Northern Territory Government
Department of Infrastructure, Planning and Environment

PART A – Introduction and Description

GUIDELINES FOR AN

ENVIRONMENTAL IMPACT STATEMENT

ON THE PROPOSED MCARTHUR RIVER MINE EXPANSION

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These Guidelines have been developed to assist MIM Holdings Limited in preparing a draft Environmental Impact Statement (EIS) for the McArthur River Mine expansion and processing facility in accordance with Clause 8 of the Administrative Procedures of the *Environmental Assessment Act (1982*) of the Northern Territory

The final guidelines will consist of 3 sections. Part A (this section) is the introduction and description of the project and the EIS process. Part B (attached) details, in a generic fashion, all the issues that require addressing by the proponent. Part C (to be attached as part of the final guidelines) will contain additional project specific issues and concerns raised during the public consultation period on the guidelines.

1 Project Description

1.1 History

McArthur River Mine is a major underground operation, which is mining one of the largest known sedimentary stratiform zinc-lead-silver deposits. The orebodies making up the deposit, named Here's Your Chance (HYC), were discovered by Mount Isa Mines Limited geologists in 1955, but development did not commence until 1995. This gap in time between the deposit's discovery and development resulted from the unusual structure and extensive faulting of the orebodies and the extremely fine-grained nature of the ore, which combined to make commercial exploitation of the resource unfeasible for many years. A number of technological advancements in mining, ore treatment and concentrate transport, were necessary before the project could proceed on an economic basis. Trial work failed to develop an economically viable technique of ore beneficiation in the 1960's and 1970's.

A small decline and pilot plant were constructed on site in 1975, with the consequent preparation of a feasibility study and environmental report in 1979. That study was based on a high-tonnage, open-pit operation. In addition to poor recovery rates, no market existed at that time for the low-grade lead and zinc concentrates produced by the pilot plant. Subsequent metallurgical developments in fine grinding technology and the emergence of a market for high-grade bulk concentrate for use by smelters using the Imperial Smelting Process (ISP) technique.

Construction of the current project commenced in 1994, with the first shipment of concentrate loaded in mid-1995. McArthur River Mining produces around 360,000 tonnes of bulk lead concentrate (containing payable zinc, lead and silver) for overseas and domestic markets.

The total workforce is currently 330 permanent personnel. Most production employees work a 7 days on/ 7 days off roster, with most support & management staff working a 5/2,4/3 roster.

1.2 Geology

The McArthur Basin comprises Carpentarian and Adelaidean rocks extending from the Alligator river in the Northern Territory to the Queensland border including the greater part of Arnhem Land and the Gulf of Carpentaria drainage region. The sediment hosted stratiform HYC deposit has similarities with ore-bodies at Mount Isa and Hilton in Queensland. It is about 1.5km long and 1.0km wide with an average thickness of 55m.

The HYC deposit occurs near the base of the HYC pyritic shale member, within the Middle Proterozoic McArthur Group. The member comprises a sequence of inter-bedded pyritic bituminous dolomitic siltstones, sedimentary breccias and volcanic tuffs.

The HYC deposit has been folded and eroded along its western margin, which is covered with 30m of soil. This western margin contains the Hinge ore zone, which is sub-vertical with a strike length of 1.0km and vertical height of 200m. The northern margins inter-finger with sedimentary breccias and the southern margin grades into thinned nodular barren pyritic siltstone. On the eastern margin the ore-body thickens and is folded to form the Fold Zone, which has a strike length of over 600m. The southeastern corner is down faulted 110m by the northeastern trending Woyzbun Fault.

1.3 Resource

Open pit mining will increase the mineable ore reserves from the current underground reserves of 40 Mt to open pit reserves of 160 Mt. The mining rate would peak at around 60Mtpa and the project life would be extended from 25 years to 35 years.

1.4 Mining

1.4.1 Current Mining Method

Current ore recovery at McArthur River is by way of a number of mining methods. Mining to date has focused on the No 2 ore-body, which is near the bottom of the mineralised package. The No 2 ore-body has principally been mined by room and pillar mining, at depths ranging from 60 metres below the surface on the western side to over 400m deep on the eastern side of the deposit. The underground mine will increasingly exploit the No 4 ore-body and the No 3 upper ore-bodies as the No 2 ore-body is depleted. The No 4 ore-body is approximately 20m above the No 2 ore-body. Current plans aim to mine these ore-bodies by open stoping methods. Ore is blasted into the No 2 ore-body level and then loaded into diesel powered trucks and hauled to the underground crushing and conveying system. The ore is then transported to the surface mill stockpile on a conveyor in an access tunnel at a gradient of 1:5.4. The current mining and milling rate is 1.5Mtpa. Further tunnel access development is now underway to mine parts of the Woyzbun ore block by the open stoping method.

1.4.2 Proposed Mining Method

The company is currently investigating the feasibility of developing the HYC ore deposit by the open pit mining method. Previously the company completed open pit investigations in a feasibility study in 1979. This study was to market a concentrate product and the result was seen to be not feasible at that time. The current study has the advantage of significant technology advances and the current strategy is to make zinc metal on site rather than to sell bulk concentrate. Recent scoping study work by ISA indicates this is significantly more viable than the current operation.

The scoping study demonstrates that having the ability to produce zinc cathode metal on site via the Albion Process significantly changes the economics of the McArthur River orebody. The scoping study of the open pit development shows that the likely mining reserve would be approximately 160Mt compared to the current underground reserves of 40Mt.

The open pit development option comprises a conventional staged open pit development of the HYC deposit. The open pit mining rate would be around 4.8Mtpa of ore which is expected to significantly enhance the economic outcomes compared with the current operation. This may commence while the current underground operations are still in progress to ensure continuity of ore supply to the mill. The operation would commence with the construction of a diversion of the McArthur River and construction of a bund wall to protect the future pit workings from inundation during localised wet season flooding. Mining would be by a fleet of conventional rope shovels, hydraulic excavators and large haul trucks. The mining rate would peak at around 60Mtpa and the project life would be around 35 years. The overlying alluvial cover material will be progressively mined as needed and placed on areas designated for rehabilitation such as the waste rock storage facility. The ultimate pit is likely to be approximately 420m deep, 1600m long by1400m wide, with an area of around 200 Ha.

