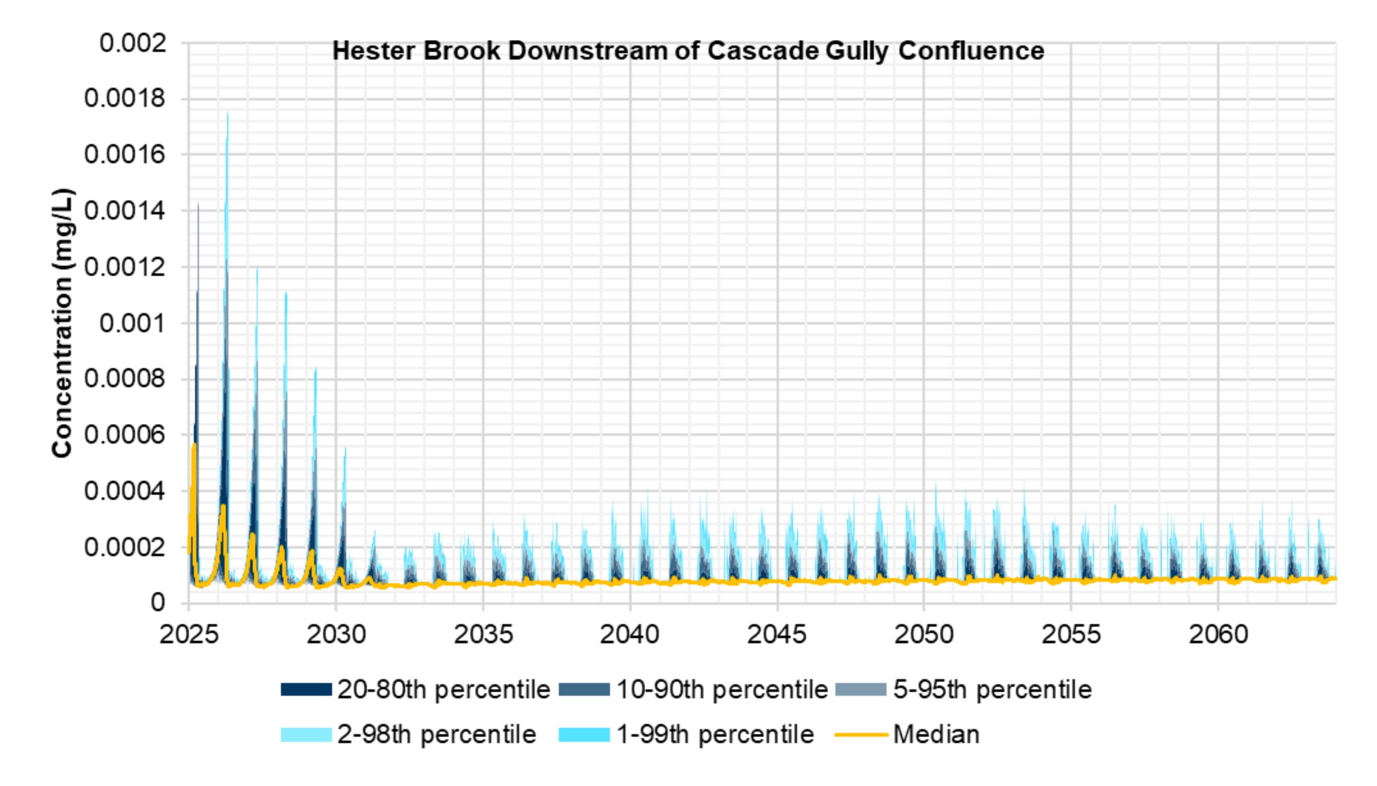
</td></tr>
</table>

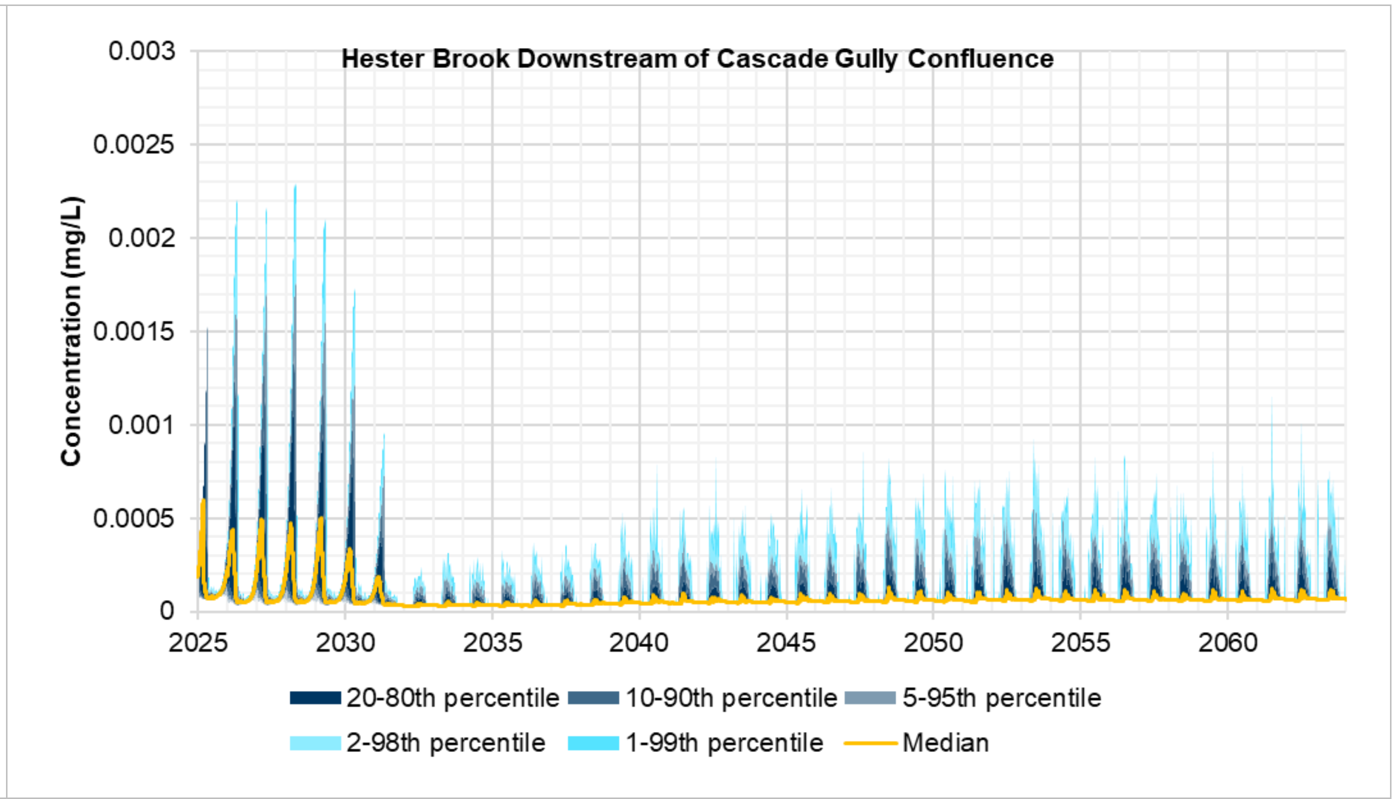

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

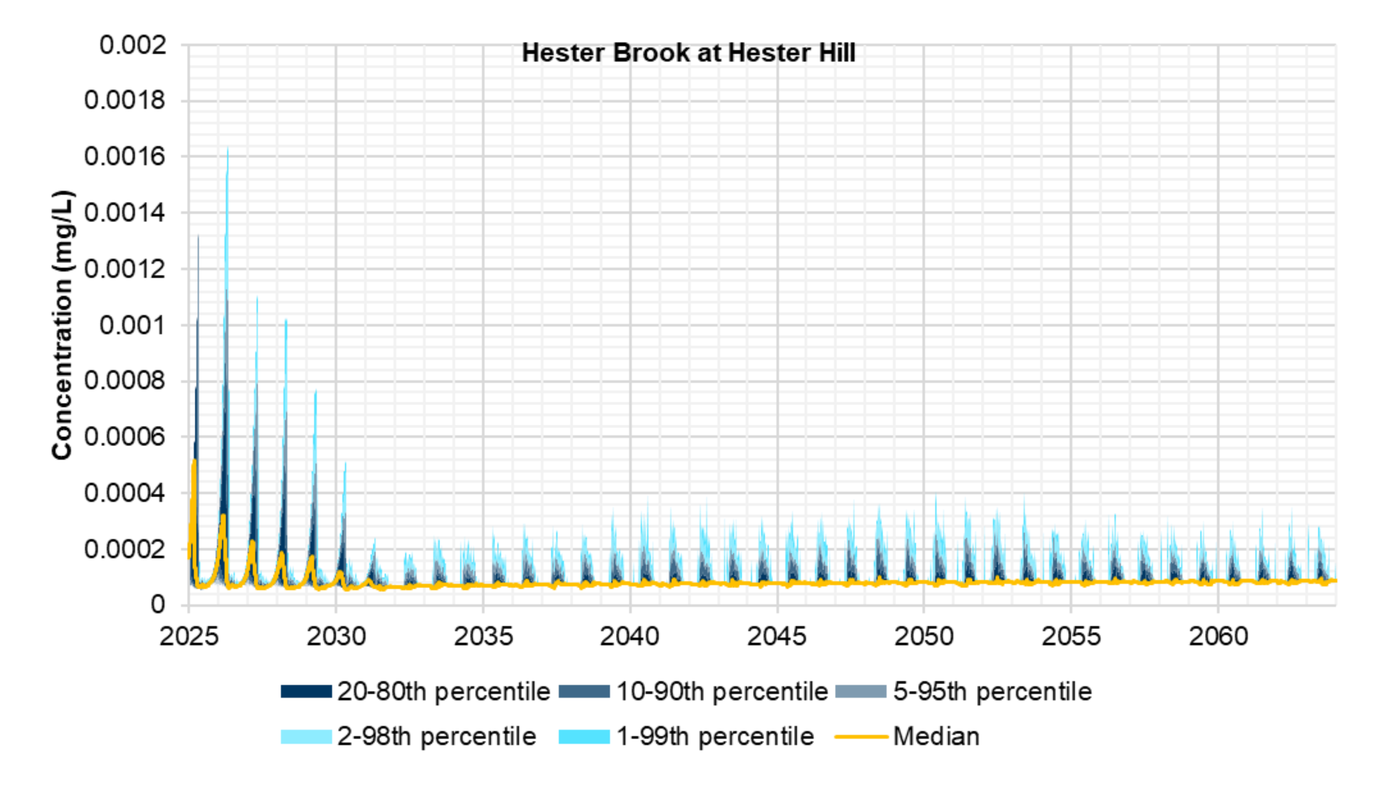

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

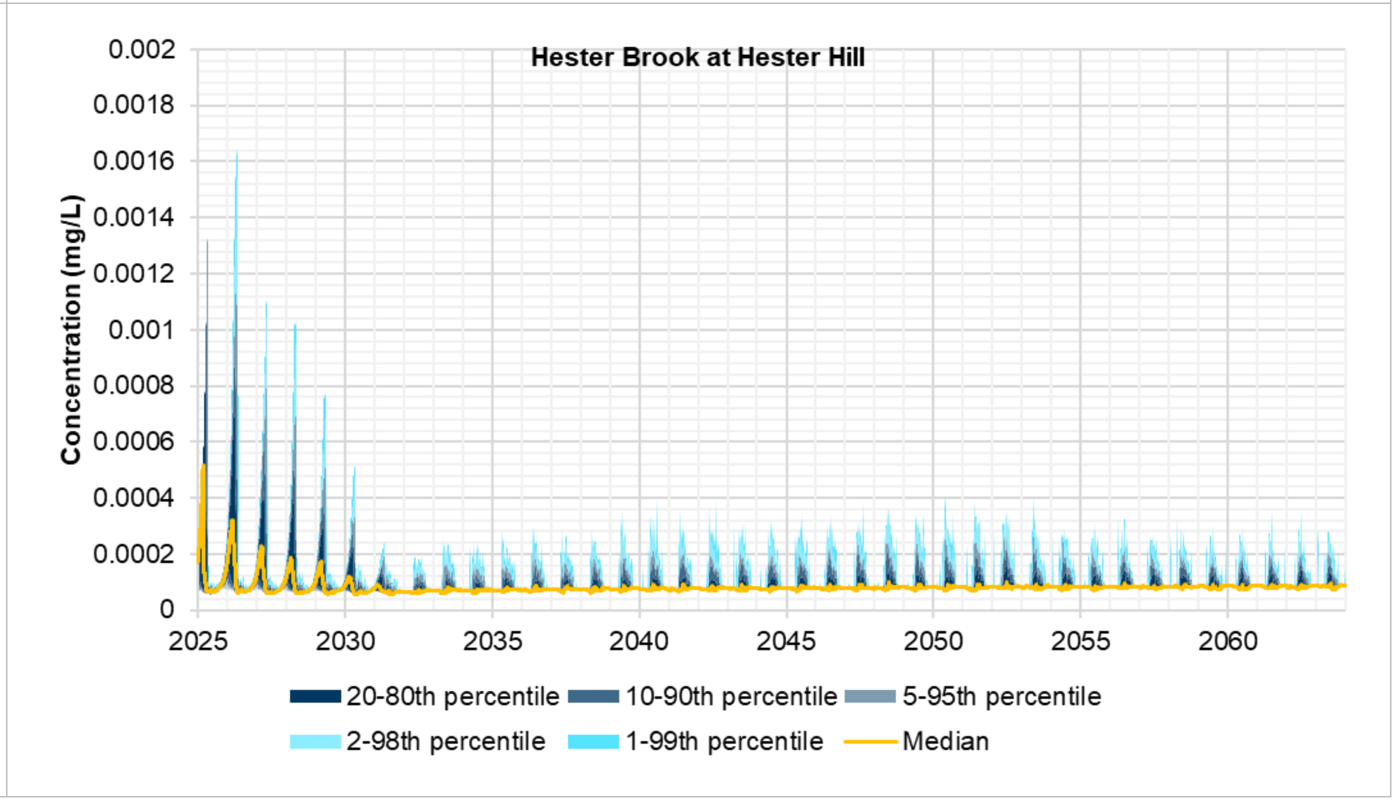

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.00001
0.000009
0.000008
0.000007
0.000006
0.000005
0.000004
0.000003
0.000002
0.000001
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

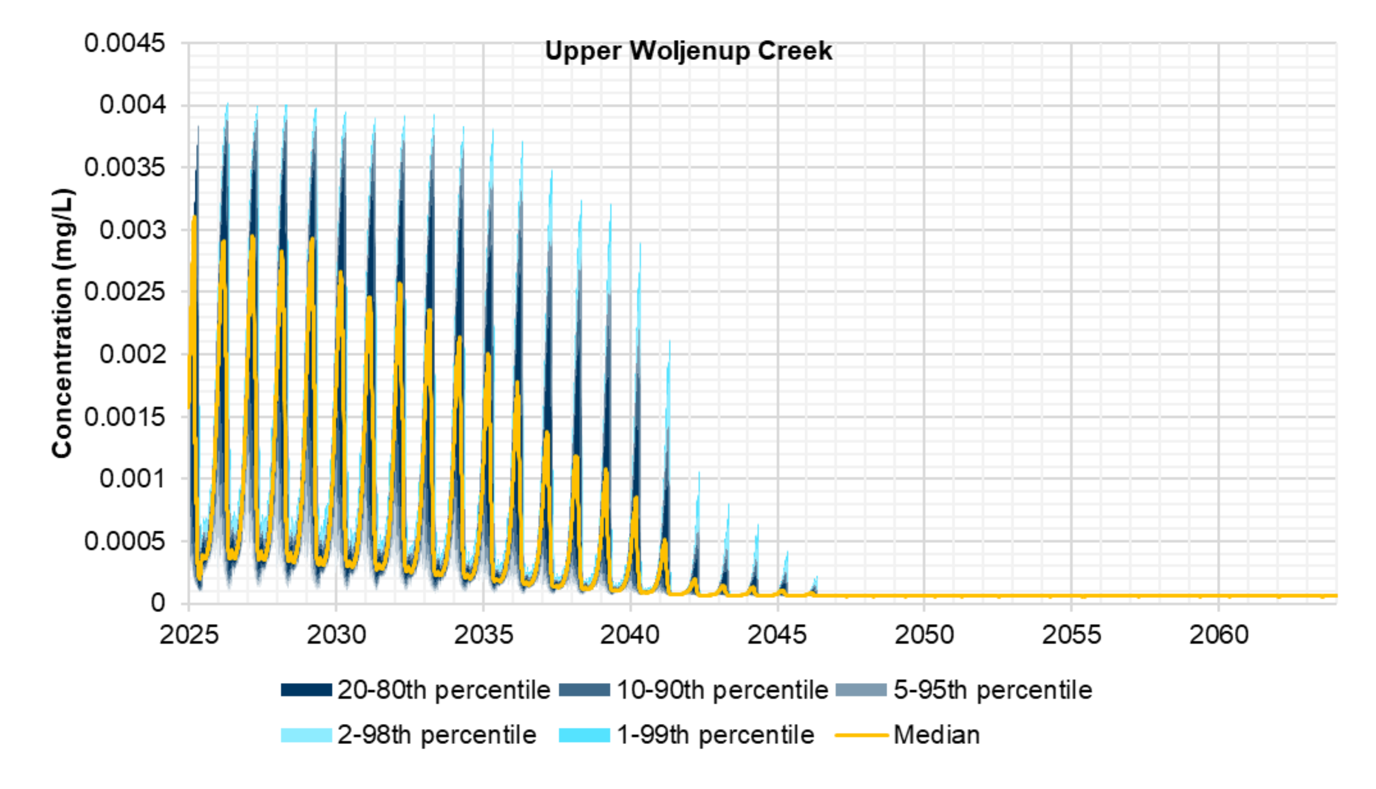

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.00001
0.000009
0.000008
0.000007
0.000006
0.000005
0.000004
0.000003
0.000002
0.000001
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

