Tropicana Joint Venture

Tropicana Gold Mine

Mine Closure Plan

CP20131231

December 2013

Version 1
Distribution: Department of Mines and Petroleum

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31 January 2014

ANGLOGOLD ASHANTI

INDEPENDENCE GROUP NL
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Mine Closure Plan Checklist

Q No	MINE CLOSURE PLAN (MCP) CHECKLIST	Y/N NA	PAGE NO.	COMMENTS
1	Has the Checklist been endorsed by a senior representative within the tenement holder/operating company? (See bottom of Checklist.)	Y		
2	How many copies were submitted to DMP? (See Appendix C for requirements)	Hard copies =0 Electronic = 1		
Cover Page, Table of Contents				
3	Does the cover page include; · Project Title · Company Name · Contact Details (including telephone numbers and email addresses) · Document ID and version number · Date of submission (needs to match the date of this checklist)	Y		
4	Has a Table of Contents been provided?	Y		
Scope and Project Summary				
5	State why the MCP is being submitted (as part of a Mining Proposal or a reviewed MCP or to fulfil other legal requirements)	Y	Section 1.1 pg 2	
6	Does the project summary include; · Land ownership details; · Location of the project; · Comprehensive site plan(s); · Background information on the history and status of the project.	Y		
Legal Obligations and Commitments				
7	Has a consolidated summary or register of closure obligations and commitments been included?	Y		A register of closure obligations and commitments is provided in Appendix 1.
Data Collection and Analysis				
8	Has information relevant to mine closure been collected for each domain or feature (including pre-mining baseline studies, environmental and other data)?	Y	Section 3	Details on baseline studies is provided in Section 3.
9	Has a gap analysis been conducted to determine if further information is required in relation to closure of each domain or feature?	Y		Additional information on appropriate rehabilitation methods is required.
Stakeholder Consultation				
10	Have all stakeholders involved in closure been identified?	Y		All key stakeholders were identified through the environmental impact assessment process. . A closure committee will be developed during operational phase and will direct closure consultation activities.

Q No	MINE CLOSURE PLAN (MCP) CHECKLIST	Y/N NA	PAGE NO.	COMMENTS
11	Has a summary or register of stakeholder consultation been provided, with details as to who has been consulted and the outcomes?	Y		Outcomes from community consultation were documented in the PER. A closure committee will be developed during operational phase and will direct closure consultation activities.
Final land use(s) and Closure Objectives				
12	Does the MCP include agreed post-mining land use(s), closure objectives and conceptual landform design diagram?	Y	Section 1.3 pg 9	
13	Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?	N/A		No pre-existing legacies occur in the region.
Identification and Management of Closure Issues				
14	Does the MCP identify all key issues impacting mine closure objectives and outcomes?	Y	Section 10 and Appendix 3	
15	Does the MCP include proposed management or mitigation options to deal with these issues?	Y	Section 10 and Appendix 3	
16	Have the process, methodology, and rationale been provided to justify identification and management of the issues?	Y	Section 10	
Closure Criteria				
17	Does the MCP include an appropriate set of specific closure criteria and/or closure performance indicators?	Y	Section 9 and Appendix 3	
Closure Financial Provisioning				
18	Does the MCP include costing methodology, assumptions and financial provision to resource closure implementation and monitoring?	Y	Section 6 pg 43	
19	Does the MCP include a process for regular review of the financial provision?	Y	Section 6 pg 43	
Closure Implementation				
20	Does the reviewed MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?	N/A		Closure implementation strategies will be developed in future iterations of the closure plan
21	Does the MCP include a closure work program for	N/A		Closure work programs will

Q No	MINE CLOSURE PLAN (MCP) CHECKLIST	Y/N NA	PAGE NO.	COMMENTS
	each domain or feature?			be developed in future iterations of the closure plan.
22	Have site layout plans been provided to clearly show each type of disturbance?	Y	Figure 1.4	
23	Does the MCP contain a schedule of research and trial activities?	N		Research and trial activities are yet to be determined
24	Does the MCP contain a schedule of progressive rehabilitation activities?	Y	Section 10.2	Further details on timing of rehabilitation activities will be provided in future iterations of the closure plan.
25	Does the MCP include details of how unexpected closure and care and maintenance) will be handled?	Y		A preliminary care and maintenance plan is included in the appendix 4.
26	Does the MCP contain a schedule of decommissioning activities?	N		A decommissioning plan is currently being developed
27	Does the MCP contain a schedule of closure performance monitoring and maintenance activities?	Y		Monitoring activities are outlined in Section 11 and monitoring strategy is provided in Appendix 5
Closure Monitoring and Maintenance				
28	Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?	Y		Monitoring activities are outlined in Section 11 and monitoring strategy is provided in Appendix 5
Closure Information and Data Management				
29	Does the mine closure plan contain a description of management strategies including systems, and processes for the retention of mine records?	Y	Section 2.1 pg 11	
30	Confidentiality			

Corporate Endorsement:
"I hereby certify that to the best of my knowledge, the information within this Mine Closure Plan and checklist is true and correct and addresses all the requirements of the Guidelines for the Preparation of a Mine Closure Plan approved by the Director General of Mines."

Name:___Belinda Bastow_____ **Signed**: 

Position:_Manager Sustainability/Approvals/compliance **Date:**_31st January 2014_____

AngloGold Ashanti Australia Ltd is the manager of the Tropicana Joint Venture and is acting as agent severally for each of the Joint Venturers in their respective percentage interests from time to time. The obligations and liabilities of the Joint Venturers are several only, in accordance with their respective percentage interests.

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EXECUTIVE SUMMARY

The Tropicana Gold Mine (TGM/Project) is an open cut gold operation located approximately 330km east-north-east of Kalgoorlie on the Western edge of the Great Victoria Desert in Western Australia. The Project includes:

- Operational area containing the pits (Tropicana, Havana, Havana South and Boston Shaker), waste landforms, stockpiles, tailings storage facility, processing plant, village, aerodrome and other supporting infrastructure.
- Pinjin Infrastructure corridor including an access road and communications corridor linking the operational area to existing communications and road networks in Kalgoorlie.
- Process Water supply area (Minigwal Trough) providing the main processing water.

The Project is a joint venture (Tropicana JV) between AngloGold Ashanti Australia (70% stakeholder and manager) and Independence Group (30% stakeholder). The operation is a conventional drill and blast, truck and excavator operated open cut gold mine with a carbon in liquid processing circuit capable of processing up to 7Mtpa of ore and a thickened tailings storage facility.

The Project has undergone an environmental assessment under both the State and Federal process at the level of Public Environmental Review (PER). The project is now into the operational phase with mining activities commencing in July 2012. The Project will have an active mining and processing life of between 10 - 15 years however the total project life will be up to 25 years including construction and closure activities. Construction activities at the Tropicana Gold Mine were completed during 2013 and processing commenced in September 2013.

As part of the PER, a conceptual closure and rehabilitation strategy was developed. As the TGM has progressed from feasibility through construction and into the operational phase, the closure plan required revision and updating to reflect the additional information and details known about the project. This Preliminary Mine Closure and Rehabilitation Plan (CP20131231) has been structured to meet the DMP and DEC's *Guidelines for Preparing Mine Closure Plans* (June 2011) requirements as well as AngloGold Ashanti Australia's standards, Safe Work Australia Code of practice and the ANZMEC strategic mine closure framework and replaces the conceptual closure and rehabilitation strategy. This mine closure plan is a dynamic document and will be revised in 3-5 years or when significant changes occurred at TGM.

The post-mining aim for the Tropicana Gold Mine is "*to establish a sustainable native ecosystem that is as similar to the pre-existing ecosystem as can be achieved within the limits of recognised good practice rehabilitation methods and the post-mining environment.*"

The key closure issues that have been identified for the project and which are discussed further in this closure plan include:

- Waste landform stability
- Potential acid generating materials in the waste landforms
- TSF rehabilitation
- Landfill capping and rehabilitation
- Used tyre disposal
- Hydrocarbon contamination
- Growth medium availability and viability.

Progressive rehabilitation activities will be conducted throughout the operation phase as temporary facilities are removed and as outer slopes of landforms become available. Backfilling of pits with waste material is not currently planned and therefore the pit voids will remain at closure and over time will develop into a saline pit lake.

Further targeted research into rehabilitation techniques for the Project is required and will target the following areas:

- Waste characterisation and management (overburden, tailings, pit lake)

- Landform design
- Restoration ecology, succession and assessment criteria
- Soil science and nutrition
- Hydrology (including hydrogeology and hydrobiology)
- Practical revegetation techniques
- Seed/ germinant management
- Fire management
- Fauna management and conservation
- Stakeholder expectations for rehabilitation.

Conceptual completion criteria have been developed and will be progressively updated as the project moves progressively into full operational phase.

Closure costs for the Project have been independently estimated and currently sit at $123.5M.

1 INTRODUCTION

1.1 Scope and Purpose

This Preliminary Mine Closure and Rehabilitation Plan (CP20131231) provides the framework for managing closure and rehabilitation requirements over the life of the Tropicana Gold Mine (TGM/Project). This closure plan replaces the Conceptual Closure and Rehabilitation Strategy prepared as part of the environmental impact assessment process at the feasibility stage of the Project and aims to meet the requirements of the Department of Mines and Petroleum WA Guidelines for preparing Mine Closure plans (DMP and DEC June 2011).

As the TGM project progresses from feasibility through construction and into the operational phase, the closure plan requires revision and updating to reflect the additional information and details known about the project. The closure planning process is outlined in the Strategic Framework for Mine Closure (Minerals Council of Australia 2000) and is illustrated in Figure 1.

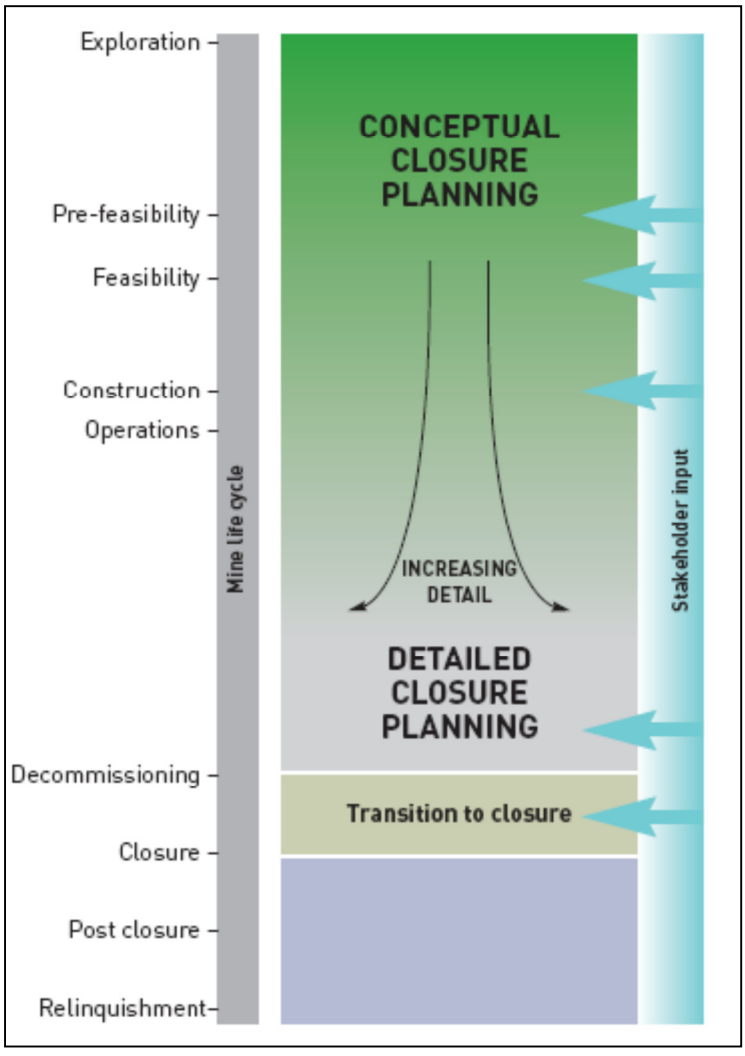


Figure 1.1: Closure Planning process illustration (ICMM 2008)

The intended progression of closure and rehabilitation planning for the TGM will be:

1. Conceptual Mine Closure and Rehabilitation Strategy – as submitted with the PER which documented the concepts behind the closure and rehabilitation outcomes and principle that will be incorporated into the closure and rehabilitation strategies

2. Proposed Mine Closure and Rehabilitation Strategy – The proposed strategy will be prepared within 5 years of the TGM commencing. The plan will be reviewed every 3-5 years.
3. Approved Mine Closure and Rehabilitation Plan – The document will be submitted to the relevant stakeholders for approval 3-5 years prior to the closure of the project.
4. Closure and Rehabilitation Research and Development Strategy - The strategy combines existing broad-scale rehabilitation knowledge with a research program tailored to improve our understanding of the rehabilitation requirements for the TGM. This strategy will be a live document that will be modified to meet the requirement of the TGM Closure and Rehabilitation object.

1.2 Project Description

The Tropicana Gold Mine (TGM/Project) is an open cut gold operation located approximately 330km east-north-east of Kalgoorlie on the Western edge of the Great Victoria Desert in Western Australia as shown on Figure 1.2. The Project includes:

- Operational area containing the pits (Tropicana, Havana, Havana South and Boston Shaker), waste landforms, stockpiles, tailings storage facility, processing plant, village, aerodrome and other supporting infrastructure.
- Pinjin Infrastructure corridor including an access road and communications corridor linking the operational area to existing communications and road networks in Kalgoorlie.
- Process Water supply area (Minigwal Trough) providing the main processing water.

The Project is a joint venture (Tropicana JV) between AngloGold Ashanti Australia (70% stakeholder and manager) and Independence Group (30% stakeholder). The tenements included in the project are all jointly held by the Tropicana JV and are listed in Table 1.1.

Table 1.1 Tenements within the TGM

Operational Area		
M39/978	M39/1010	M39/1021
M39/979	M39/1011	M39/1028
M39/980	M39/1012	M39/1029
M39/981	M39/1013	M39/1030
M39/982	M39/1014	M39/1048
M39/983	M39/1015	M39/1049
M39/984	M39/1016	M39/1050
M39/985	M39/1017	M39/1051
M39/986	M39/1018	M39/1052
M39/987	M39/1019	L39/172
M39/988	M39/1020	L39/189
	L39/188	
Process Water Supply Area (Minigwal trough)		
L38/150	L38/113	L38/114
Pinjin Infrastructure Corridor and Minigwal South		
L31/57	L31/56	L39/185
L39/211	L39/213	

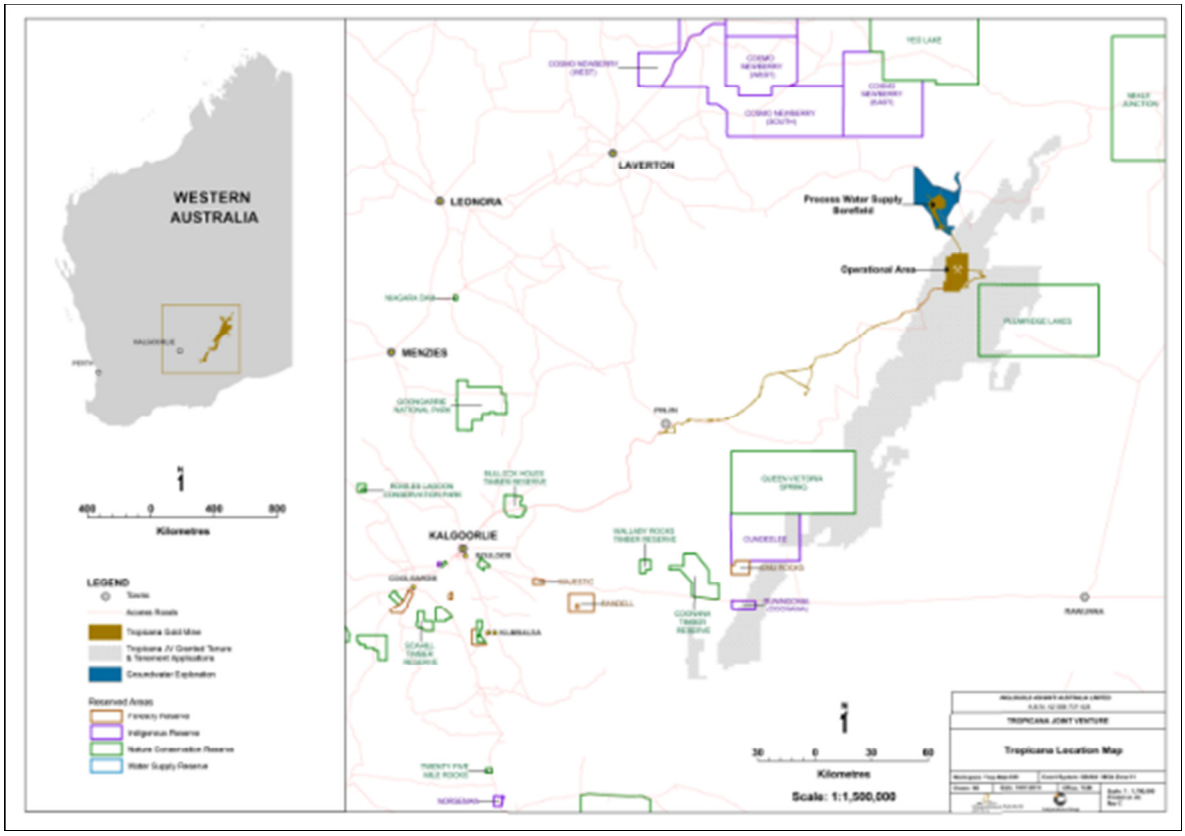


Figure 1.2. The Tropicana Gold Project Location

The Project lies within the mineral fields of Mt Margaret (38) and Mt Morgan (39) and within the Shires of Laverton and Menzies as shown on Figure 1.3.

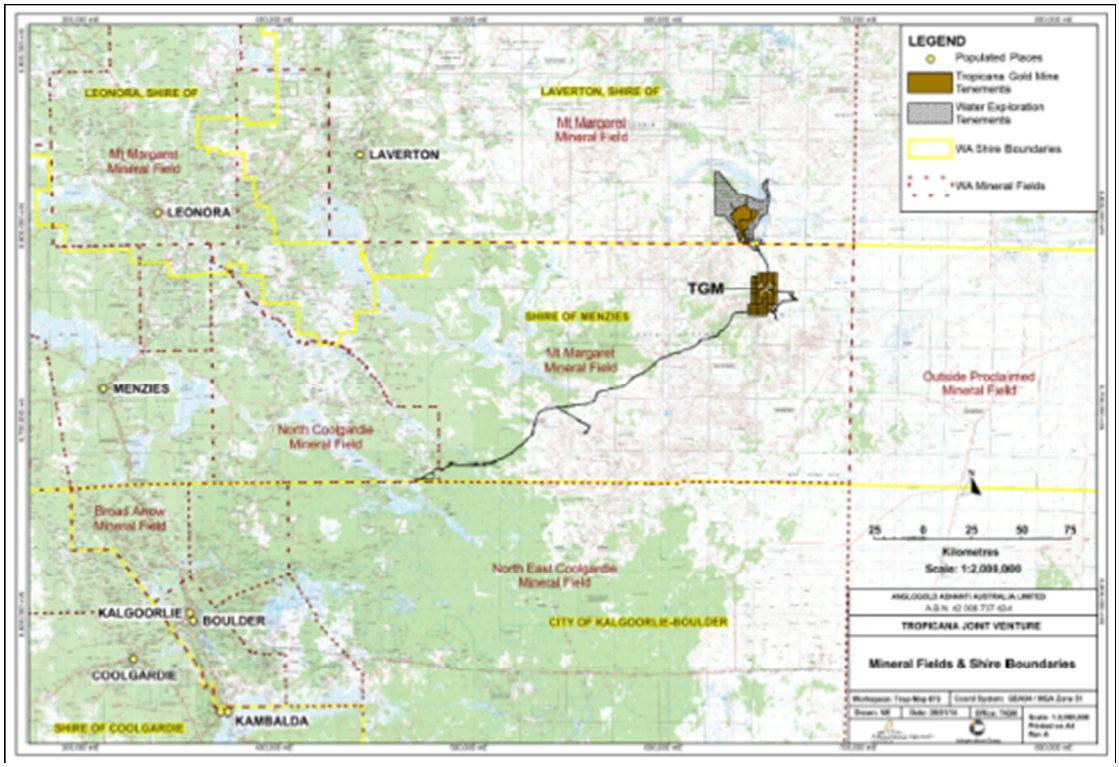


Figure 1.3 Mineral Fields and Shire Boundaries

The Project has undergone an environmental assessment under both the State and Federal process at the level of Public Environmental Review (PER). The State Environmental Approval for the project was obtained in September 2010 (Ministerial Statement 839) and the Federal Approval was obtained in December 2010 (under the Environmental Protection and Biodiversity Conservation Act (EPBC) 2008/4270)).

The project is now into the operational phase with mining activities commencing in July 2012 and processing commencing in September 2013. The Project will have an active mining and processing life of between 10 - 15 years however the total project life will be up to 25 years including construction and closure activities. The key characteristics of the Project, as approved under Part IV of the Environmental Protection Act, are provided in Table 1.2.

Table 1.2 Project's Key Characteristics as approved by the Project Part IV approval

Element	Description
Current Resource:	
Resource Tonnes	75.3 Mt
Resource Grade	2.07 g/t
Estimated Gold Resource	5.01 Moz
Proposed Utilisation of Resource:	
Construction Period	Approximately 30 months, commencing 2011
Mining Rate (ore and waste)	Up to 75 Mtpa
Stripping Ratio	Up to 8:1
Number of Pits	Up to 4
Open Pit Void(s)	Up to 400 ha
Maximum length of pit	6 km
Maximum width of pit	1.5 km
Pit Depth	Up to 400 m
Overburden Volume	Up to 800 Mt
Waste Landform	Up to 1,200 ha; some in-pit dumping being considered. Maximum height of 375 mRL Slope with a maximum angle of 15˚
Processing Plant and Rate	Carbon In Leach plant with processing rate of up to 7 Mtpa
Water Supply	Up to 7 Mm^3 /annum Borefield located 50 km NNW of Operational Area Pipeline length of 50 km
Dewatering Rate	1,000 – 5, 000 kL/ day
Major Components:	
Mine Access Road	Pinjin Option – 370 km (~ 210 km of road construction)
Communications	Fibre Optic or Microwave via either Pinjin or Tropicana-Transline Corridor
Aerodrome	All weather strip 2.4 km long
Power Supply	Onsite power station with an installed capacity of up to 40 MW during the operational phase. Temporary generators will be used during construction, with a maximum capacity of 2 MW
Tailings Storage Facility	Up to 7 Mtpa; single-cell Paddock tailings storage facility with possible in-pit deposition, Maximum height of 372 mRL Approximately 1330 m wide by 1850 m
Village	Construction phase – up to 700 rooms Operational phase – up to 450 rooms

Element	Description
Workforce	Construction – up to 700 Operational – up to 400
Life of Mine:	
Project Life	Approximately 15 years of mining; total project duration up to 25 years (including post closure monitoring)
Approximate maximum area of disturbance	3,440 ha (includes Operational area 2,570ha, water supply area 200ha and Infrastructure corridor 670ha)
Estimated CO_2 Emissions	Up to 330 kt $CO_{2\text{-}e}$/ year during operations and 4,500 kt $CO_{2\text{-}e}$ over the life of the Project

The proved and probable resource summary is provided in Table 1.3. At the end of 2013, the total ore reserve was 54.8 million tonnes at 2.13g/t with 116t (3.76Moz) of gold.

Table 1.3 Reserves Summary – December 2013

Category	Year	Tonnes (millions)	Gold (g/t)	Contained Gold (tonnes)	Contained Gold (million ounces)
Proved	2013	24.9	2.26	56.33	1.81
Probable	2013	29.9	2.02	60.51	1.95
Total	**December 2013**	**54.8**	**2.13**	**116.84**	**3.76**

Mining will occur from four main areas Tropicana, Havana, Havana South and Boston Shaker. Each area / pit will be developed in stages with mining initially commencing in the Havana area. The mining rate for the operations is envisaged to be 60Mtpa of which up to 12Mtpa will be ore. Ore will be hauled to the processing plant or stockpiles located on the western side of the mine. Waste material will be transported to the most cost effective waste landform locations, in the initial years of the mine waste material will also be used for the ROM, Crusher Area and TSF. The general layout and location of the key infrastructure and landforms within the operational area are shown on Figure 1.4.

Mining will be a conventional truck and excavator operation employing 350t and 500t class excavators and 220t class trucks. Mining is undertaken by a contractor (Macmahon) providing all services including load and haul, drill and blast, explosive supply and grade control drilling.

As mining progresses through the operational phase, excavated material (mineralised ore and waste material) will be hauled from the active mine face(s) to either the run-of-mine (ROM) pad or marginal grade stockpile. Material placed in stockpiles will be recovered for processing when economic conditions are more favourable. Extraction of the mineralised ore will require the removal of overburden and waste material surrounding the mineralised deposits.

During the initial phases, waste material with appropriate physical and geochemical characteristics (e.g. non-acid forming), will be used to build up the crusher area, construction of the tailings storage facility, the base of the ROM pad and stockpiles and internal haul roads. The remaining waste will be placed on the waste landforms.

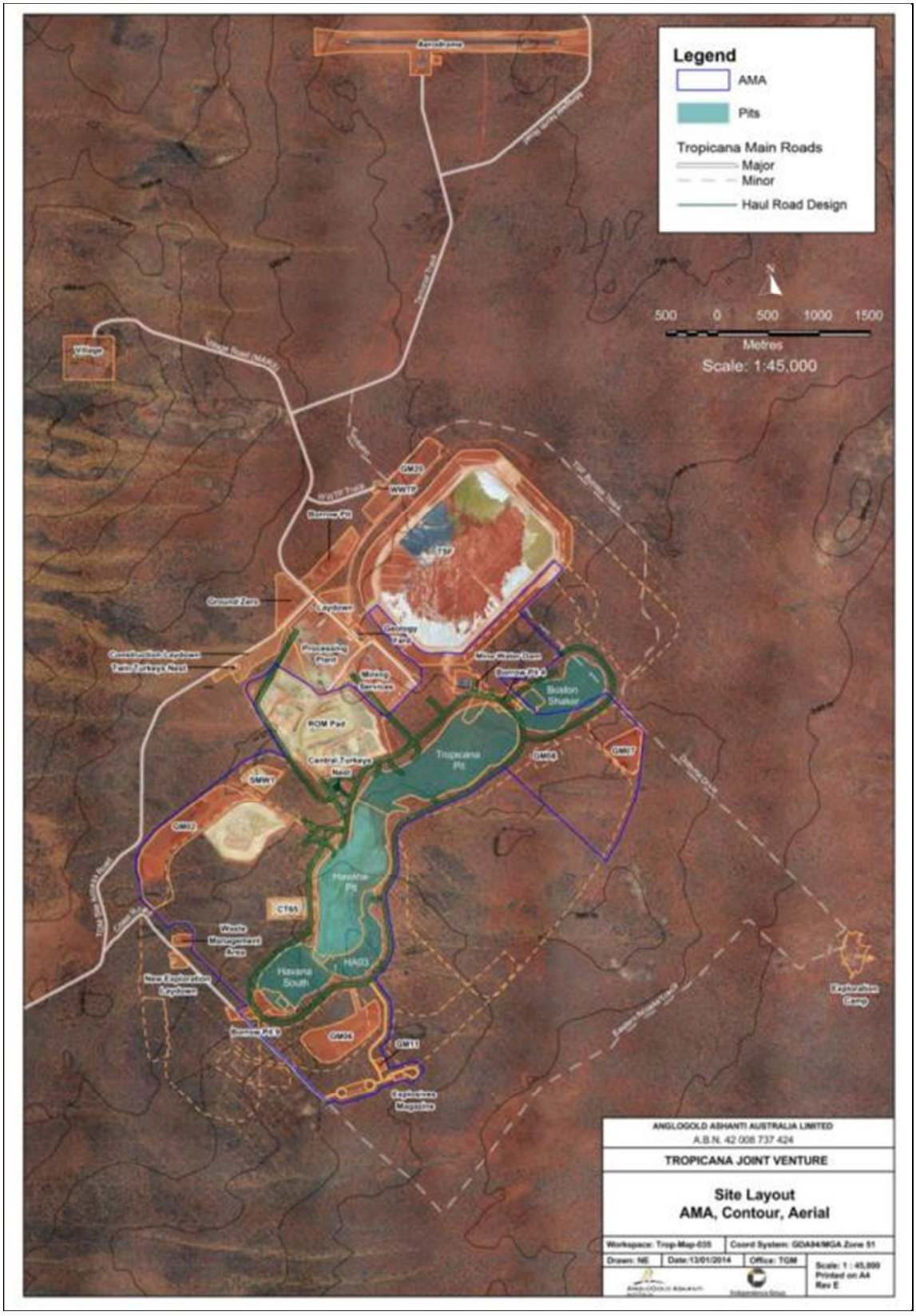


Figure 1.4 Operational Area Layout

1.3 Closure Objectives

The post-mining aim for the Tropicana Gold Mine is "*to establish a sustainable native ecosystem that is as similar to the pre-existing ecosystem as can be achieved within the limits of recognised good practice rehabilitation methods and the post-mining environment.*"(adopted from the International Council of Mining and Minerals, 2005).

The following objectives have been adopted in developing this mine closure and rehabilitation plan:

1. **Closure planning and implementation** - To ensure that the process of closure can occur in an orderly, cost-effective and timely manner with clear accountabilities defined.
2. **Risk appreciation** – To identify and manage risks to closure according to their likelihood and consequence.
3. **Financial provision** – To adequately represent and plan for the cost of closure in company accounts so that the community is not left with a liability.
4. **Stakeholder involvement** – To consider stakeholder interests during the mine closure process.
5. **Completion criteria** – To establish a set of indicators and criteria that will demonstrate successful completion of the closure process.
6. **Waste materials management** – To minimise waste generation over the mine life and to ensure that remaining waste cannot adversely affect the surrounding environment.
7. **Decommissioning** – To ensure that the Decommissioning process can occur in an orderly, cost-effective and timely manner with clear accountabilities defined.
8. **Rehabilitation Planning and implementation** - To ensure that the Rehabilitation process can occur in an orderly, cost-effective and timely manner with clear accountabilities defined.
9. **Relinquishment** – To arrive at a point where TGM has met, or is confidently tracking towards, agreed completion criteria to the satisfaction of the Western Australian Government.

1.4 Guiding Principles

There are a number of key reference documents and guidelines relating to mine closure which have been reviewed in developing this mine closure plan. These include:

- ANZMEC Strategic Framework for Mine Closure (ANZMEC/MCA 2000)
- Commonwealth Department of Industry Tourism and Resources 2006 Mine closure and Completion. Leading Practice Sustainable Development Program for the Mining Industry
- WA Guidelines for preparing Mine Closure plans (DMP and DEC June 2011)
- Safe Work Australia Mine Closure Code of Practice (2011)
- AGA Closure and Rehabilitation Standard (2009)
- AGAA Decommissioning and Closure Standard (2008)

To ensure this Proposed Closure and Rehabilitation Plan meets the requirements of the key closure guidelines and frameworks as well as AngloGold's own closure and rehabilitation standard, a gap analysis was conducted, the outcomes of which are provided in Table 1.4.

Table 1.4: Mine Closure Framework Gap Analysis

Topic	Source				
	ANZMEC Closure Guidelines (2000)	WA Mine Closure guidelines (2011)	Safe Work Australia Mine Closure Code of Practice (2011)	AGA Closure and rehabilitation Standard (2009)	AGAA Decommissioning and Closure Standard (2008)
Checklist with corporate endorsement		√			
Scope and Purpose		√			
Project Description	√	√	√		
Closure Objectives	√	√	√	√	
Guiding Principles					
Previous Project Closure Planning (already conducted through BFS)	√	√		√	√
Document management		√		√	
Environmental Setting (physical, social, cultural, biological)	√		√		
Legal And Other Requirements	√		√	√	√
Stakeholder involvement	√	√	√	√	√
Communication Strategy				√	√
Closure units/inventory of infrastructure		√		√	
Risk assessment	√	√	√	√	
Targeted research	√				
Completion criteria (with indicators of completion success)	√	√	√	√	√
Closure Action Plans (implementation/accountabilities , rehab, care and maintenance, decommissioning, communications (internal and external), documentation and reporting)	√	√	√	√	√
Relinquishment process	√		√		√
Post Closure Monitoring and Maintenance	√	√	√	√	√
Maintain Knowledge Base				√	
Closure Costs	√	√	√	√	√

All the topics listed in Table 1.4 have been included in this closure and rehabilitation plan. Closure planning documentation will be progressively refined and updated as new information generated by research, rehabilitation and monitoring becomes available. Figure 1.5 outlines the key inputs into a successful closure and rehabilitation plan.

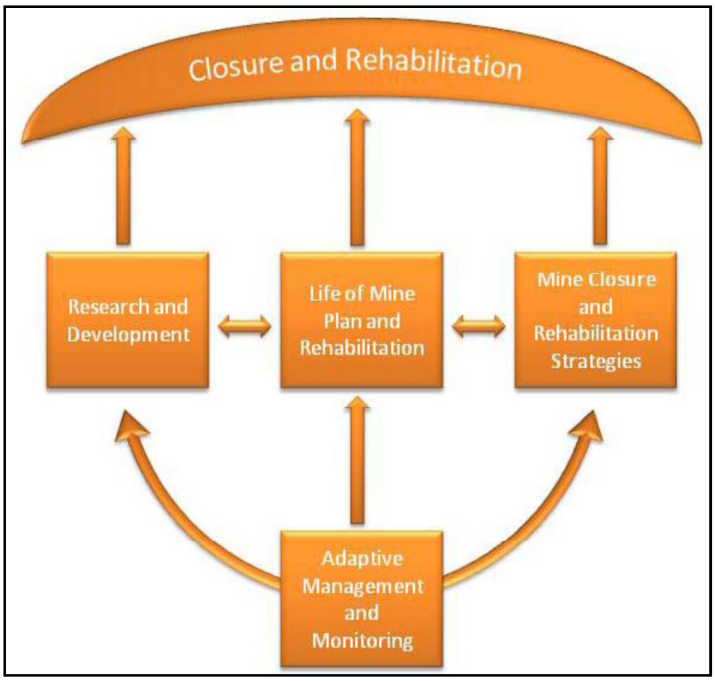


Figure 1.5 Key inputs for successful closure and rehabilitation

1.5 Previous Project Closure Planning

As previously mentioned, a closure and rehabilitation strategy has been developed for the project and was submitted to government during the environmental assessment process. Closure objectives have been considered in the design stage of the project and were a key consideration in the Projects bankable feasibility statement. Closure planning has been considered from project conception through to construction and operation.

2 MANAGEMENT SYSTEM

2.1 Document management

This mine closure plan forms part of the projects ONE Management System that ensures the effective management of all health, safety, environment, community and operational issues associated with the project. ONE establishes the framework and standards that must be achieved for all activities associated with the Project. It includes the development and management of policies, management plans, procedures and reporting requirements as outlined in Figure 2.1.

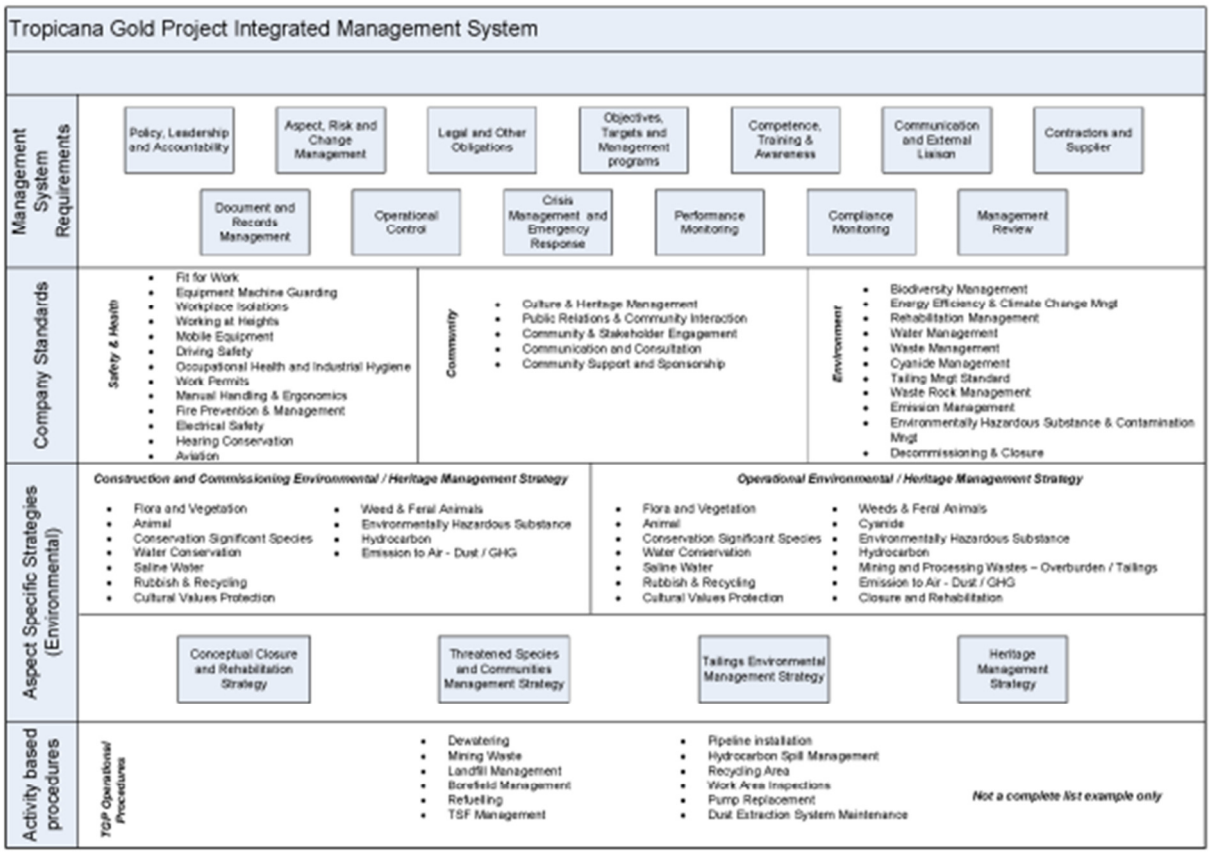


Figure 2.1 ONE Management System

The retention of knowledge is a critical factor for orderly and effective closure and rehabilitation. The Closure Plan will confirm the location of important documents at each review and will allocate responsibility for the filing and cataloguing of operational documents, environmental document and stakeholder consultation documents that are pertinent to closure and rehabilitation.

Maintaining a knowledge base of the context in which the site is being developed or operates including legal requirements, permit and approval requirements for closure, the sites physical, biological, cultural character, risk assessments, research and stakeholder engagement exercises, stakeholder agreements, site infrastructure inventory, applicable data and lessons learnt from the other sites.

3 ENVIRONMENTAL SETTING

3.1 Baseline Data

Early on in the projects development it was recognised that very little existing biological or physical information was available for the region and what information was available was at a very broad scale. As part of the environmental impact assessment process a wealth of baseline data was obtained through detailed survey and investigation conducted specifically for the project. The survey areas typically covered a much greater area than the proposed mine impact footprint to enable a regional context to be placed around the detailed information obtained. For example, the vegetation and flora survey for the Operational Area covered an area of 131,000ha which is approximately 40 times larger than the operational footprint. A summary of the baseline information collected during the impact assessment is provided in the following sections.

3.2 Physical and biological

3.2.1 Biogeographic regions

The Project is located predominately within the Great Victoria Desert (GVD) biogeographic region of the Interim Biogeographic Regionalisation of Australia (IBRA) classification system. The western end of the Pinjin Infrastructure Corridor is located in the Murchison IBRA region (Figure 3.1).

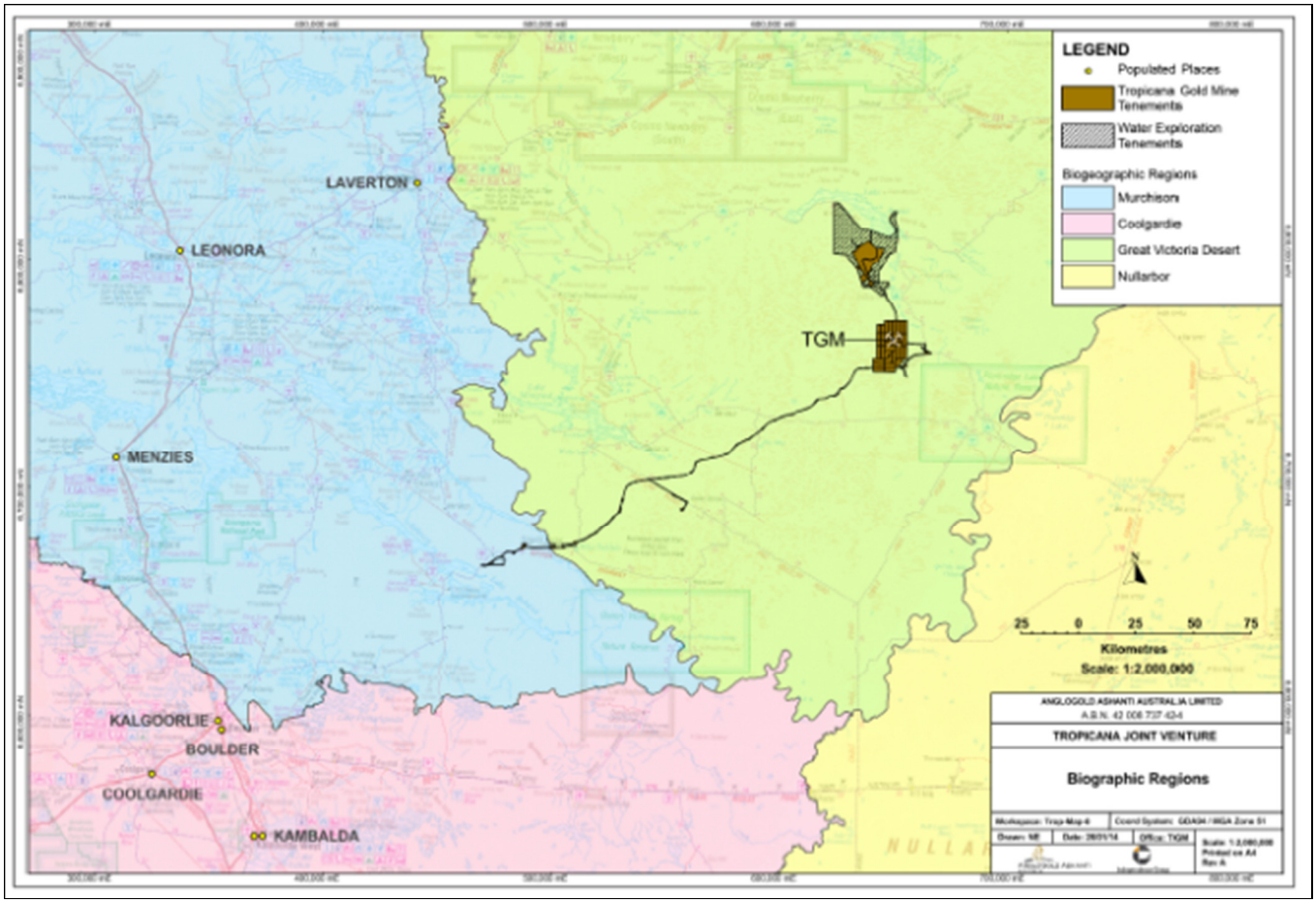


Figure 3.1 Biogeographic Regions

3.2.2 Climate

The nearest Bureau of Meteorology (BOM) weather stations are located at Balgair south-east of the road corridor, which started collecting data in 1982 and Laverton, west north west of the operational area. A summary of the monthly data collected from these two stations is represented in Figure 3.2 and Figure 3.3.