1.5 Mining Waste

The waste rock generated from the open pit mining will be placed in a purpose built waste rock dump. Preliminary estimates of the open pit waste generated are around 800Mt. The waste rock will be characterised as to its acid generating potential and selectively managed so as to minimise potential acid generation. A perimeter drain will be constructed to capture surface runoff, which will be collected in a pond and utilised in the operation as appropriate. The waste rock dump will be progressively rehabilitated. Wherever possible suitable waste rock from the pit will be utilised for construction purposes on site. Where practical waste rock will be backfilled into the open pit.

Industrial wastes generated on site will be managed in accordance with current practice, which includes:

- maximising recycling opportunities where cost effective (eg steel, waste oil and batteries)
- contaminated waste is deposited in the tailings storage facility
- clean waste is buried in a designated landfill
- putrescible waste is buried in a clay lined pit above the RL40 flood level
- a package sewage treatment plant with primary treatment and effluent irrigation

1.6 Ore Processing

1.6.1 Crushing and Comminution

Run of mine ore will be crushed and ground to 80% passing 45 microns prior to flotation. As currently envisaged the crushing and grinding circuit will be rated at 5.0 Mtpa with run of mine ore delivered to the plant at a rate of 4.8 Mtpa and an average zinc head grade of 10.7% w/w.
Run of mine ore will feed a gyratory crusher with crushed ore conveyed to a crushed ore stockpile ahead of comminution. Crushed ore will be conveyed from the stockpile to a SAG mill operating in series with two closed circuit ball mills. Discharge from the ball mill circuit will then be pumped to the concentrator and stored ahead of flotation.

1.6.2 Ore Flotation

Ground ore will be conditioned with flotation reagents prior to being pumped to a bank of pre-flotation cells where a carbonaceous concentrate will be removed and transferred to tailings. After pre-flotation, the slurry will be pumped to a bank of rougher flotation cells, where approximately 92% of the zinc and 85% of the lead bearing minerals will be recovered to a rougher concentrate. The remaining ore slurry will be pumped to a tailings thickener, where the slurry will be thickened and transferred to a tailings storage facility. All waste streams from the process plant will report to this thickener for blending with concentrator tailings prior to disposal to the tailings storage facility.

Rougher concentrate will be transferred to a bank of fine grinding mills, which will grind the concentrate to a size in the range 80% passing 9 - 18 microns. Finely ground concentrate will then be pumped to a bank of cleaner flotation cells, where approximately 90% of the zinc and 70% of the lead bearing minerals will be recovered to a final flotation concentrate, grading 30% w/w zinc. The tailings from the cleaning stage will be pumped to the tailings thickener. Final flotation concentrate will be thickened and transferred to storage tanks ahead of the oxidative leach stage.

1.6.3 Oxidative Leaching

Ground cleaner concentrate will be pumped to the head of the concentrate leach circuit. The leach will operate under atmospheric pressure with all tanks covered to minimise evaporative losses. Concentrate slurry and spent electrolyte from the electrowinning cellhouse will be pumped into the first leach tank, along with makeup water. Slurry will then cascade through each tank in series by gravity. Oxygen will be added to each leach tank from a cryogenic oxygen plant.

The leaching stage will operate at an average temperature of 70^{O}C. Zinc recovery across the leaching circuit will be 98% w/w or greater. Approximately 12% of the iron in the cleaner concentrate will report to the leach solution, and this will be removed in an iron precipitation stage. Other minor impurities that report to the leach solution will be removed in a zinc dust precipitation stage. The residue from the leach stage will consist of predominantly silica gangue and lead sulphate.

1.6.4 Iron Precipitation

The discharge slurry from the oxidative leaching stage will contain low levels of sulphuric acid and iron sulphate. The slurry will gravitate from the leach into a series of iron precipitation tanks. The iron precipitation stage will also operate under atmospheric pressure. Limestone slurry will be added to each of the iron precipitation tanks to control the pH to 3.5. The temperature in each iron precipitation tank will be maintained at 70^{o}C.

The precipitate formed in the iron removal circuit will consist predominantly of goethite and gypsum, and this precipitate will be mixed with the leach residue solids. Slurry overflowing the final iron precipitation tank will gravitate to a thickener. Thickener underflow will be pumped to a bank of pressure filters for filtration, with filtrate recycled to the thickener. The thickener overflow will be pumped through sand filters and fed to the zinc dust purification stage. Filter cake solids, containing less than 1% zinc, will be re-slurried and pumped to the tailings storage facility for disposal.

1.6.5 Zinc Dust Purification

The zinc dust precipitation circuit will remove trace metals from the neutralised solution prior to electrowinning. The purification stage will be operated at 90^{o}C, with zinc dust and other reagents such as copper sulphide and metal trioxides added to the solution to remove trace metals. The discharge from the purification circuit will be filtered to recover the zinc dust precipitate. This precipitate will then be transferred to the concentrator tailings storage facility for disposal. Filtrate from the purification stage will be transferred to the electrowinning cellhouse.

1.6.6 Electrowinning

A conventional zinc electrowinning cellhouse will be used to recover zinc from the purified solution. Purified solution will be mixed with spent electrolyte from the cellhouse to provide a rich electrolyte stream for feed to the electrowinning cells. Zinc metal will be plated from rich electrolyte in the cell, in the form of a 30 - 40 kg cathode sheets, which will be removed from the cellhouse for re-melting and casting. Spent electrolyte will overflow from each cell and gravitate to a spent electrolyte storage tank. A portion of the spent electrolyte will be recycled to the head of the tankhouse for blending with purified solution, with the remainder transferred to the leaching stage.

1.6.7 Cathode Re-melting and Casting

Cathode sheets produced in the zinc cellhouse will be conveyed to a vertical shaft furnace and re-melted. The molten zinc will then be cast into ingots for transport and sale off site. The ingots will meet the specification for Special High-Grade Zinc. Approximately 456,000 tonnes of cast zinc will be produced per annum. Zinc dust will also be generated as part of the casting process for recycle to the purification stage.

