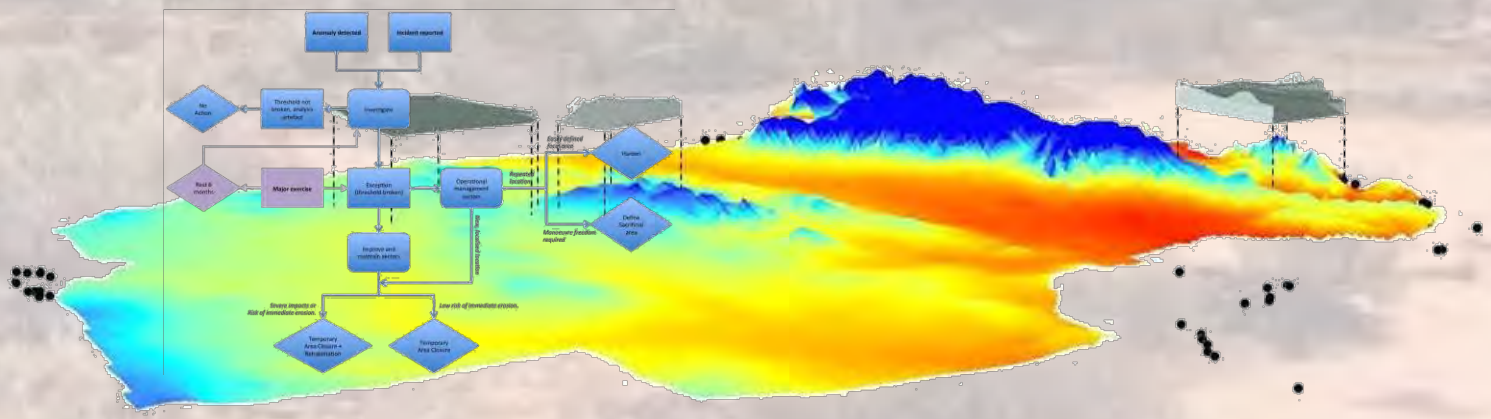
Australian Government

Department of Defence

Estate and Infrastructure Group

CULTANA ENVIRONMENTAL MANAGEMENT SYSTEM: (2) ENVIRONMENTAL MANAGEMENT PLAN



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Cultana Environmental Management System: (2) Environmental Management Plan

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Contents

Figures

Tables

List of Acronyms

ADF	Australian Defence Force
AHMP	Aboriginal Heritage Management Plan
APZ	Asset Protection Zone
BMP	Bushfire Management Plan
BoM	Bureau of Meteorology
BONS	Biosecurity and Overabundant Native Species
CEA	Cultana Expansion Area
CFS	Country Fire Service
CHL	Commonwealth Heritage List
CRAT	Contamination Risk Assessment Tool
CSR	Contaminated Site Register
CUTA	Cultana Training Area
DAF	Dissolved Air Flotation
DFSW	Direct Fire Support Weapons
DOTAM	Director of Operations and Training Area Management
EBCR	Environmental Baseline Condition Report
EF	Environmental Factor
EFR	Environmental Factor Record
EMP	Environmental Management Plan
EMS	Environmental Management System
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPA	Environmental Protection Agency
FOG	Fats, Oils and Greases
GAFLC	Government Agencies Fire Liaison Committee
GEMS	Garrison and Estate Management System
Ha	Hectare
HETA	High Explosive Target Area
IAW	In Accordance With
MLDP	Miscellaneous Lease for Defence Purposes
NWQMS	National Water Quality Management Strategy
OCE	Officer Conducting the Exercise
OIC	Officer in Charge
PER	Public Environment Report
POL	Petroleum Oils and Lubricants
RCO	Range Control Officer
RTAM-SA	Range Training Area Management – South Australia
SA	South Australia
SAAL NRMB	South Australian Arid Lands Natural Resources Management Board
SAFFA	South Australian Firebreaks Fire Access and Fire Signs Standards
SMRP	Sustainability Monitoring and Reporting Plan
SoE	State of the Environment
TA	Training Area
TAC	Temporary Area Closure
TAOA	Training Area Operational Authority
TAMA	Training Area Management Authority
TASMIS	Training Area Safety Management Information System
TAVFF	Temporary A Vehicle Field Firing Range
TPCSDS-T	Target Practice, Cone Stabilised, Discarding Sabot – Tracer
TP	Target Practice
UST	Underground Storage Tank
UXO	Unexploded Ordnance

1.0 Plan outline

1.1 Goals, principles and purpose

1.1.1 Goals

This Environmental Management Plan (EMP) implements the framework of systems and processes outlined in the EMS System Description (CUTA EMS (1)). The goals of this document are to support or wholly implement four goals of the wider EMS:

1. Support integrated management of the environment across freehold and leasehold portions of CUTA.
2. Facilitate a transition towards on-system data recording, decision-making and recording, by providing a model for sourcing and implementing core management data into an integrated environment that accounts for general site management requirements.
3. Ensure that actions and information arising from planning and operations are generated in a form that is available to relevant personnel and processes.
4. Empower training area and environment managers to make environmentally justified risk-management decisions regarding conduct of training serials with the potential to impact the environment.

The EMP has additional goals relating to the specific management of the broad range of environmental matters covered in the plan. These arise from assessing the legal and policy requirements across the various factors and land use requirements for the site. *Goals 5-9 are listed in priority order*:

5. Protect human life through management of bushfire, weed and other environmental hazards
6. Protect key environment and heritage values from impacts of Defence activities
7. Maintain the broadest possible range of opportunities for Defence activities
8. Wherever possible maintain or improve the overall condition of environmental values present at the time of Defence acquisition
9. Wherever possible manage the landscape for all its constituent parts irrespective of their legal status

1.1.2 Principles

To address the management goals above, and provide some additional context, some general principles have guided decision-making in the EMP. The first is *recognising the land as a resource*. CUTA was managed for its pastoral resources for more than a century. Defence purchased pastoral holdings because the land spaces they contained provide important opportunities for military training. Management choices must reflect the ongoing requirements for military access to the land, and allow the fullest possible utilisation of the land. However, like any resource, over-exploitation could result in loss through legal or physical access constraints and lost opportunities. Management regimes must therefore ensure demonstrable controls are in place to avoid over-exploitation. CUTA is also a *public asset*. As a government agency, Defence actions must reflect the interests of the public it serves. The

public of Australia and South Australia expect Defence to manage CUTA to ensure long-term sustainability of its environmental values, and to preserve its utility for Defence practice. There is also an expectation that, where possible CUTA, will be managed as part of the broader pastoral landscape that surrounds the property, and not as an isolated holding with incompatible land use agendas. CUTA is also under *joint custodianship*. Large parts of CUTA are leasehold land over which native title exists and Defence will engage with aboriginal people in managing the site, particularly with respect to their values and beliefs about important locations.

1.1.3 Purpose

This EMP has a specific role within the broader CUTA and Defence EMS. Management frameworks and discussion of matters covered in CUTA EMS (1) are not repeated in this EMP unless a specific management decision relates to them. The EMP is designed to provide the site-specific information required by managers to effect actions and controls that meet the relevant EMS goals. Much of this information is detailed in existing documents. Where the data, results, outcomes or proposed management of an existing plan are still relevant to the site, the EMP references that information and summarises directly relevant information or management processes. Data and management processes or prescriptions that require updating are explicitly detailed, along with the rationale for changes.

The EMP describes the management objects that populate the management system. This includes the technical description of on-system information pertaining to EFs, and the off-system management decisions that support transactions against those factors such as preliminary risk assessments (in lieu of on-system functionality being available to perform risk assessments), treatments, monitoring and performance descriptions of management actions. The EMP does not duplicate doctrinal controls, RSOs, impact assessment processes and other parts of the Defence EMS that already provide suitable management of an EFR unless there is a specific reason to do so. Generally a performance outcome is specified instead of specific treatment methods. Defence land management relies on a contracted solution that promotes rapid adoption of improvement through allowing the long-term service provider, Broadspectrum, to use the most effective method available to them at a point in time to achieve the desired outcome.

In order to achieve goal 9 of the EMP *Wherever possible manage the landscape for all its constituent parts irrespective of their legal status* the proposed management actions on CUTA are hierarchical, with landscape-level management providing umbrella management for all matters, as well as more targeted management issues such as threatened species or pest management. Other plans directly interact with each other. For example, management of vegetation modifies soil erosion, which directly interacts with runoff management and may have flow on effects for dust management. Figure 1 shows a simplified view of the hierarchical relationships between plan sections.

1.2 Plan contents and structure

The EMP is presented in three sections; whole-of-site programs, environmental factor management and the sustainability monitoring and reporting program. Most EFR sections are as short as possible to reflect the trial change in approach to management of those factors.

However, some additional requirements are necessary for bushfire and heritage management plans, and Defence templates are followed for those EFRs.

Whole-of-site programs

Experience from Defence training at CUTA has clearly highlighted vehicle impacts on vegetation are the main impact that Defence use of the site will have. Without ongoing management, even the additive effects of multiple periods of lower-level training can still create areas of heightened impact. Risk of erosion, dust impacts, sedimentation of waterways and other secondary impacts all reduce sustainability of the site through loss of physical area available for training and loss of social licence to operate if the site becomes too degraded. However, there is also good evidence from CUTA that the site is surprisingly resilient, and has a reasonable capacity to recover following disturbance given sufficient periods of time (section 9). Like grazing impacts, vehicle impacts are manageable. Because vehicle activities occur across the site, and potential impacts of those activities relate to EFs that underpin the entire ecosystem (soil and vegetation), the processes of management, monitoring and rehabilitation of vegetation are cross-cutting and support the attainment of the overarching EMP goals, while negating the need for many lower-level management actions for specific EFs. The monitoring program employed for vehicle impacts on vegetation also provides opportunity to understand any changes in the distribution of weeds and other matters. For these reasons, the vegetation management program (Section 2.2) is considered a whole-of-site program and described separately to the specific EF management sections (3-9).

Thousands of flora and fauna records are available for CUTA (Section 3.1). This means that there are limited requirements for further survey work. However, some species have been identified that may plausibly occur on CUTA, but have not been detected. One potential reason is the lack of targeted surveys for those species. A series of survey targets have been identified in the discovery program. Like the vegetation management program, this program applies across the site and has the potential to detect and inform management of any EF.

Environmental Factor Management

Each EF is treated in a section that summarises the location, management and monitoring of specific EFRs representing the occurrences and risks associated with a particular EF.

Figure 1. Relationship between EMP sections.
Plans shown at a higher level provide umbrella benefits across lower level plans. Close interactions between plans are shown as clusters. Those plans with key shared risks that fall at the same level are shown touching.

Sustainability Monitoring and Reporting Plan (SMRP)
The SMRP builds on a subset of monitoring indicators highlighted in each section that directly inform the long-term sustainability of the site. These indicators identify risks that, if realised, represent a plausible threat to the long-term sustainability of the site and its capacity to support Defence activities. These indicators each have defined thresholds that if exceeded (causing an "exception" in GEMS terms) reactive decision making processes are invoked to address the exception. Periodic reporting of how and when exceptions occur, and what decisions and actions resulted from the exception, is a key EMP output that informs revision of site management processes and assessment of site use. The SMRP reporting template provided in section 10 is an annual review point for the site, and will build to a comprehensive long-term data set informing the adaptive management of CUTA. In addition to information that can be taken directly from GEMS each year, there are some additional synthetic and qualitative assessments that provide an additional record of environmental management recommendations and lessons learned for the site.

1.3 Plan Review Process

Using GEMS to hold and manage EFRs, the EMP is intended to be continually evolving through the capacity to adapt to changing circumstances such as new legal obligations or discovery of new EFs. Such changes are not considered to represent "revision to the management plan" triggering a requirement to seek the Commonwealth Minister for Environment's approval under condition 20 of the EPBC Act approval (EPBC 2010/5316).

The Miscellaneous Lease for Defence Purposes (MLDP) (Clause 9.5.1) prescribes a review of the implementation of the EMP every second and fourth year after the signing of the MLDP. The SMRP report form will form the backbone of conducting that process. This review can be achieved by generating reports from within GEMS regarding processes such as generation of works requests, incident reports and new risks against EFRs and the success of expenditure via monitoring indicators.

The EMP will continue to evolve in accordance with the reporting and management feedback responses as presented in Figure 2. Some areas will also evolve as design solutions become known and/or are in place for major new infrastructure works. The initial two-year review period will allow further improvements of the plan, and also preliminary assessment of its efficacy in managing impacts of large exercises planned for early–mid 2016.

Management objectives for each sector are outlined in Section 1.4. These arise from management decisions documented in later plan sections and should form the basis against which implementation of the plan for long-term sustainability of the site is assessed. Some outcomes of year 2 and 4 reporting may require a revision of the plan. However, the over-arching vegetation monitoring program and other high-level monitoring events should be linked to the prescribed five-yearly review that must occur under the MLDP clause 9.6. This requires external review of the EMS and will be the primary means that will establish the currency of the plan and it contents, and the success of its prescriptions. Five yearly reviews of the EMP should take the form of updated EFRs and recommendations for on-system changes to already defined management programs and monitoring prescriptions. Minimal documentation highlighting the required changes and decision-making processes that resulted in the required changes should be the target output of that review.

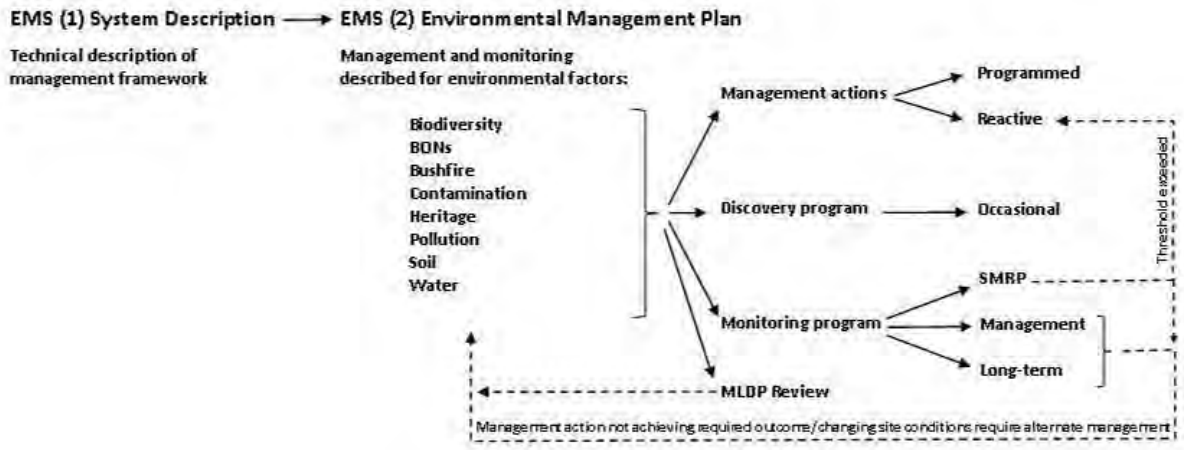


Figure 2. Management plan components and their role in EMS management and review process. Contents of CUTA EMS (2) are prepared in accordance with the overarching framework described in CUTA EMS (1). Each EFR has actions described against it including management actions and a monitoring process. Survey priorities to fill key knowledge gaps are combined into an overarching discovery program. The monitoring program consists of streams of monitoring that provide different sorts of feedback; some that inform, or potentially trigger, management plan review, and others within the SMRP that may trigger an immediate reactive management action when a sustainability threshold has been exceeded. The discovery program may reveal the presence of new species not taken into account by existing management, which may require creation of new EFRs and application of management contingencies from the current plan.

1.4 Sector descriptions and management objectives

1.4.1 Sector descriptions and key features

CUTA is divided into 23 sectors for management purposes (Figure 3). This includes conduct of military and civilian activities and some land management prescriptions. In order to support goal (1) of this EMP *"Support integrated management of the environment across freehold and leasehold portions of CUTA"* these sectors provide the units of discussion for land areas throughout the EMP. Sectors currently fall within four tenure types. El Alamein Camp and sectors A-N are freehold Commonwealth land barring a small area of coastal reserve leased from the South Australian Government. Sectors O- T and Y are leased from the South Australian Government under the Miscellaneous Lease for Defence Purposes (MLDP). All these sectors are potentially available for Defence training in accordance with controls described in Range Standing Orders and are a gazetted Defence practice area. Sector X is leased from the SA government but is not yet covered by the MLDP. It is anticipated that this area will be included within the MLDP lease in the future.

Three landforms, plain, plateau and rocky hills, typify CUTA and to some extent determine the suitability of different sectors for certain activities. A relatively narrow coastal plain in the east is backed by a steep scarp bounding the Simmens Plateau. Plains dominate sectors west of the plateau. Eroded, rocky hills of the Mt Whyalla complex dominate the northeast of sector O and intrude into Y and S. Rocky hills also occur as the Douglas hills in the east of sector I. The Lincoln Highway runs north-south through sector Y and separates the training area into two main sections. The Lincoln Highway corridor also contains the railway and water supply pipe to Whyalla. A parallel underground gas pipeline runs slightly further to the east and another two cross sectors L and M. A civil aviation corridor follows the highway. High voltage powerlines cross several parts of the site, and a power substation is located west

of the Lincoln Highway near the southern boundary of Y. Easements and leases for extraction of sand and gravel products are located along creek lines in sectors P, Q and Y. An active mine is located in the far south of sector S. The University of Adelaide Middleback Research Station has an easement through sector P to a small lease around the field station. Each of these features has a limiting effect on how Defence can use these sectors.

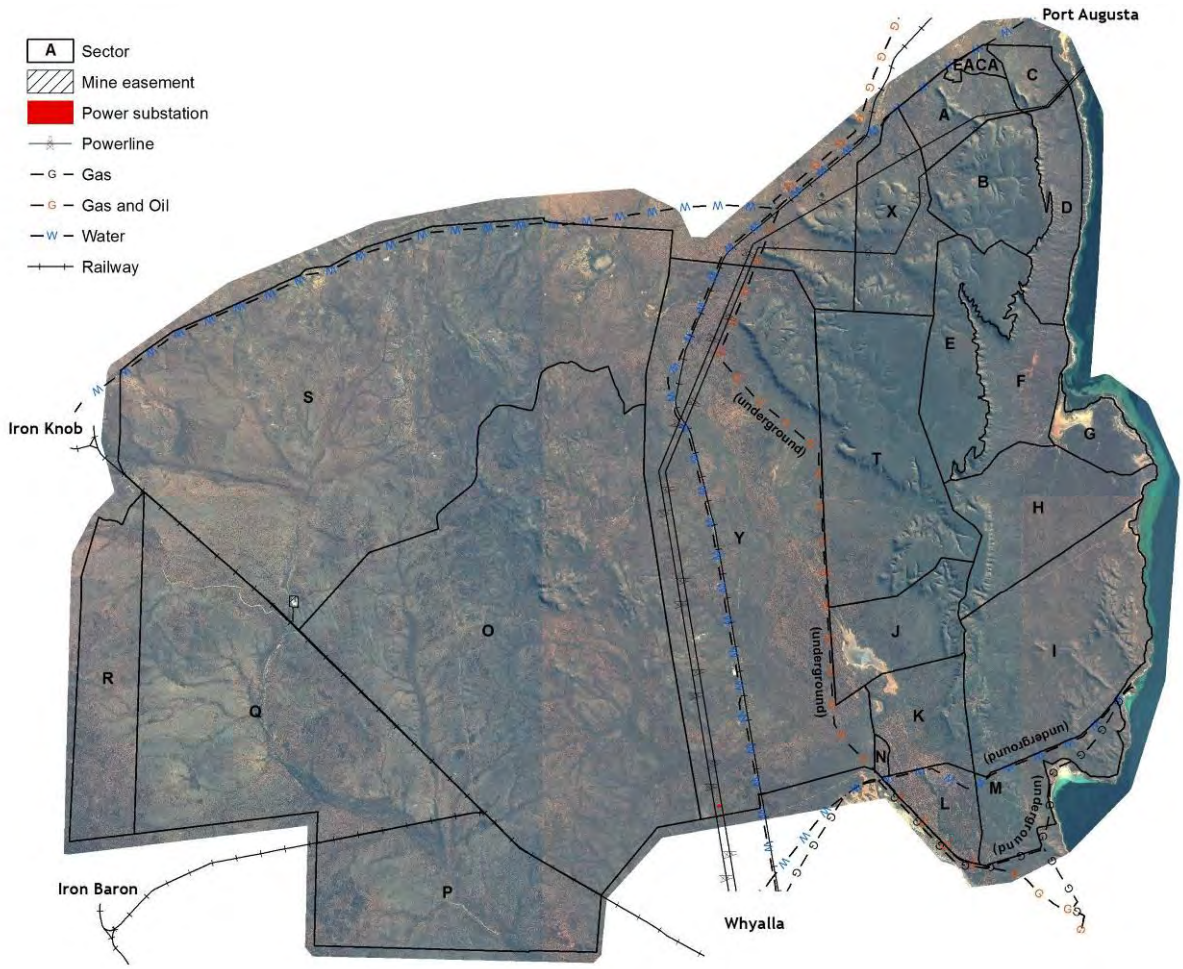


Figure 3. CUTA Sectors and main service easements.

1.4.2 Management objectives

Under Defence management, the environment of CUTA will inevitably change from its baseline state as sheep grazing country. Although CUTA is almost entirely dominated by native vegetation, weeds and introduced animals have a significant presence across the site, and vegetation communities and their current condition are the result of more than a century of grazing from stock and pest species (Figure 4 & Figure 5). General experience at other Australian sites is that many areas of native vegetation will improve in condition under Defence management, and the overall site is expected to revert towards a state closer to a natural condition. However, Defence use will necessarily also entail impacts that mean large areas will remain in an essentially managed state. Some restricted areas will be subjected to intensive impacts. The balance required of this management plan is to recognise, minimise and responsibly manage necessary intensive impacts while ensuring broadacre management

of lower level impacts such that the site as a whole possesses equivalent or better environmental values in 100 years than it does today.

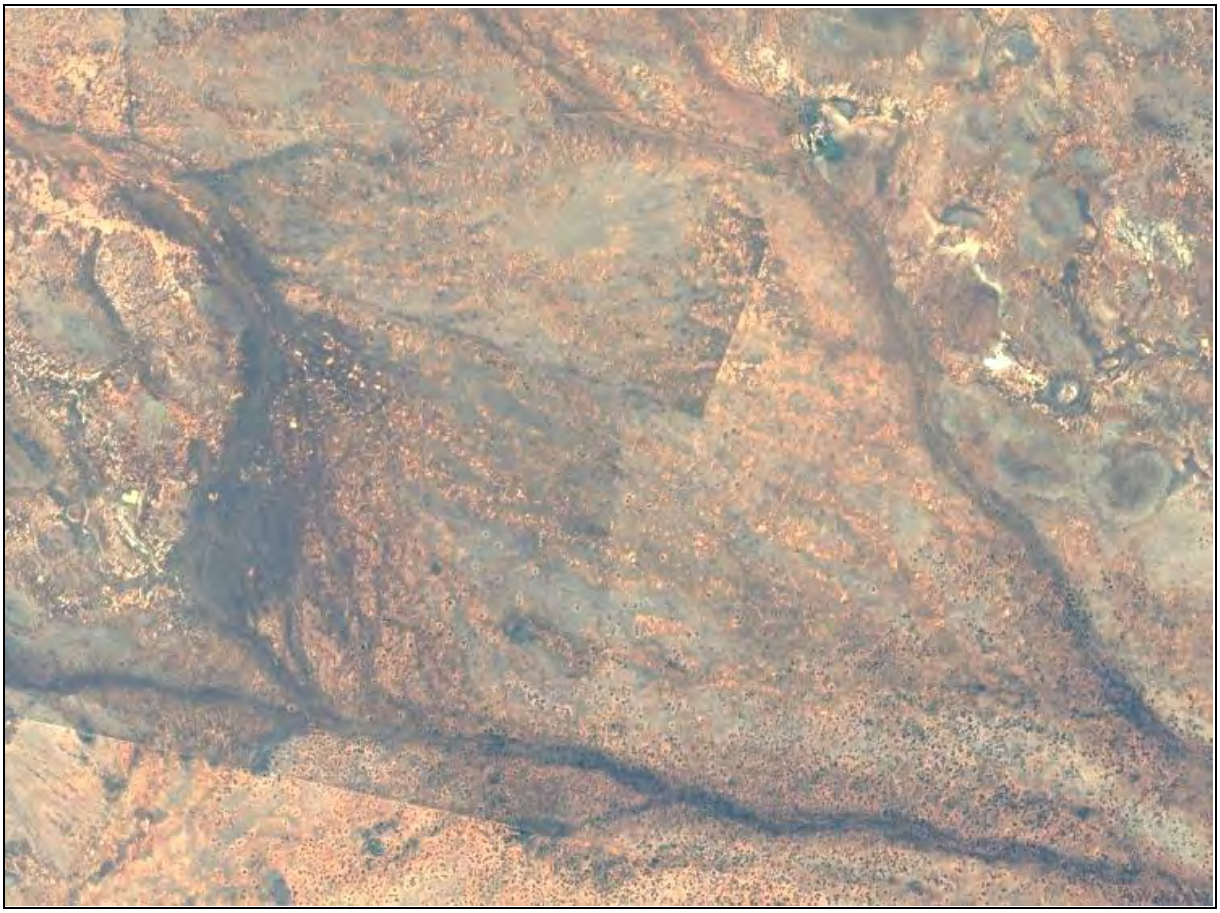


Figure 4. Grazing impacts.
These large-scale impacts are clearly evident in this image from sector S where fence lines delineate differing vegetation characteristics due to differences in grazing pressure, including degraded vegetation in areas such as the southwest of the image.

Figure 5. Severely overgrazed paddock in 2004 not long after grazing was stopped in 2003 in parts of eastern CUTA.

The key challenge in developing management prescriptions for CUTA is the highly variable ecosystem. Management actions and impacts can have very different outcomes based on the degree of recent rainfall and cumulative effect of preceding and future seasons. This drives a heightened need for active monitoring of impacts or rehabilitation when compared to more stable sites where the desired outcome may be reliably achieved within a prescribed period of time. In order to focus how and where such actions should occur the probable Defence use of each sector has been considered over the foreseeable future. In support of the EMP goals, each sector has been attributed an overall management goal with respect to environment, using vegetation condition as a proxy, either 'operational management' or 'improve and maintain' (Figure 6). This designation dictates separate decision-making processes for some management outcomes, but it is important note that 'operational management' sectors are still managed for their environmental values. Within operational management sectors some of loss of local vegetation is acceptable and managing the risk associated with that loss is considered appropriate to achieving training outcomes. However, thresholds and management prescriptions still apply to minimise undue environmental harm. Expected future management states for a number of variables related to landscape impacts are presented in Table 1. These are predictions not targets, and reflect the potentially different impacts of Defence management compared to pastoralism. They also reflect the designation of sector R as an environmental offset (Section 2.1) that will in part compensate for the increase in disturbance to some matters in some places.

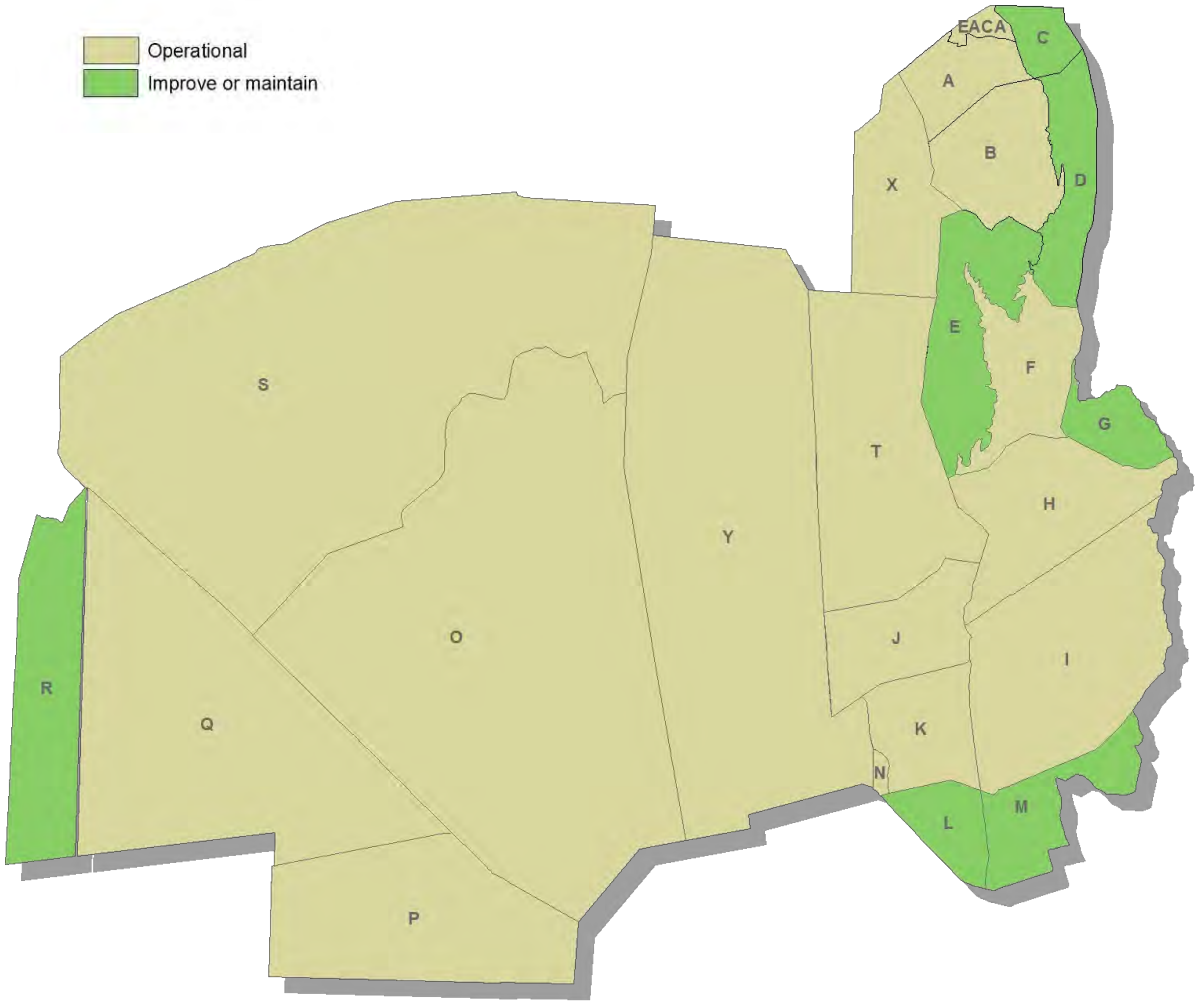


Figure 6. Sector Environmental Management Goal.
Dark Green = Improve and maintain, Light Green = Operational management.

1.4.3 Risk Analyses

All risk analyses included in the plan were conducted in accordance with the *Joint Directive on the Management of Risk in Defence* and draft *Estate and Infrastructure Group Risk Management Framework*, which is implemented through GEMS. Risk descriptions used in assessing consequence were based on existing environmental and business risk descriptions endorsed by the Risk Management Framework. Outcomes of assessments, rather than detailed risk assessments, are presented for lower-risk issues. Reasoning behind risks will be evident in text describing management of the risk or the specific matter. For potentially higher risk issues a separate risk assessment section is included.

Table 1. Speculative management outcomes for different sectors following to Defence ownership.

Sector	"Natural"	Managed	Vegetation	Bare Ground	Listed Weeds	Agricultural & Environmental Weeds	Temporarily Closed Areas	Environmental Intervention	Environmental rehabilitation	Accidental damage to aboriginal sites	Roads	Informal Tracks	Range Produce
A	–	–	–	–	–	–	–	–	–	–	–	–	?
B	–	–	–	–	–	–	–	–	–	–	–	–	?
C	–	–	–	–	–	–	–	–	–	–	–	–	?
D	–	–	–	–	–	–	–	–	–	–	–	–	?
E	–	–	–	–	–	–	–	–	–	–	–	–	?
F	–	–	↑	↓	–	–	↓	–	–	↓	–	↓	?
H	–	–	↑	↓	–	–	↓	–	–	↓	–	↓	?
I	–	–	–	–	–	–	–	–	–	–	–	–	?
J	–	–	–	–	↓	–	–	–	–	–	–	–	?
K	–	–	–	–	–	–	–	–	–	–	↑	–	?
L	–	–	–	–	–	–	–	–	–	–	↑	–	?
M	–	–	–	–	–	–	–	–	–	–	–	–	?
N	–	–	–	–	–	–	–	–	–	–	↑	–	NA
O	→	↑	↓	?	↓	→	?	–	?	↓	↓	↑	↑
P	↑	→	?	?	↓	→	?	–	?	↓	↓	?	↑
Q	↑	→	?	?	↓	→	?	–	?	↓	↓	?	↑
R	↑	↑	↑	↓	↓	↓	–	↑	–	↓	–	↓	↑
S	→	↑	→	?	↓	→	?	–	?	↓	↓	↑	↑
T	↓	↑	→	↑	↓	→	?	–	?	↓	↓	↑	↑
Y	→	↑	→	?	↓	→	?	–	?	↓	↓	↑	↑
X	–	–	–	–	–	–	–	–	–	NA	–	–	?

\- no change expected; → changed distribution; ↑ increase in area exhibiting trait; ↓ decrease in area exhibiting the trait ; ? unsure

2.0 Whole of Site Programs

2.1 Environmental Offset

Defence activities will impact the vegetation of CUTA and other environmental values. This will be managed through the processes described throughout the EMP, but in recognising that vehicles may cause impacts across much of the TA, sector R has been set-aside for dismounted training only. This sector forms an offset to compensate for some of the impacts on the remainder of the TA. This approximately 6,600 ha area is a varied block of habitat that contains chenopod communities through the northern and central sections and a small area of Mallee in the south and areas of mixed *Acacia*/*Eremophilla* Santalacae shrubland (Figure 7). Although not representative of the whole TA, this samples the key vegetation communities that will be impacted by Defence activities. Some parts of the offset area show signs of overgrazing with resultant low floristic diversity, characterised by the absence of saltbush from paddock areas despite the adjacent road reserve containing a mixed chenopod community (Figures 8 and 9). Exclusion of off-road driving from this area will allow these communities to recover and also provide a control area for future studies of vehicle impact. Additional offset measures may be conducted in the area if required for specific impacts elsewhere on the range, but these would have to clearly demonstrate additionality of environmental benefit over and above what will be achieved through the passive setting aside of this area. Both the CUTA Public Environment Report (PER) (AECOM 2012) and State of the Environment Report (SoE) (Jacobs 2015) indicate that the southwest is an area of higher biodiversity than is generally found across CUTA, and a significant population (estimated at hundreds of individuals) of state-listed sandalwood (*Santalum spicatum*) is found in the south of the proposed offset. In the short-term the southern area of sandalwood will form a focus for research aimed at understanding potential measures to facilitate recruitment in this species (Section 2.3.2, which will benefit multiple species within the region that currently struggle to recruit due to overgrazing (below). Outcomes of that research are seen as a key long-term outcome for the sustainability of the whole of CUTA and the region.

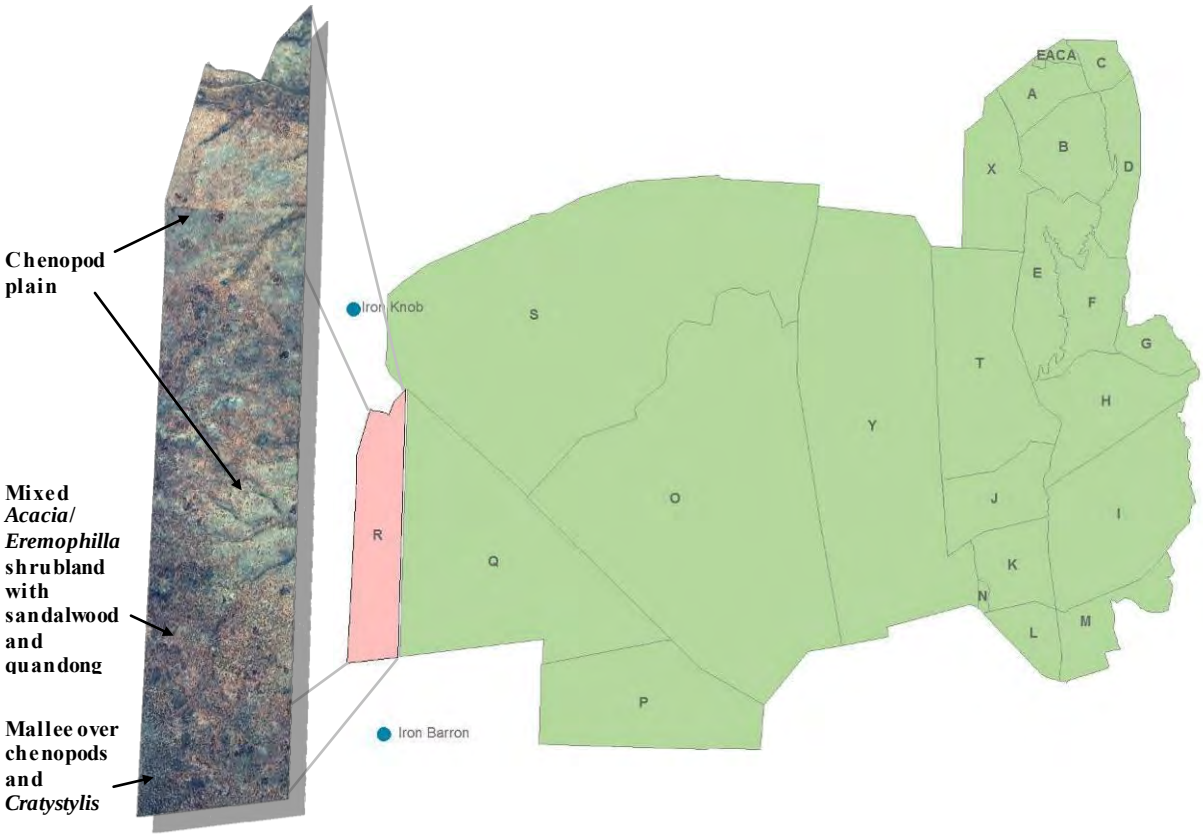


Figure 7. Sector R Environmental Offset Area.

Figure 8. Cross-fence comparison showing grazing-impacted area within the offset fence (left).

Figure 9. Bluebush dominated paddock.
Saltbush is almost absent from some areas of the offset, although adjacent paddocks and roadsides possess mixed chenopod communities.

2.2 Vegetation Management Program

2.2.1 Pastoral lease assessment program

The South Australian Pastoral Land Management Group manage the pastoral lease assessment program. One hundred and thirty one assessment sites for that program are located across CUTA (Figure 10). Defence will continue to operate these sites. A standing subset of 30 monitoring sites has been chosen to sample vegetation across CUTA. This includes all four points within the nominated offset area. These reference sites will be sampled every five years using the protocols set down in the *Pastoral Lease Assessment Technical Training Manual* (DENR (2011). Jessup vegetation transects are monitored in conjunction with photopoints at each site and provide direct metric data in addition to the photographic record. These sites will provide a general indication of landscape level vegetation condition, and therefore a general indication of Defence land management. However, their location cannot be chosen in such a way that any given site will provide information on the impacts of Defence field manoeuvre activities, which by their nature are unpredictable. Should any points be advantageously located to monitor recovery following activities that have noticeably impacted vegetation those sites will be 'switched on' and form a set of reactive sites to be monitored 2 years after the activity and in conjunction with the following rounds of five-yearly monitoring. All pastoral points were surveyed in late 2015 to provide a baseline data set. This means that any or all points can be re-visited if required for the purposes of external review of the plan and/or as part of the five-yearly review.

2.2.2 Step-point transects

Pastoral monitoring points provide a useful tool specifically developed for monitoring the long-term sustainability of a grazed landscape where impacts are widely distributed across a site, albeit to varying degrees. However, a more reactive, simpler, method is required to monitor routine Defence activities that have a focussed impact on small areas of the site and require a management decision support tool for reactive closure or rehabilitation of a site if required. Step-point transects provide that method (AECOM 2010). Step-point transects allow for non-expert post-activity monitoring of an impacted area. This provides the required information for establishing and removing temporary areas closures. Because step-point transects are a reactive tool their location cannot be planned, but once set out, they should be revisited at least annually until the pre-determined threshold for the desired management outcome has been reached (section 2.2.4, Table 2).

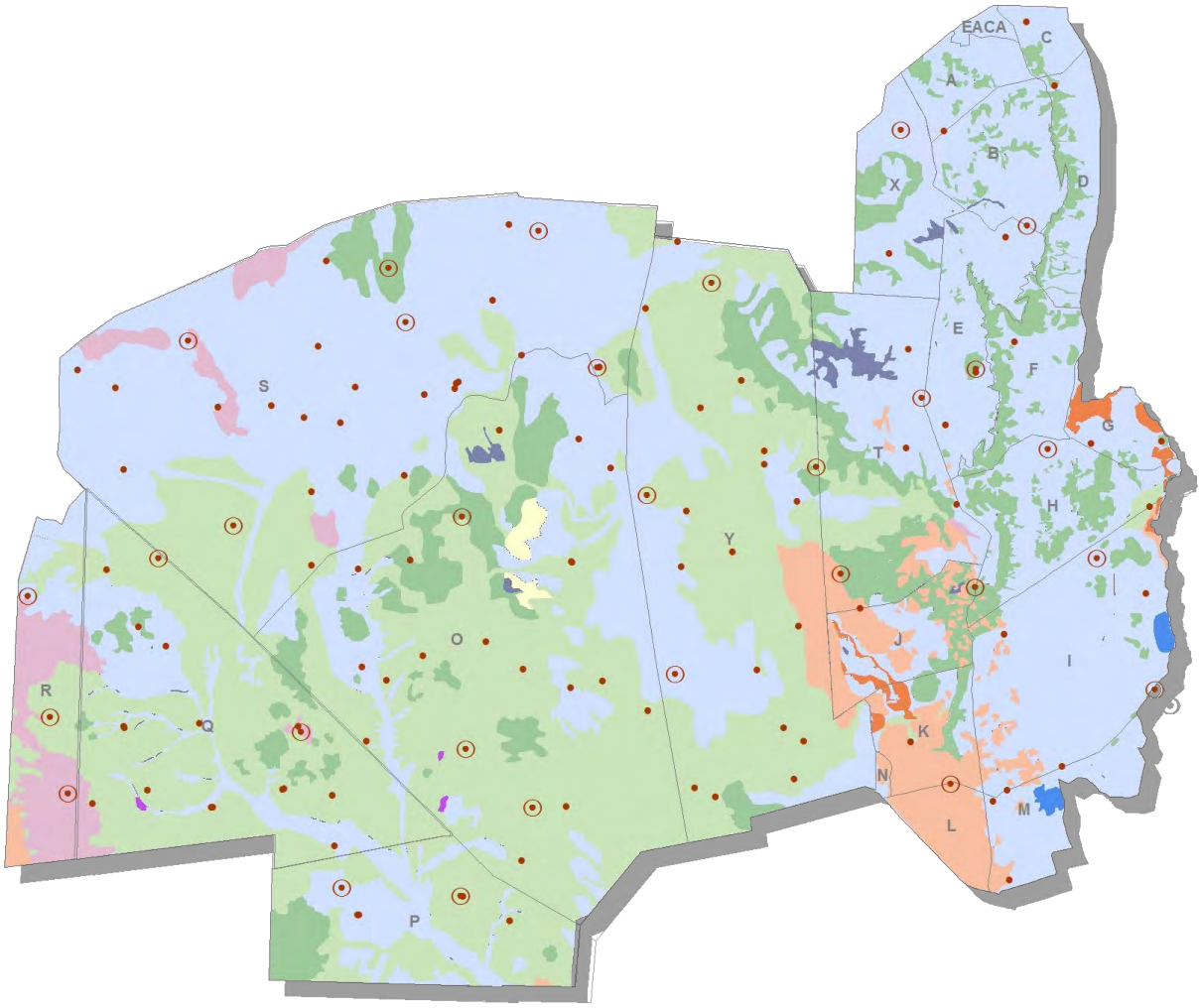


Figure 10. Pastoral photo monitoring points located on CUTA.
Circled points represent 30 points contributing to the long-term vegetation management program. Vegetation associations as per section 3.2. Other points will operate on a reactive basis following disturbance events, or as required as part of an external review.

2.2.3 Remote Sensing

Remote sensing is the most powerful approach for tracking landscape-scale changes. Methods developed to track landscape level changes will test and document the overall sustainability of Defence management. This will occur at two time and spatial scales.

Drivers of vegetation change
McCracken and Ford (in prep) have used monthly data from the MODIS satellite provided by the AUSCOVER remote sensing data facility and prepared according the methods of Guerschman *et al.* (2015) to generate the percentage of each pixel covered by bare ground, photosynthetic vegetation and non-photosynthetic vegetation. The simplicity of vegetation at CUTA makes this method particularly applicable. Grid square (pixel) resolution in the raster data is ~ 400m. Vegetation parameters were modelled against monthly, cumulative three and cumulative six monthly rainfall at Iron Knob and Whyalla and against mean monthly maximum temperature at Whyalla. All parameters responded to rainfall and temperatures, most strongly to three-monthly cumulative rainfall. A predictable significant interaction was detected between cumulative rainfall and temperature in driving all vegetation parameters, with months with high rainfall and moderate temperatures yielding the most productive vegetation and lowest percentage of bare soil, and those with low cumulative rainfall and high monthly maximum temperatures the reverse. While temperature varies fairly predictably through the year, rainfall is not. There is not a strong seasonal pattern of vegetation change compared to variation driven by random rainfall events. Vegetation on sectors under Defence management for the last 15 years exhibited a stronger response to climate parameters. This is probably explained by the much lower grazing pressure in those areas allowing a more natural response of vegetation to climate, and also partly by the more moderate climate of the eastern portion of the TA close to the Gulf. There were notable differences between the degree of vegetation cover in the years 2000-2004 (grazed landscapes in eastern CUTA) and 2011-2015, with a general significant increase in vegetation in Defence managed land and a general significant decrease in western grazed sectors. In coming years a re-analysis of the long-term data is expected to produce a stronger relationship between climate and vegetation for western sectors as the area is released from the legacy of sheep grazing.

Vegetation thresholds
Noting the key role that extremely variable climatic drivers of vegetation condition play in overall condition it is problematic to set threshold values of the minimum acceptable cover of photosynthetic vegetation and maximum acceptable threshold for bare soil. CSIRO calculates vegetation anomalies from MODIS data based on differences from the mean monthly data for each vegetation parameter. This does not suit a situation such as CUTA, with highly variable rainfall, nor does it suit land management aims based around whether a threshold has been exceeded that might indicate a requirement for remedial action. Threshold values against which to determine vegetation anomalies for CUTA were therefore calculated for each 400m pixel as the 95% percentile of the lowest value for photosynthetic vegetation and upper 95% for bare soil for the years 2000-2015. Currently the monthly MODIS data is uploaded within five months of capture. On release, simple comparison calculations for photosynthetic vegetation [current month - threshold raster] and bare soil [threshold raster - current month] can be performed by unskilled users in a matter of minutes in ArcGIS or in future Defence application, via a web-service in an internet browser on the Defence Protected Network (Figure 11). This process will identify anomalies in the data (as negative values) that indicate a threshold has been broken. This triggers the vegetation management processes described below (Section 2.2.4). There are many reasons that an anomaly might be detected, including

spurious data or cloud cover (for bare soil calculations), and testing of the preceding and following months data (if available) is the first step in identifying data anomalies or cloud effects as opposed to real vegetation anomalies. Auscover data (or equivalent should the data service cease) should be analysed at least once every six months.

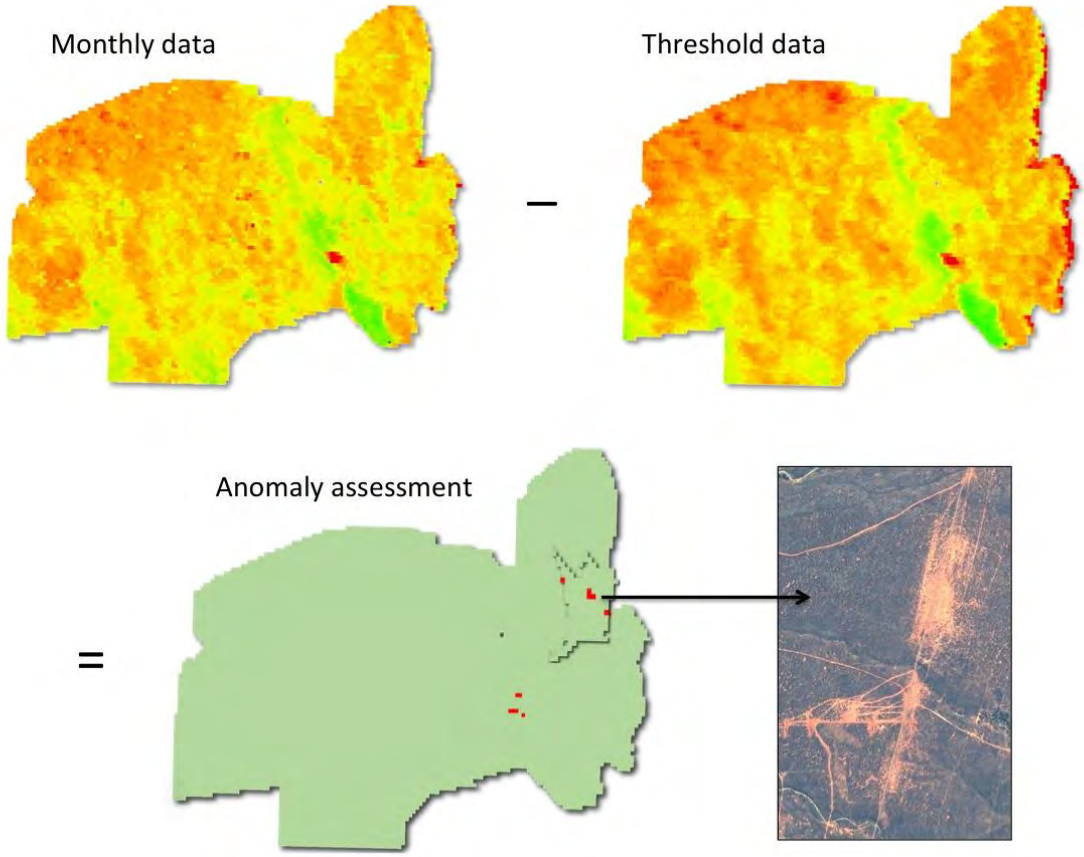


Figure 11. Threshold analysis of vegetation condition using MODIS raster data.
A simple subtraction of the threshold (usually lower cover) from the monthly data for photosynthetic vegetation cover will highlight areas below threshold as negative values (red pixels). These can then be investigated to determine the underlying cause. Note that the sector F temporary A vehicle firing range shown at bottom right and inset of sector F on the anomaly assessment are actually a test for the bare soil data set to see if this area would be detected.

Hi resolution satellite imagery

In addition to the general capacity to track higher-level changes in land condition based on MODIS data, hi-resolution satellite imagery taken every five years can provide a periodic, site-wide assessment of finer-scale changes, and complements the pastoral monitoring program. Baseline SPOT 6 and 7 imagery has been purchased at 1.5m resolution covering all of CUTA to provide a 2015 baseline condition. The photographic quality of the imagery allows visual inspection of changes, but the data is also able to be analysed in many different ways, including for identification of tracks and soil disturbance as described in ENSR (2008), or fine-scale changes using equivalent processes to the anomaly detection process described above to compare five-yearly data to MODIS data. Satellite imagery can also play a key quick role in post-activity monitoring. For large-scale field manoeuvre activities, it may not be possible to readily determine where impacts have occurred from the ground. This demands aerial post-activity surveys. Depending on the equipment involved, it may be expedient to undertake immediate aerial surveys in conjunction with the activity. However, satellite

imagery can provide an economically competitive approach for large-scale activities that can focus ground-based assessment of impacts through step-point transect placements or threshold determinations directly from satellite imagery. Satellite imagery also provides formal documentary record of the impacts that can be tracked through time in GIS systems. A simple template for post-activity inspection of major exercises is provided at Appendix A. This combines the existing post-activity inspection template from RSOs with satellite or aerial imagery analysis. All exercises that involve (at a minimum) *the equivalent of a combat team on ground for a period of two weeks* are considered major exercises that *must be subjected to this process*. The determination of exercise scale is part of the exercise approval and ECC process, and applies to the total exercise or combination of related serials conducted over a reasonably consecutive period (i.e. within a two-month period irrespective of week long breaks between serials). The management processes dealing with outcomes of this assessment are described below and provide a key first step in preventing Defence from compounding impacts of intensive exercises by re-using the area too soon.

Figure 12. Vehicle tracking following a major exercise.
Most tracks visible here are formed by the temporary compaction of vegetation, not significant soil disturbance, and will recover quite quickly. Others are formed predominantly along pre-existing tracks. Re-use of the same area too soon could transition these temporary impacts into a longer-term temporary area closure or rehabilitation site.

2.2.4 Managing impacts to vegetation

The monitoring program above describes the package of methods Defence will use to detect and understand changes in vegetation. Proposed research programs (Section 2.3.2) complement these. Multiple sources of data may create awareness that an unexpected or undesirable change in vegetation has occurred. Post-activity inspections, environmental incident reports by units or other range users, or an anomaly in routine satellite analysis may all identify that there is a potential area of vegetation loss requiring further inspection. Five-yearly monitoring of Jessup transects may also indicate an area has declined in condition

compared to the 2015 baseline. This change must be interpreted in the context of the current climate and other data sources based on the analysis of the drivers of vegetation change described above (McCracken & Ford in prep) as well as the co-incidental impacts of pest species which are documented at each monitoring site (Table 2). AECOM (2010) proposed threshold values for saltbush, bluebush and shrub densities that may support ongoing Defence training. If densities drop below these thresholds landscape degradation may occur. These preliminary thresholds have yet to be adequately tested for western sectors. However, data from the 2015 baseline Jessup transect data can be co-examined with MODIS data and several sets of post-exercise data to test their efficacy.

Table 2. Indicators, methods and initial thresholds for vegetation management.

Indicator	Method	Threshold Sectors C,D,F,G,H,I,O,P, Q,R,S,T (plain),Y,X	Threshold Sectors A,B,E,J,K,L,M, T (plateau)	Management response
Routine, whole of site				
% cover photosynthetic vegetation	Modis/Auscover	Threshold raster	Threshold raster	Vegetation management process triggered
% cover bare soil	Modis/Auscover	Threshold raster	Threshold raster	Vegetation management process triggered
Reactive, specific on-ground event (greater than 0.25 Ha (50 x 50m) in size)				
% cover lichen crust	Step-point	Change (>5%)	Change (>5%)	Record
% cover litter	Step-point	Change (>5%)	Change (>5%)	Record
% cover perennial shrubs	Step-point	Change (>10%)	Unknown (>10%)	Vegetation management process triggered
% cover groundcover	Step-point	Change (>5%)	Change	Record
% cover bluebush	Step-point	< 5%	< 15%	Record
% cover wards weed	Step-point	N/A	N/A	Record
Presence of invasive weeds	Step-point	Presence / absence	Presence / absence	Record- report carrion flower, buffel grass
Species richness	Step-point	< 10	< 15	Record
5 yearly reviews, sectors or part				
Juvenile : Adult Ratio	Jessup transects	< 0.1	< 0.5	Record
Saltbush density	Jessup transects	< 120 (3,000 / ha) > 250 (6,250 / ha)	< 140 (3,500 / ha) > 320 (8,000 / ha)	Vegetation management process triggered
Bluebush density	Jessup transects	< 15 (375 / ha) > 75 (1,875 / ha)	< 30 (750 / ha) > 100 (2,500 / ha)	Vegetation management process triggered
Perennial shrub density	Jessup transects	< 150 (3,750 / ha) > 250 (6,250 / ha)	< 200 (5,000 / ha) > 300 (7,500 / ha)	Vegetation management process triggered
Low shooting on mature plants (<30 cm above ground)	Jessup transects and surrounds	Presence for western myall, bullock bush, *Eremophilla* ssp., quandong and sandalwood	Presence for western myall, bullock bush, *Eremophilla* ssp., quandong and sandalwood	Record for each species present

Indicator	Method	Threshold Sectors C,D,F,G,H,I,O,P, Q,R,S,T (plain),Y,X	Threshold Sectors A,B,E,J,K,L,M, T (plateau)	Management response
Recruitment	Jessup transects and surrounds	Presence of independent seedling/small plants of western myall, bullock bush, *Eremophilla* ssp., quandong and sandalwood	Presence of independent seedling/small plants of western myall, bullock bush, *Eremophilla* ssp., quandong and sandalwood	Record for each species present
Herbivores				
Goats	Jessup transect and surrounds	Presence of goat tracks or scats	Presence of goat tracks or scats	Record
Rabbits	Jessup transect and surrounds	Presence of warrens	Presence of warrens	Record
Rabbits	Jessup transect and surrounds	Presence of tracks, scats or other evidence	Presence of tracks, scats or other evidence	Record

Once an area has been determined to require investigation by visual, aerial or remote-sensing inspection, the vegetation management process is triggered (Figure 13). For MODIS data this requires checking the cleanliness of the underlying satellite data with respect to clouds or other digital artefacts in the pixels of the anomaly to establish whether an exception has occurred. For immediate on-ground determination of whether an exception has occurred a simple *in situ* control can be achieved that also takes account of seasonal conditions. Step point transects should be placed within the impacted area (using method detailed in AECOM 2010), and within the nearest non-impacted vegetation of the same type. Transects must not run along tracks, but should cut across a representative sample of the disturbed area. Should a genuine exception be recorded against thresholds set in Table 2 then a decision must be made whether to temporarily close the area or continue its use under specific conditions. If the sector is an 'improve or maintain' sector (Figure 6) then the area must be closed until it has recovered to above threshold levels. If the area is severely degraded, rehabilitation works following the rehabilitation guidelines set down in HLA ENSR 2008 and outlined in section 9 may be required. If the area falls within an 'operational management' sector then two alternative management pathways are possible. If the area has been repeatedly impacted in a similar fashion because it represents a natural location for a specific activity it can be identified as a sacrificial area. Sacrificial areas must not exceed 5% of the land area of operational sectors, and are still subject to dust, erosion and other management processes, but are not expected to meet vegetation threshold requirements. An alternative to a sacrificial area is to harden areas of very focused activity such as key firing points or movement bottlenecks (see also soil erosion management processes section **Error! Reference source not found.**). The success of the step-point thresholds, area closure and rehabilitation processes in preventing long-term impacts will be determined from the longer-term monitoring program and comparison of SMRP reports of exceptions and management responses.

Major exercises

A sub-process will be applied to major exercises based on the post activity inspection process (Appendix A). Any brigade-level exercise or exercise of similar intensity over smaller areas (e.g. Predator series, ex Hamel, ex Talisman Sabre) will have a marked impact on vegetation, although much of the tracking created by these exercises may be single-pass tracks that might

recover if left undisturbed and the exercise is followed by favourable conditions, or might deteriorate if harsh conditions are experienced (Figure 12). A *compulsory rest period of six months* is suggested before areas of notable tracking identified in a major exercise post-exercise report are considered for further vehicle activities. A visual threshold key is included in Appendix A to provide a consistent approach for identification of 'notable tracking' from satellite image. It is important to identify whether the vegetation impacted by a single pass will die or recover, thereby changing the capacity of the landscape to support further training. During a rest period activities within grid squares identified as being at rest must be controlled by an ECC to minimise degree of impact and to risk-mange essential training. The implementation of a rest period should permit more frequent training than enforcing temporary area closures, which cannot be re-opened for training until thresholds for vegetation cover have been achieved. However, at the end of the rest period the area should be re-examined to determine whether vegetation thresholds have been exceeded.

