

ASSESSMENT REPORT 52

BROWNS OXIDE PROJECT

**ENVIRONMENTAL ASSESSMENT REPORT
AND
RECOMMENDATIONS**

ENVIRONMENT PROTECTION AGENCY PROGRAM

NORTHERN TERRITORY GOVERNMENT

May 2006



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Abbreviations

AAPA	Aboriginal Areas Protection Authority
AHC	Australian Heritage Council
ARD	Acid Rock Drainage
ARI	Average Recurrence Interval
AUSRIVAS	Australian River Assessment Scheme
DBERD	Department of Business, Economic and Regional Development
DPIFM	Department of Primary Industry, Fisheries and Mines (formerly part of the Department of Business, Industry and Resource Development)
DEH	Department of the Environment and Heritage (Australian Government)
DHCS	Northern Territory Department of Health and Community Services (formerly THS)
DPI	Northern Territory Department of Planning and Infrastructure
DLPE	Northern Territory former Department of Lands, Planning and Environment (now the Department of Planning and Infrastructure and Department of Natural Resources, Environment and the Arts)
EPA	Environment Protection Agency
EMP	Environmental Management Plan
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Australian Government)
Ha	Hectares
HCS	Heritage Conservation Services
km	Kilometres
km ²	Square Kilometres
L/s	Litres per second
m	Metres
MAGNT	Museum and Art Gallery of the Northern Territory
m ³ /day	cubic metres per day (1m ³ = 1000 litres)
m ³ /hr	cubic metres per hour (1m ³ = 1000 litres)
ML	Megalitres (1ML = 1 million litres)
ML/y	Megalitres per year
MMP	Mining Management Plan
MST	Main Sedimentation Trap
Mt	Million tonnes
Mt/y	Million tonnes per year
Mm ³	Million cubic metres
MW/a	Megawatt per annum
NAF	Non-acid forming
NAPP	Net Acid Producing Potential
NEPM	National Environment Protection Measure
NRETA	Northern Territory Department of Natural Resources, Environment and the Arts
NOI	Notice of Intent
NT	Northern Territory
PAF	Potentially acid forming
PER	Public Environmental Report
PM _{2.5}	Particulate Matter with equivalent aerodynamic diameter less than 2.5 micrometres
PM ₁₀	Particulate Matter with equivalent aerodynamic diameter less than 10 micrometres
ROM	Run of Mine ore stockpile
t	Tonnes
t/y	Tonnes/year
TSF	tailings storage facility
TSP	Total Suspended Particulate

EXECUTIVE SUMMARY

This report assesses the environmental impacts of the proposal by Compass Resources NL (the proponent), for the Browns Oxide Project located 65km south of Darwin and 7km northwest of the Batchelor township. The project would involve open cut mining methods to extract approximately 3.9 Million tonnes (Mt) of polymetallic oxide ore over a project life of four years. The ore would be processed using a conventional crushing, leach and solvent extraction-electrowinning circuit to produce copper cathode and a chemical precipitation circuit to produce cobalt and nickel. The products would be transported from site by road to the Port of Darwin for export by ship.

This Assessment Report reviews the Public Environmental Report (PER), public comments, the proponent's Supplement to the PER and additional information requested by the Minister during the assessment process. Information, comments and advice provided by Northern Territory Government agencies and previous studies undertaken in the region have also been used in the preparation of this report.

Environmental assessment is the process of defining those elements of the environment which may be affected by a development proposal and of determining the significance, risk and consequences of the potential impacts of the proposal. Recommendations arising from the assessment address methods to mitigate these impacts.

Major Issues

The principal environmental issues associated with the proposal are:

- The characterisation, prevention and management of ARD from the waste rock material and tailings that would be produced from the project;
- The design and management of the TSF and in particular seepage issues and closure;
- Management of uranium/radiology issues associated with mining and processing an ore body that contains low amounts of uranium;
- The fragmentation of flora and fauna habitats that support eleven known fauna species listed as 'vulnerable' to 'near threatened' and three species of national and Northern Territory significance – namely the northern quoll, partridge pigeon and red goshawk;
- The impact of groundwater drawdown from dewatering and the potential for ARD generation from the Rum Jungle pits;
- The potential to intercept contaminated groundwater beneath the former Rum Jungle area and associated management of this water;
- Management of surface water, particularly ensuring contaminated water is not discharged to the East Finnis River and that excess water discharges do not impact the Finnis River; and
- Rehabilitation and mine closure.

Conclusions

The Environment Protection Agency Program considers that the environmental issues associated with the proposed project have been adequately identified. Appropriate environmental management of a number of these issues has been resolved through the assessment process, while the remainder will be addressed through monitoring and management actions detailed in issue-based management plans proposed to be developed for the project.

The final management plans for the proposal will be subject to review to the satisfaction of the relevant Northern Territory Government agencies prior to their incorporation into the Mining Management Plan. It is recommended that a Radiation Management Plan also be developed in consultation with key stakeholders. In light of increased predicted groundwater inflows, a revised water balance model will need to be incorporated into the Water Management Plan to ensure excess water can be appropriately managed. The management plans will be working documents for the life of the project and will require continual review in light of operational experience and changed circumstances.

Based on its review of the PER and the proponent's response to submissions from relevant Northern Territory Government agencies, affected stakeholders and the public, the Environment Protection Agency Program considers that the project can be managed without unacceptable environmental impacts. This is provided that the environmental commitments and recommendations detailed in the PER, the Supplement, this Assessment Report and in the final management plans are implemented and managed under the environmental management system for the project and are subject to regular reporting and compliance auditing.

List of Recommendations

1. Recommendation

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **identified in the Browns Oxide Project, Public Environmental Report and Supplement to the Public Environmental Report; and**
- **recommended in this Assessment Report (No. 52).**

All safeguards and mitigation measures outlined in the Public Environmental Report and Supplement are considered commitments by Compass Resources NL and are included in Appendix 1 of this report.

2. Recommendation

In accordance with clause 14A of the Administrative Procedures of the Environmental Assessment Act, the proponent shall advise the Minister of any changes to the proposal for determination of whether or not further environmental impact assessment is required.

3. Recommendation

Waste rock characterisation, together with multi-element data (including uranium) and kinetic testing on both potentially acid forming and non-acid forming rock is to continue over the life of the mine.

The annual Mining Management Plan and updated closure plans are to include the latest information concerning the acid-forming potential of waste rock in order to prevent the formation of ARD.

Should additional testwork determine variations of non-acid forming and potentially acid forming material differ significantly from those described in the Supplement, the proponent will revise waste rock management strategies and submit to Department of Primary Industry, Fisheries and Mines to ensure appropriate ARD management strategies are adopted.

4. Recommendation

Any non-acid forming (NAF2) material, including hanging wall shale, with a sulphur content above 0.02%, must be treated as potentially acid forming material and not be used for construction purposes unless further testing has demonstrated its suitability.

Appropriate strategies for storing and monitoring of non-acid forming material to prevent mobilisation of heavy metals will be required as part of the Mining Management Plan prior to mine commencement.

5. Recommendation

A risk management strategy must be prepared as part of the Mining Management Plan, outlining detailed contingencies to manage contaminants in the event that waste rock drainage from any non-acid forming material is found to be a source of metal contaminants.

6. Recommendation

The proponent is to consider designing the bund separating PAF waste rock from the tailings material so that permeability of the bund is as low as possible to minimise seepage to surface and groundwater.

A monitoring program is to be developed to measure the effectiveness of the bund between the TSF and potentially acid forming waste stockpiles for inclusion in the Mining Management Plan. The Mining Management Plan is to provide an assessment of the monitoring results to determine whether the bund is adequate in its containment of seepage. A contingency plan is also to be provided.

7. Recommendation

The results of further investigations into TSF cover system designs to limit the generation of acid generating conditions are to be reported to Department of Primary Industry, Fisheries and Mines through updates of the Mining Management Plan.

8. Recommendation

The proponent is required to investigate options for ongoing collection and treatment of ARD prior to discharge post closure. Management options are to be included in the Mine Closure Plan.

9. Recommendation

The Mining Management Plan is to contain the results of the tailings kinetic testwork, including multi-element testing, and appropriate mitigation measures to prevent ARD occurring in the TSF during operations and post closure.

10. Recommendation

More detailed groundwater modelling of the interaction between seepage from the TSF and the overall groundwater response to the pit and extent of groundwater mounding needs to be undertaken during mine operation. Additional mitigation measures to manage TSF seepage, other than drains and recovery bores (eg barrier systems, liners, geotextiles) need to be included as part of the Mining Management Plan.

11. Recommendation

As part of further investigations into cover system designs for TSF closure, factors contributing to the deterioration of the Rum Jungle waste rock cover need to be investigated and lessons incorporated into final cover design. This is to be included in the Mining Management Plan.

12. Recommendation

As part of the Mine Closure Plan, the proponent will provide details on the planned management of seepage from the TSF post mine closure.

13. Recommendation

A Radiation Management Plan (RMP) will be developed and implemented in accordance with the most recent Code of Practice and Safety Guide, presently being *Radiation Protection Series 9 – Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* as part of the Mining Management Plan (commitment 16, PER). The recommendations made in Appendix 7 (section 9) of the PER must be incorporated into the RMP and include:

- A background radiological survey for the site is collected prior to mine commencement, including air, water quality and green tissue analysis;
- A site radiological survey is conducted within the first year of operation to determine sources of elevated radioactivity;
- Borehole and surface run-off water quality is monitored prior to and during mining to assess the impact of Browns Oxide project and the contribution from any deterioration of the covers on the former Rum Jungle mine site; and
- Adopt best practice in carrying out requirements for radiation management to prevent unacceptable impact of the Browns Oxide project.

14. Recommendation

The proponent will make the Radiation Management Plan available for public comment and any monitoring results from the radiation monitoring program publicly available.

15. Recommendation

Additional core samples are to be collected to undergo uranium assays at depths greater than 10m and contingency plans for management of uranium on site need to be developed as part of the Mining Management Plan.

16. Recommendation

As part of the Mining Management Plan, a Biological and Land Management Plan and Weed Management Plan incorporating recommendations to mitigate fauna impacts made in Appendix 4 of the PER and this Assessment Report, must be prepared in consultation with relevant stakeholders and submitted to the Department of Primary Industry, Fisheries and Mines, and the Department of Natural Resources, Environment and the Arts for approval prior to commencement of works.

17. Recommendation

Feral animal management will be included as a specific implementation measure in the Biological and Land Management Plan.

18. Recommendation

In conjunction with the proposed annual stream biological monitoring programme, baseline field surveys targeting fish fauna will also be undertaken in consultation with Museums and Art Galleries of the NT of the Department of Natural Resources, Environment and the Arts. If results from fish field surveys detect the presence of Lorentz's Grunter, a detailed management and monitoring plan to protect the species is to be developed and included in the Mining Management Plan.

19. Recommendation

The Medical and Entomology Branch of the Department of Health and Community Services review and comment on the final Biological and Land Management Plan and Mine Closure Plan.

20. Recommendation

The protection of fire sensitive riparian and vine forest vegetation is to be a specific implementation measure in the Fire Management Plan and Biological and Land Management Plan for the project area.

21. Recommendation

No riparian vegetation will be cleared in the project area and construction of the main sediment trap must be sited at least 50m from the drainage line in the eastern section of the project area.

22. Recommendation

The proponent will liaise with Friends of the Batchelor Open Wildlife Sanctuary and Greening Australia to arrange the controlled removal and transplant of cycads.

23. Recommendation

The proponent is to establish a monitoring program to determine any impacts on vine forest communities resulting from groundwater draw down in liaison with the Departments of Primary Industry, Fisheries and Mines and Natural Resources, Environment and the Arts. The proposed extent of disturbance to the vine forest communities must be detailed and adequate buffer areas maintained around vine forest communities to reduce the risk of disturbance.

24. Recommendation

In the event that the vine forest community is impacted by drawdown impacts, the proponent is to develop a re-establishment strategy or vegetation offset areas in liaison with Departments of Primary Industry, Fisheries and Mines and Natural Resources, Environment and the Arts.

25. Recommendation

The proposed groundwater management measures and groundwater monitoring recommendations made in the Coffey Report (commissioned in response to the further information request) are to be incorporated into the Water Management Plan.

26. Recommendation

The following are to be included in the Water Management Plan:-

- Measures for segregation of groundwater inflows into the pit in order to limit the volumes of contaminated water;
- Alternative management of groundwater inflows should monitoring determine a deterioration in groundwater quality as a result of in-pit dewatering; and
- Irrigation management details.

27. Recommendation

Prior to the mine commencing, Compass will consult with local groundwater users to determine agreed alternative water sources should dewatering activities deplete groundwater resources.

The monitoring information obtained during the life of the operation is to be used to refine the groundwater model to improve predictions of the extent and duration of drawdown. This is to be reported as part of the Mining Management Plan.

28. Recommendation

Water levels within the Rum Jungle open cuts and the presence of sulfide materials on exposed pit walls are to be monitored as part of the groundwater monitoring program with a view to avoiding disturbance of the Rum Jungle site.

29. Recommendation

Alternatives to water discharge into the East Finnis and consideration of other key risk reduction strategies prior to discharging into the river must be supplied as part of the Mining Management Plan. An appropriate waste discharge management strategy incorporating discharge management principles is required as part of the waste discharge licence.

30. Recommendation

Water balance modelling is to be updated to inform surface water management at the site for a 1 in 100 year average recurrence interval event, and assess the potential impacts of a 1 in 200 year average recurrence interval event along with the modelled groundwater inflows outlined in Recommendation 10. The proponent is to demonstrate, as a minimum requirement of the Waste Discharge Licence and in the Mining Management Plan, effective water management measures for extreme rainfall events and periods.

31. Recommendation

The final mine closure plan is to be developed and submitted to Department of Primary Industry, Fisheries and Mines for approval in the early stages of operation. In line with the monitoring programmes being reviewed and revised annually, the Mine Closure Plan must be reviewed annually as part of the Mining Management Plan. The Plan must also include rehabilitation objectives and contingency planning for sudden mine closure.

32. Recommendation

Closure criteria for Browns Oxide need to be developed with the expectation that the objectives for rehabilitation of Rum Jungle are achieved. Appropriate closure objectives detailed in the Mine Closure Plan will be based on ecosystems upstream from Rum Jungle mine impacts.

33. Recommendation

The proponent is to commit to undertake annual reporting of greenhouse gas emissions from the Browns Oxide project to the Northern Territory Government as part of the Mining Management Plan.

The Mining Management Plan needs to outline measures to minimise greenhouse gas emissions during the construction phase. The proposal's operational greenhouse gas emission estimates are to be adopted as initial emission targets and be reflected in the Mining Management Plan.

34. Recommendation

The Air Quality Management Plan must include proposed management of dust from the tailings dam surface if the TSF is identified as a significant dust source.

35. Recommendation

A dust monitoring program must be established to show that dust management practices are effective. The results of monitoring must be made publicly available and should be reviewed in the Mining Management Plan, for appropriate action, including continuation, cessation or modification of the program. At a minimum the program should include monitoring for lead, PM2.5, PM10 and Total Suspended Particulate

and baseline data should be collected and used as a comparison. The Monitoring Program should also include results of radiation surveys and quarterly assaying of dusts and air samples.

36. Recommendation

The proponent will provide detailed plans of proposed works at the Rum Jungle Road and Litchfield Road intersection for approval by Department of Planning and Infrastructure's Road Network Division prior to mine commencement.

37. Recommendation

Revised issue-based management plans covering construction and operation of the Browns Oxide project are to be submitted to Department of Primary Industry, Fisheries and Mines and the EPA Program for approval prior to commencement of construction and operation. The management plans will be included as an appendix within the Mining Management Plan. In preparing each issue-based management plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report and recommendations made by the Northern Territory Government with respect to the proposal. The plans shall be referred to relevant NT Government Agencies for review prior to finalization. The plans shall form the basis for approvals and licences issued under relevant NT legislation.

1 Introduction and Background

This report assesses the environmental impact of a proposal by Compass Resources NL (Compass) to mine a polymetallic oxide deposit located 65 km south of Darwin and 7 km north-west of Batchelor, Northern Territory (Figure 1). The project, referred to as the 'Browns Oxide Project' is adjacent to, but does not impinge on the former Rum Jungle mine site.

Compass ('the proponent') proposes to use open pit mining techniques to mine the Browns Oxide ore deposit over a period of approximately four years. The proposal includes development of an on-site processing plant where copper, cobalt and nickel would be extracted from the ore. Mine products would be transported by road to the Port of Darwin for export. Tailings would be disposed of on-site to an engineered TSF. Waste rock would be incorporated into the TSF embankment and potentially acid forming waste rock would be placed in a designated area within the tailings structure. Raw water for the project would be supplied from groundwater located within the project area and by recycling water from the TSF. Excess water of a suitable quality would be discharged into the East Finnis River under a waste discharge licence. Where excess water quality is not suitable to discharge into the East Finnis River, management options have been outlined by the proponent and presented in section 4.7.1 of this report.

This Environmental Assessment Report is based on a review of the Public Environmental Report (PER); comments from the public and NT Government agencies on the PER; and the Supplement to the PER prepared in response to those comments and additional information requested by the Minister Natural Resources, Environment and Heritage during the assessment process.

