Department of
Environment and Conservation

Our environment, our future

Resource Condition Report for a Significant Western Australian Wetland

Mungilli Claypan

2009

Figure 1 – A view across the dry bed of Mungilli Claypan.

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Contents

1. Introduction

This Resource Condition Report (RCR) was prepared by the Inland Aquatic Integrity Resource Condition Monitoring (IAI RCM) project. It describes the ecological character and condition of Mungilli Claypan (also known as Mangkili Claypan), which will provide context for future monitoring of the site. Mungilli is an ephemeral freshwater claypan in the Gibson Desert.

Mungilli Claypan was selected for study in the current project because it is a good example of a wetland type that is characteristic of the region. Free fresh water is rare in the arid interior of Western Australia and this site may support rare or endemic taxa. Lack of previous studies on this site means collection of baseline data is of extra benefit.

The IAI RCM project visited the site on the 21 August 2008, when it was dry. As such, no water chemistry, aquatic invertebrate or waterbird data were collected.

1.1. Site Code

Register of the National Estate Registered Place ID: 9891.

Aboriginal Site of Significance ID: W00456, W00458 and W00463

Inland Aquatic Integrity Resource Condition Monitoring Project (DEC): RCM018.

1.2. Purpose of Resource Condition Report

The objective of the RCR is to summarise all available ecological information relevant to Mungilli Claypan and describe the drivers of, and threats to, the system. This 'snapshot' of ecological character will provide context for future monitoring of the site and allow the effectiveness of management planning and actions to be assessed.

1.3. Relevant International Agreements and Legislation

The following is a summary of international agreements and legislation that may be relevant to the management of Mungilli Claypan.

International

Migratory bird bilateral agreements and conventions

Australia is party to a number of bilateral agreements, initiatives and conventions for the conservation of migratory birds which may be relevant to Mungilli Claypan. The bilateral agreements are:

JAMBA - The Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment, 1974;

CAMBA - The Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment, 1986;

ROKAMBA - The Agreement between the Government of Australia and the Republic of Korea for the Protection of Migratory Birds and their Environment, 2006; and

The Bonn Convention on Migratory Species (CMS) - The Bonn Convention adopts a framework in which countries with jurisdiction over any part of the range of a particular species co-operate to prevent migratory species becoming endangered. For Australian purposes, many of the species are migratory birds.

National legislation

Australian Heritage Council Act 2003

Mungilli Claypan Nature Reserve has been placed on the Register of the National Estate (registered place). However, some places may be legally registered because they are within a larger registered area they may not necessarily possess intrinsic significance. Specifically in relation to Mungilli Claypan Nature Reserve, the Heritage Commission is in the process of developing and/or upgrading official statements for places listed prior to 1991. The data for Mungilli Claypan was mainly provided by the nominator and has not yet been revised by the Commission. Hence, Mungilli Claypan currently is not offered protection under the *Australian Heritage Council Act 2003*.

Western Australian legislation

Wildlife Conservation Act 1950

This Act provides for the protection of wildlife. All fauna (animals native to Australia) in Western Australia is protected under section 14 and all flora (plants native to Western Australia) are protected under section 23 of the *Wildlife Conservation Act 1950*. The Act establishes licensing frameworks for the taking and possession of protected fauna, and establishes offences and penalties for interactions with fauna.

Conservation and Land Management Act 1987

This Act is administered by the State Department of Environment and Conservation (DEC) and applies to public lands. It sets the framework for the creation and management of marine and terrestrial parks, reserves and management areas in Western Australia, and deals with the protection of flora and fauna within reserve systems.

Aboriginal Heritage Act 1972

The purpose of this Act is to protect Aboriginal remains, relics and sites from undue interference, and to recognise the legitimate pursuit of Aboriginal customs and traditions. Under the Act, it is an offence for a person to excavate, destroy, damage or alter any Aboriginal site. The Act applies to all objects which are of sacred, ritual or ceremonial significance to persons of Aboriginal descent, or which are or were used for any purpose connected with the traditional cultural life of the Aboriginal people and the places where such objects are found. It also protects any sacred, ritual or ceremonial site, which is of importance and special significance to persons of Aboriginal descent. Finally, the Act states that, where a representative body of persons of Aboriginal descent, who usually live subject to Aboriginal customary law, has an interest in a place, that place shall be available to that body for purposes sanctioned by the Aboriginal tradition relevant to that place.

The majority of Mungilli Claypan Nature Reserve is recognised as an Aboriginal Site of Significance due mythological, ceremonial, quarry and archaeological significance. The claypan is specifically recognised for its mythological significance.