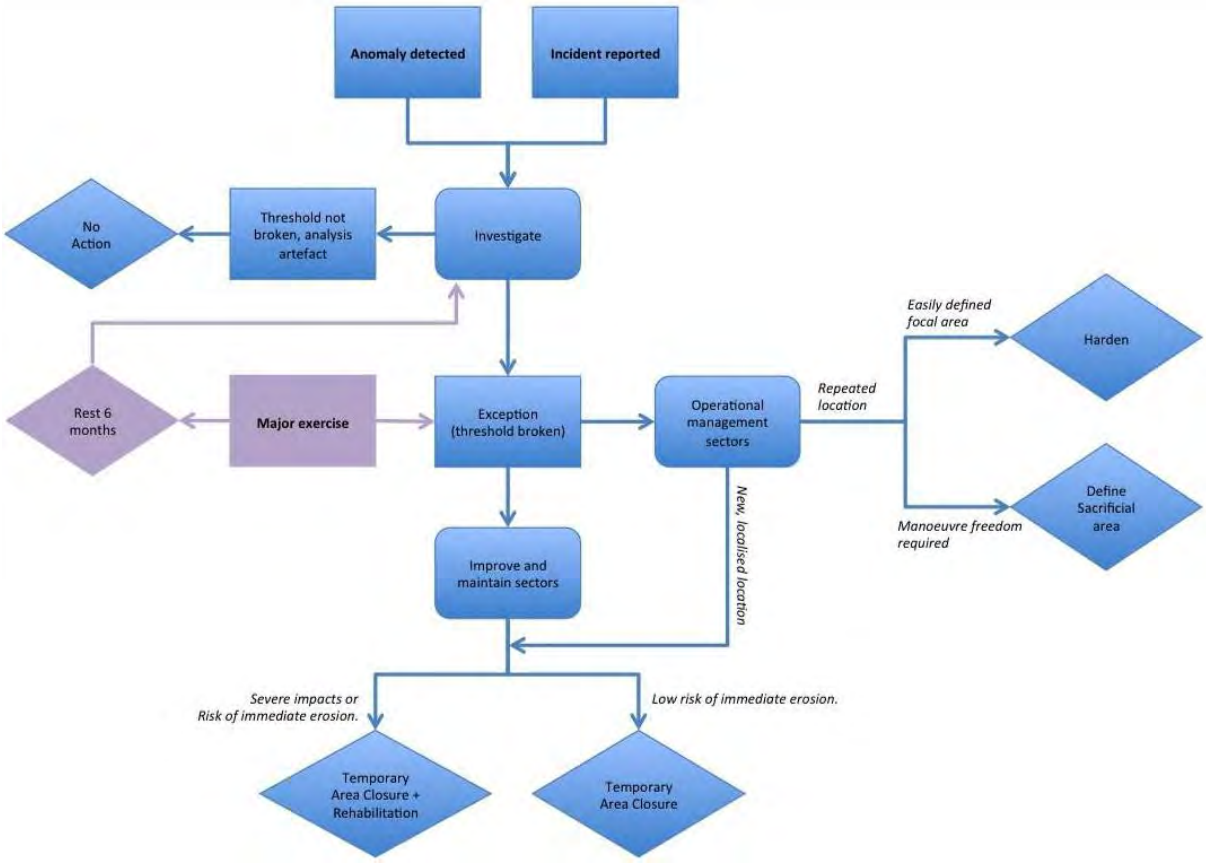


Figure 13. Vegetation Management process

2.2.5 Middleback Research Station

Long-term vegetation monitoring plots used by the University of Adelaide for undergraduate field trips and student projects can also provide an ongoing independent assessment of changing vegetation characteristics. Some changes, such as re-sprouting of Myall recruits, have already been observed (J. Facelli, *pers. comm.* Oct 2014). University plots (Figure 14) require a 100 m exclusion zone to ensure they are not impacted by exercises. Although they only sample a small area of the training area that will probably receive less intensive vehicle use than most other sectors. These plots provide a relatively rich fine-scale data set to

understand the specific processes of recovery from grazing, and also to highlight any emerging issues such as new invasive weeds, diseases or other processes that may not be detected through other means. The University have also historically visited photo monitoring points in Overland paddock in Sector O and these may more directly record the nature of vegetation change in areas where Defence use continues (J. Facelli, *pers. comm*. Oct 2014). Defence should continue to foster a collaboration with the University of Adelaide and facilitate ongoing use of these sites. However, no management thresholds are tied to these third-party data sets.

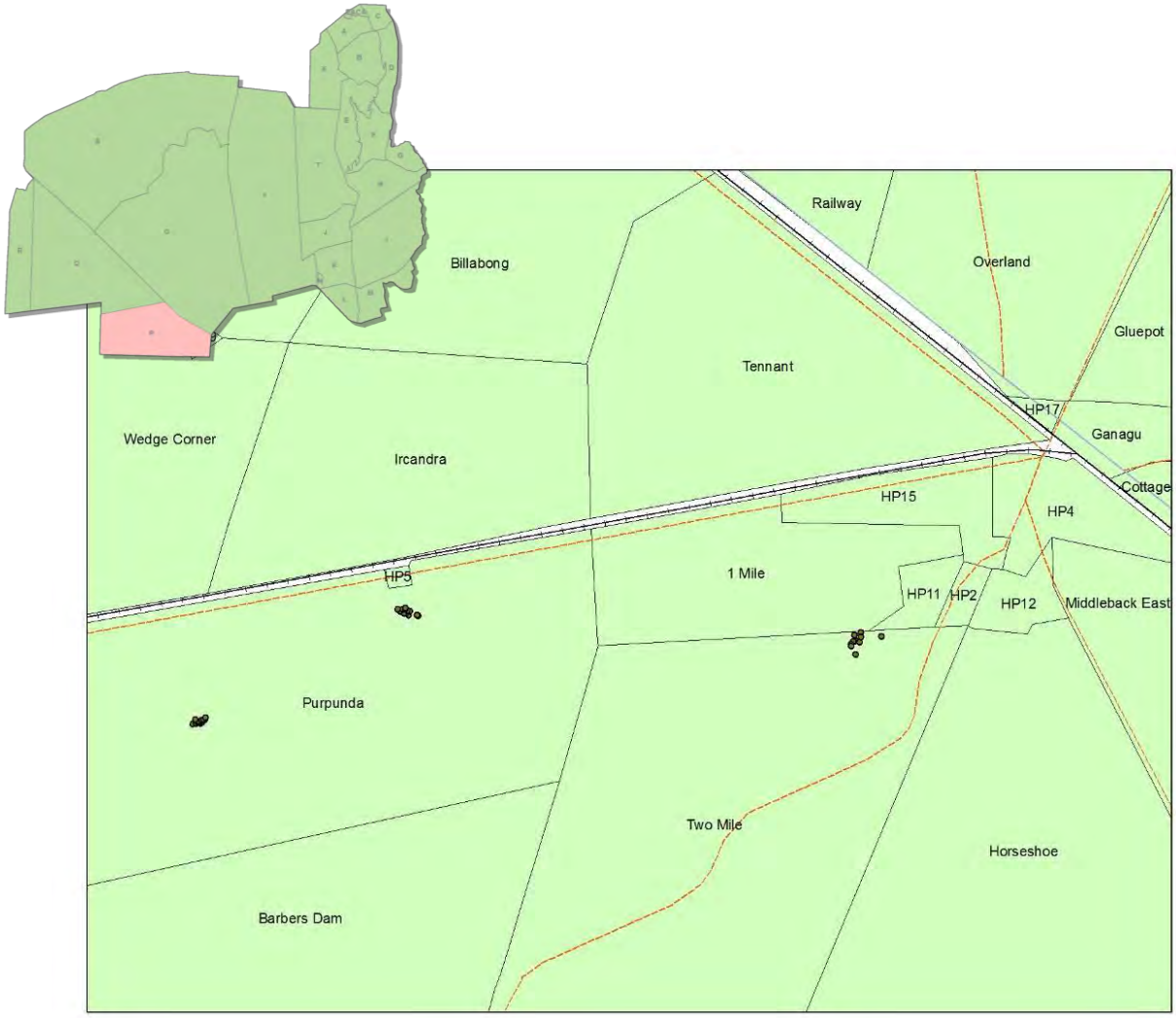


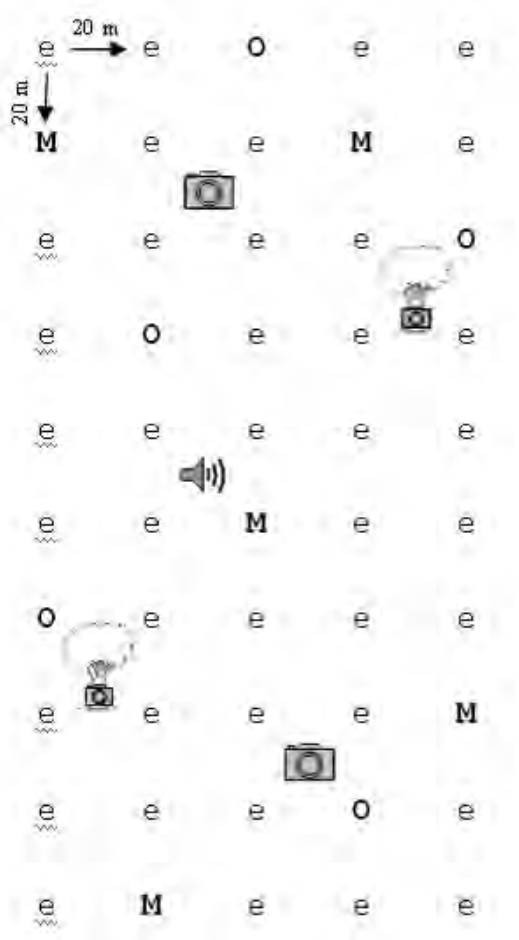
Figure 14. University of Adelaide long-term monitoring plots in the southwest of CUTA.
Paddock names shown. Each cluster of plots requires a management buffer to protect the sites from damage.

2.3 Discovery Program

2.3.1 Survey

The discovery program differs from other on-ground work that records the presence or absence of particular species in that it is not directly linked to on-going management of existing EFRs. The purpose of the program is to target threatened species or Biosecurity and Overabundant Native Species (BONS) recorded as EFRs with a 'Presence' of 'Possible/Probable' and a 'Priority' of 'High' and to sequentially survey areas of the site most

likely to contain those species. In so doing, a comprehensive survey will be conducted that also documents any other matters that are present in those locations. Surveys as part of the discovery program should be conducted no less frequently than once every five years, and three in every ten. The program should follow the methods described in the Defence National Environmental Standard for Biological Monitoring and Survey [currently draft- due for issue by June 2016]. This standard includes vertebrate and vegetation monitoring practices based around standard sampling units (e.g. Figure 15 for vertebrates would be combined with vegetation plots and transects within the same grid). Initial species to be targeted in the first ten years (three survey events) are Mallee Fowl, Buffel Grass, and Beaded Glasswort.



*x 2 sites= *minimum* nightly effort.

*Setback at least 25 m from nearest road unless impracticable for shape of habitat

*Traps are to be set for three consecutive nights per site.

*Bird surveys = One hour long. One dusk, one dawn, plus opportunistic sightings while setting grid and checking traps

*Reptiles/amphibians = three one hour searches in vicinity of grid

* If sufficient resources exist, ground based cameras should be deployed for two weeks or longer, e.g. between trapping visits.

* In arid habitats or other habitats where pitfall trapping is likely to be more effective for small mammals and reptiles substitute up to 75% of live traps for pit-falls at a ratio of 10:1

e= mouse-sized Elliot trap, Sherman trap, Longworth trap or equivalent

M= meat baited cat-sized cage trap

O= oats mix baited cat-sized cage trap

= remote camera baited with truffle oil or vanilla essence scented pad or scattered cereal

= remote camera targeting tree trunk baited with honey water mix, either sprayed on trunk or held in reservoir.

= Anabat, or dual function bird/bat sound recorder.

Figure 15. Draft Defence National Standard for survey grid layout for targeted survey of a small number of habitats and stratified habitat assessment.
To be adapted according to the composition of the site being surveyed (e.g. no cameras targeting trees for many CUTA sites).

2.3.2 Research

The ongoing use of the University of Adelaide's Middleback Research Station provides many opportunities for Defence to support and benefit from a relationship with the University of Adelaide. This includes access to long-term monitoring results from the research sites within the south-west portion of CUTA that will aid in detecting the response of vegetation to Defence management, but also the chance to develop focussed research questions that can be addressed by honours and PhD students. The initial research program discussed with the University seeks to address some of the uncertainties that arise from the transition from pastoral to Defence.

Major exercise impacts
Initially, the larger manoeuvre area provided by sectors O and P should allow for greater flexibility, more diffuse impacts, and greater capacity to reactively manage the vegetation impacts through spelling areas showing signs of impact beyond defined thresholds. However, the greater land area available is important to Defence as it allows for significantly larger scale exercises to occur. This means more vehicles performing less predictable manoeuvre in a slightly different environment previously used sectors. In order to understand what this actually means for site management it is necessary to closely monitor and investigate the outcomes of the first large-scale exercise that occurs on the site. Exercise planners face a number of constraints arising from physical site constraints, buffer zones protecting heritage sites and other environmental factors that limit the actual footprint available to them in developing exercise scenarios. Rather than take the approach of minimising the scale of early activities and progressively building up to large scale exercises, it is potentially beneficial to run a large-scale exercise as early as possible. Not withstanding the basic site constraints, planners and participants should be given free reign to exercise so that Defence can build a realistic understanding of what that tactical freedom means in terms of impact to the environment. Achieving this early in the life of the expanded training area will mean complications of cumulative impacts from smaller exercises being re-impacted by the larger exercise are minimised. If possible, an honours student will conduct a project to monitor the impacts of the first large-scale exercise.

Cumulative impacts
A second body of work represents a PhD project. This will seek to understand the actual outcomes of disturbance caused by tanks and other vehicles. This project will not take the approach of looking at vehicle impacts to vegetation. This level of impact is well understood and its management is reflected in the monitoring program and SMRP thresholds for temporary area closures. What is not known is what the long-term effects of this disturbance are, and how it may interact with fire scars and other disturbance events (Figure 16). Disturbance is a normal aspect of ecosystems, and at moderate levels generally a driver of increased diversity. To date, there has been no consideration of what any potentially beneficial outcomes of vehicle disturbance might be. In order to understand both the beneficial and negative outcomes of vehicle-caused disturbance, the student will apply the frequency and intensity conceptual framework that is used to describe the disturbance regime caused by bushfire. CUTA now represents an excellent model system for this investigation as the freehold portion has been used for many years with a mosaic of impacts and recovery overlying each other, while the leasehold portion will represent a relatively undisturbed site.

Figure 16. Cumulative tracking at the north-east corner of sector I.
Fresh tracks can be seen overlying tracks in varying degrees of recovery and permanent routes. This area has been heavily utilised for manoeuvre for many years. The mosaic of use intensity across eastern freehold sectors of CUTA provides an excellent contrast to new sectors covered by the MLDP.

Recruitment of native vegetation

One of the greatest long-term sustainability issues facing the semi-arid rangelands is the lack of recruitment among dominant plant species. Western Myall, bullock bush, quandong, sandalwood and *Eremophila* species are among key overstorey and midstorey species that struggle to successfully recruit in the face of high grazing and browsing pressure from rabbits, stock and native herbivores. Given that a large population of state-listed sandalwood occurs in the south of sector R and that overall grazing pressure on Defence land will be coincidentally reduced, the site presents a good opportunity to conduct research into recruitment of a number of species, with a focus on sandalwood (Figure 17). A significant body of research has been conducted to investigate commercial propagation of sandalwood, and the research will focus on the relative merits of commercial propagation techniques compared to fencing off areas of potential recruitment. Host relationships and role of emu consumption and dispersal of fruit to quandong and sandalwood germination will also be included in treatments (i.e., does placing emu droppings with sandalwood fruit inside a fence yield better germination rates than would otherwise be achieved. Use of fenced enclosures will coincidentally provide information about recruitment of other key species such as western Myall, bullock bush and *Eremophilla* spp..

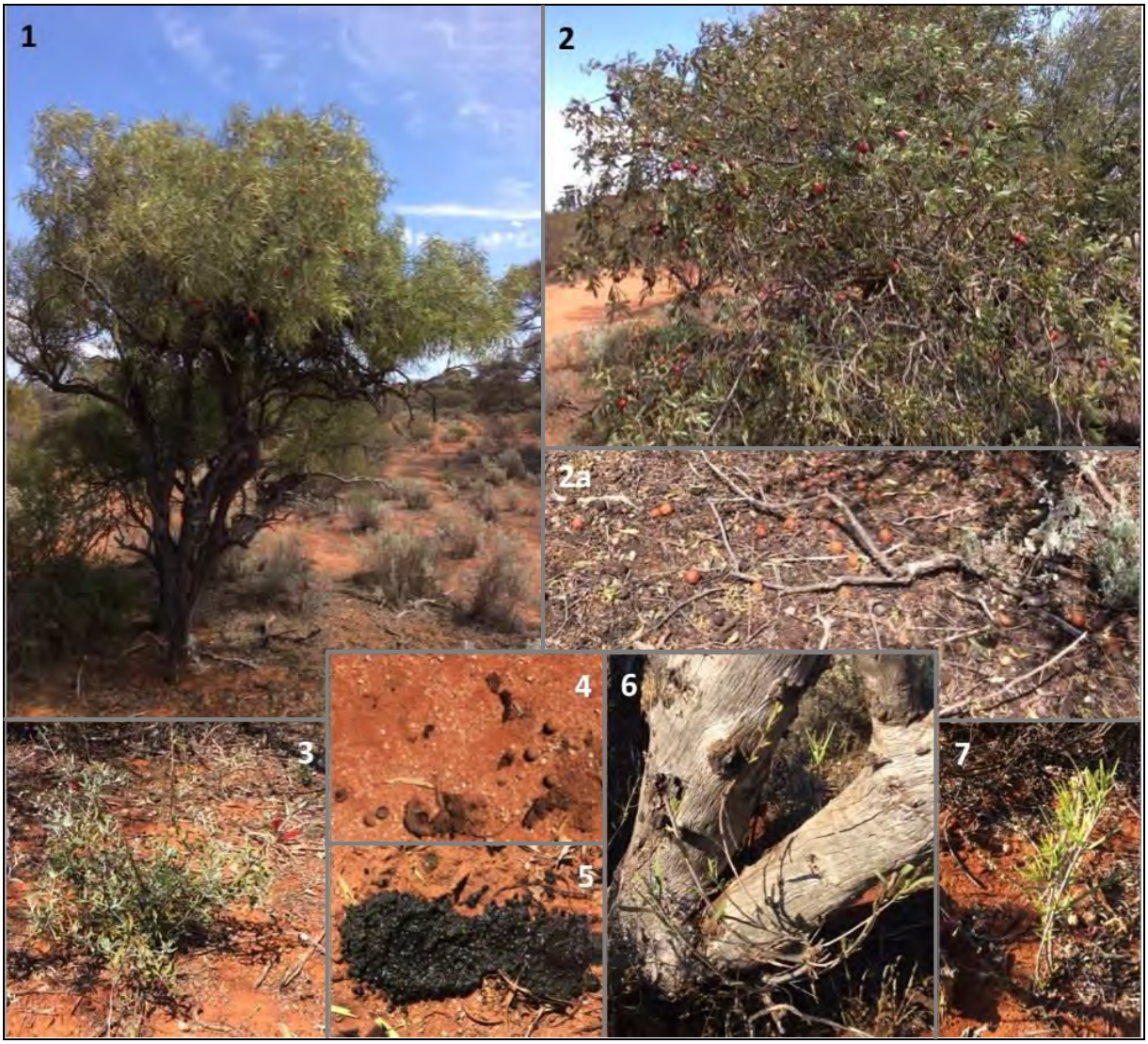


Figure 17. Recruitment research subjects in sector R.
1. Sweet quandong in fruit, 2. Sandalwood in prolific fruit. Despite the abundance of fruit in spring 2015, not seedling or young sandalwood or quandong were observed anywhere on CUTA. 2a. Fruit scatter under the sandalwood. Note these fruit are unlikely to germinate as Santalaceae are root parasites, and require a host plant. Few fruit examined anywhere on site actually contained a viable kernel. 3. Eremophila shrub flowering and surviving in the reduced grazing environment of CUTA. 4. Old emu scat containing sandalwood and quandong seeds. Dispersal by emus may be a key influence on the establishment of the trees across the landscape. 5. fresh emu scat entirely consisting of native cherry fruit. 6. Bullock bush shoots that have been browsed and had the terminal shoots clipped off by rabbits(?). 7. New bullock bush recruit in sector R.

2.4 Water point closure program

There are numerous water points distributed across CUTA (Figure 18). These include dams, tanks, wells and troughs. Such freely accessible surface water is an artificial element of the CUTA landscape. Temporary surface water may pond in low-lying areas following rain, but there would never have been a meaningful water source for most animals across most of the site. The creation of numerous water points to service sheep in numerous small paddocks was the mainstay of the Nicolson's approach to grazing much of CUTA. In the same way that this supported a sustainable population of sheep in a region where others struggled to support equivalent numbers, so the water supports populations of feral goats and elevated numbers of kangaroos. In one sense, elevated grazing pressure from these species represents a form of competition with Defence activities. Defence requires vegetation to maintain sustainability of

the site and buffer soils from vehicle impacts. Removal of vegetation by grazing reduces the inherent resistance of the system to Defence impacts. The natural ecosystem also suffers in the face of elevated grazing pressure. Browsing of Myall, bullock bush, *Eremophila* spp., quandong and sandalwood recruits is a critical issue for the long-term viability of several communities present on CUTA and across the wider region. Water points also represent focal points of disturbance and weed infestation. There is no identified requirement for surface water serviced by existing pastoral infrastructure and all existing water points will be decommissioned. In the limited situations where fire-fighting requirements have been identified around infrastructure or high-tempo ranges this is better met using tanks that secure a stable, accessible water source when compared to dams.

2.4.1 Sequencing of closure

It is unlikely that all water points can be closed in a short period of time due to the costs of civil works and planning requirements for many of the dams involved to prevent ongoing erosion issues. Several considerations dictate the proposed sequence of closure. Dams and infrastructure within the proposed High Explosive Target Areas (HETAs) should be closed first to minimise risks associated with earthworks and removal within a HETA. Because dam/water source closure fundamentally supports long-term goals of pest animal control, it makes sense to next close all points in proximity to the northern, western and southern boundaries to create a waterless buffer between CUTA and surrounding pastoral properties. This should assist in reducing incursions of animals from surrounding areas and maximise effectiveness of population control measures on CUTA. Within the central areas where dams may be retained for a longer period, they offer a slight management advantage as they focus pest species activity. This can facilitate monitoring programs and control measures as detailed in Section 4.2 Pests and Overabundant Native Species. Dams to retain were identified from aerial imagery taken when water levels were low and most dams were empty. Dams chosen currently have practical access for trucks for mustering and removal of goats. The exact methods used to decommission each dam are not specified here, as they will need to be resolved in relation to the specific dam, equipment and service provider used to perform the task. However, rehabilitation of the site following decommission should follow the protocols cited in section 9 and ongoing weed management will likely be required for some time around disturbed sites

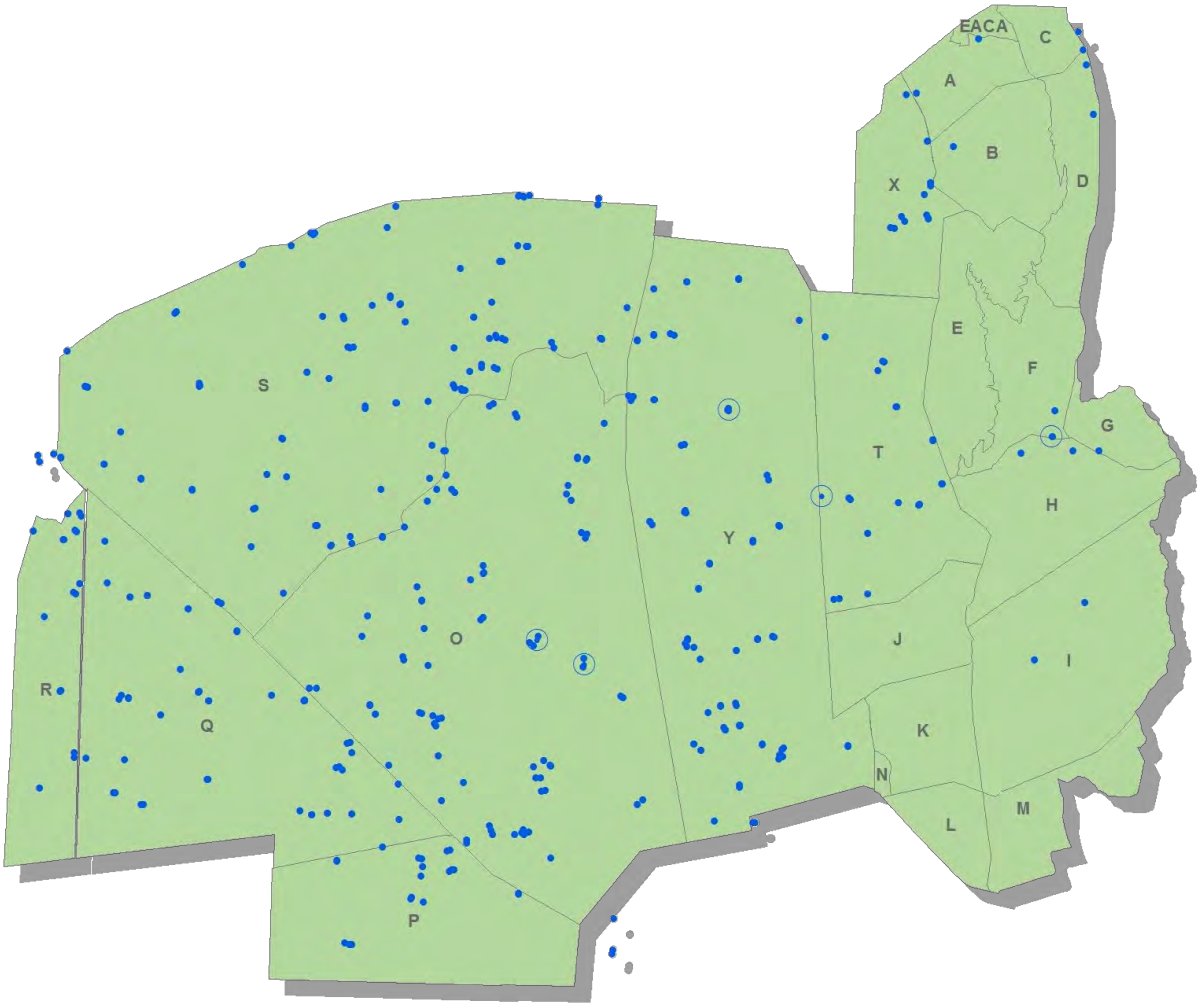


Figure 18. Location of water points on CUTA.
Pastoral Board data and identification from satellite imagery. Water points shown include dams, troughs, wells and tanks, as well as some inaccurate or decommissioned points. Many points therefore do not still represent viable water sources for pest species. The five circled points represent reliable open dams that lie in strategic positions for retention until the last round of decommissioning. They are all noted to be used by goats, and will allow focussed monitoring and control.

2.4.2 Decommissioning procedures and requirements

A wide variety of dams are present across CUTA. Most are located in drainage lines or low-lying areas that receive some level of either natural inundation or rapid water flow during rainfall events. Some have extensive artificial channel systems leading to them in order to increase inflow. Channels have also been created to move water between drainage lines and into natural water bodies from nearby drainage lines. In order to minimise the environmental harm to drainage systems through downstream scouring or sedimentation, a variety of engineering solutions may be required. An additional complication is that a number of dams have been made in lignum swamps that fall within aboriginal heritage sites. Consultation with relevant parties is required to establish the process for entry to these sites and the specific landscaping outcomes of the closure of such dams may be more important than for other water points. Accordingly, the following performance measures are proposed for dam closure, but contractors performing the decommissioning may offer alternative acceptable solutions that minimise environmental harm.

All water points

Prior to any works commencing a survey of the disturbance footprint and surrounds should be undertaken for any high-risk weed species listed as requiring eradication or control in section 4.3 (e.g. carrion flower, buffel grass, WONS). Where weeds requiring control are encountered they should be treated according to whether they will spread vegetatively, or are in flower, seed or fruit at the time of works. All reasonable measures to prevent weed spread must be undertaken and all dam remediation works should be re-surveyed 12 months after completion to ascertain the status of weed species. Documentation of management and monitoring should be effected through EFR records.

Dams in terminal swamps or indistinct drainage lines (Figure 19):

- Return to natural levels

Figure 19. Centenary Dam.

This dam lies on a low-volume drainage line with minimal incision of the stream, although minor channels have been constructed to increase water inflow.

Dams in high-flow drainage lines (Figure 20):

- Bespoke solution may be required due to complex hydrology. Many larger drainage lines are already heavily modified and artificially channelled around or into water points
- As fully as practical return to natural levels
- Do not restrict or accelerate flow by leaving parts of dam walls and embankments
- Where channelling is present along drainage lines consider re-spreading flow by using excess dam wall material to create diversion banks within channels

Figure 20. Aqua Dam.
Lies on a high-flow, heavily modified, draining line where accelerated erosion could potentially result from simply breaking the dam wall.

Channel harvesting systems (Figure 21):

- Where practical, channels should be interrupted with small embankments to disperse slow-moving water at multiple points upstream of the receiving dam.
- Where these systems have been recorded leading directly to dams they are generally in terminal swamps and other locations where the additional inflow is unlikely to lead to downstream erosion. The focus for remediation is therefore the dam (returned to natural levels) and the channels themselves (flows reduced to prevent erosion of higher-order (closer to dam) channels
- Where channels have been formed within and feeding into watercourses they now represent intermittent watercourses. These can remain *as is* unless some other management driver requires remediation or removal
- Remediation of channels can be risk-managed. Where channels are stabilised and vegetated they do not need to be treated unless downstream channels exhibit marked ongoing erosion.

Figure 21. Le Hunte dam.
An extensive channel harvesting systemprovides water into a 'terminal' drainage point.
Many channels are vegetated and stabilised, but some portions of the lower channel systemare still scoured by high flows.

Dams within restricted areas

Some dams have been built in lignum swamps that fall within restricted areas

- A return to natural ground levels should be the goal of any works in these situations
- To minimise access and disturbance to these sites a determined weed management effort should be undertaken on closure that where practical includes associated rehabilitation plantings
- The RESO or ADES should be consulted to ensure the relevant groups are consulted over any works undertaken in these sites

3.0 Biodiversity

3.1 Flora and Fauna records

CUTA's biodiversity values are generally reflective of those in the wider region and its recent pastoral history. The entire site consists of native vegetation, barring a few small areas of managed vegetation around infrastructure, and varying degrees of weed infestation. CUTA has been surveyed for flora and fauna to support management plans for older sectors (EMS and PAS 1992, Kellogg Brown and Root 2005), and to inform the assessment of the purchase of pastoral leases covered by the MLDP (AECOM 2012, Jacobs 2015a). Many additional records stem from the long history of public access along highways and to areas within the former pastoral properties, as well as the University of Adelaide research station. A search of public data on the Atlas of Living Australia yielded 9807 individual sighting records for CUTA and a 5km buffer around its boundary (Figure 22). This includes 25 mammals and 236 birds, although it also includes museum records of species that became locally extinct in the 1900's such as the stick nest rat (*Leporillus* sp) and Tammar wallaby (*Macropus eugenii*). Defence surveys of CUTA have yielded hundreds more records, and Jacobs (2015a) report 395 species of plant and the 104 species of bird from recent surveys.

Despite the fact that more than 10,000 biological records are available for the training area, the only known resident threatened species are the EPBC listed vulnerable western grasswren/thick-billed grasswren (Gawler Ranges) (*Amytornis textilis myall*) and one State listed vulnerable species, Sandalwood (*Santalum spicatum*). Flocks of up to 35 state-listed vulnerable blue-winged parrot have been recorded in northern CUTA at times but were not recorded by recent surveys. Other State and Commonwealth threatened species have been recorded occasionally as vagrants, or have been reported by casual observers with no additional verification. These species include a freckled duck near Middleback Station, two records of Australian bustard and two reports of mallee fowl (*Lepoia ocellata*) on CUTA from previous range staff. The ALA data also includes a mallee fowl record near the southern boundary of CUTA at "Whyalla" in 1999. Due to the data liability, EFRs are only maintained in GEMS for species listed as vulnerable or above under State or Commonwealth legislation, although other records should be collected in GEMS format in a single 'bi-catch' datasheet attached to the property environmental profile so that when species change their status they can be quickly transferred into GEMS.

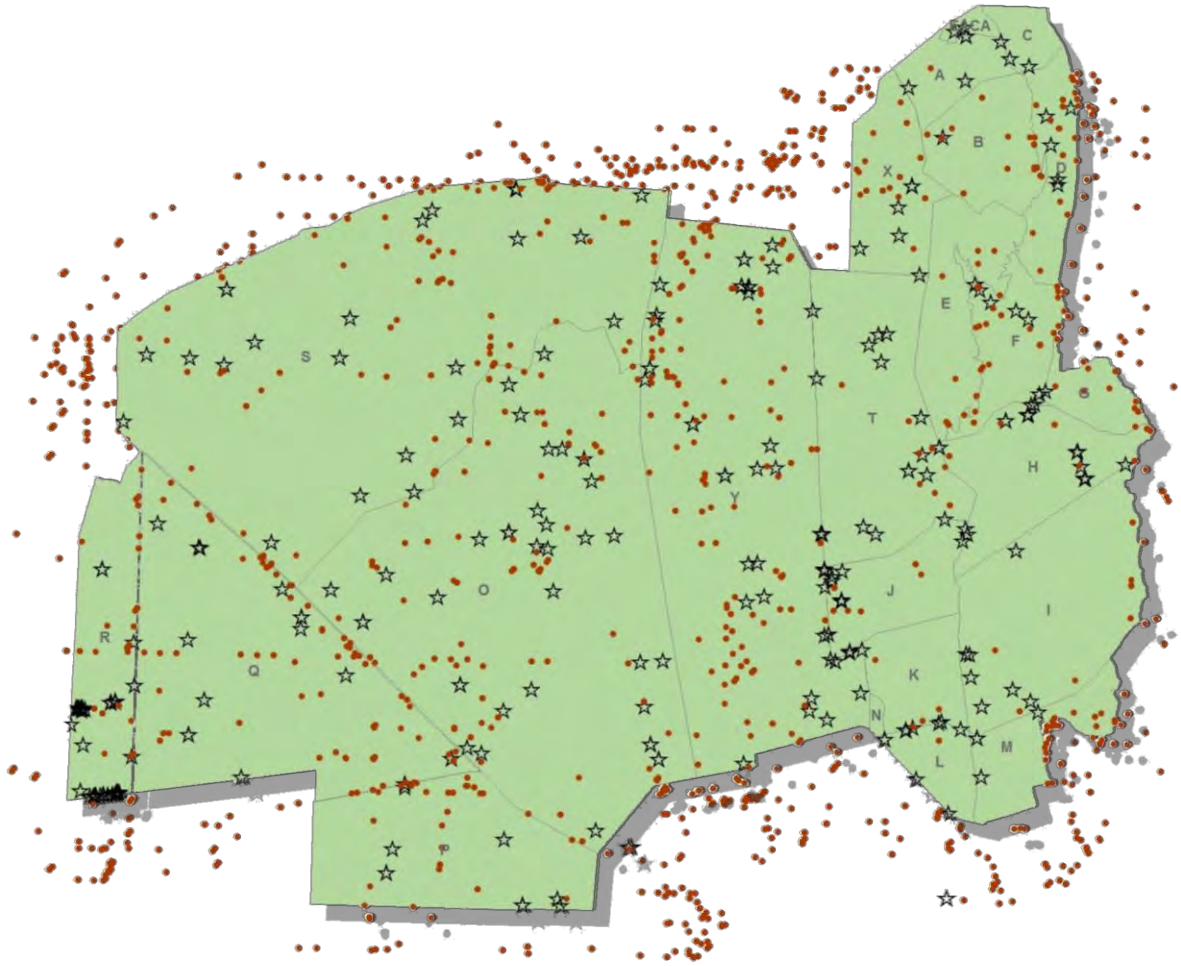


Figure 22. Records of plants and animals on CUTA and surrounds.
Dots are records from the Atlas of Living Australia (May 2015) and stars represent Defence-commissioned survey sites (Kellog, Brown & Root 2004, Aecom 2012, Jacobs 2015a and records from production of this EMP).

3.2 Vegetation communities

CUTA's vegetation is dominated by open chenopod plains or woodland associations with prominent chenopod understoreys (Figure 23). Smaller, but notable, occurrences of mallee and mixed shrublands also occur, a well as localised areas of hummock grassland on rocky hills, lignum swamps in shallow basins and indistinct drainage lines, and samphire swamps and saline flats. No communities are considered threatened or of particular conservation note.

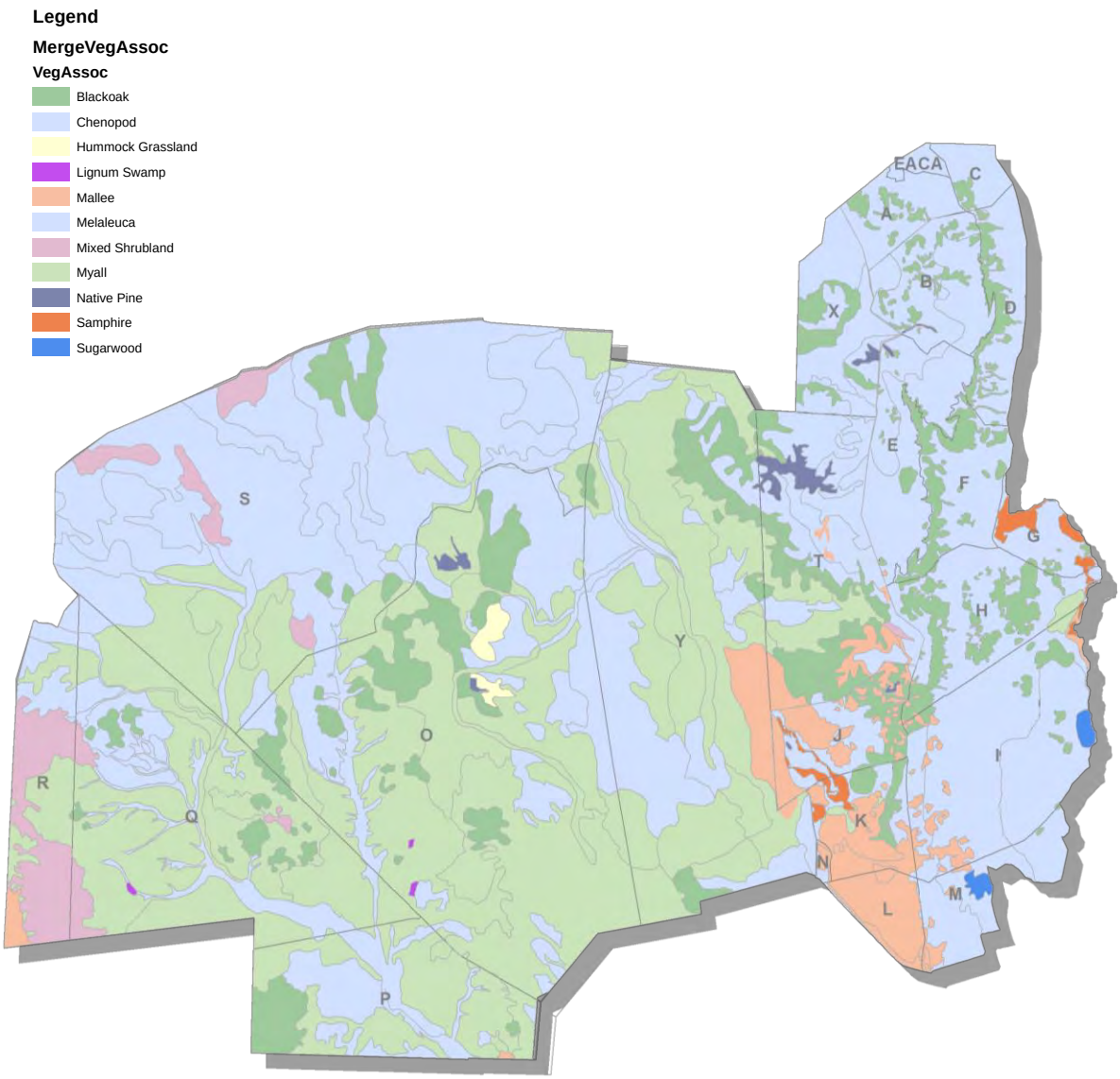


Figure 23. Vegetation associations of CUTA.
Mapped community boundaries within associations shown. Data based on existing CUTA vegetation mapping, and ground-truthed and modified mapping derived from vegetation mapping in AECOM (2012).

3.3 General biodiversity management

General biodiversity values will principally be managed through the vegetation management program (section 2.2) in combination with management of pest and weed species described in section 4. Key threatening processes listed under the EPBC Act that will be managed under the BONS program are; *Competition and land degradation by rabbits*, *Competition and land degradation by unmanaged goats*, *Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants*, *Predation by European red fox*, *Predation by feral cats* (potentially) and *Novel biota and their impact on biodiversity*. Overgrazing by kangaroos is another potential risk that is managed under the BONS program. With the removal of sheep grazing there are key opportunities for recovery of the ecosystems of CUTA, but if not managed, the above processes and species can prevent the successful recovery of many species. A key example is the western Myall (*Acacia papyrocarpa*). University of Adelaide researchers have observed that the biodiversity of the region and patches of greatest diversity are found in association with the western Myall (Jose Facelli pers. comm. Oct 2014). However, in modern grazing systems western Myall cannot recruit new individuals into a population. Emergent seedlings are grazed immediately and cannot

take hold. The trees can take 60 years or more to mature, and juvenile trees from a successful round of recruitment in the 1970s are still subject to ongoing grazing pressure that prevents them from attaining maturity. A previous heritage listing over the southern parts of CUTA specifically mentioned the chance of Myall recruitment as a potential value of the site section 8.4.1). Middleback researchers and Jacobs (2015a) have witnessed renewed growth on Myall recruits since the removal of sheep. However, rabbits, kangaroos or goats can be equally effective at preventing regrowth if total grazing pressure is not adequately controlled. Monitoring of this recovery is best continued by the Middleback program and incidentally as part of the proposed Santalaceae recruitment research project, but should retrogression in regrowth be noted, Defence may need to consider additional management actions for grazing/browsing animals specifically addressing this issue.

3.3.1 Restricted Areas

Kellogg, Brown and Root (2004) nominated some areas in sectors A-N of CUTA as being locally significant. These have been managed as restricted areas ever since. Some of these were assessed as significant by considering their status within the Eyre NRM board region to the south of CUTA, and proposing that CUTA shares close affinities with that region and therefore the status in that region should apply. However, CUTA lies within the Arid Lands region where the same species and communities are not considered regionally threatened and their presence on CUTA is not of particular significance because the correct affinity is with a region where their presence is expected. Other areas were nominated simply as the best examples of their kind within CUTA, including areas of Myall which is not common in eastern CUTA, but is now very common across the training area. There is also no reason to consider the occurrences of species on the training area in isolation from the wider adjacent landscape when determining the significance of a particular area. Given the standing protections provided to trees and vegetation in RSOs, and the lack of requirement to consider some areas as restricted based on the above logic, restricted areas across CUTA should be critically reviewed. Figure 24 presents the outcomes of an initial review. Restricted areas for Mulga and black oak ("rare trees") should be discontinued, with the exception of Sherwood Forest. A rehabilitation area in the south of sector I also appears to have reached a significant state of regeneration and could be re-opened on that basis, but those parts of the site that coincide with a heritage site will require continued protection as a restricted area. Further review of RAs in sectors K, L and N should be undertaken. All RAs should be rationalised into a single data set that covers environmental and heritage RAs, particularly given the coincidence of environmental and heritage RAs in the Glenn, Moon Lake and sector H. A decision should be made whether RAs are described at the grid-square level as per environmental RAs or delineated as polygons prescribing the actual area as per heritage RAs. Some grid-square descriptions include hundreds of hectares greater area than the actual area requiring protection, but as a trigger for an ECC, rather than an actual exclusion area, this precautionary approach may be warranted. New environmental RAs include all of sector R as an environmental offset and protective buffers around the University of Adelaide field sites in sector P.

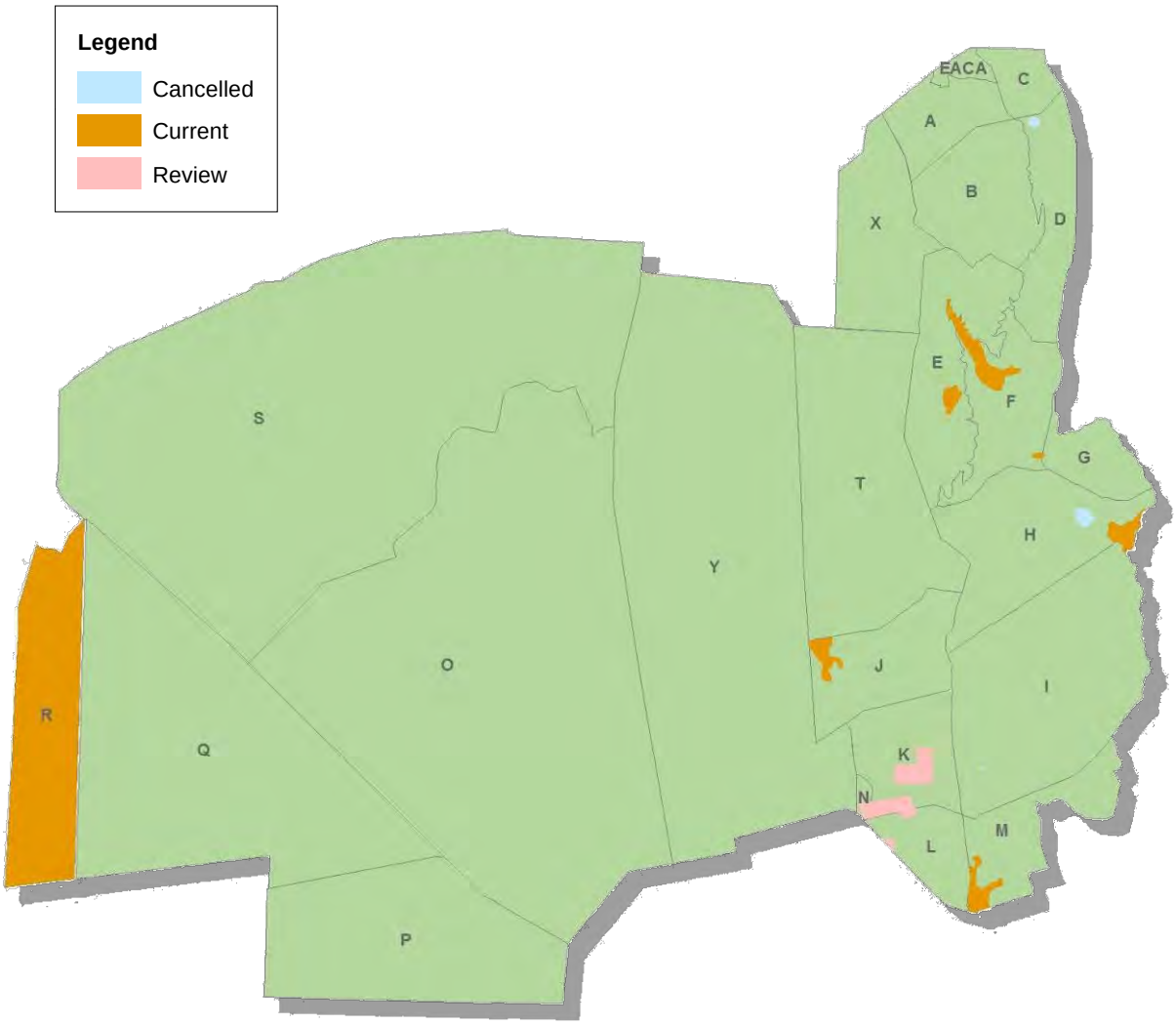


Figure 24. CUTA environmental restricted areas
Note that some RAs (University of Adelaide sites in sector P) are too small to be visible at this scale.

3.4 Threatened Species

3.4.1 Distribution of resident threatened species

The western grasswren (Figure 25) is widely distributed across CUTA, predominantly on the plains west of the Simmens Plateau (Figure 26). It can occur in any of the vegetation communities present in those areas. Aecom (2012) and Jacobs (2015) record a small number of scattered sandalwood across CUTA, generally as isolated individuals. Most of those records are derived from databases with generalised coordinates and the data is not indicative of actual locations of sandalwood, although the species is probably genuinely scattered across woodland areas of the site as a rare tree (Figure 27). Historical maps suggest a higher abundance including sandalwood in the general vegetation description for areas near the Lincoln highway. Surveys during the development of the EMP revealed a very large population of sandalwood in the south of sector R. This population is estimated to contain at least several hundred mature individuals based on densities observed at either end of the likely distribution of the stand (Figure 27). The stand is likely to be regionally significant (R. Brandle pers. comm., Oct 2015).

Figure 25. A western grasswren *Amytornis textilis myall* in northwest CUTA.

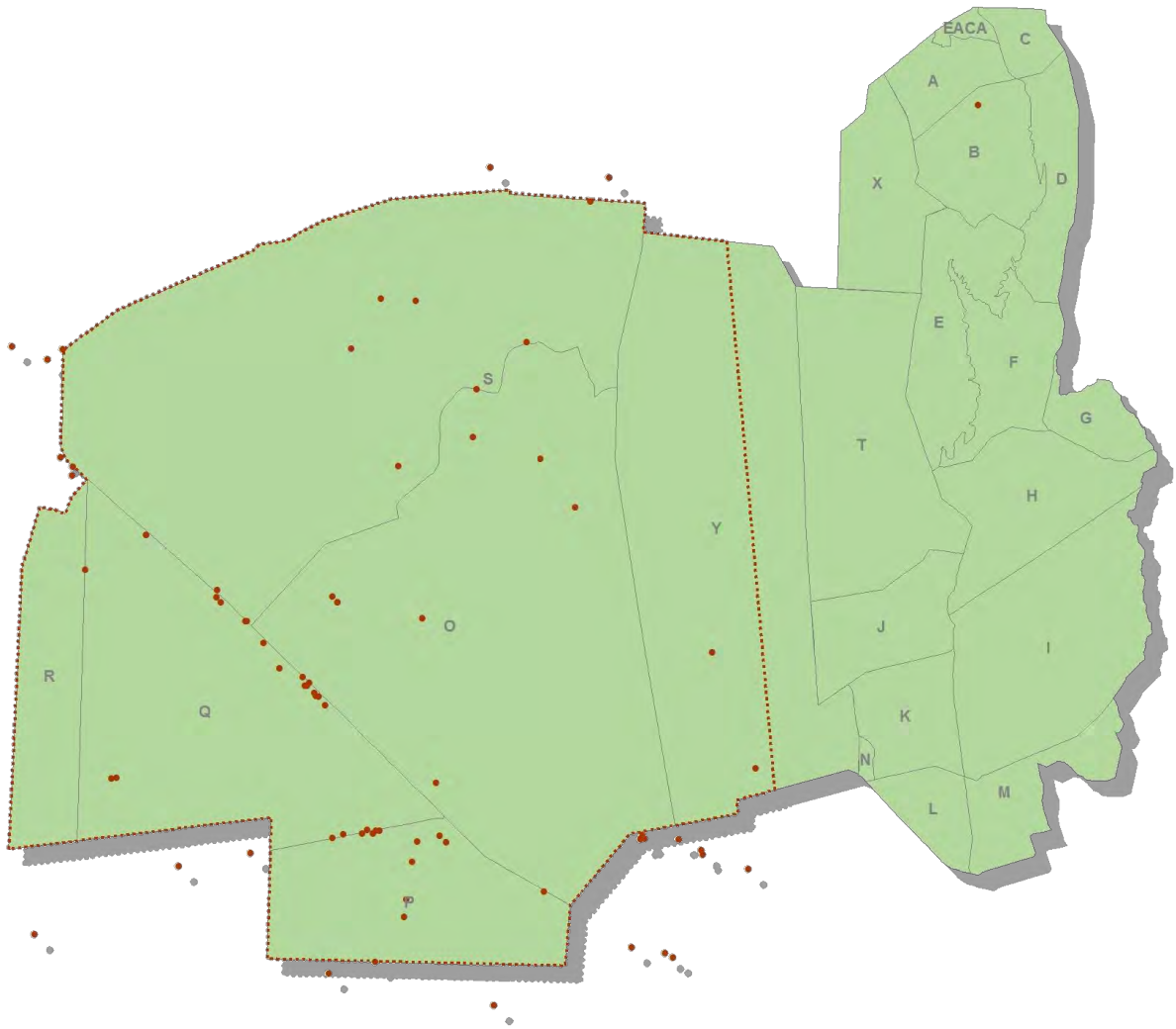


Figure 26. Western grasswren records on CUTA and immediate surrounds.
Records derived from Aecom (2012), Atlas of Living Australia (accessed May 2015) and field visits. Dotted line represents the current spatial record for the EFR record based on sighting records. This is a minimum convex polygon with minor adjustments for the property boundary and exclusion of the sector B record which is from 1978 and is based on generalised latitude and longitude. This boundary can be enlarged if new sightings are made further east.

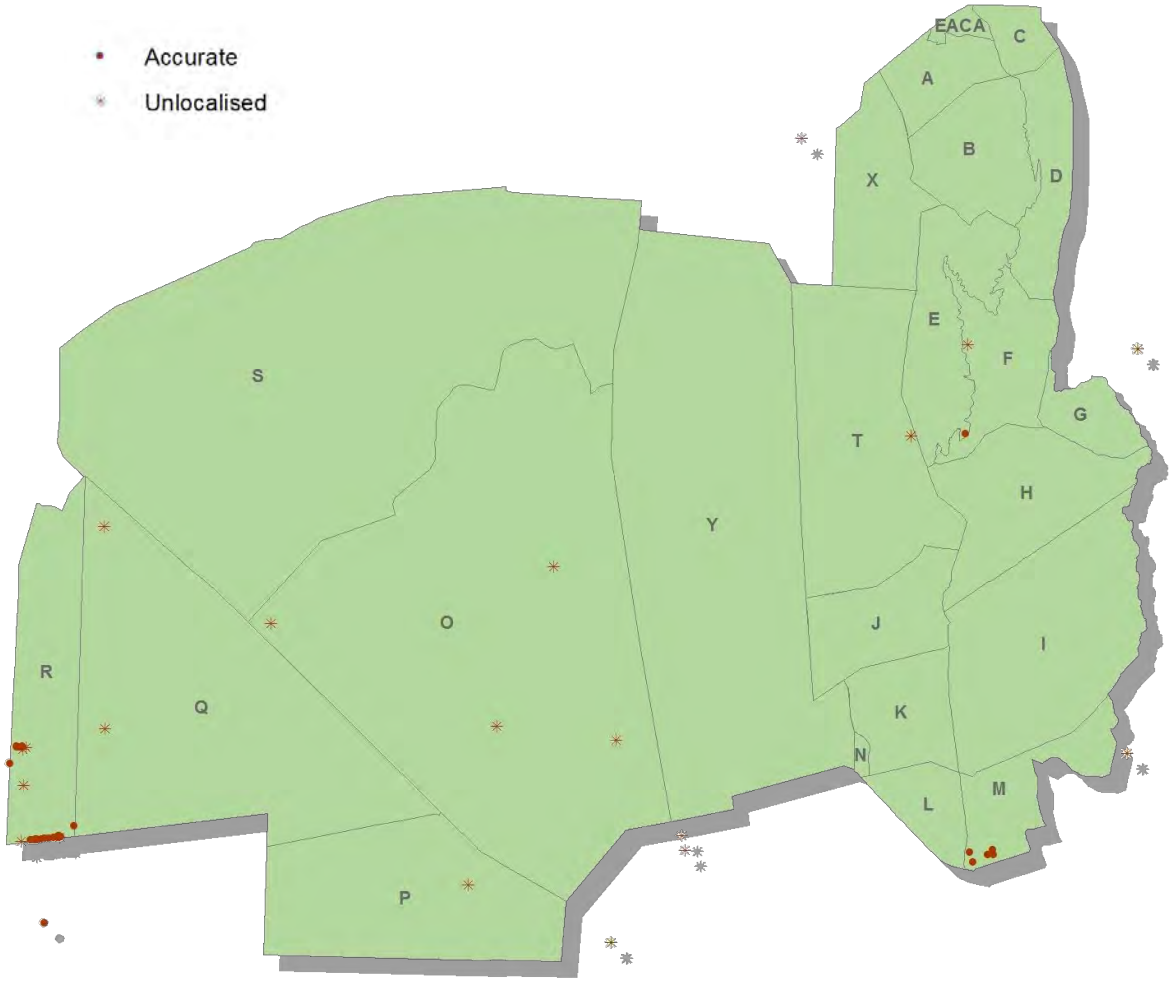


Figure 27. Sandalwood records on CUTA and immediate surrounds.
Records derived from Aecom (2012), Atlas of Living Australia (accessed May 2015), Jacobs (2015a) and field visits. There are sufficient records of scattered individuals across CUTA for a property level EFR to be created, and an additional record for the south-western population (Figure 28). The population in sector M may also warrant a separate EFR record based on past management plans but it was not visited during development of this EMP.

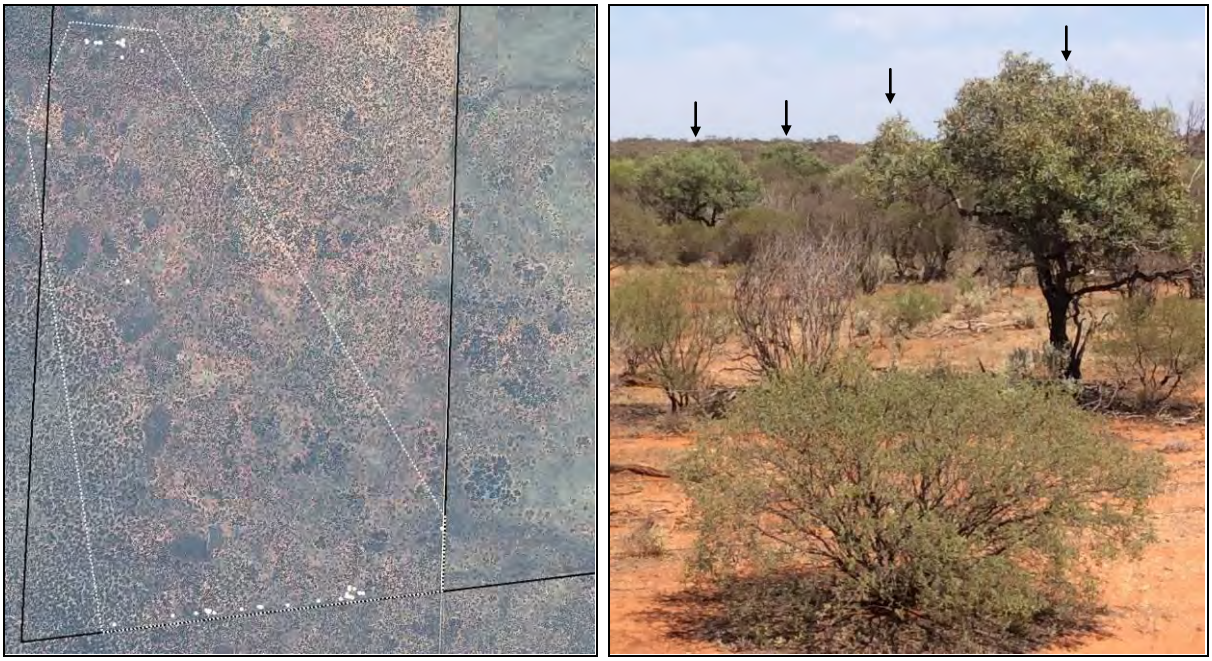


Figure 28. Southwestern population of sandalwood in sector R.
Points (left) are where GPS locations were taken of trees immediately adjacent to tracks. Many more trees are visible in the vicinity of those records. Based on underlying geology and vegetation association it is likely that similar densities of sandalwood are present in the intervening area within the polygon, and more broadly in the general vicinity. Tree densities looking across this area (right) are very high in places. Full documentation of the population will rely on a dedicated research effort. Sandalwood appear to be essentially absent from the Mallee community in the far southwest corner of the site.

