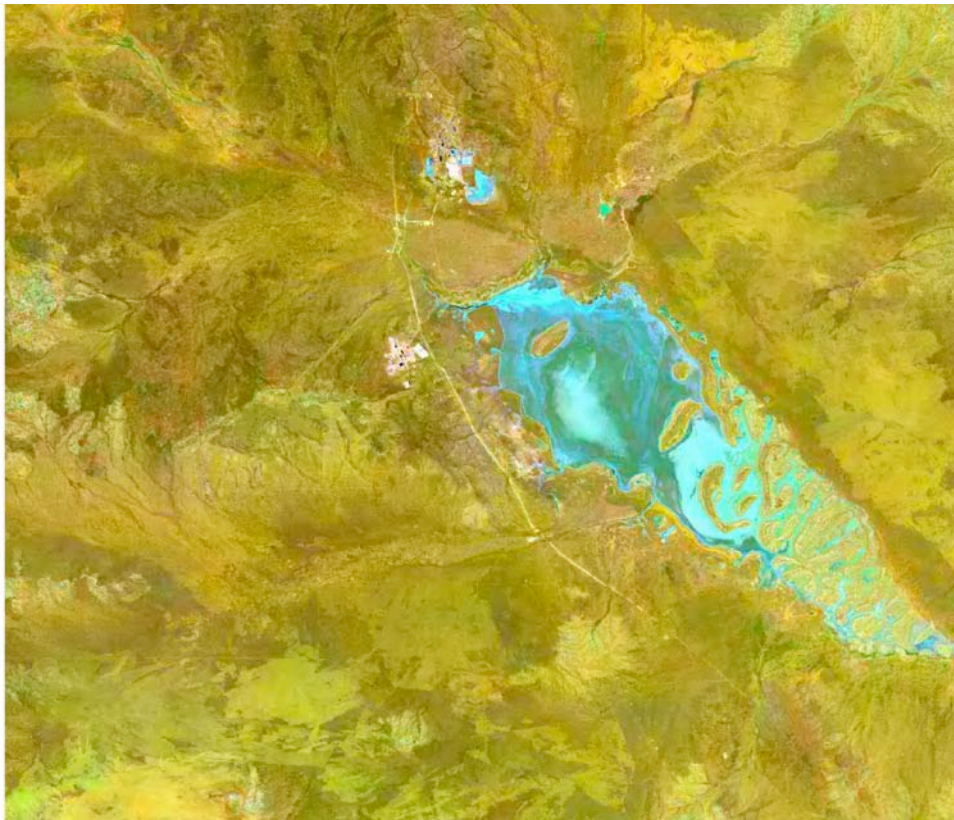


Magellan Metals Pty Ltd – Wiluna Lead Project Stygofauna Sampling Plan



Magellan Metals Pty Ltd

Subterranean Fauna Sampling Plan

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Stygofauna Sampling Plan – Wiluna Lead Project

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1.0 Introduction

1.1 Project Background

Magellan Metals Pty Ltd is commencing mining and processing operations at the Wiluna Lead Project. The project area is situated approximately 30 km west of the Wiluna town site in the Goldfields region of Western Australia (see Figure 1.1). The project proposal was formally assessed by the Environmental Protection Authority (EPA), which released its report and recommendations on the project in September 2000 (Bulletin 996). One of the issues identified during this assessment was the potential for the water supply required for the mine to affect subterranean groundwater fauna (stygofauna) in the Wiluna Magellan Lead mine locality. A general arrangement of the proposed mine development is shown in Figure 1.2.

Stygofauna investigations for the Wiluna Lead Project commenced in November 2004 with the sampling of a number of existing bores and wells within and outside of the project impact area undertaken by Biota. This sampling was conducted in accordance with the draft Stygofauna Sampling Plan as submitted to the Department of Environment (DoE), the Western Australian Museum (WAM), the Department of Conservation and Land Management (CALM) and the Water and Rivers Commission (WRC). Prior to this preliminary round of sampling only limited stygofauna investigations were conducted in the vicinity of the Wiluna Lead mining area. Previous investigations undertaken in the locality included sampling conducted by the Western Australian Museum (Watts and Humphreys (1999), Humphreys et al, (2001)). Other sampling in the region includes work conducted for the mining industry at Murrin Murrin (Anaconda Nickel) and south of Leinster (Thunderbox; Biota 2002).

1.2 Statutory Requirements

The Ministerial Statement (No. 559) relating to the implementation of the Wiluna Lead Project included a specific condition requiring the design and implementation of a Subterranean Fauna Sampling Plan as follows:

8 Subterranean Fauna

8-1 Prior to the commencement of productive abstraction of groundwater, the proponent shall prepare a Stygofauna Sampling Plan to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Museum of Western Australia and the Water and Rivers Commission.

The objective of this plan is to increase scientific knowledge about subterranean fauna to assist in conservation of this element of the environment.

The plan shall address:

- 1 subterranean fauna surveys of the areas to be affected by dewatering operations and adjacent areas to assist in establishing the conservation significance of any species within the areas;*
- 2 an appropriate groundwater monitoring programme to ensure that groundwater drawdown is monitored and related to rainfall and climatic data so as to determine if groundwater drawdown is being managed within the expected seasonal fluctuations of the aquifer;*
- 3 repeat subterranean fauna sampling of the aquifer to monitor the effects of groundwater abstraction; and*
- 4 specific measures to record and preserve biological information on any species collected in the project area.*

