



**Western
Botanical**

Initial Review of Lake Mason for Potential Translocation Sites of *Atriplex* sp. Yeelirrie Station

Cameco Australia Pty Ltd
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Executive Summary

Atriplex sp. Yeelirrie Station (L. Trotter & A Douglas LCH25025) is a newly recognised species of *Atriplex* known from two genetically distinct populations found exclusively within the Yeelirrie paleochannel on Yeelirrie Station some 80 km west-south-west of Wiluna, Western Australia. It was listed as Threatened flora under the Wildlife Conservation act (1956) in February 2012. The western genotype population of *Atriplex* sp. Yeelirrie Station lies wholly within the economic orebody of the Yeelirrie uranium deposit and can not be conserved in development of the orebody. The eastern genotype population, occurring some 30 km east (downstream) of the western population, will be wholly conserved under a proposed conservation covenant, the details of which are yet to be finalised by Cameco Australia Pty Ltd (Cameco). The only option available for conservation of the western genotype of *Atriplex* sp. Yeelirrie Station is to translocate the population from its current location to a suitable secure site.

Western Botanical was commissioned by Cameco to investigate suitable potential translocation receptor sites for the western genotype population of *Atriplex* sp. Yeelirrie Station. Options for translocation investigated included; (i) sites within Yeelirrie Station, operated by Cameco, (ii) on Altona Station (also operated by Cameco), on (iii) Kaluwiri and (iv) Lake Mason Stations, proposed conservation parks, Unallocated Crown Land (UCL) and former pastoral leasehold managed by the Department of Parks and Wildlife (DPaW) for Conservation, and (v) on Yakabindie Station, operated by BHP Billiton. The two natural populations of *Atriplex* sp. Yeelirrie Station were also assessed to gauge native soil characteristics and associated species in a reasonably good rainfall season (late March 2015).

The potential translocation of *Atriplex* sp. Yeelirrie Station to suitable receptor sites at Lake Mason is possible but there remain some limitations to the proposal. Suitable sites would have the following characteristics: sites represent lake beds with significant sub-soil moisture available during dry seasons; soils being red-brown self mulching clays or with characteristics similar to those preferred by *Atriplex* sp. Yeelirrie Station in its natural habitat; sites not inundated at the time of assessment but may be inundated for short periods following high intensity rainfall events; low to moderate salinities; sites do not support other species with conservation significance that may be displaced by *Atriplex* sp. Yeelirrie Station; sites are reasonably accessible; sites represent sufficient area to ensure a translocated population is viable.

Sites assessed as being moderately suitable for potential translocation are noted below:

Target #	Site #	Vegetation Association Code	Vegetation Association Name	Location
Target 1c	22	CF LdS	Clay Flat with annual <i>Lawrenia densiflora</i>	Lake Mason East 50J 781301mE, 6946768mN
Target 4a	29	Fsp#2 S	<i>Frankenia pauciflora</i> Shrubland	Lake Mason Central 50J 758589mE, 6947053mN
Target 5	27	CF LdS	Clay Flat with annual <i>Lawrenia densiflora</i>	Lake Mason Central 50J 761077mE, 6949718mN
Target 14b	36	Tec tenuis S	<i>Tecticornia tenuis</i> WB37336 Shrubland	Lake Mason South- West 50J 737670mE, 6927856 mN

Lake Mason shares the same Land System (Carnegie) and is similar in many respects to the region supporting the eastern natural population of *Atriplex* sp. Yeelirrie Station. However, the lake bed is highly variable in micro-topography and soil type which is reflected in a highly variable vegetation cover across the lake bed. Largely the Lake Mason system is a saline clay lake bed with fringing gypsum dunes and calcrete platforms with sandy banks. The vegetation is dominated by *Tecticornia* species which are generally regarded as being more salt tolerant and more waterlogging tolerant than *Atriplex* species.

It may prove challenging to find large enough areas (ha) of site with suitable soil types and suitably low salinity at Lake Mason to reinstate the same area (76 ha) of *Atriplex* sp. Yeelirrie Station which is proposed to be taken in the mining of the western population of *Atriplex* sp. Yeelirrie Station at Yeelirrie. The four proposed moderately suitable translocation sites noted to date are relatively small in area and are scattered across the 60 or so kilometres of lake bed at Lake Mason.