The majority of rainfall occurs during the summer months, generally associated with cyclonic rainfall extending into the interior. This may result in heavy rainfall between January and April. Dry years do occur with the lowest annual rainfall record of 140.7 mm at Balgair (1991) and 118 mm at Laverton. Temperature extremes are experienced in the region, with the highest maximum being 47.6 ℃ recorded in 1991 and lowest minima reaching -5.0 ℃ in 2006.

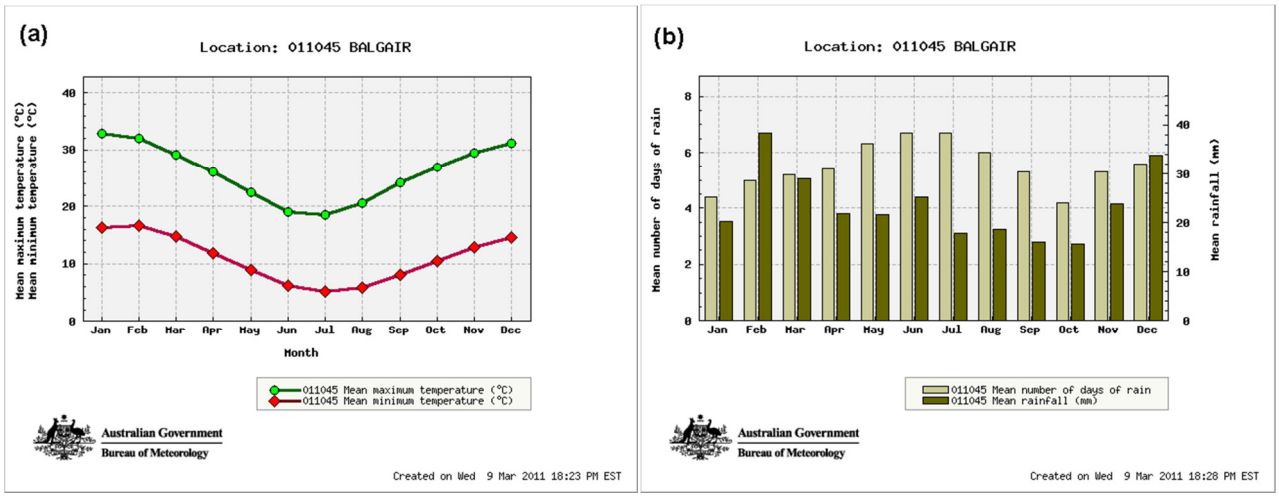


Figure 3.2 Balgair's average temperature (a) and rainfall (b) (Bureau of Meteorology, 2011a)

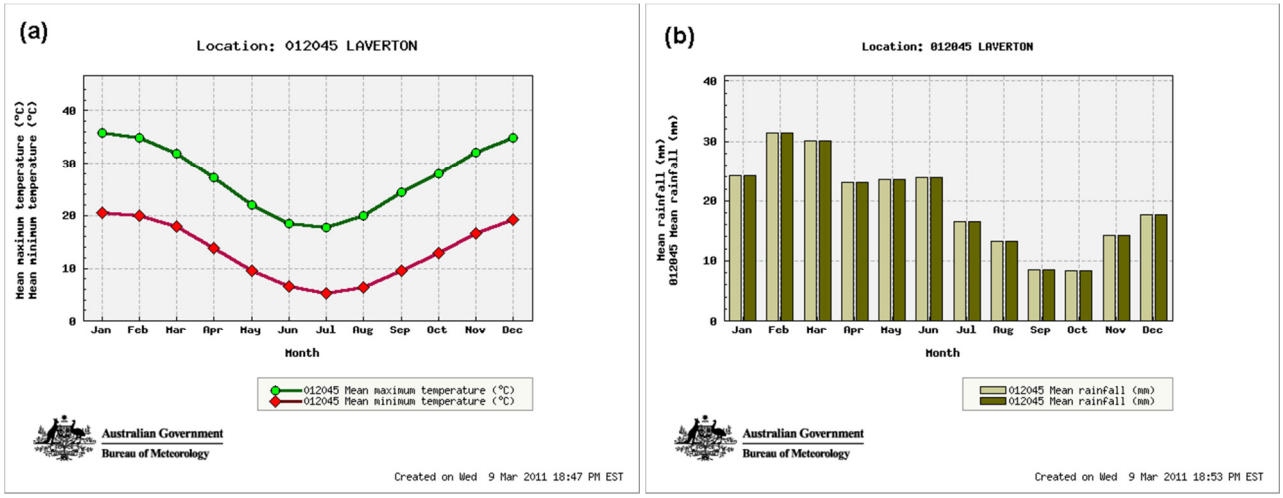


Figure 3.3 Laverton's average temperature (a) and rainfall (b) (Bureau of Meterology, 2011b)

Evaporation in the region greatly exceeds rainfall. Rainfall and flood events are highly variable in size and timing, and are often influenced by tropical cyclones. Accordingly, stormwater flows are usually infrequent and of short duration, resulting from periods of intense rainfall. However, local drainage from less permeable soils has the potential to produce runoff that could impact on Project infrastructure, operations and the surrounding environment.

Winds experienced within the operational area, based on the sites weather data, are predominately moderate to strong (between 5.5 m/s and 10.5 m/s upwards) from the east to southeast (approximately 36% combined) with seasonal variation. In spring, moderate to strong winds are experienced predominantly from the east to south (approximately 43% combined). In summer, moderate to strong winds are experienced predominantly from the east to south-southeast (approximately 68% combined). In autumn, moderate to strong winds are experienced predominantly from the east to southeast (approximately 31% combined). In winter, moderate to strong winds are experienced predominantly from the east to southeast (approximately 26% combined). These wind conditions correspond with the Bureau of Meteorology data which has been collected over a longer period of time. Wind conditions in the operational area are of particular interest when considering air quality parameters.

3.2.3 Topography

The region is dominated by longitudinal sand dunes with a predominant east-west orientation and ring dunes separated by interdune corridors (or swales) and sand plains. These sand plains sit at an elevation of 350-500 metres (m) Australian Height Datum, dropping to less than 300 m in the south.

The majority of the Operational Area lies in a broad valley between an extensive dunefield on the western side and the local high point on the northeast side. The Resource Area lies on a low ridge inside a broad valley between a local dunefield and a local high point. Two broad, low-relief drainage lines occur on either side of the Resource Area (Western Australian Geological Survey 1978). Landforms in the region are shown on Figure 3.4.

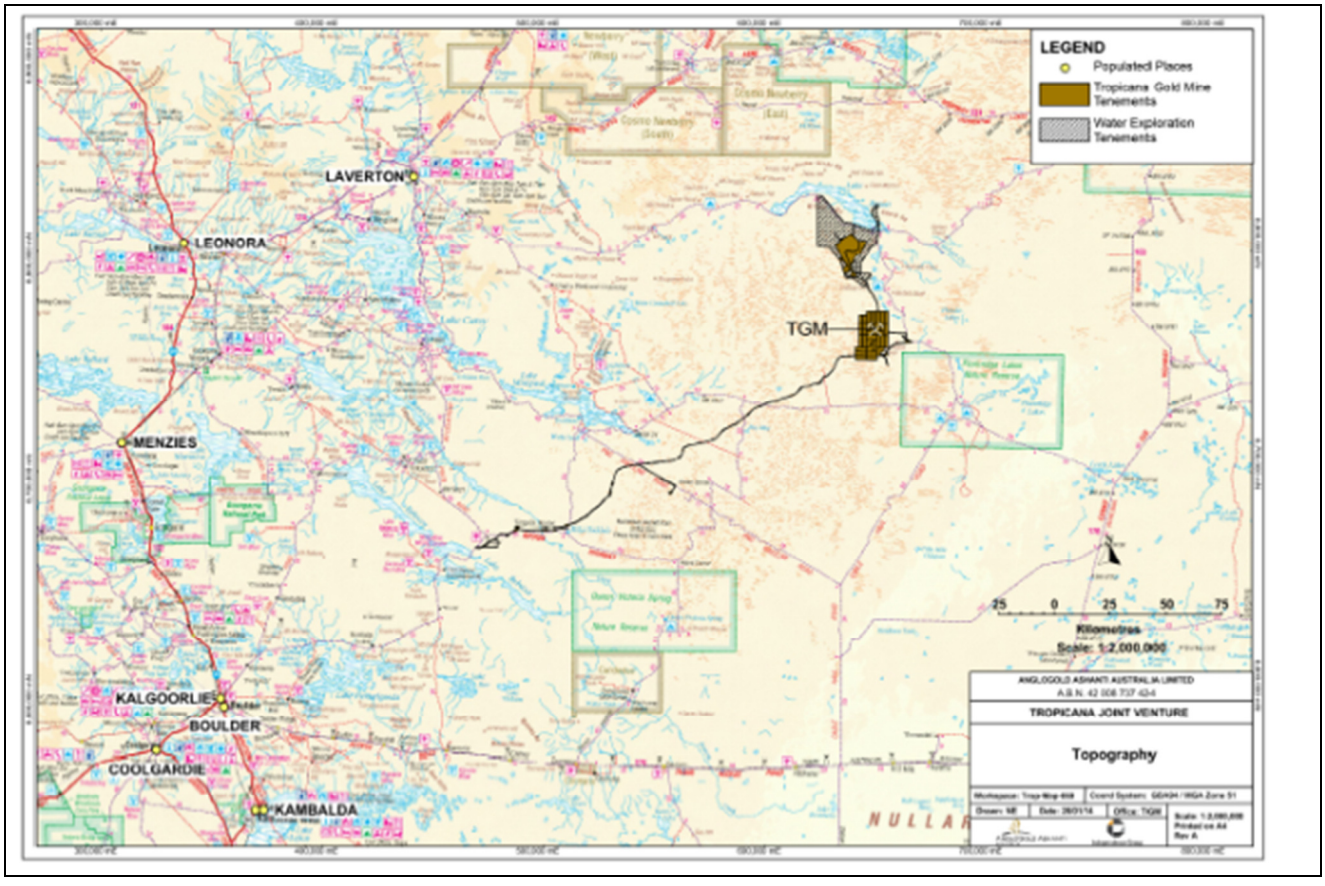


Figure 3.4 Topography and Landforms

3.2.4 Landform and Geology

The operational area is located in the Southern Great Victoria Desert Zone within the Gunbarrel Province of the Sandy Desert Region (Till, 2006). This zone has an area of 87,550 km2 and is located in the southern arid interior between Lake Minigwal and the South Australian border. The region is dominated by longitudinal sand dunes with a predominant east-west orientation and ring dunes separated by interdune corridors (or swales) and sand plains. These sand plains sit at an elevation of 350-500 m Australian Height Datum, dropping to less than 300 m in the south. Other landforms present are scarpland-breakaways and residuals of various forms (cuestas, mesas, buttes, stony hillocks and hills) (Till, 2006). Colluvium of silt, sand, pebbles of ferruginous laterite and silcrete accumulate in depressions and at the foot of breakaways. Colluvium of clay, silt and sand, partly saline occur in trunk valleys (Van de Graaff, 1977).

Shallow valleys (with lakes, claypans, salt pans, calcrete platforms, sand dunes, kopi dunes and calcareous dunes) are usually a relatively minor component of the landscape. The region also has moderately-well developed laterite crust and ferruginised silcrete are exposed. These laterite and silcrete crusts form a resistant caprock broken in places by erosion which has carved out a typical mesa and butte topography, with flat tops and breakaways. Pediments are formed in front of the breakaways and are often covered by a thin veneer of alluvial and colluvial sediments. The western end of the GVD is underlain by basement rocks of the Archaean Yilgarn Craton.

Soils in the area are predominately Quaternary sands consisting mostly of fine grained sand, often with some gravel, rock chips or powdery material at depth (Outback Ecology). Soils have relatively low clay and silt content, if any. Organic matter in arid zone is typically low and highly concentrated near the surface. Soils in the area are predominantly pH 6-8 and salinity generally increases with depth. Nutrients in the soil are typically low as is common in arid zone soils.

Soils in the Pinjin Corridor have near surface excavatable material generally comprising of Aeolian / alluvial sand or silt, with an underlying thin layer of residual soil, and is generally expected to provide a suitable subgrade material.

The gold mineralisation is hosted in gneissic metamorphic rocks. The deposits are broadly stratiform, with both the host rock and mineralised zone dipping approximately 30o towards the east southeast. The Tropicana deposit is predominantly a single lens of mineralised ore, while the Havana deposit is composed of several lenses. Both deposits are controlled by a series of discontinuous and linked shears. At Havana the deposit is open (although low-grade) at its southern end.

3.2.5 Hydrogeology

Hydrogeological studies for the project were conducted by Pennington Scott (2009). Groundwater within the Operational Area occurs mainly in fractures and joints in the deeper basement rock, with most porosity and permeability occurring in the lower saprolite and the underlying sap-rock. Groundwater recharge rates over the Albany-Fraser Range are very low, estimated at less than 0.5% of annual rainfall. Consequently, groundwater salinities are high, ranging from 10,000 to 40,000 mg/L TDS within the Operational Area, and likely up to hyper-saline (more than 100,000 mg/L TDS) at the Rason Palaeodrainage, several kilometres north of the mine.

Groundwater levels fluctuate between 20 and 30 metres below ground. There is a local groundwater gradient towards the Rason Palaeodrainage.

The Minigwal Trough is an informal name describing a 300 km long by 50 km wide north-south sedimentary trough abutting the western margin of the Archean basement on the Fraser Range. The Minigwal Trough corresponds to the Rason Regional Gravity Low described by Shevchenko (2002). It was formed and subsequently modified during several periods of tectonic faulting. The earliest tectonic activity possibly pre-dating formation of the Minigwal Trough was associated with formation of the Proterozoic Albany-Fraser Orogen, and although it did not directly lead to the development of the trough, zones of weakness from earlier tectonic features were later reactivated

as faults/fractures or have been preferentially eroded – such as the Lake Rason drainage where it crosses the Fraser Range north of Operational Area.

The proposed borefield will target a 120 m thick, fine sandstone unit at the base of the sequence, referred to as the Lower Sandstone, which is semi-confined beneath 50 m of shale. Several test production bores have been developed in the Lower Sandstone and yielded between 0.3 and 0.5 ML/day. Although the Lower Sandstone aquifer has almost negligible exposure to rainfall recharge beneath the shale and relatively poor aquifer transmissivity (measured at between 4 to 14 m2/day), the aquifer nonetheless represents a considerable stored water resource, with a water quality within Project quality requirements (ranging from 40,000 to 80,000 mg/L TDS) and has an acceptable degree of available drawdown in the proposed borefield area.

3.2.6 Surface Hydrology

GHD (2009) conducted surface and hydrology within the project area. Drainage catchments of the site are generally characterised by low relief, poorly defined drainage lines and areas with strongly linear sand dunes and internal drainage. The regional geology is predominantly aeolian sands with high infiltration capacity, interspersed with areas of colluvial soils with lower infiltration capacity. As a result, stormwater runoff rates and volumes are generally low.

The Operational Area drains from the south west to the northeast to two external catchments. Surface water flows toward the Lake Rason system which is a large, intermittently-filled, saline wetland with regional significance located 50 km to the north. The location of major water bodies and drainage lines within the region are shown on Figure 3.4. Both external catchments are characterised by soils with high infiltration rate, particularly in the upper catchment, so runoff is low. What little runoff does occur in the upper catchment is trapped by sand dunes, internally drained areas and poorly defined low-gradient drainage lines. The lower catchment contains colluvium soils which are more likely to produce runoff. This area still contains local depressions which retain stormwater and there are no well-defined watercourses, though drainage pathways are evident.

Runoff from areas around the Operational Area could impact on the mine infrastructure and operations. There is a drainage line/ valley through the lower parts of the Operational Area from the processing area, which may convey stormwater during larger rainfall events. This stormwater will probably be sourced from a 23 km2 catchment around the mine site area. There is also an area upstream of the processing plant that could pond stormwater, sourced from a 7km2 local catchment, for short periods after heavy rainfall.

3.2.7 Material Characterisation and Contaminated Site Potential

Material characterisation studies across the operational area were conducted as part of the environmental assessment process (SRK 2009, Outback Ecology Services 2009 and Landloch 2009). The soils were assessed to determine acid rock drainage potential, to obtain baseline metal contents, to determine presence of fibres that may cause health issues and determine depth of topsoil/growth medium for rehabilitation.

The term “growth medium” is used at Tropicana to describe material such as sand, lateritic gravel, sandy gravels or lateritic sand with calcrete gravel which will support regrowth on rehabilitated areas as ‘topsoil” as such does not occur. The growth medium is typically yellow red, reddish yellow or orange red in colour with a high coarse sand content (51-65%), very little silt and a generally low clay content (less than 20%), a soil pH between 5-7.5, a soil EC of less than 0.5dS/m and Exchangeable Sodium % of less than 6. Growth medium varies in depth from a few millimetres up to 5m in non-dune areas while within the dunes, growth medium may extend up to 20m deep.

Approximately 70-75% of the waste generated from the TGM is expected to be non-acid forming (NAF). Approximately 8% of the waste material could be expected to be potentially acid forming (PAF), although this could be as high as 15%.

The buffering capacity of the non-acid forming (NAF) and acid neutralising waste far exceeds the potential acidity (total mass of acidity is only 1/50th of the total mass of readily available alkalinity). Therefore the potential for acid rock drainage is minimal. The soil types that have the greatest value to acid neutralisation are Achaean amphibolitic gneiss, protzoic doleritic intrusive, garnet gneiss and schists (biotite).

The strategy for preventing acid formation and migration is to co-dump with non-acid forming waste. The dilution and potential neutralisation of potentially acid forming waste by mixing it using a co-dumping procedure is intended to avoid the creation of a cell of waste that could be potentially harmful if exposed. A layer of approximately 10 m depth of non-acid forming waste will be placed as the final layer of waste material on each waste landform to provide a barrier between the co-dumped waste and the 1 m layer (at least) of rehabilitation substrate (topsoil/ sand) to prevent access to the waste by the roots of surface vegetation and thus the uptake of metals present in the waste and to further reduce the likelihood of rainwater infiltrating the waste landform post closure. The risk of acid generation and release from the waste material is minimal.

Modelling undertaken by Landloch (2009) on the reconstructed landform suggests that rainfall infiltration following a typical or an extreme event will remain within the 10 m layer of inert material, further reducing the potential for acidic or metal contaminated seepage from the waste landforms. In the unlikely event that high levels of potentially acid forming waste are detected during the construction or operational phase another method of landform construction will be adapted.

Elemental analysis results indicated that chromium, copper, lead and nitrogen were regularly measured at levels above the limit of reporting, as were two individual sample results for zinc and mercury. Comparison of these results with average crustal abundances for these elements found that a few individual results for Chromium and Lead were above average crustal abundances in both the “Quaternary sand over laterite” and “Sandstone or ferricrete regolith types. Comparison with DEC Ecological Investigation Levels found all elemental concentrations were below respective Ecological Investigation Levels, with the exception of the average Chromium results for samples collected from “Quaternary sand over laterite” and “Sandstone or ferricrete” regolith (a natural process as Chromium gets concentrated into laterite (with iron and other cations).

3.2.8 Air Quality

Primary sources of particulate matter at the TGM include the movement of haulage trucks, processing plant area and wind erosion from exposed areas while primary sources of combustion emissions are generated from the diesel fuelled mining fleet and the sites 40MW diesel fuelled power station.

An air quality assessment was conducted for the project by Heggies (2009). This assessment focused on the potential health and environmental impacts associated with changes in the air quality resulting from the project. The air quality model was updated during 2013 and focussed on emissions from the TGM diesel fuelled power station. Both models were developed using the worst case scenarios and as a result, the predicted emissions should be viewed as conservatively high with actual levels during operations expected to be lower than those modelled. All pollutant concentrations modelled during the 2013 air quality assessment (SLR Consulting 2013) meet the health based criteria as outlined in Table 3.1.

Table 3.1 Air quality criteria and modelled concentrations

Pollutant	Averaging Period	Criteria (µg/m^3 unless otherwise stated)	2013 Assessment (µg/m^3 unless otherwise stated)
PM_{10}	24 hour	50	1.4
	Annual	20	0.4
Dust Deposition	Annual	2 g/m^2/month	0.3 g/m^2/month
Nitrogen Dioxide	1 hour	246	35.5

Pollutant	Averaging Period	Criteria (µg/m^3 unless otherwise stated)	2013 Assessment (µg/m^3 unless otherwise stated)
	Annual	62	4.3
Sulphur Dioxide	1 hour	570	15.7
	24 hour	228 (health) 100(biological integrity)	7.5
	Annual	60 (health and biological integrity)	1.8
Carbon Monoxide	8 hour	10 mg/m^3	0.1 mg/m^3
Benzene	Annual	0.01mg/m^3	0.0004 mg/m^3
Toluene	24 hour	3.77 mg/m^3	0.002 mg/m^3
Xylenes	24hour	1.08 mg/m^3	0.001 mg/m^3

Source: SLR Consulting (2013)

In addition to the parameter listed in Table 3.1, the SLR report also assessed 4 hour and annual average nitrogen dioxide concentrations (criteria of 95 µg/m^3 and 30 µg/m^3 respectively) and total nitrogen deposition levels (criteria 3 g/m^2) at the mine village to determine potential impacts on significant flora and fauna populations. Results indicated that the predicted annual average NO_2 concentrations and total nitrogen deposition levels are below assessment criteria however the 4-hour average NO_2 concentration exceeds the criteria of 95 µg/m^3 at the eastern most edge of the primary zone of the significant flora and fauna population located to the west of the mine village.

3.2.9 Flora and Vegetation

3.2.9.1 Biogeography

The TGM is situated in the Helms Botanical District, within the Eremaean Botanical Province (Beard, 1975). The Helms Botanical District as defined by Beard, (1975) is very consistent and is characterised by tree steppe of *Eucalyptus gongylocarpa* and *Triodia basedowii.* Overall, the sandy areas are a mosaic of tree and shrub communities however, *Eucalyptus gongylocarpa* is dominant on sand dunes only where it occurs locally between them (Beard, 1990).

At a broad scale, Beard (1975) determined the presence of seven distinct vegetation units within this area. These are:

- *Acacia aneura (*Mulga) low woodland between sand ridges;
- Tree (*Eucalyptus gongylocarpa. E. Youngiana*) and shrub steppe between sand hills within hummock grassland (*Triodia basedowii*);
- *Acacia aneura* (Mulga) and *Casuarina cristata* (C. Pauper; Sheoak) woodland;
- Lightly wooded succulent steppe: *Acacia aneura* (Mulga) with *Atriplex* (Saltbush) or *Kochia* (now *Maireana*);
- Shrub steppe with patches of mulga on desert plains (*Eucalyptus youngiana*, *Triodia basedowii*);
- Mulga (*Acacia aneura*), Sheoak (*Casuarina cristata*) and eucalypts mixed low woodlands; and
- Mulga and Bluebush (*Acacia aneura*, *Casuarina crsitata*, *Myoporum* sp and saltbush or bluebush).

ecologia Environment (ecologia 2009) was commissioned to conduct a Level 2 vegetation and flora survey as defined by the EPA Guidance Statement 51 (EPA, 2008) over the Operational Area. The field work was undertaken over five field trips undertaken between 2006 and 2008. Field surveys included quadrate based and opportunistic floristic sampling, targeted rare flora and declared weed searches, a description and mapping of vegetation via ground truthing of aerial

photographs and linked field traverses (ecologia, 2009a). The survey area covered 131,000 ha which is approximately five times larger than the operational area and 40 times larger than the proposed operational footprint. Vegetation condition within the survey area was found to be of good condition with some areas undergoing post-fire regeneration.

Mattiske Consulting Pty Ltd (Mattiske 2009) was commissioned to conduct a Level 1 survey, as defined by the EPA Guidance Statement 51 (EPA, 2008), and map the vegetation and flora values of the proposed Pinjin Infrastructure Corridor (Mattiske 2009). The survey was undertaken within a 200 – 500 m wide corridor of 220 km length. The total area mapped by Mattiske (2009) was approximately 20,000 ha. The main field work was undertaken in December 2007 and March 2008, with some areas revisited in May 2008. Fires resulting from lightening strikes during November 2007 significantly altered the condition of flora and vegetation in some sections in the proposed corridor, approximately 35% of the corridor was affected. It is anticipated that as a result of the intensive fire it will be years to decades before the area returns to the pre-fire state.

Botanica Consulting (2009) was commissioned to conduct a Level 1 survey, as defined by the EPA Guidance Statement 51 (EPA, 2008) over the Minigwal Trough Water Supply Area and pipeline corridor. At the time of commencing the survey it was unclear exactly where the Water Supply Area was going to be located, as a result 44,000 ha of native vegetation has been mapped with the intension of identifying vegetation communities and habitats that should be avoided. The area mapped is approximately 200 times larger than the proposed disturbance area. The field work component of this survey was conducted in November and December 2008, including a post rain survey between the 10 and 12 December 2008.

3.2.9.2 Vegetation

Eleven major vegetation communities were recorded within the Operational Area (ecologia, 2009a). Some of the major communities have been further broken down into an additional 18 sub-communities. Of these communities, only 17 could be clearly identified using aerial photography and geographically mapped (Figure 3.5).

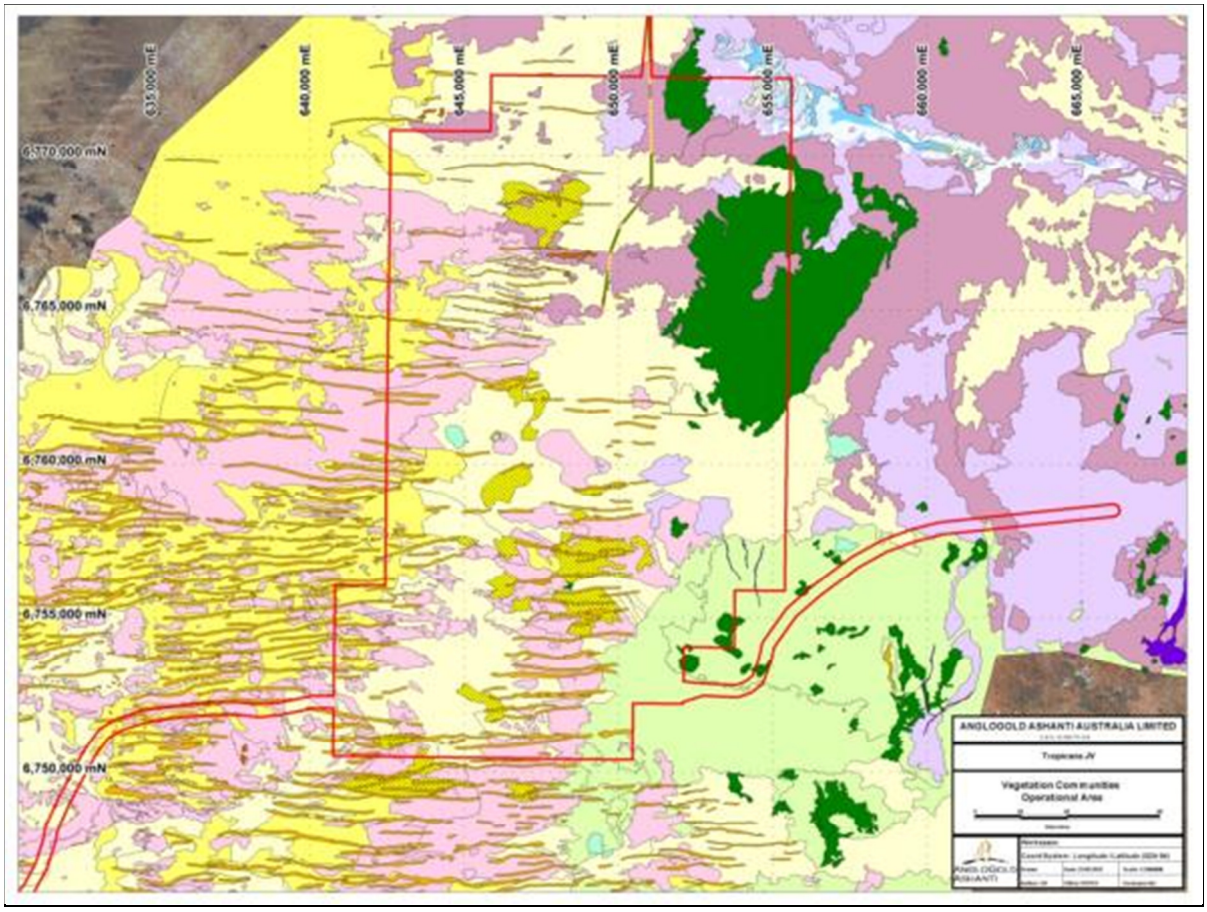
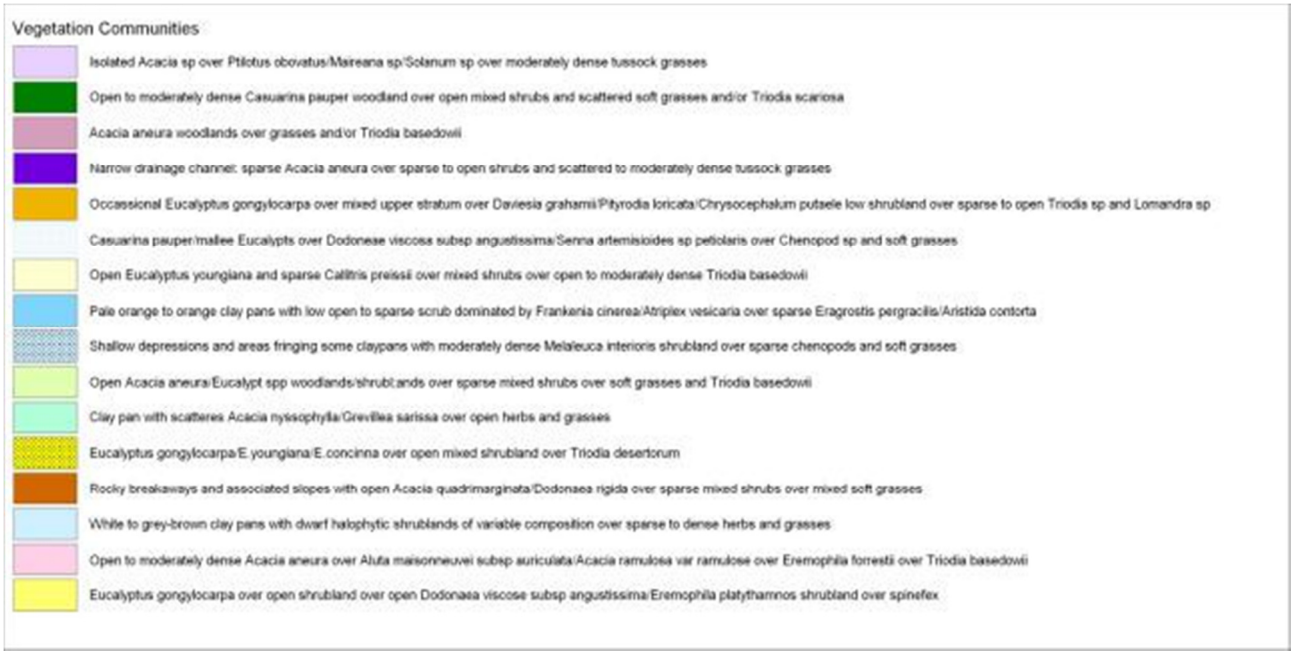


Figure 3.5 Operational Area Vegetation Communities (with legend below)



There were six major vegetation communities recorded within the Pinjin Corridor (Mattiske, 2009). These major communities were then broken up into 36 sub-communities based on structure, dominant and associated species and geographic factors. Vegetation communities within the corridor are shown in Figures 3.6-3.9.

The six major plant communities are:

- *Eucalyptus woodland;*
- *Casuarina woodland;*
- *Acacia Woodland;*
- *Shrubland;*
- *Grassland; and*
- *Chenopod shrubland*

The vegetation at the Pinjin end of the corridor is dominated by mixed shrublands and woodlands of Casuarina and Acacia whereas at the Operational Area end of the corridor the vegetation is dominated by mixed Eucalyptus and Acacia woodlands.

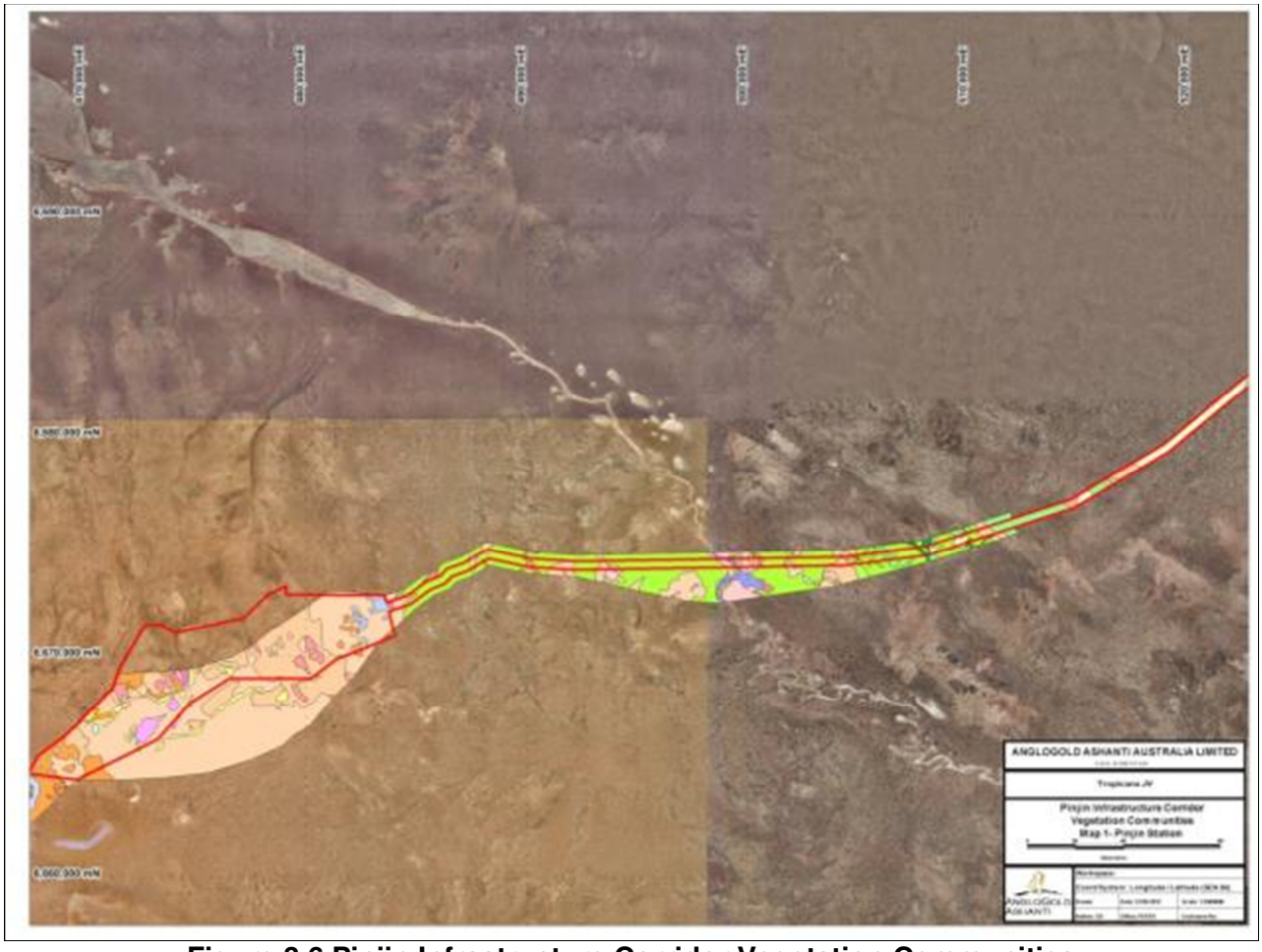


Figure 3.6 Pinjin Infrastructure Corridor Vegetation Communities
Pinjin Station (legend below)


Legend
Pinjin Vegetation Communities
A1
A2
A3
A4
A5
C1
C2
C3
CH1
CH2
E1
E2
E3
E4
E5
E6
E7
E8
E9
E10
E11
E12
E13
E14
E15
G1
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11

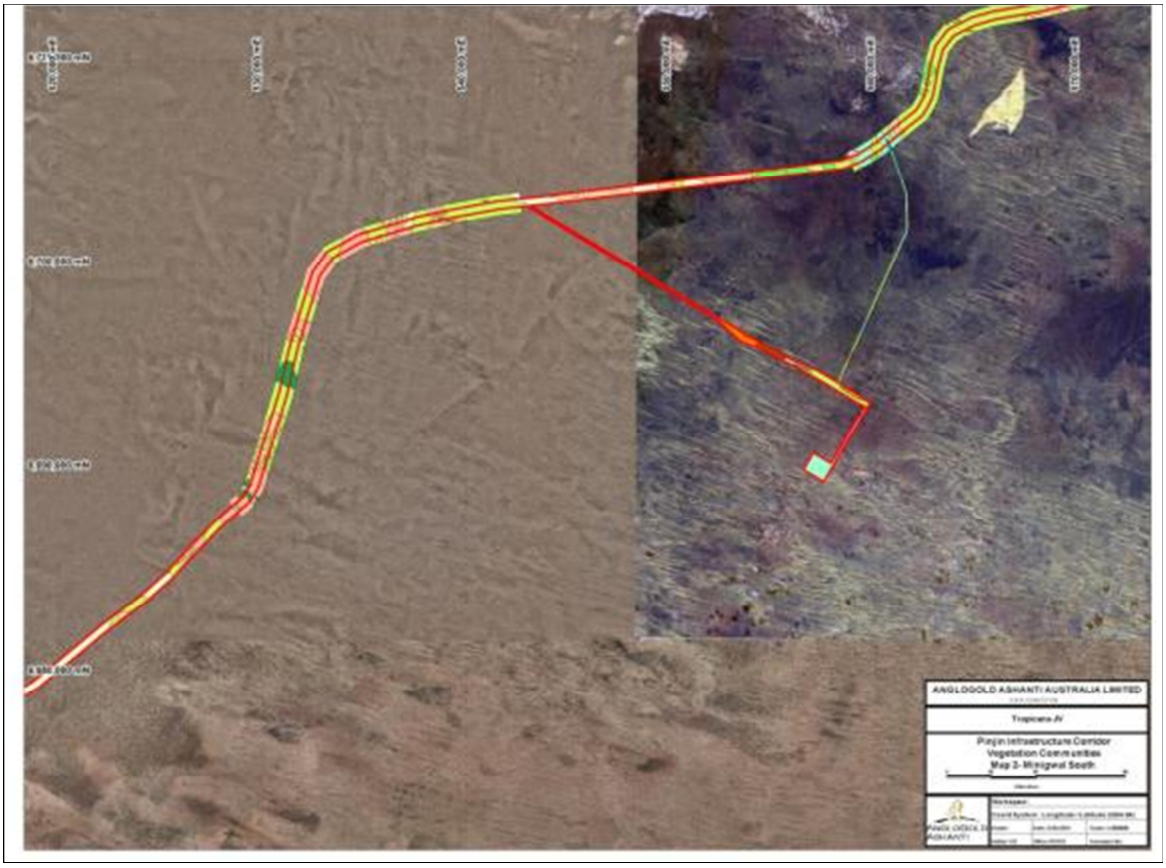


Figure 3.7 Pinjin Infrastructure Corridor Vegetation Communities - Minigwal South

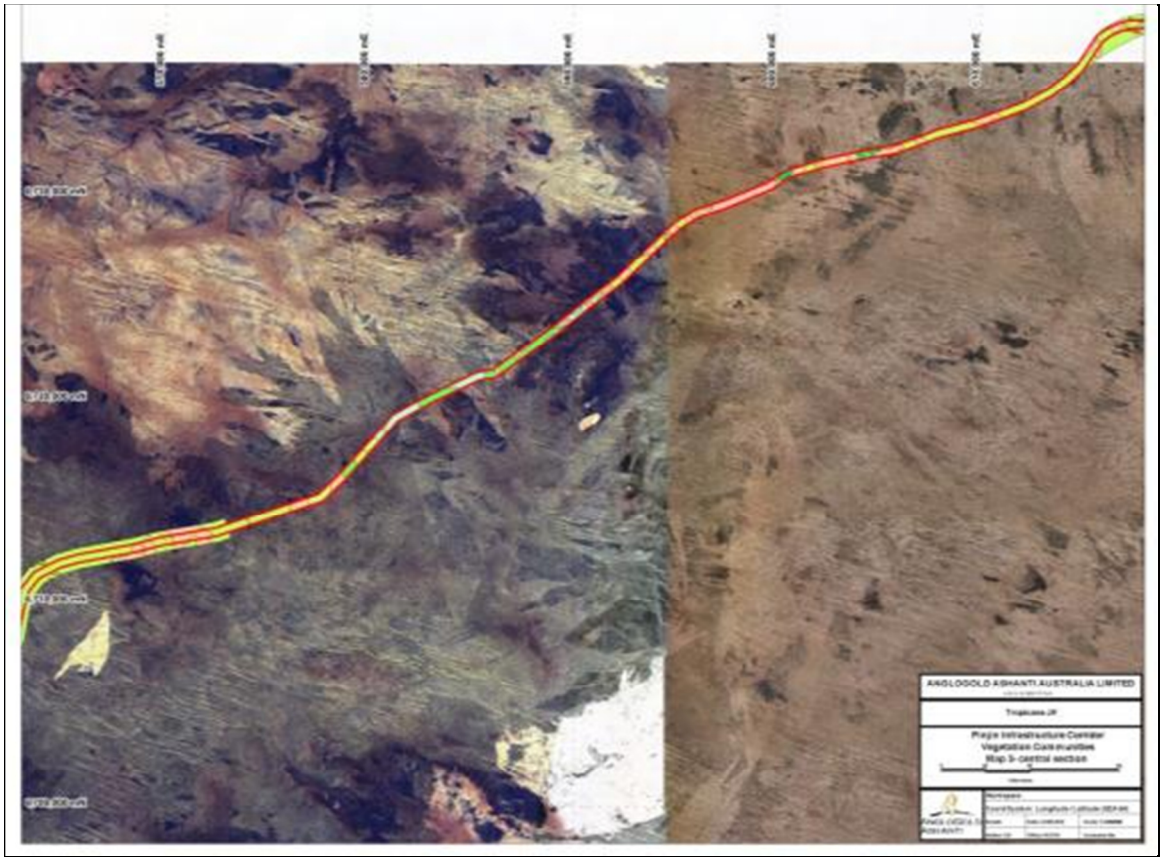


Figure 3.8 Pinjin Infrastructure Corridor Vegetation Communities-Central Section

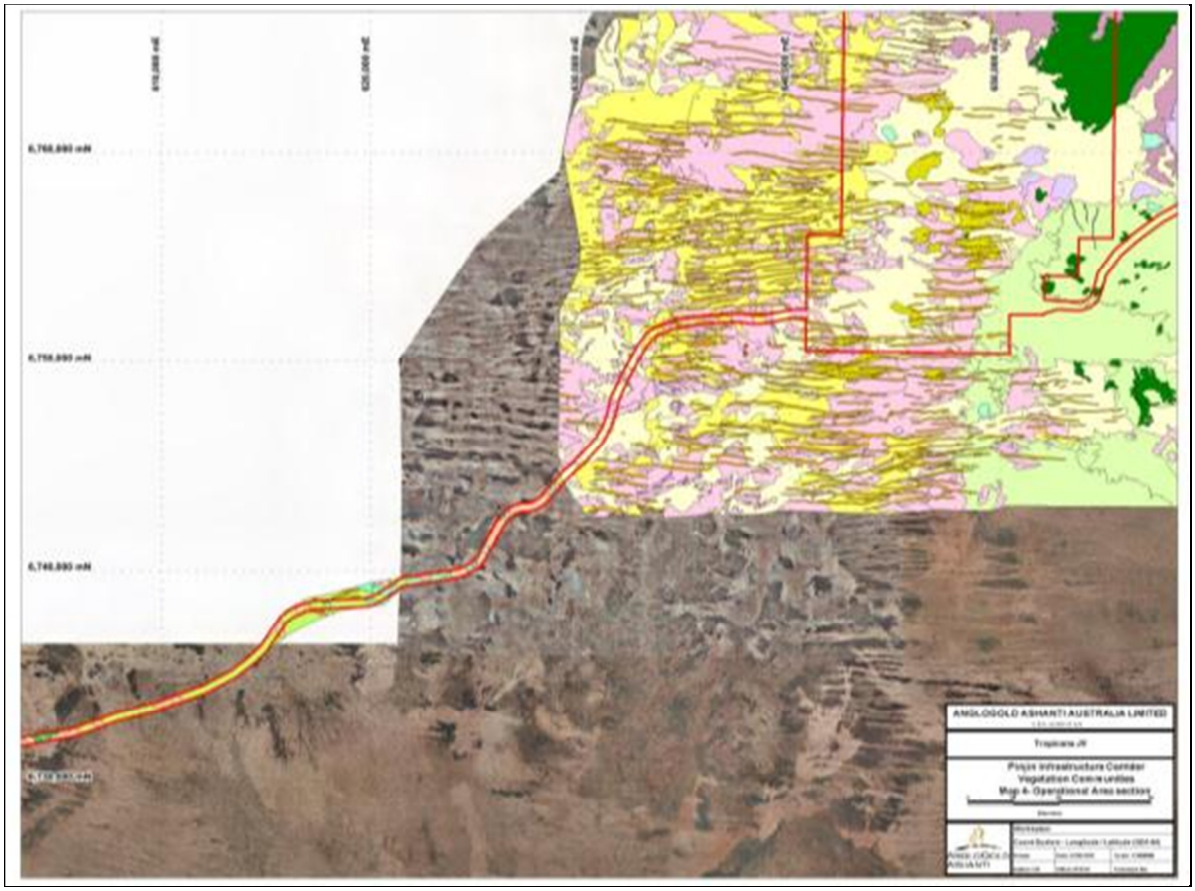


Figure 3.9 Pinjin Infrastructure Corridor Vegetation Communities - Operational Area End

There were five major plant communities where identified within the Minigwal Trough survey area based on landform (Figure 3.10). Some of the major communities were then broken down into sub-communities. A total of 13 separate vegetation sub-communities were identified within the survey area. Vegetation condition for all vegetation groups varies from excellent to degraded. The areas classified as degraded have been affected by severe fires over 5-10 years.

