

Barrytown Mineral Sand Operation – Southern Block

Water Management,

Monitoring and Effects Management Plan

Tāiko Critical Minerals Ltd

25/05/2026

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Version control and source information

Date	Report no	Issue notes
13/06/2025	Z24011BTS-2	KSL re-drafting and revision of previous draft report number 2
18/02/2026	Z24011BTS-3_Rev1	*de novo* Water Management Plan (WMP) and Monitoring & Effects Management Plan for Southern Block FTAA applications by Jens Rekker
18/03/2026	Z24011BTS-3_Rev2	Revised WMP – MEMP Report for client
25/05/2026	Z24011BTS-3_FIN-B	Final draft of WMP - MEMP

Note: Re-numbering of reports on Barrytown South project. Originally BTS-1 Assessment and BTS-2 WMP-MEMP and final copies provided to client. Then project relaunched in December 2025. Subsequently numbering undertaken with BTS-2 Assessment and BTS-3 WMP to distinguish from previous reports.

Limitations

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Glossary of Acronyms

TCM Tāiko Critical Minerals, the applicant – formerly TiGa Minerals and Metals

WMP Water Management Plan

MEMP Monitoring & Effects Management Plan

CB Central Block, formerly the CRB or Nikau Deer Farm block

SB Southern Block, including Mining Sections 1, 2, and 3 from north to south

WCP Wet Concentrator Plant

MWF Mine Water Facility attached to WCP for treating water prior to returning to the mine water circuit

HMC Heavy Mineral Concentrate concentrated at the WCP and dispatched by road to the Mineral Separation Plant (MSP) at Rapahoe

ESCP Erosion & Sediment Control Plan, a plan for minimising mine site erosion, sedimentation and turbidity

ROM Run of Mine, or run of mine ore material

MIW Mine Impacted Water

FTAA Fast-Track Approvals Act 2024

RMA Resource Management Act 1991

AEE Assessment of Environmental Effects (component technical assessments are 'assessment documents')

SH6 State Highway Six

WCRC West Coast Regional Council, the regional authority for the West Coast including the Barrytown Flats.

BGL Below Ground Level, height/depth relativity reference

RL Reference Level, often comparable to an elevation referenced to Mean Sea Level

AMSL Above Mean Sea Level

TOC Top of Casing reference point relative to bore, well or piezometer depth dimensioning

MHWS Mean High Water Springs, the highest point of tidal sea progression on the shore

MALF Mean Annual Low Flow, which is a flow statistic that characterises low flow in rivers or streams

$MALF_{7d}$ Mean Annual Low Flow Seven-days, a statistic that characterises low flow in rivers or streams

1. INTRODUCTION

1.1. Background

The Barrytown Flats in the Grey District, West Coast has a well-known mineral sand deposit (Burlet & Lee, 2019) with a history of exploration for minerals and metals, especially gold mining in the early 20th century until 1941. Alluvial gold mining of modern beach sediments as far inland as Mean High Water Springs (MHWS) is undertaken in present day along Pakiroa Beach fronting the Barrytown Flats.

Tāiko Critical Minerals Ltd (TCM) took a proposal to mine the Central Resource Block (CB) north of Canoe Creek to Grey District and West Coast Regional councils from 2022 to 2024, and the applications were granted consent to mine the CB after an appeal to the Environment Court was resolved by Consent Order. The Nikau Deer Farm Block (i.e., CB) forms the bulk of the currently planned sand mining proposals north of Canoe Creek, which are not the subject of this report but are referred to where relevant.

TCM is applying for approvals through the Fast-Track Approvals Act 2024 (FTAA) to undertake mineral sand mining across the coastal flats between approximately Canoe Creek and Fagan Creek, termed "Barrytown South" or the Southern Block (SB). The proposed mining approach would envisage a floating dredge excavating a groundwater filled dredge pond and feeding ore to slurry pipelines. The proposed sequence of sand mining would commence from north of Granite Creek and eventually progress to the south, terminating before reaching Fagan Creek. The pit alignment would follow a sinuous north – south orientation of movement within three distinct blocks,

- Mining Section 1: North of Granite Creek,
- Mining Section 2: Between Granite Creek and Cargill Road, and
- Mining Section 3: (South of) Cargill Road.

The proposed duration of mining activities would be approximately 14 years, excluding preparation and rehabilitation. The mining proposal would also include a Wet Concentrator Plant (WCP) to receive ore and separate the mineral sand as Heavy Mineral Concentrate (HMC) from the sand below the grade cut-off, before dispatching the HMC by road to a mineral processing site in Rapahoe, although a small quantity of reject material after mineral processing would return for emplacement in the tailings reception area. The WCP would also include a collocated Mine Water Facility (MWF) for the storage and treatment of Mine Impacted Water (MIW).

A management plan is required to set out how the operational mining and restoration activities in the SB will be managed to avoid adverse effects on the local hydrological environment and to provide a basis for developing operating procedures on the site.

1.2. Report purpose and scope

This report comprises two main components: a Water Management Plan (WMP) and a Monitoring and Effects Management Plan (MEMP), formerly known as a monitoring & mitigation management plan.

The purpose of the **WMP** is to define water management objectives and principles and present a management process which gives effect to these.

The purpose of the **MEMP** is to provide details of the monitoring that will be undertaken to determine whether the WMP objectives are being met and to set out the actions that will be undertaken if monitoring

results signal the potential for hydrological impacts to occur. In practise, these management plans are closely linked, and the more workable, abbreviated acronym for the plans would be WMP.

The scope of work is:

- Describe the aspects of the proposed activity which could cause hydrological effects.
- Describe roles and responsibilities.
- Define water management and monitoring and effects management objectives.
- Define water quality action thresholds and the activities that will be undertaken if the action thresholds are exceeded.

A separate Erosion and Sediment Control Plan (ESCP) has been developed and hence stormwater management and sediment control fall outside the scope of this document. The WMP and ESCP are closely related, however, and hence this document should be read in conjunction with the ESCP. Nonetheless, suspended sediment and turbidity monitoring is included within the monitoring section of this document.

2. DESCRIPTION OF ACTIVITY

The Fast-track application for the proposed operation provides the following description of the activity:

The proposed mining activity will involve the removal and preserving of topsoil, excavation of mineral sands by a floating dredge, which will be pumped to the onsite processing plant. Specifically the activities will entail:

1) Topsoil, approximately 0.2- 0.6m thick, and overburden will be removed and preserved (stockpiled) for rehabilitation using an excavator, and 45 tonne articulated trucks. This area will be approximately 1 ha. Once in mining sequence, topsoil will be removed ahead of mining and placed straight onto rehabilitated ground behind the mining pit. At any one time, up to 16 ha of disturbed land would be exposed.
2) A starter pit would be excavated, in Mining Section 1 within the SB (north of Granity Creek). A floating dredge and shore facilities would be erected and commissioned.
3) Once the mine starter pit has been constructed, the following steps will be undertaken to enable the extraction of ore:
    a) Removal of vegetation and wildlife checks (as above);
    b) Stripping of topsoil and overburden (as above);
    c) Diversion of streams and drains;
    d) Extraction of Run Of Mine (ROM) material;
    e) Initial screening of run of mine material and deposit of waste material in dredge pond;
    f) Pumping of run of mine material to WCP.

4) The sand ore will be mined *via* a floating dredge in a 1 ha pond in the mining void. The suction cutter on the dredge arm will cut away at the bank as mining progresses. The mined slurry will pass through a trommel and desliming circuit before being pumped to the WCP.

5) Reject large material from the trommel and slimes (small particles such as clay, mixed with water) will be returned to the rear of the mine pit, the tailings reception area.

6) Mining will occur at a faster rate (approximately 500 tonnes per hour of sand ore) than processing (approximately 250 tonnes per hour), and the excess ore will be stored at the processing plant and used overnight to ensure the processing plant can run 24/7.

