9. Closure, Decommissioning and Rehabilitation

9.1 Management Objectives, Standards and Guidelines

The objective for closure, decommissioning and rehabilitation is to ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform that is consistent with the surrounding landscape and other environmental values.

Applicable standards and guidelines include:

- Strategic Framework for Mine Closure (ANZECC and MCA, 2000);
- Mine Closure and Completion (DITR, 2006); and
- Mine Closure Guideline for Minerals Operations in Western Australia (CME, 2000).

9.2 Mine Closure

The Spinifex Ridge Project is designed for a nominal life of mine of 10 years. The possible extension of the life of mine beyond this period will be dependent upon many factors (refer to **Section 1.6**). Should Moly Mines choose to close the mine, the decision will be likely determined by any number of influencing factors:

- exhaustion of the mineral resource;
- economic, such as low commodity prices or high costs;
- geological, such as unanticipated decrease in grade or size of the ore body;
- technical, such as adverse geotechnical conditions or mechanical/equipment failure;
- social or community pressures; and
- closure of downstream industry or markets.

Adequate closure planning is required in all phases of project development to ensure that Moly Mines and its key stakeholders are fully aware of the requirements of closure and that appropriate provisions are made to ensure that decommissioning and rehabilitation is completed to agreed objectives.

9.2.1 Policy and Technical Framework

The closure, decommissioning and rehabilitation of Spinifex Ridge will be conducted in accordance with the general provisions of the following key legislation:

- *Mining Act 1978;*
- *Mines Safety and Inspection Act 1994;*
- *Mines Safety and Inspection Regulations 1995;* and
- *Environmental Protection Act 1986.*

Consultation and advice from the regulatory authorities that administer the above legislation (DoIR, DoCEP and DEC) will be undertaken. Specialist advice will also be sought from other stakeholders including the Department of Water, Department of Planning and Infrastructure and Shire of East Pilbara.

More specifically, it is expected that as part of obtaining statutory approval from the Minister for the Environment, the project will be required to satisfy the Minister's statement of conditions relevant to mine closure.

While effective methodologies for site closure are still developing, it is generally accepted that the earlier planning commences for site closure, the greater the chance of success. Moly Mines has developed a Conceptual Closure Management Plan (**Appendix F**) with consideration of the principles provided in the standards and guidelines listed in **Section 7**.

9.3 Potential Impacts

The Spinifex Ridge Project will disturb approximately 1,600 ha of land. If these areas are not appropriately closed, decommissioned and rehabilitated, the following potential impacts may occur:

- unstable and unsafe post-mining landforms from physical, geochemical and ecological perspectives;
- contamination of surrounding groundwater, surface water or soil;
- poor visual amenity and landscape value;
- loss of socio-economic benefits, for example post-mining land use is adversely affected by any of the above impacts;
- community and stakeholder dissatisfaction; and
- insufficient allocation of funds/resources for closure, particularly in the event of unforeseen or sudden closure.

9.4 Management of Impacts

9.4.1 Closure Planning

Moly Mines has prepared a conceptual Mine Closure Management Plan to address key closure issues. This Mine Closure Management Plan outlines closure objectives and identifies closure plans for key disturbance area and modified landforms. The planned development for the Closure Plan is:

- Conceptual Mine Closure Management Plan – included in **Appendix F**;
- Mine Closure Management Plan - within two years of plant commissioning;
- Mine Closure Management Plan review - every two years thereafter; and
- Final Mine Closure Management Plan – approximately six months prior to planned closure.

The Conceptual Mine Closure Management Plan currently addresses the proposed end landuse; conceptual closure prescriptions; and landform design requirements. For example, closure for the key project components will include:

- waste landforms – blended with surrounding topography, concave slopes, progressive shaping and revegetation, post-mining monitoring, development and satisfaction of agreed completion criteria;
- tailings storage facility – berm and batter walls constructed at final angle, limited final height, progressive revegetation of walls, rock armouring and capping to prevent erosion, revegetation;

- pit – safety bunding, signage, review of water filled closure option during operations;
- process plant – removal of equipment, removal of buildings, cleanup of any contamination, landscaping, revegetation; and
- roads and other infrastructure – removal of buildings and power lines, ripping and revegetation of unwanted roads, rehabilitation of landfill and waste water treatment plant site.

The detailed plan will outline the likely activities associated with closing and rehabilitating the open pit void, waste rock landforms, tailings storage facility, buildings and structures, infrastructure and other ground disturbance areas. For these items and activities the following broad site closure objectives will be considered:

- ensure that, as far as practicable, the desires and needs of stakeholders are met;
- comply with all relevant legal and other requirements;
- vacate the site in a safe and stable condition;
- the creation of functioning landforms consistent with the surrounding environment;
- set aside adequate financial provisions to meet closure costs;
- establish a post-closure environmental monitoring program; and
- obtain relinquishment of leases.

The Mine Closure Management Plan will be reviewed every two years to incorporate changes to the disturbance footprint, progressive rehabilitation, legislative requirements, technical improvements, cost increases, changes to the needs of stakeholders and changes to environmental practice techniques.