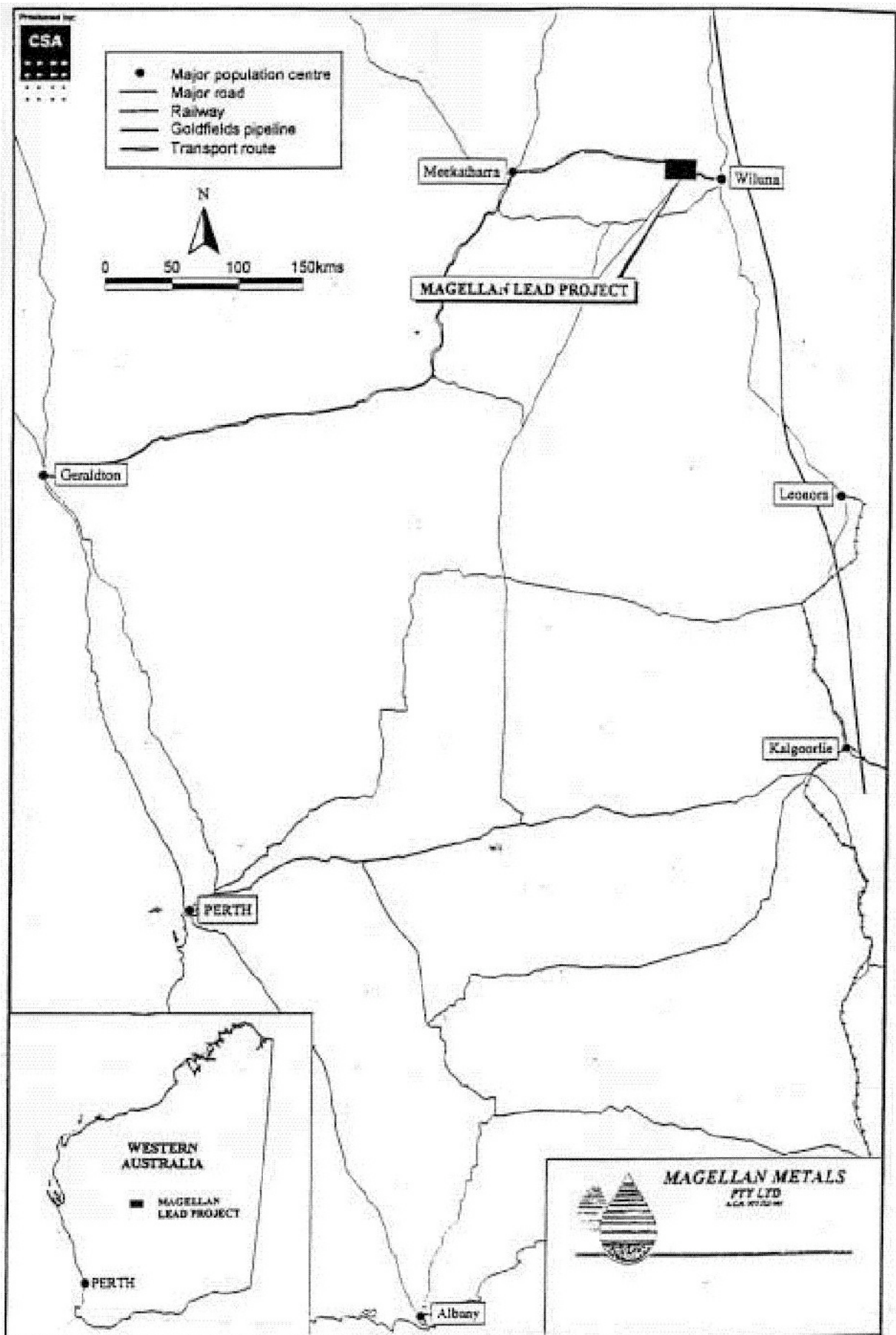


Figure 1.1: Magellan lead project locality plan.