7) Excavated material will be processed at the Processing Plant to extract the Heavy Mineral Concentrate (HMC). Heavy minerals will be separated from the ore using a water and gravity circuit, drained of excess moisture and stored at the Processing Plant in a farm implement type building with a concrete floor.

8) Un-mineralised sands termed tailings will be pumped back to the tail end of the mine void left in the wake of dredge pond progression, which will be progressively filled as the mine pit progresses. Tailings are dewatered and discharged to the mining void *via* cyclone(s). The tailings will be allowed to naturally beach out (spread out). The cyclone will be moved as required to distribute the tailings as necessary.

9) Tailings will be levelled and contoured with the use of excavators and bulldozers ready to receive the pre stripped overburden and soil. Vegetative cover (sowing of grass) is established, and the area is removed from the disturbed area once stabilised.

3. ROLES AND RESPONSIBILITIES

3.1. Project Manager

- Responsible for the implementation and enforcement of this plan.
- Authorise any personnel to perform any duties of this plan and ensure that they are competent to complete their duties.
- The Project Manager is responsible for ensuring that environmental monitoring personnel or contractors are adequately trained and experienced in taking samples, observations, and measurements as part of monitoring requirements.
- Ensure that the consent conditions related to water management of the site are complied with
- Inform a Compliance Officer of the Consent Authority immediately if a breach of Consent Condition(s) takes place, or when they believe that a breach may take place.
- Approve any 'permits to work' prior to starting tasks if required (or delegate authority)

3.2. Mine Manager

- Ensure that all personnel that enter the mining operation areas comply with this plan
- Ensure that all pre-start inspections and checklists are being completed
- Ensure all personnel operating any vehicles have been deemed competent, hold a current and appropriate permit or are under the escort of a person who holds a current and appropriate permit
- Ensure any changes to this plan are communicated to all relevant personnel when they occur

3.3. Mine Environmental Manager

- Maintain updated (environmental) management plans covering all mine activities.
- Maintain copies of current authorisations & resource consents and ensure compliance.
- Manage the environmental management workflows under deputisation from the Mine Manager.
- Mange the environmental monitoring programmes and networks under deputisation from the Mine Manager.

4. CONSENT CONDITIONS

4.1. Index to relevant conditions

Table 1 summarises the proposed consent conditions and provides cross references to the sections of this document which give effect to the proposed conditions.

Table 1: Consent conditions and plan cross references

Condition	Report section
22.1 Water Management Plan Preparation & Objectives	6.2
22.2 Components of the Water Management Plan	6.3
22.3 - Annual updates of WMP and reporting	8.2
23.1, Tables A and B Discharge of MIW from MWF to the mine void & in circumstances that it would enter groundwater	6.3.2, also refer to external ESCP
24.1, 24.2– Water monitoring protocols, schedule & thresholds	7.6 and 7.6.1 and 7.6.2
27.1 – Mine void groundwater takes flow and water quality outcomes	6.3.2 and 6.3.4
28.2 – Diversions and stream works	6.3.3
29.1 and 29.2 – Canoe Creek infiltration gallery intake and water take	6.3.5
24.3, 24.4 - Monitoring personnel and reporting procedures	3 and 0

5. POTENTIAL EFFECTS

5.1. Overview

The Barrytown South Mineral Sand Mine - Hydrological Impact Assessment (Rekker & Etheridge, 2025) describes the activities for which water management controls may be required as follows:

1. Temporary interception and diversion of surface drains and overland flow paths to prevent inflows of clean surface water to the excavation.
2. The circulation of groundwater within the mine water circuit and potential water quality impacts associated with migration of water from the excavation into backfilling areas, groundwater and ultimately to local water bodies.
3. Potential surface water quantitative effects arising from the abstraction of water from an infiltration gallery within the Canoe Creek alluvium upstream of the creek mouth by 200 metres.

5.2. Relationship of WMP to ESCP

Management of runoff diversions to avoid adverse effects associated with erosion and sediment discharges is discussed in the ESCP. The scope of this WMP for runoff management is limited to site rehabilitation to re-establish the main pre-mining catchment areas for the existing drains and creeks on site (including North Creek, Central Creek, Clarke Creek, Little Granite Creek, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek) and borrow areas of up to 72 ha combined that are generally east of the mining area. Similarly, the actions that will be taken to manage elevated sediment concentrations in water pumped from the mining excavation and management of runoff from the rehabilitation areas are described in the ESCP and are not discussed further in this document.

5.3. Water quality effects

In addition to turbid water or suspended sediment that would be largely managed using ESCP measures (see Section 5.2, above), potential water quality effects principally relate to dissolved metals and phosphorus which are naturally present in the excavated mineral sand, plus *in situ* groundwater that may be mobilised in the mining process. It is possible that dissolved metals could also be liberated and mobilised because of the mechanical processes of mineral separation and sand and slimes deposition during backfilling of the worked excavation. An increase in the discharge of these metals and phosphorus to surface waters could have an adverse impact on downstream aquatic life. A management, monitoring and effects management process is required to ensure that this does not occur.

5.4. Water quantity effects

Pumping of groundwater from a bore field or gallery to the WCP will be required to maintain and top-up the mine water circuit for the loss of adherent moisture in shipped Heavy Mineral Concentrate by road to Rapahoe. Gallery abstraction assessments presented in the Hydrological Impact Assessment (Rekker & Etheridge, 2025) indicate that depleting effects exerted on Canoe Creek would be less than minor, being less than 10% of the $MALF_{7d}$ applicable to Canoe Creek flow rates. Groundwater surface water

depletion calculations related to the groundwater abstraction presented in the Hydrological Impact Assessment (Rekker & Etheridge, 2025) indicate that limited impact would be imposed on nearby creeks.

Taking up to 63 L/s at instantaneous rate, 62.5 L/s (5,400 m^3/d) and a maximum of 1.4 million m^3/year from Granite Creek is not expected to cause adverse effects, while it would be limited to durations of no more than 7 days for filling the WCP chambers and pipelines. The long-term daily rate of 9.5 L/s (820 m^3/d) would prevail for most of the operational period to provide augmentation of moisture lost as adherent water with concentrate or evaporative losses from open ponds in the water circuit associated with the Project. Abstraction would cease at the cessation of mining activities and WCP operation.

Short-term re-filling of the water circuit and process vessels related to commissioning or re-starts of the WCP would draw on the higher rate of 62.5 L/s for a period of no more than 7 days as discrete events with a recurrence interval of no more than 3 times in any mine production year.

Water table surface modification by the travelling dredge pond void, pond surface evaporation, and dredge pond surcharge mounding would each have the effects of causing departures from the ambient water table height. However, prediction assessments of these effects reveal that these would not be at a scale to fundamentally alter the existing groundwater flow pattern. In addition, relative to any part of the mine path and its environs, the effects on the water table of the travelling dredge pond would be transient and not repeated once the focus of dredge mining moves onto the latter parts of the mine path. Groundwater calculations presented in the Hydrological Impact Assessment (Rekker & Etheridge, 2025) also indicate that groundwater exchange between pond and aquifer is limited and will have little or no impact on the surrounding creeks and wetlands.

5.5. Diversion of creeks and wetlands effects

The planned mine paths within Mining Sections 1, 2 and 3 will cross the bed of several creeks that may have RMA status as rivers[1]. In order to maintain the creeks' hydrological function, a series of diversions will be established and activated to allow the original water course to be cut by the dredge pond. Upon the full passage of the mine paths, the restored sections of the affected creek network would be fully restored and restoration integrated into planned habitat restoration of the water course and restored wetlands.

[1] Under the RMA 1991, rivers in New Zealand are defined as continually or intermittently flowing bodies of fresh water, including streams and modified watercourses, but excluding artificial ones such as farm drains.