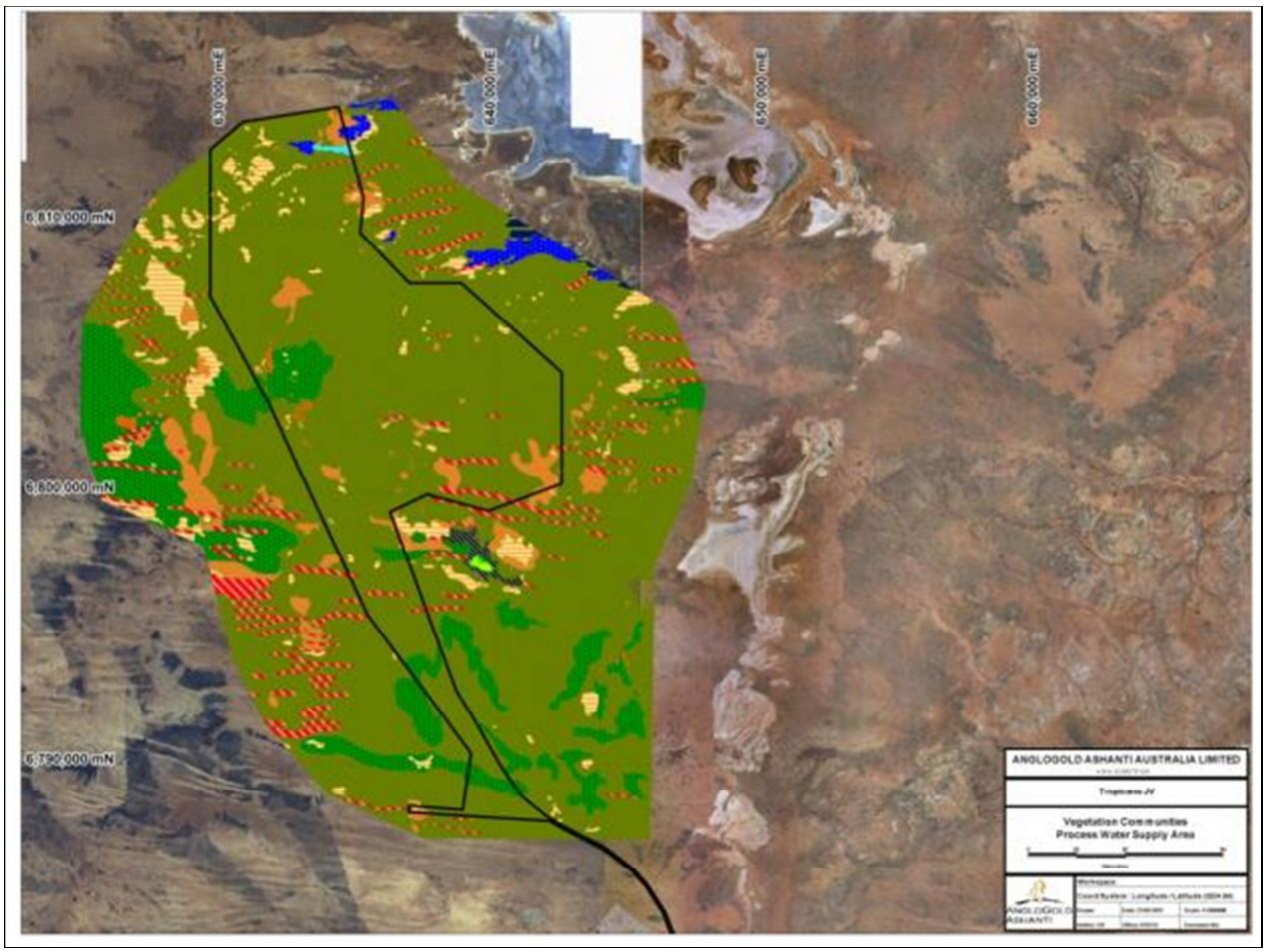


Figure 3.10 Minigwal Trough Vegetation Communities (with legend below)

Tropicana Gold Project

Vegetation Communities (Botanica 2009)

- Dense Acacia aneura woodland over scattered Triodia basedowii
- Open mallee Eucalyptus concinna over spinifex
- Mixed Eucalypt woodlands dominated by E. gongylocarpa/E. youngiana over mixed shrubs and spinifex
- Open mixed shrubs over spinifex
- Scattered E.gongylocarpa over mixed shrubs over spinifex
- E.gongylocarpa over mixed Acacia over mixed shrubs over spinifex
- Moderately dense E.mannensis over isolated shrubs and scattered spinifex
- Sparse E.horistes over low mixed shrubs dominated by Atriplex vesicaria
- Open mixed acacia over mixed shrubs and soft grasses
- Open Acacia aneura over Aluta maisonneuvei over scattered spinifex
- Moderately open Casuarina pauper woodland over open mixed shrubs over scattered Spinifex
- Moderately dense Acacia aneura over mixed shrubs dominated by Eremophila latrobei over Casutis dioica
- Moderately dense mixed acacia woodland over mixed shrubs dominated by Eremophila latrobei over Caustis dioica

There are no Threatened Ecological Communities (TECs) as defined under the EPBC Act or the DEC were recorded during the surveys over any area.

The DEC has nominated the 'Yellow sandplain communities of the Great Victoria Desert' as a Priority 3 (ii) ecological community. This PEC is described as containing highly diverse mammalian and reptile fauna, with distinctive plant communities. At this point in time the DEC has not been able to provide the Joint Venture with an accurate description of the vegetation communities that comprise the PEC. The Joint Venture has used indicator species (such as Persoonia and Xanthorrehea) and the presence of yellow to yellow-orange sands to identify vegetation communities that might represent the PEC. The DEC has supplied the Joint Venture with what they consider to be the southern boundary of this PEC, however little information is known about the full extent of the community (e.g. northern, western and eastern boundaries). At its closest point to the Project, the DEC-confirmed southern boundary of the PEC is 20 km to the south-east of the Pinjin infrastructure corridor. Work completed by Mattiske Consulting and ecologia has identified that sections of Pinjin corridor appear to intersect the potential PEC. The PEC appears to be widespread throughout the surrounding area.

3.2.9.3 Flora

Within the Operational Area a total of 446 taxa were recorded, including three naturalised alien taxa. A total of 57 families were represented by 162 genera. The most diverse families were Poaceae (47 taxa), Chenopdiaceae (45 taxa), Mimosaceae (41 taxa), Myrtaceae (33 taxa) and Asteraceae (31 taxa). The dominant genera were *Acacia* (40 taxa), *Eremophila* (25 taxa) and *Eucalyptus* (19 taxa) (ecologia, 2009a).

Within the Process Water Supply Area (Minigwal Trough) 179 species comprising of 35 Families and 81 Genera were identified. The most diverse families were: Mimosaceae (31 taxa), Myrtaceae (26 taxa), Myoparaceae (18 taxa), Chenopodiaceae (15 taxa), Lamiaceae (13 taxa), and, Poaceae (12 taxa). The most diverse genera were Acacia (31 taxa), Eremophila (18 taxa) and Eucalyptus (15 taxa) (Botanica Consulting, 2009). There were no weed species recorded in the area.

Within the Pinjin infrastructure corridor identified 267 taxa from 44 families, 122 genera, the most diverse families were: Myrtaceae (37 taxa), Chenopodiaceae (25 taxa), Mimosaceae (22 taxa); Myoporaceae (18 taxa), Proteaceae (14 taxa) and Papilionaceae (14 taxa).

A desktop review of the WA Herbarium, the DEC Flora database and consultant records identified that at the time there was the potential for two DRF and 19 Priority Flora to occur within the operational area, however only one DRF and 14 Priority Flora were recorded during the field assessment. Since the surveys, the conservation status of a number of species has changed and Table 3.2.2 lists all conservation significant species recorded during the field surveys with their conservation status at the time of the survey and their current conservation status.

Table 3.2: Threatened and Priority Flora species within the TGM

Species	Conservation Status at Time of Survey (2009)	Current Conservation Status
*Conospermum toddii**	Endangered (EPBC Act) and Declared Rare (WC Act)	Priority 4
Olearia arida	Priority 2	Priority 4
Baeckea sp. Great Victoria Desert	Priority 2	Not threatened
Baeckea sp. Sandstone	Priority 1	Priority 3
Grevillea secunda	Priority 2	Priority 4
Acacia eremophila numerous-nerved variant	Priority 3	Priority 3

Species	Conservation Status at Time of Survey (2009)	Current Conservation Status
Acacia eremophila var. *variabilis*	Priority 3	Priority 3
Daviesia purpurascens	Priority 4	Not threatened
Dicrastylis nicholasii	Priority 2	Not threatened
Dicrastylis cundeeleenis	Priority 2	Priority 4
Dampiera eriantha	Priority 1	Priority 1
Lepidobolus deserti	Priority 4	Not threatened
Malleostemon sp. Officer Basin	Priority 2	Priority 2
Microcorys macredieana	Priority 3	Not threatened
Micromyrtus stenocalyx	Priority 3	Not threatened
Caesia talingka	Undescribed taxon	Priority 2
Comesperma viscidulum	Priority 4	Priority 4
Thryptomene eremaea	Priority 2	Priority 2
Lechenaultia divaricata	Unrecorded in WA	Priority 1

**Conospermum toddii* has recently been delisted from both the state and federal threatened species lists

As indicated in Table 3.22, no Declared Rare flora species occur within the operational area as the conservation status of *Conospermum toddii* was recently reclassified. Priority species will be affected by clearing works, however where possible disturbance has been designed to avoid the most sensitive flora. Removal of some plants will however occur. The locations of conservation significant species in relation to the Project activities are shown in Figure 3.11.

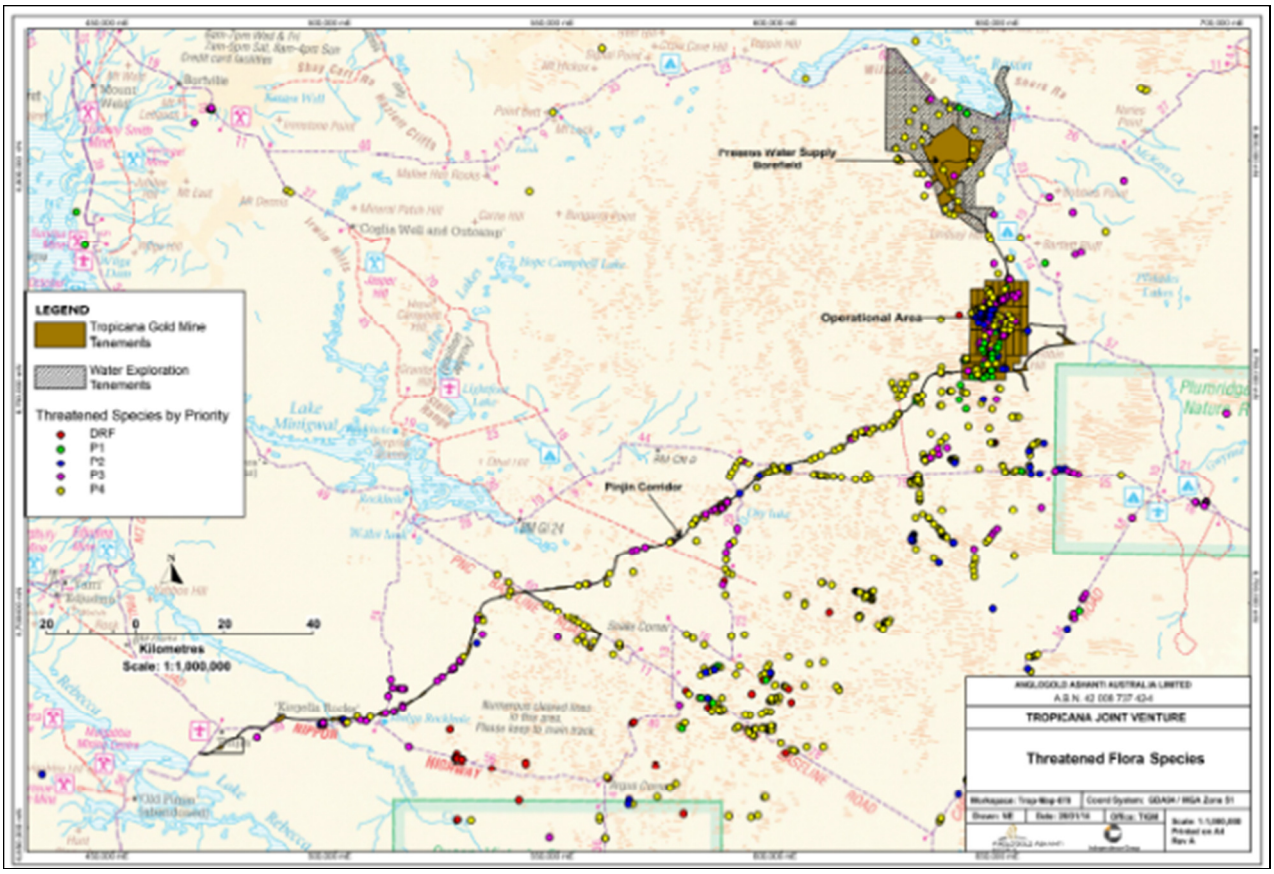


Figure 3.11. Recorded Threatened Flora species

3.2.10 Introduced flora species

Four introduced flora species were recorded during the baseline flora survey in the Operation Area and Pinjin Corridor. These were:

- *Sonchus oleraceus* (Sowthistle);
- Salvia verbenaca (Wild Sage)
- *Spergulia rubra* (Red Sand Spurrey); and
- *Erodium aureum.*

None of these species are listed as noxious weeds. There were no weeds found within the Minigwal Trough Water Supply Area. Measures to minimise the spread or introduction of weed species are outlined in Section 4.5.

3.2.11 Fauna and Fauna Habitat

A Level 2 vertebrate fauna survey (as defined by the EPA Guidance Statement 56) covering the Operational Area was undertaken over three sampling events in November 2006, March 2007 and March 2008 was undertaken by *ecologia* (ecologia, 2009b). Eighteen sampling sites were established targeting major vegetation communities and landforms as well as potential areas of impact within the operational area. A variety of trapping methods were employed at each sample site including pit fall, Elliot box, funnel and cage traps. Other sampling techniques used as part of the fauna survey included opportunistic fauna sightings, active searching for reptiles and mammals, secondary evidence of presence, bird surveys and bat recordings using an ANABAT bat detector at each site (ecologia, 2009b).

A Level 1 vertebrate fauna survey (as defined by the EPA Guidance Statement 56) over two separate field trips in December 2007 and March 2008 was undertaken over the Pinjin Corridor. This survey was supplemented by an opportunistic fauna survey of the Pinjin Station section.

A Level 1 Reconnaissance Survey was undertaken within the Process Water Supply Area (Minigwal Trough) and pipeline corridor by *ecologia* (ecologia, 2008). The field work was conducted in March 2008. The survey was designed to meet the requirements of EPA Guidance Statement 56 (EPA 2004d). Similar to the flora survey, the fauna assessment covered a much larger area than will be impacted by the Project. The aim of this was to identify areas that should be avoided wherever practical.

All habitats were assessed for their suitability for conservation significant fauna and targeted surveys were undertaken for conservation significant fauna which potentially occur in the area.

The potential and actual number of species recorded in the survey area is listed in Table 3.33.

Table 3.3: Summary of Fauna species potentially occurring

Fauna Group	Potential No. Species	No. Species Recorded
Operation Area		
Mammals	30	23
Birds	117	75
Amphibians	4	1
Reptile	105	74
Pinjin Corridor		
Mammals	37	12
Birds	118	81
Amphibians	6	0
Reptile	105	23
Process Water Supply Area (Minigwal Trough)		
Mammals	34	6
Birds	114	38
Amphibians	4	0
Reptile	102	6

3.2.11.1 Conservation Significant Species

Based on a desktop assessment and the presence of suitable habitat, a number of conservation significant species were identified as potentially occurring within the TGM. Targeted surveys using specific survey techniques were undertaken to determine species presence. Specific survey techniques employed included:

- Trenching technique developed by Benshemesh (2005) to survey for evidence of southern marsupial mole (*Notorcyctes typhlops*) activity (tunnels);
- Oversized pit trap grids for capture of Sandhill Dunnarts (*Sminthopsis psammophila*);
- Searching for Malleefowl (*Leipoa ocellata*) mounds during surveying activities, targeted searches of suitable vegetation for mounds as well as track surveys which involved grading of roads in potential Malleefowl habitat and traversing the tracks in the following days to identify Malleefowl tracks; and
- Targeted searches of suitable Brush Tailed Mulgara (*Dasycercus blythi*) habitat (Spinifex hummock) led by personnel with previous mulgara survey experience.

Species of conservation significance recorded during the surveys, targeted surveys or considered likely to occur within the Operational area are listed in Table 3.44 and their location shown in Figure 3.12.

Table 3.4: Fauna species of Conservation Significance present or likely to occur in the Operational Area (ecologia, 2009b)

Species	Conservation Status	Operational Area	Pinjin Corridor
Mammals			
Southern Marsupial Mole *Notorcytes typhlops*	Endangered under the EPBC Act and Schedule 1 under the WC Act	Traces (tunnels) recorded within and outside the survey area.	Traces (tunnels) recorded within and outside the survey area.
Sandhill Dunnart (*Smithopsis psammophila)*	Endangered under the EPBC Act and Schedule 1 under the WC Act	Low potential to occur. None recorded during survey and available habitat within the operational area is not typical of this species.	Potential habitat was observed but no sandhill dunnarts were recorded.
Brush-tail Mulgara (*Dasycercus blythi)*	DEC Priority 4	Moderate potential to occur. None recorded during survey however there are records in surrounding areas and sparse suitable habitat does occur within the Operational Area.	Burrows that are likely to be Mulgara were found during the survey.
Birds			
Peregrine Falcon *(Falcon peregrinus)*	WC Act Schedule 4	Recorded within the survey area.	
Australian Bustard *(Ardeotis australis)*	DEC Priority 4	Recorded within the survey area.	Nest with one egg was found during the survey.
Rainbow Bee-eater *(Merops ornatus)*	Listed as Migratory under the EPBC Act	Recorded within the survey area.	Recorded within survey area.
Crested Bellbird (*Oreoica gutturalis*)	DEC priority species.		Recorded within the survey area.
Fork tailed Swift *Apus pacificus*	Listed as Migratory under the EPBC Act	Recorded within the survey area.	
Princess Parrot *Polytellis alexandrae*	Vulnerable under the EPBC Act and DEC Priority 4	Moderate potential to occur. Suitable habitat present and has been recorded at Plumridge Lakes.	
Malleefowl *Leipoa ocellata*	Vulnerable under the EPBC Act and Schedule 1 under the WC Act	Moderate potential to occur. Inactive malleefowl mounds found in the area and suitable habitat (although burnt at the time of the survey) occurs so species may utilise the area during favourable conditions.	An individual was sighed and footprints were noted. Two nesting mounds were seen.
Naretha Blue Bonnet (*Northiella haematogaster narethae*)	Schedule 4 under the WC Act	Low potential to occur. Operational area is at the edge of this species known distribution in WA.	
Grey falcon (*Falco hypoleucos*)	DEC Priority 4	Low potential to occur. Suitable foraging habitat occurs but few breeding sites are available. Has been previously recorded at Plumridge Lakes.	
Slender- billed Thornbill (western) *Acanthiza iredalei iredalei*	Vulnerable under the EPBC Act	Very low potential to occur. No suitable habitat and no previous records from the area.	
Wood Sandpiper (*Tringa glareola*)	Listed as Migratory under the EPBC Act		Sighed at a small lake north of Lake Rebecca.
Common Greenshank (*Tringa nebularia*)	Listed as Migratory under the EPBC Act		Sighed at a small lake north of Lake Rebecca.
Cattle Egret *Ardea ibis*	Listed as Migratory under the EPBC Act	Very low potential to occur. No suitable habitat present.	
Oriental Plover *Charadrius veredus*	Listed as Migratory under the EPBC Act	Very low potential to occur. No suitable habitat present.	
Reptiles			
Carpet Python (south-west subspecies) *Morelia spilota imbricata*	DEC Priority 4	Moderate potential to occur. One record 25km south-west of the operational area.	
Great Desert Skink *Egernia kintorei*	Vulnerable under the EPBC Act	Low potential to occur. Suitable habitat occurs but the operational area is not within known distribution for this species.	

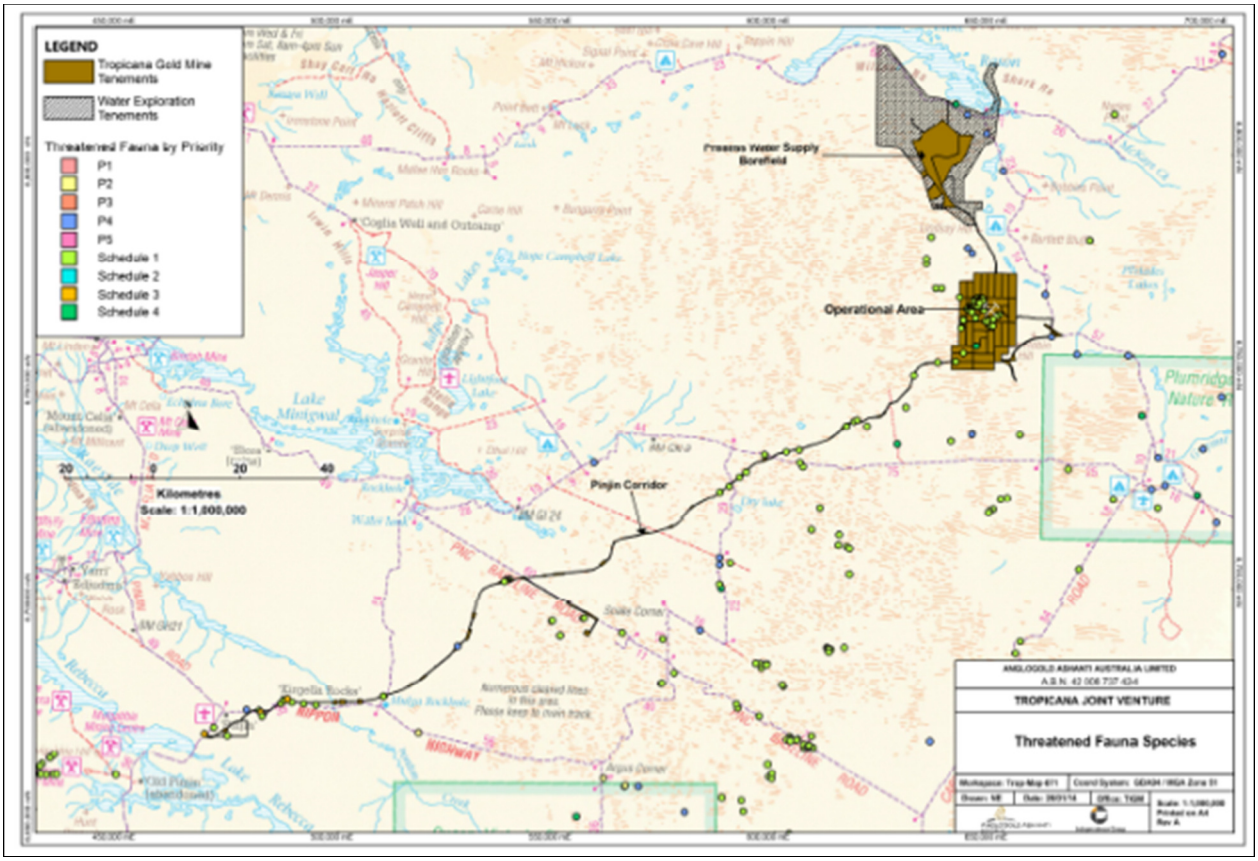


Figure 3.12 Recorded Threatened Fauna Species

The results of the surveys found traces of marsupial moles (evidence of mole holes observed during trenching) predominantly in the sand dune systems to the west of the operational impact area. This area will not be impacted by the activities covered by this proposal. There was no evidence of Sandhill Dunnart nor the Brush-tail Mulgara found during the surveys and only a small area of suitable habitat for the Mulgara was identified within the mining proposal boundary.

Based on the high intensity of the surveys and that the survey methodologies adopted were endorsed by the DEC, it is unlikely that populations of Sandhill Dunnart or Mulgara are resident within the Operational Area (ecologia, 2009b).

Four locations of potential Sandhill Dunnart habitat were however identified within the operational area these will not be impacted by this proposal. The surveys found evidence of historical Malleefowl activity in the form of inactive Malleefowl mounds, no Malleefowl tracks were found indicating the species is not currently present in the area.

The project is not considered to have an adverse effect on any of the recorded conservation significant bird species due to the vast area of suitable habitat within the region and the large home range and migratory nature of the identified species.

In the Minigwal Trough there were no mammals of conservation interest was observed during the field survey although habitat suitable for the Marsupial Mole and Mulgara was encountered. No herpetofauna species of conservation interest were recorded during the survey.

3.2.11.2 Introduced fauna

Several introduced fauna have been observed within the proposed activities areas. These include:

- *House Mouse (Mus musculus);*
- *Donkeys (Equus asinus);*
- *Wild dogs (Canis lupus);*
- *Rabbit (Oryctolagus cuniculus);*

- *Feral Cat (Felis catus);*
- *European Fox (Vulpes vulpes); and*
- *Camel (Camelus dromedaries).*

3.2.11.3 Fauna Habitats

Fauna habitats were identified as part of the fauna survey conducted over the TGM. 13 distinct fauna habitats were identified and are listed below.

- *Yellow and orange sand dune areas with an over storey of scattered Eucalyptus mallees;*
- *Mulga (Acacia aneura) woodland with a dense understorey of mature Triodia basedowii hummock grassland.*
- *Soft sandy plains with vegetation communities that include burnt and unburnt Eucalyptus woodlands, and Acacia woodlands over Spinifex and other small shrubs;*
- *Low red sand dunes with an over storey of Callitris columellaris pines and Eucalyptus sp. mallee tress;*
- *yellow sand-plain heaths (containing a mixture of unburnt or recovering vegetation);*
- *yellow and red sand dunes;*
- *red sand-plains with spinifex and eucalypts;*
- *orange sand-plains with heath/ tree mix;*
- *open soft and spinifex grasslands;*
- *mulga woodlands with varying understorey vegetation and soil types;*
- *open mallee woodlands over spinifex (mainly);*
- *Eucalypt mallee woodland with an understorey of mixed Acacia shrubs and Triodia hummock grasses; and*
- *Casuarina pauper woodland with an open understorey of low mixed shrubs and scattered soft grasses.*

None of these habitats are listed as Threatened Environmental Communities under the *Wildlife Conservation Act 195*0 or the EPBC Act. The most distinctive habitat identified is the yellow and orange sand dunes. These are located to the west of the Tropicana Operational area and may be a local variation of the '*Yellow sandplain communities of the Great Victoria Desert'* which has been listed as a Priority Ecological Community. The dunes will not be impacted by this proposal.

3.2.12 Short Range Endemics

ecologia was commissioned to undertake an assessment of the potential occurrence of terrestrial Short Range Endemic (SRE) invertebrates within the operational area. The survey methods used were developed in consultation with the DEC and were designed in accordance with the requirements of the EPA Guidance Statement 54, 54a and 56. Conventional pit fall trapping and foraging programmes were undertaken in September-October 2006, May-September 2008 and March-May 2009.

The surveys produced 43 terrestrial invertebrate taxa within and surrounding the operational area of which 17 are considered to be of conservation significance due to being new to science and/or belonging to genera composed primarily of SRE species (ecologia, 2009c). These conservation significant species have been listed in Table 3.5. The majority of the species identified occur within and/or outside of the Project footprint. One species (*Kwonkan* sp. 2,) was only found present in sample sites within the impact area for the Project and will therefore be impacted by the Project.

A habitat assessment was conducted with three habitat types identified as suitable for *Kwonkan* sp.2 (ecologia, 2009c). Two of these habitats occur both within and outside the Project footprint therefore it is considered that while the *Kwonkan* sp.2 will be impacted by the proposal this impact will be insignificant to the species as it is likely to occur in suitable habitat outside the Project footprint.

To minimise the impact of activities on known SRE locations and habitats, GIS records have been developed containing this information. These have been considered in the design of the project to avoid impact on the species and habitats were possible. The location of SRE invertebrates of Conservation Significance recorded in the Project area are shown in Figure 3.133Recorded SRE and Troglofauna Locations.

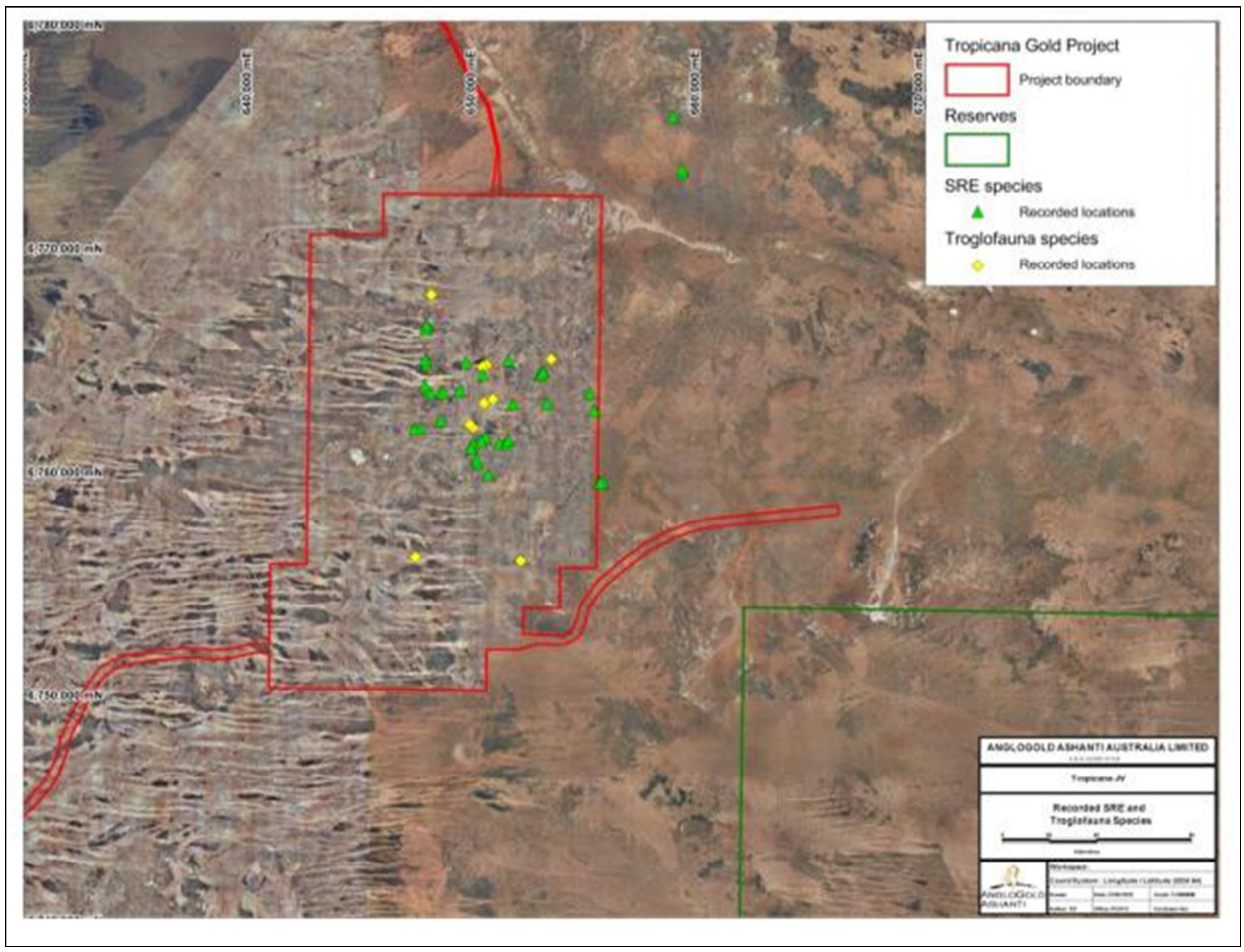


Figure 3.13 Recorded SRE and Troglofauna Locations

Table 3.5: Short Range Endemic species of Conservation Significance recorded in the Operational Area (ecologia, 2009c)

Short Range Endemics Recorded within the Tropicana Area	
Aganippe sp. 1/8	*Aganippe* sp. 2/7
Aganippe sp. 3	*Aganippe* sp. 4
Aganippe sp. 5	*Aganippe* sp. 6
Aname sp. 2	*Anidiops manstridgei*
Antichiropus sp. 1	*Antichiropus* sp. 2
Cercophonius sp. new	Chernetidae new genus
Kwonkan sp.1	*Kwonkan* sp.2
Nemesidiae new genus	*Polyzoniidae* sp. unknown
Pseudolaureola sp. new	

3.2.13 Subterranean Invertebrate Fauna

3.2.13.1 Stygofauna

Field surveys and an initial desktop survey were undertaken in September and November 2007, and February-May 2008 to determine the presence of stygofauna within the Tropicana operational area. The surveys were undertaken by *ecologia* and Subterranean Ecology in accordance with EPA Guidance Statement 54. Samples were taken from 40 existing bores within the operational area and an additional seven bores outside the area. The bores sampled were of a sufficient age for colonisation by any potential stygofauna occurring in the area. No stygofauna species were however recorded during the survey which indicates that there is an apparent lack of suitable stygofauna habitat in the Tropicana operational area. Historic geological events, specifically a marine incursion, are likely to have altered the aquatic habitat at Tropicana from a fresh environment to a saline one unsuitable for stygofauna habitation (ecologia 2009d). It is therefore highly unlikely that stygofauna occur within the operational area.

The desktop review by Subterranean Ecology concluded that the lower sandstone aquifer of the Minigwal Trough has a very low likelihood of supporting habitat suitable for stygofauna. This was determined due to the deep, fully saturated aquifer. No stygofauna have been recorded from this type of aquifer in Western Australia. To verify the conclusion obtained during the desktop assessment a pilot field survey was conducted. Ten accessible bores were sampled by net hauling or pumping methods, and water physico-chemistry parameters (temperature, pH, salinity, conductivity, redox, dissolved oxygen) were measured to characterise and evaluate water quality conditions for stygofauna. The pilot field survey detected no stygofauna in the sampled bores, consistent with the conclusions of the desktop review.

3.2.13.2 Troglofauna

Field surveys to determine the presence of troglofauna were undertaken as part of the preparation for the Tropicana PER. The surveys were undertaken by *ecologia* in accordance with EPA Guidance Statement 54. An initial five phase field survey were undertaken within and adjacent to the Operational area between September 2007 and May 2009, a total of 317 samples locations where utilised, of which 108 were within the Operational Area (ecologia, 2009e). Three definitive troglobitic species were recovered during the five phases including Diplura, Chilopoda and Isopoda however only single specimens of the Diplura and Chilopoda were collected (ecologia, 2009e). Multiple specimens of Isopoda were collected from both within and outside the Tropicana operational footprint.

Following the initial phase of field surveys an additional two survey phases were undertaken in August-September 2009 and November 2009-January 2010 which covered areas outside the operational area footprint to determine the presence of troglobitic species outside the impact area for the Project. Ninety four samples were recovered during the two additional surveys. One additional troglobitic species, Blattodea was recovered and Isopoda, which was identified during the initial surveys, was also recovered (ecologia, 2009e). In total 14 individuals, from four definitive troglobitic species were recovered during the seven phases of field surveys. Only single specimens of Diplura, Chilopoda and Blattodea were identified.

An assessment of suitable troglobitic habitat was undertaken to gain an understanding of the potential troglofauna distribution within and outside of the impact area for the Project. The assessment included compiling geological data for each drill hole where troglofauna were recorded to identify if a common geological strata occurs. The results indicated that at least one geological stratum with pores or voids occurred in holes where troglofauna were recorded, and that this stratum was adjacent to other, sometimes less prominent, porous strata which could act as 'bridges' (ecologia, 2009e). The most common strata in holes where troglofauna occurred are channel fill sediments.

Drill hole data was then used to establish geological profiles for 14 cross sections across the Tropicana project area. The profiles were assessed for suitability as a troglofauna habitat and classified as prime, likely, marginal or suitable habitat. Alluvial deposits associated with historical

drainage channels (channel fill sediments) were found to be the most prospective as troglofauna habitat due to porosity, depth and immediate contact with similar porous strata (ecologia, 2009e).

Areas classified as prime or likely habitats were extrapolated to determine the total suitable troglofauna habitat within the operational area. This was found to be approximately 16,670ha of which approximately 10% is anticipated to be impacted upon directly and indirectly by activities associated with establishment and operation of the Project (ecologia, 2009e) Figuire 3.14 shows the location of troglobites recovered during the seven phase survey program and the extent of the predicted troglofauna habitat within the Tropicana operational area based on the surface regolith profile.