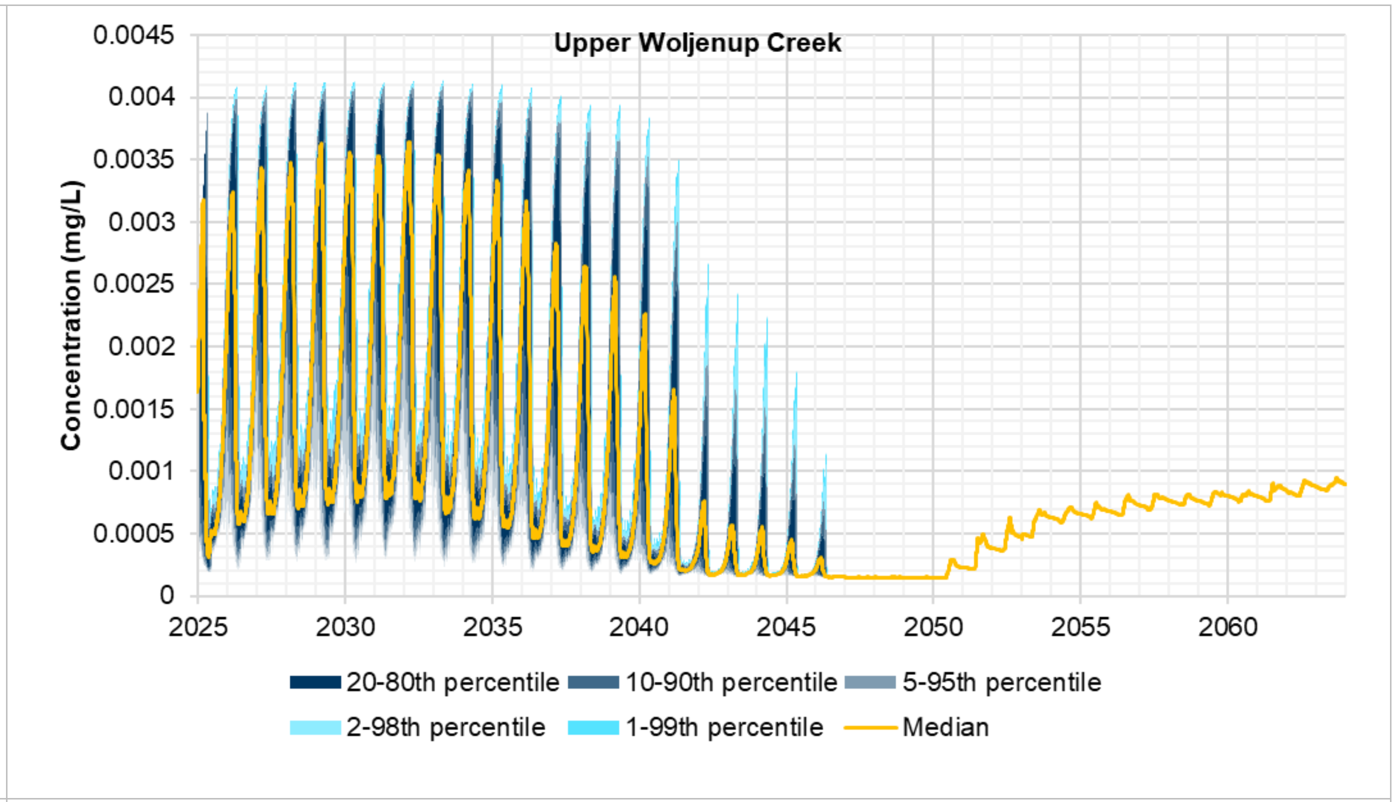

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
0.002
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

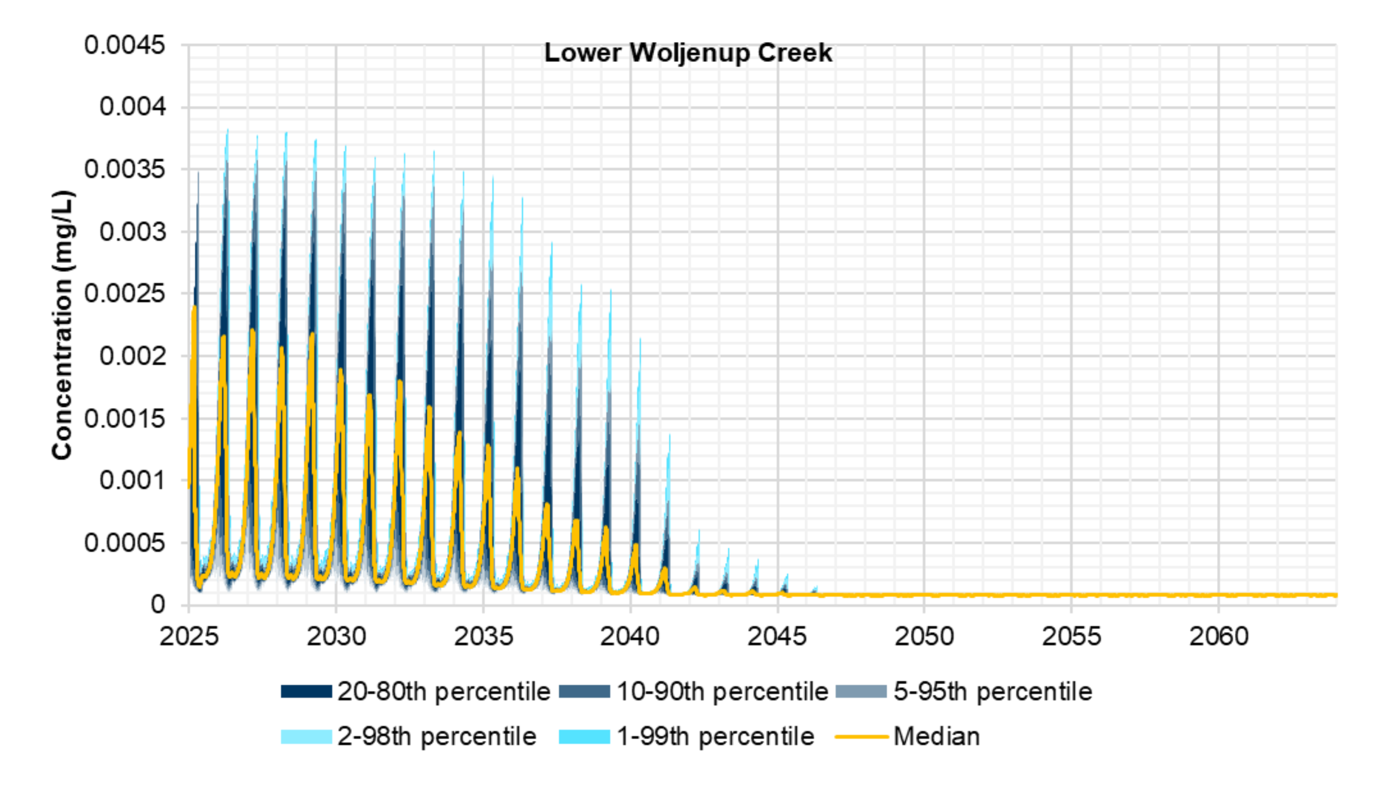

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

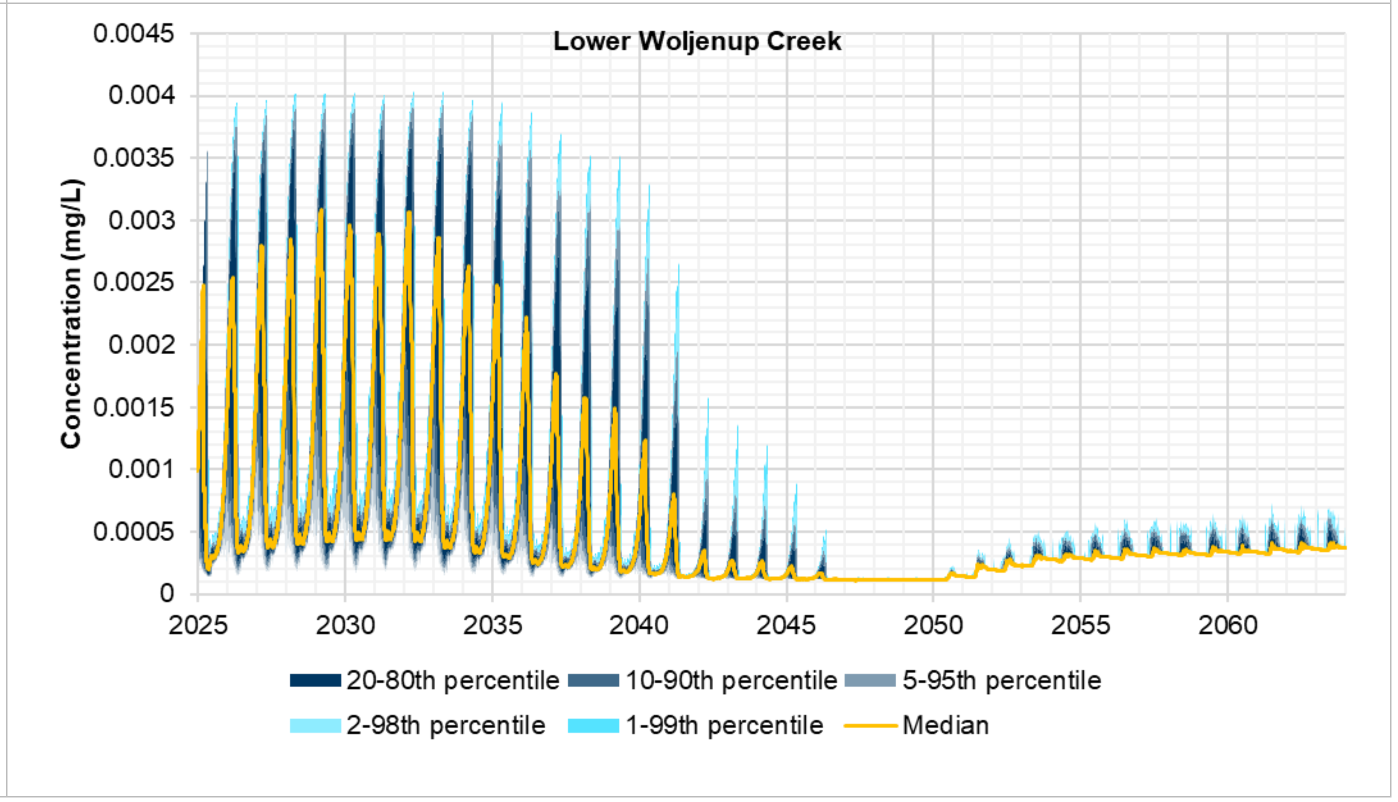

Hester Brook at Hester Hill
Concentration (mg/L)
0.002
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

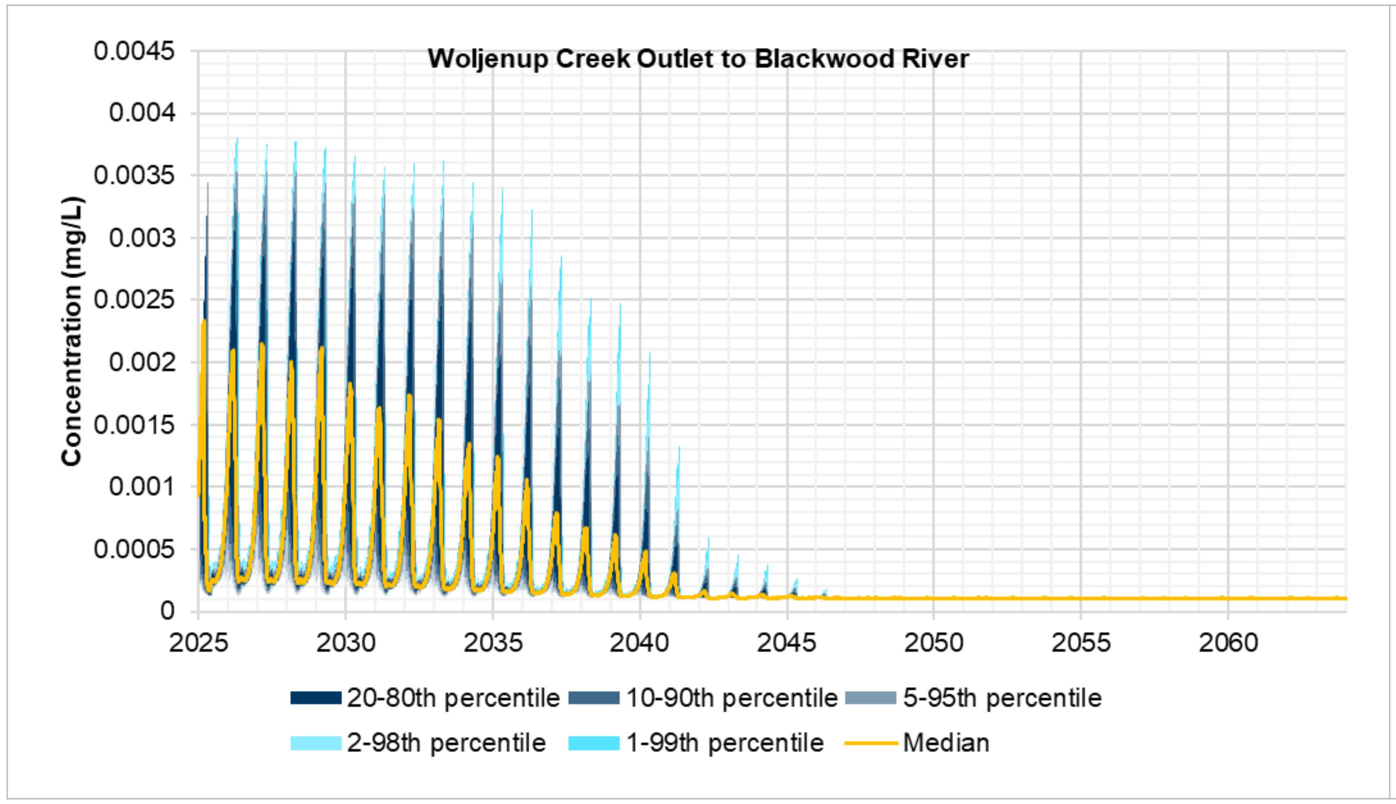

Hester Brook at Hester Hill
Concentration (mg/L)
0.002
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

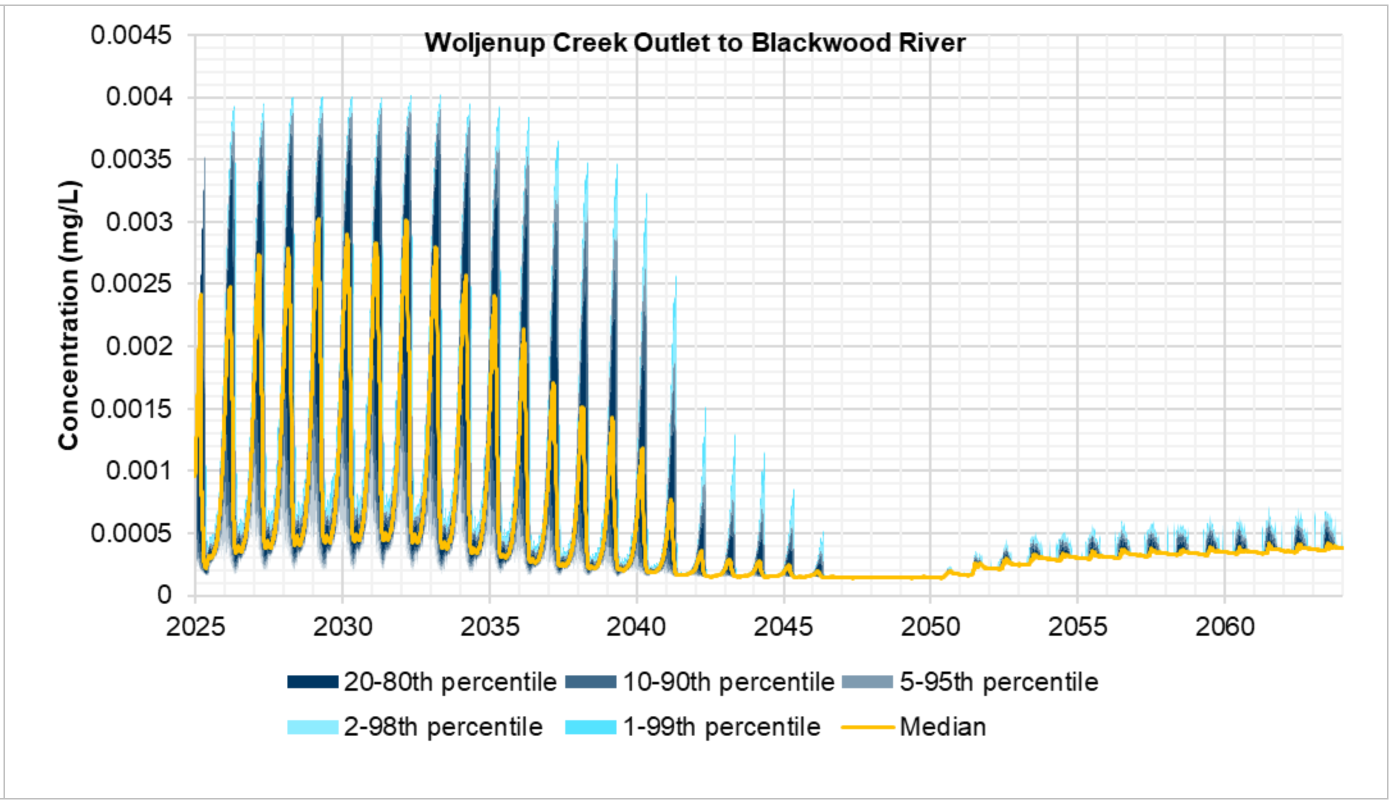

Upper Woljenup Creek
Concentration (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Upper Woljenup Creek
Concentration (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Lower Woljenup Creek
Concentration (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