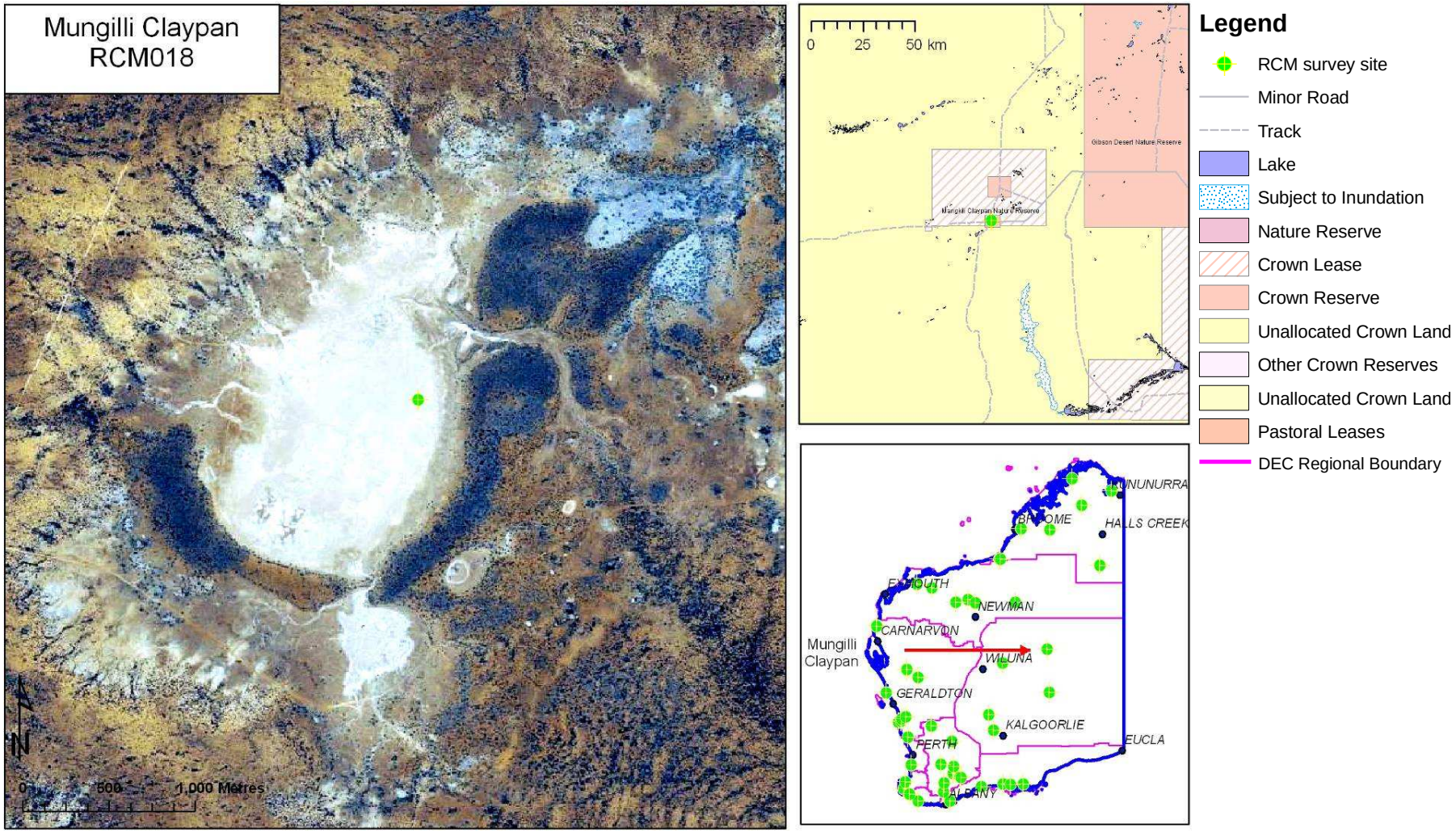

Figure 2 – Aerial photograph showing the location of the survey site at Mungilli Claypan. The upper insert shows the tenure of land surrounding the site. The lower insert shows the location of the claypan in relation to other IAI RCM sites and its location in Western Australia.

2. Overview of Mungilli Claypan

2.1. Location and Cadastral Information

Mungilli Claypan lies approximately 250 km west-northwest of Warburton Mission and 400 km east-northeast of Wiluna (Figure 2). It is contained within Mungilli (Mangkili) Claypan Nature Reserve, which covers about 3,740 ha at the junction of the Gunbarrel Highway and David Carnegie Road.

2.2. IBRA Region

Mungilli Claypan lies near the eastern boundary of the Lateritic Plain subregion (GD1) of the Gibson Desert Interim Biogeographic Regionalisation of Australia (IBRA) region. This region is a gently undulating plain with occasional sandstone mesas. Gravelly sandplains and laterised upland occur on flat-lying Jurassic and Cretaceous sandstones of the Canning (Gunbarrel) Basin.

The vegetation has been described as 'Carnegie Botanical District' (Botanic Districts of Australia), Mulga parkland over *Triodia basedowii* on lateritic "buckshot" plains. The vegetation consists primarily of mixed shrub steppe of *Acacia*, *Hakea* and *Grevillea* over *Triodia pungens* on red sand plains and dune fields. Lateritic uplands support shrub steppe in the north and mulga scrub in the south. Quaternary alluvia associated with palaeo-drainage features support coolibah woodlands over bunch grasses (Graham *et al.* 2001).

2.3. Climate

The nearest Bureau of Meteorology weather station to Mungilli Claypan is at Carnegie (Bureau of Meteorology 2009), which is 150 km west of Mungilli Claypan. Weather conditions at Mungilli Claypan would not differ appreciably from those at Carnegie.