1.1 Environmental Impact Assessment Process

Environmental impact assessment is based on adequately defining those elements of the environment that may be affected by a proposed development, and on evaluating the significance, risks and consequences of the potential impacts of the proposal at both local and regional levels. This Assessment Report describes the adequacy of the PER and Supplement submitted by Compass in achieving these objectives. The report also evaluates the adequacy of the commitments and environmental safeguards proposed by the proponent in order to avoid or mitigate potential impacts associated with the proposed Browns Oxide Project.

Where it is determined through the environmental assessment process that the potential impacts associated with aspects of the proposal can be adequately managed through the strategies presented by the proponent in the PER, these strategies are supported in the Assessment Report. Where it is determined that the potential impacts cannot be adequately managed through the safeguards presented by the proponent, additional safeguards are recommended to ensure that should the proposal be approved, it can proceed in an environmentally acceptable manner. The safeguards may be implemented at various levels within the planning framework of the project and include (but are not limited to):

- design and layout of facilities;
- management of construction activities; and
- management of processes used in operation at the facility (i.e. inputs and outputs).

A list of commitments made by the proponent in the PER and Supplement, in response to submissions from the public, NT Government and the Australian Government, is provided in Appendix 1. These commitments, along with the recommendations made in this report form the basis of advice to the NT Minister for Natural Resources, Environment and Heritage on the environmental issues associated with the project and are to inform a decision as to whether or not the project should proceed.

1.2 Environmental Impact Assessment History

Compass lodged a Notice of Intent (NOI) with the Department of Primary Industry, Fisheries and Mines (formerly Department of Business Industry and Resource Development) in December 2004, proposing the mining and processing of the Browns polymetallic oxide deposit. The proposal was referred to the EPA Program, formerly the Office of Environment and Heritage, in December 2004.

In February 2005, the then NT Minister for Environment and Heritage determined that the proposal would require assessment under the *Environmental Assessment Act* at the level of a Public Environmental Report (PER). The proponent referred the project to the Australian Government Department of the Environment and Heritage (DEH) under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. The Australian Government determined that the proposal constituted a Controlled Action under sections 18 and 18A (listed threatened species and communities) of the EPBC Act. The Australian and NT Governments agreed that the project would be assessed through accreditation of the NT assessment process under the terms of the Bilateral Agreement between the Australian and Northern Territory Governments. The proponent was instructed to prepare one PER document to fulfill both the Australian and NT Government environmental assessment requirements.

Draft guidelines covering issues to be addressed in the PER were developed by the NT EPA Program and Australian Government DEH. The Draft Guidelines were subject to a statutory 14 day public review period in February 2005. Guidelines for the PER were finalised in May 2005, taking into account submissions and comments from various members of the public, non-government groups and NT Government agencies. The NT Minister for Natural Resources, Environment and Heritage directed the proponent to prepare the PER addressing matters set out in the final guidelines.

Compass submitted a PER on the Browns Oxide Project to the NT EPA Program and Australian Government DEH in November 2005. The PER underwent a statutory public exhibition period of 35 days from the 10 November 2005 to 15 December 2005, with the EPA Program accepting comments up to the 22 December 2005. During the public exhibition period, the PER was also circulated to NT Government advisory bodies for review and comment. Nine public submissions were received. These submissions were compiled together with submissions from NT Government agencies, and were provided to the proponent at the close of the review period. A list of respondents to the PER and issues raised in their submissions can be found in the proponent's Supplement to the PER (Table 2.2, Supplement).

The proponent prepared a Supplement to the PER addressing issues raised in the public and Government submissions. The Supplement was submitted to the EPA Program on 10 February 2006 and was circulated to the NT Government agencies and the DEH for review and comment. On 15 March 2006, the Minister for Natural Resources, Environment and Heritage requested Compass to provide further information on groundwater and surface water management for completion of the assessment of the project. Following the review of the

Supplement and additional information, this Assessment Report was prepared to report on the outcomes of the environmental assessment process, and to make recommendations on the environmental issues associated with the proposal, for consideration by the Minister.

Once the Minister for Natural Resources, Environment and Heritage has considered and agreed to the findings of this Assessment Report, it will be forwarded to the Australian Government Minister for the Environment and Heritage. The Minister will consider the findings presented in this Assessment Report when determining whether to issue an approval under the EPBC Act. The Australian Government has 30 business days in which to issue an approval once it has received this Assessment Report and a notice issued by the Northern Territory's Minister for Natural Resources, Environment and Heritage, as required under Section 130 (1B) (b) of the EPBC Act.

1.3 Regulatory Framework

The NT Government has jurisdiction over environmental and other legislation relating to the siting, construction and operation of the proposed Browns Oxide Project. The Australian Government administers the EPBC Act, which applies to the project because it was deemed to have the potential to cause significant impacts on threatened species and communities listed under the Act. Therefore, environmental assessment was undertaken in accordance with the requirements of both the Northern Territory *Environmental Assessment Act (1982)* and the Australian *Environment Protection and Biodiversity Conservation Act (1999)*. As the proposal is deemed a controlled action under the EPBC Act, approval will be required from the Australian Government Minister for the Environment and Heritage (or his delegate).

Approval for the proposed Browns Oxide project is also required under the *Northern Territory Mining Management Act (2001)*. Under the provisions of the *Environmental Assessment Act (1982)*, the Minister for Natural Resources, Environment and Heritage will inform the NT Minister for Mines and Energy of the findings of the review and assessment of the environmental aspects of the proposed action. The Minister for Mines and Energy will then make a determination as to whether or not an 'Authorisation to Operate' will be issued to Compass to operate the Browns Oxide Project under the *Mining Management Act*, and if so what conditions should be attached in order to mitigate environmental concerns.

2 The Proposal

The Compass Browns Oxide Project proposal involves the development of an open cut mine, processing plant, TSF and associated mine infrastructure at a site located 7km northwest of Batchelor and 65km south of Darwin, Northern Territory (Figure 1). The proposed project is located adjacent to the old Rum Jungle mine site. The current proposal covers the mining and processing of a 3.9 million tonnes (Mt) polymetallic oxide ore deposit. A key design criterion for the proposal is to not sterilise the underlying sulfide deposit with respect to possible future mining.

The proposed project footprint is a 90 ha area within the 175 ha area of granted mineral leases. It is proposed that open pit mining techniques would be used to extract the ore deposit. Mined polymetallic oxide ore would be transferred from the pit to a run of mine (ROM) stockpile. Low-grade ore and lead-ore would be stockpiled separately for potential future processing if economically viable to treat, or returned to the pit at the end of mine life. Waste rock would be sorted according to acid-forming potential, and would be used to construct the TSF embankment and as road base.

The polymetallic oxide ore would be transported by truck to the ROM pad to provide feed for the on-site processing plant for recovery of copper, cobalt and nickel. The products would be transported by road trains to the Port of Darwin for export. Tailings produced during the recovery of metals, would be transferred to the TSF.

A summary of the key characteristics of the proposed project is provided in Table 1.

Table 1: Summary of the Proposed Project

Component	Proposed Project
Resource	3.9 Mt (confirmed resource of 2.8 Mt)
Mine Life	Four years
Mining method	Open pit, excavator/truck mining
Mine Production Rate	1 Mt/y
Depth of mine pit	20-25m on average with two deeper pockets of up to 50m
Extent of mine pit	800m long and 250 m wide
Processing	Crushing/grinding circuit and leach tanks
Product	10 000t/y copper cathode, 1000 t/y cobalt, 700 t/y nickel
Waste Rock Management	Approx 5.3Mt of waste rock generated and utilised in construction of the TSF embankment, ROM pad, sediment trap bund, safety bund and capping
Transport	Copper cathode and cobalt and nickel products transported by road to Darwin Port for export

Component	Proposed Project
Power source	Northern Territory grid
Power requirement	7.5 MW/a (subsequently changed to 10MW/a)
Tailings storage facility	35.71 ha, 3.07 Mm ³ capacity
Water Supply	groundwater, recycling water from TSF in the wet season, externally supplied drinking water
Raw water requirement	40 m ³ /hr, 350 ML/y
Groundwater level	4-8m below surface level depending on season
Groundwater	Mine dewatering pumped to process water dam and used in process
Workforce	Approx 79 operational personnel
Air Emission Sources	Fugitive emissions

The key aspects of the Browns Oxide Project proposal are listed below:

- Site clearing and development
- Mining of ore and waste-rock from an open cut pit
- Waste rock management
- Processing of mined ore
- Product storage and transportation
- Tailings management
- Water management
- Rehabilitation and closure

Facilities associated with the mining operations would include those listed below:

- Mine oxide pit
- Low-grade ore stockpile and lead ore stockpile
- ROM stockpile area
- Process plant
- Tailings storage facility
- Process water dam
- Haul road
- Access road
- Mining contractor area
- Offices and car park
- Magazine (Explosives storage)
- Water management devices
- Northwest and northeast sedimentation traps
- Main sedimentation trap
- Topsoil stockpile areas

The footprint of the proposed project is shown in Figure 2.

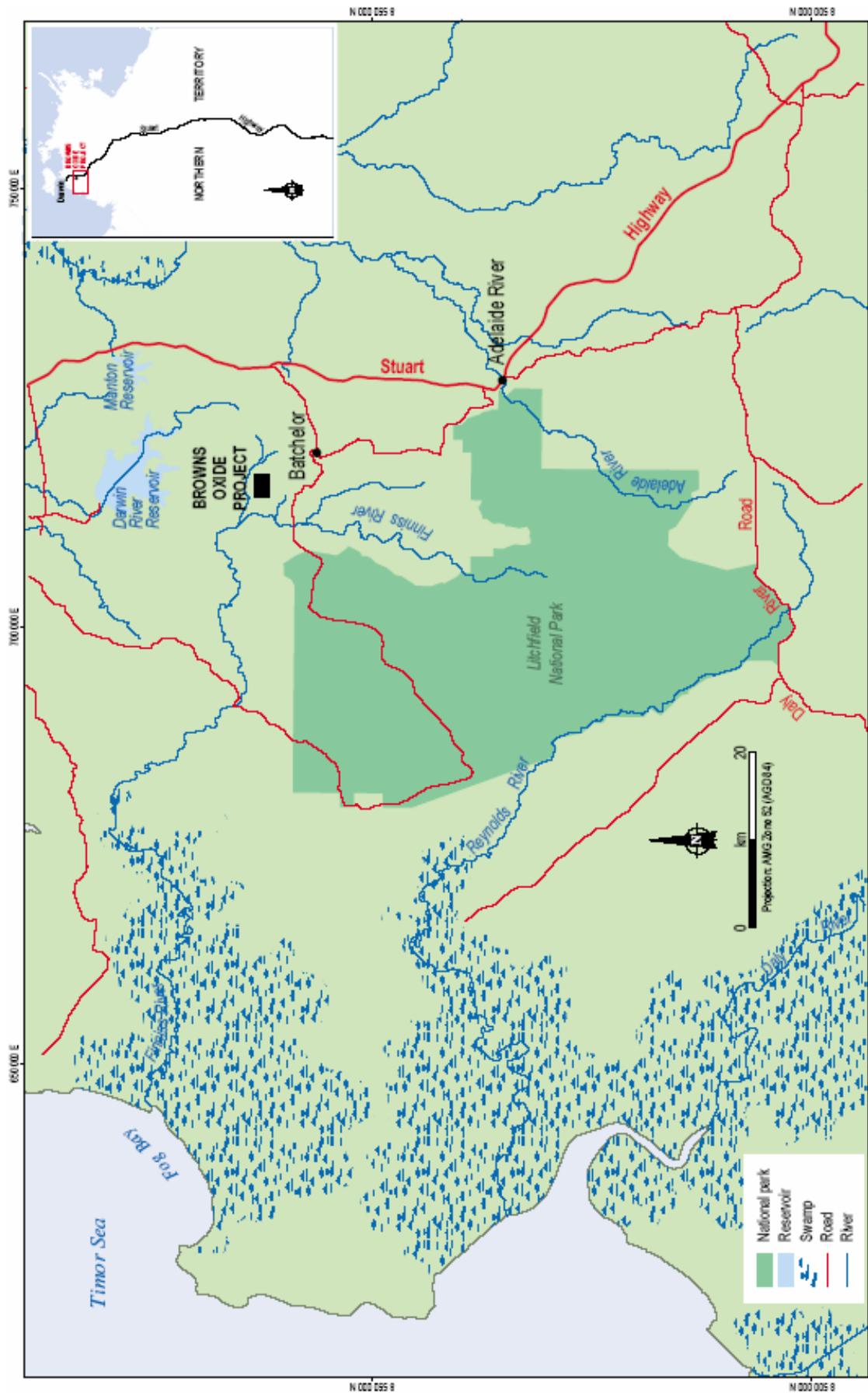


Figure 1: Location of proposed Browns Oxide Project (Fig ES1, PER)

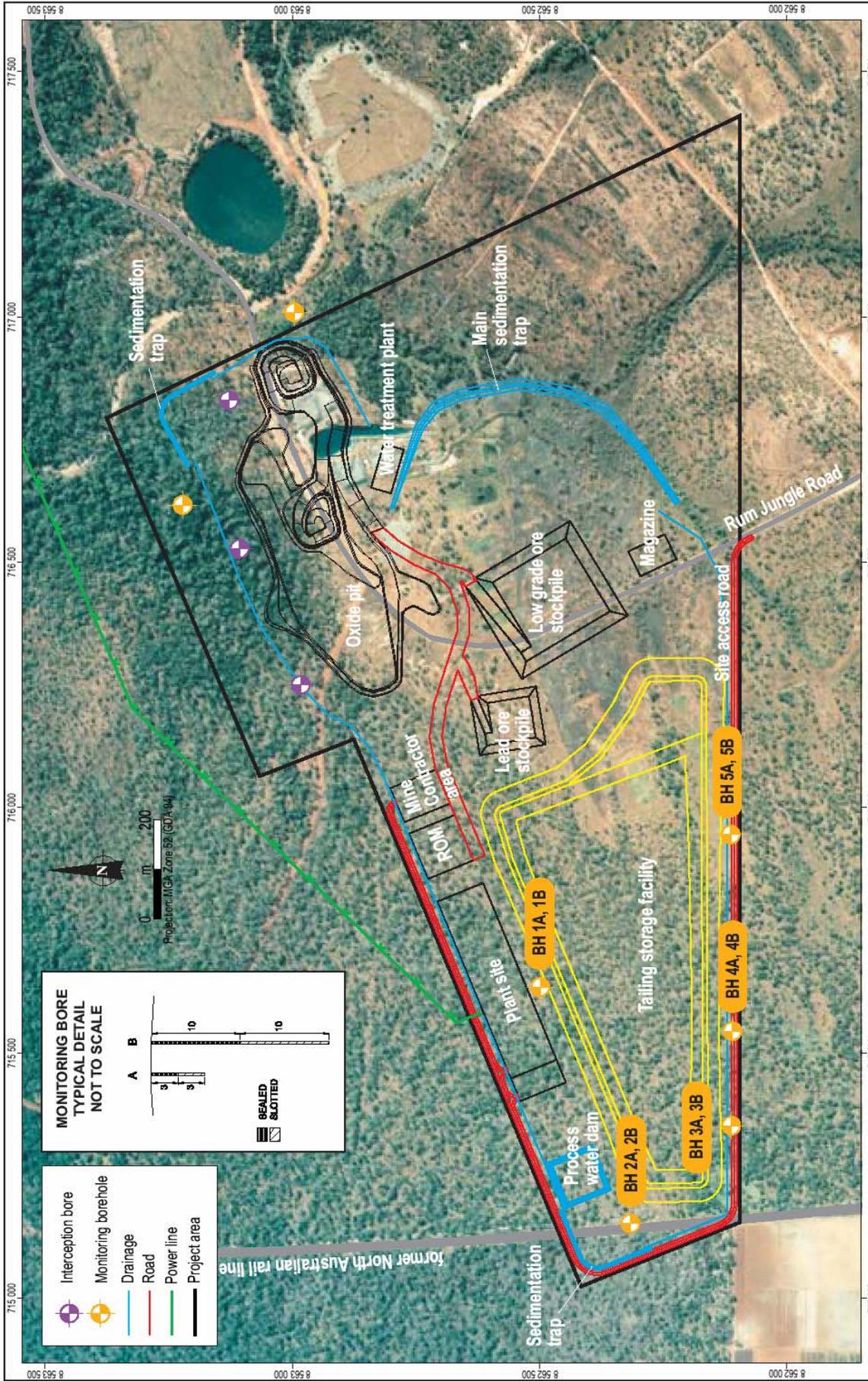


Figure No: 2

Project layout and proposed mine monitoring bore locations

Compass Resources NL
Browns Oxide Project

Job No: 836
File No: 836_10_F3.05_HB

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2.1 Site Clearing and Development

Vegetation clearing and grubbing would be the first step in the development of areas required by the project. Topsoil would be progressively stripped and stockpiled as areas are prepared for the construction of project facilities and infrastructure. Prior to earthworks commencing a site drainage system would be constructed to manage site run-off. Following this, major earthworks would be undertaken to provide suitable levels for site infrastructure and for mine pre-stripping. The proponent proposes that the area of clearing would approximate the area of each project component with a total disturbance of 90 hectares (Table 4.4, PER).