1.7 Tailing Disposal

All waste streams from the process plant will report to the tailings thickener for blending with concentrator tailings prior to discharge to the tailings storage facility. Thickened tailings will be deposited in the existing tailings storage facility which will be expanded to the west. Test work of the tailings material will be undertaken to determine the acid generating potential and leachate characteristics.

The current tailings water management design and operational strategy will be utilised on the expanded facility as per existing approvals.

The tailings rehabilitation strategy will be based on the current approach of establishing a capillary layer, 800mm nominal cover with inert material and shedding water from the surface. This approach will be tested and confirmed during rehabilitation trials on the progressively rehabilitated tailings storage facility. The rehabilitated tails will be left in a safe and stable condition.

1.8 Water Management

The climate of McArthur River region is tropical monsoonal, with a pronounced wet season between December and March and generally drier conditions for the remainder of the year. The water management system must accommodate both cases and give consideration for severe shortages and surpluses of water over the life of the mine.
Aspects of the McArthur River Expansion Project that will have an impact on water management include:

- Expansion of Process Plant and construction of a new refinery
- Expansion of Tailings Storage Facility
- Raw Water Collection and Storage
- Establishment of a weir on the Glyde River
- Diversion of McArthur River
- Diversion of Barney Creek
- Open Pit and Protective Bund Wall
- Waste Rock Disposal

The water management system will be designed and operated around these structures and apply the following principles:

- Minimise water consumption
- Maximise water recycling
- Establish a preferential hierarchy of uses based on water quality
- Control discharges from operational areas of the lease
- Minimise the disturbance of land

1.9 Power Generation

Gas fired power generation already exists on site (current generating capacity 22Mw) and a range of options are being considered to increase this capacity to approximately 350Mw.

Options being considered include:

- Additional gas fired power station equipment on site at McArthur River supplied by pipeline gas from alternative locations including PNG and Central Australia.
- A Coal fired power station on site at McArthur River supplied by coal shipped to the Gulf of Carpentaria and transported to the site.

1.10 Transport

The transport of the finished product will be by truck to Bing Bong along the existing sealed highway. The product tonnages are not significantly different to those that are currently being transported - 456kt proposed compared to 360kt actual in 2001/02. The real difference is the product itself which is a relatively inert metal that will be transported in stacked 1 tonne bundles compared with the current concentrate transported loose in covered trailers.
The metal will be unloaded at the port and transported by barge to anchorages in the gulf where it will be transferred to awaiting cargo vessels, using ship's gear in the initial years of the project.

1.11 Site Layout

The proposed site and plant layouts are shown in Figures 8 and 9 of the Notice of Intent. Building wherever possible onto the existing infrastructure the principles applied to the expansion layout are to:

- Minimise disturbance to land
- Design to topographic contours (to minimise cut and fill requirements)
- Utilise and expand on the existing infrastructure
- Design around local issues (eg cultural considerations)
- Design above known and calculated flood levels
- Control potential contaminants

1.12 Infrastructure

The new project is expected to utilise all infrastructure currently being used by the existing operation but in many cases will require it to be improved or expanded. Examples of these improvements are the airstrip and village facilities, which would have to be expanded to cater for the extra personnel and the McArthur River to Bing Bong Highway, which would need upgrading to ensure all weather access to the port.

1.13 Workforce

The operational workforce will increase from its current level of 330 to approximately 600 in the initial years of the operation with further step changes up to > 700 in future years as the mining strip ratio increases.

It is expected that during the three-year construction phase the site based construction workforce will peak at around 1000. There will be a range of other off-site jobs created within the NT and other areas of Australia as a direct result of the project.

1.14 Rehabilitation and Decommissioning

On final decommissioning all plant and infrastructure will be made safe or dismantled and removed unless stakeholders suggest otherwise.

End use objectives will be established through a consultative process involving ISA, government and relevant community stakeholders.

Progressive rehabilitation will be undertaken wherever practicable. Whilst opportunities for placement of waste rock in the open pit will be maximised, the open pit will remain as a void and will fill with water over time.

2 The Purpose of the EIS

The draft EIS aims to provide:

- a source of information from which individuals and groups may gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it would affect, the impacts that may occur and the measures taken to minimise those impacts;
- a basis for public consultation and informed comment on the proposal; and
- a framework against which decision-makers can consider the environmental aspects of the proposal, consider whether it is environmentally acceptable, and if so set conditions for approval to ensure environmentally sound development and recommend an environmental management and monitoring program.

The object of these guidelines is to identify those matters that should be addressed in the draft EIS. The guidelines are based on the initial outline of the proposal in the Notice of Intent. Not all matters indicated in the guidelines may be relevant to all aspects of the proposal. Only those matters that are relevant to the proposal should be addressed. The guidelines should, however, not be interpreted as excluding from consideration any matters which are currently unforeseen, which may arise during ongoing scientific studies or which may arise from any changes in the nature of the proposal during the preparation of the draft EIS, the public consultation process and the preparation of the Supplement to the draft EIS (response to submissions).

The proposal has been declared a controlled action under the Commonwealth *Environment Protection and Biodiversisty Conservation Act* because it was considered likely to have significant impacts on a listed threatened species and several listed migratory species. The listed threatened species is the freshwater sawfish, *Pristis microdon*. Migratory birds inhabit coastal wetlands fed by the McArthur and Glyde Rivers that contain important habitat for the listed species Great knot (*Calidris tenuirostis*), Red knot (*Calidris canutus*), Red-necked stint (*Calidris ruficollis*), Sharp-tailed sandpiper (*Calidris acuminata*) and Black-tailed godwit (*Lumosa lumosa*).

The draft EIS should be a self-contained and comprehensive document written in a clear, concise style that is easily understood by the general reader. Cross-referencing should be used to avoid unnecessary duplication of text. Text should be supported where appropriate by maps, plans, diagrams or other descriptive material. Detailed technical information and baseline surveys should be included as appendices or working papers.

