FINGERBOARDS MINERAL SANDS PROJECT

Risk treatment plan:

**Water quality and hydrology**

EPA update 9 July 2021

Notes:

* Base document is Tabled Document 202a (centrifuge changes – clean version).
* Comments / references provided in square brackets [xxx] for context.
* Correction made on 29 June 2021 to include edits to the initial paragraph of section 6 that were accidently omitted in the version dated 15 June 2021.

Risk treatment plan – water quality & hydrology Rev C

**Risk treatment plan: Water quality and hydrology**

Contents

1. [Scope 1](#_bookmark0)
2. [Key sensitive receptors 1](#_bookmark1)
3. [Inherent risk 4](#_bookmark3)
4. [Objectives 7](#_bookmark5)
5. [Compliance standards 7](#_bookmark6)
6. [Acceptance criteria 8](#_bookmark8)
7. [Controls to address hazard 12](#_bookmark11)
8. [Residual risk assessment 18](#_bookmark14)
9. [Monitoring 20](#_bookmark16)
10. [Reporting 26](#_bookmark19)
11. [References 29](#_bookmark21)
12. [Kalbar reference documents 29](#_bookmark22)

List of tables

[Table 3-1: Inherent risk ratings – water quality and hydrology 4](#_bookmark4)

[Table 6-1: Water quality acceptance criteria – protection of beneficial uses of surface water 9](#_bookmark9)

[Table 6-2: Environmental quality objectives (SEPP Waters, 2018) 11](#_bookmark10)

[Table 7-1: Controls and associated performance measures (surface water) 12](#_bookmark12)

[Table 7-2: Controls and associated performance measures (groundwater) 16](#_bookmark13)

[Table 8-1: Residual risk ratings – water quality and hydrology 18](#_bookmark15)

[Table 9-1: Proposed monitoring for surface water 21](#_bookmark17)

[Table 9-2: Proposed monitoring for groundwater 24](#_bookmark18)

[Table 10-1: Water quality and hydrology performance and compliance reporting 26](#_bookmark20)

[Table 12-1: Kalbar reference documents 30](#_bookmark23)

# Scope

This risk treatment plan is for the control of mining hazards that have the potential to adversely affect surface water or groundwater quality and / or water flows. This plan does not describe operating, maintenance or monitoring requirements for engineered water storages. Individual design reports and operating strategies will be prepared for each dam. Dam operating and maintenance manuals will also include information on dam inspections, monitoring and emergency procedures.

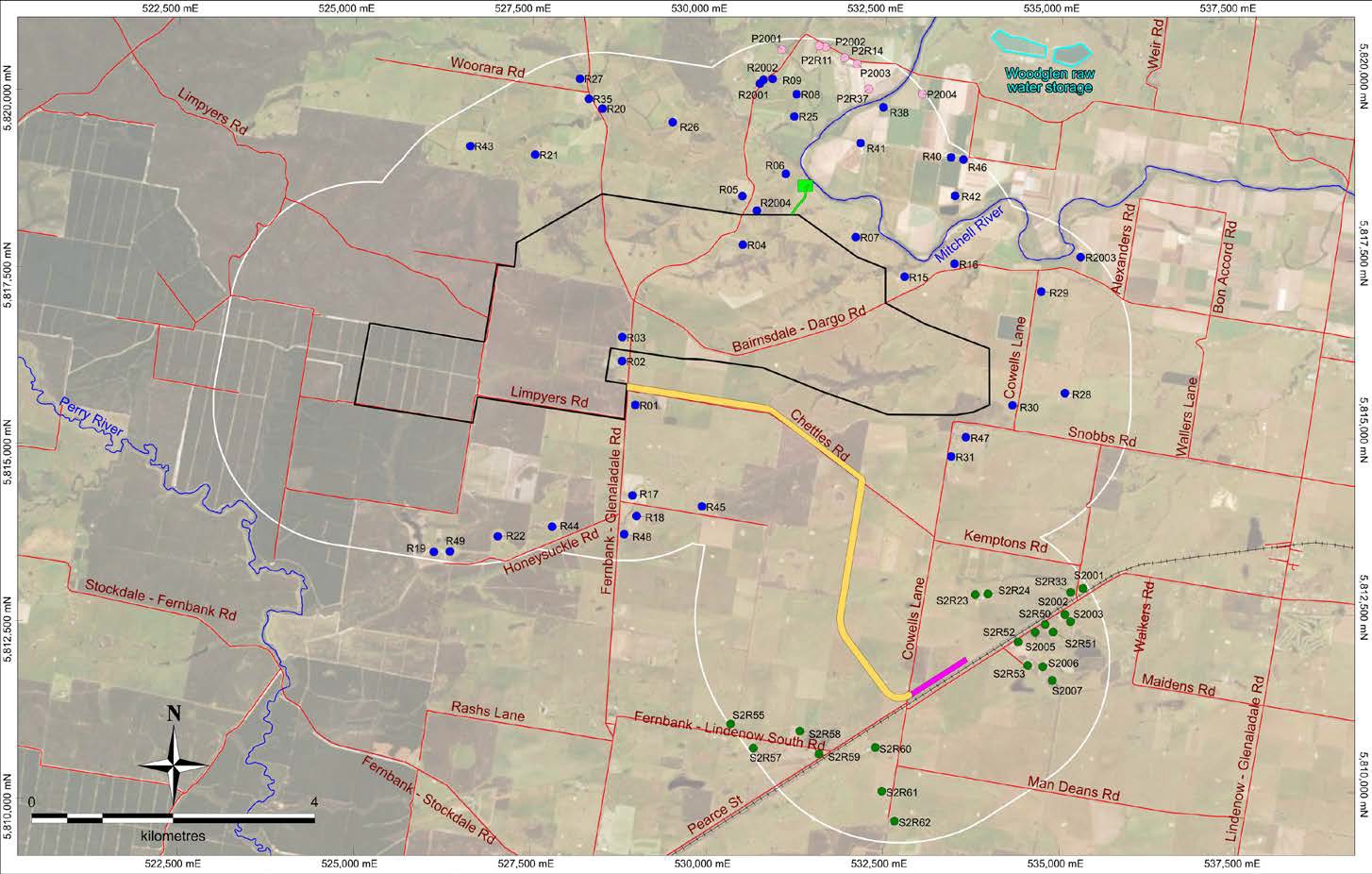
A ‘mining hazard’ means any mining activity that may pose a risk to the environment, to any member of the public or to land, property or infrastructure in the vicinity of work carried out at the Fingerboards mine at any stage of project implementation (construction, operations, decommissioning and closure).

# Key sensitive receptors

Key sensitive receptors include the environment, any member of the public or land, property or infrastructure in the vicinity of the mine that may be impacted or put at risk by changes to surface or groundwater quality or to surface water flows as a result of mining activities within the Fingerboard mining licence area. The key sensitive receptors potentially affected by project-related changes to water quality or hydrology are:

* Water quality and biota in the Perry and Mitchell Rivers downstream of the mining licence area and in the Gippsland Lakes;
* Surface water quality and catchment values of existing ponds and dams within the mining licence area;
* Surface water quality and catchment values of tributaries of the Perry and/or Mitchell Rivers that traverse the mining licence area, specifically including Perry Gully; Simpsons Gully; Lucas Creek; Long Marsh Gully; Moilun Creek and an unnamed tributary of Honeysuckle Creek;
* Vegetation in groundwater dependent ecosystems associated the Mitchell or Perry Rivers or their tributaries.
* Existing users of Mitchell River water;
* Groundwater in aquifers beneath or downstream of the Fingerboards mining licence area

The locations of these receptors relative to the mining licence area are shown in [Figure 2-1](#_bookmark2)



