POST CLOSURE MANAGEMENT PLAN

LUCKY BREAK PROJECT
POST CLOSURE MANAGEMENT PLAN

PREPARED FOR
SCONI MINING OPERATIONS PTY LTD

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List of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
ABA	Acid Base Account
ANC	Acid Neutralising Capacity
AUZ	Australian Mines Limited
ARD	Acid Rock Drainage
DAF	Queensland Department of Agriculture and Fisheries
DES	Department of Environment and Science
EA	Environmental Authority
EC	Electrical Conductivity
ML	Mining Lease(s)
MPA	Maximum Potential Acidity
NAF	Non-Acid Forming
NAG	Net Acid Generation
NAPP	Net Acid Producing Potential
PCMP	Post Closure Management Plan
PMLUP	Project Post Mine Land Use Plan
QNPL	Queensland Nickel Pty Ltd
RMP	Rehabilitation Monitoring Program
ROM	Run of Mine
WRD	Waste Rock Dump

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) was commissioned by Australian Mines Limited (AUZ) to develop a Post Closure Management Plan (PCMP) for the Lucky Break Project (the Project). The Project is authorised by Environmental Authority (EA) EPML00900713, approved on the 9th of March 2018. The Project's EA authorises the environmentally relevant activities of mining and crushing, grinding, milling or screening of nickel ore.

1.1 Purpose and scope

The purpose of this PCMP is to outline the ongoing maintenance and monitoring requirements for the Project following closure, in accordance with Conditions C5 and C6 of the Project's EA. Condition C5 requires the PCMP to be prepared and implemented for a nominal period of:

(a) at least thirty (30) years following final production on-site; or

(b) a shorter period if the site is proven to be geo-technically and geo-chemically stable and it can be demonstrated to the satisfaction of the administering authority that no release of contaminants from the site will result in environmental harm.

The scope of this PCMP is consistent with the requirements of Condition C6 which states the PCMP must address the following elements:

(a) Operation and maintenance of:

- *(i) wastewater collection and reticulation systems;*
- *(ii) wastewater treatment systems;*
- *(iii) the groundwater monitoring network;*
- *(iv) final cover systems; and*
- *(v) vegetation cover.*

(b) Monitoring of:

- *(i) surface water quality;*
- *(ii) groundwater quality*
- *(iii) seepage rates;*
- *(iv) erosion rates;*
- *(v) the integrity and effectiveness of final cover systems; and*
- *(vi) the health and resilience of vegetation cover.*

The Project has previously been subjected to management and rehabilitation activities and is now at closure. Apart from the activities nominated in this PCMP, no new mining or disturbance activities are proposed having the potential to cause further disturbance or environmental harm.

2 Project description

2.1 Project history

The Project is located at the Spyglass Beef Research Station, approximately 100 km north of Charters Towers and 140 km west of Townsville in north Queensland (Figure 1). The Project incorporates two Mining Leases (ML) identified as ML10324 and ML10332 known as Dingo Dam and Lucky Break, respectively which have a combined total area of approximately 103 ha.

Between March 2015 and July 2015, Queensland Nickel Pty Ltd (QNPL) mined approximately 114 000 tonnes (ore product tonnes) of nickel ore from the Dingo Dam deposit (ML10324) under EA EPML009007131 held by Nornico Pty Ltd. The mining campaign specifically targeted nickel ore within the deposit that was suitable for processing at the QNPL Refinery near Townsville. Nickel ore mined by QNPL was transported to Townsville in B-Double trucks via the approved B double route (Gregory Development Road, Harvey's Range Road, Black River Road, Bruce Highway and Greenvale Street).

At the completion of mining activities, QNPL commenced rehabilitation of the site including removal of infrastructure, re-profiling of the waste dump, reducing batter angles of the pit void, installing stormwater controls, ripping hardstand areas, spreading topsoil, seeding and installing fences.

No mining activities or related disturbance, with the exception of exploration drilling have been undertaken within ML10332.

All tenements associated with the Project are detailed in Table 1. The entire Project site is located within the Spyglass Station research facility (Lot 1 on OC57), which is now owned and operated by the Queensland Department of Agriculture and Fisheries (DAF).

Table 1 The Lucky Break Project tenements

Permit number	Permit name	Permit status	Grant date	Expiry date	Surface area (hectares [ha])	Real property description
ML10324	Dingo Dam	Granted	16/02/2005	28/02/2026	36.2	Lot 1 on OC57
ML10332	Lucky Break	Granted	22/11/2007	30/11/2027	66.5	Lot 1 on OC57