3.4.2 Threatened species management

Western grasswren

Loss of habitat is the key potential threat to the western grasswren arising from Defence activities. This concern has been raised in the conservation advice for the species under the EPBC Act (DotE 2014 Page 3) "About 20% of the population of western grasswrens lives within the Cultana Training Area on lands nominated for military purposes, including tank training, which poses potential risks of direct physical habitat damage (Black et al., 2009). This area is exempt from the South Australian Native Vegetation Act and vegetation clearance is permitted, under Native Vegetation Regulation 5(1)(zn), if carried out by the Commonwealth Department of Defence or an arm of the Australian Defence Force (SA Native Vegetation Regulations, 2014)". Concerns over broad acre clearing due to the exemption from the SA *Native Vegetation Act 1991* are unfounded as Defence has no intentions to conduct widespread clearing and such an action would not be acceptable when impact-assessed under either whole-of-environment provisions of the EPBC Act or Matters of National Environmental Significance if the impact would be significant to the grasswren. However, there is a plausible risk of damage to habitat from vehicle training and live-fire practices. This risk is probably no greater than the risk posed by overgrazing which is considered the greatest overall threat to the species at all locations (DoTE 2014), and it will be actively managed by Defence. The widespread population of the western grasswren and its use of a range of habitats throughout the western sectors of CUTA, including the environmental offsets are of sector R, means that it is unlikely to be seriously impacted. The risk of habitat loss is managed through the overarching vegetation management program for the site. The conservation advice for the species recommends that "…military authorities monitor and conserve populations on land they control." (DoTE 2014 page 7). No specific

Defence monitoring of grasswren populations is planned, but Defence will support any regional monitoring programs that may be undertaken. Regional monitoring would provide a context for any changes in populations on CUTA in comparison to surrounding areas, and therefore allow some gauging of whether changes in populations size are actually the result of Defence actions. Results of any monitoring can be readily tied to the long-term vegetation monitoring program, which can also be spatially extended for selected periods to take account of surrounding conditions at times of population monitoring. Defence will also potentially support research conducted in response to the recommendation of the conservation advice to "Determine the acceptable levels of grazing by livestock and feral herbivores required to ensure subspecies survival, with a focus on the regeneration potential of critical habitat plants (particularly blackbush and native boxthorn) under grazing by domestic stock" (DoTE 2014 page 6).

Sandalwood

Sandalwood is at risk of direct damage from vehicles and adult mortality due to fire. The key population of sandalwood on CUTA is in the south of sector R and forms an important aspect of the values of that environmental offset sector. No off-road vehicle access is permitted in this area to manage the risk of vehicle damage. The low incidence of fire on Cultana and the small footprint of such events (Section 5), mean that it is unlikely any areas of sandalwood will be burnt. Defence has placed a live-fire restriction over this sector in order to protect its values, including mature sandalwood trees. The known CUTA population of sandalwood consists entirely of mature trees. The proposed Santalaceae recruitment research program (section 2.3.2) is an important step towards conserving the species, and in promoting recovery following any unexpected event such as fire that does cause widespread adult mortality. This research will also establish the baseline population size. Once this baseline has been established and each tree is individually marked and accounted for, a count of trees can be undertaken as part of the five-yearly review, starting from the ten year review. This represents a key sustainability indicator for the site, and although the inevitable long-term loss of mature trees from the population is not directly related to Defence management, the intended recruitment of juveniles is.

Mallee fowl

Mallee fowl are not currently resident on CUTA, but apparently suitable habitat is found in sectors J, K, L, M and R. This habitat is protected by restriction or exclusion of off-road vehicle movement in these sectors. Mallee fowl are distinctive birds that produce distinctive nesting mounds, so the establishment of new populations in the local area or on CUTA should be detectible. Awareness material (e.g. a "Have you seen me?" poster (Appendix B)) should be placed at range control if is there is reasonable suspicion that the local area is occupied. However, having such material permanently posted in the absence of the species will detract from its value, and dilute the effectiveness of carrion flower awareness material. Most military range users will also not see material placed in Range Control, and a poster placed in the ablutions in the southern administration area (sector N) or at sentry points 1 and 2 adjacent to Mallee areas may be the most effective way of maximising eyes-on-ground in the relevant area. Targeted fox baiting and instigation of management protocols similar to those used at Murray Bridge Training Area will be required should mallee fowl become established on CUTA. If local ornithologists or NRM boards report multiple sightings of the species from near CUTA's boundaries, or if range users note more than one sighting of the species on CUTA, then detailed survey of areas of mallee should be undertaken for birds and mounds. Surveys for mallee fowl should form part of at least one survey effort of the discovery program in its first ten years.

There are no specific management activities that Defence will undertake for other transient and migratory species such as the blue-winged parrot.

3.5 Biodiversity management summary

Risks described are to the species as the highest ranking risk. The reputational risk associated with the western grasswren due to inclusion of Defence impacts in the conservation advice is considered to be subservient to the risk of actual population decline resulting from habitat loss. Broader biodiversity management is not included here as it falls within the scope of sections 2 and 4. EFRs for biodiversity include the environmental offset area of sector R, the western grasswren population as a single record, and multiple records for sandalwood in recognition of the importance of the population within the offset area in comparison to scattered known individuals elsewhere.

Table 3. Key biodiversity risks

Risk	Likelihood	Consequence	Risk	Location	Management	Monitoring	SMRP
Loss of western grasswren habitat due to vehicle impacts	Possible and Rare (Reputation)	Minor and Negligible (Reputation)	Medium	EFR: None specific, predominantly between Whyalla-Iron Knob road and Eyre Highway west of the Lincoln Highway	Vegetation management program, impact assess developments	Vegetation monitoring program	No
Long-term loss of key sandalwood populations due to lack of recruitment	High	Low	Medium	EFRs: South of sector R, other scattered locations.	Santalaceae recruitment research project	Five-yearly individual count and condition for sector R population (from year 10)	Report changes in population. No plausible management outcome to prevent ongoing loss of mature individuals to senescence.
Suppression of Myall and other recruitment by herbivores	Almost certain	Moderate	High	Myall predominantly west of the Simmens Plateau, especially south of the Whyalla-Iron Knob road. Others across site.	None specific. Tied to ongoing BONS control programs.	- Middleback Research Station long-term monitoring, recruitment research project. - Vegetation monitoring program	Reduction in Myall regrowth noted by researchers, or in five-yearly transects will trigger an investigation into potential increased herbivore controls.

Impacts on unknown threatened species	Possible	Minor	Medium	Whole property and surrounds	Discovery program, range user awareness programs	None	No

4.0 Biosecurity and overabundant native species

4.1 Overall site Assessment

4.1.1 Site context and key invasion pathways

CUTA has established populations of many pests and weeds, predominantly common pastoral weeds and pests, but also some domestic escapees. The property is particularly susceptible to ongoing invasion by many others due to the presence of road, mining and infrastructure easements over which Defence has no direct control and which are subject to high levels of uncontrolled movement by the public and commercial operators. Movement of military equipment to and from the site presents another key pathway for potential incursion of biosecurity threats. Movement of Defence equipment is most commonly from Adelaide and Darwin, but may include equipment from almost any Australian Defence facility. The climate of the site will challenge many key biosecurity threats present at other Defence sites such as chytrid fungus and *Phytophthora*. However, many weeds and pests present at CUTA also occur on other Defence sites, indicating plausible pathways exist for establishment of new species. The main initial entry points for military equipment into CUTA have historically been El Alamein camp range control, and sentry point 1. However, this will change dramatically over the next few years as new camp infrastructure and ranges are built and western sectors become a focus for vehicle activities. Potential use for marine and amphibious landing scenarios would further increase the scope of entry points for biosecurity threats and a standing risk assessment of amphibious landings and departures will be required if CUTA becomes a site used for such practices. Departure of equipment directly on to a marine platform is particularly difficult to manage as speed of disembarkation is likely to be paramount to any scenario, and vehicle hygiene will necessarily be limited or have to occur off-site. This issue is not unique to CUTA, and standing protocols should exist by the time any such scenario plays out at CUTA.

A general management approach that reflects the above context is set out in Figure 29. This differentiates between species that are already known to be present, and those that have the potential to enter the site. Many of the species already present are not manageable or do not require specific management, while some are priority species that require specific control. A key differentiation is between widespread species and those that are known from a small number of locations with a chance of meaningful control. For those species not yet known from CUTA, specific management actions are required to engage regionally to ensure priority threats to the region do not become established, particularly for those species that will enter the site from the public or commercial easements.

There are already a large number of on and off-site Defence management procedures to prevent species being introduced by Defence activities. Many of those procedures are not specific to CUTA, but some additional management is required to target points of entry and key risk sites.

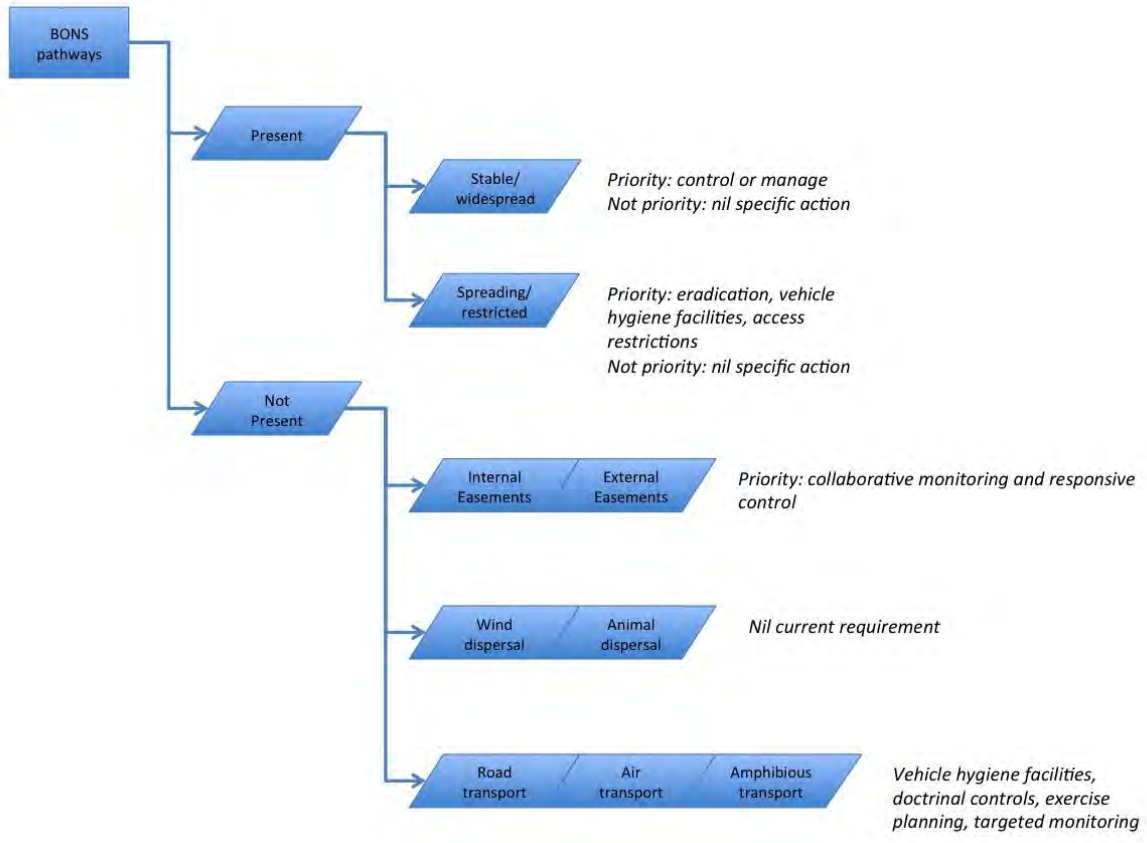


Figure 29. Cultana biosecurity management process by BONS status.

4.1.2 Management roles and key external contacts

Biosecurity management is a necessarily collaborative endeavour by all land managers. Emerging threats can only be controlled through shared vigilance and coordinated control programs, and established problems are often best managed through regional programs that coordinate control at large spatial scales to prevent localised temporary removal of an issued and rapid re-establishment of the problem. Control programs on CUTA are generally the responsibility of the EMOS contractor or another contracted service provider, but Defence land managers and range control staff have key responsibilities to consult and coordinate with council and state authorities where appropriate. The CUTA EAC provides a good vehicle to achieve regional discussion over proposed management and emerging issues, and the EAC may allow coordination of large-scale control programs. At other times, such as discovery of a notifiable weed or pest, direct contact with local authorities will be required. The first point of contact on discovery of a notifiable weed should be the SAAL NRMB.

4.1.3 Overall management objectives

It is likely to prove impossible to prevent new incursions and re-invasions of most weeds and pests on CUTA due to the decidedly 'leaky' nature of the property boundaries and internal easements. This means that risk-based management must target species that present either an easily controlled threat, or a significant threat to sustainability of the site. Species-specific approaches are detailed in the following sections.

Higher order objectives for the site are:

- Prevent establishment of species that pose a plausible risk in reducing training opportunities
- Comply as fully as practicable with local NRM management plans.
- Participate in regional programs and collaborate with local NRM boards to control socially problematic pests irrespective of the direct risk they pose to Defence.

4.1.4 Detection of new species

On detection of a new species, or new population of a species, the process in Figure 30 is triggered. For priority biosecurity threats such as buffel grass an EFR should already exist with a 'probable' or 'possible' presence attribute, depending on the likely pathway of incursion. Where detection is suspected to have resulted from a Defence activity (e.g. a weed present at an interstate site but not locally) any areas where the suspect machinery/vector may have moved should be surveyed. Where self introduction is suspected (e.g. buffel grass or species that are present in the local area and will readily cross the range boundary without assistance), an area of at least one km radius around the site of detection and around any areas adjacent to noted infestations outside the boundary should be surveyed. For highly mobile pests such as wild dogs, track surveys over a wider area will be required, but can utilise track networks.

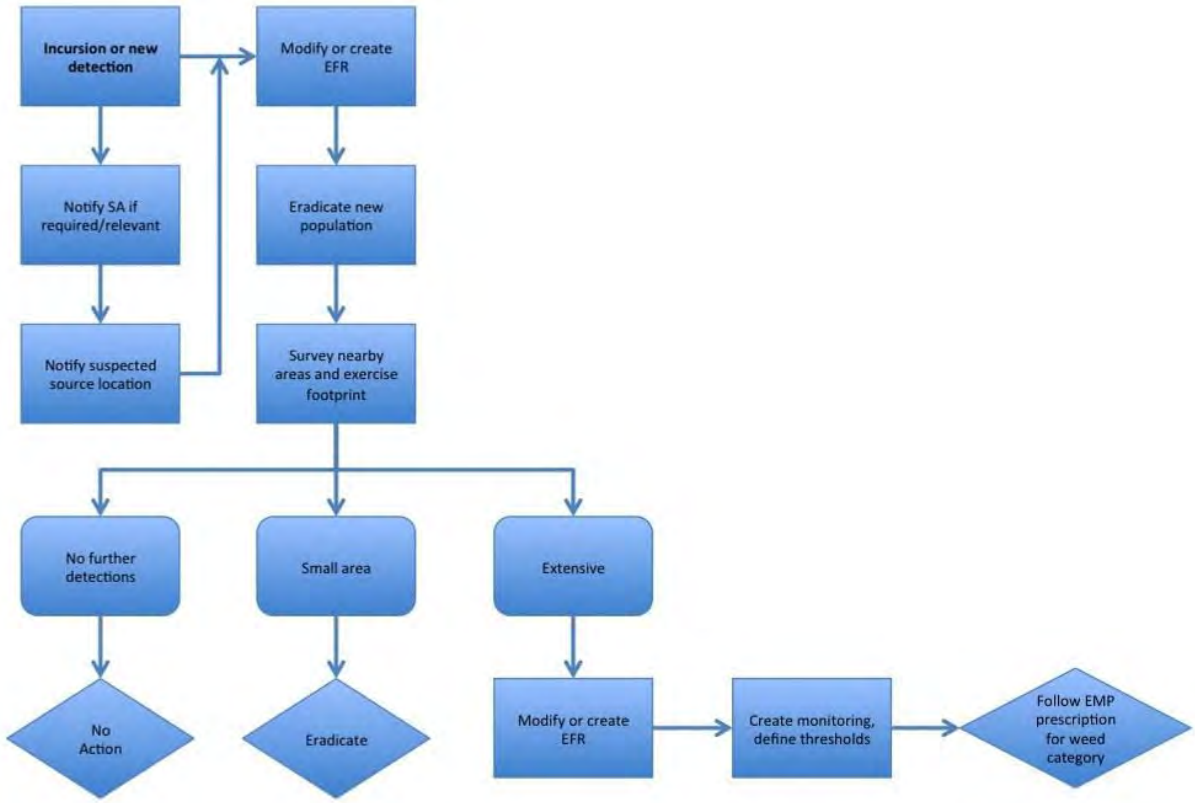


Figure 30. Management process following detection of new populations of pest and weed species.

4.2 Pests and Overabundant Native Species

4.2.1 Introduced pests and impacts

At least eight introduced mammals four introduced birds occur within CUTA. Of these species, most are generally minor environmental pests such as the house mouse, sparrow and pigeons. However, impacts of four are recognised as key threatening processes under the EPBC Act; feral goat (*Capra hircus*), European Red Fox (*Vulpes vulpes*), cat (*Felis cattus*) and European wild rabbit (*Oryctolagus cuniculus*). Management plans have been prepared and management programs have been undertaken for goats, foxes and rabbits at CUTA (Yacca Land Management 2010, Rural Solutions SA 2011). However, very few cat sightings or records have been noted from CUTA (e.g. only two reported by Kellogg Brown and Root 1995 in the most comprehensive survey of sectors A-N), and no specific management of cats has been performed.

Feral goats are highly transient within the freehold part of CUTA, possibly due to the limited available surface water. Larger numbers are present across western sectors although 2015 aerial monitoring by SAAL NRMB did not find that any areas contained high goat numbers. Goats compete with native wildlife, spread weeds, damage vegetation through overgrazing and cause soil damage and erosion. Goats are also responsible for the suppression of recruits and regeneration of many key plant species.

Foxes are found across CUTA. Foxes pose a threat to native fauna and have played a major role in the decline of ground-nesting birds, small to medium sized mammals, and some reptiles.

Rabbit densities vary across the CUTA, but are generally at low to medium densities based on above reports. Higher density populations were recorded on the plateau of sector E, at Glen Creek/Well and near Douglas point in 2009 by Rural Solutions SA (Rural Solutions 2011), and were noted around the pastoral infrastructure on western sectors, but active warrens were also noted at many locations during field visits. Rabbits compete with native wildlife, damage vegetation and degrade the land by ringbarking trees and shrubs, and preventing regeneration by eating seedlings. Rabbits have contributed to the extinction of several small ground-dwelling mammals and the decline of a number of native plants and animals.

Cats are present at CUTA, although they may not be common based on current evidence. However, cats are notoriously enigmatic, and their impacts on birds, small mammals and reptiles at CUTA cannot be underestimated based on lack of direct evidence of a sizable population.

Ten or so horses were seen in the northwest corner of sector S adjacent to Iron Knob in October 2015. This boundary has not previously been fenced and it is not clear whether the horses are domestic or feral. They are having clear impacts on the local vegetation and well-trodden tracks are present.

4.2.2 Pest management

Past pest management programs have identified the key pests on site to be rabbits, goats and foxes and this continues to be the case. These are the only pest species for which specific ongoing actions by Defence are specified here (assuming horses are readily removed from the

northwest). Management actions for these species focus on reducing key risks they pose to the environment and Defence by:

- Directly managing the impacts of pests
- Monitoring and understanding the population of pests in order to conduct relevant management actions where pest activity is greatest at the time if treatment
- Directly managing population size of pests

Directly managing the impacts of pests

The impacts of rabbits and goats on vegetation are pervasive and described in earlier sections and illustrated in Figure 31. Research will be conducted to try and ameliorate these impacts and encourage recruitment among key species suppressed by rabbits and goats using targeted fencing and other methods in sector R. At least in the short term this research will not have an impact on the wider landscape. The only way to effect broader recovery of vegetation is through directly reducing pest numbers.

Figure 31. Rabbit impacts on garden plantings at Lincoln Park, sector X.
Exposure and removal of succulent roots, ringbarking and browsing from rabbits are compounded by goat browsing of higher foliage and branches.

Monitoring and understanding the population of pests in the long-term

Monitoring of pests will be achieved through multiple programs:

- Jessup Transects run every five years for the vegetation management program include the recording of measures of the presence/absence of pests and also their impacts.
- The SAAL NRMB is contracted to provide aerial census of goats and kangaroos across CUTA and this service is planned to continue for the foreseeable future.
- A research project, the *Defence Automated Survey and Monitoring Using Cameras and Sound* (DAMASCUS), is nearing completion and will provide a set of monitoring protocols in 2016 for roll-out across Australia. Remote cameras will be used at CUTA to monitor goats (Figure 32). Remote cameras may also be set on bait stations and

other target locations to monitor foxes. However, it a reasonable assumption that targeting fox control to areas with higher rabbit densities and along boundaries and tracks negates the need to independently census foxes.

- Rabbit warrens and other indications of rabbit presence will be recorded by the CUTA indigenous ranger prior to management programs in order to target high density locations for management based on higher numbers and presence of moderate or high numbers in proximity to sandalwood populations.
- Spotlight counts and more intensive monitoring actions are probably not required for rabbits and foxes. However, if deemed appropriate due to a specific increase in the risks posed by foxes, the methods set down in the CUTA Regional Pest Management Plan (2011) should be adopted.

Figure 32. Goat on dam wall at Aqua Dam.
Aqua dam is nominated as a reliable, central dam to be retained till the end of the water closure program in order to assist goat management. Remote cameras set in time delay mode at dams have the capacity to provide good indications of relative goat numbers in an area.

Directly managing population size of pests

Eradication is not a viable management option for any of the pests already present on CUTA. Previous management plans identified targeted baiting programs for rabbits and foxes and highlighted the need to participate in collaborative regional programs through the NRM board in order to provide ongoing control. These requirements have not changed with the enlargement of the training area. Management of foxes has no benefit for Defence capability and is undertaken to ensure environmental management responsibilities and social responsibilities to surrounding neighbours are met. Management of rabbits and goats has a more direct potential benefit for capability as reducing grazing impacts increases vegetation cover and assists in sustaining training activities with a potential to damage soil. Rabbits may also produce warrens large enough to create a minor hazard for vehicles and night-time

infantry exercises (Figure 33). The Defence Mobile Data Capture tool is an i-pad based field recording system linked to a server that allows the rapid recording of feral animal locations and is the ideal tool for recording sites requiring management. Personnel can record sites as they are encountered throughout the year and these will form the basis for the next round of rabbit control. Goats have been mustered from western sectors of CUTA since 2014, and the closure of dams should provide focal points for this activity. The EMP does not set thresholds or target numbers for rabbits and foxes as management is based on general threat abatement for foxes, and on reactive management of highest density populations of rabbits.

Specific management actions to be undertaken are:

- Continue to facilitate the mustering and removal of goats. This is the primary management technique to be employed unless there are incursions into sensitive indigenous sites where immediate removal from the restricted area is necessary through either herding or shooting.
- High-density occurrences of rabbits should be treated by baiting and warren destruction in accordance with the CUTA Regional Pest Management Plan (2011). Target sites in eastern CUTA are still aligned with the surveys conducted in 2011. The indigenous ranger or other personnel with capacity to opportunistically record rabbit presence while traversing the site should records warrens using the defence mobile data capture tool or similar method that results in a reliable central database to inform management action.
- Areas to be treated should be delineated as management EFRs in GEMS, and the outcomes of control and ongoing monitoring of those units should be recorded in GEMS. The relevant metric to monitor against the EFR may be scale depended, but is likely to be number of active warrens. This measure is a good one for not only gauging the degree of local activity, but also for understanding the effectiveness of warren destruction programs. Spotlighting or other measures may be used, depending on the nature of the sites and management actions undertaken.
- Harbour removal around old pastoral infrastructure will reduce the highest density populations on newer sectors.
- Participation in regional fox management programs with the SAAL NRMB will be sufficient fox control to present a general environmental benefit, and will generate a better regional-scale program. Baiting should be conducted along boundary lines and tracks.
- If Mallee fowl are recorded on CUTA the degree of fox baiting will have to increase in order to protect that species, which is particularly sensitive to foxes.
- If horses have been fenced into CUTA, their removal is an achievable task through mustering, but establishing ownership is the first step. If no owner is identified then a separate management process will need to be undertaken to remove them. If left to establish on CUTA then horses could become a serious management issue both environmentally and politically.

All management actions must have regard for the risks posed by UXO during ground disturbance and shooting. Rural Solutions (2011) detail the acceptable methods for conducting pest management activities across CUTA given the UXO risk assessment for the site.

Figure 33. Rabbit warren in the northwest of sector S.
Warrens provide a benefit for management in allowing targeted management to areas of higher density, but large warrens in flat plains may also create a minor hazard to Defence personnel.

4.2.3 Dingo/dog management

Wild dogs (inclusive of dingos and feral dogs) are a long-term historical issue in pastoral rangelands, but were not present in the vicinity of CUTA through most of the twentieth century due to eradication south of the dog fence. Wild dogs have not been considered under past CUTA management plans. In recent years the population south of the fence has increased markedly, and an individual was shot in sector S in 2014. The recent increase in wild dog populations is a major political issue. In recent years the issue has sparked articles such as "*Dingo numbers exploding south of dog fence force SA farmers to quit the wool industry*" (Advertiser August 26, 2013) with the lead statement that "Dingoes running rampant south of the dog fence are forcing graziers to switch from sheep to cattle and have sparked warnings the wool industry will become extinct without a new battleplan." The South Australian Government has responded through the "Biteback" program that provides baiting services and traps to landholder to control their wild dog population. The *SA Arid Lands Wild Dog Management Plan* (SAAL NRMB 2015) is the guiding document for regional wild dog management. CUTA falls within zone 1 of the plan with the management goal "Allow for the destruction of all wild dogs to protect livestock enterprises or public safety." and the plan notes "ongoing surveillance and coordinated control activities by all landholders are required to protect livestock enterprises."

As an added complication to management on CUTA, wild dogs south of the dog fence are declared pests under South Australian law, but on Commonwealth freehold land they are protected native fauna. A protected native status does not preclude management. However, any long-term or significant management action that involved killing native animals protected

under the EPBC Act would need to be assessed under the Significant Impact Guidelines 1.2- *Actions on, or impacting upon, Commonwealth land and actions by Commonwealth agencies*. Given the low local population at this time this minor complication need not be considered yet. For the foreseeable future Defence can support the wild dog management plan by reporting all sighting of dingoes to the SAAL NRMB and allowing/supporting management baiting programs. While wild dogs pose little risk to Defence operations. However, the risk to surrounding landholders is that if Defence does nothing to control wild dogs across such a large landholding then the site can become a haven for dogs. The risk to Defence is that unless Defence supports regional management action there will be the perception that CUTA is a haven for wild dogs irrespective of the actual problem posed to adjacent pastoral stations by dogs on CUTA. Because CUTA is segmented by public roads, the preferred approach to wild dog management is in the first instance to support baiting by the NRM board along adjoining easements, possibly as a combined dog and fox program. Aerial baiting could also be considered. If there is an indication of large internal populations of dogs through incidental sightings or camera monitoring or bait take for control programs of other species (goats and foxes) then internal baiting should be considered. Unless there is a significant change in the local population size no baiting will be conducted in sectors A-N, which are buffered by the leasehold sectors, and backed by Spencer Gulf.

4.2.4 Kangaroo Management

Summary
Kangaroo management is currently conducted in western sectors of CUTA as a continuation of the pastoral management practices regulated by the South Australian government. This process relies on aerial surveys of kangaroo densities and quotas set by the South Australian government under the South Australian Kangaroo Management Plan 2013-2017 (SAKMP). Culling is conducted by licensed shooters to maintain a regionally sustainable population. The transition from pastoral to Defence management will see reduced pressure from competing stock and feral goats, and an initial increase in the populations of red and western grey kangaroos and Euros is expected. The environmental impacts of increased kangaroo population are likely to be less severe in the absence of stock because total grazing pressure is still less than over the past decade, but elevated numbers of kangaroos on CUTA may cause economic impacts on surrounding holdings and expose Defence to reputational risk for not contributing to the regional sustainable management of kangaroos.

The goal of the EMP is to support the goals, aims and actions of the SAKMP, in particular Aim 3 *Manage Impacts of Kangaroos on Land Condition* that directly impacts on the sustainability of CUTA and the capacity of the site to support Defence training requirements. Maintaining a sustainable population of Kangaroos will also assist in realising the potential environmental benefits of the removal of stock and reduction in goat numbers. To successfully achieve this, Defence will continue to sponsor aerial survey transects over CUTA to establish population densities and trends.

Regional kangaroo management
Kangaroos are protected native fauna, but in pastoral rangelands are often viewed as commercial pests that compete with stock for generally limited resources. The provision of artificial water points was a key step in establishing a pastoral industry in the semi-arid rangelands, but is also credited with causing an increase in the number of kangaroos. The Nutt's of Pandurra note on their website that "Due to the amount of water now available to

domestic livestock, there are also more native animals on the property. Kangaroos are so plentiful that mobs of 30 to 50 are commonly seen."

The South Australian government recognises the potential commercial impacts of elevated kangaroo numbers, and permits commercial harvesting of kangaroos within sustainable limits in order manage population size in pastoral and agricultural regions. CUTA lies within the Gawler Ranges subregion of the Western Pastoral Commercial Harvest Management Region as prescribed in the SAKMP. DEWNR conducts annual aerial surveys of the Gawler Ranges subregion in order to set commercial harvest quotas. Defence has paid for additional aerial transects to be flown over CUTA in 2014 and 2015 that contribute to the regional survey and provide estimates of large herbivore (kangaroo and goat) density across CUTA.

Harvest quotas are set by DEWNR each year based on a maximum 20% of the total regional population size of red kangaroos and 15% of western grey kangaroo and Euro populations. When populations are more than 2 standard deviations below the long-term population average, commercial harvesting of kangaroos is suspended. Gawler sub-regional population density estimates over the last 17 years are shown in Figure 34. In 2015 the regional quotas for kangaroo harvest are 17,800 (red), 42,900 (western grey), 13,000 (euro). In reality, commercial quotas have not been realised in any previous years and represent a maximum harvest level that should not impact the viability of the kangaroo population. For example, in 2013 only 37,426 of a possible 201,100 kangaroos were harvested across the Western Pastoral commercial harvest region. Only 78 additional kangaroos were culled under non-commercial permits indicating the primacy that commercial harvesting has in regional population management.

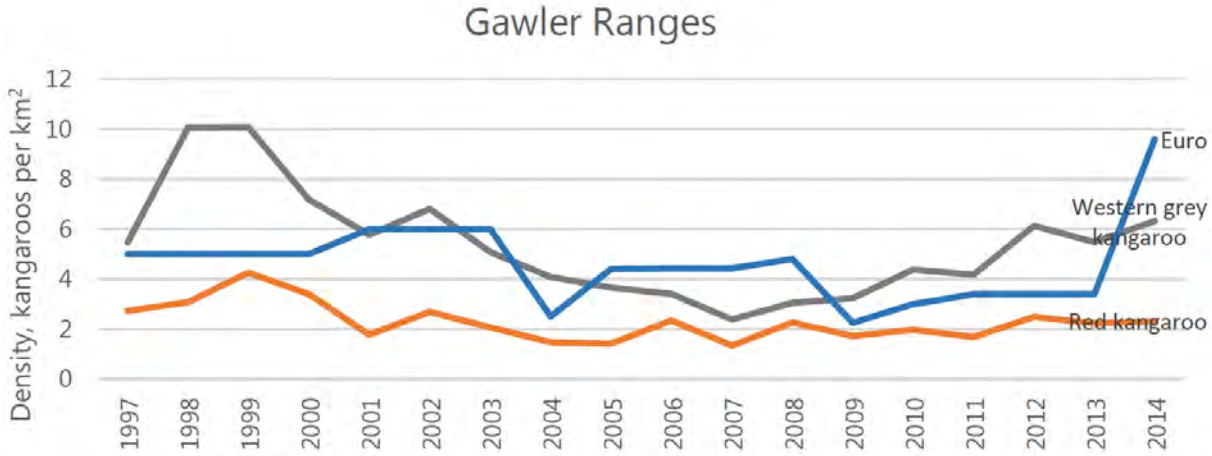


Figure 34. Population densities of kangaroos in the Gawler Ranges sub-region in which CUTA is located.

CUTA kangaroo densities on CUTA

Densities of western grey kangaroos were notably higher on CUTA than across the broader region in 2014. While the regional figure stood at 6.2/km^2, CUTA was found to have 10.2/km^2. Numbers of red kangaroo were slightly lower than the wider region at 1.51/km^2 compared to 2.2/km^2 (Stokes 2014).

Management issues

During the transition from pastoral leases to the MLDP Defence made a decision to continue to manage kangaroos as a pastoral landholder would do. This has benefits in that it contributes to the wider regional management of kangaroos, minimises management

disruption to surrounding landholders and promotes integrated management of CUTA within the regional land management community. However, kangaroo management is a potentially charged political endeavour. Now that Defence has secured the MLDP and commenced use of new sectors of CUTA for military activities, BONS policy requires a risk-based approach that examines a greater number of options and recognises different land management goals of Defence compared to pastoralists. Key management aspects that require explicit documentation in relation to management of kangaroos on CUTA are:

- Identification of potential kangaroo impacts in addition to general impacts of elevated total grazing pressure
- Assessment of kangaroo management in relation to other management measures that reduce total grazing pressure
- Risk assessment of impacts and management actions against the BONSRA
- Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of potential management control options

Kangaroo impacts

Kangaroos contribute to total grazing pressure and can therefore reduce groundcover and increase erosion. It has to be recognised that Defence use of CUTA has partly replaced grazing pressure with other mechanisms of vegetation off-take, and "total vegetation off-take" or similar is a more appropriate concept when considering the sustainability of the site. Kangaroos also contribute to browsing/grazing on recruitment of a suite of slow-growing or suppressed species (section 2.3.2) and at high density represent a vehicle collision hazard for regular traffic on and around CUTA, as well as a training risk or nuisance on the TA in high numbers. Both vehicle collisions and increased grazing pressure resulting from overabundant kangaroos could lead to reputational damage for Defence. Risks arising from these impacts are considered in table 4.

Risk analysis

Table 4. Impacts of overabundant kangaroos in the absence of control.

	Capability	WHS	Legislative	Environment	Financial	Personnel	Reputation
Loss of vegetation cover due to overabundant kangaroos	**Medium**	Low	Low	Low	Low	Low	Low
Suppression of recruitment of threatened and important shrub and tree species by kangaroos	Low	Low	Low	**Medium**	Low	Low	Low
Vehicle collision/near miss with kangaroos	**Medium**	**Medium**	Low	Low	Low	**Medium**	**Medium**
Reputational damage from perceived mismanagement of kangaroos	Low	Low	Low	Low	Low	Low	**Medium**

Table 4 assessments are based on the fact that a genuinely high-density population of kangaroos is *unlikely* at the site due to the low productivity environment, the size of the site and lack of containment, rendering vehicle collision and similar frequency-of-encounter impacts less likely. However, the relative density of kangaroos compared to low environmental productivity means that notable grazing impacts are *possible* over a five-year horizon with an increase in a population that is already at significantly higher density than the wider regional population.

Overall the risks presented by an unmanaged kangaroo population are *tolerable*. This means that taking no management action is a viable management approach, but that where additional management is possible and feasible, it should be taken. Further risk assessment of impacts is not required, as any additional control that suppresses population size of kangaroos will result in a better outcome that will be *tolerable* or *acceptable*. There are a range of potential management approaches for kangaroo management. These are considered in Table 5.

Table 5. Possible management approaches.

	Capability	WHS	Legislative	Environment	Financial	Personnel	Reputation
Do nothing	Low	Low	Low	Low	Low	Low	**Medium**
Continued use of commercial harvesting contractor	Low	Low	Low	Low	Low	Low	**Medium**
Removal of water points	Low	**Medium**	Low	**Medium**	**Medium**	Low	Low
Fertility control	Low	Low	Low	Low	**Very High**	Low	Low
Translocation	Low	Medium	Low	Medium	**High**	Low	Low
Targeted fencing around sensitive vegetation	Low	Low	Low	Low	**Medium**	Low	Low

Table 5 assessments are based on the assumption that inaction by Defence is *likely* to result in criticism in local media and community forums about Defence ceasing kangaroo control. Equally there is a *low* probability that continuation of current management arrangements will result in higher-level media attention and or ministerial submissions over Defence kangaroo management from animal rights groups. Water point removal will be a temporarily expensive project(s) and involves the use of heavy machinery, significant ground disturbance and potential alteration of surface water flows. Fertility control is *almost certain* to incur substantial ongoing costs that significantly exceed the initial costs. Construction of kangaroo fencing around target locations is likely to produce an ongoing financial liability for maintenance if the fences were to prove effective. Translocation is considered in Table 5, but is not a realistic action for the site and is not likely to be supported by the State. Table 6 presents a Strength, Weakness, Opportunities and Threats (SWOT) analysis of potential management techniques to identify the 'best fit' management techniques for the site.

Table 6. SWOT Analysis of management methods for kangaroos.

	Internal		*External*	
	Strengths	Weakness	Opportunity	Threat
Do nothing	Non-lethal method. Low effort solution. Matches absence of data indicating kangaroo impacts	It is reasonable and possible to reduce the potential risk of kangaroo impacts on the environment, local economy and	Appeals to animal rights advocacy groups. Cheap option in the short term.	Criticism of lack of management. Longer-term management may prove more expensive if population continues

		Defence capability		to build.
Continued use of DEWNR surveys to monitor population numbers.	Arrangements and approvals already exist. State endorsed approach. Integrated into regional management. Can provide relatively robust long-term data set. Provides survey of goat numbers as well as kangaroos.	Ongoing financial cost.	Good for regional reputation and relationships.	Change in SAKMP
Continued use of DEWNR surveys and commercial harvesting contractor	Arrangements and approvals already exist. State endorsed approach. Integrated into regional management. Low-cost option.	Licensing arrangements for freehold sectors potentially problematic. TA access will become more difficult over time as Defence use increases.	-	Animal rights groups publically and formally challenging the approach.
Removal of water points	Non-lethal method. Benefits across a range of management issues.	Large areas need treatment before impact will be realised.	-	-
Fertility control	Non-lethal methods endorsed by animal welfare groups.	Impractical for a large site. Impossible to treat entire population. Migration rates too high and treatment rates too low to achieve effect without major ongoing program.	Engagement with research organisations attempting to develop broad-acre control methodologies.	-
Translocation	Non-lethal methods endorsed by animal welfare groups.	Unlikely to be endorsed by State. Very intensive management and approval processes assuming a receiving site could be identified.	-	-
Targeted fencing around sensitive vegetation	Non-lethal method. Directly protects sensitive EFR. Also provides protection from other impacts. May combine with research program.	Potentially costly approach that generates ongoing management impost.	Integration with research program.	Vandalism of fences.

Management recommendations

A kangaroo population of significant size and density exists on CUTA, and this requires management to prevent harm to the environment, surrounding pastoral operations, and to Defence use of the site through reduced vegetation cover and potential safety hazards.

A fundamental premise of dealing with pest species is to minimise stress or harm to the animals themselves. For native animals, lethal control methods should only be adopted where they clearly represent the only practical approach to mitigating identified risks. As such, the goal of Defence management of kangaroos at CUTA is to cease lethal control as soon as possible. It is noteworthy that under the management of the Nicolson family Roopena and Middleback were widely provisioned with water to sustain flocks through highly variable environmental conditions. By the 1980s the Nicolsons had managed the station for over 60 years, and in that time had noted abundant kangaroo populations, but had never conducted kangaroo management activities Lange *et al.* (1984). They also never had to destock, even during the harshest droughts to that time. Kangaroo numbers on sectors that have been under long-term Defence land management have also not historically been considered a management issue for Defence capability or the environment and no kangaroo control has occurred there. However, these areas are generally provisioned with limited water compared to newer sectors.

In recognising the desired state of no lethal control Defence will, as quickly as practical, remove all artificial water sources that are accessible to kangaroos. The actual outcome of this action on the kangaroo population is unknown, but it is assumed that it will result in a significant population reduction over time. In order to understand this outcome, it is essential that aerial counts are continued throughout this period. In the absence of stock, it is expected that the environmental impacts of kangaroos are less on CUTA than they would otherwise be. The comparability of damage to vegetation by Defence activities and stock grazing is not clear, but a balance needs to be achieved that recognises that kangaroos can potentially exist at higher densities on CUTA than in surrounding land without creating an environmental concern or capability impost. An initial threshold has therefore been set above which the CUTA kangaroo population requires population management to address environmental and capability risks. This threshold takes into account the lack of stock on CUTA and the variable environmental conditions that drive kangaroo populations. The threshold is 25% above the regional population of each species for a given year. When population control is required, this should be achieved through current processes of allowing a commercial shooter accredited and licensed under SAKMP commercial harvesting processes to undertake the required work. Plan reviews must closely examine whether the desired population management outcomes are being achieved using this threshold and approach, and also examine vehicle incidents and results arising from any grazing/browsing impact research to refine the management threshold. Over the longer term a better threshold may be determined based on long-term data for CUTA itself. However, in the absence of direct evidence from the site this initial threshold is considered a reasonable approach at adaptive management of the population in the transition phase of management. More detailed studies of kangaroo impacts may be warranted once the impacts of Defence use of the site are better known and the interaction between Defence vegetation impacts and Kangaroos impacts can be reasonably studied.

Summary of management recommendations:

- Remove all surface water points to passively reduce carrying capacity of the site
- Continue aerial survey program
- Only conduct direct population control activities when the population of a given species is 25% or more above the regional density for that year
- Allow commercial harvesting as the management technique when population control is required

4.3 Weeds

4.3.1 Weed Summary

Weeds are a notable feature of vegetation across CUTA. These include widespread pastoral weeds, Weeds of National Significance (WONS), state listed noxious weeds, small numbers of garden escapees and one key emerging weed species.

Jacobs (2105a0 report 49 species of weed from CUTA. These are predominantly associated with prior disturbance, i.e. tracks, impact areas, areas subject to higher intensity military use, areas of erosion, dams, pastoral station buildings and structures, although some are much more widely dispersed. Water points are a focal are of disturbance and 48% (13 of 27) of weed infestations identified in the PER are within 250m of a water point and 74% (20 of 27) of weed infestations identified are within 1km of a water point, while only 23% of total weed recordings were within 1 km of a water point. This indicates that water points have historically played an important role in the establishment of weeds as a concentration point for stock and animals resulting in a concentration of weed seed and a water source for weed establishment. This pattern will change with the decommissioning of water points. Many of these areas will become less viable for weeds, which could aid control programs.

A number of common agricultural weeds including Ward's weed (*Carrichtera annua*), onion weed (*Asphodelus fistulosus)*, star thistle (*Carthamus lanatus*) burr medic (*Medicago minima)*, ice plant (*Mesembryanthemum nodiflorum*), alkali sand-spurry (*Spergularia diandra*) and Mediterranean grass (*Schismus barbatus*) have become well established and are not likely to be controllable. Expenditure on these species is likely to prove futile except in limited circumstance where a sensitive environment or site requires management that excludes these species. Ward's weed also appears to perform a role in re-colonising and stabilising areas disturbed by Defence activities and may confer a reasonable benefit to the site (Figure 35). However, in high abundance dried wards weed and other weeds also contribute to an elevated fire risk following periods of good growth (section 5.2.1).

Figure 35. Wards weed colonising heavily disturbed site.
Initial establishment of Wards weed is now being followed by saltbush recruits (bottom right).

The removal of sheep and reduction in feral goat populations are important management actions to reduce the spread of weeds and ground disturbance that enables the establishment of weeds. However, Defence training activities pose different weed dispersal risks compared to the historic pastoral use. The transportation of weed seed and vegetative matter by military vehicles and equipment is the main and most obvious risk. Disturbance by military vehicles and equipment has the potential to open up new areas for weeds to invade, and in a different pattern to the radiating pattern of disturbance around pastoral water points. These risks have been addressed in Table 8.

Cacti and succulents around pastoral stations
Homesteads naturally form a focal point for exotic species. However the capacity of some species, particularly cacti and succulents, to spread from dislodged leaf material means that particular care should be taken to remove these species from around old pastoral infrastructure (Figure 36. Opuntioid cacti at Lincoln Park (top) and Middleback (bottom).). Defence vehicle movement will assist spread of these species more so than past management regimes. Many of these species are part of the Opuntioid cacti WONS. Currently these species' distributions are focussed around infrastructure, so immediate control could save Defence significant financial investment in future years.

Figure 36. Opuntioid cacti at Lincoln Park (top) and Middleback (bottom).

Carrion Flower

Carrion flower (*Orbea variegata*) is a Declared Plant in South Australia and is a notable weed of the Whyalla region. It was only recently listed as a Declared Plant, although it has been considered a priority in the Whyalla area for some years (Dunbar 1996). A succulent species, it can blanket large areas of ground in semi-arid shrublands, precluding small groundcovers and grasses and significantly reducing diversity. It spreads readily through transport of broken fragments and also via numerous wind-spread seeds. The species has been a focus of past weed management on CUTA and its distribution within eastern sectors is reasonably well known (Figure 37). There is limited knowledge of its extent of occurrence elsewhere on CUTA, and neither AECOM (2012) or Jacobs (2015) recorded the species in their weed investigations. However, there is little doubt that the species is more broadly distributed on CUTA than is currently known. The University of Adelaide removed an infestation in Overland Paddock in sector O in 2005 (J. Facelli pers. comm. October 2014) and Honan (2011) recorded 4 infestations in sector Y and another in sector O. Given the ready dispersal

of the species, new incursions are likely to occur across the training area, often from unidentified source populations.

Awareness material has been produced to ensure that range users are aware of the risks that this emerging weed poses. Sector J currently contains the largest known infestation of the carrion flower in the Whyalla/Port Augusta area (Creation Care 2012). On detection of this infestation off-road driving and construction of temporary structures in this sector became controlled through an ECC. The ongoing management of the carrion flower by Defence is important in ensuring the TA can be utilised to its fullest capacity. There is a significant risk that with the expansion of the TA, Defence will move carrion flower into new sectors. Continuation of vehicle exclusions, hygiene procedures for movement from infested areas into new areas, or planned directional movement from clean areas into affected sectors are all viable management strategies to minimise risks from Defence activities. However, ongoing monitoring is also important to understand changes in the carrion flower population and its impacts on the site.

Site visits by Defence and SAAL NRMB personnel in 2015 to areas reported as untreated heavy infestations in sector J in 2012 failed to identify carrion flower. However, these visits were not determined surveys, and a key management action is to re-map the sector J infestation. Four additional restricted areas are located around smaller infestations in sectors D, F, I and K. Range Standing Orders (RSOs) currently restrict access to carrion flower infestation sites, and access to any new infestations will also require No-Go areas or management through ECC if they cannot be eradicated. The management goals of the SA declared plant policy for Carrion flower for the Arid Lands region is currently to monitor the species, while for Eyre the outcome is to contain. CUTA currently lies as a link between these areas holding a large population of carrion flower, so effecting containment on CUTA, and to known infestations if possible, is the goal of Defence management.

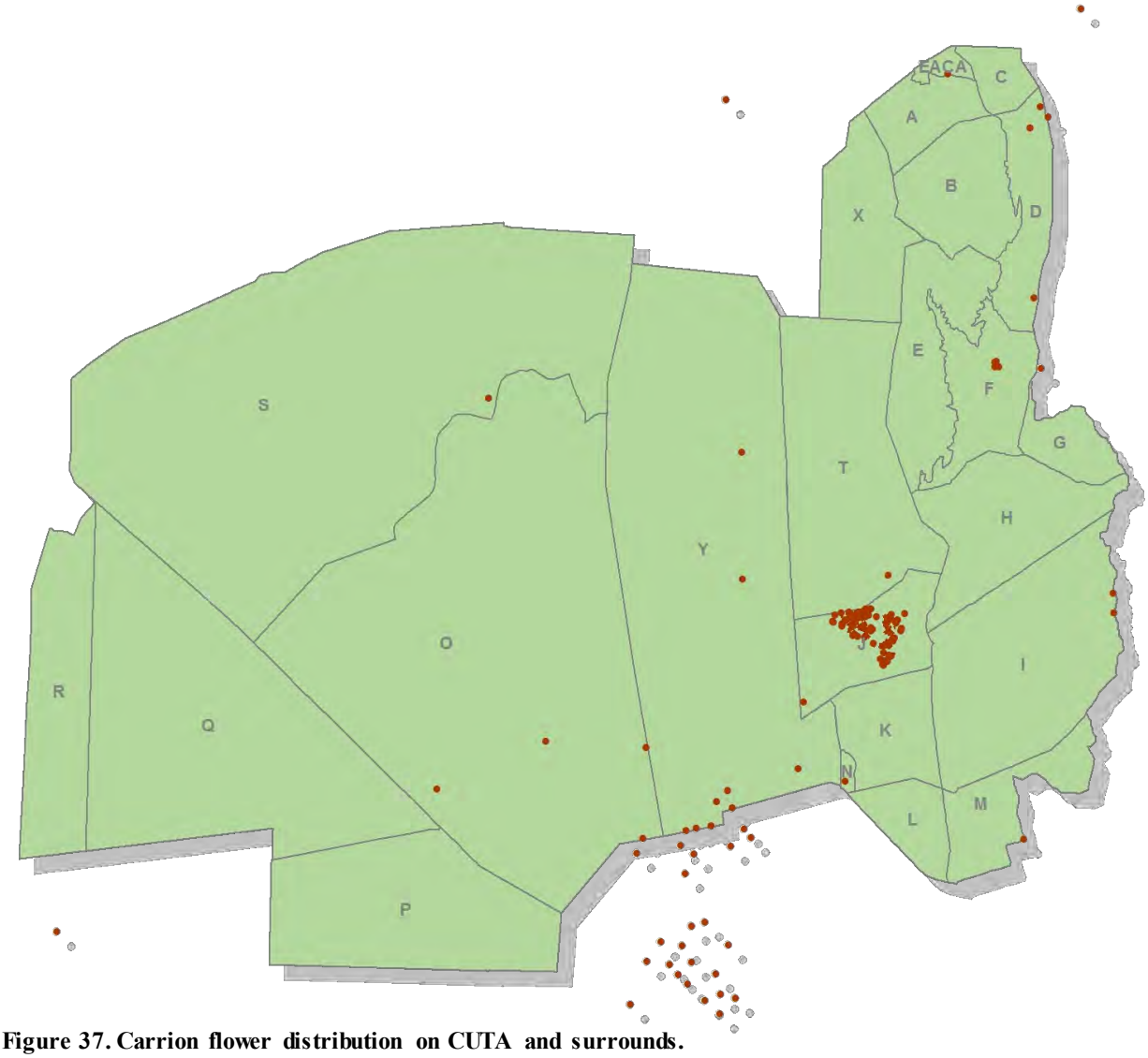


Figure 37. Carrion flower distribution on CUTA and surrounds.
Populations in D, F, I, J and K (shared with N- single point shown) represent distinct EFRs. Exact locations of other points are either unknown, unsurveyed or eradicated and require further investigation prior to EFR creation.

Buffel grass and fountain grass

Buffel grass is a recognised threat to biodiversity of semi-arid environments and is the subject of an EPBC threat abatement advice (Dote 2015); *Ecosystem degradation, habitat loss and species decline in arid and semi-arid Australia due to the invasion of buffel grass (Cenchrus ciliaris and C. pennisetiformis)*. The species was not listed as a distinct key threatening process, but is considered part of the overarching threat "Novel biota and their impact on biodiversity" (Threatened Species Committee (2013)). Buffel grass is an introduced pasture species that forms dense productive pastures that are highly valued in areas such as inland Queensland. However, the species spreads readily into natural ecosystems where the same productive pasture significantly reduces diversity. Buffel grass is well adapted to surviving drought conditions, and can spread prolifically after good rainfall. It is a focus of local NRM groups near CUTA and has been recorded from roadsides surrounding the TA (Figure 38). It has not yet been recorded on the TA, but given its (treated) presence along most boundaries, it is likely that establishment will occur in the short term, or that it has already occurred unnoticed. While the general environmental threat posed by buffel grass, and its local priority, are sufficient cause for immediate management action on detection, the highest risk posed to

Defence is a serious capability impact. Widespread establishment of buffel grass would completely alter the flammability of environments on CUTA such that training would not be possible under conditions where it is comparatively safe now. Fountain grass is similar to buffel grass in its growth habits and flammability. It has been the subject of determined management actions in the Whyalla region, including the use of controlled burning, which has very rarely been practiced for any reason in the region surrounding CUTA (DEWNR 2013, Whyalla News 10 Dec 2014). Its application to reduce the fountain grass population is an indication of the key risk posed by these species, and the potential that they have in altering the risk profile and management approaches of the TA. All occurrences of either species should be notified to the SAAL NRMBand treated immediately. Ongoing monitoring of the situation in surrounding areas is essential, and can be achieved through invited presentations to the EAC or through maintaining effective relationships with the SAAL and Eyre NRM boards.

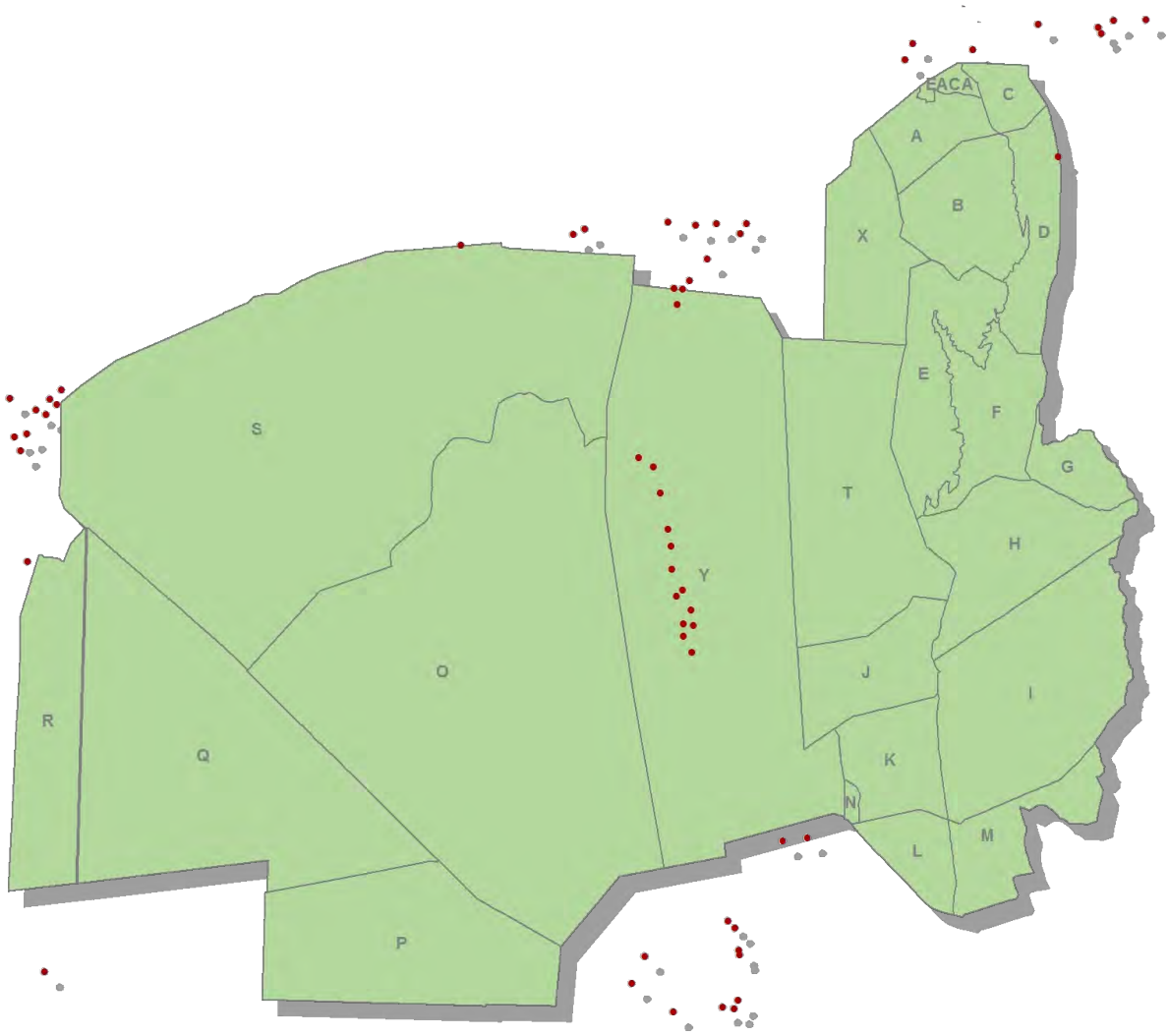


Figure 38. Buffel grass distribution along roadsides adjoining and through CUTA.

4.3.2 Management Objectives

The goals of the Australian Weeds Strategy (AWS) (National Resource Management Ministerial Council 2007) are the foundation of this weed management plan. The AWS goals together with the guidance provided by the Weeds of National Significance register

(www.weeds.org.au), the South Australian Declared Plants register (http://www.pir.sa.gov.au/biosecurity/weeds_and_pest_animals), South Australian Carrion Flower Declared Plant Policy (2015) and the South Australian Arid Land Natural Resources Management Board District Weed Strategy (SAAL NRMB 2015) are the basis for the preparation of management tasks for each of the weed species in Table 7. The AWS goals are:

- Protect weed-free areas (i.e. prevention of initial establishment).
- Those areas or populations with light infestations must be given the highest priority for management.
- Well-established infestations must be managed under a programme of action that has emphasis upon starting from the edges or upstream of a problem, and gradually reducing the problem by working towards the centre or downstream.
- Contain those infestations that are beyond economically feasible control to prevent spread until such time as new options become available or feasible.
- Rehabilitate and monitor areas that are cleared of infestations for re-establishment of introduction of new weeds.