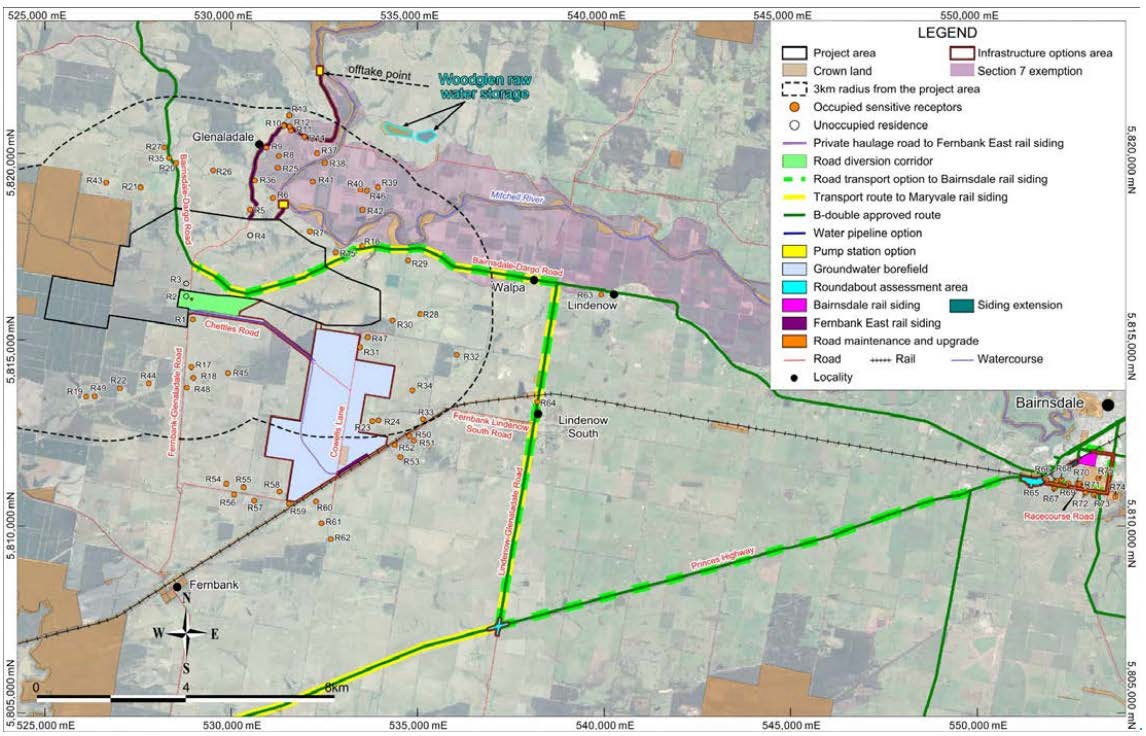


Figure 2-1: Sensitive receptors – water quality & hydrology

# Inherent risk

In this risk treatment plan ‘inherent risk’ means the likelihood and consequence of a risk event, assuming that standard controls specified in Attachment 1 of the Fingerboards Risk Management Plan are implemented.

[EPA Comment: EPA has requested further information which is required to assess the risks from seepage to groundwater and the discharge to surface water. It is premature for EPA to comment on the consequence, likelihood or inherent risk rating without that further information]

Table 3-1: Inherent risk ratings – water quality and hydrology

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | **Details of risk event** | **Phase** | **Consequence** | **Likelihood** | **Inherent risk rating** |
| 1 | Runoff from stockpiles or disturbed / rehabilitated areas: Sedimentation increases water turbidity and harms aquatic species | C, O, CL | Moderate | Unlikely | Medium |
| 2 | Runoff from stockpiles or disturbed / rehabilitated areas: Increase in metals or radionuclides or change in receiving water pH harms aquatic species or human health | C, O | Insignificant | Unlikely | Low |
| 3 | Runoff from stockpiles or disturbed / rehabilitated areas: Sedimentation increases water turbidity and harms aquatic species | C, O | Minor | Unlikely | Low |
| 4 | Discharge from contact water dams (via spillway): Sedimentation increases water turbidity and harms aquatic species | O, CL | Moderate | Rare | Medium |
| 5 | Discharge from contact water dam (via spillway):  Increase in metals or radionuclides or change in receiving water pH harms aquatic species or human health | O, CL | Insignificant | Rare | Low |
| 6 | Release of stored water as a result of failure of contact water dam(s): Sedimentation increases water turbidity and harms aquatic species | O, CL | Moderate | Rare | Medium |
| 7 | Release of stored water as a result of failure of contact water dam(s): Increase in metals, radionuclides, nutrients or oxygen demand or change in receiving  water pH harms aquatic species or human health | O, CL | Minor | Rare | Low |
| 8 | Discharge from contact water dams (via spillway): Increase in nutrients or oxygen demand harms aquatic species | O | Minor | Rare | Low |
| 9 | Discharge from process water dam (via spillway): Sedimentation increases water turbidity and harms aquatic species | O | Moderate | Rare | Medium |
| 11 | Release of turbid water as a result of process water dam overtopping event: Sedimentation increases water turbidity and harms aquatic species | O | Moderate | Rare | Medium |
| 12 | Discharge from process water dam (via spillway): Increase in metals or radionuclides or change in receiving water pH harms aquatic species | O | Minor | Unlikely | Low |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | **Details of risk event** | **Phase** | **Consequence** | **Likelihood** | **Inherent risk rating** |
| 14 | Release of turbid water as a result of process water dam overtopping event: Increase in metals or radionuclides or change in receiving water pH harms aquatic species | O | Moderate | Rare | Medium |
| 15 | Altered site hydrology results in increased rate of erosion in natural drainage lines downstream of project: Sedimentation increases water turbidity and harms aquatic species | O, CL | Moderate | Unlikely | Medium |
| 16 | Runoff from septic effluent disposal fields: Increase in nutrients or oxygen demand harms aquatic species | C, O | Minor | Unlikely | Low |
| 17 | Seepage from in-pit coarse tailings: Contamination of groundwater by acidity, metals or radionuclides | O, CL | Insignificant | Possible | Low |
| 18 | Seepage from in pit tailings storage are: Contamination of groundwater by metals or radionuclides | O | Minor | Unlikely | Low |
| 19 | Seepage from process water dam: Contamination of groundwater by metals or radionuclides | O | Minor | Unlikely | Low |
| 20 | Infiltration of septic effluent: Contamination of groundwater by nutrients, pathogens or BOD | C, O | Minor | Unlikely | Low |
| 21 | Seepage from fines centrifuge cake or HMC product stockpiles: Contamination of groundwater by acidity, metals or radionuclides | O | Minor | Unlikely | Low |
| 22 | Capture of water in mine contact water dams: Reduced frequency / magnitude of flow down drainage lines results in modifications to riparian systems along drainage lines - Mitchell system | O, CL | Minor | Possible | Medium |
| 23 | Capture of water in mine contact water dams: Reduced frequency / magnitude of flow down drainage lines results in modifications to riparian systems along drainage lines – Perry system | O, CL | Minor | Possible | Medium |
| 24 | Capture of water in mine contact water dams: Reduced flow in Mitchell harms aquatic ecology | O, CL | Insignificant | Rare | Low |
| 25 | Capture of water in mine contact water dams: Reduced flow in Mitchell reduces water available to irrigators and other water users | O, CL | Insignificant | Rare | Low |
| 26 | Winter fill water extraction from Mitchell River: Reduced flow in Mitchell harms aquatic ecology | C, O | Minor | Unlikely | Low |
| 27 | Winter fill water extraction from Mitchell River: Reduced flow in Mitchell reduces water available to irrigators and other water users | C, O | Minor | Rare | Low |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | **Details of risk event** | **Phase** | **Consequence** | **Likelihood** | **Inherent risk rating** |
| 31 | Seepage from process water dam or freshwater storage dam: Groundwater mounding affects vegetation health | O | Minor | Rare | Low |
| 32 | Seepage from tailings in mine void: Groundwater mounding affects vegetation health | O, CL | Minor | Unlikely | Low |
| 33 | Seepage from tailings in mine void: Groundwater seepage compromises geotechnical stability of surrounding areas | O, CL | Major | Unlikely | High |
| 34 | Seepage from tailings in mine void: Groundwater seepage increases risk of tunnel erosion in surrounding areas | O, CL | Major | Unlikely | High |
| 35 | Seepage from process water dam or freshwater storage dam: Groundwater seepage reduces geotechnical stability of surrounding areas | O | Rare | Moderate | Medium |
| 36 | Seepage from process water dam or freshwater storage dam: Groundwater seepage increases risk of tunnel erosion in surrounding areas | O | Rare | Moderate | Medium |
| 37 | Seepage from mine contact water dams: Groundwater seepage increases risk of tunnel erosion in surrounding areas | O, CL | Rare | Moderate | Medium |
| 38 | Seepage from mine contact water dams: Groundwater seepage reduces geotechnical stability of surrounding areas | O, CL | Rare | Moderate | Medium |
| 39 | Altered site hydrology: redirection of flow, modified storage: Increased flood risk in Mitchell / Perry catchments | C, O, CL | Minor | Unlikely | Low |
| 40 | Extraction of groundwater from the Latrobe Group aquifer: Groundwater drawdown to Latrobe Group aquifer and reduced availability for licensed users or ecosystem support. | O | Minor | Unlikely | Low |
| 41 | Extraction of groundwater from the Latrobe Group aquifer: Groundwater drawdown transmitting to overlying Seaspray Group Aquifer, Boisdale Aquifer and surficial alluvial aquifers and reduced availability for licenced groundwater users or ecosystem support. | O | Minor | Unlikely | Low |
| 42 | Extraction of groundwater from the Latrobe Group aquifer: Reduced groundwater flux in the Latrobe Group aquifer increasing saline groundwater intrusion  near the coast. | O | Minor | Rare | Low |
| 43 | Tunnel erosion compromises stability of water storage structures: Sediment discharge to surface water | O, CL | Major | Rare | Medium |
| 44 | Water erosion in drainage channels: Vegetation / ecosystem damage | C, O, CL | Minor | Unlikely | Low |
| 45 | Water erosion near active pit void: Initiation of slope instability | O | Major | Unlikely | High |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | **Details of risk event** | **Phase** | **Consequence** | **Likelihood** | **Inherent risk rating** |
| 50 | Use of inappropriate materials in constructed landforms: Slope instability: loss of containment from constructed landforms | O, CL, PC | Moderate | Unlikely | Medium |
| 53 | Runoff or seepage from HMC stockpiles or centrifuges cake storage areas | O | Minor | Unlikely | Low |
| 55 | Tailings are hard setting: Loss of land capability; increased erosion hazard; restriction in water infiltration | O, CL | Moderate | Unlikely | Medium |
| 56 | Surface water runoff erodes bare surface: Gullying / tunnel erosion results in loss of land productivity | O, CL, PC | Moderate | Possible | Medium |
| 57 | Surface water runoff erodes bare surface: Erosion and sediment mobilisation: loss of soil fertility and decline in land productivity | O, CL, PC | Moderate | Possible | Medium |

