Northern Territory Environment Protection Authority

ASSESSMENT REPORT 91

Toms Gully Underground Project

Primary Gold Limited

February 2020

Environmental Impact Assessment Process Timelines

Date	Chronology	Relevant clause under the EAAP*
28/02/2014	Notice of Intent received	6
23/04/2014	NT EPA decision and statement of reasons issued - Environmental Impact Statement (EIS) required	8(2)(a)
13/09/2014	Draft Terms of Reference (TOR) released for public comment	8(3) and 8(4)
06/10/2014	Final TOR issued to Proponent	8(5)(b) and 8(6)
26/09/2015	Draft EIS released for public comment for six weeks	9(1)
18/11/2015	NT EPA directed Proponent to prepare EIS Supplement	11A(3)(a)
12/06/2018	Receipt of notification of alterations to the Proposal	14A(1)(a)
24/07/2018	NT EPA decision on altered Proposal: EIS still required	14A(3)(b)
15/08/2018	EIS Supplement received	12(3)
05/09/2018	Further information requested	14(2)(a)
25/10/2018	Further information requested	14(2)(a)
14/12/2018	Receipt of notification of alterations to Proposal	14A(1)(a)
8/02/2019	NT EPA decision on altered Proposal: EIS still required	14A(3)(b)
17/07/2019	Addendum to the Supplement received	14(2)(a)
7/08/2019	Further information requested	14(2)(a)
6/01/2020	Further information received	14(2)(a)
21/02/2020	Assessment Report issued	14(3) & 14(4)

Ms Janice van Reyk
Delegated Member

21 February 2020

Northern Territory Environment Protection Authority
GPO Box 3675
Darwin
Northern Territory 0801

Important Disclaimer

This document has been prepared with all due diligence and care, based on the best available information at the time of publication. Any decisions made by other parties based on this document are solely the responsibility of those parties.

The Northern Territory Environment Protection Authority and Northern Territory of Australia do not warrant that this publication, or any part of it, is correct or complete. To the extent permitted by law, the Northern Territory Environment Protection Authority and Northern Territory of Australia (including their employees and agents) exclude all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and other compensation, arising directly or indirectly from using, in part or in whole, any information or material contained in this publication.

Contents

List of tables and figures

Tables

Figures

Abbreviations and glossary

AAPA	Aboriginal Areas Protection Authority
Addendum	part of the EIS, addressing further information requested by the NT EPA following the Supplement
Advisory bodies	NT Government agencies having expertise and/or administrative responsibilities in respect of the Proposal
AFANT	Amateur Fishermen's' Association of the Northern Territory
AMD	acid and/or metalliferous drainage (including neutral mine drainage, and/or saline drainage)
ANCOLD	Australian National Committee on Large Dams
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPIR	Department of Primary Industry and Resources
Draft EIS	the initial part of the EIS, subject to public exhibition
EA Act	*Environmental Assessment Act 1982*
EAAP	Environmental Assessment Administrative Procedures 1984
EIA	environmental impact assessment
EIS	Environmental Impact Statement – comprises the Draft EIS, Supplement, Addendum and Further Information
Environment	All aspects of the surroundings of man including the physical, biological, economic, cultural and social aspects (section 3 of the *Environmental Assessment Act 1982*)
EP	evaporation pond
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESD	ecologically sustainable development
Further Information	the final part of the EIS, as requested by the NT EPA following the Supplement and Addendum
MM Act	*Mining Management Act 2001*
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
responsible Minister	Northern Territory Minister for Primary Industry and Resources
ROM	run-of-mine pad – for storing/mixing ore prior to processing

SOCS	site of conservation significance
SSTVs	site specific trigger values
Supplement	the second part of the EIS, addressing comments on the Draft EIS and the Proposal as altered in 2018
the Minister	Minister for Environment and Natural Resources
the Proposal	Toms Gully Underground Project
the Proposal area	Toms Gully mine site, as defined by Mining Lease North (MLN) 1058
the Proponent	Primary Gold Limited
the / this Report	Assessment Report 91, for the Toms Gully Underground Project
TSF	tailings storage facility
WDL	Waste Discharge Licence
WRD	waste rock dump
WSD	water storage dam

Units and symbols

%	percent
GL	gigalitre = $1x10^9$ litres = $1x10^6$ m^3
g/t	grams per tonne (metric)
km	kilometre
km^2	square kilometre
kV	kilovolt
L	litre
L/s	litres per second
m	metre
m^3	cubic metre
mm	millimetre
ML	megalitre = $1x10^6$ litres or $1x10^3$ m^3
MWh	Megawatt hours
oz	ounces
t	tonne
tpa	tonnes per annum

Summary and recommendations

Environmental impact assessment (EIA) is a process for identifying potential environmental impacts and risks of a proposed action, evaluating the significance of those impacts and risks, and determining appropriate avoidance, minimisation and mitigation measures to reduce those impacts and risks to acceptable levels.

This Assessment Report (this Report) examines the environmental impacts and risks of the Toms Gully Underground Project (the Proposal), proposed by Primary Gold Limited (the Proponent). This Report concludes the assessment process by the Northern Territory Environment Protection Authority (NT EPA).

The Report is provided to the Northern Territory Minister for Environment and Natural Resources (the Minister) and to the Minister for Primary Industry and Resources (the responsible Minister) for consideration in the development of conditions and approvals for the Proposal under the *Mining Management Act 2001* (MM Act). This Report is not an environmental approval although it will guide the decision by the Responsible Minister.

The Proponent proposes to recommence underground mining and on-site processing of gold ore within granted Mining Lease North (MLN) 1058, Toms Gully, approximately 100 km south-east of Darwin. The Proposal is a brownfield site previously mined for gold between 1988 and 2011. The total mining lease area is 628 ha and is located on Old Mount Bundey Station (Perpetual Pastoral Lease 1163).

The Proposal involves the refurbishment and upgrade of existing infrastructure and the development of new infrastructure (including a water storage dam (WSD), boxcut and water treatment plant) within a disturbance footprint of 196 ha. The Proposal also involves the rehabilitation of legacy mining structures. Ore would be mined from underground using room and pillar mining methods. Ore would be processed using the upgraded Carbon In Leach plant to produce 315,000 oz of gold for export. The proposed mine life is five years.

The NT EPA identified potential impacts and risks to: soil, surface water and groundwater quality, due to contamination from mining wastes; downstream aquatic ecosystems in the Mary River as a result of surface water contamination; and downstream social, economic and cultural values. Consequently, the NT EPA assessed the Proposal against the NT EPA's objectives for the key environmental factors of:

- Inland water environmental quality
- Aquatic ecosystems
- Social, economic and cultural surroundings

The Proposal is located in the Mary River catchment, close to recognised ecological values in the Mary River and associated floodplains. These ecological values also contribute significantly to important social, economic and cultural values in the region. In recognition of these values, the NT EPA has recommended that the Mary River downstream from the Proposal is to be protected at all times from mine related and legacy impacts, and that the Proponent publicly report on the health of water and ecosystems in the river and its tributaries.

Historical mining at the site has resulted in the generation of acid and metalliferous drainage (AMD) and there is considerable potential in existing landforms for further generation of AMD. This presents a risk of contaminants being discharged to the environment, including towards the Mary River. As the Proposal includes the rehabilitation of legacy mining landforms, the NT EPA considers that the Proposal presents an opportunity to lower the potential for future discharge of contaminants from the site. The NT EPA has made recommendations (4 to 6) for the safe and effective

rehabilitation of legacy landforms including tailings storage facilities and waste rock dumps.

The Proposal includes the subaqueous deposition of waste rock and tailings in the existing pit lake to limit oxidation and the generation of AMD. The NT EPA is supportive of this approach but also recognises that there are uncertainties around the placement and potential reactivity of this material, such that the long term water quality is unknown. The NT EPA has recommended further studies and an adaptive management approach to ensure that waste materials remain in the anoxic water layer at all times.

The pit lake is already used to store water that has come into contact with historical mining components and is filling annually due to runoff from adjacent landforms. It currently contains about 4 GL of acidic, saline water containing high levels of metals. As pit lake water will be displaced by the deposition of mining waste material, and water must be removed from the underground workings to enable mining, a fundamental part of the Proposal is to treat water for controlled discharge to the environment. This would be subject to a Waste Discharge Licence in accordance with the *Water Act 1992*, which would also take into consideration all uncontrolled untreated discharges from the Proposal.

The NT EPA has recommended that, to protect values in the Mary River and tributaries, 95% species protection level is the appropriate target for water quality at compliance points and for all water to be discharge to land or a third party. As the water treatment methodology is also uncertain, the NT EPA has recommended independent validation to demonstrate that the final chosen water treatment methodology can meet target water quality at the required scale.

To avoid future overflow of the pit lake, the Proposal includes the addition of bunds and drains to direct runoff from adjacent landforms entering the pit lake. Modelling by the Proponent indicated that with these changes, the pit is unlikely to overflow in the future. However, there is also potential for seepage from the pit lake via groundwater towards surface waters in Mount Bundey Creek, and this could contain contaminants if pit lake water quality declines into the long term future. The NT EPA has recommended that additional monitoring of groundwater in the vicinity of the pit lake be conducted, with results to inform the adaptive management approach and the Mine Closure Plan.

To address the risk of uncontrolled discharge of mine affected water from all sources, the NT EPA has made recommendations relating to an AMD Management Plan and requiring that there is no net increase in contaminant mass loads to the Mary River and its tributaries compared to the current situation.

The NT EPA recognises that the Proposal could provide local economic and employment benefits and reduce the risk of environmental impacts that could have negative consequences for social, economic and cultural values downstream of the Proposal. In recognition of the importance of these values, the NT EPA has made recommendations for engagement with and reporting to stakeholders and the community, including custodians of Sacred Sites.

The Proponent intends to fully decommission the mine and complete rehabilitation during a 10-year closure period. The NT EPA has made recommendations relating to closure objectives and the final Mine Closure Plan to prevent significant environmental impacts.

The NT EPA has made 18 recommendations as an outcome of the EIA. These recommendations are for the Proponent to consider in undertaking the action and decision-makers to consider in development approval conditions for the proposed action.

The NT EPA recommends that the environmental commitments, safeguards and recommendations outlined in the EIS, this Report and in management plans, must be

implemented by the Proponent, and reviewed and enforced by the relevant regulators throughout the life of the Proposal to deliver acceptable environmental outcomes.

The NT EPA considers that, subject to the implementation of all recommendations, the Proposal can be managed in a manner that is likely to meet the NT EPA's objectives, reduce the current impacts and risks from historical mining activities on the site and avoid significant or unacceptable environmental impacts and risks in the future.

List of Recommendations

Recommendation 1

That approvals and decisions for the Proposal impose binding legal obligations on the Proponent or Operator to implement the Proposal in accordance with all environmental commitments and safeguards which are:

- **identified in the final Environmental Impact Statement for the Toms Gully Underground Project, including Draft Environmental Impact Statement (EIS), Supplement to the Draft EIS, Addendum and Further Information**
- **recommended in this Assessment Report 91**

Where there is conflict between the commitments in the EIS and the recommendations in this report, the latter are to take precedence.

Recommendation 2

That the Proponent or Operator provides written notice in advance to the Northern Territory Environment Protection Authority and the Responsible Minister if it alters or proposes to alter the Proposal, environmental commitments or safeguards in the Environmental Impact Statement in such a manner that the environmental significance of the action may change, in accordance with clause 14A of the Environmental Assessment Administrative Procedures 1984.

Recommendation 3

That the commitments and safeguards listed in the Environmental Impact Statement for the Proposal and recommended in this Assessment Report 91 are implemented in a manner and to the extent that protects the environmental values of the Mary River downstream from the Proposal site at all times from mine related impacts, whether from the Proposal or from historical mining operations. This includes during any period of inactivity or care and maintenance. This is the overarching environmental outcome that is required to be achieved in respect of the Proposal.

Recommendation 4

That relevant approvals and decisions in relation to the Proposal include a condition that requires sufficient freeboard be maintained in the existing tailings storage facilities to prevent overtopping, until such time that all tailings have been removed and the facilities repurposed or rehabilitated.

Recommendation 5

That approvals and decisions for the Proposal require that:

- **water dams be designed by, and constructed under the supervision of, a suitably qualified, independent and experienced person, approved by the**

regulator, in accordance with the requirements of the Australian National Committee on Large Dams (ANCOLD) guidelines

- **water dams be designed, constructed and maintained to ensure that the integrity would not be compromised by flood waters or erosion from floodwaters from any watercourse or drainage line**

- **water dams be designed and constructed to prevent or minimise the passage of any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam**

- **certification of compliance with ANCOLD guidelines, by a suitably experienced, independent and qualified person who has supervised the construction, be provided to the relevant regulator on completion of construction of a water dam.**

Recommendation 6

That approvals and decisions for the Proposal have conditions that require the Proponent to develop an Acid and Metalliferous Drainage (AMD) Management Plan to the satisfaction of the relevant regulator prior to mining that:

- **is prepared in accordance with leading practice AMD management recommended in the Australian Government guidelines for preventing acid and metalliferous drainage (DIIS, 2016)**

- **requires the transfer of tailings and any contaminated material present in dam walls and bases to the existing pit lake**

- **requires the capping of the Waste Rock Dumps (WRDs) and lining of the evaporation ponds (EPs) with an engineered seal constructed from benign compacted material with limited permeability; the design and construction is to be reviewed by an independent certifying engineer**

- **incorporates measures for assessing the physico-chemical suitability of boxcut material (potentially during excavation) for capping the WRDs**

- **incorporates measures to assess the effectiveness of the WRD covers in restricting rainfall infiltration and limiting the creation of acid and/or metalliferous drainage and mobilisation of contaminants**

- **incorporates measures to ensure that the quality of water stored in the water storage dam (WSD) will meet water quality targets**

- **incorporates measures, consistent with the site water management plan, to monitor and assess density driven outflow from the pit lake on surrounding groundwater quality and surface expression**

- **includes mechanisms for adaptive management of potentially acid forming materials and AMD consistent with the Northern Territory Environment Protection Authority Guidance on Adaptive Management (NT EPA, 2018b).**

Recommendation 7

That approvals and decisions for the Proposal require that reactive material in the pit lake will remain in the anoxic zone, and water quality will be stable, at all times

after closure. The adaptive management approach to achieve this, addressed in Recommendation 10, must be informed by further studies to be undertaken through the life of the mine and closure period, including:

- **further analyses of the settling process of tailings, pit lake water stratification, limnology, water quality and water levels**
- **trials of potential long-term passive water treatment options**
- **a prediction of long-term water quality and water levels based on monitoring data.**

Recommendation 8

That approvals and decisions for the Proposal specify that water quality at the compliance points in Mount Bundey Creek and Coulter Creek meet 95% species protection level. The site specific trigger values (SSTVs) for discharge water quality must be appropriate to achieve this.

Recommendation 9

That approvals and decisions for the Proposal shall include a requirement for the Proponent to:

- **provide written validation by an independent qualified person, demonstrating that the final chosen water treatment methodology can meet water quality criteria at the required scale**
- **provide a plan for the onsite storage and regular offsite disposal, sale and/or recycling of any liquid or solid waste (including mixed metal oxide) from the water treatment plant, to be approved by the relevant authority on advice from the NT EPA.**

Recommendation 10

That before approvals or decisions are given or made for the Proposal, the Proponent provides to the relevant regulator and the Northern Territory Environment Protection Authority an Adaptive Management Plan consistent with the NT EPA Guidance on Adaptive Management (NT EPA, 2018b).

Recommendation 11

That approvals and decisions for the Proposal require that any water to be discharged to land or to a third party (for example; for dust suppression, irrigation, or any other purpose):

- **be accounted for in the Water Management Plan**
- **meet the site specific trigger values specified in the Waste Discharge Licence, consistent with Recommendation 8.**

Recommendation 12

That approvals or decisions for the Proposal require that the Proponent or Operator's adaptive management approach (Recommendation 10) is to be informed by monitoring additional bores between the pit lake and Mount Bundey

Creek and the oxbow wetlands. These are to be monitored for water levels and chemistry to inform the post closure pit lake water targets.

Recommendation 13

That approvals or decisions for the Proposal require no net increase in contaminant mass loads to the Mary River following closure, compared to the current situation, from the Proposal site.

Recommendation 14

That before approvals or decisions are given or made for the Proposal, the Proponent provides to the relevant regulator a Community and Stakeholder Engagement Plan providing for:

- **maximising local employment opportunities**
- **publication of a community complaints telephone contact number and email to allow community members to contact the Proponent regarding any issues or concerns**
- **development and implementation of a complaints management procedure that requires complaints to be recorded, investigated and abatement measures to be carried out if required, for handling community complaints and grievances for the duration of the Proposal, and broadly accepted by stakeholders**
- **reporting to stakeholders and the community on the health of the Mary River and tributaries monitored as part of the proposal, including contaminant mass loads**
- **effective ongoing stakeholder engagement and consultation on agreed post-mining closure, rehabilitation, land uses and access**
- **annual reporting to the relevant regulator of local employment, any community benefits, details of complaints and action taken and details of stakeholder engagement and consultation**
- **planning to minimise negative impacts of mine closure on surrounding communities**
- **publication of the Mine Closure Plan, as updated from time to time, together with monitoring data, by the Proponent.**

Recommendation 15

That approvals and decisions for the Proposal require the Proponent or Operator to:

- **conduct works in accordance with an Authority Certificate within the meaning of the *Northern Territory Sacred Sites Act 1984***
- **communicate with custodians of Sacred Sites in the vicinity and downstream of the Proposal site.**

Recommendation 16

That approvals and decisions for the Proposal require that closure of the Proposal achieve the following objectives:

- **be safe to humans and animals and able to sustain an agreed post-mining land use**
- **be stable and not have potential to cause environmental harm**
- **improved environmental condition, compared with the pre-Proposal state, for all pre-existing mine components to be used by the Proposal**
- **maintained environmental condition, compared with the pre-Proposal state, for any new components**
- **post-mining land use (including potential re-use of mine infrastructure) that has been agreed with the landholder prior to relinquishment**
- **present no long term impacts or costs for the local community or the taxpayer at the end of the Proposal's economic life.**

Recommendation 17

That before approvals or decisions are given or made for the Proposal, the Proponent provides plans to the relevant regulator for avoiding the discharge of mine affected water to the environment during wet periods into the long term future.