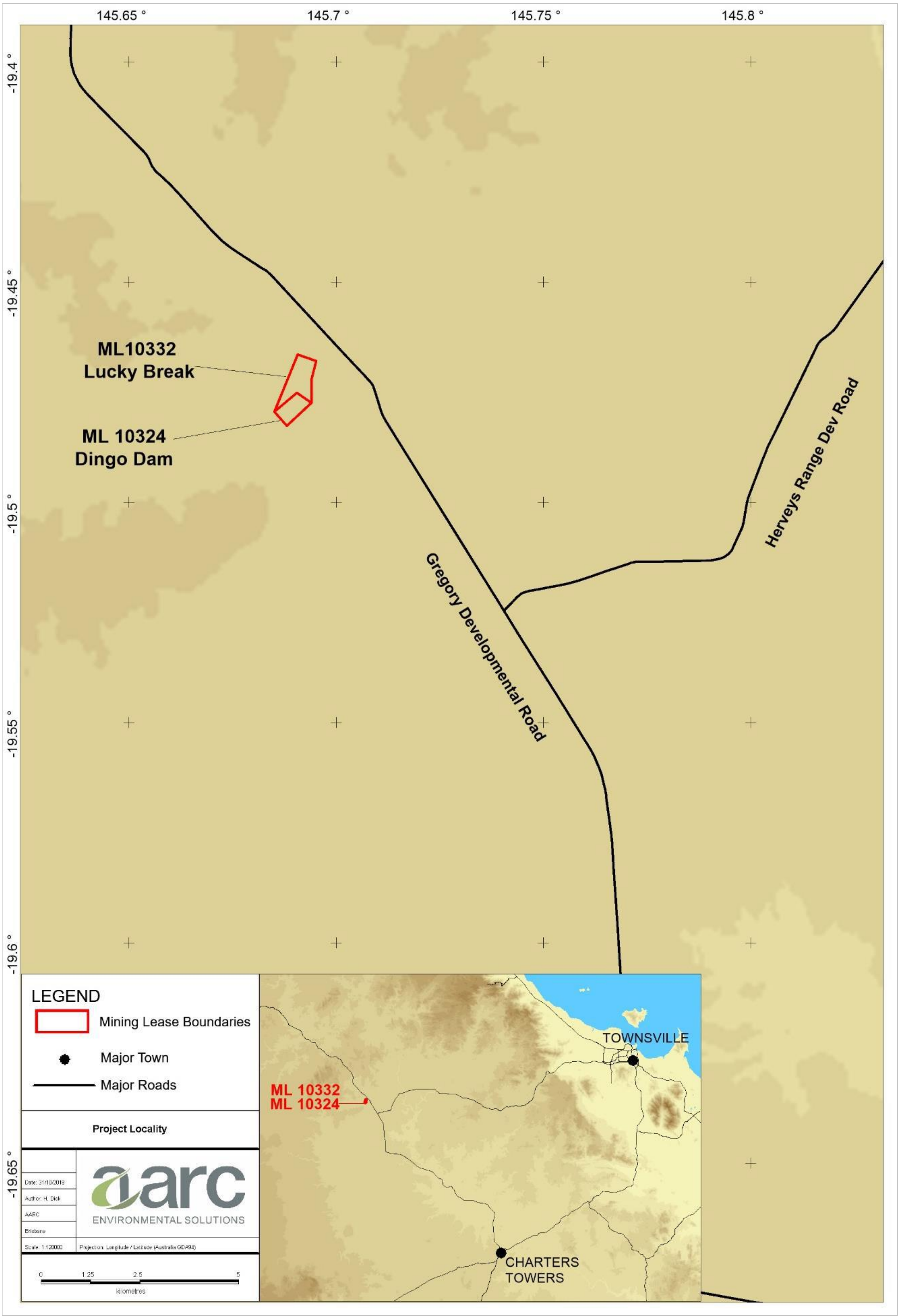

Figure 1 *Project location*

3 Project features post-rehabilitation

Consequent to the rehabilitation activities undertaken at ML10324, a number of rehabilitation areas can be defined, as described in the following sections. With respect to ML10332, the only activities that have occurred were exploration activities, with all holes having been capped and surface disturbance rehabilitated. Figure 2 depicts the location and extent of the remaining features on ML10324.

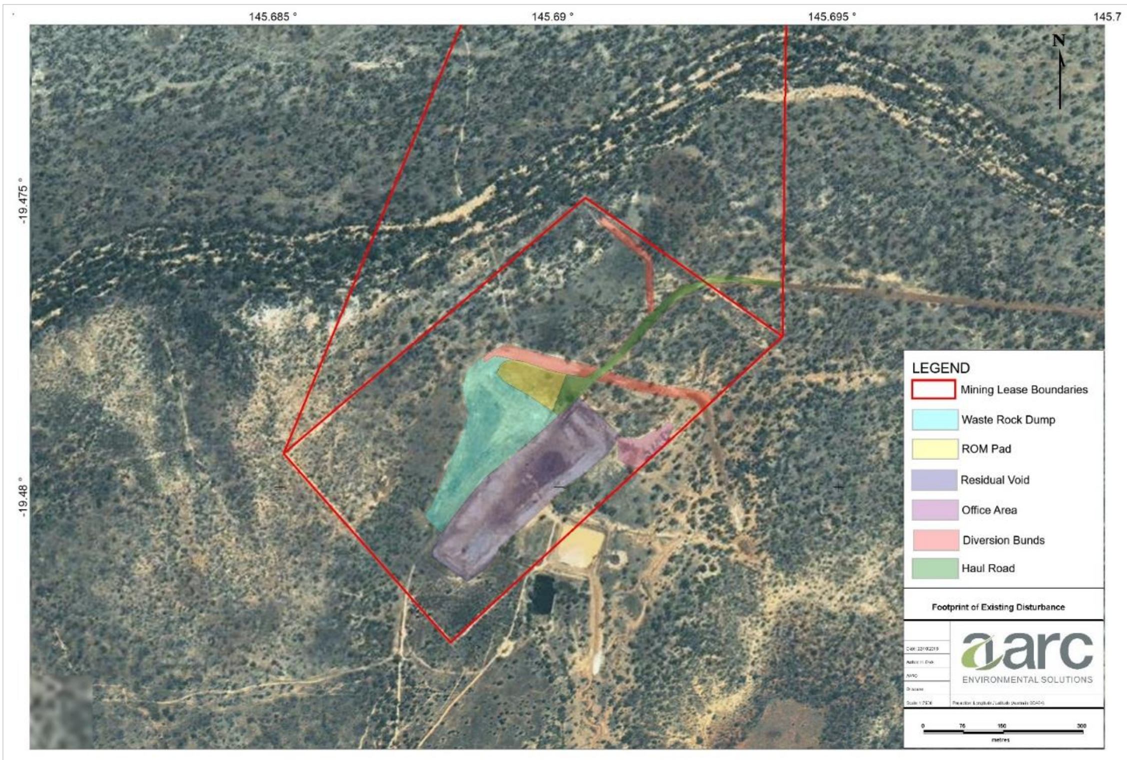

Figure 2 Project features

3.1 Residual void

A single pit void with approximate dimensions of 400 m long, 80 m wide and 12-15 m below natural surface remains within ML10324. The approximate footprint area of the pit void is 4.1 ha. Under the ML10324 landowner compensation agreement, the pit void was intended to be left as a stock water storage; with adjacent lands being shaped to direct water into the void, including any overflow from the upstream Dingo Dam, which sits immediately adjacent on the south-eastern side of the pit void; its northernmost corner located within the ML10324 boundary (refer Figure 2). Dingo Dam is a significant stock watering dam for the Spyglass research station and is to remain in place under the control and management of the landowner.

3.1.1 Void stability

Rehabilitation of the final void included reducing pit batter angles to a typical maximum of 20°. The Plan of Operations current at the time of undertaking this rehabilitation work indicated that topsoiling would occur, but that revegetation would rely on natural establishment with a review at 12 months to assess whether additional revegetation works would be required. ATC Williams (2019b) reported that sparse vegetation has established on the void batters, but that erosion rills were present. The condition of batters will be assessed as per the rehabilitation monitoring program included as part the Post Mine Land Use Plan (PMLUP) (AARC 2020).

Measures proposed at Section 4.1.2 relating to stormwater management have the objective of minimising the future erosion potential of the pit void batter.

A desktop stability study of the mining void was undertaken by ATC Williams in June 2019 (ATC Williams, 2019b). This assessment reported that, from a stability perspective, there is a very low risk of geotechnical instability affecting the mining void, other than existing erosion being caused by surface water flowing into the void. Should any slip failures occur in the relatively weak soils and upper portion of the weathered rock, it is likely that this would be a relatively low-angle failure with materials being contained within the mining void. The relatively shallow batter slope angles reduce the risk of toppling or wedge failures in any exposed rock (ATC Williams 2019b). Such conditions have not been observed to date.

3.1.2 Void water quality

Since the pit void was rehabilitated, one water release event from the site has occurred. This followed a significant rainfall event (greater than 1:20 annual exceedance probability) and under high flow receiving environment conditions. This event was subject to an investigation report (AARC 2019a). Water released at the time of this event included water from the pit void, runoff from the adjacent waste rock dump (WRD) and adjacent and upstream catchment areas either through Dingo Dam to the void or via the downstream sediment dam area. The release investigation found that water released from the sediment dam was generally in accordance with release criteria, except for total aluminium (6.13 mg/L against a release criteria of 5 mg/L). Release event monitoring also identified trigger level exceedances for dissolved aluminium and copper at the upstream (reference) monitoring point.

Receiving Environment Monitoring Program (REMP) monitoring in 2019 (AARC 2019b) determined that there is no statistical difference in water quality characteristics between the upstream (reference) or downstream (impact) sites being used for the Project, and that for some metals (aluminium, cobalt, copper, zinc) baseline concentrations have a tendency to exceed EA trigger levels.