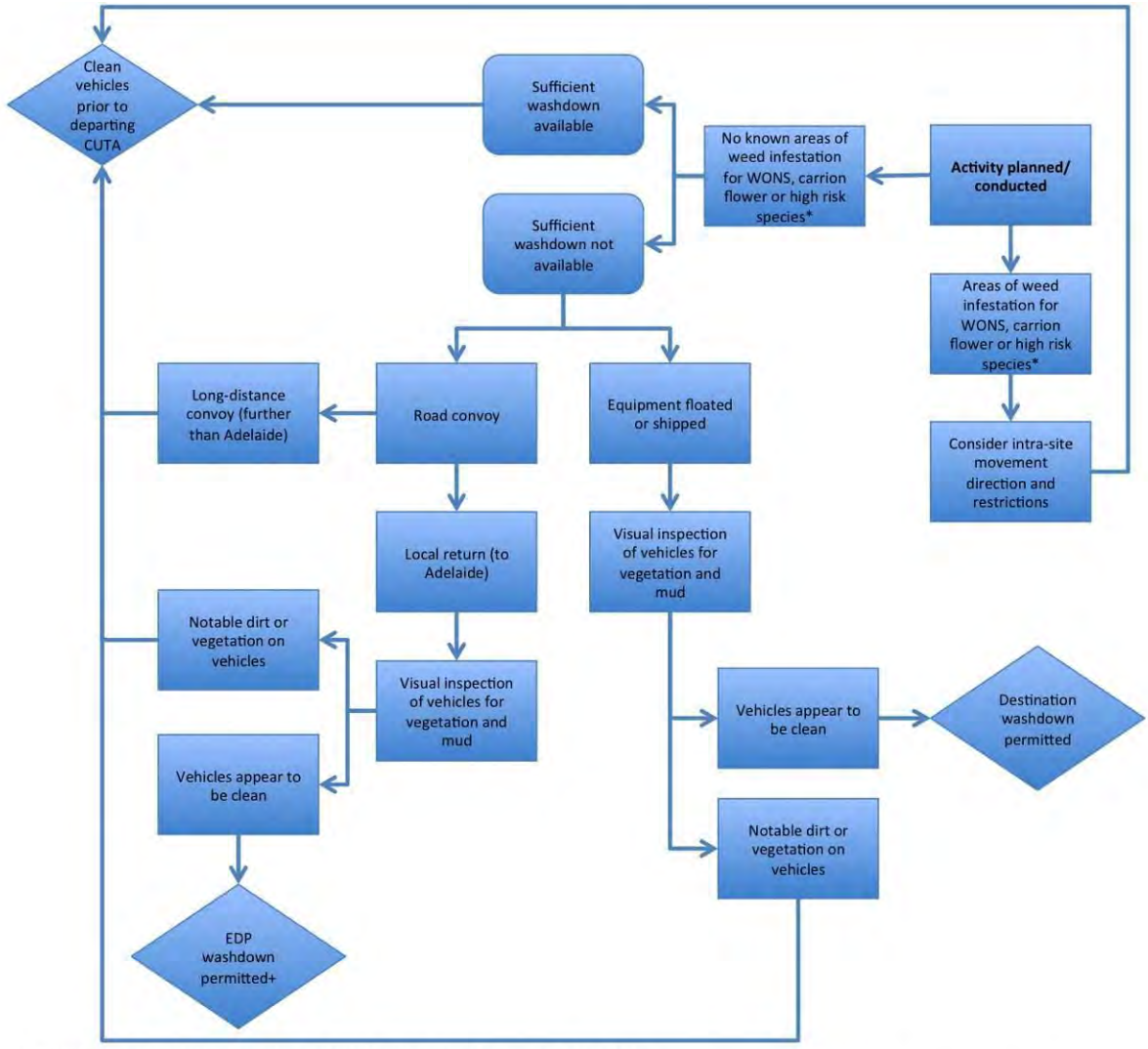
4.3.2.1 Management Activities

Vehicle hygiene and site containment

To prevent movement of weeds carried by Defence vehicles there needs to be a properly functioning washdown point. Vehicle hygiene is a routine part of Defence activity management (Figure 39). Vehicles arriving at CUTA would normally have been cleaned prior to departure from their point of origin. However, vehicles moving around CUTA between sectors that contain high weed risks (e.g. sector J) that might spread to other sectors may need to be subject to internal washdown and inspection prior to movement, and vehicles leaving the range should also be cleaned prior to shipping or convoy.

Figure 39. ASLAV vehicles being washed down at CUTA in 2004.
This is a basic facility that will be superseded by a modern washdown facility at the new camp. However, this point should still operate to cope with surge and northern exit from the site.

The current washdown facility at El Alamein is not considered fit-for-purpose to deal with the volume of equipment to be used on site, nor is it compliant with current Defence design criteria for washdown facilities (AECOM 2009). Entry and exit at this point are still likely to occur and this facility requires a project to investigate wastewater treatment, water supply, vehicle capacity and any other matters that will improve its functionality and capacity to cope with large volumes of vehicles. A new washdown facility has been incorporated into the design for new camp facilities on the Lincoln Highway and will form the primary washdown on site. This will be integral to effecting biosecurity controls for vehicles leaving the site and also potentially for vehicles crossing between the eastern and western sectors of the range. Any exercises occurring on site must consider the planned movements of vehicles carefully. No movement out of sector J and into surrounding sectors should be permitted without cleaning vehicles prior to leaving the sector. This is not a practical approach, so movement into sector J as a final destination followed by thorough washdown is the only reasonable alternative if that land space is considered essential for an exercise. Provision of significant washdown in southern CUTA will have to be effected through mobile washdown. For any exercises where on-site washdown may not be adequate to deal with the volume of vehicles taking part the risk management process in Figure 40 can be adopted. Even after construction of new washdown, temporary washdown facilities may still facilitate more freedom of within-site movement.



*High risk species includes declared plants in both SA and the next destination of the vehicles
+EDP (Edinburgh Defence Precinct) washdown requires minimal pullover en route at consistent locations. These locations must be identified to Defence environmental management staff and periodically visually inspected by Defence for establishment of carrion flower (and other weed potentially originating on CUTA).

Figure 40. Risk management of vehicle hygiene when on-site washdown facilities are deemed insufficient. Note that all other doctrine and management processes still apply to relevant aspects of the process.

Specific weed management

Table 8 lists weeds that have *present* or *probable* occurrence at CUTA, along with areas of occurrence, movement pathways, regional management approach and Defence approach. This information summarises background information used to inform how Defence will address key weed risks under the BONS management program (Table 8). Table 8 may refer to specific treatment methods, but these are notional methods at the time of writing. Contractors engaged to perform works are best placed to determine the methods required to achieve the desired outcome at the time of treatment.

Table 7. Weed species known or with potential to exist within the leasehold and freehold areas of CUTA.

Species	Status	Location	Pathway	Legal Requirement for Declared Weeds & Management Tasks
Weeds identified in the leasehold and/or freehold areas of CUTA				
Orbea variegata Carrion Flower	SA Declared Plant	Sectors EACA, D, F, G, H, I, M, N, O, S, T, Y	- Wind (seed) - Vehicles (vegetative matter)	**SA Declared Plant Objectives:** Control and contain infestations to protect key sites in accordance with NRM board Regional Management Plans; prevent spread into uninfested areas; prevent the reinfestation of areas already cleaned. **SA Arid Lands NRM Policy: MONITOR** **Defence Management Aim: Exclusion from clean areas,eradication of small infestations, containment of large populations** Annual monitoring of areas where introduction from CUTA is a high risk (to be determined once training area use determined – entry points West of Lincoln Hwy and Combined Arms Range).
Emex australis Three Corner Jack	SA Declared Plant	Leasehold CUTA| *PER* 10, 13, 34, 43, 54, 67, 72, 75, 86, 98 *EBCR* site 4	- Shoes - Vehicles - Stock (fleece) - Water - Fodder	**SA Declared Plant Objectives:** Destroy high-priority infestations; prevent introduction into clean areas; minimise further spread in generally infested areas. **Defence Management: Treat known sites. Containment difficult.** Annual chemical treatment, from late winter, shortly after emergence, with follow up treatment as their germination is staggered.
Echium plantagineum Salvation Jane	SA Declared Plant	Freehold CUTA Leasehold CUTA *PER* - l10, 118, l19 *EBCR* - site 4	- Stock (fleece & digestion) - Fodder/grain	**SA Declared Plant Objectives:** Prevent spread to clean properties; contain existing populations within their current limits; reduction in density of populations by improved management and biological controls. **SA Arid Lands NRM Policy – MANAGE SITES** **Defence Management Aim: Containment** Annual chemical treatment in conjunction with Horehound treatment early spring. Monitoring of highly disturbed areas – main roads, Roopena, small arms range, temporary closure areas.
Lycium ferocissimum African Boxthorn	WoNS SA Declared Plant Target Weed (SA Arid Lands NRM –	Freehold CUTA Leasehold CUTA *PER* - l28	1.0 Birds - including starlings, seagulls, doves and silvereyes eat the fruit and disperse seed 2.0 Foxes eat fruit	**SA Declared Plant Objectives:** Control and contain infestations to protect key sites in accordance with NRM board Regional Management Plans; prevent spread into uninfested areas; prevent reinfestation of cleaned areas. **SA Arid Lands NRM Policy - MANAGE**

Species	Status	Location	Pathway	Legal Requirement for Declared Weeds & Management Tasks
	Gawler Ranges sub region)			**Defence Management Aim: Eradication** Locate, cut and swab. Follow-up monitoring of previously treated sites at 2 and 5 years
Marrubium vulgare Horehound	SA Declared Plant	Leasehold CUTA *PER* - 43, 93, 96, 97, 111, 121 *EBCR* - site 1, 5, 6	- Animals (fur) - Clothing - Vehicles - Water	**SA Declared Plant Objectives:** Minimise further spread into any areas suitable for its establishment where it is not yet present. **Defence Management Aim: Contain** Annual chemical treatment early spring. Monitoring of highly disturbed areas – main roads, Roopena, small arms range, temporary closure areas.
Xanthium spinosum Bathurst Burr	SA Declared Plant	Freehold CUTA Leasehold CUTA *PER* - 50, 73, 129	- Animal (fur) - Water	**SA Declared Plant Objectives:** Decrease the effect on the wool industry; prevent further spread to uninfested areas within suitable habitat; contain existing infestations; eradicate high priority infestations as detected in accordance with NRM board Regional Management Plans. **Defence Management Aim: Eradication** Chemical control after summer rain Annual monitoring of water points where previously treated and follow up chemical control if needed.
Xanthium strumarium sp. Agg. (or X. *oocidentale*?) Noogoora burr complex	SA Declared Plant	Freehold CUTA	- Animal (Fur) - Water	**SA Declared Plant Objectives:** Minimise impact on wool industry; prevent further spread to uninfested areas within suitable habitat; contain existing infestations; eradicate high priority infestations as detected in accordance with NRM board Regional Management Plans. **Defence Management Aim: Control** Chemical control. Sept to Dec.
Asphodelus fistulosus Onion Weed		Freehold CUTA Leasehold CUTA *PER* - 77, 96, 118, 125, 126 *EBCR* - site 4	- Wind - Machinery/ Vehicles - Water	**SA Arid Lands NRM Policy – LIMITED ACTION** **Defence Management Aim: Containment** May not spread after removal of stock. Annual chemical treatment in conjunction with Horehound treatment early spring. Monitoring of highly disturbed areas – main roads, roopena, small arms range, temporary closure areas.
Carrichtera annua Ward's Weed		Most dominant weed Freehold CUTA	- Water - Stock (Fleece) - Vehicle	No management requirement

Species	Status	Location	Pathway	Legal Requirement for Declared Weeds & Management Tasks
		Leasehold CUTA *PER* - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 55, 57, 58, 67, 66, 67, 68, 71, 72, 72R, 73, 75, 77, 78, 80, 81, 83R, 85, 86, 88, 89, 90, 91, 93, 94, 96, 97, 98, Halo Flat R, Myall Ck R and Treg R, l1, l2, l4, l6, l7, l12, l148, l24, l25, l26, l27 *EBCR* - site 1, 2, 4, 5, 6, A		
Nicotiana glauca Tobacco Bush		Freehold CUTA Leasehold CUTA *PER* - 50, 96, l1, l14	- Water	**Defence Management Aim: Eradication** Generally confined to water points and homesteads, therefore eradication potentially achievable Cut and swab of bushes. Annual monitoring of treated sites and reactive treatment
Carthamus lanatus Saffron Thistle Star Thistle		Freehold CUTA Leasehold CUTA *PER* - 60, 62 *EBCR* - site 1, 5, 6	- Animal (fur)	No management requirement
Mesembryanthemum nodiflorum Common Ice Plant		Dominant weed, locations not identified	- Wind	No management requirement
Medicago minima Burr Medic		Dominant weed, locations not identified	- Animal (fur)	No management requirement
Spergularia diandra Alkali Sand-spurry Lesser Sand-spurry		Dominant weed, locations not identified	- Wind	No management requirement

Species	Status	Location	Pathway	Legal Requirement for Declared Weeds & Management Tasks
Schismus barbatus Mediterranean Grass		Dominant weed, locations not identified		No management requirement
Centaurea melitensis Malta Thistle		Leasehold CUTA *EBCA* - site 1, 2	- Animal (fur) - Wind	No management requirement
Salvia verbenaca Wild Sage		Leasehold CUTA *EBCA* - site 4, 5	- Water - Mud	No management requirement
Sisymbrium orientale Indian Hedge Mustard		Leasehold CUTA *EBCA* - site 2, 4, 5		No management requirement
Sonchus oleraceus Common Sow-thistle		Leasehold CUTA *EBCA* - site 1, 4	- Animal (fur) - Wind	No management requirement
Homestead Plantings		Leasehold CUTA	- Vehicles	**Defence Management Aim: Eradication** Remove & monitor for reoccurrence Low risk established trees may be kept, remove peppercorn
Solanum elaeagnifolium Silverleaf nightshade	SA Declared Plant	Freehold CUTA and areas surrounding	- Stock (ingestion) - Wind - Water - Vehicles and equipment	**SA Declared Plant Objectives:** Contain existing infestations to their present size and progressively reduced; prevent spread to uninfested properties. **Defence Management Aim: Control and Monitor** Annual treatment and monitoring of areas where spread from CUTA is a high risk (to be determined once training area use determined – entry points West of Lincoln Hwy and Combined Arms Range).
Silybum marianum Variegated thistle	SA Declared Plant	Freehold CUTA	- Animals (fur)	**SA Declared Plant Objectives:** Exclude by improving pastures, prevent seed from dispersing from road reserves or properties adjoining uninfested areas that are suitable for its establishment. **Defence Management Aim: Control and Monitor** Annual treatment and monitoring of areas where spread from CUTA is a high risk (to be determined once training area use determined – entry points West of Lincoln Hwy and Combined Arms Range).
Tamarix aphylla Athel Pine	WoNS SA Declared Plant Target Weed	Freehold CUTA	- Wind - Water - Animals, including birds (ingestion)	**SA Declared Plant Objectives:** Control and contain infestations in accordance with NRM board Regional Management Plans; prevent further planting in high risk sites; remove existing trees from high risk sites as prioritised at regional level; prevent spread into uninfested areas;

Species	Status	Location	Pathway	Legal Requirement for Declared Weeds & Management Tasks
	(SA Arid Lands NRM – Gawler Ranges sub region)			prevent the reinfestation of cleared areas. **SA Arid Lands NRM Policy: PROTECT** sites of high value from invasion **Defence Management Aim: Eradicate** Small numbers previously treated on CUTA.
Schinus molle Pepper tree	Target Weed (SA Arid Lands NRM – Gawler Ranges sub region)	Freehold CUTA, sector O, P	- Vegetatively by suckering - Birds (ingestion) - Animals (ingestion) - Water - Human activity	**SA Arid Lands NRM Policy: PROTECT** sites of value from infestation **Defence Management Aim: Remove homestead occurrences, Monitor for any increase in population elsewhere**
Opunta stricta Prickly Pear (and other opuntioid cacti)	SA Declared plant Target Weed (SA Arid Lands NRM – Gawler Ranges sub region)	Freehold CUTA, Middleback homestead, Lincoln Park homestead	- Animals (vegetative) - Vehicles (vegetative - People (vegetative) - Birds and other animals (ingestion) - Water	**SA Declared Plant Objectives:** Contain and reduce existing infestations; prevent spread to uninfested areas in pastoral areas; prevent the introduction of other prickly pear species to pastoral regions. **SA Arid Lands NRM Policy: CONTAIN SPREAD** **Defence Management Aim: Control and Monitor** Treatment and monitoring of areas where introduction from freehold CUTA is a high risk (to be determined once training area use determined – entry points West of Lincoln Hwy and Combined Arms Range).
Helitroppium europeum Potato Weed		Freehold CUTA		**Defence Management Aim: Monitor** Monitoring of areas where introduction from freehold CUTA is a high risk (to be determined once training area use determined – entry points West of Lincoln Hwy and Combined Arms Range).
Limonium companyonis Statice		Freehold CUTA		**Defence Management Aim: Control and Monitor** Treatment and monitoring of areas where introduction from freehold CUTA is a high risk (to be determined once training area use determined – entry points West of Lincoln Hwy and Combined Arms Range).
Weeds with potential to infest the leasehold and freehold areas of CUTA				
Peganum harmala African Rue	SA Declared Plant Target Weed (SA Arid Lands NRM – Gawler	Potential. Found within Gawler Ranges NRM Sub-Region	- Water - Mud moved by animals or vehicles - Animals (ingestion)	**SA Declared Plant Objectives:** Prevent spread into uninfested areas; prevent small infestations from affecting present and future land management options. **SA Arid Lands NRM Policy – PROTECT sites of high value from infestation**

Species	Status	Location	Pathway	Legal Requirement for Declared Weeds & Management Tasks
	Ranges sub region)			**Eradication of new populations if possible**
Cenchrus ciliaris Buffel Grass	SA Declared Plant Target Weed (SA Arid Lands NRM – Gawler Ranges sub region)	Potential. Found within Gawler Ranges NRM Sub-Region. Closest recorded infestation is at Iron Knob	- Wind - Water - Stock - Machinery	**SA Declared Plant Objectives:** Protect currently uninfested vulnerable sites from invasion; contain within current range and incrementally reduce range; remove infestations from key dispersal nodes and pathways; protect natural and built assets from fire risk associated with infestations. **SA Arid Lands NRM Policy – PROTECT sites of high value from infestation** **Defence Management Aim: Eradication of new populations if feasible, prevent infestation of field firing areas**
Pennisetum setaceum Fountain Grass	Target Weed (SA Arid Lands NRM – Gawler Ranges sub region)	Potential. Found within Gawler Ranges NRM Sub-Region.	- Wind - Water - Stock - Machinery	**SA Declared Plant Objectives:** Prohibition on sale of the plant, NRM authorities to increase awareness of the impact of the species, NRM authorities in the control area to map infestations and prioritise for control; NRM authorities in the control area to achieve effective control of the species. **SA Arid Lands NRM Policy – MONITOR sites for spread** **Defence Management Aim: Eradication of new populations if feasible, prevent infestation of field firing areas**

Table 8. Key biosecurity and overabundant native species risks

Risk	Likelihood	Consequence	Risk level	Location	Management	Monitoring	SMRP
Increase and spread of carrion flower population	High	Medium	Moderate	Known infestations limited to freehold portion of CUTA. Significant infestation in Sector J	No off road vehicle movement within infestations. Eradication of new and small infestations. Control of infestation in Sector J. Ongoing awareness program.	Known sites Annual Monitoring. CUTA user awareness and reporting.	Report -number of new infestations. -number of infestations treated
Increase in SA Declared Weeds Three Corner Jack Salvation Jane, Horehound, Bathurst Burr Silverleaf Nightshade Variegated thistle Yellow burrweed	Possible	Low	Low	Widespread but not dominant, concentrated at water points, buildings and structures	Monitor: Salvation Jane Control: All others	General vegetation monitoring. Post-treatment monitoring. Dam closure monitoring.	No
Increase in distribution and abundance Weeds of National Significance -African Boxthorn -Opuntioid cacti -Prickly Acacia -Athel pine	Possible	Low	Low	Very limited distributions	Eradicate known populations	Post-treatment monitoring.	Report -number of new infestations. -number of infestations treated
Establishment of buffel grass leading to: -increased fire danger and reduced training opportunities -heightened management expectation for environmental weed control	Possible	High	Moderate	Roadsides	Notify SA. Eradicate.	SA roadside surveys. Contractor and site user awareness and reporting.	Report -number of new infestations. -number of infestations treated -detailed map of distribution on establishment of any

Risk	Likelihood	Consequence	Risk level	Location	Management	Monitoring	SMRP
							sizable population
Non-Defence easements and roads promote spread of weeds despite Defence management practices	High	Variable-species dependent	-	Highways, quarries	Collaborative	General vegetation monitoring.	No
Establishment of horses	Unlikely	Medium	Low	North-west corner of sector S	Establish if horses are still present. Establish ownership. Muster and remove from site.	Follow-up survey for tracks and traces 12 months after removal/ determination that horses are no longer present.	No, unless continued presence established.
High numbers of goats lead to: -degradation of native vegetation, -increased erosion -damage to indigenous heritage	Possible	Medium	Moderate	Predominantly on and west of Simmens Plateau	Close water points. Use selected remaining water points as attractant to focus goat management actions (export, cull and monitor).	SA aerial transects. Water point camera monitoring.	Report -Incursions into Gilmores Well. -Numbers at water points. -Numbers exported.
Overgrazing of native vegetation and adjoining pastoral lands by Kangaroos	Possible	Medium	Moderate	Site wide and surrounds.	Close water points. Conduct culls in line with SA management programs.	SA aerial transects.	Report: -SA count and harvest quota. -Number culled
Vehicle collision and training nuisance from Kangaroos	Unlikely	Medium	Low	All sectors	Close water points. Conduct culls in line with SA management programs. If populations numbers temporarily high (e.g. refuge areas during drought) or high rate of	SA aerial transects, incident reports in Sentinel and	No

Risk	Likelihood	Consequence	Risk level	Location	Management	Monitoring	SMRP
					collision, consider temporary speed restrictions.	Tasmis	
Domestic plantings, including WONS, escape from vicinity of homestead ruins	Possible	Medium	Moderate	Homestead sites and old pastoral infrastructure	Eradicate plants, particularly cacti and succulents	12 and 24 month post treatment monitoring.	No
Establishment of Dingoes.	Possible	Medium	Moderate	Nil	User awareness to ensure sightings are reported. Report sightings to SA.	Repeat detection	No
Rabbits remove native vegetation cover affecting soil stability, ecosystem function and neighbouring pastoral production.	Likely	Medium	High	Key environmental risk area south section of sector R. Key capability risk areas require rolling program of identification treatment.	Ongoing targeted control around noted areas of high density, harbour-free infrastructure design, removal of existing harbour around old pastoral infrastructure	Combined monitoring and control program. target south-west corner	Yes, but through vegetation condition, not direct rabbit numbers or treatment results
Fox predation impacts native fauna species.	Likely	Medium	High	All sectors	Collaborative regional program	Camera monitoring. Bait take	No (currently no key sensitive receptors). Becomes SMRP indicator if Mallee Fowl establish on CUTA

5.0 CUTA Bushfire Management Plan 2016-2018

Development of newly acquired sectors and the re-development of infrastructure on older sectors will mean that the site as described in this document will change significantly in the coming years. A site selection board was held on 17 December 2015 that established the locations of most new assets and infrastructure on the site. Design of new infrastructure will take into account bushfire matters. However, the distribution of risks across the site will change as new infrastructure is built. The BMP will require review to reflect those changes. At the time of writing the new protocols for conducting an 'Overall site Bushfire Risk Assessment' (OSBRA) are also subject to a review process, as are the 'Activities Mitigation Map' and 'Bushfire Prevention and Response Plan'. Given the generally low risk nature of bushfire at CUTA, and the fact that the distribution of key risk infrastructure such as camp accommodation and high-tempo ranges will change markedly in the next two years, the OSBRA only takes in to account the current state of the property. Mitigation strategies are provided for some key planned ranges and impact areas, but these should be reviewed taking in to account any new processes arising from review of the Prevention and Response Plan methodology arising from the current technical review.

5.1 BMP Executive Summary

5.1.1 Hazard description

Almost all of CUTA contains category 2 bushfire prone vegetation with varying degrees of flammability. Chenopod understoreys and communities across the majority of the site can carry a fire, but generally represent a limited hazard due to the high salt content of the dominant species. Mallee, spinifex and other shrublands carry more persistent groundcover fuels and are more flammable. Limited areas of mallee with a shrubby understorey in sectors J and K could carry a potentially dangerous fire. Dried out grasses and weeds following good rain can create unusually flammable conditions even in chenopod communities. However, fire history on the site indicates that fires will nearly always self extinguish and are controllable through relatively minor breaks and tracks.

5.1.2 Overall Site Bushfire Risk Category

Medium (primarily for size and complexity rather than potential bushfire behaviour).

5.1.3 Local Fire Authority Details

Fire Ban District **EASTERN EYRE**

Fire Stations
Iron Knob Country Fire Service: (08) 8646 2185
Port Augusta Metropolitan Fire Service: (08) 8642 3895 or (08) 8204 3600
Whyalla Metropolitan Fire Service: (08) 8645 7473 or (08) 8204 3600

CFS Regions
SA Country Fire Service Flinders, Mid North and Pastoral Areas
Address: 3 Main Street Port Augusta SA 5700
Telephone: (08) 8642 2399
Facsimile: (08) 8641 0176
Postal Address: PO Box 2080 Port Augusta SA 5700
Email: CFSRegion4@cfs.sa.gov.au

Eyre Peninsula and West Coast region
Address: 28-32 Matthew Place Port Lincoln SA 5606
Telephone: (08) 8682 4266
Facsimile: (08) 8682 4300
Postal Address: 32 Matthew Place Port Lincoln SA 5606
Email: cfsregion6@cfs.sa.gov.au

5.1.4 Key risks

- Civilian properties immediately adjacent to the eastern boundary along Shack Road
- Civilian properties immediately east of sector I impact area
- El Alamein Camp
- UXO constraints to fire-fighting response in impact area of sector I
- Safety of Defence personnel conducting live-fire activities

5.1.5 Key management issues
-No formal fuel load monitoring program has been described in this plan due to the nature of the fuel hazards on site. Range Control Officers (RCOs) and those involved in assessing the conduct of live fire activities must therefore understand the role of periodic dried fuels in heightening fire risk.

-Under-reporting of fire events resulting from Defence live fire activities may mean that site risks are inadequately considered by BMP authors, particularly with respect to the cause of ignition. Audits of fire scars need to be conducted periodically, and following major exercises, to match events to reports and accurately identify the areas burnt by Defence activities.

5.1.6 On-site fire fighting appliances
Four-wheel drive mounted 500 L pod at Range control. Additional 500 L pod available to range users for mounting on their own vehicle.

5.1.7 Mitigation works
Key required works are focussed on the leasehold area.

- Fire breaks/tracks are currently being installed around all boundaries.
- No prescribed burning is required.
- Maintenance of existing breaks in the freehold portion is required.
- Minor works are required to remove vegetation around assets at El Alamein and several remote sites on the freehold portion of CUTA (Jacobs 2015d).

5.1.8 Response arrangements

The RCO will call the CFS to any fire that is not immediately contained by the user unit. Most of CUTA is free of UXO hazards and is accessible for CFS response, barring topographic constraints. Passive control lines in the form of tracks, breaks and roads all provide viable control lines for controlling fires across the site. Natural vegetation characteristics also provide the equivalent of "fuel reduced" areas that would allow tactical response to fires in mallee areas should a fall back strategy be required.

5.1.9 Site attendance and evacuation

On a Catastrophic fire day:

The following restrictions apply to site occupancy - ESSENTIAL DUTIES ONLY. ACCESS RESTRICTED TO HIGHWAYS, HARDENED ROADS AND CAMP PRECINCTS.

During a bushfire:

Evacuation is not required UNLESS INSTRUCTED TO DO SO BY RANGE CONTROL in accordance with RSOs.

5.1.10 Site-specific arrangements and other information

Special BMP review arrangements to reflect ongoing development of site with respect to accommodation, track networks and field firing ranges that fundamentally alter the fire management of the site.

5.1.11 Site Roles and Responsibilities

Standard roles and responsibilities for bushfire management within Defence and E&IG are summarised in Chapter 6 of the MFPE, Chapter 7 of the DTAMM and the ES Bushfire management "Responsible, Accountable, Supporting, Consulted, Informed" analysis. Responsibilities are slightly differently at each site depending on the type of site and staffing arrangements. Table 9 nominates localised relevant roles at CUTA. These are nearly all based around range control staff within DOTAM and range control and land management functions performed by Broadspectrum.

Table 9. Site-specifc bushfire management roles for CUTA.

Site Specific Roles*	Accountable person or position
Liaison with civilian fire authorities	RCO
Ensure integration of BMP and Emergency response plans	RCO
Distribute Prepare-Act-Survive material to site users	Range Control staff
Complete annual bushfire management plan implementation checklist	Broadspectrum/RCO
Authorise annual bushfire management plan implementation checklist	BSM
Liaise with adjoining landholders and authorities regarding planned and collaborative mitigation works	RCO

POC for emergency response authorities and notifications of bushfires	RCO
Implement bushfire mitigation works in accordance with the BMP	Broadspectrum
Conduct site familiarity briefs with civilian fire authorities	RCO
Ensure fire danger signs are changed to daily conditions	Broadspectrum
Complete bushfire reports - fires originating from Defence training activity	Units, Range Control
Complete fire incident reports - all fires not originating from Defence training activity	Broadspectrum

5.1.12 BMP Review

This BMP will *not* be reviewed according to the usual 5 year cycle. Compulsory review should occur at, or in preparation for:

- Handover/takeover of the new camp in sector Y
- Commissioning of the new combined arms range
- June 2018 if above developments are not yet complete
- If a fire leaves the boundary of CUTA or crosses a public road easement (Lincoln Highway, Iron Knob or Iron Baron Roads).
- If any fire of 500 ha or more is recorded

The latter two review points are required because the underlying basis of decisions made in this and previous fire assessments for the site is that these events should not occur given the vegetation of the site.

5.2 Site Description (including Overall Site Bushfire Risk Assessment)

5.2.1 Bushfire Hazard

Bushfire Prone Area

Mapping of bushfire prone vegetation on Defence estate follows the protocols of the *Guide for bush fire prone land mapping* (NSW Rural Fire Service 2015). Nearly all of CUTA is considered vegetation category 3 under this process (Figure 41), which includes semi-arid woodlands and arid shrublands. An additional 30 m fire-prone buffer applies around category 3 vegetation. This means that the only areas excluded from the fire-prone vegetation are the managed grounds within El Alamein camp, Moon Lake and coastal saltmarshes.

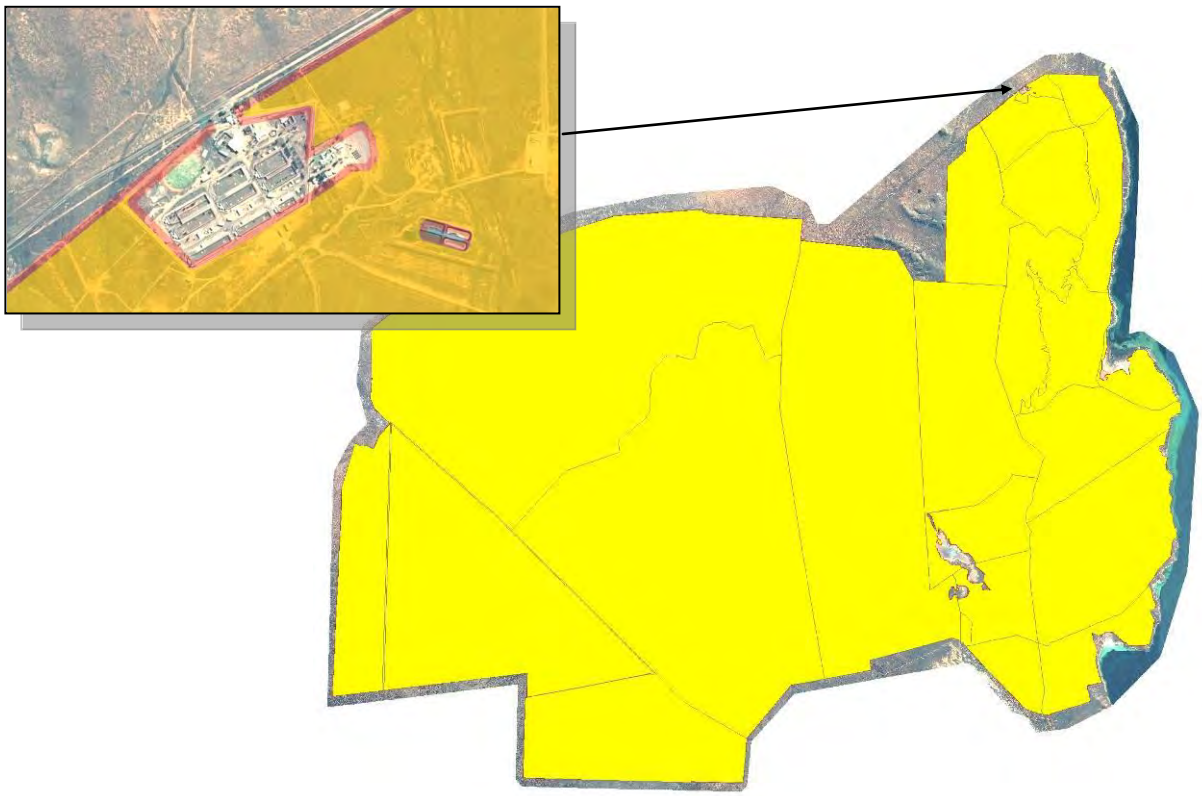


Figure 41. Bushfire Prone Areas Map.
Yellow areas are category 3 bushfire prone vegetation. Red areas are a 30m buffer.

Climate

CUTA experiences mild, dry, winters and hot, dry, summers, partly offset by the maritime buffering offered by the Spencer Gulf (Table 10). During the bushfire period (usually November – April) average temperatures are in the high twenties or low thirties, with 1 in three summer days on average reaching 30 degrees or above. Days above 35 degrees can be expected in most months of the fire danger period. Humidity at 3pm is low-moderate through the fire danger period, but on hotter days will be tend to be lower than average. Wind patterns (Figure 42) are very consistent throughout the fire danger period. Southerly winds dominate all wind speed classes, and moderate and strong winds are most likely to be from the south. This summary is based on Whyalla statistics. Western areas of CUTA will be slightly hotter and drier.

Table 10. Climate statistics for Whyalla relevant to fire behaviour.
Bureau of Meteorology data for Whyalla airport.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean maximum temperature (Degrees C)	30.1	29.7	27.2	23.8	20.6	17.2	16.9	18.5	21.7	24.1	26.6	28.3
Decile 9 maximum temperature (Degrees C)	40	38.4	35.9	31	25.8	20.8	20.6	24	29.8	33.2	36.5	37.4
Mean number of days >= 30 Degrees C	12.9	11.6	8.3	3.8	0.5	0	0	0.2	2.8	5.9	8.6	10.3
Mean number of days >= 35 Degrees C	6.9	5.7	4.2	0.6	0	0	0	0	0.3	1.8	4	5.3
Mean number of days >= 40 Degrees C	3	1.8	0.7	0	0	0	0	0	0	0.2	1.1	1.7
Mean rainfall (mm)	16.4	24.2	19.4	21.5	24.2	27.9	23.4	21.2	25.7	23.1	22.1	23.2
Mean number of days of rain	3.1	3.1	4	5	8.9	11	10.8	10	7.8	6.7	4.7	4.6
Mean daily wind run (km)	473	452	376	313	277	289	294	329	373	407	435	423
Maximum wind gust speed (km/h)	83	78	71	87	81	115	94	98	100	106	91	93
Mean 3pm temperature (Degrees C)	28.2	28	26	22.9	19.4	16.2	15.7	17.1	19.8	21.9	24.7	25.9
Mean 3pm relative humidity (%)	38	40	40	44	49	54	53	48	44	41	39	41
Mean 3pm wind speed (km/h)	24.6	23.3	21.2	19.6	17.6	17.6	19.2	21.3	22.4	24.3	23.7	24.2

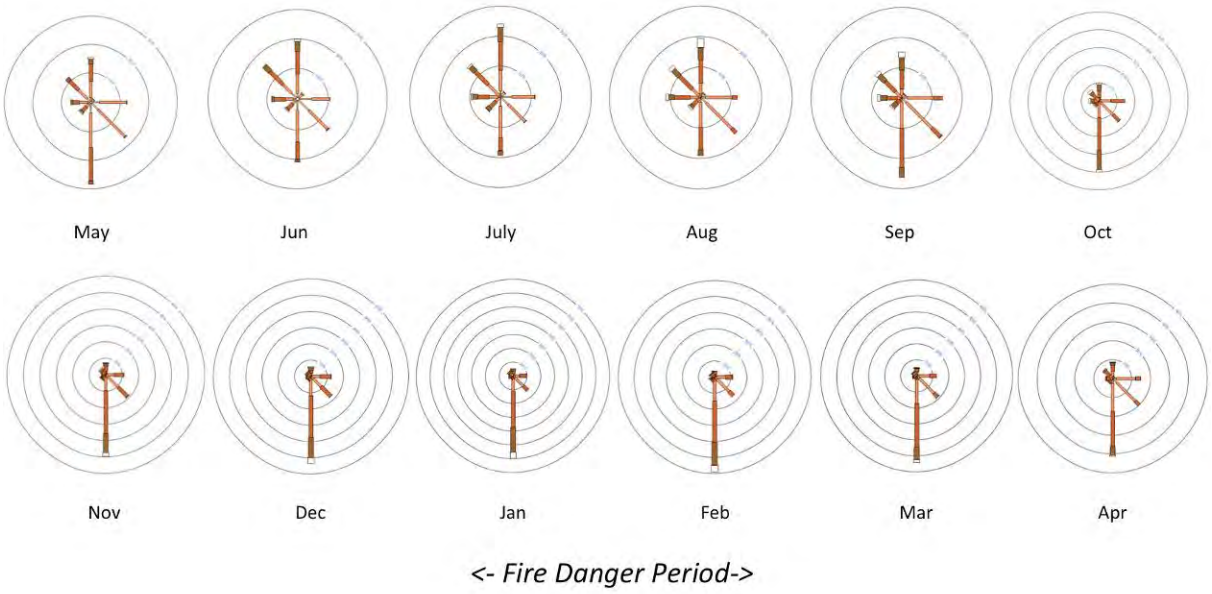


Figure 42. Wind roses for Whyalla Airport.
Bureau of Meteorology data for Whyalla airport. Length of each bar indicates percentage of winds in each strength class originating from each of eight directions (Nth up). Colour bars indicate strength classes in 10 km classes (white: 40+ km/h, dark brown 30-40 km/h, light brown 20-30 km/h)

Potential Bushfire Behaviour

Although the entire site falls within the same category for the purposes of bushfire prone mapping potential fire behaviour varies across the site. Assessment of potential fire behaviour is based on fuel classifications in DEC Fire Management Services (2010) for equivalent or

identical vegetation communities in Western Australia. Due to the small extent of some communities they have been combined into a single unit, or included within the dominant community. Although chenopod plain communities without additional shrubs could be included within category B, the presence of persistent invasion of Wards weed and other intermittent exotic groundcovers at CUTA means that many areas of these communities are more flammable than their natural state (Figure 43). As a result they are included within the S1 category. Topography will impact on fire behaviour through steep slopes, but these are almost all localised effects that will only promote short fire runs between plains and plateau. The strongest influence in generating dangerous fire behaviour will be in the Mt Whyalla hills where larger occurrences of spinifex occur on slopes. This is again a localised effect as these communities are isolated by chenopod plains. A summary of fuel categories is presented in Table 11.

Figure 43. Weed infestation.
Weeds can generate heightened ignition risk and promote fire spread in conditions that the natural (mapped) vegetation may not otherwise burn or sustain a fire.

Table 11. Bushfire fuel categorisation for CUTA (Department of Environment and Conservation 2010).

Fuel category	Image	Vegetation Description and example	Fuel Description	Fire behaviour
B		Bare ground or succulent steppe -Moon Lake -Samphire	No fuel, bare ground or chenopods/succulents only	Will not burn
W1		Medium Woodland -Mallee with chenopod understorey -Black oak with chenopod understorey	No groundcover, no mid stratum and: -Tall mallee or medium tree overstorey or -Sparse low tree or mallee overstorey	Unlikely to burn, except for short fire runs under the most extreme conditions
W3/4	 	Woodland with sparse/open shrub understorey -Mixed mallee plains -Mallee with *Cratystylis*	No groundcover, sparse tall shrub or open shrub midstorey and sparse to open tree overstorey	May burn if winds are sufficient to allow fire spread through discontinuous fuels, midstorey may be low enough to be ignited by surface fuel fire. Fires will generally self extinguish when winds drop or relative humidity rises. However, although a fire will usually only occur under extreme conditions, it is possible that a fire will continue to spread slowly after weather conditions moderate in areas of open, shrubby understorey.
S1		Open shrubland/mallee shrubland without groundcover -Open western myall woodlands with chenopod understorey -Sugarwood -Mixed shrublands -Chenopod plains without shrubby emergent or intervening vegetation	Bare-sparse groundcover and open medium-tall shrub midstorey, *or* No groundcover, sparse midstorey and open low shrub overstorey +/- tree or mallee component	Fire is significantly wind-driven and is likely to self extinguish if wind drops

Fuel category	Image	Vegetation Description and example	Fuel Description	Fire behaviour
	 			
H1		Open hummock grassland	Open hummock grass +/- tree or mallee overstorey	Will burn rapidly if winds are sufficient to allow flame contact between hummocks

B: Bare ground and Samphire. Will not burn.

W1: Medium woodland. Unlikely to burn. Short fire runs under extreme conditions.

S1: Open shrubland/Mallee shrubland. Fire singificantly wind-driven and likely to self extinguish if wind drops.

W3/4: Woodland with sparse/open shrubs. Will burn in windy, hot conditions. Can potentially sustain a going fire even after conditons improve.

H1: Open hummock grassland. Will burn fiercly in windy conditions or on slopes.

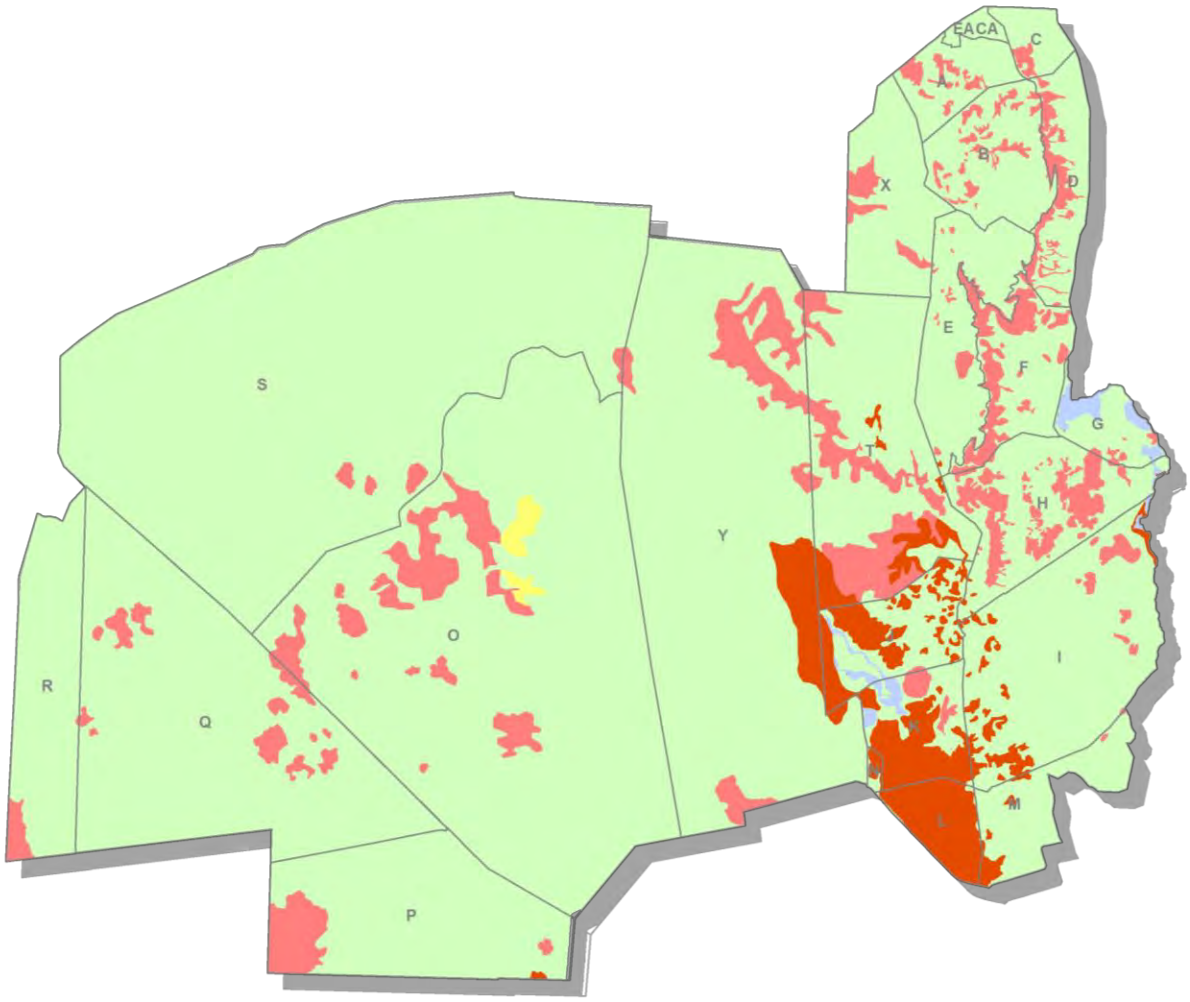


Figure 44. Fuel categorisation across CUTA.

Overall Site Bushfire Risk Assessment

Table 11 presents draft site considerations from the Defence National Bushfire Guidelines that contribute to the assessment of overall bushfire site risk and complexity. *This is not a risk assessment to identify specific risks requiring management*; the purpose of the assessment is solely to determine the level of planning required for a site. The combination of certain considerations leads to an Overall Site Bushfire Risk Category. The category triggers a requirement for different BMP elements in accordance with table 6.1 of the Defence Bushfire Policy. Based on the Table 12 assessment CUTA is a medium risk site.

Table 12. Site considerations

Category	Aspect	Applicable?
Live-fire	Live-fire activities occur on site	Yes
Site bushfire potential	Disastrous bushfire potential for region in which site is located is low[1]	Yes
	Disastrous bushfire potential for region in which site is located is moderate	
	Disastrous bushfire potential for region in which site is	

[1] Based on Bushfire CRC (2005) categorisation

Category	Aspect	Applicable?
	located is high	
	Disastrous bushfire potential for region in which site is located is very high or extreme	
	Site contains areas of terrain or vegetation likely to generate dangerous fire behaviour	
	Site has a history of dangerous or damaging fire	
Site complexity	Total extent of bushfire hazard(s) on site is < 1km square	
	Total extent of bushfire hazard(s) on site is between 1 and 10km square	
	Total extent of bushfire hazard(s) on site > 10km square	Yes
	Site contains capability assets that are within bushfire prone area or 100 m buffer	
	Site contains capability assets with limited redundancy and/or key operational role	
	Site contains fire sensitive species, communities or heritage places of conservation significance	Yes
	Site contains impact areas or other areas where unexploded ordnance presents a hazard to fire response *in areas likely to be subject to Defence ignition of fires*	Yes
	Site contains more than ten buildings routinely occupied during working hours	
	Site contains more than 50 buildings routinely occupied during working hours, or is complex due to the dispersed nature of asset clusters on site	
	Site contains transit accommodation or lines occupied during exercises	Yes
	Site contains permanent residential accommodation	
External risks	Residential suburbs within 100m of bushfire hazard on Defence property	
	Residential suburbs within 2km of site	
	Low-density residential dwellings within 100m of bushfire hazard on Defence property	Yes
	Site is adjacent to commercial forestry plantations or other fire-prone commercial assets	
	Site includes commercial easements with fire sensitive assets (pipelines, transmission lines etc)	
	Site is adjacent to warehousing or other fire sensitive commercial assets	
Bushfire emergency response	No Defence first response asset(s) on site	
	External fire response assets located more than 15 minutes from areas of site likely to experience ignitions from Defence activities	
	External fire response assets located more than 30 minutes from areas of site likely to experience ignitions from Defence activities	Yes
	Site access/egress cannot be achieved via route(s) through non fire prone areas	Yes

Category	Aspect	Applicable?
	Site access/egress is not possible via more than one route during an emergency	
	Local fire authorities have indicated no external response is available for site	

Table 13. Assessment of applicable aspects

Applicable aspects	Comments and moderators
Live-fire activities occur on site	Extensive live-fire including HE in designated impact areas
Disastrous bushfire potential for region in which site is located is low	
Total extent of bushfire hazard(s) on site > 10km square	Continuous hazard across entire site
Site contains fire sensitive species, communities or heritage places of conservation significance	Small, isolated areas of fire-sensitive threatened vegetation (sandalwood) and heritage sites of conservation significance. Minor, diffuse occurrence of fire-sensitive individual plants (sandalwood) in other areas.
Site contains impact areas or other areas where unexploded ordnance presents a hazard to fire response *in areas likely to be subject to Defence ignition of fires*	Single designated HE impact area, two more planned. Response across most of site low risk with respect to UXO. However, impact area is the most likely location of larger fires.
Site contains transit accommodation or lines occupied during exercises	Up to brigade-level exercises planned with thousands of personnel temporarily present in camp areas and other accommodation.
Low-density residential dwellings within 100m of bushfire hazard on Defence property	Linear beachfront shacks and houses along Shack Road and in the Port Bonython-Douglas Point area.
External fire response assets located more than 30 minutes from areas of site likely to experience ignitions from Defence activities	HETAs and some ranges outside 30 minutes even assuming immediate departure of services from Port Augusta or Whyalla. Most field firing and manoeuvre locations outside 30 minute response due to low-speed tracks required for access from highways and main TA routes
Site access/egress cannot be achieved via route(s) through non fire prone areas	Access not possible without transiting BF prone land, but likely fire behaviour will permit safe passage except in the most extreme circumstances

5.2.2 Bushfire History

The accepted history of bushfires on CUTA is that "As indicated by the CUTA Bushfire Management Plan ([ENSR AECOM] 2008) and cross-checked with range staff, there have been few fire ignition events within CUTA, and those that have occurred have been small and self-extinguishing (providing added evidence of the generally low fire risk of chenopod

shrubland habitat)" (Jacobs 2015(d) pg. 11). ENSR AECOM (2008) only reported seven fires in the fifteen years leading up to the preparation of the 2008 BMP, although they acknowledge that most small ignitions over that time were put out or self extinguished and would not have been reported to range staff. University of Adelaide researchers were not aware of any fires occurring on the leased portion of CUTA for many decades (J. Facelli, pers. comm. October 2014). They further recalled that the Nicolson's retained memory of a fire from as long ago as the 1930s, such is the infrequent nature of fire in the region. Neither natural fires nor planned hazards reduction burns are a significant management issue in the surrounding landscape, although targeted burns to control fountain grass were conducted in Whyalla in 2013 and 2014 (DEWNR 2013, Whyalla News 2014). Both the Port Augusta City Council and the Whyalla City Council consider that the fire risk in the region is too low to undertake routine roadside bushfire fuel management (PACC 2009, WCC 2010).

Despite an overall impression of low-frequency, low intensity fire at CUTA, there has been a marked increase in reported fire frequency and size in the last few years. TASMIS contains incident reports of 12 fires that occurred on CUTA between 2012 and 2015, while a separate informal reporting process run by DOTAM through 2014-15 recorded an additional 17 fires in February and March 2015. Based on fire reports, ignitions occurred between September and April. For those fires where fire danger rating and weather conditions were reported, ignitions occurred on high and low-moderate days, generally under gentle to moderate winds (10-20 km/h), indicating that despite the generally low flammability of CUTA vegetation, ignition is still a likely occurrence when using tracer and other burning and hot munitions. All fires were considered minor in reports, and only two were reported to have burnt more than 2 ha of vegetation. The largest reported fire burnt 100 ha and was attended by the CFS. The total burnt area of reported fires was 238 ha (Table 14). Fires were started by a variety of weapons systems and ammunition including tracer, HEAT, smoke and 84 mm illumination rounds. Although fire is more frequent and more extensive than recognised, fires are generally absent from most of CUTA. The key focal areas for bushfire occurrence are the DFSW, impact area and the Temporary A Vehicle Field Firing Range.

The above summary, based on accepted knowledge and reported fires, is a clear under-estimate of the frequency and scale of fire on CUTA. Analysis of fire scars from satellite imagery reveals additional fires occurred in all years data was available for (Figure 45, Table 14). The high number of ignitions reported in 2015 (22) through TASMIS and the informal reporting process is reasonably representative of the actual number of fires, but still does not reflect the total number that occurred. Additional unreported fires clearly occurred in the second half of 2015, including a fire with a run of more than 3km and a footprint of more than 150 ha. There is compelling evidence that these unreported fires were started and extinguished by Defence activities. Where fires have been reported, the area burnt is generally under-reported. For example, the 100 ha 2012 fire actually burnt over 260 ha. Taking into account the fact that the actual date of fires shown in Figure 46 as being burnt in 2011 is unknown and they may have occurred in 2012 (date is an estimate based on state of vegetation recovery in 2013 imagery), the total area actually burnt between 2012 and 2015 is at least 968 ha, but may be more. Formal fire reports do not contain any damage to property or personnel. However, it is widely known that equipment was damaged during a fire in 2013. This damage would have been reported through other reporting processes outside fire reports, but it is important to note that fires with behaviour capable of causing loss of equipment can occur at CUTA.

The key points arising from detailed investigation of fire history on site are:

- Essentially all fires on CUTA have resulted from Defence activities
- Fires have apparently increased in frequency, probably partly as an artefact of increased reporting in recent years and access to satellite imagery for analysis
- Notwithstanding the above, there were a large number of fires in 2015 that probably represent the largest area yet burnt on CUTA
- There is a significant under-reporting of fires on TASMIS, and the area burnt is routinely under-reported for those that are recorded
- Fires can occur on CUTA that are unpredictable and fierce enough to cause loss of equipment; therefore, loss of property and risk to personnel are real risks that must be managed
- Most fires were small and self-extinguishing when they reached even minor landscape features such as creek lines or tracks
- Most larger fires exhibit elongate, wind driven scars consistent with the fuel character descriptions above that indicate unfavourable conditions are required to promote fire spread

These facts have important implications for planning management of mitigation measures for the site:

- Fire potential at CUTA is generally low, but fires are larger and more frequent than considered in previous planning
- Passive measures such as breaks and tracks are sufficient to halt fires so far experience at CUTA
- Fires occur at predictable locations and focussed management around those areas is possible
- Mitigation measures and assessment of Defence activities should pay particular attention to wind speed
- The environmental impact of the repeated burning of areas within the impact areas is unknown. A probable outcome is that more fire-tolerant and fire-prone vegetation may develop within that area. In combination with increase activities, this could continue a trend towards more frequent and larger fires
- There is no evidence of what fire behaviour in mallee areas mapped as W3/4 fuel categories would be. A precautionary approach is required in these areas

Table 14. Fires recorded in TASMIS and informal DOTAM reporting since 2012.

Year	Month	Location	Cause	Area Burnt	Response
2012	Feb	IA?	Tank Tracer	0.003	Unit
2012	Nov	IA	Rocket?	2	Unit
2013	Apr	IA	81 mm Mortor	0.035	Unit
2013	Oct	Plateau	Charge Block Demolition	100	CFS
2013	Oct	DFSW	HEAT	0.01	Unit
2014	Sep	DFSW	HEAT	0.03	Unit
2015	Feb	TAVFR	Tracer?	1	Unit
2015	Feb	TAVFR	Tracer?	1.25	Unit
2015	Feb	IA	Tracer?	1	Unit
2015	Feb	IA	Tracer?	1	Unit
2015	Feb	TAVFR	Tracer?	0.25	Unit
2015	Feb	TAVFR?	Tracer?	50	Unit
2015	Feb	TAVFR	Tracer?	0.25	Unit
2015	Mar	TAVFR	Tracer	0.25	Unit
2015	Mar	TAVFR	Tracer	1	Unit
2015	Mar	IA	Tracer	1	Unit
2015	Mar	IA	Tracer	1	Unit
2015	Mar	IA	Tracer	0.25	Unit
2015	Mar	IA	Tracer	0.25	Unit
2015	Mar	IA	Tracer	1	Unit
2015	Mar	IA	Tracer	0.06	Unit
2015	Mar	IA	Tracer	0.06	Unit
2015	Mar	IA	Tracer	0.06	Unit
2015	Mar	DFSW	84mm Illum	0.1	CFS
2015	Oct	IA	Smoke WP M825	0.003	Unit
2015	Oct	IA	Tracer	0.05	Unit
2015	Oct	IA	M107 HE	0.005	Unit
2015	Oct	IA	81mm Mortar HE	0.08	Unit

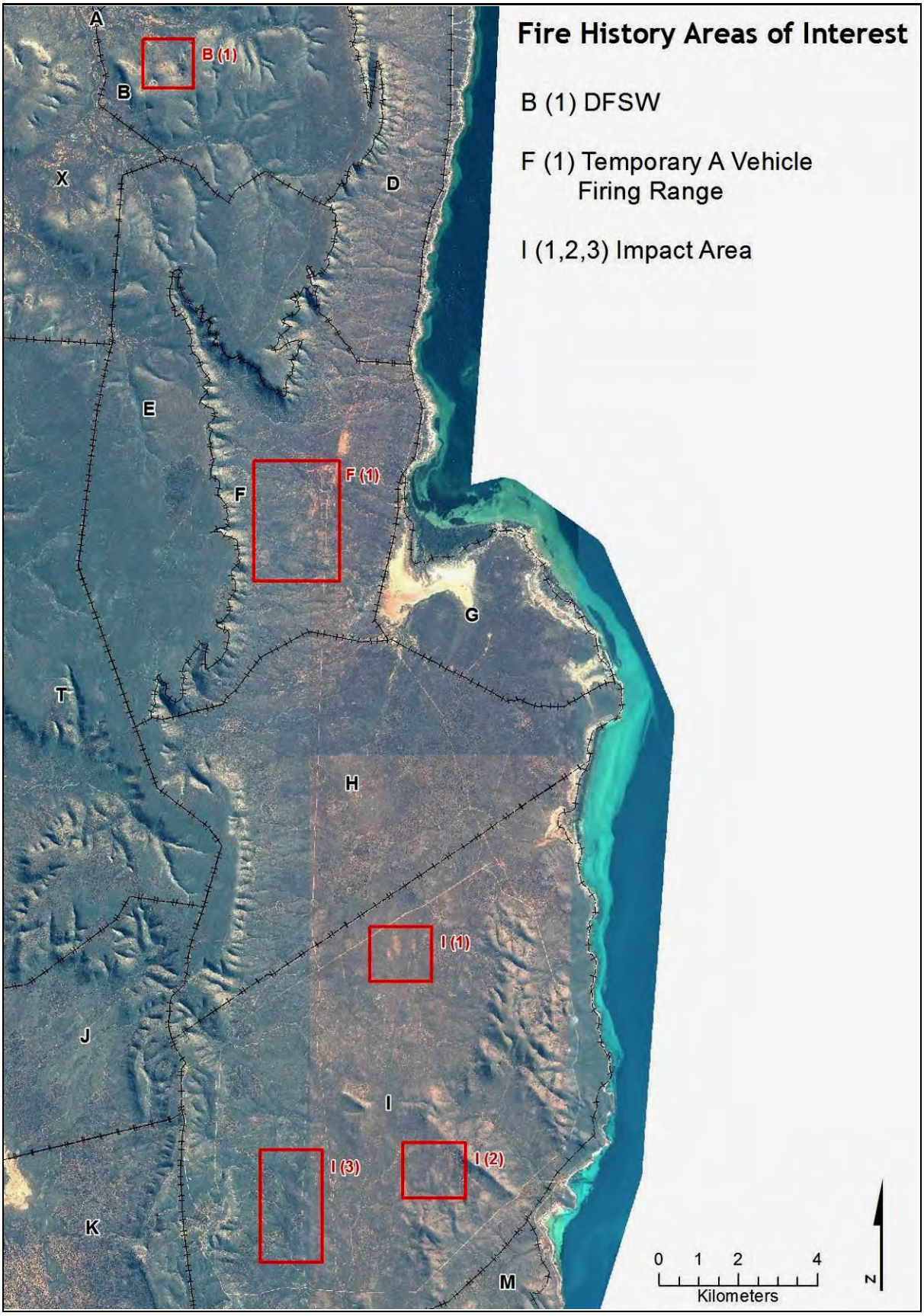
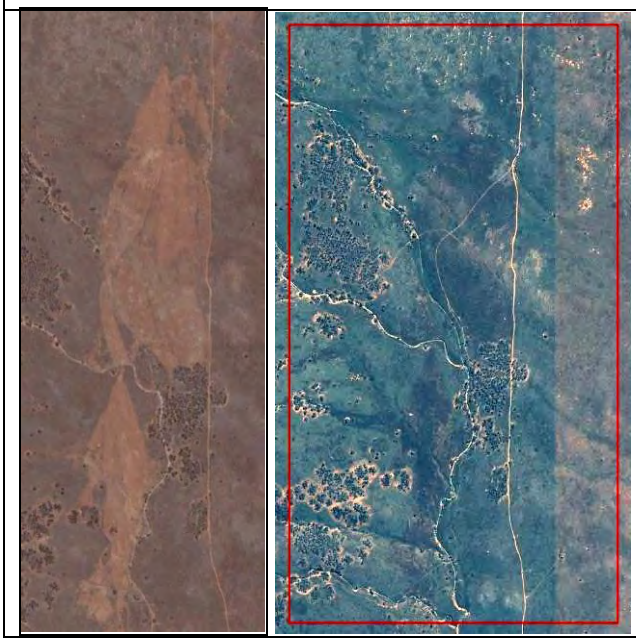


Figure 45. Bushfire scar investigation on CUTA

Table 15. Fire scars in areas of interest.