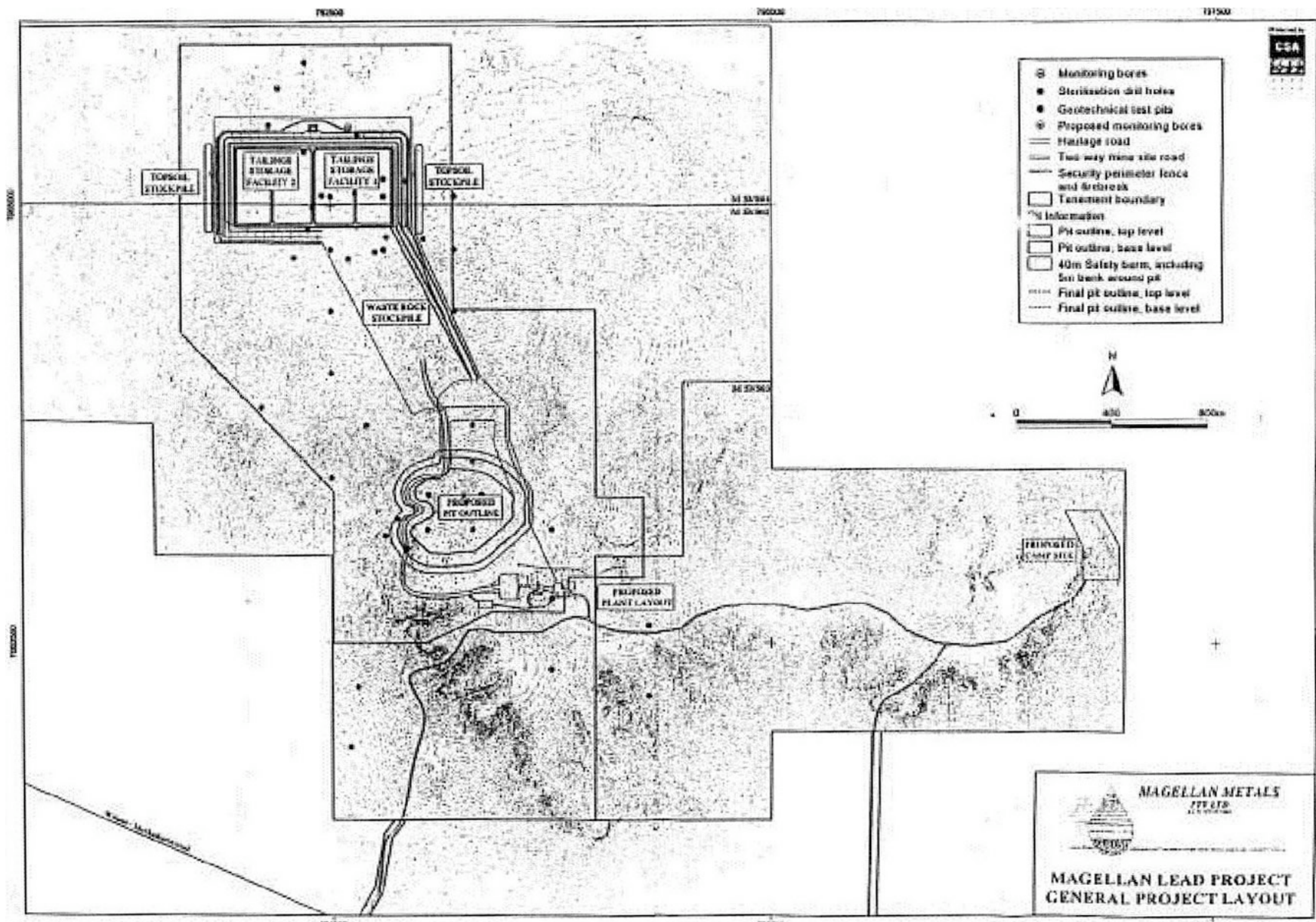


Figure 1.2: Planned general arrangement for the Magellan Lead project.

- 8-2 *The proponent shall implement the subterranean Fauna Sampling Plan required by condition 8-1.*
- 8-3 *The proponent shall make the Subterranean Sampling Plan required by condition 8.1 publicly available, to the requirements of the Environmental Protection Authority.*
- 8-4 *The results from the Subterranean Fauna Sampling Plan required by condition 8-1 shall be submitted to the Environmental Protection Authority and the Western Australian Museum.*
- 8-5 *Should the Environmental Protection Authority consider, based on the results of the Subterranean Fauna Sampling Plan required by condition 8-1 that, its objective would be compromised, then the proponent shall develop an action plan to the requirements and timing of the Environmental Protection Authority.*

This document represents the Stygofauna Sampling Plan required by Ministerial Condition 8.1. The Stygofauna Sampling Plan has been submitted to the DoE for approval, subject to consultation with the WAM and CALM.

1.3 Objective of this Plan

The objective of this Stygofauna Sampling Plan is consistent with the intent of commitment P8.1 (Section 1.2). That is:

"To increase scientific knowledge about subterranean fauna to assist in conservation of this element of the environment."

Magellan Metals Pty Ltd has incorporated a number of elements into the proposed Stygofauna Sampling Plan to meet this objective.

1.4 Definitions

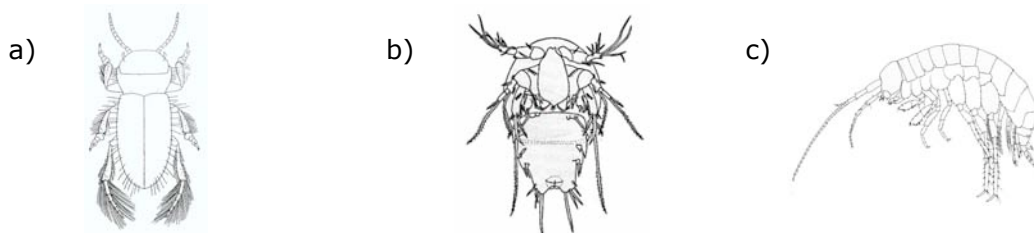
The following summary provides an overview of some of the key concepts relating to stygofauna. It is intended as a guide to the general issues involved with stygofauna only.

- **Stygofauna**

Stygofauna are those animals that inhabit various types of groundwater (Humphreys 2000). They are typically well adapted for the subterranean environment, with features such as lack of pigment, elongated appendages and reduced or absent eyes. Many of these fauna are phylogeographically linked to geological periods when the Goldfields region was less arid. They are therefore regarded as 'relict' fauna that has survived in the aquifer over geological timeframes. DNA studies suggest that the descent of surface fauna into the aquifer may have occurred as multiple 'invasion' events (Watts and Humphreys 1999).

Stygofauna in the Goldfields Region are commonly represented by a relatively small number of taxonomic groups, primarily the Coleoptera, Copepoda and Amphipoda (see Figure 1.1). Other taxa recorded include the Ostracoda, Bathynellacea and Oligochatea. Most are in the order of a few millimetres in size or less.

Figure 1.1: Generic examples of recorded Goldfields Region stygofauna orders (image sources: a) Coleoptera – Watts and Humphreys 1999; b) Copepoda – Barnes 1986, c) Amphipod – Bradbury 2000).



- **Genetic Analysis**

Two main methods exist for genetic analysis population structures and species boundaries.

Protein electrophoresis is a well-established technique of investigating genetic variation in populations of organisms. Different species will produce different variations of the same protein, known as allozymes. If populations of fauna are sufficiently different to be reproductively isolated (i.e. different species), then many of these allozymes will also differ. Electrophoresis basically consists of extraction of a protein rich sample from the subject fauna (or whole animals in the case of stygofauna). This sample is then inserted into one end of a starch or acetate gel and a weak electric field applied to it. The proteins will migrate at varying speeds through the gel and suitable stains will then reveal a pattern of different allozymes for each animal sampled. Testing of a range of protein loci enables a 'genetic distance' to be calculated based on the number of shared allozymes. These data, combined with a review of the morphological variation, enable decisions to be made as to whether morphological variation present is supported by species level allozyme differences. Electrophoretic techniques have been used on stygal amphipods from a range of sites in the Pilbara in recent years (Finston et al. submitted), but has had limited application in stygofauna in the Yilgarn.

It is also possible to carry out similar analyses of genetic variation at the DNA level of consideration. This technique has produced clear results on stygofauna in the past, but retained similarity that results from shared ancestral polymorphisms can sometimes make interpreting DNA sequences or patterns produced by DNA markers difficult (e.g. Simon *et al.* 1994). However, DNA markers have proved very useful in numerous studies for providing phylogenetic information at several taxonomic levels (eg. Watts and Humphreys 1999). Given this method's historical and current use in stygal research in the Yilgarn (Section 3.4), this will be the primary technique utilised to support morphological identifications and to assist in interpreting species level relationships (see Section 3.4).

