



**Costerfield Operations**

**SURFACE WATER MANAGEMENT PLAN**

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Document ID	SD_WM_1502_PLN
Document Owner	Sustainability Manager
Date Authorized	16 June 2023
Version	2.0

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## 1. Objective

This plan shall identify operational requirements to ensure surface water is managed to a standard consistent with project approvals, relevant State and Federal legislation or better. Adherence to this plan shall minimize risk to employees, neighbouring communities, fauna, native vegetation, surface water, groundwater and sensitive environments.

The plan is applicable to all site personnel and contractors at the Costerfield Mine site and any other relevant project areas operated by the Company.

## 2. Definitions

For the purpose of this document these definitions will apply:

**“Treated Water”** means water from these sources; reverse osmosis permeate (RO permeate), public standpipe, mains water, captured rain water.

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### 3. Current Aspects and Risks

Business Area	Risk	Potential Impact	Current Control	Conseq.	Frequency	Risk Rank
Exploration Drilling	Hydrocarbon leaks and spills during drilling, maintenance and re-fuelling	Surface water; soil, vegetation, compliance.	Spill kits, spill mgt plan, drop sheets used during minor maintenance, rigs returned to workshop for major service, centralized hydrocarbon store, minimum hydrocarbons kept at drill sites, environmental issues discussed at toolbox, contractor’s environment management plan, Pre-start check to include spill prevention and remediation, drill site selection to consider proximity to waterways, incident reporting system.	E	3	E3 MED
	Surface water leak or spill of drilling process water	Surface water; vegetation (if water is saline); compliance	Above ground tanks, recirculation of water, disposal of excess water to silt dam on site (end of hole), contractor environment	E	3	E3 MED

			management plan, pipeline checks, incident reporting system.			
	Surface water contamination (siltation) and erosion when accessing sites (waterway crossings/high rainfall events)	Siltation of waterway; erosion; vegetation damage; compliance	Environmental issues discussed at toolbox, contractor environment management plan, site selection assessment, site rehabilitation procedure	E	3	E3 MED
Processing	Hydrocarbon leaks and spills during operations, transfer, maintenance and re-fuelling	Surface water, vegetation, compliance	Spill kits, training/induction, incident reporting system.	E	3	E3 MED
	Leak or spill of process water or discharge of silty runoff from site	Surface water (stormwater dam overflow), vegetation, compliance	All runoff and process water spill diverted to stormwater dam for collection, stormwater dam overflow to TSF (contained on site), surface water quality monitoring	E	3	E3 MED
	Tailings slurry leak/spill (TSF or pipeline)	Surface water, vegetation, compliance	Engineering design of TSF, 12hr visual inspections, pipelines lines banded, low flow cut off, vegetation damage is	D	3	D3 MED

			reported to Sustainability Manager, incident reporting system.			
	Chemical spill	Surface water; vegetation, compliance	Bunds around chemical storage (plant only), chemical handling procedures, incident reporting system, MSDS information on ChemAlert, vegetation damage reported to Sustainability Manager.	E	2	E2 LOW
Reverse Osmosis Water Treatment Plant Operation	Discharge of RO treated water to local waterway - water quality does not meet the EPA operating licence criteria	Surface water, compliance	RO Plant Operating Procedures, approved monitoring program, pipeline design and monitoring.  Approved EPA discharge limits including, pH level controlled to range of 6-9, salinity controlled to <800us/cm and metal limits as stated on licence	D	3	D3 MED
	Leak or spill of brine to ground or surface waters	Surface water, vegetation, compliance	Pipeline maintenance and inspections.	D	2	D2 MED