6. WATER MANAGEMENT PLAN

6.1. Water Management Plan goals

6.1.1. Operating condition goals

Groundwater management will be undertaken to create the working conditions required for mineral sand extraction whilst avoiding adverse hydrological effects.

6.1.2. Hydrological effect goals

The specific goals associated with avoiding hydrological effects are:

I. The flows in Granite Creek or Canoe Creek are not reduced by more than 10% of the MALF in long-term operation (i.e., over more than 7 days).
II. The quality of water discharged to receiving waters will not cause adverse impacts on stream ecology or visual clarity.
III. Potential adverse water quality (including ecological) impacts associated with discharge of naturally present toxic metals and phosphorus in downgradient surface waters are avoided or remedied.
IV. The pre-mining surface drainage patterns are restored such that the catchment areas for Clark Creek, Granite Creek and other smaller creeks are not changed to any significant extent, albeit the > 50 ha of wetland is established across these catchments.

6.2. Water management objectives

The water management goals will be achieved *via* the following actions:

A. The flows in Granite Creek or Canoe Creek are not reduced by more than 10% of the MALF in long-term operation (i.e., over more than 7 days).
B. The groundwater level in the dredge pond will not be manipulated to materially lower or raise pond water levels beyond 20% of the total pond depth.
C. Pumping of groundwater will be minimised by avoiding dewatering and water table lowering while excavating saturated material within the pit down to the economic mineral grade limit or maximum reach depth of the dredge, not exceeding 10 metres.
D. Water pumped from the pit will be conveyed to the WCP. Water will be ordinarily pumped back to the dredge pond tailings zone to achieve the hydrological effect management goals above.
E. The quality of any groundwater that could enter surface water or coastal water will be monitored to confirm that it meets standards which are consistent with Hydrological effects goal II above.
F. Detailed design information for the water management system shall be issued to WCRC for review and comment at least 16 weeks prior to the start of mining operations. Design information will include design drawings of the infiltration trenches and basin. Changes to the Water Management Plan would require certification.
G. The rate of take of water from the water supply gallery will be monitored in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations and the pumping rate will be restricted to 63 L/s instantaneous rate, and 5,400 m^3/d or 62.5 L/s on a daily basis. The maximum rate of take is anticipated to be required for infrequent periods of up to 7

days. It is also anticipated that for periods beyond 7 days the long-term abstraction rate would be less at 9.5 L/s.

H. The rehabilitated mine area will provide for the establishment of a large wetlands complex in the east of the former mining area, connecting to the sea with five creeks restored with realignment and riparian plantings.

6.3. Water management concept design

6.3.1. Overview

Figure 1 illustrates the main features of the water management system which will be installed to deliver the objectives above. The key features comprise:

1. Balancing the suction pumping of sand and water during sand winning within slurry lines, with return transport of processed tailings sand and water from the WCP.
2. Avoiding the mining of the Granite Creek mainstem between the northern and central mining blocks by transporting the dredge across the creek course to largely maintain the integrity of creek bed and banks.
3. Placing the top-up water supply infiltration gallery in the Canoe Creek alluvium for access to the area's largest water body and a practical intake structure with least environmental impacts.
4. To ensure suitable downstream water quality by managing and monitoring the post-depositional water quality effects of tailings sands emplaced in the former mine void following active mining.

6.3.2. Pit water pumping, return to land, and discharge of any discharge

The WCP would receive water from three sources and modes of delivery:

- Slurry line delivery of ore sand and groundwater from the active dredge pond,
- Pipeline delivery from the water supply gallery, primarily as make-up water, and
- Stormwater falling as heavy rain and coalescing within the perimeter of the WCP, which is separately approved with RMA consent(s).

The WCP would shed and discharge water as follows:

- Adherent moisture on Heavy Mineral Concentrate transported to Rapahoe
- Incidental evaporation from WCP stockpiles and ponds, and
- Slurry line return to the active dredge pond tailings deposition area containing sand below mineral grade and suspending water.

It is not intended that the WCP and/or MWF discharges mine impacted water (MIW) to the surrounding land or water courses directly.

Mine water conveyance

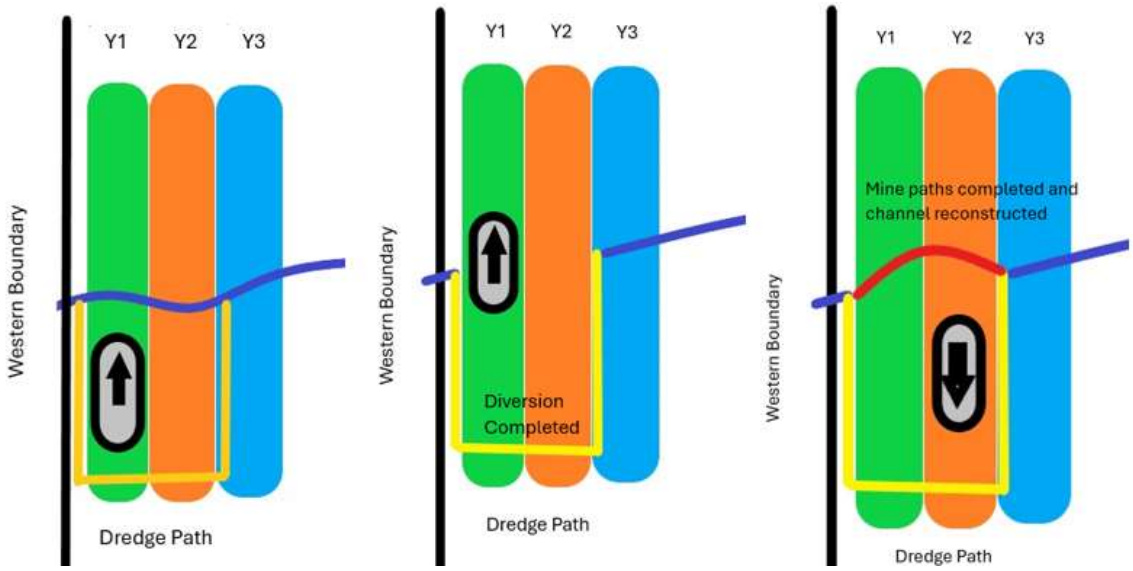
The conveyance of stormwater from disturbed areas of the site to the WCP is described in the ESCP.

6.3.3. Creek diversions and restoration of creek drainage network

East–west oriented watercourses will be diverted into previously mined areas (behind the mining void) and into the adjacent mine path (to the east as mining moves inland), prior to mining progressing through

the watercourse's existing alignment. This requires a temporary diversion of the waterbody around the active mining area. Once mining has advanced beyond the alignment, a permanent reconstructed channel can be constructed and the waterbody reinstated.

These water bodies will likely be disturbed several times, with temporary diversions occurring each time the active mining area intersects the watercourse, potentially once per year for up to three months at a time per water body. Diverting the watercourse around two sections of mine path at a time reduces the number of diversions required. See Figure 1 for diagrammatic detail on the temporary diversions and restored creek segments to be used in maintaining interim hydrological function of the east – west oriented water courses.



As the dredge approaches the waterbody, a temporary diversion (shown in yellow) is constructed behind the mining void.

The waterbody is then diverted into this temporary channel, allowing the dredge to continue along its planned path.

Once the mining void has progressed beyond the proposed reconstructed waterbody alignment, the diversion is redirected into the newly rehabilitated channel (shown in red).