9.4.2 Rehabilitation Completion Criteria

The development of site specific completion criteria is critical; however this can only be achieved during the operational phase of the project and following adequate consultation with key stakeholders. The key stakeholders currently identified to participate in site closure planning and the development of completion criteria for Spinifex Ridge are presented in **Table 9-1**. This list of stakeholders will be updated periodically throughout the life of the project.

9.4.3 Post-Mining Land Use

The post-mining land use for the project area is proposed to be re-incorporation within the existing Yarrie pastoral activities. It is anticipated that the current level of visitation to Coppin Gap will continue post-mining. No new land uses are proposed for the site, although alternative uses may be identifies during the stakeholder consultation process.

- **Table 9-1 Key Stakeholders Currently Identified to be Involved in Closure Planning**

State Government	
Department of Environment and Conservation	Department of Industry and Resources
Department for Planning and Infrastructure	Department of Water
Local Government	
Shire of East Pilbara	
NGOs	
Care for Hedland Environmental Association	
Indigenous	
Njamal People	
Other	
Warrawagine Station	Yarrie/Muccan Station
Marble Bar Community	Moly Mines Management and Staff
Moly Mines contractors	

10. Socio-Economic Impacts and Management

10.1 Communities

10.1.1 Management Objectives, Standards and Guidelines

The socio-economic objectives for this project are to maximise social and economic benefits to the local community potentially affected by the project and to work with the community to minimise and manage potential disruptions.

Applicable standards and guidelines include:

- Interim Industry Guide to Community Involvement (DoE, 2003); and
- EPA Position Statement No. 7. *Principles of Environmental Protection* (EPA, 2004b).

10.1.2 Potential Impacts

A desktop Socio-Economic Assessment for Spinifex Ridge has been undertaken (SKM, 2007) to document the existing social and economic profiles of the Marble Bar, Shire of East Pilbara and Pilbara regions and to identify the potential opportunities and risks to these areas as a result of the project. A summary of the findings from the assessment is provided in this section.

Several potential opportunities and risks have been highlighted and include:

Opportunities

- investment in social infrastructure in the town of Marble Bar;
- utilisation of local services from Marble Bar;
- creation of training and job opportunities for both indigenous and non-indigenous community members;
- capacity building within the indigenous community, especially in relation to training; and
- economic contribution to the State and local economy.

Risks

- increased pressure of existing community services such as health and medical services from a transient workforce residing within or near Marble Bar;
- community concerns regarding project development;
- wage and local price inflation due to potential short supply of available accommodation (housing) in Marble Bar should the population increase;
- increased road transport and safety risks due to increased number of vehicles; and
- access to primary recreation/tourism areas.

These potential risks are discussed in further detail below with particular regard to each phase of the project.

Potential Opportunities and Risks during Construction and Operation

The potential social impacts that may occur during the construction and operation of the project are not likely to be significant given that the workforce will be engaged on a fly-in fly-out basis and accommodation provided on site within a dedicated camp. Access to surrounding areas will be restricted and the need to visit Marble Bar is likely to be minimal. Should the project and its workforce have a greater presence within the community than anticipated, it is possible that the community may raise some concerns, particularly if the local infrastructure, services and utilities (including emergency services) used by project personnel are adversely strained.

The portion of the workforce that will be drive-in drive-out from Marble Bar will provide employment opportunities for local people and in turn increased economic activity within the town. Given the low number of the Marble Bar population with a certificate level qualification, there are opportunities for the development of long term local workforce employment strategies to provide specific training, on-the-job training and skills in positions where no pre-qualifications are required.

The project area contains two primary recreation areas, namely Coppin Gap and Kitty's Gap. Public access to Kitty's Gap will not be maintained due to the layout of project infrastructure, the need for the site to be made secure and the need to protect public safety. However, public access to Coppin Gap will be retained. Coppin Gap has significant value to the indigenous and non-indigenous community and is also protected as a Reserve for the Preservation of Natural Formations. Moly Mines will ensure that appropriate access is maintained to the area during the construction and operation phases.

Public safety during construction and operation will be critical, given that blasting in the vicinity of Coppin and Kitty's Gaps will occur. There will be increased heavy traffic within the immediate area of Spinifex Ridge and the risks in relation to transportation of hazardous and dangerous goods on public roads will need to be managed. Public safety issues and management are discussed in further detail in **Section 10.5**.

Potential Opportunities and Risks during Closure/Decommissioning

The potential impacts that may occur during the closure/decommissioning of the operations will primarily relate to a decline in the social and economic benefits that will be experienced within the region as a result of the Spinifex Ridge Project. This may include a reduction in employment numbers and in any local procurement practices that Moly Mines may have adopted.