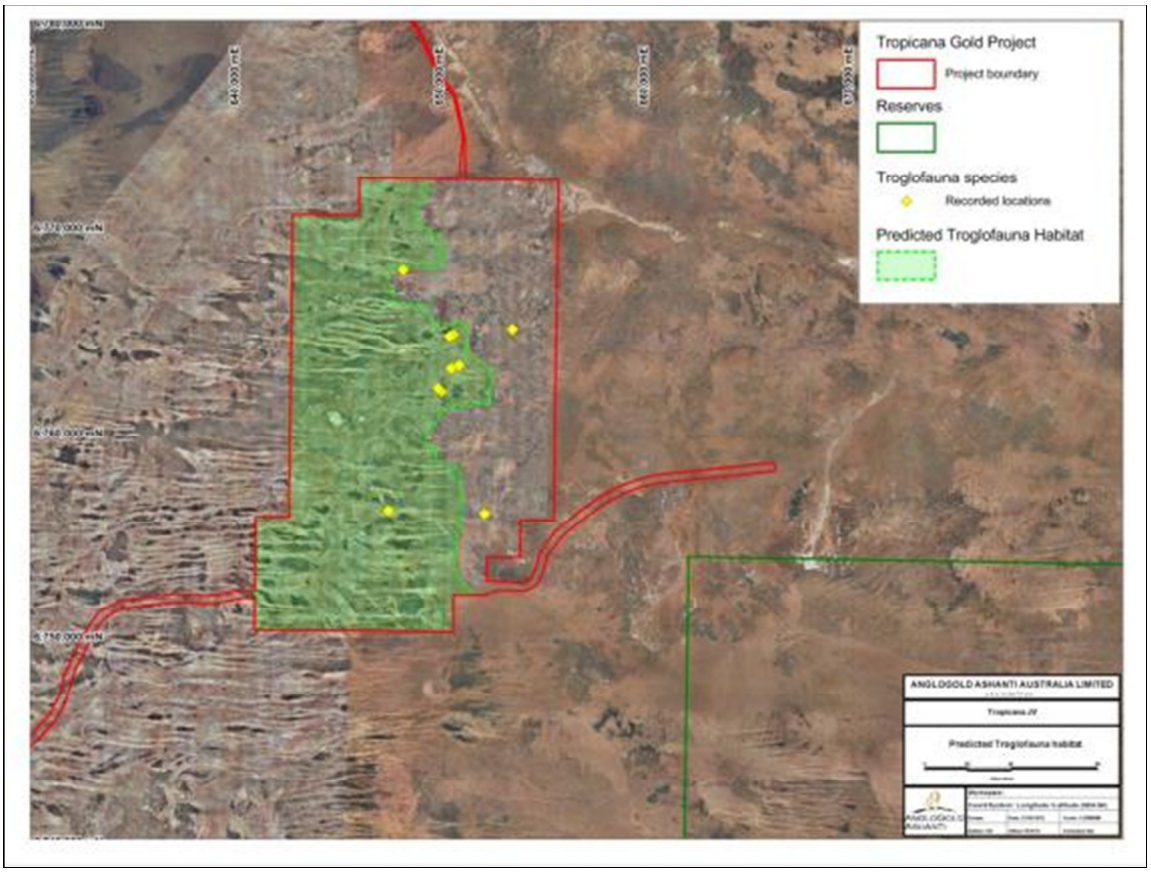


Figure 3.14 Extent of Predicted Troglofauna habitat.

3.2.14 Conservation Area

There are no conservation areas over the TGM. The closest reserves are the Plumridge Lakes Nature Reserve is located approximately 14 km southeast of the Operational Area, the Queen Victoria Spring Nature Reserve approximately 20 km southeast of the proposed Pinjin Infrastructure Corridor and the Neale Junction Nature Reserve approximately 100 km northeast of the Operational Area (Figure 3.15). The reserves are classified as Class A for the purpose of conservation of flora and fauna (there is no recreational component).

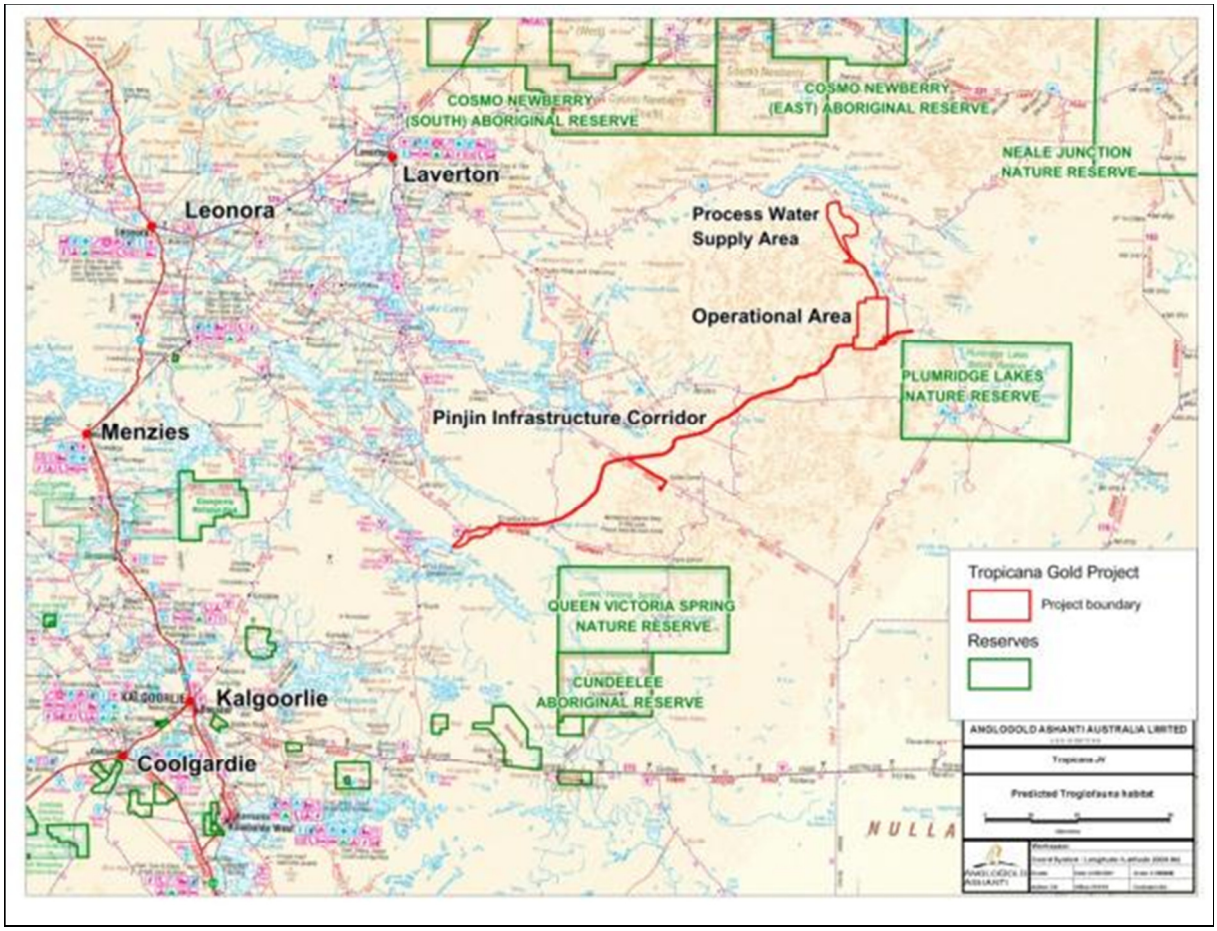


Figure 3.15 Location of Conservation Areas

3.3 Social

The Project Operational and Water Supply Area are located within the Shires of Laverton and Menzies, on unallocated vacant crown land managed on behalf of the State by the DEC. The Infrastructure Corridors are located within the boundaries of the City of Kalgoorlie-Boulder and the Shire of Menzies, and traverse a mixture of gazetted and ungazetted roads, pastoral leases and unallocated vacant crown land.

The nearest actual residence to the proposed mine is over 200 km south at the Kandanah station. In the vicinity of the infrastructure corridors there are a number of homesteads and an Indigenous community (Coonana Community).

The Project is located on a combination of granted mining leases and miscellaneous licenses. Sections of both infrastructure corridors cross granted and pending exploration leases held by other exploration companies and a small proportion of the Pinjin Infrastructure Corridor is located on the Pinjin Pastoral Lease.

The closet significant residential population is approximately 200 km to the west of the project (Laverton).

3.4 Cultural

3.4.1 Aboriginal

Archaeological and ethnographic studies have been conducted over the entire Tropicana Project area. In 2009 the results of these surveys were compiled into an archaeological report (Waru, 2009a) and an ethnographic report (Waru, 2009b). The archaeological studies identified a total of

11 sites within the wider Tropicana Project area (Figure 3.166). The most common archaeological sites were artefact scatters and quarries, with a small number of rock shelter sites. No ethnographic sites were identified within the entire operational area for the Project during the eight surveys undertaken between 2002 and 2008. There have been no reports of ethnographic sites in nearby areas either.

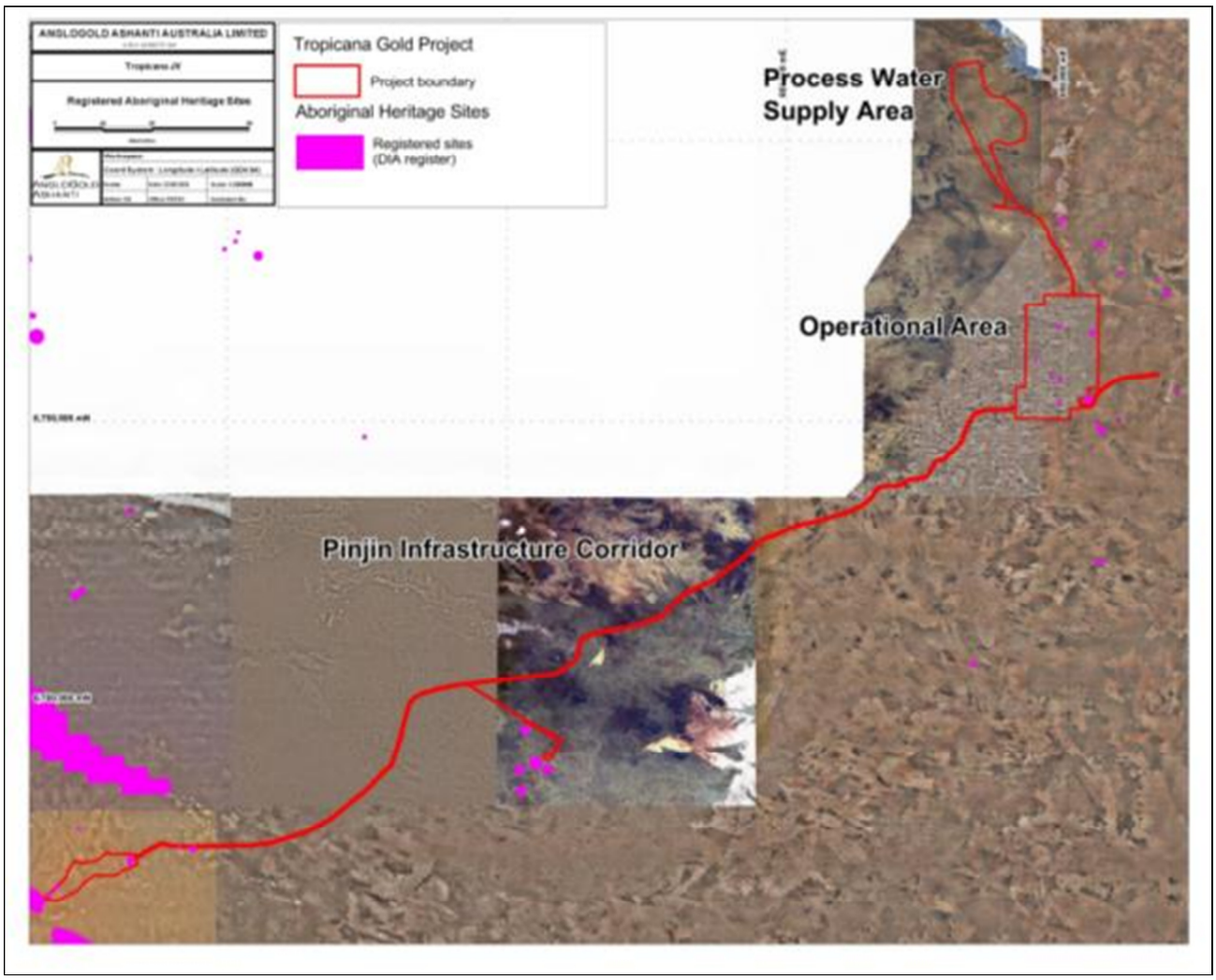


Figure 3.16 Registered Aboriginal Heritage Sites

3.4.2 European

The potential for early settler heritage was considered to be most likely in the former settlement of Pinjin, an area historically associated with the mining and the pastoral industries.

The assessment has determined that there are no current early settler heritage values or listings within the proposed Pinjin Infrastructure Corridor or Operational Area. The closest known location with European heritage value is within the old Pinjin townsite located near the western end of the Pinjin Corridor.

3.5 Key Closure Issues

Operational activities need to be careful managed to ensure successful mine closure. Key issues for successful closure of the TGM are considered to include:

- Waste landform stability
- Potential acid generating material in waste landforms
- TSF rehabilitation

- Landfill capping and rehabilitation (contaminated sites management)
- Used tyre disposal
- Hydrocarbon contamination
- Growth medium availability and viability

These issues are discussed further in Section 10.1.

4 LEGAL AND OTHER REQUIREMENTS

4.1 Legislation

The TGM will be constructed, operated and decommissioned in accordance with the following legislation:

- *Environmental Protection Act 1986;*
- *Environmental Protection Regulations 1987;*
- *Environmental Protection (Noise) Regulations 1997;*
- *Contaminated Sites Act 2003;*
- *Wildlife Conservation Act 1950;*
- *Mining Act WA 1978;*
- *Rights in Water and Irrigation Act 1914;*
- *Aboriginal Heritage Act 1972;*
- *Soil and Land Conservation Act 1945;*
- *Conservation and Land Management Act 1984;*
- *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth);and
- *Environmental Protection (Rural Landfill) Regulations 2002*.

The Mining Act 1978 is the key piece of legislation for all mineral exploration and mining activities in Western Australia. Conditions placed on all tenements associated with the TGM have been reviewed and have or will be complied with. A table of closure related commitments that apply to the project are provided in Appendix 1.

4.1.1 Tenement Conditions

Tenement conditions relating to mine closure activities include the following:

1. A detailed mine closure plan developed in accordance with the new mine closure guidelines must be submitted in the annual environmental reporting month (January) of 2014
2. On the completion of operations or progressively where possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or an alternative agreed outcome to the satisfaction of an Environmental Officer, DMP.
3. "On the completion of the life of mining operations in connection with this licence the holder shall:
    - remove all installations constructed pursuant to this licence; and
    - on such areas cleared of natural growth by the holder or any of its agents, the holder shall plant trees and/or shrubs and/or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the District Inspector of Mines and properly maintain same until the Inspector advises regrowth is self supporting; unless the Warden or Minister responsible for the Mining Act 1978 orders or consents otherwise."

4. Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of instability

4.1.2 Environmental Approvals

As previously mentioned, the Project has undergone environmental assessment under both the State and Federal process at the level of Public Environmental Review (PER). The State Environmental Approval for the project was obtained in September 2010 (Ministerial Statement 839) and the Federal Approval was obtained in December 2010 (under the Environmental Protection and Biodiversity Conservation Act (EPBC) 2008/4270)). As part of the PER, environmental management strategies were developed for operation, construction, threatened species, monitoring and closure and rehabilitation. The project has and will continue to comply will these strategies and the imposed approval conditions and will develop an annual compliance report auditing performance against the conditions.

In relation to mine closure the specific ministerial conditions include the following:

Condition 9.1:

- The waste material landforms and tailings storage facility shall be non-polluting and shall be constructed so that their stability, surface drainage, resistance to erosion and ability to support local native vegetation are similar to undisturbed natural analogue landforms as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority.
- Waste material landforms, tailings storage facility and other areas disturbed through implementation of the proposal (excluding mine pits), shall be progressively rehabilitated with vegetation composed of native plant species of local provenance (defined as seed or plant material collected within the Great Victoria Desert Bioregions 1 and 2).
- The percentage cover and species diversity of living self sustaining native vegetation in all rehabilitation areas shall be comparable to that of undisturbed natural analogue sites as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority.
- No new species of weeds (including both declared weeds and environmental weeds) shall establish in the area as a result of the implementation of the proposal.
- The coverage of weeds (including both declared weeds and environmental weeds) within rehabilitated areas shall be no greater than the average of three reference sites on nearby land, with the reference sites to be chosen in consultation with the Department of Environment and Conservation. Note: The methodology for Ecosystem Function Analysis is set out in Tongway DJ and Hindley 2004 Landscape Function Analysis – Procedures for Monitoring and Assessing Landscapes, Commonwealth Scientific and Industrial Research Organisation Sustainable Ecosystems, Canberra.

Condition 10.1:

- At least five years prior to mine completion, the proponent shall prepare and submit a Final Closure and Decommissioning Plan to the requirements of the Chief Executive Officer of the Office of the Environmental Protection Authority, on advice of the Department of Mines and Petroleum

Condition 10.2

- The Final Closure and Decommissioning Plan shall be prepared consistent with: 1. ANZMEC/MCA 2000, Strategic Framework for Mine Closure Planning; and 2. Department of Industry Tourism and Resources 2006 Mine Closure and Completion (Leading Practice Sustainable Development Program for the Mining Industry), Commonwealth Government, Canberra;

Condition 10.3:

- The Final Closure and Decommissioning Plan shall provide detailed technical information on the following: 1. final closure of all areas disturbed through implementation of the proposal so that they are safe, stable and non-polluting; 2. decommissioning of all plant and equipment; 3. disposal of waste materials; 4. final rehabilitation of waste dumps; tailings storage facilities and other areas (outside the mine pit(s)); 5. Management and monitoring following mine completion; and 6.inventory of all contaminated sites and proposed management.

Condition 10.4:

- The proponent shall close, decommission and rehabilitate the proposal in accordance with the approved Final Closure and Decommissioning Plan

Condition 10.5

- The proponent shall make the Final Closure and Decommissioning Plan required by conditions 10-1 and 10-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority

4.1.3 Mining proposals

Mining proposals for the Project have been submitted and approved in a staged approach as outlined in Table 4.1. Conditions imposed by the mining proposal approvals are attached as tenement conditions and will be complied with throughout operation and closure activities.

Table 4.1 Mining Proposals Approved and Submitted

TJV ID No / Reg Id	Area	Facilities/activities included	Timeline
Infrastructure Corridors			
MP20101230/REG ID 29358	Pinjin Infrastructure Corridor (L31/57, L39/185, M39/979, M39/980, M39/982, M39/983, M39/985, M39/987, M39/1028, M39/1049)	• Site Access Road (Kurnalpi-Pinjin Road to the Tropicana Plant Area) and supporting activities temporary camps, workshops, offices, borrow pits, water supply • Communication Towers • Water pipelines and turkey's nests (permanent and temporary)	Dec 2010
MP20110131/REG ID 29592	Pinjin Infrastructure Corridor - Minigwal South Water Supply (L39/211 and L39/213)	• Bore development • Water pipeline (temporary) • Turkey's Nest establishment • Track upgrade	Jan 2011
Operational Area			
MP20110413/REG ID30473	Exploration Camp Upgrade (M39/1050 & M39/1013)	• Expansion of the current exploration camp and offices	April 2011
MP20110531/RegID31 236	Early Works Mining Proposal (L39/188, L39/189, M39/978, M39/979, M39/980, M39/987, M39/988, M39/1010, M39/1019, M39/1020, M39/1021, M39/1028, M39/1029, M39/1030)	• Establishment of internal service corridors (roads, pipelines, communications and overhead power line) • Construction of village, waste water and sewage treatment facility, aerodrome and temporary facilities for construction activities such as workshop, offices, laydown areas, batch plant and fuel facility • Establishment of a public bypass road between the Tropicana Access Road and the Laverton- Plumridge Lakes track. • Establishment of the Kamikaze borefield. • Civil works for to establish the processing plant foundation and drainage • Vegetation clearing for a growth medium storage area.	May, 2011

TJV ID No / Reg Id	Area	Facilities/activities included	Timeline
MP20120105/REGID33727	Processing Plant, bulk fuel and chemical storage areas, mining services area and supporting infrastructure (M39/978 and M39/980)	• Construction of the Processing Plant • Mining Services Area Infrastructure establishment – workshops, washdown bays, fuel farm, chemical storage areas • Supporting services and infrastructure • Bulk Fuel and chemical storage areas	Jan, 2012
MP20120326/REGID34713	Mining Area (pits, waste material landforms,)	• Open pits of the Havana, Tropicana, Boston Shaker and Havana South deposits; • Waste landforms; • ROM Pad, ore and low grade stockpiles; • Haul roads and other internal roads; • Pit dewatering and water management infrastructure; • Growth medium recovery and stockpiles, including vegetation stockpiles; • Explosive mixing and storage; • Ancillary infrastructure including communications equipment, reticulated services (including power and water), CCTV, pit viewing points.	Mar, 2012
MP20120501/REGID35234	TSF Construction and operation	• TSF construction • Clearing footprint for the TSF and surrounding waste land form • Construction and operation of the TSF / waste landform • Ancillary infrastructure including under drainage, toe drains, monitoring bores • Growth medium stockpiles • Internal bypass road providing access around the Operational area to the aerodrome	May 2012
MP20121015/ REGID37371	Operational Area Additional infrastructure	• Plant Borrow pit expansion • Freshwater pipeline along TSF bypass • Turkeys nest for pit dewatering and excess recycled water storage • Potential concrete batch plant	Oct 2012
MP20130313/REGID38945	Operational Area Waste Management Area expansion and additional service corridors (M39/978, M39/979)	• Expanding the existing waste management area (including the landfill) • Additional pipeline corridor between the Wastewater treatment plant and tailing storage facility • Additional power line corridor between Wastewater treatment plant and tailing storage facility decant tower	March 2013
MP20120326A/REGID 34713	Additional services within pipeline corridor- change in use notification	• Request additional services within previously approved pipeline corridor/	March 2013
MP20120326B /REGID43392	80m Communication Tower installation M39/980	• Installing an additional 80m communications tower within the operational area	Nov 2013
MP20120326 Amendment C/ REGID45469	ROM pad expansion and additional infrastructure	• ROM pad footprint expansion • Ore stockpile expansion and additional coarse reject material stockpile • Haul road access to stockpiles • Biopad and associated facilities • Warehouse and stores yard • Drainage modification	December 2013

TJV ID No / Reg Id	Area	Facilities/activities included	Timeline
Water Supply Area and Pipeline Corridor			
MP20110304/RegID29999	Processing Water Supply Area (Phase 1) L38/150	• Vegetation clearing and installation of access track • Phase 1 borefield development (up to 20 production bores, earthen turkey's nests, access track)	Mar, 2011
MP20120124/RegID34023	Processing Water Supply Area (Phase 2) L38/150	• Phase 2 borefield development (up to 30 additional bores, permanent turkey's nest, PowerStation, internal tracks, pipeline and power line)	Feb, 2012

4.2 Other requirements

Other conditions imposed through water extraction licences, building licences, operating licences and works approvals will also be complied with throughout operational and closure activities.

5 CONSULTATION AND COMMUNICATION

5.1 Stakeholder involvement

Stakeholder engagement is a common theme in mine closure and rehabilitation guidance documents (WA EPA 2006, Commonwealth Government 2006, ICMM 2006, ICMM 2008). Successful stakeholder engagement throughout the TGM lifespan increases the likelihood of successful closure and rehabilitation outcomes.

During the project planning stage closure and rehabilitation thinking is premised on a mutually held goal to, as much as possible, return the TGM area to its original state. This goal may alter over the lifespan of the TGM and effective stakeholder involvement will give the TJV certainty of purpose as it plans and implements closure and rehabilitation at TGM.

5.2 Consultative Closure Committee

The establishment of a Consultative Closure Committee, as part of an overall stakeholder engagement strategy, can be a useful forum in which long term objectives can be discussed (Commonwealth of Australia 2006).

A Consultative Closure Committee will be established for the TGM and will be an effective means of engaging stakeholders and demonstrating to regulators that there is community support and input into the overall Closure and Rehabilitation Plan. The Consultative Closure Committee can also have a formal role in the relinquishment sign-off process.

The formation of a Consultation Closure Committee will be required as the TGM becomes operational. Potential stakeholders for inclusion onto the closure committee are listed in Table 5.1.

Table 5.1: Potential Closure and Rehabilitations stakeholders identified by the Tropicana Gold Project for consultation

Stakeholder type	Stakeholder
State Government Agencies	Department of Mines and Petroleum
	Department of Environment and Conservation
	Environmental Protection Agency
	Department of Indigenous Affairs
	Department of Planning and Infrastructure
	Department of Water
	Department of Health
Commonwealth Government Agencies	Department of the Environment, Water, Heritage and the Arts
Local Government	Shire of Menzies
	Shire of Laverton
	City of Kalgoorlie-Boulder
Indigenous groups	Central Desert Native Title Services
	Goldfields Land and Sea Council
	Representative from all applicable Native Title Claimants
	Tjuntjuntarra Aboriginal Community
Environmental groups	Conservation Council of Western Australia
	Goldfields Naturalist Group
	Kalgoorlie-Boulder Urban Landcare Group
	Malleefowl Preservation Group
	Wilderness Society
	Wildflower Society of Western Australia

5.3 Communication Strategy

Consultation with the community and key stakeholders will continue throughout the life of mine and mine closure activities. A detailed communications strategy will be developed during the operational phase of the project.

6 CLOSURE COST ESTIMATE

6.1 Inventory

A detailed inventory of facilities and landforms requiring decommissioning and disposal will be developed during the operational phase of the project and a detailed decommissioning plan will be developed. Table 6.1 outlines the key facilities and infrastructure that will require decommissioning.

Table 6.1 General Inventory of infrastructure

Infrastructure	Facility
Landforms	Pit voids Waste material landforms Tailings Storage Facility (TSF) Marginal Ore stockpiles ROM Pad Growth material Stockpiles Borrow pits
Industrial Infrastructure	Processing Plant and associated infrastructure Power Station Hydrocarbon Storage Facilities Infrastructure corridors (pipelines, power lines etc) Sewage Treatment Facilities Landfills Processing plant workshop and maintenance areas Reagent storage facilities Laboratory and Sample Store Process Plant offices/control room Reverse Osmosis Plant Contractor offices and workshop facilities (includes wash down pads, oil-water separators etc) Administration Offices and car parks Warehouse/store facility Telecommunications facilities Exploration facilities Village and associated facilities Lay down areas Bioremediation Pads Site vehicle wash-down facilities Aerodrome facilities and airstrip
Water Containment Structures	Evaporation Ponds Diversion Channels Other Ponds, dams and turkey nests
Groundwater Infrastructure	Minigwal process water borefield – bore infrastructure Minigwal process water borefield power station and transfer pump facilities Minigwal borefield pipelines and corridors Mining area monitoring bores
Roads	Haul Roads Pinjin infrastructure corridor Bypass road Borefield access road Internal access roads
Exploration	Exploration Drill Holes/pads/sumps Access tracks Turkey nests

A breakdown of the current approved disturbance footprint by activity is provided in Table 6.2.

Table 6.2: Approved Disturbance Areas by Activity

Activity	Total area of activity (ha)
Exploration	1241.93
Access Road/tracks	778.705
Turkeys Nest	23.6
Hypersaline Water Pipelines	78.69
Overhead Power line	59.76
Camp site	41.89
Hardstand/Laydown Areas	195.46
Other - Bores & infrastructure	15.41
Borrow Pits	173
Tailings Storage facility	290.8
Plant or Infrastructure	98.46
Waste landforms	724.9
Other - Growth Medium Stockpile	313.37
Other - Drainage	19.5
Haul Roads	119.24
Landfill	4
Explosives magazine	1.4
Bagfarm	2
ROM Pad	82.23
Marginal Ore storkpiles	27.95
Open Pits	221.14
Other - Communications Towers	7.06
Other - Septic Systems	0.42
Freshwater pipelines	3
Other - Airstrip	66.8
pump stations (tanks/turkey nests)	1.5
Total Area of disturbance (including exploration)	**4592.215**

6.2 Closure Costs

Closure cost estimates was originally prepared by AGAA during the Feasibility Study 2009. In 2011 Mike Slight and Associates was engaged to update the closure model and has been subsequently been engage to conduct annual updates (December 2013). The model takes into consideration:

- the requirements prescribed in the 2011 DMP / EPA Mine Closure Guidelines;
- Company Mine Closure Standard requirements;
- transfer post mining cost from the BFS Financial Model to the Closure Model;
- updated personnel and equipment cost and productively rates; and
- infrastructure previously excluded from the model during the project financial assessment.

The closure cost estimate prepared for the Project was developed by benchmarking the closure strategy, model assumptions, and closure cost estimates against industry knowledge and experience for similar closure projects across Australia. Industry experience has shown that mine

closure cost estimates will vary significantly over the life of the mine and generally increase as the operational footprint grows to maturity and ultimately to closure. This is likely to be the case at the Tropicana.

The assumptions and criteria used for development of the life of mine closure costs estimates are outlined below.

- Costs include load, haul and dump of rehabilitation materials, earthworks including reshaping slopes and flats, water harvesting cell bunding for store and release covers, and drainage establishment including rip-rap sourcing and placement, top soil placement, deep contour ripping and revegetation
- The assumed rehabilitation fleet has been based on the following major equipment items:
    - CAT D10 dozers
    - 110t Excavator
    - CAT 777 haul trucks
    - CAT 16G grader
    - CAT 773 Water truck
- Open pits will remain as pit voids. An abandonment bund will be established around the pit perimeter.
- Open pit and waste landform final closure works assumed to commence in 2021 following cessation of mining activities and in line with the feasibility study.
- Other mine closure activities including processing plant decommissioning, demolition, and tailings storage facilities rehabilitation will commence in 2023 following completion of all ore processing.
- Final closure earthworks over 3 years and completed by 2026 at which time the post closure-monitoring period commences.
- The post closure-monitoring period assumed 10 years to 2034 (as required under the DMP guidelines) when relinquishment of tenements will occur.
- Assumption made that there will be sufficient rehabilitation materials including growth medium available on the site at closure to complete the works.
- The project mining contractor's (Macmahon) fleet equipment costs have been used within the cost model. The rates are dayworks hourly rates, which include operator, maintenance, and supervision. Where equipment nominated for closure work activities are not included in Macmahon rates, costs are sourced from rehabilitation contractor rates worked up from first principles from the Eastern Goldfields. Fuel, accommodation, and FIFO costs are as per the projects current contracts for these services
- Monthly equipment operating hours (259 hours) based on a 12-hour day shift (only), 7 days per week, for 365 days per year with an 85% equipment availability and utilisation factor applying
- Equipment productivities applied to the closure cost model are in line with industry average for closure and rehabilitation works. The productivities based on first principle estimates utilising the Caterpillar handbook with efficiency factors applied to adjust for the lower productivities expected, and reviewer's experience, with closure and rehabilitation activities across Australia. Adjustments made to the productivities in the model to reflect equipment selected and additional earthworks activities.
- The tailings storage facility surface prior to rehabilitation is assumed to be dry for cover works to be undertaken. This will depend on the operational strategy for tailings deposition adopted during the last few years of operations. It has been assumed that during this final operational period decant water is managed such that minimal water storage occurs on the TSF. It may also be necessary for additional methods of improving tailings consolidation

during those final years. Poor consolidation and water management on the TSF will result in significantly higher closure cover costs.

- All store and release cover costs include the construction of suitably lined overflow (spill way) drains to control and direct any excess surface water runoff from the top of each facility down to natural ground surface. Suitable riprap screening of waste rock is assumed to be within 3km haulage distance to the facilities.
- The infrastructure decommissioning and demolition cost estimates are based on benchmarked industry practice and aligned with the proposed plant design detailed in the feasibility study. This estimate will require updating once the plant has been constructed and in operation.
- Cost estimates for the removal of the processing plant, equipment, and associated buildings includes;
    - All infrastructure support related components (power, water, workshops, buildings etc.);
    - Rehabilitation of structures and building foundations, including concrete slab break-up, removal and burial; and
    - Rehabilitation of footprints where storage areas are to be located, including lay downs, landfills, magazines etc.

Based on the above criteria, the Life of Mine closure cost estimates for the Project (as at December 2013) are at $123.5million. The closure cost estimate has been broken down into manageable segments or closure management units and each unit will be given its own project status and be managed as an individual entity. The closure management units used for the Tropicana Project and its associated closure cost are outlined in Table 6.3.

Table 6.3 Life of Mine Closure Cost Estimate

Closure management unit	2012 Closure Cost estimates	2013 closure cost estimates
Operations Closure Research	$2,700,000	$2,700,000
Progressive Rehabilitation	$1,886,078	$1,886,078
Open Pits	$750,703	$750,703
Waste Landforms	$35,403,113	$35,403,113
ROM Pad / Stockpile	$5,219,828	$5,349,762
Tailings Storage Facility	$29,532,088	$29,532,088
Water Containment Facilities	$575,132	$575,132
Roads	$3,425,810	$3,656,707
Borefields and Pipelines	$422,042	$422,042
Industrial Infrastructure	$29,918,055	$29,918,055
Water Treatment - Post Closure	$642,357	$642,357
Aerodrome	$1,855,133	$1,855,133
Exploration	$617,948	$617,948
Consultants	$425,000	$ 425,000
Owner's Management	$13,960,312	$13,960,312
Insurance	$399,984	$399,984
Monitoring	$540,000	$540,000
Contingency	$18,553,126	$18,607,250
Salvage Value	**$(19,112,509)**	**$(19,112,509)**
TOTAL ESTIMATED LOM LIABILITY	**$123,128,122**	**$123,543,077**

7 RISK ASSESSMENT

Identifying potential risks to closure and successful rehabilitation at the project planning stage allows for pro-active risk management strategies to be developed. The International Council on Mining and Minerals recommends the AS/NZS 4360:2004 Risk Management Standard (ICCM 2005). Informed by AS/NZS 4360:2004, risk at TGM is determined based on the following risk management process:

1. Collation of project activities;
2. Identify threatening actions or events from the collated project activities that may affect closure and rehabilitation and their possible impacts;
3. Assess the maximum reasonable likelihood of those threatening actions occurring;
4. Assess the maximum reasonable consequence of the impact;
5. Use a risk matrix to assign a risk rating to each threatening action.

There are five possible risk ratings in the risk matrix employed by TGM; Very Low, Low, Medium, High and Very High. Management of the risks will be commensurate with the severity of the risk rating. Controls to reduce the risk and its consequences to an acceptable level will be applied from the following hierarchy:

1. Avoid – avoid impacts where possible, particularly on 'critical assets'
2. Minimise – if impacts cannot be avoided, minimise and manage appropriately
3. Rectify – repair, rehabilitate and restore affected areas as soon as possible after disturbance
4. Reduce – reduce affected area by preservation and maintenance throughout life of mine
5. Offset – where negative impacts still occur, develop an offset package to achieve a net environmental benefit.

A preliminary mine closure risk assessment was undertaken by key AGAA personnel in preparation for this mine closure plan. A list of identified risks and their risk ranking is provided in Appendix 2. For each closure unit and/or facility controls required to minimise key risks were identified and closure activities required to meet identified closure criteria were developed. The outcomes from this assessment are detailed in Appendix 3.

In summary the key risks for Mine Closure at TGM identified during the risk assessment are:

- Asset management and regulator expectations;
- Hydrocarbon management;
- Chemical disposal;
- Growth medium availability and integrity;
- Rehabilitation success; and
- Pit void water quality management

8 TARGETED RESEARCH

Targeted research programs will be required to provide site specific information to assist in reducing the identified risks and rehabilitation success.

Rehabilitation Research Program

The TJV, in partnership with appropriate research institutes such as Botanical Gardens Authority, aim to further explore the ecology in and around the Project area to advance leading practice in semi-arid and arid zone mine rehabilitation. There are numerous areas of potential investigation and future directions for research will be dictated as challenges arise. The TGP Rehabilitation Research Strategy (360 environmental 2010) prepared for the Project outlines the studies and investigations required to achieve essential completion criteria including stabilisation, revegetation and ecosystem reconstruction.

There are four interrelated research themes so far identified to be explored at the TGM, they are:

1. Revegetation biology and ecology – This theme looks at the species that would be included in the rehabilitation program and what they would require to persist. Subjects under this theme include:
    - Key plant biology and key community ecology (otherwise known as eco-physiology)
    - Plant regeneration strategies and fire responses
    - Plant establishment ecology
    - Seed production.
2. Creating a landscape suitable for revegetation – This theme looks at creating landforms that can sustain vegetation. Subjects under this theme include:
    - Creating a stable, non-eroding landform to sustain vegetation
    - Soil properties required for vegetation
    - Soil properties that are hostile to vegetation
    - How to ensure that waste contained in constructed landforms does not impact on the surface vegetation
3. Utilising rehabilitation resources – This theme looks at understanding and valuing the resources that rehabilitation will utilise. Subjects under this theme include:
    - The soil seed bank
    - The available growth medium
    - Cleared vegetation and rocks
    - The exploitable seed resource in the surrounding area
4. Enabling technologies – This theme looks at enabling the rehabilitation practitioners to use the scientific knowledge on the ecology and rehabilitation to create on ground rehabilitation outcomes. Subjects under this theme include:
    - Handling growing media
    - Seed collecting, storage and utilisation
    - Rehabilitation monitoring methods
    - Rehabilitation monitoring

These themes cover areas of research including:

- Waste characterisation and management (overburden, tailings, pit lake)

- Landform design
- Restoration ecology, succession and assessment criteria
- Soil science and nutrition
- Hydrology (including hydrogeology and hydrobiology)
- Practical revegetation techniques
- Seed/ germinant management
- Fire management
- Fauna management and conservation
- Stakeholder expectations for rehabilitation.

To progress the above themes into a program of research, the following steps must occur:

- Identify methodologies, techniques and timing (may include literature review as well as field trials) t
- Scope and cost the studies.
- Prioritise the studies based on:
    - The importance of the question to achieving the required rehabilitation outcomes.
    - The scale of the research effort relative to the importance of the question.
    - The length of time required for a study (this may not equal level of effort; a trial, for example, may be initiated early so that several years of monitoring data can be collected before final analysis).
    - How soon the question needs to be answered (for example questions involving soil handling should be addressed before earthmoving begins).
- Implement and report.

Timing of rehabilitation activities and research must be linked to mining activities to accommodate access and budgetary requirements. This will be undertaken progressively as the operational activities move from vegetation clearing and stripping through to mining and ore processing.

9 COMPLETION CRITERIA

The nationally accepted definition of completion criteria is “an agreed standard or level of performance, which demonstrates successful closure of a site” (Commonwealth of Australia 2006). Determining what the “agreed standard” and the definition of “success” plays a vital role in the progression towards relinquishment. Further, completion criteria are highly site specific and should reflect the unique set of environmental, social and economic characteristics of each operation (ANZMEC 2000) and as such must be tailored to suit each operation.

Completion criteria bridge the gap between the expectations of regulatory bodies, the mining operator and relevant stakeholders and give a set of site specific, formalised objectives on which all parties agree and to which the mining operator can aim toward in order for rehabilitated land to be relinquished.

Developing completion criteria for rehabilitated mine sites has proven to be very difficult for mining operations and their stakeholders. This is in spite of the fact that completion criteria provide the mine operator with a degree of certainty about required outcomes and direction to enable the outcomes to be realised.

Defining completion criteria for the TGP at this early stage will establish clear aims and pathways to achieving the aims. The following table identifies completion goals, objectives and indicators. Deriving the actual completion criteria will require further research and consultation as the project progresses. It is intended that, as the TGP progresses, this table will be broken down into individual tables for each mine domain.

Table 9.1: Conceptual Completion Criteria for Tropicana Gold Project

Goal	Objective	Indicator	Completion Criteria
Agreed land use	Stakeholders agree on the final land use for each mine domain	Majority Agreement	Documented consultation and agreement on the final use for each mined domain
Safe	The site is safe for humans and animals, now and in the foreseeable future	Presence of hazards	Safety hazards removed or controlled including: ○ Mining infrastructure removed ○ No unstable areas ○ No hazardous materials ○ Void protected by bunding
Non-polluting	Groundwater remains uncontaminated	Groundwater monitoring	Certification that monitoring data meet specified criteria for potential contaminants
Stable landform	Landform erosion comparable to undisturbed areas	Slope angle and length	Slope angles meet agreed design specifications
Sustainable land use	Ecosystem definition: One of the analogous local vegetation communities *to be determined for each mine domain.*		
	Self sustaining vegetation community	Presence of framework species	Appropriate framework species densities *to be determined.*
		Species richness	Appropriate specie richness target 70% of original
		Priority species returned	Appropriate percentage return *to be determined*
		Presence of weeds	Absence of any weeds not recorded in pre-mining surveys.
	Fauna return	Animals	Appropriate measure of faunal utilisation *to be determined*

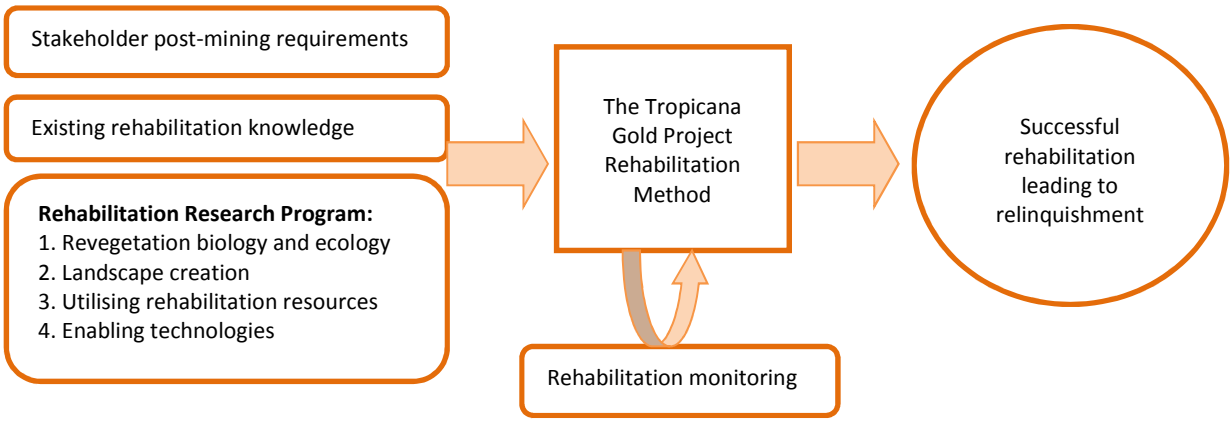


Figure 9.1: Rehabilitation Research Strategy to achieve Rehabilitation Completion Criteria

10 CLOSURE ACTION PLAN

10.1 Key closure issues

As mentioned in Section 3.4, operational activities need to be careful managed to ensure successful mine closure. The identified key closure issues for the Tropicana project are:

- Waste landform stability
- Potential acid generating material in waste landforms
- TSF rehabilitation
- Landfill capping and rehabilitation (contaminated sites management)
- Used tyre disposal
- Hydrocarbon contamination
- Growth medium availability and viability

The operational management methods to address the key closure issues are outlined below.