2.2 Mining of Ore Deposit

The open pit would be located in the north-east part of the proposed project area. A staged approach to mining is proposed, whereby the north-east site of the pit would be mined first, followed by the south-west side. The ore would be extracted as a conventional excavator/truck operation with the assumption made by the proponent that half of the material would require light blasting. The open pit would be mined to an average depth of 20-25m. The pit would extend 800m along strike (west-southwest to east-northeast) and would be 250m at its widest point. At two zones of deeper oxidation, the pit would be mined to 50m depth. The pit is proposed to cover an area of approximately 15.3 ha.

Mined ore would be hauled by truck to either the ROM stockpile located to the west of the pit, or to the low grade ore stockpile or lead ore stockpiles located south of the pit. Approximately 1 Mt of mined ore, excluding waste rock, would be delivered to the ROM stockpile each year. The low grade ore stockpile and lead ore stockpile have respective storage capacities of 1.5 Mt and 275 000t. The proponent has indicated that if economical, the low-grade ore and lead ore may be processed towards the end of operations, otherwise it would be returned to the pit at end of mine life.

2.3 Waste Rock Management

Approximately half of the material proposed to be mined from the open pit would be waste rock (a total of 5.3Mt). The waste rock would be categorised based on acid-forming potential using sulfur content as the primary indicator (non-acid forming (NAF) or potentially acid forming (PAF)). Approximately 25% of the waste rock has been classified as PAF. Non-acid forming waste rock would be used to construct the TSF embankment and other mine infrastructure. It is proposed that the TSF embankment design would provide for all PAF waste rock to be encapsulated in a designated area within the tailings structure.

2.4 Processing of Mined Ore

The process plant would comprise a crushing/grinding circuit and leach tanks. The plant would be located along the western boundary of the proposed project area adjacent to the TSF and would cover an area of 3.9 ha.

Ore would be conveyed from the ROM pad to a single stage crushing circuit to be crushed and ground. The ground product would then be sent to the leach circuit where sulfuric acid is added to the slurry to leach the minerals. The slurry would be sent to a counter-current decantation circuit to separate the solids from the liquid. Copper would be extracted from the

resulting clear liquor using solvent-extraction electrowinning technology, while cobalt and nickel would be extracted by hydroxide or sulphide precipitation.

The process plant would operate 24 hours per day, seven days per week at a rate of approximately 1 Mt/y, although the crushing circuit will operate on a day-shift only basis to mitigate noise impacts. Three metals would be produced at an estimated rate of 10,000 t/y of copper cathode, 1,000 t/y of cobalt (as a hydroxide or sulfide) and 700 t/y of nickel (as a hydroxide or sulfide). The cobalt and nickel are likely to be produced as a combined product.

It is proposed that a lead gravity circuit would be installed at the processing plant later in the mine life, once the copper/cobalt/nickel ore is depleted to allow for processing of the lead ore stockpile. The processing of this material would involve crushing and wet gravity treatment by a pressure jig to produce a carbonate end product. It is anticipated that this would achieve 65% recovery of lead.

2.5 Product Storage and Transportation

The Rum Jungle Road would be used as the main access road to the proposed mine site. Public access along this road would be restricted past the Litchfield Park turnoff. The White Road–Rum Jungle Road route to Batchelor would be severed, with alternative public access provided via Bevan and Lithgow roads. The proponent would, under the supervision of the local council, provide alternate access for residents. Proposed haul and site roads would be constructed and subsequently graded and watered as required to allow efficient mining operations.

Copper cathode would be transported on strapped pallets to the Port of Darwin for export via ship. The main transport route is proposed to be via the Rum Jungle Road and Bachelor Road to the Stuart Highway, then along the Stuart Highway to East Arm Port. Large bulka bags capable of containing one tonne of cobalt and nickel products would be placed inside 20-foot containers and transported by road to East Arm Port. Product transport would occur two or three days per week. Each truck would carry approximately 50 tonnes of cobalt and nickel product and 100 tonnes of copper cathode.

2.6 Tailings Management

The polymetallic oxide ore consists of either black shale (70%) or supergene material (30%), most of which will report as tailings after recovery of copper, cobalt and nickel. The supergene tailing (0.9Mt total) has low sulfur content and has been classified by the proponent as non-acid forming. The black shale tailings (3.1Mt total) have a sulfur content of approximately 1% and have been classified as potentially acid forming.

A TSF is proposed to be constructed with an embankment around all sides. The TSF would have an internal lining of compacted clayey soil, a transition zone of highly weathered material, a core zone of weathered rockfill for the bulk of the embankment and a layer of protective rock-fill. Tailings would be deposited to the TSF sub-aerially from a ring pipeline and multi-point spigots will be used to form beaches to assist drying and consolidation of the tailings. In the Supplement, the proponent presented a proposed TSF design, for a storage capacity of 4 Mt. The TSF is designed to retain a maximum of 290 ML of water in the decant pond so that there is no discharge from the storage up to a 1 in 200 year Average Recurrence Interval (ARI) rainfall year (2650 – 2900mm).

The tailings management strategy would be based on relevant best practice, such as placement of tailing pipeline within a bund, regular inspection of the pipeline and automatic monitoring of pump pressure to detect line failure, monitoring of significant dusting from the tailings surface and monitoring of seepage from the TSF during and after operations.

2.7 Water Management System

It is proposed that the mine site would be as self-sustaining as possible in terms of water use requirements. Raw water for the project would be supplied from groundwater located within the project area and annual water requirement for operations would be 350ML/y. The water use hierarchy that would be adopted to meet process water requirements of the proposed project involves recycling process water and input from the following sources (listed in order of preference):

1. TSF decant
2. Sewage effluent
3. Sedimentation trap water (comprising mine water and site runoff)
4. Groundwater

Excess water that cannot be used in the process is proposed to be treated if required and discharged to the East Finniss River under a waste discharge licence (refer Section 4.7).

2.8 Rehabilitation and Closure

Compass proposes that the development of rehabilitation and closure strategies for the proposed mine site, would be a continuous process that would occur throughout project planning and operation. Due to the nature of the operations and short project life, most rehabilitation would be undertaken upon mine closure (rather than progressively). A strategic rehabilitation and mine closure plan has been developed, which incorporates performance standard references, rehabilitation and closure objectives, responsibilities for implementation, end land use options for the mine site (Table 9.5, PER) and implementation strategies and measures. The mine closure plan would remain flexible and would be refined as inputs from detailed design, stakeholder consultation on end land uses and completion criteria, and various investigations become available.

2.9 Issues Not Included in this Environmental Impact Assessment

It should be noted that there are a number of issues associated with this proposal that are not within the scope of the current environmental assessment process. These are: product handling at the Port of Darwin; construction of a power-line to the mine site; and any future expansion of mining activities.

2.9.1 Darwin Port

The product would be unloaded at the Port of Darwin by wheeled fork-lift truck or crane and loaded onto ships at the container-handling terminal for export. Impacts associated with the use of facilities at East Arm Port are not considered in this Assessment Report and would be the subject of a separate application.

2.9.2 Construction of Power line

Connection to the Northern Territory power grid is the preferred option for the supply of electricity to the proposed project area. To access the grid, a new power line of about 23 km in length would be constructed. Compass has not yet reached an agreement with Power and Water Corporation in arriving at a suitable route for the proposed power line. The route originally proposed in the PER was deemed unsuitable due to its proximity to areas of significance to Traditional Owners. Assessment of the potential environmental impacts associated with connecting the proposed project to the NT electricity grid would be the subject of a separate assessment process.

2.9.3 Future Expansion of Mining Activities

The current proposal has accounted for a future expansion to mining operations within its design. A simple pit shell has been projected for the underlying sulfide deposit to a depth of 350m (Fig 4.1, PER). Only temporary elements such as the ore stockpiles and the mining contractor's area have been located within this area. This assessment does not include an assessment of a possible future expansion of the mine pit that is implied by current design. Any future mining proposal would be subject to a separate assessment process under the *Environmental Assessment Act*.

3 Regional setting

The Browns Oxide project is located approximately 65 km south of Darwin and 7km northwest of the town of Batchelor in the Northern Territory (Figure 1). Batchelor is a small town with a population of 727 people recorded at the time of the 2001 census with 39% of population identifying as being of Aboriginal and/or Torres Straight descent. The town is known as the ‘gateway’ to Litchfield National Park which is approximately 30km to the west, and lies within the greater Coomalie region. The Coomalie region covers the area from Adelaide River township in the south to Manton Dam in the north, and is administered by the Coomalie Community Government Council.

The proposed project area lies 70km inland from Fog Bay in the Timor Sea and is located within the catchment area of the Finnis River, it is mostly drained by the East Finnis River that joins the Finnis River 8km downstream from the project area. The Finnis River runs approximately 140km from the proposed project area to enter the Timor Sea via a wide, mangrove mudflat estuary. The East Finnis River generally does not flow during the latter part of the dry season when the river becomes a series of discontinuous permanent and semi-permanent waterholes and billabongs. Its catchment is one of the smaller catchments in the north-west of the Northern Territory and comprises a portion of the 9532km² catchment area of the Finnis River system.

Most of the proposed project area (approximately 50%) is dry-land savannah vegetation on gentle lower slopes and foothills that support eucalyptus-dominated communities. These communities comprise various vegetation formations ranging from open woodland to woodland. The central and eastern sections of the proposed project area show signs of disturbance with the presence of weeds and introduced grasses. The remaining vegetation comprises riparian, floodplain and vine forest communities. Three species listed as vulnerable or endangered under the EPBC Act were observed in the project area and include the northern quoll (*Dasyurus hallacatus*), partridge pigeon (*Geophaps smithii*) and red goshawk (*Erythrotorchis radiatus*).

3.1 Land Use

The Coomalie land use plan indicates a number of different current and planned land use surrounding the project area (Fig 7.6, PER). Horticulture and agriculture is one of the major contributors to the local economy and a number of properties surrounding the project area are used for horticulture. Cattle grazing occurs throughout the region using native and exotic pastures and the project is located in an area delineated as ‘grazing (natural pastures)’ in the Coomalie Land Use Structure Plan. The project’s potential impact to groundwater reserves has been highlighted, through public submissions from local landholders in the region, as a significant stakeholder concern.

The proposed project area is located in areas immediately west of, and adjacent to, the historic Rum Jungle Mine. Additional areas of road reserve, freehold land and crown land are also present. The proposed Browns Oxide project is located entirely within the 175 ha area of granted mineral leases (MLN 139 – 147 and MLN 150-152). Compass has been undertaking mineral exploration in the project area since early 1995. Compass holds three exploration retention licenses (ERL125, ERL146 and ERL148) around the project area and also has submitted applications for six nearby mining tenements (MLN 1157 to 1159 and MLN 1161 to 1163). The project area presently is not used for any purpose other than mineral exploration.

3.1.1 Rum Jungle

The Rum Jungle Mine site is adjacent to the Browns Oxide project and was Australia's first uranium mine, also producing copper, nickel and lead between 1954 and 1971. No significant environmental management was undertaken during operation and following its closure (Kraatz, 2004). As a result, the water quality of the East Finnis River was heavily impacted by long-term ARD from the three waste rock dumps.

In 1982, an \$18.6 million agreement between the Northern Territory and Commonwealth Governments established the Rum Jungle Rehabilitation Project. One of the objectives of the Project was to achieve a major reduction in surface water pollution as measured by percentage reductions in downstream heavy metal loads in the East Finnis River. Pollutant loads from the waste rock dumps were significantly reduced following the rehabilitation effort although leachate from the Rum Jungle site continues to contribute to poor water quality in the East Finnis River. The legacy of the Rum Jungle mine site and the close proximity of the proposed Browns Oxide project has been a significant community concern during the assessment process.

3.2 Climatic Conditions

The Pine Creek Region experiences a monsoonal climate with extreme weather conditions typically a part of the annual climatic cycle. The region receives an annual average rainfall of 1714 mm (recorded in Darwin), most of which falls between December and March. The average monthly rainfall in the region ranges from 423 mm (January) to 1.4 mm (July).

The relatively high rainfall during the wet season consists of isolated showers and storms with prolonged periods of cyclonic depressions, particularly in the latter half of the wet season. Stream-flow in the Finnis River is highly variable as a result of thunderstorm activity, cyclones, and monsoonal rainfall. In the wet season, flood events are superimposed on a base flow. Very intense storms result in flood peaks with rapid run-off down broad, deeply incised flood-water channels, which can discharge large quantities of water in a very short period of time.

The highly variable nature of the environment, especially the occurrence of extreme rainfall events in the wet season, presents a key challenge to management of the proposed mine.

3.3 Physical Environment

The proposed Browns Oxide project area lies on the north slope of the Pine Creek Geosyncline where lower Proterozoic sedimentary rocks were deposited over the Archaean Rum Jungle and Waterhouse granitic complexes (Davy, 1975 as cited in Low, 2001). The area can be described primarily as a lowland surface of gently undulating land interspaced by plains, and small hills typically rising less than 150 m above the surrounding plains. The Northern Lateritic Plains Geomorphological Unit on which the project area is located, is marked by lateritic soils formed on rocks of the Brocks Creek Group. The soils are generally nutrient poor, except in the river valleys, which usually flood during the wet season and tend to be acidic. Although the area has high rainfall, erosion has generally been retarded by the relative lack of relief and the high permeability of soils. Monitoring studies of the old Rum Jungle site adjacent to the proposed Browns Oxide site indicate that erosion is a localised problem and is not widespread (Kraatz, 1998 as cited in Low, 2001).

3.4 Biological Environment

Fourteen distinct vegetation communities occur in and around the proposed project area. The most widespread community is a *Eucalyptus tetradonta* and *Eucalyptus miniata* dominated open woodland, which covers 37.1% of the proposed project area. Open woodland to grassland dominated by *Eucalyptus papuana*, *Corymbia foelscheana* and *Melaleuca spp.* is the next most widespread community. This vegetation type occurs on the seasonally flooded flats surrounding drainage lines and covers 16% of the proposed project area. More restricted communities of varying species dominance are scattered through the *Eucalyptus*/*Corymbia* dominated woodland matrix. Riparian vegetation occurs along the East Finniss River in the far north-east of the project area. Disturbed areas, including old borrow pits, rehabilitated areas and recent exploration activities, cover 23.4% of the project area.

The proposed project area and immediate surrounds provide a range of habitats that support a range of fauna species. Recorded species include 18 amphibians, 38 reptiles, 120 birds and 33 mammal species (29 native and 4 introduced). A number of introduced species were recorded during surveys of the proposed project area, including the cane toad (*Bufo marinus*, which has arrived in the area during the 2005-06 wet season.

Key areas and species of conservation significance are summarised below.

3.4.1 Significant Vegetation and Flora

The plant species recorded within the proposed project area are generally common and widespread in the region. There are no vegetation communities of declared conservation significance at either Commonwealth or Territory level. However, there are vegetation communities within the project area that are recognised as being of local conservation significance. The *Acacia auriculiformis* vine thicket community in the north-east of the project area is recognised as having high plant diversity with a distinct floristic assemblage that provides food and refuge habitat for native fauna. The riparian corridor present along the East Finniss River covers only a small part of the project area (0.3%), however, it supports a significant density and diversity of riparian plant species and may act as a movement corridor and refuge habitat for fauna.

The cycad, *Cycas armstrongii*, is present within several vegetation communities that together occupy approximately 50% of the project area. The estimated mean density of cycad plants within these communities is 130 individuals per hectare. *Cycas armstrongii* is classified as a threatened species and is protected under NT legislation.

The vegetation in the proposed project area shows a high level of endemism with 11% of the recorded species being endemic to the NT. Fourteen plant species that are endemic to the NT were recorded in the proposed project area. The flora assessment undertaken by Compass concluded that all of these species have widespread distributions and are typically locally common.

3.4.2 Significant Fauna

A number of threatened and near-threatened fauna species are known to utilise the proposed project area. Three species classified as threatened under the Commonwealth EPBC Act were recorded in the proposed project area during field surveys. These are the:

- Northern quoll (*Dasyurus hallucatus*) – status Endangered;

- Partridge pigeon (*Geophaps smithii*) – status Vulnerable; and
- Red goshawk (*Erythrotrorchis radiatus*) – status Vulnerable.

Both the northern quoll and red goshawk are also classified as threatened species under the *NT Parks and Wildlife Conservation Act*. The partridge pigeon is classified as near-threatened in the Northern Territory.

A further 8 species that are classified as threatened or near-threatened under the *NT Parks and Wildlife Conservation Act* have been recorded in the proposed project area. These are the:

- Northern death adder (*Acanthophsis praelongus*) – status Near-threatened;
- Yellow-spotted monitor (*Varanus panoptes*) – status Near-threatened;
- Brush-tailed phascogale (*Phascogale tapoatafa*) – status Vulnerable;
- Bush stone-curlew (*Burhinus grallarius*) – status Near-threatened;
- Black-footed tree rat (*Mesembryomys gould*) – status Near-threatened;
- Arnhem Land pebblemound mouse (*Pseudomys calabyi*) – status Near-threatened;
- Pale field-rat (*Rattus tunneyi*) – status Near-threatened; and
- Arnhem sheathtail bat (*Taphozous kapalgensis*) – status Near-threatened.