10.1.3 Management Practices

To mitigate the potential socio-economic risks and enhance positive opportunities that may arise as a result of the project, the following management strategies will be adopted:

- a procurement and contracting strategy will be developed prior to construction to maximise local content (i.e. source goods and services locally from the Pilbara where possible);
- maximise local and indigenous employment, including contracting/consulting opportunities for locals to the project, and where possible support employment with training opportunities;
- provide a self-reliant emergency response team and medical centre dedicated to the project;

- maintain and continue stakeholder and community consultation (inclusive of indigenous consultation) with the aim of addressing community aspirations and expectations throughout the life of the mine;
- maintain the visual and landscape amenity as far as practicable during the project design phase; and
- maintain public and tourist access to Coppin Gap and provide appropriate security and signage to increase the public's safety awareness when in proximity of the project area.

10.1.4 Predicted Outcome

The proposed management strategies will address the objectives of minimising the potential adverse socio-economic impacts and maximising local socio-economic opportunities and benefits.

10.2 Land Use

10.2.1 Management Objectives

The socio-economic objectives for this project are to maximise social and economic benefits to the local community and to ensure that proposed project activities are compatible with existing land uses.

10.2.2 Pastoral Activities

10.2.2.1 Potential Impacts

The development of Spinifex Ridge will have a direct impact on 1,600 ha of pastoral land that is located within the pastoral lease boundaries of Yarrie Station. This will result in the direct loss of grazing land and will restrict stock movement across the station. The project area will be kept secure, preventing stock and general public access. A compensation agreement will be negotiated with leaseholder in recognition of impacts on pastoral activities.

The proposed water supply pipeline from borefields to Spinifex Ridge will be located within the lease boundaries of Yarrie Station. Short-term impacts will occur as a result of installing a buried water supply pipeline. Following construction of the pipeline, potential impacts on pastoral land use is expected to be negligible. In the event of Woodie Woodie borefield being required, potential impacts on Warrawagine Station will be similar to pipeline impacts for Yarrie Station.

10.2.2.2 Management Practices

Moly Mines will continue liaison with the Yarrie Station and Warrawagine Station pastoral lease holders regarding project activities during construction and operation. To date, Moly Mines has assisted Yarrie Station with the installation of several pastoral bores and has hired equipment and personnel for various activities on site. Ongoing liaison will be maintained with the stations to maximise potential social and economic opportunities and benefits.

10.2.3 Tourism and Recreation

10.2.3.1 Management Objectives

The objective for tourism and recreation is to ensure that existing and planned tourism and recreation uses are not compromised by the project.

10.2.3.2 Potential Impacts

Potential impacts of the proposed operations relate to reduced usage of the immediate area through changed access to Coppin Gap and through impacts associated with reduced appreciation of the area due to noise, dust, changed water levels.

Tourists who visit Coppin Gap, almost certainly do so as part of a broader tour of the region and are likely to visit other similar landscapes within the Pilbara. Many people visiting the region are interested in mining activities, and will not see the Spinifex Ridge operation as inconsistent with their objectives.

Recreation activities are based around four-wheel drive day trips from people within the area. With the proposed continued access to Coppin Gap, the potential impact of the operation is considered largely be a reduction in appreciation of the area. However, mining is widely accepted in the Pilbara, and it is likely that people from the area will continue to use the area for recreation including looking at progress of the mining operation.

10.2.3.3 Management Practices

A Coppin Gap Management Plan has been prepared that outlines management actions designed to reduce impacts on Coppin Gap, and hence the associated tourist and recreation values. Details of management practices are provided throughout the PER document for maintenance of water quality and levels (**Section 8.3** and **Section 8.4**); air quality (**Section 8.9**), noise, blasting and vibration (**Section 8.11**); and, visual amenity (**Section 10.7**).

Public access to Coppin Gap will be maintained with unauthorised access to key project areas restricted by fencing and signage. The access track provided will of a standard similar to the existing track and will be positioned to minimise the visual impact of the mining operation.

10.2.3.4 Predicted Outcome

Given the low level of usage of the area for tourism and recreation (estimated at approximately 60-100 vehicles/annum, **Section 5.2.3**), and the proposed management practices to minimise impacts to Coppin Gap, the objective to ensure that existing and planned uses are not compromised is considered to likely to be met.

10.3 Indigenous Heritage

10.3.1 Management Objectives

The objective for indigenous heritage is to:

- ensure that changes to the biophysical environment do not adversely affect historical and cultural associations, and comply with relevant legislation; and
- avoid or minimise impacts on indigenous cultural heritage sites.

Applicable standards and guidelines include:

- EPA Guidance Statement No. 41: *Assessment of Aboriginal Heritage* (EPA, 2004c).

10.3.2 Potential Impacts

Ethnographic surveys conducted over the project area have identified four sites of ethnographic significance (refer to **Section 5**). These sites will not be directly impacted by project infrastructure or proposed activities, and no significant indirect impacts are anticipated.

Archaeological survey work has been undertaken, identifying some archaeological material, mainly outside of the project footprint. Where appropriate, this material will be managed in accordance with Section 18 of the Aboriginal Heritage Act, 1972.