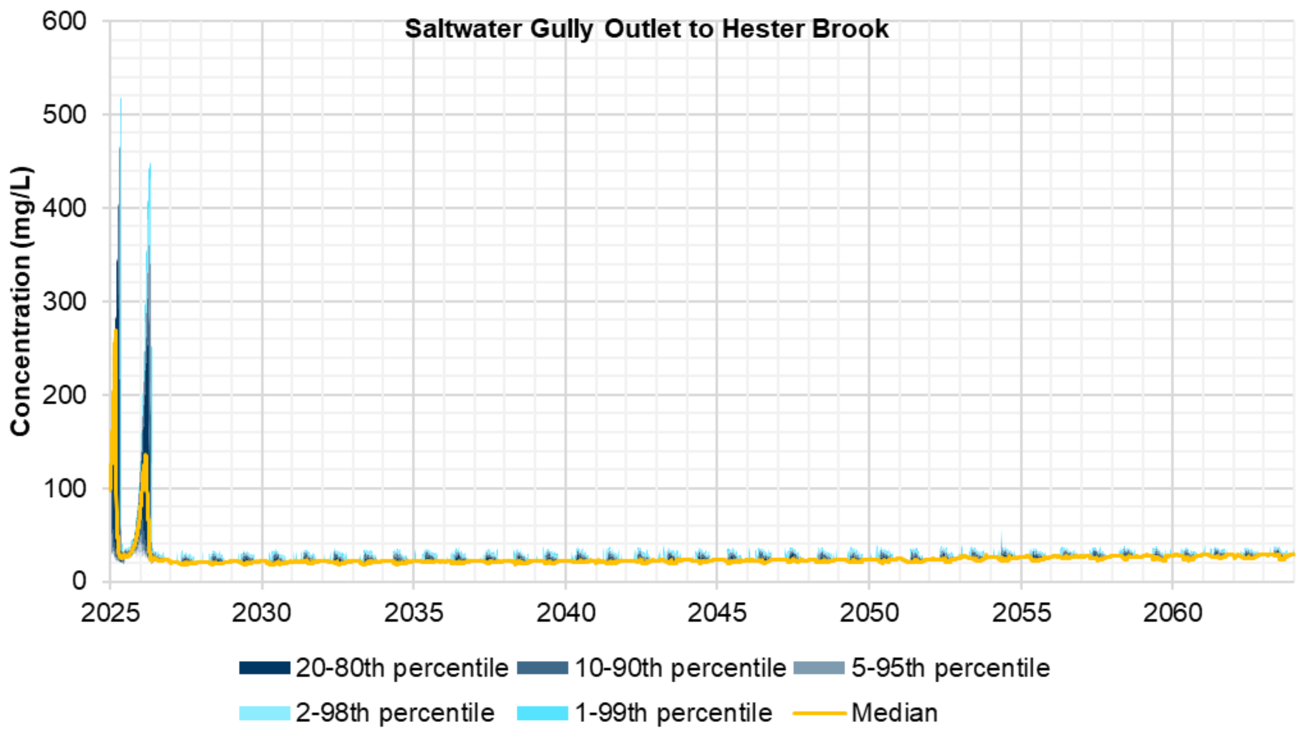
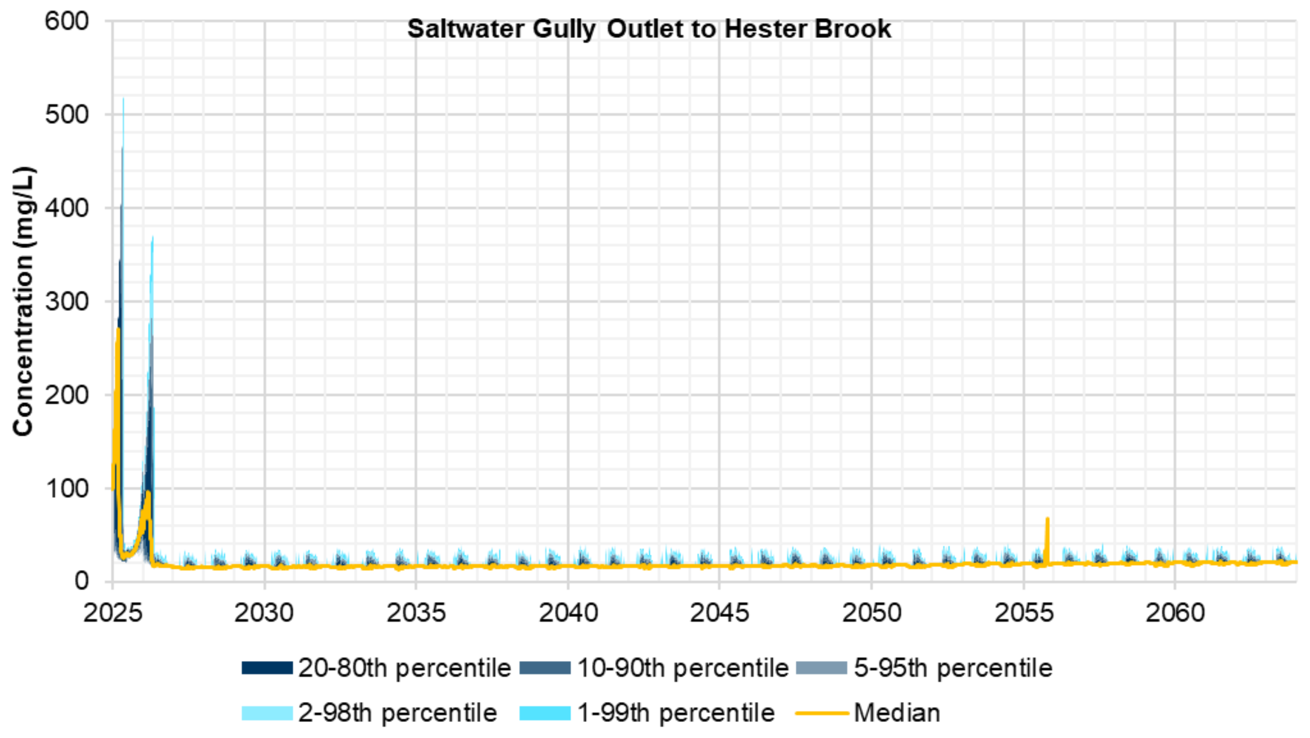
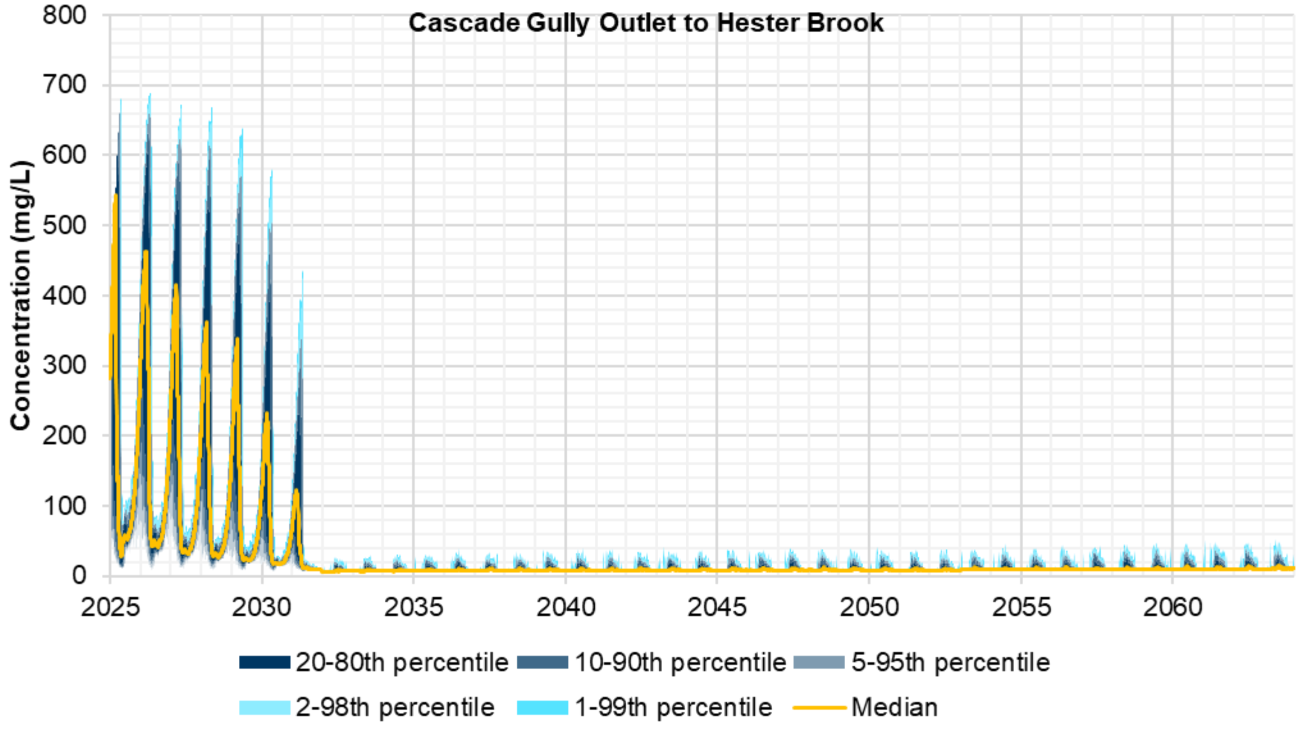
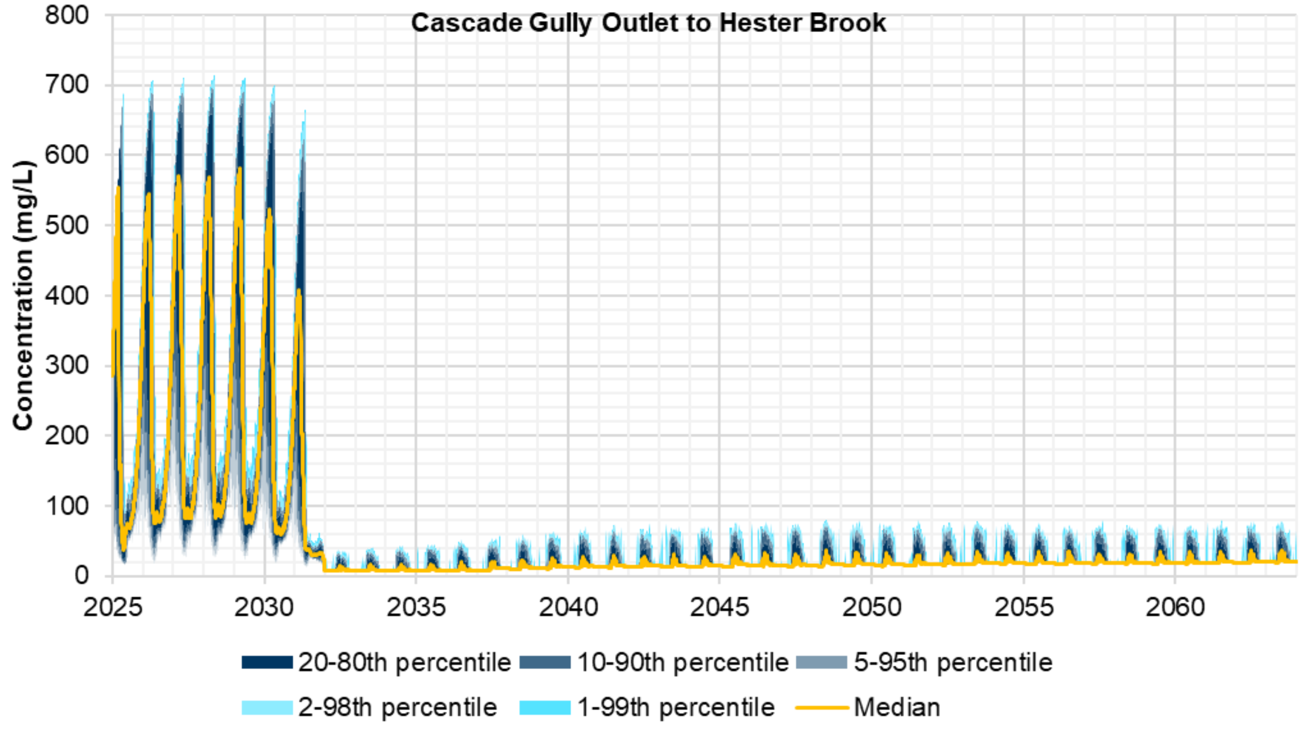

Lower Woljenup Creek
Concentration (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