2.0 Approach

The Stygofauna Sampling Plan has been designed primarily to address the requirements of Commitment P8.1. Magellan Metals Pty Ltd has also adopted an approach of focussing the work on delivering the maximum increase in the collective knowledge base in relation to stygofauna as part of the programme. This will be achieved by working collaboratively with regulators, researchers and other industry proponents (where appropriate) to:

- share data on species distributions;
- support fundamental research into the genetics and ecology of stygofauna; and
- collect and store the resultant data in a consistent fashion.

The following participants and stakeholders, and their broad roles, have been identified in relation to stygofauna and the Wiluna Lead project and the wider regional work:

Industry Proponents

Magellan Metals Pty Ltd

Management and Research Organisations

Biota Environmental Sciences

Western Australian Museum

University of Western Australia Zoology Department

University of Adelaide

Australian Museum

Decision Making Authorities

Department of Conservation and Land Management (CALM)

Department of Environment (DOE) Environmental Protection Authority (EPA)

A collaborative approach on behalf of all parties is most likely to yield the clearest outcomes in relation to speciation and distribution of stygofauna both at Magellan Lead Project Area and in the context of the wider region. This will be useful not only in evaluating the findings of the stygofauna sampling programme, but also for other sites in the Goldfields Region.

3.0 Sampling Plan Design

3.1 Geology of the Project Area

The regional geology of the area needs to be considered as part of assessing the likelihood of the occurrence of stygofauna. This is shown in Figure 3.1.

The geology of the Magellan orebody is a mineralised zone of the Yelma formation. The actual Magellan Lead deposit occurs in a strynical structure of quartz breccia, derived from limestone forming a hill formation as an outlier from the Finlayson Range. The cherty beds are strongly leached and vuggy with intraformational karstic cavernous structure (K.H. Morgan & Associates 1999). This latter unit comprises, *a priori*, the only area that may provide suitable habitat for stygofauna in the area of the orebody itself.

The wider project area also contains shallower calcretes in a superficial aquifer associated with a palaeodrainage system (K.H. Morgan & Associates 1999; Figure 3.1). This geological unit is known to provide core habitat for stygofauna in the region (Humphreys, et al. 2001), and may be locally affected by groundwater abstraction for the project (see Section 3.3).

3.2 Groundwater Monitoring Programme

Magellan Metals will continue to implement the Groundwater Monitoring Programme throughout the life of the Project in accordance with the Groundwater Well Licence (GWL96342(2)) issued under section 5(c) of the *Rights in Water and Irrigation Act 1914*. This Groundwater Monitoring Programme includes the following requirements:

- Monthly recordings of pumpage from each bore and the total for the borefield to the nearest kilolitre. Total combined draw from the approved groundwater sources will not exceed 2.5 million kilolitres per annum.
- Monthly water levels in all monitoring bores will be measured to the nearest centimetre irrespective of whether the bore is operating or resting. The operating condition of the nearest pumping bore will be recorded at the same time.
- Monthly water quality for all production bores will be determined for total dissolved solids (TDS) and pH. Every six months this analysis will include common ions, calcium, magnesium, sodium, chloride, sulphide and bicarbonate with the addition of major components including nitrate, silica, bromine, strontium and aluminium.

The collected data will be reviewed by a competent groundwater professional and reported in conjunction with the findings of this Stygofauna Sampling Plan to assess the impact of groundwater abstraction on the aquifer system and the conservation significance of stygofauna species identified (see section 4.2).

3.3 Potential Impacts to Stygofauna

Potential impacts on any stygofauna that may be present in the area arise primarily from groundwater abstraction associated with the development of a production well borefield for process water supply. The orebody itself will not require any dewatering other than removing some minor seepage to the pit. No significant disturbance to the superficial calcrete aquifer (the core habitat for stygofauna in this locality; Section 3.1) is expected from this activity (K.H. Morgan & Associates 1999, K.H. Morgan, pers. comm. 2004).

Geochemical analyses were completed to review the potential for lead contamination of the underlying aquifer by the Magellan Lead Project (Campbell 1999a and b). This study found that the stratigraphy underlying the Tailings Storage Facility (TSF) and waste rock dump have a high capacity to immobilise lead in leachates which may seep from these facilities (Campbell 1999b). This indicated that leachates from the facilities will not lead to significant contamination of the groundwater. This was also supported by the results of initial sampling of the aquifer in the project area, which showed that lead in the groundwater was below detection limits despite the presence of the lead orebody (Magellan Metals 1999, EPA 2000). Further groundwater sampling in the vicinity of the TSF conducted by Aquaterra in November 2004 also confirmed that lead levels were below detection limits in all monitoring wells (Aquaterra 2004). On this basis it appears unlikely that any significant groundwater contamination impacts on stygofauna will arise from the Project. However, as the presence of stygofauna was collected from an area adjacent to the TSF, the ongoing sampling programme will include selected monitoring wells in this area.