			5 yearly comprehensive pipeline inspection by independent engineer			
Mining	Waste rock stockpile runoff	Surface water (salts and metals), vegetation, compliance	Stormwater from Waste Rock Stockpile diverted to mine stormwater dam, design of waste rock stockpile.	D	2	D2 MED
	Evaporation dam leak/overtopping or mine water pipeline leak (saline/metals content)	Surface water; vegetation, compliance	Freeboard management, seepage detection bores around evaporation dam, contingency planning, visual inspections, real time permanent camera access online Processr.IO	D	3	D3 MED
	Hydrocarbons from mine workshop and lay down areas	Surface water; compliance	Self bunded fuel storage tank, spill kit, specific surface water drains diverted to sump & oil separator, concrete bund around oil storage areas	E	4	E4 MED
	Authorized waterway diversion non compliance	Surface water (turbidity, erosion, stock, paddock flooding and siltation); compliance	Construction to engineered design, monitoring, compliance, visual inspection	D	2	D2 MED

	Use of groundwater for dust suppression (metals and salts), pipeline burst	Surface water, vegetation,	Use of treated water for dust suppression, vegetation damage reported to Sustainability Manager	D	3	D3 MED
	Mine dewatering	Change to surface water flows, compliance	Independent hydrogeological modelling and review, surface water monitoring program	C	1	C1 MED
	Fuel tanker roll-over	Surface water, vegetation	Traffic management plan, access road maintenance, speed limits, tanker/carrier selection, vegetation damage reported to Sustainability Manager	D	1	D1 MED
	Septic overflow	Surface water, vegetation, OHS; compliance	Septic pumped as required (min every 2 years), Rhizopod system inspected and maintained by contractor annually	E	3	E3 MED
	Surface water impacts from waste rock leachate	Surface water (salts and metals); vegetation, compliance	Acid-mine-drainage assessment and analysis (annually or on significant change in geology)	C	2	C2 MED



Construction activities	Surface water contamination from the use of groundwater for dust suppression (metals and salts), pipeline leakage, topography changed to alter water flow during construction	Surface water, vegetation	Implement EPA accepted construction practices to ensure surface water is not impacted (EPA Env. Guidelines for Major Construction Sites 480), use treated water for dust suppression	E	2	E2 MED
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Table 1: Current risk to surface water

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### COSTERFIELD OPERATIONS EVENT POTENTIAL MATRIX

Assess the worst realistic consequences. I.e. what could have happened but for slightly different circumstances  
 Using the incident potential matrix, consider the frequency of the consequence of the incident occurring  
 Incident potential equals worst realistic consequence x likelihood of worst realistic consequence.

Example:

The steering fails on a loader as it is being driven down the decline and it strikes a parked light vehicle.  
 The actual consequence is slight damage of low value.  
 The worst possible consequence could arise if the light vehicle driver was in the vicinity of the vehicle when the loader struck it. In which case the incident could have resulted in a fatality. As it was only luck that determined the outcome, the worst realistic consequence would be considered a fatality.

						LIKELIHOOD					
						0	1	2	3	4	5
						Remote	Highly Unlikely	Unlikely	Possible	Quite Likely	Likely
<b>C o n s e q u e n c e</b>	> 1 Fatality (or Permanent Total Disabilities)	Large scale (10-100 km <sup>2</sup> ) Long term (decades) impact	A\$1M - A\$10M	Persistent national concern. Long term 'brand' impact. Major venture/asset operations severely restricted.	<b>A</b>	<b>Massive</b>	<b>HIGH POTENTIAL</b>				<b>SEVERE</b>
	1 Fatality (or Permanent Total Disabilities)	Medium scale (1-10 km <sup>2</sup> ) Medium term (years) impact	A\$0.5M - A\$1M	Medium term national concern. Minor venture or minor asset operations restricted or curtailed.	<b>B</b>	<b>Major</b>		<b>HIGH</b>			
	Major Injury/illness, Permanent Partial Disability or Lost Work Case >4days	Medium scale (1-10 km <sup>2</sup> ) Short term (months) impact	A\$100K - A\$0.5M	National bad mention. Short term regional concern. Close scrutiny of Asset level operations/future proposals.	<b>C</b>	<b>Moderate</b>	<b>MEDIUM</b>				
	Minor Injury/illness, Restricted Work Case, Medical treatment or Lost Work Case <4 days.	Localised (<1 km <sup>2</sup> ) Short term (weeks) impact	A\$10K - A\$100K	Short term local concern. Some impact on asset level non-production activities.	<b>D</b>	<b>Minor</b>					
	Slight Injury/illness, First Aid	Localised (Immediate area) Temporary impact (days)	<A\$10k	Local mention only. Quickly forgotten. Freedom to operate unaffected.	<b>E</b>	<b>Slight</b>	<b>LOW</b>				