Carnegie experiences a semi-arid, hot climate. It receives a mean annual rainfall of 230.4 mm with almost half falling between January and March (Figure 3). Summer rainfall is usually associated with decaying tropical lows, while winter rainfall results from the occasional cold fronts that penetrate the state's interior. Annual evaporation at Carnegie is approximately 4,000 mm, meaning that surface water is short-lived after rain. Temperatures peak in January with a mean daily minimum/maximum of 23.8 ºC/38.8 ºC and fall to 5.8 ºC/21 ºC in July.

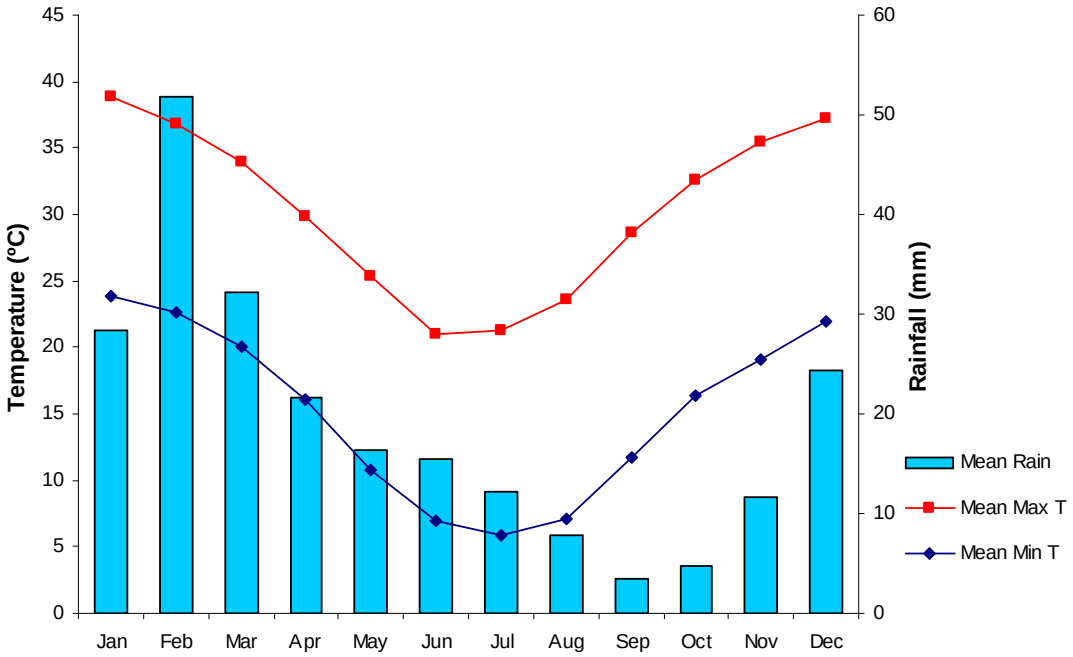

Figure 3 – Climatic averages for Carnegie, approximately 150 km west of Mungilli Claypan.

Mungilli Claypan was surveyed by the IAI RCM project on the 21st of August 2008. In the year leading up to the survey, Carnegie received 71.8 mm of rain. The majority of this (40.2 mm) fell in June. No rainfall was recorded for the first 21 days of August.

2.4. Wetland Type

According to the classification system employed by the *Directory of Important Wetlands in Australia* (Environment Australia 2001), Mungilli Claypan may be described as a 'seasonal/intermittent freshwater lake (>8 ha), or floodplain lake' (type B6).

Mungilli claypan is a large, ephemeral, freshwater claypan. Claypans are depressions in soft sediments with low permeability, allowing them to hold water (Bayly 1999). The top soil of a claypan is removed by alluvial or aeolian processes, exposing the hard clay underneath. Upon this surface, shallow water may remain following rain (Giles 1889). Claypans are generally highly turbid due to their clay substrate (Bayly 1999). Claypans are highly valued when they hold water because they support flora and fauna (Lowe and Pike 1990).

2.5. Values of Mungilli Claypan

Values are the internal principles that guide the behaviour of an individual or group. Value systems determine the importance people place on the natural environment and how they view their place within it. Divergent values may result in people pursuing different objectives in relation to nature conservation, having different reasons for desiring a commonly agreed outcome, or favouring different mechanisms to achieve that outcome. Because of this, it is important to be explicit about the values that are driving conservation activities at a wetland.

The Conceptual Framework for Managing Natural Biodiversity in the Western Australian Wheatbelt (Wallace 2003) identified eight reasons that humans value natural biodiversity:

a. Consumptive use

Consumptive use is gaining benefit from products derived from the natural environment, without these products going through a market place, for example, the collection and

personal use of firewood or 'bushtucker'. Aboriginal people have certainly used Mungilli Claypan historically (DEHA, undated), but it is not clear if that usage continues.

b. Productive use

Productive use values are derived from market transactions involving products sourced from the natural environment. For example, the same firewood that is collected may be exchanged for money or another commodity. Mungilli Claypan is not used for productive purposes.

c. Opportunities for future use

Not all uses of the natural environment may be apparent at present. The potential for future benefit from the natural environment is maximised by maintaining the greatest possible biodiversity. Every lost taxa or ecosystem represents lost opportunities. Mungilli Claypan may support endemic or rare taxa. Such unique features would increase the potential for future opportunities to present.