Recommendation 18

That the Proponent update the Mine Closure Plan prior to mining commencing to include:

- **specific, measurable, auditable targets to demonstrate that performance is consistent with closure objectives**
- **provision for the management of declared weeds and exotic plants with high fuel loads until closure criteria are met, consider weed status and fire resistance of revegetated areas in closure criteria and manage fire until the majority of the woody revegetation is likely to survive the typical fire regime for the region**
- **active management of water and sources of acid and/or metalliferous drainage during the closure period and during any period of care and maintenance**
- **provision for the appropriate disposal of offices and other infrastructure during closure, by means other than placement in the pit lake**
- **a requirement for independent periodic external audits by suitably qualified and experienced auditors of any subaqueous deposition of waste materials in the pit lake including reactivity, compaction, drainage and settlement of material layers.**

It is further recommended that the relevant regulator consult with the Northern Territory Environment Protection Authority on the Mine Closure Plan prior to mining commencing.

1 Introduction

1.1 Purpose of this Report

Primary Gold Limited (the Proponent) proposes to recommence underground mining and on-site processing of gold ore at the Toms Gully Underground Project (the Proposal), located approximately 100 km south-east of Darwin.

The Proposal has been assessed by the NT EPA at the level of an EIS under the *Environmental Assessment Act 1982* (EA Act). The NT EPA has prepared this Assessment Report (this Report) in accordance with section 7(2)(g) of the EA Act and clause 14(3) of the Environmental Assessment Administrative Procedures 1984 (EAAP).

The purpose of this Report is to ensure that matters with the potential to affect the environment to a significant extent are fully examined and reported. This Report is provided to the Northern Territory Minister for Environment and Natural Resources (the Minister) who will provide the Report to the Minister for Primary Industry and Resources (the Responsible Minister) to be taken into account in decisions made by the Northern Territory (NT) Government.

This Report is not an environmental approval, however it will guide the decisions and approvals relating to the Proposal.

1.2 Scope of the assessment

The NT EPA assessed the potentially significant environmental impacts and risks associated with the Proposal in line with the NT EPA's environmental factors and objectives (NT EPA, 2018a) and in accordance with the requirements under the EA Act.

The matters relating to the environment that the NT EPA considered necessary to be dealt with in the EIS for the Proposal were identified in the Terms of Reference (NT EPA, 2015), which were developed in accordance with clauses 8(3) to (6) of the EAAP.

The Proponent supplied details of alterations to the Proposal in accordance with clause 14A of the EAAP on 8 June 2018 and 14 December 2018. The NT EPA determined on both accounts that the Proposal had been altered in such a manner that its environmental significance had not changed and assessment at the level of an EIS was still necessary with respect to the proposed action (NT EPA, 2018c) (NT EPA, 2019).

Based on the Notice of Intent, and the notices of alteration to the Proposal under clause 14A of the EAAP, the NT EPA identified the following potential environmental impacts and risk categories that contributed to the decision to assess the Proposal at the level of an EIS:

- existing legacy acid and/or metalliferous drainage (AMD) issues from historic mining
- contamination of surface water, groundwater and soils
- impacts to hydrological processes and groundwater dependent ecosystems through altered surface water and groundwater flows
- impacts to downstream aquatic ecosystems in Mount Bundey Creek and Mary River National Park as a result of surface water contamination
- impacts to social, economic and cultural surroundings.

The Draft EIS for the Proposal was placed on public exhibition for six weeks between 26 September 2015 and 6 November 2015. A total of 13 submissions were received, 10 from NT Government advisory bodies, two from non-government organisations and one from the public.

1.3 Information before the NT EPA

In making this Report, the NT EPA had regard to:

- the Notice of Intent (February 2014)
- the Terms of Reference (October 2014)
- the EIS, comprising:
  - the Draft EIS (September 2015)
  - the Supplement to the Draft EIS (August 2018)
  - the Addendum to the Supplement (July 2019)
  - Further Information (January 2020)
- notices to alter the Proposal (June and December 2018)
- comments from NT Government advisory bodies on the Draft Terms of Reference, Draft EIS, Supplement, Addendum and Further Information
- comments from the public on the Draft Terms of Reference and the Draft EIS
- technical and other reports and guidelines that are noted in the References (section 8) of this Report.

1.4 Approval and regulatory framework

The Proposal will require approval and regulation by the NT Government. The framework for the approvals and conditions relevant to the Proposal are summarised below.

The NT EPA provides this Report to the Minister. The Minister is required to provide a copy of this Report to the Responsible Minister, together with any written comments made by the Minister in relation to this Report. If the Minister makes a comment in relation to this Report, the Minister must comply with reporting obligations to the NT EPA, under section 8B of the EA Act.

The Proposal was not referred by the Proponent to the Australian Department of the Environment and Energy (DOEE) for assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The MM Act is the primary legislation for the authorisation of mining activities and the regulation of mining sites in the NT. The Responsible Minister, taking into consideration this Report, will decide whether to grant an authorisation under the MM Act and the conditions that may be applied.

Section 8A(2) of the EA Act requires the Responsible Minister to give the NT EPA notice of the decision as soon as practicable, but within seven days, after making the decision. Alternatively, if the decision by the Responsible Minister is contrary to this Report, the Responsible Minister must comply with reporting obligations to the NT EPA and the Legislative Assembly in accordance with section 8A(3) of the EA Act.

For operation of the Proposal, the Proponent will require a Waste Discharge Licence (WDL) under Section 74 the *Water Act 1992* to permit discharges of polluted water or water that has come into contact with waste. This will require an application to the Controller of Water Resources in the prescribed manner and form. Information on the application process can be found at https://ntepa.nt.gov.au/waste-pollution/approvals-licences/how-to-apply. Other regulatory approvals may also be required for clearing native vegetation, impacting heritage sites or sacred sites, building accommodation facilities, and/or storing or transporting hazardous chemicals.

The provision of this Report to the Minister concludes the examination of the EIS by the NT EPA. The EIS and supporting documents can be viewed on the NT EPA website at: https://ntepa.nt.gov.au/environmental-assessments/register/toms-gully-underground-project.

1.5 Background to the Proposal

The Proposal area (Toms Gully mine site) has previously been subject to open cut and underground mining by various operators.

1.5.1 History of existing mine

The Toms Gully gold deposit was discovered in 1986 and the open pit mine was developed and operated by Carpentaria Gold until 1991. Development included two waste rock dumps (WRDs), evaporation ponds (EPs), a tailings storage facility (TSF), and the initiation of an underground mine. Since 1991, at least five other operators have been responsible for the mine site. The mine was reopened twice and ceased operations after brief periods. A second TSF and a Carbon In Leach plant were developed by Kakadu Resources during the 1990s. Details are provided in section 1.2 of the Draft EIS.

1.5.2 Environment condition at existing mine and surrounds

This section of the Report evaluates the current condition of the environment, as a basis for quantifying and assessing the significance of any potential future impacts from implementation of the Proposal. The site has a number of legacy environmental issues, including significant AMD from existing landforms containing acid producing material. These issues have affected the quality of groundwater and surface water, and indicators of aquatic health in Mount Bundey Creek, Coulter Creek and the Mary River National Park as outlined below.

Historical landforms and sediments

Historical infrastructure and landforms are shown in Table 1. The layout of existing mine infrastructure is shown in Figure 1.

Table 1 Existing components at the Toms Gully mine site

Component	Size/capacity	Reference
Toms Gully Open Pit (water filled) Top water level = 15 m AHD, rising at ~0.9 m per year Freeboard/spill level = 4 m/19 m AHD	15 ha 4.66 ML	Further Information
TSF1	10 ha 135 ML	Addendum Appendix O
TSF2	9 ha 409 ML	
Oxbow Wetland	4 ha	
EPs	14 ha 700 ML	
Lake Bazzamundi[1]	~ 17 ha 50 ML	
Processing area	10 ha	Draft EIS
Arterial infrastructure (including roads, power reticulation, drill pads and sumps, bores, pipelines and site drainage)	4 ha	
Oxide WRD Vegetated, with minor erosion. Mineral leaching has occurred, evident by staining of the surface and dead vegetation downslope. Seepage/runoff is collected in the diversion drain around the Oxide WRD. Water diversion flows via a channel to the Oxbow Wetland.	25 ha 4.0 million m^3	Supplement Appendix A

Sulfide WRD The western edge of the Sulfide WRD has been capped and revegetated. Surface runoff to the west passively discharges towards Mount Bundey creek. Other runoff from the Sulfide WRD is captured in TSF1 (to the south), the EPs (to the north) and the pit lake (to the east).	29 ha 3.3 million m^3	Supplement Appendix A
Total area of existing disturbance	**137 ha**	

[1] Lake Bazzamundi is a seasonal, shallow artificial wetland that was not included in the Proponent's calculations of existing infrastructure. Lake Bazzamundi has previously been used to store mine-affected water with quality appropriate for stock drinking water.

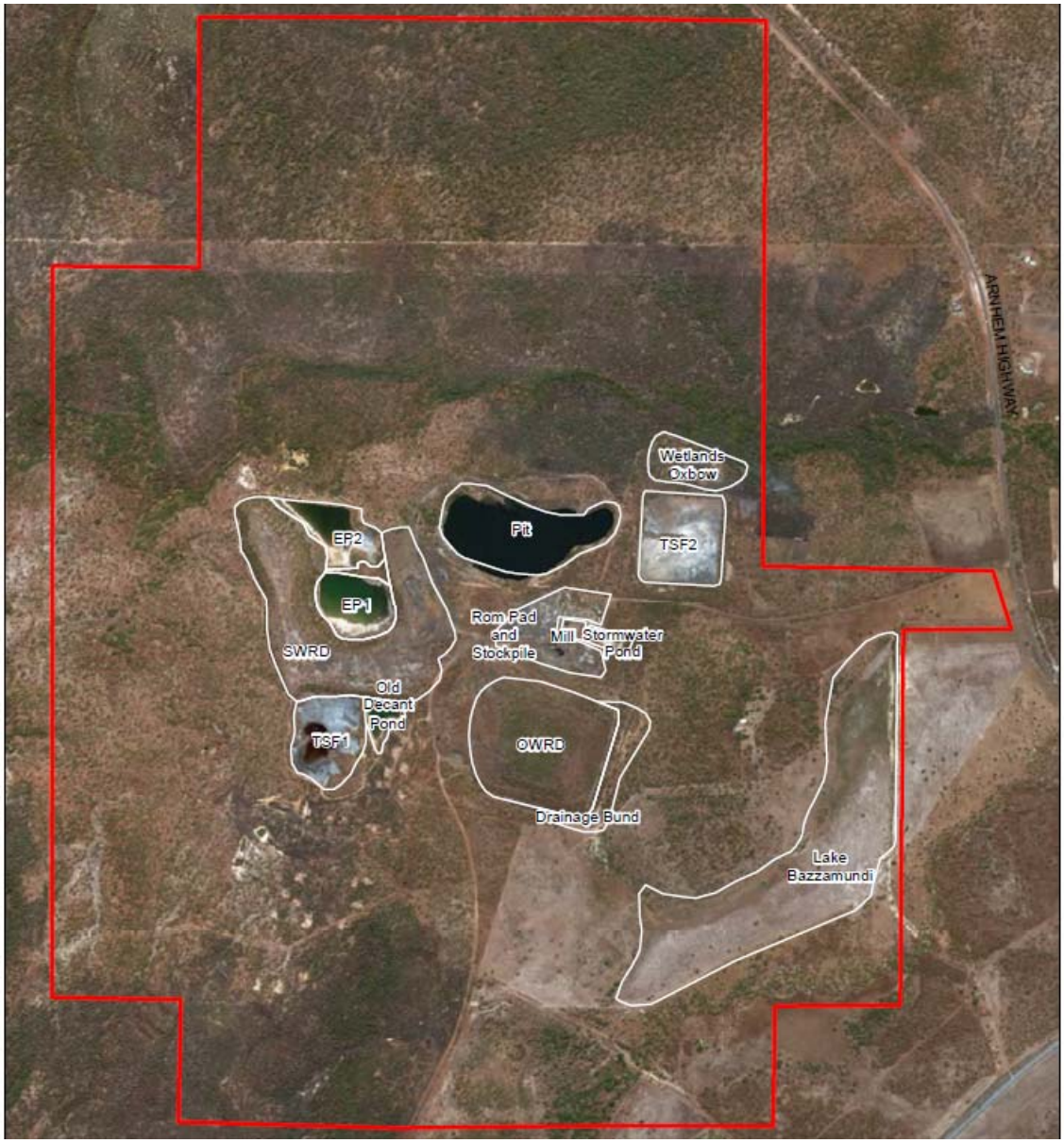

Figure 1 Layout of existing infrastructure. SWRD = Sulfide WRD; OWRD = Oxide WRD. Source: Supplement Appendix A

Material stored in the WRDs, TSFs and run-of-mine (ROM) pad stockpiles is a known source of AMD. The bulk of potential and retained acidity is in the WRDs and TSFs. Compared to the TSFs, the Sulfide WRD and Oxide WRD have relatively slow rates of acid generation (Supplement Appendix A). Acidic and saline drainage has been transported from the WRD, TSFs and ROM pad stockpiles to water storages across the site (Old Decant Pond, EPs, Stormwater Pond and Oxbow Wetland) (Supplement Appendix A). As a result, water and sediments in these storages contain contaminants including sulfides, metals and acid.

Geotechnical assessment of the existing TSFs, WRDs and processing area found all to be physically stable. The Oxide WRD was found to have minor erosion and drainage problems but otherwise stable. The processing area also has minor erosion (Draft EIS Appendix 10). The geotechnical stability of the pit and other infrastructure is uncertain.

The surrounding land has been subject to pastoral activity which has resulted in some compaction and erosion from land clearing and cattle. This has led to sediment deposition in and downstream from the Proposal area impacting water quality.

Groundwater

Previous monitoring found that the quality of groundwater at the mine site prior to mining (1987) was poor and did not meet the Proponent's proposed site specific trigger values (SSTVs) developed for surface water (Addendum Appendix F).

Contemporary groundwater monitoring has been undertaken across a network of nine bores on site. The Proponent concluded that contamination of at least shallow groundwater has occurred around the WRDs, EPs and TSFs, based on monitoring results exhibiting localised areas of elevated sulfate or low pH and elevated metals. Monitoring from bores located to the north and west of the Sulfide WRD and EP2 suggests contamination extends from the Sulfide WRD and EP2 through shallow aquifers towards Mount Bundey Creek, approximately 130 m to 300 m to the north-west. Based on current groundwater elevations, the hydraulic gradient is towards the pit, which is likely to capture contaminated seepage from beneath the polluting components on site (outlined above) (Addendum Appendix C).

There are 20 registered bores in the mine lease (and associated with the mine) and an additional 19 registered bores are located with 5 km of the Proposal site, owned by surrounding users, and primarily used for stock and domestic supplies (Addendum Appendix F). Evidence suggests that there is no connection in terms of chemistry between the bores located on site and neighbouring bores (Supplement Appendix C).

Groundwater recharge is via direct infiltration, via seepage from the overlying weathered siltstone and direct contact with the mine voids. Other than in the near-mine area, shallow groundwater is likely to discharge to local creeks.

Surface Water

The Proponent reported on surface water quality within the mine site as part of the geochemical assessment (Supplement Appendix A). On site, water quality in water storages where surface water had interacted with the AMD-generating landforms (outlined above) did not comply with the SSTVs. Most sites had low pH (3.0 – 4.7) and elevated levels of many metals except arsenic, chromium, iron and lead. The NT EPA notes that the water level of the pit is presently rising at about 0.9 m per year (Further Information page 15), and is currently 4 to 5 metres below the spill level (Further Information page 21).

Historically, contaminated runoff from the Sulfide WRD that is captured in the EPs has discharged into Mount Bundey Creek along the drainage line to the north of EP2. AMD from the Oxide WRD has historically overtopped the Oxide WRD drainage bund and discharged into Lake Bazzamundi during periods of extended rainfall and/or wet season storm events (Addendum Appendix C).

In streams, the Proponent undertook water quality assessments at 14 sites in conjunction with aquatic ecology assessments between 2015 and 2019 (Further Information Appendix 4; Figure 2). In Mount Bundey Creek, the site adjacent to the mine site (MBC06) had the highest concentrations of contaminants and salinity, followed by downstream site SWTG2. Some SSTVs were exceeded at these two sites. Contaminant concentrations were elevated compared with control and reference sites upstream and in

Coulter Creek. Sites further downstream contained comparatively reduced concentrations of metals except for aluminium (Further Information Appendix 4).

In 2017 all monitoring sites recorded low dissolved oxygen (DO) levels (below the SSTV range). In some cases, DO was very low (Addendum Appendix E). In 2019, DO was higher but still below SSTVs at all sites except Coulter Creek. This is likely to be due to the higher flows at all sites in 2019 compared to 2017. DO was low upstream of the mine. Low DO could reflect the reduced flow conditions and the general abundance of organic matter present (Draft EIS).

The elevated concentrations of contaminants adjacent to and downstream of the mine site were attributed to contaminated seepage from the WRDs and TSFs discharging to streams and potential influence from runoff from the mine site during wet conditions (Further Information Appendix 4). The report concluded that impacts from the mine site on water quality were localised, but did not address the elevated concentrations of aluminium downstream from the mine site.