To assess the potential impact on void water quality as a result of leaching of any contaminants from the void surfaces, AARC (2019a) undertook geochemical analysis of eight surface material grab samples within the void. The samples were selected as being representative of the different void surface materials.

The surface soil grab samples were analysed to assess:

- pH, electrical conductivity (EC) and sulphur;
- acid neutralising capacity (ANC);
- acid forming potential; and
- water extractable elements.

Existing pH provides an indication of the likely pH condition of runoff from the pit walls. The results show that materials represented by the samples were neutral to alkaline at the time of testing.

The EC provides an indication of the inherent salinity of topsoil material that forms the walls of the pit void. The EC results indicate that the samples were non-saline.

The total sulphur content of all samples was very low ranging from < 0.01 to 0.03%. With the exception of one sample, all samples from the walls of the pit void recorded a total sulphur content below the limit of reporting (0.01%).

The ANC results indicated that the majority of samples have a low ANC, however the analysis of acid forming potential indicated that all samples are classified as non-acid forming (NAF) according to the acid rock drainage (ARD) classification. Results are illustrated in the plot of Net Acid Producing Potential (NAPP) versus Net Acid Generation (NAG) pH (Figure 3).

In order to evaluate any potential impacts to the receiving environment of water released from the pit void, the mean and median values of the metal concentrations extracted from the void samples were compared against:

- past void water quality data, and
- downstream receiving water quality as recorded during the void overtopping and release event that occurred in February 2019.

The comparison indicates that under low storage volume and no flow conditions, void water quality can exhibit elevated concentrations of dissolved aluminium, chromium, copper and nickel. However, under high flow conditions and significant dilution, as observed during the release event (February 2019), aluminium was the only metal recorded above EA trigger levels in both stored void water, and downstream receiving water.

These findings indicate that at full capacity, and with the exception of aluminium, the extractable metal concentrations in stored void water are likely to be sufficiently diluted below trigger levels in an overtopping scenario. The downstream receiving water quality results indicate further dilution of dissolved metals (including aluminium) is likely due to upstream inputs and the settlement of suspended sediment in overland runoff. Although dissolved aluminium concentrations in the downstream receiving environment remained above the EA trigger level (0.055 mg/L), this exceedance was consistent with concentrations recorded in the upstream receiving environment at this time (AARC 2019a) and is considered a reflection of baseline conditions for the catchment.

It should be noted also that mean and median extractable metal/metalloid concentrations in void material fall below the ANZECC & ARMCANZ (2000) guideline values for Livestock Drinking Water and the EA contaminant release limits. Water quality management is discussed further at Section 4.1.1.

3.1.3 Seepage and overland flow

A hydrogeological assessment was undertaken by Geosquare in June 2019 (Geosquare 2019). Their findings are that the void is located in an area of very low hydraulic permeability resulting in minimal transport potential of water and dissolved solids. Seepage potential to outflow points is minimal and would require an extensive time period for migration through the subsurface. The assessment identifies that core hole logging data and modelling suggests that the area surrounding ML10324 is heterogenous. An impermeable intrusive body is present upgradient from the site, while ML10324 is located in lateritic material with down-gradient geological formations consisting of intrusive bodies with highly weathered material intercalating these formations resulting in low to near-impermeable zones in the subsurface.

Current understanding of the topographical, geological and hydrogeological setting would indicate that flow or seepage from Snake Creek into the open pit void is extremely unlikely with overland flow the most likely pathway to connect these bodies.

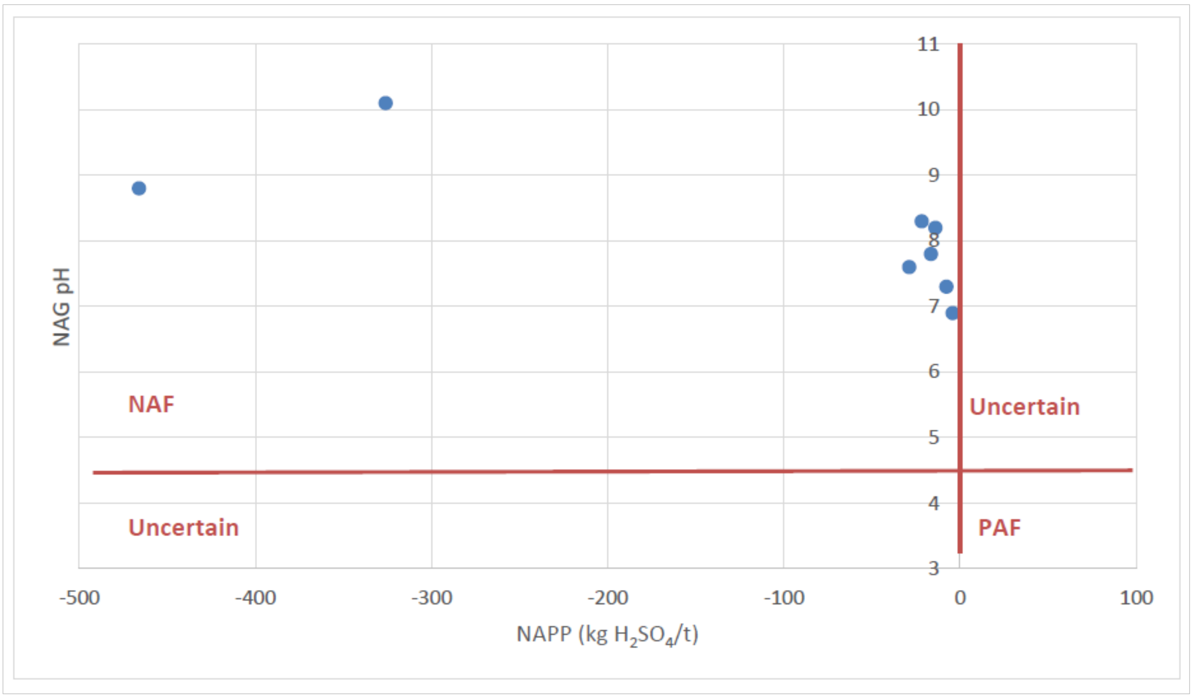

Figure 3 ARD classification plot of NAPP versus NAG pH—surface soil samples

3.2 Waste rock dump

A WRD having a footprint of approximately 2.8 ha is located immediately to the west of the pit void within ML 10324.

The WRD was previously reprofiled to reduce batter angles and create a stable free-draining surface, then topsoiled and seeded.

3.2.1 Waste rock geochemistry

Geology underlying the Lucky Break Project site comprises the Oweenee Granite and the Argentine metamorphics, which include meta-siltstones, calc-silicate, gneiss, amphibolite and serpentinised ultrafamic rocks. The major rock units consist of the Precambrian Argentine metamorphics, Carboniferous Oweenee granite, the Late Carboniferous – Early Permian intrusive rhyolites and breccias and Tertiary sediment and duricrust cover. Tertiary sediments, laterite and Quaternary alluvium underly the majority of the Project area.