	B(1) Direct Fire Support Weapons Range The DFSW (firing point top left) has been a repeated site of fires. The escarpment above the range carries a scar of the 2013 fire, bounded on the west by the road, as well as older scars, one of which can be seen breaching the road as a darker scar to the southwest of the bend half way up the scarp. These features are clearer form the ground than in this particular image.
	F(1) Temporary A Vehicle Firing Range At least 9 fire scars are evident from February 2015, the largest in the southwest is approximately 1 ha in size (390m x 275m). Scars indicate a generally northerly fire spread from a single point origin. Fires generally failed to burn across minor tracks and other low fuel obstacles such as small creek lines.

	I(1) Scars in the northern impact area. Fires have halted at minor tracks and an what appear to be reactive semi-circular fire breaks at the north of the scars.
	I(2) Superimposed fire scars. Lighter, elongate scars from fires driven northward in February 2015 by a southerly wind overlie a dark scar from a larger fire that did cross two tracks. The date of that fire is between 2011 and 2013, but has been attributed a 2011 date for mapping. Unlike most fires it crossed tracks in multiple fingers running northward. It is difficult to interpret the eastern side of this fire as available imagery is long enough post-fire that the scar contains regrowth of vegetation that resembles adjacent unburnt vegetation. It might have burnt to the impact area boundary fire break.
	I(3) Recovering fire scar. The new scar from a southward travelling fire in 2013 (left) is now evident as a darker vegetated scar similar to the older scar in I(2).

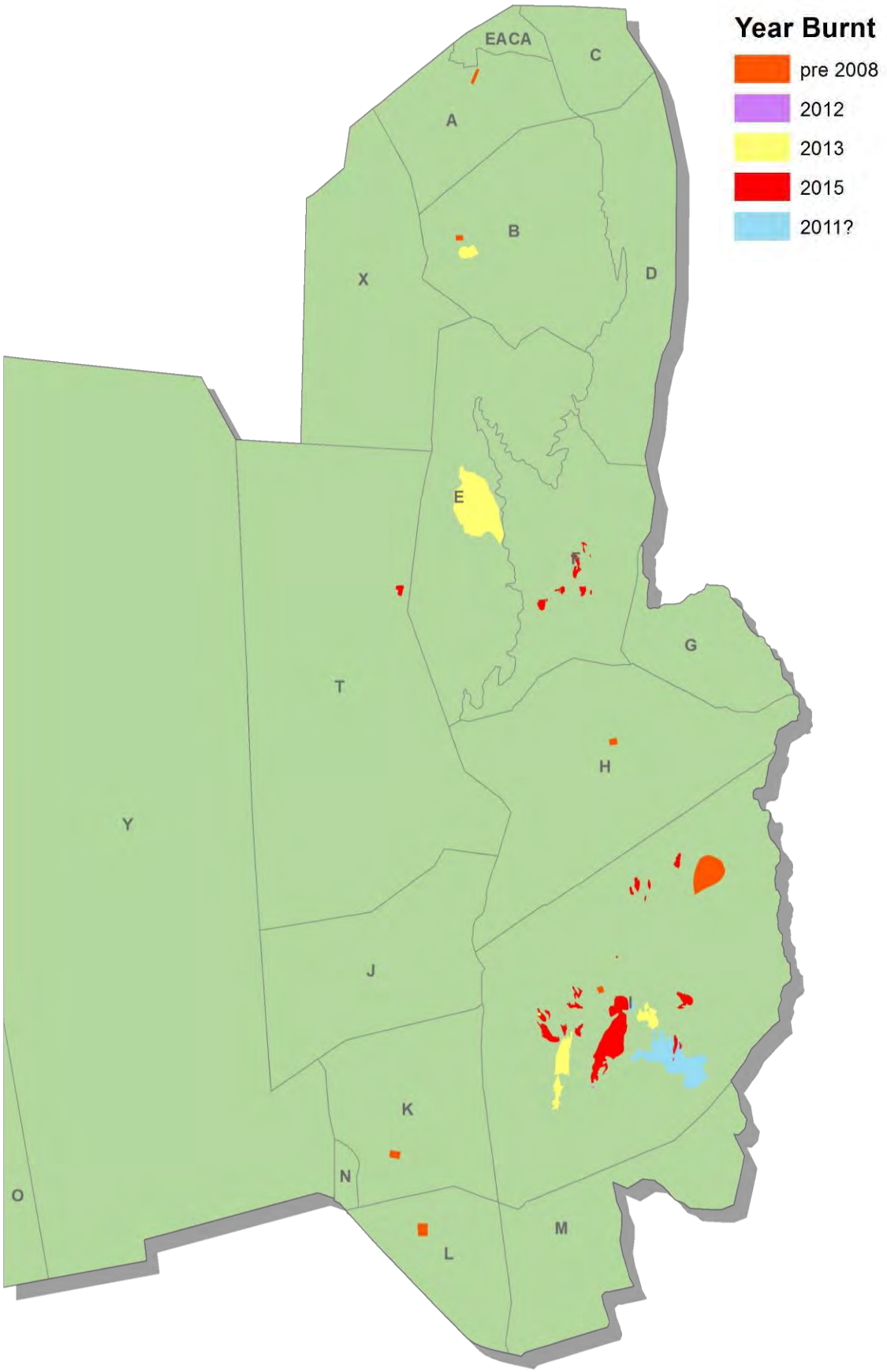


Figure 46. Fire history of CUTA.
Based on TASMIS reports, ENSR AECOM (2008) and direct mapping of fire scars. Fire footprints roughly indicated for older fires (pre 2008) due to lack of precise mapping. Small fires at the DFSW and within the Impact Area are not clearly visible.

5.2.3 Infrastructure, Assets and Functions

The infrastructure of CUTA is likely to change markedly in the next two to three years. Infrastructure is currently concentrated in the northeast around El Alamein where range control, a small camp and the vacant Baxter detention centre are located. Planned infrastructure includes a camp precinct and multiple firing ranges along the Lincoln Highway in the centre of the training area. The few planned and existing structures outside of the main camp area(s) consist of basic amenities for users of the various fixed ranges and sentry points.

5.2.4 Natural Values

Although chenopod shrublands do not readily burn, when fire does occur, saltbush, western Myall and bluebush are susceptible to burning, and large fires could significantly deplete the population of these species within the fire footprint. This in turn could lead to exposure of areas of bare soil and potential restriction of Defence activities for prolonged periods until shrubs recover. Although Myall and Mulga communities have been ascribed a 10-60 year burn period in Table 16 based on the ENSR AECOM (2008) and sources therein, the lack of regional recruitment in the dominant Myall and Mulga trees in those communities means that a fire that killed adult trees would potentially have a significant negative impact on those communities. Likewise, the native pine *Callitris glaucophylla* can be adversely impacted by fires of high enough intensity to kill adult trees. No ecological burning is proposed in this BMP. However, the next BMP should investigate and make a recommendation on the potential negative impact of not burning mallee communities.

State-listed sandalwood (*Santalum spicatum*) regenerates only from seed after fire and is therefore susceptible to frequent fire (<5 years) even when recruitment is occurring. Given the lack of recruitment on site, the loss of sandalwood populations to fire is possible should a fire occur that kills mature trees. The co-incidence of the highest density population of this species with some minor areas of spinifex in the southwest represents a potential risk in this regard. However, the historical fire frequency of the area and the low-intensity planned usage of that area by Defence means that this matter does not require specific additional management. The population is mostly contained within tracks and breaks that should prevent fire spread into the population. No Defence activities involving potential sources of ignition will be permitted in this area during the Fire Danger Period.

There are no known Matters of National Environmental Significance under the EPBC Act that need to be considered in fire management at CUTA.

Table 16. Native vegetation communities of CUTA and their fire attributes.

Community dominant	Fire Probability	Fire intensity	Interfire period	Relative sensitivity of dominant species to fire
Saltbush	Low	Low	-	Sensitive
Bluebush	Low	Low	-	Sensitive
Blackbush	Low	High	-	?
Lignum	Medium	Low		Not sensitive
Melaleuca	Medium	Med-High		Not sensitive
Myall	Low	High	10-60	Sensitive
Mulga	Low	Medium	10-60	Sensitive
Mallee	High	High-Very High	10-60	Good fire response
Mixed Woodland	High	High	-	Not sensitive
Native pine	Low-medium	medium	-	Sensitive

Community dominant	Fire Probability	Fire intensity	Interfire period	Relative sensitivity of dominant species to fire
Black oak	Low-medium	Low	10-60	
Tall shrublands	Low		10-60	
Saline Mudflats	Very low	Very low		Not sensitive
Spinifex	High	Medium-high		Not sensitive
Species				
Sandalwood (*Santalum spicatum*)				Sensitive

5.3 Bushfire Hazard Mitigation Strategies

5.3.1 Key site risks

The nature of fire at CUTA means that large-scale fire is unlikely, and that suppression of fires is generally achievable. Fires resulting from Defence activities and occurring in the immediate vicinity of Defence personnel and equipment pose the most likely risk. The proximity of linear strips of residential buildings along Shack Road and between Port Bonython and Douglas Point does present a risk, albeit of low probability, as fire escaping from CUTA could have a significant impact on civilian assets in that area. The risk to residential areas is controlled through fire breaks and separation by public roads. However additional activity controls for high-risk activities are proposed in this plan based on recent fire history.

Table 17. Key Bushfire risks

Risk	Location	Management
Injury or death of Defence personnel during bushfire		Clear range procedures for actions-on during a fire, or Prepare-Act-Survive materials. User mitigation response prescribed in RSOs.
Loss or damage of Defence property or asset during bushfire		Fire breaks around infrastructure. Fire response and prevention plan. User mitigation response in RSOs.
Injury or death of a civilian due to Defence ignited fire.		Boundary and highway fire breaks. Fire response and prevention plan.
Loss or damage to civilian property or asset due to Defence-ignited fire.	Shack Road, Iron Knob, Point Lowly/Port Bonython, Pandurra/Nutbush retreat caravan park	Boundary fire breaks. Fire response and prevention plan.
Loss of, or damage to, Middleback field station resulting from Defence activities.	Middleback	Install fire breaks around Defence perimeter of Middleback lease.
Increase in bushfire risk due to widespread establishment of exotic grasses	Whole site, particularly boundaries along highways for buffel and fountain grass. Plateau notable for Mediterranean grass	BONS management plan, Monitoring of buffel grass along roadsides and collaboration with NRM boards. Survey and map locations and densities of Mediterranean grass across site to establish scale of risk.

5.3.2 Fire Vulnerable Assets

Jacobs (2015d) have assessed the vulnerability of Defence assets on CUTA and determined that none is at particular risk based on their context and the general risk posed by adjacent vegetation. None would be considered vulnerable assets, and regularly occupied buildings are all located in managed surroundings. However, Jacobs identified a number of minor works to ensure that Asset Protection Zones maintain their function. A number of civilian residences and shacks are located close to the CUTA boundary. While not considered to be fire vulnerable assets, these are considered as sensitive assets in mitigation works planning. Power, water and gas utilities with easements within the boundaries of CUTA are generally not exposed to high fire risk as they are underground, not fire sensitive due to their construction, or are maintained by the owners with fuel-reduced zones within the easement. The University of Adelaide Middleback field station is located in a small exclusion from the training area in sector P. This station is generally unmanned and may be vulnerable to a fire due to periods of lack of fuel management. It is surrounded by Defence land.

5.3.3 Fire Sensitive Environmental Assets

There are few specific sites containing fire-sensitive environmental values on CUTA. Most fire-sensitive plant species are widespread and are generally not at risk from fire unless conditions are hazardous enough that site-wide management responses would be enacted (e.g. total fire ban days). Sandalwood is an exception and although scattered records of individual trees may not permit management of specific locations with respect to fire, the larger stands in the south of sector R and those protected in an environmental restricted area in sector M represent units that can be specifically taken in to account for fire management purposes. Buildings in the Middleback Homestead Precinct are potentially susceptible to fire. The 1950s bunker precinct in sector I was considered a medium risk heritage asset by ENSR AECOM (2008). However, it is not considered to be so here due to its generally low-flammability, poor condition, setting, and the fact that its loss is not considered to be a 'major' consequence as attributed by ENSR AECOM. Some indigenous sites are also at risk of fire damage.

5.3.4 Risk mitigation strategies

Given that fires on CUTA have, to date, almost always self-extinguished on encountering even a minor track or obstacle, the overall risk management approach for CUTA is to combine layers of passive protection in the form of breaks and tracks that prevent spread of fires started on the Training Area, and to ensure that assets are protected by asset protection zones in the unlikely event that a fire spreads beyond the break and trail network. Civilian shacks to the east are protected by the same layered approach, where the boundary break and public roads separate them from training area vegetation where an ignition is likely, and additional measures like the break surrounding the impact area (where ignitions are almost certain) provide additional layers of protection. New ranges and facilities should also adopt the approach of providing spread mitigation measures close to the likely sources of ignition (combined arms range and HETAs). These passive measures are reinforced during higher fire danger conditions by restrictions and mitigation for activities that may cause ignitions, including limiting the areas that are available for live-fire, restricting the type of ammunitions that can be fired, and increasing the number of response assets that must be present to deal with an ignition. There are no broad-acre fuel reduction strategies (e.g. hazard reduction burns) proposed under this BMP.

5.3.5 Detection and reporting arrangements

RSOs prescribe the requirement for all relevant practices to designate fire spotters during the fire danger period. It is the responsibility of units to ensure that any fires resulting from a practice are detected. In sectors shielded by the Simmens Plateau and Douglas Hills and in remote parts of other sectors reporting of a new ignition by another party is unlikely. Because of the fire environment of CUTA few fires ever require a CFS/MFS response. All fires should be reported to Range Control upon first detection. Range control will act as liaison between units, first response (Broadscpectrum 4wd) and second response (SA CFS/MFS) if required.

5.3.6 Fire management zones

Management of risks to Defence and civilian assets on and around CUTA has been designed primarily around passive breaks, tracks and asset protection zones to prevent fire spread in adverse conditions and allow access should a fire fighting response be required.

Asset Protection Zones
APZs were prescribed by ENSR AECOM (2008) to protect 16 "assets" across CUTA. These were re-assessed by Jacobs (2015d) who recommended reducing the size of most from 15 m to 5 m to "…balance vegetation removal with fire risk reduction in an area of generally low fire risk (pg. 11). The original reasoning behind ENSR AECOM's prescriptions was (pg. 29) "…achieving a low level of bushfire attack so that specific construction requirements are not warranted for assets (refer to AS 3959 Construction of Buildings in Bushfire Prone Areas)." In fact, AS3959 does not apply to the classes of assets in questions, which are mostly uninhabited sheds, shelter, toilets and ruins, and Defence is able to risk-manage the level of protection required based on their value to Defence, the ongoing cost of mitigation works and the low risk of loss due to fire. The smaller APZs nominated by Jacobs (2015d) are appropriate for the site, and for others there is no requirement for an APZ (Table 18).

The APZ terminology as applied by ENSR AECOM (2008) is potentially confusing in a couple of instances. For example APZ 4 (El Alamein Camp Area) could mean the margins of the camp, or every building within the camp. Jacobs (2015d) have described vegetation management works within the camp area as APZs around individual structures. The APZ terminology should be replaced by describing a fire break around the camp area which separates an area of non-fire prone hardstand, buildings and managed vegetation within the camp area from unmanaged vegetation. From the photograph included in Jacobs (2015d) it appears that APZ1 (Range Control) may have been interpreted as the current range control building. However, the original APZ applies to the old Range Control building to the north of the main camp area. Other APZs were applied around "assets" that in reality are collections of individual structures. For example the "Class Range and Obstacle Course" has a prescribed APZ setback of 15 m, but there are four structures at the class range (two toilets, a target shed and shelter shed) separated by up to 500 m. Where possible, terminology for APZs has been changed to include asset numbers to avoid confusion, and GEMS APZ EFRs will be linked to specific asset records. The Bushfire Hazard Mitigation Plan (Appendix C) shows locations of APZs. New camp assets to be built in sector Y will be subject to the construction standards of AS3959 where appropriate. These new APZs must be included in a revised BMP on handover-takeover for the camp.

Table 18. Asset Protection Zone assessment.

Sector	Number	Name	Prescribed by	Modified by	Comment	Prescription
A	APZ1	Range Control	ENSR AECOM (2008)	Jacobs (2015d)	No longer Range control. Building is surrounded by a road hardstand and cleared vegetation.	Discontinue APZ for asset A0026 on the assumption that road will remain effective fire protection until next BMP review
A	APZ2	El Alamein landing ground	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from asset wall (garage A0010).
A	APZ3	Sewerage treatment ponds	ENSR AECOM (2008)		It is not clear what this APZ is protecting as there are no flammable structures at this location.	Discontinue
A	APZ4	El Alamein Camp Area	ENSR AECOM (2008)	Jacobs (2015d)	A perimeter break is a better approach to protecting camp assets.	Replace with break along existing alignment of a break and other tracks (Figure 47), basic grounds maintenance and vegetation management should continue within the camp area.
A	APZ5	25m Rifle Range	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from assets A0008 and A0009
A	APZ6	PBSR and battery storage facility	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from assets A0005, A0006, A0007, A0016
A	APZ7	Class Range and Obstacle course	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from assets A0001, A0002, A0004 2m setback from A0003,
A	APZ8	Grenade Range	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from asset A0014
A	APZ9	40 mm Range	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from firing platforms, 15 m around storage container
A	APZ10	AGR	ENSR	Jacobs	Can be risk-	Adopt 5 m

			AECOM (2008)	(2015d)	managed	setback from structures
B	APZ11	DFSW	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from shed
H	APZ12	Communication tower	ENSR AECOM (2008)	Jacobs (2015d)	Required	Adopt 5 m setback from end of overhanging panels, not from base of structure
G	APZ13	Demolition area	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m setback from assets A0025 and A0029
L	APZ14	Toilet / Shower facility	ENSR AECOM (2008)	Jacobs (2015d)	Can be risk-managed	Adopt 5 m clearance and removal of overhanging vegetation
I	APZ15	Yard Ruin 1	ENSR AECOM (2008)		Not required. Fire is an unlikely event at this location.	Discontinue
I	APZ16	1950's Bunker Precinct	ENSR AECOM (2008)		Not required. Structure not particularly flammable or exposed to fire (see image in Table 29), and previous risk assessment of "Major" consequence of loss is overstated.	Discontinue
P	-	Middleback Homestead	CUTA EMS(2) 2016	-	Small APZ is required to ensure retained heritage asset is protected from plausible risk of loss to fire	5 m width from safety fence: -Vegetation height <10 cm -Planted trees can be retained, but should be trimmed to 2m clearance from structure
P	-	Middleback Shearers Quarters 1	CUTA EMS(2) 2016	-	Small APZ is required to ensure retained heritage asset is protected from plausible risk of loss to fire	5 m width from safety fence: -Vegetation height <10 cm -Planted trees can be retained, but should be trimmed to 2m clearance from structures
P	-	Middleback Shearers Quarters 2	CUTA EMS(2) 2016	-	Small APZ is required to ensure	5 m width from safety fence: -Vegetation

					retained heritage asset is protected from plausible risk of loss to fire	height <10 cm -Planted trees can be retained, but should be trimmed to 2m clearance from structures
P	-	Middleback Shearing Shed	CUTA EMS(2) 2016	-	Small APZ is required to ensure retained heritage asset is protected from plausible risk of loss to fire	5 m width from safety fence: -Vegetation height <10 cm -Planted trees can be retained, but should be trimmed to 2m clearance from structures
P	-	Middleback Drying Shed	CUTA EMS(2) 2016	-	Small APZ is required to ensure retained heritage asset is protected from plausible risk of loss to fire	5 m width from safety fence: -Vegetation height <10 cm -Planted trees can be retained, but should be trimmed to 2m clearance from structures

Figure 47. El Alamein Camp Area APZs and fire protection measures.
Asset protection zones 1 and 3 are not required. Asset protection zone 2 can be reduced from 15 m to 5 m. The camp area is already essentially ringed by a firebreak. However, the track to the northwest should be widened to at least a 5 m break. This break removes the terminology of APZ4 that applied to the camp area. In the unlikely event that a fire was threatening the camp the space between the break and the perimeter fence provides a defendable space from which to fight the fire with multiple escape routes if required.

Land Management Zones
No Land Management Zones are described in this BMP as no broad-acre burning or fuel reduction works are proposed.

Strategic firefighting advantage zones
No SFAZs are proposed in the plan. The nature of fuels across the site means that fire-fighting can generally occur in most locations under most conditions, and where a stand of potentially hazardous vegetation is present, it is usually practicable to fall-back to a nearby location and attack the fire in the surrounding less flammable setting. The area between the fire break around El Alamein shown in Figure 47 and the camp perimeter fence essentially represents a fuel-reduced zone that provides a safe fire fighting location.

5.3.7 Fire management infrastructure

Fire tracks
In general, tracks at CUTA need only meet *South Australian Firebreaks, Fire Access Track and Sign Standards Guidelines* (SAFFA) *minor* standard to provide a practical fire fighting response because tankers will find passing opportunities in many places without the construction of dedicated bays that differentiate *minor* from *standard* tracks. Exceptions are in mallee areas and steeper areas crossing the escarpment. The escarpment presents a significant barrier for tankers responding to a fire east of the Lincoln Highway. Tracks across the western scarp are generally too steep for CFS 34 tankers and the only practical access is at the far north and from the MSR at the southern end. Steepness of the western scarp also means it is difficult to ensure maintenance to an appropriate standard that would allow access even if the grade were acceptable. In reality, it is likely that earthmoving equipment rather

than water tankers will be the primary means of fighting any large fires that develop (this was the case with the largest fire yet recorded on site in October 2013). Graders and bulldozers will be less hampered by the scarp. However, consideration should be given to providing a lower grade route that accesses the Simmens Plateau from the west to allow water tankers ready access to the middle of the plateau and also provides an alternative escape/through route should a major fire occur. The most practical additional route that could access the north of the plateau appears to be along the route of an existing track up Pine Creek to Junction Hill. Northern sections of this track on the approach to the plateau are currently in poor condition. This track would ideally be upgraded to a standard track under the SAFFA in areas where topography would prevent trucks passing each other. However even a minor track will still permit better access to the plateau for tankers, and it is likely that in many places tankers could still pass each other. The route passes close to, but does not infringe, some heritage sites. This location offers the gentlest grade up to the plateau, and because it links into the Lincoln Highway rather than via Lincoln Park to Gap Road, it provides an equally viable access route for assets deployed from either Whyalla or Port Augusta.

The new track network proposed under the 30% design will provide vehicle access that will meet major track status under the SAFFA to key operational areas west of the Lincoln Highway and around the camp facilities. However, tracks currently present can only be categorised as service tracks. Although the track network is of a low standard, emergency access is generally possible due to the ease of by-passing poor condition roads on adjacent land.

Fire tracks require SAFFA compliant signage. This is not currently in place across most of the property. There are numerous informal and minor tracks across the range. This will continue to be the case given the nature of site use, so it is essential that clearly designated access routes and signage are provided to allow external agencies responding to any emergency to safely and reliably access likely areas in which they will be required. Defence needs to undertake an assessment of all tracks across the entire site, including those to be constructed under the new infrastructure projects, generate names or a naming system, and focus maintenance efforts on those tracks that are named and designated as part of the emergency response network.

Fire breaks

All external property boundaries and boundaries along internal road easements have ~5 m fire breaks either near completion or in place. A 20 m fire break is in place around the HETA. The HETA break requires maintenance in places to reduce plant growth to the SAFFA standard of <10 cm. Some sections have near continuous plant growth across them (Figure 48). This is less important on the western side of the HETA where an escaping fire will have to cross multiple tracks and topographic barriers prior to reaching a sensitive asset or external boundary. However, the eastern HETA boundary is close to both the external boundary and civilian assets and its maintenance is considered a critical work. The length between Cultana Hill (565 578 on CUTA special or GDA 94 (MGA) 53 756575 6357750) and west of sentry point 3 (621 630 on CUTA special or GDA 94 (MGA) 53 762070 6363045) inclusive must be checked and maintained to standard prior to each fire season. The boundary fire break in sector F adjacent to Shack Road (between sector boundary and sentry point 6) must also be checked and maintained to standard prior to every fire season due to civilian assets located near to the boundary in a sector where live fire is permitted. Live firing is not currently permitted in sectors C and D, but if allowed in the future the break in those sectors would also become a critical work. It is not currently considered as such because the track following the

sector boundary between sectors F and D provides a sufficient internal break that in combination with the boundary break and MSR provides a series of breaks that should be sufficient to prevent fire spread from sector F through D. The fire break illustrated in Figure 47 around El Alamein camp is not considered a critical work because the camp surrounds are generally fuel reduced through tracks and other impacts and there is no history of fires threatening the site or surrounds. Fire fighting will be possible under nearly all circumstances around the camp and rapid access to the site by external response agencies is possible.

Figure 48. HETA fire break in vicinity of southwest corner of HETA.
Note solid growth in foreground and patchy growth across visible length of break.

Water points

Water is available at four standpipes in sectors A, I, L and M (see Bushfire Operations Map Appendix D and RSOs chapter 4 annex C- Training Sector Assets and Limitations (note that this table attributes standpipes near the boundary of M to sector I, and near) boundary of L to both L and M). Reticulated water for trucks is not yet available in sectors O-X. Water is potentially available from dams in those sectors, although supply is generally unreliable in most, and water is generally held at the bottom of steep-sided depressions, meaning drafting with a portable pump will often be required to supply tankers. The most reliable dams have been selected from satellite imagery and are shown on the Bushfire Operations Map. Replacement of those sources with reliable tank supplies at relevant ranges and the camp (particularly the Combined Arms Range) should be achieved as part of the development of new infrastructure. Both ENSR AECOM (2008) and Jacobs (2015d) noted that CFS compatible fittings should be supplied to water tanks.

Fire escape routes
It is highly unlikely that a fire of sufficient ferocity to require an escape route will occur at CUTA. However, as for other emergencies, the MSR provides the main north-south escape route in eastern CUTA, as well as a number of emergency access/egress points around the boundary. Where a fire is active within mallee in sectors K,L or M evacuation should be northwards along the MSR to El Alamein not south through mallee areas. East of the Lincoln Highway, and west of the plateau, there are a limited number of crossing points to gain access to the Lincoln Highway across the train line and water pipeline. This currently requires the use of *minor/service* standard tracks that were is reasonable trafficable condition in December 2015 in order to leave the training area. In sectors west of the Lincoln Highway the main escape routes are the main access tracks to the Roopena Homestead sites through sectors O and S, but these may not be accessible without traversing significant lengths of *service track* standard tracks. No escape routes are nominated for sectors P, Q and R which are serviced by networks of relatively short *service track* standard tracks accessing public roads.

Refuges of last resort
No refuges of last resort are considered necessary for the site. Assembly during a bushfire is at El Alamein Camp.

5.3.8 Fire Prevention

Recent fire history indicates that Defence activities are the major ignition source of fires on Cultana. The generally low level of surface fuels on CUTA means that fire spread is heavily influenced by wind that promotes flame promulgation though sparse shrubby layers. Wind-driven fires were a common occurrence during certain activities in 2013 and 2015, and although few spread, there is a clear requirement to ensure that fires are not started through unreasonable use of the site during the Fire Danger Period. Fuels of the sites are nearly always dry, and relative humidity during summer days is nearly always low. This means that ignition of fuels in the immediate vicinity of fall-of-shot is a likely event. Fires are unlikely to spread and take hold in most fuels categories under most conditions, and the delineation of fire environments to be used in assessing activity mitigations across the site reflects that (Activities Mitigation Map- Appendix E). However, ignitions in areas of hummock grass H1 have a higher probability of taking hold. Although the risk of fire spreading away from these (generally hilltop) locations is low, they should not be targeted under higher fire danger, as a large fire emerging from spinifex may generate unexpectedly vigorous behaviour in surrounding shrublands. The risk of a more dangerous fire spreading through W3/4 woodlands means that these areas are also subject to higher mitigation measures. The Activities Mitigations Map provides location-specific mitigation measures for different pre-defined risk classes of activity under a given Fire Danger Rating. This also takes into account the practicality of response due to topography, track networks and UXO contamination. Response is discussed in section 5.4.

Total Fire Bans
It is the intention of RSOs and Defence that live fire should not occur during a TOBAN. No live-firing is permitted during a TOBAN unless there is an *immediate* operational imperative to do so and an appropriate waiver is in place in accordance with DTAMM chapter 7 clauses 7.21 to 7.24. All restrictions applied by the State during a TOBAN apply to non-military Defence activities.

Even if a waiver is in place, in accordance with clause 7.20 of the DTAMM "The relevant State or Territory fire authority must be made aware of proposed live fire practice… before commencement of the activity." For CUTA the "relevant State or Territory Authority" should be taken to mean:

-For activities in, or with fall-of-shot in, sectors I, J, K, L, M, O, Q, S, Y, T (plains)- Whyalla Metropolitan Fire Service Station (08) 8204 3600 or (08) 8645 7473 (if not contactable, then contact should be made through Eyre Peninsula and West Coast region CFS (08) 8682 4266)

-For activities in, or with fall-of-shot in sectors Q,S,O also consider contacting Iron Knob CFS (08) 8646 2185

-For activities in, or with fall-of-shot in, sectors A, B, E, F, G, H, T (plateau)- Port Augusta Metropolitan Fire Service Station (08) 8204 3600 or (08) 8642 3895 (if not contactable, then contact should be made through SA Country Fire Service Flinders, Mid North and Pastoral Areas (08) 8642 2399)

Consider jointly advising Whyalla and Port Augusta for sectors S and H.

Field firing is currently not permitted in sectors C, D, N, P, R, X, Y.

Due to the heightened risk of long fire runs and the untested capacity of the HETA fire break and boundary fire breaks to contain a fire under TOBAN conditions, two areas are prescribed as no live-fire under TOBAN conditions. These areas are designed to protect civilian assets outside the eastern boundary of the range:

- Eastern HETA and sector M east of the 55 and south of 63 on the CUTA special. This allows use of the northern and western HETA, but provides multiple tracks and a significantly longer fire run than has ever occurred on site between an ignition and external assets. Given the length of fire runs in the HETA in recent years, if a fire did originate in the east of HETA under severe or extreme conditions it could escape the boundary and impact civilian assets (assuming that no mitigations were in place).
- Sector F east of the MSR. This is designed to protect Shack Road through ensuring that at least one substantial internal track separates an ignition from the boundary, providing an additional protection to the boundary break and Shack Road itself. It also allows placement of assets behind a firing point and rapid movement forward along the MSR to attack a going fire if required.

5.4 Fire response

Fire response by external agencies is facilitated by the extensive network of tracks, dissection of the property by highways, and the generally flat terrain of most of the western portion of the TA. The lack of UXO contamination across most of the TA also means that direct attack on a going fire is possible under many circumstances.

5.4.1 User mitigation response

Cultana RSOs currently prescribe that all units will supply "All fire fighting equipment required for field activities, including live firing... The scale of fire-fighting equipment required should be based on the number of personnel and activity to be conducted at CUTA. The following is the minimum equipment to be provided by the unit: a. axe felling – 1, b. mattock complete – 1, c. rake fire fighting – 3, d. spray knapsack – 3, and e. shovel round, long handled – 2." A 500 l slip-on pod is also available from range control.

There is an expectation that units in the proximity of an ignition will make best efforts to extinguish an ignition before it spreads and becomes a more dangerous fire. This has been the history with ignitions at CUTA, with units successfully extinguishing many small fires in the past 12 months.

Units should not respond to a fire in a HETA due to the risk of UXO detonation from either egress across the HETA or the heat of the fire causing detonation to occur. Hand tools and hoses should not be used to fight fires within the impact area.

Given that ignitions are most likely to occur within the HETA this is a serious constraint on the effectiveness of user mitigation response. UXO risk mapping for CUTA indicates that areas around the DFSW and sector F around the Temporary A Vehicle Field Firing Range are high UXO risk as well as the HETA. However, current range use prescribing the routine destruction of UXO arising from practices outside the HETA means that User Mitigation Response should be undertaken with an aim to contain fires as they spread out of the DFSW and extinguish fires on the Temporary A Vehicle Field Firing Range, DEMS range and in other field firing locations assuming OIC prac has direct knowledge of the state of the range and any risks arising from the activity. If the practice has generated UXO that has not been destroyed then no response should be attempted and the unit should, fall back to a safe distance, generally 1 km, to monitor and report on the fire. In all cases, the safest response is to use an existing track or break as a containment line, only fighting fire that crosses the line and capitalising on the natural tendency of fires at CUTA to self-extinguish. Where tracks are not present in the vicinity, a hand break can be constructed around small fires. The use of tracked vehicles to smother small or low intensity fires is a practical option for User Mitigation Response at CUTA as the spreading of fine fuels or grass that present issues with this approach are of limited concern. A pocket guide on User Mitigation response is in preparation and should be available prior to the 2016-17 fire danger period for CUTA.

5.4.2 First response

First response on CUTA is a light 4wd unit with a 500 L tank and operators provided by Broadspectrum. Range control should be notified of any ignitions on the range so that this capability can be readied if it is required to attend. On days where there is a reasonable expectation based on the previous days firing or general weather conditions that ignitions are likely, then this vehicle should be pre-positioned at the closest safe position to the activity. Additional resources will need to be provided by users for large, dispersed activities, or activities that occur during periods expected to involve adverse conditions. Guidance is provided on the Activities Mitigation Map (Appendix E) as to what level of response is required under what conditions.

5.4.3 Second response

The size of the property is a key limiting factor in rapid response to a fire from the CFS. This must be borne in mind when planning acceptable levels of user mitigation response if there are options to bring combat engineers and service fire fighting capacity that can be positioned forward rather wait for the arrival of the CFS. Travel time between Whyalla and Iron Knob or Port Augusta and Iron Knob is roughly 45-50 minutes for a full heavy tanker. Taking in to account call out time and the long internal track networks that may then be involved in accessing a fire in remote parts of the TA, a response to many parts of the training area will take at least an hour, and more than an hour and half to many places. Some of the longest response times will be to access the boundaries of the existing HETA in sector I and the planned HETAs in sector O and S.

The proposed track network included in the 30% design for development of CUTA is considered sufficient to meet the access requirements for fighting fires across the entire site. In the interim the existing track network should be sufficient to allow response. This is a risk-management decision based on the fact that boundary breaks will be installed around the entire area, and the effectiveness of those as barriers to fire spread is re-enforced by public roads that act as breaks and serve as safe and rapid access for fire response.
The Bushfire Operations Map is attached at Appendix D. This details the current track network, fire fighting infrastructure such as water and access points and fire fighting constraints such as UXO specifically for site familiarisation of external agencies.

5.4.4 Prepare-Act-Survive

A prepare-Act-Survive pamphlet is provided at Appendix F that details site bushfire matters, evacuation procedures and routes and site communications and survival information during a fire event. Once the new camp is constructed consideration should be given to developing this material into a poster version highlighting fire risks and the same matters with respect to new infrastructure.

5.4.5 Post fire actions

Following any fire that requires attendance by first or second response the RCO should convene a post-fire debrief to review the effectiveness of mitigations in place to prevent fire, response command and control and fire suppression. Representation from external authorities is essential for all fires where second response was used. This representation can be in written form. Information gleaned from the post-fire debrief should be used to populate or update relevant sections of the GEMS/TASMIS fire report form.

Environmental staff should be consulted regarding any fire that impacts an environmental or heritage restricted area. Environment staff must also be consulted regarding any potential requirement for post-fire monitoring if any fire greater than five hectares occurs, or where a fire is know to have impacted an erosion or rehabilitation site.

5.5 Bushfire Mitigation Works Schedule

Table 19. Bushfire Mitigation Works Schedule

Work description	Location(s)	Frequency (if relevant)	Performance standard	Critical work?	Consequence if not completed
Maintain fire break	Eastern Impact Area boundary, sector I between Cultana Hill (MGRS 565 578 or GDA 94 (MGA) 53 756575 6357750) and west of sentry point 3 (MGRS 621 630 or GDA 94 (MGA) 53 762070 6363045)	Prior to 1 September each year	SAFFA*. Minimum width 10 m. Maintain existing wider widths where present.	Yes	Potential loss of civilian assets adjacent to boundary
Maintain fire break	Eastern boundary-south, sector M (adjacent Point Douglas Road) and I (to sentry point 3)	Prior to 1 September each year	SAFFA. 5 metre width.	Yes	Potential loss of civilian assets adjacent to boundary
Maintain fire break	Eastern boundary of sector F between sector boundary and sentry point 6	Prior to 1 September each year	SAFFA. 5 metre width.	Yes	Potential loss of civilian assets adjacent to boundary
Maintain fire breaks along all land boundaries and internal road easements	Sectors A,C,D,F,I,M,L, N,O,P,Q,R,S,T, Y,X	Prior to 1 September each year	SAFFA; 5 metres width	No	Potential escape of fire from CUTA onto public roads or adjoining property
Improve and maintain fire break	El Alamein Camp Area	Improve-ASAP. Maintain-Prior to 1 September each year	SAFFA. Minimum width 10 m, incorporating existing tracks and break. Maintain existing break at current 20 m width.	No	Low probability of fire incursion in to camp area and resultant loss of range control and other assets in camp area.
Maintain MSR/through road to at least minor track standard.	Sectors A,C,D,F,H,I,K, L		SAFFA	No	CFS or other fire response involving large tankers hampered
Improve/maintain MSR to standard track through sectors K,L,M,N, and sector I from GR540 650 southward.	K,L,M,N,I		SAFFA. Key requirement is provision/maintenance of passing opportunities.	No	Limited passing opportunities through these areas due to vegetation and topography in comparison to rest of route
Install fire break	Sector B DFSW	For	SAFFA.	No	Potential for continued

around DFSW		consideratio n			escape of fire from of DFSW, impacting soil stability on adjacent slopes and creating repeated requirement for First or Second response attendance
Maintain APZs	Assets A0001, A0002, A0004, A0005, A0006, A0007, A0008, A0009, A0010, A00014, A0016, A0025, A0029, Firing platforms 40mm range, AGR structures, DFSW shed, STARZN Tower (APZ 12), Toilet/shower facility sector L (APZ14)	Assess at least once every two years	5 m width: -Vegetation height <10 cm -No overhanging branches	No	Potential loss of assets
Maintain APZ	A0003	Assess at least once every two years	2m width: -Vegetation height <10 cm -No overhanging branches	No	Potential loss of asset
Maintain APZ	Storage container 40mm range	Assess at least once every two years	15 m width: -Vegetation height <10 cm -No overhanging branches	No	Potential loss of asset
Maintain APZ	Middleback Homestead, shearing shed, shearers quarters (1&2) and drying shed	Assess at least once every two years	5 m width from safety fence: -Vegetation height <10 cm -Planted trees can be retained, but should be trimmed to 2m clearance from structures	No	Potential loss of retained heritage structures and damage to safety fence
Fire track signage	All sectors	ASAP	SAFFA	No	Potential confusion and hampering of first and second response to a bushfire
Water tank fittings	El Alamein Camp	ASAP-Consider practicality/ need of supplying Storz or round thread fittings (as relevant) in discussion with Port	SA Fire Authorities Built Environs Section Policy No. 14 *Above Ground Water Storage Tanks for Fire Fighting Purposes*	No	Alternative water supply to standpipe and on-board reserves less accessible and time delays during response to fire in camp area and nearby

		Augusta MFS			
Test and service standpipes	MGRS 52830 97230 55680 56190 53210 54920 47620 55010	Prior to 1 September each year	Clear access for trucks, strong water flow	No	Fire tenders may be forced to seek alternative water source causing delays in returning to the fire front
Assess fire track and fire break condition	Site-wide	*At least* once every three years for non-critical tracks and breaks	Standard reported and updated in GEMS, works requests lodged for maintenance	No	Unknown access risks for units and external agencies responding to a fire.

*South Australian Firebreaks, Fire Access Track and Sign Standards Guidelines

6.0 Contamination Remediation and Pollution Prevention

6.1 Contaminated sites

The PER (AECOM 2012) and SoE (Jacobs 2012) both indicate a low level of contamination at CUTA, focussed around homesteads. The Defence contaminated sites register contains no records of contaminated sites at CUTA, although precautionary monitoring wells have been sunk near fuel storage tanks at El Alamein camp. Relevant newly acquired sites have been risk-assessed using the Defence Contamination Risk Assessment Tool (CRAT) based on information in AECOM (2012), Jacobs (2015b). Table 20 lists sites and their risk level and Figures 49 and 50 illustrate some sites. Those sites that received medium risk rating for environmental impact (2 of 6) were rated as almost certain on likelihood of impact, but low or negligible for consequence. The physical hazard presented by some sites, rather than the chemical, resulted in a medium rating. Agon (2015) conducted a more detailed assessment of these sites prior to deconstruction and remediation of the affected sites in late 2015. Agon recorded additional hazardous materials such as lead paint and asbestos at most sites. However, as this assessment was specifically to inform site remediation it is believed that there is a very low residual risk of contamination. This assertion requires re-assessment following the finalisation of the remediation works. Should any sites remain after that program has been completed they will be entered into the Defence Contaminated Sites Register (CSR), which will be directly transferred into GEMS. An initial field inspection of the Lincoln Park homestead site revealed similar patterns of contamination including a sheep dip and significant rubbish dumping in erosion gullies. This site requires a formal contamination assessment and clean up in association with its expected inclusion within the MLDP in the short-medium term. The risk of any further sites being discovered is very low given the past land use of CUTA. Where contamination occurs, the nature of surface water and groundwater at the site limits the potential pathways to any sensitive receptors should any unknown contamination be present in more remote locations.

Table 20. Risk assessment of contaminated sites.

No.	CSR Source	Location	Risk Priority	Risk Banding
1	Underground Fuel Storage Tank (UST)	Roopena Homestead	175	MEDIUM – Env.
2	Above ground Fuel Storage Tank (AST)	Roopena Homestead	175	MEDIUM – Env.
3	Oil / Fuel Storage Shed	Roopena Homestead	189	LOW
4	Surface soil staining with hydrocarbon odour	Beneath former AST, Roopena Homestead	194	LOW
5	Motor vehicle repair pits x2	In sheds near main homestead, Roopena Homestead	192	MEDIUM – WHS
6	Domestic waste burning area	Roopena Homestead	185	LOW
7	Possible chemical storage in outbuildings	Roopena Homestead	187	LOW
8	UST (partially above ground)	Middleback Homestead	188	LOW
9	Oil / Fuel Storage Shed x2	Middleback Homestead	195	LOW
10	Unlined waste oil seepage pit	Adjacent to fuel / oil storage shed, Middleback Homestead	186	LOW
11	Private waste dump	500m south east of main homestead, Middleback Homestead	183	MEDIUM – WHS

No.	CSR Source	Location	Risk Priority	Risk Banding
12	Blacksmith shed	Middleback Homestead	205	LOW
13	Domestic waste burning area	500m south east of main homestead, Middleback Homestead	190	LOW
14	Possible chemical storage in outbuildings	Middleback Homestead	203	LOW
15	Concrete and steel drum containing animal carcasses	300m northeast of Homestead, Middleback Station	210	LOW
16	Rotating power spray sheep dip	Middleback Homestead	188	LOW
17	UST	Tregalana Homestead	188	LOW
18	Fuel / oil storage shed with concrete floor	Tregalana Homestead	203	LOW
19	Evidence of former bowser	Adjacent to fuel / oil storage shed and UST, Tregalana Homestead	181	MEDIUM – Fin.
20	Motor vehicle repair pit	Adjacent to fuel / oil storage shed and UST, Tregalana Homestead	192	MEDIUM – WHS
21	Possible chemical storage in outbuildings	Tregalana Homestead	203	LOW
22	Multiple 200L fuel / chemical storage drums and soil staining	Whyalla Gliding Club	197	LOW

Figure 49. Fuel storage shed at Middleback Homestead.
Typical of the localised POL contamination issues encountered around the homesteads.

Figure 50. Rotating power spray sheep dip.
Localised chemical contamination is likely in the soil nearby, but this sort of apparatus is generally less contaminating than an in-ground dip.

6.2 Noise, Vibration and Light

6.2.1 Noise and vibration

Noise and vibration resulting from vehicle noise, aircraft noise and explosions are key management concerns as both sound and vibration represent the transfer of potentially damaging energy waves through air, soil or rock. Key sensitive receptors for vibration and sound at CUTA are civilian residences, Defence camps other infrastructure and roads.

Noise impacts are managed in the first instance through a 1000m buffer near residences and highways that provides protection to residential properties from vehicle movement impacts and nuisance noise. In addition, there is a minimum 1000m buffer from all boundaries and easements for live firing of any ammunition. These buffers provide a base level of protection to sensitive receptors. However, some Defence uses have the potential to carry damaging noise and vibration energy significantly further than a 1000 m buffer.

The greatest likelihood of damaging impacts from military use of a site is from explosions. Military training explosions generally differ from civil use of explosives in that mining and quarrying tend to deliberately cause explosions within rock strata. Military explosions are generally aimed at surface targets. This is a potentially important difference as the transmission of vibration through rigid rock is notably more damaging than through sand and soil matrix. However, at the distances to sensitive receptors that are relevant to CUTA research into impacts of military explosions on residential areas has shown that seismic transmission of energy through the ground is not the primary cause of damaging vibration reaching a structure (Albert *et al*. 2013). Noise travels significantly further at sustained energy

levels through air due to its lower resistance. This means that although seismic ground vibration may reach structures, it will not have any impact at distance where the ground vibrations generated by noise travelling through the air and shaking the ground are still capable of causing structural damage. The extent to which this is true is related to the coupling between the ground and the air, with more rigid ground with forest generating greater ground vibration as a result of noise than does open vegetation on softer substrates as is generally the case at CUTA (Madshus and Nilsen 2000, Albert et al 2013). Importantly, the airblast itself is likely to dominate the ground vibration at CUTA, although to a casual inside observer, the arrival of the air pressure may resemble a ground shock because the sound may not be hard, but the shaking that results from the airblast itself will be noticed.

Maunsell AECOM (2007) undertook measurement and modelling of airblast resulting from key weapons systems at CUTA. These included M1A1 Abrams tanks and 155 Howitzer artillery. They developed a set of noise templates that took into consideration the airblast overpressure resulting from each of the primary munitions they tested, and the required standards under South Australian General Environmental Duty and other Australian standards. A baseline acceptable threshold of exposure of sensitive receptors to 115 dB(LIN)Lpeak was set. This threshold represents a level that might approximate background noise to a receiving location, and is below the 120 db dB(LIN)Lpeak Australian standard for human comfort. No structural damage is expected at levels below 133 db dB(LIN)Lpeak. This means that the noise templates represent a planning guide that triggers the noise and vibration management process in section 6.2.2. It is acceptable to conduct some activities if the noise contours overlap sensitive receptors, as the risks to human comfort and risks of actual damage resulting from activities are not realised until the activity is conducted more often, or closer to the receiver than the 115 dB(LIN)Lpeak buffer size prescribes.

Table 21 presents minimum separation distances required from sensitive receptors for different weapons based on an airblast overpressure of 115 db. This simplified table is a planning tool that includes distances for calm and windy conditions. At the distances presented in the table, the sound would be roughly equivalent to background ambient noise. Based on these simplified distances, and taking the worst case scenario in each case, the area of CUTA available for deploying a 50kg explosive and for firing an Abrams tank are shown in Figure 51 and Figure 52. These figures are based on buffers drawn around the closest external sensitive receptor to the boundary (largely residential houses or shacks). There is very little of CUTA that is not overlain by the noise buffer for 50 kg explosive detonations, although areas of both planned HETAs in sectors S and O are outside the buffers. Much larger unencumbered areas are available for firing an M1A1 Abrams tank.

Table 21. CUTA Environmental noise modelling output (Maunsell AECOM 2007).

Australian Government
Department of Defence
Defence Support Group

MAUNSELL | AECOM
BASSETT

CULTANA TRAINING AREA

Minimum Distance from Firing Point or Impact Point to Closest Noise Sensitive Receptor

Weapon	Distance from Firing/Impact Point to Closest Noise Sensitive Receptor (km)	
	Cloudy Day or Night-time & no Wind	Cloudy day or Night-time & Wind in Direction of Receiver
7.62 mm machine gun firing	0.3	0.4
12.7 mm (0.5 calibre) machine gun firing	0.6	0.9
66 & 84 mm HEAT firing	1.6	2.1
66 & 84 mm HEAT impact	2.0	2.5
155 mm M198 Howitzer firing	2.4	3.2
155 mm M198 Howitzer impact	5.2	7.5
M1 Abrams tank firing	5.1	7.4
M1 Abrams tank impact	4.1	5.8
M203 grenade	3.0	4.0
50 kg explosive	7.7	14.1

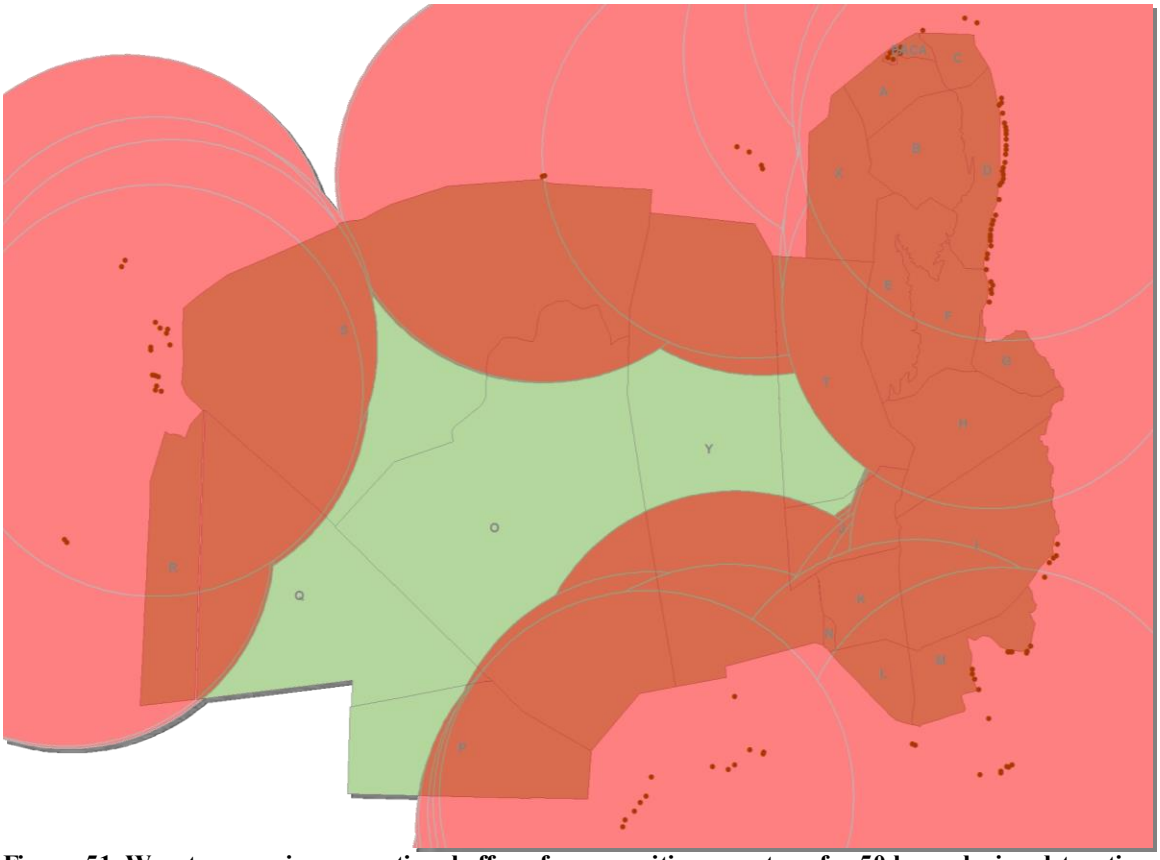


Figure 51. Worst-case noise separation buffers from sensitive receptors for 50 kg explosive detonation.

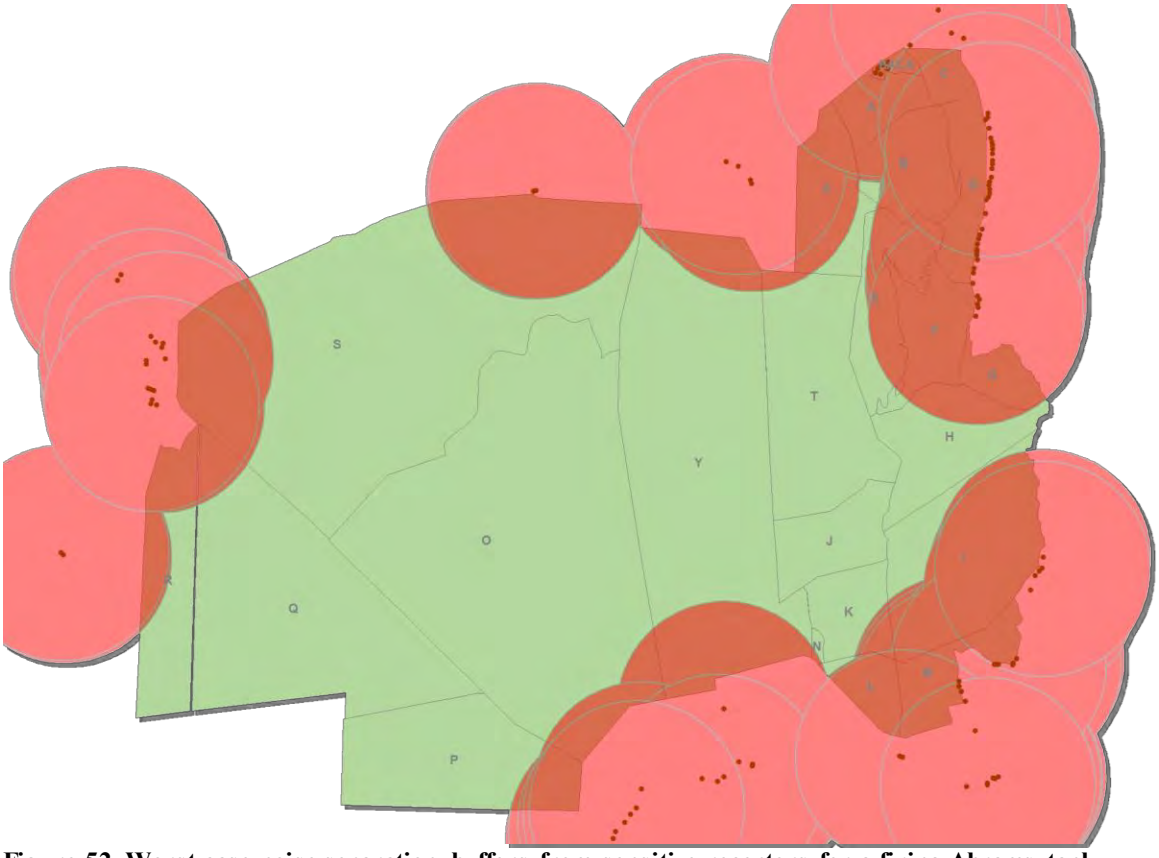


Figure 52. Worst-case noise separation buffers from sensitive receptors for a firing Abrams tank.

The basic separation distances presented by Maunsel AECOM (2007) also assume no interference between the origin of the noise and the sensitive receptor. However, many parts of CUTA provide significant topographic shielding for sensitive receptors. Importantly, this includes the HETA/impact area in sector I, which is otherwise located relatively close to shacks for deployment of noisier weapons systems. Figure 53 shows a basic analysis of whether noise from a series of impacts within the worst-case noise buffer for a 155 Howitzer impact will travel to the nearest receptor without being attenuated by intervening topography. Essentially noise from impacts at all but the closest margins of the HETA (which would not be targeted due to the risk of fall-of-shot being outside the HETA) is shielded by hills.