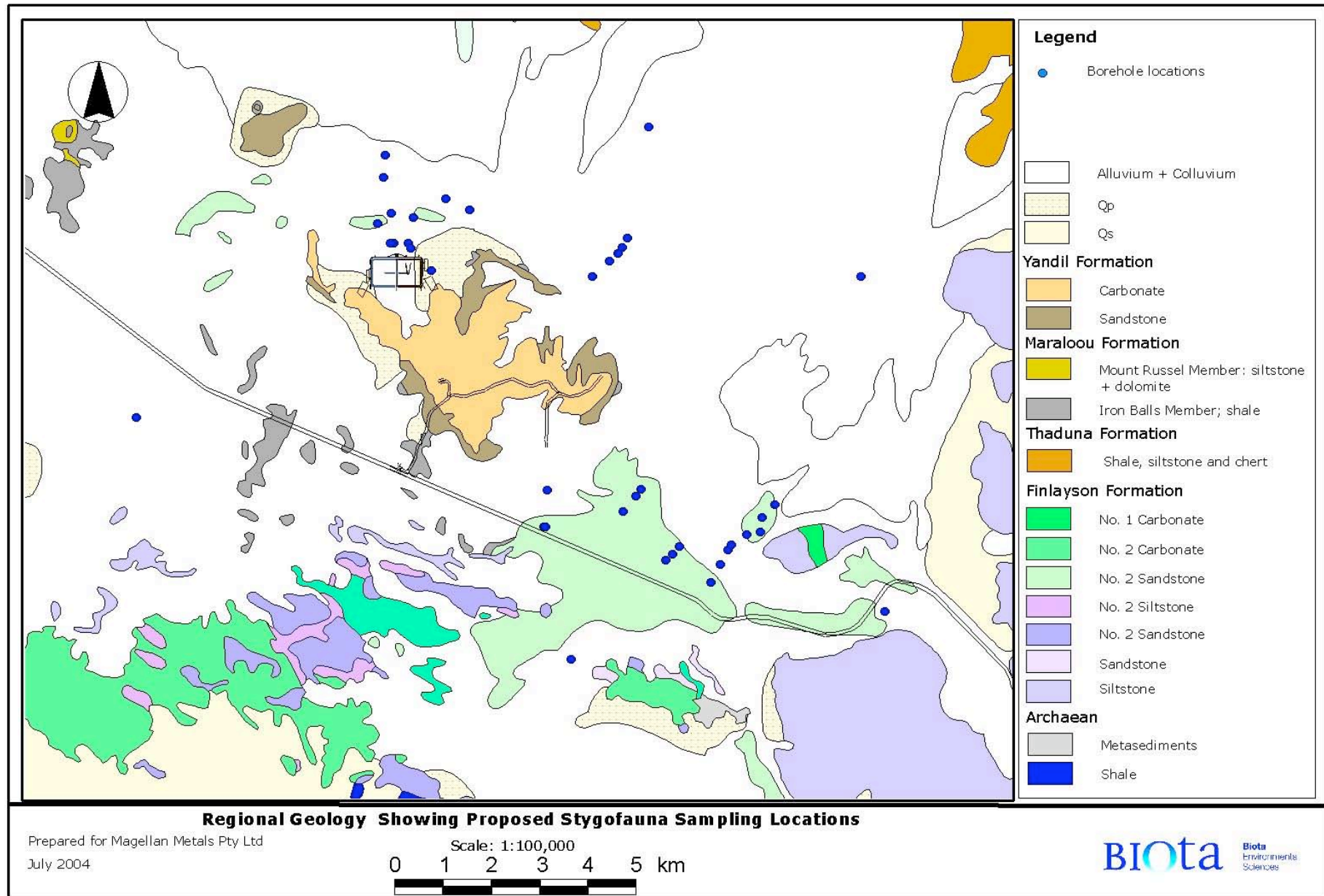


Figure 3.1: Regional geology of the Magellan Lead project area (showing locations of boreholes available for sampling).

Four production bores MWP1, MWP2, MPW4 and MPW5 are proposed to supply process water to the Magellan lead project. K.H. Morgan Associates (1999) assessed the potential groundwater changes arising from the development of these bores. The extent of influence of pumping for processing water for the proposal on the aquifer is unclear. Long term pumping studies on aquifers in the Wiluna area did not indicate a standard cone of depression (K.H. Morgan & Associates 1999, K.H. Morgan, pers. comm. 2004). It is anticipated from pumping tests undertaken during the project evaluation phase that a drawdown of 1.57 - 3.7 m below ground level (mbgl) after 10 years of continuous pumping for the calcrete palaeoriver sediments aquifer, and a drawdown of 32 - 37 mbgl after 10 years of continuous pumping for the deeper Proterozoic chert aquifer. However, given the lack of a standard cone of depression amenable to monitoring, a conservative approach has been adopted here to identify potentially impacted bores. This has been based on a nominal 500 m buffer on each production well to identify 'Impact' bores for the purposes of this Stygofauna Sampling Plan (see Section 3.4).

Magellan Metals will continue to monitor the borefield (aquifer) on a regular basis to ascertain any trends in drawdown and to evaluate any potential impacts. The adequacy of the approach of this Stygofauna Sampling Plan to identify impacted areas will be reviewed as part of this ongoing monitoring.

3.4 Contingency Trigger Levels

The following approach provides a strategy with minimal risk in the short term, while groundwater and stygofauna distribution data are collected prior to and during the first 12 months of operations. The acceptance of a trigger point in the event that borefield predictions are not supported in operation provides a robust safety net within a time frame that would allow corrective action to be agreed and taken.

In order to minimise the risk to stygofauna present in the borefield aquifer, a conservative trigger level has been adopted to maintain a nominal 75% of the predicted storage capacity of the aquifer. This trigger level will be in place during the first 12 months of productive groundwater abstraction while information on the aquifer response is collected and the conservation status of identified stygofauna species is better assessed.

The trigger level has been set at 508.12 m AHD which equates to an average water level reduction of 2.5 m across the borefield aquifer. This assumes an average, minimum aquifer thickness of at least 10 m (allowing for seasonal fluctuations) across the borefield. For the purpose of this trigger level, a baseline water level of 510.62 m AHD (August 1999) has been assumed.

The reduction in water levels due to groundwater abstraction will be determined through the monthly groundwater monitoring as an average across the following monitoring bores: MWE21, MWE23, MWE12 and MWE13 (see Figure 3.2). Magellan will redevelop these monitoring bores to an appropriate standard as directed by the consultant hydrogeologist.

Any average monthly recording exceeding the above trigger level will be reported to DoE and CALM within 48 hours of the measurement and a meeting will be convened to consider appropriate management measures based on the most complete hydrogeological and biological information available at this time.

3.4 Sampling Plan Design

The basic design of the Stygofauna Sampling Plan comprises subterranean fauna sampling of areas to be affected by the development of the production bores associated with the Wiluna Lead Project and in the immediate vicinity of the TSF. Equivalent sampling will also be completed in areas where groundwater levels will not be affected by the Wiluna Lead

project area dewatering (regional areas). This will meet the requirements of Commitment P8.1, which requires '*...stygofauna species to be sampled in...areas affected by dewatering operations and adjacent areas.*' (see Section 1.1).

In summary, the approach to the selection of sampling sites has comprised:

1. A full review to identify all available existing bores in the Wiluna Lead project area locality. Documentation of the parameters listed in Section 3.2 for all bores to the extent to which records were available.
2. All bores were captured into ArcView GIS to overlay them on background data and the boundaries of 'Impact' (bores within a 500 m radius of production bores and the TFS) and 'Reference' areas (areas in the wider area where groundwater levels are not likely to be affected by pumping of production bores). This enabled categorisation of the bores available for sampling as either 'Impact' or 'Reference' (both within the general project area and in the wider region). Other data attributed to the GIS included details of bore construction type, screened geology, depth to groundwater and other information (where available).

