



Government of **Western Australia**
Department of **Water and Environmental Regulation**

Consultation Summary

Murujuga Rock Art Strategy

Department of Water and Environmental Regulation

January 2019

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1 Background

On 8 September 2017, the Department of Water and Environmental Regulation (DWER) released the draft *Burru Rock Art Strategy*. Comments were invited on any aspect of the draft strategy. Consultation closed on 1 December 2017. Eighteen submissions were received.

A number of submissions suggested that DWER's consultation on the draft strategy should await the outcome of the Australian Senate Environment and Communications References Committee's inquiry on the protection of Aboriginal rock art of the Burrup Peninsula. The Senate Committee's report was released on 21 March 2018. On 28 March 2018, DWER provided stakeholders with an opportunity to provide their views and make suggestions on how the Senate Committee's report should inform the final *Burru Rock Art Strategy*. Consultation closed on 11 May 2018. Nine submissions were received.

When the draft strategy was released for public comment it was referred to as the *Burru Rock Art Strategy*. In recognition of the significance of the area to Aboriginal people, the strategy is to be known as the *Murujuga Rock Art Strategy*. The Dampier Archipelago, including the Burrup Peninsula and surrounds, is traditionally referred to as Murujuga, which means "Hip Bone Sticking Out" in the Ngarluma-Yaburara language.

DWER thanks all respondents and appreciates the time taken to provide comments on the draft strategy. DWER has considered the issues raised in the submissions and has finalised the strategy in consultation with the Murujuga Rock Art Stakeholder Reference Group. The Stakeholder Reference Group has been established by the Minister for Environment to facilitate engagement between the Murujuga Aboriginal Corporation (MAC) and key government, industry and community representatives on the development and implementation of the *Murujuga Rock Art Strategy*.

This document summarises the submissions received in relation to the draft strategy, the key issues raised and the responses to these issues.

2 Submissions

Submissions were received from the following organisations/individuals.

Submitting Party
Dr John Black
Mr William Carr
Chamber of Minerals and Energy Western Australia
Hon. Robin Chapple MLC
City of Karratha
Mr Warren Fish
Friends of Australian Rock Art
Griffith University: Place, Evolution and Rock Art Heritage Unit
Dr Stéphane Hoerlé
Holcim (Australia) Pty Ltd
Dr Ken Mulvaney
Murujuga Aboriginal Corporation
Pilbara Development Commission
Pilbara Ports Authority
Rio Tinto Iron Ore
Rock Art Foundation Committee
University of Western Australia: Centre for Rock Art Research and Management
Western Australian Museum
Woodside Energy Ltd
Yara Pilbara

3 Summary of Submissions

There was general support in the submissions for the development and implementation of a long-term framework for robust scientific monitoring and analysis of changes to rock art located on Murujuga and an appropriate management regime.

The strategy was identified as a fundamental first step towards achieving a considered approach to understanding and addressing the complex issues required to protect the nationally and internationally significant rock art.

Key issues raised in the submissions included:

- the review of the rock art monitoring program which should address issues identified with the previous monitoring program, including the instruments used, sampling methodologies and program design;
- the lack of detail on the proposed management framework and the management measures that would be implemented to protect the rock art in the event that monitoring indicates emissions are adversely affecting the rock art; and
- the terms of reference and membership of the Stakeholder Reference Group.

4 Submissions and Responses

Section 1.0 Purpose

Summary of comments received and response

Comment	Response
Support for the purpose of the strategy to protect the rock art on Murujuga.	Noted.
The focus of the strategy is primarily on monitoring and does not identify a mechanism for the implementation of management or mitigation responses to achieve protection and avoid irreversible damage to the rock art.	The revised strategy includes information on the Environmental Quality Management Framework, which will provide a risk-based framework for monitoring and managing environmental quality to protect the rock art on Murujuga that is consistent with the Government's responsibilities under the <i>Environmental Protection Act 1986</i> (EP Act). The strategy will be revised and updated in the future to include further information on the Environmental Quality Management Framework as key elements are derived (e.g. the Environmental Quality Criteria, which are scientifically-based limits of acceptable change).
The purpose should be expanded to include a preference for methods of preventative and protective conservation.	The revised strategy includes information on the application of the mitigation hierarchy to (i) avoid impacts, (ii) minimise impacts where avoidance is not possible, and (iii) rectify impacts if they occur.

Section 2.0 Introduction

Summary of comments received and response

Comment	Response
The strategy contains factual errors about the rock art.	The strategy has been amended to reflect the information available in the published literature.
Support a conservative approach when discussing the antiquity of the rock art; claims that the rock art are 30,000 to 40,000 years in age have no scientific basis. Research that is currently being undertaken to fill some of the knowledge gaps about the antiquity of human occupation of the Burrup Peninsula will assist in contextualising the strategy within the broader cultural landscape of the Murujuga.	Noted.

Comment	Response
<p>Industry has taken actions to reduce emissions loads (e.g. Rio Tinto's closure of the diesel power plant at Parker Point and construction of a gas fired power station near Karratha).</p> <p>Emissions from locomotives and iron ore carriers are not significant.</p>	<p>Noted.</p>
<p>Noting that monitoring to date has not concluded that industrial emissions are damaging the rock art, accept existing obligations to limit emissions, but do not support further reductions in emissions and curtailment of industrial development.</p> <p>Any proposal to introduce additional regulation of existing or future operations will require consultation with potentially affected parties to ensure it is fit-for-purpose.</p>	<p>Noted.</p> <p>In relation to new industrial developments, the Environmental Protection Authority (EPA) will consider any proposals on a case-by-case basis. The EPA undertakes environmental impact assessment under Part IV of the EP Act. As set out in the EPA's Environmental Factor Guideline for air quality,¹ application of the mitigation hierarchy to avoid and minimise emissions where possible and existing or future cumulative impacts to an air shed are important considerations when undertaking the assessment. Once the assessments are complete, the EPA will provide advice to government on whether proposals should proceed and what conditions should be imposed to minimise potential impacts on rock art.</p> <p>Industrial emissions and discharges are regulated by DWER under Part V of the EP Act. Approvals are subject to conditions for the prevention and control of pollution and environmental harm. Any proposal to amend or introduce additional regulation will be consistent with DWER's <i>Regulatory best practice principles</i>.²</p>
<p>The regulation of industry should consider cumulative effects, rather than each being considered in isolation.</p>	<p>Cumulative impacts are considered under Part IV (impact assessment) and Part V (environmental regulation) of the EP Act. The strategy has been amended to include information on the assessment of cumulative impacts.</p>
<p>The visual and audio shed, not just the emissions and footprint of industry, should also be addressed in terms of physical impact on the rock art.</p>	<p>Impacts on visual amenity, noise and social surroundings are considered as part of the assessment of proposals under Part IV of the EP Act and through licences granted under Part V of the EP Act.</p>