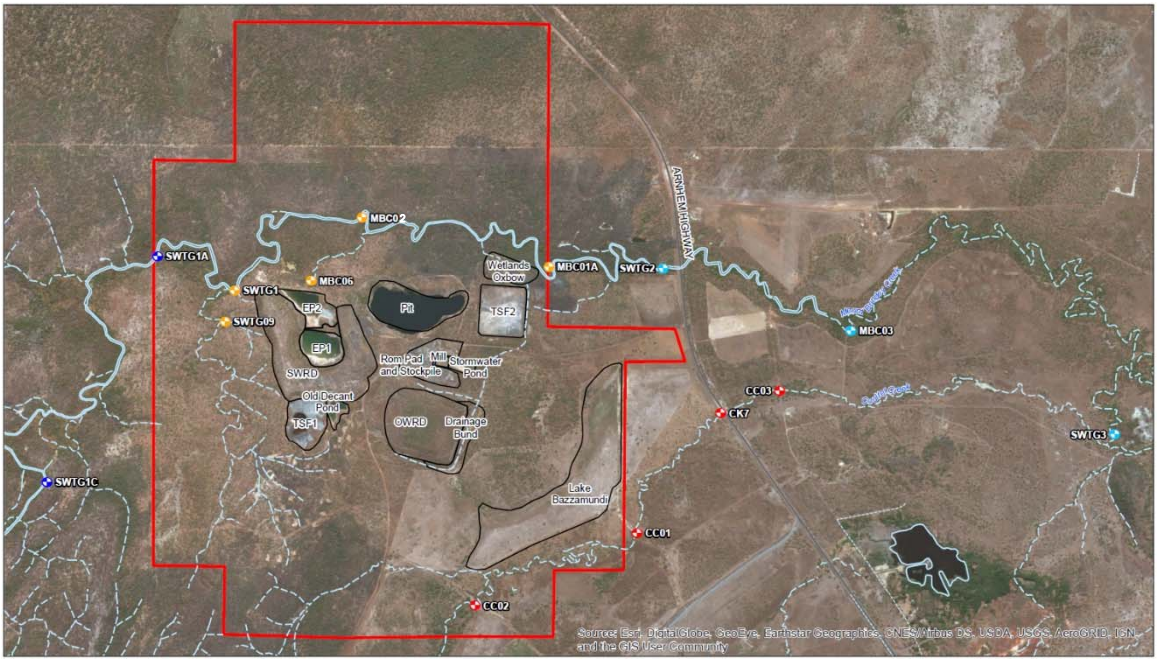

Figure 2 Water quality monitoring sites. Source: Further Information Appendix 4, Figure 3-1

Aquatic Ecosystems

Historical water quality monitoring data indicates that the receiving waters of Mount Bundey Creek are often subject to elevated turbidity levels and elevated dissolved concentrations of metals such as cobalt, copper and zinc. These potentially affect the health of the aquatic communities downstream. While the area is naturally acidic to neutral, low pH readings are most likely a reflection of historic, occasional high rainfall events which have caused AMD runoff from the Proposal site (Draft EIS).

Monitoring of indicators of aquatic ecosystems health was undertaken across 14 sites in Mount Bundey and Coulter Creeks in 2015, 2017, 2018 and 2019 (Further Information Appendix 4). Monitoring included macroinvertebrate community sampling, fish community sampling water quality sampling and aquatic habitat assessment.

Macroinvertebrates

The 2017 and 2019 aquatic ecosystem studies concluded that the macroinvertebrate community of Mount Bundey Creek and Coulter Creek comprised disturbance-tolerant macroinvertebrate families including Diptera (flies) and Ephemeroptera (mayflies), and in

2019, Hemiptera (bugs, aphids and cicadas). The number of families recorded was 55 in 2017 and 49 in 2019.

The 2017 study reported that community composition reflected water quality, such that ecosystem health metrics were poorer at sites adjacent and directly downstream of Toms Gully Mine. Sites further downstream were considered similar to those upstream of the mine.

In 2019, the macroinvertebrate community was reported as being in good condition at most sites in the study area. The exception was MBC06 (adjacent EP2) which exhibited poor macroinvertebrate community condition, likely due to the poor water and sediment quality observed.

Fish

Thirteen fish species were recorded in 2017, but only two species in 2019. Eastern Rainbowfish were the most commonly recorded, followed by Sailfin Glassfish. Spangled Perch and Eastern Rainbowfish were the most widely distributed fish.

The 2017 study concluded that the fish species of Mount Bundey Creek and Coulter Creek were indicative of moderately disturbed ephemeral streams in the area. A higher diversity of fish species was recorded in Mount Bundey Creek compared with Coulter Creek (Supplement Appendix E). This is likely due to the smaller size and lower flow of Coulter Creek, and nearby intensive cattle grazing and associated erosion such that turbidity and nutrient enrichment have resulted in poorer quality conditions for fish.

Species richness was correlated with distance downstream of the mine site. The monitoring site furthest downstream (SWTG3) had the most fish species (10); slightly more than the baseline site upstream of the Proposal (SWTG1A) (eight). This observation parallels the water quality data, which shows poorer water quality adjacent to the mine and water quality similar to baseline conditions at SWTG3 (Supplement Appendix A).

The physical condition of fish was found to be poorest at the site on the boundary of the mining lease (MBC01), which would be the most impacted by any discharges from the site. This was indicated by several Spangled Perch showing signs of Tropical Ulcerative Syndrome (red spot disease) and Seven-spot Archerfish swimming sluggishly (Supplement Appendix E).

Water Monitors

In 2017, one Mertens' Water Monitor (*Varanus mertensi*) was recorded upstream of the mine on Mount Bundey Creek. Three sightings of Mertens' Water Monitors were recorded in 2019 at two sites, including one site upstream and one site far downstream. No Mertens' Water Monitors were observed at any site adjacent to the mine or immediately downstream.

1.6 The Proponent

The Proponent is Primary Gold Limited (ABN: 42 122 726 283). Since June 2018 it is fully owned by Hanking Australia Investments Pty Ltd (ABN: 24 613 858 843), a company with several mineral investments in Australia. It is a subsidiary of China Hanking Holdings Limited, listed on the Hong Kong Stock Exchange and owner of an iron ore mine in Fushun, Liaoning, China.

2 The Proposal

A summary of the Proposal is presented in the Further Information provided 6 January 2020, with additional details provided in the Addendum and Supplement. The following section provides an overview of the Proposal.

2.1 Overview

The Proposal includes the following key activities:

- construction of a boxcut and decline to access the underground ore body; year 1
- construction of a new 1 GL WSD; year 1
- clearing 76 ha of native vegetation for the WSD, boxcut, borrow pits and associated access tracks; year 1
- establishment of a standalone water treatment plant; year 1
- upgrade and recommissioning of the existing processing plant; year 1
- capping of existing WRDs (including lining of the EPs); year 1
- removal and rehabilitation of existing TSFs 1 and 2; years 1 to 2
- placement of all tailings and waste rock via a stacker into the existing pit lake; historical tailings to be deposited in years 1 to 2
- underground mining; from year 2
- processing of ore; years 2 to 5
- new tailings to be deposited in the existing pit lake as soon as they are generated from ore processing; years 2 to 5
- rehabilitation and closure; years 6 to 15.

2.2 Location

The Proposal is located 100 km south-east of Darwin business centre and 66 km south-east of Humpty Doo (Figure 3).The nearest community is Marrakai, 18 km to the north-east. Access is via the Arnhem Highway to the Toms Gully Mine turn-off and then via an established haul road 1 km to the mine.

The Proposal lies entirely within granted MLN 1058 within Old Mount Bundey Station (Perpetual Pastoral Lease 1163). MLN 1058 covers an area of 682 ha. ML 29812 and ML 29814, directly north and south of MLN 1058 are also held by the Proponent and have an area of 158 ha and 84 ha respectively. The combined area of the mineral leases is 924 ha.

2.3 Regional context

The climate of the region is tropical, characterised by district wet and dry seasons with an average rainfall of 1394 mm. The majority of rainfall occurs in the wet season (October to April). Annual average pan evaporation is 2400 mm.

The Proposal lies within the Pine Creek Bioregion which consists of hilly to rugged ridges with undulating plains. The Proposal area contains small ridges and dissected hills drained by small stream channels and lower lying areas. Surface elevation reaches 51 m Australian Height Datum (AHD) in the south-west corner of the Proposal area and falls to 16 m AHD in the low-lying areas.

Figure 3 Proposal location (source: Draft EIS)

2.4 Key components and footprint

The components of the Proposal are summarised in Table 2 and their location is shown in Figure 5.

Table 2 Key components of the Proposal

	Component	Size/capacity
Whole of Proposal	Total area of mineral leases (MLN 1058, MLN 29812, MLN 29814)	924 ha
	Total area of disturbance (existing[1] and proposed)	195 ha
	Life of mine	5 years
	Operational workforce	104 workers
	Closure period	10 years
Mining	Ore to be extracted	900,000 t
	Waste rock to be extracted from underground	850,000 t
	Waste rock to be extracted from the boxcut	660,000 t
Processing	Gold to be extracted	315,000 oz
	New tailings generated – to be placed in pit lake	900,000 t

	Component	Size/capacity
	Existing tailings[2] – to be placed in pit lake	250,000 t – TSF1 130,000 t – TSF2
Proposed new Infrastructure (maximum)	WSD (for treated water)	16 ha 1 GL
	Boxcut for new access to underground	2 ha
	Borrow pits and associated access tracks required for dam embankments	58 ha
Rehabilitation of existing WRDs and TSFs	Once emptied of tailings TSF1 will be rehabilitated	No additional footprint
	Once emptied of tailings TSF2 will be kept if suitable as temporary water storage and rehabilitated during closures	No additional footprint
	Existing WRDs will be capped, including lining of the EPs	No additional footprint
Waste rock and tailings management	Boxcut material to be used to cap the WRDs. All other waste rock and tailings are to be deposited in the pit as described in section 2.7	
Water Management (Addendum Appendix A)	Dry season discharge of water from the WSD to Mount Bundey Creek, Lake Bazzamundi or third party in first 59 months	1.7 GL to Mount Bundey Creek and third parties 3 GL remains in pit
	Treatment process - treat to SSTVs. "Brutus" process. Refer to Section 2.8	26 ML/day
	Operational water discharge to Lake Bazzamundi, Mount Bundey Creek or third party for use	1.1 GL
	Two future WDL compliance points proposed at the eastern lease boundary	DP1 - Mount Bundey Creek DP2 - Lake Bazzamundi

[1]Does not include Lake Bazzamundi (17 ha); see section 1.5.2.

[2]Tailings material from TSF1 and/or TSF2 may be reprocessed to extract gold. Whether reprocessed or not, all tailings would be placed in the pit lake.

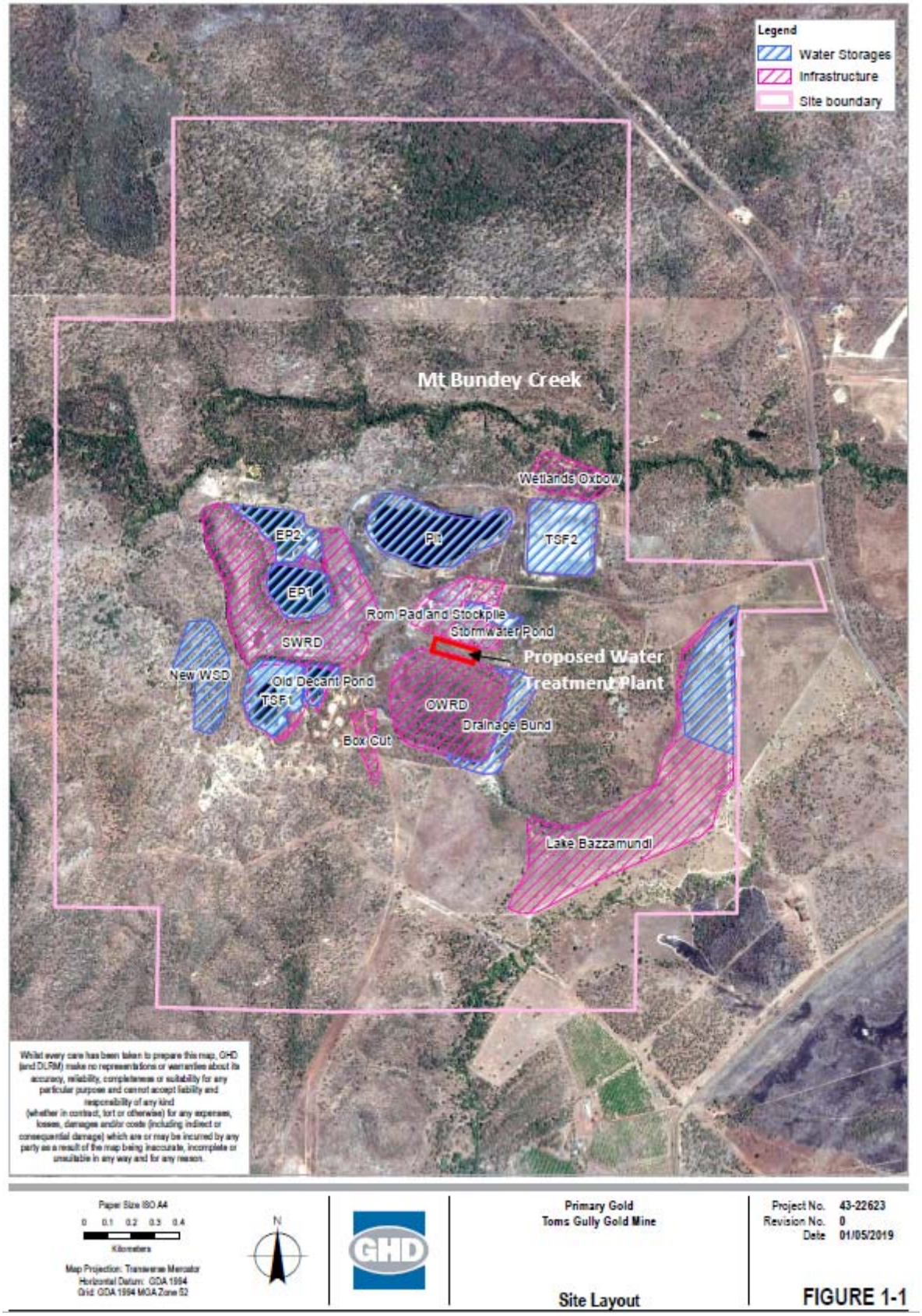

Figure 4 Mine site footprint and layout (source: Addendum Appendix K)

2.5 Historical tailings

As outlined in section 1.5.2 (existing environment), historical tailings are a known source of AMD and contaminants entering groundwater and surface water. In order to remove this source of contamination from the site the Proponent has committed to relocating all existing tailings material from TSF1 and TSF2 (380,000 t; whether processed or unprocessed) into the pit within 18 months of the boxcut excavation starting. This will inhibit oxidation. Tailings will be placed into the bottom of the pit via a floating head pipe arrangement as detailed in the Addendum.

Existing tailings from the TSFs will be pumped via a small dredge to the pit as a slurry. Some of these tailings may be reprocessed through the processing plant if the gold grade and recovery is found suitable.

Once emptied of tailings, TSF1 will be rehabilitated with uncontaminated material from the walls of the dam spread over the area the tailings were situated. The dam footprint will have topsoil spread over the footprint and this will be ripped to encourage re-growth.

Pending an assessment of suitability, after tailings have been removed, the empty TSF2 may be kept intact to use it as a short term water storage facility as part of the water treatment process. Water from underground mine dewatering will be stored in the dam and treated with caustic/lime to bring the pH up to at least 7, prior to being sent to the water treatment plant.

2.6 Mining and ore processing

Mining will be conducted using a room and pillar approach by use of conventional jumbo development drills, underground loaders and underground trucks.

Processing will be by use of crushing, grinding, flotation and Carbon In Leach extraction process. A wet slurry of ground concentrate will be subject to gold adsorption using 3000 g/t carbon over a residence time of 14 hours. Gold will be eluted with an acid wash and carbon will be regenerated for reuse.

The Proponent estimated 900,000 t of ore will be processed by the processing plant at a rate of up to 350,000 t/year. Ore processing will remove less than 0.05% of this in gold ore, such that the quantity of tailings is almost equal to the quantity of ore (900,000 t).

2.7 Disposal of waste rock and tailings

New tailings from the processing plant will be deposited subaqueously in the pit using the same method as for historical tailings deposition.

The boxcut waste rock will be placed on the existing waste dumps and used to line the EPs to reduce the ingress of water through the WRD and EP profile. If any of the boxcut material is found to be acid-producing it will be placed into the pit using the same method as for underground waste rock.

The underground waste will be deposited in the existing pit lake to limit oxidation. It will be trucked to the south side of the pit edge. A front end loader will place the waste onto a stacker conveyor belt that will convey the waste towards the middle of the pit, 60 m from the pit edge within 48 hours of extraction (Figure 5). The Proponent intends to leave some underground waste (50,000 to 200,000 t) underground in mined out areas, depending on geotechnical safety and scheduling. This would reduce the volume of waste to be placed into the pit.

The volume of the pit is sufficient to store all waste rock and tailings material beneath a 26 m deep layer (Further Information page 13). Previous studies indicate that at least 1 to 5 m of water cover is required to limit oxidation of waste materials (Addendum Appendix D).