10.3.3 Management Practices

In order to effectiuvely management aboriginal heriatge issues, Moly Mines will:

- Comply with Section 18 of the *Aboriginal Heritage Act, 1972*;
- ensure that the sites of ethnographic significance located within the project area are protected and remain undisturbed;
- continue to liaise with relevant Aboriginal representatives during all project phases; and,
- include Aboriginal heritage and cultural sensitivity issues in all site inductions.

10.3.4 Predicted Outcome

No significant impacts on Aboriginal heritage sites will occur.

10.4 Non-Indigenous Heritage

10.4.1 Management Objectives

The objective for non-indigenous heritage is to:

(i) ensure that changes to the biophysical environment do not adversely affect historical and cultural associations, and comply with relevant heritage legislation; and

(ii) avoid or minimise impacts on non-indigenous cultural heritage sites.

10.4.2 Potential Impacts

A search of the State Register of Heritage Places showed no sites of non-indigenous heritage significance are located within the project area. The project is therefore unlikely to impact on any sites of non-indigenous heritage significance.

10.4.3 Management Practices

As there are no known sites of non-indigenous heritage significance within the project area, no specific management practices will be implemented for the project.

10.4.4 Predicted Outcome

No non-indigenous heritage sites will be impacted by the project.

10.5 Public Safety – Traffic and Ore Transport

10.5.1 Management Objectives

The objective is to ensure that the public access road to Coppin Gap is maintained and managed to meet an adequate standard of service and safety and that ore haulage does not significantly impact on public safety and meets the requirements of MRWA.

10.5.2 Potential Impacts

Construction Phase

A number of large pre-assembled modules and equipment for the process plant will be imported and off-loaded using facilities at Port Hedland. These modules will be transported by road-train to the project area via the Great Northern Highway, Warrawagine Road and/or Bamboo Creek Road. The transport of large loads on public roads will be infrequent during construction, however they can be potentially hazardous for general traffic.

The transport of general construction equipment by road-train can be expected throughout the construction phase.

The potential for light-vehicle traffic movement to significantly increase on public roads is likely to be minimal as the construction workforce will be largely fly-in fly-out and accommodated on site.

Operation Phase

Approximately 3 trucks trips / day will transport molybdenum and copper concentrate to Port Hedland during operation. Haulage will be via Warrawagine Road, Marble Bar Road and Great Northern Highway. Ongoing operational requirements, such as reagents and consumables, will also be trucked to site.

Light-vehicle traffic movement on public roads is likely to remain similar to existing levels as the operational workforce will be largely fly-in fly-out and accommodated on site.

Potential exists for spillage of molybdenum and copper product whilst being transported from the site to Port Hedland, either through incidental spillage or through a trailer overturning.

10.5.3 Management Practices

The following management strategies are proposed to minimise the potential safety impacts of large load traffic on public roads:

- The Shire of East Pilbara and MRWA will be consulted regarding requirements for upgrading of Bamboo Creek Rd and Warrawagine Road between the Marble Bar Road and the mine site, including level of usage, public safety issues and signage;
- Road transport safety issues will be included in the risk assessment processes that form part of the overall site operational management. This process is likely to prompt actions including raising awareness of the volume of mine transport traffic; ensuring appropriate signage and ensuring road maintenance responds promptly to any deterioration in road condition;
- Transport to and from site will be undertaken in accordance with all relevant legislation, including Dangerous Goods legislation;
- Segregation of heavy haulage vehicles from public vehicles;
- Public access to Coppin Gap will be developed, to a standard consistent with the existing track, to reduce the likelihood of vehicle accidents in the community.
- Molybdenum concentrate will be transported to Port Hedland in shipping containers, which are designed to be robust and remain intact under foreseeable accident conditions, and which will prevent loss of any product as dust
- Copper concentrate will be transported in covered trailers to prevent product be lost in transit as dust off the trailers. In the event of a trailer overturning, procedures will be developed to promptly clean up spilled product for return to site. The nature of the product is such that it is not highly mobile to dusting or highly soluble to cause a concern in the timeframe between an accident occurring and the clean-up of an accident site
- Both molybdenum and copper products will be transported in accordance with relevant transport regulations

10.5.4 Predicted Outcome

All traffic movements during construction and operation will be conducted safely and in compliance with regulatory requirements.

10.6 Public Safety – Metal Toxicity

10.6.1 Management Objectives

The objective for product handling and management is to ensure that health and safety measures are adopted to protect against any potential risks to human health and safety.

10.6.2 Potential Impacts

Processing, product handling and transport of molybdenum and copper products has the potential to result in exposure of members of the public to these metals. Review of the ore and product composition indicates that copper and molybdenum are the two elements of potential concern.

Potential sources of exposure to these elements are through:

- Dust from product handling and transport
- Dust from the TSF
- Ingestion or absorption from exposure to soluble metals
- Spillage of transported product en route to Port Hedland

Molybdenum occurs widely in nature and is an essential trace element. Molybdenum exists in soluble form (eg molybdenum trioxide) or an insoluble form (eg Molybdenum disulphide [MoS_2]). The form of the molybdenum as mined at Spinifex ridge and throughout the processing and transportation is as MoS_2. MoS_2 is widely used as a dry lubricant in many applications, due to its stability and resistance to oxidation.