¹ <http://www.epa.wa.gov.au/policies-guidance/air>

² www.der.wa.gov.au/our-work/regulatory-framework

Comment	Response
The cultural context of the physical objects, including visual amenity and disruption to cultural practices through secondary impacts (e.g. access restrictions imposed by industrial activity and associated infrastructure), should be considered—including in the monitoring program.	
Industry licences and approvals should be amended to include conditions specific to the protection of the rock art.	The EPA is currently conducting an inquiry under section 46 of the EP Act into whether Condition 5-1: Air Quality in Ministerial Statement 870 for the Technical Ammonium Nitrate Production Facility (TANPF) should be amended to address potential impacts to rock art.
As well as growth of industry on the Burrup Peninsula, there has been an increase in shipping and tonnage through the Port of Dampier. This further supports the need for continued monitoring of the rock art.	The strategy has been amended to include information on shipping activity in the Port of Dampier.
It is important to understand what (if any) the effects of shipping emissions are on the surrounding environment. The Pilbara Ports Authority, through the Port Hedland Industries Council has investigated ship-based emissions as part of an ambient air quality monitoring program. These data may usefully inform the strategy.	Noted.
Support for further research to understand potential impacts of shipping emissions on the rock art and, if it is scientifically established that emissions from ships are causing damage to the rock art, for the uptake of low emission fuel by vessels using the Port of Dampier.	Noted.
The strategy should note that from 1 January 2020 all ships and vessels will be required to use fuel which contains a maximum of 0.5% mass by mass (m/m) sulfur. The current limit is 3.5% m/m sulphur.	The strategy has been amended to include information on the implementation of International Maritime Organization (IMO) regulations to reduce sulphur oxides emissions from shipping.
MAC's plans for the creation of a Living Knowledge Centre should be addressed and incorporated into the strategy. It represents the potential for MAC to take a leading role in bringing together cultural and scientific elements of the Murujuga rock art.	MAC's plans are acknowledged. The Western Australian Government supports MAC's plans to develop the Murujuga Living Knowledge Centre as an important education and tourism facility at Conzinc Bay to showcase the extensive culture and

Comment	Response
	rich history of the region and as a hub of a wider tourism precinct.
Section 2.1 Monitoring of the rock art	
There are few studies around the world comparable with the rock art monitoring program.	Noted.
There are considerable constraints and complexities to monitoring the rock art on the Burrup Peninsula, including issues associated with collection of data in remote, exposed locations with rough terrain and often at high temperatures; limited reticulated power available to power monitoring equipment; access to islands restricted by high tidal range.	These are matters that will be considered in the design and implementation of the Murujuga Rock Art Monitoring Program.
Support for drawing on the lessons and the expertise developed over the past 13 years to inform the future monitoring and analysis and management of the rock art. The draft strategy does not outline how previous work will be built upon.	The revised strategy states that the design and implementation of the Murujuga Rock Art Monitoring Program will be informed by the findings from the past 15 years of scientific studies and monitoring of the rock art on Murujuga. This will include ensuring that the lessons learnt from the previous studies will be considered and addressed in the future program so that stakeholders can have confidence in the robustness and integrity of the monitoring data and the findings from scientific studies.
It is important that future monitoring and research studies are undertaken in accordance with the Murujuga Research Protocols.	The revised strategy states that the Murujuga Research Protocols apply to, and are required to be adhered to, by all organisations and researchers involved in the Murujuga Rock Art Monitoring Program.
Section 2.2 Senate Inquiry into the protection of Aboriginal rock art of the Burrup Peninsula	
Given there have been further delays in the release of the Senate Committee's report, DWER's consultation on the draft strategy should await the outcomes of the Senate Inquiry.	The Senate Committee released its report on 21 March 2018. Stakeholders were provided with an opportunity to provide their views and make any suggestions on how the Senate Committee's report should inform the final strategy.
Issues highlighted through the Senate Inquiry should inform the development and implementation of the strategy.	Where appropriate, the issues identified in the Senate Committee's report have informed the finalisation of the strategy.
Concerns identified in the Senate Committee Report in relation to the compliance, monitoring and management of Yara Pilbara's facilities with respect to its	Compliance with <i>Environment Protection and Biodiversity Conservation Act 1999</i> approvals is beyond the scope of this strategy.

Comment	Response
Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> approval.	
Figure 1 Map of the Burrup Peninsula location, tenure and land use	
There are errors in Figure 1. The map should be amended to include, for example, information on relevant infrastructure such as roads; information on the location of current and proposed industrial premises and the location of recorded rock art sites.	Figure 1 has been reviewed and revised.
Table 1 Summary of State and Commonwealth Protection	
Table 1 purports to summarise existing protection mechanisms, inferring these mechanisms are sufficient to control the impact of industry and protect the rock art. Legislation alone does not protect the rock art. The existing mechanisms have failed to safeguard the rock art. The strategy should include an assessment of the effectiveness of these mechanisms.	The purpose of Table 1 is to summarise the existing regulatory mechanisms that are relevant to the protection of the rock art on Murujuga. An assessment of the effectiveness of the identified mechanisms is outside the scope of the strategy.
In July 2017, the Commonwealth, Woodside and Rio Tinto signed the Deep Gorge Joint Statement. This reaffirms the commitments made under each of the bilateral Conservation Agreements in terms of ongoing tripartite commitments.	Table 1 has been amended to include information about the Deep Gorge Joint Statement.