d. Ecosystem services

There are many naturally occurring phenomena that bring enormous benefit to mankind. For instance, plants generate oxygen, insects pollinate food crops and wetlands mitigate floods by regulating water flows. The term 'ecosystem services', is used as a broad umbrella to cover the myriad of benefits delivered, directly or indirectly, to humankind by healthy ecosystems. Mungilli Claypan provides a source of fresh water in a desert region. Therefore, it is highly valued as a fauna and flora refuge. The vegetation of the claypan differs from that of the surrounding area (DEHA Undated).

e. Amenity

Amenity describes features of the natural environment that make life more pleasant for people. For instance, pleasant views and shade or wind shelter from a stand of trees. It is difficult to quantify the amenity value of a site such as Mungilli Claypan, but it is certainly valued by the local community and passing tourists for the amenity it provides.

f. Scientific and educational uses

Parts of the natural environment that remain relatively unmodified by human activity represent great educational opportunities. Such sites allow us to learn about the changes that have occurred to the natural world. They are also 'control' sites that allow us to benchmark other, altered habitats. Mungilli Claypan is a relatively unmodified freshwater claypan in an arid region that may present opportunities for advancing the science of wetland ecology.

g. Recreation

Many recreational activities rely on the natural environment (bird watching, canoeing, wildflower tourism, etc.) or are greatly enhanced by it (hiking, cycling, horse riding, photography, etc.). Recreation may deliver economic benefit derived from tourism and also delivers spiritual and physical health benefits to the recreator. Mungilli Claypan is situated on the Gunbarrel Highway and is frequently visited by four-wheel drive enthusiasts.

h. Spiritual/philosophical values

People's spiritual and philosophical reasons for valuing natural environments are numerous and diverse. One commonly cited is the 'sense of place' that people derive from elements of their environment. This is evident in many Aboriginal and rural Australians, who strongly identify themselves with their natural environment. Many people also believe that nature has inherent value or a right to exist that is independent of any benefit delivered to humans. A sense of spiritual well-being may be derived from the knowledge of healthy environments, even if the individual has no contact with them. Mungilli Claypan is of cultural significance to

the local Aboriginal people. Permanent freshwater in an otherwise arid region is an important resource and the claypan was certainly utilised by Aboriginal people historically. There are three sites of cultural significance within the Mungilli Claypan Nature Reserve, as recognised by the Department of Indigenous Affairs. These sites, Kurtaparu Claypan, Mungilli and Yulkapatjunkulantja Hill, are of mythological, ceremonial, quarry and archaeological significance.

The intent of nature conservation is usually to maintain the ecosystem service values, opportunity values and scientific and educational values at a given site. Doing so is likely to have positive effects on the amenity values, recreational values and spiritual/philosophical values to which the site's natural environment contributes. Consumptive and productive uses of the natural environment are not usually considered, as these are often incompatible with nature conservation.

3. Critical Components and Processes of the Ecology of Mungilli Claypan

The objective of the Mungilli Claypan Resource Condition Report (RCR) is to identify, describe and quantify the critical components and drivers of the wetland's natural environment. These components and processes determine the site's ecological character and are the variables that should be addressed in any ongoing monitoring.

Climate and geomorphology are the most important drivers of wetland ecosystems. Between them, these factors determine the position of a wetland in the landscape and the type and hydrological regime of that wetland. In turn, a wetland's position, type and hydrology exert a strong influence on its biota and biochemical properties and processes.

A summary of Mungilli Claypan's critical ecosystem components is presented in Table 1, followed by a detailed description of the results of the Inland Aquatic Integrity Resource Condition Monitoring (IAI RCM) 2008 survey as well as of any previous studies conducted on the wetland.

Table 1 – Summary of critical ecosystem components at Mungilli Claypan.

Component	Summary description
Geomorphology	Irregular claypan situated in the Gibson Desert, characterised by vast, undulating sandplains and lateritic gibber plains
Hydrology	Perched wetland reliant on surface water flow following heavy rain
Water Quality	Fresh, turbid; no quantitative data available - wetland was dry at time of IAI RCM survey
Vegetation	Almost devoid of littoral vegetation, other than occasional grasses and herbs in dry phase
Aquatic invertebrates	No data available - wetland was dry at time of IAI RCM survey
Fish	No data available - wetland was dry at time of IAI RCM survey
Waterbirds	No data available - wetland was dry at time of IAI RCM survey
Terrestrial Vertebrates	Eight species of reptile

3.1. Geology and Soils

Mungilli Claypan lies on Quaternary lacustrine sediments of clay, silt, sand, gypsum and halite with aeolian gypsum and quartz sand marginal to the claypan. The soils surrounding the wetland consist of quartz sand, rock fragments, clay and silt (colluvium, minor alluvium), with areas of white claystone with minor silty and sandy claystone over thin-bedded to laminated, bioturbated micaceous siltstone, claystone and sandstone (Kls) (DME 1974).

3.2. Hydrology

Mungilli claypan is a perched wetland, isolated from groundwater interaction by the limited permeability of its clay substrate. It is entirely surface water fed and receives inputs from a number of short creeks and direct precipitation.

3.3. Water Quality

Water quality parameters were not measured at Mungilli Claypan during the 2008 IAI RCM survey, as the wetland was dry at the time. There is no record of previous water sampling at the claypan.