The Dingo Dam deposit consists of a laterised serpentinite body and occurs as a distinct low-lying feature with sub-surface units characterised by siliceous honeycomb textured rocks. The body contains scattered sub-crop and outcrops of silica-geothite laterite zones forming hard, resistant, smooth weathered areas. The Project site comprises a hard layer of soil or duricrust composed predominantly of silica, iron, calcium and gypsum. Weathering has removed the original duricrust that once connected the deposit with the surrounding laterite. Mineralisation is generally restricted to the top 30m of the weathered profile. Red brown soils are well developed over areas of lateritic outcrop and sub-crop and are generally covered with colluvial scree.

Geochemical assessment of the Dingo Dam lateritic ore body was undertaken during the Project's exploration phase. Samples were collected from the waste rock zone (to a depth of 4 m) of the Dingo Dam deposit. The samples were sent to a NATA accredited laboratory for analysis to determine the acid producing potential of the waste rock material. Parameters tested include:

- NAG capacity at pH 4.5 and 7 (kg H_2SO_4/tonne);
- NAG pH (pH OX)—final pH of the sample after oxidation;
- per cent total sulphur;
- ANC (kg H_2SO_4/t);
- NAPP (kg H_2SO_4/t); and
- fizz rating.

Results from the waste rock characterisation testing are presenting in Table 2.

Table 2 Waste rock characterisation results (MFL 2011)

Analyte	**Units**	**Level of reporting**	**Sample 1**	**Sample 2**
NAPP	kg H_2SO_4/t	0.5	–8.5	–6.8
NAG (pH (OX))	pH unit	0.1	7.4	8.9
NAG (pH 4.5)	kg H_2SO_4/t	0.	< 0.1	< 0.1
NAG (pH 7.0)	kg H_2SO_4/t	0.1	< 0.1	< 0.1
ANC as H_2SO_4 equiv.	kg H_2SO_4/t	0.5	8.5	6.8
Fizz Rating	Fizz Unit	1	0	0
Sulphur (total as S)	%	0.01	< 0.01	< 0.01

As shown in Table 2, each sample recorded a low ANC with values ranging from 6.8 to 8.5 kg H_2SO_4/t.

The acid forming potential of the waste rock material was assessed using the Acid Base Account (ABA). The ABA evaluates the balance between acid generation processes (oxidation of sulphide minerals) and acid neutralising processes (dissolution of alkaline carbonates, displacement of exchangeable bases and weathering of silicates) (Jones *et al*. 2016). The ABA is based on the Maximum Potential Acidity (MPA) and the inherent ANC of the tested samples. Total sulphur has been used as a conservative estimate of pyritic sulphur (i.e. all sulphur is assumed to be present in the form of pyrite) to calculate MPA (MPA = weight% S x 30.6).

If the MPA is less than the ANC then the NAPP is negative, indicating that the sample may have sufficient ANC to prevent acid generation. If the MPA exceeds the ANC then the NAPP is positive, indicating that the material may be acid generating (Jones *et al*. 2016).

Figure 4 shows the ABA plot of the waste rock material samples and a NAPP = 0 line, which separates NAPP positive and negative domains and is equivalent to an ANC/MPA ratio of 1. The ABA plot shows both samples lie in the NAPP negative domain.

Both samples have an ANC/MPA ratio greater than 3. The ANC/MPA ratio is used as an indication of the relative factor of safety within the NAPP negative domain. Usually a ratio of 2 or more signifies a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to ARD (Jones *et al*. 2016). An ANC/MPA ratio of 3 or higher indicates a high probability that the material will be NAF.

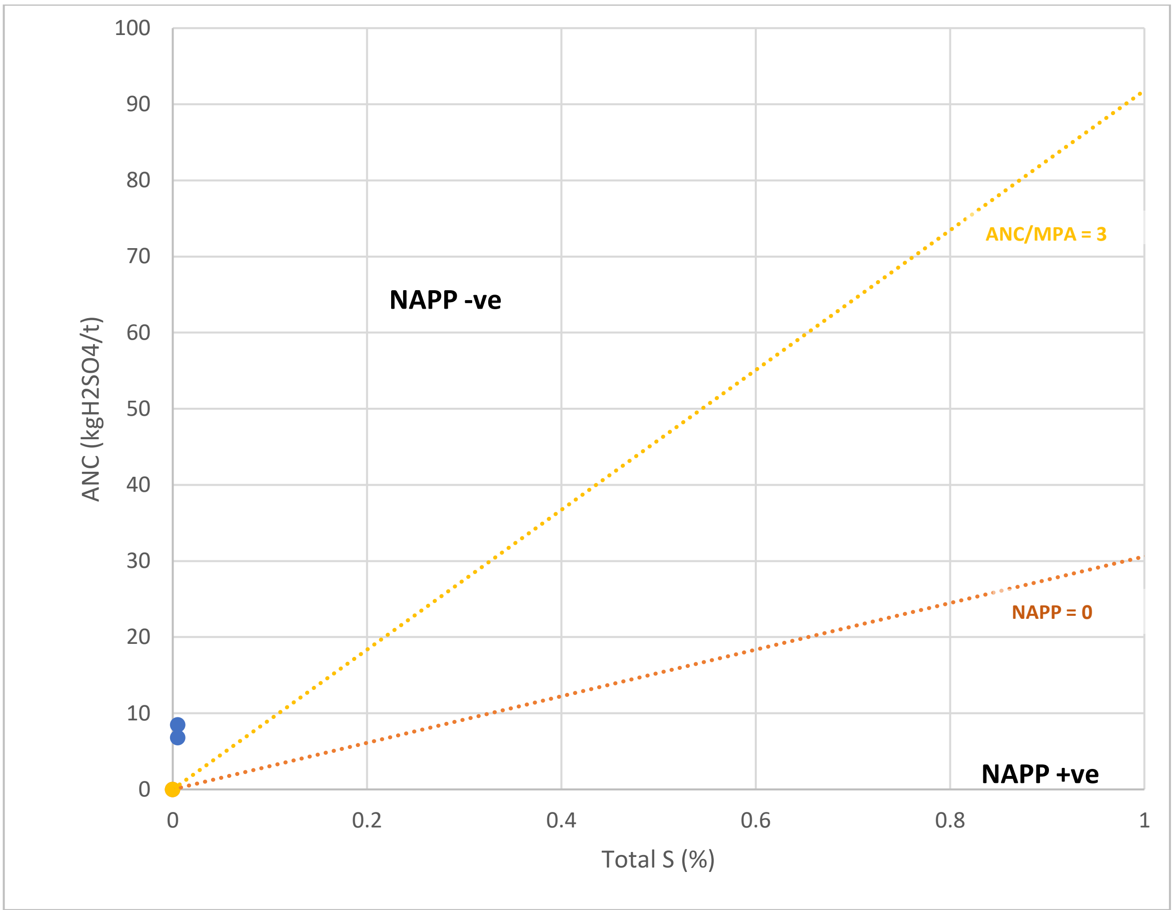

Figure 4 Acid base account plot of total S versus ANC—Ore body samples

The NAG pH test is used in association with the NAPP to classify the acid-generating potential of a sample. As the NAG pH test is completely independent of the NAPP approach, the combination of the NAPP and NAG pH provides greater certainty to the assessment of ARD potential (Jones *et al*. 2016).

The standard criteria used to classify the ARD potential of the void material samples are shown in Table 3.