Section 3.0 Scope

Summary of comments received and response

Comment	Response
The following are vital to ensuring a viable long-term strategy to protect the rock art: <ul style="list-style-type: none"> • Further monitoring and robust analysis implemented with demonstrable rigour to determine whether change is occurring to the rock art. • New studies to determine the current and emerging pollution loads, the sources of the pollution and whether that pollution load may result in deterioration of the rock art. • Appropriate governance arrangements to ensure that monitoring and reporting are undertaken in such a way as to 	The scope in the revised strategy includes: <ul style="list-style-type: none"> • The establishment of an Environmental Quality Management Framework. • The development and implementation of a monitoring and analysis program. • Identification and commissioning of scientific studies to support the implementation of the monitoring and analysis program. • Establishment of governance arrangements. • Development and implementation of a communication strategy.

Comment	Response
<p>provide confidence about the integrity, robustness and effectiveness of the monitoring.</p> <ul style="list-style-type: none"> Government requires accurate and appropriate recommendations regarding the protection of the rock art, consistent with its legislative responsibilities. 	
<p>The identified focus of the strategy is on the same areas as the previous inadequate studies which are simply monitoring studies.</p>	
<p>The scope should be expanded to include natural impacts on the rock art such as fire, cyclone and other meteorological events. Natural impacts are not currently considered and when combined with anthropogenic impacts could potentially damage the rock art.</p>	<p>It is not proposed that the scope of the strategy will be expanded. It is agreed that a robust understanding of natural impacts will be important in assessing the potential causes of impacts to the rock art. This will be considered in the implementation of the Environmental Quality Management Framework.</p> <p>The Murujuga National Park Management Plan 78 (2013) addresses other potential impacts on the rock art.</p>
<p>There has been undue reliance on the research by a few parties and other research has not been fully considered in the development of the strategy. The strategy should be amended to incorporate the full body of scientific work previously conducted on the Burrup Peninsula.</p>	<p>The strategy has been revised to include an overview of the history of scientific studies and monitoring, opportunities for improvements and the revised Murujuga Rock Art Monitoring Program.</p> <p>The development and implementation of the Environmental Quality Management Framework and the Murujuga Rock Art Monitoring Program will be informed by the findings and lessons learnt from the past 15 years of scientific studies and monitoring of the rock art.</p>
<p>The paper by Black <i>et al.</i> (2017), which was identified as informing the strategy, was unpublished and therefore not available to the general public making submissions on the draft strategy.</p>	<p>DWER amended the draft strategy to clarify the reference to the unpublished paper.</p>
<p>Principles of ecologically sustainable development</p>	
<p>Endorsement of the recognition and application of the precautionary principle. The best and most up-to-date scientific information available should be used to inform conservation and management of the rock art.</p> <p>Recognition of this principle places an obligation on the Government to implement appropriate management actions to ensure</p>	<p>The purpose of including reference to the principles in the strategy is to identify the principles which are to be had regard to in protecting the environment under the EP Act (section 4A). The revised strategy includes information on the application of the principles.</p>

Comment	Response
there is no further expansion of industrial activity on Murujuga.	
The strategy is contradictory with respect to the application of the precautionary principle and the evidence provided by the most recent research.	
Support for recognition of the principle of intergenerational equity.	
The strategy does not outline the ways in which the principles will be applied to protect the rock art and preserve the environment and the culture of Aboriginal Australians.	
Reference to the principles of 'ecologically sustainable development' is not relevant to the protection of Aboriginal rock art. The strategy should reference internationally recognised principles specific to heritage management (e.g. the Burra Charter).	Noted. The strategy has been amended to include reference to the Burra Charter.

Section 4.0 Monitoring and analysis

Summary of comments received and response

Comment	Response
Support for a world best-practice, long-term scientific monitoring and analysis program of the rock art and environmental factors that may affect the rock art to determine whether change is occurring to the rock art. Robust scientific information will be important in informing ongoing management and approvals of industrial facilities on the Burrup Peninsula.	DWER in partnership with MAC will oversee the development, implementation and analysis of a scientific monitoring and analysis program to determine whether the rock art on Murujuga is being subject to accelerated change. The scientific monitoring and analysis program will be designed by DWER and MAC in consultation with national and international experts in relevant disciplines. Suitably qualified individuals or organisations will undertake monitoring in partnership with the Murujuga Land & Sea Unit Rangers. The scope and design of monitoring program and scientific studies, standard operating procedures etc., and technical reports will be independently peer reviewed.
Question the need for further monitoring and research studies given that existing studies and independent research have shown that emissions are impacting on the rock art, as	A number of shortcomings in the design, data collection and data analysis elements of the monitoring program have been identified by independent reviewers. The strategy outlines the framework to address