1. Introduction

Atriplex sp. Yeelirrie Station (L. Trotter & A Douglas LCH25025) is a newly recognised species of *Atriplex* known from two genetically distinct populations found exclusively within the Yeelirrie paleochannel on Yeelirrie Station some 80 km west-south-west of Wiluna, Western Australia. It was listed as Threatened flora under the Wildlife Conservation act (1956) in February 2012. The western genotype population of *Atriplex* sp. Yeelirrie Station lies wholly within the economic orebody of the Yeelirrie uranium deposit and can not be conserved in development of the orebody. The eastern genotype population, occurring some 30 km east (downstream) of the western population, will be wholly conserved under a proposed conservation covenant, the details of which are yet to be finalised by Cameco Australia Pty Ltd (Cameco). The only option available for conservation of the western genotype of *Atriplex* sp. Yeelirrie Station is to translocate the population from its current location to a suitable secure site.

Any conservation through translocation of the western genotype of *Atriplex* sp. Yeelirrie Station would require the maintenance of physical separation of the translocated population from the eastern genotype population to maintain genetic isolation and prevent inadvertent gene transfer. As the species is regarded as being wind pollinated, a physical separation approximating that currently existing between populations is suggested as a measure of physical separation between the eastern genotype population and any translocated population.

The natural habitat supporting *Atriplex* sp. Yeelirrie Station is described in Western Botanical (2011). However, some species present (eg: *Tecticornia* spp.) were not fully identified in that report due to non-availability of suitable material and also the dry conditions preceding the surveys meant that some species were absent at that time. The descriptions of the habitats supporting and surrounding the two populations of *Atriplex* sp. Yeelirrie Station are therefore updated in this document with information reported in the baseline flora and vegetation report Western Botanical (2011) and updated in Addendum report Western Botanical (2015a) as well as in demography assessments Western Botanical (2014) and Western Botanical (2015b).

Western Botanical was commissioned by Cameco to investigate suitable potential translocation receptor sites for the western genotype population of *Atriplex* sp. Yeelirrie Station. Options for translocation investigated included; (i) sites within Yeelirrie Station, operated by Cameco, (ii) on Altona Station (also operated by Cameco), on (iii) Kaluwiri and (iv) Lake Mason Stations, proposed conservation parks, Unallocated Crown Land (UCL) and former pastoral leasehold managed by the Department of Parks and Wildlife (DPaW) for Conservation, and (v) on Yakabindie Station, operated by BHP Billiton. The two natural populations of *Atriplex* sp. Yeelirrie Station were also assessed to gauge native soil

characteristics and associated species in a reasonably good rainfall season (late March 2015).

2. Methods

2.1. Desktop Assessment

The desktop assessment utilised existing vegetation association descriptions and mapping (Western Botanical 2011), Land System mapping (Pringle *et al.* 1994, Payne *et al.* 1998), satellite imagery (Landsat, Google Earth) and Aster false colour imagery sourced and interpreted by Cameco (Figures 1 & 2).

The following key characteristics were used in determining potential assessment sites:

- Have secure land tenure, occur either at Yeelirrie Station (under Cameco management) or at Lake Mason (DPaW management).
- Have landscape and soil physical characteristics similar to those at the healthy natural populations of *Atriplex* sp. Yeelirrie Station.
- Are not inundated or waterlogged for prolonged periods of time and are not inundated or waterlogged at the time of assessment.
- Do not support species with conservation significance that may be displaced by the introduction of *Atriplex* sp. Yeelirrie Station.
- Do not support species that may hybridize with *Atriplex* sp. Yeelirrie Station (none known to date).
- Are reasonably accessible from firm ground.

2.2. Field Assessment

Prior to field works implementation, permission to access Lake Mason for the purposes of site investigations and undertaking limited soil profile assessments was granted by the Department of Parks and Wildlife, Kalgoorlie.

An eight day field assessment of Yeelirrie Station (2 days) Lake Mason (6 days) was undertaken between 24th and 31st March 2015 by Geoff Cockerton and Jono Warden using 4WD quad bikes to access the targets areas identified in the desktop assessment. In all cases, available existing tracks were used where possible with cross-country travel only undertaken where no alternative existed. In most cases, it was possible to negotiate a track between trees and shrubs, however, in the lake beds supporting *Tecticornia* sp. or *Atriplex vesicaria* shrublands, it was not possible to avoid impacting some plants.

At each site a description was made noting: species present, fringing vegetation (if appropriate), field measures of soil pH and EC (1+5, H₂O), soil colour and texture within strata observed to approximately maximum 40 cm depth.