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## 4. Regulatory Requirements

- *General Environments Duty (GED) Environment Protection Act 2017*
- *Water quality objectives for rivers and streams (Ecosystem protection)*

## 5. Accountability and Responsibility

Responsibility for protection of natural surface water bodies lies with the Costerfield Management team. Prior to any change in operations which may affect the site surface water balance, surface water quality or place natural surface waters at risk, consultation must occur with the Sustainability Manager. All Department Managers have a responsibility to make themselves aware of the project approval parameters which address management of surface water.

The Costerfield site induction makes all employees and contractors aware that it is everyone's responsibility to prevent pollution and protect surface waters and to report any observed risk of pollution and/or degradation. Reports of such events should be made using the Costerfield incident reporting system - isystain. It is the responsibility of the department manager to make the Sustainability Manager aware of any surface water pollution and/or degradation reports received by their department immediately. The Department Manager is then required to work with the Sustainability Manager to ensure appropriate action is undertaken immediately to prevent or rectify the problem.

## 6. Monitoring Program

Upstream and downstream surface water samples are collected from designated points in creeks that run alongside or through Mandalay's Costerfield operations.

The site's surface water monitoring program includes collecting a water sample from a range of set locations after every flow event (time between sampling not being less than one month).

An upstream and a downstream sampling point are monitored for each creek flowing around the mine site (Figure 1), the Brunswick plant site and the Tailings Storage facility (figure 2). Field parameters are collected (pH and TDS), Samples are then sent to a NATA certified laboratory for detailed analysis including total dissolved solids, electrical conductivity, suspended solids, turbidity, alkalinity by PC titrator, sulfate, chloride, dissolved major Cations (Ca, Mg, Na, K), metals (As, Sb, Cd, Cr, Cu, Pb, Ni, Zn, Fe) and ionic balance. These results are then added to a central database, where the data is assessed and compiled for reporting.