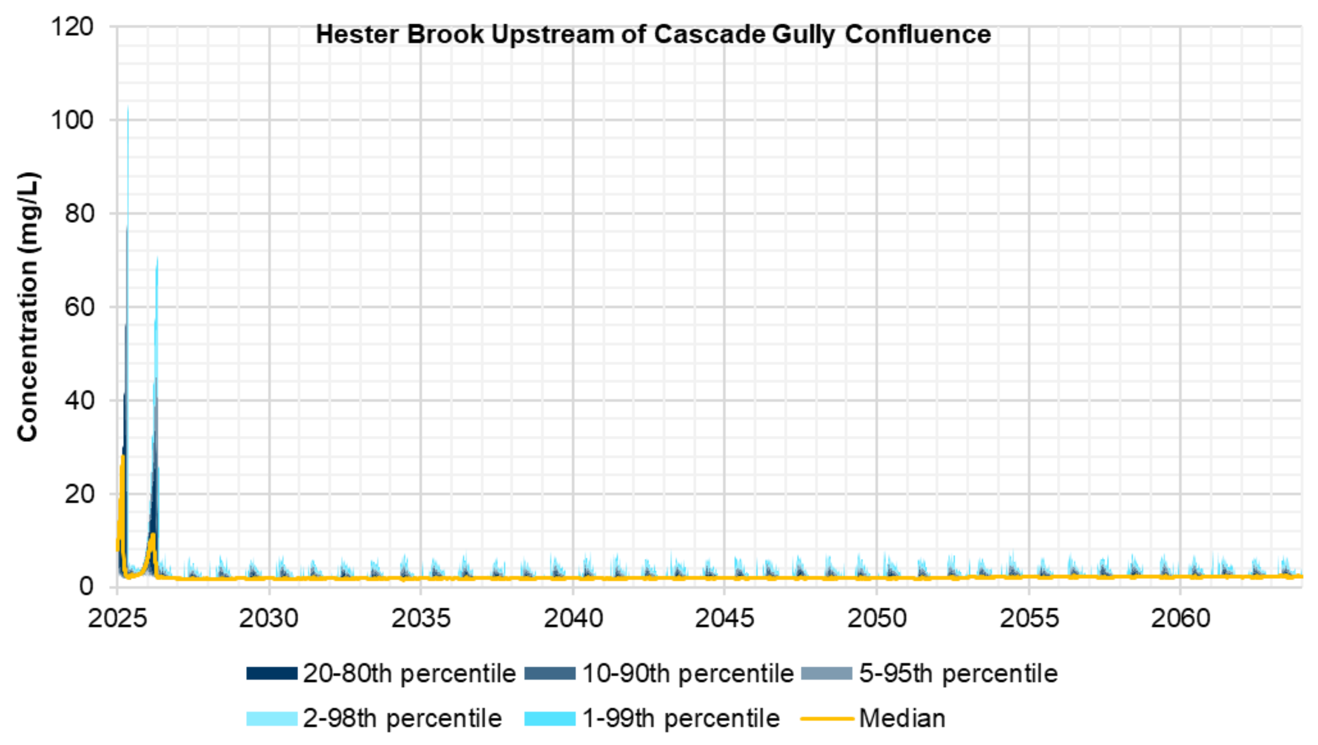

Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

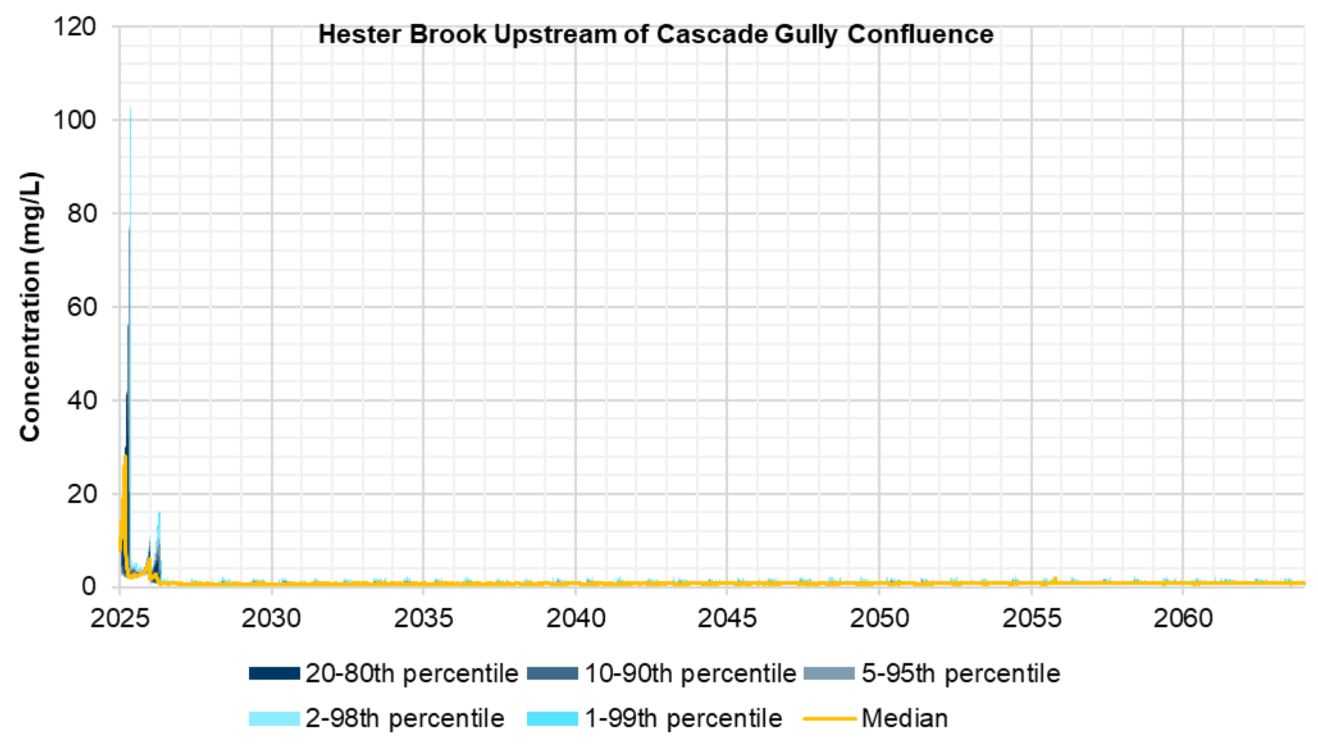

Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

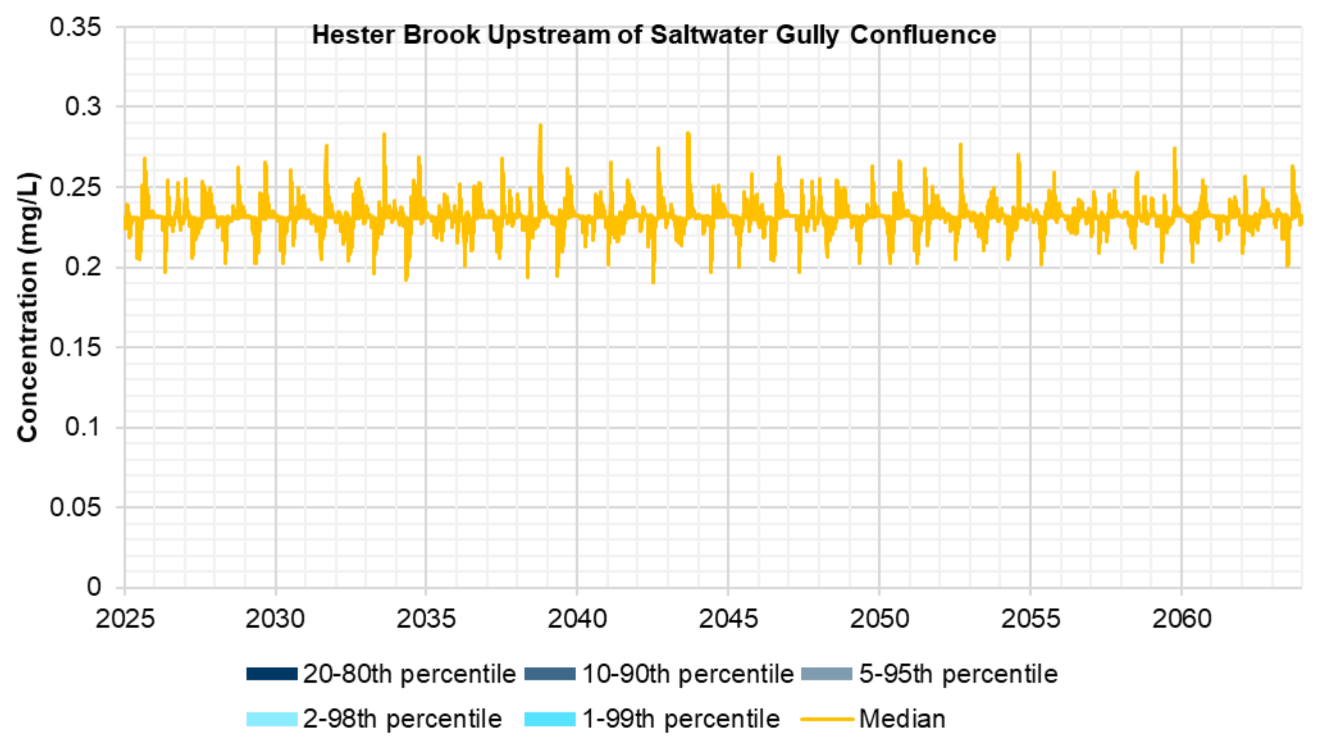
Appendix J

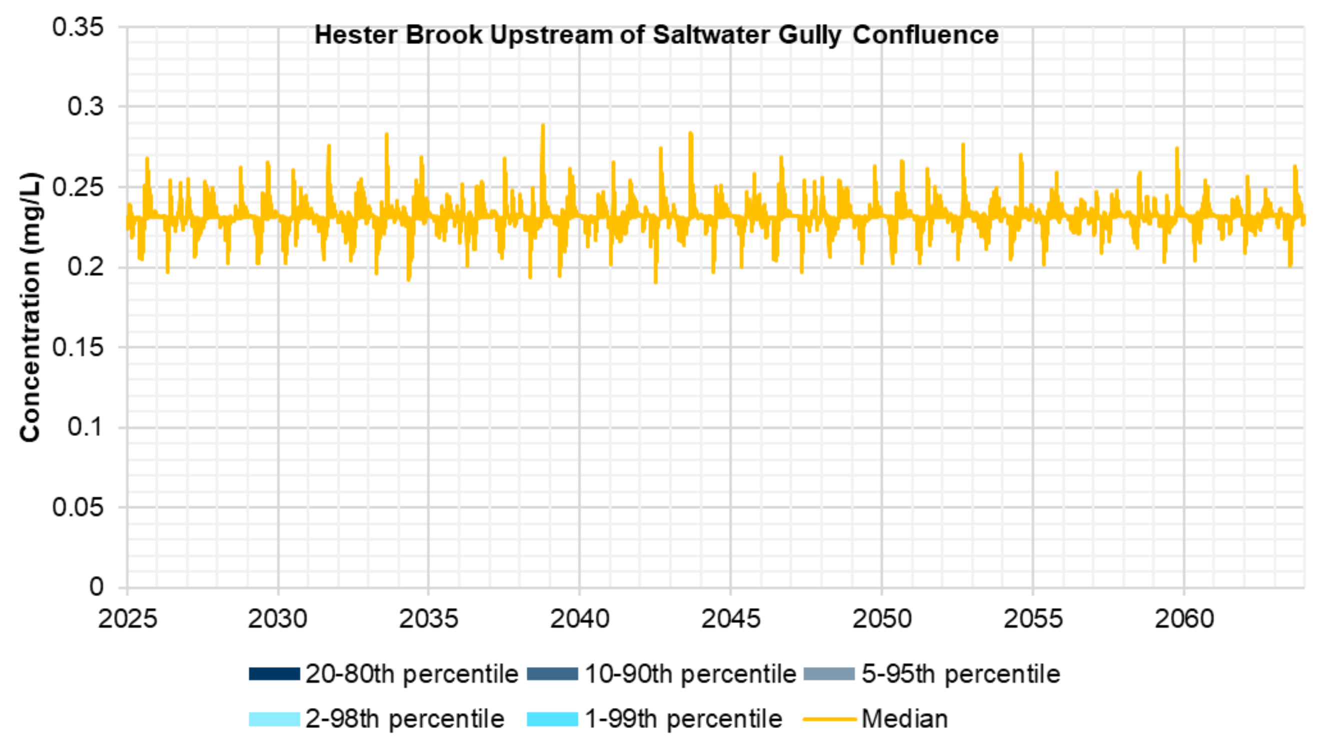
Simulated Sulphate Concentrations

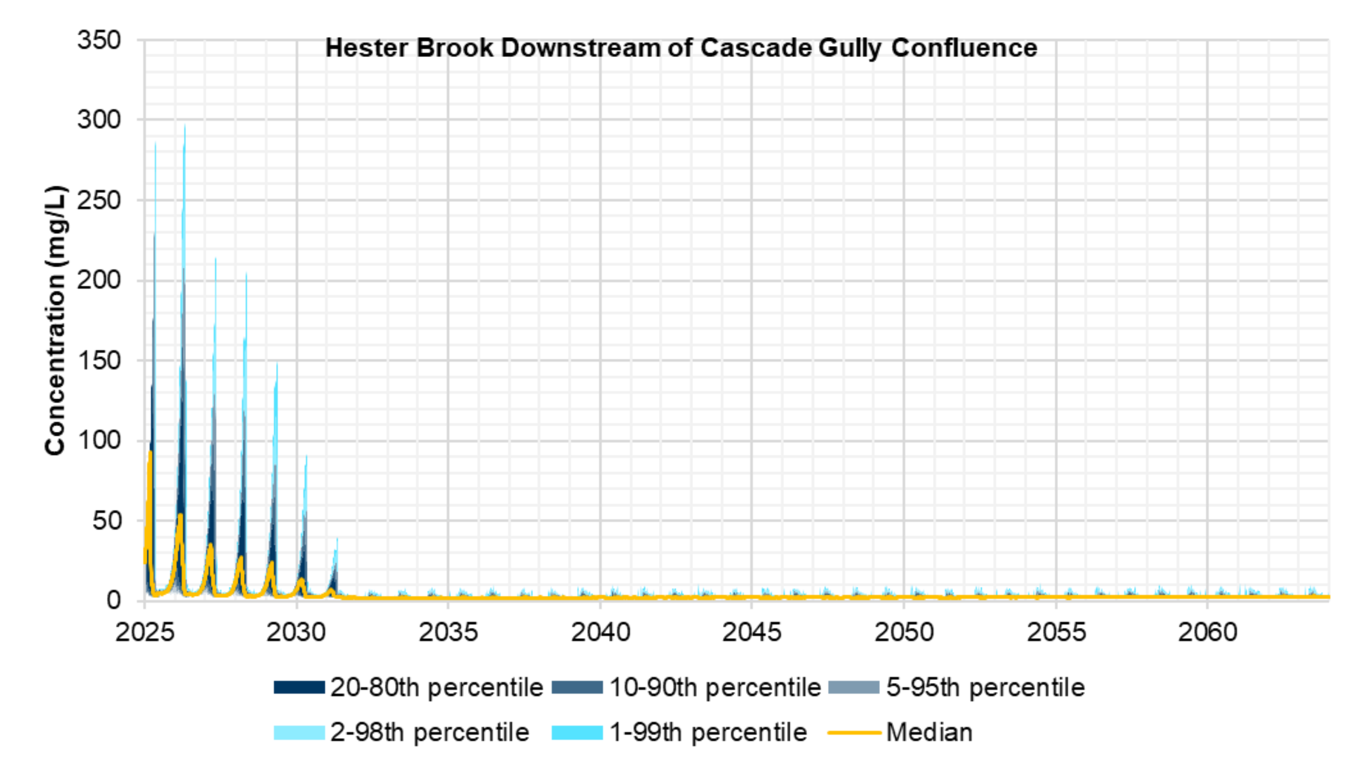
Base Case	Impact Case
	
	

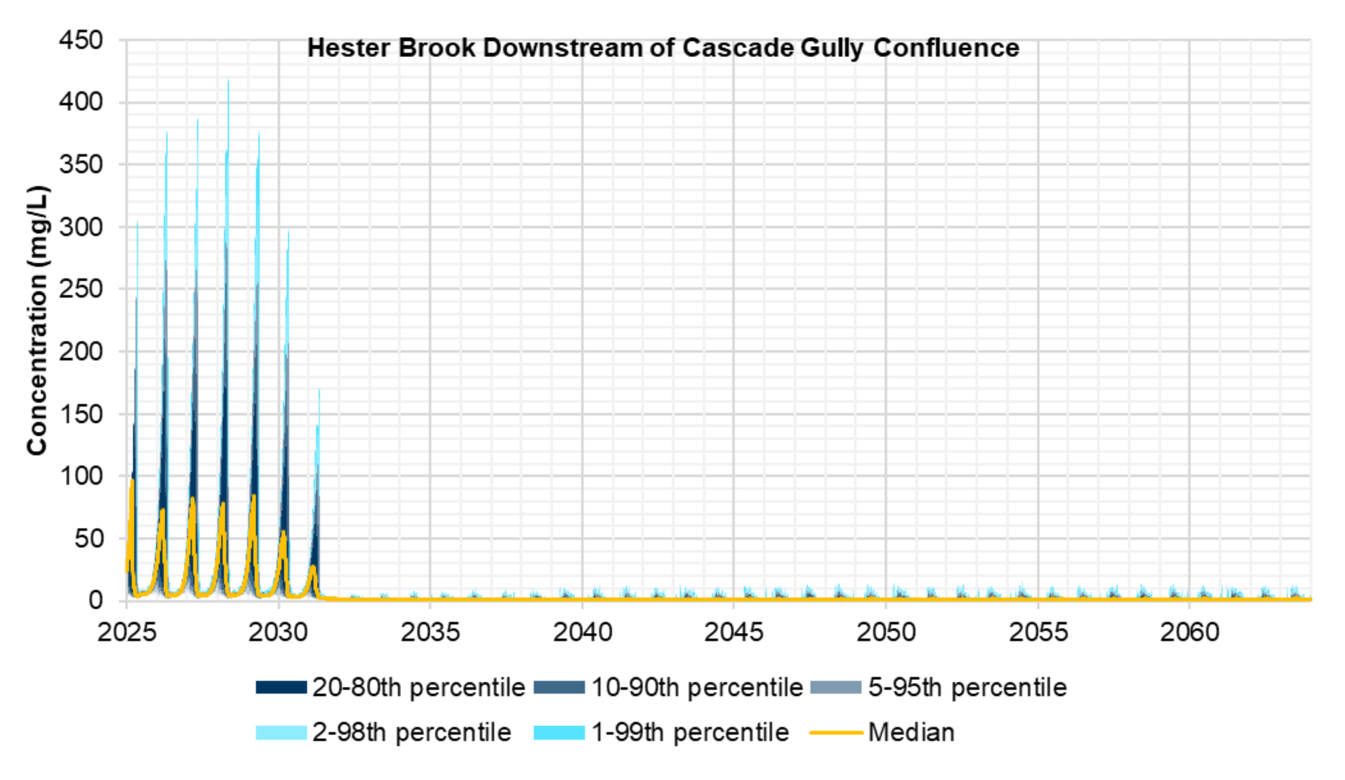

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
120
100
80
60
40
20
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

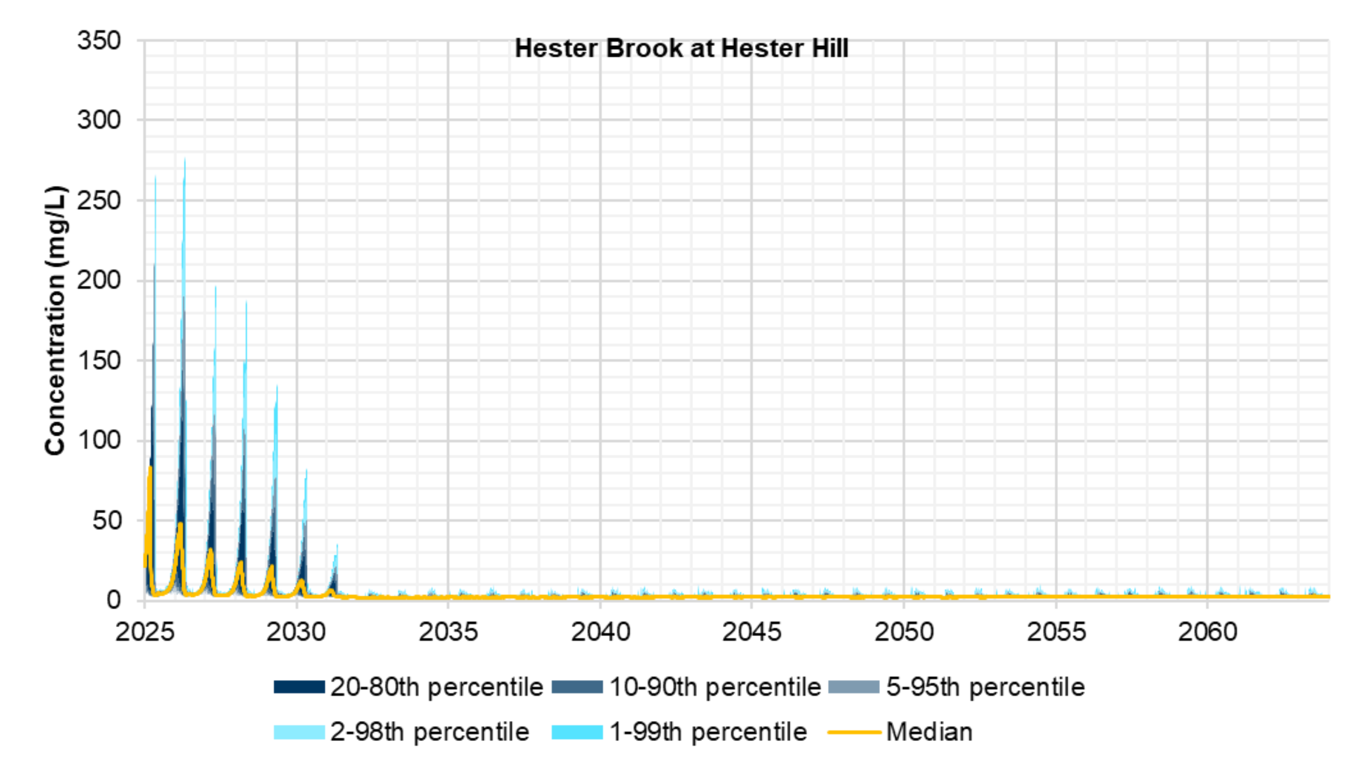

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
120
100
80
60
40
20
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