Toxicological information on molybdenum has focussed on the more soluble compounds, as these have a higher risk profile than soluble compounds. Molybdenum is also considered significantly less toxic than other metals eg cadmium, arsenic, and manganese.

10.6.3 Management Practices

Despite the low level of risk associated with metal toxicity for members of the public, management practices will be implemented to minimise the potential for unwanted impacts. The management and monitoring of employee health and exposure will provide early warning of any issues that could potentially impact the public. Employee monitoring will be undertaken in consultation with DOCEP, who have responsibility for regulating this aspect of the Spinifex Ridge operation. Management practices to be implemented include:

- Storage and loading of product in enclosed sheds;
- Molybdenum product will be transported in bulk bags within shipping containers;
- Copper concentrate will be trucked in covered trailers;
- An emergency response plan will be developed which will include response to product spillage;
- Development and implementation of an employee health monitoring programme in consultation with DOCEP;
- Implementation of dust management practices as outlined in **Section 8.9;** and
- Recovery of tailings water from the TSF.

10.6.4 Predicted Outcome

Given the relatively low toxicity of molybdenum; the limited opportunities for exposure to potentially problematic materials; and, the proposed management practices outlined, the management objectives for public safety - metal toxicity are likely to be met.

10.7 Visual Amenity

10.7.1 Management Objectives

The EPA objective for visual amenity is to ensure that aesthetic values are considered and measures are adopted to minimise visual impacts on the landscape as low as reasonably practicable.

10.7.2 Potential Impacts

The landscape features across the project area vary considerably from undulating hills on the south side of the Talga Range to extensive plains on the north side of the range. The potential impacts on landforms and the appearance of the landscape due to establishing infrastructure, an open cut pit, waste rock landforms, processing facilities, tailings storage facility, creek diversion and other supporting facilities will include:

- The open cut pit will result in a large permanent excavation being 1200m (East-West) by 1170m (North-South) and 430m deep. The pit will impact on the face of the Talga Range, however the silhouette of the range will not alter significantly (**Plate 10-4** and **Plate 10-6);**
- Overburden from the open cut pit will be stored in a number of waste rock landforms located on the southern side of the Talga Range. The waste landforms will have concave outer slopes, and will only be constructed to a height that is more than 50m below the adjoining section of the Talga Range. Waste landform construction is discussed in **Section 8.12.1**.
- The TSF will occupy 660 ha with an average embankment height of 25 m. The TSF will be visible from Warrawagine Road (**Plate 10-1** and **Plate 10-2**) and the Muccan – Shay Gap Rd (**Plate 10-3** and **Plate 10-4**);
- The processing plant area will be located between the TSF and the Talga Range, hence it will be partially screened and not clearly visible from public access roads (**Plate 10-2** and **Plate 10-4**). The process plant does not comprise of any stacks that will protrude above the process plant profile. Extensive lighting of the process plant will be required to adhere to mandatory safety requirements. This lighting is likely to make the process plant visible from a distance at night. Obtrusive night spill is not likely to occur or adversely affect public amenity due to design considerations (refer to **Section 10.7**) and the large separation distance to the nearest residence (~25 km);
- The ROM pad will also be provided with appropriate lighting however potential light spill from this area is likely to be insignificant as the southern side of the ridge is visble at night time only to the extremely infrequent traffic travelling to Bamboo Creek mine;
- The proposed creek diversion route has been selected to follow low lying terrain and small valleys between undulating hills. Although the physical changes to the landscape will not be as significant as the establishment of waste rock landforms and the TSF, noticeable changes to riparian vegetation may occur. It is likely that riparian vegetation along sections of Coppin Creek downstream of the diversion may show reduced vigour and condition, whilst the new diversion channel will provide the opportunity for riparian vegetation to establish;
- The amenity of Coppin Gap, importantly the presence of water and condition of vegetation within and immediately surrounding the Gap (**Section 8.7.1** and **Section 8.7.2**), is important to the

Marble Bar community. The potential impacts of the proposed creek diversion and groundwater abstraction on Coppin Gap is discussed in **Sections 8.3 and 8.4**; and

- The administration buildings, accommodation village and air strip will all be located on level terrain to the north of the Talga Range (**Figure 1-1**). The construction of these facilities require limited earthmoving hence disturbance to landforms for these facilities will be minimal. These facilities are not large or obtrusive therefore the impact on visual amenity is also considered to be minimal.

Of the above project components, the TSF, waste landforms and lighting for the process plant will have a noticeable impact on amenity and will be visible in part or in full from public viewing points such as Warrawagine Road, Coppin Gap (including the access road to Coppin Gap) and the Bamboo Creek Road (**Plate 10-5** and **Plate 10-6**).