Figure 1: Schematic diversion methodology for east west water courses

For water courses predominately flowing north – south or south – north the approach would be for a new water course would be constructed along the axis of traversing mine path, in the wake of the passage of the dredge pond. The new creek alignment would be in a different position to the north – south oriented water course but would be sized and lined so as to restore the interrupted hydrological function. North–south oriented watercourses will be diverted into a previously mined area before mining reaches the watercourse (except where mining is adjacent to the coastal setback boundary). This may require adjustments (widening or narrowing) of the mine path to facilitate this. A permanent reconstructed

channel will be built in advance as part of the rehabilitation of the mined land, and the flow will be redirected into it in a single 'livening' event.

6.3.4. Tailings reception area groundwater and water quality management

Dr Mike Fitzpatrick, in the Ecological Solutions Ltd ecological and water chemistry assessment document, indicated that groundwater and surface water would be altered during the operational phase of the SB mineral sand project (Bramley et al, 2025). Furthermore, Bramley, et al (2025) suggested that a plume or groundwater compositional front of higher than pre-mining geochemical signatures would percolate westwards from the backfilled tailings areas with the prevailing groundwater flow paths to the Tasman Sea in the medium term within the operational phase of mine life (14 years). The seepage emergence of groundwater into creek baseflow would pass these effects onto surface water, albeit diluted by upstream flow contributions. Proposed effects management measures included lime augmentation (i.e., lime dosing) of tailings and slimes at the time of emplacement within the void in the wake of the active dredge pond.

Tailings Dosing for pH Adjustment and Metals Fixation

Tailings deposited in the tailings reception area would include mixing (i.e., dosing) of hydrated lime [$Ca(OH)_2$] with the tailings. The method has measurable benefits to the environmental performance of tailings such as raising the pH and stabilizing the tailings leachate by immobilizing dissolved (heavy) metals and/or nutrients such as phosphorus. The mixing ratio for optimal stabilization would be set following testing to assess immobilization efficiency, prior to mining, using bulk samples of a tailings as an analogue. However, the goal and performance criteria of lime dosing was pH adjustment to approximately 7 pH units and substantial removal of metals and nutrient concentrations in interstitial water.

Lime dosing in accordance with the parameters and thresholds in Condition 20.1 Table A and Table B must be undertaken at the dosing station. The effectiveness of the dosing system should be monitored by sampling tailings leachate and the dredge pond water column.

Water Quality Monitoring

Groundwater and surface water at the following locations are proposed for sampling and analysis as the backbone of the monitoring programme:

- Northern Creek (Downstream),
- Central Creek (Downstream),
- Granite Creek (Downstream),
- Unnamed Creek north of Cargill Road (Downstream),
- Wasabi Creek (Downstream)

- Southern Creek (Downstream),
- Upstream counterparts to the above as Pond 2, Clarke Creek, Little Granite Creek, and Granite Creek,
- Groundwater sampling bores PZ-1 to PZ-4, placed between the western mining boundary and MHWS.

Water sampling and analysis in accordance will the parameters and thresholds in Condition 20.1, Table A and Table B, must be undertaken. The minimum monitoring for visual clarity and DRP, includes 12 months of baseline characterisation or the assumption of A band pristine water quality status. Comparison of upstream and downstream composition and concentrations during operations and active closure will be feasible for surface water quality monitoring results.

Frequency: Monthly (physio-chemical and nutrients) or Quarterly (metals, sulphate & hardness)

Duration: Preceded by 12 months of monitoring prior to mining commencement, for the duration of mining, and 12 months following the end of mining activities.

Water sampling, analysis and monitoring result collation would continue into the rehabilitation, active closure phase of mine life. Any elevation in dissolved metals, and dissolved inorganic nutrients (i.e., DRP) was expected to dissipate following the conclusion of mining in the mining blocks from north the south.

6.3.5. Water Supply

Water to make up for water losses by transport of adherent moisture off-site and incidental evaporation from exposed water surfaces during mining operations would be provided by an off-site water supply. The proposed water supply source is the same as has previously been proposed and granted consent for a finite term in relation to the Central Block. This comprises an infiltration gallery on the north bank of Canoe Creek approximately 200 metres upstream of the Canoe Creek Lagoon and the coastline. The water take would be water metered in terms of measuring its pumping rates and volume and limited to a daily-equivalent abstraction rate of 62.5 litres per second that was set to be less than the relevant MALF7d for Canoe Creek. As a consequence, flow monitoring is recommended to confirm the low flow statistics of Canoe Creek, which may be reviewed in annual plans.

It is also proposed to monitor the level of water within the Canoe Creek Alluvium in proximity to the infiltration gallery. The measured water level would be compared with a coincident time series measured stage and flow rates in Canoe Creek and reported in annual reports.

6.4. Rehabilitation: Management of Effects on Wetlands

Plans have been developed to rehabilitate the post closure former mining area with a complex of wetlands. Figure 2 illustrates the wetlands rehabilitation proposal. The total of wetland areas totals 53 ha, which includes open water wetland marshes and fens with water depths up to 2 metres, flaxlands, rushlands, expanses of raupo, and raised islands amidst the wetlands complex. Figure 2 shows a wetlands complex hugging the eastern boundary of the former mining area, in a hydrological zone where the base of wetlands would receive sustaining groundwater seepage. The water table in these areas are shallow to within 0.25 metres of the land surface and may in fact have above ground water pressures measured at depths of 1 to 2 metres below ground. Accordingly, it is anticipated that the replenishment of freshwater would be sustained by surface water inflows from Clarke Creek, other minor terrace drainages and groundwater seepage from the underlying coastal groundwater system.

Four creeks emerge at the downstream edge of the wetlands complex as proposed and drawn in Figure 2. These creeks are proposed to emerge at the coastline in the same locations as contemporary creeks and therefore would not require rehabilitation works any further westward of the mining area boundaries.

A large, centralised wetlands complex would be created within the Mine Sections 1 and 2, essentially between the WCP and Cargill Road. The wetland complex would be born from the restoration of the eastern mine paths in those Mine Section and initially comprise more than 30 individual ponds.

The formation of the beds of multiple component wetland ponds is an initial step towards final wetland complex rehabilitation works. The east-west segregation of initial ponds allows for the later formation of deep water, open water fens and marshes. This includes a midline running down part of the line of the future wetlands allowing for further excavation linking the wetland ponds from west to east and linking low gradient creeks internal to the wetland complex.

Figure 2 displays the ultimate wetland complex, including the following notable hydrological features:

- Creeks: Clarke Creek and Granite Creek main stem **enter** the wetland from the east at elevations between 6 and 7 metres,
- Creeks: Four creeks or drains **emerge** from the wetland complex and are trained towards the coastline,
    - Additional Drain 1; a new creek aligned across the line of former farm drains, sinuous for the incorporation of enhance aquatic habitat,
    - Granite Creek main stem; an existing creek and banks preserved from disturbance during operations,
    - Additional Drain 2; a new creek but following a topographic low to an old creek mouth on the coastline,
    - Additional Drain 3; a new creek aligned into the former course of the farm drain network named “Unnamed Creek North of Cargill Road”. The new creek also enters the sea at the same mouth.
- Granite Creek main stem water course would be maintained somewhat hydrologically separate from the wetland complex by the original banks and bed gradient, slightly perched above that of the wetlands bounding the creek course,

- Water depths greater than 1 metre and less than 2 metres across 5.3 ha equates to at least 50,000 cubic metres of water storage buffer within the open water leads of the wetland complex,
- Additional flow buffering will be held within shallower leads of water and porous beds of the wetlands,
- Due to the buffering of different storage reservoirs combined, the creeks draining the wetland complex will maintain a more consistent flow regime than under the previous flow characteristics of land networked with rectilinear farm drains.