Whilst the main focus of the sampling design was on the impacts of the production bores, ongoing sampling will also include the TSF area to allow for confirmation of the preliminary impact assessment conducted by Magellan Metals (1999), Campbell (1999 a and b) and K.H. Morgan & Associates (1999b), as summarised in Section 3.3.

Thirty-nine sample locations (32 drilled boreholes and seven pastoral wells (Figure 3.2, Appendix 1) have been selected for the initial phase of the sampling programme. This total of 39 sample sites amongst locations across the Wiluna Lead Project area will provide 16 'Impact' sites and 23 'Reference' sites, assuming that all sites are sampleable (see Figure 3.2). Note that borehole MWE11 is on the boundary of the 500 m buffer from the production wells and has been included as an 'Impact' site as a precautionary approach.

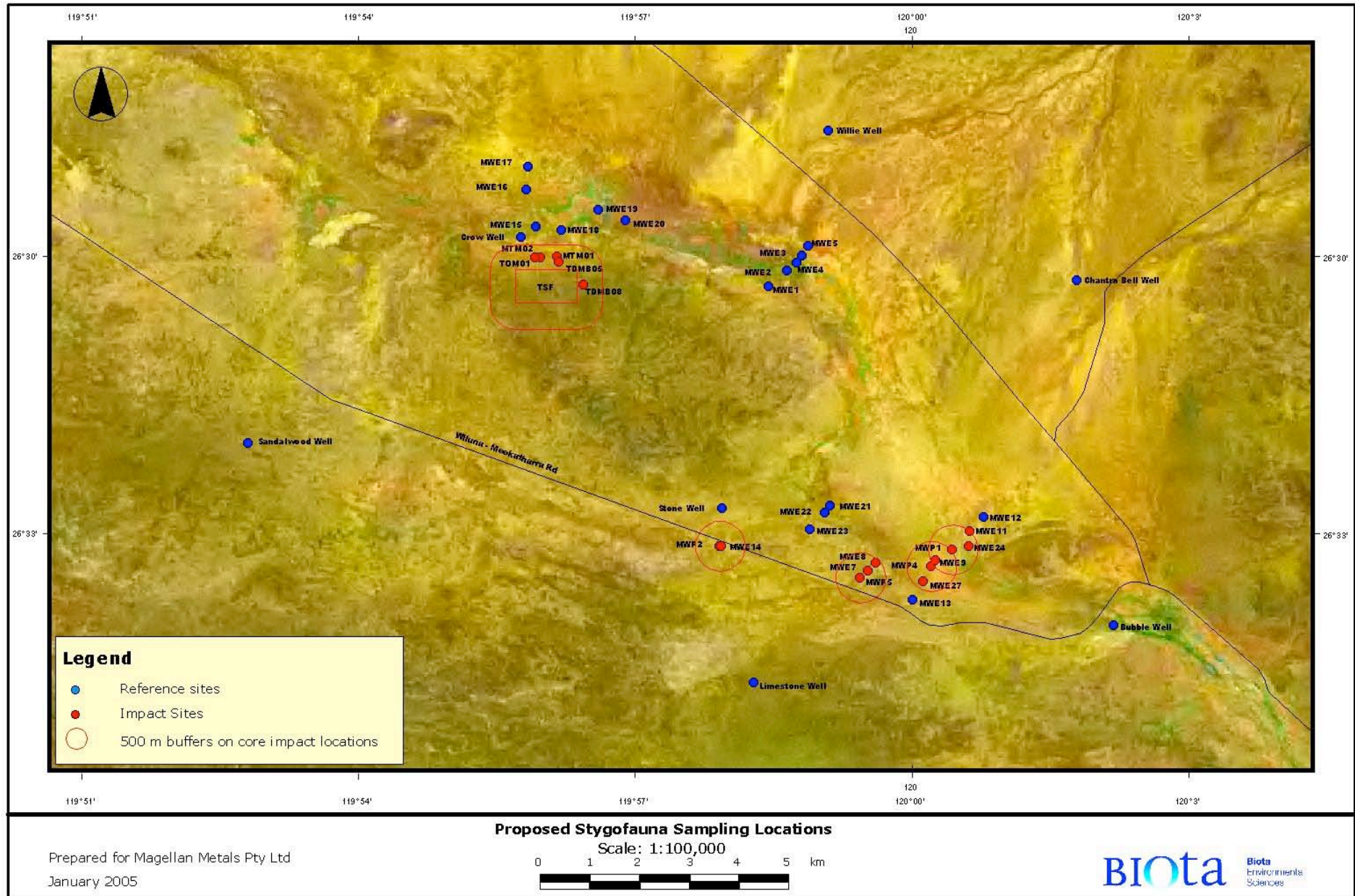


Figure 3.2: Locations of nominal Impact and Reference stygofauna sampling sites.

3.5 Implementation of the Sampling Plan

The sampling programme methodology will be generally consistent with that applied to other stygofauna survey projects in the Goldfields and other regions. The first phase of the field survey was undertaken in November 2004, with initial year follow up sampling phase scheduled for April and October 2005 (see Section 5.0). Subject to the findings of this work, it is expected that subsequent years sampling will occur annually in April. Given the number of bores planned for sampling, it is likely that each round of field work will be in the order of four days duration.

The field sampling methodology will comprise:

1. Sampling of boreholes, primarily by standard plankton net bailing techniques (100 μ m mesh). Each bore will be bailed a minimum of three times per sampling effort. If stygofauna are apparent in the material recovered then additional hauls will be carried out at these locations. To ensure the maximum return of stygofauna, nets will be agitated gently once on the bottom of the hole to distribute stygofauna present in the benthos above the net before dragging the water column.
2. Treatment of the specimens on recovery depends somewhat on the direction followed for the more detailed genetic work. For protein electrophoresis work, the recovered specimens will need to be stored in a liquid nitrogen flask to ensure proteins do not denature, rendering the specimens useless. Specimens that will be utilised for morphological analysis and DNA work will be curated in 100% ethanol.
3. Repeat sampling efforts will be conducted to take temporal variation into account. Repeat sampling may yield additional specimens and minimise the risk of recording low frequency species from a single bore only as a sampling artefact.