10.1.1 Waste landforms – stability and ARD management

Mine waste consists of non-gold bearing overburden. The overburden has not been altered by the mining process but exposure to the atmosphere can activate chemical processes that could be harmful to a receiving environment. The two potential pollution types are acid generating waste and leachable heavy metals. To contain mine wastes the mine waste landform design will adhere to the following principle and parameters:

- Create a permanent landform that is stable, non-eroding and sustains native vegetation so that the landform will blend into the surrounding environment visually and ecologically.
- Potentially Acid Forming (PAF) waste will be co-dumped with Non-Acid Forming (NAF) waste and waste with an Acid Neutralising Capacity (ANC). The dilution and potential neutralisation of PAF waste by co-mingling with NAF and ANC waste will avoid the creation of a concentrated cell of PAF waste that could be potentially harmful if exposed. Initial overburden characterisation indicates relatively small volumes of PAF.
- A 10m deep layer of NAF waste will encapsulate the co-mingled (NAF, PAF and ANC) waste.
- The waste landform will appear as low elevated landform that surround the mine pit voids. Waste landforms will be between 30m and 40m high. This will be lower than surrounding high points so that the final structures will not be visible from beyond the valley where the TGP operational area occurs.
- The maximum landform slope angle will be 15° (6:1 ratio) which is comparable to local dune slope angles.
- The dumps will be ringed by a toe bund. This will direct any surface runoff resulting from heavy rain into a pit void.
- Ongoing work over the life of the project will be required to verify the results obtained during the initial static and kinetic testing to ensure the proposed strategies remain appropriate.
- A 1m deep layer of selected growing medium will sheet the surface of the landforms with a wind erosion rock armouring on landform crests. This landform surfaces will then be revegetated (see Figure 10.1).

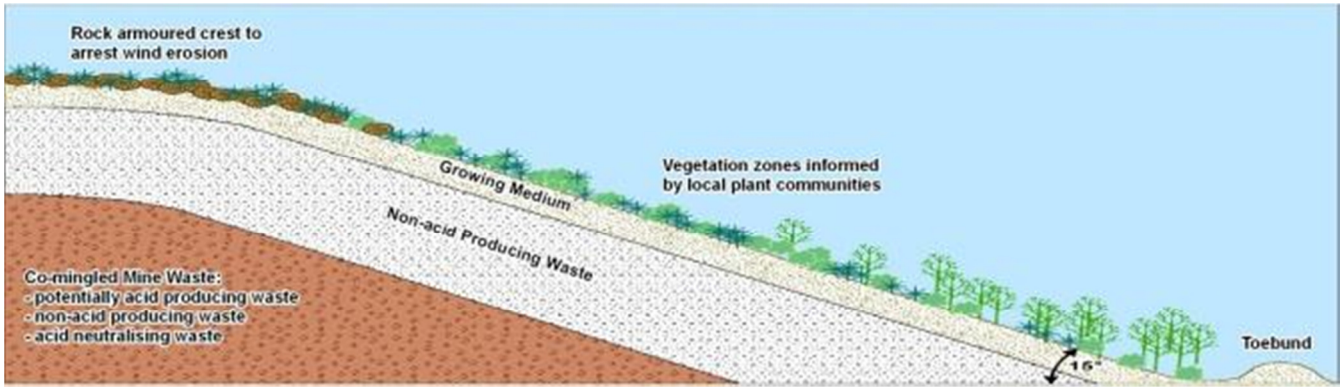


Figure 10.1 Conceptual waste landform cross section

10.1.2 Tailings Storage Facility

The projects TSF is a paddock style single celled facility comprised of a multi-zoned perimeter embankment with a low permeability basin liner being a combination of clay and HDPE liner. The TSF has been designed to store up to 75Mt of tailings and meets the requirements of the Department of Mines and Petroleum guidelines on the *Safe Design and Operating Standards for TSF's* (1999).

The tailings storage facility (TSF) has been located adjacent to the waste material landforms so that it can be incorporated into the surrounding waste landform at closure. To minimise the potential for acid generation within the TSF, closure and rehabilitation of the facility has been designed to reduce seepage potential and lowering the oxygen influx into the tailings by:

- Designing the closure profile to the water shedding;
- Placing low permeability layer over the tailings surface to reduce infiltration and oxygen influx; and
- Running the underdrainage system after mine closure to ensure tailings is fully drained.

A layer of growth-medium up to 1m thick will be placed over the low permeability soil layer and may be lightly ripped to encourage vegetation establishment. The main focus of the rehabilitation program will be revegetation, erosion control and stormwater management. Coarser material may be added to the growth medium in order to reduce the erosion potential of water running across the surface after rehabilitation.

10.1.3 Landfill

Landfill waste material will be segregated to facilitate recycling where practical. Putrescible and inert wastes will be disposed of at the site landfill. At closure the site will be capped with at least 2 m of inert material and then spread with at least 1 m of growing medium before being revegetated. The landfill will be recorded on a contaminated site register, as required by the *Contaminated Sites Act 2003 (WA).*

10.1.4 Used Tyre Disposal

Tyres form a substantial waste stream in mining operations. If tyre reuse or recycling is not feasible, used tyres will be appropriately buried within the waste material landforms. The disposal strategy will be consistent with the Department of Environment and Conservation requirements, which requires that all tyres are covered with at least 500mm of material:

a) in batches separated from each other by at least 100 mm of soil and each consisting of not more than 40 cubic metres of tyres reduced to pieces; and / or
b) in batches separated from each other by at least 100 mm of soil and each consisting of not more than 1 000 whole tyres.

10.1.5 Hydrocarbon Contamination

Hydrocarbons will be managed by ensuring they are stored in designated areas however it is inevitable that an amount of hydrocarbon contaminated soil will be created over the project life from spills associated with mobile and fixed plant. Hydrocarbon contaminated material will be decontaminated using a designated hydrocarbon bio-remediation facility. The bio-remediation facility will be decommissioned after monitoring confirms contamination levels have diminished and the site will be capped with 1 m of growth medium and revegetated.

10.1.6 Growth medium availability and Viability

The term “growth medium” is used at Tropicana to describe material such as sand, lateritic gravel, sandy gravels or lateritic sand with calcrete gravel which will support regrowth on rehabilitated areas. It is typically yellow red, reddish yellow or orange red in colour with a high coarse sand content (51-65%), very little silt and a generally low clay content (less than 20%), a soil pH between 5-7.5, a soil EC of less than 0.5dS/m and Exchangeable Sodium % of less than 6. Growth medium varies in depth from a few millimetres to up 5m in non-dune areas. Within the dunes the growth medium including the dune may extend up to 20m deep. Figure 10.2 shows a typical soil profile with material classified as sand and growth medium.

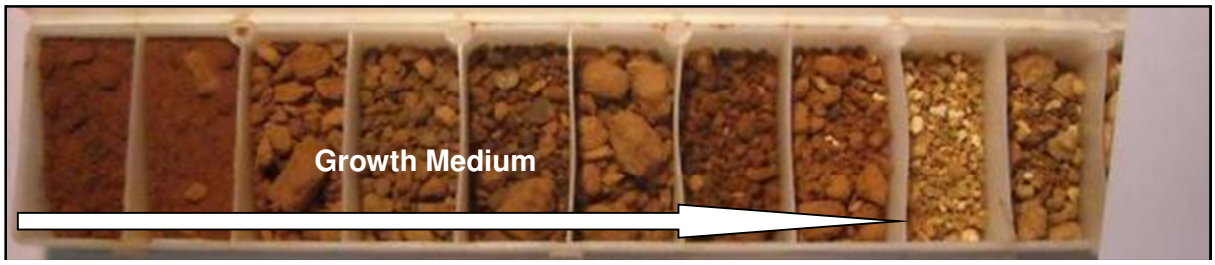


Figure 10.2 Soil Profile the two key types of Growth medium (sand and gravel)

Growth medium will be recovered following the removal of vegetation for use in rehabilitation. The growth medium will be stockpiled and managed in such a way as to minimise dust production, erosion, sedimentation of adjacent areas.

It is estimated that approximately 13Mm^3 of growth medium will be required for final rehabilitation the bulk of which will be recovered from within the pits (7.5Mm^3) and the remaining required material be recovered from sand dunes and prime growth medium areas located with the proposed waste landform footprints. Infrastructure areas and roads will be rehabilitated using 300mm of growth medium, while elevated landforms and haul road will be covered with a 1m layer.

Growth medium stockpiles will be established across the mining area, they have been design to minimise environmental impacts and to emulate the natural landforms in the area. Efforts will be made over the life of the projects to recovery and direct place growth medium onto rehabilitation area.

10.2 Rehabilitation plan

As part of the environmental impact assessment process, a rehabilitation benchmarking study for the project was undertaken by 360 environmental (2009). The aim of the report was to provide a summary of current industry practices that can guide the rehabilitation activities for the project, the outcome of which help guide the rehabilitation and closure principles for the project.

Rehabilitation for the Project will be progressively undertaken where practical. Within the first five years of the Project (including construction), rehabilitation activities will focus on the rehabilitation of historical exploration activities. Table 10.1 provides an indicative rehabilitation schedule for the Project.

Table 10.1 Indicative Rehabilitation Schedule (taken from the BFS)

Facilities	Rehabilitation period	Comments
Exploration areas	2013-2015	Rehabilitation associated with the temporary camp and airstrip
Waste material landforms	2016-2023	
Pits	2021-2022	Pit voids will remain. Abandonment bund will be rehabilitated
TSF	2021-2025	Assumes that TSF is required for the full life of the Project
Process Plant/workshops/administration	2021-2023	
ROM	2021-2023	
Mine village	2023-2025	
Borefield and Pipeline Corridor	2023-2025	Water bores will be retained
Airstrip	-	Envisaged that the asset will be transferred to another owner
Mine access Road	-	Envisaged that the asset ownership will be transferred. Retired borrow pits will be progressively rehabilitated.

As a principle, rehabilitation will be progressively undertaken as an area ceases to be operational. Progressive rehabilitation will reduce environmental risk, reduce financial liability at closure and enable site specific rehabilitation techniques to be proven. The majority of disturbed areas, however, will remain operational until the closure and de-commissioning phases of the TGM, thus the majority of rehabilitation will occur at the End of Mine life (EOM).

Up to approximately 3,940 (including the pit void) hectares of land will be disturbed and require rehabilitation over the life of the project. Areas requiring rehabilitation are listed in Table 10.2.

Table 10.2 Areas Requiring Rehabilitation

Activity	Area (ha)
Operational Area	2,170*
Water Supply	200
Infrastructure area	670
Total Disturbance	3,440

*excludes the 400ha open pit voids which will not be rehabilitated

Following the removal of infrastructure, a case by case decision will be made as to the most appropriate surface preparation for areas to facilitate revegetation. Options include leaving an area as is, preparing a seeding and/or planting surface by ripping and scarifying, to spreading of a growing medium.

Successful revegetation of the project area presents numerous technical challenges that will require targeted research and trials to address over the mine life. There is a well-developed body of knowledge on revegetation techniques throughout Australia including waste dump revegetation in the Goldfields and other arid and semi-arid areas; however, there is no revegetation project that is directly comparable to the TGM and therefore the overall revegetation process will be unique to the site.

There are two distinct types of rehabilitation proposed for the TGM:

1. Constructed landform rehabilitation – This is a challenging technical exercise that requires the creation of conditions to permanently support revegetation and the selection of vegetation types that are appropriate to the new landforms.
2. Re-instatement of disturbed areas – This will aim at blending into the surround landscape by, and as much as is practicable, returning original vegetation. These areas are outside of

the active operational area and include access roads, water extraction areas, the village and the airstrip.

The waste landforms will be covered with one metre of sand as a growing media. Research will determine whether an impervious layer below the growth medium is needed to support dune vegetation. The waste landform crests will be particularly vulnerable to wind erosion and will be armoured with a gravel/rock cover. The cover material will be carefully selected to be able to support vegetation. To this end it must not be dispersive or hard setting, acidic, saline or contain heavy metals in concentrations that negatively impacts plant growth.

Selection of the preferred vegetation assemblage for each distinct area of rehabilitation will be developed through a comprehensive understanding of the various vegetation communities that occur in the local area and matching that with a comprehensive understanding of what type of vegetation communities are possible in the reconstructed landscape.

The establishment of the nominated vegetation communities will be tackled by applying the following hierarchy of priority:

1. Focus on framework species: Vegetation surveys have identified a number of species that make up the majority of plant cover in the various plant communities expected to be routinely rehabilitated. Those species are:
   - *Eucalyptus gongylocarpa* (Marble Gum) and a variety of other tree form and mallee eucalypts;
   - *Acacia aneura* (Mulga); and,
   - *Casuarina cristata* (Black Oak).
2. Dominant understorey species:
   - *Triodia basedowii* (Hard Spinifex) and other ubiquitous grass species.
3. Priority species affected by mining operations.
4. Other species that were present before clearing: Ideally all species that were present prior to clearing for the mine operation will be returned into the rehabilitation. However, the applied research program may demonstrate that the return of some species cannot reasonably be accomplished. The TGM assumes a species return target of at least 70% of the original botanical diversity of the area formerly occupied by the disturbance area in question.

Rehabilitation methods may include the following techniques and it is likely that a combination of these techniques will be adopted:

- Re-introduce plant species and soil biota by careful handling of growing medium;
- Direct seeding;
- Growing seedlings for planting out;
- Growing cuttings for planting out;
- Direct transplanting;
- Employing micro-propagation methods to multiply plants; and,
- Creating habitat and micro-habitat for fauna re-colonisation by employing methods such as increasing surface roughness or replacing sheltering logs and rocks within the rehabilitation areas.

Management of fire within rehabilitation areas will assist in protecting and encouraging young rehabilitation as well as assisting to minimise weed growth.

10.3 Rehabilitation Monitoring

The rehabilitation monitoring program will be designed to measure the indicators that will be used to assess completion criteria. In addition to the completion criteria a set of interim monitoring criteria will be defined to measure against. The interim criteria will, in effect, act as gates that a section of rehabilitation must successfully pass through to its next interim criteria or completion criteria. If a section of rehabilitation is unable to reach an interim criterion the monitoring will trigger a remedial response.

Monitoring serves two purposes - it confirms that rehabilitation is tracking towards the completion criteria, and if it is not a, remedial response can be triggered. The TJV recognises that remediation is a critical element of successful rehabilitation and is building remediation planning into standard operating practice. Rehabilitation remediation may require a different suite of methods to rehabilitation establishment. The TGM will address gaps in remediation knowledge in its rehabilitation research program.

10.4 Care and maintenance plan

Should an unexpected early closure of the TGM be required or if the project was placed in care and maintenance, the following actions will be required:

- An environmental audit of the site will be undertaken to identify and fully appreciate any environmental risks that will exist during the closure period;
- The Care and Maintenance Plan will be reviewed immediately; and
- The reviewed Care and Maintenance Plan will be submitted to the Department of Minerals and Energy.

A preliminary care and maintenance plan has been developed and is provided in Appendix 4. The Care and Maintenance Plan includes:

- An Emergency Response Procedure.
- A mine access and security review.
- A geo-technical monitoring program to ensure the ongoing stability of tailings storage and waste landforms.
- A program to address outstanding rehabilitation and remediation works.
- A program of environmental monitoring and inspection. This will include; chemical and hydrocarbon storage, treatment plant condition, pit water monitoring, erosion monitoring, rehabilitation monitoring.

10.5 Decommissioning plan

Decommissioning and removal of plant and infrastructure (including processing facilities, power plant, offices, camp, borefield and service roads) will be undertaken by conventional measures to meet standard tenement conditions. Tasks to be implemented for plant and infrastructure decommissioning at TGM include:

- Disconnection and termination of services (water, power, communications).
- Purging of hazardous storage tanks and treatment or disposal off-site by a licensed operator. Removal of tanks and associated pipes, valves and pumps.
- Breaking up of bitumen surfaces and concrete footings.
- Demolition of buildings (unless a buyer can be found), and disposal.
- Emptying of ponds, removal of liners and pushing in embankments.
- Removal of pumps, pipelines, fuel tanks and generators from groundwater bores.
- Complete decommissioning (including backfilling and capping) may not be necessary if another stakeholder can be found to take over liability for the borefield.
- Identification and removal or remediation of any contaminated material.

10.5.1 Water Supply Area and Pipeline Corridor

Investigation of the proposed production water bore field at Minigwal aquifer concludes that the aquifer will recover naturally following 10 years of abstraction of up to 14 ML/day (Pennington Scott, March 2009).
For closure:

- the individual bores will be capped and locked
- all borefield infrastructure of value will be transported off site.
- all remaining inert waste will be removed to the landfill or broken up and buried in situ.
- all ground disturbance will be rehabilitated using the techniques to be developed in the TGP rehabilitation program.

The aquifer will be monitored for 10 years or until it recovers more than 80% of its initial capacity.

10.5.2 Mine Voids

It is intended that the mine pit voids will remain at closure although there is potential to backfill small satellite voids provided reopening of a pit due to changes in the resource economics is not considered as an option.

The core objectives of final void management are informed by the Mine Void Water Resource Issues in Western Australia report (Johnson and Wright, 2003) prepared by the then Water and Rivers Commission (Department of Water). They are:

- render the site acceptable and safe over the long term;
- minimise environmental and health risks;
- maximise to the practicable extent an potential future usage of the site; and,
- develop a “walk away” solution.

The mine voids will intersect with saline groundwater aquifers between 20 m and 50 m below the present surface (URS, October 2007) and will slowly form permanent pit lakes at the cessation of operations. The pit lakes have the potential to become increasingly saline over time. The possible impact of the permanent pit lakes on the surrounding groundwater will be resolved over the life of mine closure process.

10.5.3 Other Infrastructure

This plan is premised on the removal, remediation and rehabilitation of all mine infrastructure including roads, airstrip, buildings and other structures. Prior to mine closure a decision will be made in consultation with stakeholders as to whether any infrastructure will be retained. All structures that are dismantled will be removed from site, relocated for burial in a designated onsite landfill or broken up and buried in situ.

The mine village is planned to be constructed using environmentally sustainable principles and sited in an aesthetically pleasing setting. There is scope for the village to be utilised for post-mining purposes if required.

A detailed decommissioning plan is currently being developed and will be provided in future iterations of the mine closure plan.

10.6 Communications Plan

Stakeholder information and consultation plan/Internal communications plan will be developed by the closure communications committee when it is formed.

10.7 Implementation and Accountabilities

Mine closure activities will be conducted progressively where possible. An implementation plan will be developed which clearly outlines Department accountabilities in regards to closure activities. These will be documented in future versions of the sites mine closure documentation.

10.8 Documentation and Reporting

This mine closure plan will be updated every 3-5years as required and will become more detailed as the operations head towards closure. Annual reporting will be undertaken throughout the operational phase of the Project which will include details on any closure and rehabilitation activities that have been conducted.

AngloGold Ashanti Australia's ONE Integrated Management System provides the mechanism for records retention following the closure and relinquishment of the Project. Records to be retained following relinquishment will include:

- geological records, including core logs;
- plans and surveys of developments and facilities;
- locations, quantities and qualities of stored waste;
- design and specifications of final landform construction and rehabilitation; and,
- rehabilitation research and monitoring.

11 POST CLOSURE MONITORING PROGRAM

Post closure monitoring will be required on a variety of parameters including groundwater, rehabilitation succuss and landform stability to ensure completion criteria is being achieved. An Environmental Monitoring Strategy has been developed for all phases of the project, including mine closure which details the monitoring requirements, purpose, methods, frequency and reporting requirements. Post closure monitoring will be conducted in accordance with that strategy, a copy of which is attached in Appendix 5.

12 RELINQUISHMENT PROCESS

Upon the successful rehabilitation of the TGP the TJV will seek to relinquish the mining lease to the Western Australian Government via the lead regulatory agency (currently the Department of Mines and Petroleum). The establishment of a closure process early in the project's life (outlined in this document and including agreed and achievable completion criteria) will engender a clear understanding of expectations and direction for all participants.

It is proposed that relinquishment at the TGP will take the following steps:

1. Establishment of formal closure, sign off and relinquishment mechanisms – The TGP seeks to achieve this through the establishment of agreed completion criteria, an up to date closure plan and a Consultative Closure Committee.
2. Peer review of formal mechanisms prior to stakeholder assessment and approval – The TGP is working with the Botanical Parks and Gardens Authority to establish the technical parameters for the rehabilitation of the TGP. That engagement will shift to other areas of technical speciality as the project progresses.
3. Sites that have successfully met the criteria are presented for relinquishment in a formal sign off – The TGP will prepare a checklist of completion criteria and record the status of each area against the criteria. To be inspected and signed off by representatives of the TJV and lead regulatory agency.
4. Establish a process to deal with any sites that do not meet the completion criteria – a corrective action plan would be prepared by the TGP to address the concern of the lead regulatory agency.

12.1.1 Records Retention

This Conceptual Closure and Rehabilitation Plan has identified that records retention can play an important role in achieving consistent rehabilitation outcomes. The AngloGold Ashanti Integrated Management System provides the mechanism for records retention following the closure and relinquishment of the TGP. Records to be retained following relinquishment should include the following:

- Geological records, including core logs
- Plans and surveys of developments and facilities
- Locations, quantities and qualities of stored waste
- Design and specifications of final landform construction and rehabilitation
- Rehabilitation research and monitoring

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APPENDIX 1 TENEMENT CLOSURE CONDITIONS/COMPLIANCE REGISTER

Source	Condition Number/report section	Commitment
Conceptual Closure and Rehabilitation Strategy	5.2	An environmental audit of the entire site will be undertaken to fully appreciate any environmental risks that will exist during the closure / care and maintenance period;
Conceptual Closure and Rehabilitation Strategy	5.2	The Care and Maintenance Plan will be reviewed immediately; and,
Conceptual Closure and Rehabilitation Strategy	5.2	The reviewed Care and Maintenance Plan will be submitted to the Department of Mines and Petroleum for their information
Conceptual Closure and Rehabilitation Strategy	5.2	The Care and Maintenance Plan will include: • an Emergency Response Procedure; • a mine access and security review; • a geo-technical monitoring program to ensure the ongoing stability of tailings storage and waste landforms; • a program to address outstanding rehabilitation and remediation works; and, • a program of environmental monitoring and inspection. This will include chemical and hydrocarbon storage, treatment plant condition, pit water monitoring, erosion monitoring, rehabilitation monitoring.
Conceptual Closure and Rehabilitation Strategy	5.5	Establish a Closure Consultative Committee.
Conceptual Closure and Rehabilitation Strategy	5.5	Determine final land-uses and get regulator sign off.
Conceptual Closure and Rehabilitation Strategy	5.5	Determine indicators for completion and obtain regulator sign off.
Conceptual Closure and Rehabilitation Strategy	5.5	Determine actual completion criteria (often expressed as a number or range) through environmental investigation and applied research
Conceptual Closure and Rehabilitation Strategy	5.5	Develop and maintain an information system that records and maps waste stockpiling and final deposition.
Conceptual Closure and Rehabilitation Strategy	5.5	Develop and maintain an information system that records and maps growing media stockpiling and final deposition.
Conceptual Closure and Rehabilitation Strategy	5.5	Implement the Closure Knowledge Document Control Procedure
Conceptual Closure and Rehabilitation Strategy	8.1	A Consultative Closure Committee for the Project will be an effective means of engaging stakeholders and demonstrating to regulators that there is community support and input into the overall Closure and Rehabilitation Plan. The Consultative Closure Committee can also have a formal role in the relinquishment sign-off process.
Conceptual Closure and Rehabilitation Strategy	10.1	Create a permanent landform that is stable, non-eroding and sustains native vegetation so that the landform will blend into the surrounding environment visually and ecologically.
Conceptual Closure and Rehabilitation Strategy	10.1	The identified preferred waste management procedure will entail co-dumping Potentially Acid Forming (PAF) waste with Non-Acid Forming (NAF) waste and waste with an Acid Neutralising Capacity (ANC). The dilution and potential neutralisation of PAF waste by comingling with NAF and waste with ANC will avoid the creation of a concentrated cell of PAF waste that could be potentially harmful if exposed to air. Initial overburden characterisation indicates relatively small volumes of PAF.
Conceptual Closure and Rehabilitation Strategy	10.1	A layer of NAF waste will cover the co-mingled NAF, PAF and ANC waste.
Conceptual Closure and Rehabilitation Strategy	10.1	The final waste landform will be a low elevated landform that surrounds the mine pit voids. Waste landforms will be lower than surrounding high points so that the final structures will not be visible from beyond the valley where the Project's Operational Area is situated.
Conceptual Closure and Rehabilitation Strategy	10.1	The maximum landform slope angle will be 15° (6:1 ratio) which is comparable to local dune slope angles.
Conceptual Closure and Rehabilitation Strategy	10.1	The waste landforms will be ringed by a toe bund. This will direct any surface runoff resulting from heavy rain into a pit void.
Conceptual Closure and Rehabilitation Strategy	10.1	Ongoing work over the life of the Project will be required to verify the results obtained during the initial static and kinetic testing to ensure the proposed strategies remain appropriate.
Conceptual Closure and Rehabilitation Strategy	10.1	A layer of selected growing medium will cover the surface of the landforms with a wind erosion rock armouring on landform crests (if required). This landform surface will then be revegetated.
Conceptual Closure and Rehabilitation Strategy	10.2	The tailings storage facility will be incorporated into the surrounding mine waste landform and the outer wall will be progressively rehabilitated is practicable. The facility will be covered with inert mine waste, followed by growing medium and revegetated.
Conceptual Closure and Rehabilitation Strategy	10.3	At closure the landfill will be capped with inert material and then spread with growing medium before being revegetated.
Conceptual Closure and Rehabilitation Strategy	10.3	The landfill will be recorded on a contaminated sites register, as required by the State *Contaminated Sites Act 2003.*
Conceptual Closure and Rehabilitation Strategy	10.5	The remediation facility will be decommissioned after monitoring confirms contamination levels have diminished and the site will be capped with growing medium and revegetated.
Conceptual Closure and Rehabilitation Strategy	11.1	Water Supply Area and Pipeline Corridor for closure: • individual bores will be capped and locked; • all borefield infrastructure of value will be transported off site; • all remaining inert waste will be removed to the landfill or broken up and buried in situ; and, • all ground disturbance will be rehabilitated using the techniques to be developed in the Project's rehabilitation program.
Conceptual Closure and Rehabilitation Strategy	11.1	The aquifer will be monitored for 10 years or until it recovers more than 80 % of its initial level.
Conceptual Closure and Rehabilitation Strategy	11.2	The mine voids will intersect with saline groundwater aquifers between 20 m and 50 m below the present surface (URS, October 2007) and will slowly form permanent pit lakes at the cessation of operations. The pit lakes have the potential to become increasingly saline over time. The possible impact of the permanent pit lakes on the surrounding groundwater will be resolved over the life of mine closure process.
Conceptual Closure and Rehabilitation Strategy	11.3	This plan is premised on the removal, remediation and rehabilitation of all mine infrastructure including roads, airstrip, buildings and other structures. Prior to mine closure a decision will be made in consultation with stakeholders as to whether any infrastructure will be retained.
Conceptual Closure and Rehabilitation Strategy	11.3	All structures that are dismantled will be removed from site, relocated for burial in a designated onsite landfill or broken up and buried in situ.
Conceptual Closure and Rehabilitation Strategy	11.3	The mine village is planned to be constructed using environmentally sustainable principles and sited in an aesthetically pleasing setting. There is potential for the village to be utilised for post-mining purposes if required.
Conceptual Closure and Rehabilitation Strategy	12	As a principle, rehabilitation will be progressively undertaken as an area ceases to be operational.

Source	Condition Number/report section	Commitment
Conceptual Closure and Rehabilitation Strategy	12.1	All disturbed areas (excluding the open pit voids) will be prepared for revegetation. Following the removal of infrastructure a case by case decision will be made as to the most appropriate surface preparation for areas to facilitate revegetation. Options include leaving an area as is, preparing a seeding and/or planting surface by ripping and scarifying, or application of a growing medium.
Conceptual Closure and Rehabilitation Strategy	12.2	The waste landforms will be covered with one metre of sand as a growing media.
Conceptual Closure and Rehabilitation Strategy	12.2	Another set of rehabilitation protocols will be developed to prepare areas for revegetation outside the operational area (such as access roads, water extraction infrastructure and the village).
Conceptual Closure and Rehabilitation Strategy	12.2	Sandy growing medium for rehabilitation is identified as a crucial resource at the Project. Procedures will be developed to characterise, strip, stockpile, re-spread and account for growing medium to ensure its wise use. If trials prove it possible, biological attributes such as seed and soil biota will be recovered from the clearing and stripping process and transported to waste landform covers
Conceptual Closure and Rehabilitation Strategy	12.2	Selection of the preferred vegetation assemblage for each distinct area of rehabilitation will be informed by developing a comprehensive understanding of the various vegetation communities that occur in the local area and matching that with a comprehensive understanding of what type of vegetation communities are possible in the reconstructed landscape.
Conceptual Closure and Rehabilitation Strategy	12.2	Seed management will include the following elements: • establish seed collection provenance zones that ensure the genetic integrity of the new vegetation communities; • determine the abundance of the seed resource within the allocated seed provenance zones to ensure that the ecology of the seed collection areas are not compromised by over collecting; • establish seed storage protocols that maximise viability, shelf life and revegetation success; • establish seeding techniques that maximise germination and establishment; and, • undertake a cost-benefit analysis that weighs up the effort of collecting seed with the effectiveness of the revegetation method. For example, if the seed of a particular species is relatively abundant then direct seeding with a relatively low establishment may be appropriate, however, if the seed of a species is difficult to collect then methods such as seedling raising (to increase recruitment) may be more appropriate.
Conceptual Closure and Rehabilitation Strategy	12.2	The Project team will: • monitor and analyse revegetation establishment; • make provision for poor establishment; and, • include rehabilitation maintenance and remediation as part of its standard practice.
Conceptual Closure and Rehabilitation Strategy	12.2	The rehabilitation monitoring program will be designed to measure the indicators that will be used to assess completion criteria. In addition to the completion criteria a set of interim monitoring criteria will be defined to measure against. The interim criteria will act as a series of sequential milestones that a section of rehabilitation must pass through in order to meet the next interim criteria or completion criteria. If a section of rehabilitation is unable to reach an interim criterion the monitoring will trigger a remediation response.
Conceptual Closure and Rehabilitation Strategy	12.2	Management of fire within rehabilitation areas may include: • excluding fire from some areas for at least seven years to protect young rehabilitation as it develops to a state that is fire tolerant; and, • potentially using fire in specific areas as a tool to manipulate rehabilitation development e.g. to encourage re-
Conceptual Closure and Rehabilitation Strategy	12.2	Upon successful rehabilitation of the Project area, the Joint Venture will seek to relinquish the mining lease to the Western Australian Government via the lead regulatory agency (currently the Department of Mines and Petroleum).
Conceptual Closure and Rehabilitation Strategy	12.2	It is proposed that relinquishment of the Project will involve the following steps: Establishment of formal closure, sign off and relinquishment mechanisms – The Joint Venture seeks to achieve this through the establishment of agreed completion criteria, an up to date closure plan and a Consultative Closure Committee. 2. Peer review of formal mechanisms prior to stakeholder assessment and approval – The Joint Venture is working with the Botanical Gardens and Parks Authority to establish the technical parameters for the rehabilitation of the Project. Their participation will incorporate other areas of technical speciality as the Project progresses. 3. Sites that have successfully met the criteria are presented for relinquishment in a formal sign off – The Project team will prepare a checklist of completion criteria and record the status of each area against the criteria to be inspected and signed off by representatives of the Joint Venture and lead regulatory agency. 4. Establish a process to deal with any sites that do not meet the completion criteria – a corrective action plan would be prepared by the Project team to address any concerns of the lead regulatory agency.
Conceptual Closure and Rehabilitation Strategy	13.1	Records to be retained following relinquishment should include the following: • geological records, including core logs; • plans and surveys of developments and facilities; • locations, quantities and qualities of stored waste; • design and specifications of final landform construction and rehabilitation; and, • rehabilitation research and monitoring.
Mining Landform Infrastructure Mining Proposal MP20120326	3.2.6	Growth medium will be recovered following the removal of vegetation for use in rehabilitation. The growth medium will be stockpiled and managed in such a way as to minimise dust production, erosion, sedimentation of adjacent areas.

Source	Condition Number/report section	Commitment
Mining Landform Infrastructure Mining Proposal MP20120326	3.2.6	Infrastructure areas and roads will be rehabilitated using 300mm of growth medium, while elevated landforms and haul road will be covered with a 1m layer. It is estimated that approximately 13Mm^3 of growth medium will be required for final rehabilitation the bulk of which will be recovered from within the pits (7.5Mm^3) and the remaining required material be recovered from sand dunes and prime growth medium areas located with the proposed waste landform footprints.
Mining Landform Infrastructure Mining Proposal MP20120326	3.2.6	Growth medium stockpiles will be established across the mining area, they have been design to minimise environmental impacts and to emulate the natural landforms in the area. Given the large volumes of growth medium required to achieve a 1m cover, it is envisaged that growth medium stockpiles will be up to 20m high. The width of the stockpiles will be determined by the equipment used to recovery and transport the material taking into consideration safety requirements. Efforts will be made over the life of the projects to recovery and direct place growth medium onto rehabilitation area. It is not envisaged that this will be practical for the first 5-years of mining.
Mining Landform Infrastructure Mining Proposal MP20120326	3.2.6	Vegetation will be recovered and stockpile across the mining area as a rehabilitation resource. Trees above 300mm diameter will be selectively recovered and stockpile.
Mining Landform Infrastructure Mining Proposal MP20120326	4.5	Any vegetation and growth medium removed (including large trees >300mm) is placed either directly on disturbed areas to reduce erosion or stockpiled (away from drainage lines) for later use in rehabilitation.
Mining Landform Infrastructure Mining Proposal MP20120326	4.5	Rehabilitate surplus areas as soon as practical to reduce dust generation.
Mining Landform Infrastructure Mining Proposal MP20120326	4.5	At closure, a toe drain will be installed to contain any run-off generated from the rehabilitated waste landform. This drain will divert run-off to the pit void.
Mining Landform Infrastructure Mining Proposal MP20120326	4.5	Conduct rehabilitation progressively where appropriate.
Mining Landform Infrastructure Mining Proposal MP20120326	4.5	Protection of newly rehabilitated areas and rehabilitation resources from fire.
Mining Landform Infrastructure Mining Proposal MP20120326	4.5	Construct landforms that are stable and support target ecosystems.
Mining Landform Infrastructure Mining Proposal MP20120326	5.1	As outlined in the Conceptual Closure and Rehabilitation Strategy, a Consultative Closure Committee will be established during the operational phase of the Project to provide a forum for ongoing discussion about long term objectives for closure.
Mining Landform Infrastructure Mining Proposal MP20120326	5.2	The post operational aim for the Project is to establish a sustainable native ecosystem, which is as similar to the pre-existing ecosystem, as can be achieved within the limits of recognised, good practice rehabilitation methods and the post mining environment. At present, the end use for the operational area will be a return to unallocated crown land which is the current tenure status. Consideration will be given to an alternative closure strategy for the area in consultation with key stakeholders and other land users in the region.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	At mine closure, the operational area infrastructure will be decommissioned and disassembled and the land will be rehabilitated. Any disturbed areas that are no-longer required by the project will be progressively rehabilitated. As a principle, rehabilitation will be progressively undertaken as an area ceases to be operational. Progressive rehabilitation will reduce environmental risk, reduce financial liability at closure and enable site specific rehabilitation techniques to be proven. The majority of disturbed areas, however, will remain operational until the closure and de-commissioning phases of the Project, thus the majority of rehabilitation will occur during the closure phase.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	To contain mine wastes the mine waste landform design will adhere to the following principles and parameters: • create a permanent landform that is stable, non-eroding and sustains native vegetation so that the landform will blend into the surrounding environment visually and ecologically; • the identified preferred waste management procedure will entail co-dumping Potentially Acid Forming (PAF) waste with Non-Acid Forming (NAF) waste and waste with an Acid Neutralising Capacity (ANC). The dilution and potential neutralisation of PAF waste by comingling with NAF and waste with ANC will avoid the creation of a concentrated cell of PAF waste that could be potentially harmful if exposed to air. Initial overburden characterisation indicates relatively small volumes of PAF; • a layer of NAF waste will cover the co-mingled NAF, PAF and ANC waste; • the final waste landform will be a low elevated landform that surrounds the mine pit voids. Waste landforms will be lower than surrounding high points so that the final structures will not be visible from beyond the valley where the Project's Operational Area is situated; • the maximum landform slope angle will be 15° (6:1 ratio) which is comparable to local dune slope angles; • the waste landforms will be ringed by a toe bund. This will direct any surface runoff resulting from heavy rain into a pit void; and, • ongoing work over the life of the Project will be required to verify the results obtained during the initial static and kinetic testing to ensure the proposed strategies remain appropriate.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	A layer of selected growing medium will cover the surface of the landforms with a wind erosion rock armouring on landform crests (if required). This landform surface will then be revegetated.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	It is intended that the mine pit voids will remain at closure although there is potential to backfill small satellite voids provided reopening of a pit due to future changes in resource economics is not considered viable.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	The mine voids will intersect with saline groundwater aquifers between 20 m and 50 m below the present surface (URS, October 2007) and will slowly form permanent pit lakes at the cessation of operations. The pit lakes have the potential to become increasingly saline over time. The possible impact of the permanent pit lakes on the surrounding groundwater will be resolved over the life of mine closure process.