Note: ‘C’ = construction; ‘O’ = operations; ‘CL’ = decommissioning and closure ‘PC’ = post closure Note 2: # may not appear in the table as risks have been removed with the removal of the TSF

# Objectives

The objectives of this risk treatment plan are to minimise and manage project-related changes to existing water quality and hydrological function in order to protect catchment environmental values[1](#_bookmark7) and uses of water resources over the short and long-term. [EPA Comment: As per EPA’s cover letter the language across all of the risk treatment plans should be amended to reflect the intent of the New EP Act (ie focus on prevention and minimising harm). Reference to the general environmental duty should be included]

The water quality environmental values that this risk treatment plan seeks to protect are the environmental values identified in the Environment Reference Standard which apply to the mining licence area and downstream catchments potentially affected by activities within the mining licence area. Environmental values are listed in [Table 6-1](#_bookmark9).

# Compliance standards

The compliance standards for this risk treatment plan are derived from applicable requirements of the:

* *Water Act (1989),*
* *Catchment and Land Protection Act (1994),*
* *Planning and Environment Act (1979),*
* *Environment Protection Act 2017 – Environment Reference Standard*; and
* EPA Guideline 1287 *Risk Assessment of Wastewater Discharge to Waterways*.

1 An environmental value is:

A quality or physical characteristic of the environment that is important to ecological health; public benefit (or amenity), safety or health; or

A quality of the environment identified and declared to be an environmental value under and environmental protection policy or regulation.

# Acceptance criteria

Acceptance criteria are the measures which, if attained, are the basis for concluding that the control measures described in this plan have been effective in achieving the plan objectives. The acceptance criterion for this risk treatment plan is that the diversion and return of diverted water to the environment does not give rise to the risk of harm to human health or the environment. Environmental values will be considered to be adequately protected if:

* project activities (including any water discharges from the mining licence area) do not cause receiving waters to exceed relevant criteria specified in the ERS and summarised in [Table 6-2](#_bookmark10); and
* it is not reasonably practicable to further reduce any risk of harm to human health or the environment associated with the environmental value.

[new Table 6-1 inserted given extent of drafting changes arising out of Environmental Reference Standard]

Table 6-1: Water quality acceptance criteria – protection of environmental values of surface   
and groundwaters

| **Environmental Value** | **Acceptance Criteria** |
| --- | --- |
| Water dependent ecosystem and species | Receiving waters will not be affected to the extent that the level of any indicator specified in the Environmental Reference Standard (ERS) exceeds:   * the objective for the specific water body or section of water body specified in Tables 5.8 and 5.9 of the ERS; or * the background water quality level, where the objective is unattainable due to existing background water quality level or the background water quality level better protects water dependent ecosystems and species. |
| Human consumption after appropriate treatment (surface water only) | Receiving water will not be affected to the extent that the level of any indicator specified in the Australian Drinking Water Guidelines (ADWG) exceeds:   * the health-related guideline value for that indicator specified in the ADWG; or * the background water quality level, where the objective is unattainable due to existing background water quality level or the background water quality level better protects human consumption (after appropriate treatment).   The constituents of the receiving water will not be affected in a manner or to an extent that leads to tainting. |
| Potable water supply and Potable mineral water supply (groundwater only) | Groundwater quality will not be affected to the extent that the level of any indicator specified in the ADWG exceeds:   * the health-related or aesthetic guideline values for that indicator specified in the ADWG; or * the background water quality level, where the objective is unattainable due to existing background water quality level or the background water quality level better protects human consumption (after appropriate treatment). |
| Agriculture and irrigation | Receiving water will not be affected to the extent that the level of any indicator specified in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) exceeds:   * levels for that indicator specified for irrigation and water for general on-farm use in the ANZG; or * the background water quality level, where the objective is unattainable due to existing background water quality level or the background water quality level better protects agricultural and irrigation activities. |
| Receiving water will not be affected to the extent that the level of any indicator specified in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) exceeds:   * levels for that indicator specified for livestock drinking water use in the ANZG; or * the background water quality level, where the objective is unattainable due to existing background water quality level or the background water quality level better protects stock watering activities. |
| Human consumption of aquatic foods | Receiving waters will not be affected to the extent that the level of any indicator specified in the Environmental Reference Standard (ERS) exceeds:   * the objective for the specific water body or section of water body specified in Tables 5.8 and 5.9 of the ERS; or * indicators specified for metal contaminants, non-metal contaminants, natural toxicants, and mercury specified in Schedule 19 of the Australia New Zealand Food Standards Code as in force from time to time; or * the background water quality level, where the objective is unattainable due to existing background water quality level or the background water quality level better protect human consumers of aquatic food. |
| Aquaculture | Receiving waters will not be affected to the extent that:   * levels of faecal (thermotolerant) coliforms exceed 14 orgs / 100mL; * levels of physical and chemical stressors exceed guideline values specified for aquaculture in the ANZG (or, if no guideline value is specified, the objective specified for that indicator in Tables 5.8 and 5.9 of the ERS); * levels of toxicants exceed guideline values for aquaculture specified in the ANZG (or, if no guideline value is specified, the objective specified for that indicator in Tables 5.8 and 5.9 of the ERS); * levels of off-flavour compounds specified in the ANZG for compounds found to causing tainting of the flesh of fish and other aquatic organisms or * indicators specified for metal contaminants, non-metal contaminants, natural toxicants, and mercury specified in Schedule 19 of the Australia New Zealand Food Standards Code as in force from time to time; or * the background water quality level, where the above levels are unattainable due to existing background water quality level or the background water quality level better protects aquaculture. |
| Industrial and commercial | Surface receiving waters will not be affected to the extent that the water is unsuitable for the commercial or industrial purposes for which it is used. |
| Water-based recreation | Surface receiving waters will not be affected to the extent that the level of any water quality indicator exceeds the level specified or fails to meet the required description in relevant guidance, including the Recreational Water Guidelines.  Surface receiving waters will not be affected to the extent that the level of any microbial water quality objective exceeds levels specified in the ERS or site specific objectives, if required to be developed. |
| Traditional owner cultural values | Water quality that protects the cultural values of Traditional Owners in line with indicators and objectives outlined in the ERS and developed in consultation with Traditional Owners. |