3.4. Vegetation

The vegetation of the Gibson Desert has a distinct association with landscape and soil type. The lateritic "gibber" plains are characterised by mulga parkland over grasslands of hard spinifex (*Triodia basedowii*). Dunefields and red sand plains are dominated by a mixed shrub steppe of acacia, hakea and grevillea over soft spinifex (*T. pungens*) grasslands. The lateritic upland areas consist of scrub steppe in the north and mulga scrub in the south. The palaeodrainage and associated Quaternary alluvium support coolibah woodlands over bunch grasses (Thackway and Cresswell 1995).

The bed of Mungilli Claypan was almost devoid of vegetation (Figure 5) and, as such, a vegetation transect was not established. The soil was completely dry at the time of survey (Table 2). *Eragrostis australasica* tall isolated grasses were scattered across the claypan (Figure 6). The only other vegetative cover across the claypan basin was occasional clusters of herbs and grasses (Figure 4). Plant taxa recorded within these clusters included (in alphabetical order): *Atriplex semilunaris*, *Calotis plumulifera*, *Enneapogon cylindricus*, *Eragrostis dielsii*, *Gnephosis brevifolia*, *Lepidium muelleri-ferdinandii* and *Portulaca* sp.

Figure 4 – Cluster of annual herbs growing on the Mungilli Claypan floor.

Figure 5 – Sparsely scattered vegetation at the dry Mungilli Claypan.

Figure 6 – *Eragrostis australasica* isolated grasses at Mungilli Claypan.

The overall community condition was considered 'natural/impacted' (Table 4 in Appendix 1) with heavy camel trampling and grazing evident in some parts of the claypan.

Sand dunes form a distinct boundary around Mungilli Claypan (Figure 7). The vegetation of this fringing zone was dominated by open woodland with *Eucalyptus victrix* growing at the base of the dune and *Acacia aneura* occupying a more elevated habitat. Shrubs formed a sparse mid stratum on the fringing dunes, with taxa recorded including *Chenopodium nitrariaceum*, *Ptilotus obovatus* subsp. *obovatus*, *Melaleuca interioris*, *Senna artemisioides* subsp. *filifolia*, *S. artemisioides* subsp. *helmsii*, *S. artemisioides* subsp. x *sturtii* and *Solanum lasiophyllum*. The perennial grasses *Triodia schinzii*, *Aristida contorta* and *Enneapogon cylindricus* were the dominant taxa of a sparse ground cover.

According to the National Vegetation Information System (NVIS), the vegetation community may be described as (ESCAVI 2003):

M1+ ^*Eragrostis australasica*\grass\3\bc.

Figure 7 –Vegetation of the fringing dunes of Mungilli Claypan dominated by *Eucalyptus victrix.*

Table 2 – Site attributes at Mungilli Claypan (no vegetation transect was established).

Wetland state			Dry
Soil state (%)		dry	100
		waterlogged	0
		inundated	0
Substrate (%)	Observed	bare	95
		rock	0
		cryptogam	0
		litter	0
		trash	0
		logs	0
	Expected	bare	95
		rock	0
		cryptogam	0
		litter	0
		trash	0
		logs	0
Time since last fire			no evidence
Community condition			Natural/impacted
Upper Stratum		Cover (%)	-
		Height (m)	-
Mid Stratum		Cover (%)	<2
		Height (m)	<1.5
Ground Cover		Cover (%)	<2
		Height (m)	<0.1

3.5. Aquatic Invertebrates

Aquatic invertebrates were not collected from Mungilli Claypan during the IAI RCM survey, as the wetland was dry at the time. There is no record of previous invertebrate sampling at the claypan.

3.6. Fish

No fish were observed at Mungilli Claypan during the IAI RCM survey, as the wetland was dry at the time. There are no previous records of fish at the claypan.

3.7. Waterbirds

No waterbirds were observed at Mungilli Claypan during the IAI RCM survey, as the wetland was dry at the time. However, birdlife is known to occur at the wetland after rain (DEHA Undated).

3.8. Terrestrial Vertebrates

No evidence of native terrestrial fauna was observed at Mungilli Claypan during the 2008 IAI RCM survey. However, there was significant evidence of feral camel presence.

Notaden nichollsi (Desert Spadefoot) is the only amphibian recorded at the site, while eight species of reptile have been recorded within the nature reserve.

The wildlife of the Gibson Desert area includes red kangaroo (*Macropus rufus*), emu (*Dromaius novaehollandiae*), greater bilby (*Macrotis lagotis*), bush stone-curlew (*Burhinus grallarius*), thorny devil (*Moloch horridus*), and the perentie (*Varanus Giganteus*) - the largest goanna in Australia (Anonymous Undated). The Gibson Desert bioregion has a significant population of striated grass wren (*Amytornis striatus*) (DEWHA 2009).

4. Threats to the Ecology of Mungilli Claypan

The aim for management at Mungilli Claypan is to maintain those elements of the ecology that make it a characteristic freshwater claypan of the arid interior. The critical components of the ecology are the geomorphologic and hydrologic factors that allow the claypan to periodically fill with fresh water. These factors will exert a strong influence on the biota that inhabit or visit the claypan. Also of importance, are the elements of the system that contribute to its cultural and scientific value.

