

Appendix T - Acid Mine Drainage Management Plan

Primary Gold Pty Ltd

**Rustlers Roost and Quest 29 Open-cut Mine
Redevelopment - Acid and Metalliferous Drainage
Management Plan**

8 October 2021



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Section 1 Introduction

The Rustlers Roost and Quest 29 Open-cut Mine Redevelopment Project (herein referred to as the Project) will involve open-cut mining with the expansion of all existing open-cut pits and the development of two new smaller pits at Rustlers Roost. Primary Gold Limited (PGO) is the proponent of the mine redevelopment. The mine sites are located approximately 11 km apart and are connected by an existing unsealed access track, which will be upgraded to accommodate haulage of ore from the Quest 29 satellite pits to Rustlers Roost processing facility. Figure 1-1 provides a depiction of the overall Project location. Ore mined at both sites will be processed at a new purpose-built processing facility located at the Rustlers Roost site to produce gold bullion. The rate of production will be up to 5 million tonnes per annum (Mtpa) over an approximately ten-year Life of Mine (LOM).

Waste rock will be deposited in surface waste rock dumps (WRDs) and will be used to backfill a number of pits where mine scheduling permits. At Quest 29, a new surface WRD is proposed for mining of the first pit (Zamu), with the waste material from the four consecutive pits to be backfilled into Zamu pit and a portion of oxide material used for rehabilitation of the decommissioned heap leach facility. At Rustlers Roost, the majority of the waste rock material will be deposited within two surface WRDs (located partially over the historic WRD to the north-west of the main pit) and a portion backfilled into the two new minor pits (Annie's Dam pit and Annie's Oakley pit) (refer to Figure 1-2 and Figure 1-3).

Mined ore will be processed using a Carbon in Leach (CIL) processing method, which extracts gold from the ore by mixing with a cyanide solution. Tailings produced from the processing facility will be deposited in a Tailings Storage Facility (TSF) to be constructed. The mining methodology will be consistent over Rustlers Roost and Quest 29, with the open-cut mining operation being conducted with conventional truck and shovel methods. Mining of Rustlers Roost and Quest 29 will be undertaken concurrently with each site having their own mining fleet. Mined ore from each of the Quest 29 pits will be placed on the surface crest of the pit where it will be loaded into a haul truck and transported to the Rustlers Roost Run of Mine (ROM) for processing (refer to Figure 1-2).

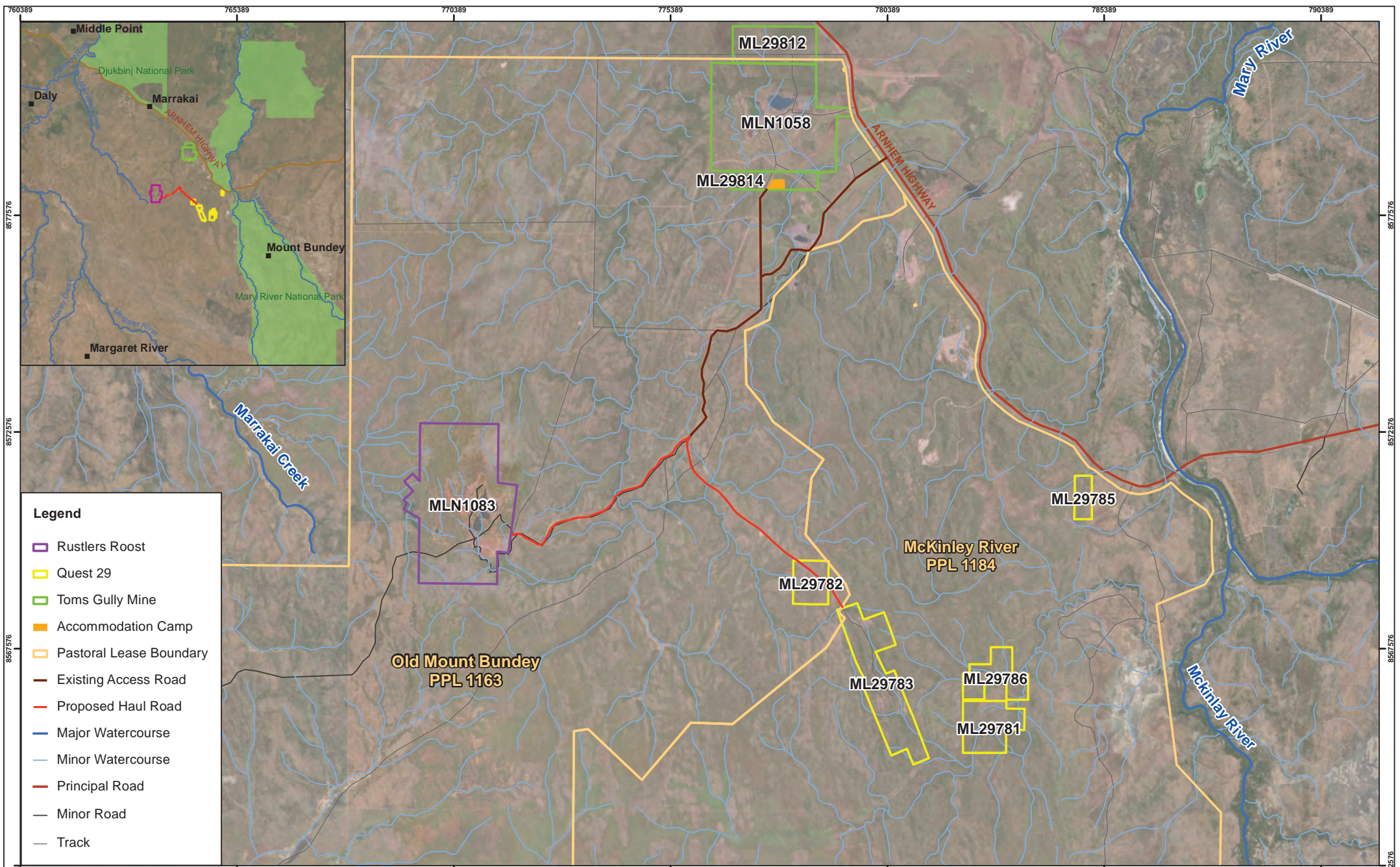
Mining activities have the potential to impact local surface and groundwater resources over short and long-term time frames through the exposure, disturbance and/or deposition of geological and waste materials. Acid and metalliferous drainage (AMD) (including neutral and saline drainage) from existing mine features (i.e., WRDs, pit lakes, heap leach pads (HLPs), ROM pads, and water storage ponds) and new features have the potential to impact water quality and downstream aquatic ecosystems, and therefore, must be managed accordingly. The Environmental Impact Statement (EIS) Terms of Reference (ToR) (NT EPA 2021) issued by the Northern Territory Environmental Protection Authority (NT EPA) for the Project requires that the EIS should contain an Acid and Metalliferous Drainage Management Plan (AMDMP) that outlines how AMD risks will be managed on site. This AMDMP has been developed to address the EPA's recommendations in the ToR.

1.1 Purpose and Scope

The purpose of this AMDMP (or, the Plan) is to describe the systems, processes and procedures used at the Project to manage the overall risk of AMD being generated on site throughout operations (and therefore into closure). It does so by classifying waste rock and tailings based on geochemical testing, providing a management strategy, and articulating management and monitoring procedures for the handling and long-term storage of waste rock and tailings on site.

This document outlines the objectives and methods for PGO to follow in pursuit of leading practice AMD management. The principle objective is to manage AMD risk resulting from the oxidation of sulfidic mineral waste material throughout operations, such that off-site environmental values are maintained during operations and into closure.

The plan is applicable to Mining Leases (ML) ML 1083 (Rustlers Roost) and ML 29783 (Quest 29), and has been informed by the Rustlers Roost and Quest 29 Preliminary Material Characterisation Study shown in Appendix D of the Draft EIS.

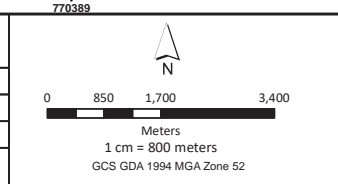


Legend

- Rustlers Roost
- Quest 29
- Toms Gully Mine
- Accommodation Camp
- Pastoral Lease Boundary
- Existing Access Road
- Proposed Haul Road
- Major Watercourse
- Minor Watercourse
- Principal Road
- Minor Road
- Track

R	Details	Date
1	First Draft	29/06/21
2	Second Draft	21/07/21
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

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DESIGNED	SS	CHECKED	JM		
DRAWN	SS	CHECKED	JM		
APPROVED	-	DATE	22/09/21		
Notes:					



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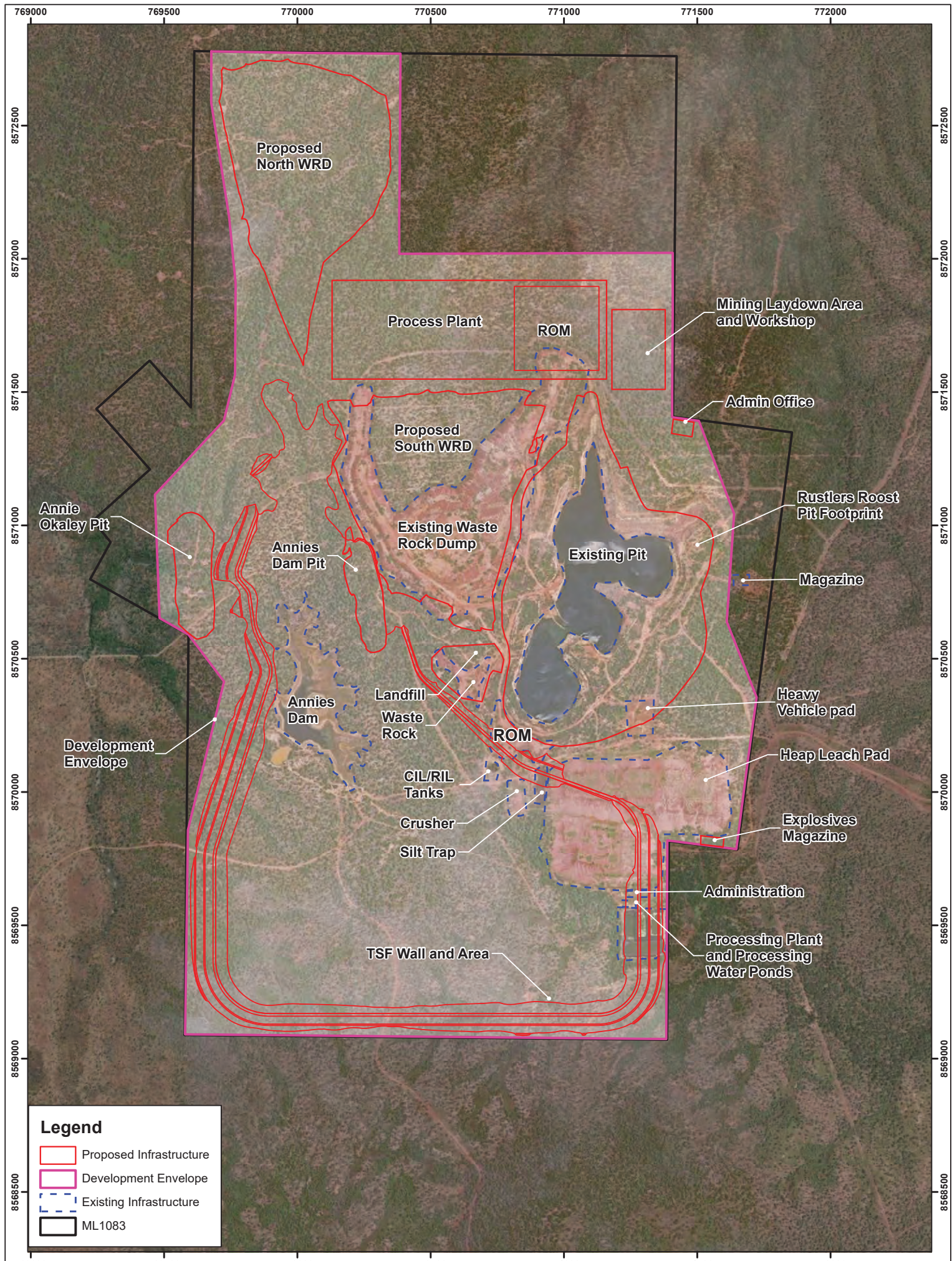
DATA SOURCE
NT Government Open Source Data



FIGURE 1-1

Rustlers Roost and Quest 29 Project Location

DRG Ref: 1001087-EIS-01-1.4



Legend

- Proposed Infrastructure
- Development Envelope
- Existing Infrastructure
- ML1083

R	Details	Date
1	First Draft	30/06/21
2	Final	19/07/21

DESIGNED				SS				CHECKED				TK			

N

0 95 190 380

Meters
1 cm = 125 meters
GCS GDA 1994 MGA Zone 52

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DATA SOURCE
NT Government Open Source Data



FIGURE 1-2

Rustlers Roost Existing and Proposed Disturbance Footprint

DRG Ref: 1001087-EIS-04-4.1

Section 2 Legal and Other Requirements

PGO has been operating in accordance with approved separate care and maintenance Mining Management Plans (MMP) for both the Rustlers Roost and Quest 29 areas (both re-submitted in 2020), which are regulated by the NT Department of Industry, Tourism and Trade (DITT). Primary Gold has also been operating in accordance with the Mine Closure Plan (MCP) for the Rustlers Roost area which was also updated in 2020 (these documents can be found at <https://www.hankingmining.com/en/plus/list.php?tid=19>).

A proponent initiated Environmental Impact Statement (EIS) referral was submitted by PGO to the NT EPA on 3 February 2021 for consideration under the *Environment Protection Act 2019* (EP Act). The referral was accepted for consideration on 23 February 2021 and a public consultation period held from 25 February 2021 to 9 April 2021. The NT EPA determined a standard assessment by EIS to be an appropriate method of assessment for the proposed action to address the requirements of section 42 and section 43 of the EP Act. The NT EPA issued a formal Notice of Decision and Statement of Reasons on the assessment approach concurrently with the ToR for the EIS on 11 May 2021.