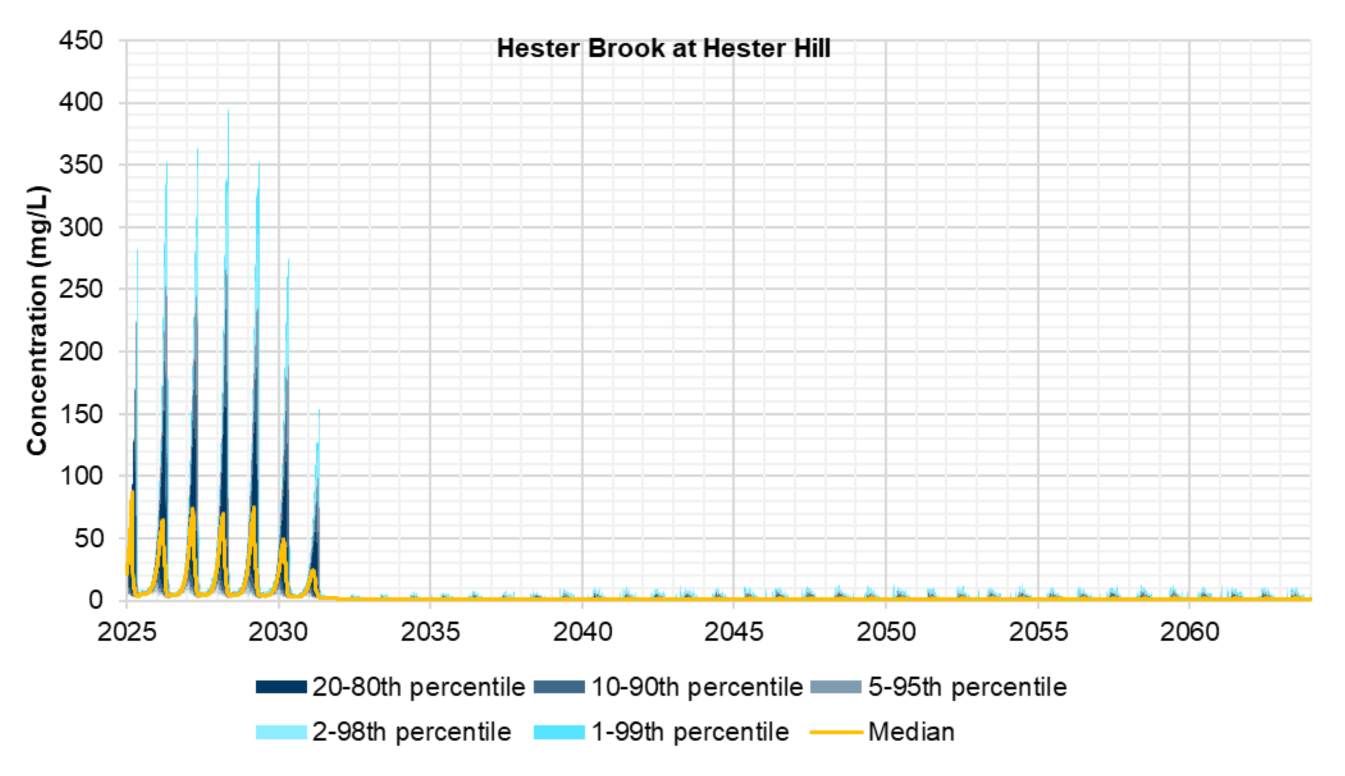

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

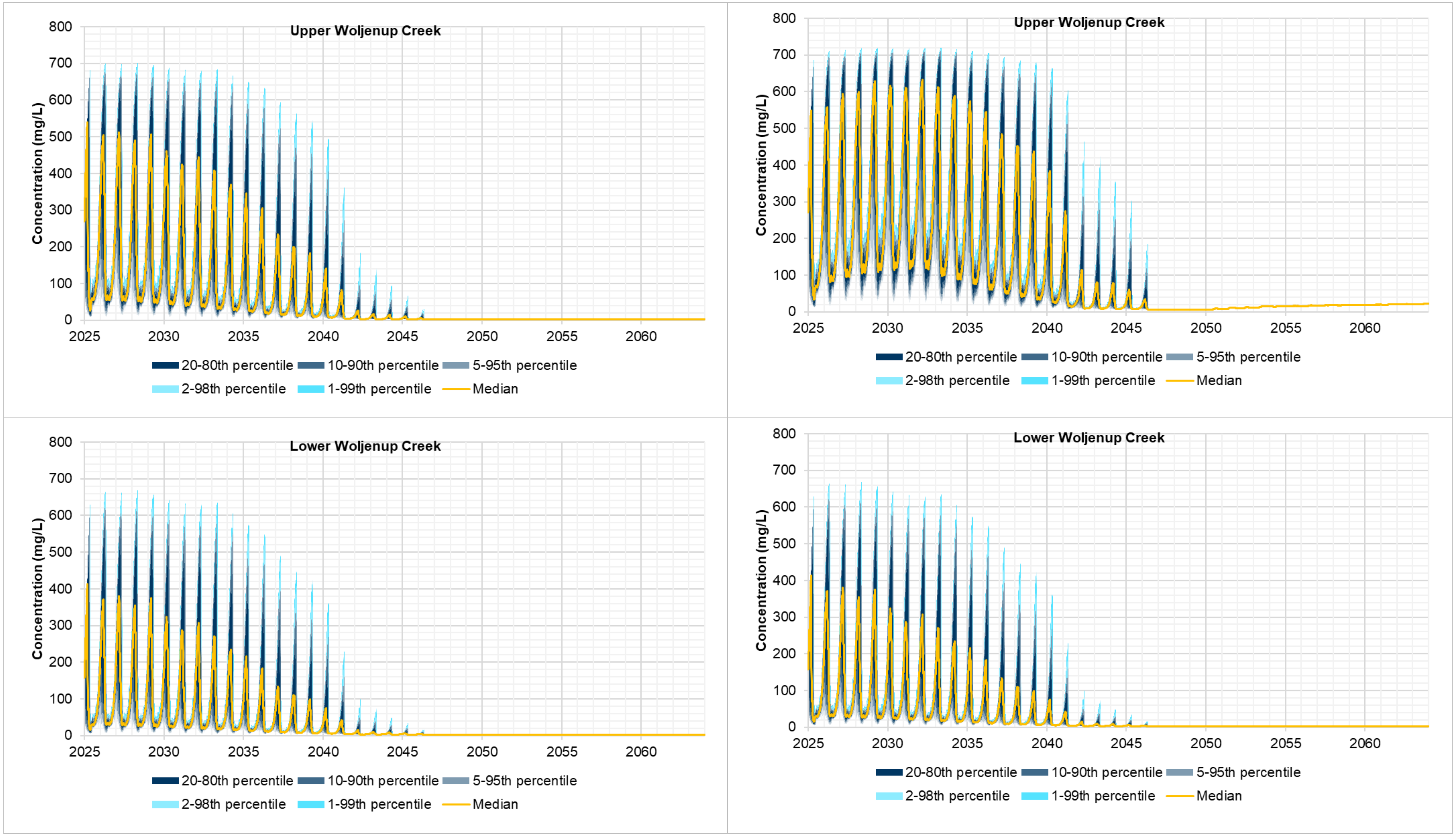

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

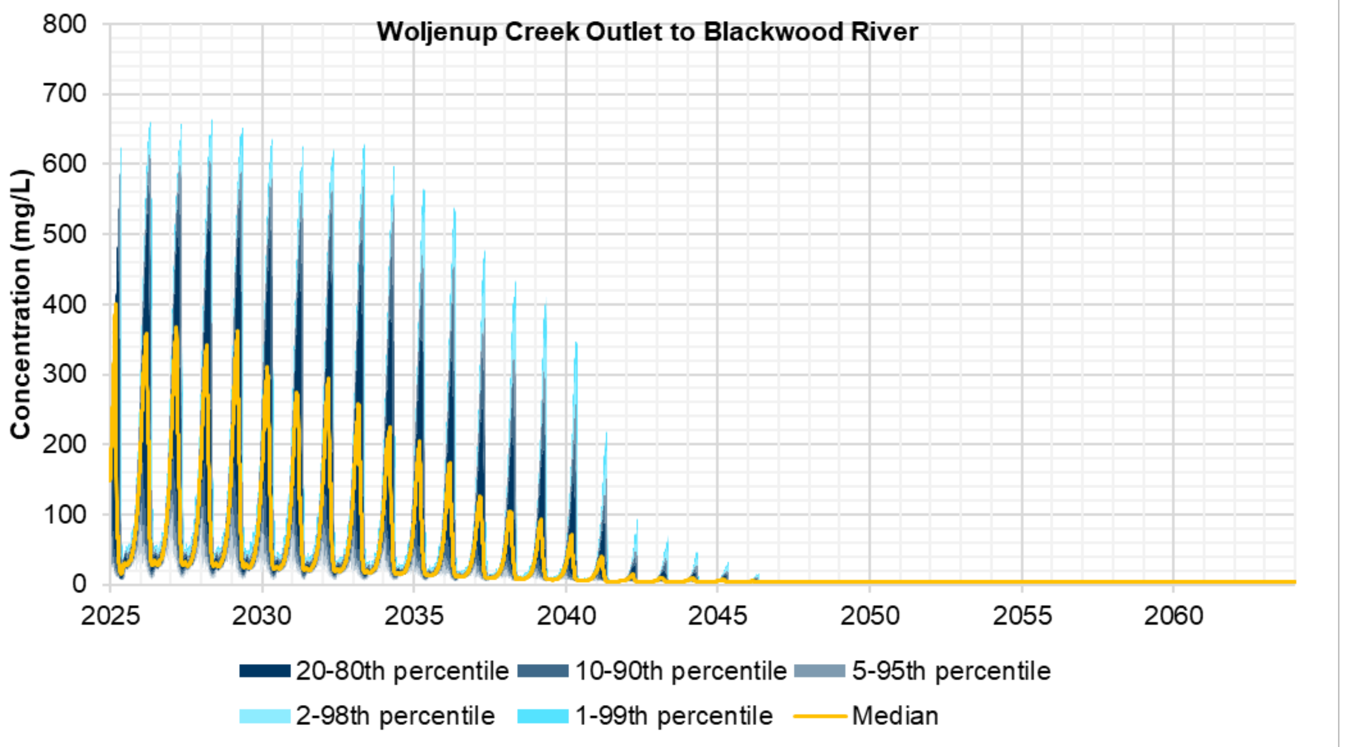

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
0
50
100
150
200
250
300
350
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

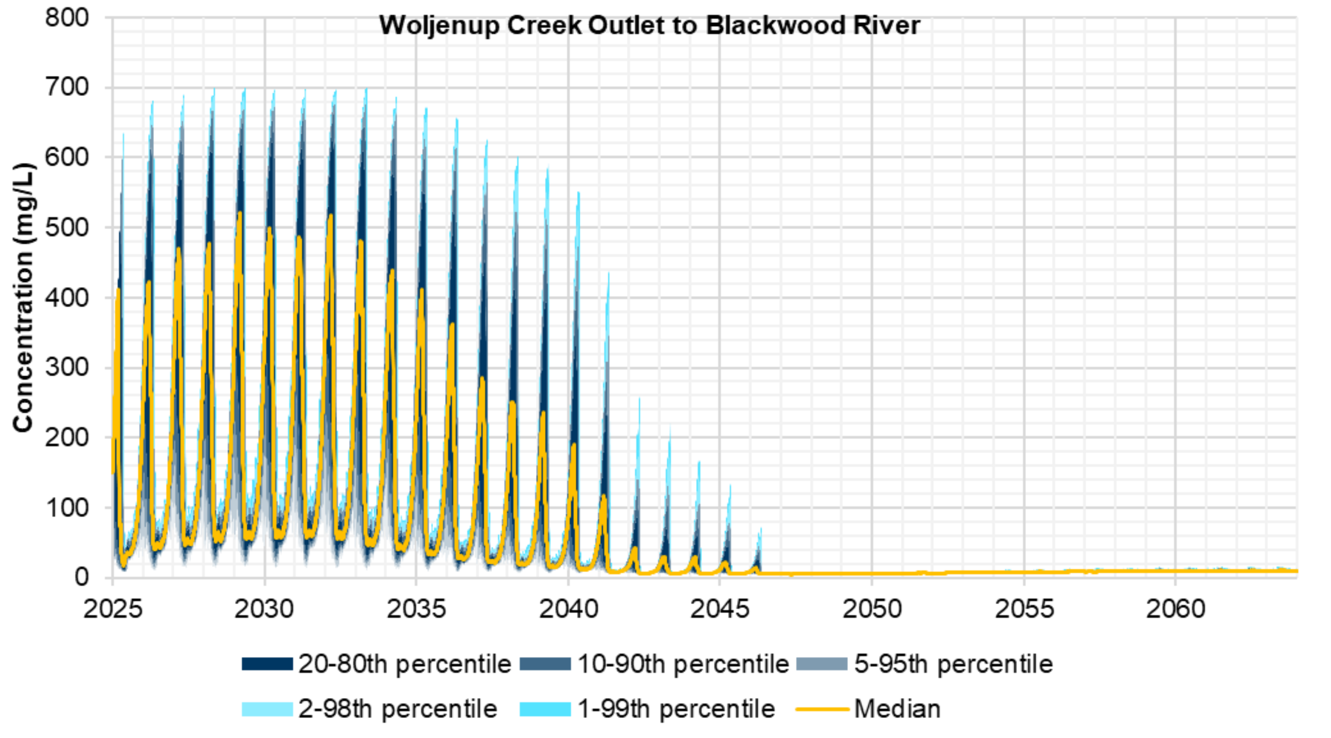

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
0
50
100
150
200
250
300
350
400
450
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Hester Brook at Hester Hill
Concentration (mg/L)
0
50
100
150
200
250
300
350
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Hester Brook at Hester Hill
Concentration (mg/L)
0
50
100
150
200
250
300
350
400
450
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

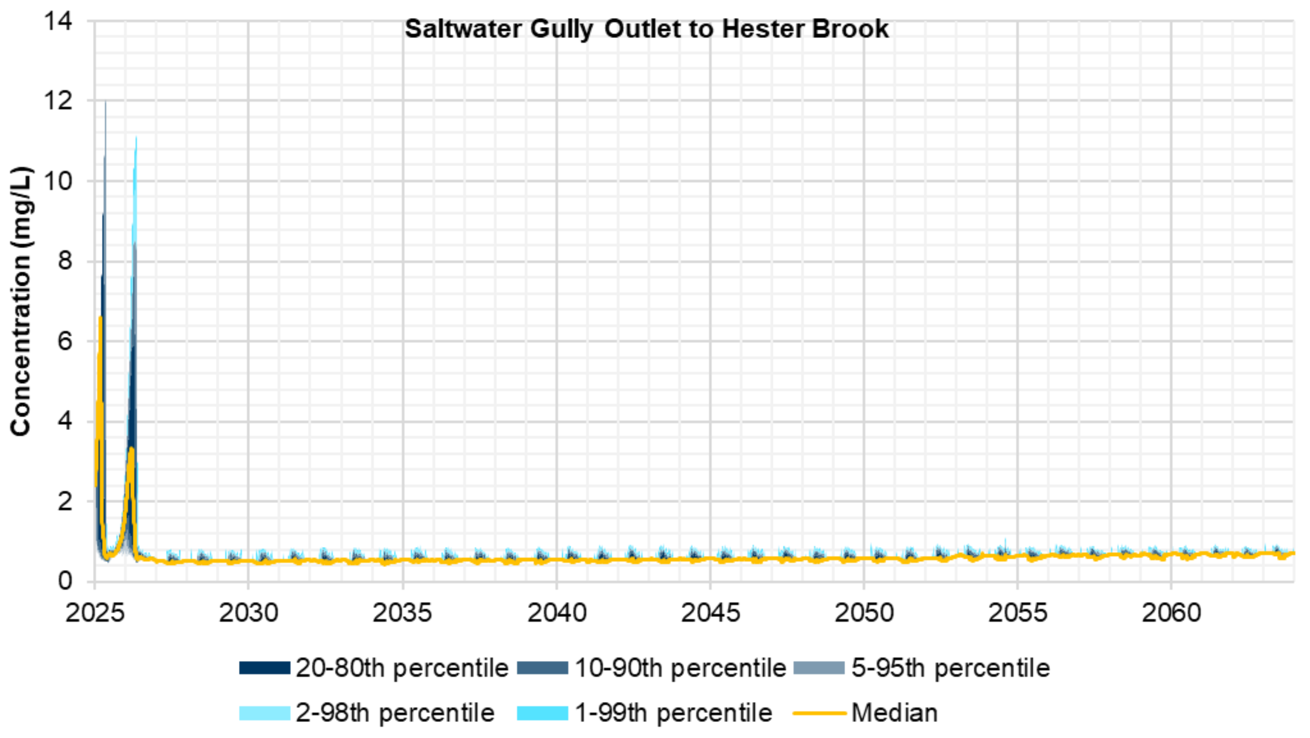
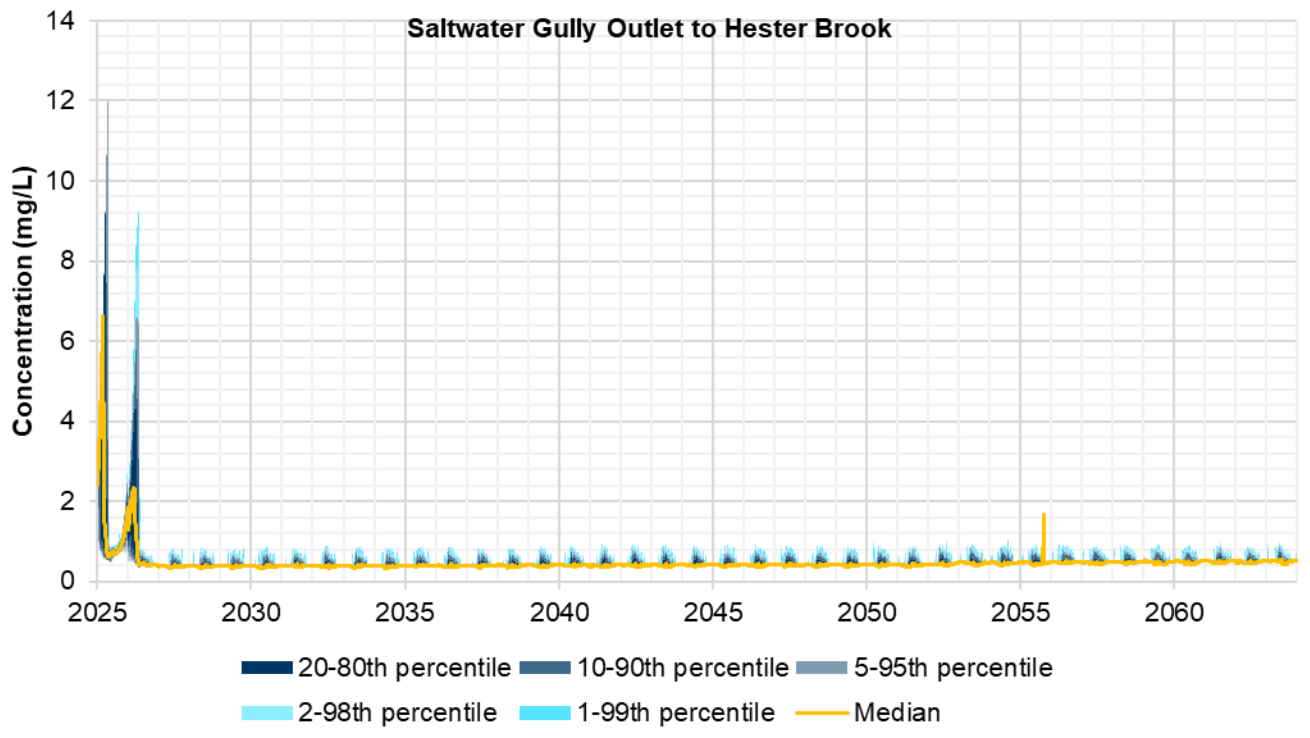
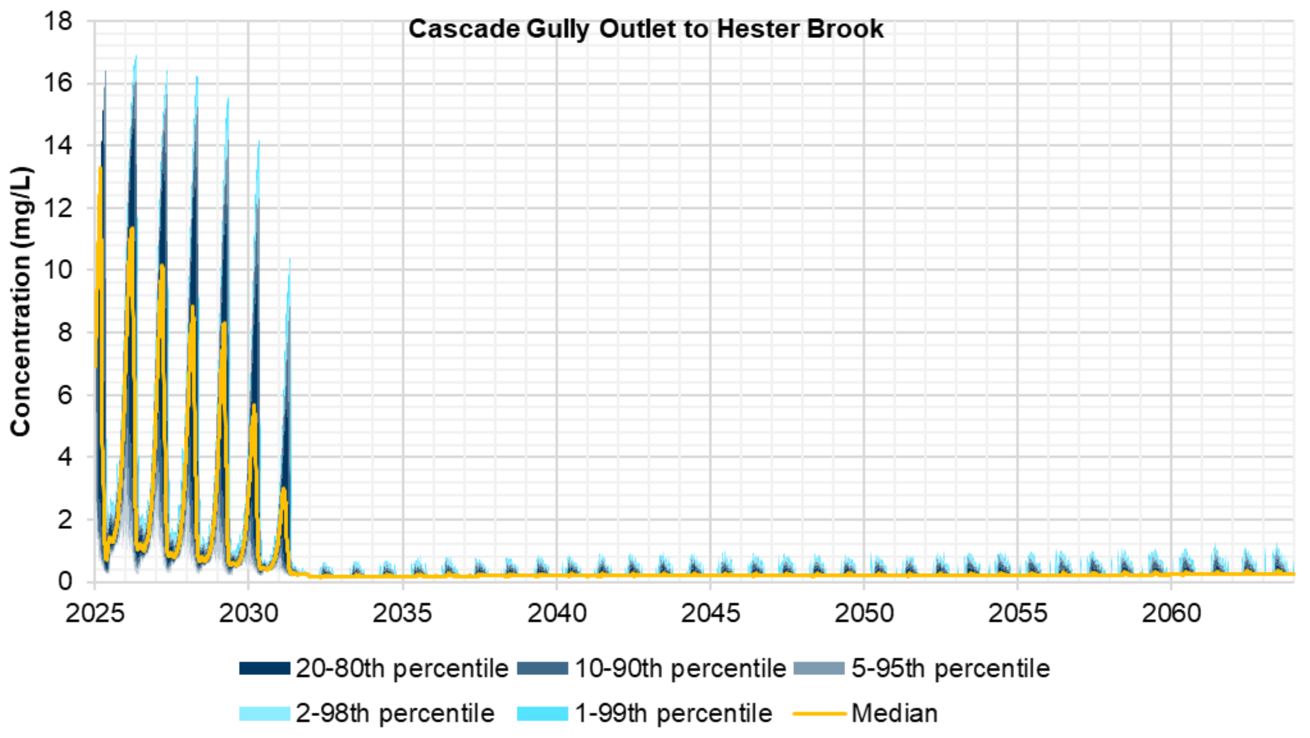
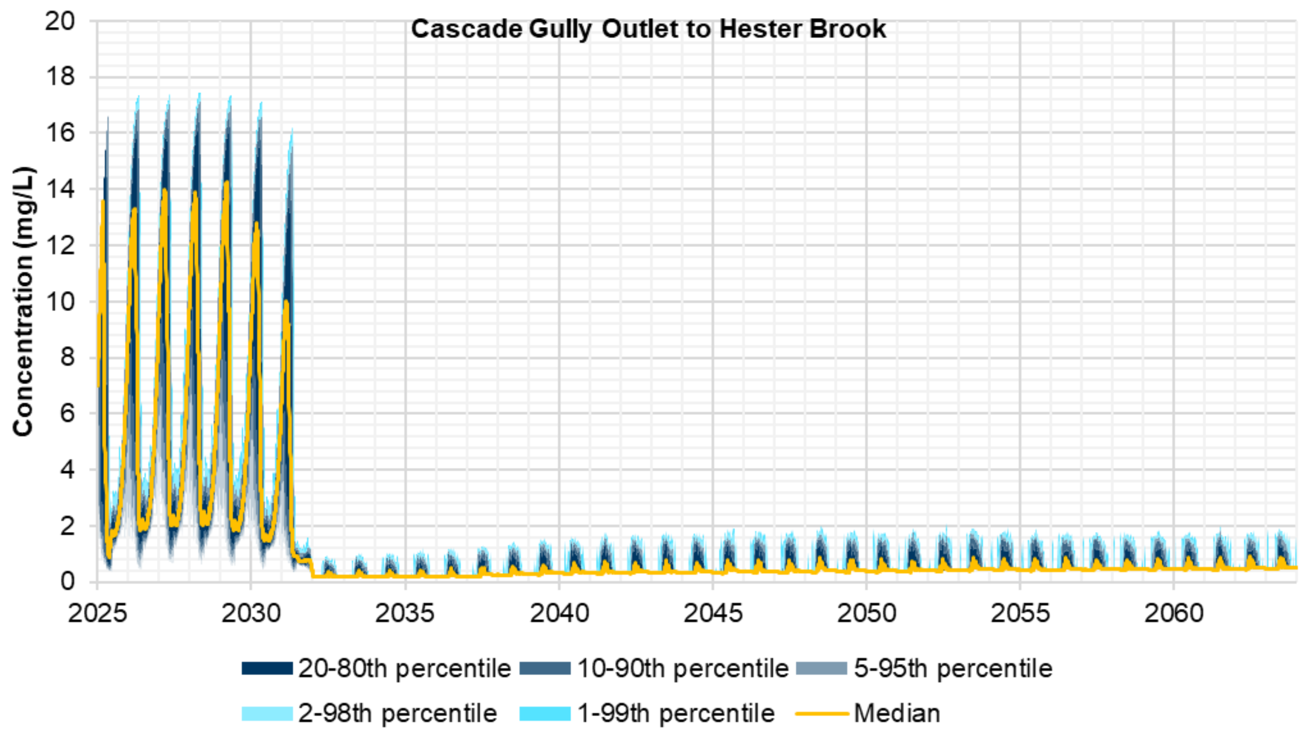