[superseded Table 6-1]



Kalbar Operations Pty Ltd Fingerboards Mineral Sands

Table 6-2: Environmental quality objectives (Environment Reference Standard

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Segment** | **Total P (µg/L)** | **Total N (µg/L)** | **Dissolved oxygen (% sat)** | | **Turbidity (NTU)** | **Total Suspended Solids**  **(mg/L)** | **Electrical conductivity**  **(µS/cm)** | **Salinity (PSU)** | | **pH (units)** | | **Toxicants (water)** |
|  | 75th  percentile | 75th  percentile | 25th  percentile | Maximum | 75th  percentile | 75th  percentile | 75th  percentile | 25th  percentile | 75th  percentile | 25th  percentile | 75th  percentile | % protection (2) |
| Central Foothills and Coastal Plains | ≤55 | ≤1100 | ≥75 | 130 | ≤25 | - | ≤250 | - | - | ≥6.7 | ≤7.7 | 95 |
| Wetland |  |  |  |  |  |  |  |  |  |  |  |  |
| Estuaries | 90 | 1000 | 30 | 130 | 10 | - | - | - | - | 7.0 | 8.0 | 95 |
| **Gippsland Lakes** |  |  |  |  |  |  |  |  |  |  |  |  |
| Lake Wellington | 120 | 1000 | 95 | 130 | - | 30 | - | NA | 15 | 7.5 | 8.5 | 95 |
| Lake Victoria (1) | 90 | 600 | 95 | 130 | - | 10 | - | 15 | 25 | 7.5 | 8.5 | 95 |
| Lake King (1) | 50 | 500 | 95 | 130 | - | 5 | - | 20 | 30 | 7.5 | 8.5 | 95 |
| Lake Reeve (3) | R75 | R75 | R25 | R75 | - | R75 | - | R25 | R75 | R25 | R75 | 95 |
| **Exchange (1)** | 50 | 500 | 95 | 130 | - | 5 | - | 20 | 30 | 7.5 | 8.5 | 95 |

1. – Water quality indicators and objectives for ‘surface’ water listed. Refer Environment Reference Standard for additional criteria for deeper ‘bottom’ water.
2. – ‘% protection’ refers to the species protection levels in ANZG.
3. – Refer to Environment Reference Standard for further explanation of criteria.
4. – In this Table ‘R’ means ‘riffle’.

# Controls to address hazard [refer to updated Mitigation Register, below superseded] [EPA Comment: EPA assumes that the third column “performance measures” in this table will remain in this risk treatment plan (despite not being shown in the Mitigation Register). EPA has sought and received a compare of Table 7-1 against the Mitigation Register (as there were differences). EPA will review that compare and provide any additional comments if necessary.]

The controls listed in [Table 7-1](#_bookmark12) will be implemented in order to minimise adverse impacts on environmental values of surface water from activities conducted within the mining licence area. Controls and performance measures for hazards associated with changes in groundwater quality or groundwater hydrology are listed in [Table 7-2.](#_bookmark13)

[EPA Comment: additional mitigation measures may be required to minimise the risk of harm to human health or the environment to the extent reasonably practicable. These additional measures may evolve overtime as the state of knowledge evolves]

Table 7-1: Controls and associated performance measures (surface water)

|  |  |  |
| --- | --- | --- |
| **#** | **Details of controls** | **Performance measures** |
| SW01 | Surface water will be extracted from the Mitchell River in line with the conditions, timings, and limits detailed in any licence issued by Southern Rural Water. | Water pumping data, annual compliance reports. |
| SW02 | The design and placement of infrastructure in the project area will consider potential for flow accumulation and increased flood risk. | Design reports, licence application documentation, as-built reports |
| SW03\* | Mine contact water from outside of the mine void or tailings dam that is retained in water management dams will be offset by releasing the same volume of fresh water from the fresh water storage dam. Water will be released downstream of the project area (to the Perry River catchment) or directly to the Mitchell River via the pipeline from the freshwater dam. | Dam water level records, site water balance, site meteorological data, discharge data, annual compliance report. |
| SW04 | A Water Risk Treatment Plan will be developed and implemented to minimise discharge of stormwater from the construction areas. | Implementation of this plan. |
| SW04 a | Surface runoff will be directed around or away from areas of land disturbance, stockpiles, embankments or nearby sensitive areas, where practicable. | Mine plan, site drainage plan and designs, as-built reports. |
| SW04b | Runoff that comes into contact with construction areas will be captured by surface water management infrastructure and directed to sedimentation dams. If required, water treatment (i.e., alum, gypsum or hydrated lime) will be used to drop suspended sediment levels in the stormwater. | Mine plan, site drainage plan and designs, as-built reports. |
| SW04c | Erosion within gullies will be controlled using primary and secondary sediment traps constructed at appropriate sites. | Records of sediment accumulation in detention structures; observations of gully / rill erosion. |
| SW04d | Catchment water onsite will be retained to approximately 3.3% annual-exceedance-probability. | Meteorological records; dam water levels and discharge records. |
| SW04e | All site drains will be designed and profiled to reduce water flow velocity, to reduce erosion | Mine plan, site drainage plan and designs, as-built reports; routine erosion |
| SW05 | Freeboards on the fresh water storage dam, process water dam and sedimentation ponds will be maintained to allow for storm events and high rainfall periods, in accordance with relevant licence, permit and approval requirements. | Meteorological records; dam water levels and discharge records. |

|  |  |  |
| --- | --- | --- |
| **#** | **Details of controls** | **Performance measures** |
| SW06 | Where infrastructure, such as dams and haul roads, are to be installed on or in close proximity to a watercourse, these areas will be inspected for nearby stream bed instability prior to construction | Design reports, inspection records. |
| SW07 | If required, bed instability should be addressed though appropriately designed grade controls, such as the use of rock chutes. | Inspection records, design reports, as- built reports, routine erosion observations. |
| SW08 | All stream bed instability areas should be inspected prior to, and annually during construction to ascertain a rate of movement and potential risks posed to mine infrastructure. | Inspection records, design reports, as- built reports, routine erosion observations. |
| SW09 | Surface water management infrastructure designed to capture run- off (and eroded sediments) will be maintained until such a time that vegetation is sufficiently established to control landscape erosion. | Records of sediment accumulation in detention structures; observations of gully / rill erosion. |
| SW10 & RH23 | Stockpile slope angles will be constructed as low as practicable and seeding or mulch materials and contour ripping will be strategically used to stabilise stockpiles, prevent runoff and minimise erosion. | Standard operating procedures, records of sediment accumulation in detention structures |
| SW11 | A daily water balance approach will be applied to dam design to achieve a probability of spillway activation of once per 100 years on average (1% average-exceedance probability) for Perry River catchments, and three times per 100 years on average (3.3% average-exceedance probability) for Mitchell River catchments. | Design and as-built reports |
| SW12 | The design, construction and operation of the freshwater storage dam will follow the Australian National Committee on Large Dams (ANCOLD) Guidelines on the Consequence Categories for Dams (October 2012 – or subsequent revisions). | Design and as-built reports, operating records, annual inspection reports. |
| GW04 | Limited quantities of chemical will be stored on site. Any hazardous materials, such as laboratory chemicals, will be stored in designated areas in accordance with their safety data sheets. | Chemicals inventory records; materials safety data sheets. |
| GW11 | Spills of fuels or chemical will be managed in accordance with requirements set out in the Spill Response and Clean-up Procedure. | Standard operating procedures; materials safety data sheets; incident reports. |
| GW05 | Handling of concentrated flocculant and any hazardous materials will be done in accordance with safety data sheet recommendations. | Standard operating procedures; materials safety data sheets |
| GW12 | Hazardous materials will be transported in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2018). | Transport manifests |
| GW06 | Hazardous waste will be removed from site by a licensed contractor for treatment or disposal in an approved facility in accordance with the requirements. | Procurement documentation; waste cartage and disposal records. |