2.1 Guidelines

Content from the following industry guidelines were considered when preparing this Plan:

- ARD Test Handbook. Project P387A Prediction and kinetic control of acid mine drainage (AMIRA 2002);
- Preventing Acid and Metalliferous Drainage, Leading Practice Sustainable Development Program for the Mining Industry (Australian Government 2016a);
- Global Acid Rock Drainage (GARD) Guide (INAP 2014); and
- Environmental Assessment Guidelines. Acid and metalliferous drainage (NT EPA 2013).

2.2 Environmental Corporate Governance

It is PGO's mission to operate in an environmentally and socially responsible way, in order to minimise their footprint and maximise benefits for their staff, shareholders and stakeholders well beyond the life of their mines.

PGO formally endorsed their Environmental Policy in August 2015 and updated it in May 2020. The Environmental Policy includes:

- A strong emphasis on rehabilitation;
- Engaging widely with Project stakeholders;
- Continuous improvement;
- Cultural awareness;
- Maximising shareholder value while balancing the quadruple bottom line of:
 - Environmental sustainability
 - Social equity
 - Cultural vitality
 - Economic prosperity.

2.3 Key Inputs to the AMDMP

This Plan has been informed by the preliminary geochemical analysis completed to inform the Draft EIS and presented in the Materials Characterisation Study (refer to Appendix D of the Draft EIS), and compiled using the following key input documents and information sources:

- The Draft EIS Project description;
- The Terms of Reference for the Rustlers Roost and Quest 29 Open-cut Mine Redevelopment Project (NT EPA 2021);
- Geotechnical results and assay data for drilling programs at Rustlers Roost (GHD 2018) and Quest 29 (Primary Gold 2020);
- PGO exploration data from the 2018 and 2020 drilling programs;
- Rustler’s Roost Project – desktop geochemical assessment (CDM Smith 2019);
- Publicly available information; and
- Rustlers Roost Project – desktop and limited field geochemical assessment (CDM Smith 2019).

2.4 Document Revision

The Plan is a dynamic document and therefore should be revised annually (as required) and appended to the operational MMP upon its re-submission to DITT.

Section 3 Waste Rock and Tailings Characterization and Classification

New waste rock material mined at both Rustlers Roost and Quest 29 will be deposited in surface WRD's. Through use of the CIL method, tailings will be deposited in a new TSF at the Rustlers Roost site. Based on the mineral resource estimate, probable ore reserves are estimated at 44.9 Million Tonnes (Mt) and waste material is estimated at 68.5 Mt. Mined ore from Rustlers Roost will be hauled directly to the ROM pad adjacent to the pit. Mined ore from each of the Quest 29 pits will be placed on the surface crest of the pit where it will be loaded into a haul truck and carted to the Rustlers Roost ROM for processing.

All existing pits (one at Rustlers Roost and five pits at Quest 29) are proposed for expansion in surface area and depth. Two new smaller pits are proposed at Rustlers Roost. The proposed mining stages are summarised below:

- Rustlers Roost pit dewatering starting at the end of 2021 and finishing in April 2023;
- Rustlers Roost mining operations starting in April 2023 and finishing at the end of 2031;
- Quest 29 pits dewatering starting at the end of 2024 and finishing in April 2031;
- Quest 29 mining operations starting at the end of 2024 and finishing at the end of 2031; and
- Processing operation is proposed to run from July 2023 until March 2033.

The following subsections describe the geochemical characteristics and classification of waste rock and tailings materials and specifically addresses their propensity for generation of AMD. The final WRD design will be developed following complete geochemical characterisation of waste material.

3.1 Waste Rock Characterisation

For the Rustlers Roost, the area to the north of the existing U-shaped WRD will be the designated location for the disposal of waste rock from Rustlers Roost pit. Waste rock will be placed in two separate WRDs termed the northern WRD and the southern WRD. The expansion of the existing WRD was selected to minimise haulage distances and to keep haulage costs low as it is close to the main pit exit.

Table 3-1 provides the estimated quantities of waste materials by weathering zone. A total of 50.9 Mt of waste material will be produced from the main Rustlers Roost pit. Approximately 45.6 Mt will be placed within the surface WRDs and 5.36 Mt of fresh waste backfilled into the pit. The other two smaller pits will be mined and completely backfilled, including Annie Oakley Pit (3.9 Mt) and Annie's Dam Pit (1.6 Mt).

Table 3-1 Rustlers Roost Pit, Annie Oakley and Annie's Dam Pit waste quantities by weathering zone

Waste Quantities	Million Tonnes	% Total waste
Oxide	20.7	37
Transitional	9.0	16
Fresh	26.7	47
Total Waste	56.4 MT	100

For the Quest 29 site, the proposed surface WRD (East Koolpin WRD) will be developed in the area north of Zamu Pit and will be comprised of waste rock developed from further mining in the pit. This was selected to minimise haulage distances for the initial stage of mining Zamu pit. Following initial mining phase, the remaining four pits at Quest 29 will be mined and waste rock from those pits will be backfilled into the expanded Zamu Pit.

Total waste produced from Quest 29 is estimated to be approximately 12.1 Mt (refer to Table 3-2). The total volumes and placement of waste material produced at Quest 29 is detailed in Table 3-3.

Section 3 Waste Rock and Tailings Characterization and Classification

Table 3-2 Quest 29 Pit Waste Quantities by Weathering Zone

Waste Quantities	Million Tonnes	% Total waste
Oxide	4.6	38
Transitional	2.8	23
Fresh	4.7	39
Total Waste	12.1 MT	100%

Table 3-3 Quest 29 Pit Waste Quantities and Placement

Waste Rock Placement	Million Tonnes
Surface WRD	5.4
Backfilled Zamu pit	5.9
Heap leach pad and ponds backfill to BHS Pit	0.8
Total Waste Material	12.1 MT

3.1.1 Mineralogy

Mineralogical analyses by XRD were performed on the siltstones and shales from the transitional and fresh materials at Rustlers Roost (see Appendix D of the Draft EIS). The materials were selected due to their potential to generate deleterious drainage quality. The major minerals were clinocllore, muscovite, quartz and microcline. Smaller quantities of pyrite, calcite and albite were also observed. Similar mineralogical analyses were performed on dolerite and shale samples from Quest 29 (see Appendix D of the Draft EIS). The major minerals were clinocllore, muscovite and quartz. Smaller quantities of pyrite, albite and kaolinite were also observed. Refer to EIS Section 5 and Appendix D of the Draft EIS for further details on site mineralogy and geology.

3.1.2 Existing Waste Rock and HLP Materials

From 1997 to now, exploration and care and maintenance activities have been undertaken at the Project area. The following mine waste related features are present at the two mine areas:

- Rustlers Roost: associated open pits that have flooded and have become a single pit, Annie's Dam, one WRD, two HLPs, and HLP ponds; and
- Quest 29: Five open-cut pits, five WRDs, one HLP, and HLP ponds.

Previous mining targeted the weathered oxide zone through open-cut mining methods that have been characterised as Non-acid forming (NAF). A limited characterization of existing WRD (11 samples), ROM (4 samples) and HLP (11 samples) were previously performed at Rustlers Roost (CDM Smith 2019). All samples which were collected from surface had low sulfur content (all less than 0.04 %) and all samples were classified as NAF. The assessment determined that the materials currently stored on-site at Rustlers Roost had low potential to leach significant dissolved chemical load into the receiving environment. This was informed by surface and groundwater quality monitoring.

At Quest 29, the current indicated AMD risk from previously mined materials is considered low based on the existing shallow pit depth, predominantly mining of the weathered oxide zone, available pit water quality and no visual AMD observations from site visits or satellite imagery.

Management of HLP leachate residuals is currently implemented through storage in lined ponds at both sites. These ponds may be subject to overflow during storm events. Although the sulfur content of the mined spent oxide ore material in the HLPs is low, there is potential that leachate from HLPs may have increased salinity (electrical conductivity) and similarly depressed pH (4 to 5) as runoff from surrounding soils due to the naturally elevated aluminium and iron in the weathered oxides.

Section 3 Waste Rock and Tailings Characterization and Classification

3.1.3 New Rustlers Roost Waste Rock

At Rustlers Roost, 131 samples were selected for characterisation (see Appendix D of the Draft EIS). The paste pH ranged from 4.5 to 9.6 with an average of 7.2. Paste EC (uS/cm) ranged from 38 to 1180 with an average of 183. The sulfur percent ranged from below limit of reporting (LOR) (<0.01) to 2.55 with an average of 0.336. Of the 131 samples, 61 had sulfur percent below the LOR. The highest sulfur values were in shales in the transitional zone. The fresh zone and oxide zone had relatively low sulfur content in all lithologies. Additional sulfur speciation was performed on 30 samples.

In all samples, the vast majority of the sulfur was sulfide. Based on the ongoing waste characterisation work (see Appendix D of the Draft EIS) it is expected that fresh material will be NAF and transitional material will be a mixture of potentially acid forming (PAF) and uncertain (UC). The oxide material is expected to be predominately NAF, although some of the deeper material near the transitional zone may classify as PAF. In contrast, some NAF or UC material is present in the fresh zone due to the significant acid neutralising capacity (ANC) measured as a result of carbonates.

Kinetic testing of samples is still ongoing and will be evaluated upon receipt of results to better predict long-term acid generating potential.

3.1.4 3.1.4. New Quest 29 Waste Rock

At Q29, 59 samples were selected for characterisation (see Appendix D of the Draft EIS). The paste pH ranged from 2.6 to 8.7 with an average of 6.33. Paste EC (uS/cm) ranged from 60 to 5,680 with an average of 1,340. The sulfur percent ranged from 0.01 to 21.56 with an average of 3.23. None of the samples had sulfur percent below the LOR. The highest sulfur values were in shales in the fresh zone. Additional sulfur speciation was performed on 20 samples. In all samples, the vast majority of the sulfur was sulfide. Based on the ongoing waste characterization work (Appendix D of the Draft EIS), it is expected that the fresh material will be PAF and the transitional and oxide material will be a combination of NAF and PAF.

Kinetic testing of samples is still ongoing and will be evaluated upon receipt of results to better predict long-term acid generating potential.

3.2 Tailings Characterisation

A single TSF will be implemented to store tailings from the mine processing circuit. The TSF has been designed to store a total of 40 Mt of tailings and will operate continuously until the storage capacity is met. The TSF is designed to encapsulate the existing Annie's Dam, a large portion of the HLP at Rustlers Roost, and the legacy leach ponds. Deposition will occur from the East, South and West embankments, maintaining the supernatant pond within the northern valley of the TSF. Deposition will initially commence along the eastern embankment at the lowest point within the basin, before commencing along the western embankment and then the southern embankment.

3.2.1 Mineralogy and Characterisation

The mineralogy of the tailings was characterised by XRD analyses. Major minerals (8 to 42%) included clinocllore, muscovite, quartz, magnesio-ferro hornblende and microcline. Smaller quantities (1 to 4 %) of pyrite, calcite, albite, maghernite, grossular and fluorapatite were also observed. The total sulfur was 1.76 % with the majority being sulfide (1.5 %). The paste pH was 8.6 and the paste EC (uS/cm) was 30. The tailings sample had a positive net acid generation (NAG) and a low NAG pH indicating that the ANC present is insufficient to buffer the acid generated and upon oxidation the tailings are acid forming.

3.3 PAF/NAF Estimated Quantities

Based on the assessment provided in Appendix D of the Draft EIS (Materials Characterisation Study), static test results were used to estimate the quantities of PAF/NAF materials proposed to be mined for the Project. Table 3-4 and Table 3-5 show the waste quantities by weathering zones. The number in parenthesis is the total number of samples characterised for NAF, PAF and UC.

Section 3 Waste Rock and Tailings Characterization and Classification

Table 3-4 Rustlers Roost Waste Quantities by Weathering Zone

Waste Zone	Quantity (MT)	No. samples assessed	No. containing S	NAF	PAF	UC
Oxide	20.7	8	1	0(1)	0(1)	1(1)
Transitional	9.0	76	26	0(14)	3(14)	11(14)
Fresh	26.7	47	43	12(15)	2(15)	1(15)
Total Waste	56.4 MT	131	70	12(30)	5(30)	13(30)

Based on Table 3-4, approximately 46% of the waste does not contain sulfur and thus up to 25.9 Mt could be used for construction purposes.

Table 3-5 Quest 29 Waste Quantities by Weathering Zone

Waste Zone	Quantity (MT)	No. samples assessed	No. containing S	NAF	PAF	UC
Oxide	4.6	13	13	2(3)	1(3)	0(3)
Transitional	2.8	9	9	4(6)	2(6)	0(6)
Fresh	4.7	36	36	2(11)	9(11)	0(11)
Total Waste	12.1 MT	58	58	8(20)	12(20)	0(20)

Based on the data in Table 3-5, all the waste at Q29 contain sulfur and approximately 60% could be PAF and 40% NAF.

Section 4 Conceptual Site Model

The mineralised geology at Rustlers Roost and Quest 29 has been discussed in terms of waste rock and tailings geochemistry in Section 3.

Figure 4-1 provides an illustrative conceptual site model (CSM) as an example of the general processes currently occurring at the Rustlers Roost site with regards to water and potential AMD transport towards the Mt. Bunday Creek catchment. These same general water flow pathways also occur for the Marrakai Creek catchment at Rustlers Roost and at the Quest 29 site for its associated catchments. For the redevelopment mines, similar processes will also occur. Specifically, addition of a TSF for the project adds another source of potential contamination that can lead to the various transport pathways for AMD.