10.7.3 Management Practices

Some impact on visual amenity associated with the large project components is unavoidable, however management practices will be adopted to minimise such impacts as far as practicable. Potential impacted people include the infrequent visitors to Coppin Gap and local community members who use Bamboo Creek and Warrawagine Roads. Management practices to be adopted to minimise impacts include:

- Construction of the new access road to Coppin Gap away from mine infrastructure;
- optimisation of waste landform placement and design with consideration of closure and rehabilitation such that the post-mining landform blends, as far as practicable, with the surrounding terrain;
- waste rock landform and TSF construction methods shall maximise the opportunity for progressive rehabilitation and re-vegetation to take place;
- all re-vegetation on-site will be undertaken utilising local native flora species;
- following the construction of the Coppin Creek diversion channel, progressive re-vegetation of the riparian zone will be undertaken;
- lighting for the process plant and other areas will be undertaken in accordance with Australian Standard *AS4282-1997 Control of the Obtrusive Effects of Outdoor Lighting* ; and
- water levels and condition of vegetation at Coppin Gap will be monitored in accordance with a management plan.

10.7.4 Predicted Outcome

The proposed open cut pit, waste rock landforms, TSF and creek diversion will result in impacts to visual amenity of the site. However, given the infrequent visitation and usage of the area, and the proposed management practices, it is anticipated that the EPA objectives are likely to be met.

- **Plate 10-1 View of the TSF and plant site from Warrawagine Road.**

- **Plate 10-2 Simulated view of the TSF and plant site from Warrawagine Road near the end of the proposed 10 year minelife.**

- **Plate 10-3 View of the TSF and plant site from the Muccan – Shay Gap Road**

- **Plate 10-4 Simulated view of the TSF and plant site from the Muccan – Shay Gap Road near the end of the proposed 10 year minelife**

- **Plate 10-5 View of the Pit and waste dumps from Bamboo Creek road**

- **Plate 10-6 Simulated view of the Pit and waste dumps from Bamboo Creek road near the end of the proposed 10 year minelife (prior to rehabilitation).**

11. Environmental Management Commitments

11.1 Management Commitments

Moly Mines is committed to achieving a level of environmental management and performance consistent with industry standards and statutory obligations. The development of the Spinifex Ridge Project will be conducted in a manner that will minimise impacts on the surrounding biophysical and social environments. Specific management commitments are detailed in **Table 11-1**.

Table 11-1 Proponent Management Commitments

No.	Commitment	Section
1	Moly Mines will operate in accordance with a management system developed to be consistent with the intent of AS/NZS ISO 14001:2004. This management system will include processes for managing the risks associated with any change to operations.	7.4
2	Moly Mines will develop an Environmental Management Programme (EMP) to direct the environmental management of the operation. The EMP will: ■ Provide an overview of the company and relevant corporate policies; ■ Provide an overview of the Spinifex Ridge project; ■ Outline management system requirements that relate to environmental issues; and, ■ Incorporate specific Environmental Management Plans for identified key issues. These plans will outline management actions and responsibility to address.	7.4
3	Moly Mines will develop and implement a Flora and Vegetation Management Plan, to be included in the EMP. This management plan will include: ■ Management of weeds ■ Management of fire ■ Procedures to manage clearing of vegetation (consistent with the PER) ■ Pipeline construction requirements ■ Monitoring of vegetation ■ Establishment of vegetation along the diversion channel	8.5
4	Moly Mines will develop and implement a Terrestrial Fauna Management Plan, to be included in the EMP, with particular focus on species of conservation significance. This management plan will include: ■ Procedures to manage clearing of vegetation (as habitat) ■ Monitoring of fauna, including waterbird usage of the TSF ■ Feral animal management	8.6
5	Moly Mines will develop and implement a Coppin Gap Management Plan which will consolidate actions designed to address aspects of: ■ Groundwater and surface water quantity ■ Groundwater and surface water quality ■ Tourism ■ Visual amenity ■ Security	7.4 8.6 8.7
6	Moly Mines will develop and implement a Groundwater Management Plan, to be included in the EMP, that includes ■ Monitoring and management of drawdown associated with the pit, including ongoing refinement of the groundwater model ■ Monitoring of borefield water levels and impacts ■ Seepage associated with the TSF	8.3

7	Moly Mines will develop and implement a Surface Water Management Plan, to be included in the EMP. This management plan will include: ■ Diversion channel construction ■ Sediment build up associated with the diversion channel ■ Sediment control ■ Monitoring of water flows and water quality	8.4
8	Moly Mines will develop a conceptual Mine Closure Plan, to be included in the EMP. This management plan will include conceptual closure strategies for : ■ Waste landforms ■ TSF ■ Pit ■ Processing Plant ■ Roads and infrastructure	9.4

12. References

ABS – See Australian Bureau of Statistics.

AGO – See Australian Greenhouse Office.