The justification of the project in the manner proposed should be consistent with the principles of ecologically sustainable development. Assessment of the environmental impacts of the proposal and alternatives should consider the life-cycle impacts, from cradle-to-grave, including sourcing of materials, operational impacts and decommissioning. For the purpose of these Guidelines, the "principles of ecologically sustainable development" are as follows:

- the precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- inter- and intra-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations;
- conservation of biological diversity and ecological integrity; and
- improved valuation and pricing of environmental resources.

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PART B – Guidelines

GUIDELINES FOR AN

ENVIRONMENTAL IMPACT STATEMENT

ON THE PROPOSED MCARTHUR RIVER MINE EXPANSION

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The draft EIS should include the following sections, but need not be limited to these sections or inferred structure.

1 EXECUTIVE SUMMARY

The Executive Summary should include a brief outline of the project and each chapter of the draft EIS, allowing the reader to obtain a clear understanding of the proposed project, its environmental implications and management objectives. The Executive Summary should be written as a stand-alone document, able to be reproduced on request by interested parties who may not wish to read or purchase the draft EIS as a whole.

The summary should include:

- the title of the project;
- name and contact details of the proponent, and a discussion of previous projects undertaken by the proponent and their commitment to effective environmental management;
- a concise statement of the aims and objectives of the project;
- the legal framework, decision-making authorities and involved agencies;
- a discussion of the background to and need for the project, including the consequences of not proceeding with the project;
- a discussion of the alternative options considered and reasons for the selection of the proposed development option;
- a brief description of the project and the existing environment, utilising visual aids where appropriate; and
- an outline of the principal environmental impacts, environmental management strategies (including waste minimisation and management) and commitments to overcome or minimise these impacts.

2 INTRODUCTION

The introduction should include:

- a brief explanation of the purpose and structure of the document;
- title of the project;
- name and contact details of the proponent;
- scope of the proposed project;
- an outline of the environmental assessment processes under the relevant NT and Commonwealth legislation;
- reference to initial investigations and feasibility studies;
- relevant Territory, Commonwealth and International policies, legislation, and treaties; and
- planning issues such as land tenure, zoning, timeframes, potential for additional development and the lifetime of the project.

3 OBJECTIVES AND BENEFITS OF THE PROPOSED PROJECT

Discuss the social and financial objectives and benefits of the project. This should include:

- socio-economic objectives and benefits, including reference to local and global markets, other economic activities in the affected area (eg Tourism, Pastoral etc.), foreign trade objectives, occupational health and safety objectives, and benefit to the local workforce, land users and indigenous people;
- commercial objectives (eg predicted volume of product and proportion of market demand to be met by output); and
- local, regional and global environmental objectives (eg reference to the company's environmental policies and the implications of the project with respect to the National Greenhouse Strategy).

4 ALTERNATIVES

Alternative proposals, which may still allow the objectives of the project to be met, should be discussed, detailing reasons for the selection and rejection of particular options. The selection criteria should be discussed, and the advantages and disadvantages of preferred options and alternatives detailed. The potential impacts of the alternatives should be described.

Alternatives to be discussed should include:

- not proceeding with the project;
- alternative locations, including power station and process plant;
- alternative sources of raw materials for the project, including water supply and storage (eg no weir on the Glyde River);
- alternative extraction including expanded underground operations, and processing technologies considered;
- alternative environmental management technologies considered, such as treatment and disposal of byproducts and waste products, co-generation etc;
- alternative workforce accommodation; and
- alternative power supply options and service corridors.

5 PROJECT DESCRIPTION

The draft EIS should describe the project in sufficient detail to allow an appreciation of the construction and operation timeframes and processes, and assist in determining the potential environmental impacts of the project. Key decision-making processes (such as risk assessment) should be detailed. Where appropriate, relevant Northern Territory and Commonwealth Government legislation, strategies and policies as well as international and national standards should be considered. Relevant NT

Government environmental and construction guidelines should also be considered during the design phase of the project.

The use of a table describing the key characteristics of the project and a description of the phases of the proposal, including the nature and extent of proposed works likely to involve environmental impacts, may be an appropriate means of summarising this information.

The project description should consider the following, as a minimum, for all aspects and components of the project:

5.1 Location Details

- Provide a description of the project's location indicating distance from Darwin, Borroloola and the port at Bing Bong.
- Provide maps and diagrams displaying the above information.
- Provide maps showing the project in relation to Borroloola, McArthur River, Barney Creek, Glyde River, access routes and Bing Bong Port.

5.2 Project Design

Provide overall layout of the proposed mine site including pit, processing facilities, waste dumps, tailings storage facilities, power station, other infrastructure, rivers, river diversion structure and weir, access and transport routes and existing features of interest.

- Describe the components of the project with a description of each component and its function. Include the port at Bing Bong.
- Location of the components (include detailed maps).
- Land area to be used including:
    - size (area of total project and area of land disturbance);
    - tenure (mining and other land tenure);
    - current uses;
    - claims under the *Native Title Act, 1993* and the *Aboriginal Land Rights (Northern Territory) Act 1976*;
    - Aboriginal Areas Protection Authority certificates issued or required under the NT *Aboriginal Sacred Sites Act*;
    - acquisition requirements; and
    - access requirements.
- Current and proposed infrastructure (roads, airstrips, communications, power etc).
- Describe how the project design will include the existing infrastructure for the current mining processing and transport operations, alteration of existing waterways and effects of major rainfall and flood events in recent years.

5.3 Construction Details

- Timing of construction activities (include a time-line of all activities).
- Materials required for construction including:

  - solids;
  - water (construction and potable) and other liquids;
  - gases; and
  - power.