Table 3 Standard geochemical classification criteria (source: Jones et al. 2016)

Primary geochemical material type	NAPP ($kg\ H_2SO_4/t$)	NAG pH
Potentially Acid Forming (PAF)	> 10	< 4.5
Potentially Acid Forming–Low Capacity (PAF–LC)	0 to 10	< 4.5
Non-Acid Forming (NAF)	Negative	≥ 4.5
Acid Consuming (AC)	< -100	≥ 4.5
Uncertain	Positive	≥ 4.5
	Negative	< 4.5

The primary geochemical classification types are described as follows:

Potentially Acid Forming (PAF)	Likely to result in acidification and ARD generation during exposure to atmospheric conditions.
Non-Acid Forming (NAF)	Generally contains ANC sufficient to neutralise any acid that might have been produced by sulphide oxidation.
Uncertain (UC)	Disparity occurs between the NAPP and NAG results. Under certain conditions a sample may have either a negative NAPP and a positive NAG, or a sample may have a positive NAPP and negative NAG. Further testing is required to determine the acid producing potential.

The ARD classification plot of NAPP versus NAG pH is shown in Figure 5. The plot demonstrates that both samples were classified as NAF with a negative NAPP and pH of > 4.5.

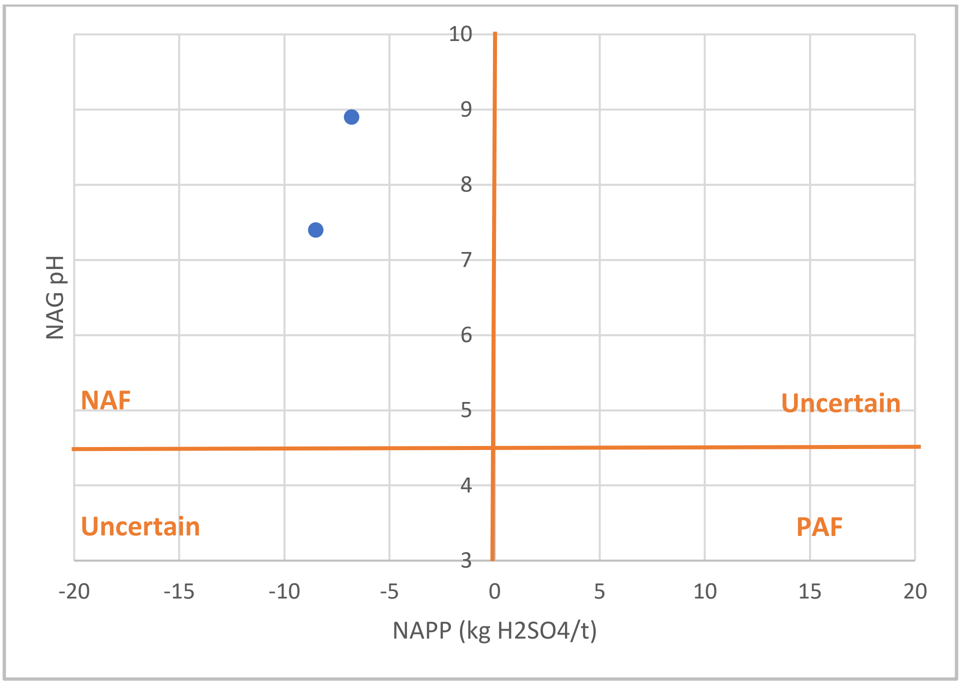

Figure 5 *ARD classification plot of NAPP versus NAG pH—Ore body samples*

The waste rock testing results from the Dingo Dam pit demonstrate that the material is NAF due to the negative NAPP. Total sulphur concentrations also fell below detection limits.

The geochemical assessment identified significant nickel enrichment. The main phyllosilicate minerals such as smectite, chlorite, talc and serpentine were identified as likely to host the nickel mineralisation with chlorite and smectite being preferred. The Global Acid Rock Drainage Guide (INAP 2018), focuses on drainage produced by sulphide mineral oxidation with potential sources for generation of ARD, NMD, and saline drainage, including reactive sulphide minerals and their oxidation products. A review of the resource minerology for the Lucky Break Project revealed a distinct absence of sulphur containing minerals and acid forming species (MFL 2011). The absence of any sulphur containing minerals confirms that the waste rock does not pose a threat from ARD from the WRD in the long term.

Overall, the waste rock characterisation results demonstrate that the waste rock is a net acid consumer and does not produce saline runoff (MFL 2011).

3.2.2 Waste rock stability

At the completion of mining, the WRD was reshaped to reduce batter angles and create a stable landform and was then topsoiled and seeded. Site investigations conducted since September 2018 revealed that the WRD landform remains stable with an intact surface of rock-raked, gravelly topsoil and no presence of erosion. A minor erosion gully occurs down the side of the void / WRD access ramp. Four minor erosion gullies (approximately 40cm deep) and one moderate gully (approximately 80 cm deep) were also recorded on the eastern face of the WRD. A small number of pioneering Acacia shrubs were noted on the surface of the WRD along with a variety of grasses (*Heteropogon contortus,* Aristida sp. and Chloris sp.) and forbs (*Stylosanthes scabra,* sclerolaena sp. and Chenopodium sp.).

Past geochemical testing of the WRD indicates that the waste rock material extracted from the Dingo Dam pit contains only benign material. The waste rock material lacks sulphur containing minerals and is geochemically stable (non-acid forming), presenting a low risk of generating any environmental harm.

Site investigations suggest that topsoil material was likely sourced from one of the topsoil stockpiles stripped from the Corea, Cape or Barkla soil units prior to the commencement of mining. The topsoil was applied across the current mine disturbance areas (pit void, WRD and Run of Mine (ROM) pad). The topsoil quality is largely representative of the red brown soils overlying laterite bodies. Topsoil quality characteristics recorded throughout the rehabilitation areas are described in Appendix A of the *Application for Estimated Rehabilitation Cost – Supporting Information* (AARC 2019c). Black chromite grains are present in the soils of the Project region and reflect the insoluble nature of chromite in the laterite environment. The presence of chromite is evident in the elevated chromium levels recorded in the WRD topsoil. Levels of cobalt and nickel are also elevated due to the naturally high levels present in Corea topsoils and subsoils as shown in the geological testing conducted at the time of exploration activities (AARC 2019c).

Given that the elevated metals in the WRD soils are naturally high in the surface and subsoils overlying lateritic outcrops, the WRD is considered to present a minimal risk of causing environmental harm to the receiving environment. Recent downstream water quality data indicates the WRD material poses a very low risk of causing harm to the receiving environment. Following the release of mine affected water, water quality in the downstream receiving environment was consistent with upstream reference water quality. Runoff from the WRD and other mine disturbance areas was found to have no measurable impact on the downstream receiving water quality (refer also Section 3.1.2).

3.3 Sediment dam, ROM pad and office area

The sediment dam consists of a shallow depression formed from an approximately 1m high constructed diversion bund along its eastern boundary. At a site inspection carried out in December 2019, this area was dry and contained mature trees with scattered groundcover vegetation. Rehabilitation of the sediment dam shall include sediment removal, re-profiling of the sediment dam banks/bunds to create a free-draining landform and re-seeding. Sediment removed from the dam shall be disposed of in the residual void.