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## 7. Monitoring Schedule

Table 7.1: Surface water monitoring schedule

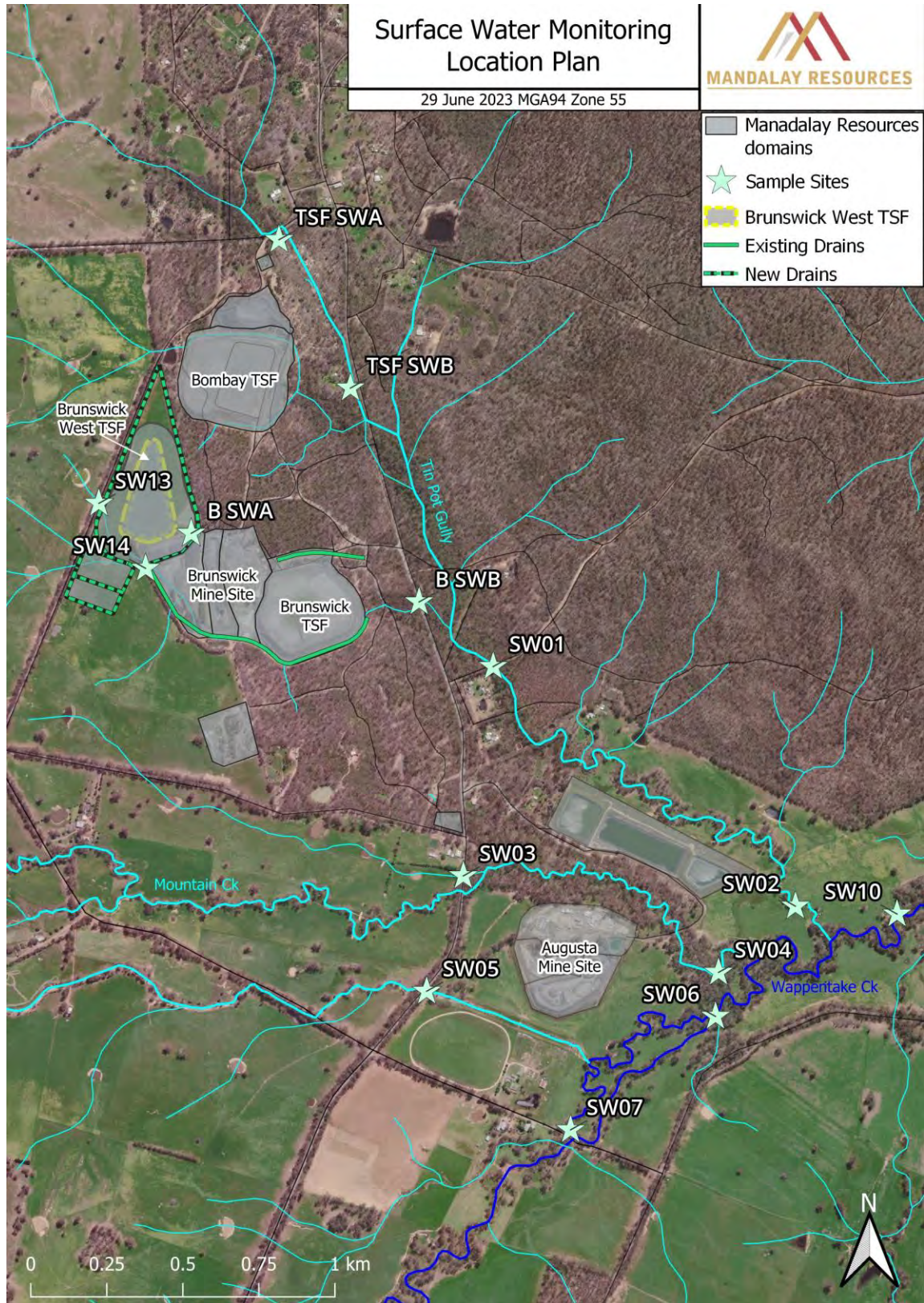
Environmental Aspect	Process and/or Location	Parameters Measured	Sample Frequency	Regulatory Limit	Monitoring Location ID	Person(s) Responsible
Surface water: creeks	Site perimeter – designated points	pH, Total Dissolved Solids, Electrical Conductivity, Suspended Solids, turbidity, alkalinity by PC titrator, dissolved major cations (Ca, Mg, Na, K), sulfate, chloride, metals (Sb, As, Cd, Cr, Cu, Ni, Pb, Zn, Fe)	Whenever flow occurs, with time between sampling not being less than one month.	No impact from mining and processing	SW1 – SW7 B SWA, B SWB (Brunswick TSF) TSF SWA, TSF SWB (Bombay TSF)	Environmental Officer
Surface Water: RO discharge	Mountain Creek South  Wappentake Creek	Flow, water depth, photo monitoring, EC, pH, temperature, DO, turbidity (collected in-situ with a calibrated probe) and TDS & TSS, Sb, As, Cd, Cr, Cu, Pb, Ni, Zn and Fe (total & dissolved fractions), Major anions and cations, alkalinity and ion balance,	Weekly then monthly when results consistent with licence conditions	EPA Environment Reference Standards EPA discharge operating licence OL000109992	RO permeate RO feed water SW07 SW10 SW12	Environmental Officer
Mine Dewatering	Augusta Mine Dam	pH, Total Dissolved Solids, Suspended Solids, turbidity, alkalinity by PC titrator, dissolved major cations (Ca, Mg, Na, K), sulfate, chloride, metals (Sb, As, Cd, Cr, Cu, Ni, Pb, Zn, Fe)	Weekly	No impact from mining and processing	Augusta Mine Dam	Environmental Officer