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13. Abbreviations

Abbreviation	Full Title
AMD	Acid Mine Drainage
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZMEC	Australian and New Zealand Minerals and Energy Council
ARD	Acid Rock Drainage
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
AS/NZS ISO 14001	Australian Standard/New Zealand Standard International Standards Organisation 14001:2004 Environmental management systems - Requirements with guidance for use
ABS	Australian Bureau of Statistics
AGO	Australian Greenhouse Office
Bonn Convention	The Convention on the Conservation of Migratory Species of Wild Animals
CALM	Department of Conservation and Land Management (now DEC)
CAMBA	China-Australia Migratory Bird Agreement
CEMP	Construction Environmental Management Plan
CIP	Carbon-in-Pulp
CME	Chamber of Minerals and Energy
dB	Decibel
DEC	Department of Environment and Conservation
DEH	Commonwealth Department of the Environment and Heritage
DEP	Department of Environmental Protection
DEW	Commonwealth Department of Environment and Water Resources
DIA	Department of Indigenous Affairs
DIDO	Drive In Drive Out
DITR	Commonwealth Department of Industry, Tourism and Resources
DLI	Department of Land Information
DMA	Decision Making Authority
DoA	Department of Agriculture
DoE	Department of Environment (now DEC)
DoCEP	Department of Consumer and Employment Protection
DoH	Department of Health
DoIR	Department of Industry and Resources
DoW	Department of Water
DLGRD	Department of Local Government and Regional Development
DPI	Department of Planning and Infrastructure
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EHS	Environment, Health and Safety
EMP	Environmental Management Programme
EP	Environmental Protection
EP Act	*Environmental Protection Act 1986*
EPA	Environmental Protection Authority

Abbreviation	Full Title
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPHC	Environmental Protection and Heritage Council
ESA	Environmentally Sensitive Area
FESA	Fire and Emergency Services Authority
FIFO	Fly In Fly Out
IBRA	Interim Biogeographic Regionalisation for Australia
IMOA	International Molybdenum Association
IUCN	International Union for the Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
LGA	Local Government Area
MCA	Minerals Council of Australia
MRWA	Main Roads Western Australia
NATA	National Accredited Testing Authority
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure (Ambient Air Quality)
NSESD	National Strategy for Ecological Sustainable Development
NOHSC	National Occupational Health and Safety Commission
NPI	National Pollutant Inventory
NVIS	National Vegetation Information Service
OES	Outback Ecology Services
PAF	Potentially Acid Forming Material
PDC	Pilbara Development Commission
PER	Public Environmental Review
PIL1	Chichester Subregion
RFDS	Royal Flying Doctor Service
ROM	Run of Mine
SAG	Semi-Autogenous Grinding
SFMP	Subterranean Fauna Management Plan
SRE	Short-range Endemics
SoEP	Shire of East Pilbara
SS	Suspended Solids
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
TWA	Time Weighted Average
UCL	Unallocated Crown Land
UHF	Ultra High Frequency (300-3000 MHz)
UWA	University of Western Australia
VHF	Very High Frequency (30-300 MHz)
WAM	Western Australian Museum

Units	Definition
µS/cm	micro siemens per centimetre
µg	micrograms
dcm	dumped cubic metre
m^3	cubic metre
mg/m^3	milligrams per cubic metre
meq/kg	milli-equivalence per kilogram
mg/L	milligrams per litre

14. Glossary of Terms

Term	Definition
A Class Reserve	An area of land or habitat that is set aside for the purpose of protecting their recognised conservation value
Aeolian	Formed by wind action
Anthropogenic	Produced by humans
Alluvia	Plural of alluvium, meaning sediment deposited by flowing water (riverbed, floodplain or delta)
Alluvium	Unconsolidated gravel, sand, silt and clay deposited by streams
Ambient Air Quality	External air environment, not including air inside structures or buildings
Ambient Noise	Background noise associated with a given environment. Typically a composite of sounds from many sources located both near and far. No particular sound is dominant.
Amenity	The quality of being pleasant or attractive, a feature that increases attractiveness or value
Archaean	Of or belonging to the earlier of the two divisions of Precambrian time
Avifauna	Birds
A - Weighting	A noise measurement that has been corrected to reflect the way a human would hear it.
Bioregion	An area constituting a natural ecological community with characteristic flora, fauna, and environmental conditions and bounded by natural rather than artificial borders.
Biota	The plant and animal life of a particular site, area or period
Calcrete	Carbonate deposits that form in the soil or in the vicinity of the groundwater table as a result of the evaporation of soilwater or groundwater respectively.
Charpohyte	A macroalgae
Closure	A whole of mine process which typically culminates in tenement relinquishment and includes decommissioning and mine rehabilitation.
Completion Criteria	An agreed standard or level of performance which demonstrates successful closure of a site.
Cosmopolitan	Of worldwide distribution
Decibel (dB)	Decibel (dB) A logarithmic scale used to denote the intensity, or pressure level, of a sound relative to the threshold of human hearing.
dB(A) or A-weighted decibels	Decibels with the sound pressure scale adjusted to conform with the frequency response of the human ear. A sound level meter that measures A-weighted decibels has an electrical circuit that allows the meter to have the same sensitivity to sound at different frequencies as the average human ear.
Decommissioning	The shut-down, dismantling and removal of assets, infrastructure and equipment from the mine.
Diatoms	Member of the algal division Bacillariphyta, characterised by a cell wall of two siliceous valves
Drainage division	Region of major river catchments
Echo-location	The use of an animals sonar system to sense and determine distances between itself and other objects
Ecologically Sustainable Development	Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.
Ecosystem	A community of organisms together with their physical environment, viewed as a system of interacting and interdependent relationships and including such processes as the flow of energy through trophic levels and the cycling of chemical elements and compounds through living and nonliving components of the system