The ROM pad was a levelled area immediately to the northeast of the WRD used for storing, crushing, screening and load-out of ROM product. Similarly, the office area was a levelled site to the north-east of the pit void used for and housing a secondary bunded fuel tank, storage containers, two demountable offices and an ablutions demountable, a shipping container dome shed used as a workshop and various other miscellaneous materials. Rehabilitation of both areas involved removal of all infrastructure and product material and ripping to aid rainfall infiltration. Soil samples tested from the footprint of the ROM Pad were found to contain concentrations of chromium, cobalt and nickel that exceeded the upgradient reference site (REF 4) soil quality characteristics. Cobalt and nickel results also exceeded the mean values for all shallow (0-1 m) drill data, but well within the range of results obtained. It is considered that the data is representative of the naturally mineralised characteristics of soil in this area. Some remedial rehabilitation actions are proposed to facilitate vegetation establishment in these areas including remedial ripping, re-seeding, fertiliser application and soil amelioration (i.e. application of recycled gypsum or topdressing with organic amendments; as required on the ROM pad).

Various earthen bunds were constructed to control and contain stormwater runoff with some of these retained post-mining. ATC Williams were commissioned to review and assess the status of site stormwater management with a view to recommending modifications to the retained stormwater drainage system. The assessment nominated the following objectives to be achieved (ATC Williams 2019a):

- to protect the receiving environment from adverse water quality impacts as a result of overtopping of the void; and
- maintain appropriate management of peak storm water flow releases from the site (i.e. ensure that peak store water flows from the site will not adversely affect the receiving environment).

ATC Williams (2019a) have proposed an amended stormwater drainage system that involves relatively minor earthworks to create new bunds/embankments, remove bunds/embankments at various locations and, at certain locations levelling or grading works to create new preferable flow paths. These works are proposed to be undertaken early within the period of this PCMP.

3.4 Haul road

The Project's haul road remains in the eastern portion of ML10324. The haul road footprint traverses from the north-eastern corner of the WRD in an easterly direction across the ML boundary and towards the Gregory Developmental Road.

The haul road was retained at the completion of mining but will require ripping, grading and seeding to achieve final rehabilitation success. These works are proposed to be undertaken early within the period of this PCMP.

3.5 Post-mine land use

A full assessment of post-mining land use is provided within a PMLUP developed in accordance with EA Condition C4 (AARC 2020).

The Project area lies in a rural landscape and historically has been subject to low-intensity cattle grazing with limited exploration and mining activities. The pre-mining use of the land within both MLs is low-intensity cattle and horse grazing, and mineral exploration.

A summary of the post-mining land uses for the site is provided inTable 4. The previously disturbed rehabilitation areas will largely be returned to a grazing / native ecosystem land use with the exception of the residual void. The pit void will have a final land use of non-use management area (NUMA), although over time, this area may prove to be a suitable stock water supply. Regardless, the pit void will meet the rehabilitation goals of being safe, non-polluting and stable.

The landholder of both MLs is the Spyglass Station (DAF) and is also the existing user of the land and retained structures. Dingo Dam is a pre-existing structure owned by t1he landholder. The final land uses and rehabilitation responsibilities of both MLs have been negotiated and shared with the landholder. It is anticipated that water quality monitoring as proposed in the RMP for the pit void may demonstrate over time a water resource suitable for livestock.

While all areas of existing mine disturbance on ML10324 have undergone rehabilitation, rehabilitation success to date has been limited. All areas previously disturbed by mining activities will be subject to rehabilitation maintenance and monitoring activities as discussed in the following sections.

Table 4 Project pre- and post-mine land uses

Project area	Pre-mining land use	Post-mined land use
Infrastructure areas		
Office area	Grazing/native ecosystem	Grazing/native ecosystem
Diversion bunds	Grazing/native ecosystem	Grazing/native ecosystem
Haul road	Grazing/native ecosystem	Grazing/native ecosystem
Stormwater management features	Grazing/native ecosystem	Grazing/native ecosystem
Waste		
WRD	Grazing/native ecosystem	Grazing/native ecosystem
Run of Mine (ROM)		
ROM Pad	Grazing/native ecosystem	Grazing/native ecosystem
Voids		
Residual Void	Grazing/native ecosystem	Non-use management area
Dams		
Sediment Dam	Grazing/native ecosystem	Grazing/native ecosystem
Dingo Dam	Water storage	Water storage

4 Post closure operation and maintenance

In accordance with EA Condition D25, rehabilitated areas at the Project site must be rehabilitated to meet the following final acceptance criteria:

(a) *the landform is safe for humans and fauna;*

(b) *the landform is stable with no subsidence or erosion gullies for at least three (3) years;*

(c) *any contaminated land (e.g. contaminated soils) is remediated and rehabilitated;*

(d) *not allowing for acid mine drainage; or*

(e) *there is no ongoing contamination to waters (including groundwater);*

(f) *rehabilitation is undertaken in a manner such that any actual or potential acid sulfate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the Instructions for the treatment and management of acid sulfate soils (2001);*

(g) *all significantly disturbed land is reinstated to the pre-disturbed soil suitability class;*

(h) *for land that is not being cultivated by the landholder:*

  a) *groundcover, that is not a declared pest species is established and self-sustaining*

  b) *vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining, and*

  c) *the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activity(ies).*

(i) *for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of petroleum activities being completed.*

The following sections are structured to address the requirements of Condition C6 (a). The requirements of Condition C6 (b) are addressed at Section 5.

4.1 Water management

For the purposes of this PCMP and in accordance with the Project EA (EPML00900713), wastewater is defined as being water from the activity, process water or contaminated stormwater.

There is no legacy water from the mining activity remaining on the site. The key water management aspects associated with the site relate to stormwater collected in the pit void and stormwater drainage for the site. These categories of water are discussed in the following sections.

During the operational phase of the Project, and apart from collection and sedimentation systems and processes, no wastewater collection, reticulation or treatment systems are or have been operated on the Project site

Decommissioning and rehabilitation works already undertaken have significantly reduced the potential for contamination resulting from the Project. It is anticipated that the proposed stormwater management works will further reduce the risk of environmental harm.

4.1.1 Residual void water

Residual void water quality is discussed in Section 3.1.2. A release investigation for Sconi Mining Operations undertaken by AARC (2019a) highlighted the relatively high aluminium levels, albeit below guideline values for Livestock Drinking Water (ANZECC & ARMCANZ 2000), naturally present in stormwater runoff and were a key factor in proposing both stock exclusion and the review and assessment of stormwater drainage for the site.

It is considered that the stormwater works proposed will address environmental concerns relating to stormwater quality for the Project.

Residual void water quality will continue to be monitored for the duration of this PCMP.

4.1.2 Stormwater management

Following the void release event of February 2019, ATC Williams were commissioned to review and assess the status of site stormwater management at the site with a view to recommending modifications to the retained stormwater drainage system (ATC Williams 2019a). The proposals are intended to ensure the following:

- catchment areas reporting to the pit void are minimised to limit the risk of the void overtopping;
- natural drainage paths are restored, where possible, to minimise impounded water;
- potential for environmental harm, such as erosion, is minimised.

ATC Williams (2019a) has proposed an amended stormwater drainage system that involves relatively minor earthworks to create new bunds/embankments, remove bunds/embankments at various locations and, at certain locations, levelling or grading works to create new preferable flow paths. These works are proposed to be undertaken early within the period of this PCMP and are anticipated to address all remaining stormwater drainage management issues identified at the site.