|  |  |  |
| --- | --- | --- |
| **#** | **Details of controls** | **Performance measures** |
| GW08 | Inductions and training will be provided to all relevant project personnel on the safe storage, handling and transport of dangerous goods and in emergency management. | Induction records; emergency response and dangerous goods handling training records |
| TE26 | Bunding for the fuel storage area (fuel farm) will be in accordance with Australian Standard 1940:2017 (Standards Australia, 2004). The capacity (i.e., bund height), storage, stormwater control and maintenance, and operation of bunded areas will comply with EPA liquid storage and handling guidelines (EPA, 2018). | Design report; as-built report. |
| TE41 | Areas used for handling and/or storage of hazardous materials will be appropriately bunded and contain spill response equipment. | Design report; as-built report; compliance with spill response procedure |
| SW21 | Rainfall runoff water from vehicle workshops, vehicle service areas and refuelling areas will be captured and directed to an interceptor trap to extract hydrocarbons, prior to it being discharged to the drain and sump network. The trap will be emptied of hydrocarbons routinely by a licensed contractor for disposal offsite at a license facility. | Drainage design and as-built report; waste cartage and disposal records |
| SW22 | Water draining from in-pit tailings will be managed using sumps and underdrains to capture and reuse seepage. | Records of water recovery / transfer; groundwater monitoring records |
| SW23 | The project will recover and reuse water where practicable (such as run-off from ore stockpiles and water recovered from the in pit tailings storage) and optimise operations to maximise water use efficiency. | Water balance, dam water level records, meteorological records, plant production records |
| SW24 | Where practical, undisturbed water will be diverted around disturbance areas to prevent clean surface water from entering the site and becoming contaminated. | Drainage design report; as-built reports. |
| SW25 | Wastewater from ablutions and the office will be treated with a wastewater treatment system. There will be sufficient capacity to cater for the operations workforce and visitors. | Wastewater treatment plant design specification; effluent monitoring records. |
| SW26 | All waste excluding septic waste will be removed from site and disposed of by licensed contractors. | Procurement documentation; waste cartage and disposal records. |
| SW27 | Waste hydrocarbons will be stored in suitable containers for removal from the mine site for disposal at either an EPA-approved hydrocarbon waste site or a recycling depot. | Waste inventory; waste cartage and disposal records. |
|  |  |  |
| SW29\* | Permanent and long-term drains and bund walls will be topsoiled and vegetated with suitable vegetation as soon as possible. | Rehabilitation reports. |

|  |  |  |
| --- | --- | --- |
| **#** | **Details of controls** | **Performance measures** |
| SW30 | Appropriate outlet scour protection will be placed on all stormwater outlets, chutes, spillways and slope drains to dissipate flow energy and minimise risk of soil erosion. | Drainage design report and as-built reports; erosion monitoring records; records of sediment accumulation in  detention ponds. |
| SW32 | Mine contact water management dams within the Perry River catchment will be emptied as a priority over those located in the Mitchell River catchment to reduce potential water quality impacts to the Perry River catchment. | Site water balance; dam water level records. |
| SW33\* | If during successive storm events water management dams are required to be drawn down at a rate greater than can be achieved by the process water demand, mine contact water will be treated at a rate of 24 ML/day prior to discharge to the freshwater dam. Mine contact water will be treated to a level that is acceptable for discharge to the Mitchell River. | Treated water quality test results |
| SW34\* | Revegetate ephemeral drainage gullies in areas downstream of future mining activities prior to operations commencing to mitigate current instability and to increase stability of landscape during and post mining. | Rehabilitation records |
| SW35 | An adaptive management strategy will be implemented, based on water quality and quantity monitoring results, to determine whether offset water that would typically be returned to the Mitchell River may be directed to ephemeral drainage gullies in a controlled manner. | Results of waterways health assessments and drainage line stability monitoring; periodic reviews of this risk treatment plan |
| SW36 | Aquatic and riparian vegetation will be established in minor waterways between water management dams and major receiving waterways to reduce potential water quality impacts from the release of mine contact water. | Rehabilitation records; results of waterways health assessments |
| SW37 | Natural surface water drainage courses will be re-routed to avoid post-mining landforms, where practicable. | Rehabilitation design and construction reports |
| SW38 | Surface water ponding on post-mining landforms will be avoided, where practicable, through appropriate slope profile design and topsoil treatments. | Rehabilitation design and construction reports |
| SW39 | The downhill side of containment structures, such as surface water drains and road batters, will undergo soil conditioning and be spread with topsoil and revegetated as soon as practicable to minimise erosion and sediment laden runoff. | Rehabilitation records, results of waterways health assessments and drainage line stability monitoring |
| SW40 | Sediment traps and dams will be cleaned at regular intervals, and following storm events and high rainfall events, to maintain the efficiency of the infrastructure. | Maintenance schedule and maintenance reports; dam capacity surveys |

Table 7-2: Controls and associated performance measures (groundwater)

|  |  |  |
| --- | --- | --- |
| **#** |  |  |
|  | **Details of controls** | **Performance measures** |
| GW01 | The freshwater dam and contingency water storage dams will be constructed with engineered liners to reduce infiltration to groundwater. | Dam design report; liner specification; as- built reports |
| GW02 | Groundwater will be extracted from the Latrobe Group aquifer in line with the conditions, timings, and limits detailed in a licence issued by Southern Rural Water. | Water metering data; water meter calibration certificates; annual compliance reports |
| TE26 | Bunding for the fuel storage area (fuel farm) will be in accordance with Australian Standard 1940:2017). The capacity (i.e., bund height), storage, stormwater control and maintenance, and operation of bunded areas will comply with EPA liquid storage and handling guidelines (EPA, 2018). | Bunding design and as-built reports; annual environmental compliance reports. |
| GW04a | Limited quantities of chemical will be stored on site. Any hazardous materials, such as laboratory chemicals, will be stored in designated areas in accordance with their safety data sheets. | Chemicals inventory records; materials safety data sheets. |
| GW05 | Handling of concentrated flocculant and any hazardous materials  will be done in accordance with safety data sheet recommendations. | Standard operating procedures; materials  safety data sheets; incident reports. |
| GW06 | Hazardous waste will be removed from site by a licensed contractor for treatment or disposal in an approved facility in accordance with the requirements. | Procurement documentation; waste cartage and disposal records. |
| TE41 | Areas used for handling and/or storage of concentrated flocculent and other hazardous materials will be appropriately bunded and contain spill response equipment. | Bunding design and as-built reports; spill response procedure; emergency response training records. |
| GW08 | Inductions and training will be provided to all relevant project  personnel on the safe storage, handling and transport of dangerous goods and in emergency management. | Hazardous materials procedure; spill  response procedure; emergency response training records. |
| GW09 | Waste will be removed from the site and disposed of by licensed contractors (except for septic effluent approved for disposal by irrigation). | Procurement documentation; waste cartage and disposal records. |
| GW10 | Waste hydrocarbons will be stored in suitable containers for removal from the mine site for disposal at either an EPA-approved hydrocarbon waste site or a recycling depot. | Waste inventory; waste cartage and disposal records. |
| GW11 | Spills of fuels or chemical will be managed in accordance with requirements set out in the Spill Response and Clean-up Procedure. | Standard operating procedures; materials safety data sheets; incident reports. |
| GW12 | Hazardous material will be transported in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2018). | Transport manifests. |
| SW22 | Water draining from in-pit tailings will be managed using sumps and underdrains to capture and reuse seepage. | Records of water recovery / transfer; groundwater monitoring records |
| GW15 | Management techniques, such as underdrains, sumps and water recovery pumps will be used to maximise the recovery of water in the mine void tailings containment cells. | Operational monitoring records; site water balance. |

|  |  |  |
| --- | --- | --- |
| **#** |  |  |
|  | **Details of controls** | **Performance measures** |
| GW16 | The open voids will be progressively backfilled with sand tailings  and clay/silt tailings which will then be covered with overburden, subsoil and, in areas other than Grassy Woodland revegetation, topsoil. Revegetation with crop/pasture or native vegetation will be undertaken where required. | Rehabilitation records. |