  Tabulate details showing quantities, hazardous and non-hazardous substances, NPI reporting requirements, greenhouse gas emissions, and potential sources.
- Outline plant and machinery requirements.
- Outline personnel requirements:
  - numbers;
  - positions;
  - shifts;
  - staff structure with responsibilities;
  - housing requirements.
- Wastes to be generated including:
  - solids (this does not include waste rock and overburden – see below);
  - liquids;
  - gases;

  Tabulate details showing quantities and highlighting hazardous substances, NPI reporting requirements, dust and emissions to air including greenhouse gases.
- Applicable standards including:
  - mining;
  - building;
  - environmental and heritage protection (including indigenous heritage);
  - occupational health and safety (include measures to prevent exacerbating mosquito breeding in the area);
  - project management.
- Traffic and freight requirements:
  - vehicle types and numbers;
  - hours of operation;
  - vehicle washdown facilities and procedures.
- Areas of borrow.
- Footprint for construction compared with operation.

5.4 Operational Details

5.4.1 Mine

- Outline design of pit and its dimensions (including maps, plans and geological cross-sections). The principles of geotechnical engineering for safe design should be used for both open pit and underground mining for slopes, safety bunds and driveway size and support requirements.
- Indicate extent of area to be cleared of vegetation (or substantially thinned) in the form of a ”Clearing Plan”.
- Describe erosion and sediment control measures.
- Describe mining methods, scale of operations and timetable for ore extraction and open cut and underground operations.
- Detail drilling and blasting requirements (including frequency).
- Outline possible future extensions to the mine operation, above ground and below ground level, and discuss the probability of mining satellite ore bodies.

- Identify availability, location and suitability of borrow material including topsoil, describe requirements, extraction methods and proposed uses of the borrow material.

5.4.2 Limestone supply and processing

- Identify the source/s of limestone and the quantities required;
- Describe the location of any limestone quarry that may be used, the extraction methods, transport and storage; and
- Describe the preparation of the limestone slurry and any waste products produced.

5.4.3 Waste Rock

- Characterise waste rock in terms of AGP (acid generation potential) from drill core samples and in-situ assessments (kinetic tests and field trials).
- Outline sampling criteria and test methods, identify possible chemical constituents in drainage, and specify test methods (provide all test information).
- Identify classes of waste rock for handling purposes, including acid generating and acid neutralising potential.
- Outline proposed waste dump locations (discuss alternatives), dimensions, water catchments, contingency drainage interception arrangements, extreme event design specifications, surface treatment and final landform.
- Describe in detail the methods for waste rock disposal and dump construction; including sample selection methodology and characterisation to direct different waste rock types to appropriate locations for disposal, and cross sections for the design of the waste rock dumps. Problematic waste will require strategic positioning.
- Describe means of interception and management of potential acid mine drainage.

5.4.4 Ore Processing and metal production

- Identify and describe in detail the stages of ore processing from run of mine ore to the finished metal. Include flow diagrams and options for processing the ore.
- Detail all input products (solids, gasses and liquids) and pathways for each item in the process. Tabulate, indicating the quantity and nature of the substances, handling requirements, NPI reporting requirements, sources and transport.
- Detail all output products (solids, gasses and liquids) and pathways for each item in the process. Tabulate, indicating the quantity and nature of the substances, handling and transport requirements, disposal, reuse or recycling options.

5.4.5 Tailings

- Characterise the tailings, including mineralogy, base metal content, neutralising capacity, sulfide content and net acid production potential.
- Describe proposed tailings storage facility location and catchment details.
- Describe tailings disposal and impoundment principles, surface configurations, wall designs and construction, estimated flood heights and provisions for extreme rainfall events, erosion protection, spillway design and location, subdrainage and collection sumps. Ensure current geotechnical engineering principles/practices and ANCOLD guidelines are met.
- Outline any provisions in the design and management of the tailings storage facility for future extraction of lead and silver.

- Describe geotechnical details of dam (specifically seepage potential and expected chemistry of leachate).
- Describe the incorporation of the existing tailings storage facility into the proposed expanded tailings storage facility.

5.4.6 Water Management

- Detail the water requirements and sources (surface or ground water).
- Document the approach used to model impacts of proposed changes to the hydrologic regime (data sources, data limitations, model timesteps, model assumptions and uncertainties).
- Describe the management of clean, dirty and contaminated surface water on the mine site.
- Document the management of process waters and acid drainage waters, including contingency planning for accidents.
- Describe the diversion of McArthur River and Barney Creek, including construction works, and whether and how the new channels will match the existing channels.
- Describe the construction of the weir on the Glyde River, including the dimensions of the weir and any provisions for fish ladders.
- Detail the mechanisms proposed for dewatering the pit.
- Document the management of high/extreme rainfall events, including contingency planning.
- Describe the recycling process and the materials that will be recycled.
- Describe the current water management and monitoring at the existing mine and its applicability to the proposed expanded mine.

5.4.7 Power requirements and generation

- Describe the energy requirements at the different stages of ore processing and metal production.
- Describe in detail the options for power generation in terms of:
  - Sources of gas or coal;
  - Transport, transport routes and storage;
  - Cooling requirements;
  - Water management; and
  - Emissions to air.

5.4.8 Management of emissions to air

- Document the emissions to air, including NOx, SOx and greenhouse gases.
- Provide data on the maximum annual emissions of the six greenhouse gases listed in the Kyoto Protocol (carbon dioxide, methane. Nitrous oxide hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride). Include emissions associated with the power generation alternatives.
- Describe measures and techniques to minimise and manage the emissions to air.

5.4.9 Bing Bong Port facilities

- Describe any changes to the port at Bing Bong required for the shipping of the zinc metal, including any dredging and widening of the channel.
- Detail the vessel types and numbers used for shipping the zinc metal.

- For the coal fired power option describe handling and storage facilities required at the port.
- Detail the vessel types and numbers used for shipping the coal to Bing Bong.
- Describe the methods likely to be used for transferring the coal to the power station at the mine.
- Describe water management and dust suppression at the port and associated storage facilities.