Comment	Response
a prerequisite for implementation of appropriate protection.	the limitations of the past monitoring and analysis program and to provide advice to government where a management response is recommended.
Monitoring and reporting are insufficient to ensure protection of the rock art.	The revised strategy includes information on an Environmental Quality Management Framework, which will provide a risk-based framework for monitoring and managing environmental quality to protect the rock art on Murujuga.
Data should be publically available to enable independent verification of the findings.	Data and metadata will be published on DWER's website consistent with the Government of Western Australia's <i>Open Data Policy (2015)</i> .
Monitoring program design	
Support for the review of the existing monitoring program given the issues raised by independent reviewers. This should include the incorporation of more robust and contemporary statistical analyses, the monitoring of more sites (in particular control sites) and review of the number of replicate measurements at each point, to improve the quality of the rock art monitoring program.	These matters will be addressed through the design of the Murujuga Rock Art Monitoring Program.
The alteration mechanisms affecting the rock art are very complex, involving many interacting parameters. An understanding of the alteration mechanisms naturally affecting the rock art, how pollutants may alter these naturally occurring mechanisms and what mechanisms are not naturally occurring but may be triggered by pollutants, is critical to designing the monitoring program and improving monitoring procedures, interpreting the monitoring results and identifying appropriate management responses.	These matters will be considered in the monitoring studies commissioned to inform the development of the Environmental Quality Management Framework and the design of the Murujuga Rock Art Monitoring Program.
Submissions identified a number of matters which should be considered in the design of the monitoring program (and subsequent management), including: <ul style="list-style-type: none"> • the main different rock types on which the rock art is found to ensure these are adequately represented; • control sites should be in similar geographic situations in terms of facing and degree of marine influence; 	These matters will be considered in the design of the Murujuga Rock Art Monitoring Program.

Comment	Response
<ul style="list-style-type: none"> the representativeness of the sites in terms of their archaeological attributes and how they fit into the regional petroglyph sequence; and an understanding of the materiality of the rock art. 	
<p>A review of existing environmental monitoring and data should be undertaken. This should include, for example, collation and mapping of existing environmental monitoring (including industrial emissions monitoring), with information on the techniques used, frequency of measurement etc. This information should be considered within the context of environmental conditions (e.g. prevailing winds, seasonal rainfall, the location of freshwater bodies, ocean currents) that could affect the delivery of and retention of industrial emissions which could impact the rock art. This information will serve as a foundation for understanding threats to the rock art and underpin decisions regarding monitoring.</p>	<p>The review and synthesis of existing information will inform the scope of monitoring studies commissioned to inform the development of the Environmental Quality Management Framework and the design of the Murujuga Rock Art Monitoring Program.</p>
<p>It is important to have a firm baseline from which assessments concerning the preservation of the rock art and their surrounding cultural landscape can be made.</p>	<p>This issue will be considered in the scope of the monitoring studies commissioned to inform the development of the Environmental Quality Management Framework and the design of the Murujuga Rock Art Monitoring Program.</p>
<p>The principles identified in the strategy relating to the method for collection and analysis of data and for the annual monitoring program are appropriate.</p>	<p>Noted.</p>
<p>Monitoring methods</p>	
<p>Submissions identified a number of matters which should be considered in the assessment of future monitoring methods, including:</p> <ul style="list-style-type: none"> the potential adverse effects of repeated placement of instruments on the rock art to obtain independent measurements on each sampling point (there will should be a balance between statistical endeavor and protection of the rock art); and improved means of accurately relocating sampling points on each sampling occasion. 	<p>These matters will be considered in the selection of monitoring technologies and methods to be used in the Murujuga Rock Art Monitoring Program.</p>

Comment	Response
<p>Submissions recommended alternative monitoring methods/technologies that could be used in the future monitoring program. Examples included: portable X-Ray Diffractometry; portable X-Ray Fluorescence Spectrometry; photogrammetry.</p>	<p>Since the start of the rock art monitoring program in 2004, the development of new or improved technologies has made available accurate, relatively simple to use, reasonably cost-effective and essentially non-intrusive and non-destructive methods for measuring and monitoring changes in rock surfaces and near-surfaces to enable diagnosis of weathering processes. These will be considered within the context of the Murujuga Rock Art Monitoring Program to assess their applicability (and limitations) for long-term monitoring of the rock art.</p>
<p>It is premature to commission a new monitoring program until an appropriate methodology has been established.</p>	
<p>Submissions recommended parameters which should be monitored in the future monitoring program. Examples included: micro-topographic changes in the surface of the rock art.</p>	<p>The parameters to be monitored and how the selected parameters will be monitored, will be considered in the design of the Murujuga Rock Art Monitoring Program.</p>
<p>The strategy identifies several types of monitoring to be undertaken. Although these are important for assisting in understanding if changes that are occurring, they are not the most important measurements to be collected. Some parameters may be more relevant to the weathering mechanisms actually occurring than the parameters (e.g. colour, pH, etc.) that are listed in the strategy.</p>	
<p>Support for regular review of sampling methods/instruments, procedures and analyses used in the monitoring program, to ensure the most appropriate technologies are employed as knowledge improves and technologies evolve. This should include the involvement of independent experts.</p>	<p>The revised strategy includes the requirement for the regular independent review of the Murujuga Rock Art Monitoring Program. This will include consideration of whether best-practice methodologies and techniques are being implemented.</p>
Independent team of experts to undertake the monitoring program	
<p>It will be important that an independent, appropriately qualified contractor undertakes the scientific monitoring and analysis.</p>	<p>The monitoring and analysis program will be undertaken by suitably qualified individuals or organisations selected through a government procurement process. The procurement process for commissioning the Murujuga Rock Art Monitoring Program will be managed by DWER in accordance with the <i>State Supply Commission Act 1991</i> and government procurement policies.</p>
<p>The tender process for selecting the contractor should be in consultation with MAC and the Stakeholder Reference Group.</p>	<p>The procurement process for commissioning the Murujuga Rock Art Monitoring Program will be managed by DWER in accordance with the <i>State Supply</i></p>