[Table 7-3 now superseded, with content covered elsewhere (including updated Appendix H, Mitigation Measures and updated EMF]



# Residual risk assessment

Table 8-1: Residual risk ratings – water quality and hydrology [EPA Comment: EPA repeats its comment in relation to Table 3-1 above]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | **Details of risk event monitored** | **Phase** | **Consequence** | **Likelihood** | **Residual risk rating** |
| 1 | Runoff from stockpiles or disturbed / rehabilitated areas: Sedimentation increases water turbidity and harms aquatic species | C, O, CL | Moderate | Unlikely | Medium |
| 2 | Discharge from contact water dams (via spillway): Sedimentation increases water turbidity and harms aquatic species | O, CL | Minor | Rare | Low |
| 3 | Discharge from contact water dam (via spillway): Increase in metals or radionuclides or change in receiving water pH harms aquatic species or human health | O, CL | Insignificant | Unlikely | Low |
| 4 | Release of stored water as a result of failure of contact water dam(s): Sedimentation increases water turbidity and harms aquatic species | O, CL | Moderate | Rare | Medium |
| 5 | Discharge from process water dam (via spillway): Sedimentation increases water turbidity and harms aquatic species | O | Moderate | Rare | Medium |
| 6 | Release of turbid water as a result of process water dam overtopping event: Sedimentation increases water turbidity and harms aquatic species | O | Moderate | Rare | Medium |
| 7 | Discharge from process water dam (via spillway): Increase in metals or radionuclides or change in receiving water pH harms aquatic species | O | Moderate | Rare | Medium |
| 8 | Altered site hydrology results in increased rate of erosion in natural drainage lines downstream of project: Sedimentation increases water turbidity and harms aquatic species | O, CL | Moderate | Rare | Medium |
| 9 | Capture of water in mine contact water dams: Reduced frequency / magnitude of flow down drainage lines results in modifications to riparian systems along drainage lines - Mitchell system | O, CL | Minor | Unlikey | Low |
| 10 | Capture of water in mine contact water dams: Reduced frequency / magnitude of flow down drainage lines results in modifications to riparian systems along drainage lines – Perry system | O, CL | Minor | Unlikey | Low |
| 11 | Seepage from tailings in mine void: Groundwater seepage compromises geotechnical stability of surrounding areas | O, CL | Major | Rare | Medium |
| 12 | Seepage from tailings in mine void: Groundwater seepage increases risk of tunnel erosion in surrounding areas | O, CL | Major | Rare | Medium |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # | **Details of risk event monitored** | **Phase** | **Consequence** | **Likelihood** | **Residual risk rating** |
| 13 | Seepage from process water dam or freshwater storage dam: Groundwater seepage reduces geotechnical stability of surrounding areas | O | Moderate | Rare | Medium |
| 14 | Seepage from process water dam or freshwater storage dam: Groundwater seepage increases risk of tunnel erosion in surrounding areas | O | Moderate | Rare | Medium |
| 15 | Tunnel erosion compromises stability of water storage structures: Sediment discharge to surface water | O, CL | Major | Rare | Medium |
| 16 | Water erosion near active pit void: Initiation of slope instability | O | Major | Rare | Medium |
| 17 | Use of inappropriate materials in constructed landforms: Slope instability: loss of containment from constructed landforms | O, CL, PC | Moderate | Unlikely | Medium |
| 18 | Surface water runoff erodes bare surface: Gullyng / tunnel erosion results in loss of land productivity | O, CL, PC | Moderate | Unlikely | Medium |
| 19 | Surface water runoff erodes bare surface: Erosion and sediment mobilisation: loss of soil fertility and decline in land productivity | O, CL, PC | Moderate | Unlikely | Medium |

Note: ‘C’ = construction; ‘O’ = operations; ‘CL’ = decommissioning and closure; ‘PC’ = post-closure

# Monitoring [EPA Comment: additional monitoring requirements may be imposed via any development or operating licence]

The purpose of environmental monitoring for the project is to verify impact predictions made in this report and to demonstrate regulatory and licensing compliance. Corrective action will be taken should monitoring indicate that management measures are not effective. [EPA Comment: Where are corrective actions intended to be documented? EPA understands there won’t be any sub-plans, therefore potential corrective actions should be added into this water risk treatment plan]. Monitoring will also inform day-to-day operation of the mine and will enable periodic updating of this risk treatment plan and the hydrological models upon which it is based.

Monitoring required to check the effectiveness of controls aimed at limiting impacts on surface water quality and surface water hydrology is summarised in [Table 9-1.](#_bookmark17) Monitoring required to check the effectiveness of controls aimed at limiting impacts on groundwater is summarised in [Table 9-1](#_bookmark17).

Table 9-1: Proposed monitoring for surface water

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Aspect to be monitored** | **Details of monitoring** | | |
| **Receptor** | **Monitoring points** | **Frequency** |
| 1 | Flow rate - preconstruction | Mitchell River | DELWP gauging stations | Daily |
| 2 | Water quality - preconstruction | Mitchell River | As a minimum suspended sediments (or turbidity), heavy metals, nutrients, dissolved oxygen, pH and salinity.  MR01 to MR05 | Quarterly |
| 3 | Water quality - preconstruction | Perry River | As a minimum suspended sediments (or turbidity), heavy metals, nutrients, dissolved oxygen, pH and salinity.  Two locations – to be agreed with regulators | Quarterly |
| 4 | Flow rate - preconstruction | On-site ephemeral catchments | Initially at Honeysuckle Creek Eastern Tributary, Moulin Creek Tributary #3, and Perry Gully. | Continuous (via data loggers) |
| 5 | Water quality - preconstruction | On-site ephemeral catchments | Initially at Honeysuckle Creek Eastern Tributary, Moulin Creek Tributary #3, and Perry Gully. | Twice per year (if water is present) |
| 6 | Drainage line stability – visual evidence of gullying or other instability | On-site ephemeral catchments | Initially at Honeysuckle Creek Eastern  Tributary, Moulin Creek Tributary #3, and Perry Gully, thereafter. three points in gullies affected by or going to be affected  by mining | Annually and prior to finalizing any  infrastructure design where asset lies within 100 m of an existing drainage line. |
| 7 | Water quality during construction, operations and active rehabilitation phases | Mitchell River | As a minimum suspended sediments (or turbidity), heavy metals, nutrients, dissolved oxygen, pH and salinity.  MR01 to MR05 [EPA Comment: Please confirm which plan/map these points are identified on and that these monitoring points are upstream and downstream of the mine] | Every two months initially, moving to  quarterly thereafter with agreement from regulator. |
| 8 | River flow rates during construction, operations and active rehabilitation phases | Mitchell River | DELWP gauging stations | Daily |
| 9 | Water extraction (winterfill) during construction, operations and active rehabilitation phases | Mitchell River | At water extraction point | Daily when pump is operating |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Aspect to be monitored** | **Details of monitoring** | | |
| **Receptor** | **Monitoring points** | **Frequency** |
| 10 | Water quality during construction, operations and active rehabilitation phases | Perry River | As a minimum suspended sediments (or turbidity), heavy metals, nutrients, dissolved oxygen, pH and salinity.  Two locations (one location upstream and one downstream of the confluence of Honeysuckle Creek and the Perry  River) – to be agreed with regulators | Every two months initially, moving to  quarterly thereafter with agreement from regulator. |
| 11 | Water quality during construction, operations and active rehabilitation phases | Onsite: disturbed catchments | Two locations with ineach impacted drainage line – to be agreed with regulators | Every two months (if water is present) |
| 12 | Water quality following significant rainfall events during construction, operations and active rehabilitation phases | Onsite: undisturbed catchments | SW01, SW02, SW03, SW04, SW05, SW06 | When rainfall received at mine site exceeds 60 mm within a 24 hour period (corresponding approximately to a 1 year ARI event), assuming water is available to  sample. |
| 13 | Water quality discharged from water storages [EPA Comment: How does this relate to items 20 and 21? What water will be discharged from water storages other than that set out in items 20 and 21?] | Varies, depending upon discharge point | Point of discharge, nearest accessible point to receiving water and (if  applicable), upstream of water storage. | At least daily during discharge and for minimum of 5 days at upstream and  downstream sampling locations following  cessation of discharge. |
| 14 | Water quality in mine contact water dams | -- | One designated sampling point for each dam. | Twice yearly and no less than 72 hrs before any discharge event. [EPA Comment: What discharge event is this referring to which is not covered by items 20 and 21?] |
| 15 | Quantity of water intercepted by or stored in mine contact water dams | -- | Water level indicator post at each dam. | Daily input to site water balance |
| 16 | Sediment detention ponds – sediment accumulation | -- | Observations of quantity of sediment in detention ponds | Twice yearly, including one event prior at end October each year. |
| 17 | Sediment detention ponds – water quality | -- | Field and laboratory testing of water quality in ponds | Twice yearly |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Aspect to be monitored** | **Details of monitoring** | | |
| **Receptor** | **Monitoring points** | **Frequency** |
| 18 | Structured observations to assess  stability / health of waterways within / immediately adjacent to operational  areas | Perry Gully; Simpsons Gully; Lucas Creek; Long Marsh Gully; Moilun Creek and an unnamed tributary of Honeysuckle Creek | At furthest accessible downstream point within mining licence area. | 2-yearly and following any major rainfall events (72 hr rainfall exceeds 136 mm, corresponding approximately to a 1 in 5 year 72 hour event. |
| 19 | Quantity of water released from  freshwater dam to offset surface water intercepted in mine contact water  dams | Mitchell River | At licensed discharge point(s) specified in EPA development licence. | Daily during periods of water discharge. |
| 20 | Quality of water released from  freshwater dam to offset surface water intercepted in mine contact water  dams [EPA Comment: How does this relate to items 13 and 21? If it is the same, EPA recommends the details as per item 21 are adopted] | Mitchell River | At licensed discharge point(s) specified in EPA development and operating licence. | Daily during periods of water discharge. |
| 21 | Quality of water released to Mitchel River from freshwater dam | Mitchell River | Within dam, at point of discharge, downstream and upstream | Monitoring would be carried out at least daily during discharge and for minimum of 5 days at upstream and downstream sampling locations following cessation of discharge. |