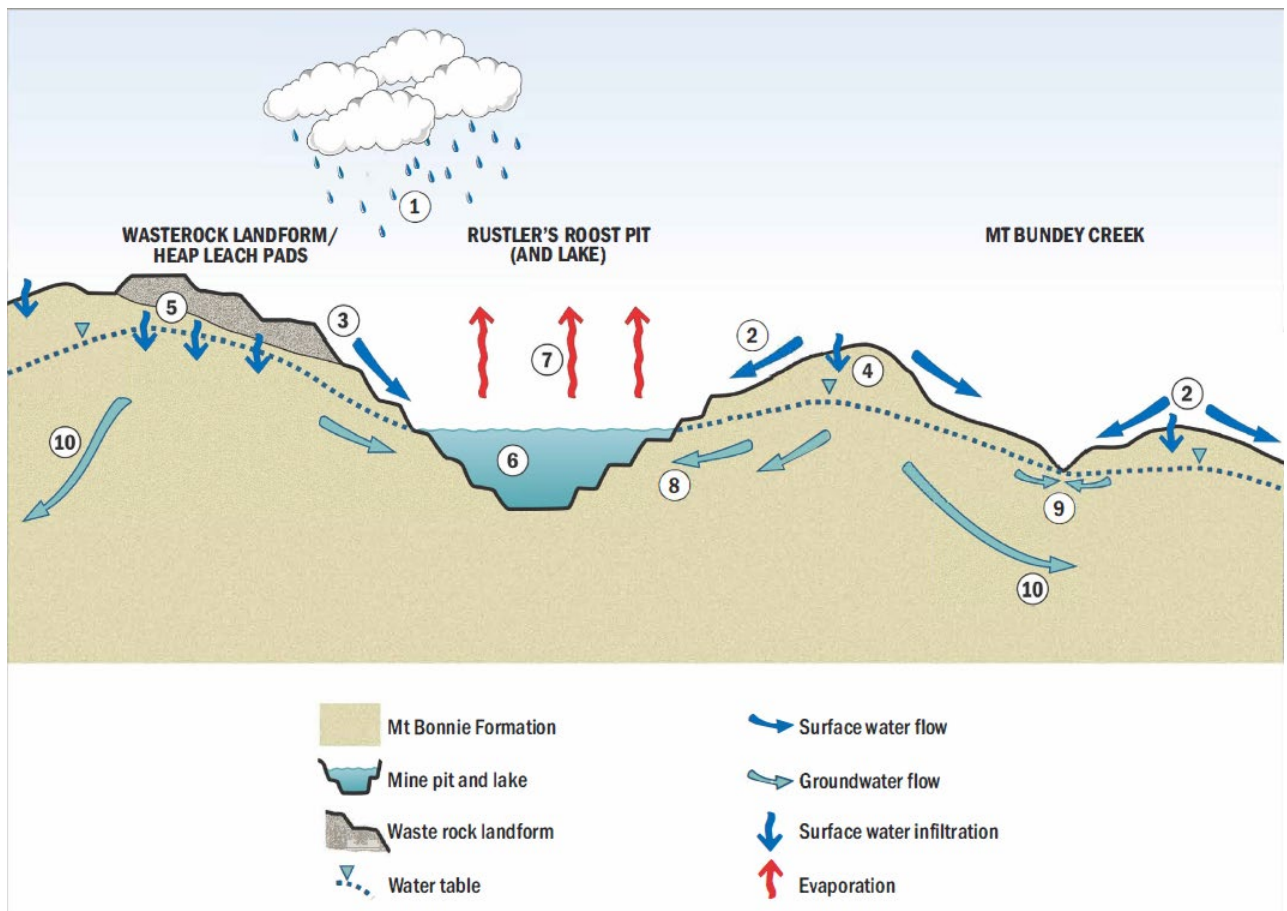


Figure 4-1 Conceptual Site Model at Rustlers Roost (CDM Smith 2019)

The following describes the essential elements of the conceptual site model:

- ① - Wet season rainfall generates surface water runoff (sheet and stream flow) and groundwater recharge.
- ② - Runoff to local catchments, the Rustler's Roost pit lake and Annie's Dam.
- ③ - Seasonal runoff from waste rock (to northern creek and mine pit) and heap leach pads (to Mt Bonny Creek/ Mount Bunday Creek).
- ④ - Rainfall infiltration and recharge.
- ⑤ - Infiltration of water from waste materials and leach pads to underlying groundwater system.

- ⑥ - Pit lake formed from groundwater discharge to former mine pit, incident rainfall and seasonal runoff.
- ⑦ - Evaporative losses from pit lake maintain a dynamic steady state pit lake level (seasonal fluctuations).
- ⑧ - Groundwater discharge to pit lake.
- ⑨ - Possible seasonal groundwater discharge to creeks (reliant on water table rise due to seasonal recharge).
- ⑩ - Deep regional groundwater flow toward Mary River (Rustler's Roost catchment) and the catchment to the northeast of the Site (Marrakai Creek – Adelaide River).

Descriptions of the CSM from a background, source, pathway, and receptor perspective is provided in the following subsections.

4.1 Background

4.1.1 Soil and Sediment

There is evidence of localised erosion within the previous mined area. For example, inspections and aerials surveys have recorded gully erosion of Rustler's Roost heap leach pad. However, existing berms prevented widespread sedimentation outside of the original heap leach pad footprint. The existing WRD and the leach pad at Rustlers Roost do not show any signs of significant erosion.

Assessment of soil contamination from past land use and previous mining activities has to date been limited to waste rock and drainage lines. Contamination from hydrocarbon/chemical storage and use has not been assessed. Desktop review of previous geochemical characterisation studies and limited geochemical field assessment was undertaken at Rustlers Roost to assess the likelihood of AMD to be released from previously mined materials stored onsite. Ten surface samples were collected from the WRD and Heap Leach pads and two samples from the ROM pad, which were subject to geochemical analysis. All samples were classified as NAF. The report concluded, that for the waste materials currently stored on the surface, the potential for significant dissolved chemical loads to leach to surface or groundwater resulting in soil contamination is low.

In April 2021 a targeted sediment sampling survey was conducted to obtain a contemporary baseline of existing surface water sediment quality and to characterise potential impacts on surface water quality from previous mining activities at the Rustlers Roost portion of the Project area. Weak acid extraction was used by the laboratory for quantification of bioavailable metals in the sediment. All analytes with an Australia and New Zealand Government (ANZG) (2018) default guideline value (DGV) recorded concentrations far below those guidelines. The large majority of results were below the laboratory's limit of reporting (LOR).

The concentrations for extractable metals were generally greatest at RRSW2 and RRSW23. This was largely for metals without a DGV, such as aluminium, which recorded the highest concentration of 400 mg/kg at RRMCDUS, and iron, with a concentration recorded at RRSW2 and RRSW23 of 1,830 mg/kg and 1,120 mg/kg respectively. The concentrations of cyanide were below LOR at all sites. The sediment concentrations for iron were highest at the downstream locations from the heap leach pad (RRSW2 and RRSW23). Other metals where concentrations were higher at these sites compared to RRMDCS and RRMCDUS were Arsenic, Barium, Cobalt, Copper, Lead, Manganese, Vanadium and to a lesser extent Zinc and Nickel (only recorded at RRSW2). While these analytes have no applicable default guideline values (DGV)s, the concentrations indicate a potential impact from the pre-existing mine site. Aluminium recorded a maximum concentration of 400 mg/kg at RRMCDUS, the only occurrence of a site recording a greater concentration than that found at RRSW2 and RRSW23. All metals not discussed in this section recorded concentrations below the laboratory's limit of reporting (LOR). No exceedances as per the DGV and the fact that cyanide was below LOR indicate that there are no concerns regarding sediment toxicity at present.

4.1.2 Surface Water

Figure 4-2 provides the upstream existing and proposed surface water monitoring sites and Figure 4-3 and Figure 4-4 provide the downstream existing and proposed surface water monitoring sites, respectively.

Overall, the water quality at the Annie's dam spillway (SW6) and downstream of the spillway within an unnamed tributary of the Marrakai Creek (SW7) has been within ANZG (2018) Guidelines, with pH and DO readings below default trigger values and occasional exceedance for some dissolved metals (Al, Zn, Cu) (Figure 4-2). Overall, the water quality in the upstream section of Mount Bunday Creek tributaries has been within ANZG (2018) limits for most of the parameters, sites and sampling. However, exceedance for some values (e.g. pH, turbidity, dissolved metals and nutrients) indicates that water quality is likely to be influenced by a range of sources including storm events, natural geology as well as previous mining activities and current pastoral land use. In the downstream section of Mount Bunday Creek, site specific trigger values (SSTV) for Toms Gully mine have been developed. These values represent the 80th percentile related to the freshwater species protection as outlined in the ANZG (2018) guidelines for dissolved metals, EC, pH and turbidity. Overall, exceedance of dissolved metals was recorded at site SWTG2 (Figure 4-3 and Figure 4-4). This site appears to be most directly influenced by the mining activities from Tom's Gully mine as it is about 1 km downstream from mine related infrastructure (TSF). However, there was no significant dissolved metal exceedance recorded at SWTG3, a site that is further 5.5 km downstream from SWTG2. This indicates that the potential influence on water quality from dissolved metals associated with mining does not extend further downstream.

In the Mount Bunday Creek catchment of Quest 29, most of the elevated dissolved metal readings have been associated with water samples taken from the SWQ Leach point (Figure 4-2) between 2016 and 2018, which is the historic heap leach ponds. Overall, the water quality results are consistent with impacts from previous mining and current pastoral activities in and surrounding the Project area.

In the McKinlay River catchment tributaries of Quest 29, the water quality results in the pit lakes, leach ponds and creeks are reflecting the hydrological properties of each sampling site. They are consistent with the ephemeral character of the creek flows, including first flush and storm events and residual flows and with impacts on water quality from disturbance due to previous mining and current pastoral lease activities in the Project area.

4.1.3 Groundwater

Three historical monitoring bores exist within the Project area, with one at Rustlers Roost and two at Quest 29. Bore MB01 at Rustlers Roost is to the south of the heap leach pad, between the pad and the leach ponds (Figure 4-2). The Quest 29 bores are located in the northern section of the Project area between the DHS pit and the leach pad and leach ponds (Q29MB01 and Q29MB02) (Figure 4-2). Due to the lack of historic groundwater monitoring bores in the Project area, knowledge of historic groundwater quality is deficient. Existing water quality results indicate that groundwater may have been locally impacted by historical mining activities (i.e. Q29MB01 and Q29MB02).

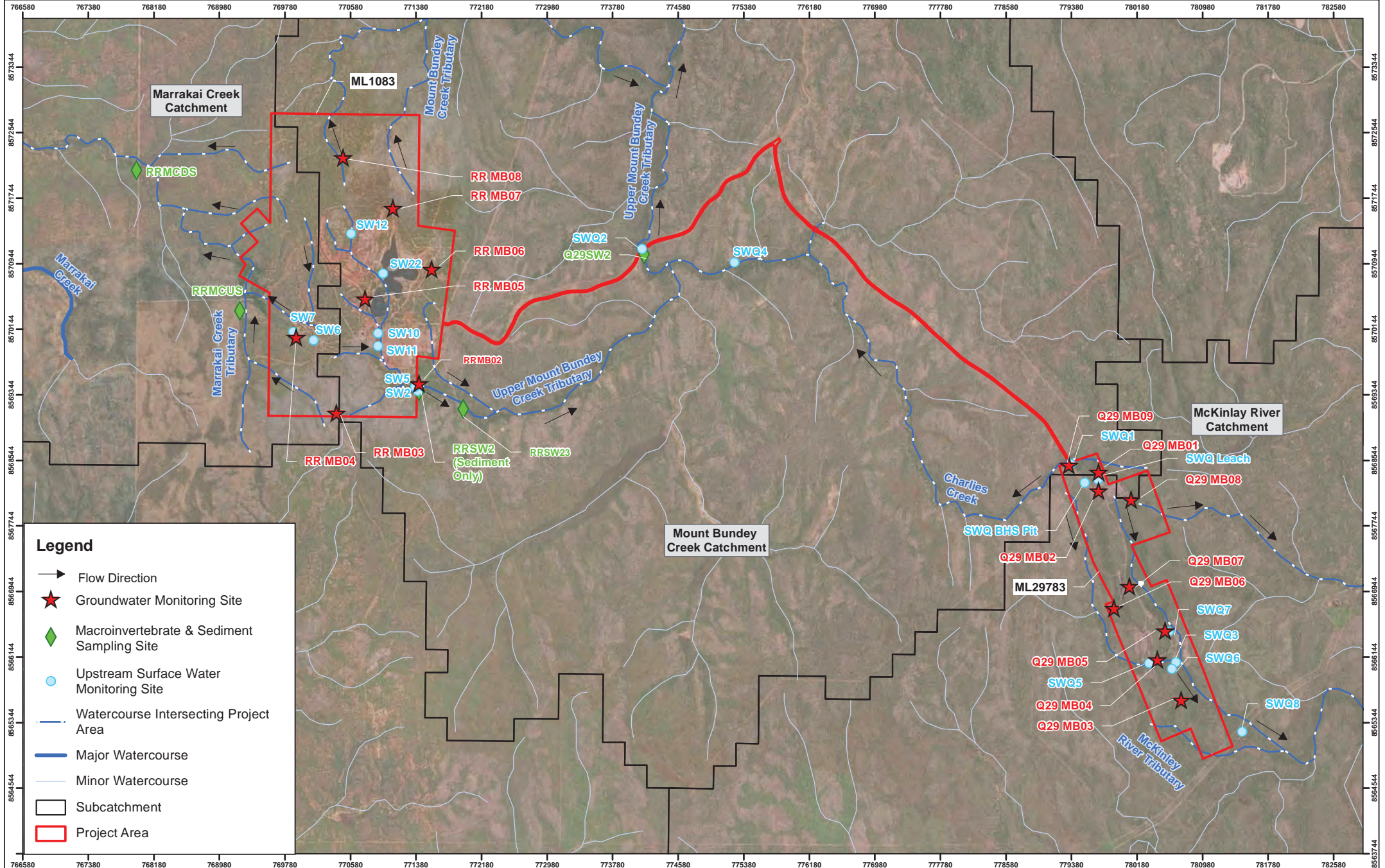
Background groundwater quality at Rustlers Roost from historical bore reports with available water quality data (five bores drilled in 1994 and one bore drilled in 1985), indicate freshwater quality with an average pH of 6.8 and EC of 114 $\mu\text{S}/\text{cm}$. Water quality from two sampling occasions indicate pH values are slightly acidic, ranging between 5.9 to 6.2, EC is low (110 to 140 $\mu\text{S}/\text{cm}$) and exceedance of the aquatic ecosystem protection guidelines values (GVs) for Zn and Ni.

Background groundwater quality at Quest 29 from historical bore reports with available water quality data (one bore drilled in 1999 and two bores drilled in 1976), indicates that groundwater is fresh and good quality, with an average pH of 7.06 and an EC of 262 $\mu\text{S}/\text{cm}$.

Recent monitoring of Q29MB01 shows elevated EC and dissolved metals in comparison to other sites. pH values range between 6.09 to 7.33, and elevated EC, well above the aquatic ecosystem protection GV of 250 $\mu\text{S}/\text{cm}$ (ranging from 210 to 1,213 $\mu\text{S}/\text{cm}$) and exceedance of the ecosystem protection GV for Al, As, Cd, Cr, Cu and Zn.