Upper Woljenup Creek
Concentration (mg/L)
0
100
200
300
400
500
600
700
800
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median
Upper Woljenup Creek
Concentration (mg/L)
0
100
200
300
400
500
600
700
800
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median
Lower Woljenup Creek
Concentration (mg/L)
0
100
200
300
400
500
600
700
800
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median
Lower Woljenup Creek
Concentration (mg/L)
0
100
200
300
400
500
600
700
800
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

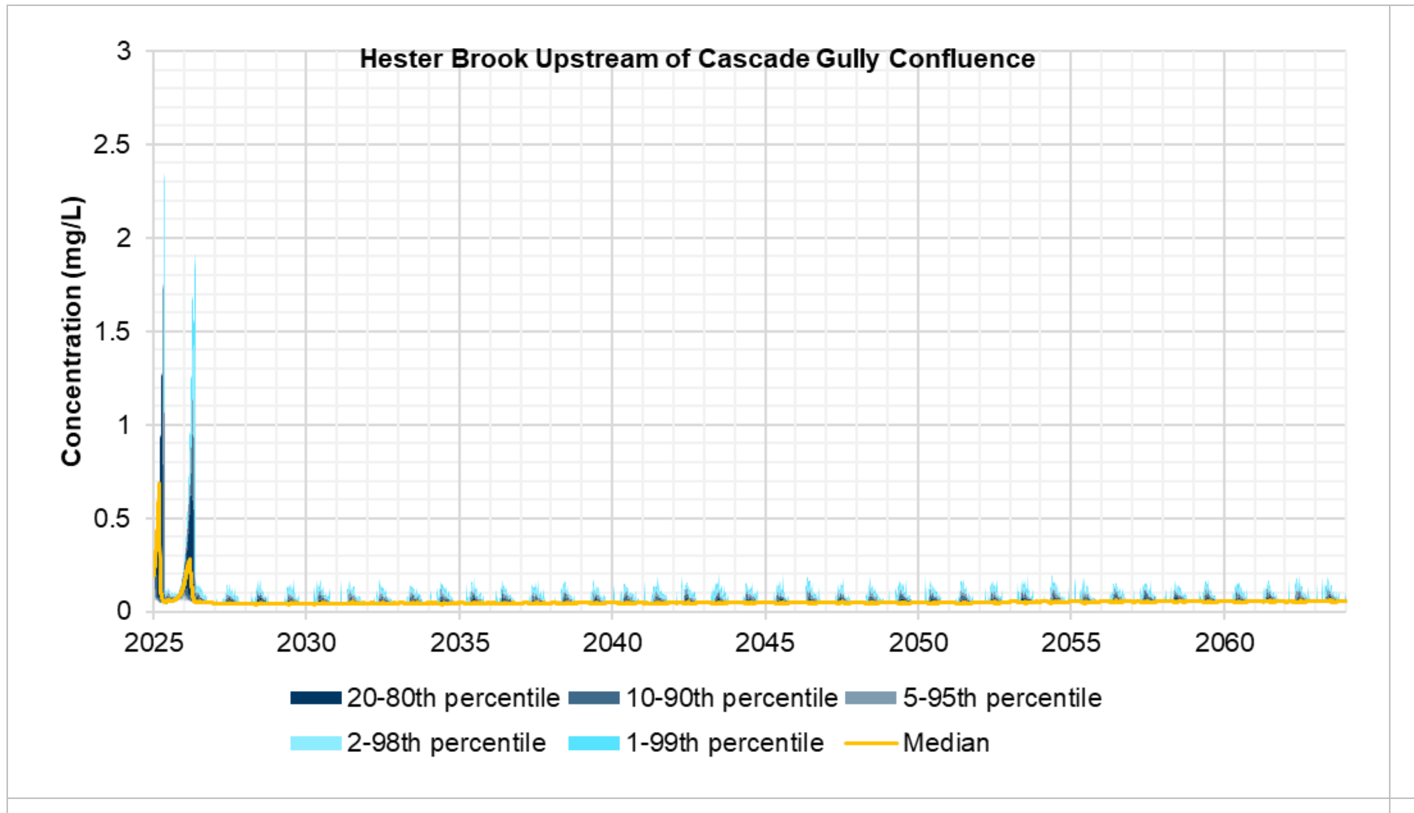

Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

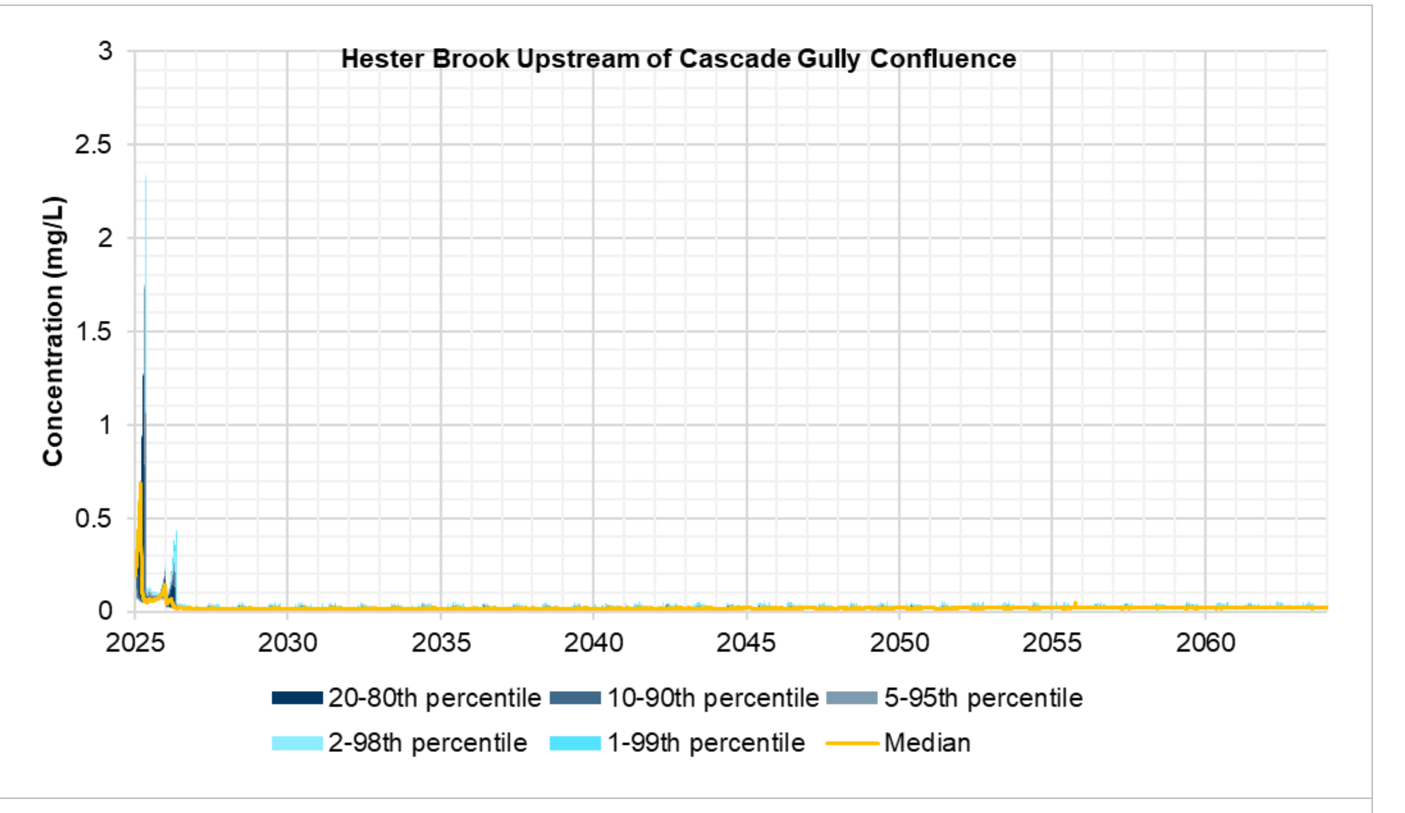

Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
800
700
600
500
400
300
200
100
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