Comment	Response
	<i>Commission Act 1991</i> and government procurement policies. The process for selecting contractors will be undertaken in partnership with MAC.
To ensure that monitoring is of a sufficiently high scientific standard to be able to measure subtle changes to the rock art, consultants should either possess specific skills and expertise in rock art recording and analysis or work with rock art experts to identify and record the rock art. This will ensure that suitable study locations are selected that are directly relevant to the rock art of the region.	The team contracted to undertake the Murujuga Rock Art Monitoring Program will be required to include member(s) with expertise in rock art analysis and recording.
Submissions expressed different views on the proposal in the draft strategy that data collection and analysis should be undertaken by separate parties. Submissions noted the importance of the data analyst understanding the data collection process so that data trends and patterns can be interpreted within their environmental context.	The team contracted to undertake the Murujuga Rock Art Monitoring Program will be required to include member(s) with expertise in the design of monitoring programs and statistical data analysis. The design of the monitoring program and the proposed statistical data analyses will be required to be endorsed by a suitably qualified statistician. The design of the monitoring program and the proposed statistical data analyse will also be independently peer reviewed prior to implementation.
Submissions expressed different views on the future involvement of individuals/organisations that have previously been involved with the scientific studies and monitoring and analysis.	The procurement process for commissioning the Murujuga Rock Art Monitoring Program will be managed by DWER in accordance with the <i>State Supply Commission Act 1991</i> and government procurement policies. It is open to any individual or organisation to submit an offer or to be part of a third party offer in response to the Request.
Involvement of MAC and the Murujuga Land & Sea Unit Rangers	
The practical aspects of the monitoring program should be undertaken by the Murujuga Land & Sea Unit Rangers. This will require appropriate capability building.	The development and implementation of the Murujuga Rock Art Monitoring Program will be undertaken in partnership with MAC. The Murujuga Land & Sea Unit Rangers will be involved in the implementation of the monitoring program, which will include training and capacity building.
MAC and the Murujuga Park Council should be consulted and agree with the location of monitoring sites and monitoring methods.	The selection of monitoring sites, monitoring methodologies and other decisions relating to the design and implementation of the monitoring program

Comment	Response
	will be determined with the agreement of MAC.
Welcome the commitment to scientific research into the petroglyphs and their condition but emphasise there should be cultural sensitivity in these matters and the focus should not be merely on scientific appraisal.	The monitoring program and scientific studies will be undertaken in partnership with MAC and in accordance with the Murujuga Research Protocols.
It is important to ensure that technical information is presented in accessible ways to the Traditional Owners. Resources should be made available to report the findings of commissioned scientific studies to the local Aboriginal community in an accessible way.	The Murujuga Land & Sea Unit Rangers will be involved in the development and implementation of the monitoring program. The Murujuga Rangers will be involved in the preparation and communication of information from the monitoring program and scientific studies to the MAC Board of Directors, the Circle of Elders and Traditional Owners.
Independent peer review	
Support for rigorous independent peer review. The strategy should identify mechanisms that provide for external input into the design and quality of the research and actions required in relation to findings from any investigations.	A panel of independent international and national peer reviewers with relevant expertise will be established. The peer reviewers will review the scope and design the Murujuga Rock Art Monitoring Program; supporting documentation (e.g. standard operating procedures, analysis plans); the scope and design of scientific studies; and annual reports, technical reports, etc. The independent peer reviewers will provide advice to DWER, MAC, the Stakeholder Reference Group and the Minister for Environment.
Peer reviewed scientific publication is an appropriate forum for discussion and for canvassing the diverse opinions of the scientific community. The strategy should include a specific statement encouraging and facilitating scientific publication as well as commissioned peer review of specialist studies.	The revised strategy identifies that annual reports detailing the results of data collection and analysis, reports from scientific studies, the reports of the independent peer reviewers and annual reports on the implementation of the strategy will be published on DWER's website.
Section 4.1 Colour change and spectral mineralogy	
Support for continuation of the colour contrast and spectral mineralogy monitoring, given the longitudinal dataset is globally unique and should be continued. There have been limitations identified with the instruments and methods used previously. It will be important to assess the ongoing use of these instruments and	Continuation of the colour contrast and spectral mineralogy monitoring will be considered in the development of the Environmental Quality Management Framework and the design of the Murujuga Rock Art Monitoring Program. Alternative monitoring methodologies will be considered to address the issues that have

Comment	Response
consider alternative instruments and methodologies to ensure that the most appropriate technologies are used. There should also be consideration of ways to use the historical data.	been raised in the independent reviews of the methodologies that have been used to date. Consideration will need to be given to ways of integrating the previously collected monitoring data (that is considered to be credible) with monitoring data collected in the future, potentially using different methods, to enable an understanding of the long-term changes in the rock art on Murujuga.
Section 4.2 Other studies	
This section describes one of the criticisms of the 2008 CSIRO acid dissolution tests of the parent geology of the rock art. However there is no statement as to whether the study should be repeated and/or data analysis redone.	The development of the Environmental Quality Management Framework and the design of Murujuga Rock Art Monitoring Program will consider and build on the findings from the monitoring and scientific studies that have been undertaken to date, including the CSIRO 2008 study.
Submissions included recommendations on additional scientific studies that should be undertaken. Examples included: further studies into the age of the rock art; studies on the mechanisms of patina formation; quantification of the rate of patina dissolution and whether acidity of the rock surfaces can be reversed and the stability of the patina restored; assessment of impacts to the cultural context of the petroglyphs, including disruption of Aboriginal peoples' cultural practices through secondary impacts.	The Stakeholder Reference Group will develop and implement a process for identifying and prioritising scientific research projects.
All research studies should be based on the principles of good experimental design, with careful consideration of the hypotheses to be tested and the methods to be used, and appropriate protocols and documentation prepared. Studies must be adequately resourced to ensure there appropriate data collection processes, techniques, personnel and equipment.	Noted and supported. A panel of independent international and national peer reviewers with relevant expertise will be established. The peer reviewers will review the design of research studies and the reports from research studies. The independent peer reviewers will provide advice to DWER, MAC, the Stakeholder Reference Group and the Minister for Environment.
Section 4.2.1 Air quality	
Support for the establishment of a coordinated long-term ambient air and meteorological monitoring network across the Burrup Peninsula and at appropriate control sites as a priority.	The Western Australian Government is considering the establishment of an Ambient Air Quality Monitoring Network on Murujuga.