Tracks and sample sites were recorded using GPS (+/- 5m accuracy) and digital photographs of sites and soils were recorded. Soil strata observed were described and samples were assessed for pH and electrical conductivity using a combined EC, pH meter

supplied by Cameco. For these assessments, approximately 15 ml soil and approximately 75 ml distilled water (made up to a total volume of 90 ml) were combined and the readings were made following sufficient time for the EC readings to stabilise (approximately 1 to 5 minutes per sample). By the nature of the sampling method, the records generated are approximate and should not be relied upon for accurate measures of pH or EC at each site. Soil samples were collected for each profile noted at each site and have been dried and stored for future reference or analysis. Soil textures were assessed in the field using deionised water and McDonald *et al.* (1990) and field (dry or moist) soil colours were recorded using Munsell Soil Colour Charts (Munsell Color 1994).

Specimens of all perennial flora species encountered were taken for verification and reference and vouchering at the WA Herbarium where necessary. Data was entered directly into a MS Excel workbook in the field for the majority of the program.

3. Results and Discussion

3.1. Desktop Assessment

The western population of *Atriplex* sp. Yeelirrie Station lies within the Mileura land system (characterised by calcrete platforms and alluvial plains with saline soils) while the eastern population occurs on the Carnegie land system (salt lakes and fringing alluvial plains and dunes of Kopi (gypsum) or sand).

A desktop review of land systems and associated habitats discounted Altona and Kaluwiri Stations as they did not contain significant (any) areas of the Mileura or Carnegie land systems (habitats with similarities in landforms, soils or vegetation associations) compared with the Yeelirrie paleochannel. Further, the desktop review discounted other portions of Yeelirrie Station as potential recipient sites as, with the limitation on physical separation required and development plans, it also lacks suitable habitat within the paleochannel outside it's current known distribution. The paleochannel both upstream and downstream of the western population of *Atriplex* sp. Yeelirrie Station is overlain by sand sheet and hardpan plains which are dissimilar to those soil conditions observed within the *Atriplex* sp. Yeelirrie Station's current known distribution. While the south-eastern extremity of the Yeelirrie Paleochannel extending into Yakabindie Station, Carnegie land system, was also considered, this station is managed by BHP Billiton and was excluded from further investigation as no negotiations have occurred with the land manager on this matter. The desktop review therefore settled on the majority of Lake Mason, a 60 km linear east-west extent of the Carnegie land system, as a potential translocation receptor site. Lake Mason had the added benefit of being a Proposed Conservation Park, Unallocated Crown Land (UCL), ex-pastoral lease, and under DPaW management for conservation.

An interpretation of Aster hyperspectral imagery conducted by Cameco shortlisted a series of targets within Lake Mason with similar reflectance to the habitats supporting the western genotype of *Atriplex* sp. Yeelirrie Station at Yeelirrie (Figure 1). These were used to improve targeting for field survey and assessment of soils and associated vegetation (Figure 2).

The Aster imagery analysis performed by Cameco utilised MgOH carbonated group composition & the AIOH Group Composition. The classification used an "Unclassified Image classification" method using ArcGIS Image Classification tool. The resultant pixels were reclassified into groups. A spatial analysis was then performed and some filtering, smoothing and generalizing of the data was performed.