Term	Definition
Electrical Conductivity	Measurement of the total concentration of ions in the water. Used as a measure of salinity
Emergent	General term for a plant growing or protruding above the water surface (e.g. sedges)
Endemic	Referring to organisms that are confined to a particular area or geographical location, restricted in distribution to one region
Epigean	The surface environment as opposed to the subsurface (hypogean)
Exotic species	An organism that is not indigenous to a given place or area
Flora	the plant life characteristic of a region, period, or special environment
Floristic	Pertaining to flowers or flora
Habitat	The place where a plant or animal lives
Habitat Dynamics	Factors relating to habitat such as water quality, vegetation present in the water column
Herpetofauna	Reptile and amphibian species
Humic	Material obtained from organic matter of soils, produced by decomposition of plant or animal matter
Hyporheic	Interstitial spaces within the sediments of a stream bed
Karst	Soluble rock landscape; product of selective chemical dissolution of limestone or other soluble bedrock by natural waters.
Karstic	Soluble rock landscapes; terrain with distinctive hydrology and landforms arising from a combination of high rock solubility and well developed secondary porosity
LA_{10}	The noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the LA_{10} level for 90% of the time.
Lentic	Referring to standing water
Littoral zone	Edge or shore region where the water is shallow enough for continuous mixing
Lotic	Referring to running water
Macroinvertebrate	Larger invertebrates, functionally defined as those >500 µm. Body length usually exceeds 1mm.
Macrophytes	Large plants, represented by submerged, floating and emergent plants
Mesic habitats	A type of habitat with a moderate or well-balanced supply of moisture
Migratory	A species that moves between populations for the purpose of feeding and reproduction
Noise Emissions	Airborne sound radiated by a well- defined noise source
Nomadic	Species that do not 'settle' in one area, but move from habitat to habitat to find optimal conditions
Nuisance Algae	Unnatural and undesirable algal growth generally due to the introduction of nutrients to the natural system.
Opportunistic sampling	Method of choosing items arbitrarily and in an unstructured manner
Periphyton	The biota attached to submerged surfaces
pH	The symbol for the logarithm of the reciprocal of hydrogen ion concentration in gram atoms per liter, used to express the acidity or alkalinity of a solution on a scale of 0 to 14, where less than 7 represents acidity, 7 neutrality, and more than 7 alkalinity.
Phreatophytic	A deep-rooted plant that is dependant on water from a permanent ground supply or from the water table.
Plankton	Community of microscopic organisms freely moving in the open water
Pristine	Remaining in a clean, pure state
Regolith	The layer of unconsolidated soil and rock material which overlays solid rock.

Term	Definition
	Usually formed by the combination of weathering and erosion.
Rehabilitation	The return of disturbed land to a stable, productive and self-sustaining condition after taking into account beneficial uses of the site and surrounding land.
Riparian zone	Any land which adjoins, directly influences, or is influenced by a body of water. The vegetated corridor along streams and rivers
Riverine	Encompassing the banks of a river; riparian
Sediment Load	The proportion of sediment present in the water column
Shrub-steppe	A type of low rainfall natural grassland where there is sufficient moisture levels for growth of perennial grasses and/or shrubs
Short-range endemics or endemics	Those species with restricted, isolated or fragmented ranges, or those that are at the extreme limits of their distribution.
Stygal	Referring to groundwater (stygo-)
Stygobite	Species that are specialised subterranean forms, obligate groundwater inhabitants
Stygobiont	Aquatic obligates in subterranean ground waters and cave streams.
Stygofauna	Fauna inhabiting various types of groundwater
Subterranean	Beneath the earth's surface
Sustainability	Development which meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987).
Taxa	A taxonomic category or grouping
Taxon	A taxonomic group of any rank. (pl. taxa)
Tethys	Ancient sea divided Gondwana from Laurasia around 15 million years ago
Troglobite	Species that do not exist outside of caves
Troglofauna	Terrestrial fauna inhabiting various types of subterranean spaces, from caves to air filled voids
Troglomorphic	Morphological characters that are adaptations to living in constant darkness such as caves
Trogloxene	Species that enter caves actively or passively but feed on the surface
Trogolophile	Species able to live and reproduce underground as well as in the epigean domain
Turbidity	Turbidity is a cloudiness or haziness of water (or other fluid) caused by individual particles (suspended solids)
Vagile	Characterized by vagility; able to move about or disperse in a given environment
Water Regime	The pattern of wetting and drying of the water body.