Threats to Mungilli Claypan must be considered in relation to their likelihood of causing failure of the above management goal for the lake. An assessment of each threatening process was conducted to assess the probability that goal failure would result as a consequence of each particular threatening process. The results of this assessment are presented in Table 3. In summary, failure to achieve the management goal for Mungilli Claypan is most likely to result due to the impacts of feral animals, particularly camels.

The impacts of feral animals is recognised as a significant threatening process in the entire Gibson Desert region (DEWHA 2009). Herbivores, principally camels and, until recently, rabbits, impact on a range of vegetation in the desert (Woinarski *et al.* in prep). Some parts of the claypan were heavily impacted by camels. Cats and foxes also occur widely over the bioregion and will probably impact on fauna at the site (Woinarski *et al.* in prep).

The Gunbarrel Highway passes through the southern portion of Mungilli Claypan. It appears that an attempt was made to bypass the claypan when the road was originally constructed. However, the extent of inundation was underestimated (Figure 2). When the wetland is dry, vehicles pass through the claypan. When water is retained in the claypan, vehicles detour around the southern boundary of Mungilli Claypan to avoid bogging. This does not appear to be having a deleterious effect on the site, but should be monitored.

Climate change is also a potential threatening process. Temperature has been rising in Western Australia by about 0.1 ˚C per decade since 1910 and this trend is expected to continue. Annual

rainfall is also expected in increase in inland Australia, mainly due to an increase in the frequency of extreme rainfall events. It is possible that an increase in heavy rainfall events could result in more frequent and longer periods of inundation of Mungilli Claypan. It is unclear how this change may affect the ecology of the claypan.

Table 3 – Threat assessment for Mungilli Claypan.

An estimate is provided of the perceived likelihood of goal failure resulting from the impacts of each identified threat category.

Goal: to maintain the geomorphology and hydrology of Mungilli Claypan, thus ensuring it remains a suitable drought refuge for fauna and flora, and retains its cultural and scientific values.

Threat category	Management issue	Probability (%) that threat will cause goal failure with:		Assumptions underlying initial probability assessment and explanatory notes
		Existing management	Extra management	
Altered biogeochemical processes	Hydrological processes, particularly salinity	0	0	There is no evidence of alteration to the hydrology of Mungilli Claypan, nor does there appear to be any likelihood of any alteration in the foreseeable future.
	Carbon cycle and climate change	1	1	Temperature and annual rainfall are both expected to increase in the WA interior. Extreme rainfall events are also expected to be more frequent. This may result in longer and more frequent inundation of Mungilli Claypan. The impacts of climate change are unclear and difficult to predict, particularly as there are presently no hydrological data available for the wetland.
Impacts of introduced plants and animals	Environmental weeds	0	0	There was no evidence of weeds at Mungilli Claypan.
	Herbivory, wallowing and trampling by introduced species	15	5	Evidence of heavy grazing by camels. Trampling of vegetation was also evident. Soil disturbance in the catchment may lead to deposition of sediments in the claypan.
Impacts of problem native species	Overgrazing by native species	0	0	No impacts evident.
Impacts of disease	Plant pathogens	0	0	No impacts evident.
Detrimental regimes of physical disturbance events	Fire regimes	0	0	Mungilli Claypan is mostly devoid of vegetation. As such, fire is unlikely to affect it.
	Drought	0	0	Climate change projections for inland Australia show an increase in rainfall. Further, as a claypan in the Gibson Desert, the ecology of Mungilli Claypan is adapted to prolonged periods of aridity. Therefore, drought is unlikely to affect the wetland.
	Flood	0	0	Flooding is a natural part of the ecosystem and is unlikely to have detrimental impacts.

Threat category	Management issue	Probability (%) that threat will cause goal failure with:		Assumptions underlying initial probability assessment and explanatory notes
		Existing management	Extra management	
Impacts of pollution	Herbicide, pesticide or fertiliser use and direct impacts	0	0	There are no agricultural activities occurring near Mungilli Claypan.
Impacts of competing land uses	Recreation management	1	0	The Gunbarrel Highway passes through the southern portion of Mungilli Claypan. When the wetland is dry, vehicles pass through it. When water is retained in the claypan, vehicles detour around the southern boundary of Mungilli Claypan to avoid bogging. This does not appear to be having detrimental impacts on the claypan, but may require ongoing monitoring.
	Nutrient enrichment of water body	0	0	No evidence of any threat.
	Urban and industrial development	0	0	Mungilli Claypan is located in a remote area with a very low population density, making urban or industrial development unlikely.
	Consumptive uses	0	0	Any consumptive use of Mungilli Claypan by local Aboriginal people is most probably sustainable in the long term due to the small number of people involved.
	Illegal activities	0	0	No evidence of any threat.
	Mines and quarries	0	0	No mining or proposals in near vicinity.
Insufficient ecological resources to maintain viable populations	Habitat, genetic exchange	0	0	Mungilli Claypan is well connected to extensive areas of natural or near-natural environment. Populations are likely to self-supporting in this setting. Assuming migratory waterbirds utilise the wetland, off-site impacts could potentially reduce their population size to unsustainable levels, but this could not be addressed at a site level.

5. Knowledge Gaps and Recommendations for Future Monitoring

Mungilli Claypan was dry at the time of the 2008 IAI RCM survey and has not been previously surveyed for water quality, waterbirds or aquatic invertebrates. As a result, there are significant data gaps pertaining to almost all areas of the wetland's ecology. Limited data have been collected on the vegetation at Mungilli Claypan. Further surveys, at different times of the year and when the claypan is inundated, would be useful to ensure all species have been recorded.