In order to minimise the risks of accidentally transferring collected fauna from one hole to another (and potential cross-contamination of samples) a sampling hygiene procedure is used. This consists of thorough washing of all nets and sample vials to remove all sediment and other material prior to re-use at the next location.

Recovered material is stored in labelled sample bags inside an insulated container subject to preliminary sorting in a field laboratory.

3.6 Specimen Storage and Data Management

Given that morphology based identification and analysis for DNA markers will be the primary methods of specimen analysis (Section 3.7), recovered stygofauna will be curated in 100% ethanol. All vials will include a label with an assigned field specimen number (based on borehole name and number), collection date and broad taxonomic group.

All specimens will be the subjects of a detailed chain of custody and sample data forms, which will be used to track collection location, date, sample number and specimen numbers throughout the duration of the study. This will be of importance in the latter parts of the investigations, when specimen morphological taxonomic work must be matched precisely to genetic data and collection locations. These data will be stored in Biota's relation database, which also currently house capture records from previous stygofauna work, facilitating GIS analyses and regional context assessments. All specimens collected during this study will be lodged with the Western Australian Museum to ensure that they form part of the State's collection and contribute to wider regional data sets.

3.7 Specimen Analysis, Identification and Genetics

Stygofauna specimens recovered will be identified and their conservation status assessed via the WA Museum, Australian Museum, the University of Adelaide or other specialist taxonomists as required. This will involve identification to species level for described fauna where the maturity and condition of the specimens allow. Any undescribed fauna will be determined to a 'morphotype' level by a suitably experienced specialist, to enable species level distribution comparisons to be made. This would be supported by genetic analyses utilising DNA markers where necessary. Most genetic studies completed on stygal animals in the Yilgarn craton to date has utilised this method rather than protein electrophoresis. It is therefore planned to follow this approach to allow for a wider comparison data set and to enable easier integration with previous and currently ongoing work in the region.

The results from this study would be consolidated with the previous work carried out by the University of Adelaide, South Australian Museum and the WA Museum. This will include liaison with Dr Bill Humphreys (WA Museum) and Mr John Bradbury (University of Adelaide) who are currently undertaking further work on amphipod diversity in the Yilgarn craton.

Stygofauna were collected during the initial sampling phase completed in November 2004. Seven of the bores sampled yielded stygofauna, with three of these situated within the designated impact areas. All specimens are currently in the process of more detailed identification but priority is being given to the material collected from within the impact areas. The Stygofauna Sampling Plan will be reviewed and updated throughout the life of the Project depending on results of ongoing monitoring as information is obtained on the distribution of identified species in relation to potential impacts associated with the Wiluna Lead Project.

An overall summary report of the results of the initial sampling programme will be prepared for Magellan Metals Pty Ltd specific to the Magellan Lead Project area, utilising inputs from the WA Museum and the UWA studies. This report would ultimately be submitted to the EPA, WA Museum and CALM in accordance with the requirements of Condition 8.1 (see Section 1.1). A summary of the results of ongoing monitoring will be included in periodic Performance and Compliance reports to be submitted to DoE on an annual basis.

4.0 Evaluation and Reporting of Results

4.1 Evaluation Framework

It is proposed that the evaluation of the results of the programme be carried out against the framework provided by the clauses of Condition 8.1. A suggested set of objectives and evaluation criteria based on this is provided below for review and approval by the DOE, CALM, EPA and the WA Museum (Table 4.1).

Table 4.1. Objectives and Evaluation Criteria

Objective 1: Prepare a subterranean fauna assessment programme	
Requirements	The assessment programme must make provision to: <ol style="list-style-type: none"> 1. survey stygofauna species within areas affected by the Magellan Lead project and in other surrounding areas; 2. provide for an appropriate groundwater monitoring programme; 3. allow for repeat sampling to monitor the affects of groundwater abstraction; and 4. provide measures to record and preserve biological information on stygofauna collected in the project area.
Evaluation Criteria	The Subterranean Fauna Sampling Plan will meet the identified requirements when it is formally approved for implementation by the DEP/EPA subject to consultation with the WA Museum and other relevant regulators.
Objective 2: Implement the Stygofauna Sampling Plan	
Requirements	1. The proponent will implement the Stygofauna Sampling Plan.
Evaluation Criteria	This requirement will be met by the implementation of the sampling procedures specified in this document, once approved by the DoE/EPA.
Objective 3: Submit the results of the Stygofauna Sampling Plan to the EPA for consideration	
Requirements	1. The proponent will submit the results from the Stygofauna Sampling Plan to the Environmental Protection Authority, WA Museum and CALM for consideration.
Evaluation Criteria	A report will be prepared summarising the findings of the work and will include the findings of morphological taxonomy and genetic investigations carried out on collected material. Distribution and status of the fauna will also be documented to enable species level evaluation of the fauna present within impact and reference areas.
Objective 5: Evaluation of the objective for the Stygofauna Sampling Plan	
Requirements	1. Determine whether the EPA's objective ('...to increase scientific knowledge about subterranean fauna to assist in conservation of this element of the environment') has been met.
Evaluation Criteria	This assessment will draw on the consolidated data from the Magellan Lead Project area, in addition to the findings of other ongoing research efforts in the wider region. These will be used to determine if the EPA's objective has and can be met during the life of the Project.

4.2 Stygofauna Assessment Report

A report will be prepared to assess the conservation status of, and potential impact to, stygofauna species identified from the project area at the conclusion of the 12 month evaluation period ending 31st March 2006. The report will be submitted to DoE and CALM before the end of April 2006.