Eight species covered by the migratory provisions of the EPBC Act occur in or near the project area. These are the:

- Estuarine crocodile (*Crocodylus porosus*);
- Fork-tailed swift (*Apus pacificus*);
- Cicadabird (*Coracina tenuirostris melvillensis*);
- Swinhoe's snipe (*Gallinago megala*);
- White-bellied sea eagle (*Haliaeetus leucogaster*);
- White-throated needletail (*Hirundapus caudacutus*);
- Rainbow bee-eater (*Merops ornatus*); and
- Rufous fantail (*Rhipidura rufifrons*).

3.4.3 Aquatic Environment

The natural aquatic environment of the East Finnis River system has been adversely affected by ARD from the historic Rum Jungle mine site. Prior to remediation of the old mine site, very few fish survived in the 10km section of the East Finnis River downstream of the old Rum Jungle Mine, due to elevated levels of copper and zinc. Post remediation surveys undertaken in 1996 and 1997 recorded seven species of fish in the stream, which is still less than the potential diversity of up to 18 species that occur in similar habitats elsewhere in the Finnis River system. Post-remediation surveys of macroinvertebrates undertaken in 1993, 1994 and 1995 found that macroinvertebrates also remained significantly less diverse and less abundant in the lower reach of the East Finnis River compared with control sites.

Lorentz's grunter (*Pingella lorentzi*), a species classified as Vulnerable under the *Territory Parks and Wildlife Conservation Act*, has been recorded in the Finnis River upstream and downstream of the proposed project area.

3.4.4 Introduced Flora and Fauna

A total of 33 introduced plant species have been recorded in the proposed project area. Weeds are distributed patchily through all vegetation communities, but are concentrated in disturbed

areas, such as roadsides, along tracks, around old mines and associated areas cleared of vegetation. The high number of introduced species is likely to be associated with high levels of disturbance from past mining and other land use activities.

Nine of the introduced plant species recorded in the proposed project area are Class B declared weeds (indicating that growth and spread must be controlled) under the *NT Weed Management Act*. These are:

- Hyptis (*Hyptis suaveolens*);
- Mimosa (*Mimosa pigra*);
- Mission Grass (*Pennisetum polystachion*);
- Mission Grass (*Pennisetum pedicellatum*);
- Sicklepod (*Senna obtusifolia*);
- Spinyhead Sida (*Sida acuta*);
- Flannel Weed (*Sida cordifolia*);
- Snake Weed (*Stachytarpheta cayennensis*); and
- Snake Weed (*Stachytarpheta jamaicensis*).

Of particular concern, is the distribution and density of the tall, introduced grasses *Pennisetum polystachion* (mission grass) and *Andropogon gayanus* (gamba grass). Although not a declared noxious weed, gamba grass has a similar growth pattern and habit as mission grass, a Class B weed. These species have the potential to have a widespread and major impact on the fire ecology of the Top End by changing vegetation structure and species composition (with associated reductions in savanna biodiversity).

Four introduced fauna species are known to use the project area. These are the domestic dog (*Canine domesticus*), pig (*Sus scrofa*), cane toad (*Bufo marinus*) and feral cat (*Felis catus*). The cane toad is a recent arrival to the project area in the 2005 wet season. The biological effect of cane toads is listed as a key threatening process under the EPBC Act. Ingestion of cane toads, and predation by feral cats have been identified as key threats to a number of the threatened and near-threatened fauna species that occur in the project area.

3.5 Cultural Environment

The proposed project area lies on Aboriginal Land granted to the Finnis River Aboriginal Land Trust under the *Aboriginal Land Rights (Northern Territory) Act*. The original and main Aboriginal tribal groups of the Coomalie region are the Kungarakana and Awarai people. A third group, the Maranunggu, also resides in the Batchelor area but are originally from the Daly River region. Many other Aboriginal groups have resided (and in some cases still reside) in the area, such as the Muluk-Muluk, Wadgigan, Brinkin and Djerait groups (DLPE, 2000).

There are records of Aboriginal sacred sites within the vicinity of the proposed project area and Compass has applied for an Authority Certificate from the Aboriginal Areas Protection Authority (AAPA) in relation to the project area and works.

Four archaeological sites (one of low to moderate significance and 3 of low significance), seven areas of isolated artefact scatters and 3 historic sites (old mine lease marker, remnant section of the North Australian Railway, CRA (Conzinc Riotinto of Australia Ltd) Mine headframe) occur in the proposed project area. The old mine leaser marker historic site is considered to be of low to moderate historic significance. The CRA mine headframe historic site was assessed as being relatively intact and in good condition.

3.6 Socio-economic

The total workforce of the Batchelor region was 250 people at the time of the 2001 census and unemployment was 6.9%. Education is the largest employer followed by the hospitality industry. Tourism is also an important industry in the area and Batchelor receives a considerable share of the regions tourist market. Approximately 250 000 people visit Batchelor each year with most of these people being in the region to visit Litchfield National Park.

There have been mixed reactions to the proposed project from the local community with the majority of concerns relating to:

- the legacy of the Rum Jungle site;
- potential for expansion of the project to mine the underlying polymetallic sulphide deposit;
- uranium and radiological issues;
- management of ARD; and
- water management, particularly the potential impacts associated with pit dewatering.

4 Environmental Impact Assessment

4.1 Introduction

The purpose of this Assessment Report is to evaluate the environmental protection measures of the project proposal and to determine whether the proposal can proceed without unacceptable environmental impacts. This is done by identifying all potential environmental impacts and evaluating the corresponding safeguards or prevention measures suggested by the proponent. Where the proposed safeguards are considered insufficient, or where a safeguard is significantly important, recommendations are made in this Report to complete or emphasise those commitments made by the proponent.

The environmental acceptability of this project is based on consideration of the following from the PER and Supplement:

- adequacy of information outlining the proposal (particularly which structures or activities are likely to impact the environment);
- adequacy of information on the existing environment (particularly environmental sensitivities);
- adequacy of information on the range and extent of potential impacts; and
- adequacy of the proposed safeguards to avoid or mitigate potential impacts.

Acceptable environmental outcomes for this project are dependent on the proponent completing and refining ARD and seepage estimates; developing the issue-based management plans in consultation with relevant stakeholders to the satisfaction of the NT Government; and implementing all environmental commitments identified in the PER and Supplement as well as those presented in this Assessment Report. Appropriate environmental management of these issues will be addressed through monitoring and management actions detailed in comprehensive management plans to be included as part of the Mining Management Plan (MMP).

The EPA Program considers that the environmental issues associated with the project have been adequately identified. Appropriate environmental management of some of these issues has been resolved through the assessment process, while the remainder will be addressed through monitoring and management actions detailed in issue-based management plans, included as part of the Mining Management Plan. The EPA Program considers that the project can be managed in a manner that avoids unacceptable environmental impacts, provided that the environmental commitments and recommendations made in this Assessment Report and in the final issue-based management plans are implemented, with regular reporting and compliance auditing.

Subject to decisions that permit the project to proceed, the primary recommendations of this assessment are:

1. Recommendation

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **identified in the Browns Oxide Project, Public Environmental Report and Supplement to the Public Environmental Report; and**
- **recommended in this Assessment Report (No. 52).**

All safeguards and mitigation measures outlined in the Public Environmental Report and Supplement are considered commitments by Compass Resources NL and are included in Appendix 1 of this report.

2. Recommendation

In accordance with clause 14A of the Administrative Procedures of the Environmental Assessment Act, the proponent shall advise the Minister of any changes to the proposal for determination of whether or not further environmental impact assessment is required.

The principal environmental issues associated with the proposal are:

- The characterisation, prevention and management of ARD from the waste rock material and tailings that would be produced from the project;
- The design and management of the TSF and in particular seepage issues and closure;
- Management of uranium/radiology issues associated with mining and processing an ore body that contains low amounts of uranium;
- The fragmentation of flora and fauna habitats that support eleven known fauna species listed as 'vulnerable' to 'near threatened' and three species of national and Northern Territory significance – namely the northern quoll, partridge pigeon and red goshawk;
- The impact of groundwater drawdown from dewatering and the potential for ARD generation from the Rum Jungle pits;
- The potential to intercept contaminated groundwater beneath the former Rum Jungle area and associated management of this water;
- Management of surface water, particularly ensuring contaminated water is not discharged to the East Finnis River and that excess water discharges do not impact the Finnis River; and
- Rehabilitation and mine closure.

The remainder of Section 4 deals with issues raised in the government and public submissions to the PER and the proponent's commitments to environmental management provided within the PER and Supplement. In addition, recommendations to strengthen environmental management strategies and safeguards are presented. Some issues were adequately addressed in the Supplement and require no further discussion. The outstanding environmental issues that remain are addressed below.

4.2 Acid Rock Drainage

4.2.1 Waste Rock Characterisation

The legacy of ARD pollution from the adjacent Rum Jungle mine is a significant operational and environmental consideration at Browns Oxide. In the PER it is stated that the aquatic ecology of the East Finnis River system has been adversely affected by ARD from Rum Jungle. In the early 1980's the waste rock dumps were remediated with the main objective to reduce water infiltration rates into the waste rock dumps to less than 5% of incident rainfall. Post-remediation monitoring attributes the increase in abundance and diversity of fish species in the East Finnis River to the reduction in metal loads and concentrations following remediation. It is therefore imperative that ARD at Browns Oxide is further characterised and managed appropriately to prevent additional contaminants entering a recovering river system.

When sulfide minerals within waste rock become exposed to air and water, a low pH, high heavy metal pollutant may occur resulting in ARD. For mine planning processes, different lithologies of waste rock are categorised based on acid-forming potential (either non-acid forming (NAF) or potentially acid-forming (PAF)). Table 1 below summarises the waste rock categories used for the Browns Oxide Project:

Table 1: Waste rock acid-forming potential categories and waste rock production

Lithology	Sulphur (%)	ARD Category	Total Waste Production (t)	Waste Rock Type as % of all Waste Rock
Dolomite	<0.5	NAF1	2 057 000	38.7
Shale	<0.5	NAF2	1 843 000	34.7
Dolomite	0.5 – 1.5	NAF3	82 000	1.5
Shale	0.5 -1.5	PAF4	402 000	7.6
Dolomite	>1.5	PAF5	126 000	2.4
Shale	>1.5	PAF6	800 000	15.1
		All NAF	3 982 000	74.9
		All PAF	1 328 000	25.1

(Source: Table 3.3, Supplement and Table 4.9, PER)

The characterisation and prevention of ARD at the Browns Oxide project is vital to ensure the mistakes of Rum Jungle are not repeated. Managing waste rock requires sufficient sampling to characterise the nature, distribution and variability in each material type. Testwork on 16 samples of waste rock was included in the PER and to address concerns raised, an additional 14 samples were included in the Supplement. The EPA Program notes that waste characterisation presented in the PER and Supplement is based on 30 samples for approximately five million tonnes of waste rock that will be generated for the project. Only five samples of waste rock material types underwent multi-element data testing (refer section 4.2.3). The EPA Program questions whether there has been adequate sampling intensity for each waste rock type and supports further testwork to characterise waste rock, including element data, for NAF and PAF waste rock.

The proponent has established five leach columns to examine the acid forming potential of waste rock from the project. Data from these columns would provide information about the kinetics of acid formation and allow further refinement of material classification in terms of acid forming potential (Commitment 2, PER). The EPA Program recommends that the kinetic testing program needs to be carefully designed to ensure they are operated to simulate field exposure conditions. The interpretation of kinetic test results is site specific and an

appropriately qualified person in the area of acid mine drainage would be required to interpret these results.

In the Supplement, the proponent has committed that should the relative tonnages of NAF and PAF material alter from those described in the Supplement with deleterious outcomes, Compass would inform the NT authorities to determine an appropriate course of action (B1, Supplement). The EPA Program Monitoring of waste rock material during mining will involve classification of rock type combined with routine sulfur analyses.

3. Recommendation

Waste rock characterisation, together with multi-element data (including uranium) and kinetic testing on both potentially acid forming and non-acid forming rock is to continue over the life of the mine.

The annual Mining Management Plan and updated closure plans are to include the latest information concerning the acid-forming potential of waste rock in order to prevent the formation of ARD.

Should additional testwork determine variations of non-acid forming and potentially acid forming material differ significantly from those described in the Supplement, the proponent will revise waste rock management strategies and submit to Department of Primary Industry, Fisheries and Mines to ensure appropriate ARD management strategies are adopted.

4.2.2 *NAF2 Waste Rock Management*

Testwork provided by the proponent in the PER and Supplement determined NAF2 material is likely to be non-acid forming because its Net Acid Producing Potential (NAPP) value resulted in the range -7 to 2 kg H₂SO₄ neutralised/tonne of waste rock. Theoretically, a sample with a NAPP value of less than 0 is classified as non-acid forming. Given the potential for some positive acid generation in this range, the EPA Program is of the opinion that these NAPP values are in a zone of uncertainty. A NAPP of -20kg H₂SO₄ neutralised/tonne is required to predict a near neutral result and for material to be classified as non-acid forming (Morin & Hutt, 1997). The revised waste rock production means NAF2 material constitutes 34.7% of all waste rock – approximately 1.8 million tonnes (Table 1).

It is strongly recommended that NAF1 is the only material used for construction purposes and any NAF2 material with sulphur content above 0.02% is not considered for construction. However, should the proponent wish to use NAF2 material for construction, further testwork is required to determine whether it has an identifiable capacity to provide a neutralising base and not generate acid. The proponent has established leach column tests on this material to confirm the waste rock category for NAF2 material at these undetermined levels and this is supported. Information on the disposal and storage of this material needs to be supplied prior to mining commencement and can be managed through the Mining Management Plan (MMP).

4. Recommendation

Any non-acid forming (NAF2) material, including hanging wall shale, with a sulphur content above 0.02%, must be treated as potentially acid forming material and not be used for construction purposes unless further testing has demonstrated its suitability.

Appropriate strategies for storing and monitoring of non-acid forming material to prevent mobilisation of heavy metals will be required as part of the Mining Management Plan prior to mine commencement.

4.2.3 Multi-element Testing

Multi-element tests were conducted on the waste rock material for one sample of sulfidic dolomite (NAF3) and four samples of black shale (NAF2 and PAF). There is potential for metal mobilisation to occur from non-acid forming material if the material does not have a capacity to provide a neutralising base. The results from the NAF 2 and 3 samples indicated there are elements of environmental significance present including beryllium, cobalt, copper, lead, magnesium, sulfur, arsenic and molybdenum (Table 2, Appendix 9, PER).

The Supplement has not addressed whether there are any elements of environmental significance for NAF1 material that would be used for the external tailings storage embankment, capping and other mine infrastructure. The issue of metal contamination from NAF1 rock has not been fully investigated and further tests are required for all NAF material proposed to be used for construction and capping. Water runoff from NAF material is expected to report to the main sedimentation trap and if this material is a source of contaminants, water quality stored in the main sedimentation trap would be compromised and runoff would need to be managed accordingly. The issue can be addressed by ensuring that the kinetic testing includes a composite of NAF1 material to determine whether there are any neutral drainage issues (refer to recommendation 3, Assessment Report 52). Risk management strategies with detailed contingencies in the event of the occurrence of neutral drainage with elevated metals are to be prepared as part of the Mining Management Plan.

5. Recommendation

A risk management strategy must be prepared as part of the Mining Management Plan, outlining detailed contingencies to manage contaminants in the event that waste rock drainage from any non-acid forming material is found to be a source of metal contaminants.

4.2.4 PAF Waste Rock Disposal

Design of the TSF was revised in the Supplement to address ARD issues and provides for all PAF waste to be incorporated in a designated area within the TSF. The PAF waste that is placed behind the internal bund would not be compacted. The internal bund wall in the TSF would consist of PAF waste spread and compacted in 0.3m thick layers with the purpose of the bund to provide a physical separation between the tailings and PAF waste zone. This separation is required because the tailings level would be higher than the PAF waste level in the early stages (Appendix 13, Supplement). The proponent has indicated that low permeability is not a necessary requirement of the bund as a final design provision will be made to pump any excess water (rainfall and seepage) which accumulates in the PAF area, back into the tailings side of the bund. The EPA considers that the bund should be designed to

contain seepage and therefore should be as impermeable as possible. The proponent has committed to monthly monitoring to detect seepage and will focus on collection of any seepage; however, the prevention of seepage should be prioritised in the first instance.

6. Recommendation

The proponent is to consider designing the bund separating PAF waste rock from the tailings material so that permeability of the bund is as low as possible to minimise seepage to surface and groundwater.

A monitoring program is to be developed to measure the effectiveness of the bund between the TSF and potentially acid forming waste stockpiles for inclusion in the Mining Management Plan. The Mining Management Plan is to provide an assessment of the monitoring results to determine whether the bund is adequate in its containment of seepage. A contingency plan is also to be provided.