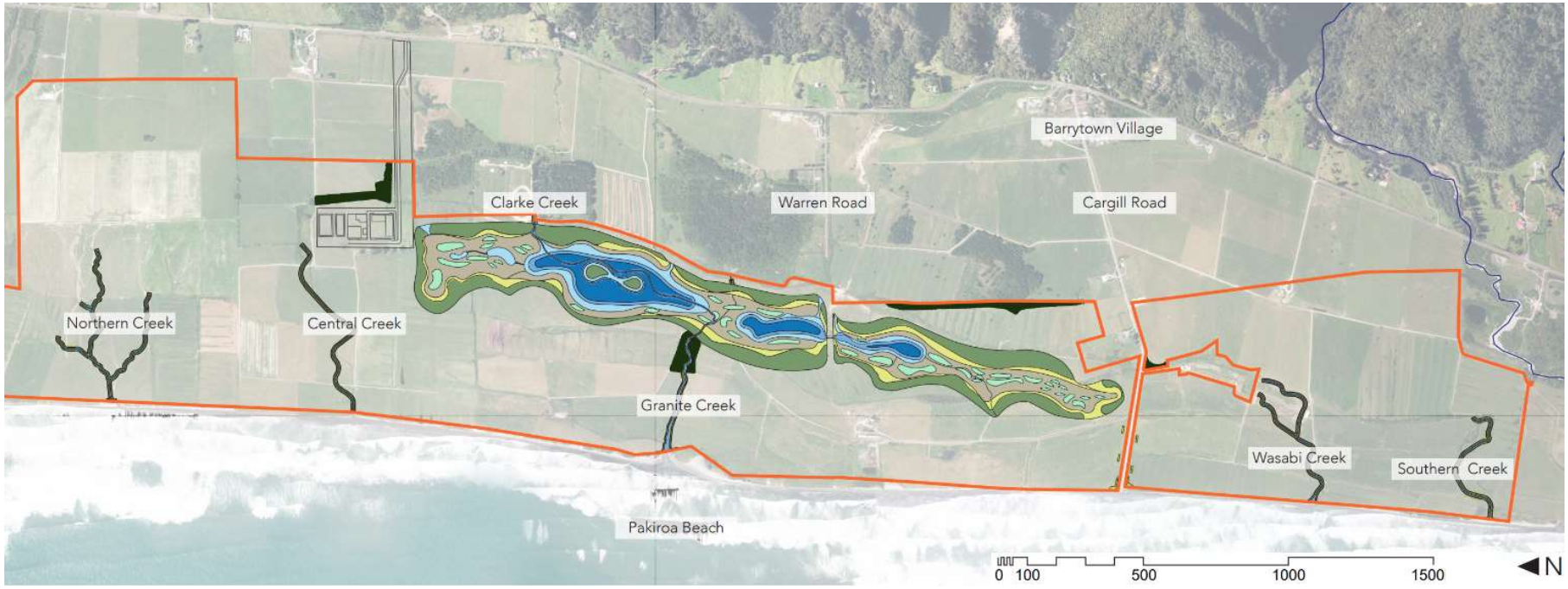


Figure 2 Proposed post closure rehabilitation of the mining disturbed area with > 50 ha of wetlands (Glasson Huxtable, 2026)

6.5. Rehabilitation: Management of Diversion Effects & Water Quality

Creeks classed as rivers include the following:

- Northern Creek,
- Central Creek,
- Clarke Creek,
- Granite Creek, including flows of Little Granite Creek,
- Wasabi Creek, and
- Southern Creek.

6.5.1. Clarke Creek and Granite Creek main stem

Clarke Creek currently crosses the eastern margin of the mining area into Year 1 and Year 2 mine paths. A management of the effect of mining would be for an intentional diversion of Clarke Creek from immediately upstream of the mining area margin to Little Granite Creek. East – West Oriented Creeks

The Northern, Central, Wasabi and Southern creeks are essentially east-west oriented creeks that would be overtaken and mined through by the proposed mining activity. Temporary diversions are proposed to manage the effect of these creeks being mined through. 'Dogleg' diversion channels would bridge across two mine paths north and south of the original creek bed to allow creek flow to be maintained while sections of the original creek are being mined through.

6.5.2. East – West Oriented Creeks

Northern and Central creeks would be mined through by six passes of the mine void. Wasabi creek would be mined through by three passes of the mine void, while Southern Creek would be mined through four times. The number of mine void passes doubles the number of temporary dogleg diversion channels (see Table 2).

Table 2: Quantity of Mine Void Passes and Dogleg Diversions

Creek	Number of Mine Path Passes	Number of Dogleg Diversions	Rehabilitation Solution
Northern	6	12	Restored creek in largely the same form.
Central	6	12	Restored creek in largely the same form, plus sinuosity.
Wasabi	3	6	Restored creek in largely the same form, plus sinuosity.
Southern	4	8	Restored creek in largely the same form.
Totals	19	38	

The final rehabilitation management of rehabilitated water courses is detailed in Section 6.4.

6.5.3. Lime Dosing

Dosing of the returned tailings ('tails') is proposed as an approach for managing the effects of elevated metals, metalloids and nutrients. A laboratory scale trial of lime dosing has been undertaken and further field trials are recommended. It is envisaged that dosing of the whole tailings and suspending water would raise the pH and hardness levels inducing the complexing to solids and immobilisation of metals, metalloids and nutrients.

It is proposed that crushed limestone emulsion would be introduced either at the MWF – WCP before tailings are injected to the return slurry lines or alternatively before the tailings are discharged at the tailings reception area. It is anticipated that reactions to reduce or immobilise metals, metalloids and nutrients would occur in the tailings deposit pore water or within downstream groundwater.

7. MONITORING AND EFFECTS MANAGEMENT PLAN

7.1. Monitoring and Effects Management Plan Objectives

The objectives of the Monitoring and Effects Management Plan (MEMP) are as follows:

- The groundwater level in the dredge pond will not be manipulated to materially lower or raise pond water levels beyond 20% of the total pond depth.
- Pumping of groundwater will be minimised by avoiding dewatering and water table lowering while excavating saturated material within the pit down to the economic mineral grade limit or maximum reach depth of the dredge, not exceeding 10 metres.
- Water pumped from the pit will be conveyed to the WCP. Water will be ordinarily pumped back to the dredge pond tailings zone to achieve the hydrological effect management goals above.
- The quality of any groundwater that could enter surface water or coastal water will be monitored to confirm that it meets standards which are consistent with Hydrological effects goal II above.
- Detailed design information for the water management system shall be issued to WCRC for review and comment at least 16 weeks prior to the start of mining operations. Design information will include design drawings of the infiltration trenches and basin. Changes to the Water Management Plan would require certification.
- The rate of take of water from the water supply gallery will be monitored in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations and the pumping rate will be restricted to 63 L/s instantaneous rate, and 5,400 m^3/d or 62.5 L/s on a daily basis. The maximum rate of take is anticipated to be required for infrequent periods of up to 7 days. It is also anticipated that for periods beyond 7 days the long-term abstraction rate would be less at 9.5 L/s.
- The rehabilitated mine area will provide for the establishment of a large wetlands complex in the east of the former mining area, connecting to the sea with five creeks restored with realignment and riparian plantings.

These objectives are achieved by:

- Specification of a monitoring programme which can robustly confirm that the water management system is working effectively and identify where adjustments are required to optimise water management and avoid adverse effects.
- Definition of action thresholds and an associated set of activities which can be implemented within a suitable timeframe to achieve the objectives of the WMP.
- Setting out reporting procedures for environmental monitoring data and consent compliance.

7.2. Baseline monitoring

Baseline monitoring through installation of three piezometers within the Barrytown Farms Limited property was established in 2022.

The following baseline monitoring is to be initiated on granting of the Fast-track Application Consent in 2026:

1. Monitoring of groundwater levels at piezometer 1, 2, 3, 4 and 5 to define baseline water levels (see Figure 3 for locations of monitoring sites).
2. Monitoring of flow in Clarke Creek to define the natural change in flow between these points (see Figure 3 for the location of these sites).
3. Monitoring of water quality in Northern Creek, Central Creek, Granite Creek, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek to define baseline water quality and any elevation potentially attributable to mining activities (see Figure 3 for locations of monitoring sites).