Source	Condition Number/report section	Commitment
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	The following hierarchy will apply to establishing vegetation communities: 1. Focus on framework species: Vegetation surveys have identified a number of species that make up the majority of plant cover in the various plant communities that are expected to be routinely rehabilitated for the Project. Those species are: • Eucalyptus gongylocarpa (Marble Gum) and a variety of other tree- and mallee-form • Eucalypts; • Acacia aneura (Mulga); and, • Casuarina cristata (Black Oak). 2. Dominant understorey species being Triodia basedowii (Hard Spinifex) and other ubiquitous grass species. 3. Priority species affected by mining operations. 4. Other species that were present before clearing: Ideally all species that were present prior to clearing for the Project will be returned during rehabilitation. However, the applied research program may demonstrate that the return of some species cannot reasonably be accomplished. The Joint Venture assumes a species return target of at least 70% of the original botanical diversity of the area formerly occupied by the disturbance area in question.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	Rehabilitation will however be vulnerable to drought and other weather extremes. To address this uncertainty rehabilitation success will be monitored and measures to repair/maintain rehabilitation success will be implemented.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	The following objectives will direct rehabilitation across the Project: • Rehabilitation work will be undertaken to ensure that it achieves an acceptable standard compatible with the intended land use and consistent with appropriate criteria. • To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values. • To ensure that aesthetic values are considered and measures are adopted to reduce visible impacts on the landscape as low as reasonably practicable. • Create the integrity, ecological functions and environmental values of landscapes and landforms.
Mining Landform Infrastructure Mining Proposal MP20120326	5.3	Upon successful rehabilitation of the Project area, the Joint Venture will seek to relinquish the mining lease to the Western Australian Government via the lead regulatory agency (currently the Department of Mines and Petroleum).
Mining Proposal - Minigwal South Water Area MP20110131	3.2.1	All of the water pipeline and associated materials shall be removed at the close of mine.
Mining Proposal - Minigwal South Water Area MP20110131	3.5	At the completion of the mining activities at the TGP, the Tropicana JV shall ensure that the all conditions relating to the cessation of activities at the Minigwal South Water Area are complied with.
Mining Proposal - Minigwal South Water Area MP20110131	4.2	The minigwal south area will be rehabilitated at the end of its use
Mining Proposal - Minigwal South Water Area MP20110131	4.4	Stockpiled volumes of growth medium will be periodically monitored to ensure the volume available meets rehabilitation requirements for borrow pit and road rehabilitation
Mining Proposal - Minigwal South Water Area MP20110131	4.4	Conduct visual inspections of areas following rehabilitation to determine compliance with closure criteria.
Mining Proposal - Minigwal South Water Area MP20110131	5.1	Where appropriate, the Conceptual Closure and Rehabilitation Strategy shall be applied
Mining Proposal - Minigwal South Water Area MP20110131	5.1	A Consultative Closure Committee will be established during the operational phase of the TGP
Mining Proposal - Minigwal South Water Area MP20110131	5.2	The post operational aim for the MSWA is to establish a sustainable native ecosystem
Mining Proposal - Minigwal South Water Area MP20110131	5.2	Currently it is proposed that at closure, the land will be returned to Vacant Crown Land tenure
Mining Proposal - Minigwal South Water Area MP20110131	5.3	Rehabilitation of the pipeline corridors, access tracks and the turkey's nest will progressively utilise the stockpiled growth medium
Mining Proposal - Minigwal South Water Area MP20110131	5.3	As water abstraction from boreholes located at the Minigwal South Water Area are no longer required they will be decommissioned
Mining Proposal - Minigwal South Water Area MP20110131	5.3	Borehole will be sealed with concrete, cutting collars below ground and mounding soil over the cut collar.
Mining Proposal - Minigwal South Water Area MP20110131	5.3	ensure that rehabilitation achieves an acceptable standard compatible with the intended land use and consistent with appropriate criteria
Mining Proposal - Minigwal South Water Area MP20110131	5.3	that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values
Mining Proposal - Minigwal South Water Area MP20110131	5.3	ensure that aesthetic values are considered and measures are adopted to reduce visible impacts on the landscape as low as reasonably practicable
Mining Proposal - Minigwal South Water Area MP20110131	5.3	Create the integrity, ecological functions and environmental values of landscapes and landforms
Mining Proposal - MP200110531 TGP Operational Area Early Works	1.2	The growth medium stockpile will be revegetated progressively to minimise erosion and encourage biological activity.
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.10	Most of the growth medium recovered during the early works construction phase will be transported to the growth medium stockpile for storage unless it can be used for rehabilitation of temporary activity areas. In some cases, such as alongside access tracks or pipeline corridors, growth medium may be stockpiled adjacent to the corridor to reduce rehandling of the material. Borrow pits may also be used as topsoil storage areas if required
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.4	Laydown areas along the process water supply service corridor will be rehabilitated with recovered growth medium and vegetation post construction.
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.8	Sewage and waste water systems may be retained initially during the operational phase. If not required they will be decommissioned and rehabilitated at an appropriate time
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.8	Temporary buildings established for the construction project will be removed following completion of construction activities.
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.8	The temporary RO plant will be removed from site when no longer required

Source	Condition Number/report section	Commitment
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.8	Temporary service areas will be decommissioned on completion of construction activities. Contaminated soil from within the service area and any present in the surrounding area will be either be cleaned-up via insitu bioremediation or the contaminated soil will be removed and taken to the site bioremediation facility.
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.8	Plastic lining from temporary service areas will be disposed of at an appropriately licensed hydrocarbon disposal site
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.8	When decommissioning the temporary fuel facility the soil will be removed and taken to the site bioremediation facility for decontamination and the plastic will be disposed of at an appropriately licensed hydrocarbon disposal site.
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.9	Cleared vegetation and growth medium will be stockpiled within the disturbance footprint of the pits for later rehabilitation activities.
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.9	Three borrow pits are located within the mining and waste landform footprints and will therefore not be rehabilitated. The one adjacent to the Process Plant to Village Service corridor will be rehabilitated when no longer required as a borrow source.
Mining Proposal - MP200110531 TGP Operational Area Early Works	3.2.10	Revegetation of the stockpile will be undertaken progressively to minimise erosion and encourage biological activity.
Mining Proposal - MP200110531 TGP Operational Area Early Works	4.2	Should temporary construction areas no longer be required they will be rehabilitated and the disturbance footprint of the project updated accordingly through the Annual Environmental Report (AER).
Mining Proposal - MP200110531 TGP Operational Area Early Works	4.4	Stockpiled volumes of growth medium will be periodically monitored to ensure the volume available meets rehabilitation requirements.
Mining Proposal - MP200110531 TGP Operational Area Early Works	4.4	Conduct visual inspections of areas following rehabilitation to determine compliance with closure criteria.
Mining Proposal - MP200110531 TGP Operational Area Early Works	5.1	A Consultative Closure Committee will be established during the operational phase of the Project to provide a forum for ongoing discussion about long term objectives for closure.
Mining Proposal - MP200110531 TGP Operational Area Early Works	5.1	The Project Conceptual Closure and Rehabilitation strategy is currently being reviewed and updated in line with the draft DMP Mine Closure Plan Guidelines. It is anticipated that this review will be completed by end of 2011 and submitted to the DMP.
Mining Proposal - MP200110531 TGP Operational Area Early Works	5.3	Any disturbance which ceases to be required by the Project will be progressively rehabilitated as they are no longer required.
Mining Proposal - MP200110531 TGP Operational Area Early Works	5.3	Redundant infrastructure such as temporary offices, ablutions, crib rooms, the village 'fly camp', temporary water treatment plant and batch plant will be removed from site.
Mining Proposal - MP200110531 TGP Operational Area Early Works	5.3	The following rehabilitation activities will be undertaken following completion of the Project: • Surplus infrastructure including buildings, pipelines, power lines and telecommunications will be decommissioned and removed from site. • Concreted areas will be broken up and removed to an appropriate disposal location if practical or buried in-situ. • If not required by stakeholders, the bitumised airstrip will be broken up and buried in situ. • Drainage features will be in-filled and surface drainage re-established. • Collected growth medium will be stockpiled during the operations and will be used for rehabilitation of disturbed areas and landforms at the TGP where appropriate. • Hardstand areas will be ripped to facilitate rainfall infiltration, seed collection and control runoff. • Roads not required by stakeholders will be ripped to facilitate rainfall infiltration, seed collection and control runoff. • Stockpiled vegetation will be returned to disturbed areas. • Revegetation of disturbed areas will be undertaken with species appropriate to the vegetation community which existed prior to disturbance. Research and trials will be undertaken throughout the Project and the information gained will be used to determine the appropriate seed mix for each disturbance area. • Contaminated areas will be appropriately remediated. • Bores will be capped and locked.
Mining Proposal - MP20101230- Tropicana Gold Project Pinjin Infrastructure Corridor	Executive Summary	The post operational aim for the corridor is to establish a sustainable native ecosystem that is as similar to the pre-existing ecosystem as can be achieved within the limits of recognised good practice rehabilitation methods and the post mining environment. At present the end use for the corridor will be a return to unallocated crown land as is the current tenure status.
Mining Proposal - MP20101230- Tropicana Gold Project Pinjin Infrastructure Corridor	4.4	Within the Mining Leases, topsoil to a depth of 300mm will be recovered and used to rehabilitate existing tracks (collection of topsoil within the mining leases is a Tenement condition)
Mining Proposal - MP20101230- Tropicana Gold Project Pinjin Infrastructure Corridor	4.4	Stockpiled volumes of growth medium will be periodically monitored to ensure the volume available meets rehabilitation requirements for borrow pit and road rehabilitation.
Mining Proposal - MP20101230- Tropicana Gold Project Pinjin Infrastructure Corridor	4.4	Conduct visual inspections of areas following rehabilitation to determine compliance with closure criteria.
Mining Proposal - MP20101230- Tropicana Gold Project Pinjin Infrastructure Corridor	5.1	A Consultative Closure Committee will be established during the operational phase of the project to provide a forum for ongoing discussion about long term objectives for closure.
Mining Proposal - MP20101230- Tropicana Gold Project Pinjin Infrastructure Corridor	5.3	As water abstraction from established boreholes along the infrastructure corridor are no longer required, they will be decommissioned which includes sealing the borehole with concrete, cutting collars below ground and mounding soil over the cut collar.
Mining Proposal - MP20110115- Tropicana Gold Project Landfill and Bagfarm Mining Proposals	Mgt Considerations	On closure should the facilities not be covered by waste landform the area will be covered with at least 0.5m of material and covered with growth material scarified and seed
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 1	4.4	Rehabilitation management associated with decommissioning will form part of the Mine Closure and Rehabilitation Management Strategy. This will include close out and reporting requirements
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 2	4.4	Following completion of the Project, the Joint Venture will cease abstraction from the borefield and monitor the aquifer recovery for a period of up to 10 years or until it recovers to more than 80% of its capacity or until another user takes control of the borefield. Water levels in all production bores will be monitored at monthly intervals during the first year of recovery, then at quarterly intervals until year three (3), then annually until year 10. Theaquifer would then be returned to the State. The Joint Venture will cap and lock all production bores and will remove and rehabilitate all other associated borefield infrastructure and ground disturbance to the satisfaction of relevant authorities.

Source	Condition Number/report section	Commitment
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	4.4	Rehabilitation will include placing cleared vegetation and logs within the area to provide fauna refuge.
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	4.4	In areas where significant ground disturbance is to occur and growth medium collection is practical collect and stockpile growth medium for future rehabilitation activities as required by Project Closure and Rehabilitation Strategy.
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	4.4	Stockpiled volumes of growth medium will be periodically monitored to ensure the volume available meets rehabilitation requirements for borrow pits and road rehabilitation.
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	4.4	Conduct visual inspections of areas following rehabilitation to determine compliance with closure criteria.
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	4.4	Ensure compliance with closure criteria
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	5.1	1. Closure planning and implementation – To ensure the process of closure can occur in an orderly, cost-effective and timely manner with clear accountabilities defined. 2. Risk appreciation – To identify and manage risks to closure according to their likelihood and consequence 3. Financial provision – to adequately represent and plan for the cost of closure in company accounts so that the community is not left with a liability 4. Stakeholder involvement – to consider stakeholder interests during the mine closure process 5. Completion Criteria – top establish a set of indicator and criteria that will demonstrate successful completion of the closure process 6. Waste materials management – to minimise waste generation over the mine life and to ensure that the remaining waster cannot adversely affect the surrounding environment. 7. Decommissioning – To ensure that the decommissioning proves can occur in an orderly, cost-effective and timely manner with clear accountabilities defined 8. Rehabilitation planning and implementation – to ensure that the rehabilitation process can occur in a cost –effective and timely manner with clear accountabilities defined 9. Relinquishment – to arrive at a point where the project has met or is confidently tracking towards agreed completion criteria to the satisfaction of the Australian Government
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	5.2	In accordance with tenement condition No 17, on the completion of the life of mining operations in relation to this licence the holder shall (unless the Mining Registrar or Minister responsible for the Mining Act 1978 orders or consents otherwise): • remove all installations constructed pursuant to this licence; • cover over all wells and holes in the ground to such degree of safety as shall be determined by the Environmental Officer, DMP; and • on such areas cleared of natural growth by the holder or any of its agents, the holder shall plant trees and/or shrubs and/or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the Environmental Officer, DMP and properly maintain same until the Environmental Officer advises regrowth is self supporting;
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	5.2	Where possible, rehabilitation of temporary access tracks and turkeys nests will be progressive undertaken.
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 4	5.2	The following general rehabilitation objectives will be pertinent to the Water Supply Area: • to ensure that rehabilitation achieves an acceptable standard compatible with the intended land use and consistent with appropriate criteria • to ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values; • to ensure that aesthetic values are considered and measures are adopted to reduce visible impacts on the landscape as low as reasonably practicable; and • create the integrity, ecological functions and environmental values of landscapes and landforms.
Mining Proposal - MP20110304 - Tropicana Gold Project Processing Water Suppply Minigwal Trough Phase 5	Amendment	Growth medium will be collected where practical and used for future rehabilitation activities.
Mining Proposal - MP20110413 TGP Exploration Camp Expansion	Executive Summary	The camp is designed to be a temporary facility and will be decommissioned, dismantled and removed from site once the mine village associated with the TGP has been completed. The exploration camp site will then be rehabilitated back to Vacant Crown Land capability.
Mining Proposal - MP20110413 TGP Exploration Camp Expansion	4.4	Stockpiled volumes of growth medium will be monitored to ensure the volume available meets rehabilitation requirements.
Mining Proposal - MP20110413 TGP Exploration Camp Expansion	4.4	Conduct visual inspections of areas following rehabilitation to determine compliance with closure criteria.
Mining Proposal - MP20110413 TGP Exploration Camp Expansion	5.1	The exploration camp will be decommissioned once the mine village associated with the TGP has been completed and all personnel in the exploration camp are transferred to the new mine village accommodation.
Mining Proposal - MP20110413 TGP Exploration Camp Expansion	5.3	The exploration camp will be decommissioned and all buildings and associated facilities will be dismantled and removed off site. The site will then be rehabilitated back to Vacant Crown Land.
Mining Proposal - MP20110413 TGP Exploration Camp Expansion	5.3	The following activities will be completed for each area to be rehabilitated: • The area will be scarified to facilitate rainfall infiltration and seed collection • Stockpiled vegetation will be returned and the area will be seeded with local species • Tracks will be blocked off to prevent damage to regenerating vegetation.
Ministerial Conditions (Ministerial Statement 839)	9.1.1	The waste material landforms and tailings storage facility shall be non-polluting and shall be constructed so that their stability, surface drainage, resistance to erosion and ability to support local native vegetation are similar to undisturbed natural analogue landforms as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority.
Ministerial Conditions (Ministerial Statement 839)	9.1.2	Waste material landforms, tailings storage facility and other areas disturbed through implementation of the proposal (excluding mine pits), shall be progressively rehabilitated with vegetation composed of native plant species of local provenance (defined as seed or plant material collected within the Great Victoria Desert Bioregions 1 and 2).

Source	Condition Number/report section	Commitment
Ministerial Conditions (Ministerial Statement 839)	9.1.3	The percentage cover and species diversity of living self sustaining native vegetation in all rehabilitation areas shall be comparable to that of undisturbed natural analogue sites as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority.
Ministerial Conditions (Ministerial Statement 839)	9.1.4	No new species of weeds (including both declared weeds and environmental (weeds) shall establish in the area as a result of the implementation of the proposal.
Ministerial Conditions (Ministerial Statement 839)	9.1.5	The coverage of weeds (including both declared weeds and environmental weeds) within rehabilitated areas shall be no greater than the average of three reference sites on nearby land, with the reference sites to be chosen in consultation with the Department of Environment and Conservation.
Ministerial Conditions (Ministerial Statement 839)	9.2	Rehabilitation activities shall continue until such time as the requirements of condition 9-1 are met, and are demonstrated by inspections and reports to be met, for a minimum of five years following mine completion to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority, on advice of the Department of Mines and Petroleum.
Ministerial Conditions (Ministerial Statement 839)	10.1	At least five years prior to mine completion, the proponent shall prepare and submit a Final Closure and Decommissioning Plan to the requirements of the Chief Executive Officer of the Office of the Environmental Protection Authority, on advice of the Department of Mines and Petroleum
Ministerial Conditions (Ministerial Statement 839)	10.2	The Final Closure and Decommissioning Plan shall be prepared consistent with: 1. ANZMEC/MCA 2000, Strategic Framework for Mine Closure Planning; and 2. Department of Industry Tourism and Resources 2006 Mine Closure and Completion (Leading Practice Sustainable Development Program for the Mining Industry), Commonwealth Government, Canberra;
Ministerial Conditions (Ministerial Statement 839)	10.3	The Final Closure and Decommissioning Plan shall provide detailed technical information on the following: 1. final closure of all areas disturbed through implementation of the proposal so that they are safe, stable and non-polluting; 2. decommissioning of all plant and equipment; 3. disposal of waste materials; 4. final rehabilitation of waste dumps; tailings storage facilities and other areas (outside the mine pit(s)); 5. management and monitoring following mine completion; and 6. inventory of all contaminated sites and proposed management.
Ministerial Conditions (Ministerial Statement 839)	10.4	The proponent shall close, decommission and rehabilitate the proposal in accordance with the approved Final Closure and Decommissioning Plan.
Ministerial Conditions (Ministerial Statement 839)	10.5	The proponent shall make the Final Closure and Decommissioning Plan required by conditions 10-1 and 10-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.
MP20120326B_80m coms tower mining proposal amendment	Section 3.2	The post operational aim for the Project area is to establish a sustainable native ecosystem, which is as similar to the pre-existing ecosystem, as can be achieved within the limits of recognised, good practice rehabilitation methods and the post mining environment. At present, the end use for the operational area will be a return to unallocated crown land
MP20120326B_80m coms tower mining proposal amendment	Section 3.2	Upon successful rehabilitation of the project area, the Joint Venture will seek to relinquish the tenement mining lease to the Western Australian Government via the lead regulatory agency (currently the Department of Mines and Petroleum).
PER	7.2.1	At closure, once the built infrastructure has been removed, the land will be reshaped as required to blend into the surrounding landscape. Stockpiled growing medium will be re-spread and revegetated with local species.
PER	7.2.8	When the mining void is ultimately decommissioned, the tailings storage facility will be rehabilitated. The exact rehabilitation strategy is yet to be determined but the facility will be covered with a capillary break and growth medium. The capillary break will be used to prevent saline water rising up to the growth medium to avoid negative impacts to vegetation establishment. The outer western slope of the facility will be battered down to blend into the adjacent final waste landform.
PER	7.2.5	Upon closure, runoff from the waste landforms will be permanently diverted into the pit void.
PER	7.2.6	Following completion of the Project, the Joint Venture will cease abstraction from the borefield and monitor the aquifer recovery for a period of 10 years or until it recovers to more than 80% of its capacity or until another user takes control of the borefield. Water levels in all production bores will be monitored at monthly intervals during the first year of recovery, then at quarterly intervals until year three, then annually until year ten
PER	7.2.8	At closure, a toe drain will be installed to contain any run-off generated from the rehabilitated waste landform. This drain will divert run-off to the pit void.
PER	10	A Proposed Mine Closure and Rehabilitation Strategy will be prepared within five years of project commencement, and reviewed every two to three years.
PER	10	A draft Approved Mine Closure and Rehabilitation Strategy will be prepared three to five years prior to the end of the Project's operational phase and submitted to the relevant stakeholders for approval.
PER	10	The development and refinement of closure strategies will be informed by a closure and rehabilitation research program, and by ongoing consultation with key stakeholders.
PER	10.2	The waste landforms will not exceed 375 mRL. This is lower than the surrounding landforms (dunes and rock outcrops) ensuring that the final landforms are not visible outside of the immediate broad valley in which the Mining Area occurs.
PER	10.2	The waste landform slopes will be continuous (rather than benched) at a maximum angle of 15°. This is a similar slope angle to sand dunes in the area.
PER	10.2	The strategy for preventing acid formation and migration after closure will be to co-dump with non-acid forming waste during operation.
PER	10.2	A layer of approximately 10 m thick of non-acid forming waste will be placed as the final layer of waste material on each waste landform to provide a barrier between the co-dumped waste and the 1 m layer (at least) of rehabilitation substrate (topsoil/ sand) to prevent access to the waste by the roots of surface vegetation and thus the uptake of metals present in the waste and to further reduce the likelihood of rainwater infiltrating the waste landform post closure.
PER	10.2	In the unlikely event that high levels of potentially acid forming waste are detected during the construction or operational phase another method of landform construction will be adapted.
PER	10.2	The waste landforms will be surrounded by a toe drain to prevent sediment generated from the structures from dispersing into the surrounding landscape.
PER	10.2	Surface runoff from the waste landforms collected by the toe drain will either evaporate or will be directed into the pit void where it will mix with void water.

Source	Condition Number/report section	Commitment
PER	10.2	Benign capping material for the tailings storage facility will be obtained from the adjacent waste landform or the pit.
PER	10.2	The landfill will be capped with at least two metres of inert material and then spread with at least one metre of growing medium before being revegetated
PER	10.2	An abandonment bund will be constructed around the perimeter of the pit outside of the zone of geotechnical instability and all access ramps will be blocked off.
PER	10.2	The abandonment bund will be constructed of competent waste rock material and will be at least two metres high and five metres wide at the base, consistent with statutory requirements
PER	10.2	The post closure landforms will be covered with topsoil/ sand as a growing media
PER	10.2	Research will determine what depth of growing medium is required to support the new ecosystem and whether an impervious layer below the growth medium is needed to support dune vegetation. At a minimum, one metre of growth medium will be applied.
PER	10.2	The cover material will be carefully selected to be able to support vegetation.
PER	10.2	Tailored rehabilitation protocols will be developed to prepare areas for revegetation outside the active mine area (such as access roads, water extraction infrastructure and the village).
PER	10.2	The establishment of nominated vegetation communities will be tackled by applying the following hierarchy of priority: 1. focus on framework species. Vegetation surveys have identified a number of species that make up the majority of plant cover in the various plant communities expected to be routinely rehabilitated. These framework species include Eucalyptus gongylocarpa (marble gum) and a variety of other tree form and mallee eucalypts, Acacia aneura (mulga) and Casuarina cristata (Black Oak); 2. dominant understorey species including Triodia basedowii (Lobed spinifex) and other ubiquitous grass species; 3. Priority species affected by mining operations; and, 4. other species that were present before clearing. Ideally all species that were present prior to clearing for the mine operation will be returned into the rehabilitation, however the Rehabilitation Research Project may demonstrate that this is not feasible, within reasonable constraints.
PER	10.2	Seed management will include the following elements: - establish seed collection provenance zones that guarantee the genetic integrity of the new vegetation communities; - establishment of seed storage protocols that maximise viability and shelf life; and, - establish seeding techniques that maximise germination and establishment.
PER	10.2	The Project will: - monitor and analyse rehabilitation establishment; - make provision for poor rehabilitation establishment; and, - include rehabilitation remediation as part of its standard practice.
PER	10.2	Employing a state and transition model of rehabilitation development, a series of interim criteria of rehabilitation progress will be defined to measure against. The interim criteria will, in effect, act as gates that a section of rehabilitation must successfully pass through to its next interim criteria or completion criteria. If a section of rehabilitation is unable to reach an interim criterion the monitoring program will trigger a remedial response.
PER	10.2	Management of fire for rehabilitation may include: - excluding fire for at least seven years to protect young rehabilitation as it develops to a state that is fire resistant; - using fire as a tool (in a highly controlled manner) to manipulate rehabilitation development; for example to encourage re-sprouting species and grasses or to create space for enrichment seeding or planting; and, - introducing controlled fire into established rehabilitation to test the resilience of the rehabilitation.
PER	10.3.3	Weed management measures will include: -a weed hygiene procedure for light vehicles and mobile heavy equipment will be developed to prevent weeds from entering the Project or the surrounding areas; and, - weed surveys will be undertaken across the Project areas to identify and eradicate any weed species that might gain a foothold within the Operational Area including rehabilitation sites.
PER	10.3.3	Should a forced or unexpected closure occur, the following measuire will be implemented: - An environmental audit of the entire site will be undertaken to fully appreciate any environmental risks that will exist during the closure period -The Care and Maintenance Plan will be reviewed immediately. - The reviewed Care and Maintenance Plan will be submitted to the relevant authorities (such as the DMP, DEC and DEWHA)) for their information.
PER	10.3.3	The Care and Maintenance Plan will include: • an Emergency Response Procedure; • a mine access and security review; • a geo-technical monitoring program to ensure the ongoing stability of the pit(s), tailings storage and waste landforms; • a program to address incomplete rehabilitation and remediation works; and, • a program of environmental monitoring and inspection. This will include; license requirements, chemical and hydrocarbon storage, treatment plant condition, pit water monitoring, erosion monitoring, and rehabilitation monitoring.
PER	10.3.4	The Closure Strategy will confirm the location of important documents at each review and will allocate responsibility for the filing and cataloguing of operational documents, environmental documents and stakeholder consultation documents that are pertinent to closure and relinquishment.
PER	10.3.4	The Joint Venture aims to achieve relinquishment and the return of Environmental Performance Bonds as soon as possible following the cessation of operations. To achieve this, the Joint Venture will need to achieve the agreed completion criteria.
PER	10.3.4	The Joint Venture will propose a relinquishment process that includes: • the division of the Project into Closure Management Units to allow for individual rehabilitation and closure strategies to be applied and for each Closure Management Unit to be individually assessed against the agreed completion criteria; • the formation of a Consultative Closure Committee with a role in ascertaining the success of rehabilitation and closure efforts; and, • the establishment of formal closure, sign off and relinquishment mechanisms.

Source	Condition Number/report section	Commitment
Tailings Environmental Management Strategy	9.5	Two years prior to decommissioning, a tailings rehabilitation and decommissioning audit will be conducted to ensure that adequate preparation is occurring or has occurred for rehabilitation to proceed in an orderly manner.
Tailings Environmental Management Strategy	9.5	A detailed closure and decommissioning plan will then be completed including designs and drawings that can be used for construction of the final landform.
Tailings Environmental Management Strategy	9.5	Decommissioning of the TSF will include termination of tailings deposition and removal of the pond around the decant tower area. Drying of the tailings is expected to take several months and possibly require completion of the capping in the following dry season
Tailings Environmental Management Strategy	9.5	The underdrainage system will continue to operate for a number of years after completion of capping and revegetation to drain excess water from the tailings deposit.
Tailings Environmental Management Strategy	9.6	At the end of the mining operation, the perimeter embankments will have a downstream slope of 15 degrees so that it blends into the surrounding waste landform.
Tailings Environmental Management Strategy	9.6	The adopted downstream profile will be inherently stable under both normal and seismic loading conditions and will allow for revegetation
Tailings Environmental Management Strategy	9.6	The embankment face can only be revegetated at closure due to the downstream construction method adopted.
Tailings Environmental Management Strategy	9.6	A low permeability soil fill cover is proposed for the TSF as the most appropriate long-term solution for benign tailings.
Tailings Environmental Management Strategy	9.6	The top surface of the TSF will be covered with non-acid forming material from the adjacent waste landform to a minimum depth of 0.5 m but at a thickness dependent on the relative level (RL) of the tailings during rehabilitation
Tailings Environmental Management Strategy	9.6	The outer slope and capped tailings surface will then be covered with 1 m of growth medium (sand or sandy gravel depending on the RL).The growth medium will be ripped along contour and revegetated with suitable shallow rooting local species.
Tailings Environmental Management Strategy	9.6	Upon completion of the rehabilitation activities, as-built construction drawings will be drawn and incorporated into a closure completion report.
Tailings Environmental Management Strategy	12.2	Once decommissioned and rehabilitated, the TSF should be: • stable and structurally sound; • resistant to major wind and rain erosion; • visually compatible to the surrounding landform; and, • functionally compatible with the agreed post-mining land use.
Tailings Environmental Management Strategy	12.2	In the period after rehabilitation to relinquishment of bonds provision will be made for monitoring, repair and
Tailings Environmental Management Strategy	12.2	The TSF will be audited and inspected after the following milestones: • external geotechnical audit prior to decommissioning; • rehabilitation and decommissioning audit; and • post-closure auditing.
Tailings Environmental Management Strategy		A layer of growth-medium up to 1m thick will be placed over the low permeability soil laye o nthe TSF and may be lightly ripped to encourage vegetation establishment.
Tenement Conditions		All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.
Tenement Conditions		All topsoil and vegetation being removed ahead of all mining operations and being stockpiled appropriately for later respreading or immediately respread as rehabilitation progresses
Tenement Conditions		All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.
Tenement Conditions		At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of an Environmental Officer, DMP.
Tenement Conditions		At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environment Division, DoIR.
Tenement Conditions		On the completion of operations or progressively where possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or an alternative agreed outcome to the satisfaction of an Environmental Officer, DMP.
Tenement Conditions		On the completion of the life of mining operations in connection with this licence the holder shall: remove all installations constructed pursuant to this licence; and on such areas cleared of natural growth by the holder or any of its agents, the holder shall plant trees and/or shrubs and/or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the District Inspector of Mines and properly maintain same until the Inspector advises regrowth is self supporting; unless the Warden or Minister responsible for the Mining Act 1978 orders or consents otherwise.
Tenement Conditions		Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of instability
TSF Mining proposal and Works Approval MP20120501	6.5	Decommisioning of the TSF will include termination of tailings deposition and removal of the pond around the decant tower area. Drying of the tailings is expected to take several months and possibly require capping to be collected in the following dry season. The underdrainage will continue to operate for a number of years after completion of capping and revegetation to drain excess water from the tailings
TSF Mining proposal and Works Approval MP20120501	7.3	In order to minimise the acid generation potential of the tailings, closure and rehabilitation of the facility has been designed to reduce the seepage potential and lowering the oxygen influx into the tailings by designing the closure profile to the water shedding; Placing low permeability layer over the tailings surface to reduce infiltration and oxygen influx; and r unning the underdrainage system after mine closure to ensure tailings is fully drained.
TSF Mining proposal and Works Approval MP20120501	6.5	Once decomissioned and rehabilitated, the TSF will be stable and structurally sound, resistant to major wind and rain erosion, visually compatible to the surrounding landform and functionally compatible with the agreed post-mining land use.

Source	Condition Number/report section	Commitment
TSF Mining proposal and Works Approval MP20120501	7.1	As outlined in the TSF Feasibility study, the closure of the TSF will proceed through the following key steps: • The final supernatant pond would be removed via evaporation on the beach. • The tailings surface would be allowed to dry until it has sufficient strength to provide access. • The embankment in the decant area would be cut down to the final tailings level. • The decant tower sections would be removed to below tailings level and sealed. • The closure spillway would be cut through the western embankment and connected into the downstream end of the diversion channel. • The downstream end of the diversion channel would be widened to the required diversion for the PMP storm event. • Embankment external faces rehabilitated. • The cover design placed over the tailings surface. • The underdrainage system would continue to be operated. • Revegetation for the tailings cover would be undertaken.
Waste management Facility expansion and additional operational area facilities Minnig Proposal MP20130313	Section 6.2	The post operational aim for the Project is to establish a sustainable native ecosystem, which is as similar to the pre-existing ecosystem, as can be achieved within the limits of recognised, good practice rehabilitation methods and the post mining environment. At present, the end use for the operational area will be a return to unallocated crown land
Waste management Facility expansion and additional operational area facilities Minnig Proposal MP20130313	Section 6.3	At mine closure, the operational area infrastructure will be decommissioned and disassembled and the land will be rehabilitated
Waste management Facility expansion and additional operational area facilities Minnig Proposal MP20130313	Section 6.3	Any disturbed areas that are no-longer required by the project will be progressively rehabilitated.
Waste management Facility expansion and additional operational area facilities Minnig Proposal MP20130313	Section 6.3	The following objectives will direct the rehabilitation across the Project: • Rehabilitation work will be undertaken to ensure that it achieves an acceptable standard compatible with the intended land use and consistent with appropriate criteria. • To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values. • To ensure that aesthetic values are considered and measures are adopted to reduce visible impacts on the landscape as low as reasonably practicable. • Create the integrity, ecological functions and environmental values of landscapes and landforms.
Waste management Facility expansion and additional operational area facilities Minnig Proposal MP20130313	Section 6.3	Rehabilitation activities will include: • Removing pipelines and lining material • Re-contouring of the area to ensure the ground is level with the surrounding environment • Ripping to remove compaction • Respreading of growth medium and scarifying to encourage vegetation growth and water infiltration, and • Spreading of cleared vegetation and seeding with local species to assist with vegetation establishment.
Waste management Facility expansion and additional operational area facilities Minnig Proposal MP20130313	Section 6.3	Rehabilitation success will be monitored to ensure it meets the rehabilitation objectives.

APPENDIX 2: RISK ASSESSMENT

TGM Mine Closure Risk Assessment

Areas/activities	Identified hazards	Risk rating		
		Likelihood	Consequence	Risk Rating
Processing Plant and associatd facilities	buried services - location	Likely	Moderate	18
	traffic management	Unlikely	Moderate	16
	drive in/drive out	Likely	Minor	11
	chemical management - cyanide (cyanide code)	Very likely	High	25
	hydrocarbon management (power station/grease)	Very likely	High	25
	concrete disposal	Very Likely	Minor	12
	contaminated areas	Very likely	Moderate	19
	recovery of infrastructure	Very likely	Minor	12
	fauna traps	Likely	Moderate	18
	security/public access	Unlikely	Minor	10
	safety management (supervision limited)	Likely	Moderate	18
	decontamination and disposal	Very likely	Moderate	19
	hazardous materials /radiation guages	Likely	Moderate	18
	unused chemical disposal	Likely	Moderate	18
	buried tanks/septic systems	Likely	Minor	11
	groundwater pollution	Unlikely	Moderate	16
	surface water management during decomissioning	Likely	Moderate	18
	dust management	Likely	Minor	11
	licences/compliance conditions	Likely	High	24
	confined spaces - safety issues	Likely	Minor	11
	open tanks	Likely	Minor	11
	waste disposal/waste steel etc	Likely	Minor	11
	working at heights	Likely	Minor	11
	compaction	Very likely	Moderate	19
	gas bullet removal	Likely	Minor	11
Mine services area	hydrocarbon management	Very likely	High	25
	fuel tanks decommissioning	Very likely	High	25
	diesel pipeline between mine services area and fuel farm	Very likely	High	25
	pressurised vessels/vapour/hotwork	Likely	Moderate	18
	contaminated soils	Very likely	Moderate	19
	sumps	Likely	Moderate	18
	fauna traps	Likely	Moderate	18
	waste tyres disposal/removal (especially within mining area - delineation)	Very likely	Moderate	19
	disposal of unused checilas/greases	Very likely	Moderate	19
	septic pump wells disposal	Very likely	Minor	12
	removal of temporary septic systems (tanks/leach drains) - health, enviro, fauna	Very likely	Minor	12
	groundwater pollution - hydrocarbon contamination	Likely	Moderate	18
	compaction	Very likely	Moderate	19
	fibrous materials	Unlikely	Moderate	16
	dust management	Likely	Minor	11
	weed management	Unlikely	Minor	10
	fire protection /starting fires - hot works	unlikely	Minor	10
	emergency management	Likely	Moderate	18
	exploration - exposure to cavities during ripping	Unlikely	Minor	10
Mine village	buried services - planned location v's reality (survey data)	Likely	Minor	11
	grease traps	Likely	Moderate	18
	weeds	Unlikely	Minor	10
	compaction soils	Very likely	Moderate	19
	sewerage pumps	Likely	Minor	11
	Temporary facilities	Very likely	Moderate	19
	introduced fauna - feral cats	Likely	Moderate	18
	hydrocarbon	Very likely	High	25
	contaminated groundwater	Likely	Moderate	18
	fire management - functioning fire suppression system	Likely	Moderate	18
	potable water supply/quality	Likely	Minor	11
	dust	Likley	Minor	11
	communication tower (obstacle for airplanes)	Unlikley	Minor	10
	disposal and ongoing liability	Likley	Minor	11
	unrealistic expectation by community	Likley	Moderate	18
Borefield	poor rehabilitation/closure of bores	Likely	Moderate	18
	power supply - transformers/power lines/gensets	Likely	Minor	11
	groundwater recharge	Very likely	Moderate	19
	monitoring during closure - access major issue	Very likely	Moderate	19
	hydrocarbons	Likely	Minor	11
	backfilling turkey nests - lined pond	Very likely	Minor	12
	maintaining fence integrity	Likely	Minor	11
	maintenance	Likely	Minor	11
	remote working issues	Very likely	Moderate	19
	contaminated sites	Likely	Minor	11
	pipeline removal (45km to process plant)	Very likely	moderate	19
	spills/leaks - no leak detection	Very likely	Moderate	19
	theft by public of material/willfull damage	Unlikely	Minor	10
	trench inspections - fauna traps	Very likely	Moderate	19
Contamination	contaminated soils/compacted soils	Very likely	Moderate	19
(risk areas include TSF, Processing plant, refuelling areas	generation of contaminated sites (Contaminated Sites Act compliance and identification)	Very likely	Moderate	19
	liability of remediation	Very likely	Moderate	19
	Resources available for closure	Likely	Moderate	18
	contaminated material disposal	Very likely	Moderate	19

Areas/activities	Identified hazards	Risk rating		
		Likelihood	Consequence	Risk Rating
Rehabilitation	weeds	Unlikely	Minor	10
	lack of growth medium (not enough recovered)	Very likely	Moderate	19
	Lack of research on depth required for successful rehab	Likely	Minor	11
	availability of suitable growth medium	Very likely	Moderate	19
	grazing pressure on rehab	Unlikely	Minor	10
	Growth medium condition (saline water contamination)	Very likely	Moderate	19
	mined growth medium may not sustain rehab	Likely	Moderate	18
	growth medium stockpile management/strategy compromises condition or use	Likely	Moderate	18
	Burying growth medium in waste landform	Likely	Moderate	18
	Unsanctioned use of material (ie used for road works/concrete batching not for purpose	Likely	Moderate	18
	Dilution of growth medium with other materials (calcrete)	Likely	Moderate	18
	natural events (fire/flood/insects/droughts)	Likely	Moderate	18
	seed availability/viability/storgae life/germination viability/application rates	Very likely	Moderate	19
	grazing pressure on rehab	Unlikely	Minor	10
	meet completion criteria 70% species composition	Very likely	Moderate	19
	managing transition/succession	Likely	Moderate	18
	soil conditions/compaction/structure/preparation	Likely	Moderate	18
	habitual situation (ie sanddunes/sandplain species)	Likely	Minor	11
	nutrient limitations	Likely	Minor	11
	wind water erosion	Likely	Moderate	18
	seed loss by ants	Unlikely	Minor	10
	non provincial seed/access to local seed source	Likely	Moderate	18
Fauna reintroduction and habitat establishme	no logs/tree branches to reinstate (habitat resources)	Very Likely	Moderate	19
	feral species	Likely	Minor	11
	habituation	Likely	Minor	11
Cyanide Code compliance	meeting cyanide code compliance (water ponds for fauna may cause camel (and other animal) habituation)	Very likely	Moderate	19
pit void	freshwater lense (at least for a short time)	Likely	Minor	11
	ARD - post mining contaminated water in void	Likely	High	24
	Backfilling approach inconsistent with stakeholder requirements	Unlikely	Minor	10
	no backfilling of void (against dumping strategy)	Unlikely	Minor	10
	Backfilling to surface triggers rehab requriements.	Likely	Minor	11
	if no backfilling occurs where will waste be dumped?	Very likely	Moderate	19
	pit wall stability/instability	Very likely	Moderate	19
	cutbacks encroach into pit zones of instability boundary	Very likely	Moderate	19
	pit void causes groundwater pollution subregionally	Unlikely	Moderate	16
	Void water attracts fauna	Likely	Minor	11
	People access/interaction with void and contaminated water	Unlikely	Minor	10
	groundwater drawdown cone greater than predicted	Very likely	Moderate	19
	change of use to a TSF (in-pit tails)	Very likely	Moderate	19
Landforms	drainage management around stockpiles to capture runoff/erosion	Very Likely	Moderate	19
	external material placement - poor placement of dispersive material affecting stability	Very Likely	Moderate	19
	final footprint extends beyond approved area (incorrect location of landform prebattered toe)	Very Likely	Moderate	19
	non-compliance with batter slope angle	Likely	Moderate	18
	misalignment between rehab and mining schedules	Very Likely	Moderate	19
	ARD materials incorrectly dumped	Very Likely	Moderate	19
	Potential expansion changes material characterisation management	Likely	Moderate	18
	landform criteria does not meet predicted outcomes or is not practical	Very Likely	Moderate	19
	TSF capping strategy inappropriate	Very Likely	Moderate	19
ARD material	co-dumping NAF and PAF materials (don't want to concentrate ARD materrials) (risk is we don't follw the waste management strategy to co-dump)	Likely	Moderate	18
	material characterisation - loss of knowledge	Likely	Minor	11
	Waste management strategy is outdated (need to review reguarly)	Very Likley	Moderate	19
	post mining contaminated water in pit void	Very Likley	Moderate	19
	No ARD strategy for ROM or mineralised waste stockpiles	Likely	Moderate	18
	TSF material is more problematic than predicted	Very Likley	Moderate	18
People Management	Loss of Knowledge	Very Likely	Moderate	19
	staff turnover/lack of continuity	Very Likely	Moderate	19
Stakeholders	stakeholder engagement / stakeholder expectations	Very Likley	Moderate	19
	Asset management/handover of facilities to Gov	Very Likley	High	25
	regulator expectations	Very Likley	High	25
	inconsistencies between obligations/commitments (ie tenement conditions and mining proposal)	Very Likley	High	25
	cant deliver on expectations/commitments	Very Likley	High	25
	Joint Venture expectations	Very Likley	Moderate	19

APPENDIX 3: CLOSURE ACTIVITIES BY MANAGEMENT UNIT

Closure management units

This section contains descriptions of each of the closure management units, outlining the objectives for each one, the potential key risks, closure activities required to be undertaken and the current status of the closure activities.

A summary of the closure units is provided in table A1.

Table A1: Closure units

Closure unit	Activity	Total Approved area of activity (ha)
Airstrip	Other - Airstrip	66.8
Borefield and pipelines	Freshwater pipelines	3
	Hypersaline Water Pipelines	78.69
	Other - Bores & infrastructure	15.41
Exploration	Exploration	1241.93
Industrial infrastructure	Overhead Power line	59.76
	Hardstand/Laydown Areas	195.46
	Plant or Infrastructure	98.46
	Other - Drainage	19.5
	Landfill	4
	Explosives magazine	1.4
	Bagfarm	2
	Other - Communications Towers	7.06
	Pump stations	1.5
Mine Village	Camp site	41.89
N/A	Other - Growth Medium Stockpile	313.37
Open pits	Open Pits	221.14
Roads	Access Road/tracks	778.705
	Borrow Pits	173
	Haul Roads	119.24
ROM Pad./ Stockpiles	ROM Pad	82.23
	Marginal Ore stockpiles	27.95
Sewage Treatment Systems	Other - Septic Systems	0.42
TSF	Tailings Storage facility	290.8
Waste landform	Waste landforms	724.9
Water containment facilities	Turkeys Nest	23.6

Mine Village

Description
The mine village contains accommodation units for up to 700 people, mess, recreation area, laundry facilities, power and water supply infrastructure from the plant to the village and light vehicle access tracks and park up areas.

Disturbance Footprint
The disturbance footprint for the mine village is approximately 22ha and is contained entirely within tenement M39/1019.

Closure challenges
The following key challenges have been identified for the mine village closure.

Table A2. Mine Village Closure risks

Aspect	Challenge/Issue	Control
Buried services	Locating and removing	Ensure detailed construction plans are prepared showing location of services as they are installed
Rehabilitation	Weeds Compacted soils Introduced fauna (mice/rats) Poor rehabilitation success	Develop a rehabilitation plan including research and trials
Contaminated sites	Hydrocarbon spills Grease traps Septic systems	Include contaminated sites clean up requirements in the decommissioning plan and in decommissioning contracts

Closure Activities
Closure activities associated with the mine village include:

- Investigate sale or re-use of building and facilities
- Investigate salvage and disposal options of the village buildings and infrastructure
- investigate and remediate contaminated sites where required
- close and rehabilitate access roads
- eradicate feral fauna species
- scheduling decommissioning activities

Closure Actions

Table A3 outlines the proposed mine village closure actions and their current status. This table is dynamic and will be updated in subsequent versions of the mine closure plan.

Table A3: Closure Action Plan – Mine Village

Action	Timing	Responsibility	Status
Develop a strategy and plan for the removal of all infrastructure and equipment at, the village (Village Decommissioning Plan) to include scheduling of the removal of infrastructure and equipment so that the following are achieved: • no extra clearing of native vegetation • accommodation requirements of ongoing closure activities • maximum commercial return from sale is obtained • reuse and recycling of material is maximised	Three years prior to closure	Site management	To be prepared

Action	Timing	Responsibility	Status
• disposal of material to on site landfill is minimised.			
Conduct contaminated sites investigation including a review contaminated sites inventory. Remediate contaminated sites if required.	18months prior to closure	Environmental Coordinator	To be undertaken
Reshape the final soil surface so that it is free draining and consistent with the surrounding drainage features.	At closure	Environmental coordinator	To be undertaken
Rehabilitate all disturbed areas including roads in accordance with the sites Rehabilitation Procedure.	At closure	Environmental Coordinator	To be undertaken

Closure targets

The following conceptual closure targets have been developed:

- no equipment, materials or infrastructure, apart from that agreed with stakeholders, remains on site
- all voids within the village are filled
- no ongoing requirement for management of erosion
- surface water quality including metal levels and hydrocarbons meet DEC requirements;
- final landform shape blends with surrounding environment
- vegetation communities have ground cover, species richness and diversity that is consistent with surrounding vegetation communities.