The proposed cover for the PAF waste rock stored within the tailings will consist of (bottom to top):

- 0.3m thick layer of compacted low permeability material;
- 1.0m thick layer of rolled NAF rock (from additional excavation of NAF pit waste); and
- A layer of “dimple dumped” NAF rock to a maximum thickness of 1m.

The most critical factors in limiting acid generating conditions when designing the TSF cover system for the PAF material is the air/oxygen diffusion rate through the cap while ensuring there is sufficient depth of water available to protect the clay layer from drying out. The EPA Program therefore supports the proponent’s commitment to conduct further investigations into cover system designs as part of TSF closure trials (Commitment 22, PER).

7. Recommendation

The results of further investigations into TSF cover system designs to limit the generation of acid generating conditions are to be reported to Department of Primary Industry, Fisheries and Mines through updates of the Mining Management Plan.

4.2.5 Tailings Acid Rock Drainage

Tailings management of ARD has been based on the following assumptions:

- Only the black shale tailings is PAF and would be deposited first into the TSF, with a 3 - 3.5m layer of NAF supergene tailing following;
- Under existing conditions, acidification of the PAF black shale occurs after several months;
- The continual disposal of tailings within the TSF means no single surface is likely to be exposed for any significant period, reducing the likelihood of acid conditions occurring.

These assumptions are discussed below.

Only the black shale tailings is PAF and would be deposited first into the TSF, with a 3 - 3.5m layer of NAF supergene tailing following

To minimise the likelihood of acid generation from the tailings, the proponent has suggested the tailings cap include a top layer of 3-3.5m of secondary copper tailings (supergene tailings). Geo-chemical testing of supergene tailings samples confirmed that

tailings have low sulphur content and are non-acid forming. However, as discussed in section 4.2.1, the EPA Program regards the determination of the NAF status tenuous given the NAPP value for the sample was slightly positive (3 kg H₂SO₄/t, table 1, Appendix B in Appendix 13, Supplement). Multi-element data for supergene tailings samples indicate significant element enrichments of arsenic, beryllium, cobalt, copper, molybdenum, nickel and lead. This means that the proponent would need to consider and manage the presence of enriched elements in seepage during design of the tailings storage facility and when evaluating closure options for storage. The proponent has indicated during operations that seepage will be collected and recycled in the process and that they will investigate options for ongoing collection and treatment of ARD post closure if required. The EPA Program has concern about the long term sustainability of ARD collection and treatment due to the potential for impact on the receiving environment.

8. Recommendation

The proponent is required to investigate options for ongoing collection and treatment of ARD prior to discharge post closure. Management options are to be included in the Mine Closure Plan.

Under existing conditions, acidification of the PAF black shale occurs after several month

Based on a single test of proto-type tailings, black shale tailings had a total sulfur content of approximately 1% and were classified as PAF, contrary to the proponent's expectations. Any seepage through these tailings could result in acid conditions. Therefore, the proponent has committed to conduct further geochemical testwork on tailings which would also include leach column tests and tailing liquor characterisation (Commitment 5 & 9, PER). The regular sampling and testing to confirm acid forming potential of the tailings has been included as a requirement of the TSF Operations and Maintenance Manual (Appendix 13, Supplement).

9. Recommendation

The Mining Management Plan is to contain the results of the tailings kinetic testwork, including multi-element testing, and appropriate mitigation measures to prevent ARD occurring in the TSF during operations and post closure.

The continual disposal of tailings within the TSF means no single surface is likely to be exposed for any significant period, reducing the likelihood of acid conditions occurring

To reduce the onset of acidic conditions occurring in the TSF, the proponent indicates that the disposal of tailings means no single surface would be exposed for any significant time. It is not clear how long tailings may be exposed for and whether this period of time may result in acid conditions. Preliminary testwork indicated a lag time of several months for acid conditions to occur although further clarification of this lag period is required through longer-term kinetic testing in accordance with Recommendation 9 of this Assessment Report.

4.3 Tailings Storage Facility

4.3.1 Tailings Water Discharge

A number of queries were raised regarding the TSF design capacity. In the Supplement the proponent has addressed this issue by increasing the TSF design capacity to retain volumes of water for a 1 in 200 year rainfall year (2650 – 2900mm). The capacity has therefore increased from retaining a maximum volume of 125 000m³ to 290 000m³ based on a 1 in 200 year rainfall year of 2650 – 2900mm. The spillway capacity has been designed to be capable of

passing excess rainfall for a 72 hour rainfall event of 1500 – 2000mm. The spillway would discharge to the main sedimentation trap where water would be treated prior to discharge if required (to meet any requirements of a Waste Discharge Licence issued under Part 7 of the Water Act). Water management strategies for the TSF have been adequately clarified in the Supplement and would be required as part of the mine planning process.

4.3.2 Tailings Seepage

The proponent has estimated seepage of water through the cap of the TSF and into the tailings at 50m³/day with the same volume expected from the base of the storage. The proponent proposes mitigation measures to manage seepage through the TSF would include collection of ‘shallow’ seepage in a toe drain for recycling. ‘Deep’ seepage would be detected by monitoring bores (BH1 to BH5, Figure 3.5, Supplement) and extracted and returned to the TSF and/or process plant. The proponent also expects the groundwater drawdown cone resulting from the pit would capture seepage from the TSF although further modelling is required for confirmation. The proponent has indicated that more detailed assessment of seepage from the TSF and the overall groundwater response to the pit would be carried out using results from monitoring during production. Possible impacts of a TSF derived groundwater mound and acidification of groundwater on recharge of the drawdown cone also require further investigation during operations. The EPA Program recommends seepage monitoring outcomes are reported to DPIFM as part of the MMP to determine that seepage management strategies are effective in ensuring full containment of seepage.

The supplement states that water quality of TSF seepage would be monitored on a monthly basis during operation to detect seepage, and if necessary, provide a focus for collection and recycling of seepage plumes. The proponent has indicated that groundwater monitoring of users’ bores in the vicinity of the minesite, as well as the establishment of monitoring bores between the mine and irrigation areas would occur as part of the groundwater monitoring programme. The EPA Program is satisfied that the groundwater monitoring programme is adequate to detect TSF seepage impacts that may arise from the project. The EPA Program recommends that the proponent explore additional protection measures for TSF seepage control (eg barrier systems, geotextiles) in the event that drawdown impacts around tailings recovery bores are detected during the groundwater monitoring program.

10. Recommendation

More detailed groundwater modelling of the interaction between seepage from the TSF and the overall groundwater response to the pit and extent of groundwater mounding needs to be undertaken during mine operation. Additional mitigation measures to manage TSF seepage, other than drains and recovery bores (eg barrier systems, liners, geotextiles) need to be included as part of the Mining Management Plan.

4.3.3 Tailings Storage Facility Closure

The Supplement details the different cover treatments proposed for the tailings and PAF waste zones. In both cases, the form of capping is a “store and release” type cover to minimise the oxygen rate through the cap to limit the development of acid generating conditions. The proposed TSF cover has taken into account the design factors that contributed to the failure of covers at Rum Jungle in terms of capping thickness. However, the PER has not considered how root growth from shrub/trees and the development of galleries by termites and ants would be prevented to ensure integrity of the TSF covers – a factor contributing to failure in the covers at Rum Jungle. The EPA Program recommends that as part of further

investigations into cover system designs for TSF closure (Commitment 22, PER), factors contributing to cover failure at Rum Jungle should be further investigated to prevent re-occurrence at Browns Oxide. A report undertaken by ANSTO and CSIRO scientists called *Determination of the Reasons for Deterioration of the Rum Jungle Waste Rock Cover* is available from the Australian Centre for Minerals, Extensions and Research (ACMER) and Internet (Taylor *et al.*, 2003). The report makes recommendations on the design and construction of covers, based on the findings of the study.

11. Recommendation

As part of further investigations into cover system designs for TSF closure, factors contributing to the deterioration of the Rum Jungle waste rock cover need to be investigated and lessons incorporated into final cover design. This is to be included in the Mining Management Plan.

The EPA Program supports the proponent's commitment to conduct further investigations into cover system designs as part of TSF closure trials (Commitment 22, PER).

The cover at Rum Jungle placed in the 1980's consisted of (from the base up):

- 225mm thick low permeability layer
- 50mm thick "store and release" layer
- 150mm thick erosion protection layer

The proponent concluded that the thickness of the "store and release" cover needs to be greater than 0.4m used at Rum Jungle. The proposed cover for the TSF includes a 3-3.5m layer of NAF, low permeability secondary copper tailings deposited as the last layer of tailings. This would then be capped with a 1m NAF rock fill to provide the water retention cover with the top of the surface contour ripped. Seepage through the cap and into the tailings would depend on the permeability of the secondary copper tailings and the extent of ponded water occurring in the wet season. The proponent is seeking input from its TSF consultants on seepage from the TSF beyond three years after closure (email, 3 March 2006). The proponent has committed to monitor and manage the TSF until closure objectives have been achieved (commitment 26, PER).

12. Recommendation

As part of the Mine Closure Plan, the proponent will provide details on the planned management of seepage from the TSF post mine closure.

4.4 Radiological Issues

4.4.1 EPBC Nuclear Action

A number of PER submissions raised concern that the Browns Oxide project did not trigger a nuclear action under the EPBC Act when in 2002 it was deemed a controlled action (nuclear action). In 2002, the proponent submitted a larger scale development proposal (Brown's Polymetallic Project) that involved mining of the underlying sulphide deposit under the Browns Oxide deposit. This proposal overlapped the Rum Jungle Mine. The proponent referred this proposal to DEH under the EPBC Act and it was deemed a nuclear action on the basis that the "project could be considered to include rehabilitating a facility or area in which mining or milling of uranium ore has been undertaken" (Supplement, 2006).

The proponent has clarified in the PER and Supplement that the Browns Oxide project is substantially different to the Browns Polymetallic Project with uranium occurring at low

concentrations in the oxide project ore and waste, and uranium will not be an economic product of the operation. The Browns Oxide project will be adjacent to, but not impinge upon, the Rum Jungle site. Therefore, the current project did not trigger the nuclear action controlling provisions of the EPBC Act. The EPA Program is satisfied that the current proposal will not intercept viable uranium deposits and any intention to do so will require referral under the EPBC Act and be assessed under the *Environmental Assessment Act* as a new proposal (Recommendation 2).

4.4.2 Management of Radiological issues

Through submissions received for the PER, there was a perception from local stakeholders that the proponent has underplayed radiological issues and made misleading statements about the issue of uranium in the deposit. The proponent has since acknowledged that while uranium levels in the ore are low and will not be commercially produced as part of development, the accumulation of radiation and uranium may occur anywhere during mining, ore stockpiling, plant processing, water management and waste disposal. The proponent addresses this issue in the Supplement by committing to undertake a quarterly radiological monitoring program (Table 3.5, Supplement) and to develop a Radiation Management Plan (RMP) as part of the MMP (Appendix 14, Supplement). The proponent is to operate in accordance with the *Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005)*.

The RMP is to demonstrate to all stakeholders that sufficient data is available to show that:

- Radiation dose is not accumulating in the process, with associated potential for increased exposure to the workforce, public or surrounding environment and/or;
- Radioactive material that is accumulating or is present in significant concentrations, is being managed in an appropriate way and not impacting on human health or the surrounding environment.

13. Recommendation

A Radiation Management Plan (RMP) will be developed and implemented in accordance with the most recent Code of Practice and Safety Guide, presently being *Radiation Protection Series 9 – Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* as part of the Mining Management Plan (commitment 16, PER). The recommendations made in Appendix 7 (section 9) of the PER must be incorporated into the RMP and include:

- **A background radiological survey for the site is collected prior to mine commencement, including air, water quality and green tissue analysis;**
- **A site radiological survey is conducted within the first year of operation to determine sources of elevated radioactivity;**
- **Borehole and surface run-off water quality is monitored prior to and during mining to assess the impact of Browns Oxide project and the contribution from any deterioration of the covers on the former Rum Jungle mine site; and**
- **Adopt best practice in carrying out requirements for radiation management to prevent unacceptable impact of the Browns Oxide project.**

The EPA Program is satisfied that with implementation of the RMP and reporting in accordance with regulatory requirements, radiation issues can be adequately managed. Due to the number of public submissions regarding radioactivity and uranium concerns about the project, it is strongly recommended the RMP is publicly available for comment. This would improve perception by stakeholders that the proponent has downplayed radiological issues

and appease concerns that radioactivity would be managed appropriately so that no off-site impacts result and that on-site health and safety is appropriately managed.

14. Recommendation

The proponent will make the Radiation Management Plan available for public comment and any monitoring results from the radiation monitoring program publicly available.

4.4.3 *Radiological Monitoring*

Due to the proximity of Brown's Oxide proposal to the former Rum Jungle mine and the legacy of environmental impacts that remain today, it is recommended that baseline environmental data, including radiological data, be collected prior to the commencement of mining operations. This is particularly important given the number of submissions received about possible existing radiological pollution from the Rum Jungle site. Compass acknowledges in the Supplement that additional monitoring is required before and during construction and operations (N3, Supplement).

There was concern raised that only 10 core samples drawn from a maximum of 10m were analysed for uranium concentration and reported by ANSTO (Appendix 7, PER). As the proposed pit will have a typical depth of 20-25m with two deeper pockets reaching 50m depth, additional core samples are required to improve baseline data and radiological management strategies. In particular, the deeper core samples may provide additional information on appropriate management of potential small pockets of high uranium ore that could be encountered during mining operations. Contingency management plans need to be developed as part of the MMP approval process, in the event pockets of high uranium ore are encountered. As part of the Mining Management Plan approval process, the proponent would need to clarify whether uranium is disposed in the tailings as:

- Part of the tailings solution and subject to precipitation/concentration reactions;
- Removed and disposed from the process as a solid; and
- Recycled through the process creating elevated uranium concentrations in solution.

15. Recommendation

Additional core samples are to be collected to undergo uranium assays at depths greater than 10m and contingency plans for management of uranium on site need to be developed as part of the Mining Management Plan.

4.5 Biological

4.5.1 *Vulnerable/Endangered Species*

Several submissions raised concern that the PER did not mention the endangered bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*) however Appendix 4 of the PER and Supplement indicated bat surveys were undertaken during the 2005 wet season surveys in and around the project area. Due to absence of reference calls for the species, the bare-rumped sheath-tail bat was unable to be identified from call detection. While knowledge of this species is poor, it is thought to occur in habitat types (*Eucalyptus playphylla* tree hollows and coastal caves) that do not occur within the project area. The EPA Program considers that the fauna survey methods used by the proponent were unlikely to have detected the presence of this species. However, due to its habitat preferences, there is a low probability that the species occurs in the project area.

Three species listed as vulnerable or endangered under the EPBC Act were present or adjacent to the project area and the following were recorded during field surveys:

- Northern quoll (*Dasyurus hallucatus*) - Endangered
- Partridge pigeon (*Geophaps smithii*) -Vulnerable
- Red goshawk (*Erythrotriorchis radiatus*) -Vulnerable

The potential impacts of the proposal on these species include habitat fragmentation, altered fire regimes, changes in native grass and vegetation composition and increased predation by feral animals. Land clearing may have an impact on the red goshawk, however it is most likely to be impacted by the disturbance in the vicinity of nest sites (none of which were identified in the project area). The proposed mitigation methods proposed by the proponent for significant species included:

- Minimising vegetation disturbance associated with proposed infrastructure to prevent unintended changes to the structure and condition of existing vegetation communities;
- During construction, habitat will be protected from disturbance to the greatest extent possible;
- Maintenance of preferred red goshawk habitats in particular riparian and *Melaleuca* and vine forest communities when designing fire management practices.

Recommendations made in section 7 of Appendix 4 in the PER also need to be included as mitigation measures and include but are not limited to:

- Impacts of habitat value and condition are minimised in the design stage by preventing indirect impacts associated with drainage, waste contamination and the spread of weeds;
- Control of feral species in the vicinity of the mine area; and
- Implement speed limits and traffic controls in areas where partridge pigeons and other threatened wildlife occur (eg Rum Jungle Road, White Road).

Additional recommendations for significant species include:

- Any red goshawk nests subsequently located in the project area are clearly identified to minesite personnel to avoid disturbance in the vicinity of the nest – a buffer zone of 200-300m is to be made around any identified red goshawk nesting sites;
- Fire Management Plan should consider the requirements of fauna species that favour early dry season low intensity fires (eg partridge pigeons); and
- The proponent to liaise with the Territory Wildlife Park about possible re-location of northern quolls if any are trapped in future fauna surveys.

The EPA Program is satisfied that the implementation strategies and measures of the proposed Biological and Land Management Plan, following approval by relevant NTG agencies prior to the commencement of any works, would ensure impacts to fauna species are appropriately managed.

16. Recommendation

As part of the Mining Management Plan, a Biological and Land Management Plan and Weed Management Plan incorporating recommendations to mitigate fauna impacts made in Appendix 4 of the PER and this Assessment Report, must be prepared in consultation with relevant stakeholders and submitted to the Department of Primary Industry, Fisheries and Mines, and the Department of Natural Resources, Environment and the Arts for approval prior to commencement of works.