Q29MB02 located west of the heap leach ponds and pad at Quest 29, has had elevated EC and occasional exceedances of the aquatic ecosystem protection GV for As, Cd, Cr, Cu, Pb and Zn. pH values range from slightly acidic (6.49) to slightly alkaline (7.6), and elevated EC, above the aquatic ecosystem protection GV of 250 $\mu\text{S}/\text{cm}$ (ranging from 210 to 336 $\mu\text{S}/\text{cm}$).

Additional monitoring bores were constructed in 2020 in the Rustlers Roost and Quest 29 portions of the Project area to improve understanding of groundwater quality (Figure 4-2).

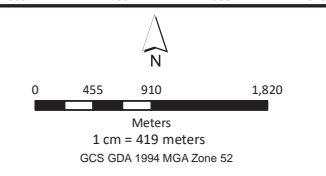


Legend

- Flow Direction
- ★ Groundwater Monitoring Site
- ◆ Macroinvertebrate & Sediment Sampling Site
- Upstream Surface Water Monitoring Site
- Watercourse Intersecting Project Area
- Major Watercourse
- Minor Watercourse
- Subcatchment
- ▭ Project Area

R	Details	Date
1	Final	26/08/21
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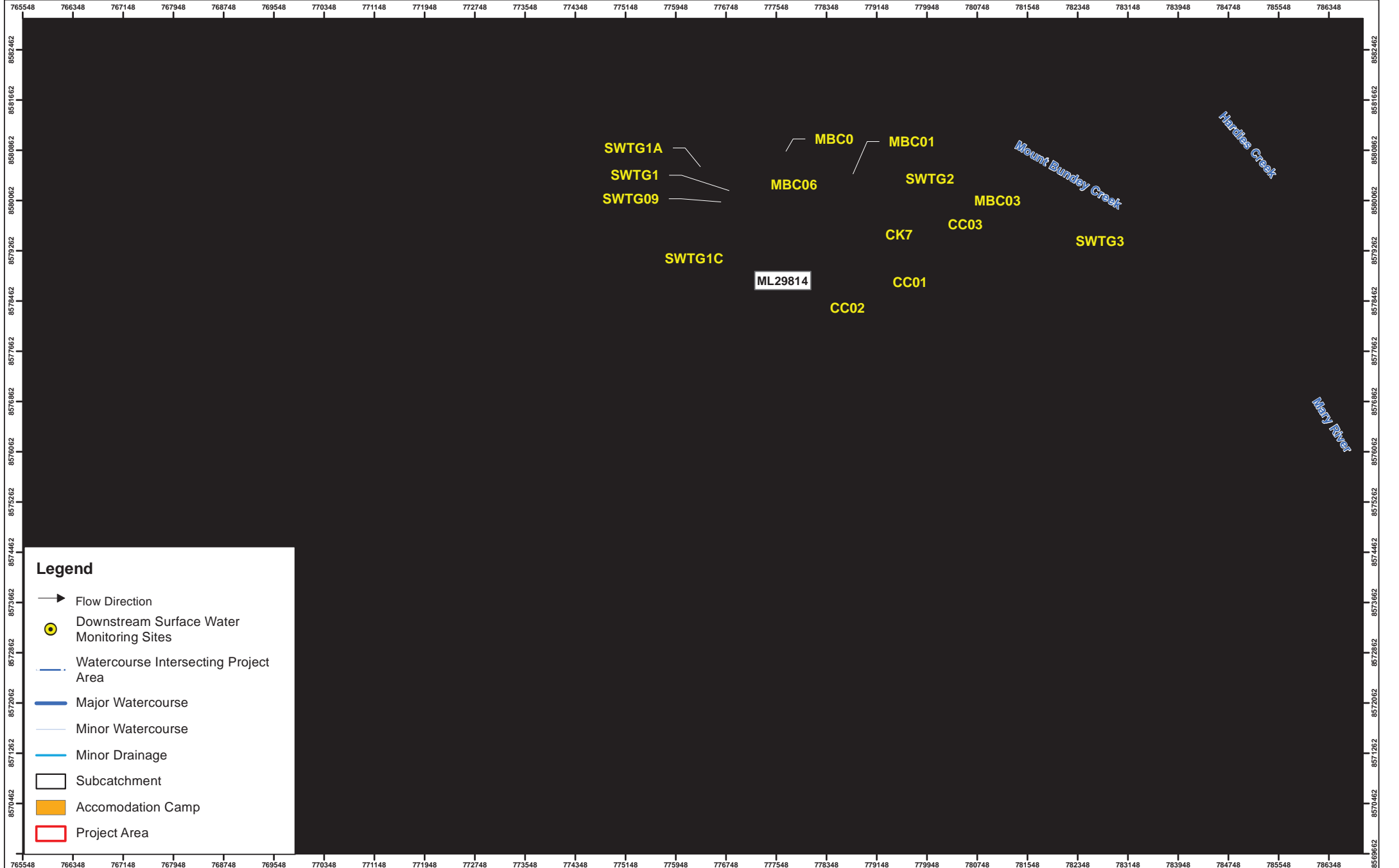
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FIGURE 4-2
Existing and Proposed Upstream Surface Water and Groundwater Monitoring Sites

DRG Ref: 1001087-EIS-07-7.31

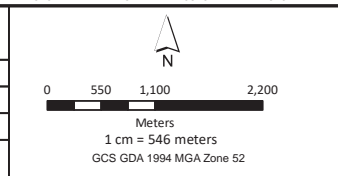


Legend

- Flow Direction
- Downstream Surface Water Monitoring Sites
- Watercourse Intersecting Project Area
- Major Watercourse
- Minor Watercourse
- Minor Drainage
- ▭ Subcatchment
- Accomodation Camp
- ▭ Project Area

R	Details	Date
1	Final	26/08/21
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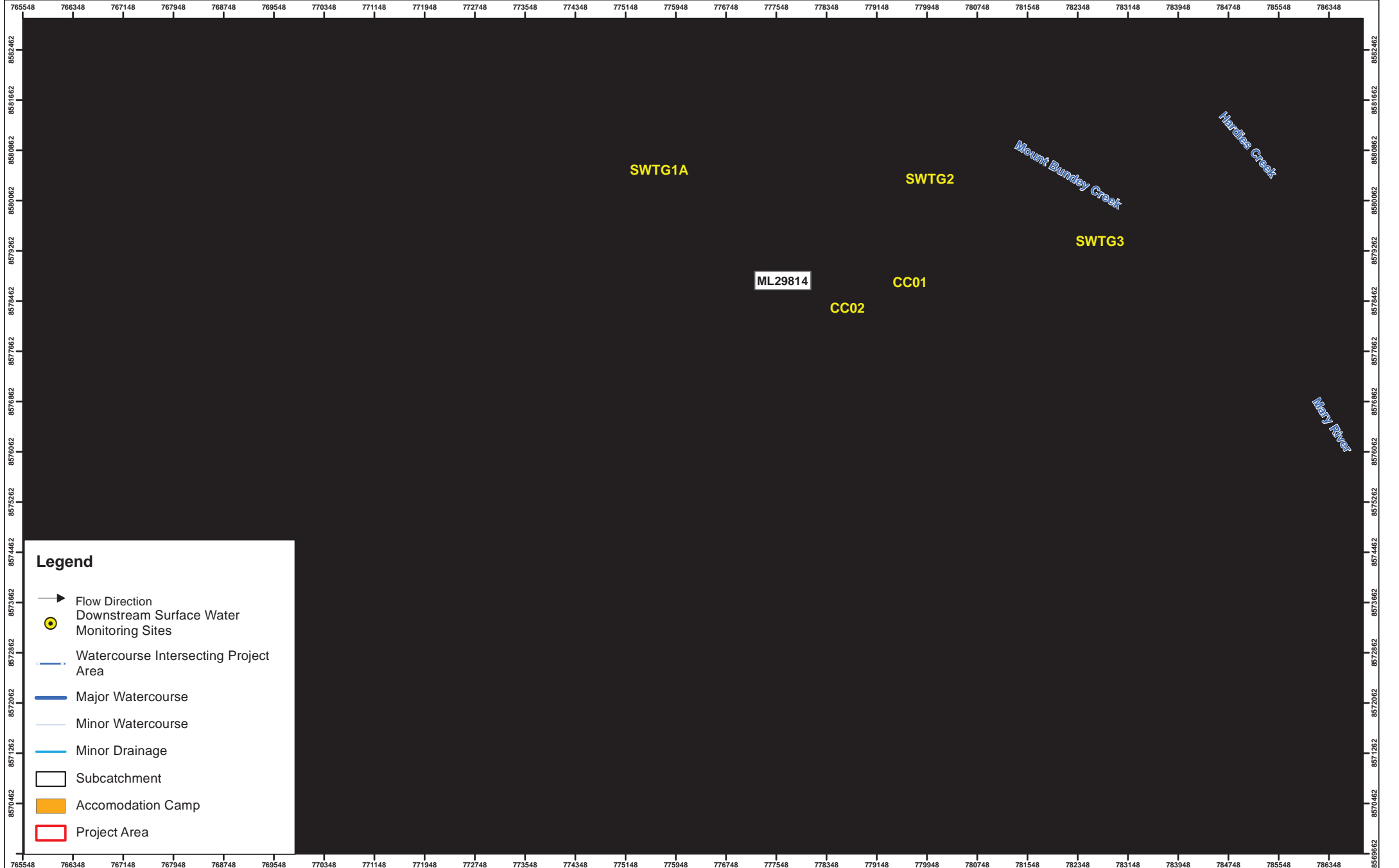
DATA SOURCE
 QLD Government Open Source Data



FIGURE 4-3

Existing Downstream Surface Water Monitoring Sites

DRG Ref: 1001087-EIS-07-7.32



Legend

- Flow Direction
- Downstream Surface Water Monitoring Sites
- Watercourse Intersecting Project Area
- Major Watercourse
- Minor Watercourse
- Minor Drainage
- Subcatchment
- Accomodation Camp
- Project Area

R	Details	Date
1	Final	27/09/21
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APPROVED	TK	DATE	27/09/21
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N

0 550 1,100 2,200

Meters

1 cm = 546 meters

GCS GDA 1994 MGA Zone 52

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FIGURE 4-4

Proposed Downstream Surface Water Monitoring Sites

DRG Ref:

4.2 Sources

Sources of potential AMD that may impact surface water and groundwater resources are described based on existing conditions and future mining conditions. The descriptions are presented generically with respect to the mechanisms by which AMD may form, rather than specific details on classification of AMD potential or AMD generation rate estimates. These details, to the extent that data is available, are described elsewhere in the EIS and this AMDMP.

4.2.1 Existing Sources

Existing potential sources of AMD include both surface and subsurface materials. Surface materials include WRDs, HLPs, ROM pads, whereas subsurface sources include mineralised bedrock in connection with pit lakes or present on the exposed (or seasonally submerged) pit walls. These sources may generate AMD from 1) acid generation from sulfidic minerals, 2) leaching of more soluble constituents within neutral pH waters, and 3) runoff that may entrain suspended metals. In addition, regional and local soil pH may be acidic due to the acidity generated by soluble iron and aluminium oxide minerals in the weathered soil profile. These potentially acidic soils surrounding the mine disturbance areas may also be sources of AMD.

Due to the oxidised nature of the surficial or exposed materials (e.g., pit wall bedrock) and some residual sulfide minerals present, acid forming secondary sulfate minerals may also exist. These mineral salts are potentially secondary sources of AMD. For example, as surface water sources evaporate during the dry season, these secondary salts are precipitated on surfaces. During periods of rainfall, the dried salts will report back to surface water and potentially infiltrate to groundwater.

Although there are several potential acid sources at the site there are also minerals present that provide a source of neutralising potential for the released acidity, including calcite, dolomite, chlorite, quartz, oxides, and clays, with calcite and dolomite likely have the greatest influence on neutralising AMD. Given the presence of a variety of neutralising minerals, AMD generated within the groundwater zone and other source areas may be neutralised to some degree. The effects of the mobilisation of metals and metalloids will be reflected in the distribution of the elements in the water and the final electrical conductivity.

As noted in the EIS (Section 7.1.2.3), the potential for significant contaminant loads to leach to surface or groundwater and soils is low based on available geologic, geochemical, and water quality data. A detailed description of pit lake water quality is provided in the associated Appendix P to the EIS (Pit Lake Assessment Report). The EIS Section 7.4.1.3 Baseline Surface Water Quality summarised the baseline surface water quality. The following summarises baseline water quality in related to potential AMD:

- Elevation of aluminium in the region is known and currently assumed to reflect influences from natural geology;
- **Marrakai Creek below Rustlers Roost:** Water quality at the Annie's dam spillway (SW6) and downstream of the spillway within an unnamed tributary of the Marrakai Creek (SW7) has been within ANZG (2018) guidelines for most of the water quality parameters, with pH and dissolved oxygen (DO) readings below GVs and occasional exceedance of GVs for some dissolved metals (Al, Zn, Cu). Low pH water has been recorded (4.3) that suggests AMD impacts from past mining activities;
- **Mount Bunday Creek below Rustlers Roost:** Water quality in the upstream section of Mount Bunday Creek tributaries has been within ANZG (2018) limits for most of the parameters, sites and sampling. However, exceedance for some values (e.g. pH, turbidity, dissolved metals and nutrients) indicates that influences on water quality are likely to come from a range of sources including storm events, natural geology as well as previous mining activities and current pastoral land use;

- **Mount Bunday Creek below Quest 29:** Water quality in the Mount Bunday Creek catchment are influenced seasonally by first-flush, storm events, residual flow and evapoconcentration, which result in a broad range of water quality conditions observed. High turbidity readings reflect ongoing erosion from existing disturbance on site. Most of the elevated dissolved metal readings have been associated with water samples taken from the SWQ Leach point between 2016 and 2018, which is the HLP ponds. Overall, the water quality results in are consistent with previous mining and current pastoral activities; and
- **McKinlay River below Quest 29:** Water quality results in the pit lakes, leach ponds and creeks are reflecting the hydrological properties of each sampling site. They are consistent with the ephemeral character of the creek flows, including first flush and storm events and residual flows and with impacts on water quality from disturbance due to previous mining and current pastoral lease activities.