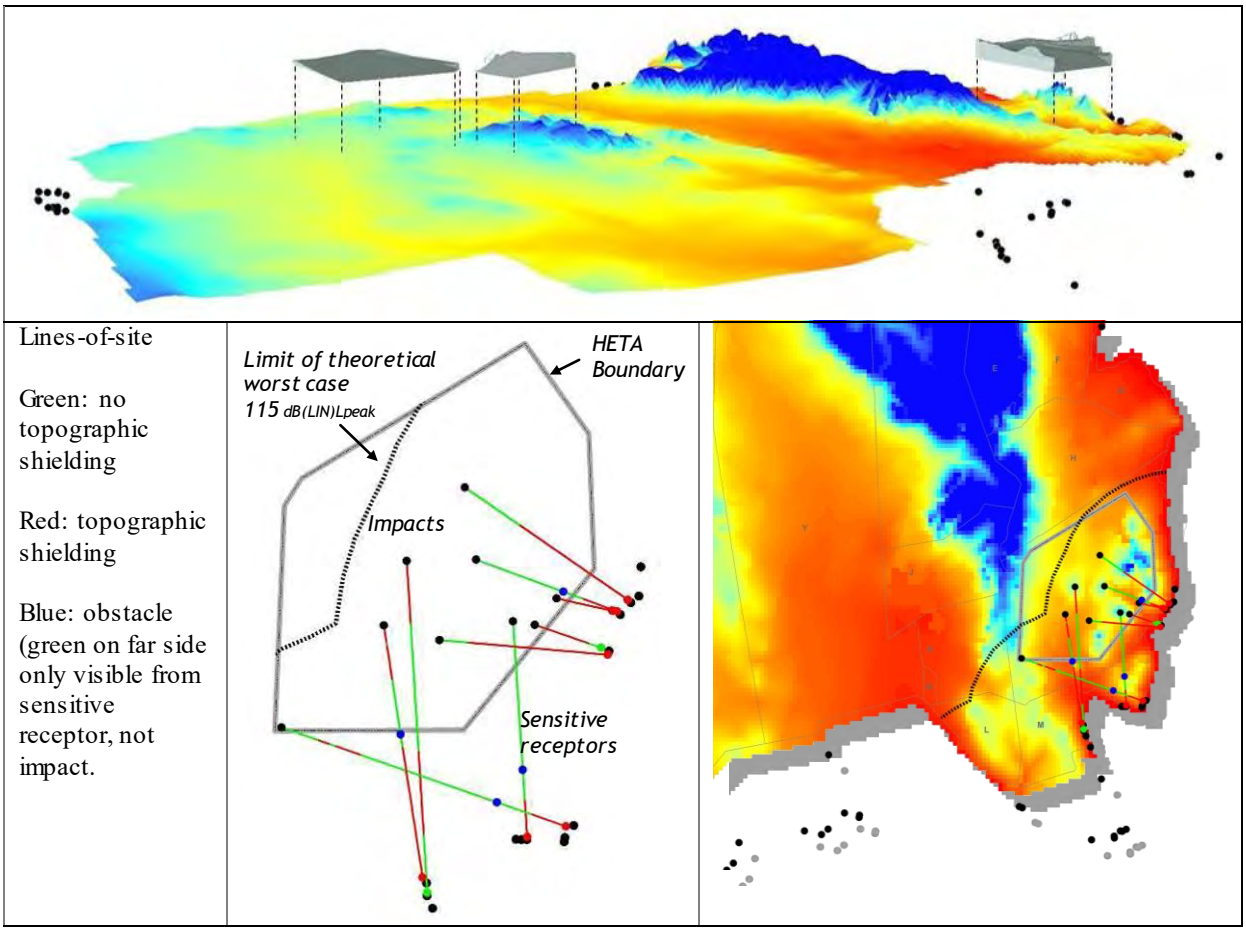


Figure 53. Topographic shielding effects on noise originating in HETAs
Top- topography of CUTA and High Explosive Target Area locations. Bottom right- southeast CUTA with sector I HETA (grey line) and worst case noise buffer (dotted line). Bottom left- close up of HETA showing line-of-site analysis between impact sites within the HETA and shacks outside the HETA. Impact sites were chosen based on high points within the HETA with greatest chance of reaching a sensitive receptor. Note that longest line that actually has line of site to southern shack is longer than the buffer for that location. Topography based on 9 second DEM. Line of site analysis performed in ARCGIS 10 using 3D Analyst.

6.2.2 Management of noise and vibration

As noted above, the exercise planning distances provided by Maunsell AECOM (2007) trigger a series of management requirements. For fixed infrastructure this requires a strict application of the distances for routine activities that will be conducted at a site. For example, the combined arms range has been sighted based on a number of constraints, and will

routinely be used for tank firing practices. For more detailed planning Maunsell Aecom (2007) produced noise templates in addition to the simplified table above. These include contours for still, clear, cloudy and windy conditions. Even under a worst-case scenario of wind and weather the noise template for firing and Abrams tank on the combined arms range affects only a very minor area outside the boundary (Figure 54), and there are no sensitive receptors in the vicinity. If other constraints dictate that a facility needs to be placed in an area where some of these contours overlap a receptor, the more detailed contours allow for activity management based on prevailing conditions.

Field firing practices that will not require consistent or repeated firing from the same general location can limit the risks of noise impacts through maintaining the maximum distance possible, and ideally restricting firing to calmer daytime conditions. Prior notification of potentially impacted residences could also be undertaken. Standing notifications in local papers regarding use of the training area meet this requirement for routine activities. Currently six-monthly notifications of the routine use of CUTA for live firing are placed in local newspapers. Prior to any potentially louder practice special notifications are placed.

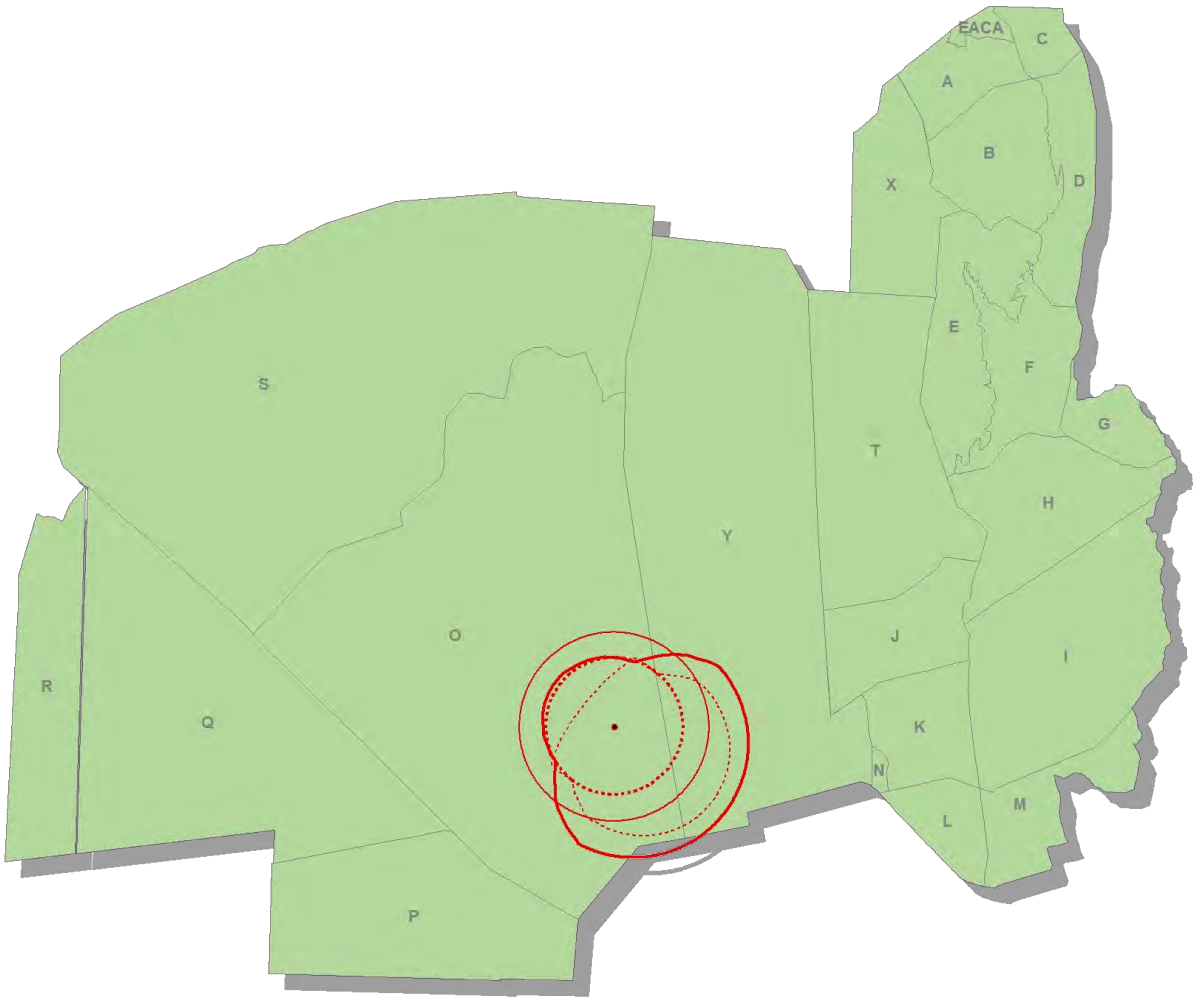
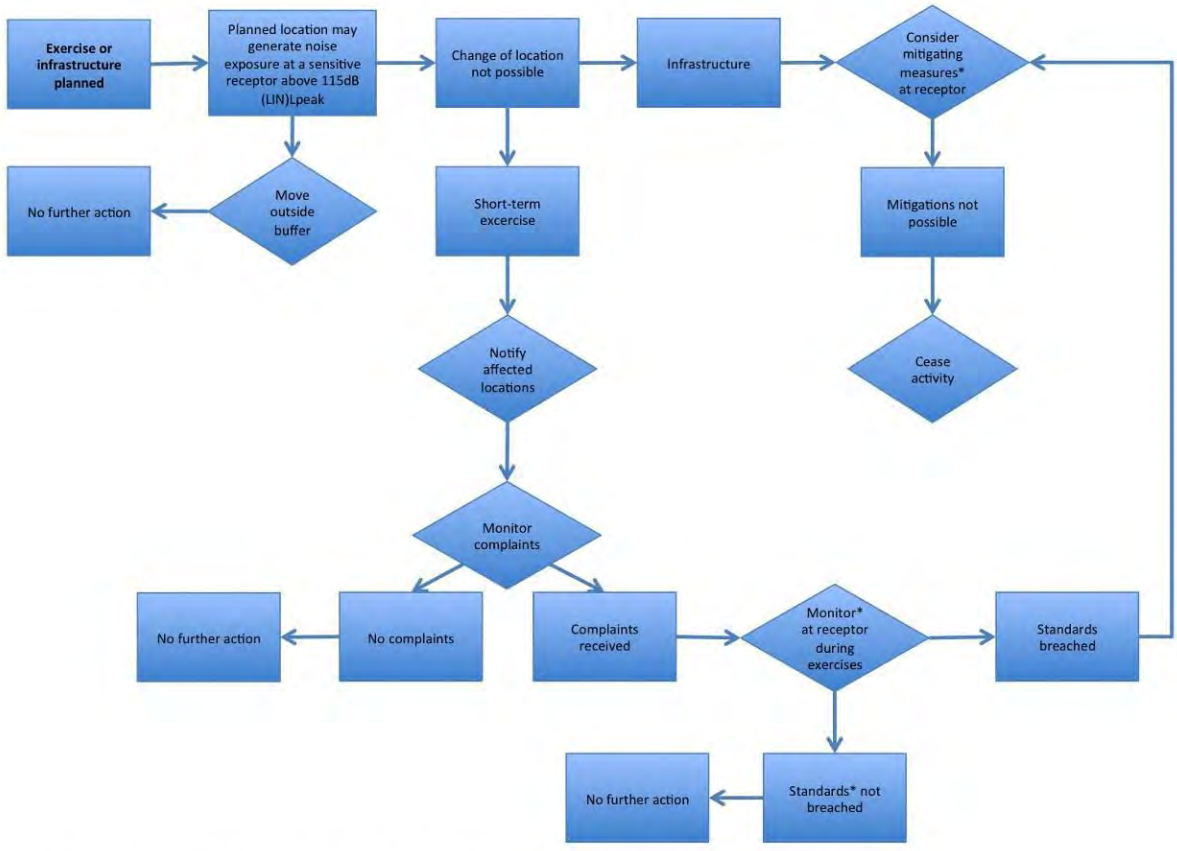


Figure 54. Noise templates for proposed Combined Arms Range.
Based on an Abrams tank firing at the proposed combine arms range in sector O with a (worst case) strong NW wind. Dashed circle: clear and still, dashed polygon: clear and windy, solid circle: cloudy and still, solid polygon: cloudy and windy.

Large exercises that include combined land, sea and air manoeuvre may present a range of atypical scenarios that could cause temporary loud noise for residents, particularly low-level flypasts of FA-18 hornets or equivalent. Night-time activities, in particular, require careful management and restriction of flying hours is usual practice in residential areas. These activities are subject to a higher level of scrutiny and planning, and must be impact assessed and provide different notifications to any affected areas. The requirement to cross public infrastructure along the Lincoln Highway corridor is a specific situation where a suite of impacts including vibration have the potential to cause damage. This issue will be addressed through a specifically designed crossing point. Individual activities prior to that solution being in place will have to assess the risk of such a crossing and negotiate a solution with the infrastructure owners and management authorities.

The basic noise management process for the site is presented in Figure 55. This requires assessment against the 115 db threshold for a sensitive receptor and may ultimately result in a requirement to conduct activity specific monitoring at a location where complaints have been received of structural damage or unacceptable noise. Where this is the case the monitoring is not against the 115 dB(LIN)Lpeak Defence precautionary threshold, but against Australian standards that generally use direct measurements of vibration and also prescribe the acceptable measurement methods.



*Monitoring, mitigations and standards: AS 1055.2—1997, AS 60068.2.65—2003, AS 2187.2-1993 and AS 2436—2010.

Figure 55. Noise and vibration management process

6.2.3 Management of light impacts

Night firing of illumination rounds and use of lasers can generate concern in the civilian community, particularly illumination rounds that can give the appearance of a bushfire (Figure 56). Light impacts will not be sufficient to affect light levels in residential areas. However, the potential concerns of residents and resultant calls to emergency services require management. Procedures to manage all the above impacts are already in place for both the training area and major exercises. Any use of 85 mm illumination rounds or other bright light sources also requires special notification in papers in addition to the routine 6-monthly notifications, including to the emergency services. Major exercises undergo more than 12 months of planning, which includes environmental impact assessments and considerable engagement with local communities over what the likely noise and other impacts of that exercise will be on local residents. Such processes fall outside the CUTA EMP but form part of the broader EMS.

Figure 56. Use of illumination rounds can cause concern in local communities not aware of the activity. Image: Defence Image Library.

6.2.4 Noise, vibration and light management summary

Table 22. Key Noise and Light pollution risks.

Risk	Location	Risk	Management	Monitoring	SMRP
Nuisance noise pollution from Defence activities	Iron Knob, Whyalla, Port Augusta, rural residences, shacks	Low	Employ noise buffers in keeping with the CUTA environmental noise assessment. Six-monthly notifications to community for routine activities. Specific notifications in lead up to major exercises.	Complaints received.	Number of complaints. More than 5 from at least three independent sources in a six month period triggers need for investigation and monitoring of noise at receptor during exercises.
Structural damage and other impacts resulting from noise and vibration from Defence activities	Iron Knob, Whyalla, Port Augusta, rural residences, shacks	Low	Vibration and noise management procedure enforcing Australian standards and more restrictive Defence buffers	Reports of damage.	Number of cases of actual damage to buildings
Light pollution from Defence activities	Iron Knob, Whyalla, Port Augusta, rural residences, shacks, Lincoln Highway near unction with Eyre Highway where DFSW is visible	Low	Notifications to emergency services and community prior to use of illumination rounds.	Complaints received.	Number of complaints. More than 5 from at least three independent sources in a six-month period triggers need for more active notification process (assuming complaints from uninformed sources).

6.3 Dust

Dust is a feature of the semi-arid rangelands and can have significant health and safety implications for civilian and Defence communities. Defence activities involving vehicle movements at CUTA inevitably generate some dust (Figure 57), and there have been repeated historical complaints of the impacts of dust from the residents of Shack Road to the immediate east of CUTA. Submissions to the PER also raised the issue as a key matter of concern (AECOM 2012a). Previous attempts to monitor the actual impacts of dust on Shack Road during exercises proved expensive and inconclusive (SKM 2009). The result was the restriction of off-road training in adjacent sectors to dismounted training only or a 1 km buffer. Large manoeuvre areas west of the Lincoln Highway are well away from any residential areas with the exception of areas near Iron Knob. The natural restriction posed by converging boundaries and the dominant wind direction mean that risks to Iron Knob are considered lower than to Shack Road as a coincidental source and transport mechanism for dust in that area is less likely to occur. The nature of locality is also different (a mine versus holiday shacks and residences) and occasional minor dust is more likely to be tolerated. Dust caused by Defence activities is therefore highly unlikely to cause health or nuisance impacts to houses. However, the key manoeuvre area is now bounded by two highways and a secondary road. This creates the potential for a dust hazard for drivers in windy conditions where movements are occurring close to roads.

Figure 57. Dust plume from an M1A1 Abrams tank at CUTA.
Image: Defence Image Library.

6.3.1 Management of dust

The entire external boundaries of sectors O, P, Q and S have been prescribed a 1 km movement buffer for tracked vehicles to minimise risk of fugitive dust. Movement buffers also apply within 1 km of boundaries of sectors C, D, F, L and M where boundaries adjoin public roads and shacks. Further dust mitigation is provided by sector-wide vehicle movement restrictions as shown in Figure 58. Restrictions generally prohibit off-road vehicle movement. Sectors C and D have had restrictions on off-road movement in RSOs since dust complaints were received from Shack Road residents.

Range standing orders prescribed speed limits on unsealed roads in camp areas and other areas that are partly for dust suppression. As the new camp is developed adjacent to the Lincoln Highway it is proposed to seal high-use internal roads and assembly areas close to the highway to minimise dust. Dust suppression polymers may also provide a useful solution for suppressing fugitive dust in non-hardened areas during large exercises.

Intensive monitoring of the first major exercise should help Defence to understand the actual risk posed by dust, including during administrative moves. Previous dust monitoring has employed nephelometers (that measure particulate loads in fluids), but these proved expensive, and due to various logistical constraints failed to answer the key questions being posed. In addressing whether dust caused by exercises poses a risk to drivers on adjoining roads, a potential method may be a series of time-lapse cameras placed at 2 km intervals along the Eyre Highway or Iron Knob road boundaries (or an equivalent road or location within CUTA). Photographs taken every 15 minutes will provide documentary evidence of any dust plume passing over the boundary (exact methods will be refined during exercise planning in early 2016). Direct observations of the exercise should help to establish how far the dust plume travels from the site of large-scale movements.

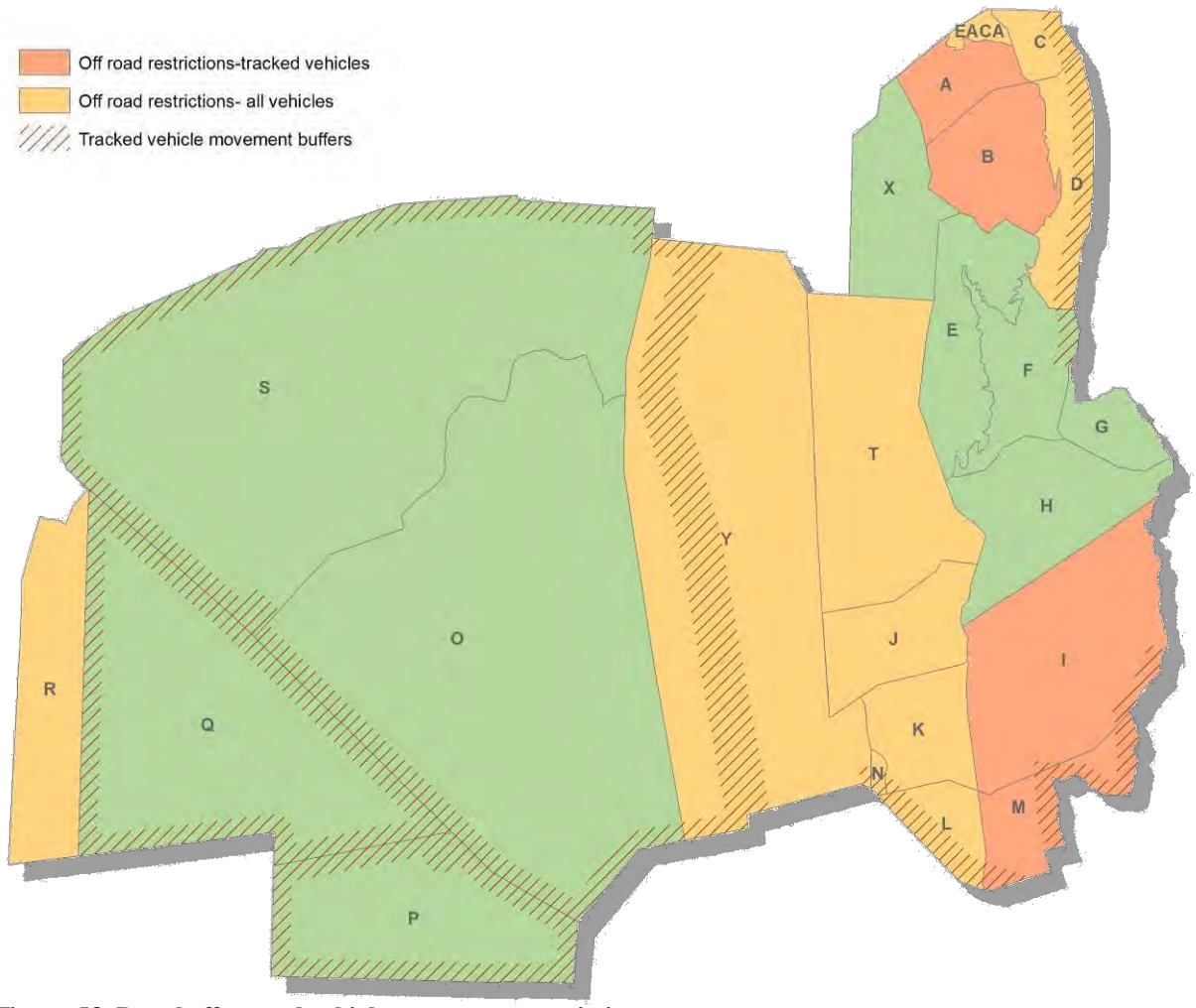


Figure 58. Dust buffers and vehicle movement restrictions.
Vehicle movement restrictions based on CUTA Range Standing Orders July 2015.

Another key monitoring measure is complaints received about dust. Management revision should be undertaken of dust control measures for an exercise or location if; more than five complaints are received during an exercise, a single complaint is received from a civil authority, or more than ten complains are received in a year about a particular location on range being a source of dust nuisance. Management controls for fugitive dust are straightforward once any potential impacts are known. If necessary, activity restrictions will be developed for weather conditions that promote a dust hazard. These may include increased buffers from the down-wind boundary for off-road movements, and dust suppressants for temporary consolidation of unsealed road surfaces used for large-scale administrative moves. It is not expected that such measures will be required given the existing buffer and movement controls. The dust management process is set down in Figure 59.

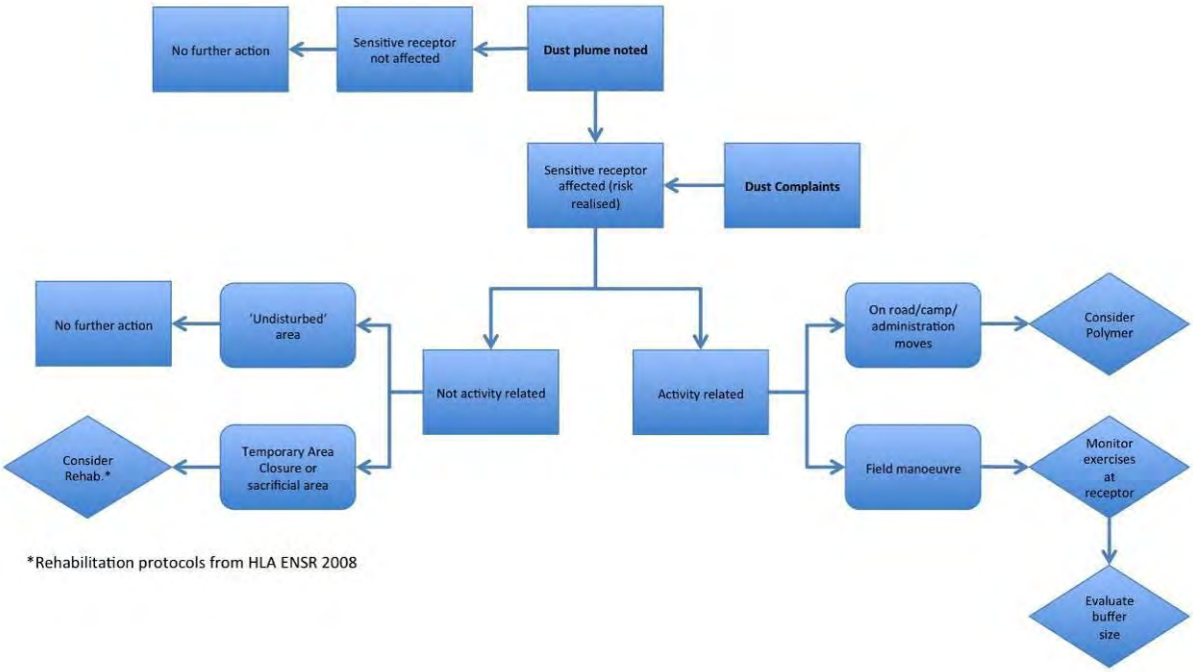


Figure 59. Dust management process.

Table 23. Key dust risks

Risk	Location	Likelihood	Consequence	Risk	Management	Monitoring	SMRP
Health impacts to civilian populations caused by dust	Shack road, Iron Knob, Douglas Point	Rare	Moderate	Low	Boundary buffers	Complaints, received.	Action- Complaints threshold: One from external authority, five complaints per exercise, ten in a calendar year Report- All complaints
Health impacts to Defence personnel caused by dust	Camp and high tempo areas	Possible	Moderate	Medium	Speed limits, Hardened roads and tracks in camp areas and combined arms range	Speed enforcement in accordance with RSOs	
Dust obscures Highways	Highways	Possible	Negligible		Boundary buffers. Hardened roads and tracks in camp areas and combined arms range.	Complaints received. Observation during early exercises. Cameras or instrument monitoring if required.	Action- Complaints threshold: One from external authority, five complaints per exercise, ten in a calendar year Report- All complaints

6.4 Unexploded Ordnance and Range Produce

Defence is legally required to ensure that any unexploded ordnance (UXO) within the leased area of CUTA is removed prior to cessation of the lease. Defence has established procedures for the identification, reporting and demolition of UXO. Site procedures for CUTA are detailed in RSO chapters 12 and 14 with all exercises outside the HETA requiring individual firing and confirmation of detonation of each high explosive nature and provision of a demolition qualified person to deal with any UXO and ensure that it is detonated. Annex A to chapter 14 set out procedures for marking UXO locations ready for disposal by designated disposal units. The area affected by new UXO on CUTA will therefore be limited to designated impact areas. These areas are subject to long-range firing and use of high explosives, and movement through them is restricted and requires tracks to be cleared of UXO prior to use. UXO waste is removed from site by a contracted service provider and disposed in accordance with legal requirements for the handling and disposal of the constituent elements. General range produce such as expended ammunition, shell casings and other waste produced by training activities will be collected and disposed at ranges and areas of high usage. However, general field firing and tactical exercises that involve movement over large areas of ground will not permit exhaustive clean up of range produce and inert munitions are specifically excluded from the requirement to remove UXO from the MLDP area.

7.0 Water Management

7.1 Water Resources and Management

7.1.1 Water drainages and general condition

Aside from dams scheduled for closure there is no permanent surface water on CUTA. Western sectors are predominantly drained by two ephemeral creek systems, the Pine Creek-Salt Creek system, which exits the training area through sector P, and Myall Creek which is a substantial creek system, but terminates in flat land in sector Y without crossing the training area boundary. Stream channel development is typically broad and shallow with sandy sediments (Figure 60). Due to the flat topography of the western plains there are numerous small depressions that form temporary swamps and soaks after heavy rainfall. Where these lie in active drainage channels they may form terminal lignum swamps, or intermediate swamps that overflow into continuations of the drainage line. The eastern scarp in sectors C, D and F drains in numerous small parallel channels straight into Spencer Gulf. Higher order stream development occurs on the larger plains further south in sectors H, I and M. Moon Lake in sector J is a saline lake with a small internal catchment draining sectors J, K and T. Drainage lines west of the Lincoln Highway have been used for sand and gravel extraction and numerous modifications have been made to natural drainage features. Most modifications to drainage are aimed at increasing inflow to dams.

Figure 60. Creek line in sector O.
This is typical of creeks of CUTA; heavily disturbed by stock, vehicles and pastoral water extraction/drainage modification. Weeds are also concentrated along waterways.

Infrastructure water management requirements

CUTA does not lie within any areas that are prescribed water resources under South Australian law for groundwater, surface water or watercourses. There are no plans to use the generally saline on-site groundwater resources for infrastructure or other purposes. Surface water is unreliable, and dams will be removed. Small roof areas will harvest water for tanks for local usage, but it is intended that town supplies will service new Defence infrastructure. El Alamein Camp is already serviced by town supplies. Given that town water relies on a limited piped supply water conservation is a key element of infrastructure design solution for the site.

Currently there are only design options available that deal with water and wastewater management for the development of new infrastructure on the leasehold sectors of CUTA. Key wastewater management infrastructure/options include sewerage treatment and vehicle washdown facility. The 30% design (AECOM 2015) considers three options for the main camp sewerage treatment: connecting to the SA Water network in Whyalla, treating the water in a wastewater lagoon system (two lagoons) or an evapotranspiration / absorption system. Peak loading of 1000 personnel is the current design specification for the lagoon system. Connection to the sewer is the preferred option environmentally as it avoids any potential on-site complications. However, either of the alternatives could function and practicalities of all options are yet to be resolved. Environmental elements of the design are all subject to environmental impact processes, and 2 of the 5 objectives of the wastewater treatment general design objectives are environmental (enable construction within EPBC approval conditions and sustainable development philosophy). Treatment of wastewater at the dispersed ranges will occur on-site. Currently, the preferred option for treatment at high-use ranges is a septic system utilising run-off collected from the range infrastructure. Smaller outposts will be serviced by waterless composting toilets. Where on-site management is required, key design options are considered in

Table 24.

Table 24. Wastewater design requirements to be implemented in development of CUTA (Aurecon 2015).

Asset Type	Design Criteria	Adopted Requirement	Source
Internal treatment and disposal	Effluent quality	Comply with effluent quality target values that are applicable	NWQMS Part 11, EPA licences and any other requirements from the relevant environmental authority.
	Buffer zone to nearest public use building (lagoons)	500 metres to the nearest public use building	EPA SA Guidelines for Separation Distances (Appendix 1) (modified)
	Buffer zone to nearest public road way (lagoons)	200 metres to the nearest public road.	EPA SA Guidelines for Wastewater Lagoon Construction
	Rainfall impacts (lagoons)	The siting of the internal treatment system must be such that it is not subject to inundation or damage from flood waters. Interceptor drains or other methods of diverting stormwater runoff to be adopted.	EPA SA Guidelines for Wastewater Lagoon Construction
	Impervious liners (lagoons)	Lagoons require an approved impervious liner to achieve the permeability criteria and minimise leakage (clay liner or geosynthetic preferred).	EPA SA Guidelines for Wastewater Lagoon Construction
	Accessibility	The internal treatment system shall be located in an area to discourage access and shall be fenced to restrict access. Appropriate signage is recommended.	EPA SA Guidelines for Wastewater Lagoon Construction (adopted for all internal treatment options)
	Overflows	The internal treatment system shall be sized such that overflows do not occur. Provide methods of diverting stormwater runoff away from the treatment area.	EPA SA Guidelines for Wastewater Lagoon Construction (adopted for all internal treatment options)

The vehicle washdown is a key piece of infrastructure for management of biosecurity risks on the site. The facility will use hand held hose systems/cannons. A medium capacity and high capacity option have been designed, but the medium capacity option is currently favoured based on power and water requirements. The washdown will be co-located with the main camp. Recycling of water within the system has been incorporated into the design. AECOM (2015) specify the following methods for achieving environmentally complaint recycling and water treatment:

- Water discharged by the various hose points and water cannons within the vehicle wash point washing areas will be captured via a graded drainage system and returning initially to a dedicated settlement pond. Lessons learnt from existing installations in similar Defence sites have shown that the very high quantities of mud and debris washed from vehicles returning from the training area are prone to blocking the drains, and as such the drainage gulley system will be provided with a flushing water supply to ensure all debris is carried to the settlement pond.

7.1.2 Treatment Plant Description

To meet the required water quality for recycling to the wash facility, the following treatment steps will be required.

- Settlement – to remove the gross solids. The settlement stage will comprise a below ground concrete tank with ramp access to remove the accumulated solids periodically by "Bobcat". These solids will be dried by evaporation in an on-site evaporation pond, to be confirmed in the next design phase.
- Coagulation – to remove the majority of the remaining suspended particulate material and to destabilise the emulsified fats, oils and greases (FOG) and detergents. At this stage, an electrocoagulation package plant is planned, and this will be reviewed during the subsequent design phases. An electrocoagulation plant has the advantage that no hazardous chemicals, dosing equipment or separate coagulation tanks are required.
- Dissolved Air Flotation (DAF) – to remove the coagulated solids, together with the FOG and the detergents. DAF has the advantage that it is very efficient for the removal of FOG and detergents. These are separate as a "float sludge" which is scraped from the surface of the tank to be disposed of with the solids from the settlement stage.
- Pressure dual media filtration – a polishing stage comprising sand-anthracite media to remove the remaining fine suspended solids material and any remaining FOG. Dirty backwash water from the filters will be discharged either to the sewer or to the site wide surface water drainage system, with the discharge route to be confirmed in the next design phase.

7.1.3 Monitoring water and Defence impacts

Groundwater at CUTA generally lies at a depth of around 15-20 m (Figure 61). Due to the nature of water resources on site, and the lack of activities with the potential to impact on water resources, no groundwater monitoring wells or routine surface or groundwater quality monitoring are currently proposed. The most likely sources of localised contamination from infrastructure are the vehicle washdown facility and sewerage treatment systems. However, these lie above deep groundwater, and surface flows will not transport contaminants to sensitive receptors from these sites. Precautionary monitoring wells may be incorporated in the detailed facilities design to ensure that reactionary and occasional due diligence monitoring can take place. Localise accumulations of lead and other ammunition-derived chemicals will also occur on fixed ranges. Fixed ranges are also located above the deepest parts of the aquifer. Stop-butts are periodically de-contaminated of lead, and infiltration of any chemical into the water table is unlikely and would only occur in trace quantities well within ANZECC standards. However, the potential for contamination does exist in other parts of the site where the water table is shallow (predominantly sector S). Should any activity, incident or discovery occur that indicates a potential for contamination of groundwater a more rigorous sampling-based monitoring program will be adopted.

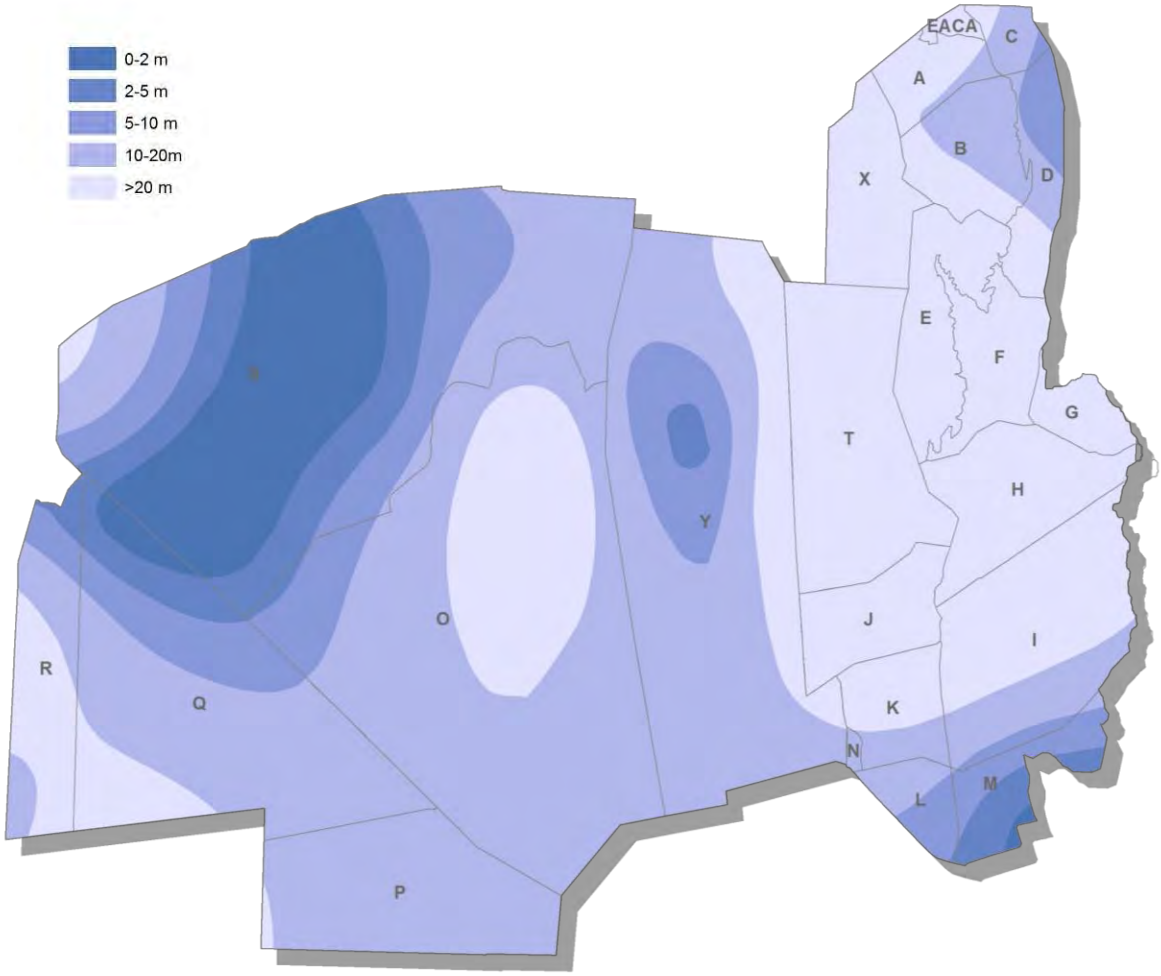


Figure 61. Depth to groundwater across CUTA.

Irregular, large rainfall events can result in large amounts of water moving across the landscape of CUTA, causing erosion and potentially transporting pollutants, weed seeds and sediment. Defence's use of CUTA should not result in any pollutants that can be transported during rainfall events, but there is a risk of weed seeds, sediment generated by soil and vegetation disturbance being transported. Figure 62 and Figure 63, identify monitoring locations for surface runoff from CUTA. Four terminal lignum swamps and one shallow creek junction have been chosen that harvest water from sectors O and S where large-scale vehicle manoeuvre exercises will occur. Sites 1 and 2 also lie in the area of shallowest groundwater depth and have the potential to highlight impacts on the aquifer. Site 2 also harvests water and groundwater directly outside the planned northwest HETA, and provides the closest practical location to examine a potentially sensitive site that could be impacted by processes within the less accessible HETA.

All locations can be monitored using satellite imagery to detect sedimentation or changes to vegetation composition. Ground truthing as part of the five-yearly pastoral point review could be undertaken, or as a result of noted change at a site. Each five-yearly review should be accompanied by image(s) from fixed photo point(s) for each site. The key parameters of interest are shown in Table 25. Moon Lake and Blanche Harbour have also been identified as environmentally sensitive sites that should be monitored. Sedimentation of Moon Lake should be obvious from satellite imagery due to the white salt background. Weeds are unlikely to establish in the saline environment and there is no potential requirement for on-ground inspection unless sediment is detected. Blanche Harbour is probably the only off-site sensitive

receptor that takes runoff from CUTA. Mangroves and its status as a marine reserve make the site a high risk if any impacts were to result from Defence activities. Blanche Harbour receives runoff from sectors F, G and H, an area with a history of soil impacts from Defence activities and grazing. A large saline flat separates and probably protects the mangrove belt from the larger inflows in the south of the bay. However, smaller drainages have outflows significantly closer to the mangroves in the north, including development of an alluvial fan into the bay, presumably as a result of the wave protection afforded by the mangroves. It is important to ensure that runoff is not impacting the mangroves as a key element of the marine reserve, and as an indicator of the reserve's health. Historical and future satellite imagery can track the boundaries of the mangroves, and any sediment that may be impinging on them.

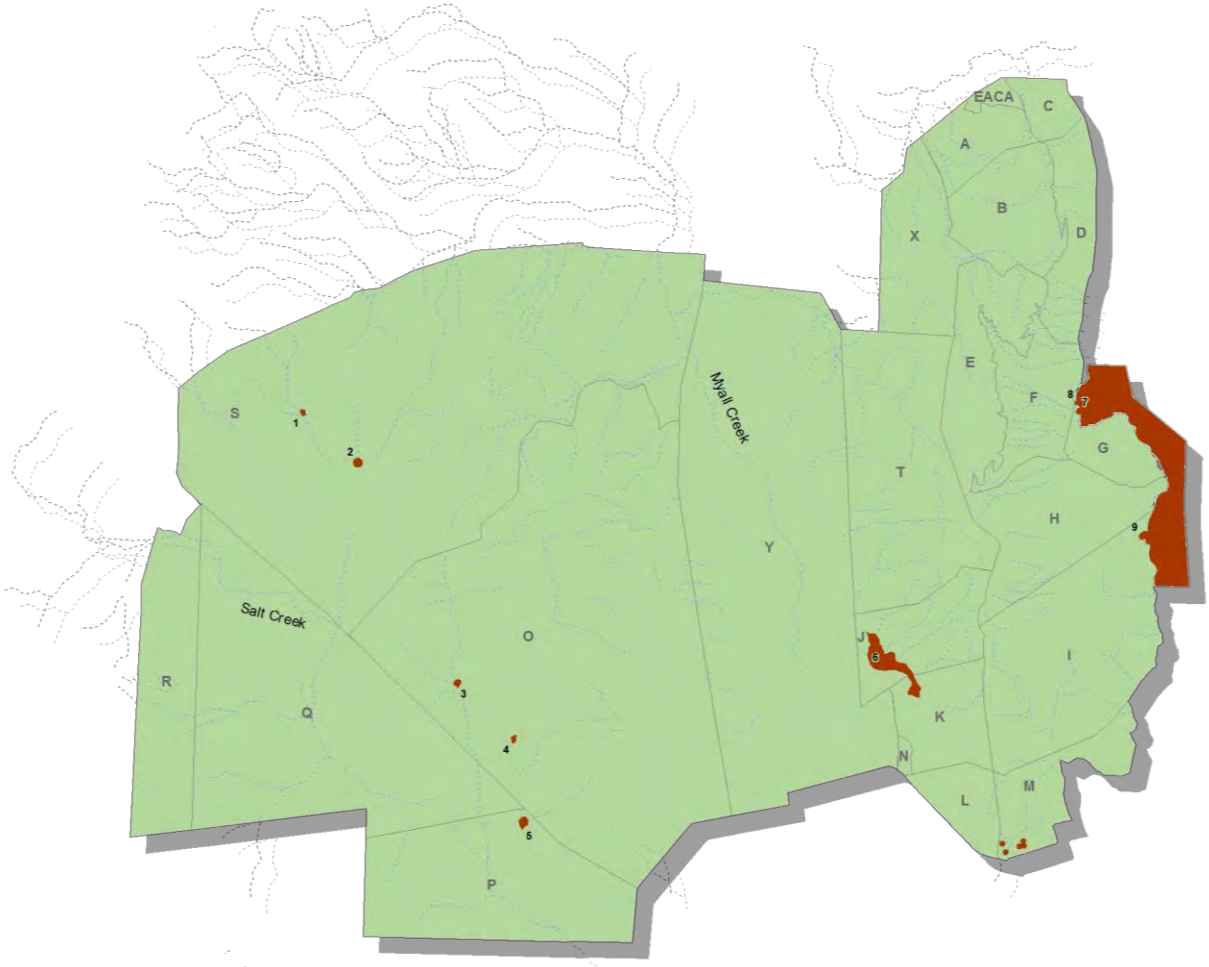


Figure 62. Monitoring locations for surface runoff and sedimentation.

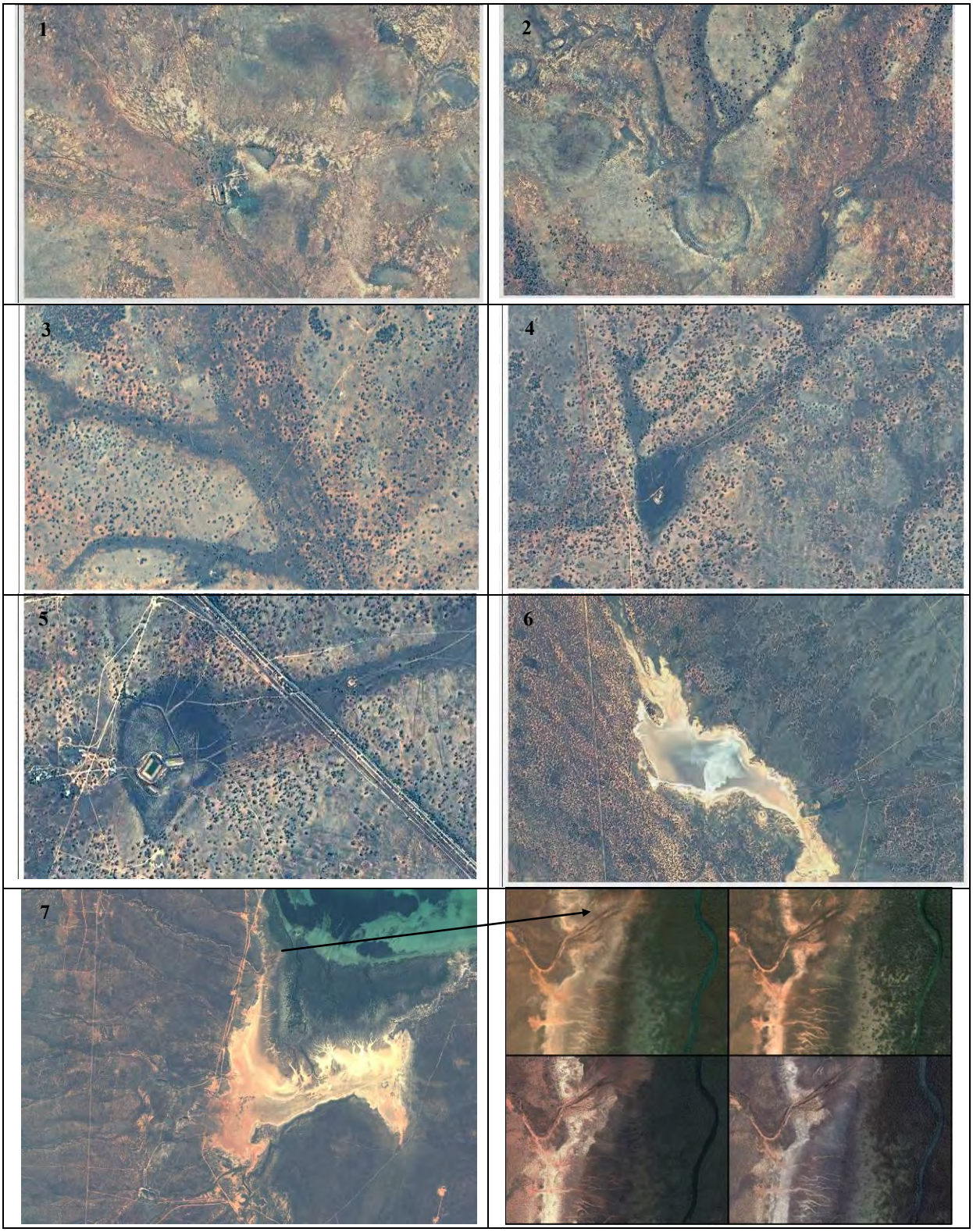


Figure 63. Imagery of runoff monitoring locations and sensitive receptors.
1, Gibbons and Ten mile Paddock lignum swamp; 2, Ten mile paddock; 3, West End and Extension Paddock creek junction; 4, Overland lignum swamp; 5, Middleback dam and lignum swamp; 6, Moon Lake; 7, Blanche Harbour. The distribution of mangroves through the time-series at bottom right is constant though the nine year sequence (an image every three years). Sediment is running into the harbour, and a sediment plume can be seen at the top of the bay (enlargements). However, this is constant through the time series. In a short time-frame, natural blow-outs in backing dunes are contributing as much sediment to the harbour as the outflow of the larger creek line draining the north of sector F.

Table 25. Surface runoff monitoring points parameters.

Location	Monitor	Frequency	On-ground work?	Trigger for an investigation of impacts across catchment	SMRP
Gibbons and Ten Mile Paddock lignum swamp	Sediment, vegetation change, weeds	At least once every five years	Beneficial-site assessment and photo point	Obvious sediment inflow, unexplained death of vegetation, significant change in vegetation through increased abundance, especially new weed species	Yes. Report- any suspect change at receptor and outcome of on-ground investigation
Ten mile paddock lignum swamp					
West End and Extension Paddock creek junction					
Overland lignum swamp					
Middleback dam and swamp					
Moon Lake	Sediment		Not required	Sediment evident in imagery	
Blanche Harbour	Mangrove distribution, infiltration of sediment fans		Not required	Unexplained deaths of mangroves, change in inland margin of mangroves, infiltration of sediment into mangroves	

8.0 Heritage

8.1 Summary

No elements of Cultana Training Area are listed on any contemporary heritage registers. While no formal heritage values are recognised, Defence recognises the importance of certain places within CUTA to local aboriginal people and has collaboratively developed a large number of management prescriptions around those places. Defence further recognises that historical remnants across the site while not of listing significance form part of the wider regional heritage and should be preserved wherever possible. Natural values of the site are comparable to the wider regional landscape and there are no places warranting separate recognition for their natural values. However, natural values of the property are recognised and managed through other elements of the EMP.

A total of 130 management buffers, restricted areas or management precincts have been put in place to protect indigenous and historic sites from accidental damage.

8.2 General

8.2.1 Objectives

This Heritage Management Plan (HMP) has been prepared to assist Defence in complying with requirements under the MLDP and EPBC Act and in understanding the heritage values of CUTA to inform future management of the site and the conservation of those values. It has assessed or referenced assessments of the potential of:
natural heritage (including fauna and flora and geodiversity);
Indigenous heritage (including consultation with the Indigenous community); and
non-Indigenous historic heritage (built) values.

It is the objective of this HMP to present practical policies, implementation plans and guidelines for the future heritage management of CUTA.

8.2.2 Methodology

Information and assessments used to inform this plan stem from existing heritage management plans for the freehold sectors of CUTA, and a long period of site investigations related to the purchase and establishment of the leasehold portion, as well as on-ground survey work to identify any further values.

Primary documents (and references within) used to inform the process were:

- Public Environment Report (AECOM 2012)
- Cultana Expansion Area Environment and Heritage Studies – Environmental Baseline Condition Report (Jacobs 2015b)
- Cultana Expansion Area – Historic Heritage Assessment Jacobs (2015c).
- Cultana Expansion Area Aboriginal Heritage Management Plan (Jacobs 2015e)
- Cultana Training Area Indigenous Heritage Management Plan (CUTA IHMP) (AHCM 2007)
- Cultana Defence Training Area European Heritage Survey (Woodhead 2006)

- Cultana Training Area Range Standing Orders (July 2015)

Additional site visits were conducted in April, June, October and November 2015 to investigate additional potential values.

8.2.3 Structure of Heritage Management Plan

This section has been prepared using a modified version of the Defence Heritage Management Plan Template, which is generally used to prepare stand-alone HMPs required for sites listed under the EPBC Act. Modifications were made to take into account the fact that the site is not listed under the EPBC Act, and that the primary drivers for preparing an HMP stem from the ILUA and MLDP. These required the separate preparation of an Aboriginal HMP. That plan is subject to various sensitivities and restrictions that mean this general site HMP presents summary information about management arrangements, but does not detail specific values and attributes of sites identified as having importance by aboriginal groups. Presentation of heritage attribute mapping, values and assessments was altered to accord with new GEMS business processes and outputs.
General site information and other aspects detailed in the larger EMP are also excluded from the HMP.

8.2.4 Consultation

Extensive consultation was undertaken during the preparation of the plans and reports feeding into this HMP. Previous landholders provided input into the PER process, including commenting on the report itself during the public comment period. Aboriginal groups were engaged through three separate periods of field surveys and assessment across the leasehold portion of CUTA and invited to comment on the final report (full details available in the AHMP).

8.2.5 Limitations

HMPs, through their inventories of assets and precinct descriptions, allow Defence to identify and manage heritage values on the estate. These HMPs should be the first port of call to assist in decision-making. However the HMP will not necessarily cover all activities that could potentially impact on heritage values on-site. Additional advice may need to be sourced from heritage professionals internally or from the Defence Environment and Heritage Panel (DEHP), to determine whether a proposed action may impact heritage values.

While the HMP presents a robust framework for effective management, the implementation of management actions, and their effectiveness, is subject to human and financial resource availability. A balance must therefore be identified between Defence's objectives to manage and maintain the estate to support Australian Defence Force Capability (ADF) capability and the ongoing conservation of heritage values. For CUTA, nearly all management arrangements are based area access to prevent damage, rather than maintenance of built structures or other labour and cost intensive activities. The implementation of this HMP should prove straightforward from existing budgets and personnel arrangements.

8.3 Legislative Framework

CUTA is located on Commonwealth land and managed by a Commonwealth agency (Defence), hence Commonwealth legislation is the guiding legislation for the site. However, large parts of CUTA are also lease from the South Australian government and subject to the MLDP. Requirements stemming from that lease, which include an Indigenous HMP convened under the ILUA and a "European Heritage Management Plan" have a key role in determining heritage management documents required for the site. The CUTA user guide and the Defence Legal and Other Compliance Register detail the complexities of these arrangements. However, for most site users the application of strategies in this HMP is straightforward and need not reference any higher instructions or legislation.

8.4 Site Background

8.4.1 Heritage Status

There are no statutory heritage listings that apply to CUTA.

Natural Heritage

Sectors P and Q in the southwest of CUTA fall within a larger place, the *Whyalla-Iron Knob-Iron Baron Area*, registered in the non-statutory RNE (Place ID 6964)

This area was originally listed for being:

> *"the best example in Australia of representative Western Myall-Saltbush-Bluebush vegetation, and an important reference area for conservation pastoral management of this vegetation type. It is also an area where regeneration of Western Myall and associated shrub species is most likely to occur; and it is an Australian centre of richness for soil lichens and a centre of distribution of ant species".*

The area does not coincide with CUTA property boundaries (Figure 64). The RNE listing was never transferred to State or local registers when the RNE was removed from national environmental legislation. The place therefore no longer has formal legal protection as a heritage place.

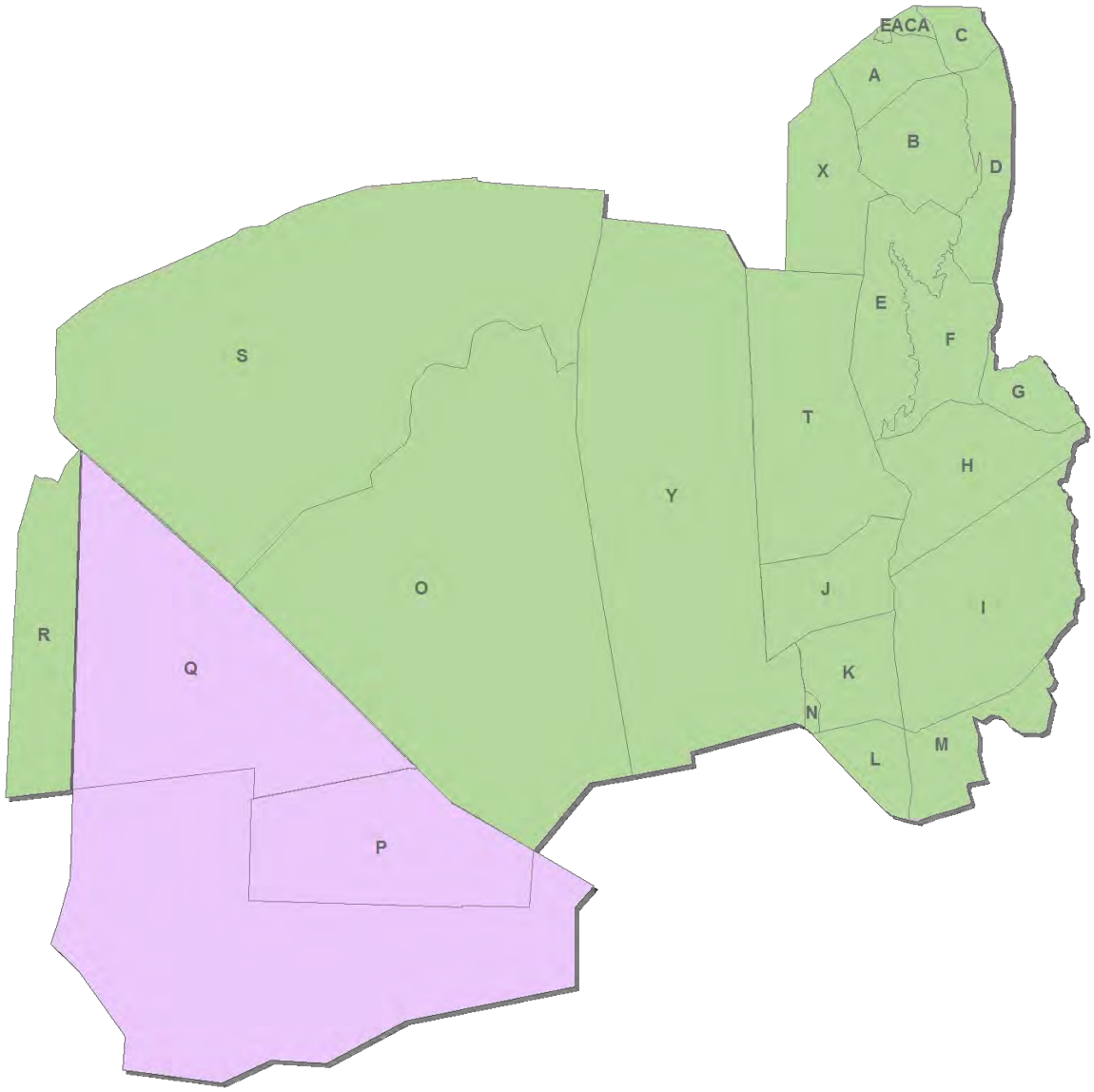


Figure 64. Whyalla Iron Knob Iron Barron Area RNE listing.

Indigenous Heritage

A place registered on the RNE as *Indigenous Place Gilmores Well via Port August* (Place ID 6960) is located in the southeast of sector T. While this place was not transferred to any heritage register on cessation of the RNE, it is registered in the SA Central Archive (Register of Aboriginal Sites and Objects).

8.5 Heritage Assessment

8.5.1 History

Aboriginal History

Prehistory

The Cultana leasehold and free hold areas are located in what was traditionally Pangkala (Barngarla) territory (Berndt 1985; Tindale 1974). According to Tindale (1974), Bangarla territory extended from Franklin Harbour in the south, northwest to the Gawler Ranges near

Poochera, northeast to Lake Torrens and east to Edowie. However, these boundaries are qualified through his recognition and documentation of significant territorial instability for the area (AECOM 2012b).

The Bargarla, Kokatha, Kuyani and Nukunu groups have expressed cultural heritage interest on all or part of CUTA (ENSR 2007; Czerwinski 2007; AECOM2012b; AECOM 2015). This interest is supported by Gara (1989), who notes how responsibility for these sites is based on kinship and ritual links between the Kokatha, Pangkala (Barngarla) and Nukunu in prehistoric and historic times. According to AECOM (2012b), Lucas (1991a) noted that the contact experiences of both the Barngarla and the Kokatha have severely affected the transmission of cultural knowledge, resulting in the development of new strategies and alignments to express the relatedness to the landscape in the Cultana leasehold area.