Creek flow monitoring

An upstream monitoring site on Canoe Creek located at or near SH6 the crossing would be maintained to monitor the water resource status of Canoe Creek in the instance that a gallery is installed in the Canoe Creek alluvium for WCP water supply.

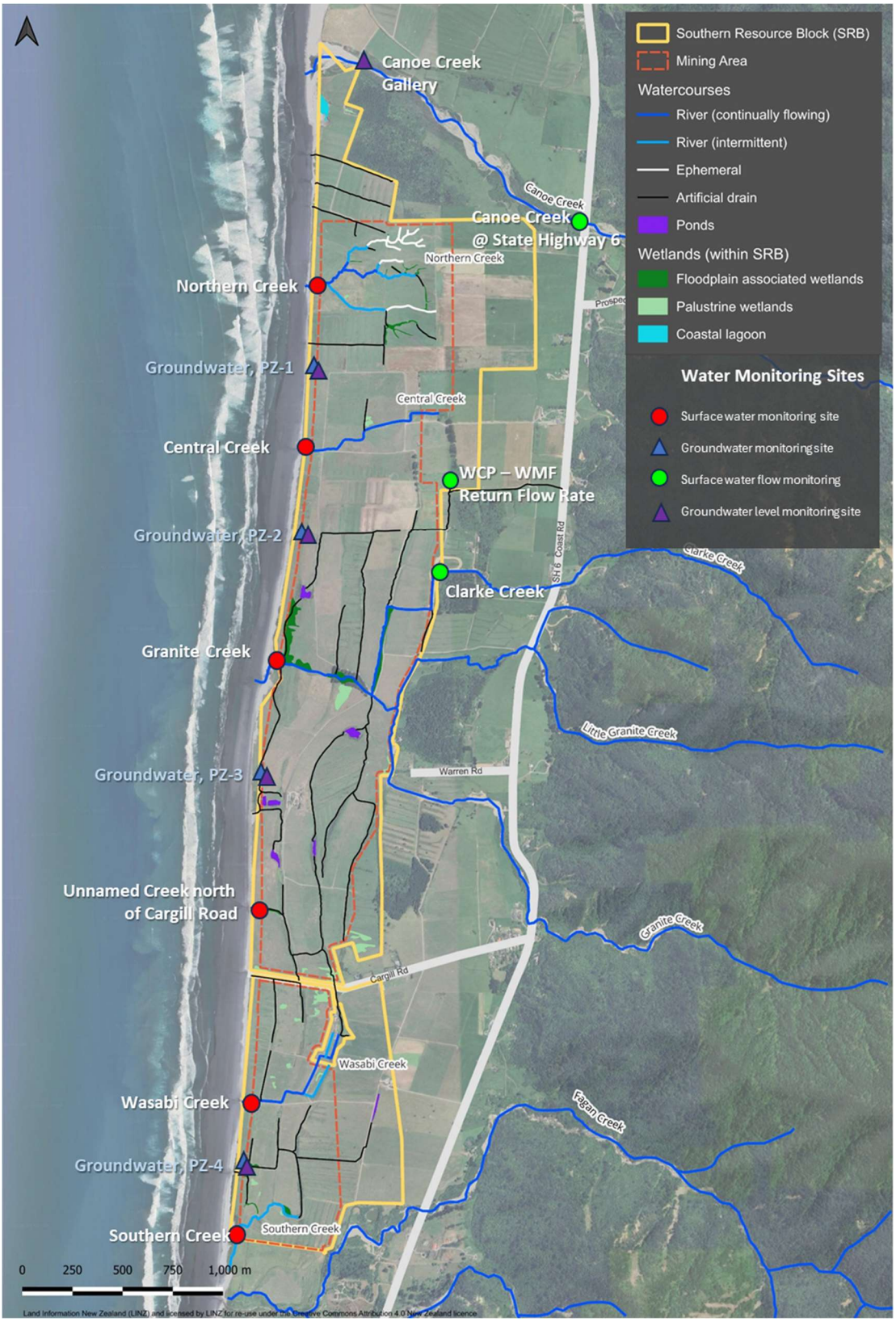


Figure 3: Creek mouth monitoring sites for surface water and groundwater

7.3. Operational monitoring

Operational level and quantity monitoring will include:

1. Discharge rates from Pond 2
2. Discharge rates from the mining void

Operational water quality monitoring will include:

- Flow monitoring to the mining void at MWF
- Water quality and visual clarity in Northern Creek downstream of the excavation area
- Water quality and visual clarity in Central Creek downstream of the excavation area
- Flow monitoring of Clarke Creek upstream of the excavation area
- Water quality and visual clarity in Little Granite Creek upstream of the excavation area
- Water quality and visual clarity in Granite Creek upstream of the excavation area
- Water quality and visual clarity in Granite Creek downstream of the excavation area
- Water quality and visual clarity in Unnamed Creek north of Cargill Road downstream of the excavation area
- Water quality and visual clarity in Wasabi Creek downstream of the excavation area
- Water quality and visual clarity in Unnamed Creek south of Wasabi Creek downstream of the excavation area
- Level monitoring of piezometers 1, 2, 3, 4 and 5.

Monitoring will be undertaken at or about the locations shown in Figure 3 in accordance with the schedule in Table 3 and Table 4.

Table 3: Monitoring schedule

Monitoring site	Parameters	Minimum frequency
Discharges to mining void @ MWF near WCP	Flow	Continuous Automated
Canoe Creek @ SH6	Flow	Hourly
Northern Creek	Monitoring Suite A* Visual clarity	Quarterly (metals) Monthly (Others)
Central Creek	Monitoring Suite A* Visual clarity	Quarterly (metals) Monthly (Others)
Clarke Creek upstream	Flow	Quarterly (metals) Monthly (Others)
Little Granite Creek upstream	Monitoring Suite A* Visual clarity	Quarterly (metals) Monthly (Others)
Granite Creek upstream	Monitoring Suite A* Visual clarity	Quarterly (metals) Monthly (Others)
Granite Creek downstream of mining	Monitoring Suite A*	Quarterly (metals)

Monitoring site	Parameters	Minimum frequency
	Visual clarity	Monthly (Others)
Unnamed creek north of Cargill Road	Monitoring Suite A* Visual clarity	Quarterly (metals) Monthly (Others)
Wasabi Creek	Monitoring Suite A* Visual clarity	Quarterly (metals) Monthly (Others)
Southern Creek	Monitoring Suite A* Visual clarity	Quarterly (metals) Monthly (Others)
PZ 1, 2, 3, 4, 5	Water level and Monitoring Suite A*	6 hourly
Canoe Creek infiltration gallery	Abstraction (Flow)	15 minutes

Table 4: Monitoring Suite A (Q = quarterly sampling, M = monthly sampling)

Dissolved Metals Quarterly	***Threshold (mg/L)***	***Dependency / Interference***
Aluminium	0.62	Hardness, pH, DOC
Arsenic	0.013	As arsenic (V)
Boron	0.94	N/A
Cadmium	0.0002	Hardness
Chromium	0.033	Hardness, as chromium (III)
Copper	0.0039	Hardness, pH, DOC
Iron	1.0	As total fraction
Nickel	0.011	Hardness
Lead	0.0034	Hardness
Manganese	1.9	N/A
Zinc	0.008	Hardness
Others Quarterly		
Hardness	_	
Sulphate	500	ANZECC stock water guideline
Dissolved Organic Carbon	_	
Other Physio-chemical Monthly		
EC	3,500 µS/cm	TARP of 350 µS/cm
pH	6.5 - 9.0 pH units	N/A
Turbidity	20	N/A
TSS	20	As a back-up, and to develop a ratio to turbidity
Dissolved Ammoniacal Nitrogen	NPS-FM 2020 attribute state	
Dissolved Reactive Phosphorus (DRP)	NPS-FM 2020 attribute state	

7.4. Water quantity thresholds

Hydrological thresholds are defined below to give effect to the hydrological effect goals presented in Section 6.1.2.