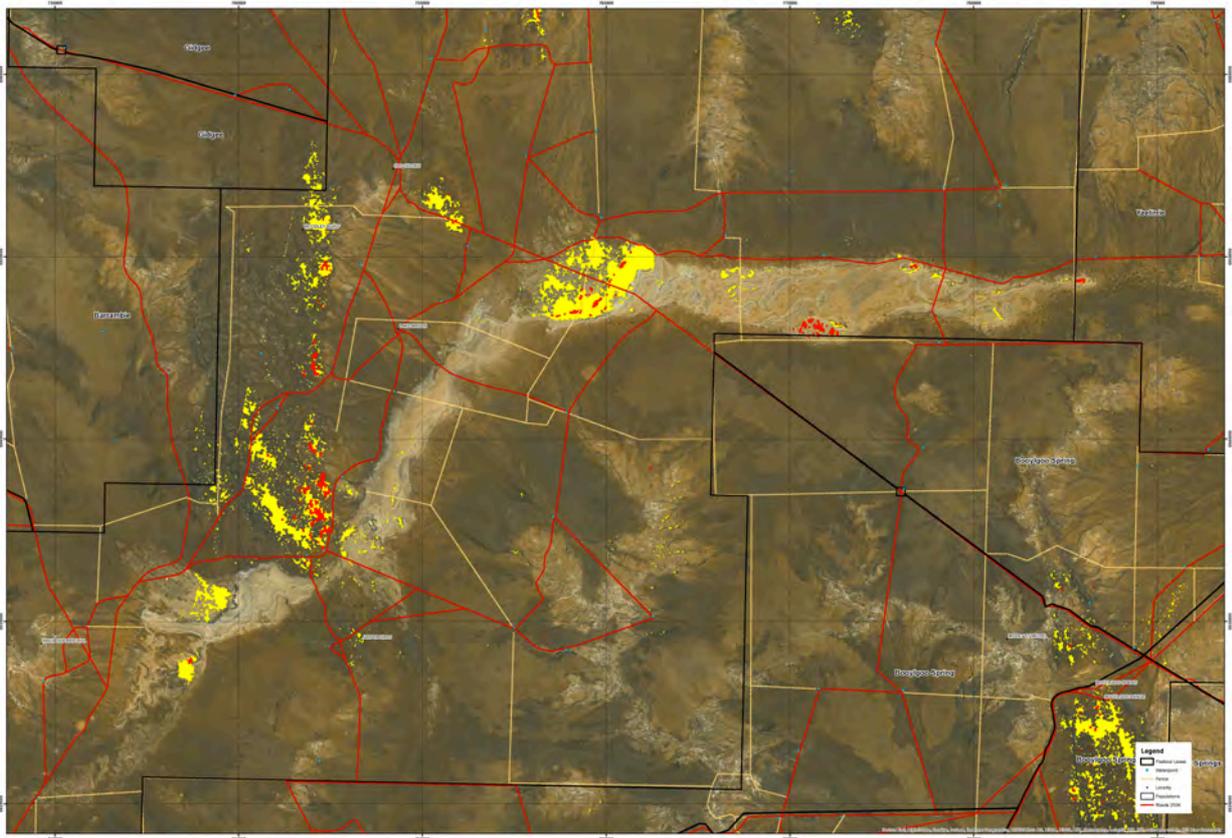


Figure 1. Lake Mason showing field investigation sites identified using Aster Imagery.

Key: Yellow = moderate value target; Red = high value target.

Note: Only targets within the Lake Mason paleochannel were investigated and those outside the palaeochannel were discounted from field survey.