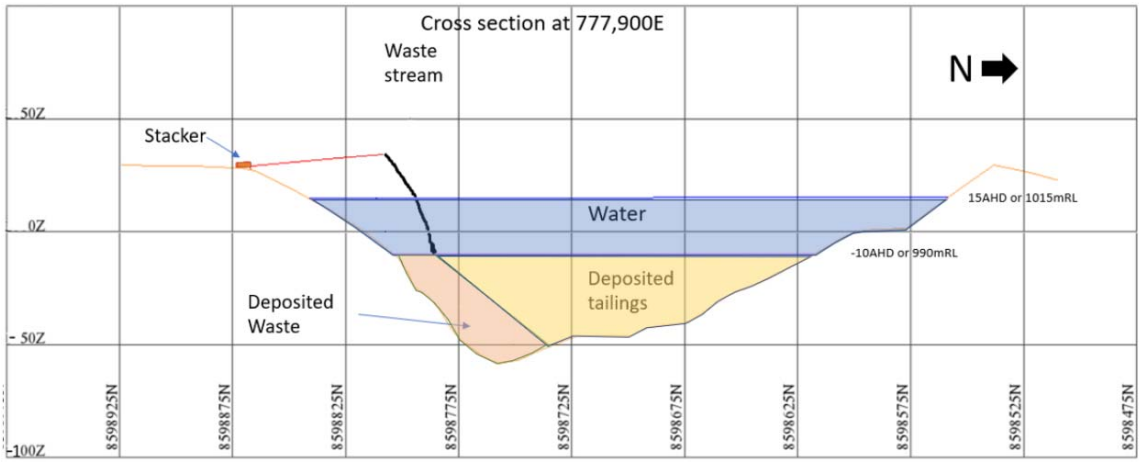

Figure 5 Indicative positioning of the waste rock and tailings in the pit (source: Addendum)

2.8 Water management

Surface water storage infrastructure on site is illustrated in Figure 4. All infrastructure is existing with the exception of the new WSD and water treatment plant that are to be constructed in the first year of the Proposal. All water storages do or will contain or capture mine-affected water, with the exception of the new WSD that will contain treated water, and Lake Bazzamundi that will capture potentially mine-affected runoff.

The intent of the water management system is to contain all mine-affected water on site and also to contain clean water over the dry season so that it can be discharged from the WSD to the environment when natural creek flows are occurring in the wet season. Volumes in each storage will be managed using pumped transfers between the storages, in accordance with the water management schematic at Figure 6. The primary mine-affected water storage is the pit lake.

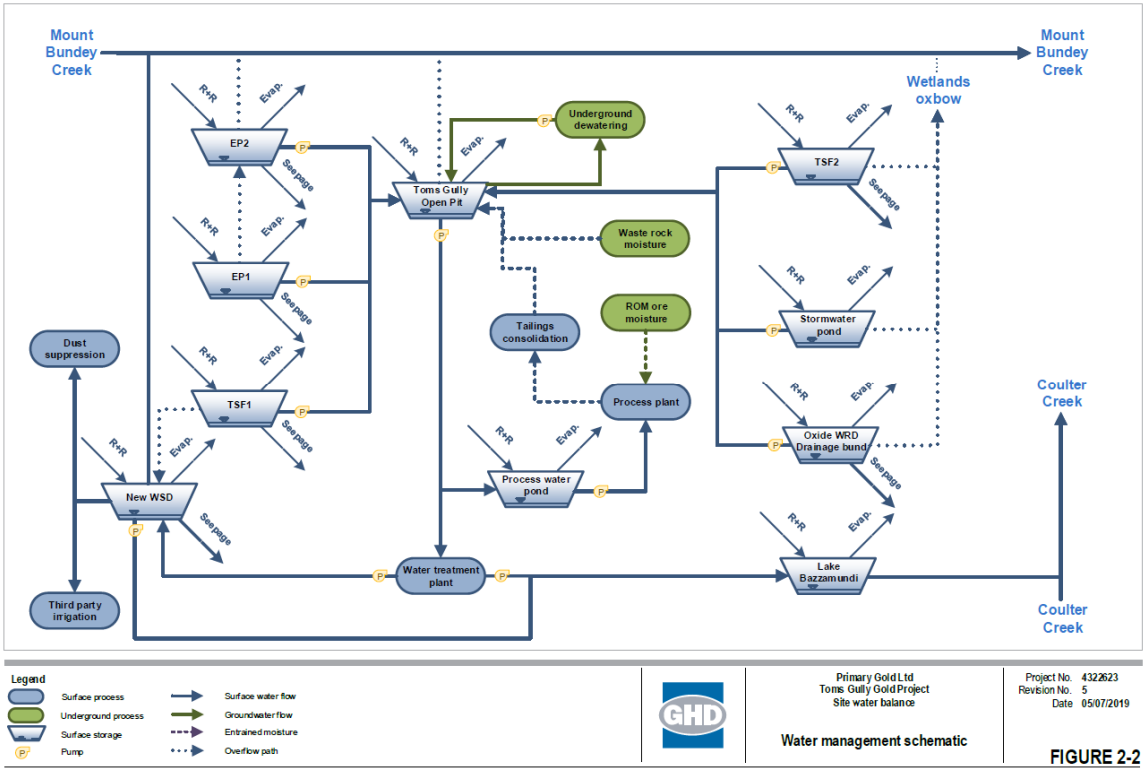

Figure 6 Water management schematic (source: Addendum Appendix O)

Throughout operations the Proponent proposes to progressively remove water from the pit lake to create space for the deposition of waste materials while maintaining the water level in the pit at or above the existing level. All excess water will be treated as detailed below, and stored in the WSD prior to environmental discharge in the wet season (to be licensed) or diversion to a third party user (Pastoralist) for use during the dry season.

The process for treating and discharging this excess water will be as follows:

- Prior to the placement of tailings and waste rock into the pit, pit water will be treated insitu using lime/caustic to keep the pH of the pit water at 8.5 and assist the precipitation of dissolved heavy metals in the water.

- The preferred final treatment process is the Brutus treatment plant developed by WaterX (Further Information page 8). This is a bacterial leach based treatment plant that converts all impurities into products that can be sold, including a mixed metal oxide, sulfur and carbonate. The Brutus system is described in Appendix Q of the Addendum (therein titled the BioAqua process). The scalability of the Brutus process requires testing. If the test plant is determined not economically scalable, then a conventional Reverse Osmosis (RO) plant will be used for the primary water treatment and the Brutus test plant will be used to treat the brine waste from the RO plant (Further Information page 5).

- Treated water will be discharged from the WSD to Mount Bundey Creek and Coulter Creek (via Lake Bazzamundi) in the wet season when streams are flowing (Addendum Appendix O). The Proponent will apply for a WDL that will facilitate regulation of this discharge in accordance with the *Water Act 1992*. Water from the WSD will also be utilised on site where required for dust suppression and it is intended that 200 ML/year will be transferred to a third party for irrigation.

- The Proponent has developed water quality targets for all discharges. Water quality targets (SSTVs) for discharge to the environment are presented in Appendix F of the Supplement. Toxicants that had SSTVs developed are:

  - Aluminium
  - Arsenic
  - Cadmium
  - Chromium
  - Copper
  - Iron
  - Lead
  - Manganese
  - Nickel
  - Zinc
  - Total ammonia.

  SSTVs are based on the 80th percentile of water quality data collected in the wet season from the reference site SWTG1A, to take into account natural variation and background levels. For all other toxicants, the default guidelines from the Australian and New Zealand Environment and Conservation Council and Agriculture and Resources Management Council of Australia and New Zealand (ANZECC & ARMCANZ, 2000) have been used.

  Water quality targets for Pastoralist use are provided in Table 6-4 of the Addendum. These are based on the (ANZECC & ARMCANZ, 2000) long term trigger values for 100-year irrigation periods. Exceptions to the ANZECC/ARMCANZ trigger values are:

  - Manganese and iron – the SSTVs are to be used instead, as these are higher than the ANZECC/ARMCANZ values

  - Sulfate and Electrical Conductivity – values derived to protect soil quality and protect plants sensitive to salinity, as these were not defined by ANZECC/ARMCANZ.

To minimise the possibility of pit water overflowing and discharging to Mount Bundey Creek in extreme rainfall events, the Proponent has proposed the following (Further Information pages 16 and 21):

- construction of bunds and drains to divert upstream runoff from the Sulfide WRD away from entering the pit
- additional bunds to increase the capacity of the pit (creating a freeboard of 5.7 m in the 1000 year extreme rainfall event), noting that the pit is currently filling due to wet season rainfall and runoff
- removal of the two TSFs so that pumping to the pit is not required.

2.9 Energy use and transport

The Proposal will utilise the existing mains 22 kV power supply to the mine and processing facility. The Proponent estimated power usage at approximately 2500 MWh per month. Diesel fuel consumption (mostly for underground mining equipment) is estimated to be approximately 50,000 L per month. Back-up power generators will be in place in the event of power loss to the site. The Proponent does not propose to offset its greenhouse gas emissions which the NT EPA has estimated to be 10,200 t CO_2-e over a five year life of mine (refer Appendix 1).

The Proponent estimated that construction traffic would comprise on average three trucks and 10 light vehicles a day travelling to and from site (Draft EIS). Estimated traffic during operations is for five delivery trucks per week, up to six bus trips daily and ten light vehicles daily. Peak traffic times would be between 5 am to 10 am and 3 pm to 7 pm. As there have been substantial changes to the Proposal since the Draft EIS, the NT EPA considers that actual traffic will differ from these estimates.

2.10 Workforce

The Proposal would provide approximately 104 jobs. This includes underground, processing plant, maintenance, administration and contractors. The workforce would comprise mainly local residents but would likely also include some fly-in fly-out workers. No accommodation camp is proposed as workers would be local residents or accommodated locally and would travel to and from the Proposal area for each shift.

2.11 Rehabilitation and closure

Closure will occur over approximately 10 years, with the primary aim to return as much of the Proposal area as possible to a state suitable for pastoralism, and to significantly reduce environmental impacts for the future.

The draft Mine Closure Plan outlines the closure precincts of 1) livestock exclusion (where remediation is not possible), and 2) pastoral. The exclusion zone (pit, boxcut, WRDs and all associated runoff/EPs) will have restricted access while water is being treated, the landscape stabilises and is revegetated, and while investigations conducted to ensure rehabilitation is safe and sustainable to support pastoral grazing. The Proponent's plans for the two major closure domains are summarised in Table 3.

Table 3 Proposed closure activities (source: Further Information Appendix B1)

	Domain	Closure activities
Livestock exclusion precinct	Pit lake	The pit lake will contain ~1.5 Mt of waste rock and tailings submerged under ~26 m of water. Water will have a pH of 8.5 due to active management during operations. The spill level will be 22 m AHD. An abandonment bund or fence with signage installed outside of the theoretical zone of potential pit instability (as per the Western Australian guideline Safety Bund Walls Around Abandoned Open Pit Mines (DMIRS, 1997) to prevent public entry.
	Processing Area (including ROM Pad)	Infrastructure and waste will be removed from site (unless required by a third party taking a controlling interest in the lease). The ground surface will be ripped and seeded with native species.
	TSF1 and TSF2	TSF1 – see section 2.5. If TSF2 is used for water storage during operations (see section 2.5), it will be decommissioned and rehabilitated during closure. Uncontaminated material from the walls will be flattened and spread over the dam area. Topsoil will be spread over the top and ripped to encourage re-growth.
	Oxide and Sulfide WRDs	These will remain in situ at closure, having been capped within four months of starting operations. The bunds and drains diverting runoff from the top of the Sulfide WRD running into the pit will remain in situ.
	EPs	The EPs will remain in situ at closure. A fence around the EPs will be maintained to exclude unauthorised personnel and livestock. During closure, water within the EPs will be treated using a water treatment process that removes metals and lowers sulfate. The long term rehabilitation of the EPs will be included in the further closure planning.
	Arterial Infrastructure (roads, pipelines, power reticulation)	These will be either: • retained for post closure site management • transferred to the Pastoralist • rehabilitated.
	Boxcut and Decline	Groundwater will fill the base of the portal, stabilising at about 30 m below the natural ground surface. The entrance will be sealed. The seal will prevent public/wildlife access to the decline. Eventually the seal will be underwater. A bund will be established around the boxcut to prevent the inflow of surface runoff and to prevent public/wildlife access.
	Oxbow wetlands	This will be retained. The wetlands are stable and considered to have more ecological value than if they were rehabilitated.

	Domain	Closure activities
Pastoral precinct	Surface and Groundwater bores	Production bores may be retained by the Pastoralist for future use by written agreement and have a fenced enclosure installed around them. Monitoring bores will be sealed.
	Proposed WSD	This will be retained as an available water store for pastoral grazing if water quality meets ANZECC livestock guidelines (ANZECC & ARMCANZ, 2000). If ANZECC livestock guidelines are not met or the Pastoralist does not wish to retain the WSD, the area will be included in the livestock exclusion precinct and be remediated as follows: • transfer remaining water to the open pit in the dry season • embankments used for rehabilitation or construction material to remediate existing infrastructure • base of dam ripped, scarified, topsoil re-spread (if available) and seeded with native species.
	Lake Bazzamundi	Will continue to be available as a water storage for pastoral grazing. The management of Lake Bazzamundi is expected to revert to the pastoralist at closure.
	Offices, workshops and sheds	These are likely to be retained for the Pastoralist. If not required, the Proponent intends to take them offsite to an approved landfill or demolish and submerge them in the pit lake. Remediation of the workshop footprint will be undertaken if deemed necessary by a contamination assessment following the cessation of operations. The ground surface will be ripped and seeded with native species.

3 Consultation

The Draft EIS for the Proposal was on public exhibition for six weeks between 26 September 2015 and 6 November 2015. A total of 10 submissions were received from NT Government advisory bodies, two from non-government organisations and one from a member of the public. All submissions were forwarded to the Proponent.

In preparing this Report, the NT EPA has considered each submission in relation to the Proposal's potential environmental impacts and risks.

3.1 Proponent consultation

The Proponent has consulted with the owners of Old Mount Bundey Station on a number of matters including the transfer of water for potential irrigation and the return of land to pre-existing pastoral land use. The Proponent stated that the pastoralist wishes to obtain water during the dry season and may wish to retain sheds, workshops and water storage assets post closure, pending further consultation.

3.2 Public submissions

There were two formal opportunities for public comment under the environmental assessment process. The first opportunity was to inform the development of the EIS Terms of Reference and secondly to comment on the Draft EIS.

The draft Terms of Reference were advertised for comment between 25 October 2014 and 7 November 2014. The Amateur Fisherman's Association NT (AFANT) provided comment.

The Daft EIS for the Proposal was on public exhibition for six weeks between 26 September and 6 November 2015. Comments were received from AFANT and the Environmental Defenders Office and one anonymous commenter.

The key concerns expressed by AFANT were:

- potential impacts to the health of downstream ecosystems resulting from inappropriate management of water quality and quantities
- potential impacts from AMD and/or saline drainage due to inadequate management of waste rock
- potential impacts from erosion and sedimentation during clearing
- the financial risk and the rehabilitation bond not being sufficient to address management requirements in the event of an emergency shut down or failure.

The key concerns expressed by the Environmental Defenders Office were:

- that elevated cyanide levels in TSF2 could impact on Gouldian finch drinking water and that a method for appropriately managing this risk was not proposed
- the lack of an appropriate closure or rehabilitation plan, or timeline for such plans to be submitted for the Sulfide WRD, the Oxide WRD and TSF1.

The anonymous commenter expressed their opinion regarding the lack of certainty regarding species presence or absence on site as no on-ground fauna survey had been undertaken in the area.

The Proponent responded to these issues in section 6 of the Supplement.

In preparing this Report, the NT EPA has considered each submission in relation to the Proposal's potential environmental impacts and risks.

The NT EPA acknowledges that the Proponent proposes to continue to engage with relevant stakeholders during implementation of the Proposal.

3.3 Consultation by the NT EPA

The NT EPA consulted with eleven NT government advisory bodies in respect of the Draft EIS, Supplement and Addendum to the Supplement when preparing this Report. The agencies consulted include Department of Environment and Natural Resources, Department of Infrastructure, Planning and Logistics, Department of Primary Industry and Resources (DPIR), Department of Tourism and Culture, NT Police, Fire and Emergency Services, Department of Health, Department of Trade, Business and Innovation, Department of the Attorney-General and Justice, Department of the Chief Minister, Aboriginal Areas Protection Authority and Power Water Corporation.

The NT EPA consulted with the Proponent and visited the Proposal site on 9 October 2018 during NT EPA Meeting 36. Further consultation with the Proponent was held at the NT EPA Meeting 37 on 6 December 2018.

Following submission of the Supplement, the NT EPA engaged the DPIR to provide additional technical information in respect of the EIS. The NT EPA also consulted with DPIR regarding the recommendations made in this Report.

The NT EPA has considered relevant environmental issues raised by stakeholders in making this Report.

4 Key environmental factors

Having regard to the Notice of Intent, the Draft EIS, Supplement and Addendum to the Supplement, further information received and comments from the public and advisory bodies during the EIS review, the NT EPA assessed the Proposal for its potential impacts on the NT EPA's factors and objectives. The NT EPA has identified the following key environmental factors that may be significantly impacted by the Proposal, and that are assessed in this Report (Table 4):

Table 4 Key environmental factors

Theme	Key environmental factor	Objective
Water	Inland water environmental quality	Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.
	Aquatic ecosystems	Protect aquatic ecosystems to maintain the biological diversity of flora and fauna and the ecological functions they perform.
People and communities	Social, economic and cultural surroundings	Protect the rich social, economic, cultural and heritage values of the Northern Territory.

The NT EPA has considered the importance of other environmental factors during the course of its assessment. Those factors that were not identified as key environmental factors that may be significantly impacted by the Proposal, or that were addressed through consideration of the above factors, are summarised at Appendix 1 of this Report.

The key environmental factors are discussed in Section 5 of this Report. The description of each factor shows why it is relevant and how it would potentially be affected by the Proposal. The assessment of each environmental factor contains recommendations for implementing the Proposal in a manner which protects the values associated with the factor. It concludes with a judgement by the NT EPA about whether or not the Proposal can meet the NT EPA's environmental objective for each factor.

5 Assessment of environmental factors

5.1 Overview

This section evaluates the Proposal and presents the views of the NT EPA on the environmental acceptability of the Proposal. The environmental acceptability of this Proposal was considered with regard to the principles of Ecologically Sustainably Development (ESD), through analysis of:

- the Proposal (particularly which components or activities are likely to significantly impact the environment)
- the existing environment (particularly environmental values and sensitivities)
- the potential environmental impacts and risks of the Proposal and the evaluation of the significance of those impacts and risks
- the proposed avoidance or minimisation / mitigation measures to reduce potential impacts and risks to acceptable levels and to meet NT EPA objectives.