5.4.10 General

- Personnel requirements:
  - numbers;
  - positions;
  - shifts;
  - staff structure with responsibilities;
  - housing requirements;
  - induction in relation to the local community including cross cultural training.
- Occupational Health and Safety, and Emergency Response Details:
  - fire and emergency services planning, including bush fire management;
  - spill response plans;
  - induction details;
  - management structure responsibilities;
  - communication details.
- Operational fleet details including cars, trucks, mining equipment etc showing:
  - ownership (ie corporate or lease/hire);
  - expected fuels, oil, tyre usage;
  - maintenance requirements;
  - disposal options.
- Traffic and freight requirements:
  - vehicle types and numbers;
  - hours of operation; and
  - vehicle wash down facilities and procedures.

5.4.11 Rehabilitation and Decommissioning Details

The text should outline a time scale for decommissioning and for determination of compliance with, and release from, requirements of the appropriate authorities.

Specific information requirements include:

- Identify decommissioning and rehabilitation objectives including the current McArthur River mine and the four affected water ways.
- Include a commitment to submit a security bond in case of failure of the project.
- Identify post mining land use.
- Identify proposed completion criteria or process of developing these criteria.
- Identify proposed environmental indicators to measure progress in achieving the completion criteria (or process to develop these).
- Integration of the rehabilitation program with mine design and operation.
- Design of rehabilitated landforms.

- Erosion and sediment control procedures.
- Describe progressive and/or final rehabilitation plan for the pit and surrounds.
- Natural and constructed drainage system design to ensure runoff discharge does not erode or add to downstream siltation.
- Actions to prevent the development of mosquito and other biting insect breeding habitats.
- On-going water management requirements linking storage, quantity and quality (including maintenance of the pit void, wetlands and other systems).
- Describe progressive and final rehabilitation plans for waste rock dumps and tailings storage facilities; specifically collection and selection strategy for native species, eg native grasses and other vegetation to be used for runoff and erosion control, final topographic and drainage morphology, maintenance of water quality, prevention of leaching and revegetation procedures.
- Establishment of vegetation to include seeding, flora selection, fertiliser use (if needed), and rehabilitation trials, including native plants to prevent future weed problems.
- Continued water monitoring and discharge requirements following decommissioning, including the pit.
- Responsibilities of the proponent after decommissioning.

6 Existing Environment and Impacts of the Project

The draft EIS should include an in-depth description of the areas potentially impacted by the project. These areas should include:

- areas affected by mining operations and maintenance;
- areas affected by construction (including off site);
- construction sites, lay-down areas, corridors and buffer zones;
- offsite operational areas;
- the existing McArthur River Mine site;
- downstream to Borroloola and the McArthur River estuary; and
- the port at Bing Bong.

Seasonal and diurnal meteorological changes, and any significant trends (eg flood, cyclone frequency) should be indicated where appropriate. Areas of environmental sensitivity should be identified and the scope of investigations fully discussed. Where areas of environmental sensitivity have been identified any inter-relationship between sensitive areas and other areas should be discussed. Sites and species of special conservation status should be identified and described (eg RAMSAR and wetlands of national importance, endangered, protected or migratory species, environmental and conservation values to indigenous people).

Studies to describe the existing environment should be of a scope and standard sufficient to serve as a benchmark against which the impacts of the project may be assessed over an extended period. Control areas not impacted by the project should be included in studies and long term monitoring locations established. Studies from the existing McArthur River Mine site should be used where relevant.

This section of the draft EIS should also clearly identify, qualify and quantify, where appropriate, the potential environmental impacts expected to result from the project and from any feasible alternatives.

The potential impacts and proposed mitigation measures of the proposal should be discussed for all relevant stages of the project (including construction, operation, decommissioning, incidents and accidents). Performance indicators for all potential impacts and remediation efforts should be identified. The nature of effects should be characterised by the following qualities:

- direct/indirect
- short-term/ medium-term/ long-term
- adverse/beneficial

The section should also include an assessment of the level of significance of the impact, be it global, regional or local (eg. global and national implications of greenhouse gases and the localised impact of service roads or artificial water bodies). The vulnerability of key habitats and species to potential impacts should be assessed, as should visual impacts of the proposed development. Cumulative impacts should also be discussed. The reliability and validity of forecasts and predictions, confidence limits and margins of error should be indicated as appropriate.

Description of those areas potentially impacted by the project should, as a minimum, include:

6.1 Physical Environment

6.1.1 Existing Environment

Air

- List all meteorological conditions including but not limited to:
  - prevailing wind directions and strengths;
  - maximum wind gusts;
  - precipitation data (max., min., avg., design rainfall intensities);
  - temperature data;
  - evaporation data;
  - relative humidity data;
  - barometric pressure data.
- Provide air quality data including but not limited to:
  - particulate (PM_{10}) levels;
  - oxides of sulfur (SO_x) levels;
  - oxides of nitrogen (NO_x) levels;
  - lead (Pb) levels;
  - volatile organic compounds (VOC's);
  - ozone levels (O_3);
  - carbon monoxide levels (CO);
  - radon gas and its decay products;

  - Data on maximum annual emissions of the six greenhouse gases listed in the *Kyoto Protocol* (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluoroocarbons and sulfur hexafluoride).
- Undertake studies and provide information on seasonal air dispersion.
- Describe ambient light levels in the area.
- Provide ambient noise levels for the area and the site.
- Discuss the current bushfire regime for the region.

Land

- Provide maps of and interpret the site and regional geology.
- Provide maps of and interpret the site and regional geomorphology.
- Discuss the soil types and land units.
- Provide seismic information for the region.
- Detail the existing level of soil erosion and other disturbances.

Hydrology

- Describe the site and regional surface water systems including:
  - rivers;
  - creeks;
  - streamlines;
  - lakes;
  - lagoons;
  - wetlands;
  - flood plains
  - estuaries and coastal waters.
- Describe the site and regional ground water systems including:
  - confined aquifers;
  - unconfined aquifers;
  - ground soaks, expressions etc.;
- For both ground water and surface water systems, discuss;
  - their significance (RAMSAR etc);
  - current uses, including Borroloola and current mine water supply;
  - declared beneficial uses[1];
  - flows (including flood contours) and discharge rates;
  - water quality, including seasonal changes and relationship between water quality and flow;
  - impact of acid drainage from past mining activities;
  - release or seepage of heavy metals (primarily lead and zinc).