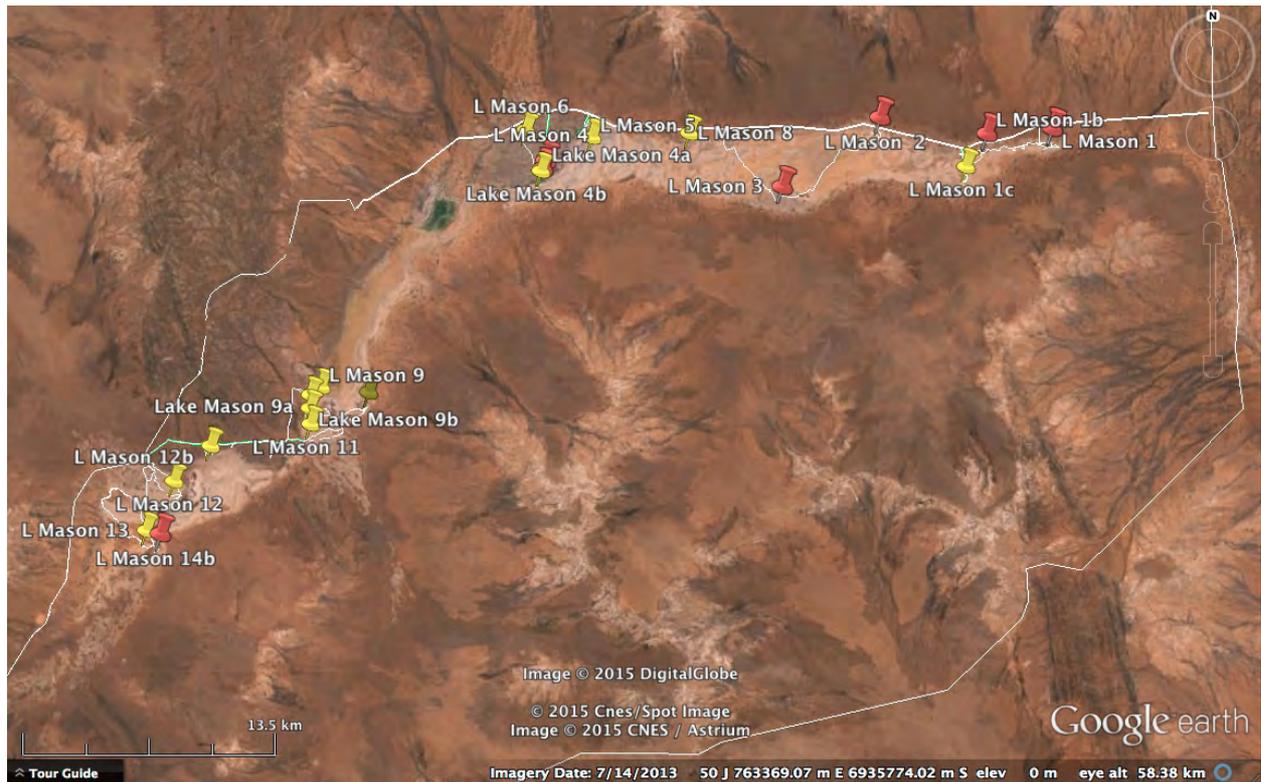


Figure 2. Map showing assessed field investigation sites.

Key: Colours reflect the medium & high value targets ascertained using Aster imagery (Figure 1), yellow = medium value, red = high value.

3.2. Field Assessment

The field assessment (23rd to 31st March 2015) followed significant cyclonic rainfall (27th Feb to 7th Mar 2015, 114.5mm at Yeelirrie, 75.7mm at Sandstone), consequently perennial grasses were flowering and perennial shrubs were growing actively while annual grasses and herbs had germinated and were at the seedling stage and the latter were therefore largely not assessed. Tracks recorded using GPS are presented in Figure 3.

Thirty eight sites at three geographical areas were assessed in the field survey:

- Western population of *Atriplex* sp. Yeelirrie Station, 1 site.
- Eastern population of *Atriplex* sp. Yeelirrie Station, 7 sites plus 9 sites of differing vegetation associations adjacent to the *Atriplex* sp. Yeelirrie Station populations.
- Potential translocation sites at Lake Mason, 22 sites.