Table 9-2: Proposed monitoring for groundwater

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Aspect to be monitored** | **Details of monitoring** | | |
| **Receptor** | **Monitoring points** | **Frequency** |
| 1 | Groundwater levels - preconstruction | Groundwater aquifers within the Coongulmerang, Balook, and Seaspray Formations and in the Latrobe Group. | Designated monitoring bores constructed in the Coongulmerang; Balook (2), Seaspray and Latrobe Group aquifers  [inappropriate to specify precise number of monitoring bores at this stage] | Monthly |
| 2 | Groundwater quality - preconstruction | Groundwater aquifers within the Coongulmerang, Balook, and Seaspray Formations  and in the Latrobe Group. | pH, salinity, dissolved metals, radionuclides, major  cations and anions, nutrients at designated monitoring bores constructed in the Coongulmerang ;  Balook , Seaspray and Latrobe Group aquifers | Quarterly |
| 3 | Groundwater levels in Coongulmerang and Balook Formations | Coongulmerang Formation, Balook Formation and groundwater dependent ecosystems | Twelve locations – to be agreed with requlators | Monthly |
| 4 | Groundwater quality in Coongulmerang and Balook Formations | Coongulmerang Formation, groundwater dependent ecosystems | pH, salinity, dissolved metals, radionuclides, major  cations and anions, nutrients at designated monitoring bores constructed in the Coongulmerang ;  Balook | Quarterly |
| 5 | Water extraction from production bores accessing water from the  Latrobe Group | Latrobe Group aquifer,  existing groundwater users | Water extraction records | Daily |
| 6 | Groundwater levels in water supply bores drawing on the Latrobe Group | Latrobe Group aquifer, existing groundwater users | Groundwater levels in monitoring network at production borefield – minimum of 5 monitoring bores. | Continuous water level monitoring via data loggers |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Aspect to be monitored** | **Details of monitoring** | | |
| **Receptor** | **Monitoring points** | **Frequency** |
| 7 | Water quality in water supply bores drawing on the Latrobe Group | Kalbar operations | pH, salinity, dissolved metals, radionuclides, major cations and anions at active production bores | Monthly monitoringof water discharge from borefield into the  contingency water dam |
| 9 | Water quality contractor’s work area and processing plant | Coongulmerang Formation | Water levels, pH, salinity, dissolved metals,  radionuclides, major cations and anions, nutrients and hydrocarbons at 6 designated shallow groundwater monitoring bores. | Quarterly |
| 10 | Water quality in process water dam | Coongulmerang Formation, groundwater dependent ecosystems | One designated sampling point | Monthly for first year reverting to quarterly if consistency is  demonstrated |
| 11 | Effluent quality discharged from WWTP [EPA Comment: If this is different to the DAF plant, What is the expected waste quantity discharge?] | Coongulmerang Formation | BOD5, suspended solids, E coli, and other parameters in discharged effluent, as specified in EPA works approval / licence ((if waste quantity triggers requirement for  licensing under EP Act). ). | As specified in approval |
| 12 | Quantity of treated sewage effluent [EPA Comment: As above] | Coongulmerang Formation | Discharge records at disposal points(if waste quantity triggers requirement for licensing under EP Act). ). | As specified in approval |
| 13 | Quantity and quality of tailings seepage | Coongulmerang Formation, groundwater dependent ecosystems | Pit void drainage system and if reasonably practicable prior to placement of tailings in the mine voids. | As specified in approval |

# Reporting

Table 10-1: Water quality and hydrology performance and compliance reporting

|  |  |  |  |
| --- | --- | --- | --- |
| # | Aspect being reported | To whom will the information be reported? At what frequency? | How will the information be used? |
| 1 | Mitchell River flow rate - preconstruction | Internal quarterly reporting – Fingerboards management team. | Input to site water supply  strategy and water balance. |
| 2 | Mitchell River water quality - preconstruction | Internal quarterly reporting – Fingerboards management team. | Input to future revisions of water risk management plan. |
| 3 | Perry River water quality - preconstruction | Internal quarterly reporting – Fingerboards management team. | Input to future revisions of water risk management plan. |
| 4 | On-site ephemeral catchments flow rate - preconstruction | Internal reporting (6-monthly)– Fingerboards design team. | Input to site drainage design and rehabilitation plan |
| 5 | On-site ephemeral  catchments water quality - preconstruction | Internal reporting (6-monthly)– Fingerboards design team and environmental compliance team. | Input to site drainage design and future revisions of water risk management plan |
| 6 | On-site ephemeral  catchments drainage line  stability – visual evidence of gullying or other instability | Internal reporting (6-monthly)– Fingerboards design team. | Input to site drainage design |
| 7 | Mitchell River - water quality during construction,  operations and active rehabilitation phases | Internal quarterly reporting – Fingerboards management team and Community Reference Group; annual reporting to ERR, EPA, other agencies | To demonstrate compliance with regulatory requirements; as  input to future revisions of water risk management plan. |
| 8 | Mitchell Riverflow rates during construction, operations and active rehabilitation phases | Internal quarterly reporting – Fingerboards management team | Input to site water supply  strategy and water balance. |
| 9 | Water extraction (winterfill) during construction,  operations and active rehabilitation phases | Internal quarterly reporting – Fingerboards management team and Community Reference Group; annual reporting to ERR, EPA, other agencies | To demonstrate compliance with regulatory requirements; as  input to water supply strategy and water balance. |
| 10 | Perry River water quality during construction, operations and active rehabilitation phases | Internal quarterly reporting – Fingerboards management team and Community Reference Group; annual reporting to ERR, EPA, other agencies | To demonstrate compliance with regulatory requirements; as  input to future revisions of water risk management plan. |
| 11 | Onsite undisturbed  catchments: water quality during construction, operations and active rehabilitation phases | Internal quarterly reporting – Fingerboards management team and Community Reference Group; annual reporting to ERR, EPA, other agencies | To demonstrate compliance with regulatory requirements; as  input to future revisions of water risk management plan. |