Comment	Response
Continuous measurements of air quality should be real-time to identify impacts on air quality of plant start-up, shut down and upset conditions and displayed on a public website.	Real-time monitoring options will be considered in the design and implementation of an Ambient Air Quality Monitoring Network.
There are challenges with operating atmospheric monitoring stations with little reticulated power available. Instruments will be required to have their own power supply.	The challenges identified will be considered in the design and implementation of any future Ambient Air Quality Monitoring Network.
The location of monitoring stations should be mapped and made publically available.	Data and metadata will be published on DWER's website consistent with the Government of Western Australia's <i>Open Data Policy (2015)</i> .
Data should be in a form that can be incorporated into the annual Burrup Rock Art Monitoring Program report.	
Deposition monitoring, including of dust levels and composition, should also be undertaken.	The establishment of an atmospheric deposition monitoring network on Murujuga, will be considered as part of the design of the Murujuga Rock Art Monitoring Program.
Section 4.2.2 pH	
There was support for regular measurements of pH on rock surfaces. Submissions included recommendations for other parameters that should be monitored (e.g. dissolved minerals/soluble metals ions, nitrate, sulphate and chloride ions). It was also recommended that pH should be measured in rainwater and on a variety of rock art surfaces.	Consideration of pH as an appropriate parameter to be monitored will be considered in the design of the Murujuga Rock Art Monitoring Program.
Field monitoring will require standardisation to ensure the results are reliable and reproducible.	Standard Operating Procedures (SOP) will be developed to document the details of how all elements of the Murujuga Rock Art Monitoring Program are to be carried out to ensure that the data are collected, analysed and interpreted in a standardised and technically rigorous manner.
Section 4.2.3 Microbiology	
There was support for further microbiological studies and monitoring. Submissions included recommendations to broaden the scope, including for example, micro-organism activity on dust.	Further microbiological studies will be considered in the design of the Murujuga Rock Art Monitoring Program.
Section 4.2.4 Sources of pollutants	
There was support for studies of the sources of pollutants, including current and	These matters will be considered in the development of the Environmental Quality

Comment	Response
emerging pollutant loads and the sources of those pollutants.	Management Framework and the design of the Murujuga Rock Art Monitoring Program.
A program of pollution monitoring and analysis should be accompanied by an assessment of the local geology to determine the susceptibility of the rock surfaces to the various industrial emissions. This requires an appropriate research methodology and must be adequately resourced. The work should be undertaken by an independent, suitably qualified team to ensure credibility of the results. The data must be made publically available so the findings can be independently verified.	The procurement process for commissioning the Murujuga Rock Art Monitoring Program will be managed by DWER in accordance with the <i>State Supply Commission Act 1991</i> and government procurement policies. Data and metadata will be published on DWER's website consistent with the Government of Western Australia's <i>Open Data Policy (2015)</i> .
Measurements of emission loads from industry will not in itself provide understanding of impacts on rock art and it is important to understand whether emissions loads may result in the deterioration of the rock art.	

Section 5.0 Management responses

Summary of comments received and response

Comment	Response
The strategy should include information on the proposed management framework, including triggers for action and the management options that may be implemented in the event that monitoring indicates emissions are adversely impacting the rock art. While the strategy should be flexible, there should be some certainty about the triggers for action. The strategy should also identify who is responsible for decision-making.	The revised strategy includes information on an Environmental Quality Management Framework, which will provide a risk-based framework for monitoring and managing environmental quality to protect the rock art on Murujuga that is consistent with the Government's responsibilities under the EP Act. The revised strategy also identifies who is responsible for decision-making in the event of an exceedance of the Environmental Quality Criteria.
The strategy does not identify or commit to any specific management measures that will be implemented to protect the rock art or any other culturally significant features. Examples include: restrictions on total emission loads; requirements on industry to adopt best practice technologies to reduce emissions; cessation of further industrial development on the Burrup Peninsula; location of industry away from the Burrup Peninsula; use of cleaner fuel by shipping. The strategy should not be used to continue	The strategy will be revised and updated in the future to include further information on the Environmental Quality Management Framework as key elements are derived (e.g. the Environmental Quality Criteria, which are scientifically-based limits of acceptable change).

Comment	Response
to allow industrial expansion and continuing industrial emissions.	
While DWER is responsible for the implementation of the strategy it is unclear who is responsible for enforcement.	DWER is responsible for ensuring compliance with the EP Act in accordance with its interim <i>Compliance and Enforcement Policy</i> . ³
The strategy should include undertakings to progress World Heritage nomination in accordance with the wishes of the Aboriginal custodians of Murujuga.	On 27 August 2018, the Premier of Western Australia and MAC, representing the Traditional Owners of Murujuga, announced that they would pursue World Heritage Listing for the Dampier Archipelago and surrounds. Information on the World Heritage nomination process is included in the revised strategy.
Section 5.1 Joint Management – Murujuga National Park	
Murujuga Rangers should be afforded legislative powers to undertake enforcement activities to protect the Murujuga’s cultural heritage values.	DWER will investigate what powers are available under legislation to assist the Murujuga Rangers to undertake environmental enforcement activities that relate to the strategy in consultation with agencies that administer the legislation.
The Murujuga National Park should be given Class A Reserve status. Twenty-five of the 42 islands in the Dampier Archipelago are Nature Reserves. The strategy should suggest a request for reservation be made.	Consideration of the reserve status of the Murujuga National Park or the islands in the Dampier Archipelago is beyond the scope of the strategy.
The strategy should include undertakings to transfer unoccupied gazetted industrial leases to the Murujuga National Park.	The expansion of the Murujuga National Park to include unoccupied gazetted industrial leases is beyond the scope of the strategy.
Visitor access, vandalism and graffiti, and inadvertent damage continue to cause adverse impacts to the rock art. The Murujuga National Park Management Plan strategies to manage visitor access and activities should be implemented. This should include giving the Murujuga rangers Honorary Warden status under the <i>Aboriginal Heritage Act 1972</i> .	The implementation of the Murujuga National Park Management Plan (2013) is beyond the scope of the strategy.
The National Park status does not provide protection against emissions.	The strategy relates to monitoring and management of anthropogenic emissions to protect the rock art.