4.1.3 Water management structures

Decommissioning and rehabilitation strategies aim to achieve safe, stable, non-polluting and sustainable final landforms. A Consequence Category Assessment was undertaken on the site storage structures (Dingo Dam, Pit Void and Sediment Dam) and the summary of the outcomes is shown in Table 5 below. The Consequence Category was assessed as 'low' for 'Failure to Contain Overtopping' of all three storage structures, 'low' for 'Dam Break' of Sediment Dam and Dingo Dam, and 'low' for 'Overall Consequence' of all three structures.

Table 5 Consequence category assessment summary

Dam	Failure to contain seepage	Failure to contain overtopping	Dam break	Overall consequence	Regulated structure (as defined in the manual Y/N)
Residual void	NA	Low	NA	Low	N
Sediment Dam		Low	Low	Low	N
Dingo Dam		Low	Low	Low	N

Source: Lucky Break–Dingo Dam Consequence Category Assessment (ATC Williams 2019c)

For the pit void, no further works are proposed other than the installation of standard fencing and signage and the stormwater modification works recommended by ATC Williams (2019a). Erosional stability and water quality will continue to be monitored on an annual basis in accordance with the rehabilitation monitoring program.

The sediment dam will retain stormwater occasionally following rainfall events until such time that collected sediments are removed, the bunds reprofiled to create a free-draining landform, and revegetation works undertaken. Water quality samples will continue to be undertaken in accordance with the rehabilitation monitoring program until the sediment dam has been rehabilitated.

Dingo Dam will be retained with its current use and under the operational control of the landowner. Apart from the stormwater modification works as per ATC Williams, no other works are proposed. Water quality samples will continue to be undertaken in accordance with the rehabilitation monitoring program.

4.2 Groundwater management

Decommissioning and preliminary rehabilitation work has significantly reduced the potential for contamination resulting from the Project. In addition to the pit void water quality investigations undertaken, a hydrogeological assessment undertaken by GeoSquare (2019) has demonstrated a low to very low risk of pit and groundwater interaction and potential risk of groundwater contamination. As such, further groundwater management actions are not considered necessary.

4.3 Waste management

The only waste materials remaining on-site are the waste rock materials comprising the WRD. The environmental risks associated with the WRD are discussed in Section 3.2 and are summarised in Table 6.

Table 6 Waste rock dump: level of environmental risk

Rehabilitation objective	**Level of risk**
Potential for environmental harm arising from surface runoff or subsurface seepage	Very low (refer Section 0)
Potential for environmental harm arising from contaminant pollution (surface runoff or subsurface seepage, groundwater)	Very low (refer Section 3.1.2 and Section 3.2)
WRD geotechnical stability	Very low (refer Section 3.2.2)
Erosion stability	Low (refer Section 3.2.2)
Safety	Very Low

4.4 Vegetation cover

Rehabilitation aims to establish a self-sustaining vegetative cover over final landforms consistent with the agreed post-mining land use stated in the PMLUP (AARC 2020). Until such time that the vegetative cover is established to a point that it may be deemed self-sustaining, ongoing maintenance works may be necessary. These ongoing works may include further application of fertiliser and watering to promote vegetation growth and recruitment.

Pest and weed control measures may also be necessary; ongoing management and maintenance of rehabilitated areas should include efforts to minimise the proliferation of species not consistent with the agreed post-mining land use (refer to the RMP attached to the PMLUP). In addition, rehabilitation monitoring proposed will assess species composition, to ensure established vegetation is consistent with rehabilitation objectives.

The following species are consistent with the rehabilitation objectives (refer to the PMLUP for details regarding species selection) and will be considered as part of the revegetation work:

- *Eucalyptus crebra*
- *Corymbia clarksoniana*
- *Corymbia erythrophloia*
- *Corymbia tessellaris*
- *Neptunia dimorphantha*
- *Sida subspicata*
- *Heteropogan contortus*
- *Aristida calycina var. calycina*
- *Rhynchelytrum repens*
- *Atalaya hemiglauca*
- *Carissa lanceolata*
- *Grevillia striata*
- *Hakea chordophylla*

5 Post closure monitoring

Rehabilitation monitoring – also detailed in the Rehabilitation Monitoring Program (AARC 2020) – will include monitoring of surface water, erosion rates and revegetation growth. It is proposed that rehabilitation monitoring will continue until objectives and completion criteria (refer to the PMLUP for details) have been achieved or for a period of three years from the date of this PCMP. The following sections provide detail on monitoring requirements.

5.1 Surface water quality

All determinations of water quality must be:

- performed by a person or body possessing appropriate experience and qualifications to perform the required measurements;
- made in accordance with methods prescribed in the latest edition of Department of Environment and Science (DES) Monitoring and Sampling Manual (DES 2018);
- collected from the monitoring locations identified by the EA, within two hours of each other (reference/downstream) where possible;
- carried out on representative samples; and
- laboratory tested using a laboratory accredited (e.g. National Association of Testing Authorities) for the method of analysis being used.

5.1.1 Water storage monitoring

Water storage monitoring locations are detailed in Table 7 (adapted from EA Schedule G, Table G3). Water storage contaminant limits are detailed in Table 8 (adapted from EA Schedule G, Table G4). Water storage monitoring will be undertaken on an annual basis. Monitoring will continue for the duration of the PCMP or until it can be demonstrated that rehabilitation objectives and completion criteria have been achieved.

Dingo Dam will also be monitored following the same methodology and compared with the water quality criteria listed in Table 8.

Table 7 Site water storage locations

Monitoring point	Latitude (GDA94)	Longitude (GDA94)	Monitoring location	Frequency of monitoring
Sediment Dam 1	–19.476024	145.691493	Dam spillway	Annual

Table 8 On-site water storage contaminant limits

Quality characteristics	Test value	Contaminant limit [3]
pH (pH unit)	Range	> 4, < 9[2]
EC (µS/cm)	Maximum	59 701
Sulphate (mg/L)	Maximum	10 001
Aluminium (mg/L)	Maximum	5[1]
Arsenic (mg/L)	Maximum	0.5[1]
Cadmium (mg/L)	Maximum	0.01[1]
Cobalt (mg/L)	Maximum	1[1]
Copper (mg/L)	Maximum	1[1]
Lead (mg/L)	Maximum	0.1[1]
Nickel (mg/L)	Maximum	1[1]
Zinc (mg/L)	Maximum	20[1]

Note 1: Contaminant limit based on ANZECC and ARMCANZ (2000) stock water quality guidelines.

Note 2: Page 4.2–15 of ANZECC and ARMCANZ (2000) "Soil and animal health will not generally be affected by water with pH in the range of 4–9."

Note3: Total measurements (unfiltered) must be taken and analysed.

5.1.2 Receiving water monitoring

Receiving water monitoring locations are in accordance with Schedule G, Table G5 of the EA and the Project's REMP. These monitoring locations are described in Table 9 and shown in Figure 6 below. Receiving waters trigger levels and contaminant limits are prescribed in the EA (Schedule G, Table G6).

Monitoring will continue until it can be demonstrated that rehabilitation objectives have been achieved or for a period of three years from the date of this PCMP.