7.4.1. Canoe Creek flow threshold.

The $MALF_{7d}$ in Canoe Creek at SH6 is taken to be 633 litres per second based on the hydrological model-based statistic presented in (Booker & Woods, 2014). The maximum rate of depletion of Canoe Creek arising from gallery pumping at 63 litres per second is therefore less than 10% of the projected $MALF_{7d}$ statistic. The assessment document notes that abstraction or groundwater depletion of less than 10% of $MALF_{7d}$ falls below the threshold of significance for such activities.

7.5. Water quantity actions

7.5.1. Groundwater level threshold actions

Groundwater level in terms of a Mean Sea Level datum of elevation would be subject to monitoring at the five coastal groundwater monitoring points.

The main action threshold for groundwater level is that groundwater elevation remains sufficiently above mean sea level that seawater intrusion via the groundwater system is avoided. The coastline adjoining the SB is relatively straight in alignment and generally lacks coastal lakes, estuaries or hāpua, apart from an occasional hāpua formation at the Granite Creek mouth. This is a hydrological setting where groundwater level monitoring with reference to sea level would invoke the Ghyben – Herzberg ratio (Veruijt, 1968). Piezometers P1 – P5 are located along the western mine disturbance boundary, within 50 metres of MHWS. Persistent groundwater elevations of greater than 0.5 metres AMSL in these piezometers would signify the presence of at least 20 metres of freshwater in groundwater at the coastline.

Thus, an action threshold for boundary monitoring piezometers PZ1 – PZ4 would be set at a minimum groundwater elevation of 0.5 metres ASML throughout the measurement period. Exceedance of the minimum elevation threshold would trigger an Effects Management action threshold.

7.5.2. Canoe Creek flow threshold actions

If the Canoe Creek flow threshold is breached the following actions will be undertaken:

- The consent holder shall contact the West Coast Regional Council within five working days with details of the threshold exceedance and the actions that will be undertaken.
- The flow monitoring sites will be inspected and a manual flow gauging undertaken to confirm the flows if the accuracy of the flow monitoring rates is uncertain.
- The rate of flow augmentation will be increased until the upstream-downstream flow difference falls within the required range.

7.6. Water quality thresholds and actions

7.6.1. Water quality action thresholds

Metals and metalloids

Action thresholds for metals and metalloids measured in accordance with the operational monitoring programme in receiving waters at the Northern Creek, Central Creek, Granite Creek downstream, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek water quality monitoring sites shown in Figure 3 are provided in Table 5.

Table 5: Water quality action thresholds - metals and metalloids

Parameter	Threshold mg/L	Dependency	Reference
Aluminium	0.62[B]	Hardness, pH, Dissolved Organic Carbon	USEPA (2018)
Arsenic	0.013	As arsenic (V)	ANZECC (2000)[c]
Boron	0.94	NA	ANZECC (2018)[c]
Cadmium	0.0002[D]	Hardness	ANZECC (2000)[c]
Chromium	0.0033[D]	Hardness, as chromium (III)	ANZECC (2000)[c]
Copper	0.0039[E]	Hardness, pH, Dissolved Organic Carbon	USEPA (2007)
Iron	1.0	As total fraction	USEPA (1986)
Lead	0.0034[D]	Hardness	ANZECC (2000)[c]
Manganese	1.9	NA	ANZECC (2000)[c]
Nickel	0.011[D]	Hardness	ANZECC (2000)[c]
Zinc	0.008[D]	Hardness	ANZECC (2000)[c]

[A] dissolved fraction, unless stated

[B] at hardness = 25 g/m^3, pH = 7.0, Dissolved Organic Carbon = 1.0 g/m^3

[C] 95%-ile trigger value

[D] at hardness = 30 g/m^3

[E] at hardness = 25 g/m^3, pH = 7.0, Dissolved Organic Carbon = 2.0 g/m^3

Non-Metals and Physio-Chemical Determinands

Additional determinands in the proposed water monitoring programme have thresholds and dependencies, as listed in Table 6. Hardness and pH levels represent dependencies used in the adjustment of the threshold values for the dissolved metals concentrations. Water concentrations of sulphate and the nutrients of turbidity, Total Suspended Solids (TSS), and the nutrients

ammoniacal nitrogen and Dissolved Reactive Phosphorus are also listed in Table 6. Electrical conductivity is proposed as a surrogate for Total Dissolved Solids (TDS) or salinity.

Table 6: Water quality action thresholds – Non-Metallic and Physio-Chemical Determinands

Dissolved Metals Quarterly	***Threshold (mg/L)***	***Dependency / Reference***
Others Quarterly		
Hardness	_	Dependency factor
Sulphate	500	ANZECC stock water guideline
Ammoniacal nitrogen	See Table 7	
Dissolved Reactive Phosphorus (DRP)	See Table 7	
Other Physio-chemical Monthly		
EC	3,500 µS/cm	TARP[2] of 350 µS/cm as indicator of possible seawater intrusion of surface freshwater or groundwater
pH	6.5 - 9.0 pH units	Dependency factor
Turbidity	20 NTU	N/A
TSS	20 mg/L (approximate, to be confirmed from NTU - TSS ratio delineation)	As a back-up, and to develop a ratio to turbidity

Turbidity, suspended sediment, visual clarity and nutrient thresholds

Action thresholds for turbidity and suspended sediment, clarity and nutrients are provided in Table 7.

[2] Trigger Action Response Plans (TARPs) for environmental monitoring are structured, proactive risk management frameworks used to detect, assess, and respond to environmental changes before they become adverse. Typically the triggers are particular concentrations of physio-chemical measurement values.

Table 7: Water quality action thresholds - turbidity, TSS, clarity, and nutrients

Parameter	Threshold	Notes
Total Suspended Solids	20 mg/L	Applies to discharges to Central Creek as a result of potential overflow of stormwater from Mine water facility shown.
Turbidity	20 NTU	Applies to discharges to Northern, Central, Granite Creek downstream, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek.
Visual clarity	Conspicuous visual change	In the receiving water bodies of Northern, Central, Granite Creek downstream, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek.
	Relevant NPS-FM (2020) attribute state for visual clarity	No change in the attribute states of the receiving surface water bodies, as an annual median and a 95%-ile, versus the baseline states. See note below. Monitoring locations are Northern, Central, Granite Creek downstream, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek.
Dissolved Reactive Phosphorus (DRP)	Relevant NPS-FM (2020) attribute state	No change in the attribute states of the receiving surface water bodies, as an annual median and a 95%-ile, versus the baseline states. See note below. Monitoring locations are Northern, Central, Granite Creek downstream, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek.
Dissolved Ammoniacal Nitrogen (NH_x-N)	Relevant NPS-FM (2020) attribute state	No change in the attribute states of the receiving surface water bodies, as an annual median and a 95%-ile, versus the baseline states. See note below. Monitoring locations are Northern, Central, Granite Creek downstream, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek.

The attribute state for visual clarity and DRP shall be defined with at least 12 months of baseline monitoring in Northern, Central, Granite Creek downstream, Unnamed Creek north of Cargill Road, Wasabi Creek and Southern Creek. The monitoring data and attribute state assessment shall be submitted to WCRC for approval at least 4 weeks prior to the start of mining operations.