4.5.2 Fauna Impacts

The Browns Oxide project will result in the clearing of approximately 90 hectares of *Eucalyptus miniata/tetradonta* dominated open forest to woodland. This habitat is typical of eucalypt forest and woodland across the Top End and comprises part of the extensive Pine Creek bioregion covering over 3 million hectares. Approximately 43% of the Pine Creek bioregion is reserved for conservation purposes and therefore in the regional context, the clearing represents a minor vegetation and habitat loss in an area disturbed from mining activities, roads and tracks, introduced weeds and pests.

Despite the signs of prior disturbance in the project area, fauna surveys conducted in the area have indicated the habitat supports high species diversity. Eleven species of fauna classified as 'vulnerable' or 'near threatened' under the *Territory Parks and Wildlife Conservation Act*, including two reptiles, six mammals and three birds occur within the Browns Oxide Project area. An additional nine species located in the area were listed as 'data deficient' due to the potential impact of cane toads on their distribution.

The fauna surveys conducted indicate a high number of significant species within the project area and the proponent has indicated that additional information and assessment of fauna could be gained during mining operation. The EPA Program supports the proponent undertaking additional fauna surveys within the area (particularly in those areas marked for early development) during the mining life to assess the impact of mining operation on surrounding fauna populations.

4.5.3 Feral Animals

The fauna impact assessment determined that a number of significant species within the project area, including the northern quoll, brush-tailed phascogale, goannas, snakes and frogs are likely to be negatively impacted by the arrival of cane toads in the area. Recent field trials conducted by FrogWatch NT have indicated that up to 70% of local cane toad populations can be eliminated through trapping. It is anticipated that mining activities would attract cane toads by providing permanent water bodies and industrial lights. In the Supplement, the proponent has made an additional commitment to investigate the option of an inspection program to minimise the spread of the cane toad and to seek expert advice on the effective control of cane toads (Commitment 30, Supplement). The effective control of cane toads should be a firm commitment and be reflected in the final Biological and Land Management Plan.

The fauna impact surveys conducted for the PER indicated that the presence of feral cats and pigs are threatening processes for many of the significant species identified in the project area. Therefore, a management program for the effective control of introduced pests within the project area should be a specific implementation measure in the Biological and Land Management Plan.

17. Recommendation

Feral animal management will be included as a specific implementation measure in the Biological and Land Management Plan.

4.5.4 Aquatic Fauna

The Lorentz's Grunter (*Pingalla lorentzi*) is listed as vulnerable under the *Territory Parks and Wildlife Conservation Act*. This species is only known in two areas of Australia – northern Cape York and the Northern Territory. In the Northern Territory, three individuals have been recorded at two sites in the Finnis River downstream and upstream from the Rum Jungle mine site (Twining pers. comment 21 March 2006). Its habitat preferences include deep small and large pools with rock and sand substrates.

The Museum and Art Gallery of the Northern Territory (MAGNT) of the Department of Natural Resources, Environment and the Arts raised concern that the desktop study on fish fauna was inadequate. The proponent contended in the Supplement that sufficient information was obtained to determine the status of the East Finnis River and provide context within which water discharges will occur. The EPA Program questions whether sufficient information has been obtained given that it remains unknown as to whether the Lorentz's Grunter's occurrence is more widespread in the Finnis River. For this reason, it is recommended that the proponent commit to undertake field surveys targeting fish fauna in the East Finnis and Finnis river systems to provide sufficient baseline information. If the results from these surveys indicate the presence of Lorentz's Grunter, a detailed management and monitoring plan for this species should be developed to ensure any impact on the species is minimized.

The proponent has stated that stream biological monitoring would be undertaken to determine indices of stream health and identify spatial and temporal changes in the river system (Table 3.8, Supplement). Macroinvertebrates would be sampled annually using standard methods outlined by the Australian River Assessment Scheme (AUSRIVAS) or other appropriate sampling protocols. In response to the number of concerns raised regarding water quality and ecological status of the East Finnis and Finnis rivers, the proponent intends to discuss proposed sampling programmes with the relevant Northern Territory and Commonwealth authorities. The proponent should also discuss fish sampling programmes with the MAGNT.

18. Recommendation

In conjunction with the proposed annual stream biological monitoring programme, baseline field surveys targeting fish fauna will also be undertaken in consultation with Museums and Art Galleries of the NT of the Department of Natural Resources, Environment and the Arts. If results from fish field surveys detect the presence of Lorentz's Grunter, a detailed management and monitoring plan to protect the species is to be developed and included in the Mining Management Plan.

4.5.5 Biting Insects

The mosquito *Culex annulirostris* is identified as being the most prevalent species likely to occur at the Browns Oxide mine site. The mosquito is a vector for many viruses and it is important mining activities do not result in the creation of mosquito breeding sites. The proponent has advised that information provided from the NT Department of Health and Community Services for prevention of mosquito breeding sites will be reflected in the final Biological and Land Management Plan.

The EPA Program recommends the proponent consult with the Medical Entomology Branch of the Department of Health and Community Services, during mine closure planning for

advice on the rectification of mosquito breeding areas and that their comments provided to the PER are incorporated into the mine closure plan.

19. Recommendation

The Medical and Entomology Branch of the Department of Health and Community Services review and comment on the final Biological and Land Management Plan and Mine Closure Plan.

4.5.6 *Flora Impacts*

Most of the project area consists of dryland savannah vegetation comprising of *Eucalyptus* dominated open woodland to woodland, which would be subject to the direct clearing of approximately 90 hectares. The central and eastern sections of the project area are disturbed with weeds and introduced grasses. The remaining vegetation consists of riparian, floodplain and vine forest communities with varying degrees of disturbance. The EPA Program considers the final Biological and Land Management Plan, completed prior to mine construction would ensure impacts to vegetation communities are appropriately managed. Fire management practices in the area as part of the Fire Management Plan and Biological and Land Management Plan are to take into account the protection of fire sensitive riparian and vine forest vegetation.

20. Recommendation

The protection of fire sensitive riparian and vine forest vegetation is to be a specific implementation measure in the Fire Management Plan and Biological and Land Management Plan for the project area.

Concern was raised regarding the proximity of the main sediment trap (MST) to the riparian vegetation on the project lease, in particular due to the observation recording of the significant species red goshawk on the margins of the mining lease. In response to this concern, the proponent has made a commitment in the Supplement that no riparian vegetation along the East Finnis River would be cleared during project construction and operations. (Commitment 31, Supplement) however the MST would be sited within 50m of the drainage line. In line with accepted environmental practice in the NT, the MST should not be placed any closer than 50m from the drainage line located in the eastern section of the project lease.

21. Recommendation

No riparian vegetation will be cleared in the project area and construction of the main sediment trap must be sited at least 50m from the drainage line in the eastern section of the project area.

The only protected plant species found in the project area is the cycad *Cycas armstrongii* with this species present in several vegetation communities on the project area. These vegetation communities occupy approximately 50% of the total project area and the mean density of *Cycas armstrongii* is approximately 130 individuals per hectare. This species is endemic to the Northern Territory and is a common understorey species within *Eucalyptus* dominated woodlands. The EPA Program considers the proponent's commitment to take into account the provisions of the Management Plan for Cycads in the NT 2003-2008 during site preparation will ensure appropriate management of this species. The EPA Program also supports the

proponent's discussions with Friends of the Batchelor Open Wildlife Sanctuary and Greening Australia about possible use of some of these plants in the proposed sanctuary and assistance in transplanting the cycads.

22. Recommendation

The proponent will liaise with Friends of the Batchelor Open Wildlife Sanctuary and Greening Australia to arrange the controlled removal and transplant of cycads.

4.5.7 Vine Forest Drawdown Impacts

A number of submissions have expressed concerns regarding reduced groundwater availability for sensitive vegetation – in particular the vine forest community north of the pit. Although the Supplement conceded that vine forests may rely more heavily on seasonal rainfall and moisture transfer from the adjacent Finnis River, the EPA Program considers that this vegetation is likely to be highly dependent on groundwater supplies particularly during the dry season. This is demonstrated by their occurrence as discreet patches in the environment rather than a widespread occurrence relating to a reliance on seasonal rainfall or watercourses. Numerical modelling conducted by the proponent indicated groundwater drawdown due to dewatering operations may up to 10m where the vine forest communities occur (Fig 10, Coffey, 2006).

In response to concerns regarding the effect of dewatering on the water table and impacting the vine forest vegetation, the proponent has stated that a monitoring bore will be installed to assess groundwater drawdown impacts on root zones of vegetation in this area (Fig 2). The EPA Program advises that further disturbance to the vine forest area through the sinking and maintenance of monitoring bores need rationalising as part of the mining management plan, prior to any disturbance in the area.

The proponent has proposed to irrigate the vine forest vegetation should drying of the vine forest be observed. Uncertainties remain as to whether irrigation would ensure the vegetation survival if groundwater impacts do affect the area. Due to uncertainties of groundwater impacts, the proponent acknowledges this community may be impacted by mining activities and suggests the possibility of its re-establishment after mining. Alternatively, the proponent has discussed with the Coomalie Council the establishment of offset vegetation areas as part of the Council's current natural vegetation program. The EPA Program supports any offset vegetation areas the proponent may establish to compensate for potential impacts to the vine forest vegetation.

23. Recommendation

The proponent is to establish a monitoring program to determine any impacts on vine forest communities resulting from groundwater draw down in liaison with the Departments of Primary Industry, Fisheries and Mines and Natural Resources, Environment and the Arts. The proposed extent of disturbance to the vine forest communities must be detailed and adequate buffer areas maintained around vine forest communities to reduce the risk of disturbance.

24. Recommendation

In the event that the vine forest community is impacted by drawdown impacts, the proponent is to develop a re-establishment strategy or vegetation offset areas in liaison with Departments of Primary Industry, Fisheries and Mines and Natural Resources, Environment and the Arts.

4.6 Groundwater Management

4.6.1 Groundwater Quantity

The EPA Program requested further information from the proponent in the form of numerical modelling outputs to provide a better understanding of hydrogeology and groundwater quality in the surrounding area. The purpose of the modelling was to provide an assessment of groundwater inflows into the pit and to predict the regional extent of lowering of groundwater levels due to pit dewatering. Improved estimates of dewatering volumes as a result of numerical modelling would be used to inform management planning for the maximum flows likely to be encountered during mining. The numerical model considered the possible impact of high transmissivity from the weathered carbonate aquifer and local geology – factors that were not taken into account in the PER.

The modelling contained several conservative assessments:

- It modelled the pit at its ultimate depth, including the two deeper pockets, from the outset;
- It assumed a worst case with the East Finniss River continuing to flow all year round; and
- It assumed a worst case with the water level in the Intermediate Open Cut remaining stable at present levels.

Under these conditions, the numerical model predicted the total inflow of groundwater to Browns Oxide pit to be approximately 300 L/s. Two thirds of this flow was estimated to comprise of inflow from the East Finniss River with a small proportion (28L/s) attributed to the Whites Formation, south of the pit. The modelling results have indicated a significant increase of estimated groundwater inflows into the pit from 30-60L/s (stated in the PER) to 300L/s.

The EPA Program acknowledges that the model uncertainties have taken a very conservative position and that the proponent has ensured that the magnitude of inflows has not been understated. The proponent has emphasised that due to the conservative modelling assumptions, inflows would be likely to be lower than the modelled flows (Coffey, 2006). Nevertheless, the modelling outcomes have recommended the proponent make provision for addressing 300L/s groundwater inflows – a considerably larger volume than accounted for in the PER. The management measures indicated by the proponent (Coffey (2006)) in response to the modelling outcomes include:

- The collection of groundwater using in pit drainage trenches and sumps;
- Sampling of groundwater at the point of significant pit inflow (greater than 5L/s) Measures to isolate such inflow would be carried out if testing reveals degraded water quality in relation to discharge criteria;
- The preferential use of low quality water for process purposes and dust control;
- Consideration of control measures such as grouting if inflows of low quality groundwater prove problematic;
- Engagement of an experienced hydrogeologist to provide advice in relation to management of groundwater inflows (in the PER it was recommended at flows greater than 30L/s); and
- Periodic (6 monthly) review of the rate and quality of groundwater inflow with a view to distinguishing between separate streams of groundwater inflow of differing quality.

The EPA supports the above management measures and additional recommendations that were made for the groundwater monitoring plan in Coffey (2006), which include:

- Establishment of a network of monitoring bores to assess groundwater level response to mine dewatering within the Whites Formation and Coomalie Dolostone;
- Development of a program of water sampling to check groundwater quality variation over the life of the mine;
- Establishing measures for monitoring the rate and distribution of groundwater inflow; and
- Regular review of monitoring data by an experienced groundwater specialist.

25. Recommendation

The proposed groundwater management measures and groundwater monitoring recommendations made in the Coffey Report (commissioned in response to the further information request) are to be incorporated into the Water Management Plan.

4.6.2 Groundwater Quality

Further groundwater quality information was requested from the proponent to provide a better understanding of groundwater quality in the area. The EPA Program requested the proponent to demonstrate that in maximum modelled groundwater inflows, contaminated water could be collected, stored and treated to appropriate discharge standards.

Additional sampling and analysis of groundwater was undertaken from five bores – three test pit monitoring bores (TPB1 – TPB3) and registered bores RN22107 and RN22108. Results from the three test pit bores indicated concentrations of filtered metals in groundwater were generally lower than the mean filtered concentration in the East Finniss River measured during periods of flow in the 2003/04 and 2004/05 wet seasons (Table 1 & 2, Further Information). The EPA Program notes that there were some metals higher than the maximum values measured in the East Finniss River (iron, manganese and lead) and it is expected that this water would need to be monitored closely and possibly treated prior to discharge if the proponent was to meet their objective of maintaining and improving water quality of the East Finniss River.

The proponent proposes a high proportion of water from the Browns Oxide pit (200L/s) could be returned to the East Finniss River and Intermediate Pit without affecting the natural flow of the river and that the quality of groundwater inflows would be comparable to the quality of water recorded from the East Finniss River (Coffey, 2006). Therefore, the proponent indicates that discharge of this water is unlikely to adversely impact the water quality of the East Finniss and Finniss Rivers. The EPA Program has concerns that the numerical model has inferred that 200L/s of inflow is seepage from the East Finniss River and can be directly discharged back to the East Finniss River via in-pit dewatering at an acceptable water quality. The EPA Program questions whether water quality would be compromised by continual in-pit dewatering and the inflow of this water back into the pit.

Robust monitoring would be required to ensure that the quality of groundwater inflows is not degraded and that water treatment design criteria is adequate to treat anticipated volumes of excess water. If monitoring determines that in-pit dewatering results in a deterioration of groundwater quality, the proponent would need to indicate alternative management of groundwater inflows. Details of any proposed risk reduction strategy for wastewater management prior and post treatment (if treatment is insufficient) would need to include use of the waste management hierarchy approach – avoidance, separation, recycling and irrigation prior to treatment or disposal. The Water Management Plan needs to include details of

irrigation management for the site that contains details of soil, groundwater, irrigation scheduling, and a monitoring program to validate the sustainability of the irrigation system and to check for potential soil accumulation of metals.

The numerical modelling also shows that groundwater in the vicinity of the Intermediate waste rock dump is contaminated with high levels of metals, has high salinity and low pH due to leachate from the Rum Jungle waste dumps. The model indicates that 50% of the portion of inflow from the Whites Formation could be contaminated water and could affect the portion of inflow from this direction. As a mitigation measure to manage this water, the proponent has indicated that water flows from this source could be segregated and preferentially used as make up water for the process plant. The EPA has concerns that segregation of this water may be challenging and clarification is needed on what measures would be used to segregate low quality water inflowing into the pit for preferential use.

26. Recommendation

The following are to be included in the Water Management Plan:-

- **Measures for segregation of groundwater inflows into the pit in order to limit the volumes of contaminated water;**
- **Alternative management of groundwater inflows should monitoring determine a deterioration in groundwater quality as a result of in-pit dewatering; and**
- **Irrigation management details.**

4.6.3 Groundwater Resources

A number of submissions expressed concerns regarding reduced groundwater availability for regional users. The EPA Program considers the proposed monitoring program provided in the Supplement is adequate to detect impacts on other groundwater users and vine forest communities dependent on groundwater supplies. The monitoring program would also include additional sites to the northwest and southwest of the project area to provide information concerning hydrogeology and impacts on other groundwater users, including Bachelor's groundwater supply. In consultation with landholders, a number of key landholder bores would also be included in the monitoring program.

Further information requested from the proponent indicated groundwater drawdown to be less than 4m at a distance greater than 2km southwest of the Browns Oxide pit (Figure 10, Coffey, 2006). It is therefore possible that groundwater users in the irrigation area 1.5km southwest of the mine may be impacted by pit dewatering. The proponent has noted that should adverse impacts occur to those groundwater users, impacts could be mitigated by supplying suitable alternative water, or enhancing bore capacity to accommodate drawdown (Commitment 11, PER). This statement needs to be a direct commitment and consultation with groundwater users and identification of alternative water sources is required in the planning stage to ensure agreed contingencies are available prior to project commencement.

27. Recommendation

Prior to the mine commencing, Compass will consult with local groundwater users to determine agreed alternative water sources should dewatering activities deplete groundwater resources.