Industrial Infrastructure

Description

Industrial infrastructure consists predominantly of the processing plant, mine services area and associated infrastructure. The processing plant consists of the following key infrastructure

- Crushing / Mill circuits and associated conveyors
- Thickener, leaching and carbon adsorption
- Carbon elution and regeneration
- Tails thickener and disposal
- Pipeline from processing plant to TSF
- Power lines
- Process Water/Raw Water pond
- Plant workshop and stores
- Geology and Laboratory facilities
- Administration control and training rooms, emergency and medical facilities (Plant site amenities and utilities)
- Heavy / Light vehicle workshops
- Boilermaking workshop including tool storage space
- Heavy vehicle tyre change facility and tyre storage area
- Truck change facility and office complex
- Heavy / Light Vehicle Wash down bay and associated water treatment infrastructure
- In circuit driver change over bay
- Mine store consumable laydown area including drilling equipment workshop, equipment stores, combined office and ablution for staff
- Heavy vehicle equipment assembly yard
- Re-fuel bay and bunded fuel storage area
- Bulk diesel storage facility
- Bulk chemical storage facility

Disturbance Footprint

The total disturbance footprint for the processing plant area is 98ha and is located on Tenement M39/980.

Closure Challenges

Aspect	Challenge/Issue	Control
Decommissioning	Decommissioning liability challenges	Develop detailed decommissioning plan
Contaminated sites	Hydrocarbon and chemical contaminated soils	Identify location and management requirements of potential contaminated sites and
Contaminated surface water	Surface water runoff may be contaminated during decommissioning activities.	Divert surface water into pit void
Rehabilitation	Shortfall in available growth medium, soil compaction, contamination, equipment availability	Develop rehabilitation plan

Closure Activities

Closure activities associated with the processing plant include:

- plant and equipment decommissioning
- demolition of plant, equipment and buildings and removal of services and infrastructure

- decontamination of the site
- site ripping and rehabilitation
- rehabilitation success monitoring

Closure Actions

Action	Timing	Responsibility	Status
Develop Plant decommissioning plan to include: Retention/disposal/decontamination/decommissioning of equipment and infrastructure	12 months prior to closure	Processing	To be undertaken
Develop cyanide management plan	12 months prior to closure	Processing	To be undertaken
Identify contaminated material and contaminated sites and undertake remedial actions	At decommissioning	Environmental Coordinator	To be undertaken
Identify appropriate disposal methods for contaminated material including concrete	12 months prior to closure	Maintenance	To be undertaken
Rip, re-contour and rehabilitate site in accordance with TGM rehabilitation procedure.	At closure	Environmental Coordinator to manage	To be undertaken
Monitor revegetation to ensure rehab success criteria are achieved.	Post closure	Environmental Coordinator	To be undertaken

Completion Targets

- demolition and removal of all buildings, plant and equipment by contractor
- removal or remediation of hydrocarbon contaminated soils
- disposal and rehabilitation of the equipment and infrastructure
- investigate and, if necessary, remediate contaminated sites
- successful rehabilitation of hard stand areas and roads.

Tailing Storage facility

Description

The tailings storage facility (TSF) is a paddock style single celled facility comprised of a multi-zoned perimeter embankment with a low permeability basin liner being a combination of clay and HDPE liner. The TSF has been designed to store up to 75Mt of tailings and is approximately 1330 m wide by 1850 m. The TSF is located adjacent to the waste material landforms so that it can be incorporated into the surrounding waste landform at closure.

Disturbance Footprint

The TSF has a disturbance footprint of approximately 290.8 ha and is located on tenements M39/980 and M39/978.

Closure Challenges

Aspect	Challenge/Issue	Control
Rehabilitation	Potential water infiltration and seepage Vegetation establishment Soil/vegetation contamination	Slope design to encourage water flow and prevent pooling Ongoing groundwater, soil and vegetation monitoring
Compliance	Failure to meet obligations	Continual monitoring Management Plan
Groundwater contamination	Groundwater contaminated from TSF seepage post closure	Monitor seepage and groundwater quality

Closure Activities

Closure activities associated with the TSF include:

- Allow the tailings surface to dry
- Embankments and decant towers will be cut down to tailings level
- Cover the tailings surface
- Rehabilitate embankments and tailings cover
- Close and rehabilitate access roads
- Continue the operation of underdrainage system
- Revegetate the tailings cover

The underdrainage system will need to continue to operate for some time after completion of capping and re vegetation to drain excess water from the tailings deposit. The quantity of water recovered from the underdrainage system will reduce with time and experience with similar facilities suggests that water recovery may continue for a period of several years following closure. During this time, water from the underdrainage will be pumped back into the facility for evaporation. After the flow ceases, the underdrainage pump will be removed and the underdrainage riser pipe backfilled and sealed as part of the rehabilitation process.

Closure Actions

Action	Timing	Responsibility	Status
Develop a strategy and plan for closure and rehabilitation	3 years prior to closure	Site management	To be prepared
Level decant area and towers	At closure	Environmental coordinator	To be undertaken
Layer of growth medium will be spread and lightly ripped	At closure	Environmental coordinator	To be undertaken
Rehabilitate landforms in accordance with the site rehabilitation procedure	At closure	Environmental coordinator	To be undertaken

Action	Timing	Responsibility	Status
Operation and eventual closure of the underdrainage system	Post closure	Processing Superintendent	To be undertaken

Completion Targets

The following conceptual closure targets have been developed for the TSF

- No equipment, materials or infrastructure remaining
- Surface water and groundwater of acceptable quality and meets DEC requirements
- Vegetation is established and resembles natural communities
- Landform shape is accepted by stakeholders
- DMP requirements have been met

Waste Landforms

Description

There are four main waste landforms which will surround the pits. These will be of a maximum height of 375m and with a slope angle of 15˚. Slopes will be continual rather than with embankments. Landforms will appear as low and elevated surrounding the pit voids. Structures will be between 30-40m high and will blend with the surrounding environment. A proportion of waste generated could be potential acid forming material. The blending of this waste with neutralising waste away from the margins will be established to avoid acid mine drainage.

Disturbance Footprint

The waste landforms have a combined disturbance area of 724.9ha and are located on tenements M39/980, M39/978, M39/979, M39/981, M39/982 and M39/1052.

Closure Challenges

Aspect	Challenge/Issue	Control
Stability	Landform failure	Geotechnical assessments
Revegetation	Vegetation establishment failure	Monitoring Species selection Growth medium quantity and quality
Surface and groundwater	Contaminated surface and/or groundwater Runoff and erosion	Continual monitoring of water quality Waste dump design
Acid rock drainage	Potential acid forming material exposed Improper placement of contaminated material	Toe drains to capture runoff Monitoring
Compliance	Failure to meet obligations	Continual monitoring Management Plan
Pit void	Contaminated water Fauna access Fauna mortality/injury	Monitoring Fencing

Closure Activities

Closure activities associated with waste landforms include:

- Potential acid waste will be co-mingled with NAF, PAF and ANC waste and encapsulated by a 10m deep layer of NAF waste
- Ensure waste landforms do not exceed 40m high and have a slop angle of 15° to blend in with the surrounding environment
- Development of a toe bund to direct any surface runoff resulting from heavy rain into a pit void
- Removal of nearby infrastructure including lookouts, buildings, communication towers
- Ongoing work over the life of the project will be required to verify the results obtained during the initial static and kinetic testing to ensure the proposed strategies remain appropriate.
- A 1m deep layer of selected growing medium will sheet the surface of the landforms with a wind erosion rock armouring on landform crests
- landform surfaces will then be revegetated following rehabilitation procedures

The waste landforms will be covered with one metre of sand as a growing media. Research will determine whether an impervious layer below the growth medium is needed to support dune vegetation. The waste landform crests will be particularly vulnerable to wind erosion and will be armoured with a gravel/rock cover. The cover material will be carefully selected to be able to support vegetation. To this end it must not be dispersive or hard setting, acidic, saline or contain heavy metals in concentrations that negatively impacts plant growth

Closure Actions

Action	Timing	Responsibility	Status
Develop a strategy and plan for closure and rehabilitation	3 years prior to closure	Site management	To be prepared
Final reshaping to ensure landform meets criteria	Mine closure	Environmental coordinator to manage	To be undertaken
Layer growth medium	Mine closure	Environmental coordinator	To be undertaken
Rehabilitate waste landforms in accordance with rehabilitation procedures	Mine closure	Environmental coordinator	To be undertaken
Conduct a contaminated sites or ARD investigation. Remediate if necessary	Mine closure	Environmental coordinator	To be undertaken

Completion Targets

The following conceptual closure targets have been developed for the rehabilitation of the waste landforms:

- Slope angle remains stable and meets specifications
- Pit void water quality
- Waste landforms must be safe, stable, non-polluting and integrated into the surrounding landscape
- Surface vegetation not impacted by waste beneath growth medium and capping
- Rehabilitated vegetation communities consistent with surrounding vegetation
- Surface water quality meets DEC requirements
- No requirement for management of erosion

Open Pits

Description

Mining will be undertaken within from four main pits being the Tropicana, Havana, Havana South and Boston Shaker pits. These are located on a roughly north – south alignment with a combined length of approximately 5km and nearly 1km wide at the widest point. Waste landforms will surround the open cut. Tropicana pit will extend to a depth of approximately 220m below surface and Havana pit will be approximately 280m below surface. Access to the pits will be via ramps and dual lane roads. It is intended that the mine pit voids will remain at closure although there is potential to backfill small satellite voids provided reopening of a pit due to changes in the resource economics is not considered as an option

Disturbance Footprint

The open pits will have a combined disturbance area of 221.14ha and are located on M39/980, M39/981 and M39/982.

Closure Challenges

Aspect	Challenge/Issue	Control
Stability	Waste dump instability	Geotechnical assessments
Surface and groundwater	Water quality within pit Seepage Contamination of groundwater Water bird access	Continual monitoring
Compliance	Failure to meet obligations	Continual monitoring Detailed plans available to stakeholders for comment
Pit void	Access to pit void (fauna and human)	Removal of roads Rehabilitation of waste landforms Water level at natural ground level

Closure Activities

Closure activities associated with the open pits include:

- Complete a pit stability assessment on waste landforms
- Monitor pit lake salinity and presence of metals and chemicals
- The possible impact of the permanent pit lakes on the surrounding groundwater will be resolved over the life of mine closure process
- Decommission and remove any facilities, equipment
- Decommission bores and remove bore infrastructure
- Rehabilitate and remove access roads to pit void
- Construct an abandonment bund around the pit perimeter

Closure Actions

Action	Timing	Responsibility	Status
Develop a strategy and plan for closure and rehabilitation	3 years prior to closure	Site management	To be prepared
Archive exploration data	Mine closure	Geology management	To be undertaken
Monitor surrounding groundwater quality	Mine closure	Environmental Coordinator	To be undertaken
Construct an abandonment bund around the pit perimeter	Mine closure	Environmental Coordinator	To be undertaken
Decommission bores and bore infrastructure	Mine closure	Environmental	To be

Action	Timing	Responsibility	Status
		Coordinator	undertaken
Meet the core objectives of final void management informed by the Mine Void Water Resource Issues in Western Australia report (Johnson and Wright, 2003) prepared by the then Water and Rivers Commission (Department of Water). They are: • Render the site acceptable and safe over the long term; • Minimise environmental and health risks; • Maximise to the practicable extent an potential future usage of the site; and, • Develop a "walk away" solution.	Mine closure	Environmental Coordinator	To be undertaken

Completion Targets

The following conceptual closure targets have been developed for the closure of the open pits, including:

- No equipment, materials or infrastructure remain onsite
- Public safety risk managed and bunding constructed to DMP requirements
- Fauna safety risk managed
- Pit characteristic accepted by DMP
- Water quality trends and characteristics accepted by DMP and DEC
- Surrounding groundwater trends accepted by DMP and DEC

ROM Pad / Stockpiles

Description

Ore will be hauled from the pit to the ROM pad this operation has been designed to maximise the direct tipping of ore and minimise ROM rehandling. The ROM has two main access roads for heavy vehicles and a secondary access for light vehicles. Haulage paths for the ROM and skyway have been designed with traffic management controls.

The ROM pad level extends approximately 35 m above current topography. Ore stockpiles will be established for material that is classed as ore but does not meet the cut-off grade or material type scheduled for processing. Stockpiled ore will generally be processed late in the mine life with rehandle by front end loader or excavator and trucks. Two areas south of the ROM pad have been delineated for dumping marginal ore and mineralised waste amounting to 4 Mt and 8 Mt, respectively. Marginal ore will be stockpiled into a separate dump. Mineralised waste, defined as mineralised material below 0.3 g/t gold cut-off, will be placed at the northern end of the of the Western Landform. Both material types may be reclaimed at the end of mine life if suitable economic circumstances prevail.

Disturbance Footprint

The ROM pad has a total disturbance footprint of 82.23ha while the marginal ore stockpiles have a disturbance footprint of 27.95ha giving the area a total disturbance footprint of 110.2ha.

Closure Challenges

Aspect	Challenge/Issue	Control
Stability	Landform instability	Geotechnical assessments
Compliance	Final landform not accepted	Develop a design for comment by stakeholders
Rehabilitation	Inability to establish vegetation Contaminated soil	Topsoil audit and monitoring Continual vegetation monitoring Monitoring soil quality
Soil/water contamination	Contaminated soils and surface water	Monitor water and soil quality

Closure Activities

Closure activities associated with the ROM pad and ore stockpiles include:

- Decommissioning and removal of plant and equipment
- Reshaping of landforms if necessary
- Revegetate the area
- Close and rehabilitate access roads

Closure Actions

Action	Timing	Responsibility	Status
Develop a strategy and plan for closure and rehabilitation	3 years prior to closure	Site management	To be prepared
Process all ore stockpiles	At closure	Processing	To be undertaken
Decommission infrastructure	At Closure	Processing/Maintenance	To be undertaken
Conduct a contaminated sites investigation for potential acid forming material and hydrocarbon contaminated material	3 years prior to closure	Environmental Coordinator	To be undertaken
Reshape stockpile slopes and batter down to 15% angle	At closure	Mining	To be undertaken
Rehabilitate landforms and roads	At closure. Progressive	Environmental Coordinator	To be undertaken

Action	Timing	Responsibility	Status
	rehabilitation where possible		
Monitor rehabilitation to ensure rehabilitation success criteria are met.	Post closure	Environmental Coordinator	To be undertaken

Completion Targets

The following conceptual closure targets have been developed for the ROM pad and ore stockpiles:

- No equipment, materials or infrastructure remain on site
- Final landform shape meets DMP requirements and is accepted by stakeholders
- Water quality meets DMP and DEC requirements
- Vegetation communities have established and are consistent with the surrounding vegetation

Water Containment Facilities

Description
Water containment facilities include all evaporation ponds, diversion channels, dams and turkey nests. A number of turkey nests of varying size have been established across the Tropicana area for the permanent and temporary containment of water and have been lined with a HDPE liner.

Disturbance Footprint
The total disturbance footprint of all turkey nests within the Tropicana area is 24ha.

Closure Challenges

Aspect	Challenge/Issue	Control
Surface and groundwater	Water quality Seepage Contamination of groundwater Fauna access and potential death Altered hydrology	Continual monitoring of groundwater quality and hydrology
Compliance	Failure to meet obligations	Continual monitoring Detailed plans available to stakeholders for comment
Rehabilitation	Vegetation establishment	Continual monitoring

Closure Activities
Closure activities associated
- Facility decommissioning
- Removal of bore and pipeline infrastructure (if present)
- Revegetation
- Dewatering

Closure Actions

Action	Timing	Responsibility	Status
Develop a strategy and plan for closure and rehabilitation	3 years prior to closure	Site management	To be prepared
Monitor surrounding groundwater quality	Mine closure	Environmental Coordinator	To be undertaken
Decommission pipelines	Mine closure	Environmental Coordinator	To be undertaken
Decommission bores and bore infrastructure	Mine closure	Environmental Coordinator	To be undertaken
Revegetate surrounding roads	Mine closure	Environmental Coordinator	To be undertaken

Completion Targets
The following conceptual closure targets have been developed for all water containment facilities
- No equipment materials or infrastructure remain on site
- Water quality meets DEC and DMP requirements
- Surrounding groundwater trends accepted
- Fauna safety risk managed
- Vegetation communities established and are consistent with the surrounding vegetation

Borefields and Pipelines

Description
Water for the Project will be obtained predominantly from groundwater within the Process Water Supply Area which is located 43km north-west of the processing plant and Operational Area within the Minigwal Trough.

Disturbance Footprint
The Process Water Supply Area (Minigwal Trough) with associated bores and infrastructure is located on miscellaneous licence L38/150.

Closure Challenges

Aspect	Challenge/Issue	Control
Surface and groundwater	Water quality within pit Seepage Contamination of groundwater Water bird access	Continual monitoring
Decommissioning	Timing for decommissioning	Develop decommissioning plan

Closure Activities
Closure activities associated with the borefields and associated pipelines include:

- Facility decommissioning
- Removal of bore and pipeline infrastructure (if present)
- Revegetation

Closure Actions

Action	Timing	Responsibility	Status
Develop a strategy and plan for closure and rehabilitation	3 years prior to closure	Site management	To be prepared
Monitor surrounding groundwater quality	Mine closure	Environmental Coordinator	To be undertaken
Decommission bores and bore infrastructure	Mine closure	Environmental Coordinator	To be undertaken
Rehabilitation of roads and access tracks	Mine closure	Environmental Coordinator	To be undertaken

Completion Targets
The following conceptual closure targets have been developed for the closure of the borefield and pipelines, including:

- No equipment, materials or infrastructure remain onsite
- Fauna safety risk managed
- Water quality trends and characteristics accepted by DMP and DEC
- Surrounding groundwater trends accepted by DMP and DEC

Roads

Description
Haul road and key access roads around the TGM will be ripped, recontoured and rehabilitated.

Disturbance Footprint
Access Tracks and roads throughout the TGM and account for 778ha.

Closure Challenges

Aspect	Challenge/Issue	Control
Stakeholder agreement/liability	It is uncertain whether stakeholders may request some road remain open. Liability for remaining infrastructure to be agreed	Stakeholder liaison and agreement on infrastructure to remain in situ.
Rehabilitation	Growth medium availability/timing for closure	Manage and monitor growth medium stockpile volumes

Closure Activities
Closure activities associated with roads and tracks include:

- Recontouring
- Ripping and rehabilitation
- Preventing access

Closure Actions

Action	Timing	Responsibility	Status
Deep rip borrow pits and road surfaces	At closure	Environmental Coordinator to manage	To be undertaken
Reshape borrow pit batters to 15%	At closure	Environmental Coordinator to manage	To be undertaken
Rehabilitation of roads access tracks in accordance with TGM Rehabilitation procedures	At closure	Environmental Coordinator to manage	To be undertaken
Monitor rehabilitation success	Post closure	Environmental Coordinator to manage	To be undertaken

Completion Targets

- Slopes of borrow pits and road edges battered down to 15 degrees
- no ongoing requirement for management of erosion
- surface water quality including metal levels and hydrocarbons meet DEC requirements;
- final landform shape accepted by stakeholders
- vegetation communities have ground cover, species richness and diversity that consistent with surrounding vegetation communities

Waste Water Treatment Plant

Description
The wastewater treatment plant has been designed with a capacity of treating 230Kl of waste water per day.

Disturbance Footprint

The waste water treatment plant is located on tenement M39/978.

Closure Challenges

Aspect	Challenge/Issue	Control
Decommissioning	Timing for decommissioning	Develop decommissioning plan for WWTP
Contaminated sludge	Disposal of contaminated sludge/infrastructure at closure. Contaminated site potential	Develop decommissioning plan for WWTP
Surface water contamination		Develop decommissioning plan for WWTP

Closure Activities

- Decommission and decontaminate infrastructure
- Rip and recontour hard stand area and evaporation ponds
- Rehabilitate

Closure Actions

Action	Timing	Responsibility	Status
Allow all waste water within evaporation ponds to completely dry, then remove plastic liners and any solid waste residue and dispose of into the landfill facility.	At closure	Maintenance	To be undertaken
Remove fence around facility and either recycle or dispose to landfill	At Closure	Maintenance	To be undertaken
Reshape pond batters to 15% angle , rip and rehabilitate in accordance with TGM rehabilitation procedure.	At closure	Environmental Coordinator to manage	To be undertaken
Monitor rehabilitation success	Post closure	Environmental coordinator	To be undertaken

Completion Targets

- no equipment, materials or infrastructure, apart from that agreed with stakeholders, remains on site
- pond slopes are battered down to 15 degrees
- no ongoing requirement for management of erosion
- surface water quality meet DEC requirements;
- final landform shape accepted by stakeholders
- vegetation communities have ground cover, species richness and diversity that consistent with surrounding vegetation communities.

Airstrip

Description
The TGM airstrip is a sealed airstrip with terminal building and refuelling area.

Disturbance Footprint

The disturbance footprint attributed to airstrip is approximately 66ha.

Closure Challenges

Aspect	Challenge/Issue	Control
Hydrocarbon contamination	Hydrocarbon contaminated at refuelling area and soil beneath tarmac	Clean up contaminated soils (insitu or remove to bioremediation pad)
Stakeholder agreement on retaining or decommissioning infrastructure		Engage and agree end landuse with stakeholders
Rehabilitation	Rehabilitation challenges beneath compacted runway	Develop rehabilitation plan

Closure Activities

- liaise with stakeholders to obtain agreement for the facility to be retained
- conduct contaminated sites investigation to identify contaminated sites and carry out remediation requirement
- decommission buildings and fuel facilities
- remove gravel, rip, topsoil and revegetate disturbed areas.

Closure Actions

Action	Timing	Responsibility	Status
Stakeholder liaison	During operation	Environmental coordinator	To be undertaken
Conduct contaminated site assessment	12 months prior to closure	Environmental coordinator	To be undertaken
Decommission and decontaminate facilities	At closure	Processing	To be undertaken
Rehabilitation of roads and access tracks	At closure	Environmental coordinator	To be undertaken

Completion Targets

- No equipment/infrastructure visible on site
- No ongoing management required surface water quality meet DEC requirements;
- final landform shape accepted by stakeholders
- vegetation communities have ground cover, species richness and diversity that consistent with surrounding vegetation communities.

APPENDIX 4: PRELIMINARY CARE AND MAINTENANCE STRATEGY

Tropicana JV

Tropicana Gold Mine

Preliminary Care and Maintenance Plan

December 2013

Version 1

Prepared by: AngloGold Ashanti Australia on behalf of the Tropicana JV

ANGLOGOLD ASHANTI

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1. INTRODUCTION

1.1. Project Description

The Tropicana Gold Mine (TGM/Project) is an open cut gold operation located approximately 330km east-north-east of Kalgoorlie on the western edge of the Great Victoria Desert in Western Australia as shown on Figure 1.1. The Project includes:

- Operational area containing the pits (Tropicana, Havana, Havana South and Boston Shaker), waste landforms, stockpiles, tailings storage facility, processing plant, village, aerodrome and other supporting infrastructure.
- Pinjin Infrastructure corridor including an access road and communications corridor linking the operational area to existing communications and road networks in Kalgoorlie.
- Process water supply area (Minigwal) providing the main processing water.

The Project is a joint venture (Tropicana JV) between AngloGold Ashanti Australia (70% stakeholder and manager) and Independence Group (30% stakeholder). The tenements included in the project are all jointly held by the Tropicana JV and are listed in Table 1.1.

Table 1.1 Tenements within the TGM

Operational Area		
M39/978	M39/1010	M39/1021
M39/979	M39/1011	M39/1028
M39/980	M39/1012	M39/1029
M39/981	M39/1013	M39/1030
M39/982	M39/1014	M39/1048
M39/983	M39/1015	M39/1049
M39/984	M39/1016	M39/1050
M39/985	M39/1017	M39/1051
M39/986	M39/1018	M39/1052
M39/987	M39/1019	L39/172
M39/988	M39/1020	L39/189
	L39/188	
Process Water Supply Area (Minigwal Trough)		
L38/150	L38/113	L38/114
Pinjin Infrastructure Corridor and Minigwal South		
L31/57	L31/56	L39/185
L39/211	L39/213	

The project is now into the operational phase with mining activities commencing in July 2012 and processing commencing in September 2013. The Project will have an active mining and processing life of between 12 - 15 years however the total project life will be up to 25 years

including construction and closure activities. The key characteristics of the Project, as approved under Part IV of the Environmental Protection Act, are provided in Table 1.2.

Table 1.2 Project's Key Characteristics as approved by the Project Part IV approval

Element	Description
Current Resource:	
Resource Tonnes	75.3 Mt
Resource Grade	2.07 g/t
Estimated Gold Resource	5.01 Moz
Proposed Utilisation of Resource:	
Construction Period	Approximately 30 months, commencing 2010
Mining Rate (ore and waste)	Up to 75 Mtpa
Stripping Ratio	Up to 8:1
Number of Pits	Up to 4
Open Pit Void(s)	Up to 400 ha
Maximum length of pit	6 km
Maximum width of pit	1.5 km
Pit Depth	Up to 400 m
Overburden Volume	Up to 800 Mt
Waste Landform	Up to 1,200 ha; some in-pit dumping being considered. Maximum height of 375 mRL Slope with a maximum angle of 15°
Processing Plant and Rate	Carbon In Leach plant with processing rate of up to 7 Mtpa
Water Supply	Up to 7 Mm^3 /annum Borefield located 50 km NNW of Operational Area Pipeline length of 50 km
Dewatering Rate	1,000 – 5, 000 kL/ day
Major Components:	
Mine Access Road	Pinjin Option – 370 km (~ 210 km of road construction)
Communications	Fibre Optic or Microwave via either Pinjin or Tropicana-Transline Corridor
Aerodrome	All weather strip 2.4 km long
Power Supply	Onsite power station with an installed capacity of up to 40 MW during the operational phase. Temporary generators will be used during construction, with a maximum capacity of 2 MW
Tailings Storage Facility	Up to 7 Mtpa; single-cell Paddock tailings storage facility with possible in-pit deposition, Maximum height of 372 mRL Approximately 1330 m wide by 1850 m
Village	Construction phase – up to 700 rooms Operational phase – up to 450 rooms
Workforce	Construction – up to 700 Operational – up to 400
Life of Mine:	
Project Life	Approximately 15 years of mining; total project duration up to 25 years (including post closure monitoring)
Approximate maximum area of disturbance	3,440 ha (includes Operational area 2,570ha, water supply area 200ha and Infrastructure corridor 670ha)
Estimated CO_2 Emissions	Up to 330 kt $CO_{2\text{-}e}$/ year during operations and 4,500 kt $CO_{2\text{-}e}$ over the life of the Project

1.2. Objectives

A preliminary mine closure plan for the project has been developed for planned closure activities. This care and maintenance plan has been developed to guide activities in the event the TGM encounters either planned or unplanned temporary closure resulting in a period of care and maintenance. This preliminary care and maintenance plan will be reviewed and updated where required within three years of the mine becoming operational.
The objectives of this preliminary Care and Maintenance plan are to:

- Describe the process of planned and unplanned closure leading to Care and Maintenance;
- Comply with legal obligations;
- Communicate TGM's approach to managing the site entering care and maintenance;
- Minimise the risk of environmental degradation from mine shutdown and care and maintenance
- Minimise degradation of key infrastructure from environmental processes, theft and vandalism;
- Maintain a secure site; and
- Preserve the site to maximise the potential for use in future mining operations.

The care and maintenance plan will be reviewed and updated as required, with the first review to be conducted during 2016, three years from operations commencing.

2. ENVIRONMENTAL SETTING

This plan is intended to compliment the TGM Mine Closure Plan. The background information provided below is therefore a brief summary of the more detailed information provided in the main mine closure plan document.

2.1. Climate

The TGM is located on the western edge of the Great Victoria Desert within the Great Victoria Desert Biogeogrpahic region. This region obtains the majority of rainfall during the summer months, generally associated with cyclonic rainfall extending into the interior. This may result in heavy rainfall between January and April. Temperature extremes are experienced in the region, with the highest maximum being 47.6 °C recorded in 1991 and lowest minima reaching -5.0 °C in 2006. Evaporation in the region greatly exceeds rainfall. Rainfall and flood events are highly variable in size and timing, and are often influenced by tropical cyclones.

2.2. Hydrogeology

Groundwater within the Operational Area occurs mainly in fractures and joints in the deeper basement rock, with most porosity and permeability occurring in the lower saprolite and the underlying sap-rock. Groundwater recharge rates over the Albany-Fraser Range are very low, estimated at less than 0.5% of annual rainfall. Consequently, groundwater salinities are high, ranging from 10,000 to 40,000 mg/L TDS within the Operational Area, and likely up to hyper-saline (more than 100,000 mg/L TDS) at the Rason Palaeodrainage, several kilometres north of the mine.

Groundwater levels fluctuate between 20 and 30 metres below ground. There is a local groundwater gradient towards the Rason Palaeodrainage.

2.3. Drainage

Drainage catchments of the site are generally characterised by low relief, poorly defined drainage lines and areas with strongly linear sand dunes and internal drainage. The regional geology is predominantly aeolian sands with high infiltration capacity, interspersed with areas of colluvial soils with lower infiltration capacity. As a result, stormwater runoff rates and volumes are generally low.

The Operational Area drains from the south west to the northeast to two external catchments. Surface water flows toward the Lake Rason system with is a large, intermittently-filled, saline wetland with regional significance located 50 km to the north.

2.4. Material Characterisation and Contaminated Site Potential

Approximately 70-75% of the waste generated from the TGM is expected to be non-acid forming (NAF). Approximately 8% of the waste material could be expected to be potentially acid forming (PAF), although this could be as high as 15%.

The buffering capacity of the non-acid forming (NAF) and acid neutralising waste far exceeds the potential acidity (total mass of acidity is only 1/50th of the total mass of readily available alkalinity). Therefore the potential for acid rock drainage is minimal. The soil types that have the greatest value to acid neutralisation are Achaean amphibolitic gneiss, protzoic doleritic intrusive, garnet gneiss and schists (biotite).

The strategy for preventing acid formation and migration is to co-dump with non-acid forming waste. The dilution and potential neutralisation of potentially acid forming waste by mixing it using a co-dumping procedure is intended to avoid the creation of a cell of waste that could be potentially harmful if exposed. The risk of acid generation and release from the waste material is minimal.

2.5. Flora and Fauna

The TGM is situated in the Helms Botanical District, within the Eremaean Botanical Province (Beard, 1975). The Helms Botanical District as defined by Beard, (1975) is very consistent and is characterised by tree steppe of *Eucalyptus gongylocarpa* and *Triodia basedowii.* Vegetation and flora surveys have been conducted across the project area and have identified 11 major vegetation communities within the operational area, 6 major vegetation communities along the Pinjin access corridor and 5 major vegetation communities within the process water supply area. One vegetation community that occurs along the Pinjin corridor, the Yellow Sandplains community of the Great Victoria Desert, is listed as a Priority ecological community. No threatened flora species have been recorded from the project area, however a number of priority flora species are known to occur.

Based on a desktop assessment and the presence of suitable habitat, a number of conservation significant fauna species were identified as potentially occurring within the TGM. Targeted surveys using specific survey techniques have determined that a number of significant fauna species occur in the region including the Southern Marsupial Mole (*Notorcyctes typhlops*), Malleefowl (*Leipoa ocellata*), Mulgara (*Dasycercus blythi),* Sandhill Dunnnart (*Smithopsis psammophila),* Australian Bustard *(Ardeotis australis)* and Rainbow Bee-eater *(Merops ornatus).*

2.6. Heritage Values

The archaeological studies conducted for the TGM identified 11 Aboriginal heritage sites within the wider Tropicana Project area. The most common archaeological sites were artefact scatters and quarries, with a small number of rock shelter sites. No ethnographic sites were identified within the entire operational area for the Project.

2.7. Community Stakeholders

The TGM is a remote site with access to the City of Kalgoorlie Boulder located 330km away. Liaison with relevant stakeholders has been conducted throughout the projects development. Key stakeholders are listed in Table 2.1.

Table 2.1 Key Stakeholders

Stakeholder type	Stakeholder
State Government Agencies	Department of Mines and Petroleum
	Department of Environment and Conservation
	Environmental Protection Agency
	Department of Indigenous Affairs
	Department of Planning and Infrastructure
	Department of Water
	Department of Health
Commonwealth Government Agencies	Department of the Environment, Water, Heritage and the Arts
Local Government	Shire of Menzies
	Shire of Laverton
	City of Kalgoorlie-Boulder
Indigenous groups	Central Desert Native Title Services
	Goldfields Land and Sea Council
	Representative from all applicable Native Title Claimants
	Tjuntjuntarra Aboriginal Community
Environmental groups	Conservation Council of Western Australia
	Goldfields Naturalist Group
	Kalgoorlie-Boulder Urban Landcare Group
	Malleefowl Preservation Group
	Wilderness Society
	Wildflower Society of Western Australia

3. CURRENT CLOSURE LIABILITIES

Every six months the TGM closure liability cost is independently assessed and updated. The current liability cost estimate (as at December 2013) was $46,056,220 based on the current disturbance footprint outlined in Table 3.1.

Table 3.1 Current Disturbance footprint

Activity	Current disturbance (ha) (December 2013)
Exploration	390.07
Access Road/tracks	659.20
Turkeys Nest	17.70
Hypersaline Water Pipelines	52.35
Overhead Power line	47.46
Camp site	32.74
Hardstand/Laydown Areas	68.17
Other - Bores & infrastructure	4.41
Borrow Pits	122.01
Tailings Storage facility	290.20
Plant or Infrastructure	72.91
Waste landforms	44.99
Other - Growth Medium Stockpile	81.36
Other - Drainage	18.77
Haul Roads	58.41
Landfill	2.04
Explosives magazine	1.18
Bagfarm	1.96
ROM Pad	76.55
Marginal Ore stockpiles	0.00
Open Pits	117.16
Other - Communications Towers	2.75
Other - Septic Systems	0.29
Freshwater pipelines	1.63
Other - Airstrip	63.30
pump stations (tanks/turkey nests)	0.5
Total Area of disturbance (including exploration only from tenements listed in column A)	**2228.11**

4. CARE AND MAINTENANCE PLAN

4.1. Unplanned Closure

An unplanned or sudden closure occurs when the business is unable to operate as normal due to an acute or catastrophic change. This could be attributed to:

- Catastrophic mechanical failure in the plant;
- Catastrophic geotechnical failure of a TSF or pit wall;
- Administrative, safety or regulatory suspension of operations following a catastrophic event; or measure applied by a regulatory agency in response to a non-compliance event;
- Disruption of supply of key consumables or labour to operations; or

- Political or economic events or circumstances having an immediate and substantial effect on costs of production or availability of working capital.

With unplanned closure the following issues may arise:

- Licences and regulatory mechanisms have not been amended to reflect care and maintenance environment increasing the risk of excursions to licence requirements;
- Information gaps may still exist on rehabilitation methods and closure strategies; and
- The final closure plan has not been developed, consequently there is no coordinated approach to manage closure.

In the event of an unplanned closure, the focus will be on ensuring the most critical requirements are addressed in order to bring the operation into care and maintenance. This will lead to establishing a final closure plan once the immediate critical issues have been addressed with studies put in place to understand key risks that still remain at closure. Key closure issued identified for the TGM are considered to include:

- Waste landform stability
- Potential acid generating material in waste landforms
- TSF rehabilitation
- Landfill capping and rehabilitation (contaminated sites management)
- Used tyre disposal
- Hydrocarbon contamination
- Growth medium availability and viability

Care and maintenance comprises three key phases:

- Preparation for closure – initiated once it is known that the site will cease operating at a nominal time. In this phase communications, notifications and administrative requirements will be reviewed, mining, processing and exploration activities will be suspended, rehabilitation requirements will be assessed and rehabilitation plan will be developed, abandonment bunds and other preparation earthworks will be conducted and initial clean up will commence.
- Preservation and clean-up – notionally commences when ROM and economic low grade ore is exhausted and the milling stops for the first time and ceases once all clean-up and preservation activities for care and maintenance have been completed.
- Care and maintenance – commencement once preservation works are complete and the reduced care and maintenance workforce are in place.

4.2. Legal and Other Requirements

Obligations associated with mine closure activities, including care and maintenance, are contained within the sites following approvals, legislation and agreements:

- Prescribed Premises Licence;
- Ministerial Statement;
- Tenement conditions and Mining Proposal commitments;
- RIWI Act Groundwater abstraction licences
- Human resources requirements.
- Mining Act 1978;
- Dangerous Goods Safety Act 2006;
- Mines Safety and Inspection Act 1994;
- Continuous disclosure requirements of the exchanges where AngloGold Ashanti Ltd is listed (New York, Johannesburg and Australian Stock Exchanges).

- Commercial agreements made with suppliers;
- International Cyanide Management Code; and
- AngloGold Ashanti (AGA) and AngloGold Ashanti Australia corporate standards.

Closure commitments associate with the above have been identified in the sites mine closure plan. Should the site enter into care and maintenance, a review of these conditions will be undertaken and action plan developed to ensure compliance.

4.3. Key activities for Care and maintenance

On the decision to enter care and maintenance, a risk and timing review will be conducted to determine:

- the key areas that are of greatest risk or still in need for further research,
- what elements of closure have not been addressed,
- the lead time before closure; and
- level of stakeholder engagement required

The key components required to place an operation into care and maintenance include:

- Reducing the workforce to the minimum required;
- Close and secure all non-essential services within the mine village;
- Close and secure the aerodrome;
- Secure open pit mining areas and install safety bunds where required;
- Clean up core yard and ensure all logging has been completed and samples are secured;
- Shutdown borefield with pumping infrastructure relocated to the plant;
- Plant has been completely shutdown, cleaned, surface made to achieve drainage outcomes and secured;
- Close and secure waste water treatment plant;
- Block or secure access road entry;
- Items of value have been relocated to the securely fenced compound in the process plant or locked sheds in the process plant area;
- Fire breaks are in place;
- Fire water system has been modified for care and maintenance;
- Deposition of tailings and water on the TSF has been completed and drainage outcomes achieved;
- Identified rehabilitation opportunities have been completed and research trials have been established;
- Site drainage network has been reviewed and any modifications made to enable diversion of water around site.

4.4. Notification and Communication Strategy

Communication of closure issues (eg expected life of mine) is required with key stakeholders throughout the operating phase. Once a definitive decision is made to place TGM into care and maintenance, the following notifications will need to be made:

- Disclosure to the New York, Johannesburg and Australian Stock Exchanges (if suspension of operations is deemed material);
- Site workforce and contractors;
- Office of the EPA;
- Department of Environment (Commonwealth);

- Department of Mines and Petroleum – Resource Safety, Dangerous Good and Environment;
- Department of Environmental Regulation;
- Department of Health
- Department of Water;
- Shire of Menzies and Laverton ;
- suppliers and other contracted parties;
- Local indigenous communities;
- Minister for Mines;
- State and Federal Members of Parliament for Laverton, Kalgoorlie-Boulder and Menzies region;
- Australian Gold Council;
- Chamber of Minerals and Energy WA.

For each stakeholder group, the order and method of communicating of the decision to enter care and maintenance will be based on current legal requirements (eg some stakeholders will require formal notification) and sensitivity to the impact of the announcement.

4.5. Mining Area

Key closure activities that will be required within the mining area when entering into a period of care and maintenance include:

- Dewatering pumps turned off;
- All machinery and potentially contaminating installations/consumables removed from the underground;
- Pit geotechnical assessment undertaken;
- A satellite image of the TGM will be arranged as a record of the site for commencement of care and maintenance;
- Final survey of the workings and pits completed for submission to the DMP;
- All field survey equipment will be retrieved, cleaned and placed into storage;
- Final geological report completed for submission to the DMP;
- Abandonment bunding installed around the pits Abandonment bunds will be installed in accordance with DMP guidelines;
- Whilst site drainage is a whole of site issue, its main purpose has been to prevent inundation of the pit. The site bypass drainage system will reviewed to ensure it still performs to design and make any adjustments required;
- Internal drainage and protection bunding will be installed or refurbished.
- Other earthworks that will assist securing the site will be completed eg site fire breaks, drainage, bunding off any superfluous entry points to the mining area, closure or rehabilitation of roads not required for care and maintenance;
- Where primary earthworks have been completed on landforms, rehabilitation will be completed in accordance with the prevailing prescription;
- Fuel inventories minimised with the aim of ensuring adequate supplies to complete mining operations without having an excessive fuel inventory;
- Once mining has been completed, fuel farms will be drained and transferred to TGM's main fuel farm or a new tank in the plant area;
- Complete demobilisation of mining contractors and supporting contractors at the respective workshop areas;
- Fully clean out the mining workshops earthworks and supporting infrastructure once earthworks are complete. Hard copy records in offices will be archived, then the offices cleaned and locked.

- Conduct a contaminated sites investigation (and where necessary remediate) of the mining workshop footprints, fuelling areas, explosives magazine, batch plant and any other area where contamination is suspected;
- The explosives supplier will arrange to remove explosives from site. Once this is complete, the site's magazine will be deregistered and licence cancelled.

4.6. Processing Area

During unplanned closure, the immediate focus will be to empty the processing circuit as efficiently as possible using pre-existing safety procedures for undertaking plant shutdowns. The focus will be to transfer all material to the TSF and prevent bogging the plant or tailings lines. Other key activities within the processing plant will include:

- Conduct first pass clean-up of the plant including removal any built up material (ore) on tanks, launders, pipes, sumps, crusher floor, bins and hoppers. This material can then be returned to the process via sump pumps.
- Water will be preferentially drawn from the TSF for processing to minimise the inventory of decant water present.
- Specific cyanide decontamination safety training will be conducted by the cyanide supplier ahead of the preservation phase.
- Review of procedures to focus on plant shutdown.
- HAZOP and WRAC assessments to be conducted.
- Planned rundown of reagent and other spares to minimal inventories.
- Survey of all fire extinguishers and testing of the fire suppression system.
- TSF risk assessment and pre-decommissioning audit conducted for submission to the DMP (if it hasn't been already conducted).
- Deposition strategy will be adapted to ensure residue surface allows free flow of water to stormwater facilities.

4.7. Village and borefield

The mine village will be closed to essential services only for the reduced staff numbers. Essential services will include the provision of portable water, ablutions and sewage disposal, kitchen and laundry facilities.

Borefield operations will be shutdown with pumping infrastructure relocated to the plant where possible. An alternative water supply will be required to provide potable water to staff remaining during the care and maintenance period.

4.8. Media Interest

The announcement of placing TGM into care and maintenance may attract local, state and national media interest. If this occurs, all enquiries are to be referred to the designated media spokesperson.