4.2.2 Redevelopment Mine Sources

Redevelopment of the mines will result in expanded waste rock dumps, expanded open pits, and a new TSF. In general, studies indicate that deeper materials than previously mined become more PAF with depth. Estimated PAF/NAF material quantities were provided in Section 3 which summarises that oxide materials are generally classified as NAF, transition zone to the fresh zone is likely to be PAF or UC, and fresh zone materials are usually classified as PAF. For tailings, the preliminary geochemical assessment indicates that tailings (which will represent a composite of all lithologies) will be PAF. However, these classifications do not inform the solubility of the materials, rate of sulfide oxidation, and potential composition of leachate formed. These types of predictions will need to be made based on conclusions of the ongoing kinetic testing currently being completed (see Appendix D of the Draft EIS).

In addition to waste rock and tailings as sources for AMD and associated elevated metals, tailings will be processed using cyanide to extract the gold. Residual cyanide will be removed and detoxified from tailings prior to disposal in the TSF; however, there is potential that residual cyanide may remain in the TSF and within any leachate that may be generated from the TSF.

As noted in Appendix D of the Draft EIS, thorium bearing flouroapatite has been measured in some fresh zone samples. As a result, some associated waste rock and tailings generated from this zone may result in sources of radioactivity because of thorium decay.

4.3 Pathway

The three key AMD pathways for potential transfer of contaminants from source to receptors are:

- a. Sediment;
- b. Surface water; and
- c. Groundwater.

4.3.1 Sediment

Uncontrolled surface water discharges can transport loads of particulates (e.g., tailings, impacted soil, waste rock) from mine areas to locations downstream and may continue to re-entrain these particulates in subsequent stormwater events. This includes both annual flooding cycles within the stream and less frequent events that overtop the stream banks. Materials may be deposited close to their source or, depending upon the conditions and the material being transported, may be carried for many miles prior to deposition.

Streamside overbank deposits are expected to be more stable than sediments as they are only occasionally exposed to the erosive force of the stream. These materials are deposited in years of extreme flooding when flood waters overtop the stream banks and deluge low-lying areas in the floodplains. In some instances, a stabilising layer of vegetation may be established on older deposits where metals concentrations in the rooting zone are not too high. The vegetation would be expected to slow down future erosion. In other cases, overbank deposits accumulate, lowering the depth to groundwater and hindering the colonisation of plants, making these areas susceptible to erosion.

Dissolved phase contaminants from AMD (either from the surface water column or from groundwater discharging to surface water) can also form secondary precipitates or adsorb to stream sediments, resulting in contaminant accumulation in the sediments.

4.3.2 Surface Water

Surface water is responsible for the conveyance of the AMD from upstream sources to downstream areas. Contaminated surface water can flow directly into streams and tributaries under normal flow conditions or under storm runoff conditions. Transport to surface water may occur as follows:

- Vegetation clearing – mobilisation of soils on slopes and during wet season in drainage lines;
- WRDs – water seepage and runoff in drainage lines;
- TSF – water seepage and runoff in drainage lines;
- Pit dewatering – discharge of dewatering effluent in drainage lines and surface water bodies; and
- Site infrastructure (e.g. haul road, processing plant, access roads) – runoff in drainage lines.

4.3.3 Groundwater

As a result of potential leaching of source materials, impacts to groundwater may occur. Wet season rainfall generates surface water runoff and groundwater recharge. During periods of recharge, infiltration through some mined materials may generate AMD and may infiltrate to underlying groundwater system. With regard to open pits, both rainfall and groundwater discharge may contribute to pit water infilling. Locally, groundwater is likely to drain into the pit. More regionally, deeper bedrock groundwater that may be connected to deeper pits, will transport generally towards Mary River.

4.4 Receptors

Receptors are primarily aquatic species located within the catchments downstream of the mine areas. Terrestrial biota, live stock, and humans are also potential receptors. The Project area traverses two river basins (Adelaide River and Mary River) and three sub-catchments. The Rustlers Roost portion of the Project area is predominantly located in the upper Mount Bunday Creek sub-catchment of the Mary River system. A portion of the western section of Rustlers Roost is located in the Marrakai Creek sub-catchment of the Adelaide River system.

The Quest 29 area of the Project is predominantly located in the McKinley River sub-catchment, which also flows into the Mary River system. A minor northern portion of Quest 29 is located in the upper Mount Bunday Creek sub-catchment of the Mary River system as is the haul road and accommodation camp (refer to Figure 4-5 and Figure 4-6).

4.4.1 Marrakai Creek

The headwaters of Marrakai Creek, a tributary of the Adelaide River, is located downstream of the western parts of the Rustlers Roost mine site. The site is approximately 37 km upstream of the Adelaide River confluence. The Adelaide River and associated floodplain system is considered environmentally significant.

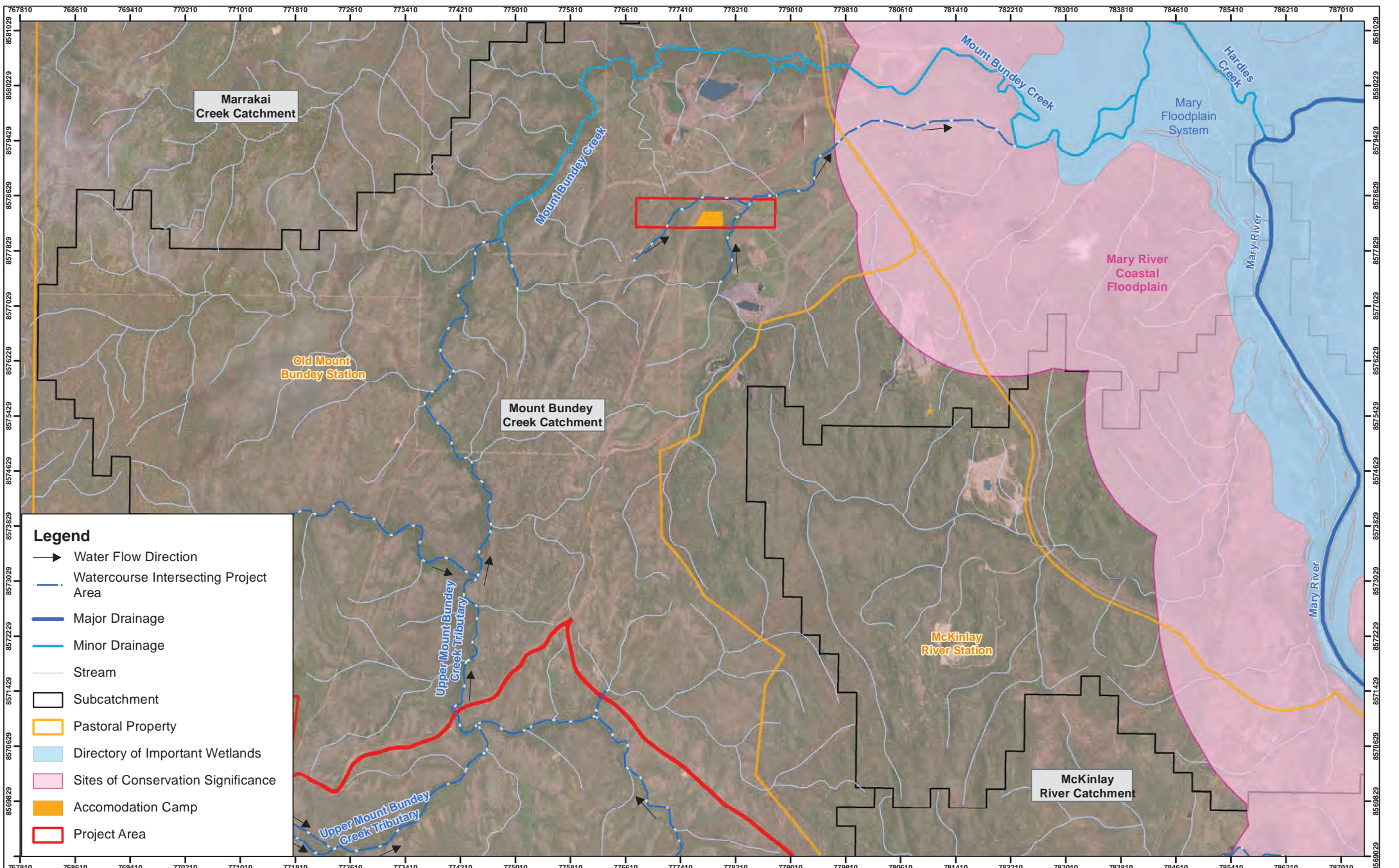
4.4.2 Mt Bunday Creek

During the wet season, drainage lines downstream of both Rustlers Roost and Quest 29 sites discharge to the north into the receiving Mount Bunday Creek, which flows into the main branch of the Mary River approximately 35 km downstream. Mount Bunday is an ephemeral creek that has limited flow and contains isolated pools during the dry season (Primary Gold 2020). The creek flow is dependent on localised rainfall and historically the creek flows for 3-4 weeks annually (Primary Gold 2020). The creek is utilised primarily by the Mount Bunday Station Pastoralist for livestock drinking water and supports aquatic flora and fauna at the upper and lower sections of the creek when flowing.

Mount Bunday Creek and the Mary River main branch are considered important watercourses, with beneficial uses declared under the Water Act. The declared beneficial uses for Mount Bunday Creek are for stock water supply for approximately a 7 km section at the Arnhem Highway flowing north-east (approximately 25 km downstream of the Project area), and aquatic ecosystems protection for the remainder (approximately 30 km downstream of the Project area). The declared beneficial uses and objectives for the Mary River region is for environment, riparian and cultural uses. Sections of Mount Bunday Creek and the Mary River downstream of the Project area are protected in the Mary River National Park.

4.4.3 McKinlay River

The majority of the Quest 29 mine site (eastern and southern parts) are located in the McKinley River catchment. Unnamed ephemeral drainage lines downstream of the site discharge to the east through floodplains towards the McKinley River main branch, which is approximately 15 km downstream of the Project. From this location, the McKinley River flows north and discharges to the Mary River at a location 2 km upstream from the Arnhem Highway Mary River Bridge.



Legend

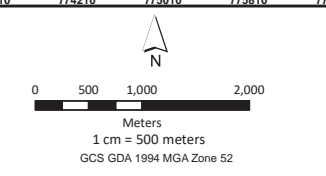
- ➔ Water Flow Direction
- Watercourse Intersecting Project Area
- Major Drainage
- Minor Drainage
- Stream
- ▭ Subcatchment
- ▭ Pastoral Property
- ▭ Directory of Important Wetlands
- ▭ Sites of Conservation Significance
- ▭ Accomodation Camp
- ▭ Project Area

1	First Draft	18/08/21
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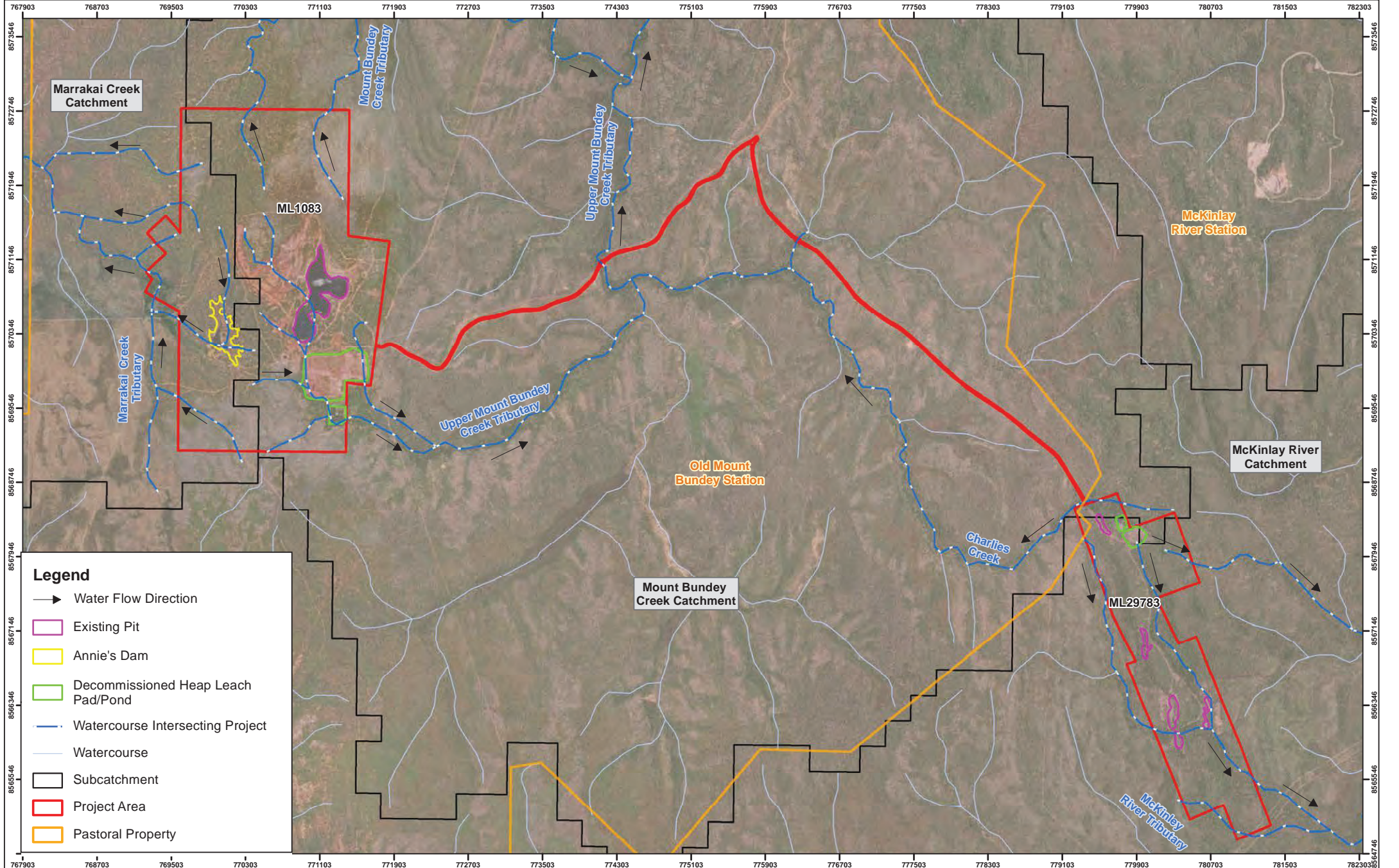
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FIGURE 4-5

Map of Project Area Hydrology (North)

DRG Ref: 1001087-EIS-05-5.5

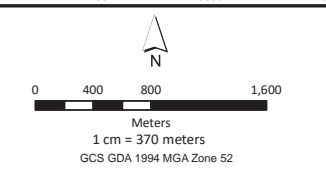


Legend

- ➔ Water Flow Direction
- ◻ Existing Pit
- ▭ Annie's Dam
- ▭ Decommissioned Heap Leach Pad/Pond
- Watercourse Intersecting Project
- Watercourse
- ▭ Subcatchment
- ▭ Project Area
- ▭ Pastoral Property

R	Details	Date
1	First Draft	18/08/21
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FIGURE 4-6

Map of Project Area Hydrology (South)

DRG Ref: 1001087-EIS-05-5.6

Section 5 Acid Mine Drainage Model and Balance

Since kinetic studies are ongoing (see Appendix D of the Draft EIS), predictions of net acid generation rate from different sources cannot yet be detailed. This information will be added to a revised EIS (and associated appendices) upon completion of those studies and evaluation of results. The project water balance is described in Appendix H to the EIS (Water Balance and Groundwater Modelling Report). The water balance results that predict groundwater inflows to the various pits will be used to estimate the volume of AMD produced, where applicable.

