WS FISH

[redacted]

DRAFT BURRUP ROCK ART STRATEGY

Dear Sir/Madam,

Thank you for the opportunity to comment to the Department of Water and Environmental Regulation (DWER) on how the Senate Environment and Communications Reference Committee Inquiry into the Protection of Aboriginal Rock Art of the Burrup Peninsula report (Inquiry Report) should inform the Western Australian (WA) Government's Burrup rock art strategy.

I note that DWER has not to date engaged Murujuga Aboriginal Corporation (MAC) in developing a strategy that goes to the heart of MAC's ability to determine the future of their land and culture.

Both Coalition and Labor Senators were unanimous in their view that MAC needs to be central to any rock art management protocols and plans for the Burrup and that consultation with MAC has been inadequate to date.

The Murujuga Aboriginal Corporation (MAC) was established under the Burrup and Maitland Industrial Estate Agreement and is the body corporate responsible for the management of the Murujuga National Park. MAC represents all four Aboriginal Groups who have cultural responsibilities on and connection to Murujuga. MAC has an active Ranger program and has been involved in previous rock art monitoring programs. Indeed, MAC has been working with Dr Ian MacLeod and myself, both respected professionals in the fields of corrosion management in cultural heritage contexts and archaeology. I attach an alternative methodology for rock art monitoring for your perusal.

I request that the following actions be undertaken by your Department:

1. Serious consideration be given to the alternative rock art monitoring methodology;
2. A consultative process be set up that established meaningful dialogue between the WA Government and MAC, as representative of Traditional Owner interests on Murujuga.

I look forward to discussing this with you.

[redacted]

Warren Fish

Executive Summary

Conservation Management options for monitoring Murujuga sites, Burrup peninsula

Report for Commonwealth Government
W S Fish Consulting

Prepared by Dr Ian D MacLeod
Heritage Conservation Solutions

Version 1.4
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Figure 1: View of the TAN plant from site 22

Summary of November 2017 monitoring

- Measurements on three gabbro sites and three granophyre sites as previously recorded by CSIRO were conducted around the Yara plant in November 2017.
- Gabbro refers to a large group of dark, often coarse-grained mafic intrusive igneous rocks chemically equivalent to basalt, being its coarse-grained analogue. Granophyre is a subvolcanic rock that contains quartz and alkali feldspar that is akin to granite. Increasing rock acidity (measured using a surface pH electrode) shows a strong correlation of increased colour difference between the engravings and the un-engraved rock
- The colour differences indicate that the more recently deposited patina over the engravings appears to be dissolving faster than the background minerals of the weathered rock surfaces.
- Higher salt concentrations on the rock surface generally leads to less acid dissolution, which tends to mitigate the acid dissolution because of the alkaline nature of sea salts.
- In some instances acidity on specific sites increases with increased salt concentration. This is an indicator of chloride obligate bacteria and not atmospheric pollutants.
- Data from 2003 & 2004 showed that FeOOH was dissolving as $Fe(OH)_2^+$ but presently the iron is coming from silicate minerals such as actinolite $\{Ca_2(Mg, Fe)_5Si_8O_{22}(OH)_2\}$, augite $\{(Ca, Mg, Fe)_2(Si, Al)_2O_6\}$ and chlorite $\{(Mg, Al, Fe, Li, Mn, Ni)_{4\text{-}6}(Si, Al, B, Fe)_4O_{10}(OH, O)_8\}$.
- Data from the 2003-2004 period showed that the rock patina was dissolving as Mn^{2+}, but presently the manganese is coming from MnO as $Mn(OH)^+$ due to lowered acidity levels.
- Cyclonic downpours between February 2003 and March 2017 have reduced the amount of soluble nitrate and this has brought about a change in deterioration mechanism. However, data from June 2017 show increasing rock acidification near the Climbing Man gully.
- The nitrate concentration in wash solutions has fallen from 6.3 ppm in 2003, to 4.5 ppm in 2004 down to 0.6 ppm in 2017. The earlier measurements did not include Yara sites.
- A combination of low soluble nitrates around the Yara site when combined with high sea salt accumulation has prevented acidification of these areas.
- The CSIRO accelerated ageing study showed that chlorite appeared to be one of the first minerals to dissolve with increased acidity. This study confirmed the CSIRO findings and demonstrated that granophyre rocks are eight times more sensitive to chlorite dissolution than gabbro rocks.
- For the six Yara sites additional sulphate is coming from sources other than the sea.

Recommendations for future monitoring

- Routine sampling of both gabbro and granophyre rocks near the engraved sites provides opportunities to determine the surface mineralogy using semi-quantitative X-Ray Diffraction analyses (XRD) for chlorite on 10-gram samples.
- Conduct surface pH on specified rock engravings and on non-engraved adjacent rocks for analyses by XRD to confirm the relationship between increased acidity and diminished chlorite content of the rock patina.
- Analyse the washings from the engraved rocks for soluble metal ions and for nitrate, sulphate and chloride ions to confirm relationships between atmospheric conditions and decay processes.
- Identifying the sources and potential impact of additional sulphate will be considered as part of this analysis
- The monitoring and sampling will be conducted by staff of the Murujuga Aboriginal Corporation (MAC) in the company of a rock art conservator who will facilitate the subsequent mineralogical and chemical analyses as required by the above monitoring process.
- The collaboration between WS Fish Consulting and MAC will continue until the rangers have developed appropriate skill sets that will allow them to operate independently of consultants. The anticipated hand-over period would be between 2-3 years.