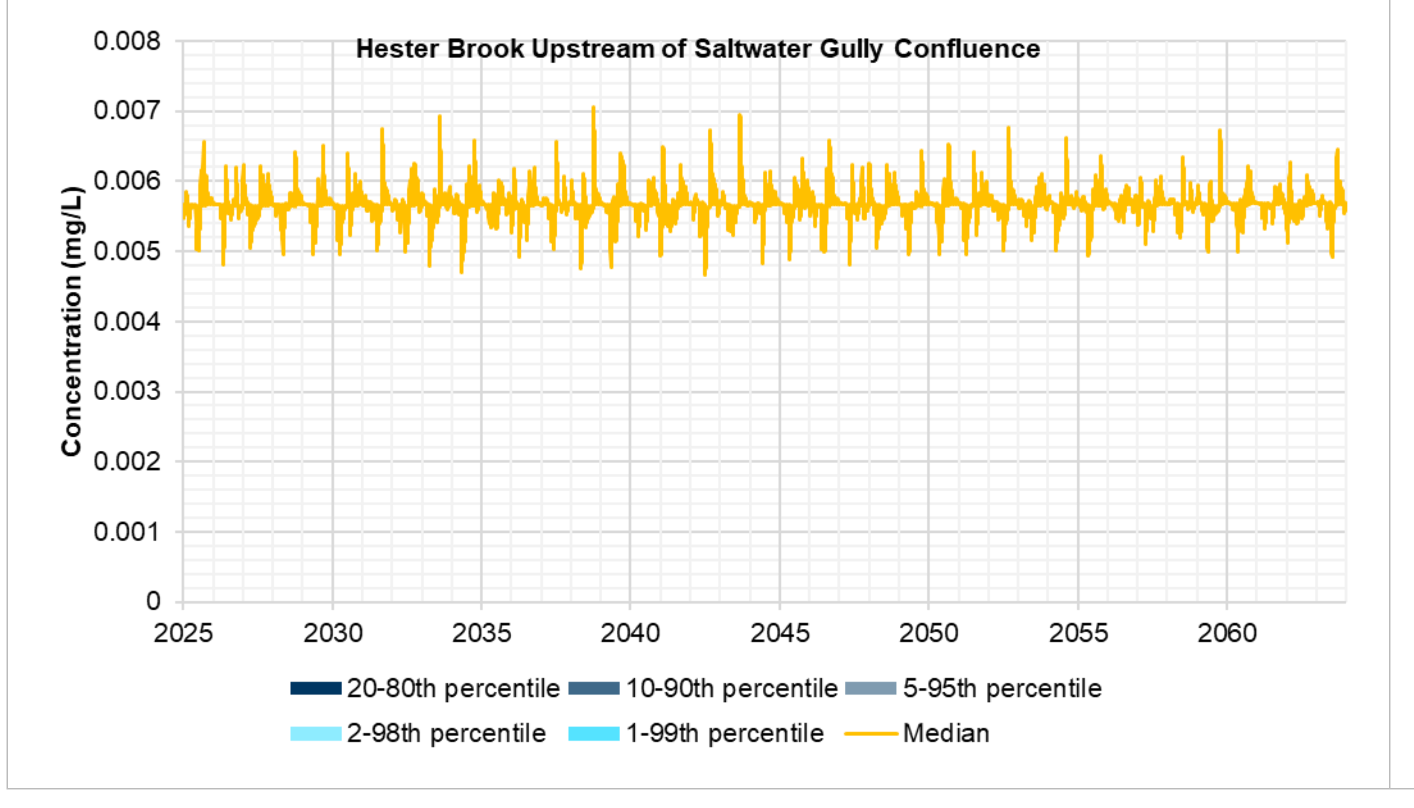
Appendix K

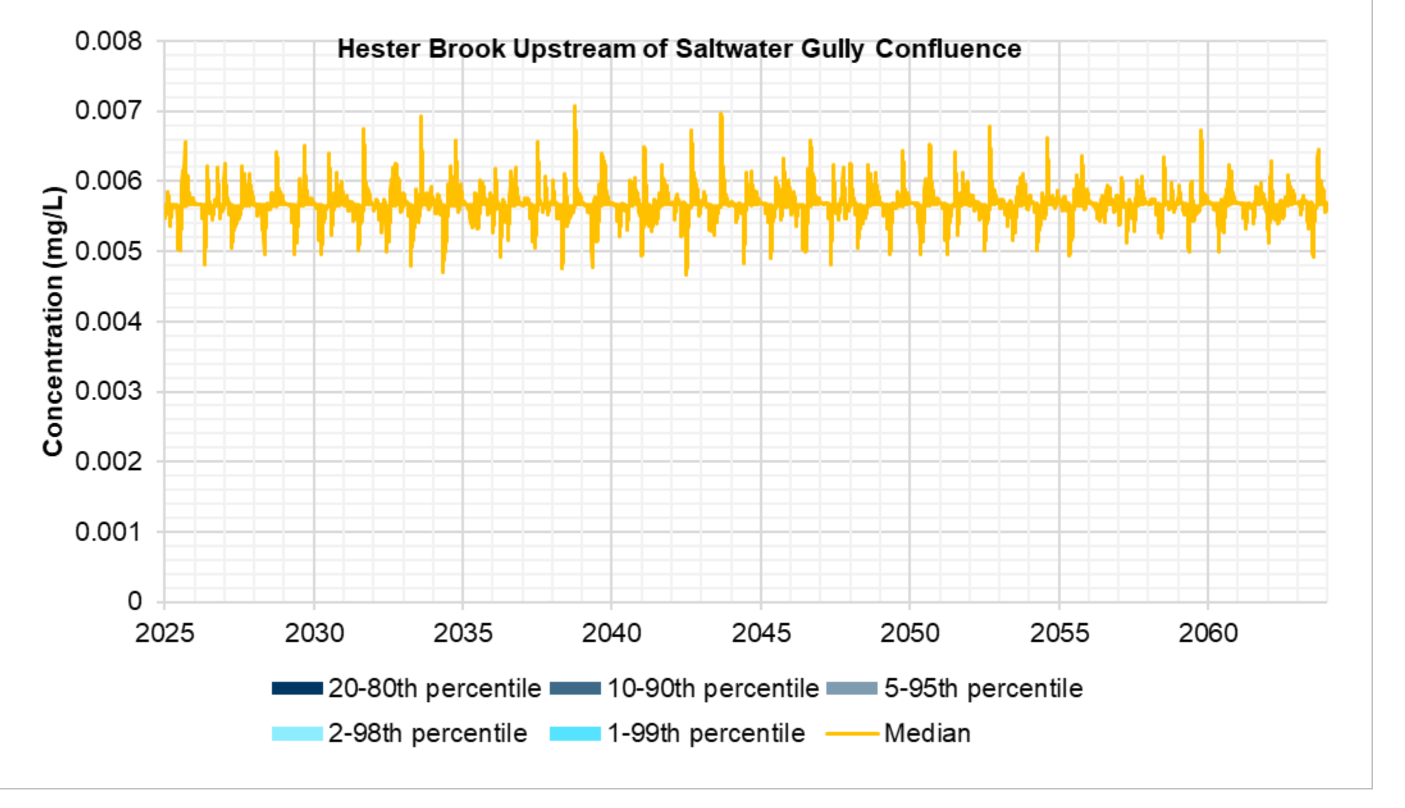
Simulated Nitrate Concentrations

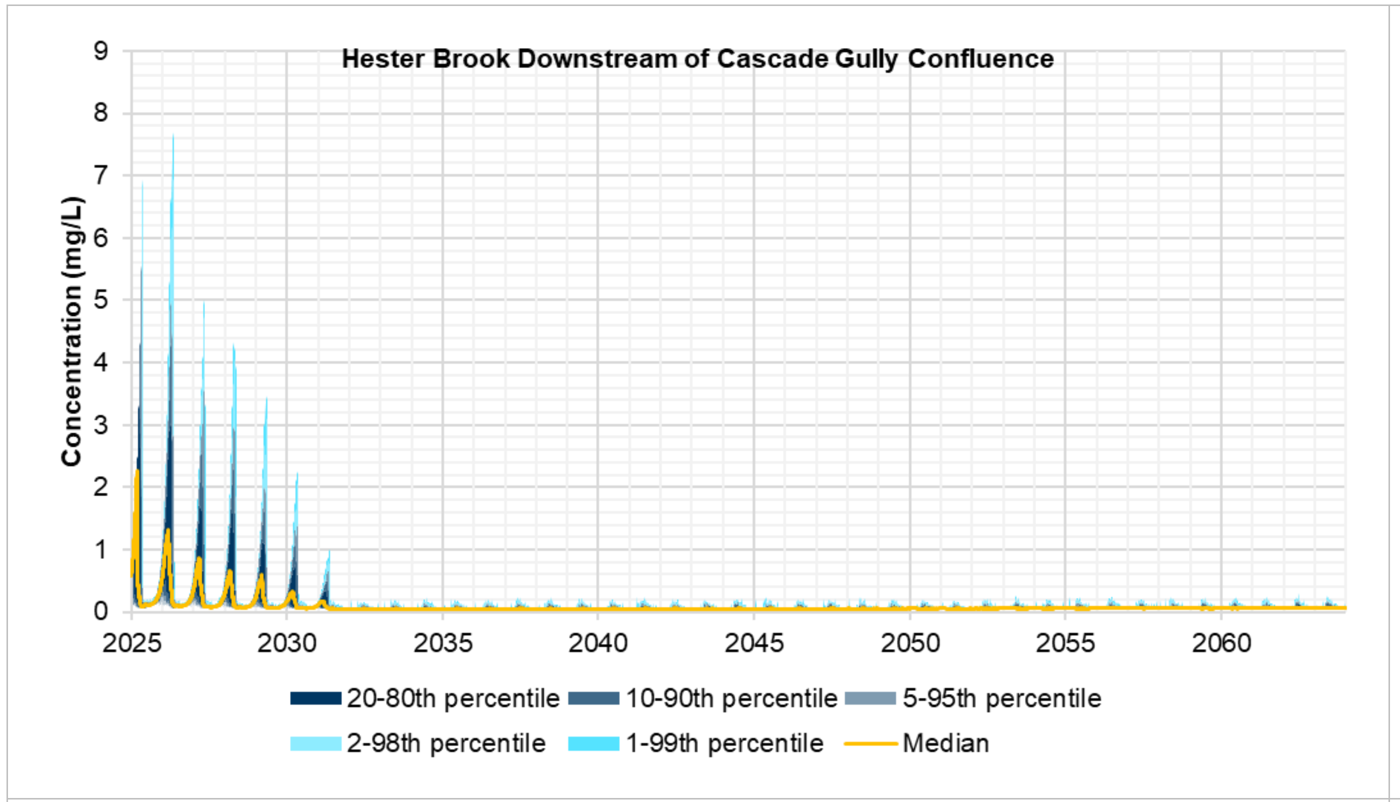
Base Case	Impact Case
	
	

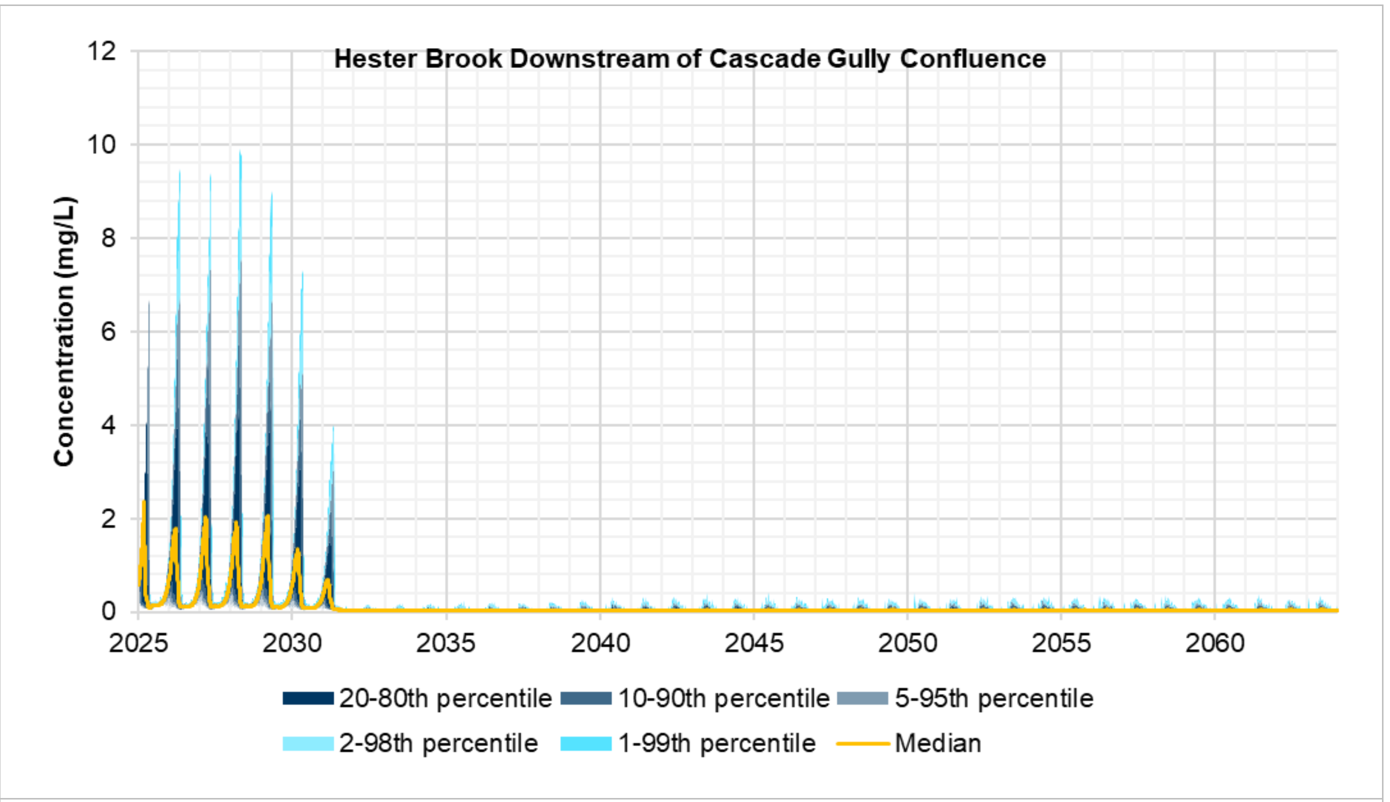

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
3
2.5
2
1.5
1
0.5
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

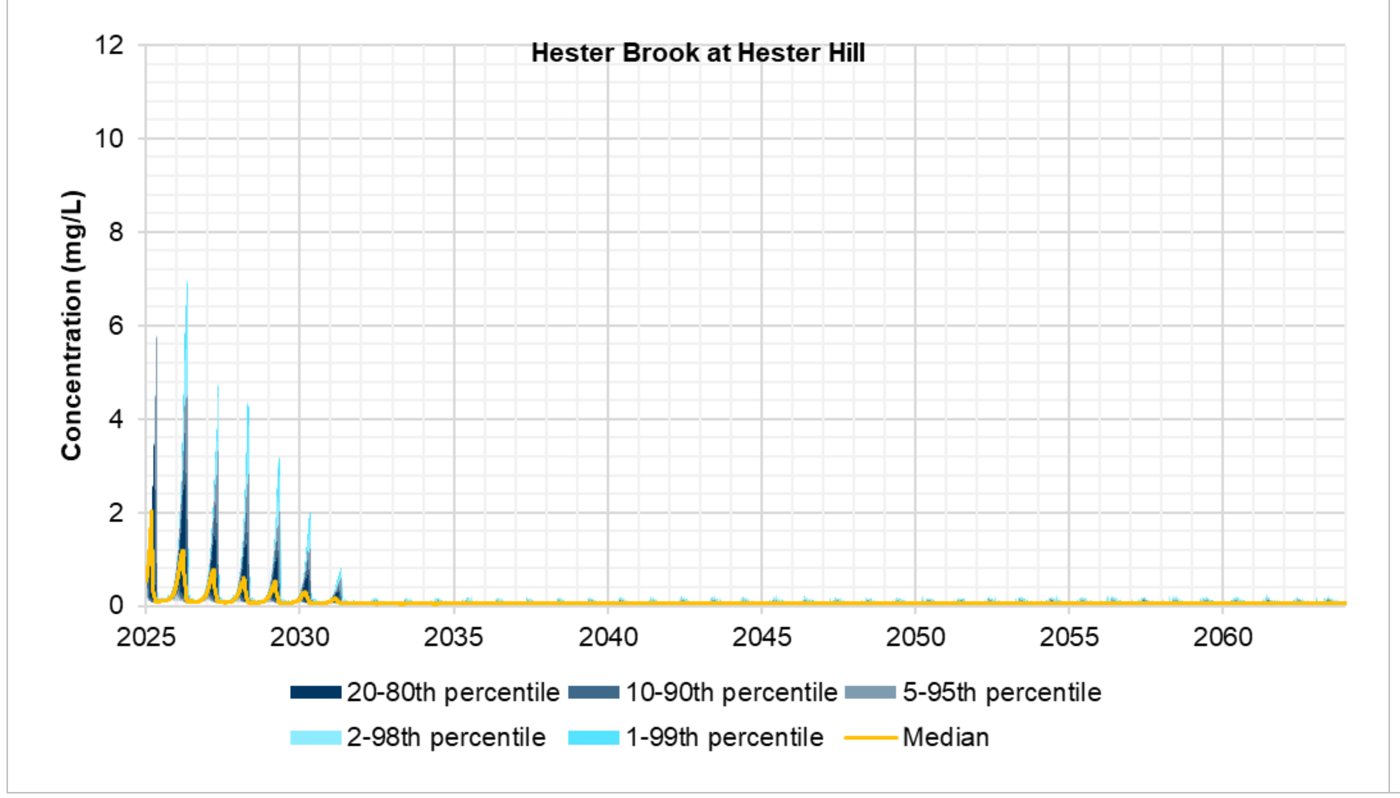

Hester Brook Upstream of Cascade Gully Confluence
Concentration (mg/L)
3
2.5
2
1.5
1
0.5
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

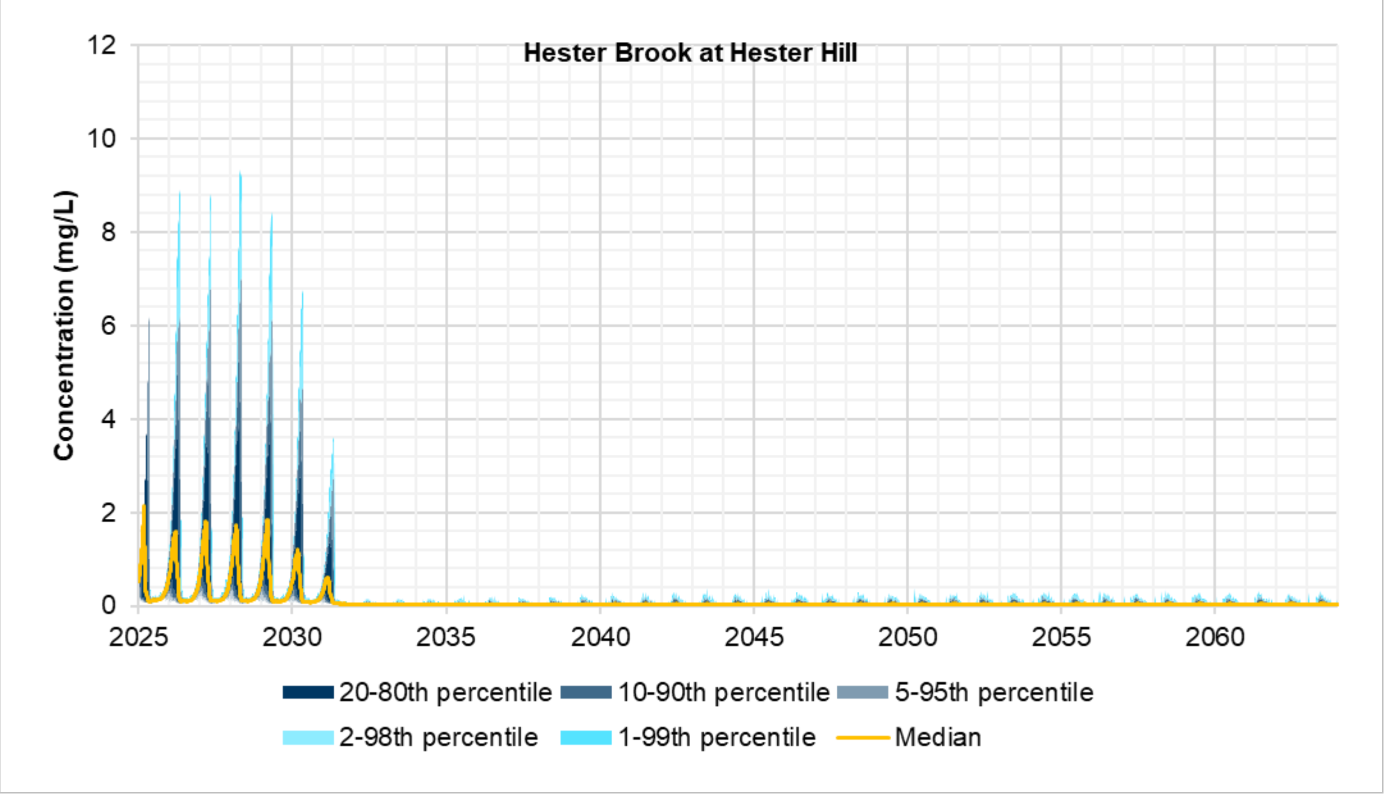

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

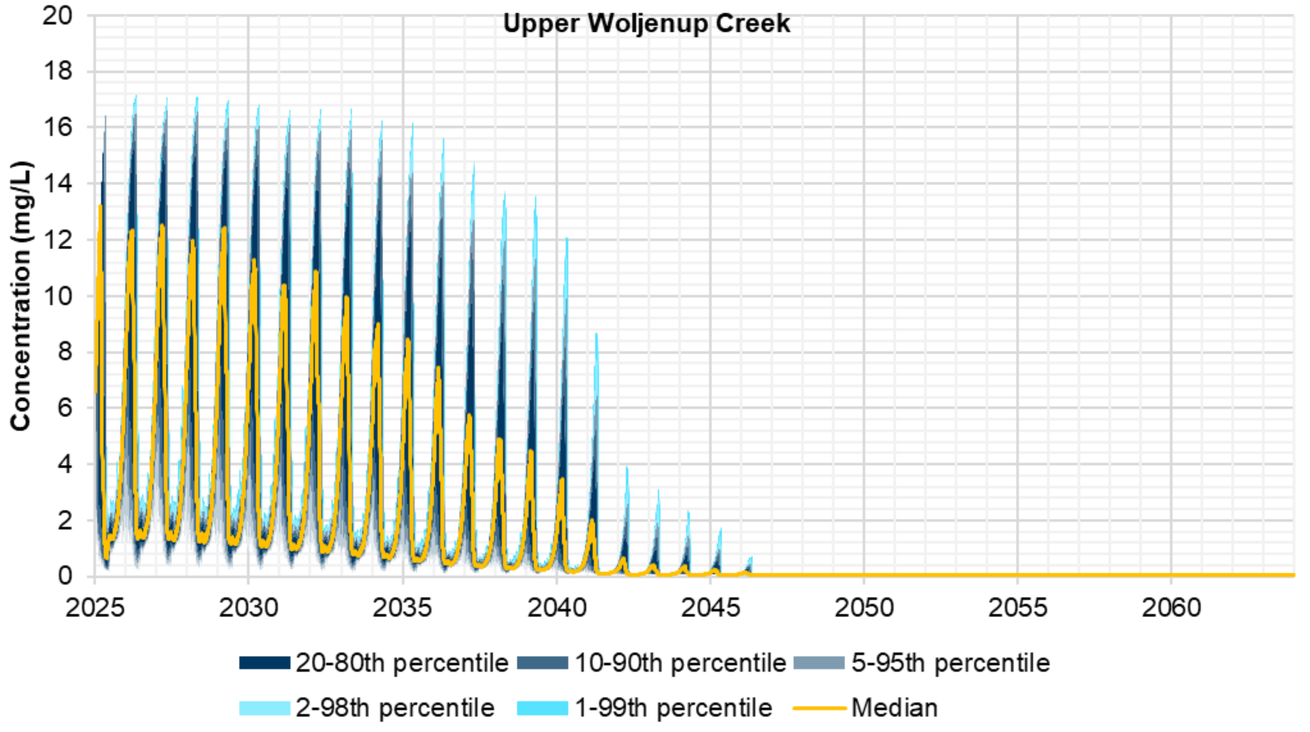

Hester Brook Upstream of Saltwater Gully Confluence
Concentration (mg/L)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

