REVIEW OF

BURRUP PENINSULA ABORIGINAL PETROGLYPHS:

COLOUR CHANGE AND SPECTRAL MINERALOGY

(FINAL REPORT)

(CSIRO, September 2008)

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The Report is based on the scientific research performed on the evaluation of physico-chemical change of the petroglyphs in the Burrup Peninsula situated in the Pilbara region of Western Australia, which are of both cultural and historical significance. The objective of the study is to evaluate possible environmental modification of the surface appearance on the rock art.

The experimental work carried out is clearly described and is based on the application of advanced methodologies and non-destructive analytical techniques for evaluating colour change and spectral mineralogy in the field studies performed during 4 years, from 2004 to 2007.

The analysis carried out, the data presentation and results discussion are thorough and appropriate in terms of the objectives of the project.

Furthermore the discussion is well structured and articulately developed, including a useful correlation with the meteorological measurements performed.

Overall, the Report entirely fulfils the objectives of the project, which was conducted completely and the conclusions it draws are well founded on scientific based results.

In conclusion, no part of the Report is misleading and it can therefore be released into the public domain with confidence.

Review of Draft final report "Burrup Peninsula Aboriginal Petroglyphs: Colour Change and Spectral Mineralogy 2004 – 2007".

Background

The West Australian Department of Industry and Resources Burrup Rock Art Management Committee has in 2004 commissioned scientific investigations on possible adverse effects of pollution on the condition of rock art in the Pilbara region on the Dampier archipelago. The undersigned has been asked to serve as an independent reviewer of this ambitious project. The present review concerns the final draft report on Colour Change and Spectral Mineralogy issued in September 2008.

Results obtained

Final results from the accelerated laboratory fumigation investigations including dust deposition have been presented in a report issued in March 2007. The present draft final report contains results obtained in the field activities including evaluation of colour changes and spectral mineralogy in the period 2004 - 2007. In the following a brief valuation of the results obtained will be given.

Colour changes

One of the key issues is the risk that changes in the environment from industrial activity may cause colour changes. The selected methodology describes the colour in a 3-dimensional colour space for each measurement point. It has been applied on 7 selected measurement points within the researched area. The results from the measurements performed in 2004 have been used as a baseline data set for assessment of potential variations that occurred during the project period. The final evaluation shows that no trends in colour have been observed and no consistent perceptible increase in colour change has been detected in the 2004-2007 period.

Spectral mineralogy

Spectral mineralogy using reflectance spectroscopy (ASD) has been applied at the same sampling locations as for the colour measurements on both engravings and surrounding undisturbed background rock. The 2004 spectral study provided the baseline dataset to monitor and explain any mineralogical changes at the seven rock art sites during the period 2004-2007. Supplementary moisture-time experiments has demonstrated the impact of moisture on spectral behaviour and further contributed to the interpretation of the results. For most measuring spots mineralogically related absorption were unchanged from 2004 to 2007 and only brightness varied from year to year. Only at two locations small changes were detected and the variations are local and correspond to natural mineralogical variations.

Concluding remarks

The Draft Final Report on colour changes and spectral mineralogy constitutes the last step of the field exposure part according to the original plan. The field exposures are the most valuable and convincing parts of the whole project. The results obtained are presented in a logical and systematic way. The report is of high quality and contains to my judgement no errors. The two components of the study are interconnected and add substantially to an overall understanding of the surface chemistry and mineralogy. The results obtained are discussed in an objective way which will give the public an unbiased view on potential risk. They will in combination with already finished and reported laboratory experiments greatly contribute to a fundamental understanding of the degradation processes and potential risk on the rock art in the Burrup region due to the combined effects of gaseous airborne emissions and industrially generated dust. The developed methodology and the network of measuring points form also a valuable asset if follow-up field measurements should be performed in the future.

6 November 2008