These are significant knowledge gaps that can be rectified with additional surveys when the claypan is inundated. Surveys would need to be opportunistic and reactive to rainfall to capture the wetland's hydrological cycle. This should ensure the full suite of aquatic invertebrates and waterbirds are recorded, and that trends in water quality and regime are identified. Uncertainties also exit regarding the potential effect of climate change on Mungilli Claypan's ecology.

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Appendix 1 – Vegetation Condition

Table 4 – Overall Vegetation Community Condition Rating as adapted from Thackway and Lesslie (2005). Shading indicates the condition of Mungilli Claypan.

Overall Community Condition Rating					
	0	1	2	3	4
	RESIDUAL BARE	**NATURAL**	**IMPACTED**	**DEGRADED**	**REMOVED/REPLACED**
Community Condition Class	Areas where native vegetation does not naturally persist	Native vegetation community structure, composition and regenerative capacity intact - no significant perturbation from land management practices	Native vegetation community structure, composition and regenerative capacity intact but perturbed by land management practices	Native vegetation community structure, composition and regenerative capacity significantly altered by land management practices	Species present are alien to the locality and either spontaneous in occurrence or cultivated. Alternatively, vegetation may have been removed entirely
Regenerative Capacity	Natural regenerative capacity unmodified - ephemerals and lower plants	Regenerative capacity intact. All species expected to show regeneration are doing so	Natural regenerative capacity somewhat reduced, but endures under current/past land management practices	Natural regenerative capacity limited and at risk due to land management practices. Rehabilitation and restoration possible through removal of threats	Regenerative potential of native vegetation has been suppressed by ongoing disturbances. There is little potential for restoration
Vegetation Structure	Nil or minimal	Structural integrity of native vegetation is very high. All expected strata, growth forms and age classes are present	Structure is altered but persists, i.e. some elements of a stratum are missing	Structure of native vegetation is significantly altered, i.e. one or more strata are missing entirely	All structural elements of native vegetation are missing or highly degraded
Vegetation Composition	Nil or minimal	Compositional integrity of native vegetation is very high. All species expected at the site are present	Composition of native vegetation is altered. All major species are present, although proportions may have changed. Some minor species may be missing	Significant species are missing from the site and may have been replaced by opportunistic species. Loss of species affects structure of vegetation	Native vegetation removed entirely +/- replaced with introduced species

Appendix 2 – Herbarium Plant Records

Table 5 – Herbarium Records for Mungilli Claypan.

Search Coordinates: NW corner -25.2666°S, 124.1707°E; SE corner -25.5063°S, 124.4°E

Family	Species	Alien	Cons. Status
Acarosporaceae	*Acarospora citrina*		
Aizoaceae	*Trianthema triquetra*		
Asteraceae	*Calocephalus* sp. Pilbara-Desert (M.E. Trudgen 11454)		
	Calotis plumulifera		
	Gnephosis brevifolia		
	Rhodanthe propinqua		
Brassicaceae	*Lepidium muelleri-ferdinandii*		
	Menkea sphaerocarpa		
	Menkea villosula		
Bryaceae	*Bryum argenteum*		
Chenopodiaceae	*Chenopodium gaudichaudianum*		
	Chenopodium nitrariaceum		
	Maireana integra		
	Maireana tomentosa subsp. *tomentosa*		
	Sclerolaena cornishiana		
	Sclerolaena diacantha		
	Sclerolaena eriacantha		
Elatinaceae	*Bergia perennis* subsp. *obtusifolia*		
Lamiaceae	*Dicrastylis exsuccosa*		
Lobeliaceae	*Lobelia heterophylla*		
Mimosaceae	*Acacia paraneura*		
	Acacia subcontorta		
	Acacia tetragonophylla		
Myoporaceae	*Eremophila latrobei* subsp. *glabra*		
	Eremophila latrobei subsp. *latrobei*		
	Eremophila platythamnos subsp. *exotrachys*		
Myrtaceae	*Eucalyptus intertexta*		
	Eucalyptus victrix		
Papilionaceae	*Kennedia prorepens*		
Poaceae	*Eragrostis australasica*		
	Triodia schinzii		
Psoraceae	*Psora crystallifera*		
Rubiaceae	*Synaptantha tillaeacea* var. *tillaeacea*		
Santalaceae	*Santalum lanceolatum*		
Sapindaceae	*Diplopeltis stuartii*		
	Diplopeltis stuartii var. *stuartii*		
Zygophyllaceae	*Tribulus suberosus*		

Plant specimens submitted to the Western Australian Herbarium:

Gnephosis brevifolia (RCM018-01)
Melaleuca interioris (RCM018-14)

Appendix 3 – Aboriginal Heritage Records

Aboriginal Sites within Mungilli Claypan Nature Reserve

Government of Western Australia
Department of Indigenous Affairs

Aboriginal Heritage Inquiry System

Register of Aboriginal Sites

Department of Indigenous Affairs

Search Criteria

3 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 51	
Northing	Easting
7188090	623828
7194388	631448