Recommendations are made in this Report to add, emphasise or clarify any commitments made by the Proponent, where the proposed avoidance or minimisation/mitigation measures are considered insufficient, or where a safeguard is deemed particularly important. In this Report, the recommendations (in **bold**) are

preceded by text that identifies issues and undertakings associated with the Proposal. For this reason, the recommendations should not be considered or read in isolation.

The NT EPA acknowledges that detailed design and operational plans for the Proposal have not been finalised. Minor and insubstantial changes are expected in the design specifications of the Proposal following the conclusion of the EIA process. It is necessary for approval mechanisms to accommodate subsequent changes to the environmental safeguards described in the EIS and recommendations in this Report. The NT EPA considers that the application of conditions associated with the statutory approvals governing the Proposal will give effect to such safeguards. However, if future proposed changes to the Proposal could increase potential impacts on the environment, further environmental assessment may be required.

The NT EPA considers that this assessment is valid for five years from the date of this Report. If the Proposal has not substantially commenced in this period, the NT EPA requests that it be notified in writing by the Proponent.

The NT EPA considers that commitments made by the Proponent in the EIS are binding and must be fulfilled for the duration of the Proposal. The NT EPA makes Recommendations 1 and 2.

Recommendation 1

That approvals and decisions for the Proposal impose binding legal obligations on the Proponent or Operator to implement the Proposal in accordance with all environmental commitments and safeguards which are:

- **identified in the final Environmental Impact Statement for the Toms Gully Underground Project, including Draft Environmental Impact Statement (EIS), Supplement to the Draft EIS, Addendum and Further Information**
- **recommended in this Assessment Report 91**

Where there is conflict between the commitments in the EIS and the recommendations in this report, the latter are to take precedence.

Recommendation 2

That the Proponent or Operator provides written notice in advance to the Northern Territory Environment Protection Authority and the Responsible Minister if it alters or proposes to alter the Proposal, environmental commitments or safeguards in the Environmental Impact Statement in such a manner that the environmental significance of the action may change, in accordance with clause 14A of the Environmental Assessment Administrative Procedures 1984.

The remainder of this section identifies and discusses, in relation to each key environmental factor (NT EPA, 2018a), the environmental values and potential impacts and risks to these values based on the likely significance of potential impacts, the Proponent's investigations and studies, and the Proponent's commitments to identify, avoid, mitigate, monitor and manage the potential impacts and risks.

In defining its environmental objectives, the NT EPA also had regard to the principles of ESD articulated in the Intergovernmental Agreement on the Environment (DoEE, 1992). The NT EPA has summarised its consideration of ESD in Appendix 2.

The NT EPA considers it essential that good mine closure planning for each individual mine domain be integrated into mine development and operations planning, particularly as the proposed life of mine is short. The NT EPA's assessment of the Proponent's proposed Mine Closure Plan is discussed in Section 6.

5.2 Inland water environmental quality and aquatic ecosystems

5.2.1 Environmental objectives

Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.

Protect aquatic ecosystems to maintain the biological diversity of flora and fauna and the ecological functions they perform.

5.2.2 Environmental values

Groundwater

Groundwater at the mine site occurs in three aquifer systems that have heterogeneous porosity. The conceptual hydrogeological model (Supplement Appendix C) indicates that the hydraulic gradient of groundwater beneath existing mine infrastructure is inwards towards the pit. Other than in the near-mine area, shallow groundwater is likely to discharge to local creeks.

The Declared Beneficial Uses of Mary River groundwater are environmental, riparian and cultural under the *Water Act 1992*.

The earliest available baseline groundwater quality sampling was undertaken in 1987, prior to the commencement of mining. The bores sampled were situated within the now open pit. Several parameters were elevated in comparison to the SSTVs developed for surface water quality. These included electrical conductivity, turbidity, total suspended solids, arsenic and iron and acidity (Addendum Appendix F). These results were attributed to natural background values of the mineralised area (Draft EIS).

Historical mining has resulted in the generation of AMD from several sources within the Proposal site. Contemporary groundwater sampling on site has shown that generally groundwater is slightly acidic to slightly alkaline with a pH between 6.3 and 8. The exception is bore G8 near the Sulfide WRD which is acidic (pH 4.5) (Supplement Appendix A). Contamination of at least shallow groundwater has occurred around existing mine components. Some contamination may extend through shallow aquifers to Mount Bundey Creek to the north-west of the EPs (Supplement Appendix C). Further details are provided in section 1.5.2 of this Report.

Surface Water

The Proposal site is located in the Mary River catchment between two ephemeral streams: Mount Bundey Creek to the north and Coulter Creek to the south; both flow eastwards into Hardies Creek before joining the Mary River. The catchments of Mount Bundey Creek and Coulter Creek are about 120 km^2 and 40 km^2 respectively, totalling about 2% of the 8000 km^2 Mary River Catchment (sourced from maps supplied by the Proponent).

Surface water values are recognised under the *Water Act 1992* with the Declared Beneficial Uses of environmental, riparian and cultural for the Mary River. Mount Bundey Creek has a Declared Beneficial Use of ecosystem protection (including for the section running through the mineral lease), with the exception of a section downstream of the Proposal site (from about the Arnhem Highway crossing downstream for ~3 km to approximately the confluence with Hardies Creek), which is livestock water supply (NT Government, 1997).

Surface waters in the vicinity have relatively good water quality, with the exception of the section immediately downstream of the site that has had (at times) poorer water quality,

as described in section 1.5.2 of this report. While this is mostly due to seepage from legacy components at the Proposal site, it is also influenced by other activities in the local catchments. The quality of water in the storages on the Proposal site is generally poor (see section 1.5.2).

Aquatic Ecosystems

The Mary River system has significant conservation values related to its aquatic ecosystems. The Mary River coastal floodplain site of conservation significance (SOCS) and the Mary River National Park are downstream of the Proposal site, within 100 m and 3 km, respectively, of the site boundary (Figure 7). Combined with adjacent SOCS, the Mary River floodplain forms part of an extensive interconnected wetland system (NRETAS, 2009). This system is rich in biodiversity and is significant nationally and internationally. The proximity of the Proposal site to the SOCS and the Mary River National Park indicates that the site is very close to recognised ecological values that are downstream of the Proposal.

The Mary River is the most significant and reliable breeding habitat for magpie geese in the Northern Territory, and is an important breeding and feeding ground for other important water, shore and sea-birds. The Mary River floodplains are a major breeding area for fish species, including barramundi. Seasonal and semi-permanent waterholes in Mount Bundey and Coulter Creek are considered ecologically important, serving as refuges for fish and aquatic reptiles during the dry season. The Mary River system's aquatic ecosystems and terrestrial biodiversity also have socio-economic and cultural values as outlined in section 5.3.

5.2.3 Potential impacts

Water quality in the vicinity may be affected by contaminants (including sediments) entering surface water or groundwater from:

- AMD arising from historical and new mine components
- active water discharge to Mount Bundey Creek or Coulter Creek (via Lake Bazzamundi)
- active water discharge to a third party (e.g. for irrigation)
- uncontrolled discharges of mine-affected water via surface water or groundwater seepage, during operations and following closure
- uncontrolled discharge of liquids or materials stored on site, including from the water treatment plant.

Any contaminants discharged from the Proposal that impact downstream water quality could have adverse impacts on the downstream aquatic ecosystems. This could occur during implementation of the Proposal, during any period of inactivity or care and maintenance, or following closure.

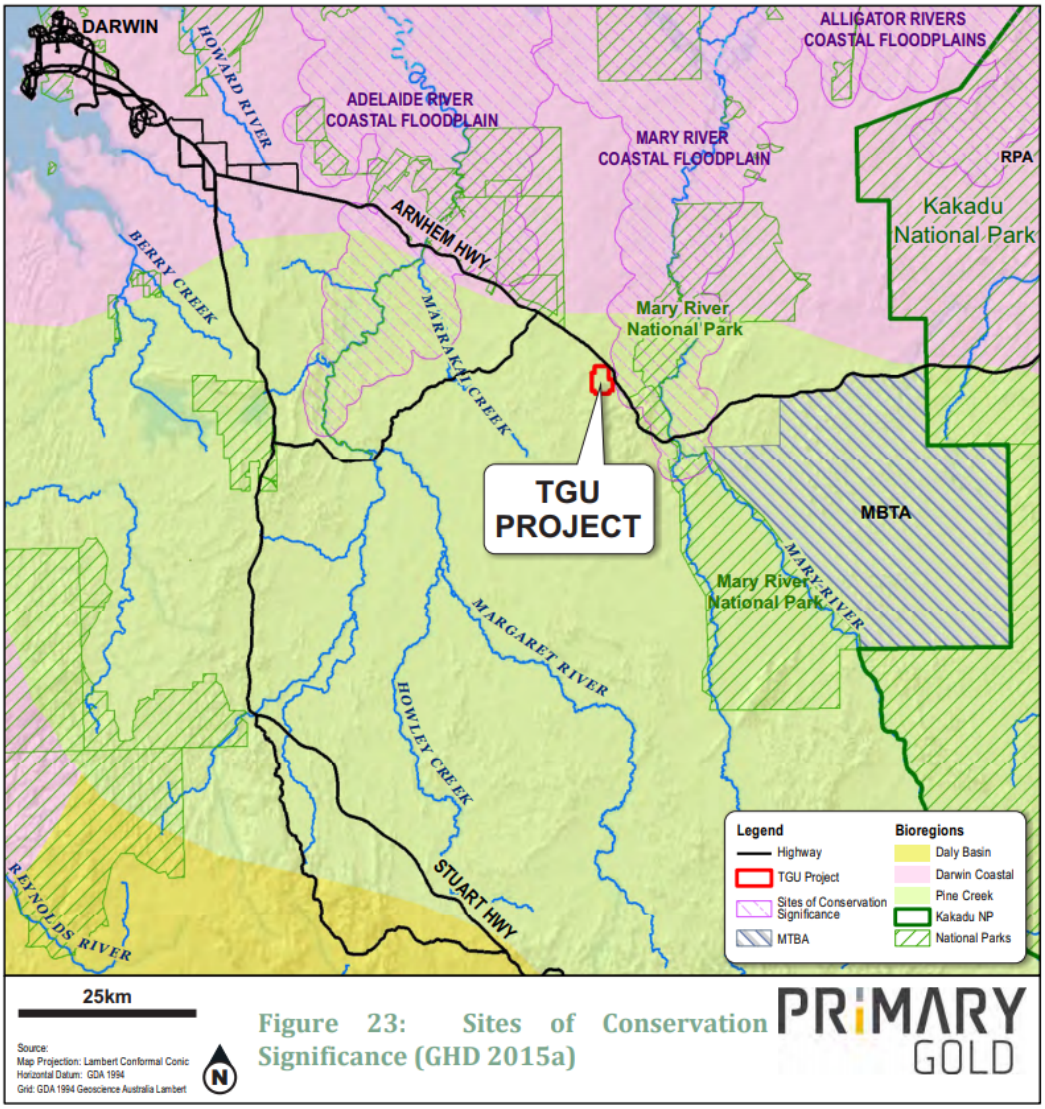

Figure 7 Sites of conservation significance (source: Draft EIS)

5.2.4 NT EPA assessment

Overarching protection of the Mary River

The Mary River and associated floodplains, and the values they support are the critical elements of the receiving environment for the Proposal that must be protected from site-related degradation. The NT EPA considers that to meet its environmental objectives across environmental factors, and the principles of ESD, the Proposal must meet the following overarching environmental objectives for the Mary River:

- protect the water quality and environmental health of the Mary River downstream of the Proposal site at all times from mine related impacts, including after closure
- reduce the impacts and risks to the Mary River from the legacy mine site.

To support this, the NT EPA makes Recommendation 3 to guide the Proponent in implementing the Proposal and to guide approvals and decisions for the Proposal. This will require effective contaminant source control as discussed below.

Recommendation 3

That the commitments and safeguards listed in the Environmental Impact Statement for the Proposal and recommended in this Assessment Report 91 are implemented in a manner and to the extent that protects the environmental values of the Mary River downstream from the Proposal site at all times from mine related impacts, whether from the Proposal or from historical mining operations. This includes during any period of inactivity or care and maintenance. This is the overarching environmental outcome that is required to be achieved in respect of the Proposal.

This recommendation also supports the requirement under the *Water Act 1992* for the Proponent to do all things reasonable and practicable to ensure the Proposal does not adversely affect the Declared Beneficial Uses and Objectives: Mary River surface water (environment, riparian and cultural); Mary River groundwater (environment, riparian and agricultural); Mount Bundey Creek, upper and lower sections (aquatic ecosystem protection); Mount Bundey Creek, mid-section (stock water supply).

In addition, the Proponent should publicly report on the health of water and ecosystems of the streams from the mine site downstream to, and within, the Mary River, and at reference sites upstream of the site to keep stakeholders and the community informed in accordance with Recommendation 15 (in section 5.3).

Sources of AMD

The two existing TSFs (TSF1 and TSF2) are currently the major sources of AMD on the Proposal site. The Proponent has committed to moving all tailings material from these facilities to the pit lake for subaqueous storage within 18 months of commencement of the Proposal and removal and rehabilitation of the TSFs. This would significantly reduce these sources of contamination and eliminate the long-term risk of a dam-break scenario that would deposit AMD-producing sediments in floodplain or flood fringe areas (Supplement Appendix K). The NT EPA supports this amelioration of historical site contamination.

In the short term, the NT EPA notes that the risk of contaminated materials being discharged to the downstream environment may be slightly increased while the material (tailings and dam walls) is being removed, and this risk could be reduced by transferring materials in the dry season. This can be managed by the Proponent and the relevant regulator. Before all material is removed, it will continue to be important to maintain sufficient freeboard in TSF1 and TSF2 to reduce the potential for overflow that could carry contaminants to the environment or destabilise the facilities. The NT EPA makes Recommendation 4.

Recommendation 4

That relevant approvals and decisions in relation to the Proposal include a condition that requires sufficient freeboard be maintained in the existing tailings storage facilities to prevent overtopping, until such time that all tailings have been removed and the facilities repurposed or rehabilitated.

The Proponent proposes to repurpose TSF2 as a water storage dam with a capacity of 80 ML and will assess the feasibility of this after it has been emptied of tailings. It would only proceed if deemed suitable by an independent assessment of stability, water retention capacity and suitability for water storage, in accordance with the Australian National Committee on Large Dams (ANCOLD) 2012 guidelines. The Proponent has committed that if TSF2 is retained as a structure for water storage during operations, that it will meet ANCOLD requirements for management. The NT EPA notes that management in accordance with ANCOLD would be appropriate for avoiding dam break

and potential impacts from any remaining contamination in the base or walls of the facility, and makes Recommendation 5.

Recommendation 5

That approvals and decisions for the Proposal require that:

- **water dams be designed by, and constructed under the supervision of, a suitably qualified, independent and experienced person, approved by the regulator, in accordance with the requirements of the Australian National Committee on Large Dams (ANCOLD) guidelines**
- **water dams be designed, constructed and maintained to ensure that the integrity would not be compromised by flood waters or erosion from floodwaters from any watercourse or drainage line**
- **water dams be designed and constructed to prevent or minimise the passage of any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam**
- **certification of compliance with ANCOLD guidelines, by a suitably experienced, independent and qualified person who has supervised the construction, be provided to the relevant regulator on completion of construction of a water dam.**

The two WRDs, the Oxide WRD and Sulfide WRD (which includes the EPs), are currently sources of contamination and predicted to be sources for the long-term future (see section 1.5.2). The Proponent proposes to cap both WRDs (top and sides) and the base of the EPs with 660,000 t of uncontaminated material from the boxcut within four months of commencement of operations. The average thickness of waste rock material applied to the WRDs and EPs will be 0.54 m and compacted in layers to achieve the stated objective of preventing water from infiltrating.

The NT EPA notes that capping of the existing WRDs would require the removal of existing vegetation on those landforms, but considers that this is a positive trade-off for reducing the potential for AMD generation. Reducing the capacity for oxygen and water to enter and preventing the generation of AMD is an important objective to reduce the contaminant loads in runoff and seepage and protect the downstream values in accordance with Recommendation 3. This is even more important due to the Proposal's inclusion of bunds and drains that will divert runoff from the Sulfide WRD away from the pit lake and towards the external environment.

The NT EPA is supportive of the Proponent's commitment to cap WRDs to limit further generation of AMD. However, the NT EPA considers that the Proponent has not provided sufficient evidence that the proposed covers would reduce AMD generation to the extent of preventing contaminated runoff. The reasons for this are outlined below:

- The Proponent identified priority areas for capping as the top of the Sulfide WRD and the western side of the Oxide WRD (where the sulfide rock appears on the surface), as it is unsure if there will be adequate boxcut waste material for full capping. The Proposal does not include an alternative for capping the remainder of the Oxide WRD.
- The Proponent assessed the boxcut material for its geochemical risk (Addendum Appendix J). The study found that over 95% of the tested samples (from two cores; one of which was within the boxcut footprint) were non-acid forming and the remainder were uncertain. The report concluded that the samples posed a low risk for metalliferous (neutral) and saline drainage. While there was a small

risk of aluminium and zinc leaching at low concentrations, these were within acceptable dilution factors. The NT EPA considers that while the sample material was considered benign, as this was based on limited samples, there is potential for some of the material to be unsuitable.

- The Proponent also conducted erosion modelling to assess the long term stability of the WRDs including the capping layer (Further Information Appendix 1). However this assessment was based on use of material from the Oxide WRD rather than boxcut material, so the long term stability of a cap constructed of boxcut waste rock is uncertain.