Table 9 Receiving water reference sites and downstream monitoring points

Monitoring point	Receiving waters location description	Latitude (GDA94)	Longitude (GDA94)
Reference monitoring points			
LBUS1* Sediment and receiving waters	Snake Creek approximately 800 metres upstream of the release point	–19.476129	145.684473
LBUS2* Sediment and receiving waters	Snake Creek approximately 500 metres upstream of the release point	–19.475612	145.688002
LBUS3 Sediment and receiving waters	Unnamed tributary approximately 350 m upstream of Dingo Dam ML	-19.484011	145.690512
LBUS4 Sediment and receiving waters	Snake Creek approximately 1000 m upstream of the release point	-19.476178	145.68254
Downstream monitoring points			
LBDS1* Sediment and receiving waters	Snake Creek approximately 1000 metres downstream of the release point)	-19.47549	145.69960
LBDS2* Sediment and receiving waters	Snake Creek approximately 2000 metres downstream of the release point	-19.476218	145.709432
LBDS3 Sediment and receiving waters	Unnamed tributary approximately 1700 metres downstream of Dingo Dam ML	-19.477806	145.708092

* Receiving water reference sites and downstream monitoring points prescribed in EA Table G5

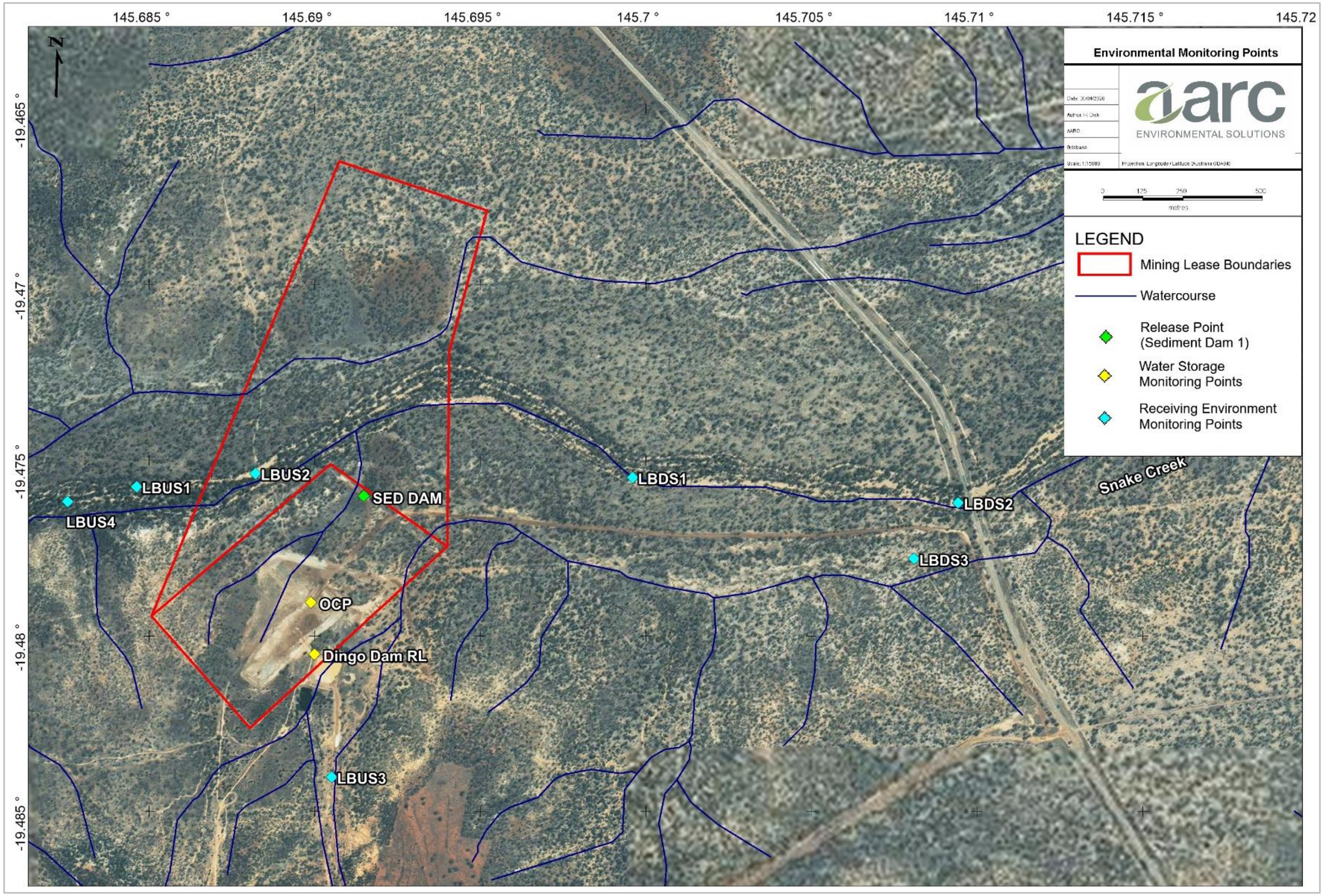

Figure 6 *Surface water and stream sediment monitoring sites*

5.2 Groundwater level/quality

Sampling of the Homestead bore water in 2006 indicated that the water quality was good due to low salinity, neutral pH and most metals being below detection limits or low in concentration.

Compliance bores #1 and #2 were not installed prior to acquisition by AUZ. The hydrogeological assessments undertaken (GeoSquare 2019) have indicated that further groundwater monitoring is not required at the Project site due to a low to very low risk of pit and groundwater interaction and consequent very low risk of groundwater contamination.

5.3 Erosion rates

Monitoring of erosion rates will be undertaken on an annual basis during the post wet season for the period of the PCMP. The following attributes will be monitored/recorded:

- Global Positioning System coordinates of location;
- general description of type of erosion present (e.g. gully, rill line, circular failure, tunnelling) and possible causes;
- depth of erosion;
- width of erosion;
- length of erosion;
- location of eroded material deposition; and
- evidence of stabilisation of the erosion line by vegetation.

Erosion monitoring will be conducted at all final landforms.

5.4 Integrity and effectiveness of final cover system

Visual observation will be conducted on an annual basis following the wet season, to ensure that covers are operating as expected and to identify any issues. Monitoring requirements outlined above, such as receiving water monitoring, will assist in ensuring topsoil covers are established in an effective manner. Indicators to be observed and recorded include:

- evidence of erosion which may affect the groundcover; and
- evidence of ponding which may inhibit the establishment of vegetation.

5.5 Health and resilience of vegetation

Rehabilitation aims to establish self-sustaining vegetative covers on final landforms to ensure consistency with the proposed mine land uses in the PMLUP and to facilitate stability. Monitoring of the health and resilience of vegetation is integral to minimising the Project’s potential to cause environmental harm at mine closure.

The following attributes will be monitored during the post wet season on an annual basis:

- presence of key species;
- species type and diversity;

- abundance of weeds;
- tree density (trees/ha);
- shrub density (shrubs/ha);
- herb/grass density (grasses/ha);
- groundcover (%);
- chemical indicators of soil;
- erosion indicators; and
- photographic records of the site.

Monitoring of vegetative covers will be undertaken at all final landforms.

6 References

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