DECEMBER 2014

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LAKE MAITLAND
PEER REVIEW – BASELINE AQUATIC ASSESSMENT

A Resource Development Group Company

Document status						
Rev	Author	Reviewer/s	Date	Approved for Issue		
				Name	Distributed To	Date
0	M Davies	D Cancilla	27/11/2014	R Young	A Tandy	27/11/2014

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TORO ENERGY

LAKE MAITLAND

PEER REVIEW – BASELINE AQUATIC ASSESSMENT

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Lake Maitland Baseline Aquatic Assessment report, produced by Outback Ecology, is a well structured, well written report. The scope of works and methodology used are appropriate for the assessment of this type of environment (playa salt lake) and conditions (dry conditions only), perhaps with a small exception of distribution of sampling site within the resource area (two sites only, both located in the same habitat). The results are presented in relevant detail and information given is appropriate for each component of the study (sediment chemistry, diatoms, dormant propagule bank, cryptogamic crusts). The conclusions presented in the report are appropriate, given that the results are based on dry conditions of the lake only. The authors recognise the limitation of the assessment (i.e. the lack of data from wet conditions after substantial flood event) and make recommendations towards it.

The report presents sufficient information for EIA process initiation. However, should hydrology and/or chemistry of the lake be impacted by LMUP development, we recommend conducting additional data collection after a substantial flood event, whenever the opportunity arises. Such data will provide key information for correct risk assessments and development of management plans.

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1 INTRODUCTION

Toro Energy Limited (Toro) acquired the Lake Maitland uranium deposit from Mega Uranium in August 2013 and plans to seek environmental approval for the mining of this deposit as well as the Millipede deposit. Toro plans to process ore from Centipede and Lake Way along with ore from Millipede and Lake Maitland at one central processing plant located adjacent to the Centipede deposit. Toro intends to refer the Millipede and Lake Maitland deposits to the Environmental Protection Authority (EPA) for assessment, which will require detailed surveys and studies across all proposed disturbance areas.

Mega Uranium undertook and completed environmental assessments and surveys across the Lake Maitland project sufficient to allow the proposal to be assessed under an Environmental Review and Management Programme (ERMP) (equivalent to the current PER level) in 2009. Initial discussions between the OEPA and Toro indicate that the existing environmental assessments and surveys for Lake Maitland would be acceptable for submission in a PER following peer review for correctness of content and adequacy. Toro have sought the advice and recommendations of *ecologia* Environment and appropriate sub-consultants who will undertake a peer review of the following reports:

- Regional and local flora
- Terrestrial fauna
- Short Range Endemic invertebrates (SREs)
- Stygofauna
- Troglofauna
- Aquatic Ecology
- Sediments and erosion
- Soils and waster rock characterization and geochemical assessment
- Human health and ecological risk assessment (human and non human biota) and
- Air quality impact assessment and monitoring

This peer review report pertains to the Lake Maitland Baseline Aquatic Assessment report, which was undertaken by Outback Ecology in September 2011.

1.1 LEGISLATION AND POLICY BACKGROUND OF PEER REVIEW

1.1.1 Compliance

This peer review will satisfy the requirements of all necessary statutory legislation, guidance and policy, including but not limited to:

- EPA Position Statement No. 4, Environmental Protection of Wetlands.
- EPA Guidance Statement No. 55. Implementing Best Practice in proposals submitted to the Environmental Impact Assessment process

1.1.2 Approach

A review was undertaken of all environmental reports pertaining to the acquired Lake Maitland Project for breadth of scope, technical methodology, correctness of content and adequacy. The main findings of the peer review were to determine:

a) Correctness of findings and conclusions of all reports;

b) Adequacy of scope, methodology and results of all reports;

c) Compliance of all reports with statutory legislation and policy; and

Recommendations to address knowledge gaps (if applicable).

2 REVIEW RESULTS

2.1 CORRECTNESS OF FINDINGS AND CONCLUSIONS

The major findings of the report were based on appropriate methodologies, given the circumstances of field sampling restrictions (i.e. sampling during dry conditions only) and relevant analyses of available results. As such, the findings are considered to be correct. The conclusions and advice based on these findings are correct and appropriate. A summary of the major findings is given below.