Residential Tank Water	Nominated residential water tanks drinking and non-drinking for water quality testing	Total dissolved solids, pH, sulphate, total dissolved metals (including Sb, As, Cd, Cu, Fe, Pb, Ni, Zn)	TBA	Aus Drinking Water Guidelines 2016; Total & Dissolved Antimony 0.003mg/L	TBA	Environmental Officer
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**Table 7.2: Surface Water Management Triggers**

Parameter	Trigger	Management Action
Surface Water (All)	Significant deviation in water quality from background (non-mine affected) conditions	Conduct an incident investigation to identify source of deviation and apply management controls to rectify the situation where necessary. Report to regulator.
Antimony in Residential Tanks	Levels exceed ADWG 2016; Total & Dissolved Antimony 0.003mg/L	Complete incident investigation and identify source of contamination and mitigate (if mine related)
Antimony in surface water	Presence of elevated antimony levels in surface waters	Follow ANZECC and ARMCANZ Guidelines to establish a trigger level
RO discharge: All parameters	EPA ERS and EPA Operating Licence parameters	Weekly water quality monitoring to be reduced to monthly if results consistent with licence conditions.
RO discharge: All parameters	Presence of water in additional monitoring locations downstream of discharge at time of monitoring (SW10, and SW12)	If water depth at additional monitoring locations downstream is $\geq 20$ cm, and sample can be taken without disturbing sediment, sample shall be collected and analysed for parameters listed in table 3.
RO discharge: All parameters	Water quality indicators exceed EPA operating licence conditions	An assessment of potential impacts should be made, including a longitudinal assessment of the downstream distance of potential impacts. Consultation should be had with the EPA to determine acceptable levels of risk and actions taken to reduce the discharge if acceptable levels of risk are exceeded.

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## 8. Recording

All data recorded in field onto data collection sheet (refer to technical procedure). Data is then entered into site environmental monitoring database:

P:\ENVIRONMENTAL\1. Environmental Monitoring\Water\WATER QUALITY RESULTS.xls

## 9. Auditing and Reporting

External Reporting

- Quarterly: Environment Review Committee

## 10. Technical Procedures

- PRO\_Surface Water Monitoring

## 11. Other Reference Documents

- ENV\_EMP\_001 – Costerfield Environment Management Plan
- ENV\_EMP\_004 – Groundwater Management Plan
- ENV\_EMP\_008 – Tailings Management Plan
- Ambient Air Quality Management Plan
- EPA Publication 480 “Environmental Guidelines for Major Construction Sites”
- EPA Publication “A guide to the sampling and analysis of waters, wastewaters, soils and wastes”, March 2000.
- EPA Publication 1287 “Guidelines for risk assessment of wastewater discharges to waterways” July 2009
- EPA Publication 1992 “Guide to the Environment Reference Standard” June 2021
- National Water Quality Management Strategy Australian Water Quality Drinking Guidelines 6 Version 3.2 2016
- Australian/New Zealand Standard 5667.5 (1998) Water Quality – Sampling Part 5: Guidance on sampling of drinking water
- SKM Costerfield Mine Water Discharge Approvals- EPA Works Approval Application February 19 2014

## 12. Revision History

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Revision Date	Ver	Section	Revision Description	Prepared by	Reviewed by	Approved By	Critical Change <sup>1</sup> Y/N
14/06/23	2.0		Remove reference to Brunswick pit as water storage, Update EPA licence conditions, replace reference to SEPP guidelines	K. Brauns	R. Laity	R. Laity	N

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<sup>1</sup> The document owner/reviewer is responsible to identify any critical changes of the procedure in this document and is required to notify employees of any change.