6.1.2 Impacts

- Describe how the project will impact on air, land and water quality and on water quantity during the construction and operation phases. Detail this with reference to the inputs and outputs from the mining and processing operations, and the declared beneficial uses:

[1] The declared beneficial uses for the McArthur River and its catchment are "Aquatic Ecosystem Protection" and "Recreational Water Quality and Aesthetics".

- Discuss greenhouse gases and global warming in the NT, national and global context.
- Rate the risk and seriousness off each impact.

6.1.3 Mitigation

Discuss with reference to each impact on each of the values the proposed management and mitigation measures to be undertaken.

6.1.4 Monitoring

Baseline - Detail the baseline surveys undertaken for each value, identifying when the data was obtained and its relevance to the project.
Ongoing - Detail the proposed monitoring programs and reporting arrangements for each value that is likely to be impacted and requires management.

6.2 Biological Environment

6.2.1 Existing Environment – Fauna

For each terrestrial and aquatic (freshwater and estuarine) vertebrate and invertebrate species:

- Tabulate or list all resident and migratory species discussing:
  - prevalence;
  - conservation status;
  - international treaty obligations;
  - preferred habitats;
  - breeding habits;
  - native or introduced;
  - hazardous nature and pest status;
  - social and cultural significance.
- Tabulate or list invertebrate species of importance including the range and density of mosquitos and biting midges and their seasonal habits. Also include other pests, dangerous species and harmful bacteria that may occur in the area.

6.2.2 Existing Environment – Flora

For each terrestrial and aquatic (freshwater and estuarine) flora species:

- Tabulate or list all species discussing:
  - prevalence;
  - conservation status;
  - land associations;
  - dependencies and interactions;
  - propagation habits;
  - native or introduced;
  - hazardous nature;
  - social and cultural significance.
- Tabulate or list the declared weeds (*Weeds Management Act*) and invasive species present in the area and current management techniques.

6.2.3 Impacts

- Describe how the project will impact on each fauna and flora value, but in particular on species of conservation significance. Detail this with reference to the inputs and outputs from the mining and processing operations, and to the river works (diversion and weir):
  - Particular reference must be given to the listed threatened freshwater sawfish, *Prisis microdon*.
  - Particular reference must be given to the listed migratory species Great knot (*Calidris tenuirostis*), Red knot (*Calidris canutus*), Red-necked stint (*Calidris ruficollis*), Sharp-tailed sandpiper (*Calidris acuminata*) and Black tailed godwit (*Limosa limosa*).
- Rate the risk and seriousness off each impact.

6.2.4 Mitigation

Discuss with reference to each impact, the proposed management and mitigation measures to be undertaken including impacts on the threatened and migratory species.

6.2.5 Monitoring

Baseline - detail the baseline surveys undertaken for each value (including mosquitos), identifying when the data was obtained and its relevance to the project.
Ongoing - detail the proposed monitoring programs and reporting arrangements for each value that is to be impacted and requires management.

6.3 Cultural and Socioeconomic Environment

6.3.1 Existing Environment – Cultural

- Provide a detailed description of the past and present uses of the site (Aboriginal and non-Aboriginal).

- Tabulate or list all terrestrial and aquatic areas of cultural and social importance that may be influenced by the project including:

  - areas nominated for listing or listed on the Register of the National Estate or the Interim list of the Register of the National Estate;
  - archaeological and heritage places and objects under the *Northern Territory Heritage Conservation Act 1991;*
  - historic sites;
  - areas with special values to indigenous and non-indigenous people (eg. traditional land use, landscape, visual environment, recreational, commercial, tourism, scientific, educational);
  - areas of significance to the Aboriginal population and culture, including sacred sites within the meaning of the *Aboriginal Land Rights Act* and the NT *Aboriginal Sacred Sites Act*;
  - implications of the *Native Title Act* (including potential compensation issues);
  - national parks;
  - conservation reserves;
  - wilderness areas;
  - wetlands of national importance.

discussing:

- importance;
- conservation status;
- national and international treaty obligations;
- clearance permits required or obtained;

6.3.2 Existing Environment – Social

- Discuss the social characteristics of the region including:
  - demographics;
  - lifestyle and values;
  - social trends;
  - employment levels and characteristics;
  - economic structure;
  - community services and facilities;
  - recreational and commercial fishing;
  - transport network and usage (road, air, waterways, traffic volumes), including access to Darwin, Borroloola and Bing Bong port.

6.3.3 Impacts

- Detail how the project will impact on each cultural and social value of the area.
- Rate the risk and seriousness off each impact.

6.3.4 Mitigation

Discuss with reference to each impact, the proposed management and mitigation measures to be undertaken.

6.3.5 Monitoring

Baseline - Detail the baseline surveys undertaken for each value, identifying when the data was obtained and its relevance to the project.
Ongoing - Detail the proposed monitoring programs and reporting arrangements for each value that is to be impacted and requires management.

6.4 Systems and Habitats

6.4.1 Existing Systems and Habitats

- Identify all systems and habitats discussing their:
  - uniqueness;
  - importance;
  - interrelationships
  - dependencies;
  - sensitivities;
  - vulnerability's;
  - conservation status;
  - national and international treaty obligations;

linking the four categories of:

- Physical Environment;
- Biological Environment – Fauna;
- Biological Environment – Flora;
- Cultural and Socioeconomic Environment;

where appropriate.

6.4.2 Impacts

- Describe how the project will impact on each ecosystem and habitat value of the area. Detail this with reference to the inputs and outputs from the mining and processing operations.
- Rate the risk and seriousness off each impact.

6.4.3 Mitigation

Discuss with reference to each impact, the proposed mitigation measures to be undertaken.

6.4.4 Monitoring

Baseline - Detail the baseline monitoring undertaken for each value, identifying when the data was obtained and its relevance to the project.
Ongoing - Detail the proposed monitoring programs and reporting arrangements for each value that is to be impacted and requires management.