|  |  |  |  |
| --- | --- | --- | --- |
| # | Aspect being reported | To whom will the information be reported? At what frequency? | How will the information be used? |
| 12 | Onsite undisturbed  catchments water quality following significant rainfall events during construction, operations and active  rehabilitation phases | Internal quarterly reporting – Fingerboards management team and Community Reference Group; annual reporting to ERR, EPA, other agencies | To demonstrate compliance with regulatory requirements; as  input to future revisions of  water riskmanagement plan. |
| 13 | Water quality discharged from water storages | Internal reporting to Fingerboards senior management, SRW, EGCMA, EPA and other regulators within 48 hours of discharge event; if appropriate (major uncontrolled release), immediate notification to emergency response organisations and downstream communities. | To guide incident responses; compliance reporting |
| 14 | Water quality in mine  contact water dams (prior to discharge event) | Fingerboards senior management, EPA and EGCMA – at least 48 hrs prior to planned discharge. [EPA Comment: What “planned discharge” from mine contact water dams is this referring to?] | To guide incident responses; compliance reporting |
| 15 | Quantity of water in mine contact water dams | Internal quarterly reporting – Fingerboards management team; annual reporting to SRW on quantities of water intercepted and offset | To demonstrate compliance with regulatory requirements; to  inform operational water  management and planning; use for calibration of site  hydrological modelling |
| 16 | Quantity and quality of water released from freshwater dam to Mitchell River | Monthly internal reporting – Fingerboards management team; annual reporting to SRW and EPA on quantities and quality of water  intercepted and offset [EPA Comment: specifics on reporting to EPA to be included in any development licence] | To demonstrate compliance with regulatory requirements; to  inform operational water  management and planning; use for calibration of site  hydrological modelling |
| 17 | Sediment detention ponds – sediment accumulation | Internal 6-monthlyreporting – Fingerboards management team | To inform drainage design; use to check modelled erosion predictions; to guide  maintenance scheduling. |
| 18 | Sediment detention ponds – water quality | Internal 6-monthlyreporting – Fingerboards management team | To inform drainage design; use to check modelled water quality predictions; to inform water treatment procedures; to guide future revisions of risk  management plan |
| 19 | Structured observations to assess stability / health of waterways within /  Immediately adjacent to operational areas | 2-yearly reporting to Fingerboards  management team, Community Reference Group, ERR, EGCMA | Check on effectiveness of water management controls, input to future revisions of water risk management plan and miner rehabilitation plan |

|  |  |  |  |
| --- | --- | --- | --- |
| # | Aspect being reported | To whom will the information be reported? At what frequency? | How will the information be used? |
| 20 | Groundwater levels - preconstruction | Six-monthly reporting to environmental permitting and compliance team. | Augment baseline groundwater hydrological knowledge; input to future revisions of water risk treatment plan. |
| 21 | Groundwater quality - preconstruction | Six-monthly reporting to environmental permitting and compliance team. | Augment baseline groundwater hydrological knowledge; input to future revisions of water risk treatment plan. |
| 22 | Groundwater levels in Coongulmerang and Balook Formations | Quarterly reporting to Fingerboards management team and Community Reference Group. | Inform mine planning; use to update site groundwater model, including predicted impact of in- pit tailings placement |
| 23 | Groundwater quality in Coongulmerang and Balook Formations | Quarterly reporting to Fingerboards management team and Community Reference Group. | Inform mine planning; use to update site groundwater model, including predicted impact of in- pit tailings placement |
| 24 | Water extraction from production bores accessing water from the Latrobe Group | Monthly reporting to Fingerboards  management team; quarterly reporting to Community Reference Group; annual environmental compliance reports to regulators, including SRW. | To demonstrate compliance with licence conditions; to guide  water management strategy. |
| 25 | Groundwater levels in water supply bores drawing on the Latrobe Group | Monthly reporting to Fingerboards  management team; quarterly reporting to Community Reference Group; annual environmental compliance reports to regulators, including SRW. | To demonstrate compliance with licence conditions; and to inform mine water planning; use to update site groundwater model |
| 26 | Water quality in water  supply bores drawing on the Latrobe Group | Quarterly reporting to Fingerboards processing manager; annual environmental compliance reports to regulators, including SRW. | To demonstrate compliance with licence conditions; andt o  confirm suitability of process water supply |
| 28 | Water quality beneath the contractor’s work area and processing plant | Quarterly reporting to Fingerboards  management team; quarterly reporting to Community Reference Group; annual environmental compliance reports to regulators | Demonstrate compliance |
| 29 | Water quality in process water dam | Quarterly reporting to Fingerboards processing manager | Confirm suitability of process water supply |

|  |  |  |  |
| --- | --- | --- | --- |
| # | Aspect being reported | To whom will the information be reported? At what frequency? | How will the information be used? |
| 31 | Effluent quality discharged from WWTP [EPA Comment: If this is different to the DAF plant, What is the expected waste quantity discharge?] | Monthly reporting to environmental  superintendent, maintenance manager;  annual reporting to EPA(if waste quantity triggers requirement for licensing under EP Act). | Check adequate functioning of WWTP; inform maintenance  schedule; demonstrate statutory  compliance. |
| 32 | Quantity of treated sewage effluent [EPA Comment: As above] | Monthly reporting to environmental  superintendent; annual reporting to EPA(if waste quantity triggers requirement for  licensing under EP Act). . | To demonstrate statutory compliance. |
| 33 | Quantity and quality of water intercepted by in-pit seepage collection system. | Monthly reporting to Fingerboards management team; quarterly reporting to Community Reference Group; annual environmental compliance reports to regulators, including SRW. [EPA Comment: specifics on reporting to EPA to be included in any development licence] | To demonstrate compliance and to inform water balance and guide water management strategy. |

Note 2: # may not appear in the table as risks have been removed with the removal of the TSF

# References

ANZECC/ARMCANZ. 2000 (updated 2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council.

DEDJTR, 2017. Technical Guideline Design and Management of Tailings Storage Facilities. Department of Economic Development, Jobs, Transport and Resources. Melbourne, Victoria.

DELWP, 2018a. Index of Stream Condition - The Third Benchmark of Victorian River Condition. https://[www.water.vic.gov.au/water-reporting/third-index-of-stream-condition-report](http://www.water.vic.gov.au/water-reporting/third-index-of-stream-condition-report) Department of Environment, Land, Water and Planning. Melbourne, Victoria.

EMM, 2020a. Fingerboards Mineral Sands Project, Conceptual Surface Water Management Strategy and Water Balance. Report prepared for Kalbar Operations Pty Ltd.

EMM, 2020b. Fingerboards Groundwater Modelling Report. In support of the Environmental Effects Statement. Prepared for Kalbar Operations Pty Ltd April 2020

National Transport Commission, 2018. Australian Code for the Transport of Dangerous Goods by Road & Rail Edition 7.6.

Standards Australia, 2017. AS 1940:2017, The storage and handling of flammable and combustible liquids.

Environmental Protection Act 2017 – Environmental Reference Standards

Water Technology, 2020a. Fingerboards Mineral Sands. Revised Landscape Stability and Sediment Transport Regime Assessment.

Water Technology, 2020b. Fingerboards Mineral Sands. Surface Water Assessment – Site Study. Water Technology, 202-c. Fingerboards Mineral Sands. Surface Water Assessment – Regional Study.

# Kalbar reference documents

[To be completed when EMS is fully developed] Table 12-1: Kalbar reference documents

|  |  |
| --- | --- |
| **#** | **Document** |
| 1 |  |
| 2 |  |
| 3 |  |