- An effective cap would require the incorporation of suitable clayey material in an engineered layer to seal the WRDs against oxygen ingress and rainfall infiltration; however it is unclear if the boxcut waste rock contains such clayey material.

The NT EPA considers that while the proposed WRD covers would improve runoff quality and reduce the volume of AMD produced, they will not completely prevent infiltration. It is likely the WRDs will continue to produce some AMD, so some management of runoff water is likely to be required. This is discussed below in relation to the uncontrolled discharge of mine affected water. The NT EPA makes recommendation 6 below for the management of AMD.

The Proponent will need to control all sources of potential contamination to minimise contaminated drainage from the site and protect downstream values in the Mary River and its floodplains in accordance with Recommendation 3. To ensure AMD is avoided and managed appropriately, the NT EPA makes Recommendation 6.

Recommendation 6

That approvals and decisions for the Proposal have conditions that require the Proponent to develop an Acid and Metalliferous Drainage (AMD) Management Plan to the satisfaction of the relevant regulator prior to mining that:

- **is prepared in accordance with leading practice AMD management recommended in the Australian Government guidelines for preventing acid and metalliferous drainage (DIIS, 2016)**

- **requires the transfer of tailings and any contaminated material present in dam walls and bases to the existing pit lake**

- **requires the capping of the Waste Rock Dumps (WRDs) and lining of the evaporation ponds (EPs) with an engineered seal constructed from benign compacted material with limited permeability; the design and construction is to be reviewed by an independent certifying engineer**

- **incorporates measures for assessing the physico-chemical suitability of boxcut material (potentially during excavation) for capping the WRDs**

- **incorporates measures to assess the effectiveness of the WRD covers in restricting rainfall infiltration and limiting the creation of acid and/or metalliferous drainage and mobilisation of contaminants**

- **incorporates measures to ensure that the quality of water stored in the water storage dam (WSD) will meet water quality targets**

- **incorporates measures, consistent with the site water management plan, to monitor and assess density driven outflow from the pit lake on surrounding groundwater quality and surface expression**

- **includes mechanisms for adaptive management of potentially acid forming materials and AMD consistent with the Northern Territory Environment Protection Authority Guidance on Adaptive Management (NT EPA, 2018b).**

The pit lake currently contains AMD due to storing water that has come into contact with historical mining components. Since 2010 the pH has averaged 3.3 and has high salinity and levels of metal contaminants (Further Information Appendix 1). The Proponent intends to reduce the current acidity in the pit lake through the addition of alkaline materials during operations, allowing heavy metals to precipitate and drop to the base of the pit. However, the final pit lake could also potentially create a new source of AMD as it will also contain acid-producing material from tailings and waste rock and this could generate AMD into the future.

The Proponent conducted geochemical modelling to determine pit water quality after the addition of this material and into the long term following closure (Addendum Appendix D). This report indicated that, once all material had been deposited in the pit (including boxcut waste rock), it would be 21.9 m below surface, overlapping the oxic layer of water (25 m below surface) and therefore reactive. The predicted water quality at the time of closure was poor; with pH, salinity, sulfate, cadmium, copper, nickel and zinc all exceeding SSTVs. However, the report concluded that due to the highly conservative assumptions included in the model, the resultant water quality might be better than the modelled predictions.

Since the publication of that report, the Proponent has stated that boxcut waste rock will not be placed into the pit, and therefore the tailings and waste rock material will be at a significantly lower level in the pit (26 m below surface; Further Information page 13) and therefore not reactive. The NT EPA considers that there is still uncertainty regarding the potential for ongoing generation of AMD within the pit into the long term future, especially if the material is unevenly spread and protrudes into the oxic layer of water. Therefore, the NT EPA makes Recommendation 7.

Recommendation 7

That approvals and decisions for the Proposal require that reactive material in the pit lake will remain in the anoxic zone, and water quality will be stable, at all times after closure. The adaptive management approach to achieve this, addressed in Recommendation 10, must be informed by further studies to be undertaken through the life of the mine and closure period, including:

- **further analyses of the settling process of tailings, pit lake water stratification, limnology, water quality and water levels**
- **trials of potential long-term passive water treatment options**
- **a prediction of long-term water quality and water levels based on monitoring data.**

Controlled water discharge

The Proposal will require the discharge of water during operations due to the extraction of water from dewatering the underground mining operation and from displacement of water from the pit lake due to the deposition of tailings and waste rock. Therefore, a fundamental part of the Proposal is to treat water to an appropriate quality for controlled discharge to adjacent waterways. The treated water will be stored in the WSD for discharge at appropriate times when there is flow in the creeks.

This controlled discharge would be subject to the conditions in a WDL to be issued by the Controller of Water Resources in accordance with the *Water Act 1992*. The Proponent developed SSTVs for the quality of this water (Supplement Appendix F).

These SSTVs have been peer-reviewed and revised by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The SSTVs for physico-chemical parameters are based on the 80th percentile of wet season monitoring data from the reference site SWTG1A, to take into account natural background levels.

For toxicants such as metals, the default guidelines for 90% aquatic ecosystem protection (ANZECC & ARMCANZ, 2000) were used, as these are based on actual ecotoxicological effects. CSIRO recommended that 90 or 95% species protection should be achieved in Mount Bundey Creek 1 to 2 km downstream of the discharge point at the proposed compliance point SWTG2 (Supplement Appendix F).

The NT EPA considers that to meet Recommendation 3 above, and protect the declared beneficial uses of Mount Bundey Creek, the Mary River and other downstream values, 95% species protection for aquatic ecosystems is the appropriate target for the compliance points. The NT EPA notes that this would take into consideration all sources of contamination, both controlled (treated) and uncontrolled (untreated). The NT EPA makes Recommendation 8.

Recommendation 8

That approvals and decisions for the Proposal specify that water quality at the compliance points in Mount Bundey Creek and Coulter Creek meet 95% species protection level. The site specific trigger values (SSTVs) for discharge water quality must be appropriate to achieve this.

For the WDL application process, the Proponent will need to provide proposed water quality trigger values at the discharge point and the proposed compliance points in Mount Bundey Creek and Coulter Creek. The Proponent may also need to apply for mixing zone for the dilution of discharge water with streamflow.

The Proposed water treatment methodology to achieve the water quality targets is the ‘Brutus’ process. A purpose-built plant would be constructed on site and could potentially be combined with conventional reverse osmosis (see section 2.2.8). As there is some uncertainty regarding the final treatment process and the disposal of waste generated by it, the NT EPA makes Recommendation 9.

Recommendation 9

That approvals and decisions for the Proposal shall include a requirement for the Proponent to:

- **provide written validation by an independent qualified person, demonstrating that the final chosen water treatment methodology can meet water quality criteria at the required scale**
- **provide a plan for the onsite storage and regular offsite disposal, sale and/or recycling of any liquid or solid waste (including mixed metal oxide) from the water treatment plant, to be approved by the relevant authority on advice from the NT EPA.**

The Proposal includes the use of adaptive management to ensure SSTVs are met by the proposed water treatment (Addendum Appendix C). The NT EPA makes Recommendation 10 for the application of an adaptive management approach.

Recommendation 10

That before approvals or decisions are given or made for the Proposal, the Proponent provides to the relevant regulator and the Northern Territory

Environment Protection Authority an Adaptive Management Plan consistent with the NT EPA Guidance on Adaptive Management (NT EPA, 2018b).

The NT EPA notes that the WSD will capture runoff from the Sulfide WRD and TSF1. It will be important for the Proponent/Operator to effectively manage AMD in accordance with Recommendation 6 to ensure that the quality of water stored in the WSD will meet the water quality targets specified in the WDL.

The Proponent has stated that the WSD will also be the water supply for dust suppression. As the intention is for this water to meet the SSTVs, the NT EPA considers that this would be appropriate for dust suppression around the Proposal site. However, as this is not explicitly stated in the EIS, the quality of water to be used for dust suppression is addressed below in Recommendation 11.

The Proponent also intends to transfer up to 200 ML per year to the adjacent Pastoralist for irrigating hay, pasture and mangoes. The proposed water quality targets for this are provided in Table 6-4 of the Addendum. These were derived conservatively with the aim of minimising the build-up of contaminants in surface soils. They are based on ANZECC & ARMCANZ (2000) guideline long term trigger values for 100-year irrigation periods with the exception of:

- manganese and iron – the SSTVs are to be used instead, as these are higher than the guidelines values
- sulfate and electrical conductivity – trigger values were derived with the aim of protecting soil quality and protecting plants sensitive to salinity, as these were not defined in the guideline.

While the NT EPA supports the intent of these water quality targets, it notes that there is no mechanism for regulating this transfer of water from a mine site to a third party nor for regulating use of that water. There is uncertainty about the potential discharge of water with lower quality than controlled discharges to the environment and the impact it could have on the declared beneficial uses of adjacent waterways and other downstream environmental values. . Therefore the NT EPA makes Recommendation 11.

Recommendation 11

That approvals and decisions for the Proposal require that any water to be discharged to land or to a third party (for example; for dust suppression, irrigation, or any other purpose):

- **be accounted for in the Water Management Plan**
- **meet the site specific trigger values specified in the Waste Discharge Licence, consistent with Recommendation 8.**

Potential for uncontrolled discharge of untreated mine affected water

Currently seepage and wet season runoff from the Proposal site is poor quality, as described in section 1.5.2. There is potential for the Proposal to improve or exacerbate this.

During operation of the Proposal, mine-affected runoff captured in water storages will be directed to the pit lake for containment. For example, the EPs will be managed to maintain freeboard for the 1000 year average recurrence interval flood event. The pit lake water level will be managed (using controlled (treated) discharge) for sufficient freeboard (5.7 m beneath spill level) for the maximum predicted rainfall year (Further Information Appendix 2). The NT EPA supports this approach to contain mine-affected surface water onsite including during any periods of very high rainfall.

However, not all mine-affected runoff will be captured in water storages. For example, as the Proposal incorporates new bunds and drains to divert runoff from the Sulfide WRD entering the pit lake, this runoff will be directed towards Mount Bundey Creek. As described above, there is uncertainty about the effectiveness of the WRD capping for limiting AMD and it is likely that this runoff will contain some contaminants. It is likely that some form of management will be required to meet water quality targets of the WDL. The Proponent will be required to address these matters in accordance with its adaptive management approach (Recommendation 10).

There is also potential for water from the pit lake to enter Mount Bundey Creek and as discussed above, the current water quality in the pit is poor. The long term water quality in the pit is uncertain. The potential pathways for discharge of pit lake water are overflow (spill) and seepage to groundwater. The pit lake water quality at closure is discussed further in section 6.1 of this Report.

The pit is currently filling such that it could overflow within about five years without further management (see section 1.5.2). This has been addressed by the Proponent by the incorporation in the Proposal of bunds and drains to prevent rainfall runoff entering the pit lake by minimising its catchment area (Further Information pages 14 to17). With these landform changes, the long-term (1000-year) water balance simulated by the Proponent showed that the pit would not overflow under an average future climate nor a wetter climate (5% increase in average annual rainfall; Further Information Appendix 2).

The Proponent modelled a worst-case scenario of the pit overflowing (Further Information Appendix 2), even though this is a highly unlikely event. Modelling predicted that some constituents in water at the SWTG2 would exceed SSTVs for aluminium, cadmium, cobalt, copper, lead, nickel, uranium, zinc, calcium and magnesium. However, at existing monitoring points further downstream, SSTVs would not be exceeded. The NT EPA is supportive of the proposal to manage runoff entering the pit lake so that the potential for overflow is reduced.

There is also potential for seepage from the pit lake via groundwater, as density-driven outflow will occur, at least locally. The Proponent's modelling indicated that the pit lake was a groundwater sink (Further Information Appendix C). However, a more recent report indicated that although water in the pit is not well connected with surrounding groundwater at present levels, this would not be the case if the water level rises. It estimated that groundwater levels surrounding the pit would rise alongside pit water levels, resulting in the surface expression of groundwater. From a pit-lake level of approximately 17 m AHD there would be seepage from the pit towards the oxbow wetlands (Further Information Appendix 1).

The NT EPA notes that there is potential for seepage from the pit lake towards surface waters in Mount Bundey Creek, and given that the future pit-lake water quality is uncertain, it could contain contaminants. Therefore the NT EPA considers that to ensure the protection of downstream environmental values (Recommendation 3) from potential seepage from the pit lake, there is a need for greater understanding to inform long term management options and makes Recommendation 13. This is considered necessary to inform the mine closure plan.

Recommendation 12

That approvals or decisions for the Proposal require that the Proponent or Operator's adaptive management approach (Recommendation 10) is to be informed by monitoring additional bores between the pit lake and Mount Bundey Creek and the oxbow wetlands. These are to be monitored for water levels and chemistry to inform the post closure pit lake water targets.

In further support of Recommendation 3 to protect the environmental values of the Mary River, the NT EPA considers that the Proposal should result in a net reduction in contaminant base loads discharged to surface water and groundwater, and makes Recommendation 13. This would require the Proponent/Operator to provide a summary of current baseline loads prior to Authorisation being granted, as a basis for comparing with future loads. The Proponent will also need to continue building their understanding of contaminant loading from all sources at the Proposal site.

Recommendation 13

That approvals or decisions for the Proposal require no net increase in contaminant mass loads to the Mary River following closure, compared to the current situation, from the Proposal site.

5.2.5 Conclusion against the NT EPA objective

With the implementation of relevant management plans and recommendations identified above, the NT EPA considers that the Proposal could be conducted in such a manner that its objective for Inland water environmental quality is likely to be met.

5.3 Social, economic and cultural considerations

5.3.1 Environmental objective

Protect the rich social, economic, cultural and heritage values of the Northern Territory.

5.3.2 Environmental values

Social and economic values

The Alligator and Humpty Doo statistical areas have a combined population of 13,968 (ABS, 2019). These areas are likely to be a key source of labour and services for the Proposal. Humpty Doo, located 66 km north-west of the Proposal, is the nearest regional population centre. The rural subdivision of Marrakai, 18 km north-west, is the nearest community, and is predominantly comprised of small dwellings occupied by rural residents, recreational fishers and holiday makers. Proximal infrastructure includes the Corroboree Park Tavern and roadhouse approximately 15 km north-west and the Mary River Wilderness Retreat 17 km south-east of the Proposal.

Horticulture, mining and tourism are the principal contributors to the economy of the Alligator and Humpty Doo statistical areas. The area around Toms Gully has been used for long-term pastoral purposes, with Old Mount Bundey, Marrakai and McKinley River pastoral tenure underlying or nearby. Historic and active gold mines occur extensively throughout the area. There has been historical gold mining at Quest 29, 13 km to the south of Toms Gully and Rustlers Roost, 12 km to the south-west. Granite quarrying is currently undertaken approximately 5 km east of the Proposal.

The region hosts a significant proportion of the Top End's tourist attractions, with Kakadu and Mary River National Parks identifying as iconic locations for tourism. The Adelaide River and Mary River systems are popular locations for four wheel driving, hunting, camping, wildlife watching and recreational fishing. Recreational fishing locations downstream within the Mary River system include Hardies Creek (approximately 10 km downstream from the Arnhem Highway crossing), Corroboree Billabong (approximately 20 km downstream) and Shady Camp (approximately 60 km downstream). The Mary River is known as one of the most important recreational fishing sites in the Northern Territory (PWCNT, 2015), attracting local and visiting fishers year round.

Recreational fishing is an important social and cultural component of the NT lifestyle as well as being a major tourism drawcard and a significant contributor to the economy. The fishing tourism industry's total economic contribution is estimated at $26 million per year,

with $22 million of this generated by interstate or international visitors to the NT. Seventy percent of recreational fishing occurs in regional areas, where recreational fishing is the primary economic and development driver (Tourism NT, 2015). Fish stocks that support the social and economic values of the area are intrinsically dependent on healthy aquatic ecosystems in the whole Mary River system.

The Arnhem Highway is the major arterial road into Kakadu National Park and the East Arnhem Land area. For the year ending June 2018, tourism from Darwin into the Arnhem Kakadu area was approximately 176,000 overnight visitors (Tourism NT, 2019). Local residents, pastoral stations and existing mining operations also contribute to vehicle traffic along the Arnhem Highway.

Cultural and heritage values

No registered Aboriginal sacred sites were identified within the Proposal area.

An archaeological survey was completed (Addendum Appendix M) over the area proposed for clearing. No archaeological material was found.

While there are no registered Aboriginal sacred sites within the Proposal area, a number of sacred sites are found in the vicinity and downstream of the Proposal in the Mary River catchment. A number of these sites are water feature sites that could potentially be impacted by any alterations to downstream water quality as a result of the Proposal.

There are no declared heritage places within the Proposal area.

5.3.3 Potential impacts

Social and economic impacts

The following changes to the social and economic surroundings may occur as a result of implementation of the Proposal and could lead to positive and/or adverse outcomes for stakeholders and/or community members:

- opportunities for employment and training and increased economic activity
- increased levels of monitoring and management of the site could improve environmental conditions at the mine site, lessening risks to the downstream social, economic and cultural values
- potential impacts to recreation values of the Mary River system if contaminated water impacts aquatic ecosystems, fish stocks or amenity, and subsequent impacts on economic values
- potential impacts to the local supply and quality of water resources for human use
- increased heavy traffic in the region, with potential impacts on road infrastructure, tourism activity and community amenity
- increased pressure on local accommodation
- a downturn in employment and economic benefits following a short mine life.

Cultural and heritage impacts

The following impacts to cultural and heritage surroundings may occur as a result of implementation of the Proposal:

- potential impacts to sacred sites protected under the *Northern Territory Aboriginal Sacred Sites Act 1989* downstream of the Proposal area.

5.3.4 NT EPA assessment

Social and economic assessment

Increased employment, training and economic activity

The Proponent estimated in the Draft EIS (2015) its capital expenditure would be $24 – 27 million during construction with revenue of $220 – 225 million generated. The estimated total operational expenditure was estimated to be at least $100 million with project cash flow of $47 - 52 million. Tax payable over the life of the Proposal was estimated by the Proponent to be $6.3 million and mineral royalties payable to the NT government approximately $11.6 million. As these estimates were based on modelling subject to assumptions, the actual economic benefits realised are likely to differ.