6.5 Hazard/Risk to Humans and Facilities

The draft EIS should include a preliminary hazard analysis and assessment of the risks to people, the environment and nearby facilities from potential accidents associated with the construction, operation and maintenance of the various components of the proposal, storage and transport of materials to and from the complex which includes the port (including transport where appropriate).

The preliminary hazard analysis and risk assessment should outline and take into account emergency plans that detail strategies, response procedures and staff responsibilities in the event of an emergency or accident. Issues such as cyclones, floods, bush fires, lightning strikes, mine collapse and landslip should be considered. Contingency plans for dealing with spillage of any hazardous materials should be detailed. The risks in relation to underground and open pit rescue should also be discussed.

The hazard/risk analysis will identify the critical areas that need to be addressed in management plans, monitoring programs and contingency/emergency plans.

6.6 Summary

A summary table listing undertakings and commitments made in the draft EIS, including performance indicators, with cross-referencing to the text of the report should be provided.

6.7 Environmental Management Plan

A draft Environmental Management Plan (EMP) should be provided in a form suitable for inclusion in a Mining Management Plan as required under the *Mining Management Act*. The draft EMP should be strategic, describing a framework for environmental management. Where possible specific management policies, practices and procedures should be included in the draft EMP. A final EMP would be prepared at the conclusion of the assessment, taking into consideration comments on the draft EIS, the Supplement and incorporating the Assessment Report recommendations. The draft EMP should:

- define the management structure of both the construction and operational phases and the relationship to the environmental management of the site;
- describe the proposed measures to minimise adverse impacts and the effectiveness of these safeguards (eg provide performance indicators by which all anticipated and potential impacts can be measured);
- describe monitoring to allow early detection of adverse impacts;
- describe remedial action for any impacts that were not originally predicted;
- detail how monitoring will be able to determine the differences between predicted and actual impacts; and
- provide for the periodic review of the management plan itself.

Reference should be made to relevant legislation and standards, and proposed arrangements for necessary approvals and permits should be noted. The agencies responsible for implementing and overseeing the management plan should be identified. Proposed reporting procedures in relation to the implementation of the management plan, independent and self- auditing and reporting of accidents should be outlined.

7 PUBLIC INVOLVEMENT AND CONSULTATION

Public involvement and the role of government organisations should be clearly identified. The outcomes of surveys, public meetings and liaison with interested groups should be discussed, and any resulting changes made to the proposal clearly identified. Any plans for ongoing liaison with the local community (Aboriginal and non-Aboriginal) should also be discussed. (If not why not)

Negotiations and discussions with local and community government, the Territory Government and the Commonwealth Government should be detailed, and any outcomes referenced. Details of any ongoing negotiations and discussion should also be presented.

8 INFORMATION SOURCES, REFERENCE LIST, BIBLIOGRAPHY

The draft EIS should contain a comprehensive reference list/bibliography. Any source of information such as studies, research, maps and personal communications used in the preparation of the draft EIS should be clearly identified, cited in the text and referenced in the bibliography

9 APPENDICES, GLOSSARY

Information and data related to the draft EIS but unsuitable for inclusion in the main body of the statement should be included as appendices. This may include detailed analyses, monitoring studies, baseline surveys, raw data and dispersion modelling data. Where necessary, specific guidance should be provided on the most appropriate means of accessing information not appended to the draft EIS.

A glossary should be provided, defining the meaning of technical terms, abbreviations and colloquialisms. (Note: throughout the EIS, technical terms and jargon should be minimised).

10 ADMINISTRATION

The Project Officer is Helge Pedersen, Office of Environment and Heritage, Department of Infrastructure, Planning and Environment. The contact number is (08) 8924 4138 and facsimile (08) 8924 4053, e-mail helge.pedersen@nt.gov.au

"Preliminary" copies of the draft EIS should be lodged with the Office of Environment and Heritage, NT Department of Infrastructure, Planning and Environment and the Environment Assessment Branch of Environment Australia (if the proposal is determined to be a controlled action) for internal review prior to release for public and advisory body comment.

The number of copies of the draft EIS required for distribution to Territory and Commonwealth advisory bodies will be determined at the review of the "preliminary" draft EIS. The Northern Territory will require approximately 20 copies (plus 10 CD ROM copies). ***CD ROM*** *copies should be in ADOBE® *.pdf format for placement on the Internet*.

Several copies of the draft EIS should also be prepared for distribution to relevant Public Libraries for public review. Several copies of the draft EIS should be available for purchase by the public on request. Locations for public review will be determined at the review of the "preliminary " copies of the draft EIS.

PART C – Specific Concerns

GUIDELINES FOR AN

ENVIRONMENTAL IMPACT STATEMENT

ON THE PROPOSED MCARTHUR RIVER MINE EXPANSION

1 SPECIFIC CONCERNS OF THE PROJECT

In addition to the requirement of Part B of the guidelines, the following issues have been raised, during the public consultation period on these guidelines, as project specific issues that will need to be addressed within the draft EIS. These issues are by no means the only issues of concern with the project, and the proponent should not limit studies and assessments to these concerns alone.

River diversion and weir

The diversion of the McArthur River and Barney Creek and the weir on the Glyde River have raised concerns about downstream impacts on the McArthur River as far down as the estuary and into the Gulf of Carpentaria.

1. Changes to environmental flows in the McArthur River.
2. Impacts on sacred sites caused by the diversion of the McArthur River.
3. Effects on activities and uses such a recreational fishing.
4. Are there alternatives to the weir on the Glyde River for water supply and storage, eg offstream storage with wet season harvest.

Lead in tailings

Given that the mine will only produce zinc, concerns have been raised about the high lead content in the tailings.

1. Will any special design or provision be made for the future extraction of lead and also silver from the tailings storage facility?
2. Stability of the tailings storage facility to ensure no future failure and downstream contamination of the McArthur River, both during operations and following decommissioning of the mine.

Decommissioning and pit water.

Management of the water in the pit and its quality once the mine has been decommissioned were also of concern.

Social and economic implications

Issues raised included the interaction of the current mining operation with the local community, including employment and enterprise development possibilities.