³ www.der.wa.gov.au/our-work/enforcement

Section 6.0 Governance

Summary of comments received and response

Comment	Response
<p>It is important that MAC is engaged throughout the development and implementation of the strategy to ensure that Indigenous custodians are given priority in monitoring and management decisions.</p> <p>Noted the Murujuga Cultural Management Plan contains relevant material.</p>	<p>DWER is committed to partnering with MAC to develop and implement an internationally recognised, world best practice management and monitoring framework to protect the rock art on Murujuga. This will include the involvement of MAC in the development and implementation of the monitoring program.</p> <p>The partnership between DWER and MAC will be formalised through a management agreement/memoranda of understanding.</p>
<p>The strategy should reflect that DWER will ensure an appropriate level of oversight of the commissioning of studies, peer review and the implementation of the monitoring program. The DWER staff should have appropriate scientific expertise and experience to inform such decisions.</p>	<p>DWER has primary responsibility for the day-to-day implementation of the strategy in partnership with MAC. This includes partnering with MAC to oversee the development, implementation and analysis of a scientific monitoring and analysis program; commissioning of scientific studies; and managing the peer review process.</p>
<p>There should be appropriate governance arrangements in place to ensure that monitoring and reporting are undertaken in such a way as to provide confidence to the Traditional Owners, industry and scientists on the integrity, robustness and effectiveness of the monitoring program.</p>	<p>The scientific monitoring and analysis program will be designed by DWER in close consultation with a team of national and international experts in relevant disciplines. Monitoring will be undertaken by suitably qualified individuals or organisations and the results of the monitoring will be subject to independent peer review.</p>

Section 7.0 Funding

Summary of comments received and response

Comment	Response
<p>Financial resources should be allocated to fund the work of the Murujuga Rangers in the monitoring program.</p>	<p>DWER will investigate what resources are available to support the involvement of the Murujuga Land & Sea Unit Rangers in the Murujuga Rock Art Monitoring Program.</p>
<p>The financial contributions from government should be identified.</p>	<p>The strategy identifies that DWER will support the development and implementation of the strategy, including providing secretariat support to the Stakeholder Reference Group; contract management and oversight of the monitoring and analysis program, scientific</p>

Comment	Response
	studies and independent peer review; and preparation of the annual report to the Minister for Environment.
The strategy should include information on the costs of studies, shortfalls in funding and the mechanisms to ensure fiscal constraints do not impact on the range or validity of studies.	The strategy is not intended to provide detailed information on the costs of studies or the financial arrangements in place to support these studies.
A real-time register of funds contributed by industry and reports commissioned out of the funding pool should be published on DWER's website.	A public register of funds contributed by stakeholders, including industry, to support monitoring and scientific studies is not supported. The reports from commissioned studies will be published on DWER's website.
<p>Industry is generally supportive of further monitoring and analysis of the rock art and the environmental factors that may affect it and is not averse to contributing to funding monitoring and analysis. Do not support conditioning of approvals for the purpose of funding such an initiative with limited consultation.</p> <p>There should be further discussion with industry operating on the Burrup Peninsula on the details of the monitoring program and funding arrangements including contribution rates, oversight, and review.</p>	DWER will consult further with industry and other stakeholders with respect to the funding arrangements for future monitoring and scientific studies.
If industry is to fund the monitoring and analysis program, it would expect greater oversight of the funding expenditure or the design and methodology of ongoing monitoring and analysis than proposed by the membership of the Stakeholder Reference Group.	The membership of the Stakeholder Reference Group has been revised to include three industry representatives.
Minor polluters on the Burrup Peninsula, should not be required to contribute to the monitoring and analysis program. Support for the current approach that the major polluters fund the monitoring program.	DWER will consult further with industry and other stakeholders with respect to the funding arrangements for future monitoring and scientific studies.
Contracts to undertake the monitoring/scientific studies should be managed by DWER to ensure independence from industry.	The strategy identifies that DWER will be responsible for contract management.
The <i>Murujuga (Burrup) Rock Art Conservation Project</i> is being developed by the UWA Centre for Rock Art Research and Management in partnership with other parties. This could provide the research	The procurement process for the Murujuga Rock Art Monitoring Program will be managed by DWER in accordance with the <i>State Supply Commission Act 1991</i> and government procurement policies.

Comment	Response
<p>framework to develop an appropriate long-term monitoring program.</p> <p>Crowd-funding has been initiated to raise funds for the project and it is proposed that the project will be funded as an Australian Research Council Linkage Project. Funds available from industry sources, managed through the Western Australian Government, could be used to support this project rather than as a separate government overseen project.</p>	<p>Information from previous scientific studies and new research studies on the rock art on Murujuga will inform the implementation of the Murujuga Rock Art Strategy by ensuring there is a scientifically rigorous approach to the monitoring program and providing a robust basis for the management of impacts to the rock art.</p>

Section 8.0 Stakeholders and consultation

Summary of comments received and response

Comment	Response
<p>The strategy was released prematurely without adequate consideration of the governance arrangements and stakeholder engagement to inform the success of the strategy.</p>	<p>Noted.</p>
<p>There are other key stakeholders that are not listed and which should be included (e.g. academics and researchers, the local and wider community, and a more representative inclusion of Aboriginal people).</p>	<p>Many of the key stakeholders are represented on the Stakeholder Reference Group. Other key stakeholders identified in the revised strategy include the Western Australian Minister for Environment, the Commonwealth Minister for the Environment, the Commonwealth Department of the Environment and Energy, project proponents and occupiers of licensed prescribed premises, research organisations and institutes, and the community.</p>
<p>Pilbara Ports Authority (PPA) is identified as a key stakeholder but the strategy does not provide details on how PPA will be engaged regarding the development and implementation of the strategy.</p>	<p>The membership of the Stakeholder Reference Group has been revised to include a representative from PPA.</p>
<p>It is unclear whether consultation will be undertaken only as part of the five-year review process or on a more frequent basis. Support for wide consultation during the development, implementation and review of the strategy.</p>	<p>The revised terms of reference for the Stakeholder Reference Group include consultation, informing and educating other stakeholders on matters referred by DWER for input or comment, including further development of the strategy, implementation of the strategy and five yearly reviews.</p>
<p>In addition to the Stakeholder Reference Group, consideration should be given to</p>	<p>A panel of independent international and national peer reviewers with relevant</p>