- In comparison to other lakes in the Carey Palaeodrainage system, the Lake Maitland system has low concentrations of salts, nutrient and metal.
- Sediments of the lake were alkaline, with fluctuations in ionic composition and low metal concentrations.
- The Main Lake had higher concentrations of uranium, the North-West Arm was characterised by lower salinities but higher sediment disturbance and the Southern Area showed the greatest sediment salinity.
- Productivity was highest in the Southern Area and lowest in the North-West Arm.
- Aquatic biota was identified and/or raised from sediments or cryptogamic crusts as no live forms could be collected in the field during dry conditions. The organisms included seven diatoms, six cyanobacteria, two charophytes, two lower plant species, one flowering plant and five crustaceans.
- None of the aquatic biota found are considered to be rare or threatened.
- The risk to the actual resident aquatic taxa from development of the Lake Maitland Uranium Project (LMUP) is minimal due to their broader distribution in lakes throughout the region.
- The risks to the actual Lake Maitland ecosystem from development of the LMUP need to be considered because they are related to hydrological processes (e.g. changes in the drainage patterns of surface water, changes in sediment properties due to groundwater drawdown and/or removal of the resource, potential contamination from storage of tailings into the system), which can affect the resilience of the propagule bank and the ability of Lake Maitland to maintain its aquatic ecosystem (via the re-colonisation of biota following flooding).
- The Southern Area supports the highest diversity of aquatic biota, therefore it is important that the ecological values in this part of the lake are maintained, in line with the current proposal for the LMUP.

2.2 ADEQUACY OF SURVEY

2.2.1 Scope of Works

The scope of works consisted of gathering baseline data to gain an adequate understanding of the lake ecology during dry conditions, applicable to future monitoring and management strategies. The data included:

- specification of physico-chemical parametres of sediments;
- identification of biota present;
- taxonomic composition;
- presence/absence of rare or protected species; and

- productivity of the ecosystem and its relevance to other systems or organisms (e.g. migratory birds)

The assessment met the scope of works for collecting and analysing baseline data of the lake ecology during dry conditions. It is unclear whether the original scope of works also included collection of baseline data on lake ecology during wet conditions but was later removed due to the fact that such conditions did not eventuate during the course of the survey. The significance of collecting data during wet conditions is discussed in the Recommendations and Gap Assessment section.

2.2.2 Sampling/Survey adequacy

Seventeen sites were established across three different areas of Lake Maitland: 1. Main Lake - Resource area (two sites), 2. North-West Arm (four sites), and 3. Southern Area (11 sites). All sites were sampled twice. While the total number of sampling sites were sufficient for the scope of work, there is an apparent disproportion in the distribution of sites among these areas, which is not explicitly explained or justified in the report, but seems to follow an attempt to cover a range of different habitat types. If such assumption is correct, the Main Lake Resource area is particularly under-sampled as both sites located in this area were placed within the playa central line, while no sites were established along the litoral zone where deposition of propagules belonging to certain species may occur (Brendonck and De Meester 2003). With this exception, the survey methodology, including cryptogamic crust sampling, collection of cores for benthic microbial communities and sampling of sediments for chemical analysis, dormant propagule bank and rehydration trials, was adequate for data collection in dry conditions.

2.2.3 Results

The results section is detailed, well presented and well discussed with respect to broader context, citing relevant literature. The statistical evaluation (PCA) of sediment properties was appropriate and relevant to the context. The main results of the assessment were:

- Sediments of Lake Maitland were alkaline, with fluctuations in ionic composition and low metal concentrations. They had low concentrations of salts, nutrient and metal in comparison to other lakes in the Carey Palaeodrainage system.
- The Main Lake (Resource area) had higher concentrations of uranium, the North-West Arm was characterised by lower salinities but higher sediment disturbance and the Southern Area showed the greatest sediment salinity as a result of drainage patterns.
- Productivity was highest in the Southern Area (due to high water retention capacity) and lowest in the North-West Arm (due to a cattle disturbance and limited water retention capacity).
- Aquatic biota identified and/or raised from sediments or cryptogamic crusts included seven diatoms, six cyanobacteria, two charophytes, two lower plant species, one flowering plant and five crustaceans.
- A discovery of a new species of ostracod, *Dragoncypris outbacki* gen. nov. sp. nov., identified from Lake Maitland, was followed by a subsequent study, which showed the species to be present in other lakes of the Carey Palaeodrainage system.