Section 6 AMD Management

PGO recognises that planning for closure is a fundamental component of mine planning (INAP 2009, DTIR 2007). Therefore, identifying any PAF material either historical or within the context of future mine plans and schedules is essential for effective management. Hence, PGO has developed AMD design and operational controls to minimise the potential risks.

PGOs overall AMD strategy has been aligned to leading standard practice as per the following:

- Subaqueous tailings / waste rock deposition – INAP 2009 Section 6.6.7; DITR 2007 Section 7.1.6; DERM 1995 Section 7; DITR 2006, various MEND reports at: <http://mend-nedem.org/category/prevention-and-control/water-covers/>;
- Store-release TSF cover design - INAP 2009 Section 6.6.6, DITR 2007 Section 7.1.4, NT EPA 2013 Section 8; DERM 1995 Section 7; DITR 2006, various MEND reports at: <http://mend-nedem.org/category/prevention-and-control/dry-covers/>;
- Drainage controls – DITR 2007 Section 7.1.1 (DRET 2008);
- Ongoing monitoring – INAP 2009, Chapter 8; DITR 2007, Chapter 8; NT EPA 2013 Section 9; DERM 1995 Section 7.2; various MEND reports at: <http://mend-nedem.org/category/monitoring-category/>;
- Acid Mine Drainage – Environmental Notes on Mining, updated September 2009 (DMP 2009).

AMD Management for the Project can be divided into two key strategies:

1. Managing existing AMD sources (WRDs, RoM pads, ponds, pit lakes); and
2. Managing proposed AMD sources (waste from underground mining, tailings and ore stockpiles).

6.1 AMD Risk Assessment

As part of the Project Draft EIS, a risk assessment framework and risk register was developed (Appendix B of the Draft EIS). This included undertaking consideration of potential AMD risks on site. See the Draft EIS for the comprehensive risk framework document and assessment. Risks associated with AMD were taken from the Project Risk Framework and are summarised and addressed in Table 6-1 below. Each risk number is presented in association with the key environmental factor abbreviations, and potential impacts, mitigation/management controls, and performance indicators are summarised for each risk.

Table 6-1 AMD Risk, Potential Impact and Management / Mitigation Control

Risk#/Description	Potential Impact	Mitigation / Management Control	Timing	Performance Indicator
TEQ-2/TE-2/HP-2/IWEQ-2/AE-2. Overtopping, embankment failure or seepage from the new TSF at Rustlers Roost leading to uncontrolled release of tailings material to surrounding environment	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> • TSF to be planned, designed, constructed and operated in accordance the guideline Tailings Management: Leading Practice Sustainable Development Program for the Mining Industry (Australian Government 2016b) • Design TSF for storm events up to and greater than the required design criteria • An operational emergency spillway to be constructed as part of each embankment raise • Development of Monitoring Plan / Operational Manual which includes weekly inspections of the TSF, survey pins to monitor the embankment and piezometers to measure pore water pressure • Tailings performance monitoring (e.g. TSF water volume, collection efficiency of underground system) • Install seepage control and underground drainage including a cut-off trench, compact soil liner, basin underdrainage collection system, underdrain collection sump and embankment tow drain • Groundwater and surface water monitoring to check quality and any seepage • Implementation of AMDMP and Water Management Plan (WMP) • Manage the site water balance to reduce build-up of water 	Design Operations Closure	<ul style="list-style-type: none"> • Surface water and groundwater monitoring data within SSTVs • No incidents of overtopping • TSF embankment geotechnical stability monitoring within design criteria • Measurement of tailings beach water volume to not exceed water balance • Measurement of seepage underdrain collection volume to not exceed water balance • Measurement of seepage underdrain water chemistry to evaluate risks • Regular visual inspection of outside of TSF embankments to confirm no signs of erosion or seepage
TEQ-3/TE-3/HP-3/IWEQ-3/AE-3. Overtopping, embankment failure or seepage from the process water storage at Rustlers Roost leading to uncontrolled release of process water to surrounding environment.	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> • Installation of the process water storage facility within the footprint of the TSF to contain any potential for uncontrolled AMD releases • Development of Monitoring Plan / Operational Manual which includes weekly inspections of the process water dams • Groundwater and surface water monitoring to check quality and any seepage • Implementation of AMDMP and WMP • Manage the site water balance to reduce any build-up of water 	Design Operations	<ul style="list-style-type: none"> • Surface water and groundwater monitoring data within SSTVs • No incidents of overtopping • TSF monitoring as noted above to ensure embankment stability and water balance management

Section 6 AMD Management

Risk#/Description	Potential Impact	Mitigation / Management Control	Timing	Performance Indicator
		<ul style="list-style-type: none"> Storage and management of cyanide in accordance with the Commonwealth of Australia Leading Practice Handbook for Sustainable Mining - Cyanide Management (Australian Government 2008) 		<ul style="list-style-type: none"> Measurement of water volume in process water storage ponds to not exceed water balance
HP-4/IWEQ-4/AE-4. Embankment failure or seepages from the new WRDs at Rustlers Roost and Quest 29 to surrounding environment	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> Development of Monitoring Plan / Operational Manual which includes weekly inspections and maintenance of bunds and run-on/runoff control structures associated with WRDs Groundwater / surface water quality monitoring Implementation of AMDMP and WMP Manage the site water balance to reduce any build-up of water Temporary and/or final capping of the WRDs to reduce ongoing water infiltration and seepage 	Design Operations Closure	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs No incidents of failures of associated erosion control structures designed to divert clean water or collect and management potential AMD
TEQ-4/HP-5/IWEQ-5/AE-5. Embankment failure of Annies Dam water storage and sediment release	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> Geotechnical studies and assessment to ensure structural stability Engineering design to ANCOLD standard Development of Monitoring Plan / Operational Manual which includes weekly inspections to check sufficient freeboard and structural integrity Groundwater / surface water quality monitoring Implementation of AMDMP and WMP Manage the site water balance to reduce any build-up of water 	Design Operations	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs Embankment geotechnical stability monitoring within design criteria Measurement of stored water volume to not exceed water balance
TEQ-5/IWEQ-6/AE-6. Poor quality runoff or seepage from the historic WRDs and heap leaches.	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> Maximise runoff pond capacity prior to wet season Investigation and consideration of long-term closure options Calculations, identification and provisioning of suitable cap material Capping and revegetating materials that generate AMD Implementation of AMDMP and WMP Groundwater / surface water quality monitoring Manage the site water balance to reduce any build-up of water 	Design Operations Closure	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs Erosion from WRDs is limited or not present Sedimentation within runoff diversions and collection ponds is limited

Section 6 AMD Management

Risk#/Description	Potential Impact	Mitigation / Management Control	Timing	Performance Indicator
		<ul style="list-style-type: none"> Implement erosion and sediment control measures (ESCMs) in accordance with the erosion and sediment control plan (ESCP) Daily inspections for runoff and drainage problem areas 		<p>and/or manageable in accordance with the ESCP</p> <ul style="list-style-type: none"> No seeps are visible at the toe or downgradient of WRDs Temporary or final caps perform as designed to limit infiltration and promote vegetation
TE-4/IWEQ-7/AE-7. Poor water quality released from site during wet season (stormwater)	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> Development and implementation of a geochemical block model Compliance with the Waste Discharge Licence All water storage facilities geotechnically stable and engineered ANCOLD guidelines Weekly inspections of freeboard, structural integrity and pipelines Implementation of AMDMP and WMP Groundwater / surface water quality monitoring Manage the site water balance to reduce any build-up of water Implement ESCMs in accordance with the ESCP Daily inspections for runoff and drainage problem areas Capping and revegetating materials that generate AMD 	Design Operations Closure	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs Measurement of stored water volume onsite does not exceed water balance recommendations to accommodate wet season precipitation Embankment geotechnical stability monitoring within design criteria ESCMs are maintained and operational in accordance with the ESCP
HP-9/IWEQ-10/AE-8. Planned pit over topping or release to surface water features during extreme rainfall and flooding events	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> Development of Monitoring Plan / Operational Manual which includes weekly inspections of the pits Pumping of pit water for use in the process circuit Implementation of AMDMP and WMP Groundwater / surface water quality monitoring Manage the site water balance to reduce any build-up of water 	Design Operations Closure	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs, especially within pits that may require discharge to surface water catchments

Section 6 AMD Management

Risk#/Description	Potential Impact	Mitigation / Management Control	Timing	Performance Indicator
		<ul style="list-style-type: none"> Implement clean water diversions in accordance with the ESCP Adhere to buffer widths recommended by the Northern Territory Land Clearing Guidelines with regard to riparian vegetation in drainage lines to reduce sedimentation risk 		<ul style="list-style-type: none"> Measurement of stored water volume onsite does not exceed water balance recommendations to accommodate wet season precipitation ESCMs are maintained and operational in accordance with the ESCP
HP-10/IWEQ-11/AE-9. Unplanned pit overtopping or release to surface water features during extreme rainfall and flooding events	Contamination of surface water, sediment, and groundwater quality and associated ecosystems	<ul style="list-style-type: none"> Development of Monitoring Plan / Operational Manual which includes weekly inspections of the Pits Pumping of pit water for use in the process circuit Implementation of AMDMP and WMP Groundwater / surface water quality monitoring Manage the site water balance to reduce any build-up of water Implement clean water diversions in accordance with the ESCP Adhere to buffer widths recommended by the Northern Territory Land Clearing Guidelines with regard to riparian vegetation in drainage lines to reduce sedimentation risk 	Design Operations Closure	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs, especially within pits that may require discharge to surface water catchments Measurement of stored water volume onsite does not exceed water balance recommendations to accommodate wet season precipitation ESCMs are maintained and operational in accordance with the ESCP
HP-13/IWEQ-14/AE-11. Poor handling and management of tailings and waste rock	Contamination of surface water, sediment, and groundwater quality and associated ecosystems. Increased	<ul style="list-style-type: none"> Development and implementation of a geochemical block model Daily monitoring of waste rock handling and tailings disposal Tailings and Waste Rock will be managed in accordance with the Tailings Management Plan and Operational Manual (including inspections) Use of a perimeter spigot with regular movement to evenly distribute tailings 	Design Operations Closure	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs Monitoring of waste rock movement and positioning is in accordance with the related plans

Section 6 AMD Management

Risk#/Description	Potential Impact	Mitigation / Management Control	Timing	Performance Indicator
	quantity of AMD to manage than expected.	<ul style="list-style-type: none"> Regular surveys to measure the tailings and waste rock deposition and water depths Groundwater / surface water quality monitoring Implementation of AMDMP and WMP Temporary and/or final capping of the waste rock and tailings to reduce ongoing water infiltration and seepage 		<ul style="list-style-type: none"> Geochemical sampling of waste rock to identify changes in chemistry ESCMs are maintained and operational in accordance with the ESCP
TEQ-7/HP-7/IWEQ-8. Indiscriminate use of existing waste rock for construction. Storage of waste rock outside of pit footprint for too long.	Contamination of surface water, sediment, and groundwater quality and associated ecosystems. Increased quantity of AMD to manage than expected.	<ul style="list-style-type: none"> Development and implementation of a geochemical block model Tracking of the waste rock and dumping locations Waste rock dump plan ESCP to prevent mobilisation Hydrological studies to ensure WRDs are outside flood affected areas Maximisation of placement within pits Testing of waste rock for AMD, heavy metals and radioactivity prior to use as on or offsite construction material Groundwater / surface water quality monitoring Implementation of AMDMP and WMP 	Design Operations	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs Monitoring of waste rock movement and positioning is in accordance with the related plans Geochemical sampling of waste rock to identify changes in chemistry ESCMs are maintained and operational in accordance with the ESCP
HP-8/IWEQ-9. Pit and groundwater dewatering exposing PAF and causing AMD.	Contamination of surface water, sediment, and groundwater quality and associated ecosystems.	<ul style="list-style-type: none"> Develop and implement a geochemical block model Sump below underground decline to reclaim contaminated water Implementation of AMDMP and WMP including ore and waste rock controls and tailings controls. Treatment of pit and underground water to within SSTV criteria. Upgrading of site drainage measures. Visual inspection of pit walls to identify locations and volumes of PAF material Groundwater / surface water quality monitoring 	Design Operations Closure	<ul style="list-style-type: none"> Surface water and groundwater monitoring data within SSTVs Pit wall geochemical data that indicates locations of PAF material

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Risk#/Description	Potential Impact	Mitigation / Management Control	Timing	Performance Indicator
HP-16/AE-13. Long term positive water balance	Potential build-up of water onsite and the need for long term treatment and constant discharges of water. Contamination of surface water, sediment, and groundwater quality and associated ecosystems.	<ul style="list-style-type: none"> • Close out structures to be water shedding to reduce water build up across site • Reduce and minimise contact water contact with AMD forming material • Improve and maintain site drainage infrastructure • Review options for WRD Rehabilitation • Implementation of Mine Closure Plan and adherence to commitments • Closure Plan updated and refined throughout mining operations including life of mine closure planning and contingency planning • Financial provisioning for closure implementation 	Closure	<ul style="list-style-type: none"> • Surface water and groundwater monitoring data within SSTVs • Surface caps and grades are performing as designed to shed water and limit erosion • Closure ESCMs are maintained and operational in accordance with the closure plan and associated operations and maintenance procedures.