The monitoring information obtained during the life of the operation is to be used to refine the groundwater model to improve predictions of the extent and duration of drawdown. This is to be reported as part of the Mining Management Plan.

4.6.4 Groundwater Impacts and Rum Jungle Interactions

A number of comments were received regarding the impacts of mine dewatering on water levels in the Intermediate and Whites open cut pits at Rum Jungle. The numerical modelling showed that the seepage of groundwater from the East Finniss River due to mine dewatering would act to limit the influence of water quality from the Intermediate Open Cut on inflows to the pit (Coffey, 2006). Therefore the impacts of pit dewatering are not likely to affect drawdown in the Intermediate Open Cut. It must be stressed that the impacts of pit dewatering on the Rum Jungle mine need to be closely monitored to ensure the Rum Jungle site is not disturbed. In the PER the proponent states that water levels within the open cuts and the presence of sulfide materials on exposed pit walls would be monitored (Section 7.9.3, PER).

28. Recommendation

Water levels within the Rum Jungle open cuts and the presence of sulfide materials on exposed pit walls are to be monitored as part of the groundwater monitoring program with a view to avoiding disturbance of the Rum Jungle site.

4.7 Surface Water Management

4.7.1 Water Discharges

Water discharge into the East Finniss River is of concern given that the former Rum Jungle mine has already seriously degraded the water quality of the river. It is assumed that any discharge of waters that may increase the contaminant concentrations in the receiving environment is likely to further stress the aquatic communities and extend the spatial range of impacts. Water monitoring results conducted for the Australia-wide Assessment of River Health (AWARH) in 1998-99 indicated there was no increase in total metal concentrations in the Finniss River pre and post Rum Jungle remediation (Appendix 2, PER). It is therefore essential that the Finniss River water quality is maintained and not adversely impacted by water discharges from the project.

The proponent was requested to provide further information on the quantity of discharge water and whether excess discharges would be accommodated in the East Finniss River. The concern on this issue was that the discharge of water to the East Finniss River during the dry season, may flush leachate contaminants from the Rum Jungle site down to the Finniss River during low flows. The EPA Program requested the proponent demonstrate that a worst-case quantity of water identified through modelling could be discharged and accommodated within the East Finniss River without overflowing to the Finniss River. The EPA Program also requested the proponent identify other key risk reduction strategies prior to discharging water into the river.

Further information provided indicated that the East Finniss River has the capacity to contain a discharge of 200L/s during the dry season when there is no natural flow in the river (ie water discharged at less than this rate would be drawn to the pit and would therefore not flow down to the Finniss River). The model was conservative as it did not consider the East Finniss ceasing to flow in the dry season and did not consider the volume of water that could be used in the process plant (40L/s) and dust suppression. Losses to evaporation and riverbed

infiltration were estimated at 5L/s along the length of the East Finniss River. Assuming that 200L/s is drawn and delivered back to the East Finniss River, there remains 100L/s inflow of excess water of which the proponent has detailed approximately half would be used in the process plant, dust suppression, and lost through evaporation and riverbed infiltration when discharged to the East Finniss River. The EPA questions where the remaining water would be consumed or stored and the water balance modelling needs to identify the fate of this water under varying rainfall scenarios prior to mine commencement (refer 4.7.3).

Management approaches suggested by the proponent to manage excess water included:

- Irrigation of land, including the vine forest community that may be impacted by pit dewatering;
- Discharge of water further downstream in the East Finniss River to avoid flushing of contaminants contained in pools near the old Rum Jungle mine site;
- Pumping of water to Whites and/or Intermediate open cuts;
- Re-injection of water back to the ground; and
- Construction of a weir in the East Finniss River to retain water during the dry season.

The EPA Program considers the weir option to be problematic as it would interfere with the natural hydrology of the East Finniss River. If pumping of water to Whites and/or Intermediate open cuts is proposed as a contingency water storage system, then the liability issues associated with contaminated groundwater discussed in section 7.8.4 of the PER, need to be identified and managed. The reinjection of water back to the ground would only be possible if water quality was suitable and remained unaffected by mining.

It is noted that the proponent has committed to best practice environmental management for water management practices to maintain and allow improvement of the existing ecosystem consistent with the approach recommended by ANZECC for Condition 3 (highly disturbed) ecosystems (section 9.8.4, PER). The EPA Program believes the proponent has not considered all the management options to manage excess water and that best practice environmental management of water on mine sites requires water to be discharged off-site only where no other feasible method of disposal is available. A hierarchical approach to waste management similar to that discussed in Section 4.6.2 needs to be employed in the management of surface water discharge.

Prior to mine commencement and as part of the waste discharge licence, an appropriate discharge management strategy must be provided that incorporates the following principles:

- Determine appropriate receiving water quality criteria on the basis of existing water quality, a statement of ecosystem condition using physical, chemical and biological methods such as AUSRIVAS and downstream beneficial uses;
- Separation of contaminated and clean waters;
- Minimise water discharges by maximising use on the mine site;
- Implement “opportunistic discharge” to surface waters based on agreed climatic events, flow conditions in the East Finniss and receiving water quality criteria, and identify downstream compliance points;
- Locate discharge points to minimise environmental impacts (eg downstream from Rum Jungle leachate);
- Monitor receiving water quality; and
- Document discharges to surface waters and leakages to groundwater to allow periodic review and verification or revision of the discharge and management strategies.

29. Recommendation

Alternatives to water discharge into the East Finniss and consideration of other key risk reduction strategies prior to discharging into the river must be supplied as part of the

Mining Management Plan. An appropriate waste discharge management strategy incorporating discharge management principles is required as part of the waste discharge licence.

The Supplement addresses the requirement to monitor discharges to the East Finnis River. The proponent has acknowledged sufficiently the importance of monitoring and has committed in the Supplement to develop monitoring programs in consultation with DPIFM and NRETA for monitoring main sedimentation trap water quality, controlled releases and overtopping events. Performance criteria can be developed as a component of the Mining Management Plan and waste discharge licences.

4.7.2 Water Treatment Plant

The Supplement provides additional details on the proposed water treatment plant although specifications would be finalised during detailed design. During the peak of the wet season, the main sedimentation trap may contain more water than necessary for processing requirements and would be discharged to the East Finnis River. The water treatment plant would treat water from the main sedimentation trap to ensure conformance with the waste discharge licence.

In the Supplement, it is stated that the water treatment plant is similar to the one used for the past 25 years to treat contaminated water from the Brukunga Mine Site in South Australia. The principal mining engineer responsible for the project clarified that such a system cost over \$500K/year to operate and treat approximately 160 ML/year of very acidic water (Cox, pers. com., 22 Feb 2006). Costs of treating water would be minimised with the separation of contaminated water from “clean” water and it is expected that the proponent would take a preventative approach to on-site water contamination to reduce the requirement for water treatment. This approach is in line with best practice that Compass has committed to implementing for surface water management (page 7.62, PER). Compass has also committed to ensuring plant design criteria meets the modelled predictions of maximum volume requiring treatment. The EPA Program will require the design performance criteria for the water treatment system to develop the final discharge/dilution management regime in a waste discharge licence for any excess water requiring discharge during seasonal flow of the East Finnis. This should also be included in the Mining Management Plan.

4.7.3 Water Balance Modelling

Many submissions were received relating to surface water management and water discharges to the East Finnis River. Establishing a water balance during the design stage is one of the most important considerations to prevent water management problems occurring during operation and closure. It is essential that the Browns Oxide project is designed to handle and control the required inflows and outflows as well as any unpredictable fluctuations (eg high rainfall events). In light of the numerical model information, the conceptual water balance of all inflows and outflows needs to be revised to ensure water can be managed appropriately.

The proponent has assured the EPA Program that the volumes of water generated on the site will be manageable; however, as discussed in Section 3.2 of this report, this region is prone to extreme rainfall events and there remains uncertainty associated with groundwater inflow volumes (Section 4.6.1). The preliminary water balance has estimated discharges for the wettest year on record for the period 1958 to 2004 (2305mm), which is below the 1 in 100 years Average Recurrence Interval (ARI) of 2500 – 2700mm. The proponent has not demonstrated an ability to manage water during more extreme rainfall events and it is

expected that more detailed modelling studies would inform water management requirements for a 1 in 100 year ARI event, and assess the potential impacts of a 1 in 200 year flood event.

30. Recommendation

Water balance modelling is to be updated to inform surface water management at the site for a 1 in 100 year average recurrence interval event, and assess the potential impacts of a 1 in 200 year average recurrence interval event along with the modelled groundwater inflows outlined in Recommendation 10. The proponent is to demonstrate, as a minimum requirement of the Waste Discharge Licence and in the Mining Management Plan, effective water management measures for extreme rainfall events and periods.

4.8 Rehabilitation and Decommissioning

4.8.1 Rehabilitation

Due to the short-term nature of the proposed operation, most rehabilitation will be undertaken at the cessation of mining operations. Section 9.10 summarises the rehabilitation objectives and methodology in the PER. Concern was raised on the management of topsoil and the proponent has committed to providing additional detail on topsoil management in the final Biological and Land Management Plan. The Supplement has not provided details on whether the total amount of topsoil to be stripped over the life of the project (75 200m²) is sufficient for rehabilitation purposes and the placement of these stockpiles to ensure double handling and accompanying loss of soil structure does not occur. It is expected that these details will be provided in the final Biological and Land Management Plan and that the proponent will follow the Department of the Environment and Heritage's Best Practice booklet detailing procedures for soil handling (*Rehabilitation and Revegetation*, 2005)

4.8.2 Mine Closure Plan

The short life of the proposed Browns Oxide project (4 years) means that decommissioning planning needs to commence prior to operation and in the early stages of operation. The rehabilitation and closure of the Browns Oxide project will reflect the current standards prevailing at the end of the project life and in consultation with regulatory authorities and other key stakeholders. The proponent has committed that the *mine closure plan will be refined as inputs from detailed project design, stakeholder consultation on end land uses and completion criteria and investigations/studies become available* (Commitment 23, PER).

It is the intention of the proponent to allow the final void to fill with water. The proponent has acknowledged that monitoring selected groundwater, surface water and final void water will continue for a period of at least three years after closure, and will be negotiated with government once stable conditions have been reached and water quality reflects agreed closure criteria (Commitment 25, PER). The proponent has indicated that the mine closure plan will provide description of any treatment that may be required to achieve acceptable water quality in the pit. The proponent will consider known attributes and accumulated data relating to the Rum Jungle operation to assist in quantifying risks, anticipating potential impacts and proposing control strategies. The proposed closure plan to be accepted through MMPs will require long term strategies to manage potential issues that have occurred in similarly other similar pits in the region.

It is expected that the mine closure plan will provide more detail on the proposed measures for managing the final void. The proponent has proposed that if ARD is a significant problem they would consider diverting the East Finness River through the pit. Any intention to do so would require further referral under the Environmental Assessment Act (refer recommendation 2). The potential for significant environmental impact resulting from river diversions can not be understated and this issue has not been dealt with in this current assessment.

31. Recommendation

The final mine closure plan is to be developed and submitted to Department of Primary Industry, Fisheries and Mines for approval in the early stages of operation. In line with the monitoring programmes being reviewed and revised annually, the Mine Closure Plan must be reviewed annually as part of the Mining Management Plan. The Plan must also include rehabilitation objectives and contingency planning for sudden mine closure.

4.8.3 Closure Criteria

The proponent has noted that there is evidence that the infiltration rates of the Rum Jungle mine waste rock dump covers have increased and as a result pollutant loads from Rum Jungle even without any further activity at Rum Jungle, may increase over the next 20-30 years. The proponent also states that the establishment of baseline conditions for the project will be difficult since the existing environment is in a state of flux and that the ecological health of the Finness River system may deteriorate due to ongoing failure of the Rum Jungle waste rock cover systems. However, given the lag in response times to cover emplacement (approximately 15 years), it is possible that pollutant loads will decrease first, reflecting the period of post cover emplacement before any increase is seen due to higher infiltration rates (Kraatz, 2004). Therefore, in determining closure criteria, the proponent should not assume that the contamination plume from Rum Jungle is a permanent influence on downstream water quality.

Compass has determined that operational discharge will meet quality criteria recommended by Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines for Condition 3 (highly disturbed) ecosystems. There is no recognition that the contaminated inputs to the Finness River from the Rum Jungle site are transitional and that evolving best practice requires no further degradation of the disturbed environment. Closure objectives and long term impacts from the Browns Oxide Project would be consistent with upstream ecosystems, which better reflect the background and natural conditions.

32. Recommendation

Closure criteria for Browns Oxide need to be developed with the expectation that the objectives for rehabilitation of Rum Jungle are achieved. Appropriate closure objectives detailed in the Mine Closure Plan will be based on ecosystems upstream from Rum Jungle mine impacts.

4.9 Air Quality and Greenhouse

4.9.1 Greenhouse Gas Emissions

The Supplement states the project is not classified as a large energy user (>0.5PJ/a) and therefore the proponent is not obligated to participate in the Greenhouse Challenge Plus programme. The Greenhouse Challenge Plus program provides a valuable framework for non-

public reporting of greenhouse gas emissions and achieving ongoing improvement in emissions management.

It is recommended that the proponent demonstrate its commitment to best practice greenhouse gas emissions by joining the Greenhouse Challenge Plus program. Mandatory participation in the greenhouse challenge program will extend to large energy resource development projects by the end of 2006. The energy threshold options for mandatory participation for such projects are being investigated and may require the proponent to join the program in the near future.

The proponent should be aware that under the *Northern Territory Strategy for Greenhouse Action*, the Northern Territory Government is committed to introducing mandatory public reporting of greenhouse gas emissions by major industry by the end of 2006. This will be achieved either through a national reporting scheme or, if agreement on a national scheme is not reached, through local action. The proponent is likely to be captured by this commitment. Until a national or Northern Territory system is established, a commitment to annual reporting should be undertaken through the MMP process. At a minimum, reporting should detail total annual greenhouse gas emissions, provide a breakdown of emissions by gas and source (actual emissions and in carbon dioxide equivalents), and the emissions intensity of production.

It is noted that the proponent intends to incorporate greenhouse gas emission control measures in the Mine Management Plan. This should also outline measures to minimise greenhouse gas emissions during the construction phase.

It is recommended that the proposal's operational greenhouse gas emission estimates be adopted as initial emission targets and that these targets be reflected in the proponent's Mining Management Plan. The proponent should aim to reduce the initial targets over time through evaluation and continuous improvement.

33. Recommendation

The proponent is to commit to undertake annual reporting of greenhouse gas emissions from the Browns Oxide project to the Northern Territory Government as part of the Mining Management Plan.

The Mining Management Plan needs to outline measures to minimise greenhouse gas emissions during the construction phase. The proposal's operational greenhouse gas emission estimates are to be adopted as initial emission targets and be reflected in the Mining Management Plan.

4.9.2 Dust

Dust deposition impacts from the mine site were raised in the PER with the potential of mining and processing activities generating dust and impacting on air quality. Particular concern from stakeholders included fugitive dust impacting the Darwin River Dam catchment area and human health issues of lead and radon-bearing dust. The proponent proposes to adopt a best practice approach to dust controls for mines in Australia (C1, Supplement), to address concerns raised regarding lead and radionuclides associated with fugitive dust. In the PER, the Air Quality Management Plan outlines dust suppression measures which include spraying the road surface, low grade and lead ore stockpiles with water and the operation of water sprays in the crusher and conveying system. The Air Quality Management Plan would

also need to include proposed management of dust from the tailings dam surface if the TSF is identified as a significant dust source.

34. Recommendation

The Air Quality Management Plan must include proposed management of dust from the tailings dam surface if the TSF is identified as a significant dust source.

In the Supplement, the proponent states ambient air quality monitoring would occur in response to public complaint - this is not a suitable approach to managing environmental impacts and is not best practice. Given the number of stakeholder concerns regarding air quality impacts and impacts to the Darwin River Dam catchment area, the EPA Program recommends a dust monitoring program is incorporated into the Air Quality Management Plan to ensure dust emissions are not adversely impacting human health, environment and surrounding land uses. The results of the monitoring program would indicate whether the relevant dust assessment criteria for PM_{2.5}, PM₁₀ and TSP (Total Suspended Particulate matter), including lead contained in that dust fallout are met (Section 4.2, Appendix 1, PER). If the dust monitoring program indicates that the dust suppression techniques employed on site are adequate, the monitoring requirement can be reviewed as part of the annual Mining Management Plan. The Radiation surveys indicated in Appendix 14 of the Supplement includes measurement of dust loadings and radioactivity content of the dusts. Table 1 in Appendix 14 also suggests quarterly assaying of dusts and air samples for their contained radioactivity and implementation of these monitoring programs would indicate whether radioactivity in dust is an issue.

35. Recommendation

A dust monitoring program must be established to show that dust management practices are effective. The results of monitoring must be made publicly available and should be reviewed in the Mining Management Plan, for appropriate action, including continuation, cessation or modification of the program. At a minimum the program should include monitoring for lead, PM2.5, PM10 and Total Suspended Particulate and baseline data should be collected and used as a comparison. The Monitoring Program should also include results of radiation surveys and quarterly assaying of dusts and air samples.