7.6.2. Water quality threshold exceedance actions

The following actions shall be undertaken in the event of a water quality threshold exceedance:

- The consent holder shall notify WCRC within 5 working days.
- In the case of an exceedance within the surface water monitoring sites, the water quality data from upstream monitoring sites and the downstream monitoring sites shall be compared to determine whether it is related to natural water quality.
- The consent holder shall provide a **toxicant management plan** (see below) to WCRC. The plan will employ the effects management hierarchy to ensure the adverse effects of the discharge on aquatic life are reduced to no more than minor.

Toxicant Management Plans

If a toxicant management plan is developed in response to a threshold level exceedance, the plan shall include the following as a minimum:

a) The actions to be taken to avoid, minimise, remedy, offset or compensate for more than minor effects.
b) The timeline in which the actions identified through (a) above will be implemented.
c) The consent holder shall implement the actions identified through Condition (a) in accordance with timeline in Condition (b).

7.7. Unexpected Artesian Pressure Protocol

In the instance of the mine void being observed to encounter elevated or above-ground artesian pressures, the above protocol would become operative. The objectives in implementing the protocol would be to restore any impaired safe working conditions at the active mining area and prevent uncontrolled overflows of groundwater from the mine void. APPENDIX C contains the proposed protocol, including the steps to be taken followed by the review of the protocol after such an encountered. Requirements to take actions and to consult with West Coast Regional Council are included.

8. ANALYSIS, REPORTING AND IMPROVEMENT PROCEDURES

8.1. Plan updates

The WMP should be updated on an annual basis. Key components of the WMP to be defined for the year ahead include:

- The proposed mine area for that year.
- A description of all site activities with the potential to cause hydrological impacts.
- The water management actions that will be implemented to avoid hydrological effects.
- Audit checklists.
- An organisational chart showing staff and contractor positions and responsibilities for plan implementation.
- Relevant training and induction procedures and schedules.

The water management plan and associated procedures should be updated to improve water management practices and reduce the potential for adverse hydrological impacts in the following circumstances:

- Ongoing actions or management changes are implemented in response to breaching of any of the action thresholds.
- The hydrological monitoring system is not performing as intended (e.g. due to lack of flow in a surface water monitoring site or insufficient information being gathered to identify the cause of any water quantity or quality issues)
- A pollution incident or one or more near-misses occur which could have resulted in water quality or quantity impacts, and new procedures have been identified to reduce future risk.
- Improvement opportunities identified through the data review and analysis procedures.

8.2. Annual reporting

An annual monitoring report will be prepared by a suitably qualified and experienced person and submitted to WCRC for review. The report will include:

1. A summary of the monitoring undertaken over the preceding 12 months. The summary will:
    a. Reference the specific consent conditions under which the monitoring has been undertaken to show how the conditions have been complied with.
    b. Provide tables, graphs and summary data of the water quality, flow and water level monitoring.
2. Discussion and evaluation of the monitoring data in relation to the relevant consent conditions including a summary of compliance with conditions.
3. A summary of the actions that have been undertaken in response to any action thresholds.
4. Records of the inspections/monitoring undertaken to verify that the mine operation has not caused any of the following effects within any receiving waterbody measured at or beyond 100 metres from any discharge:
    a. Any conspicuous oil or grease films, scums or foams, or floatable or suspended materials,
    b. Any conspicuous change in the colour or visual clarity,
    c. Any emission of an objectionable odour,
    d. Any significant adverse effects on aquatic life, or
    e. The rendering of fresh water unsuitable for consumption by farm animals.
5. Proposal of monitoring and/or effects management requirements that may be adjusted to reduce the potential for adverse hydrological and/or water quality effects.

The annual monitoring and effects management report (also termed the Annual Hydrological and Water Quality Report in proposed conditions) is required to be provided to WCRC (the "Consent Authority"). Consent Authorities may request further information that is considered to be absent or incomplete within the tendered annual report. Revision and updating of the Water Management Plan and Monitoring & Effects Management Plan are required to be considered and certified before the revisions are applicable to mine site management. In some cases, revised management plans are

undertaken as a result of the conclusions from the annual report. These revisions require would re-certification, often via external peer review commissioned by the Consent Authority.

END

9. REFERENCES CITED

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APPENDIX A. WATER MANAGEMENT AND MONITORING PROCEDURES

To be completed at least 8 weeks prior to start of mining

APPENDIX B. HAZARDOUS SUBSTANCES ENVIRONMENTAL MANAGEMENT PROCEDURES

To be completed at least 8 weeks prior to start of mining

Unexpected Artesian Pressure Interception Protocol

Key contingency measures may include:

- Immediate Action on Breakthrough: If an artesian inflow from an aquifer is unexpectedly intercepted, the mine manager must cease all work in the area immediately and assess next steps.
- Emergency Sealing Procedures: Measures to stop the flow include installing a "capping layer" of impermeable material to plug the breach, effectively restoring the confining layer.
- Monitoring and Assessment: Operators must monitor, document, and report whether the flow is increasing and if it is confined to the excavation area.
- Below Water Table Excavation Controls: Plans must account for groundwater levels and any new knowledge on the disposition of artesian conditions. Excavations are often limited in terms of depth or extent to prevent tapping into higher-pressure water-bearing layers or aquifers.
- Precautionary Pressure Monitoring: In some scenarios, operators must use extended vertical pipes to monitor the height of the artesian pressure head ahead of the travelling mine void for the anticipation of higher-pressure before the excavation encounters them.

Unexpected Artesian Aquifer Interception

1. In the event of an accidental interception or unanticipated levels of artesian flows, all practicable measures shall be undertaken to remedy or mitigate any change in aquifer pressure, water quality or temperature. This shall include but not be limited to:
    a. The mine manager shall immediately cease all works within the immediate area of excavation that caused the interception of the artesian flows;
    b. The return of tailings slurry from the WCP should also be curtailed and consideration given to halting the pumping of make-up water from the Canoe Creek infiltration gallery as a means of easing any water surplus accumulations in the Mine Water Facility.
    c. The mine manager shall determine and document whether the flow is constant or increasing, if the turbidity is constant or increasing and if the flow is confined to the excavation;
    d. The mine manager shall notify the mine manager and environmental officer and/or other appropriate personnel to determine the emergency measures required to arrest the artesian flow. Emergency measures shall include, but not be limited to:

i. the installation of impermeable material to the extent required to reform a capping layer over the aquifer breach; or

ii. inserting a pressure relief system to control discharge and minimise overflow from the dredge pond.

e. Appropriate erosion and sediment control measures shall be installed to minimise the sediment entrained in any artesian flow from entering surface water or the Coastal Marine Area;

f. The West Coast Regional Council shall be notified as soon as practicable but no later than two working days after the interception; and

g. Upon remediation and arresting of flow from the aquifer interception, the design of the mining works and dredging methodology shall be reconsidered and, if required, revised to avoid future interceptions of the aquifer. The revisions may be included in the Water Management Plan for recertification by the Consent Authority.

2. There shall be no seepage of artesian flows from an aquifer beneath the excavated and backfilled areas following the completion of the remedial works outlined in Condition (1)(c). If seepage does occur, further remedial actions shall be taken to cease or minimise the seepage of artesian flows to the satisfaction of the West Coast Regional Council.

Dewatering Management Plan

3. At least 10 working days prior to commencing the works, the Consent Holder shall submit a Dewatering Management Plan (DMP) to the West Coast Regional Council. The DMP shall be prepared in accordance with the appropriates Erosion and Sediment Control Plan. The DMP shall contain the following:

    a. The methodology for dewatering, including:

    b. A map showing the location of areas that are likely to require dewatering;

    c. A programme of works, including an indicative timeframe.

4. The DMP may be amended at any time. Any amendments shall be:

    d. Only for the purpose of improving the efficacy of dewatering; and

    e. Consistent with the conditions of this resource consent; and

    f. Submitted in writing to the West Coast Regional Council.