Comment	Response
establishing an independent, technically competent group to provide input into, oversight and coordination of the future monitoring program and scientific studies (or re-establishing the Burrup Rock Art Technical Working Group). A representative from this group could be appointed to the Stakeholder Reference Group.	expertise will be established. The peer reviewers will review the scope and design the Murujuga Rock Art Monitoring Program; supporting documentation (e.g. standard operating procedures, analysis plans); the scope and design of scientific studies; and annual reports, technical reports, etc. The independent peer reviewers will provide advice to DWER, MAC, the Stakeholder Reference Group and the Minister for Environment.

Section 9.0 Custodian

Summary of comments received and response

Comment	Response
It is important that there is a clear custodian for the development and implementation of the strategy and DWER is appropriate.	DWER has primary responsibility for the development and implementation of the strategy. This will be undertaken in partnership with MAC and in consultation with other stakeholders.
There should be shared custodianship with the local Traditional Owners.	

Section 10.0 Communication

Summary of comments received and response

Comment	Response
Support for the publishing of information on the Murujuga Rock Art Monitoring Program on DWER's website.	Publishing of information on the monitoring and analysis of the Murujuga rock art on DWER's website will continue.
Publishing information on DWER's website does not achieve protection of the rock art.	

Section 11.0 Evaluation and review of the strategy

Summary of comments received and response

Comment	Response
Submissions expressed different views on the proposal that the strategy will be reviewed every five years.	The strategy has been amended to reflect that the strategy will be reviewed every five years, or earlier as determined by the Minister for Environment. Any proposal to undertake an earlier review would be discussed with MAC and the Stakeholder Reference Group.
The frequency of review should be determined by DWER in consultation with MAC and other stakeholders.	

Appendix B Stakeholder Reference Group - Terms of Reference

Summary of comments received and response

Comment	Response
Support for the establishment of a Stakeholder Reference Group to facilitate further engagement between government, industry and the community, particularly Ngarda-Ngarli representatives.	Noted.
The Stakeholder Reference Group should be given formal status to provide credibility and improve its effectiveness.	The Stakeholder Reference Group is appointed by the Minister for Environment and therefore has credibility.
<p>The role of the Stakeholder Reference Group should not be restricted to that of communication, consultation, informal liaison and information sharing within the group and with other stakeholders.</p> <p>Suggested additional roles for the Stakeholder Reference Group included:</p> <ul style="list-style-type: none"> • review and provide advice on the adequacy of management decisions made by DWER relating to the Burrup Peninsula; • to avoid DWER being selective, all reports and issues should be referred to the Stakeholder Reference Group for review; and • oversight to assist in interpreting, monitoring and disseminating results of the monitoring program. 	The strategy includes the revised terms of reference for the Stakeholder Reference Group. The terms of reference were revised taking into account the advice of MAC.
<p>The proposed membership does not adequately represent the key stakeholders and will not enable the Stakeholder Reference Group to effectively inform the development and implementation of the strategy.</p> <p>The proposed membership will not provide a means through which DWER can seek "<i>informed discussion from a diverse group</i>".</p> <p>The basis for the selection of some representatives on the Stakeholder Reference Group is not transparent.</p> <p>Suggested changes to the membership included:</p> <ul style="list-style-type: none"> • the proposed representation from MAC is inadequate and should be increased; • MAC should chair or co-chair the Stakeholder Reference Group; 	<p>Following consideration of the submissions received, and noting the role of the Stakeholder Reference Group, the membership has been revised to include:</p> <ul style="list-style-type: none"> • an independent Chair appointed by the Minister for Environment; • one representative from the Commonwealth Department of the Environment and Energy; • one representative from the Pilbara Ports Authority; and • one representative from each of Woodside Energy Ltd, Rio Tinto Iron Ore and Yara Pilbara. <p>The membership was revised taking into account the advice of MAC.</p>

Comment	Response
<ul style="list-style-type: none"> • there is an over-representation of government departments with different management and regulatory roles on the Burrup Peninsula and which lack the relevant technical/specialist knowledge; • the number of government department's should be reduced to those with a clear regulatory or management function in delivering the strategy; • there should be more balanced government and non-government representation; • technical experts should have a more prominent role, including more independent researchers; • include participants in earlier rock art studies to ensure continuity; • industry is over-represented, including with pro-industry representatives; • industry is under-represented with one member representing the entirety of industrial and resources sector interests (including ports, other infrastructure and resource projects); • industry should be represented by appropriately qualified scientists working for companies; • a position should be available for each of the industrial facilities operating on Murujuga; • there are other options for university representation; • positions should be prescribed by qualified technical expertise (e.g. corrosion and weathering expert, meteorology and atmospheric modeling expert), rather than by naming a specific individual; and • the Commonwealth Department of the Environment and Energy is a key government regulator and should be included. 	
<p>The proposed frequency of meetings is inadequate.</p>	<p>The strategy provides for meetings to be held at least annually, or as determined by the Chair.</p>
<p>The strategy does not address the reporting, recommendations and accessing of expertise by the Stakeholder Reference Group.</p>	<p>The Stakeholder Reference Group will report and provide advice to the Minister for Environment.</p>

Appendix C Summary of industry licences and approvals

Summary of comments received and response

Comment	Response
Include information on distance from industry to nearest rock art.	Figure 1 has been revised to show the location of specific industries on Murujuga. Note that Appendix C has been removed from the revised strategy.