6.2 AMD Management Strategy

As noted in Section 3, kinetic testing is ongoing to determine the longer-term acid generating potential of the waste materials and tailings generated from the different weathering zones. Based on preliminary conclusions as presented in Appendix D of the Draft EIS, the Rustlers Roost and Quest 29 project areas contain waste materials (rock and tailings) which are acid forming; therefore, these materials will require management to minimise the impacts to the surrounding environment from the release of solutes (leachable elements and compounds). In general, the AMD management strategy is twofold: 1) managing the existing AMD sources and 2) minimising the risk of proposed AMD sources (waste rock, tailings and ore).

6.3 Controls and Maintenance

As part of the AMD management strategy and minimising the risk and volumes of AMD on site, a number of operation controls have been designed. Typical management considerations where the avoidance of disturbance is not an option include:

- Segregation and selective placement;
- Encapsulation with NAF material of sufficient thickness to limit infiltration and/or use of low permeability cover systems;
- Submergence withing aqueous environment (e.g., pit lakes);
- Backfilling of hydrogeologically contained voids with minimal re-handling of materials;
- Erosion and sediment control measures such as bunding, run-on/runoff diversions, and stormwater ponds; and
- Water treatment and discharge.

The selection of the most appropriate management measures will be based on site specific environmental considerations including the climate, geology, hydrogeology, hydrology and geochemistry of the materials and cost and schedule implications to the project. Encapsulation should consider not only the acid generation potential of the waste but should also consider radioactivity requirements given the results gathered for the ore that may contain thorium-bearing fluorapatite.

6.3.1 Ore and Waste Rock

For waste rock, the following controls are proposed:

- A geochemical block model will be implemented prior to and during mining to better understand the geochemical characteristics of the resources that are being mined. The model, updated with regular geochemical sampling, will provide updated estimates of anticipated volumes of PAF and NAF material as mining continues, which will be used to develop management strategies for that material within the WRD and/or backfilled within the pits. Geochemical classification of the ore material will also provide an indication of the tailings characteristics and identify the requirements for tailing dam design, tailings management during operations and closure;
- To limit air and water contact with PAF material that causes AMD generation for the Rustlers Roost WRDs:
 - Material classified as NAF will be placed at the outer annulus of the WRD
 - NAF material with sufficient ANC will be placed on the natural surface, lining the drainage lines
 - Temporary and/or final cover systems over waste rock will be designed to limit infiltration to the extent needed based on the propensity for the material to generate AMD
 - PAF material will be encapsulated with the central areas of the dump, not near the outer slopes or toe areas and covered with NAF waste material from the outer perimeter.

- The Annie Oakley and Annie's Dam pits will be backfilled as part of closure. These pits will be entirely mined within NAF oxide material. Where possible, fresh waste from the Rustlers Roost Pit will be placed in the bottom of these backfilled pits. This approach will encapsulate fresh waste deeper within the pit backfill, surrounded by NAF bedrock on the pit walls and floor, and limit the amount of water and oxygen contact with PAF material;
- To limit air and water contact with PAF material that causes AMD generation for the Quest 29 WRDs:
 - Construction will commence with the placement of NAF material for the base and outer annulus
 - PAF material encountered will be placed onto the NAF base, and encapsulated within the centre of the WRD
 - Temporary and/or final cover systems over waste rock will be designed to limit infiltration to the extent needed based on the propensity for the material to generate AMD
 - No PAF material will be placed on outer perimeter, slopes, toe, surface or base of the dump.
- For Quest 29, the BHS pit will be mined entirely within NAF oxide material. This material will be used for beneficial mine closure purposes, such as use in rehabilitation (capping) of the decommissioned heap leach facility in the Project area. NAF oxide material from other pits will also be used for mine closure and AMD controls, such as encapsulation of PAF material within WRDs as described above;
- To provide geotechnical stability and water shedding on WRDs, final landform designs for all surface WRDs will have a maximum of 17-degree slope (approximately 3:1 horizontal to vertical);
- To limit potential for failure of Annies dam embankment or other structural embankments, geotechnical sampling, modelling, and regular inspections will be implemented to ensure structural stability;
- To reduce the site water storage and accommodate for stormwater containment during the rainy season, pit dewatering will be implemented at the start of mining (where water is present) and during mining using in-pit pumps. Dewatering will be implemented during mining as needed in response to direct precipitation events. This approach limits water contact with PAF material and reduces AMD generation potential, while also providing added storage for potential AMD that may be generated during peak water periods. Pumped water will be reused in the mining process circuit or discharged to the surface water catchments under approved permits;
- To update the site water balance and manage water, rainfall conditions and water levels across the site will be monitored (flow and volume) to manage peak water periods to maintain constant water volumes across site;
- To minimise erosion and offsite discharges of AMD, ESCPs will be implemented:
 - Perimeter drains, bunds, and sediment basins constructed at the down-gradient base of each of the surface WRDs (toe drain) to manage sediment and monitor surface water quality runoff and seepage
 - Check dams within diversion channels to provide velocity control where needed based on engineering estimates of maximum stormwater velocity
 - Sediment will be cleaned out of the sediment basins as required and in anticipation of the wet season to provide greater runoff capacity
 - Water volume will be measured within basins to manage the site water balance and maintain capacity needed for peak water periods
 - The sediment basins will remain post rehabilitation until the landform is stable
 - To minimise contact of clean water with WRDs, minimise AMD generation volume, and reduce clean water inflows into open pits and ponds, clean water run-on diversions will be installed to route clean unimpacted water away from the disturbed mine area and directly into area catchments. Further details are provided in the ESCP provided in Appendix L of the Draft EIS
 - These approaches will be implemented, inspected, and maintained in accordance with the associated plans for the mine operation (e.g., WMP, ESCP)
 - Engineering details of ESCMs are provided in the ESCP (Appendix L of the Draft EIS)
 - Water will be managed in accordance with the WMP (Appendix I of the Draft EIS) and the water balance provided in the Water Balance and Groundwater Modelling Report (Appendix H of the Draft EIS)
 - Water captured within stormwater ponds will be sampled and assessed through the established network of surface water monitoring sites in accordance with the WMP (Appendix I of the Draft EIS).

For ore material, the following controls are proposed:

- Ore will only be stored for extended periods on the ROM Pad;
- Similar to that described above for WRDs, ROM pad or other areas which stockpile or process ore material will be bunded and surface water run-on and runoff controls implemented to manage stormwater and erosion;
- Drainage from the ROM pad shall be directed to a stormwater sump which shall be managed to prevent overflow. Collected water from the ROM pad will be used in the mine process circuit; and
- Ore will not be used for construction purposes other than extraction of gold.

A design review is to be completed with each annual Mine Management Plan (MMP) that verifies the AMD standards are being implemented for the MMP term. Following final conclusions of kinetic testing of waste rock and tailings materials, the lag time for the breakdown of sulfides to generate AMD should be estimated. Taking into consideration the lag time of the PAF materials and to limit the egress of oxygen and water, certain operational measures such as encapsulation with low permeability covers may need to be implemented for PAF materials and potentially some UC materials both during mining operations and at closure.

6.3.2 Tailings

Design and operational controls for the tailings include the following details as provided in the Draft Tailings Management Plan (Knight Piesold 2021):

- Installation of stable TSF embankment slopes in accordance with seismic and slope stability design requirements. To limit potential for failure of the TSF embankments, geotechnical sampling, modelling, and regular inspections will be implemented to ensure structural stability;
- The TSF will be designed to contain a range of design storm and rainfall sequences up to and greater the required design criteria;
- An engineered spillway will be constructed as part of each embankment raise. After the initial year of operation, embankments will be constructed to accommodate 16 months of deposition and elevations raised on an annual basis;
- A decant system will be operated to abstract water from the supernatant ponds to use as return water in the process plant. This approach controls water levels and reduces liability for potential AMD management and treatment outside of the TSF that may result in discharge to watercourses;
- Seepage control will be designed that includes:
 - Low-permeability compacted soil liner inhibit infiltration into underlying soils/groundwater
 - Cut-off key trenches along the embankment perimeter to reduce seepage along the interface between original ground and the new embankment
 - Underdrainage collection system designed to reduce the phreatic surface within the tailings and embankments, reduce seepage potential, improves embankment stability, increases tailings density and maximises storage capacity, and increases geotechnical stability of the tailings mass adjacent to the embankment
 - Embankment toe drains designed to reduce the phreatic surface within the tailings adjacent to the embankments and improve geotechnical stability of the tailings
 - Underdrainage collection sump installed at the lowest point in the TSF underdrainage collection system. The sump will be designed to route water back to the supernatant pond and ultimately into the process water circuit.

These design aspects and operational controls will have the overall benefit of reduced risks associated with TSFs, such as unplanned discharges of AMD to surface water catchments through the spillway and embankment dam failures that would lead to catastrophic discharge of tailings and AMD to area catchments.

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In addition, as part of water management and site water balance goals, the volume of stored water, changes in water storage, and volume of collected and recirculated underdrain water will be measured regularly to 1) update the water balance with current information and 2) confirm operations are in compliance with the planned volume freeboards that can accommodate peak water periods. As part of the water balance maintenance and monitoring, regular surveys of the tailings deposition (extent and volume) will be documented to assess the evenness of the deposition and provide estimate of stored water within the tailings pores.

Section 7 AMD Monitoring

AMD monitoring provides feedback to confirm that the design and operational controls are effective for their stated aim. In that regard, the following will be monitored:

- Tailings and waste rock (including ore) to validate the existing geochemical classifications and to provide an historic inventory for site archives and legacy management;
- Sources and use of construction materials; and
- Water (surface water and groundwater).

PGO will utilise an adaptive management approach to meet the SSTVs to be developed for the site. The concept of adaptive management is a structured, iterative approach to decision making with the ability to gradually reduce uncertainty over time through monitoring and adapting to environmental, economic and social changes. In circumstances where potential impacts cannot be entirely avoided, the adaptive management approach allows for an evaluation of the preferred mitigation controls which can then be progressively improved and refined. This approach is particularly relevant to the longer term management strategies for AMD sources such as the WRDs.

The process of adaptive management is shown in Figure 7-1. Specifically, the AMD monitoring program would aim to:

- Detect environmental change and, specifically, identify those changes resulting from the Project;
- Determine actual versus predicted change;
- Contribute to the assessment of the effectiveness of environmental management procedures; and
- Provide data for the assessment of adherence to the environmental management plan, approval and licence conditions.

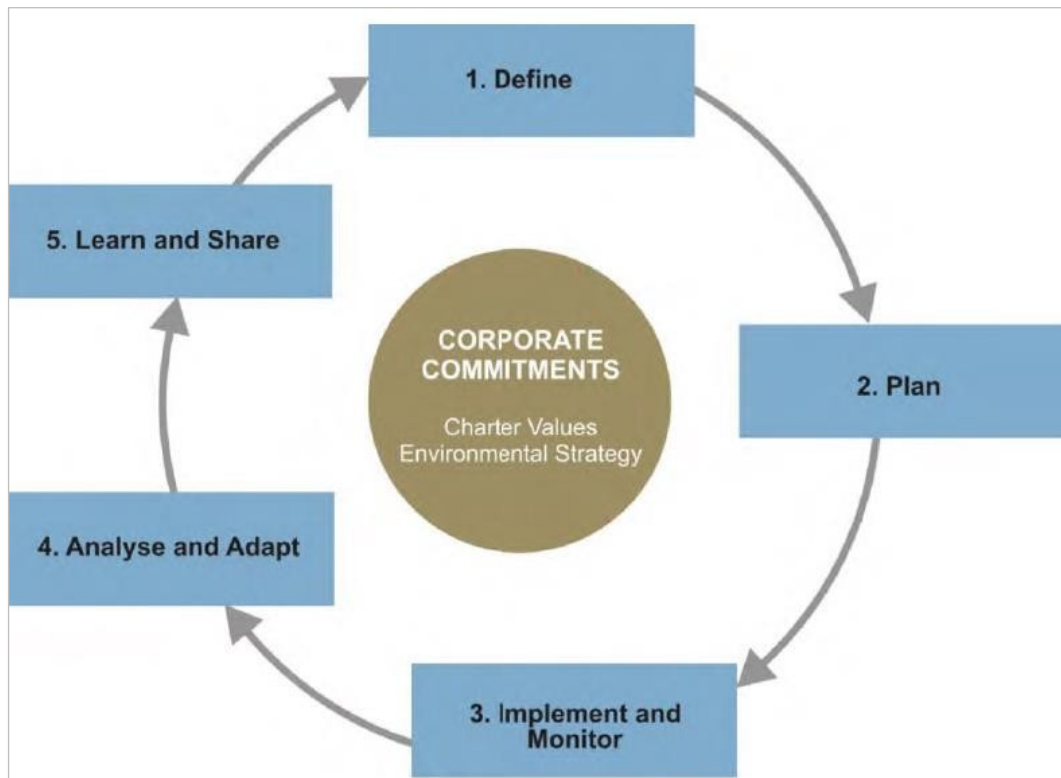


Figure 7-1 The process of adaptive management

The AMD monitoring program is to be reviewed annually and modified to assure continued appropriateness. Reviews will consider the frequency and duration of monitoring and evaluate the ongoing need for individual programs. Records of all monitoring activities will be retained to facilitate auditing.

The following sections provides an overview of the strategy and rationale. Note that the surface and groundwater monitoring is wholly captured by the WMP; therefore, it has not been reproduced here (refer to Appendix I of the Draft EIS).

Geochemical sampling and analysis on waste rock and tailings materials is to be undertaken using visual and analytical methods. Each method is explained below.

7.1 Geochemical Monitoring

The purpose of the geochemical monitoring program is to maintain an inventory of waste types and records for development of the components of the Project. The data will help facilitate closure and legacy management strategies, plans and monitoring.

7.1.1 Visual Methods

The Site Manager or delegate will undertake weekly inspections of waste rock/ore management and water management structures to ensure their integrity. The Site Manager or delegate will also inspect to ensure that no PAF material has been won from the engineered landforms for use in construction.