The implementation and operation of the Proposal could provide local economic benefits to businesses as well as employment opportunities within the Alligator and Humpty Doo statistical areas. It is estimated that a total workforce of 104 personnel will be required during commissioning and operations, equivalent to a 15.1% increase in mining sector jobs in the combined Alligator and Humpty Doo statistical areas (ABS, 2019). The Proponent intends to source staff locally where possible.

The NT EPA supports the Proponent's commitment to advertise employment opportunities in the local community but notes that there may be negative economic and social impacts from releasing employees at the end of the mine life. The NT EPA considers that the Proponent should plan for minimising such negative impacts.

Increased levels of site monitoring and management

The mine has been under care and maintenance since 2010 and is operating under a Care and Maintenance Mine Management Plan (Authorisation 0740 01, 28 May 2013). The site has existing infrastructure that has been subject to closure and rehabilitation planning that has resulted in a partially rehabilitated site, with residual AMD from WRDs and TSFs, and a pit containing poor quality water.

The NT EPA considers that the resumption of underground mining, water treatment, tailings upgrades, rehabilitation of existing mining infrastructure and subsequent closure has the potential to improve the existing conditions and reduce future risks to the environment. The alternative of not mining is likely to result in the site continuing as is with ongoing AMD issues and no clear long-term strategy for closure of the key infrastructure such as WRDs and TSFs. The Proposal includes increased monitoring and management and, if implemented according to the EIS, would improve the environmental condition of the mine. This would reduce impacts to the downstream environment.

Impacts to the recreation and economic values of the Mary River National Park

The Proponent has consulted with AFANT and other stakeholders concerned with water management throughout the life of the Proposal in accordance with a communication schedule (Draft EIS) and has committed to continue stakeholder engagement prior to implementing closure of the Proposal as per the Stakeholder Engagement Strategy (Addendum Appendix B). The Proponent proposes to maintain a complaints register and reporting in the annual Mine Management Plan on complaints received and how they have been addressed. This will partly address the requirement under the MM Act and Regulations for the Proponent to report all environmental incidents to DPIR. To minimise adverse impacts arising from the Proposal, the NT EPA makes Recommendation 14 for continual engagement with and reporting to stakeholders and the community.

Recommendation 14

That before approvals or decisions are given or made for the Proposal, the Proponent provides to the relevant regulator a Community and Stakeholder Engagement Plan providing for:

- **maximising local employment opportunities**
- **publication of a community complaints telephone contact number and email to allow community members to contact the Proponent regarding any issues or concerns**
- **development and implementation of a complaints management procedure that requires complaints to be recorded, investigated and abatement measures to be carried out if required, for handling community complaints and grievances for the duration of the Proposal, and broadly accepted by stakeholders**
- **reporting to stakeholders and the community on the health of the Mary River and tributaries monitored as part of the proposal, including contaminant mass loads**
- **effective ongoing stakeholder engagement and consultation on agreed post-mining closure, rehabilitation, land uses and access**
- **annual reporting to the relevant regulator of local employment, any community benefits, details of complaints and action taken and details of stakeholder engagement and consultation**
- **planning to minimise negative impacts of mine closure on surrounding communities**
- **publication of the Mine Closure Plan, as updated from time to time, together with monitoring data, by the Proponent.**

The Proposal has been amended during the EIA process to reduce the potential risk associated with all phases of the Proposal, especially in reducing the requirement for dewatering and including defined SSTVs for discharge to Mount Bundey Creek. The NT EPA is of the view that potential impacts to downstream recreation and economic values will be addressed by meeting the objectives of factors assessed above and through meeting WDL requirements and including biological monitoring.

Impacts to the supply and quality of water resources for human use

There are 19 registered bores, primarily for stock and domestic use, within 5 km of the Proposal and external to the mining tenements owned by the Proponent (mapped in Addendum page 64). There is potential for the Proposal to reduce yields from these bores due to groundwater drawdown resulting from dewatering of the underground mine.

The Proponent modelled potential groundwater inflow into the Proposals decline access (Addendum Appendix R). The Report found that the cone of depression is mainly contained in the Proposal's mining tenements and it is therefore unlikely that mine dewatering would affect bores outside the Proponents mining tenements. The Old Mount Bundey homestead bore RN027956 is the bore most at risk of being affected by dewatering. However, any impact at this bore would be offset by the Proponent's agreement with the Mount Bundey Pastoralist to supply the homestead and associated orchard with treated water up to quantity of 200 ML per year or 6.3 L/s.

As discussed in Section 6.3.3.2 of the Draft EIS and the Supplement (Appendix C), external bores are located away from the main fractured rock systems associated with the faults bounding the mineralisation and the mineralised zone. As the Proposal does not share any connection in terms of chemistry with these bores, impacts to groundwater quality of neighbouring users are not expected.

The Proponent addressed concerns regarding impacts to groundwater in the Water Management Plan (Addendum Appendix F). Groundwater levels and quality will be monitored at quarterly intervals at several production and monitoring bores located upstream, within and downstream of the Proposal site. The data and information gathered during these monitoring programs will be used to assess potential impacts of mining operations on local groundwater resources (level and quality).

Additionally, in the instance water levels at the bores outside the mining tenements, and within 5 km of the mine, drop below agreed levels the Proponent will (Addendum):

1. Supply a bore pump and additional rising main piping to lower the bore pump, if depth of bore allows; or
2. Drill a deeper bore and supply pumping gear for that bore; or
3. Pump treated water to the affected landowner for the duration of the mine. Normal approvals to dispose of water will be sought if pumping is required.

The NT EPA is of the view that implementation of the measures outlined above and ongoing stakeholder involvement will mitigate impacts to the supply and quality of water resources for human use.

Increased heavy vehicle traffic

The transport of materials and personnel to and from site on the Arnhem Highway has the potential to impact on other road users. While an increase in traffic along the Arnhem Highway is expected, the Economic and Social Impact Assessment (Draft EIS Appendix 8) states that there will be a negligible increase (0.2% to 0.3%) to current traffic volumes. Further, the proposed processing capacity of 350,000 tpa is expected to produce 65,000 oz of gold dore per annum. The Proponent also plans to bus employees to and from site on a daily basis to minimise the generation of additional traffic and improve road safety.

As per the Traffic Management Plan (Draft EIS Appendix 14) road signage will be installed on both northern and southern approaches on the Arnhem Highway warning of slow turning trucks entering and exiting the Proposal site. Signage will also be installed along the site entrance road warning of the upcoming intersection with the Arnhem Highway to minimise the potential for vehicle collisions. A stop sign will also be installed at the site exit intersection with the Arnhem Highway. This signage shall be in accordance with Austroads requirements and to the satisfaction of the Department of Infrastructure, Planning and Logistics.

The NT EPA considers that implementation of the Traffic Management Plan will address potential impacts associated with increased heavy vehicle traffic generated by the Proposal. Given the expected negligible increase in traffic volumes, the NT EPA does not expect the Proposal to significantly impact tourist activity or road user safety along the Arnhem Highway.

Increased pressure on local accommodation

No on-site workers accommodation is proposed. While workers are expected to be primarily sourced locally, existing accommodation facilities in the region are expected to be used to accommodate short term visitors and specialist staff that cannot be recruited locally.

The local area is serviced by a limited number of food and accommodation facilities (Corroboree Park Inn and the Mary River Wilderness Retreat). While use of local accommodation by workers has the potential to limit accommodation for tourists, the increased demand associated with the Proposal's operations is likely to have a positive effect by raising occupancy rates and assist in smoothing out the effects of seasonality.

Given the majority of the workforce is expected to be sourced locally, the NT EPA considers that the additional demand for food and accommodation services created by the Proposal is within the region's current capacity and can provide a short-term positive economic stimulus to the local economy.

Cultural heritage assessment

Much of the Proposal area has been subject to previous disturbance and land clearing. Survey and assessment consistent with NT Government requirements has determined that there are no nominated, provisional or declared heritage places or sacred sites located on site. In September 2018, an archaeological survey was undertaken over the area proposed for clearing. The area proposed to be cleared is located within a few hundred metres of a watercourse - where Aboriginal archaeological sites are commonly located. No archaeological sites were found on site. The Proponent has developed appropriate measures to ensure, if archaeological sites are encountered during clearing, they will be managed correctly.

Twenty-nine sacred sites have been recorded and registered by the Aboriginal Areas Protection Authority (AAPA) in the vicinity and downstream of the Proposal in the Mary River catchment. There is potential for impacts to these sites if downstream water quality is altered as a result of the Proposal. The Draft EIS indicates several unsuccessful attempts to liaise with Traditional Owners through the Northern Land Council and Local Management Committees of the Mary River and Djukbinj National Parks, in their capacity as Traditional Owners and managers of the land.

While NT EPA considers that impacts to downstream sacred sites can be avoided by addressing the recommendations in this Report, it is important that the Proponent engage with Traditional Owners to communicate how sacred sites downstream will be protected. The NT EPA makes Recommendation 15.

Recommendation 15

That approvals and decisions for the Proposal require the Proponent or Operator to:

- **conduct works in accordance with an Authority Certificate within the meaning of the *Northern Territory Sacred Sites Act 1984***
- **communicate with custodians of Sacred Sites in the vicinity and downstream of the Proposal site.**

In March 2019, the AAPA received an Authority Certificate application (201901769) for mining and processing on MLN 1058 (NT Portion 4937). The AAPA is liaising with the Proponent to ensure that the proposed activities in its Authority Certificate application match the proposed works in the Addendum. Updated AAPA Authority Certificates and heritage surveys will be provided to DPIR as part of the mine authorisation process.

5.3.5 Conclusion against the NT EPA objective

With the implementation of relevant management plans and recommendations identified above, the NT EPA considers that the Proposal could be conducted in such a manner that its objective for social, economic and cultural surroundings is likely to be met.

6 Whole of environment considerations

6.1 Closure and rehabilitation

6.1.1 Closure objectives

The Proponent's Mine Closure Plan (Further Information Appendix B1) outlines '*two key overall closure objectives:*

1. *To reduce the long term environmental risks posed by the Proposal; and*
2. *Make environmental improvements to the site so as to have a lower liability*'.

The Proponent refers to the 2016 Leading Practice Sustainable Development in Mining handbooks for mine closure (Australian Government, 2016). The NT EPA supports the use of these handbooks and also suggests the Proponent refers to WA Government Guidelines for Preparing Mine Closure Plans.

The Mine Closure Plan states that the Proponent will aim to return as much of the land as possible to a condition that enables pastoralism (the predominant land use in the area) to continue and also significantly reduce the environmental impact for the future. The Proponent has consulted with the landholder on this matter (see section 3.1) and defined two closure precincts (see section 2.11). The NT EPA considers that the post-mining land use and potential use of mine infrastructure should be reviewed, on consultation with the landholder, prior to relinquishment.

The NT EPA considers that for all existing mine components used, managed or rehabilitated as part of implementing the Proposal, environmental condition is to be improved; and for all other legacy or new components the environmental condition is to be maintained or improved. An improvement would mean that there is lowered potential for the discharge of contaminants to the surrounding environment. The NT EPA expects that the site must not have potential to cause environmental harm, and that this must be demonstrated prior to relinquishment to the NT Government. The NT EPA makes Recommendation 16.

Recommendation 16

That approvals and decisions for the Proposal require that closure of the Proposal achieve the following objectives:

- **be safe to humans and animals and able to sustain an agreed post-mining land use**
- **be stable and not have potential to cause environmental harm**
- **improved environmental condition, compared with the pre-Proposal state, for all pre-existing mine components to be used by the Proposal**
- **maintained environmental condition, compared with the pre-Proposal state, for any new components**
- **post-mining land use (including potential re-use of mine infrastructure) that has been agreed with the landholder prior to relinquishment**
- **present no long term impacts or costs for the local community or the taxpayer at the end of the Proposal's economic life.**

The proposed life of the mine is only five years, whereas, mine legacy issues have the potential to be borne by the community and government (in the future for much longer than the proposed life of the mine). The NT EPA considers that ensuring the Closure Objectives are met and there are no unacceptable long term impacts/costs for the local community or the taxpayer at the end of the site's economic life, prior to relinquishment, would align with the principles of ESD, and take into account community objectives.

6.1.2 Water Management

It is likely that the existing Oxide WRD bund would continue to overflow in wet years following the cessation of active water management during operations (see Further Information page 2) as this structure will not be modified by the Proposal. While the capping of the Oxide WRD may assist in isolating AMD producing material, the effectiveness of this is uncertain at this stage, and stormwater runoff from the Oxide WRD would likely still contain contaminants (see section 5.2.4). The capacity of the Oxide WRD drainage bund may need to be increased in future to direct runoff towards the oxbow wetland for filtration.

The EPs are also predicted to overflow in the future (Further Information Appendix 2). Prior to the commencement of mining the EPs will be drained and contaminated soil/sediments will be removed and deposited subaqueously in the pit. The EPs will then be lined with a cover of boxcut waste material and compacted (Further information page 29). As outlined in section 5.2.4, there is uncertainty regarding the effectiveness of this capping and there is potential for this runoff water to be contaminated. If so, there may be a need for future passive filtration of overflow water from the EPs.

Another existing source of AMD is the ROM pad and processing area, which have contributed contaminants towards Mount Bundey Creek via the stormwater pond during previous high rainfall events. The Proponent intends to fill the stormwater pond with clean fill and fully clean up the processing area by removing AMD producing material, ripping the surface, and seeding with native species. The NT EPA is generally supportive of this approach, but notes there is potential for contaminants to continue to enter surface runoff if this is not done properly.

To account for these uncertainties the NT EPA makes Recommendation 17. The NT EPA notes that the prevention of the discharge of contaminants from the Proposal site in seepage and runoff will require effective management of AMD in accordance with Recommendation 6.

Recommendation 17

That before approvals or decisions are given or made for the Proposal, the Proponent provides plans to the relevant regulator for avoiding the discharge of mine affected water to the environment during wet periods into the long term future.

The Proponent's expectation is for the pit lake to have reasonable water quality with a pH of 8.5 at the time of closure. The Mine Closure Plan states that pit water will be monitored and treated (if necessary) for five years after closure. The Proponent has proposed to investigate the potential to establish an in situ sulfide bioreactor in the pit for water treatment in line with defined water quality. The NT EPA considers that it is not appropriate for long term treatment to occur and asserts that pit lake water quality must be stabilised before relinquishment.

The NT EPA also notes that the Proponent has not specified the target water quality for the pit lake, and that it may not be necessary to apply the surface water quality targets, as overflow to surface water is not likely. As seepage to groundwater is possible, the NT EPA suggests the Proponent could develop SSTVs for groundwater based on data from reference bores.

Considering the uncertainty regarding pit chemistry changes over time, it will be important for the Proponent to conduct further investigations during operations, as outlined in Recommendation 7, and adapt the AMD Management Plan and Mine Closure Plan accordingly.

6.1.3 Mine Closure Plan

The Proponent intends to achieve its key closure objectives by the activities outlined in its Mine Closure Plan (and summarised in table 3 of this report). The Proponent's conceptual Mine Closure Plan (Further Information Appendix B1) is dynamic and intended to be updated as further information relevant to mine closure planning is obtained. The closure period is anticipated to be 10 years and, in general, all monitoring during this period will occur six monthly or annually until relinquishment, or until data is trending towards completion criteria/baseline.

The NT EPA considers that while the Proponent's planned closure activities offer environmental improvements, they may not meet Recommendation 3 for long term protection of downstream values. Issues of concern have been discussed in sections 5.2 and 5.3 of this report. In addition, the NT EPA considers that the submerging of offices and other infrastructure into the pit lake (see table 3 of this report) is not an appropriate form of disposal. If this infrastructure is not to be used on site in future by the landholder, it must be removed from site and disposed at a suitable landfill facility.

The NT EPA supports the Proponent's commitment to fully decommission the mine and complete rehabilitation during the closure period. The NT EPA also considers that, in the event that the Proponent or Operator is unable to complete the implementation of the Proposal (including closure), the impacts of mine legacy issues and/or the costs of rectifying them could be borne by the community and government for a much longer period that the life of mine. The NT EPA expects that such future liabilities will be addressed through the mining security bond, and that this security will account for meeting closure objectives to the extent provided for in the MM Act. The NT EPA also expects that the security will account for the cost of rehabilitating the historical mining structures to be disturbed as part of the Proposal (waste rock dumps and tailings storage facilities) as committed in the EIS.

The NT EPA acknowledges the importance of the Mine Closure Plan for preventing potential future legacy environmental issues. It is noted that the DPIR, as the regulator of mine closure, has minimum expectations for a Mine Closure Plan to include:

- a system of quality assurance/quality control
- addressing all aspects of rehabilitation and mine closure, including post-mining land use and rehabilitation objectives as agreed with stakeholders, landform designs, schedules for rehabilitation, completion criteria and monitoring of rehabilitation success
- a plan for identifying a closure strategy during operations for achieving the objective of no increase in baseline contaminant loads (in accordance with Recommendation 13)
- provision for ongoing monitoring and maintenance of the site post-mining, in accordance with an approved monitoring and maintenance program that includes a trajectory to achieving closure criteria, until closure criteria are achieves and the site has been relinquished
- details of reporting requirements to the relevant regulator on any investigations that will inform decision making to ensure successful post-mining rehabilitation.

To support the DPIR in ensuring the Mine Closure Plan also addresses specific potential significant impacts identified in this Report, The NT EPA recommends the DPIR consult

with it in relation to the Mine Closure Plan prior to mining commencing and makes recommendation 18.