4.9. Supply and Contracts

When entering into care and maintenance contract parties will be advised of termination of contracts, commencement of notice periods or new contractual arrangements reflecting changes to the operation. This will include:

- Running down supplies of reagents and consumables to just-in-time quantities;
- Arranging return or consignment of goods supplied but aren't going to be required for the remaining life of the processing plant;

- Negotiating legacy arrangements for the open pit contractors area and power generators;
- Negotiating demobilisation of major contractors;
- Return of any leased infrastructure to suppliers if they are superfluous to care and maintenance requirements.
- Review of lease expiry dates on light vehicles, with return of those expiring and re-allocation of those no longer in use due to reductions in site personnel.
- If AGAA has other Australian operations, arrange transfer of common goods and spares that are no longer required;
- Liquidate redundant items and items that will perish within the anticipated life of care and maintenance (at the end of the preparation phase);
- Items that cannot be sold at commercial or scrap value, recycled or donated shall be disposed either to landfill or to an appropriate offsite disposal facility.
- Final stocktake of stores inventories that remaining on site (at the end of the preparation phase).

4.10. Environmental Management

Dust

No active dust management would be conducted during care and maintenance as dust producing activities will have ceased. However depending on the frequency and intensity of dust issues experienced, controls may need to be put in place. This could include application of a commercial binding agent on key roads or other protective coating such as molasses.

Water Quality and Quantity

It is expected that a reduced water monitoring programme will be implemented during care and maintenance following negotiations of licence amendments with the DER and DoW.

Borefields will be inactive during the care and maintenance phase.

In the mining area, groundwater levels are expected to increase as the groundwater system recovers from suspended mine dewatering activities. Surface water input to the pit will be limited as a consequence of the site's drainage channel allowing runoff from undisturbed area to bypass the site.

In the processing area, activities undertaken during the preservation phase will have filled or otherwise capped water pooling areas to make the site free draining (other than those structures purposely retained to capture sediment from runoff leaving the plant).

At the TSF, there may be process water from the preservation phase that needs to be evaporated. Depending on the nature of seepage present at the time of closure and outcomes of licence negotiations with the DER, seepage recovery may be required.

Management of water will be supplemented through the site's monitoring and inspection programme.

Waste and Gaseous Emissions

Waste and air emissions will reduce substantially during care and maintenance. However, there will be residual amounts of both that will require management.

With closure of the sites landfill, domestic waste will be transported in sealed containers to Kalgoorlie for disposal at the Shire landfill.

Gaseous emissions will be limited to fuel consumption in vehicles and electricity generation. TGM will continue to calculate emission based on fuel consumption for use in AngloGold Ashanti's corporate reporting and for submission to NPI and NGERS if triggers are exceeded.

Hydrocarbon and Chemicals Management

There should be no commercial quantities of chemicals or reagents remaining on site as these would have been consumed, removed from site or neutralised and disposed to the TSF.

There will be a bulk diesel storage (plus some other minor hydrocarbons such as oils and greases). The size of the facility retained for use during care and maintenance will be dependent on how diesel is delivered. It is envisaged that the sites Dangerous Goods Licence will be retained even if its storage volumes reduce below trigger thresholds.

Rehabilitation

The rehabilitation mandate for care and maintenance is to complete areas where rehabilitation earthworks were in progress or had been conducted at the end of mining before demobilisation.

Research

It is likely that care and maintenance will offer the opportunity to study particular closure risks that can't be measured during operations (eg groundwater level recovery in the pit once dewatering pumps have been turned off to calibrate modelling).

Research activities initiated for the care and maintenance period should take into account the low staffing that will be on site. If research projects involve earthworks they should be established whilst earthmoving equipment is available on site.

Fire Management

A critical component of care and maintenance is to maintain an adequate fire management system in the event of fire on site. This will comprise:

- Firebreaks around infrastructure eg the plant and village;
- Fire detection alarms in the plant;
- Fire water system to provide gravity fed water;
- Retention of bores and associated infrastructure as a back up source of fire water;
- Fire extinguishers;
- Fire tender; and
- Removal of any vegetation growth around sensitive areas prone to fire (eg fuel storage).

4.11. Resourcing, safety and communications

Staffing

Caretakers will reside on site during care and maintenance to provide a site presence/deterrence to people illegally entering the site, undertake general condition inspections, rudimentary maintenance, induction of authorised visitors to site and take actions (where appropriate) to minimise impacts to the environment.

In addition to the caretakers, support personnel will be required to undertake specific tasks. This will include a maintenance coordinator who will manage the care and maintenance of fixed plant equipment and environmental personnel to conduct environmental monitoring when required.

Specialist inspections and assistance will be conducted by appropriate consultants and discipline specific AGAA personnel.

Safety

In care and maintenance, activities return to being more routine revolving around set inspections and maintenance activities. However this does not mean the activities are without risk.

A care and maintenance Emergency Management Plan will be developed to address emergencies that may potentially occur during care and maintenance and reflect personnel and resources available in site. Copies of the care and maintenance emergency plan will be distributed to relevant stakeholders including the DMP, Local shires and emergency service agencies.

Detailed communication protocols will be in place during care and maintenance to ensure the skeleton staff onsite remain safe.

A revised site safety induction will be prepared for care and maintenance to reflect the risks and manning levels on site.

Communications

During care and maintenance satellite phones will be available for use along with two way radio communications. The computer network connection with AGAA Perth office will be maintained to access AGAA's system and other documentation as well as being another source of communications between site and Perth office personnel.

Security

All facilities will be locked and assets that can be moved will be placed within the fenced and locked process plant area.

Security cameras will be installed at strategic locations most likely to receive traffic from intruders, areas containing high value assets (ie the plant and village) and the site's fuel supply. Footage from security cameras will be used to assist police identify intruding vehicles or people.

4.12. Administration and Reporting

During care and maintenance there will remain a number of administrative requirements that will continue including tenement management, information technology management and environmental reporting. These responsibilities will be undertaken by resources in the Perth office with site visits as required.

Under section 33 of the *Mines Safety and Inspection Act*, the maintenance coordinator will be the Registered Manager. To satisfy section 89, Mine record books and other required log books will be retained on site.

It is anticipated that an annual care and maintenance report will be required by regulatory authorities, however reporting requirements would need to be confirmed during the planning phase.

4.13. Monitoring and Inspection Programme

The monitoring and inspection programme will be a key part of care and maintenance duties to assist management of the site and to meet regulatory requirements. The monitoring and inspection programme will include:

- Mining area inspections;
- Village inspections;
- Tailings inspections;
- Drainage inspections;
- Process plant inspections/tests;
- Fire system tests;
- Water monitoring;
- Biodiversity monitoring;
- Site audits.

Mining Area Inspection

General area inspection (includes coreyard) to observe:

- Evidence of unauthorised access;
- Security of infrastructure – ensure offices/sheds haven't been broken into or buildings/windows damaged from storms, condition of fencing;
- Pit and waste dump stability;
- Obvious drainage failures;
- Damage to warning signs, bunding or other protective measures;
- Any other safety or environmental hazards.

Village Inspection

General area inspection of the village to observe:

- Evidence of unauthorised access;
- Security of infrastructure – ensure rooms and facilities haven't been broken into or buildings/windows damaged from storms, condition of fencing;
- Condition of firebreak
- Any other safety or environmental hazards.

Plant Area Inspection

General area inspection to observe:

- Evidence of unauthorised access;
- Security of infrastructure – ensure offices/sheds haven't been broken into or buildings/windows damaged from storms, condition of fencing;
- Condition of firebreak;
- Integrity of hydrocarbon storage
- Fuel levels in storage tanks
- Errant livestock inside fenced compound
- Any other safety or environmental hazards.

Tailings Inspection

General area inspection to observe:

- Evidence of unauthorised access;
- TSF stability;
- Position of any ponded water on the TSF;
- Seepage recovery pump operation;
- Fauna usage;
- Evidence of new seepage;
- Any other safety or environmental hazards.

Drainage Inspection

The site drainage network will be inspected as soon as practicable after a storm event to identify:

- if there has been any damage to the drainage which may compromise its ability to withstand a 1 in 100 year storm event (eg drainage has been blocked with debris)
- if internal drainage structures have been damaged or in need of repair and
- if an environmental impact has been caused by drainage or drainage failure.

An annual inspection will also be conducted at the start of cyclone season (notionally conducted in January) to ensure the drainage network is in good condition ahead of the cyclone season.

Plant Mechanical Inspections/Testing

Specialist inspections managed or undertaken by the maintenance coordinator which will focus on specific maintenance aspects of the processing plant including:

- Engineering risk assessment of elevated work areas safety of stair wells and walking platforms;
- Condition of mills and rotating equipment;
- Testing of equipment; and
- Electrical testing and tagging of equipment.

Fire Management System Testing

- Operate fire system to ensure it is in working order;
- Check water levels on the fire water tank;
- Check fire tender preparedness;

- Test operation of backup bore pump;
- Checks on fire extinguisher condition;
- Testing of fire alarms (conducted by external contractor);
- Inspection of firebreaks and facilitate their maintenance.

Water Monitoring

Water monitoring is a combination of negotiated changes to the DER and DoW licences, Department of Health requirements and management data collection including:

- Potable water tank levels;
- Potable water sampling;
- TSF pond water levels;
- Pit water level recovery;
- TSF bore monitoring;
- Borefield water level recovery; and
- Event monitoring

Biodiversity monitoring

Rehabilitation monitoring will be required to determine the effectiveness of rehabilitation activities. Monitoring wildlife visitation on the TSF is also likely to be an ongoing requirement.

Site Audits

To ensure care and maintenance activities are being conducted to an appropriate standard internal and external site audits will be conducted which will include:

- Environmental and safety audits - focusing on site environmental acceptability, adherence to safe systems of work, completion of inspection forms and addressing legal requirements. These will be completed by TGM Sustainability and Safety personnel;
- AGA TSF audits – conducted by AGA's Principal Tailings Engineer
- Regulatory inspections – conducted by DER and/or DMP environmental inspectors or other specialist DMP inspectors; and
- Annual geotechnical TSF audit – conducted by a third party geotechnical engineering consultant and submitted to the DMP.

4.14. Contingency Plan

Table 4.1 provides a brief summary of key emergencies/events and the corresponding response.

Table 4.1: Table of Care and Maintenance Contingency Actions

Contingency/Emergency	Response
Missed scheduled call	Ring phone numbers of security personnel and any other personnel (if on site). Contact Police and AGAA Kalgoorlie office to initiate search.
Intruder detected	Observe details of vehicle etc and report to Police. If two persons present intruders can be approached (to make them

Contingency/Emergency	Response
	aware of site presence) but do not engage in a confrontation.
Fire in plant area	Report fire to AGAA Perth and Bushfire Control Officer. Registered manager to report to DMP. Control fire if safe to do so. Otherwise maintain safe distance and wait for support equipment to arrive or evacuate site if required.
Bush fire	Report fire to AGAA Perth and Bushfire Control Officer. Registered manager to report to DMP. Evacuate site if required.
Potential TSF geotechnical issue	Contact and send photograph of issue to AGAA's geotechnical consultant. Arrange for site inspection. Report to DMP if required.
Pit wall subsidence event.	Contact and send photograph of issue to AGAA's geotechnical consultant. Arrange for site inspection. Report to DMP.
Heavy rainfall/flood	Report event to AGAA Perth. Inspect key infrastructure once safe to do so.
TSF overflow	Report event to AGAA Perth. AGAA to notify DEC and DMP. Obtain background sample and overflow sample for further analysis
Vehicle accident requiring urgent medical attention	Contact closest emergency response unit. Contact AGAA Perth. Report to DMP if on AGAA tenure.

APPENDIX 5: MONITORING STRATEGY

Tropicana Gold Project

Environmental Monitoring Strategy

1 OVERVIEW

The Environmental Monitoring Strategy contained within this document provides an overview of all environmental monitoring that will occur over the life of the Tropicana Gold Project (Project). The actual monitoring methods may change over the life of the Project as more appropriate technologies and methodologies become available. This Monitoring Strategy forms part of the Project's Integrated Management System that ensures the effective management of all health, safety, environment, community and operational issues associated with the Project.

The Integrated Management System (including this Monitoring Strategy) establishes the framework and standards that must be achieved for all activities associated with the Project. It includes the development and management of policies, management strategies, procedures and reporting requirements.

This document has been compiled with the assistance of 360 Environmental.

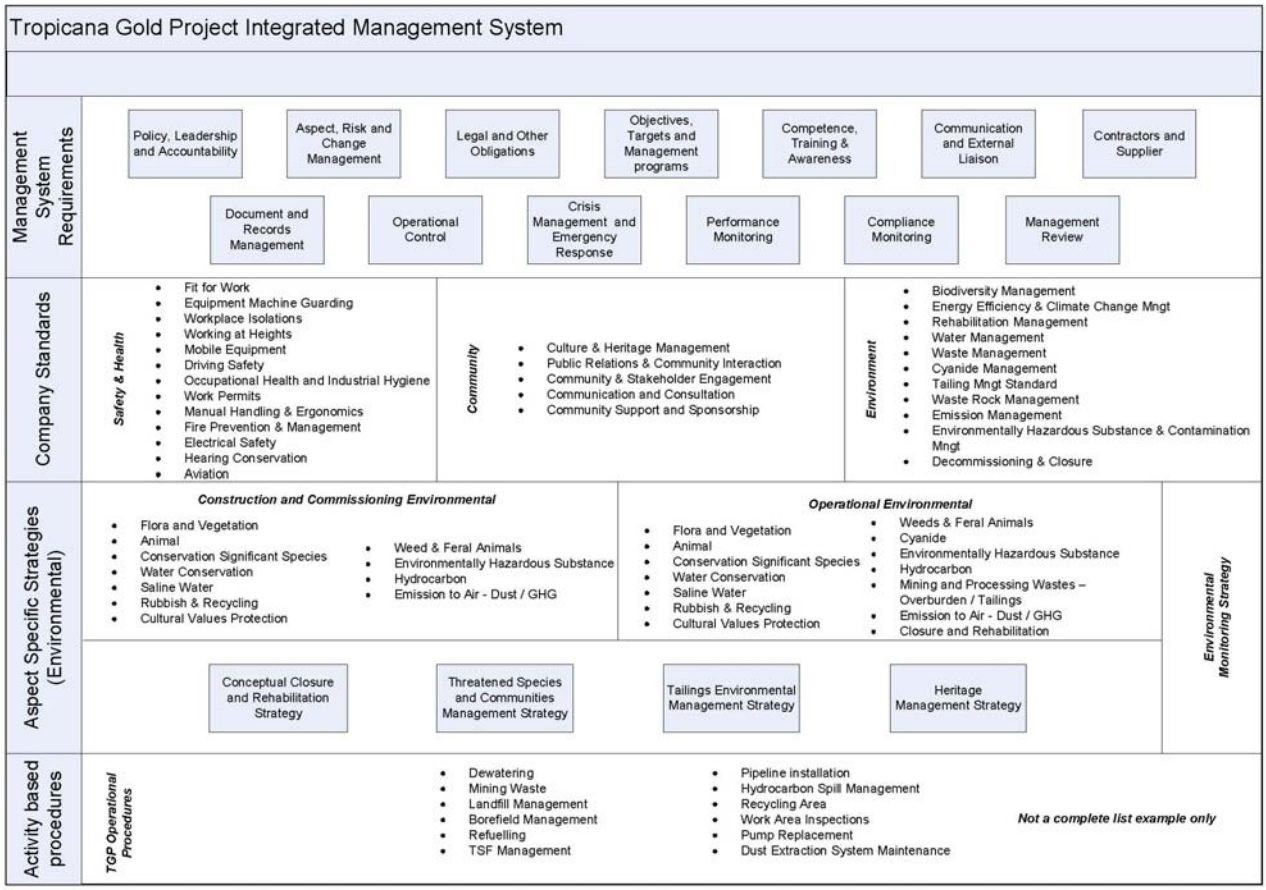

Figure 1 Tropicana Gold Project Integrated Management System

The Project's integrated Management System will operate on an adaptive management or continual improvement philosophy. The principle behind adaptive management is a structured, iterative process of optimal decision making in the face of uncertainty, with the aim of reducing uncertainty over time by monitoring the outcomes of the management strategy or by adopting procedures.

2 PURPOSE

The purpose of this document is to collate the key details of environmental monitoring programs, methods and action triggers associated with changes in key environmental values for the Project. Trigger values have been set for monitoring method to prompt investigation by the Joint Venture to determine whether the trigger has been exceeded due to activities related to the Project, or other factors (e.g. long dry-spell). In the event that investigation identifies that the Project is the cause, management will be altered to address the impact.

3 SCOPE

This Monitoring Strategy is applicable to all activities associated with the Project from construction through closure.

4 BACKGROUND

The Joint Venture's philosophy in the development of the Project has been to avoid impacts to threatened or conservation significant environmental values (e.g. Declared Rare Flora) in the first instance, and to minimise impacts where avoidance is not possible. In cases where a potentially significant impact to an important environmental value could not be avoided (e.g. Priority Flora situated beneath the Waste Material Landform (WML)) offsets have been proposed.

To ensure that the proposed management strategies, and procedures are resulting in the expected outcomes (e.g. drains are competent and adequate to contain and divert surface water run-off adequately) the Joint Venture has proposed a series of monitoring actions, documented in the Public Environmental Review and supporting documentation.

This document brings together all monitoring commitments made in the Public Environmental Review and the supporting documentation and monitoring obligations associated with legislation and other approvals. It is envisaged that this document will be periodically updated (bi-annually) to ensure that monitoring regimes are appropriate.

5 LEGAL REQUIREMENTS AND OTHER CONSIDERATIONS

There are several acts, regulations and other requirements that should be considered during the life of the Project. The most significant documents are summarised below.

5.1 ENVIRONMENTAL PROTECTION ACT 1986 (AND SUPPORTING REGULATIONS)

The *Environmental Protection Act 1986* (EP Act) provides for an Environmental Protection Authority, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. The Project is subject to Part IV and V requirements under the EP Act which consider and manage environmental impacts such as clearing extent (Part IV) and pollution control (Part V) – among other things.

5.2 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as matters of national environmental significance. The EPBC Act enables the Federal Government to join with the states and territories in providing a truly national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act focuses Federal Government interests on the protection of matters of national environmental significance, with the states and territories having responsibility for matters of state and local significance.

5.3 MINING ACT 1978

The *Mining Act 1978* is the key piece of legislation for all mineral exploration and mining activities in WA. The Act covers all aspects relating to obtaining prospecting licenses, exploration and mining leases, obtaining access to land for mineral activities, bonds and expenditure.

Conforming to Tenement Conditions, Mining Proposal and Program of Work requirements under this Act will be crucial for all phases of the Project.

5.4 WILDLIFE CONSERVATION ACT 1950

The *Wildlife Conservation Act 1950* (WC Act) is a key piece of legislation in the protection and conservation of all native flora, vegetation and fauna within WA. Under the Act, the Minister may declare any flora and fauna to be specifically listed as threatened, rare or extinct. These lists of specially protected species are regularly updated and published in the Government Gazette.

5.5 DANGEROUS GOODS AND SAFETY ACT 2004

The *Dangerous Goods and Safety Act 2004* relates to the safe storage, handling and transport of dangerous goods and related purposes. The Act indicates those activities and substances which

require licensing prior to use, storage or transport. The aim of the Act is to reduce or minimise risk from dangerous goods.

Several substances used in the processing of gold, and in the general running and up keep of the Project will require management under this Act and its associated regulations. For example:

- Explosives used for drill and blast in the mine; and,
- Hydrocarbons (e.g. diesel fuel).

The Project will need to ensure certain activities and substances that require licensing are identified. Places where dangerous goods are stored or handled or transported must also be licensed under this Act.

5.6 Contaminated Sites Act 2003

The *Contaminated Sites Act 2003* provides for the identification, recording, management and remediation of contaminated sites. A site is considered contaminated if it has 'a substance present … at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value'.

Various facilities and activities associated with different stages of the life of the Project have the potential to generate a contaminated site under this Act. The Joint Venture will appropriately manage its obligations under the act, particularly in regard to:

- Bulk hydrocarbon storage;
- Waste rock dumps and low-grade ore stockpiles; and,
- The tailings storage facility.

5.7 Rights in Water and Irrigation Act 1914

The *Rights in Water and Irrigation Act 1914* provides for the planning, regulation, management, protection and allocation of water resources in Western Australia. The objectives of the legislation include providing for the management, sustainable use and development of water resources to meet the needs of current and future users, and for the protection of their ecosystems and the environment in which water resources are situated.

The Act provides for the permanent transfer of a licence or water entitlement (ie, part of a licence), and also temporary transfer (called agreements with licensees).

5.8 National Greenhouse Emissions Reporting Act 2004

The *National Greenhouse Emissions Reporting Act 2004* (NGER Act) is the National Emissions Data reporting framework that establishes for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production, from 1 July 2008.

The NGER Reporting Guidelines document outlines the steps corporations need to take when determining their registration and reporting obligations. The reporting guidelines also outline the principles of the NGER Act, for corporations needing to report.

5.9 National Pollutant Inventory

The National Pollutant Inventory (NPI) provides the community, industry and government with information regarding substance emissions in Australia. The NPI is tracking pollution across Australia, and ensuring that the community has access to information about the emission and transfer of toxic substances which may affect them locally.

The desired environmental outcomes of the NPI program are to:

- maintain and improve air and water quality
- minimise environmental impacts associated with hazardous waste, and
- improve the sustainable use of resources.

5.10 Other Requirements And Considerations

5.10.1 Cyanide Code

The Code is a voluntary, industry-based program for the gold mining companies that promotes:

- Responsible management of cyanide used in gold mining;
- Enhanced the protection of human health; and,
- Reduction of the potential for environmental impacts.

AngloGold is a signatory of the Code; therefore the Joint Venture will comply with the Code for the Project.

5.10.2 Department of Environment and Conservation Priority List

Species or communities recognised under the Department of Environment and Conservation (DEC) Priority scheme. If a species does not meet the criteria for listing as Threatened Fauna or Declared Rare Flora under the WC Act (e.g. due to lack of information) and is poorly known and/or conservation dependent, it may be classified as a Priority Species at the discretion of the DEC. Priority species are not provided any extra protection to other native species in Western Australia. The listing of a species or a community as a Priority indicates that activities that may impact them are in need of special consideration. A similar program exists for Priority Ecological Communities

5.10.3 EPA Position Statement 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection

The Environmental Protection Authority (EPA) regards biological diversity as a key environmental factor and has an objective to ensure that biodiversity is protected. Position Statement 3 discusses the principles which the EPA will use when assessing proposals which may impact on biodiversity values.

5.10.4 International Council on Mining and Metals Sustainable Development Principle

The International Council on Mining & Metals (ICMM) is an industry group that addresses key priorities and emerging issues within the sector. The ICMM has implemented 10 principles to measure their performance relating to sustainable development in the mining and minerals. Of importance:

Principle 7: Contribute to conservation of biodiversity and integrated approaches to land use planning:

- respect legally designated protected areas;
- disseminate scientific data on and promote practices and experiences in biodiversity assessment and management; and,
- support the development and implementation of scientifically sound, inclusive and transparent procedures for integrated approaches to land use planning, biodiversity, conservation and mining.

6 SUMMARY OF MONITORING PROGRAMS

6.1 PHYSICAL FACTORS

6.1.1 Groundwater

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Groundwater characteristics	PER, Tailings EMS	Monitor bores in the TSF embankment downstream of the embankment.	Assess TSF seepage.	Monitor water level.	Monthly	25% deviation of modelled.	DMP DEC	Annually
				Monitor water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.		
	PER	Monitor groundwater levels, quantity and quality (including groundwater and recharge monitoring against modelling) in the Minigwal Trough.	Assess impacts to Minigwal Trough and to assess pressure changes over the life of the Project.	Monitor Minigwal Trough bores for water level and abstraction rate.	Monthly	25% deviation of modelled recharge and drawdown. 25% of initial pressure.	DoW EPA	Annually
				Monitor Minigwal Trough bores for water quality.	Quarterly	10% variation of baseline groundwater quality monitoring.		
	PER	Monitor post closure recovery of the aquifer for a period of up to 10 years or until it recovers to more than 80% of its capacity or until another user takes control of the borefield.	Assess recovery of Minigwal Trough after the cessation of operations.	Monitor water level and abstraction rate in all production bores.	Monitor at monthly intervals during the first year of recovery, then at quarterly intervals until year three (3), then annually until year 10, or the site is returned to the state (whichever comes first).	25% deviation of modelled recharge and drawdown. 25% of initial pressure.	EPA	Annually
	PER	Monitor the drawdown effect over the life of the Project to determine if the operations are affecting the local groundwater supply beyond what was modelled.	Assess impacts of dewatering on groundwater levels. Indicator for impact to subterranean fauna, vegetation, flora and terrestrial fauna habitat. Assess accuracy of predicted recharge during operations.	Monitor mining area bores for water level and abstraction rate (inside and outside the operational footprint).	Quarterly	25% deviation of modelled recharge and drawdown. 25% of initial pressure.	DoW EPA	Annually

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
				Monitor mining area bores for water quality.	Quarterly	10% variation of baseline groundwater quality monitoring.		
				Compare realtime data against projected modelling or field tests data.	Annually			
	PER	Monitor bores installed across site to determine if the operation is affecting the local groundwater supply.	Assess impacts on groundwater from surface water run-off from the landforms and/or the site internal drainage system.	Monitor mining area bores for water level and abstraction rate (inside and outside the operational footprint).	Monthly	25% deviation of modelled. 25% of initial pressure.	DoW DEC	Annually
				Monitor mining area bores for water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.		
	PER, CEMS, OEMS	Monitor potential pollution/ groundwater quality adjacent to the pit, processing area, TSF and production bores and surrounding undisturbed areas (e.g. downstream of mining area).	Assess impacts to groundwater quality from mine operations.	Monitor mining area bores for water quality (inside and outside the disturbance area).	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.	DoW DEC	Annually
	PER	Monitor superficial aquifers to identify drawdown impacts.	Assess impact on non-target aquifers (if present).	Monitor bores in superficial aquifer(s) for water level and pressure.	Monthly	25% deviation of modelled. 25% of initial pressure.	DoW EPA	Annually
				Monitor bores in superficial aquifer(s) for water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.		

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
	PER, OEMS, CEMS	Groundwater remains uncontaminated after operations.	Assess groundwater contamination occurring after operations cease (during rehabilitation and closure).	Monitor observation bores at the mining area for water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly. during the first year of recovery. After that, the full suite will be monitored at six monthly intervals until year three (3), then annually until year 10 (or until the site is returned to the state).	10% variation of baseline groundwater quality monitoring	EPA	Annually
Groundwater usage	CEMS, OEMS	Monitor groundwater abstraction volumes (flow meter readings).	Record groundwater abstraction volumes.	Flow meter readings.	Monthly		DoW	Annually
Soil moisture	PER	Monitor sand dunes adjacent to the dewatering operation for water retention levels.	Assess dewatering impacts on sand dune water retention levels.	Monitor sand dune sites for moisture levels in the immediate vicinity of the mining area.	At least annually for the first five years of the Project.	25% variation from monitoring sites.	EPA DEC	Annually
Drinking water quality	Submission	Monitor drinking water from source to end user.	To ensure a drinking water of adequate quality is available for the workforce.	As appropriate to the analyte being investigated (e.g. pH is measured with a pH meter, microbiological monitoring requires laboratory techniques).	Thermotolerant coliforms, amoeba, free chlorine will be monitored monthly Dissolved oxygen, hardness, pH, TDS (and other parameters) will be monitored six-monthly. Other sampling requirements as described in DoH document "*Small Community Model Assessable Sampling Grid*"	Result is out of specification	DoH	According to DoH document: "*Systems Compliance And Routine Reporting Requirements For Minesites And Exploration Camps*"

6.1.2 Surface Water

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Surface water quality	PER	Monitor run-off (waste landforms) in the collection point following significant rain events.	To determine if management strategies are working.	Monitor surface water quality in collection points.	Following rain events of over 20mm in 24 hr or when surface water is observed in collection ponds.	TBD	DMP EPA	Annually
	PER	Monitor pit water quality post operations	To assess water quality of pit water post rehab and closure.	Monitoring of pit water post rehab and closure.	Six monthly intervals until year three (3), then annually until the site is returned to the State.	Statistically significant deleterious change in pH and/ or metal content (other than salinity).	DMP EPA	Annually

6.1.3 Air Quality (Dust, Gaseous Emissions)

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Dust	CEMS	Monitor dust emission from construction in areas at high risk of dust.	Assess dust levels and compliance with environmental and health guidelines.	Dust monitoring stations.	Monitor dust emission from construction in dusty area Monthly	Dust levels above 1000mg/m^3, measured over 15 minutes, according to Dust Guidelines (DEP 1996).	EPA DEC	Annually
	OEMS	Monitor dust emissions at environmentally sensitive areas (Dunes west of plant).	Assess dust generation from internal traffic at Dunes west of plant.	Dust monitoring stations.	Quarterly	as above	EPA DEC	Annually
	OEMS	Monitor ambient dust level at the village.	Assess dust generation from internal traffic at the village.	Dust monitoring stations.	Quarterly	Dust levels above 1000 mg/m^3,	EPA DMP	Annually
GHG production	PER	Monitor emissions, as required under NGERS reporting and EEO participation.	To ensure compliance.	GHG calculation/estimation.	Annually	NA	DCC	Annually
	PER	Monitor the effectiveness of greenhouse gas emissions controls.	To track and assess GHG production.	Reconciliation between actual and expected emissions.	Annually	Higher than expected GHG emissions		

6.1.4 Soil Quality and Landform

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
TSF embankment stability	PER	Monitor TSF survey pins to check embankment movements.	Assess TSF embankment stability	GPS monitoring of survey pins.	Annually	TBD	DMP	Annually
	PER - Tailings EMS	Monitor pore water pressures at various key locations within the TSF embankment.	To ensure that stability is not compromised.	Stand pipe peizometers phreatic surface	Monthly	TBD	DMP	
Erosion	PER	Monitoring and remediation program during construction.	Prevent sedimentation and ensure stability.	Regular visual inspection.	Weekly and following rain event over 20mm in 24hr	NA trigger covered under surface water (above)	EPA	Annually
	PER	Monitoring and remediation program during operation.	Prevent sedimentation and ensure stability.	Regular visual inspection.	Monthly and following rain event over 20mm in 24hr			
	PER	Monitoring and remediation program post operation.	Prevent sedimentation and ensure stability.	Regular visual inspection.	Monitor at Quarterly intervals during the first year of recovery, then at six monthly intervals until year three (3), then annually until the site is returned to the State			
Landform stability	PER	Monitor the ongoing stability of the pit(s), tailings storage and waste landforms during rehab and closure.	Assess landform stability during rehabilitation and closure.	Regular visual inspection of general embankment integrity will be used as a qualitative check for stability.	Monthly	No specific environmental trigger as stability is covered under OSH	DMP EPA	Annually
				Survey monitoring using a combination of survey pins and monitor prisms.		TBD		
Soil volumes	CEMS	Soil volumes will be monitored.	To ensure the volume available meet rehabilitation requirements.	Visual assessment of stockpiles to qualitatively assess volumes remaining.	Periodic	NA	NA	NA
				Reconciliation of available vs required	Annually	Negative reconciliation	DMP EPA	Annually

6.1.5 Noise and Vibration

This will be monitored under the OSH monitoring strategy.

6.2 BIOLOGICAL/ BIODIVERSITY VALUES

6.2.1 Flora and Vegetation

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To Stakeholder	Reporting Frequency
Vegetation and flora condition	PER, OEMS, CEMS	Monitor vegetation and flora adjacent to the Project and road corridor to identify indirect impacts e.g. dust (both internal and Mine Access Road).	To quantitatively determine level of decline/impact for flora and vegetation within a predetermined buffer area.	Remote sensing, photopoints and physical flora and vegetation survey including indicator species[1] within monitoring sites of potentially impacted areas outside of the Project footprint (within a 200 m buffer of the Operational Area footprint and a 100 m buffer of the Mine Access Road and Water Supply Area infrastructure) as well as reference sites that are not subject to Project impacts.	Annually with additional photo monitoring – Quarterly during construction and six monthly during operations.	25% deviation in cover or productivity within monitoring (impact) sites relative to reference sites. 25% deviation of indicator species of impact against reference sites.	DEC Project NGOs	Annually
	CEMS, OEMS	Monitor Project footprint boundaries	To ensure clearing boundaries are clearly marked and that there are no breaches in boundaries (e.g. unauthorised clearing, off road driving).	Visual inspection of clearing boundaries.	Fortnightly check during construction. Annually during operation.	Clearing beyond boundary and/or clearing in the absence of a marked boundary.	DEC DMP	Annually
				Reconciliation between satellite (or other) imagery and project GIS data.	Annually	Actual clearing beyond expected extent (GIS).		
Presence, distribution, abundance and density/cover of invasive flora	PER, CEMS, OEMS	Assessment of weeds present including: species, their distribution, abundance and density/cover of weeds.	Monitor the introduction of weeds to determine if weed treatment is required.	Visual inspection for weeds at known locations in and around the Project footprint and at high risk areas (e.g. the airport and rest stops on Mine Access Road). Annual vegetation monitoring sites will include the collection of weed data (if present in monitoring sites).	Annually and six weeks after significant rainfall events (>20mm)	Identification of a weed species in a site where it had not previously been recorded. 25 % increase of weed species in abundance or cover relevant to reference site.	DEC DMP	Annually

[1] Indicator species

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To Stakeholder	Reporting Frequency
	CEMS, OEMS	Monitor weed presence within the Project area and on roadsides.	To ensure weeds do not spread from known locations and high risk areas.	Visual inspection for weeds at known locations in and around the Project footprint and at high risk areas. Satellite or 'similar' imagery will be utilised.	6-weeks after rain greater than 20 mm	Identification of a weed species in a site where it had not previously been recorded.	DEC DMP	Annually
Hygiene compliance	OEMS	Monitor weed hygiene compliance.	To ensure that weed hygiene measures are being adhered to.	Random check of compliance by subcontractor.	As required.	Identified non-compliance		
Rehabilitation	CEMS, OEMS	Monitor vegetation establishment in rehabilitated areas.	To identify the attainment of successful rehabilitation stages.	Combination of remote sensing and visual assessments will be used to assess factors such as soil condition, vegetation stability and establishment appropriate to the establishment of rehabilitation.	Annually	NA	DMP EPA / DEC Project NGOs	Annually
Rehabilitation	PER, CEMS, OEMS	Following rehabilitation, areas will be monitored and treated for invasive flora invasion, if necessary.	To assess the occurrence of invasive flora in rehabilitated areas.	Visual inspection for weeds in rehabilitated areas.	Annually	Weed identified in rehab.	DEC DMP	Annually
Closure	PER	Compliance with Closure Criteria.	To track progress with meeting closure criteria and ensuring Project compliance with environmental requirements.	Administrative	Biennially (post-operations)	Failure to meet identified milestones in closure and rehab management strategy.	Closure	

6.2.2 Fauna

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Fauna health, injury, mortality	PER, Tailing EMS	Monitor use of TSF by fauna (particularly birds).	To ensure contaminants from the TSF are not impacting native fauna and to prevent entrapment/ death at the TSF.	Visual inspections of fauna utilising the TSF.	Daily	Death of a conservation significant species.		
	PER	Monitor presence of fauna (particularly birds) at potentially contaminated and potable water ponds	To prevent fauna entrapment/death in ponds and to ensure contaminants are not impacting native fauna.	Visual inspections of fauna utilising ponds in the mining area.	Daily	as above		
	CEMS	Inspections of trenches during construction and other high risk areas to identify and release entrapped fauna.	To prevent fauna entrapment/death in trenches.	Visual inspection of trenches while trenches are open. Records will be kept of all fauna removed and any deaths	Twice-daily or more frequently if the weather requires	as above	EPA DEC	Annually
Threatened fauna population	Appendix 4I of the Project's Response to Submissions. (Joe Benshemesh report)	Monitor impacts to Marsupial Moles	To assess whether Project operations (including clearing, pit excavation, noise, and vibration) has impacted the local Marsupial Mole population.	Monitoring technique and criteria to be developed in consultation with Joe Benshemesh and other relevant statutory authorities.	Biennially	to be developed	DEC DEWHA Project NGOs	Annually
Fauna habitat	Submissions	To monitor the known habitat of *Aganippe* sp. 4 and presumed habitat of *Kwonkan* sp. 2.	To provide information on the indirect impacts from mine activities on SRE invertebrate fauna and to ensure the species are not subject to indirect impacts beyond the mine's footprint.	Monitoring of fixed sites of known habitat of *Aganippe* sp. 4 and presumed habitat of *Kwonkan* sp. 2 will include: • Census of all mygalomorph burrows present • New burrows to be flagged. • Monitoring of *Aganippe* sp. 4 and *Kwonkan* sp. 2 habitat will be undertaken in conjunction and accordance with the monitoring methods for vegetation and flora (section 6.2.1)..	Annually	No net decline beyond than 25% of reference sites over a three year period.	DEC	Annually
Introduced fauna	CEMS	Monitor the abundance of invasive fauna populations.	Monitor the introduction/ spread of fauna to determine if fauna control is required.	Visual inspections of village and mine for evidence of feral animals, observations to be recorded in the Project's feral animal register.	Quarterly.	Increase in observations quarter to quarter.	DEC	Annually

6.3 INFRASTRUCTURE

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
pH	PER	The pH in the CIL circuit will be monitored and a slow acting control loop will control quicklime addition based on the ball mill feed rate and the measured pH.	To assess CIL performance and lime dosing rate.	Automatic.	Realtime/daily.	Design specification.		
Integrity	PER	Monitor pipelines.	To prevent saline water leakage.	Leak detection system.	Realtime	Greater than 25% between two points.		
Asset and track location	CEMS, OEMS	Tracked infrastructure / facility location via Geographic Information System (GIS) and satellite (or other) imagery.	Identify whether infrastructure is in correct location	Reconcile database against satellite imagery or aerial photography.	Annually	Infrastructure not located as expected.		
Roads, internal and external	CEMS, OEMS	Monitor roads for obvious signs of unauthorised off-road driving.	To ensure roads are maintained and clearly marked.	Periodic drive-by inspections.	Monthly	Signs of unauthorised off-road driving.		
				Reconcile against satellite imagery or aerial photography.	Annually			
Sewage infrastructure	CEMS, OEMS	Monitor the integrity of the sewage system.	To ensure sufficient capacity and appropriate maintenance is occurring	Dependant on system selected.	Dependant on system selected.	System failure. Trigger to be determined at works approval.		
Pipeline containment systems	OEMS	Inspect and monitor pipeline containment systems.	To ensure containment systems are properly maintained.	Visual inspections of bunds and surface pipes.	Monthly	Bund contains water or other debris or pipe perforation.		
				Leak detection system for buried pipes.	Real time.	Greater than 25% between two points.		
Weak acid dissociable cyanide	Tailing EMS	Monitor decant/ bleed water on the TSF for levels of Weak Acid Dissociable Cyanide (WAD cyanide; a form of cyanide that can be environmentally harmful once dissociated).	To ensure that wildlife are protected and the ICM Code is complied with (by keeping the WAD cyanide to below 50 mg/L).	Water samples collected at the TSF and analysed for WADCN.	Weekly	WAD cyanide detected in decant/ bleed water above 50 mg/L	DEC	Annually
Facility integrity and compliance	Tailing EMS	Inspect the TSF to ensure tailings capture.	Avoid uncontrolled release of tailings.	Visual inspection.	Daily	Evidence of tailings on road. Less than 300mm freeboard.		
	OEMS	Inspections of fauna egress at all lined ponds (mining area and Water Supply Area).	To prevent fauna entrapment/death in ponds.	Visual inspection of egress mats/ ramps.	Weekly	Faulty egress		
Facility integrity	CEMS	Audited and inspected landfill and recycling facilities.	To ensure landfill and recycling facilities are properly maintained.	Regular inspection.	Landfill - Weekly Recycling - Monthly	Excessive exposure of tip face. Presence of introduced fauna. Lack of recycling capacity or incorrect sort of recyclables.		
				Regular audit.	Landfill - Annual Recycling - Annual	Audit non-conformance	DEC	Annually

Further information on the management and monitoring requirements can be found in the Tailings Environmental Management Strategy (Appendix-3G of the PER). A summary is provided in Appendix 1 of this document.

6.4 WASTE

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Recyclable material volumes	CEMS, OEMS	Record volumes of recyclable material leaving site.	To track recyclable material leaving site.	Tracking system.	Monthly or as required	NA		
Controlled Waste volumes	CEMS, OEMS	Record volume of Controlled Waste leaving site.	To track Controlled Waste leaving site.	Tracking system.	As removed	NA		

6.5 MANAGEMENT SYSTEM

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Management system	CEMS, OEMS	Monitor spills through the site incident tracking system and follow-up inspections	To track incidents and follow-up actions.	Tracking system.	Monthly			

APPENDIX 1: ADDITIONAL MONITORING REQUIREMENTS FOR THE TSF

Area	Monitoring Requirement	Frequency
Section 1:	**Short Term Operation Monitoring**	
Tailings	Pipeline integrity	Daily
	Visual check of tailings level versus embankment crest	Daily
	Visual check of water level versus embankment crest	Daily
	Off-take location	Daily
	Blockage of discharge	Daily
	Check integrity of geomembrane lining	Daily
	Discharge of free cyanide	Real-time
Decant	Ingress of tailings into decant tower	Daily
	Location of decant pond	Daily
	WAD CN concentration	Weekly
Section 2:	**Compliance Monitoring**	
Embankment	Embankment integrity	Daily
	Seepage from embankments	Daily
	Access ramps	Daily
	Piezometer water level	Weekly
	Decant / supernatant water analysis	
	- Regular	Monthly
	- Comprehensive	Quarterly
	Water level and volume	Monthly
	Tailings level	Monthly
	Survey pins	Quarterly
	General inspection by suitably qualified engineer	Annually
Monitoring bores	Water level	Monthly
	Water quality	Quarterly
Section 3:		
Tailings	Tailings solids (tonnes)	Daily
	Water in tailings (tonnes or m^3)	Daily
	Average tailings flow (m^3/s)	Daily
	Freeboard monitoring survey	
	- Regular	Monthly
	- Comprehensive	Quarterly
	Outflow from decant, underdrainage	Daily
	Outflow from external seepage interception system	Daily
	Water return to plant	Daily
Return Water	Silt removal	Once every 6 months or more frequently if required
Climate	Precipitation	
	Evaporation	Daily
	Maximum - minimum temperatures	Daily
	Wind direction and speed	Daily
		Daily