The Aboriginal participants for the ICHS1-3 ethnographic surveys (AECOM 2015) identified four primary mythological stories that transect through the Cultana area: The Wilyaru (primary ancestor); the Moon; the Seven Sisters and Wati Kutjarra (Two Men). These primary dreaming stories generally travel through the Cultana leasehold area from west to east and north to south. A number of subsidiary dreaming stories also interact and travel through the Cultana leasehold area. The Seven Sisters and the Wilyaru are identified as having the most important mythological significance. The mythological importance of the Cultana leasehold area and adjacent areas has been summarised as follows:

> *'The area at the head of Spencer Gulf has been noted as a point at which many Dreaming tracks intersect. Several important ancestral Beings travelled through this region. From here, Dreaming tracks run northward to central Australia, eastward to the Flinders Ranges and westward to the Gawler Ranges and the west coast (Gara 1989) Sites associated with several of these Dreamings are present in the Point Lowly area, particularly the Moon and the Seven Sisters…The Cultana Army Training Area also contains sites (at Blanche Harbour and South Hummock) which are possibly related to other major Dreaming tracks such as Native Cat.' (Lucas 1991b in AECOM 2012b)*

Finlayson (1993) notes that knowledge of the Seven Sisters' Dreaming is understood at different levels by Aboriginal men and women and that the Kokatha, Pitjantjatjara and Barngarla peoples have mutual ritual concerns and generally operated in concert with one another.

Ethnographic and archaeological research has confirmed that the Cultana leasehold and freehold areas formed part of a trading point and cultural intersection for the Aboriginal groups in the area. The archaeological evidence suggests that although there was no long-term, permanent habitation of the Cultana leasehold and freehold areas, Aboriginal people would have frequently moved in and out of the area for the purposes of hunting, ceremony, resource collection and tool making. Aboriginal informants during the ICHS1-3 surveys confirmed that the area was an important centre for the making and trading of artefacts (AECOM 2015). While no archaeological dates are available for sites on the Eyre Peninsula, evidence from Allen's Cave (40,000 Before Present (BP)) and Koonalda Cave (16-27,000 BP) suggests occupation of up to 40,000 years in the southern region of South Australia (Lally 2013).

History

The historical literature consistently suggests that Aboriginal groups on the Eyre Peninsula were undergoing a process of territorial encroachment from the north and north-west that had existed prior to colonisation (Berndt 1985; Tindale 1974).

The historical observations following first settlement of the Eyre Peninsular suggest that although the Kokatha were confined to inland country, by the 1870s they were occupying land between Venus Bay and Point Brown, along the coast and inland to the Gawler Ranges, as well as frequenting Port Lincoln and Fowlers Bay(Berndt 1985). Berndt hypothesises that the Kokatha virtually overwhelmed the Wirangu and made substantial encroachments onto the territories of the Barngarla and Nauo, who were based in the southern area of the Eyre Peninsula. This occurred directly and indirectly in the latter case, as they forced the Barngarla into the territory of the neighbouring Nauo (Berndt 1985:128). Berndt also speculates that the Wirangu and Nauo were historically the original inhabitants of a large part of the Peninsula, making a point of the fact that the Barngarla belonged culturally to the middle north and northeast Lakes people of South Australia (Berndt 1985).

A strong argument for pre-colonial and post-colonial migratory processes is made by Tindale (1974). Although exacerbated by post-colonial influences, Tindale provides evidence to show that environmental factors were prime instigators in recent historical movements, suggesting that destabilising pressures were already in place prior to colonisation. Tindale argues with a detailed account of a chain of migrations and displacements affecting the area from the early twentieth century. The longer term outcome of processes described by Tindale and extenuated by recurrent demographic shifts toward white resource centres including early ration depots, workplaces and townships (compared with Warrell (1992) and Morton (1993) can be seen in Gara's (1989) description of contemporary Kokatha representations of country:

> *'Kokatha people in Port Augusta today regard their eastern boundary as being the western side of Lake Torrens and the chain of salt lakes that connects Lake Torrens with the head of Spencer Gulf. Their territory extends northwards to Canegrass Swamp, Stuart Creek and Wintinna. Kokatha people regard themselves as being the custodians of sites in the Port Augusta area and in the low range of hills down the western side of the gulf, although they acknowledge that Pangkala people also have interests there. The Kokatha also accept responsibility for sites on the eastern side of the gulf in what was formerly Nukunnu territory (Gara cited in Lucas 1991).'*

These territorial redefinition and/or succession processes continue to be strongly contested by the other groups in the Cultana leasehold and freehold areas where descent is the essential basis for territorial affiliation and connection to the landscape.

Non-indigenous History

The first non-Indigenous contact with the Port Augusta / Whyalla area came in 1802, when Matthew Flinders sailed into the head of the Spensor Gulf in the *Investigator*. Louis Claude de Freycinet survey the area in 1803 and the process of land exploration commenced with Edward Eyre in 1839 and 1840 when he traversed the Eyre Peninsula on two expeditions, but found no useful grazing land (Twindale and Campbell 1985). John Darke travelled further north and explored the Gawler rangers in 1844, but was speared by Aboriginal people (Griffin and McGaskil 1986; Twidale and Campbell 1985).

Mining and the establishment of Iron Knob and Whyalla

In 1840, explorer Edward John Eyre climbed a hill that was either Iron Baron or Iron Prince and identified the area principally comprised ironstone. It was ultimately mining which started the development of Iron Knob and Whyalla and established Broken Hill Proprietary (BHP) as one of the largest companies in Australia (Flinders Range Research 2015a; 2015b; Iron Knob Progress Association 2011).

Initially, iron ore was taken from Iron Knob and surrounding areas by bullock teams to Port Augusta and loaded on barges for transport to the Port Pirie smelters. Shipments of iron ore were also made from Hummock Hill (now Whyalla) by barge to Port Pirie. In 1901, work began on a private narrow gauge railway line from Iron Knob and Iron to Monarch to Hummock Hill (Whyalla). The railway was, and still is, used to transport iron ore between Iron Knob and Whyalla. The railway line runs through the Cultana leasehold area, with a branch line between Iron Baron and Middleback (Flinders Range Research 2015a; 2015b; Iron Knob Progress Association 2011).

In 1901, a new wharf was built in Whyalla, following that a conveyor belt, crushers, storage bins and a powerhouse were added and completed in 1914. These additions made it possible to transport iron ore to Newcastle, NSW. The expansion of the Wharf facilities created the need for more workers and by 1905, a permanent settlement was well established at Whyalla. Around the same time, the town of Iron Knob was proclaimed and within six years it had a population of 528, eventually reaching to approximately 700. The Iron Baron township, to the south west of the Cultana leasehold area, was constructed during 1937-8 to house the men, and their families, working at this quarry (Flinders Range Research 2015a; 2015b; Iron Knob Progress Association 2011).

Pastoralism

Pastoral leases were introduced in 1851 to encourage grazing. The government established Port Augusta at the head of Spencer Gulf in 1854 to support the region. The first pastoral occupation on the western shore of the Spencer gulf began around the later site of Whyalla in January 1854 when James Paterson lodged an application for grazing lands to the north of Iron Knob, with the lease being known as Cooroona (Corunna) Hill (towards the western side of the Cultana Lease Area). In 1888, Frederick George Morgan acquired a pastoral lease for a 51 square mile area (to the east of what is now the Cultana leasehold area) and named it Mount Hummock. Graziers, Wilsdon and Brook took up the Cultana run in 1888 and build their homestead near the head of the Fitzgerald Bay (Manning 1990). In later years, the Point Lowly and Lincoln Gap runs to the north occupied the gulf coast as far as Port Augusta (Stanton 1996). The Pandurra Run (Figure 65) was also a large property from the early pastoral occupation of the area, with some of its primary infrastructure built by the 1860s. It changed hands from Fowler and Murray to the Messrs Whitham, Craven and Smedley for £28, 000 cash in May 1881 (Adelaide Observer, 21 May 1881, p.16), and was bought by the family of the present owners, the Nutts, in 1895.

Pastoral settlement in the area was always sparse, with low stocking rates and little infrastructure. In poor seasons, it was common for such marginal grazing land to be abandoned altogether. In 1895, the original Pandurra Station was subdivided into 26 separate blocks, including what is today known as Tregalana Station (South Australian Chronicle, 1 June 1895, p.9).

The subdivision of the larger original pastoral runs came about as a result of the passing of the *Pastoral Act 1893*, which established the Pastoral Board of South Australia. The Board was given the power to determine lease areas, boundaries, rents and the duration of tenured occupancies. Its early tasks included having to deal with the effects of a serious northern drought, which led to the 1902 Royal Commission. At the time of the introduction of the Pastoral Act, the pastoral lease was the preferred tenure for any lands not deemed suitable for closer settlement, and included large tracts of land on the Eyre Peninsula (Lay 2013).

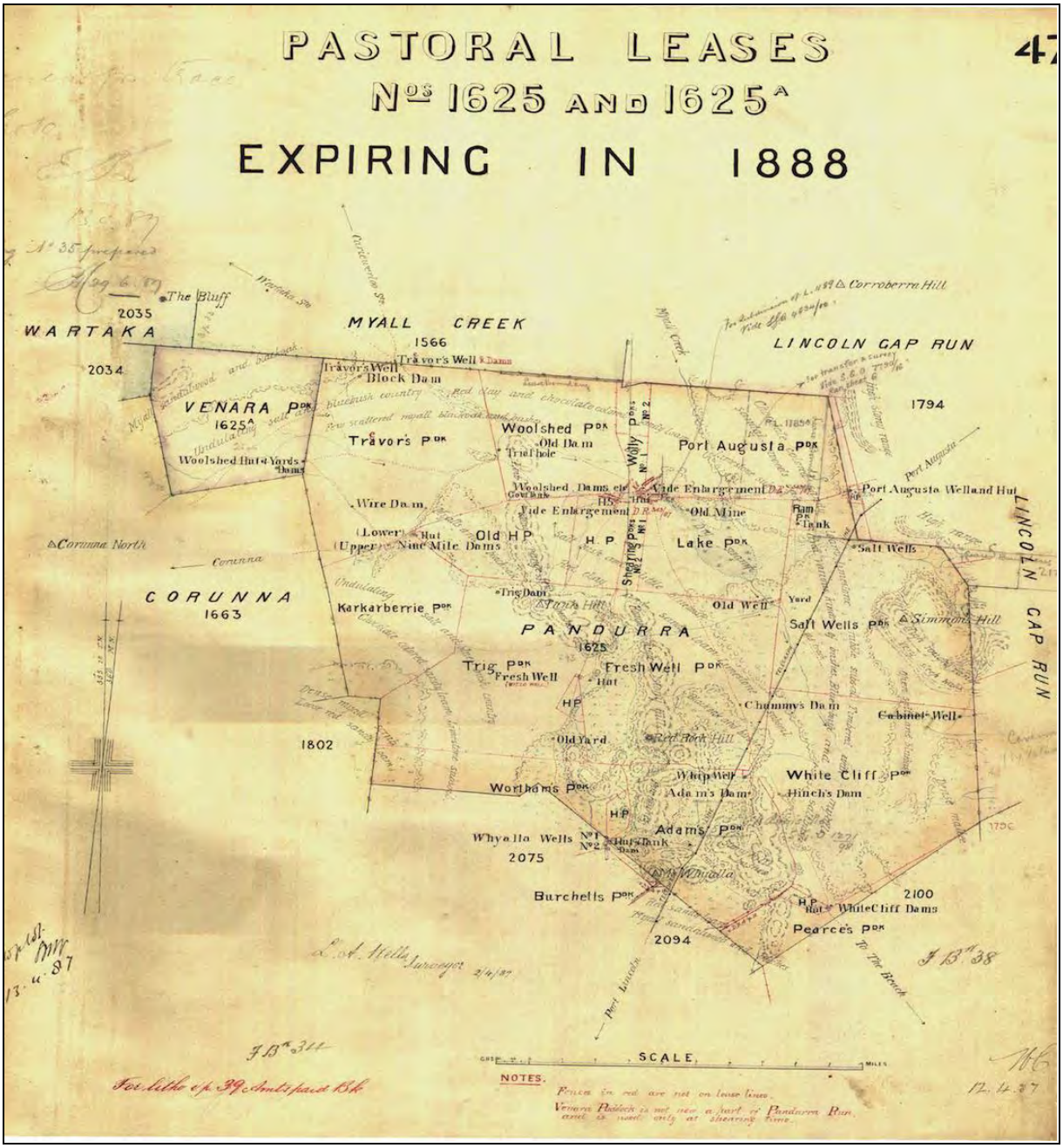


Figure 65. 1888 pastoral lease map of Pandurra.
At that time this included the future holdings of Roopena and Tregalana.

Historical homesteads

CUTA is comprised of a number of historical stations dating to the late 19th and early 20th century, including Cultana, Point Lowly, Lincoln Park, Tregalana, Roopena and Middleback.

Tregalana was originally part of the Pandurra Station and a hut is shown at roughly the location of Tregalana on the 1887 pastoral lease map. The property, comprising 107 square miles, was practically unimproved when purchased by Adolf Peter Gebhardt (Peter) in 1928. Gebhardt developed the property including a stone homestead (built in 1935), fencing and water infrastructure (The Chronicle, 22 July 1937, p.11). Gebhardt married Mary Drake-Brockman in Melbourne in 1935. Mary's family was of high status with her father being Judge Drake-Brockman and her aunt being Lady Moulden. Both Peter and Mary were well known and popular in Adelaide society with their activities, travels and social events regularly reported in the Adelaide and South Australian press throughout the 1930s.

In early 1940, Peter Gebhardt joined the army, and subsequently sold Tregalana to George Nicolson and Sons. Tregalana Station was operated and occupied by members of the Nicolson family up until its acquisition by Defence.

Roopena Station was run by JT Mortlock, and Middleback Station by Arthur Brook when George Andrew Nicolson took up both properties in 1919. When the Stations were initially established is unclear. However, sales of wool from Middleback occurred in Adelaide from as early as 1880 (Northern Argus, 19 November 1880, p2). A hut is indicated at the location of Roopena on the 1887 pastoral lease map, at which stage it formed part of the Pandurra holding. Roopena and Middleback combined comprised 288 square miles of saltbush, blue bush and myall country. The Nicolsons constructed numerous buildings including; a homestead in 1926, which was renovated in 1973, a woolshed and the original homestead.

The Nicolsons appeared in the local and Adelaide newspapers, particularly related to the efficient and effective operation of the station, and adoption of new techniques in raising, grazing and shearing of sheep. This included the adoption of autumn rather than winter shearing, to suit the local environmental conditions and aid the ewes in reducing the physical stress of winter lambing, thus resulting in reduced stock losses. The Nicolsons also had an extensive program of water conservation and reticulation, again to adapt to the harsh, dry conditions of the area. Their active policy of sinking dams and wells, including 20 miles of piping from these, provided permanent water supply for their stock. The Nicolsons were congratulated in the press for their 'light judicious stocking and careful nursing, Roopena [Middleback and Roopena] has comeback 80 percent to the original virgin bush' (The Chronicle, 30 March 1933, p.6).

By the 1950s, the Nicolsons controlled what were four stations – Middleback, Roopena, Tregalana and Nonowie. The Nicolson family were described in the 1950s as 'almost an institution in this part of the State', with George Nicolson referred to as 'still 'the uncrowned Mayor of Whyalla' to some' (The Chronicle, 28 January 1954, p.21). The final shearing of 16,000 sheep at Middleback Station by the Nicolson family took place in early March 2013 (Dean 2013), prior to acquisition of the properties by Defence.

The gliding club was formed at Whyalla in 1948 and planned to build a two-seat glider (The Chronicle, 9 September 1948, p. 13). The current Whyalla Gliding Club has been in operation since the late 1960s, flying out of Tregalana (AECOM 2012a). It is likely the current glider club is a continuation of the initial club.

Military History

The use of the Cultana area for Defence training activities commenced in the 1950s. Until World War Two, the Army used a training area and field firing range near Kanmantoo in the Mount Lofty Ranges, in convenient proximity to the Woodside Barracks, established in 1927. However, with increased subdivision and development in the area after the war, the area became unsuitable for an artillery range. This prompted the move to the Cultana area, where the first test firings were held in 1953. All the land in the vicinity was unoccupied at the time, the pastoral leases having been relinquished. Construction of buildings at the El Alamein camp was underway from 1957 onwards (NAA catalogue). The training area land was progressively acquired by the Commonwealth in three stages, firstly in 1955 and 1956, and then the area was greatly extended in 1968. This coincided with an

intensive period of military training during the Vietnam War in the 1960s and 70s, when a regular infantry battalion was based at Woodside.

8.6 Assessment of Heritage Significance

8.6.1 Assessment of Heritage Values

Aboriginal heritage values have been assessed in the IHMP and in AHMP in collaboration with relevant aboriginal groups. Assessment against the CHL criteria for indigenous values is in keeping with management prescriptions agreed with local aboriginal people based on the significance and preferred management approach of the groups claiming affiliation with those sites and values, but has not been socialised. Irrespective of the assessed CHL significance, Defence recognises the significance of all sites to the local aboriginal groups. Historical settlements were assessed by Woodside (2006) and Jacobs (2015), although some additional ruins and remnants were located and assessed after these reports were completed. Natural values are assessed below based on flora and fauna data presented in section 3 and geology and other information presented in Kellogg, Brown and Root (2004) and AECOM (2012).

Because no parts of CUTA are currently listed on any heritage register, an assessment that concludes a threshold for a given criterion is met by values on CUTA indicates that the criterion *may* be met. The only authority that can confer CHL value on a place is the Australian Heritage Council. However, any places identified in a Defence HMP as potentially meeting CHL criteria are managed accordingly.

Natural Heritage

Values present

Previous assessments of CUTA have indicated that the property contains a variety of communities representing the transition form the Eyre Peninsula to the south to arid lands to the north, and has an accordingly diverse flora and fauna. These assessments shave focussed particularly on the mallee and shrubland components of sectors J,K,L and M. The expansion of the training area westward has added areas of Myall woodland that formed part of an RNE listing for the quality of the woodland. The southwest corner of the property contains a potentially regionally significant stand of sandalwood in an area of generally high vegetation diversity.

Table 26 Natural Heritage Assessment against the Commonwealth Heritage criterion

Criterion (a) the place's importance in the course, or pattern of Australia's natural or cultural history	
Values	CUTA sits in a region of local interchange between the biota of Eyre Peninsula to the south and arid lands to the north. As a result a number of species, including some notable widespread species such as Mulga and Coolibah, reach their distributional limits in the vicinity of CUTA.
Assessment	CUTA does not meet this criterion for natural values. The phenomena represented on site are broadly present in the local region and are of a similar status to those present in many non-listed places.
Criterion (b) the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;	
Values	One State and one Commonwealth threatened species are known to be resident on site, while a small number of additional listed species occur as vagrants or transient visitors.
Assessment	CUTA does not meet this criterion for natural values. The phenomena represented on site are broadly present in the local region and are of a similar status to those present in many non-listed places. The site does not include any notably rare or unusual characteristics that meet CHL thresholds.

Criterion (c) the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history;	
Values	Middleback Research Station and the former Nicolson holdings have contributed to our knowledge of the natural history and management of semi-arid rangelands through hosting and supporting research disseminated through refereed journal publications, book chapters and formal conference proceedings. Middleback facilities are not part of CUTA, but researchers have accessed paddocks within CUTA to conduct research. CUTA has potential to yield further information regarding the transition of a long-term pastoral landscape to a Defence management regime and impact that process such as removal of water points that may have broad landscape impacts. The potential to investigate important processes such as recruitment of Western Myall that contributed to a former RNE listing over parts of the site continues with the long-term research association with the Adelaide University Middleback Field Station. The long-term management regime put in place by Defence will generate a varied mosaic of management that may further contribute to the value of such research and could yield results that are important to understanding necessary management actions across large tracts of ageing Myall woodland where lack of recruitment will ultimately lead to loss of the community.
Assessment	CUTA does not currently meet this criterion for natural values. Research publications arising from work at Middleback Research Station represent a relatively small body of work (contribution or subject of eight journal publications) in comparison to the similar sites at Koonamore to Fowlers Gap. The potential value of the site for understanding long-term changes with respect to removal of grazing and Defence land management are yet to be realised. However, periodic re-assessment against this criterion is warranted.
Criterion d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of: *i) a class of Australia's natural or cultural places; or* *ii) a class of Australia's natural or cultural environments;*	
Values	CUTA exhibits many typical landscape features of the Gawler Ranges region. These include large chenopod calcareous plains, dissected rocky plateaux and eroded low hills. Sectors P and Q were previously part of a heritage listed place on the basis that the broader area was the best remaining example of semi-arid Western Myall-Saltbush-Bluebush vegetation.
Assessment	Of itself, CUTA does not meet this criterion for natural values. The landscapes of CUTA extend uninterrupted into the wider region. The RNE place included a significantly larger area than that represented within CUTA.
Criterion (e) the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;	
Values	The Simmens plateau in eastern CUTA is a prominent landscape feature from Port Augusta and areas on the eastern side of the Gulf. The naming of El Alamein camp stemmed from the supposed similarity of the scarp and semi-arid shrub lands to western desert locations in which Australian forces served in the Second World War.
Assessment	CUTA does not meet this criterion. The values present in the CUTA are represented more widely through the Gawler Ranges and there is no indication that any group particularly values the aesthetics of the property, particularly in comparison to the nearby Flinders Ranges.
Criterion (f) *the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period;*	
Values	N/A
Assessment	CUTA does not meet this criterion for natural values
Criterion (g) *the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;*	
Values	N/A
Assessment	CUTA does not meet this criterion for natural values
Criterion (h) *the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history;*	
Values	N/A
Assessment	CUTA does not meet this criterion for natural values
Criterion (i) *the place has significant heritage value because of the place's importance as part of Indigenous tradition;*	
Values	N/A

Assessment	CUTA does not meet this criterion for natural values

Aboriginal Heritage

Values present

Users seeking information on indigenous heritage values must consult the aboriginal heritage management plans (AHCM 2007, Jacobs 2015e). Some sites are culturally sensitive and access is restricted to appropriate persons. To access the plans contact the RESO or ADES.

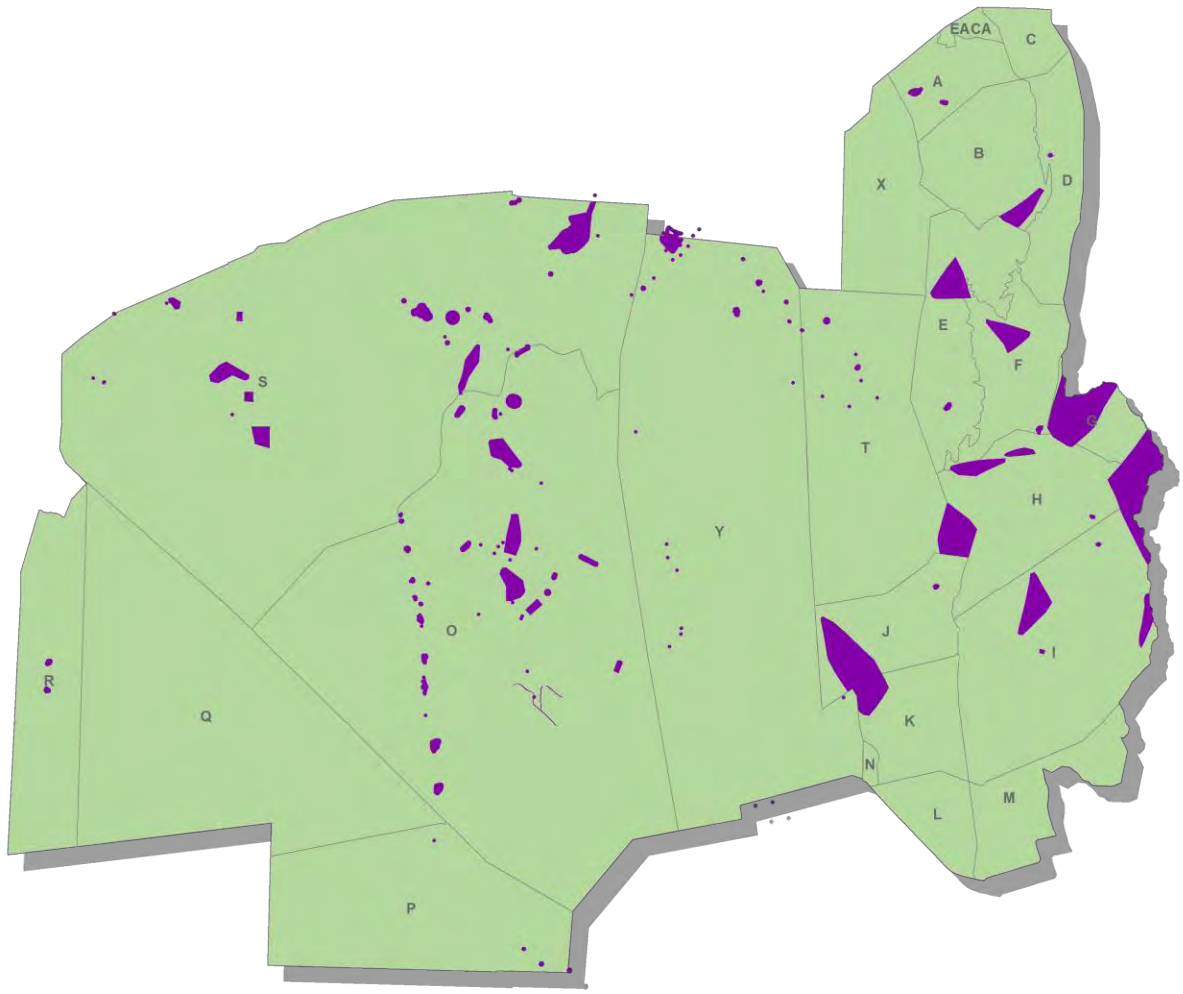


Figure 66. Restricted areas and protective buffers around Aboriginal heritage sites.

Table 27 Indigenous Heritage Assessment against the Commonwealth Heritage criterion

Criterion (a) the place's importance in the course, or pattern of Australia's natural or cultural history	
Values	There are recorded patterns of movement across CUTAs landscape by local aboriginal groups, but no specific events or associations of the place with noteworthy events in Australian history.
Assessment	CUTA does not meet this criterion for Indigenous values
Criterion (b) the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;	
Values	A regionally rare place at Gilmores Well was listed on the RNE. Other values present on site are broadly represented across the region.
Assessment	The RNE Place *Indigenous Place Gilmores Well* is likely to meet this criterion.
Criterion (c) the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history;	
Values	There are not sites of particular significance in this regard recorded on CUTA.

Assessment	CUTA does not meet this criterion for Indigenous values.
Criterion d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of: *i) a class of Australia's natural or cultural places; or* *ii) a class of Australia's natural or cultural environments;*	
Values	CUTA contains a variety of archaeological and mythological sites. None of these is regarded as important or outstanding examples of their kind.
Assessment	CUTA does not meet this criterion for Indigenous values.
Criterion (e) the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;	
Values	Several landscape features are of key importance to local aboriginal groups. The inter-relationship between aesthetic and spiritual values is complex, and while the aesthetic value of those places contributes to their spiritual value, it is considered secondary.
Assessment	CUTA does not meet this criterion for Indigenous values.
Criterion (f) *the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period;*	
Values	None known
Assessment	CUTA does not meet this criterion for Indigenous values.
Criterion (g) *the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;*	
Values	Local aboriginal groups identify strongly with some landscape elements of CUTA including the Simmens Plateau, Mt Whyalla Hills complex and nearby landscape features, Monument Hill, Moon Lake, the Douglas Hills, Blanche Harbour and a number of smaller locations. These landscapes provide a tangible link to the important stories including the Seven Sisters and Wilyaru dreamings. The RNE listed *Indigenous Place Gilmores Well* is a place of special cultural importance.
Assessment	Parts of CUTA may meet this criterion. Landscape elements for some spiritual elements are continuous with areas to the north and form part of an inter-connected landscape that means CUTA of itself may not threshold for significance for those values. Gilmores Well is a distinct place of significance that has previously been listed in its own right.
Criterion (h) *the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history;*	
Values	None identified.
Assessment	CUTA does not meet this criterion for indigenous values
Criterion (i) *the place has significant heritage value because of the place's importance as part of Indigenous tradition;*	
Values	Gilmores Well is a place of importance in local aboriginal tradition. Parts of CUTA also lie within a region where the native title of the Barngarla people has been formally recognised, indicating that there is an ongoing traditional association with the wider region. Local groups have also indicated ongoing association with the spiritual landscapes of CUTA.
Assessment	Parts of CUTA may meet this criterion. Gilmores Well continues to play an important role in local tradition.

Historic Heritage

Values present

A number of heritage sites with association to the pastoral, mining and military use of CUTA have been identified. Tables 28, 29 and 30 summarises these sites and their locations are shown in Figure 67).

Table 28. Pastoral Sites.

Pandurra Homestead Ruin c. 1860  	This site represents physical evidence of the early stages of pastoral development in the region. Pandurra was established by the 1860s, and the original homestead location is shown on an 1887 pastoral lease field diagram adjacent to a horse paddock. The shearing shed and other farm infrastructure were already located to the northeast where the current Pandurra Homestead is located. The Nutt family who have a tourist operation on Pandurra Station note on their website that "*Unfortunately after a 9 year battle with the Department of Defence we lost 50,000 acres… We also lost the… walk to the original Pandurra homestead site.*" Given the long history of visitation, the site is remarkably clean, with no plastic among the historical artefacts in the vicinity of the ruin. The physical remains include a mortar-lined in ground tank, scatters of artefacts, remains of floor slabs, and collapsed brickwork.
Cultana Homestead Ruin c.1880s and yards  *Photograph from Woodhead (2006)*	Little remains of this site. Woodhead (2006) could not locate any physical evidence of the original homestead or associated infrastructure except for an old wagon. The yard remnants to the north are constructed using wire dating from the mid-late 1800s.

 *Photograph from Woodhead (2006)*	
Nine Mile Ruin 	A ruin is present in the vicinity of a hut marked on the 1887 pastoral lease field diagram. Given the preservation of other stone and brick structures of the same period, it is likely that this is the same structure. It was presumably part of the operations at Pandurra.
Whyalla Wells 	The paddock in the vicinity of Mt Whyalla was known as Whyalla Paddock before the town of Whyalla existed. Two wells, Whyalla Wells 1 and 2 are shown on the 1887 pastoral run map for Pandurra. Another well of identical construction is located slightly further south. Evidence of a braced standing structure associated with the wells is still present. The internal boarding that prevents collapse of the shaft is in variable condition. The wells are constructed in the vicinity of the natural drainage line.

	
Point Lowly Ruin  Photograph from Woodhead (2006)	The Point Lowly ruin consists of an old fireplace and archaeological deposit of crockery and bones in a nearby creek that Woodhead (2006) surmise was a rubbish dump.
Middleback Homestead Precinct 	Middleback is of similar antiquity to Pandurra, dating to the mid 1800s. The original homestead is no longer present, and the main modern homestead dating from the early twentieth century was renovated during the 1970s using modern building materials. Other infrastructure such as the shearing shed and drying shed are significantly older, and the site contains a collection of structures typical of the regions pastoral industry including workshops, shearers quarters, a secondary homestead. Landscape elements include gardens, a graveyard, sheep yards and other enclosures and a home made cricket pitch.

Landing ground ruin

This well-preserved stone chimney has an unknown origin.

Photograph from Woodhead (2006)

Table 29. Military Sites.

1950s Bunker Precinct  Photograph from Woodhead (2006)	This site contains the remains of an artillery position that Woodhead attribute to the early development of military use of CUTA in the 1950s. A dilapidated command bunker is located near a series of circular earthen mounds that indicate former gun positions. Woodhead documented four mounds, but at least nine were present at that time. Some have since been removed during a remediation project, but six are still present, as well as the bunker.

Table 30. Mining Site.

Point Lowly Mine 	Woodhead (2006) visited the site of the Point Lowly Mine indicated on the 1:50,000 map sheet. They recorded no mining remnants, but some pastoral infrastructure. They attributed a dam and "shallow scrape" to a minimal attempt at mining. However, the dams represent a standard pastoral configuration at CUTA. Remnants of mining are found further north with filled shafts, mullock and a large "quarry" pit. There is limited remaining infrastructure associated with the mine. (Site photos Kael Da Costa).

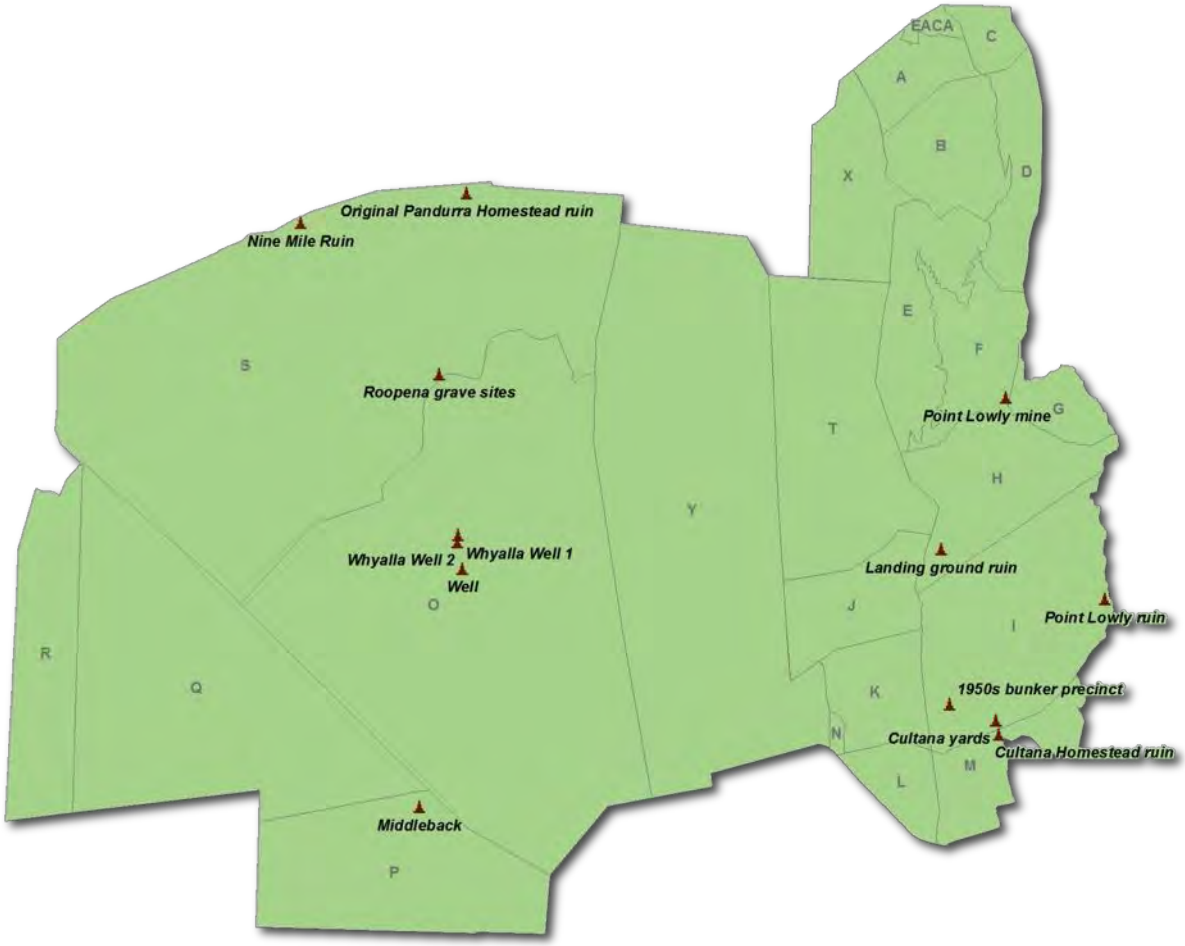


Figure 67. Historic heritage site locations

Table 31. Historic Heritage Assessment against the Commonwealth Heritage criterion.

Criterion (a) the place's importance in the course, or pattern of Australia's natural or cultural history	
Values	CUTA retains evidence of early pastoral settlement of the region in the form of ruins and wells across the property dating from the mid 1800s. There is also evidence of the ongoing development of pastoralism with the subdivision of Pandurra into smaller runs, and former huts and outbuildings at Roopena and Tregalana developing into distinct holdings. There is evidence of the increasing ownership of land and development of dams and pastoral infrastructure by the Nicolsons across much of the western portion of CUTA from 1919 until Defence purchase of these leases. There is also evidence of the early development of the site for military practice at the ruins of the 1950s bunker precinct and through ongoing used of the El Alamein Camp Area.
Assessment	CUTA does not meet this criterion. Physical evidence of 20th century pastoralism at CUTA is comparable to surrounding properties. Evidence of 1800s pastoralism is poorly preserved in comparison to better examples elsewhere in the region. Although the Nicolsons were actively involved in research into the benefits of their pastoral management to rangelands and supported the RNE listing of the southern parts of their holdings, they never proposed the listing of built assets.
Criterion (b) the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;	
Values	None present.
Assessment	CUTA does not meet this criterion.
Criterion (c) the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history;	
Values	Some physical evidence of pastoral development of the region at Middleback is coupled with contemporary newspaper articles during the 20th century. Jacobs (2015c), following AECOM (2012) consider that an "artefact scatter" at Middleback has potential to yield

	information about the early development of the site and about pastoral development of the region more broadly.
Assessment	CUTA does not meet this criterion. The physical fabric of historical ruins and infrastructure are typical of the region. Written accounts provide higher order information than can be yielded by archaeological remnants and ruins at CUTA.
Criterion d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of: *i) a class of Australia's natural or cultural places; or* *ii) a class of Australia's natural or cultural environments;*	
Values	Pastoral remnants at CUTA represent the characteristics of pastoral stations of the region, including elements of architectural styling, site layout and infrastructure.
Assessment	CUTA does not meet this criterion. Places within CUTA are not important in demonstrating these values in comparison to other regional stations that share the fundamental aspects of the place that characterise pastoralism in the region.
Criterion (e) the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;	
Values	None.
Assessment	CUTA does not meet this criterion.
Criterion (f) *the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period;*	
Values	CUTA exhibits numerous technical solutions for the provision of water to stock, including 1800s wells, large-scale irrigation piping, dams, windmills, and large channel systems. Water transportation and provision of water to numerous smaller paddocks was a fundamental element of the Nicolson family's farming practices at Roopena, and was facilitated by application of these technologies.
Assessment	CUTA does not meet this criterion. Although the way in which these technologies were applied was a noteworthy achievement in supporting a successful pastoral outcome for the Nicolson family, none of the technologies present on CUTA were specific to the place, and none were developed or notably refined on CUTA.
Criterion (g) *the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;*	
Values	N/A
Assessment	CUTA does not meet this criterion
Criterion (h) *the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history;*	
Values	Parts of CUTA have strong associations with the Nutt and Nicolson families. The ruins of the original Pandurra Homestead are closely associated with the nearby pastoral station of Pandurra, which has been owned by the Nutt family for over a hundred years, and from which the land was accessioned that contains the homestead ruin. The Nicolson family moved to Roopena in 1919 and developed a highly successful pastoral system based around numerous small paddocks with low stocking rates. Tregalana, Roopena and Middleback Homesteads all have associations with the Nicolson family. Roopena and Middleback were still in Nicolson ownership at the time CUTA was purchased by the Commonwealth. The strength of this connection was summarised by Andrew Nicolson "We're so emotionally connected; it's our identity, it's our home, it's our business, it's everything…" (Whyalla News Oct 29 2012). This association extended more broadly to the key role the Nicolson's played in the Whyalla community and the connection with pastoral endeavors that association brought to the wider community.
Assessment	Parts of CUTA may meet this criterion. The Nicolson approach to sheep grazing was recognised in published scientific literature. However, the approach had limited influence in altering wider practices, even in the local region. Nonetheless, the Nicolsons were an important local family in the Whyalla District. The Nicolson family legacy and works were largely associated with the areas acquired by Defence, starting at Roopena in 1919. The physical evidence of this association is most strongly embodied by the gravesites at Roopena and Middleback.
Criterion (i) *the place has significant heritage value because of the place's importance as part of Indigenous tradition;*	
Values	N/A
Assessment	CUTA does not meet this criterion for historical values.

8.7 Management

8.7.1 Heritage Management Strategies and Guidelines

Objectives
The management objectives establish aims for the conservation of the heritage values of CUTA in the context of a range of management requirements and issues. The management objectives have been informed by the heritage values of the study area, results of stakeholder consultation and the site investigation analysis outlined in the key reference documents.

The overall heritage management objective is to ensure that CUTA is managed in a manner that conserves the heritage values of the place while allowing for continued Defence uses and activities now and into the future.

Defence has primary responsibility for the detailed heritage management objectives. The objectives for heritage management at CUTA are to ensure:

- the continued, sustainable use of the place is compatible with the heritage values summarised in this HMP;
- the management and maintenance of the place is informed and guided by its heritage values;
- the heritage values of the site are understood and interpreted; and
- stakeholders and the local community are consulted on relevant issues arising from the use and management of the place in relation to heritage values.

Management Framework
Strategy 1 Places with potential Commonwealth Heritage values or listed on the Register of the National Estate are to be managed as though they are formally entered onto the CHL. Places identified by aboriginal groups as being of significance to them are to be managed in accordance with the processes agreed in the CUTA AHMP irrespective of their listing status.

Strategy 2 The general approach to the conservation of the physical heritage 'fabric' should be one of minimal intervention, with the Burra Charter philosophy of "do as much as necessary, but as little as possible ".

A copy of the Burra Charter can be found at http://australia.icomos.org. The conservation and management of the heritage values of CUTA shall be carried out in accordance with the principles of The Burra Charter. While any conservation and/or remediation works, alteration or upgrading activities may affect historic or aboriginal fabric, the aim is to minimise necessary work through reuse and management planning. In this way, the authenticity of the item can be retained as much as possible and the impact on the overall significance minimised within a process of change and good maintenance practice.

Strategy 3 Conservation, remediation or maintenance works should avoid altering or negatively impacting on the heritage values of the property. This includes works to aboriginal and natural sites.

In accordance with Article 27 of the Burra Charter, any landscape and/or building works that may adversely impact the heritage values of the site should be monitored and undertaken by suitably qualified professionals and tradespeople with experience in heritage conservation.

8.7.2 Future use, development, unforseen discoveries and disposal

Future Use
Changes in use and new development have the potential to impact the heritage values of CUTA, particularly the aboriginal places dispersed widely across the site. It is important to ensure any proposed changes consider potential heritage impacts and the necessary approvals have been obtained.

New facilities being built on CUTA including the camp, roads, ranges and combined arms range all require footprint surveys by aboriginal groups prior to excavation commencing. No developments are currently planned that are likely to impact non-indigenous heritage sites identified as requiring ongoing management in this HMP.

Strategy 4 Consider heritage values when planning new uses and ensure proposed changes and development consider potential heritage impacts. Seek advice from DEHPD as required.

Unforseen Discoveries
Strategy 5 In the event of an unforseen discovery, the find should be reported immediately to the Range Control, RESO and/or ADES, and any works ceased immediately. Depending on the nature of the find, other authorities may need to be consulted, including Indigenous and archaeological professionals.

Reporting Protocol
The objective for reviewing and reporting on the plans and processes in this HMP is to ensure information about the heritage values of the study area, their maintenance and management continues to be regularly updated.

Maintenance and conservation works carried out on any heritage value within CUTA should be recorded against the EFR for the value. This is best achieved by linking a project or works request to the EFR within GEMS.

Indigenous heritage values identified in the CUTA AHMP are required to be inspected to ensure that their condition maintained. The CUTA Indigenous Ranger has a central role in inspecting and establishing the condition of aboriginal sites. Condition could be both in the physical sense of fabric condition and in a less tangible sense of how well the values can be understood and interpreted. Historic sites in this HMP are all managed as ruins and their condition is not expected to be maintained. However, the effectiveness of management approaches to prevent accidental damage from Defence activities should be reported through post-activity inspections and periodic sites visits to inspect fencing and signage around sites and establish whether any damage has occurred to the site. Where damage has occurred this should be recorded as an incident linked to the EFR.

Strategy 6 Ensure planned and unplanned works conducted on heritage sites recorded in GEMS as works requests or projects are linked to the relevant heritage EFRs.

Strategy 7 Monitor and report on the condition of the indigenous heritage values at the site in accordance with the AHMP. Periodically monitor condition of historic sites and ensure required works to protective measures are maintained. Report all damage to sites as an environmental incident.

8.7.3 Interpretation and Access

The purpose of interpretation of heritage places is to reveal and explain their significance and to enable that significance to be understood by the people that manage the place and the public that access it. A heritage interpretation strategy can be developed where there is a public access and/or interest in the place. The only site where this is likely to be the case is the original Pandurra Homestead ruin. Given the public "shaming" of Defence for denying access to guests of Pandurra to this site, an agreement could be sought whereby tourists are permitted access between Pandurra Homestead and the ruin when sector S is not in use. This would be a problematic arrangement for Defence and may not be practical or worth the complexity for a site with limited appeal and significance to the wider community.

8.7.4 Training

Training management personnel about the heritage values and management requirements is a key part of protecting the heritage significance of CUTA. To that end the AHMP and ILUA prescribe a Cross-cultural Awareness Package that must be delivered to range users of the leasehold sectors. Historical values at CUTA do not warrant specific training or interpretation.

Strategy 8 In accordance with the AHMP and ILUA, training and awareness should be provided for management personnel, including Defence, contractors and site users (undertaking training activities in or near sensitive environments) about the heritage values of CUTA, management of sensitive information, stop work procedures, legislative requirements and where to seek further information and guidance.

8.7.5 Stakeholder Consultation

Consultation with a range of stakeholders will be required from time to time. This is primarily achieved through the CUTA Environmental Advisory Committee and direct liaison with indigenous groups. There are no other key stakeholders that require consultation for management of natural or historic values.

Strategy 9 Consult with key stakeholders on matters that may involve heritage impacts.

Strategy 10 Ensure key stakeholders are kept informed of decisions regarding changes to heritage values at CUTA.

8.7.6 Review of the Heritage Management Plan

Review of the HMP will form part of the periodic reviews of the EMP prescribed by the MLDP.

Strategy 11 This HMP will be reviewed as part of the MLDP review process.

8.7.7 Detailed Management Guidelines

Natural Heritage

Although natural values of the site are not heritage listed, it is important to ensure that land management activities avoid impacts on threatened species and ecological communities, as this will assist in maintaining the natural heritage values of CUTA. Management of these values is achieved primarily through sections 2 and 3 of this EMP.

Strategy 12 Avoid significant impacts on natural heritage values when planning activities.

Aboriginal Heritage

Traditional associations and surviving evidence of Indigenous occupation should be protected and conserved. Management of aboriginal sites on CUTA should be in accordance with the AHMP and ILUA. The primary mechanism for protection of sites is through buffer zones of agreed size and additional fencing and signage as appropriate and agreed with relevant groups. Access restrictions are clearly identified and communicated through Range Standing Orders and exercise planning and approvals.

The 2007 IHMP noted that signs for protected areas dating from 1992 required replacing as they were clearly out of date and cited incorrect authorities. These signs are still in place and need to be updated and standardised across the site for the simple identification by Range users.

Strategy 13 Defence will refer to the IHMP, AHMP, Range Standing Orders and Figure 66 for areas of potential Indigenous sensitivity prior to any future development or activity. Defence will liaise with Indigenous stakeholders on heritage management issues as necessary.

It is possible that sites will be identified through the course of ongoing management activities for CUTA. In the event that a potential new site is identified, advise Range Control, the CUTA Indigenous Ranger or RESO/ADES who will seek advice from an archaeologist and Indigenous community representatives. If a site is verified, record the site in accordance with AHMP procedures and create an EFR.

Strategy 14 In addition to the sites described in this HMP potential new sites will be recorded and reported in accordance with the AHMP and GEMS EFR data prescriptions.

The cultural sensitivities around specific sites identified in the AHMP must be respected and liaison only conducted with the correct groups with affiliation to each site.

Historic Heritage

All historical remnants are to be managed as ruins in accordance with the 2013 Australian Heritage Council guide "Ruins: A guide to conservation and management". The primary mechanism for conserving historical sites is access restrictions, reinforced by fencing and signage where appropriate.

In accordance with Jacobs (2015c) four buildings will be retained at Middleback to preserve some key structures reflecting the potential CHL values of the site. These include the shearing shed, shearer's quarters and drying shed. Additionally, the cricket pitch should be retained as

it lies between retained structures, presents no hazard, and allows richer interpretation of the Nicolson's lifestyle and that of people visiting and working on the Nicolson's holdings.

All graveyards and grave sites will be fenced and protected.

New fences are required to ensure the safety of range users at Middleback Homestead, Whyalla Wells, and the Original Pandurra Homestead.

Existing fences and management restrictions should be maintained at Point Lowly, Cultana Homestead, Airfield Ruin and the 1950s Bunker Precinct.

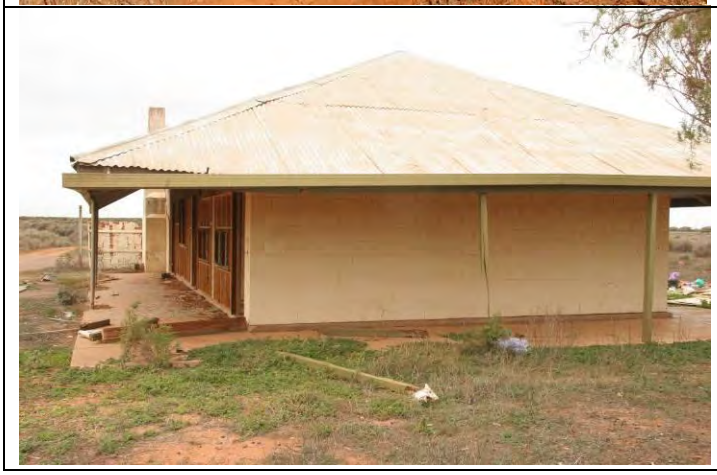
The Middleback Homestead precinct represents a serious management issue for Defence. Extreme vandalism of this site has occurred. Offensive anti-Government and anti-Army graffiti has been written on structures. Supporting columns, floorboards and much of the fabric of buildings assessed by Jacobs as being of high contribution to the values of the site have been removed and buildings rendered completely unsafe. Targeted retrieval of copper and historical artefacts has also occurred that has further diminished the values of the site. Power poles made from steel girders have been bent to working height in order to strip electrical wire from them, and bottle fossickers have turned over the "artefact scatter" noted by AECOM (2012). This artefact scatter underpinned Jacobs (2015c) proposal of CHL significance under criterion c. This assertion is not supported on technical grounds, but the loss of artefacts nonetheless has diminished the values of the site and the possibility of gaining information about 19th century development of the place. The decorative gate to the main graveyard, which had a memorial plaque "Gate from Angas House Franklin harbour, made by G.A. Nicolson, Blacksmith and Pastoralist, Settled at Roopena 1919" (Table 32) was cut from the steel pipe fencing protecting the graveyard sometime between July and October 2015.

Defence cannot adequately control access to this site. It is well known to locals, and is immediately adjacent to the Whyalla-Iron Knob Road. Gates and fencing installed to prevent access were immediately cut and removed, and new boundary fences along the Iron Knob road were cut within weeks of erection. It is not possible or practical to maintain a presence at the site. Management of the retained buildings as ruins may prove to be potentially viable. However, experience to date is that any safety fences or structures erected to prevent access of vandals to the site are likely to be destroyed. Persons entering the site are exposed to a significant risk. Condition of the buildings and any breaches of access to the site need to be monitored closely. If members of the public continue to enter the site, the standing structures need to be reduced to footings and slabs to retain the functional layout of the site and preserve some physical evidence of the key associative values of the site to the Nicolson family and the history of CUTA.

A further heritage impact assessment is required prior to removal of any buildings considered to make a high contribution to the site by Jacobs (2015c). The key heritage value of the place is associative, and is recorded in papers, historical newspapers and local museums. Removal of the physical fabric may therefore be a practical and legal action. If such an action is undertaken the retention of footings, slabs or stumps may be a method of preserving physical evidence of the layout of the site. Although the site is not formally accessible to the public, the immediately adjacent university field station means that a regular group of site users may benefit from being able to view physical remains of the station complex. The association of the homestead and the Nicolson family with the university is a legitimate dimension of the

heritage values of the place. The role of pastoralism in driving the ecosystems being studied by students provides and additional element to the associative value of the remnants.

Table 32. Vandalism at Middleback Station.

	Vandalised Woolshed. The Inscription "Wizzo 1919" celebrates the arrival of George Nicolson at Nicolson. It indicates the pride and attachment the Nicolson's felt for the history of the family in the region. The removal of timber includes not only floorboards, but structural supports for the roof. The homesteads themselves have been the target of even greater vandalism.
	The Middleback graveyard gate and memorial plaque were stolen in mid 2015. 
	Supporting posts and columns within and outside structures have been removed or broken. This structure is the modern section of one of the shearers quarters buildings to be retained at Middleback in accordance with Jacobs (2015c).

	All the steel girder power poles on site have been bent over to extract the copper wire
	The "artefact scatter" noted by AECOM (2012) has been dug over by fossickers.

Archival Recording

If it has been determined that an element of heritage value to the place should be removed, replaced or modified, the element should be photographically recorded beforehand. Where the modification or change is small, a number of 'before and after' digital photographs is normally sufficient. They should be printed and annotated and kept with a plan of the structure that records the precise location of the modification. The records should be stored on GEMS and attributed to either the precinct or individual values. Any overarching plans and documentation describing the layout or values of the site should be attributed at the lowest level to which the information relates.

Where the change is significant, more detailed archival records should be kept. This should be in accordance with the NSW Heritage Office guidelines for archival recording and photographic recording of heritage items, which is freely available on the internet ((http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/infoarchivalrecords.pdf); and http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/infophotographicrecording2006.pdf).

All historical homesteads on CUTA were archivally recorded in early 2015.

Strategy 15 Where an element of heritage value to the place is to be removed, replaced or modified, the element should be photographically recorded beforehand.

Strategy 16 Where the change to an element of heritage value is significant, the recording should be in accordance with the NSW Heritage Office Guidelines How to Prepare Archival Records of Heritage Items (1998) and Photographic Recording of Heritage Items Using Film or Digital Capture (2006).

8.7.8 Heritage Risks

Table 33 summarises heritage risks across CUTA. Physical remnants of historical heritage are generally in poor condition and much of the value of each site is attributable to the place itself rather than the structures present. Condition of indigenous values is significantly higher, and an active monitoring and management of indigenous values is proposed in the AHMP. There are also financial penalties for damage to aboriginal sites under the ILUA. This means that damage to aboriginal sites is a greater risk to the sustainability of the site and the sole SMRP criterion arising from the HMP is to report the number of aboriginal sites damaged in each year.

Table 33. Heritage risks on CUTA

Risk	Likelihood	Consequence	Risk level	Management	Monitoring	SMRP
Damage to Port Lowly Mines/Quarry	Rare+	Minor	Low	Restricted access -Vehicles to stay on existing access tracks - Pedestrian ADF movement permitted –Area is not to be targeted –Safety trace over area permitted	Incident and post activity reports	No
Damage to other ruins (Nine Mile, 1950s Bunker, Landing Ground, Cultana Yards, Original Pandurra Homestead, wells)	Unlikely*	Minor	Low	Restricted access to immediate surrounds of ruins -fences and signs around remnants	Incident and post activity reports	No
Damage to Roopena gravesite	Unlikely*	Moderate	Low	Restricted access to immediate surrounds of ruins -fences and signs around remnants	Incident and post activity reports	No
Damage to Middleback structures or gravesites	Unlikely*	Moderate	Low	Restricted access to immediate surrounds of ruins -fences and signs around remnants -Asset protection zones around flammable structures in accordance with section 5.	Incident and post activity reports	No

Risk	Likelihood	Consequence	Risk level	Management	Monitoring	SMRP
Damage to aboriginal site	Possible	Moderate	Medium	Restricted areas and significant management buffers around actual site locations.	Incident and post activity reports, dedicated site inspections by CUTA ranger	Yes. Report number of events

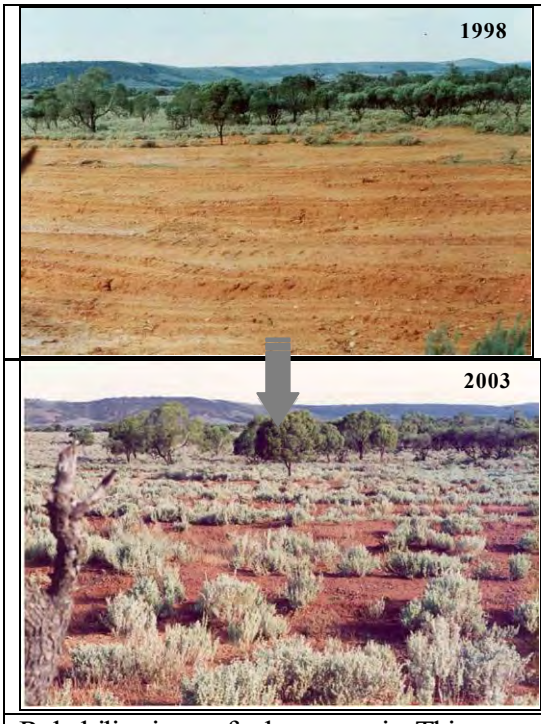
+Taking in to account current management. *Assuming proposed management buffers.

9.0 Soil

9.1 Soils overview

Management approach and history
Soil exposure is one of the two key aspects managed by the vegetation management program (section 2.2), and downstream sediment and impacts on sensitive receptors are monitored through the surface water management program (section 7.1.3). The processes identified under that program should provide generalised management of soil exposure to ensure sustainability of site soils through ensuring widespread wind and water exposure do not occur as a result of ongoing use of the site. The purpose of this soil management section is to detail more specific processes of managing individual erosion sites, conducting site rehabilitation and identifying areas of lower land capability that may require more restrictive management in order to prevent escalation in erosion across the site.

CUTA has a legacy of erosion sites caused by pre-Defence and Defence use (section 1.2). In response, many sites have been successfully remediated at CUTA over the last few decades. These range from post-activity repair of small areas used for digging-in and other field activities to major rehabilitation works on quarries and closed roadways on steep escarpment slopes. It is the stated expectation of RSOs that areas used by a unit are in as good or better condition following use than they were prior to the training activity. Kellogg, Brown and Root (2004) presented imagery and summary information for several large-scale rehabilitation projects (Figure 68).



Rehabilitation of a borrow pit. This level site provided over 800m3 of topsoil for rehabilitation of an escarpment track, and in turn required rehabilitation through contouring and re-seeding.

A steep, eroded, track up the eastern scarp. The track was closed, graded, topsoiled and water diversions were installed.

Figure 68. Examples of past rehabilitation works at CUTA.

Soils and erosion sensitivity

Surveys and assessment of susceptibility of CUTA landscapes to erosion have been conducted by Rural Solutions (through Connell Wagner (2007)), HLA-ENSR (2008), Aecom (2012) and Jacobs (2015a). While Connell Wagner (2007) report high susceptibility of escarpment areas to water erosion, AECOM (2012) and Jacobs (2015a) consider that these areas are less susceptible to erosion due to rocky substrate. In an undisturbed state this may be true, but the steep slopes of the scarp are clearly susceptible to water erosion and any attempts at rehabilitation in those areas requires water movement to be addressed as an over-riding concern or erosion of the site will continue. In flatter areas the likelihood of wind erosion following vegetation loss has been emphasised for areas with sandier substrates. While an interaction between water and wind erosion was noted (areas susceptible to wind erosion also include areas of water eroded soil (Connell Wagner (2007))), heightened water erosion has been linked directly to vehicle movements, tracks and creek crossings. Even flatter areas of Sector D were noted as a particularly susceptible area for water erosion by Connell Wagner (2007). At that time sector D formed a major off-road vehicle manoeuvre corridor and it receives high-intensity runoff in many parallel drainage lines. A combination of erosion susceptibility assessments for CUTA is presented in Figure 69. This highlights area of steeper slopes where water flow has primacy in driving erosion, and flatter areas where other factors such as clay content of soil or salinity may take precedence. In general, the higher clay content and flat land surface of the Simmens Plateau renders this area less prone to erosion. Elsewhere most soils are moderately prone to erosion through either water or wind action, or a combination of both. Jacobs (2015) highlight a large area primarily in sector Q as potentially subject to inundation and overland flows. This area receives flow from the Pine Creek- Salt Creek system but it has a relatively deep water table and water will dissipate from this area relatively quickly. The key features of this area are well-developed riparian vegetation across the broad channel of Salt Creek such that loss of that vegetation in combination with the hydrological features identified by Jacobs (2015a) could lead to erosion issues, and the potential for off-site impacts as the systems drains southward out of CUTA. Parts of this area are used by third parties for sand a gravel extraction from long stretches of the creek channel. Further north there are large areas in sector S dominated by shallow clay pans and a near-surface, saline, water table (Fig 70). The coincidence of these factors renders this area potentially susceptible to vehicle impacts during wetter periods through bogging, vegetation removal, and rising salinity through exposure of the groundwater table. This would facilitate wind-driven deflation and erosion of soils. Careful management of this area during and after rain may be required to prevent broad-scale impacts.