2.3 CURRENCY OF RESULTS

The results of this assessment are still current and meet current standards for collecting data for wetland characterisation in dry conditions. However, regulators may require further work to be conducted due to lack of data collected during wet conditions (discussed further in the Recommendations and Gap Assessment section).

2.4 COMPLIANCE

The assessment aligns with statutory legislation.

2.5 RECOMMENDATIONS AND GAP ASSESSMENT

The assessment has an important knowledge gap related to the fact that all wetlands are best studied during wet conditions following a substantial flood event. While such requirement was completely beyond the control of those conducting the aquatic assessment (Outback Ecology) due to no flood event taking place during the fieldwork period, the gap is still a significant one. The report recognises this fact, too, and makes recommendations towards it.

While sampling during dry conditions allows for mapping of the lake geomorphology, sediment chemistry and some taxa that inhabit it, it does not allow for:

- a comprehensive list of resident taxa,
- characterisation of biological assemblages and their succession in time, and
- an accurate evaluation of a broader ecological function of the lake (e.g. use by migratory birds)

This is mainly because sampling during dry conditions limits data collection to a fraction of a real diversity and abundance, while collection methods themselves may influence the outcomes of sampling (Brandão *et al.* 2014). In addition, subsequent re-hydration of samples under laboratory conditions may provide different environmental cues for hatching than those in nature (Caâ Ceres and Schwalbach 2001). Therefore, some species that are very abundant under natural conditions may not hatch at all under laboratory conditions, while those relatively rare in nature, may be present, adding to a skewed view of species composition and function (Caâ Ceres and Schwalbach 2001). This is especially valid when evaluating the resilience of the ecosystem based on the species that inhabit it and their potential response to changes. Such changes include:

- flooding regimes, which can result in inability of resting stages to hatch and existing eggs/ spores being buried in the sediment and thus not able to contribute to re-colonisation (Stephens 1990);
- physico-chemical properties (e.g. changes in salinity or pH, leading to change of biota and/or destruction of resting propagules of original biota) (Stephens 1990; Faustová *et al.* 2004); or
- increased pollution, presenting potential risk to resident biota and other organisms that depend on the ecosystem (e.g. migratory birds) (Wurtsbaugh and Jones 2012).

If such changes are likely due to the LMUP development, additional data collection during wet conditions will become essential to evaluate the lake's ecosystem stability, and to design a long-term monitoring and management plan.

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3 CONCLUSIONS AND RECOMMENDATIONS

- The report is well structured and well written.
- The scope of works and methodology used are appropriate for the assessment of this type of environment (playa salt lake) and conditions (dry conditions only).
- The results are presented in relevant detail and information given is appropriate for each component of the study (sediment chemistry, diatoms, dormant propagule bank, cryptogamic crusts).
- The conclusions presented in the report are appropriate, given that the results are based on dry conditions of the lake only. The authors recognise the limitation of the assessment (i.e. the lack of data from wet conditions after substantial flood event) and make recommendations towards it.
- The report presents sufficient information for EIA process initiation. However, risk assessment of potential impacts from LMUP and development of monitoring and management plans will require further data collected after a substantial flood event, especially if changes in hydrology are expected to take place as a result of the LMUP development.

The report presents a good basis for EIA process to be initiated. Should hydrology and/or chemistry of the lake be expected to be impacted by LMUP development, however, we strongly recommend additional sampling to be conducted after substantial flood event, whenever the opportunity arises.

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