4.10 Cultural and Heritage Impacts

The project proposed by Compass Resources has the potential to impact upon four archaeological sites, seven areas of isolated artifacts and three historic sites located within the boundaries of the proposed mine site. Section 9.8.8 details the implementation measures to protect potential heritage sites or artifacts during construction. The proponent has agreed to develop a Cultural Heritage Management Plan in consultation with relevant stakeholders, traditional owners and the Northern Land Council.

4.11 Social Impact

The original (and still main) Aboriginal tribal groups of Coomalie are the Kungarakan and Awarai people with a third group, the Maranungu. A concern was raised that an

appropriately detailed Social Impact Assessment (including baseline studies) needs to be conducted prior to project commencement and a related Social Impact Monitoring programme involving the active participation of traditional owners, the NLC and other relevant agencies should be formally established. The proponent contended that the impact assessment presented in section 7.10 of the PER was sufficient and has acknowledged that identifying and protecting indigenous environmental values and land uses will be part of the project's ongoing consultation programme (Commitment 7, PER).

The Browns Oxide project is situated 7km from the town of Batchelor and during the PER review period, nine public submissions were received voicing concern about the project and the inadequate community consultation process. An additional two submissions were received in response to the Supplement. Given the interest the project has generated, the proponent needs to ensure community consultation remains open and transparent so that all stakeholders remain informed during operation and post closure.

Community sensitivity about the Browns Oxide project has been compounded by the proponent is plans to develop the Browns Polymetallic sulfide deposit underlying the Browns oxide ore in the future. Although this development would require separate environmental assessment, there is community concern that this relatively small-scale mining proposal may ultimately develop into the mining of the sulfide deposit and uranium ore. In the Supplement, the proponent has clarified their future intentions by stating that "Compass has been actively exploring for uranium, and on successful delineation of economic uranium resources, would aim to become a uranium producer in the short term". The proponent will need to keep all stakeholders informed of any future plans so that their concerns are considered for future approval processes.

Another sensitive issue to the development of Browns Oxide is its proximity to the Rum Jungle mine site. Many people voiced their concern that Rum Jungle has not been adequately rehabilitated and it remains a significant environmental and financial burden to the Commonwealth. The proponent will need to look at the wealth of information that exists for Rum Jungle and closely look at the lessons learnt from the Rum Jungle operation to ensure their operations do not add to contaminant loads in the regional ecosystem.

4.12 Road Access and Transport

As part of the Browns Oxide project, the existing Rum Jungle Road will be used as the main site access road and additional information was provided in R2 of the Supplement to assess the extent of impact on local road usage. Other than at the Rum Jungle/Litchfield Road intersection, substantial road infrastructure upgrades would not be required. However, the proponent will need to liaise with the Department of Planning and Infrastructure's Road Network Division to arrange additional signing and delineation on Batchelor Road to accommodate the predicted increase in road trains. More substantial works than outlined in R7 of the Supplement are required at the Rum Jungle Road and Litchfield Road intersection. A change of priority will be needed at the intersection requiring curb returns.

36. Recommendation

The proponent will provide detailed plans of proposed works at the Rum Jungle Road and Litchfield Road intersection for approval by Department of Planning and Infrastructure's Road Network Division prior to mine commencement.

4.13 Issue-based Management Plans

The issue-based management plans outlined in the PER included the following issues applicable to the project:

- Emergency Response Plan
- Fire Management Plan
- Biological and Land Management Plan
- Water Management Plan
- Air Quality Management Plan
- Noise and Vibration Management Plan
- Hazardous Materials and Waste Management Plan
- Cultural Heritage Management Plan
- Radiation Management Plan

These management plans will need to be revised to incorporate the additional measures for environmental protection and monitoring that are contained in this Assessment Report. The issue-based management plans, as part of the Mining Management Plan, will be used for implementing management and monitoring commitments made by the proponent in the PER and the recommendations detailed in this Assessment Report. As such, it will be a working document for the life of the mine and will require continual review in light of operational experience, monitoring results and changed circumstances.

37. Recommendation

Revised issue-based management plans covering construction and operation of the Browns Oxide project are to be submitted to Department of Primary Industry, Fisheries and Mines and the EPA Program for approval prior to commencement of construction and operation. The management plans will be included as an appendix within the Mining Management Plan. In preparing each issue-based management plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report and recommendations made by the Northern Territory Government with respect to the proposal. The plans shall be referred to relevant NT Government Agencies for review prior to finalization. The plans shall form the basis for approvals and licences issued under relevant NT legislation.

5 References

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Appendix 1

The following table summarises the key commitments and statements of proposed preventative and management measures made by the Compass Resources Browns Oxide project in the PER, Supplement to the PER and subsequent correspondence and consultations. While not all preventative and management measures proposed by the proponent have been detailed in this table, all commitments and measures proposed, along with the recommendations in this Assessment Report must be fulfilled by the proponent for the project to be implemented in an acceptable manner. These commitments and management measures are to be managed under the project's issue-based Management Plans and Mining Management Plan.

PER Commitment No.	Commitment/Safeguard	Section			Recommendation No. from Assessment Report
		PER	Supplement	Assessment Report	
	Planning and Future Expansion				
	Proponent shall ensure the proposal is implemented in accordance with the environmental commitments identified in the PER, Supplement, subsequent correspondence and recommendations in this Assessment Report.	9.11	Appendix 11	4.1	1
	Proposed changes to the project to be referred to Minister for determination under the <i>Environmental Assessment Act</i> .	1.1, 4.4	M2	4.1, 4.4.1	2
	Acid Rock Drainage				
2	Column leach test results for selected waste rock samples will be reported in the Mining Management Plan.	4.9.2	B1	4.2.1	3
4	The implementation of selective handling of PAF material requires integration with the mine plan, with identification of material types involving continuous in-pit sampling, logging, mapping and testing during mining.	4.9.2		4.2.1	
	Should relative tonnages of NAF and PAF material alter from those described in the Supplement, Compass shall inform the NT authorities to determine an appropriate course of action		B1	4.2.1	
	Management of PAF wastes will be an ongoing, high-priority focus during project development and implementation.	8.3.4	B4	4.2.1	
	An appropriate qualified person to interpret kinetic test results would be required			4.2.1	
10	Additional management and mitigation measures for ARD will be investigated as required (incorporating information obtained as the mine is developed), including options for ongoing collection and treatment of ARD prior to discharge if warranted.	7.8.4			
	Any NAF2 material, including hanging wall shale, with a sulphur content above 0.02%, be treated as potentially acid forming material and not be used for construction purposes unless further testing has demonstrated its suitability.	4.9.1	B1, Appendix 12	4.2.2	4
	A risk management strategy must be prepared as part of the mine planning process, outlining detailed contingencies in the event that waste rock drainage is found to be a significant source of contaminants	4.9.1		4.2.3	5

PER Commitment No.	Commitment/Safeguard	Section			Recommendation No. from Assessment Report
		PER	Supplement	Assessment Report	
	The effectiveness of the impermeable bund between the TSF and PAF waste stockpiles be assessed through the MMP.		B3, Appendix 13	4.2.4	6
	Monthly monitoring of the TSF will be conducted to detect seepage issues and focus on collection of any seepage			4.2.4	
5	Further geochemical testwork will be undertaken to address inconsistencies in tailing testwork results. This testwork will also include column leach tests and tailing liquor characterisation.	4.10.1		4.2.5	8
9	Compass will obtain improved estimates of ARD during project development and will closely monitor TSF runoff and drainage.e			4.2.5	8
	Regular sampling and testing to confirm acid forming potential of the tailings to be included as a requirement of the TSF Operations and Maintenance Manual.		Appendix 13	4.2.5	
	Tailings Storage Facility				
3	Compass will ensure direct supervision by a qualified person during construction of the TSF and, upon completion; sign off by that qualified person on submission of the 'as constructed' designs and plans.	4-26			
22	A TSF closure study will examine the technical feasibility of dry cover system designs. The design factors that contributed to failure of covers at Rum Jungle in terms of root growth and development of galleries by termites/ants should also be incorporated into the further investigations.	9.9.6	E16	4.2.4, 4.3.3	7, 10
	Compass to manage seepage through the TSF with collection of shallow seepage in a toe drain for recycling and deep seepage detected by monitoring bores and extracted/returned to the TSF/process plant.	4.10.3		4.3.2	
	More detailed assessment of seepage from the TSF and the overall groundwater response to the pit will be carried out using results from monitoring during production		E2	4.2.5	9
	Additional TSF seepage mitigation measures other than drains and recovery bores need to be included as part of the MMP.			4.3.2	9
26	The TSF will be monitored and audited regularly to address whether closure objectives have been achieved.	4.10.2	E16	4.3.3	11
	Radiological Issues				
16	A Radiation Management Plan will be developed and implemented as an issue-based management plan as part of the MMP.			4.4.2	12
	Compass is committed to undertake a quarterly radiation monitoring program summarised in Table 3.5 in the Supplement and additional monitoring is required before and during construction and operations.		N3, Appendix 14 section 3.2	4.4.3	
20	The Radiation Management Plan is available for public comment and any monitoring results from the radiation monitoring program is publicly available	9.9.4		4.4.2	13
	Additional core samples to undergo Uranium assays at depths greater than 10m and contingency management plans for management of by-product uranium on site need to be developed as part of the MMP approval process.		N8	4.4.3	14
	As part of the MMP, the proponent is to clarify how by-product uranium is disposed of in tailings.			4.4.3	

PER Commitment No.	Commitment/Safeguard	Section			Recommendation No. from Assessment Report
		PER	Supplement	Assessment Report	
33	Further to Commitment 20, implementation of the monitoring programs described in those sections will be undertaken after discussion with relevant authorities.		N3, O6		
	Biological				
16, 18	A Biological and Land Management Plan and Weed Management Plan incorporating recommendations to mitigate fauna impacts made in Appendix 4, PER and this Assessment Report must be prepared in consultation with relevant stakeholders for approval prior to commencement of works.	9.8.3	F9, F16	4.5.1	15
	A clearing program will be submitted as part of the MMP prior to work commencing on site and will include management strategies and measures described in Section 9.8.3 of the PER.		F5		
30	Compass will investigate the practicalities of instigating an inspection program to minimise the likelihood of cane toads being transported into and from the project area, and will seek advice from expert groups (such as FrogWatch) on effective control of cane toads.		F3	4.5.3	
	Feral animal management, including cane toad control on site, will be included as a specific implementation measure in the Biological and Land Management Plan.		F3	4.5.3	16
	In conjunction with proposed annual stream biological monitoring program, baseline field surveys targeting fish fauna will be undertaken. If fish field surveys detect the presence of Lorentz's grunter, a detailed management and monitoring plan for the species is to be developed and included in MMP.		F1	4.5.4	17
	Compass intends to discuss the proposed stream biological monitoring program with the relevant NT and Commonwealth authorities.		O6	4.5.4	
	The Medical and Entomology Branch of the Department of Health and Community Services review and comment on the final Biological and Land Management Plan and Mine Closure Plan.		F2	4.5.5	18
16, 17	The protection of fire sensitive riparian and vine forest vegetation is a specific implementation measure in the Fire Management Plan and Biological and Land Management Plan.				19
31	No riparian vegetation along the East Finiss will be cleared by Compass during construction and operations.		F11	4.5.6	20
	The proponent will continue discussions with Friends of the Batchelor Open Wildlife Sanctuary and Greening Australia about possible use and transplanting of the cycad <i>Cycas armstrongii</i> . The proponent will adhere to the provisions of the Management Plan for Cycads in the NT 2003-2008 during site preparation.		F10	4.5.6	
	The proponent liaises with the relevant NTG agencies on the groundwater monitoring program to determine whether groundwater changes are impacting on vine forest communities. As part of final design, the proposed extent of disturbance to the vine forest communities is detailed and adequate buffer areas maintained to reduce the risk of disturbance.		F14	4.5.7	21
	In the event that the vine forest community is impacted by drawdown impacts, the proponent is to commit to developing a re-establishment strategy or offset in liaison with relevant authorities.		F15	4.5.7	22
	Groundwater Management				
	The proposed groundwater management measures and additional groundwater monitoring recommendations made in the Further Information request are to be incorporated into the Water Management Plan as part of the MMP prior to construction.			4.6.1	23

PER Commitment No.	Commitment/Safeguard	Section			Recommendation No. from Assessment Report
		PER	Supplement	Assessment Report	
	The proponent to clarify measures used to segregate low quality water inflowing into the pit for preferential use. If monitoring determines in-pit dewatering results in a deterioration of groundwater quality, the proponent needs to indicate alternative management of groundwater inflows. An irrigation management plan is required as part of the management of excess water.			4.6.2	24
11	Should adverse impacts occur to groundwater users, mitigation measures will involve sourcing suitable alternative water or enhancing bore capacity. Local groundwater users are to be consulted prior to mine commencement to identify agreed contingencies. Monitoring data obtained during operation is to be used to refine the groundwater model predicting extent and duration of drawdown and reported as part of the MMP.	7-74, 9-46		4.6.3	25
	Water levels within the Rum Jungle open cuts and the presence of sulfide materials on exposed pit walls will be monitored as part of the groundwater monitoring program.	7.9.3		4.6.4	26
	Surface Water Management				
	Alternatives to water discharge into the East Finnis and consideration of other key risk reduction strategies prior to discharging into the river must be supplied as part of the MMP. An appropriate waste discharge management strategy will be required as part of the waste discharge licence.			4.7.1	27
29	Compass will provide detailed design information for the sedimentation traps to DPIMF.			4.7.2	
	Specifications of the water treatment plant to be finalised as part of the MMP with particular focus on the design performance criteria	7-62, 9-46	E15	4.7.2	
	Water treatment plant design criteria meet the modelled predictions of maximum volume requiring treatment.			4.7.3	
	Water balance modelling is required to assess the impacts to site water management of a 1 in 200 year average recurrence interval event. The proponent is to demonstrate in the Mining Management Plan effective water management measures for high rainfall events and periods.			4.7.3	28
	Rehabilitation and Decommissioning				
	Additional details on topsoil management will be included in the final Biological and Land Management Plan.	4.5.2	O11	4.8.1	
23	The mine closure plan will be refined as inputs from detailed project design, stakeholder consultation on end land uses and completion criteria, and investigations/studies become available.	9-39, 9-47	O4	4.8.2	29
	Modelling will be undertaken prior to mine closure to determine the time to fill the final void, probability of any overflow during the wet season and likely pit water quality.		S11, S12	4.8.2	
	Appropriate closure criteria detailed in the Mine Closure Plan will be based on ecosystems upstream from Rum Jungle mine impacts.	9.8.4		4.8.3	30
	Ongoing sampling and monitoring of groundwater boreholes (water level and quality), selected surface water sampling locations and mine water will continue for a period of not less than three years from the cessation of operations.	9-44, 9-47			
	Proposed closure plan will require long term strategies to manage potential issues that have occurred in similarly hosted pits in the region. Mine closure plan will provide description of any treatment required to achieve acceptable water quality in the pit.			4.8.2	

PER Commitment No.	Commitment/Safeguard	Section			Recommendation No. from Assessment Report
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	Greenhouse Policy				
	Compass undertake annual reporting of greenhouse gas emissions as part of the MMP and the Construction Environmental Management Plan needs to outline measures to minimise greenhouse gas emissions during construction. The operational greenhouse gas emission estimates are to be adopted as initial emission targets and reflected in the MMP.		G2, G3	4.9.1	31
	Dust				
	Compass to adopt a best practice approach to dust control for mines in Australia though the Air Quality Management and Radiation Management Plans to be developed as part of the MMP.	7.3.3, 9.8.5	C1	4.9.2	
	As part of the MMP, the Air Quality Management Plan must include proposed management of dust from the tailings dam surface if the TSF is identified as a significant dust source.			4.9.2	32
	A dust monitoring program must be established to prove that dust management practices are effective. The results of monitoring must be made publicly available and should be reviewed in the annual mine plan review, for appropriate action, including continuation, cessation or modification of the program.				33
	Cultural and Heritage Impacts				
	Compass to develop the Cultural Heritage Management Plan in consultation with relevant stakeholders, traditional owners and the Northern Land Council.	9.8.8	A2	4.10	
	Social Impact				
7	Identifying and protecting indigenous environmental values and land uses will be part of Compass's ongoing consultation program.	6.5.2	A4/A5	4.11	
	Community consultation regarding the project and any future plans by Compass needs to remain open and transparent so that all stakeholders are informed during operation and post closure. The social monitoring program will be reviewed after 12 months of data have been obtained.	9.9.5	Q2	4.11	
	Road Access and Transport				
35	Compass will provide detailed plans of proposed works to the local road network, including the intersection of Rum Jungle Road and Litchfield Road and additional signing and delineation on Batchelor Road for approval by the Roads Network Division prior to mine commencement.		R6	4.12	34
	Issue-based management plans				
16	Revised issue-based management plans covering construction and operation of the Browns Oxide project are to be submitted to DPIFM and the EPA Program for approval prior to commencement of construction and operation. The management plans will be included as an appendix within the Mining Management Plan.	9.8		4.13	35