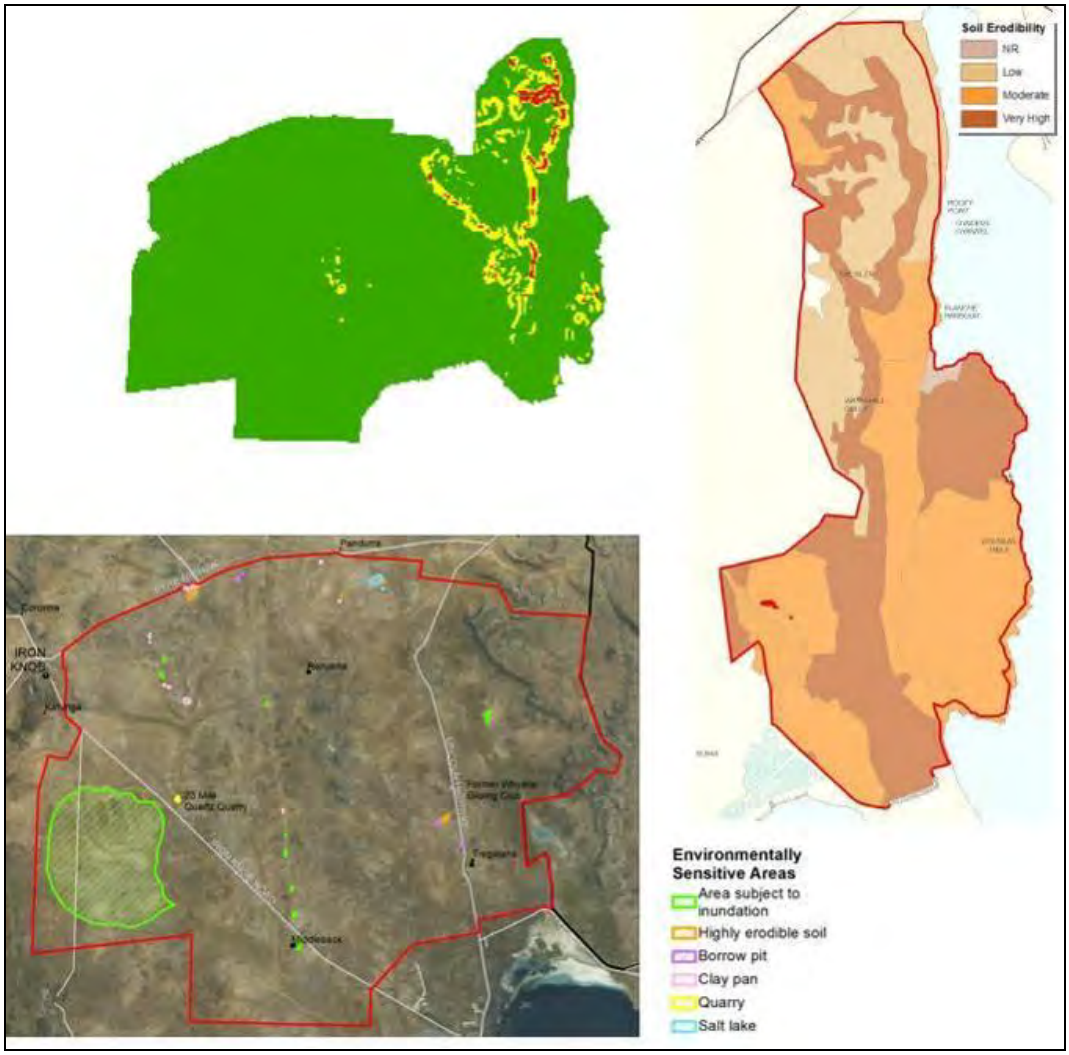


Figure 69. Erosion susceptibility and sensitive areas across CUTA.
Top left: Slopes greater than 5 degrees (yellow) are susceptible to water erosion following vegetation disturbance and will require water diversion measures or erosion will continue to occur. Elsewhere, soil characteristics (right) and landscape features in combination with soil characteristics (left) have been used to identify areas of erosion sensitivity.

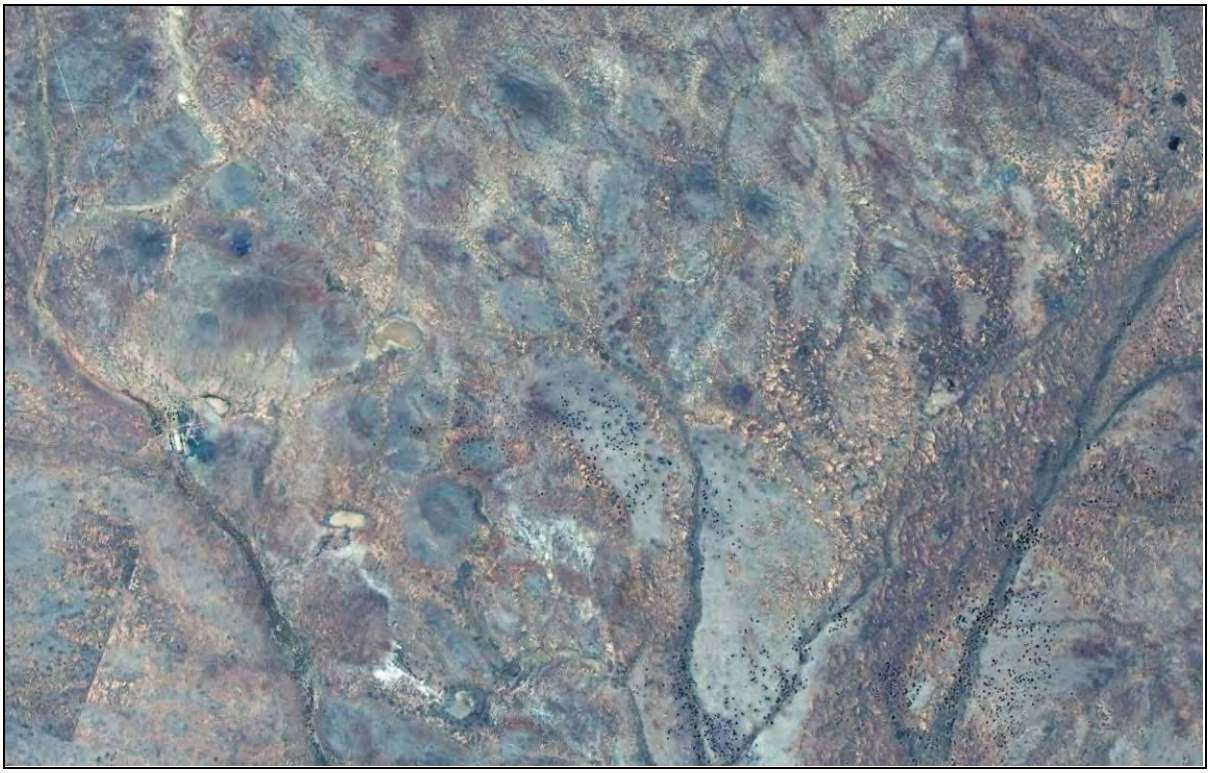


Figure 70. Claypan dominated plain in western sector S.

9.2 Erosion sites and characteristics

HLA-ENSR (2008) documented erosion sites across sectors A-N. Legacy erosion resulting from reduced vegetation cover was typified by gullies and wind scalds, while Defence roads, informal tracks and vehicle damage also contributed to notable sites (Figure 71). Sites were ranked according to whether they posed an immediate risk to infrastructure, whether there was a risk of large-scale environmental damage, and whether the site was likely to naturally revegetate or remediate. This approach has been adopted in preliminary surveys of sites across newly acquired sectors and to identify new sites across older sectors. There are numerous minor legacy erosion sites across newer sectors. These have not been mapped. It is assumed that they will either a) naturally attenuate and revegetate with the removal of stock, or b) be managed through the vegetation management program. Larger erosion sites that may require Defence intervention have been recorded (Figures 71 and 72), and further sites will be identified and recorded over time. The approach adopted by HLA-ENSR to characterise sites based on risk to infrastructure (capability & financial risk), and to the environment, will be continued. A number of extractive industry sites (e.g. quarries, gravel and sand extraction leases) that have been rehabilitated or that are in current use are not shown on the figure, but are noted, and could present a management impost in the long-term if/when these areas become part of the training area.

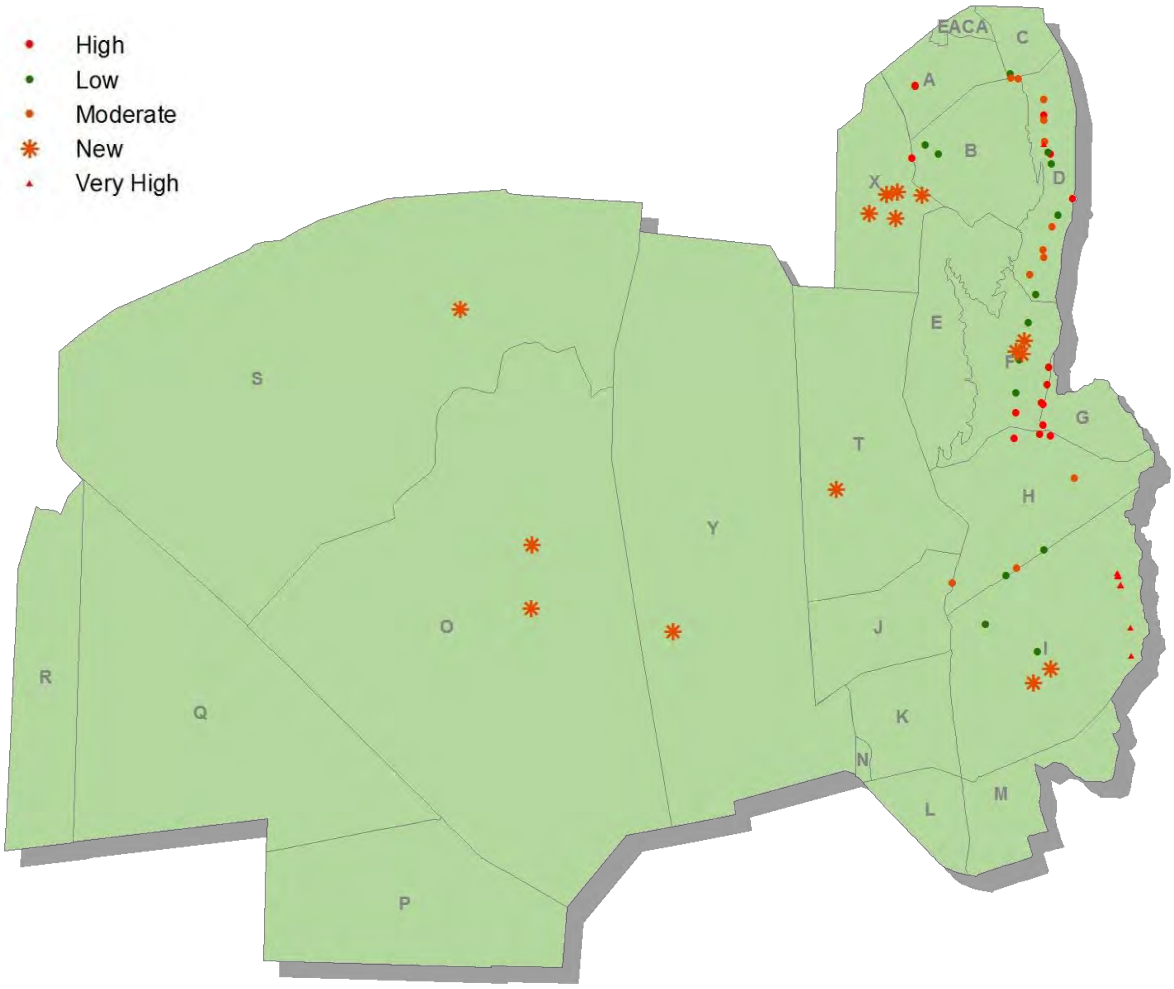


Figure 71. Noted erosion sites across CUTA.
Ranked sites (Low-Very High) from HLA-ENSR (2008). Other sites recorded during development of the EMP. Ongoing recording and management of sites will follow management processes (Figure 76).

Figure 72. Legacy erosion near Mt Whyalla and Lincoln Park.
Multiple parallel erosion channels are present along a current and older track alignments (right) on a low-moderate slope for a distance of around 1000 m. Smaller gullies stemming from these channels are advancing up the lower slopes of Mt Whyalla. It is highly unlikely this site will ever stabilise, and the route is highly likely to be used by Defence vehicles during training exercises. Lincoln Park and its surrounds (right) is a heavily eroded area along tracks, creek lines and hill slopes. Some of these require remediation due to use as rubbish dumps, and further intervention may be required for soil stabilisation.

Fire: an emerging risk

It was noted in section 5 that the incidence and scale of fires on CUTA is both larger than appreciated, and seemingly increasing. Bushfire-affected areas represent a key situation in which Defence activities can potentially generate an impact equivalent to overgrazing (Figure 73), particularly in the sector I HETA where fire control is more difficult. Future site use potentially means wider areas of the western sectors including the combined arms range and new HETAs may also be affected by fire and removal of vegetation.

Figure 73. Fire impacting a legacy erosion gully.

9.3 Management

Prevention of soil erosion

While proactive management prescriptions have been adopted for CUTA that should minimise the occurrence of new disturbance and potential erosion, the intended purpose of the site is to train very heavy vehicles across challenging terrain. This will lead to new erosion no matter how effective the controls are. The key sustainability outcome is not whether specific new erosion events occur, but whether the response to erosion manages to prevent an ongoing increase in the extent of individual erosion sites, and of the number of sites. HLA ENSR (2008) nominated the following key elements for preventing erosion at CUTA:

Preventing water erosion:

- Maintain or improve density of native perennial vegetation
- Maintain lichen crusts on the soil surface
- Maintain stone cover, where appropriate
- Avoid the creation of steep drains and banks into dams
- Divert water away from areas likely to gully and gully heads
- Plan and properly construct access tracks
- Avoid the creation and use of tracks on steep country

Preventing wind erosion:

- Maintain density, height and structure of native perennial vegetation
- Maintain lichen crusts on the soil surface

- Maintain litter and annual grass cover (particularly on sandy soils)
- Eradicate or manage rabbit populations
- Manage fire affected areas
- Avoid placing water points or access tracks on sandy soils

Some of these strategies are at best difficult to manage with respect to a Defence training activity (e.g. retention of lichen), or at worst incompatible with specific operational areas. However, at a whole-of-site level the outcomes achieved against each of these benchmarks may prove better than surrounding pastoral land and most are monitored against pastoral monitoring points. Vegetation management has already been highlighted as a key management objective of sustainable management of CUTA and water diversions and dams have been highlighted as another key management issue. Under clause 13.13 of CUTA RSOs (2015) activities with specific potential to cause or exacerbate erosion require individual environmental impact assessment and approval through an ECC (see CUTA EMS (1) section 4.3.4). Activities cited in clause 13.13 include:

f. Major excavation including all platoon level or above, defensive positions, vehicle scrapes, anti-tank ditches and mechanical target installation.
h. Civil works including road works, establishing creek crossings, and site rehabilitation works.
i. Mining, quarrying and extractive activity (e.g. for purpose of extracting materials for earthworks) including use of established site quarries/borrow pits and the establishment of new quarries/borrow pits.
k. Any activity requiring access to fenced off site rehabilitation areas.
l. Any activity requiring the removal, damage, collection or disturbance of vegetation.
m. The use of mine ploughing, earthmoving or similar equipment that will cause significant ground disturbance.

Defence also has key guidance material aimed at ensuring soil management is a key aspect that is understood in developing and managing infrastructure, all of which apply at CUTA:
- Survey Methodologies
- Principles of Erosion and Sediment Control
- Principles of Stormwater Management
- Fire Trail Management and Construction Guide
- Construction Guide for Erosion Control Structure

In addition to applying general principles and soil management practices site-specific controls are required to control vehicle impacts to sensitive areas. Vehicle movements are already controlled across the sectors to minimise dust, noise, fires and spread of weeds, and many of those controlled also confer benefits for soil management. Specific additional controls and management options are:

Site-wide:
- Wind-down off road activities after 2 mm of rainfall if more rain is forecast.
- Cease off-road activities after 5 mm if rainfall

Sector S:
- Cease off-road activities after 2mm of rainfall if more rain is forecast.
- No vehicle manoeuvre west of MGRS easting 22 if standing water evident in any claypan or depression encountered during the activity

Escarpment

Sectors A, B, C, D, E, F, H, I, J, K, T, X:
- No A and B vehicle access to the escarpment except at designated existing access points
- Harden/stabilise designated access routes or close and rehabilitate those that are unmanageable
- If a training requirement exists to access the escarpment in A or B vehicles, the user unit must arrange for, or immediately remediate the route using protocols set down in HLA-ENSR (2008)

Vehicle access to the escarpment under the conditions above would be permitted at a starting number of 23 routes including the MSR and 21 additional routes as per Figure 74. These routes are variable in their condition, and recent activities have caused significant degradation of some of the steepest due to follow-up storm rain that did not allow for re-consolidation of disturbed road surfaces (Figure 75). These sorts of events will continue to occur, and the ongoing management of very steep routes to trafficable standard, and in such a way that associated erosion does not occur, will require careful monitoring. Closure of impractical routes and maintenance of a lower number of better-constructed tracks may be the only viable long-term solution.

An alternative solution, or modification to the above management regime, may be to designate only a certain grid square(s) with moderate grade for off-road vehicle access to the western scarp. The actual requirement to move east-west across the escarpment with the new opportunities to access to the leasehold area of the training area is not yet clear. These issues will have to be resolved through understanding user requirements as future exercises attempt to design scenarios within site constraints and test their practicality. In the first instance, prevention of off-road access to the scarp is the most responsible course of action given its very high sensitivity to vehicle impacts.

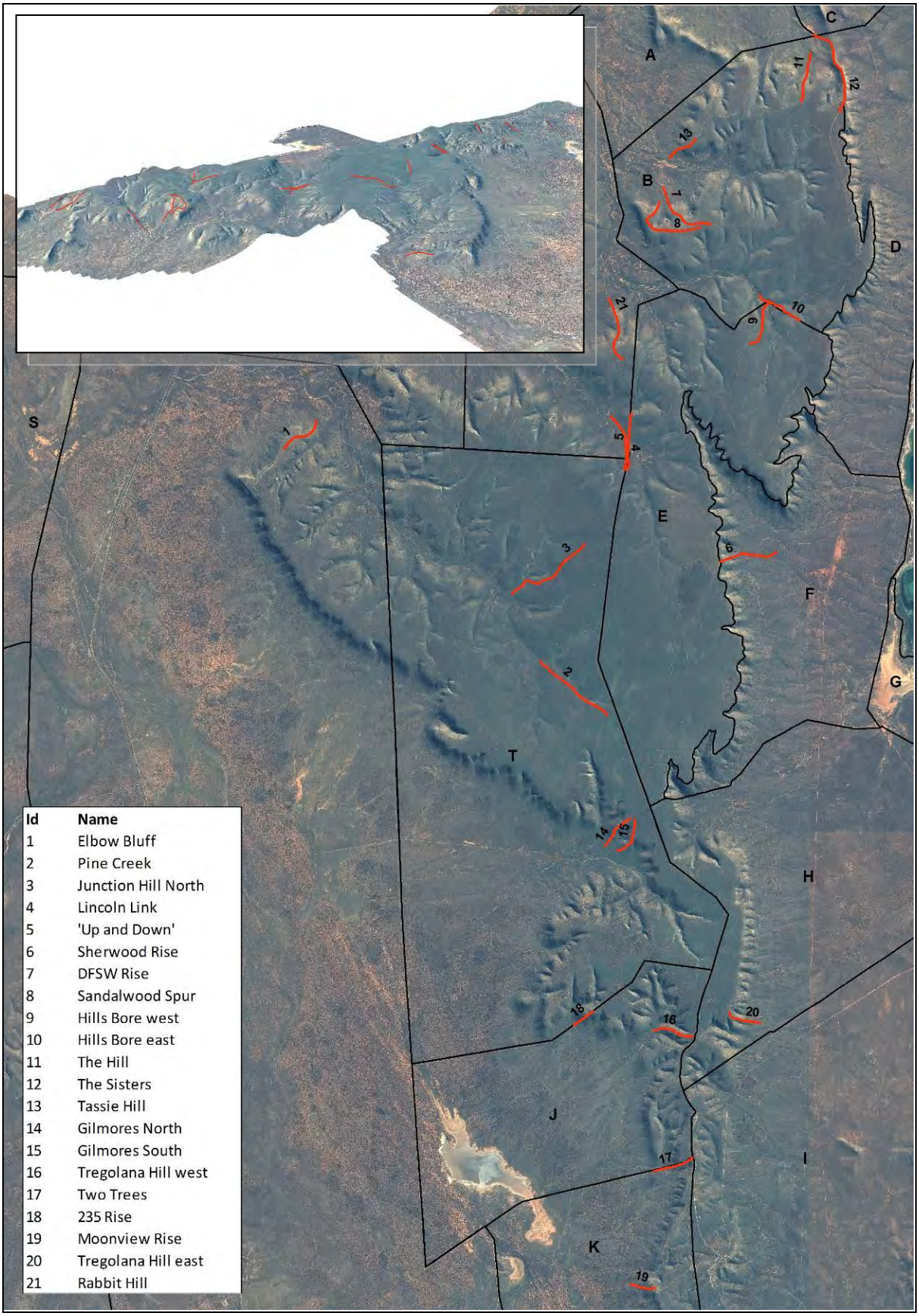


Figure 74. Formed track access to escarpment.
Informal track/pass names should be reviewed after track naming process under bushfire plan has been completed.

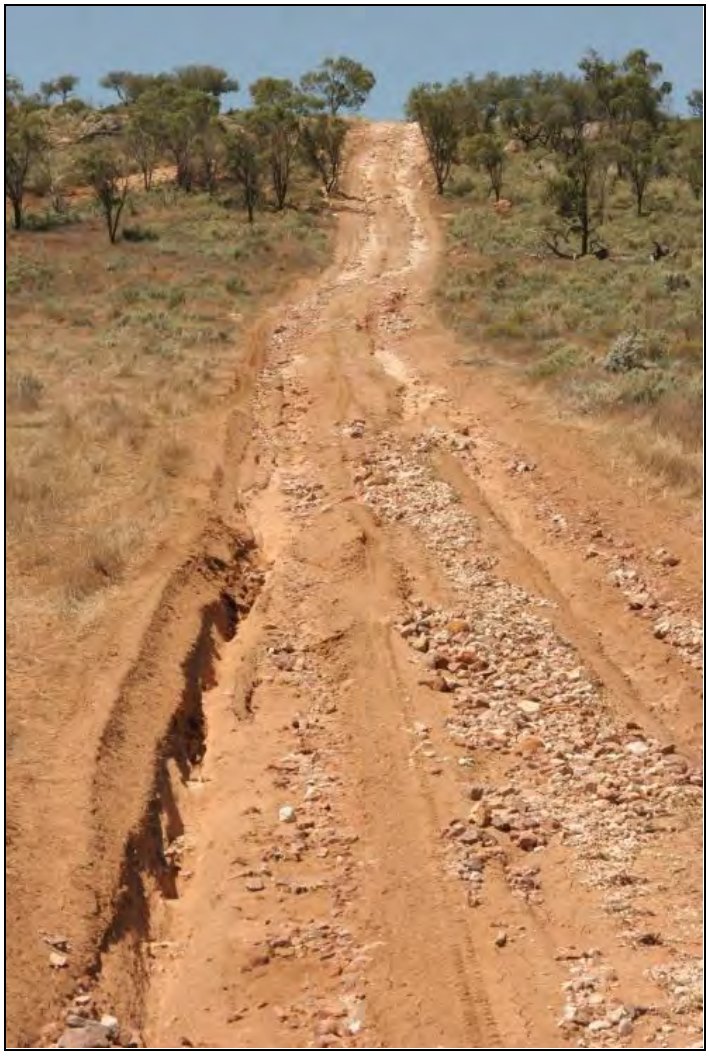


Figure 75. Erosion of track down the escarpment in sector T.

Management process

The management of exiting and new erosion events follows the process in Figure 76. Where intervention is required to ensure a site does not continue to degrade, protocols set down in the CUTA Site Rehabilitation Plan (HLA-ENSR 2008) are to be followed. The rehabilitation protocol contained within the plan provides detailed guidance on how to rehabilitate a site based on the specific situation of each site, and includes guidance on the appropriate plant species. The rehabilitation plan aims for a fully functioning ecosystem. The full rehabilitation process and follow-up monitoring is warranted in cases such as the proposed closure of dams, particularly those in heritage sites where attainment of as natural an outcome as possible is desirable. Other cases may be where intervention is required to prevent ongoing erosion of unused tracks and area closure is required to ensure that the closed route is not re-opened by off-road vehicle movements during exercises. As a general rule, events in 'Improve or Maintain' sectors should follow the full process, whereas a lower level of rehabilitation to within vegetation cover thresholds (section 2.2) is acceptable for 'Operational Management' sectors.

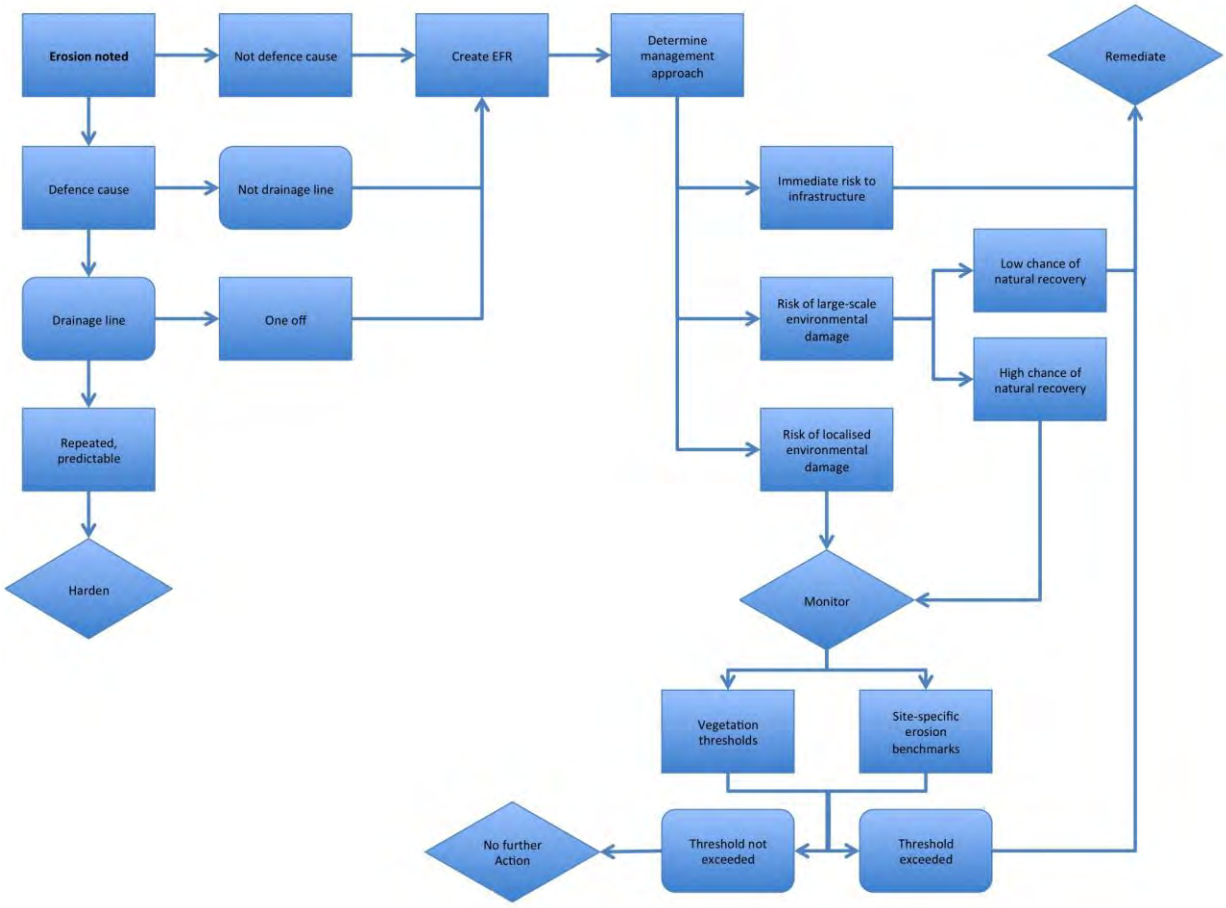


Figure 76. Soils management process.

Fire

Soil and vegetation management processes apply equally to these sites as any others, but there is a potentially heightened requirement for long-term monitoring of fires as repetition could represent an emerging sustainability issue for the site. This could require either acceptance of localised environmental damage to soils within the HETAs and Combined Arms Range, or development of a fire-specific management response, noting that fire has impacts on vegetation, but not directly on soil integrity.

10. Sustainability, Monitoring and Reporting Plan

Throughout the EMP there key risks were identified that directly impact on the long-term sustainability of CUTA for Defence activities and environmental values. For the foreseeable future the key site sustainability risks will remain primary and secondary vehicle impacts on vegetation and soils. This is a risk that can be directly monitored and controlled through management for Defence activities. There are several emerging risks that may become more significant in the medium term irrespective of Defence management. Potentially the most problematic of these would be widespread establishment buffel grass. Fire risks on CUTA are comparatively low and confer a freedom to train under conditions that may not be possible at other sites. To date, buffel grass is thought to have been controlled along highways adjoining CUTA, but if it does establish more broadly it will have serious impacts on the flammability of the environment and severely restrict training opportunities in the dry hot weather that typifies the site. Buffel grass is also recognised as a key threat to biodiversity values of semi-arid rangelands. Flammability of parts of CUTA may also be impacted by Defence actions. Defence activities are the cause of essentially all fires on site, and most vegetation communities on CUTA are not well adapted to fire and recover slowly after being burnt. Where a pattern of repeated burning is promoted in an impact area there will naturally be a long-term transition to a more flammable vegetation, most likely dominated by wards weed, grasses and other weeds. This vegetation may promote larger fires that incrementally spread the footprint of more flammable areas closer to sensitive assets outside or on the training area.

The SMRP combines monitoring and reporting of all such key sustainability measures into a single snapshot of how CUTA is performing against standards and thresholds established in this plan. In addition to specific risks against a particular EFR or process that have been identified in EMP sections, there are some over-arching synthetic reports that aid in monitoring Defence performance. These are generally simple metrics such as the number of environmental incidents that occurred on site in a given period or total number of threshold exceptions identified by monitoring results. The number or overall area of temporary area closures or areas on 'rest' are also good indicators of whether management controls are being implemented, and whether the degree of impacts requiring management are increasing or not. A key element of the SMRP is to match sustainability measures to the tempo of site use (from TASMIS) against. If the training area is not capable of sustaining the required tempo of exercises it is important to identify this as soon as possible so that the capability requirements for the site can be re-examined and higher-level management and disposition alternatives can be considered.

The SMRP should be completed annually and forwarded to the DOTAM Assistant Director for Sustainability. The completion of the SMRP report should form the basis of two-yearly review of the SMRP, and assist in framing the scope of the five-yearly review through highlighting known sustainability issues across the site SAAL NRMB.

Table 34. All SMRP Risks, and Monitoring and Additional Synthetic Measures.

EFR	Matter or Risk	SMRP
Biodiversity, Soils	Saltbush density, bluebush density, perennial shrub density	-(Five-yearly) N# threshold exceptions based on Jessup transects
	Vegetation cover	-Number of threshold exceptions based on reactive step-point transects
	Vegetation cover	-Number of temporary area closures enforced

	Vegetation cover	-Number of compulsory rest areas enforced
Biodiversity	Juvenile : Adult Ratio	-(Five-yearly) Change in ratio on Jessup transects and why- loss of juveniles/senescence of mature plants/recruitment and why
	Low shooting on mature plants (<30 cm above ground)	-(Five-yearly) Number of sites where low shooting recorded and comparison to previous survey
	Recruitment	-(Five-yearly) Number of sites where recruits recorded and comparison to previous survey
	Long-term loss of key sandalwood populations due to lack of recruitment	-Changes in population
	Protection of biodiversity	-Number of incident reports involving damage to flora and fauna
BONS	Goats	-(Five yearly) Change in distribution
	Rabbits	-(Five yearly) Change in distribution
	Increase and spread of carrion flower population	-Number of new infestations. -Number of infestations treated
	Increase in distribution and abundance Weeds of National Significance -African Boxthorn -Opuntioid cacti -Prickly Acacia -Athel pine	-Number of new infestations. -Number of infestations treated
	Establishment of buffel grass leading to: -increased fire danger and reduced training opportunities -heightened management expectation for environmental weed control	-Number of new infestations. -Number of infestations treated -Detailed map of distribution on establishment of any sizable population
	High numbers of goats lead to: -degradation of native vegetation, -increased erosion -damage to indigenous heritage	-Incursions into Gilmores Well. -Numbers at water points. -Density from SAAL NRMB aerial transects -Numbers exported.
	Overgrazing of native vegetation and adjoining pastoral lands by Kangaroos	-Density from SAAL NRMB aerial transects -Number culled
Bushfire	Modification of vegetation through repeated burning	-(Five yearly) Area of site burnt more than once in past five years -(Five yearly) Area of site burnt at least once in the current and previous reporting period in this reporting period
	Fire frequency and size	-Number of fires reported -Number of fires greater than 100ha
	Bushfire prevention and response	-Number of breaches of a boundary break or HETA fire break by an uncontrolled fire
Pollution	Nuisance noise pollution from Defence activities	-All complaints -Threshold exceptions and actions
	Structural damage and other impacts resulting from noise and vibration from Defence activities	-Number of cases of actual damage to buildings
	Light pollution from Defence activities	-All complaints -Threshold exceptions and actions
	Health impacts to civilian populations caused by dust	-All complaints -Threshold exceptions and actions

	Dust obscures Highways	-All complaints -Threshold exceptions and actions
	Pollution prevention	-Number of incident reports involving discharge to the environment
Water	Change in state of sensitive receptors and monitoring sites	-Noted sedimentation or changes -Ground-truthing results for suspect changes
	Pollution prevention	-Number of incident reports involving discharge to aquatic or marine systems
Heritage	Aboriginal sites	-Number of sites damaged
Soils	Rehabilitation sites	-(Five yearly) Number of rehabilitation projects undertaken
Soils	Erosion	-Number of new erosion EFRs resulting from Defence practice

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12. Appendices

A. CUTA Major Exercise Post Activity Inspection Template
B. Mallee fowl awareness poster (A3)
C. Bushfire Hazard Mitigations Plan (A1)
D. Bushfire Operations Plan (A1)- this plan may be subject to further review after consultation with local brigades to ensure it meets their purposes
E. Bushfire Activities Mitigation Plan (A1)- this plan may be reviewed following a technical review project examining the methods and application of activities mitigations on the Defence estate
F. Prepare-Act-Survive pamphlet

Appendix A. CUTA Major Exercise Post Activity Inspection Template

-To be used in conjunction with post activity inspection, annex D chapter 13 CUTA Range Standing Orders-

Exercise Summary
Footprint: *General description of movements and sectors used.* **Activities:** *Including personnel and equipment numbers.* **Risks:** *Environmental, fire and damage risks.* **Controls:** *I.e. controls in place as required by ECC and any other mitigations.* **ECC Reference:**

Post Exercise Summary
What worked well: **Lessons learnt:** **Damage and incidents:** *including control failures that may not have resulted in damage or an incident.*

Map
Map of all identified damage sites

Damage Site *(duplicate this section for each recorded site damage)*
Title: *Site description:* *Sector:* *MGR:*
EFR: *list impacted EFRs and any new EFRs to be created*
Photos & Diagrams
Details – *how, when, why, description of damage, initial action taken*
Threshold exception: *Does this meet a threshold requiring a long-term management response?*
Management response: *Rectification, unit response/ notification, changes to requirements of exercise participants and planners in the future. Include POC for required actions*

Have you seen me?

Report all sightings of mallee fowl to range control

Cultana Training Area
Bushfire Hazard Mitigation Plan
2016-2018

Bushfire Mitigation Works Program

	Work description	Location(s)	Frequency (if relevant)	Performance standard	Critical work?	Consequence if not completed
1.	Maintain fire break	Eastern Impact Area boundary, sector between Cultana BUI (MGRS 565 578 or GDA 94 (MGA) 53 756575 6357750) and west of sentry point 3 (MGRS 621 630 or GDA 94 (MGA) 53 762070 6363045)	Prior to 1 September each year	SAFFA* Minimum width 10 m. Maintain existing wider widths where present.	Yes	Potential loss of civilian assets adjacent to boundary
2.	Maintain fire break	Eastern boundary- south, sector M (adjacent Point Douglas Road) and I (to point) point 3)	Prior to 1 September each year	SAFFA. 5 metre width.	Yes	Potential loss of civilian assets adjacent to boundary
3.	Maintain fire break	Eastern boundary of sector F between sector boundary and sentry point 6	Prior to 1 September each year	SAFFA. 5 metre width.	Yes	Potential loss of civilian assets adjacent to boundary
4.	Maintain fire breaks along all land boundaries and internal road easements	Sectors A,C,D,F,I,M,L,N,O,P,Q,R,S,T, Y,X.	Prior to 1 September each year	SAFFA; 5 metres width	No	Potential escape of fire from CUTA onto public roads or adjoining property
5.	Improve and maintain fire break	El Alamein Camp Area	Improve- ASAP. Maintain- Prior to 1 September each year	SAFFA. Minimum width 10 m, incorporating existing tracks and break. Maintain existing break at current 20 m width	No	Low probability of fire incursion in to camp area and resultant loss of range control and other assets in camp area.
7.	Maintain MSR through road to at least minor track standard	Sectors A,C,D,F,H,I,K,L		SAFFA	No	CFS or other fire response involving large tankers hampered
8.	Improve/maintain MSR to standard track through sectors K,L,M,N, and sector I from GR540 650 southward.	K,L,M,N,I		SAFFA. Key requirement is provision/maintenance of passing opportunities	No	Limited passing opportunities through these areas due to vegetation and topography in comparison to rest of route
9.	Install fire break around DFS/W	Sector H DFS/W	For consideratio n	SAFFA.	No	Potential for continued escape of fire from of DFS/W, impacting soil stability on adjacent slopes and creating repeated requirement for First or Second response attendance
10.	Maintain APZs	Assets A0001, A0002, A0004, A0005, A0006, A0007, A0008, A0009, A0010, A00014, A0016, A0025, A0029, Firing platforms 40mm range, AGR structures, DFS/W shed, STARZN Tower (APZ 12), Toilet/shower facility sector I, (APZ14)	Assess at least once every two years	3 m width: -Vegetation height <10 cm -No overhanging branches	No	Potential loss of assets
11.	Maintain APZ	A0003	Assess at least once every two years	2m width: -Vegetation height <10 cm -No overhanging branches	No	Potential loss of asset
12.	Maintain APZ	Storage container 40mm range	Assess at least once every two years	15 m width: -Vegetation height <10 cm -No overhanging branches	No	Potential loss of asset
13.	Maintain APZ	Middleback Homestead, shearing shed, shearers quarters (1&2) and drying shed	Assess at least once every two years	5 m width from safety fence: -Vegetation height <10 cm -Planted trees can be retained, but should be trimmed to 2m clearance from structures	No	Potential loss of retained heritage structures and damage to safety fence
14.	Fire track signage	All sectors	ASAP	SAFFA	No	Potential confusion and hampering of first and second response to a bushfire
15.	Water tank fittings	El Alamein Camp	ASAP- Consider practicality/ need of supplying Storz or round thread fittings (as relevant) in discussion with Port Augusta MFS	SA Fire Authorities Built Environs Section Policy No. 14 *Above Ground Water Storage Tanks for Fire Fighting Purposes*	No	Alternative water supply to standpipe and on-board reserves less accessible and time delays during response to fire in camp area and nearby
16.	Test and service standpipes	MGRS 52830 97230 55680 56190 53210 54920 47620 55810	Prior to 1 September each year	Clear access for trucks, strong water flow	No	Fire tenders may be forced to seek alternative water source causing delays in returning to the fire front
17.	Assess fire track and fire break condition	Site-wide	*At least* once every three years for non-critical tracks and breaks	Standard reported and updated in GEMS, works requests lodged for maintenance	No	Unknown access risks for units and external agencies responding to a fire.

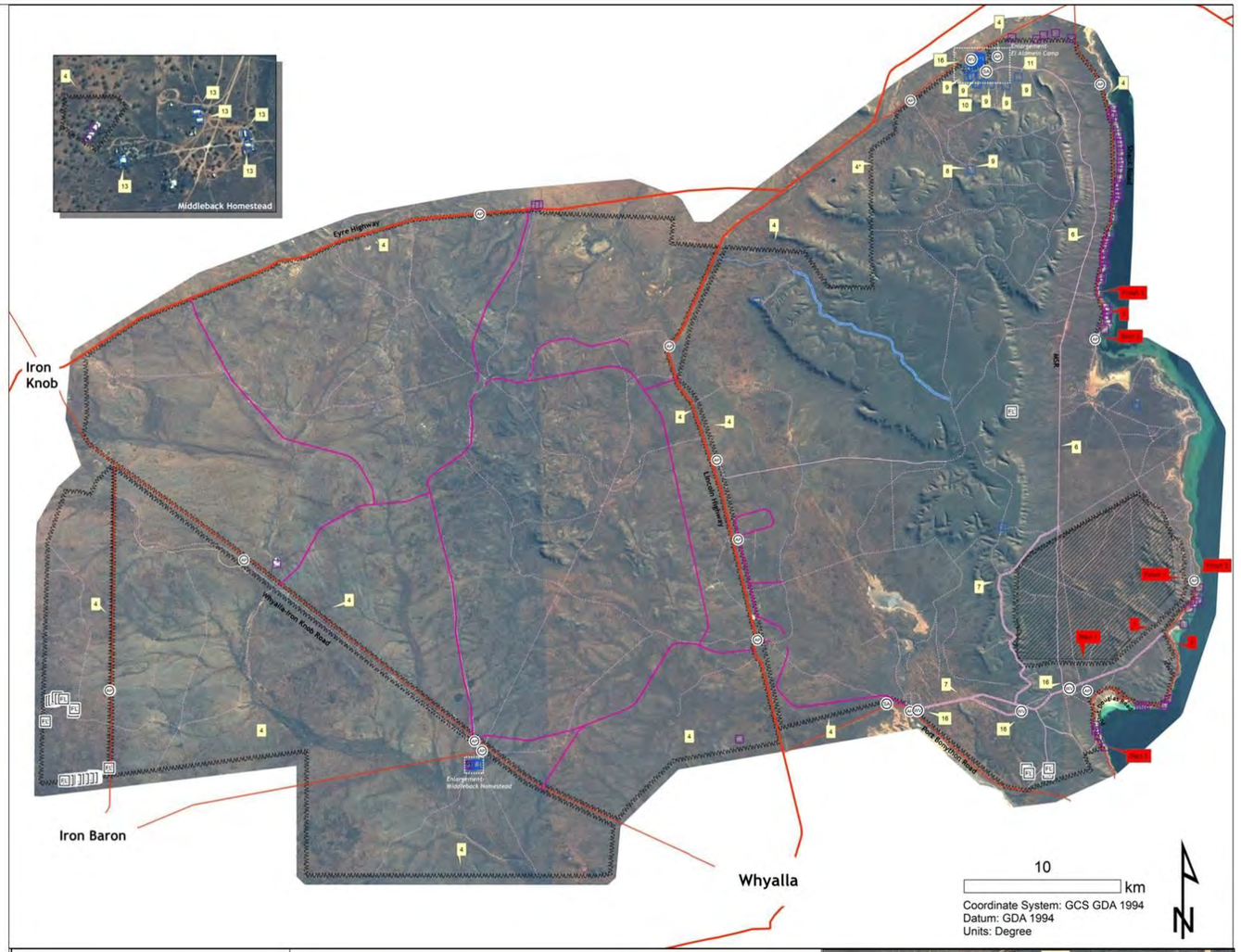
Explanatory Notes

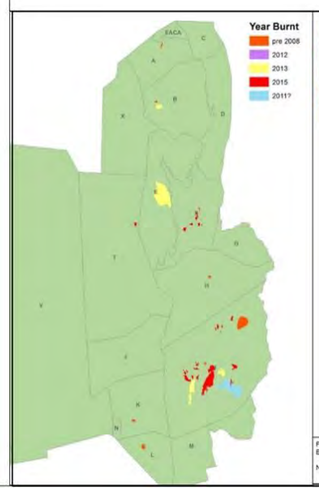
4*- This break is not part of the current program of fire break installation. It should be installed prior to Defence comencing use of this area under an expected future change in the MLDP.

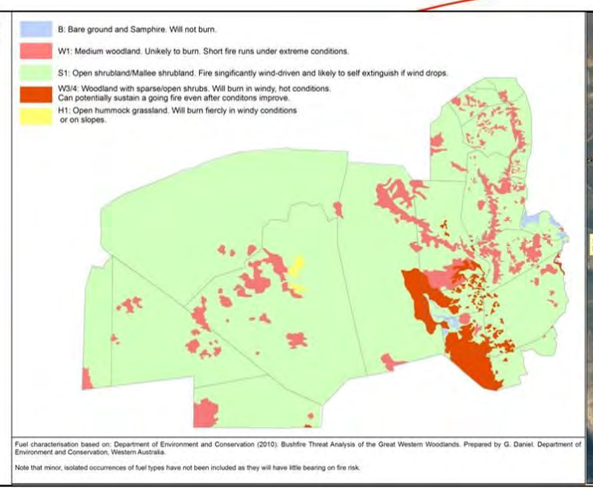
7*- Track shown as a SAFFA Standard Track on this map, and generally confoms (Minor on Bushfire Operations Map). However, some vegetation clearance and passing opportunities are required. On flatter ridegliness where topography and vegetation permit passing without dedicated formed road conformance to Standard track is not required. Post any works the sections complying with each standard will require re-assessment and mapping to provide a more accurte Bushfire Operations Maps for external authorities.

Critical works locations shown in Red

- Access/Emergency Exit
- Staging Areas
- Water Point Vehicle
- Defence Assets
- Threatened flora (Sandalwood)
- Civilian Assets
- Fire Break
- Proposed roads - 30% design
- Potential Minor Track
- Potential Standard Track
- Service Track
- Minor Track
- Standard Track (see notes)
- Highway
- Secondary/Minor Road
- HETA
- Bushfire Mitigation Works Program reference







Cultana Training Area
Bushfire Operations Plan

General
- Defence Sectors
- Contour (50 m interval)

Roads
- Highway
- Secondary/Minor Road- Sealed
- Mnor Road- Unsealed

Fire Tracks and Breaks
- Minor Track^
- Service Track
- Firebreak

Fire fighting infrastructure
- Airfield
- Helipad
- Emergency Exit
- Staging Areas
- Water Point Vehicle
- Best supply dams*
- Escape route

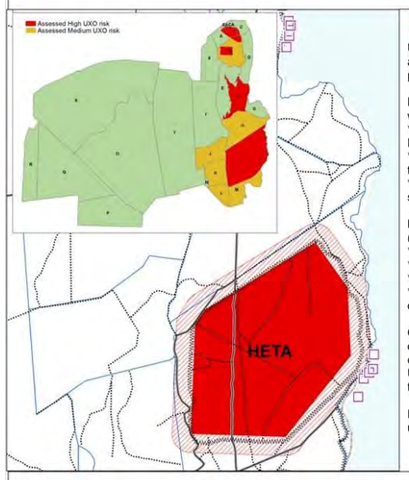
Assets
- Non-Defence asset
- Defence Asset Defendable

Fire fighting constraints
- HETA (main map)
- HETA (UXO map)
- 1000m standoff (UXO map)

Areas of higher fire risk
- Hummock Grassland
- Mallee

Areas of recent fire activity: DFSW, TAFFV, HETA. Other names and sectors shown for reference only

*Except in areas of steep terrain and Mallee, minor tracks generally provide clearance and passing opportunities equivalent to a standard track due to low surrounding vegetation
*Best supply dams hold water longest of the dams on CUTA, but are unreliable. Drafting with a portable pump is likely to be required to access water.



UNEXPLODED ORDNANCE

Unexploded ordnance (UXO) may be present anywhere on CUTA. However, standard operating procedures mean the risk is low in most locations.

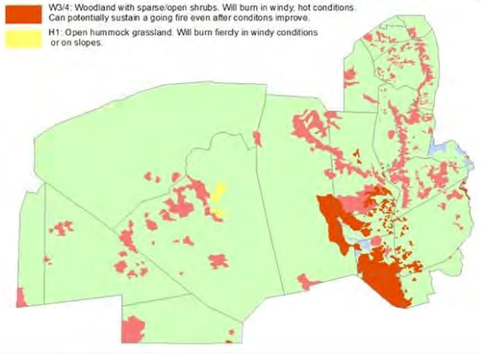
HETA: There is a HIGH risk posed by UXO within the High Explosive Target Area (HETA).
* Fire-fighting Vehicles SHOULD NOT enter the HETA.
* Aerial assets SHOULD NOT be deployed over the HETA during a fire.
* A stand-off distance of 1000 m from a going fire should be adopted.

DFSW, sector F and Northern ranges:
(Additional "High" areas on UXO map at left) .
* Do not drive on the actual ranges
* Vehicle access possible on range surrounds
* Do not use hand tools for excavation in these areas
* Immediately evacuate the area if any detonations occur

Other sites: The Officer in Charge of a practice or the Defence incident controller should be consulted to establish whether any uncleared UXO was generated by an exercise near a fire incident.

Earthmoving equipment should prefentially be used to augment existing tracks.

Vegetation fuel classification and fire potential



El Alamein Camp: Range Entry, Staging Area, Emergency Assembly Area

Cultana Training Area Activities Mitigation Plan

Fire Danger Ratings are for the Eastern Eyre District

EscapeRoute

HETA

TOBAN restrictions

Mallee

Dozer

Tanker (min 1500L)

4wd (min 500L)

Wind Restriction:
50 km/h Low to Very high
30km/h Severe and Extreme

Time restriction:

Standard-
Cease activity prior to 1300 Low to Very high
Cease activity prior to 1100 Severe to Extreme

OR

Base restriction around actual forecast changes in weather conditions through day

General field firing, per sector

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Severe	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Very high	✔	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒
High	✔	✔	≈ 🚒	≈ 🚒	≈ 🕒 🚒
Low-Moderate	✔	✔	✔	≈ 🚒	≈ 🚒

DFSW

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Severe	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Very high	✔	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒
High	✔	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Low-Moderate	✔	✔	✔	✔	✔

Fixed Ranges, Sector A

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Severe	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Very high	✔	✔	🚒	≈ 🚒	≈ 🚒
High	✔	✔	✔	🚒	🚒
Low-Moderate	✔	✔	✔	✔	✔

DEMS range

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Severe	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Very high	✔	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒
High	✔	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Low-Moderate	✔	✔	✔	✔	✔

Northeast F

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	✖	✖	✖	✖
Severe	✔	✖	✖	✖	✖
Very high	✔	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒
High	✔	✔	≈ 🚒	≈ 🚒	≈ 🕒 🚒
Low-Moderate	✔	✔	✔	≈ 🚒	≈ 🚒

Sector R

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	✖	✖	✖	✖
Severe	✔	✖	✖	✖	✖
Very high	✔	✔	✖	✖	✖
High	✔	✔	✖	✖	✖
Low-Moderate	✔	✔	✖	✖	✖

SW I and M

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	✖	✖	✖	✖
Severe	✔	✖	✖	✖	✖
Very high	✔	✔	≈ 🚒	≈ 🕒 🚒	≈ 🕒 🚒
High	✔	✔	≈ 🚒	≈ 🚒	≈ 🕒 🚒
Low-Moderate	✔	✔	✔	≈ 🚒	≈ 🚒

Mallee woodlands

	IP0	IP1	IP2	IP3	IP4
Catastrophic	✖	✖	✖	✖	✖
Extreme	✔	✖	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Severe	✔	✖	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
Very high	✔	✔	≈ 🕒 🚒	≈ 🕒 🚒	≈ 🕒 🚒
High	✔	✔	≈ 🚒	≈ 🚒	≈ 🕒 🚒
Low-Moderate	✔	✔	✔	≈ 🚒	≈ 🚒

Fire Environment	Consequences of Fire	Defence Asset location	Consider additional assets
R	Loss of protected fire-senstitive biodiversity values that form an offset for Defence acivities elsewhere on CUTA		
SW I and M	Potential loss of civilian assets (shacks) located immediately adjacent to CUTA boundary	Additional assets should be positioned for containment within TA, not for direct attack on fire within Impact Area	External agency response along Douglas Point Road
Northeast F	Potential loss of civilian assets (shacks) located immediately adjacent to CUTA boundary	Additional assets should be positioned for containment west of the MSR.	External agency response along Shack Road
DFSW	Environmental damage to surrounding hills, visible fire from public roads and minor reputational risk.	Firing point, or nearest safe location, for containment within DFSW	
Fixed Ranges, Sector A	Potential threat to El Alamein camp under unfavourable conditions.	Firing point, or nearest safe location, for direct attack on an ignition	
DEMS range	Minor environmental harm.	Nearest safe location for direct attack on an ignition	
General field firing	Limited risk to isolated civilian assets.	Closest possible location to ignition sources that lies outside RDAs	Earthmoving equipment
Mallee woodlands	Potential damage to fire-senstitive environmental values. Potentially dangerous fire behaviour that could endangered defence	Closest possible location to ignition sources that lies outside RDAs	Earthmoving equipment

10 km

N

Coordinate System: GDA 1994 MGA Zone 53
Projection: Transverse MercatorDatum: GDA 1994

Prepare

Cultana Training Area is a bushfire prone site.
This means that vegetation on Defence property or surroundings has the potential to carry a bushfire that puts lives and property at risk.

It is essential that you understand what to do if a bushfire occurs on site, and what precautionary actions may be required during the fire danger period.

The fire danger period ('bushfire season') usually runs from November to April. Daily fire danger ratings will be issued by the Country Fire Service during this period. When the fire danger is above Very High it will be very difficult for fire fighters to extinguish a bushfire. Weather reports (www.bom.gov.au), http://www.cfs.sa.gov.au/site/fire_bans_and_ratings.jsp and roadside signs will alert you to the current fire danger.

When a TOTAL FIRE BAN has been issued it is illegal to light fires or conduct activities such as welding that may start a fire. For more details you can download the CFS fact sheet - FIRE DANGER DAYS

If the fire danger rating reaches CATASTROPHIC do not attend the site unless explicitly instructed to do so by the SADFO or a person acting under their authority.

Base Support Contractors should prepare Defence sites for the Fire Danger Period in accordance with the site Bushfire Management Plan. You can assist with this process by ensuring that you report issues such as:
-areas adjacent to buildings that contain potential bushfire fuels such as leaf litter and debris
-gutters and roofs clogged with leaves
-unkept garden beds and lawns adjacent to native bushland
-trails and fire breaks that are untrafficable or overgrown

Act

Report all fires
On sighting suspected bushfire smoke notify Range Control.

Know what to do when a fire occurs
You may be alerted to the presence of a bushfire on or near CUTA by Range Control, through the media, or you may receive a text message. Further information will be available at http://www.cfs.sa.gov.au/site/warnings_and_incidents.jsp

There are three levels of bushfire alert that may be issued; Advice, Watch and Act and Emergency Warning. If you receive any of these alert messages outside of Defence communications (mobile devices, radio) you should contact Range Control to ensure they are aware of the situation.

If an Advice alert is issued you should ensure you are familiar with site evacuation and emergency procedures in Range Standing Orders and monitor the situation for an escalation in alert level. Make sure other people are also aware.

If a Watch and Act or Emergency Warning alert is issued you are under threat and need to take actions to ensure your safety.
-Do as instructed by Range Control.
-If no direction is received from Range Control establish the safety of evacuation routes based on the best available information on the fire.
-Fall back to El Alamein or an alternative pre-determined evacuation point.

Survive

During a bushfire the first unit on scene has initial control of the incident until handing over to range control or civilian authorities. In most circumstances if you are not on scene you will receive radio instructions that an incident is in progress.

Site evacuation procedures
As instructed by Range control unless communication is not possible. Otherwise evacuate via the most accessible safe route and re-establish comms ASAP to inform Range Control of safe egress from site.

Basic bushfire survival
You should assume that fire services will not attend site
If you find that you are in the path of a bushfire and cannot escape: Do not attempt to drive through or near a fire. **Ideally you should find a building made from non combustible (brick, concrete) material with limited openings that can be closed.**

Stay informed
Mobile devices and ABC local radio 639AM or 1485AM may provide information about how close the fire front is to you.

Stay in touch
If your phone is working ensure that authorities know your location. However, do not assume any assistance will result.

Avoid heat exposure
Cover exposed skin, preferably in heavy cotton materials.
Drink water as often as required.

Protect your sheltering place
If possible as the fire approaches ensure gutters and walls are free of potential bushfire fuels such as leaf litter, twigs and rubbish. Close all doors and windows. Block gaps under doors with wet towels. Secure a water supply by fillings inks, bathtubs and buckets.

When the fire arrives stay inside the building. Most fire fronts will pass quite quickly. Inside is the safest place to be. Have fire extinguishers on standby should the structure catch alight.

Extinguish small fires
As the fire front approaches and after it passes there are likely to be small spot fires or residual fires that pose a significant risk. When safe to do so put these out.

Remember; the best place to be is somewhere else- follow any instructions to evacuate

Prepare | **Act** | **Survive**

Site contacts

To report a fire call Range Control (08) 8641 5830. After hours call the RCO on 0408 834 094.

If Range control cannot be reached and assistance may be required, immediately dial 000.

To report required fire preparation works such as gutter clearing, trail maintenance or vegetation management call 1300 658 975 or use works request form webform AE574.

Current Fire Danger Rating is available by calling the CFS Information line on 1300 362 361 or at

http://www.cfs.sa.gov.au/site/fire_bans_and_ratings.jsp

Information on current bushfire incidents in the local area can be viewed at http://www.cfs.sa.gov.au/site/warnings_and_incidents.jsp

Whyalla Fire Station: 8645 7473
Port Augusta Fire Station: 8642 3895
Iron Knob Fire Station: 8646 2185

For more information on Defence bushfire management contact the Regional Environment and Sustainability Officer on (08) 7383 0291 or (08) 8305 5310

If a Watch and Act or Emergency Warning alert has been issued you may be instructed to evacuate the site or move to a safer place.