Records will be kept and photographic evidence of any management inconsistencies and structural integrity failing captured, with the Mine Manager notified for action. Examples include evidence of erosion and sediment transport downslope after a storm event, poorly maintained sediment traps, or a ruptured run-on bund. This is applicable to historic and future mineral waste and water management structures.

On-site visual monitoring will be undertaken down-catchment of the toe of the WRDs, TSF and ROM Pad/Process area, in addition to downstream of the WRDs, ROM pad and TSF runoff dams. Staff will be alert to the formation of secondary salts on waste rock surfaces and in drainage lines, particularly in dry season. The sources of the salts will be investigated to assist in determining future amelioration strategies for the WRDs and site remediation for the ROM pad and TSFs.

Such salts are readily dissolved into solution during 'first flush' rain events and will compromise water quality. In wet season, staff should note any discolouration of drainage water, particularly red-brown (sometimes Fe, sometimes tannins), clear/whitish (often dissolved Al due to acidic pH conditions), or blue-green (often dissolved Cu) rich discharge. The results of the visual inspections will be documented and communicated to the Site Manager.

Excess sedimentation in flow channels or sumps may also be indicative of active erosion and material transport and implies a lack of integrity of up-slope engineered management structures – which would be investigated with remedial actions undertaken as required for stabilisation.

Material removed from drainage lines or sumps that are cleaned at the end of dry season will be managed as PAF material and disposed accordingly with other PAF materials.

The supervising geologist will undertake visual inspection of development material (ore/waste) and construction material collected for geochemical sampling and note the presence of any visual sulfidic material (particularly pyrite and/or arsenopyrite). This inspection will be documented with the laboratory results cross referenced to the visual sample for data quality control and inventory, and appropriate emplacement of the mineral waste material.

7.1.2 Laboratory Analysis

Following visual inspection, a subset of the development waste and tailings samples will be forwarded to a NATA accredited laboratory to be analysed for:

- Acid base accounting; and
- Metals.

Further details of this laboratory based analytical program will be provided in a supplemental geochemical sampling and analysis procedure pending final results of kinetic testing. The data will have two purposes:

- Supplementing the visual data generated; and
- Establishing quantitative data for inventory and legacy management purposes.

The sampling and analysis frequency is provided in Table 7-1. The sample numbers in Table 7-1 are based on an industry accepted formula provided in Equation 1 below (Price 1997).

$$n = 25 * \sqrt{x} \qquad \text{Equation 1}$$

(Where x = Million tonnes (MT) of material per major lithological unit).

Therefore, based on Equation 1, a rule of thumb for representative sampling is around 25 samples per million tonnes of material - per major lithology. As all waste rock will be stored together underground or in pit and each individual waste rock unit has been geochemically assessed, the 'lithological' units for waste rock and tailings management purposes become simply 'waste rock' and 'tailings'.

Waste rock and tailings will be sampled and analysed approximately every month. The sampling frequency will be reviewed upon the mine schedule and amended as required.

Table 7-1 Sampling Frequency

Waste Quantities	Million Tonnes	Approx. sample number required	Assumed mine life (months)	Approximate sampling frequency per month
Oxide Waste Rock	20.7	114	120	1
Transitional Waste Rock	9	75	120	1
Fresh Waste Rock	26.7	129	120	1
Tailings	48	173	120	1 - 2

7.2 Surface Water Monitoring

The locations, sampling procedures, schedule and analytes for AMD surface water monitoring are entirely consistent with the WMP (Appendix I of the Draft EIS) and are therefore not reproduced here. Analytes with specific reference to AMD monitoring include pH, EC, acidity and alkalinity, sulfate and metals. Baseline water quality data is also included in the WMP.

Decreasing alkalinity and pH is generally a good early indicator of deteriorating conditions in leachate from a WRD containing PAF material and can therefore be tracked as an 'early warning' mechanism. Metals concentrations and declining pH values generally lag behind declining alkalinity; therefore, corrective actions can be implemented early should alkalinity decreases be detected. However, more neutral pH AMD may form containing elevated metals/salinity; therefore, a regular monitoring program is critical to the Project.

Other trends that highlight the onset of AMD include increasing sulfate, increasing sulfate / alkalinity ratio, decreasing pH values and an increase in soluble metals as a result. Given the Project area is a brownfield site with potential historic AMD impacts, the focus will be on improving trends through operations and ensuring offsite water chemistry compliance is maintained.

Given the development strategy adopted by PGO, the risks of the Project creating new AMD impacts on surface water quality are greatly reduced. Any deterioration in surface water quality will be investigated to determine the source. Adherence to SSTVs and appropriate actions will be undertaken.

7.3 Groundwater Monitoring

The locations, sampling procedures and schedule and analytes for groundwater monitoring are entirely consistent with the WMP (Appendix I of the Draft EIS). Analytes with specific reference to AMD monitoring include pH, EC, acidity and alkalinity, sulfate and metals. Baseline groundwater quality data is also included in the WMP.

Section 8 Contingency Planning

8.1 Overview

PGO will develop contingency plans for those failure modes where residual risk remains after the application of AMD prevention and control approaches. A contingency plan will include targeted monitoring, trigger levels for actions, and specific responses in case a certain event occurs. For example, if a failure mode is the potential for increased AMD seepage from a WRD, then monitoring can be established for changes in seepage sulfate concentrations and/or acidity as an early indicator of potential ARD formation. If significant increases in sulfate concentrations are measured, then contingency measures such as additional drainage collection will be implemented.

PGO will develop contingency plans specific to AMD management for this Project which will comparison of sampling results at appropriate/designated locations against SSTVs to evaluate if exceedances occur. The approach will be to undertake a 'root cause' analysis whereby the causal link for the water chemistry exceedance would be determined. Adaptive management would then seek to implement an appropriate alternate management strategy to eliminate any future risk of a repeat, given the nature of the incident.

Future revisions of this document will inform forward AMD risk management by providing feedback based on additional water chemistry and geochemical monitoring to inform AMD risk, and therefore, any adjusted management strategy.

8.2 Specific Measures

8.2.1 Tailings Management

Contingency measures for tailings management include the use of flocculants to enhance settlement.

8.2.2 Waste Rock

Contingency measures for waste rock management include storage underground or submerged in a pile. These scenarios may be unlikely for this Project. More likely, geochemically unstable/highly AMD generating waste rock may require use of a temporary cover during operations until final cover can be installed. Temporary low permeability plastic covers (e.g., low-density polyethylene) can be implemented to inhibit water contact with reactive waste rock during the rainy season and/or placed over areas of the WRDs that achieved final grade until such time that final covers can be installed. In active disposal areas of the WRDs, the temporary covers can be pulled back as needed to grade and compact waste materials, and then reinstall the temporary covers after grade is reached.

In lieu of geosynthetic covers, other alternative cover materials may also be considered such as evapotranspiration or store and release type covers. For example, sufficient thickness of NAF oxide waste rock or other suitable borrow soil resource could be placed over the reactive waste rock, and may include establishment of surface vegetative growth on a growth media (topsoil) layer. These alternative covers inhibit infiltration of precipitation into the underlying waste layer by having sufficient water holding capacity in the cover material that is greater than the designed storm volume and intensity. Addition of a surface vegetative growth layer also serves to increase water holding capacity as a result of rooting systems and plant evaporation, and hence the thickness of cover layers may need to be less in order to achieve the same performance as unvegetated alternative covers.

8.2.3 ROM Pad / Ore

Contingency measures for managing / stockpiling ore is for it to be stored temporarily underground for AMD control if there is insufficient capacity on the ROM pad. This scenario is not anticipated.

8.2.4 Water Management

In the event of an emergency situation where freeboard is not maintained for a particular pit or storage, water would be pumped between facilities taking into consideration water chemistry. At the same time water treatment would be ramped up to treat the excess water. Should there be an emergency situation with the ROM pad stormwater sump with all contained water not being able to be reused in the process; the water would be pumped to the evaporation ponds. In the event of an emergency situation where the evaporation ponds exceeding their design capacity, water would be treated and pumped to the process water dam.

Section 9 Roles, Responsibilities and Training

The roles and responsibilities for the implementation of the AMDMP are outlined in Table 9-1 below (reproduced from Section 10.4 of the EIS). This will be communicated to all relevant personnel during operations.

Table 9-1 Roles and Responsibilities

Role	Responsibility
Managing Director	<p>Approve and endorse the Environmental Policy.</p> <p>Ensure that adequate resources are available to comply with the Environmental Policy.</p> <p>Taking accountability for the effectiveness of the environmental management framework.</p> <p>Ensuring that the environmental management framework achieves the intended outcomes.</p> <p>Promoting continual improvement.</p> <p>Supporting other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility.</p>
Management Team	<p>Ensure compliance with all legal requirements including requirements of the NT EPA approval Project commitments and other permits.</p> <p>Ensure that requirements of the Project EMP are incorporated into engineering and procurement processes, and that these processes do not conflict with environmental performance requirements.</p> <p>Ensure that adequate resources are available to meet all compliance requirements and implement the requirements of the Project EMP.</p> <p>Ensuring that the Environmental Policy and objectives are established and are compatible with the strategic direction and the context of the organisation.</p> <p>Ensuring the integration of the environmental management framework requirements into the organisation's business processes.</p> <p>Directing and supporting personnel to contribute to the effectiveness of the environmental management.</p>
Contract Management and Procurement Team	<p>Ensure that procurement and contracting strategies reflect environmental performance requirements.</p> <p>Ensure that specifications and contracts include performance requirements in relation to energy and water efficiency and other measures to reduce resource consumption and waste generation.</p> <p>Ensure that contractors hold necessary approvals and authorisations, particularly in relation to waste management services.</p> <p>Review environmental performance credentials of potential contractors.</p> <p>Demonstrate a visible and pro-active commitment to health and safety issue.</p>
Chief Mining Engineer	<p>Ensure that design requirements set out in the EIS commitments, Project EMP and any other design requirements needed to meet conditions of approval are incorporated into design.</p> <p>Consider safety in design and minimisation of environmental impacts in design.</p> <p>Demonstrate a visible and pro-active commitment to health, environment and safety.</p> <p>Identify and provide resources and equipment for the effective management of environmental matters.</p> <p>Ensure Project personnel are trained to improve awareness of environmental issues and responsibilities.</p> <p>Coordinating control measures in the event of environmental emergency.</p> <p>Controlling construction activities until environmental deficiencies are rectified.</p> <p>Reporting environmental performance and compliance to the Managing Director and Management Team through the provision of event-based incident reports and monthly construction performance reports.</p> <p>Ensuring Project operations are performed in accordance with legal and other requirements.</p>

Section 9 Roles, Responsibilities and Training

Role	Responsibility
	<p>Reviewing the effectiveness of the system for continual improvement.</p> <p>Ensuring Project personnel understand and comply with environmental requirements.</p>
<p>Environment, Health and Safety Manager</p>	<p>Provide advice and guidance to internal management, procurement and design teams, and external contractors, in relation to environmental requirements.</p> <p>Conduct regular audits and checks of environmental performance to ensure the EIS conditions, commitments, Project EMP and associated plans are implemented to meet the environmental requirements for the Project.</p> <p>Review and approve the Project environmental risk register and EMP.</p> <p>Manage technical studies and research activities relating to environmental assessment and management of the Project.</p> <p>Communicating the importance of effective environmental management and of conforming to the environmental management framework requirements.</p> <p>Reporting environmental non-compliances to management.</p> <p>Monitoring and documenting environmental performance through the completion of checklists and or inspection reports.</p> <p>Developing procedures specific to address applicable legal and other requirements.</p> <p>Providing Project training and awareness programs.</p> <p>Liaising with employees on environmental matters.</p> <p>Ensuring non-conformances and environmental incidents are identified, reported and suitable corrective actions are determined and completed.</p> <p>Ensuring subcontractors fulfil their environmental obligations.</p> <p>Gathering, analysing and disseminating information on environmental legislation and other requirements relevant to the Project.</p> <p>Coordinating control measures in the event of environmental emergency.</p> <p>Preparing of completing weekly environmental inspections checklists or reports.</p> <p>Manage external relations with landholders and other stakeholders.</p> <p>Coordinate investigation and response to complaints and incidents involving members of the public.</p>
<p>Contractor Construction Managers, Supervisors and Environment Staff</p>	<p>Implement all relevant requirements of the EIS, permits and Project EMP.</p> <p>Integrate environmental management requirements into work procedures and practices.</p> <p>Conduct monitoring, auditing and reporting activities required by PGO.</p> <p>Provide initial responses to emergencies involving potential environmental impacts.</p> <p>Participate in incident investigations and assist with incident responses and investigations where required to manage and address environmental impacts of incidents.</p> <p>Conduct induction training and toolbox talks on environmental topics.</p> <p>Compile monthly and quarterly environmental reports.</p>
<p>Contractor Construction workers and all other staff</p>	<p>Comply with all relevant requirements of the EIS conditions, commitments and Project EMP.</p> <p>Identify and report any potential or actual environmental non-conformance or near miss to the EH&S Manager.</p> <p>Comply with the relevant acts, regulations, standards and contractual requirements.</p> <p>Comply with the environmental policy and procedures.</p> <p>Comply with management / supervisory directions.</p> <p>Attend induction and training on environmental awareness as directed.</p> <p>Be aware of environmental risks associated with work activities as identified on risk assessments for those activities.</p>

9.1 Awareness, Training and Competence

All senior geology, mining, processing and environmental personnel will have an understanding of AMD through a site induction. All operational staff entering site, including contractors, are to be made aware of the AMDMP and the WMP through a site induction, which would include PAF material management.

9.2 Records, Reporting and Document Control

Records that are required to be held for this AMDMP include:

- Laboratory geochemical analytical results and geochemical monitoring reports;
- Tailings operating manual;
- Research and development reports (e.g. for long term management of WRDs);
- An inventory of all mineral waste placement which includes the following:
 - quantities and nature of mineral waste located in specific areas within the pit and/or underground
 - the nature of emplacement
 - quality control data as applicable
 - materials that may be re-used at a later date, such as topsoil, NAF, AC, etc.

Records shall be maintained in accordance with PGO corporate policies and procedures, with all records maintained into perpetuity to inform future site risk management.

Reporting would be undertaken consistent with approval requirements, and would include:

- Geochemical data on mineral waste: to be included in annual updates of the AMDMP as an appendix to the Mining Management Plan under the NT *Mining Management Act 2001*; and
- Water monitoring data: to be included in a specific annual water report as required under the NT *Mining Management Act 2001*.

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