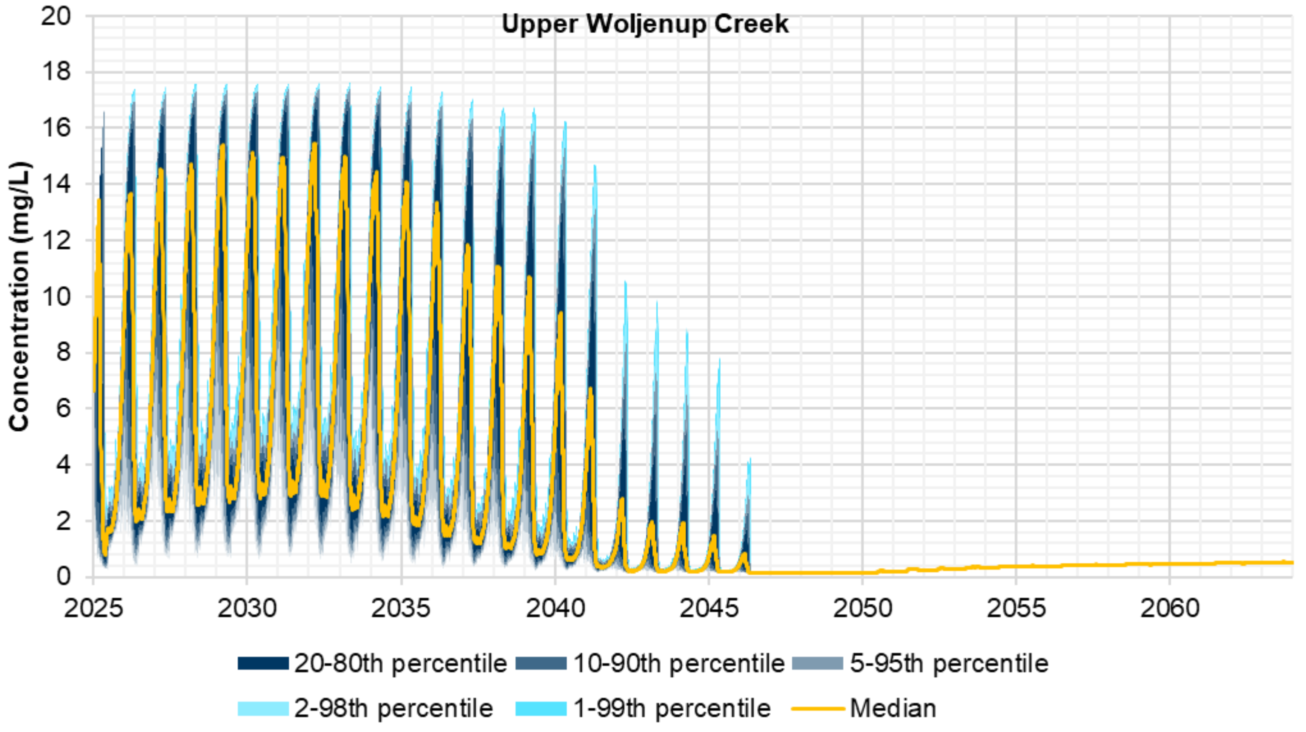

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

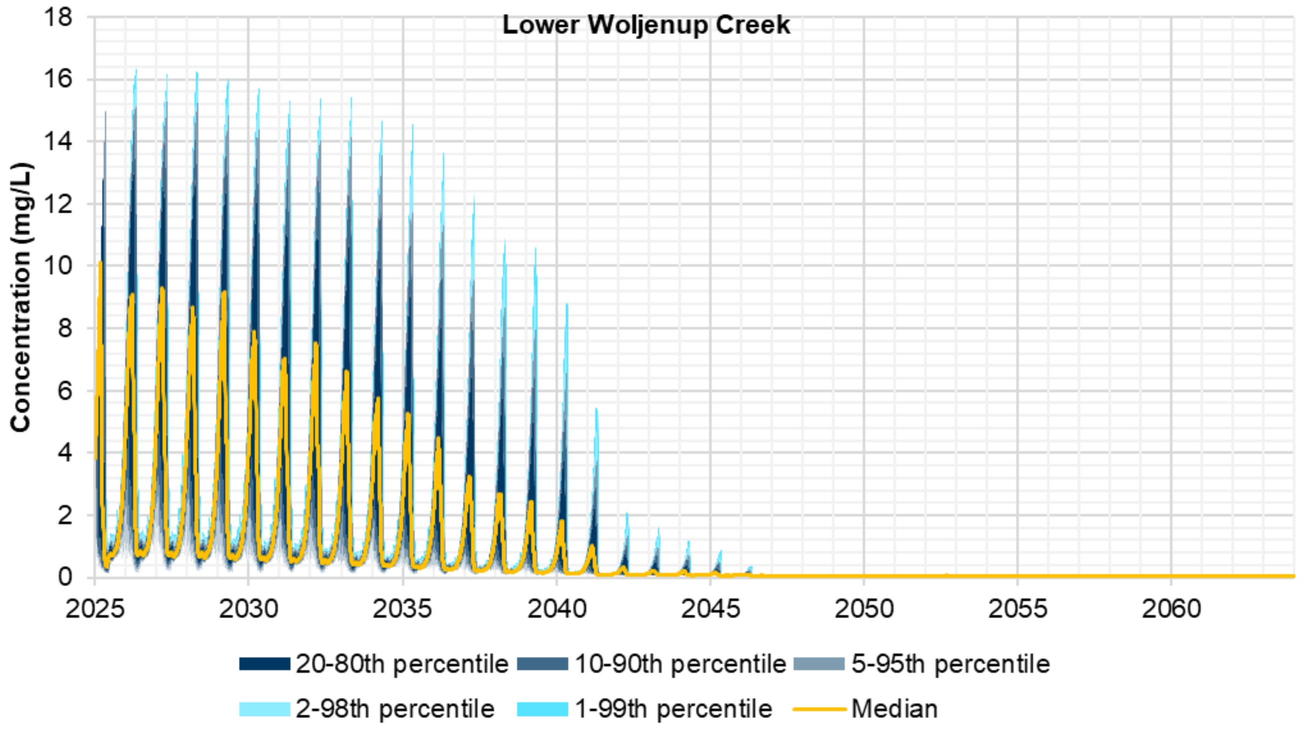

Hester Brook Downstream of Cascade Gully Confluence
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

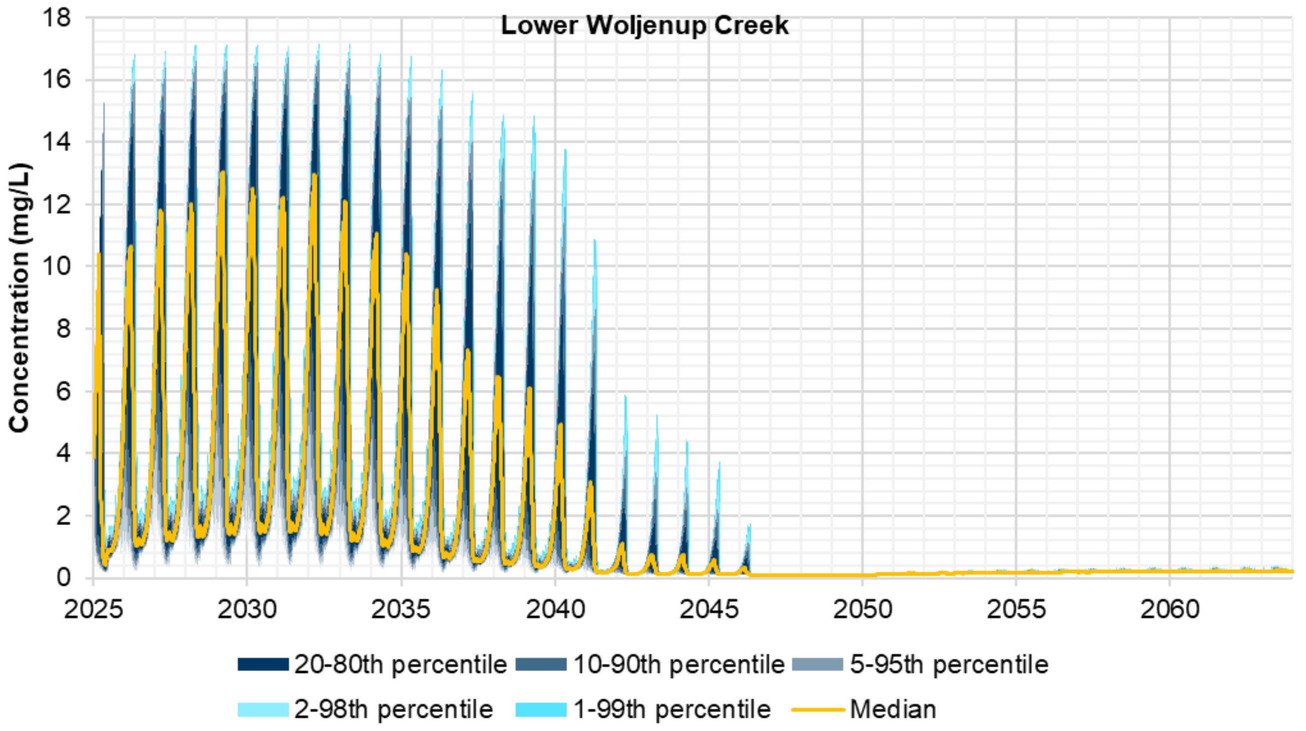

Hester Brook at Hester Hill
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

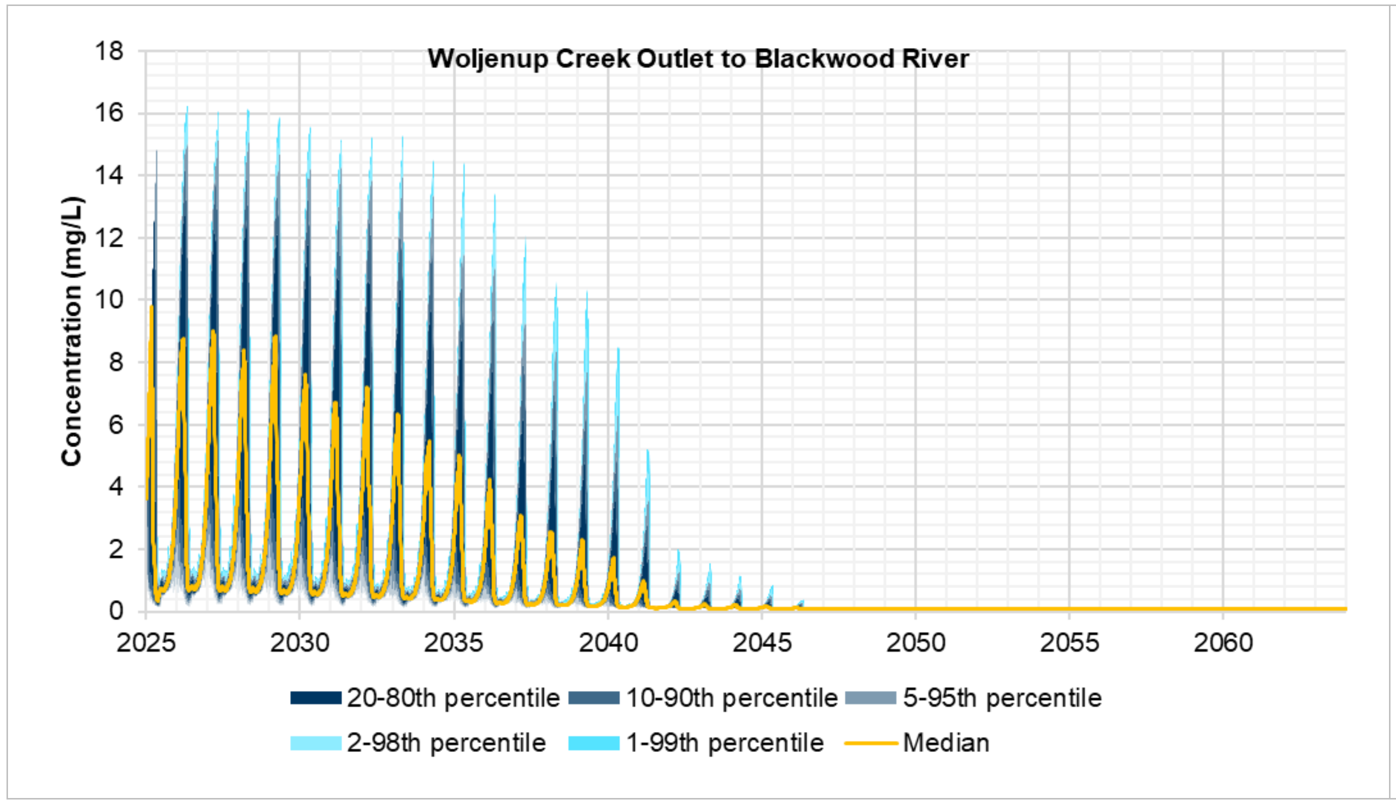

Hester Brook at Hester Hill
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

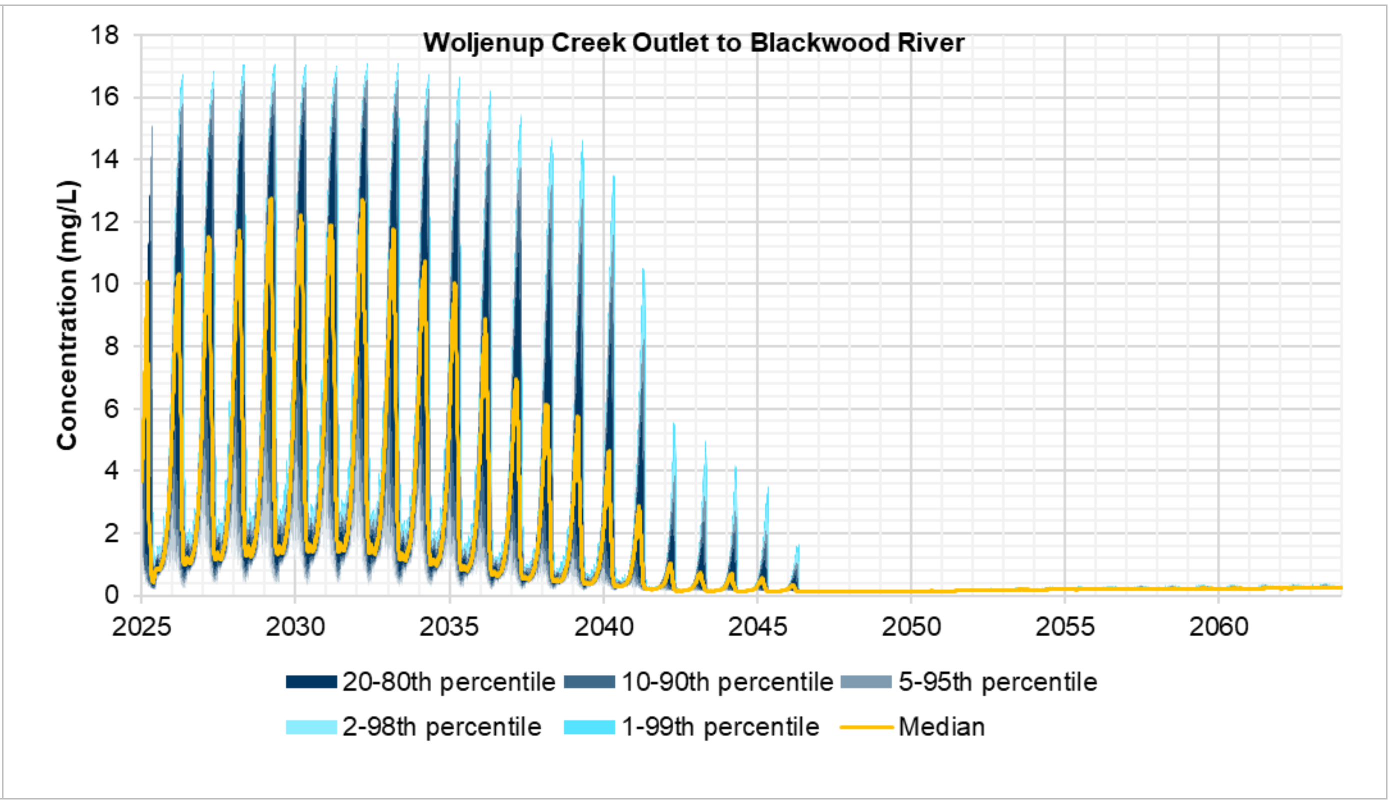

Upper Woljenup Creek
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Upper Woljenup Creek
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Lower Woljenup Creek
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Lower Woljenup Creek
Concentration (mg/L)
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
0
2
4
6
8
10
12
14
16
18
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median


Woljenup Creek Outlet to Blackwood River
Concentration (mg/L)
0
2
4
6
8
10
12
14
16
18
2025
2030
2035
2040
2045
2050
2055
2060
20-80th percentile
10-90th percentile
5-95th percentile
2-98th percentile
1-99th percentile
Median

ghd.com

→ The Power of Commitment