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

Copyright

Legend

Restriction

N	No restriction
M	Male access only
F	Female access

Access

C	Closed
O	Open
V	Vulnerable

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[Unreliable	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status

L	Lodged
I	Insufficient Information
P	Permanent register
S	Stored data

IR	Insufficient Information (as assessed by Site Assessment Group)
PR	Permanent register (as assessed by Site Assessment Group)
SR	Stored data (as assessed by Site Assessment Group)

Site Assessment Group (SAG)

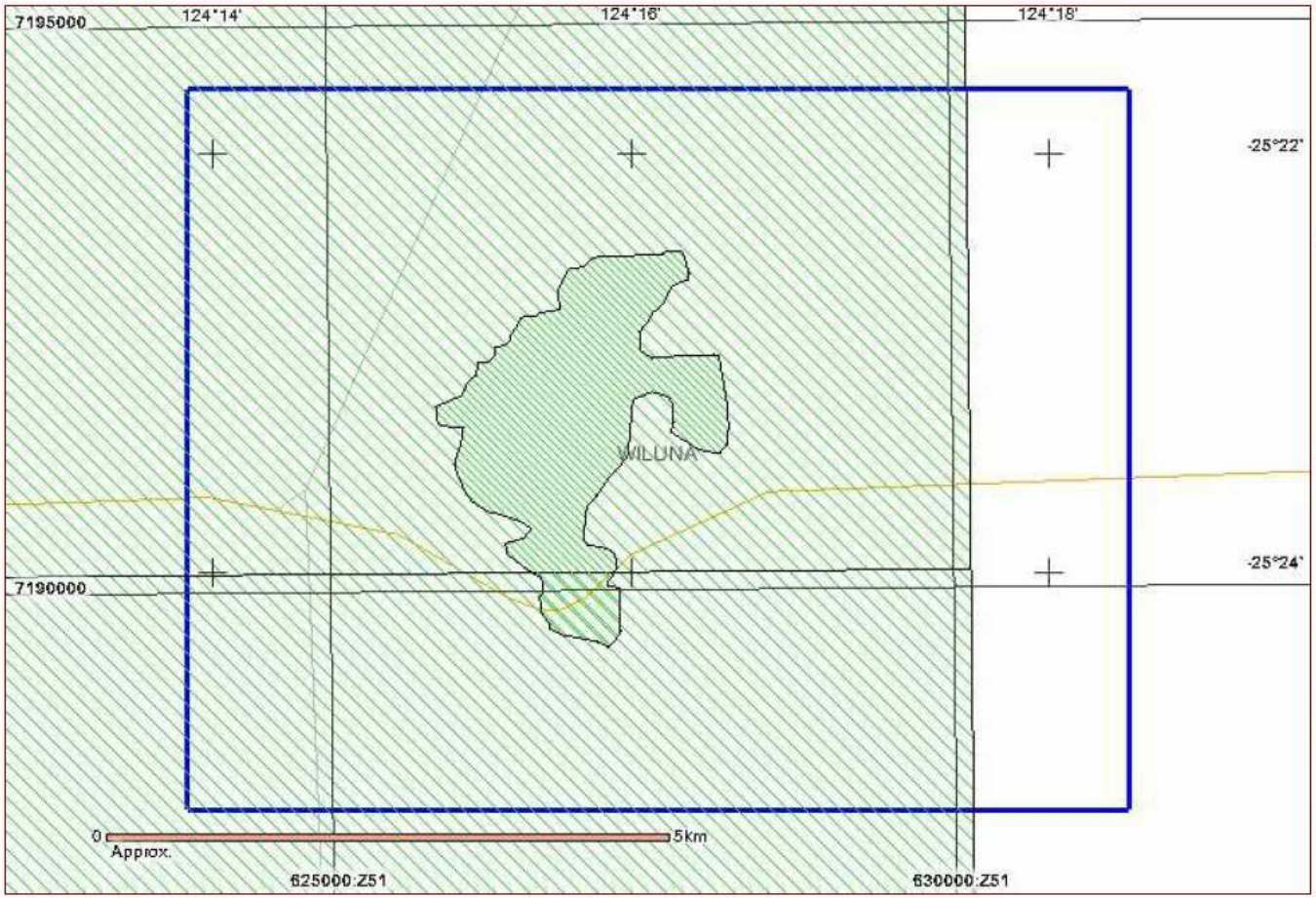
Sites lodged with the Department are assessed under the direction of the Registrar of Aboriginal Sites. These are not to be considered the final assessment.

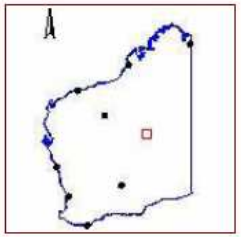
Final assessment will be determined by the Aboriginal Cultural Material Committee (ACMC).

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
2751	P	O	N	Kurtaparu Claypan.	Mythological	[Other: CLAYPAN]		627027mE 7191254mN Zone 51 [Reliable]	W00456
2753	P	C	N	Mungili	Mythological			Not available for closed sites	W00458
2758	P	C	N	Yulkapatjunkulantja Hill.	Ceremonial, Mythological, Quarry, Artefacts / Scatter	Meeting Place, Camp		Not available for closed sites	W00463





Legend

- Highlighted Area
- Town
- Map Area
- Search Area