The report will include the following:

- results of the initial three rounds of stygofauna sampling (October 2004, April 2005 and October 2005);
 - an assessment of the conservation status of identified stygofauna species;
 - a location plan showing production and monitoring bores in relation to stygofauna records;
 - groundwater monitoring data and graphical presentation of monthly recordings, including aquifer change compared to seasonal rainfall events (to demonstrate evidence of recharge or lack of recharge during the survey period);
 - an assessment of both current and potential effects of borefield abstraction on the aquifer and associated stygofauna; and
 - a review of the stygofauna and groundwater monitoring programme and any proposed changes for ongoing monitoring.
-

5.0 Timing for Implementation

Review and approval of this sampling Plan is required by EPA and other agencies, to ensure that conditions imposed by the Minister for the Environment have been met in terms of the content of the plan. This will then set the timing and process required to clear the balance of the Ministerial Condition. The review process and anticipated timing for sampling plan implementation is given in Table 5.1.

Table 5.1: Anticipated timing for implementation of the Stygofauna Sampling Plan.

Task	~ Start	~ Duration
Submission of draft Sampling Plan to the EPA	August 2004	Complete
Review and consultation between EPA, DOE and other regulators regarding Sampling Plan	November 2004 – March 2005	Complete
Phase 1 field sampling survey	November 2004	Complete
Preliminary Phase 1 specimen sorting and IDs	November 2004	Complete
Phase 2 field sampling survey	April 2005	Complete
Finalisation and EPA approval of sampling plan	May 2005	2 weeks
Final Sampling Plan made publicly available	May 2005	-
Preliminary Phase 2 specimen sorting and IDs	June 2005	2 weeks
Phase 3 field sampling survey	October 2005	Complete
Preliminary Phase 3 specimen sorting and IDs	November 2005	2 weeks
Genetic comparisons and morphological identifications for Phase 1, 2 and 3 material	November 2005	8 weeks
Mapping and analysis of findings, preparation of stygofauna assessment report	January 2006	8 weeks
Submission of stygofauna assessment report	March 2006	-
Annual field sampling surveys	April each year (project life)	-
Results of sampling reported in PCR	To be advised	-

The programme will initially require an initial three rounds of field sampling in part compliance with clause 3 of Condition 8-4: '*...repeat subterranean fauna sampling of the aquifer to monitor the effects of groundwater abstraction...*'. As the presence of stygofauna species was detected during the preliminary sampling programme, ongoing repeat sampling will take place on an annual basis to monitor any potential impacts as a result of the Wiluna Project. A summary of the results of ongoing monitoring will be included in periodic Performance and Compliance reports to be submitted to DoE on an annual basis.

The Stygofauna Sampling Plan will be reviewed and updated throughout the life of the Project depending on results of ongoing monitoring as information is obtained on the distribution of identified species in relation to potential impacts associated with the Magellan operation.

6.0 References

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Appendix 1

Details of Selected Boreholes

Selected Boreholes for Magellan Lead Project Stygofauna Sampling.

Bore	Status	Easting	Northing	Depth (m)	Water Level (m)	Casing	Slotted Interval
MWP1	Impact	799638	7059575	18	2.1	1.6m 305mm steel, +0.5m-17.5m 195mm, CL9 pvc	+0.5m-15.5m
MWP2	Impact	795445	7059745	84	4.5	2m 305mm steel, +0.5m-81.5m CL9 195mm vinidex	27.5m-81.5m
MWP4	Impact	799244	7059255	20	2.3	1.5 152 CL4 upvc	
MWP5	Impact	797961	7059054	24	4.5	nil	
MWE1	Reference	796450	7064910	34	3.43	4.5 152 CL4 upvc	
MWE2	Reference	796788	7065229	41	3.52	2 152 CL4 upvc	
MWE3	Reference	797067	7065515	47	3.51	2 152 CL4 upvc	
MWE4	Reference	796965	7065385	13	3.20	nil	
MWE5	Reference	797175	7065705	30	3.75	nil	
MWE7	Impact	798099	7059184	26	4.5	2 152 CL4 upvc	
MWE8	Impact	798244	7059340	28	2.93	2 152 CL4 upvc	
MWE9	Impact	799325	7059366	26	2.1	2 152 CL4 upvc	
MWE11	Reference	799961	7059935	19.5	3	2 152 CL4 upvc	
MWE12	Reference	800215	7060207	27	3.5	2 152 CL4 upvc	
MWE13	Reference	798900	7058600	20	-	2 152 CL4 upvc	
MWE14	Impact	795465	7059740	30	-	2 152 CL4 upvc	
MWE15	Reference	792280	7066210	15	2.5	2 152 CL4 upvc	
MWE16	Reference	792120	7066955	15	2.4	nil	
MWE17	Reference	792162	7067405	21	2.7	nil	
MWE18	Reference	792731	7066120	16	4.5	nil	
MWE19	Reference	793410	7066520	17	3.4	nil	
MWE20	Reference	793900	7066290	15.5	2.5	nil	
MWE21	Reference	797450	7060510	16	3	2 152 CL4 upvc	
MWE22	Reference	797350	7060370	22	3.5	2 152 CL4 upvc	
MWE23	Reference	797080	7060050	43	5	2.5 152 CL4 upvc	
MWE24	Impact	799927	7059642	22	2	2 152 CL4 upvc	
MWE27	Impact	799093	7058965	52	2.2	1.5 152 CL4 upvc	
Mtm01	Impact	792640	7065595	16	2.6	12.5m 105mm slotted pvc	
Mtm02	Impact	792342	7065592	13	2.6	11.4m 105mm slotted pvc	
Tom01	Impact	792258	7065590	20	2.6	50mm slotted pvc	
Tdmb05	Impact	792678	7065490	11.7	2.9	10.7m 50mm slotted pvc	
Tdmb08	Impact	793113	7065033	11.7	6.2	10.7m 50mm slotted pvc	
Bubble Well	Reference	802500	7058000	unknown	-	-	-
Chantra Billie Well	Reference	802000	7064900	unknown	-	-	-
Crow Well	Reference	792000	7066000	unknown	-	-	-
Limestone Well	Reference	796000	7057000	unknown	-	-	-
Sandalwood Well	Reference	787000	7062000	unknown	-	-	-
Stone Well	Reference	795500	7060500	unknown	-	-	-
Willie Well	Reference	797600	7068000	unknown	-	-	-