Recommendation 18

That the Proponent update the Mine Closure Plan prior to mining commencing to include:

- **specific, measurable, auditable targets to demonstrate that performance is consistent with closure objectives**
- **provision for the management of declared weeds and exotic plants with high fuel loads until closure criteria are met, consider weed status and fire resistance of revegetated areas in closure criteria and manage fire until the majority of the woody revegetation is likely to survive the typical fire regime for the region**
- **active management of water and sources of acid and/or metalliferous drainage during the closure period and during any period of care and maintenance**
- **provision for the appropriate disposal of offices and other infrastructure during closure, by means other than placement in the pit lake**
- **a requirement for independent periodic external audits by suitably qualified and experienced auditors of any subaqueous deposition of waste materials in the pit lake including reactivity, compaction, drainage and settlement of material layers.**

It is further recommended that the relevant regulator consult with the Northern Territory Environment Protection Authority on the Mine Closure Plan prior to mining commencing.

7 Conclusion

The NT EPA has considered the Proposal by Primary Gold Limited to develop the Toms Gully Underground Project. The NT EPA's assessment of the Proposal identified potentially significant environmental impacts and risks associated with the environmental factors of inland water environmental quality, aquatic ecosystems and social, cultural and economic surroundings.

The NT EPA considers that, subject to the implementation of the 18 recommendations in this Assessment Report and the commitments and safeguards listed by the Proponent in the EIS, the Proposal can be implemented and managed in a manner that is likely to meet the NT EPA's objectives and avoid significant or unacceptable environmental impacts and risks.

8 References

ABS, 2019. *Data by Region. Australian Bureau of Statistics.* [Online]
Available at: https://itt.abs.gov.au/itt/r.jsp?databyregion

ANCOLD, 2012. *Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure. Australian National Committee on Large Dams Inc.* [Online]
Available at: https://www.ancold.org.au/

ANZECC & ARMCANZ, 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.* [Online]

Available at: https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000

ANZG, 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian State and Territory Governments, Australia.* [Online]
Available at: https://www.waterquality.gov.au/anz-guidelines

Australian Government, 1992. *Intergovernmental Agreement on the Environment. Canberra.* [Online]
Available at: https://www.environment.gov.au/about-us/esd/publications/intergovernmental-agreement

Australian Government, 2016. *Leading Practice Sustainable Development Program for the Mining Industry: Mine Closure Handbook.* [Online]
Available at: https://www.industry.gov.au/data-and-publications/leading-practice-handbook-mine-closure

BOM, 2015. *Daily Rainfall. Beatrice Hill. Station Number 14086. Bureau of Meteorology.* [Online]
Available at:
http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=136&p_display_type=dailyDataFile&p_startYear=2017&p_c=-39838143&p_stn_num=014086

de Groot, R. et al., 2008. Integrated assessment of wetland services and values as a tool to analyse policy trade-offs and management options: A case study in the Daly and Mary River catchments, northern Australia. *Supervising Scientist Report 198.*

DENR, 2009. *Mary River coastal floodplain Site of Conservation Significance. Department of Environment and Natural Resources, Northern Territory Government.* [Online]
Available at:
http://www.territorystories.nt.gov.au/bitstream/handle/10070/254276/13_mary.pdf

DIIS, 2016. *Leading Practice Handbook: Preventing Acid and Metalliferous Drainage (Department of Industry, Innovation and Science, Australian Government).* [Online]
Available at: https://www.industry.gov.au/data-and-publications/leading-practice-handbook-preventing-acid-and-metalliferous-drainage

DMIRS, 1997. *Guidelines - Safety bund walls around open pit mines, Department of Mines, Industry Regulation and Safety,Government of Western Australia.* [Online]
Available at: http://www.dmp.wa.gov.au/Safety/Guidelines-16146.aspx

DoEE, 1992. *Intergovernmental Agreement on the Environment, Department of the Environment and Energy, Australian Government, Canberra.* [Online]
Available at: https://www.environment.gov.au/about-us/esd/publications/intergovernmental-agreement

DoEE, 2008. *Rangelands 2008 - Taking the pulse. Department of the Environment and Energy, Australian Government.* [Online]
Available at: https://www.environment.gov.au/land/publications/acris-rangelands-2008-taking-pulse

DoEE, 2019. *State and Territory Greenhouse Gas Inventories 2017.* [Online]
Available at: https://www.environment.gov.au/system/files/resources/917a98ab-85cd-45e4-ae7a-bcd1b914cfb2/files/state-territory-inventories-2017.pdf

ICMM, 2019. *Integrated Mine Closure - Good Practice Guide, International Council on Mining and Metals, United Kingdom.* [Online]

Available at: https://guidance.miningwithprinciples.com/integrated-mine-closure-good-practice-guide/

NRETAS, 2009. *Mary River coastal floodplain site of conservation significance, Northern Territory Government.* [Online]
Available at:
http://www.territorystories.nt.gov.au/bitstream/handle/10070/254276/13_mary.pdf

NT EPA, 2014. *Statement of Reasons 2014 Primary Gold Limited - Toms Gully Mine Project, Darwin, NT.* [Online]
Available at: https://ntepa.nt.gov.au/environmental-assessments

NT EPA, 2015. *Terms of Reference for the Preparation of an Environmental Impact Statement - Toms Gully Mine Project - Primary Gold Limited, Darwin NT. Northern Territory Environment Protection Authority.* [Online]
Available at: https://ntepa.nt.gov.au/environmental-assessments

NT EPA, 2018a. *Environmental Factors and Objectives. Northern Territory Environmental Protection Authority, Darwin.* [Online]
Available at: https://ntepa.nt.gov.au/environmental-assessments/env-assessment-guidelines

NT EPA, 2018b. *Guidance on Adaptive Management. Northern Territory Environment Protection Authority, Darwin.* [Online]
Available at: https://ntepa.nt.gov.au/environmental-assessments/env-assessment-guidelines

NT EPA, 2018c. *Statement of Reasons 2018 Primary Gold Limited - Toms Gully Mine Project, Notice of an Alteration - Clause 14(A) Darwin, NT.* [Online]
Available at: https://ntepa.nt.gov.au/environmental-assessments

NT EPA, 2019. *Statement of Reasons 2019 Primairy Gold Limited - Toms Gully Mine Project, Notice of an Alteration 14(A), Darwin, NT.* [Online]
Available at: https://ntepa.nt.gov.au/environmental-assessments

NT Government, 1997. *The Northern Territory Government Gazette No. G23, 11 June 1997..* [Online]
Available at:
https://denr.nt.gov.au/__data/assets/pdf_file/0003/269301/mtbundeycreekgn.pdf

NTC, 2014. *Australian Dangerous Goods Code, National Transport Commission Australia.* [Online]
Available at: https://www.ntc.gov.au/codes-and-guidelines/australian-dangerous-goods-code

PWCNT, 2015. *Mary River National Park Joint Management Plan – March 2015, Parks and Wildlife Commission of the Northern Territory,* s.l.: s.n.

TourismNT, 2015. *Fishing Segment Profile, Northern Territory Government.* [Online]
Available at: https://www.tourismnt.com.au/en/development/sector-strategies/fishing

TourismNT, 2019. *Regional profiles, Northern Territory Government.* [Online]
Available at: https://www.tourismnt.com.au/en/research/regional-profiles

Appendix 1– Assessment of the NT EPA's environmental factors

The NT EPA assessed the environmental impact of the Proposal in line with its environmental factors and objectives (NT EPA, 2018a). The following table presents environmental factors for the Proposal which, based on current knowledge, were assessed as not significant. The NT EPA considers it unlikely that implementation of the Proposal would have a significant impact on these factors and they can be managed to meet the NT EPA's environmental objective.

Environmental factor	Assessment of the potential impacts on the environmental factor	Explanation of why the factor is not a key environmental factor
LAND		
Terrestrial Environmental Quality Objective: Maintain the quality of land and soils so that environmental values are protected.	There is potential for erosion and sediment deposition in and downstream from the Proposal area due to potential instability of landforms (existing and new). The Proposal could increase or decrease the potential for significant impacts to downstream values. The site is has been unavailable for other uses while it has been in Care and Maintenance. This would continue during any future unplanned closure of the Proposal.	The stability of the site was assed using the RUSLE and CAESAR-LisFlood erosion models. Results show that erosion on site is similar to what occurs in the surrounding environment. The Proponent has committed to developing and implementing an Erosion and Sediment Control Plan (ESCP) to ensure that sediment and erosion are no greater that surrounding environs. The ESCP will be cross-referenced with the Mine Closure Plan to align it with closure objectives. The Mine Closure Plan states that the Proponent will aim to return as much of the land as possible to a condition that enables pastoralism to continue and also significantly reduce the environmental impact for the future. The NT EPA considers that if the proposed management measures are implemented and the key environmental factors are addressed, the Proposal is unlikely to have a significant impact on terrestrial environmental quality.
Terrestrial Flora and Fauna Objective: Protect the NT's flora and fauna so that biological diversity and ecological integrity are maintained.	Removal of habitat due to clearing (approximately 76 hectares). Loss or alteration of habitat due to weeds (introduction and/or spread) or fire (inappropriate fire regime). Degradation of habitat due to potential impacts on water quality and downstream ecosystems. Dust generation from mining activities resulting in reduced vegetation health and condition.	One plant species (*Helicteres macrothrix*) listed as endangered under the EPBC Act is known to occur in the vicinity of the Proposal and could be impacted by clearing or disturbance associated with the Proposal. A targeted survey for this species demonstrated that the species was not present in the areas proposed to be disturbed (Addendum Appendix M), and is therefore unlikely to be impacted. Results from field surveys undertaken on site concluded that the Proposal was unlikely to significantly impact any of the ten fauna species listed under the *Territory Parks and Wildlife Conservation Act 1976* or EPBC Act. No fauna species of conservation significance were recorded on site. A trained fauna handler will be present during clearing on site to relocate any fauna found. The Proponent has committed to developing and implementing a Biodiversity Management Plan as well as an Environmental Management Plan to for avoiding and minimising potential

Environmental factor	Assessment of the potential impacts on the environmental factor	Explanation of why the factor is not a key environmental factor
		impacts and risks to biodiversity. The Proponent has committed to ensuring the plans include the appropriate avoidance/mitigation measures and performance indicators. Gamba grass (Class A; Weed of National Significance) and three other Class B weed species have been recorded on site. The Proponent recognises the densely infested areas of NT Portion 4937, particularly those infested with gamba grass, and is proposing measures to reduce the impact of these weeds. These measures would involve seasonal control, vehicle hygiene protocols, monitoring for incursions, and, if needed, liaison with appropriate government agencies to ensure conformity with the *Weed Management Act 2001*. The EIS and supporting documentation identifies that these measures will apply during the construction, operational, closure and post closure rehabilitation phases of the Proposal. The Department of Environment and Natural Resources Weeds Branch considered the weed identification and proposed management measures to be appropriate. Weed management and the fire regime are intrinsically linked. Sensitive/significant vegetation communities have been identified adjacent to the Proposal site (riparian vegetation Mount Bundey Creek and wetlands). The Proponent intends to avoid this vegetation and would ensure that appropriate buffers are maintained. Degradation of downstream habitat would be avoided by addressing Inland water environmental quality and Aquatic ecosystems assessed in this Report. The NT EPA considers that if the proposed management measures are implemented and the key environmental factors are addressed, the Proposal is unlikely to have a significant impact on terrestrial fauna and flora.
WATER		
Hydrological processes Objective: Maintain the hydrological regimes of groundwater and surface water do that environmental values are protected.	Altered flows entering Mount Bundey and Coulter Creek from: • Discharges, especially from dewatering of the Toms Gully Open Pit to Mount Bundey Creek and Lake Bazzamundi via the WSD • positioning of new infrastructure.	The Proponent has reduced the quantity of water be treated and discharged compared to the original Proposal. Only water displaced by the addition of mining waste and tailings will need to be removed from the pit and treated to SSTVs before being discharged to Mount Bundey Creek or Lake Bazzamundi. Discharge of treated water to Mount Bundey Creek and Coulter Creek (via overflow from Lake Bazzamundi) is expected to take place only in the wet season when ephemeral streams have natural flows. This will reduce impacts on aquatic ecosystem processes.

Environmental factor	Assessment of the potential impacts on the environmental factor	Explanation of why the factor is not a key environmental factor
	Alterations to groundwater movement due to dewatering for operations. Potential impacts to the health of aquatic ecosystems from an increase in the volume of water entering Mount Bundey and Coulter Creeks.	The TSFs will not be reused, reducing the hydraulic water head and lower potential seepage that could create groundwater mounding. The potential impacts to this factor can be mitigated through addressing the key environmental factors and through standard management plans. The NT EPA does not consider that hydrological processes will be significantly impacted by the Proposal.
AIR		
Air quality and greenhouse gases Objective: Maintain air quality and minimise emissions and their impact so that environmental values are protected.	The clearing of vegetation, mining activities and vehicle transportation is likely to generate dust, which may reduce air quality and impact sensitive receptors. Implementation of the Proposal would result in emission of greenhouse gases from land clearing, combustion of diesel for onsite power generation and operation of mining equipment and vehicles.	The clearing of approximately 76 hectares for project infrastructure is unavoidable and is unlikely to contribute significantly to emissions from a national perspective. The nearest sensitive receptors are a small cottage owned by land owner (1.3 km south-east) and the station manager's residence (2.8 km south-south-east). The nearest community is Marrakai (18 km north-west). The Proposal is considered to be of a distance where dust is unlikely to impact sensitive receptors. Dust generation would be limited by the placement of tailings subaqueously in the pit, watering unsealed tracks and open areas, wet crushing and use of sprays and not burning on site. The Proposal would source power from the existing mains 22kV power supply. Diesel generators will be in place in the event of power loss to the site. Monthly power usage is estimated to be approximately 2500 MWh. A standard vehicle and machinery fleet would operate to support the transport of personal and to undertake mining operations. Diesel fuel consumption is estimated to be approximately 50,000L per month. It is unlikely that the emissions would be significant from a national perspective. The NT EPA calculated that the total estimate greenhouse gas emissions from the Proposal (10,200 t CO_2-e.) equates to 0.06% of the total emissions produced in the NT in 2017 (DoEE, 2019) All plant and equipment will be regularly inspected and maintained to minimise exhaust emissions. A complaints register will be implemented d and regularly reviewed to identify if there are potential trends in the number, frequency and type of air quality complaints being recorded. The NT EPA considers that if the proposed management measures are implemented and the key environmental factors are addressed, the Proposal is unlikely to have a significant impact on air quality and greenhouse gases.

Appendix 2 – Principles of Ecologically Sustainable Development

Under the *Northern Territory Environment Protection Authority Act 2012*, ecologically sustainable development (ESD) means using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quantity of life now and in the future can be increased.

In December 1992, the NT Government endorsed the 'National Strategy for Ecologically Sustainable Development' and agreed, along with all other States and Territories, to the 'Intergovernmental Agreement on the Environment' (IGAE) (Australian Government, 1992).

The NT EPA uses the four principles contained in the IGAE to demonstrate that it has considered ESD in its assessment of the Proposal and in its fulfilment of its objectives under the NT EPA Act 2012.

ESD Guiding principle	NT EPA assessment
The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.* *In application of this precautionary principle, decisions should be guided by:* *a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *b) an assessment of the risk-weighted consequences of various options.*	In considering this principle, the NT EPA notes that Inland water environmental quality, Aquatic ecosystems and Social, economic and cultural surroundings could be significantly impacted by the Proposal. The assessment of these impacts is provided in this Report. The NT EPA notes that the Proponent has identified measures to avoid or minimise impacts. The EPA has considered these measures during its assessment. The Proponent's investigations into the biological, physical and cultural environment have provided sufficient certainty to enable assessment of the risks and potential impacts and to identify measures to avoid or minimise those impacts and risks. The NT EPA has made recommendations to ensure these measures are implemented by the Proponent. From its assessment of the Proposal, the NT EPA concludes that if its recommendations are implemented and managed as approval conditions of the Proposal, significant or unacceptable environmental impacts and risks are likely to be avoided.
The principle of intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations*.	The NT EPA notes that the Proponent has taken measures to avoid and minimise impacts of the Proposal on the environment. Additionally, the NT EPA has made recommendations to manage impacts to the key environmental factors identified during the course of this assessment. In particular, the NT EPA has recommended that the overarching environmental outcome of protecting the Mary River at all-times from mine related impacts be the primary consideration for management. From its assessment of this Proposal, the NT EPA has concluded that provided its recommendations are imposed as conditions on the implementation of the Proposal,

ESD Guiding principle	NT EPA assessment
	environmental values will be protected and that the health, diversity and productivity of the environment will be maintained for the benefit of future generations.
The principle of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration*.	In considering this principle, the NT EPA notes that the Proposal will result in impacts and risks to Inland water environmental quality and Aquatic ecosystems. In assessing this Proposal, the NT EPA has considered these impacts and risks and taken into consideration measures proposed by the Proponent to avoid and minimise impacts to the affected values. The NT EPA has concluded that, provided its recommendations in this Report are imposed as conditions, the Proposal will not compromise the biological diversity and ecological integrity of the affected areas.
Principles relating to improved valuation, pricing and incentive mechanisms a) *environmental factors should be included in the valuation of assets and services.* b) *the polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.* c) *the users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.* d) *environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimize costs to develop their own solution and responses to environmental problems.*	In considering this principle, the NT EPA acknowledges that the Proponent would take responsibility for preventing, managing and mitigating any adverse environmental impacts during all stages of the Proposal including clearing, construction, operation, decommissioning, closure and rehabilitation. The NT EPA notes that this responsibility includes: (a) valuing the Proposal's water resources (b) accounting for the costs of residual risks associated with the Proposals final landforms (WRDs, TSF, pit lake, boxcut, WSD, EPs) (c) preventing, managing and mitigating waste and pollution, including contamination of soils, groundwater and surface waters through accidental spills, uncontrolled discharges and tailings seepage (d) ensuring rehabilitation and closure are consistent with agreed outcomes and public scrutiny (reporting) without ongoing unacceptable liability to the NT.