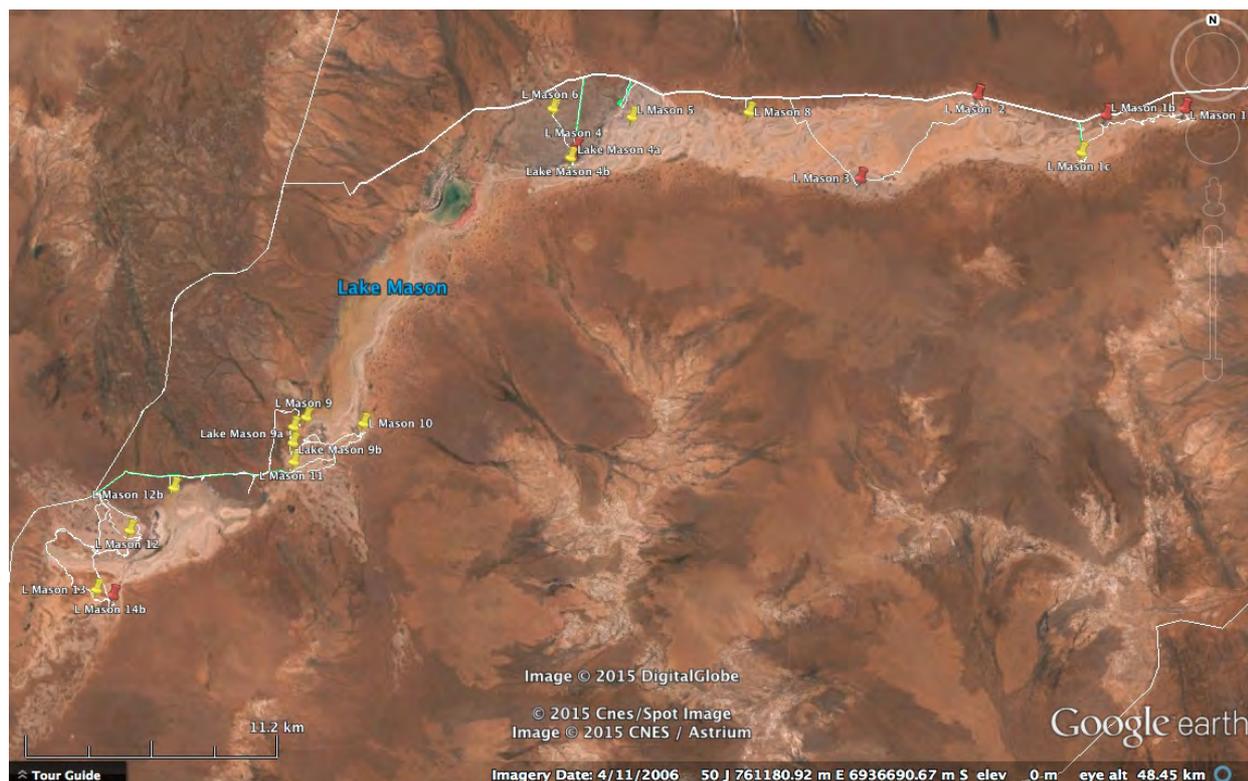


Figure 3. Lake Mason showing tracks accessed in field investigation.

Key: White lines indicate tracks used in field survey. Green lines indicate recommended tracks for future access.

3.2.1. Site Assessments at Natural Populations of *Atriplex* sp. Yeelirrie Station

The summary site characteristics were observed at natural populations of *Atriplex* sp. Yeelirrie Station, Table 1. Key points of difference between the eastern and western populations of *Atriplex* sp. Yeelirrie Station are also highlighted (shaded cells) in Table 1.

Of the sites assessed at the Eastern Population of *Atriplex* sp. Yeelirrie Station, two replicates of each vegetation association were targeted. Some parts of the *Atriplex* sp. Yeelirrie Station population were unhealthy. Plants in such areas had reduced canopies, appeared stressed, and were not thriving. To determine the factors contributing to poor condition, four replicates assessments were conducted here. Sites assessed are listed in Table 2.

Table 1. Summary of site characteristics of natural populations of *Atriplex* sp. Yeelirrie Station (key differences highlighted).

Vegetation Description	Western Population	Eastern Population
Land System and description.	Mileura Calcrete platforms and alluvial plains with saline soils	Carnegie Salt lakes and fringing alluvial plains and dunes of Kopi or sand
Natural populations occur on red-brown self mulching clays with moisture at shallow depth (5 cm or more).	yes	yes
Healthy natural populations have soil pH in the range of 6.4 to 6.7 and soil EC generally below 2500 micro Siemens per meter.	yes	yes
Unhealthy natural populations have soil EC generally significantly above 2500 micro Siemens per meter, ranging from 2365 to 14750 micro Siemens per meter at depths of 15 cm or more.	no	yes
Plants occur within lowest part of the landscape but are not waterlogged or inundated for long periods of time and are not waterlogged or inundated at the time of assessment.	yes	yes
Are associated with <i>Lawrenzia densifolia</i> (annual herb), annual grasses including <i>Eragrostis dielsii</i> , annual herbs <i>Atriplex codonocarpa</i> and <i>Zygophyllum compressum</i> .	yes	yes
May be associated with <i>Lycium australe</i> shrubland.	yes	yes
May be associated with <i>Tecticornia laevigata</i> , <i>Tecticornia indica</i> subsp. <i>bidens</i> WB37320 as a minor component of vegetation.	no	yes

Table 2. Sites assessed at Eastern Population of *Atriplex* sp. Yeelirrie Station.

Population Condition	Site #	Veg Code	Vegetation Association	Vegetation Description
	8	AbS	<i>Atriplex bunburyana</i> Shrubland	<i>Atriplex bunburyana</i> 0.8m, PFC 15 to 20%, occasional emergent <i>Lycium australe</i> 1.5m, <i>Maireana pyramidata</i> 1., <i>Rhagodia drummondii</i> 1m, PFC < 2%, occasional emergent <i>Acacia oswaldii</i> 2.5m PFC < 1%. Site represents the sloping bank of the playa system with <i>Acacia ayersiana</i> over <i>Atriplex bunburyana</i> Shrubland to the east and lies immediately up-slope of the <i>Frankenia cinerea</i> Shrubland (site 3). Site is elevated approximately 1 m above adjacent <i>Atriplex</i> sp. Yeelirrie Station population.
	9	AbS	<i>Atriplex bunburyana</i> Shrubland	<i>Atriplex bunburyana</i> 0.7 to 1m PFC 35 to 30%, occasional <i>Lycium australe</i> 0.5 to 1.2m, <i>Lawrenzia helmsii</i> 1m, <i>Frankenia</i> sp. (branched flower heads - sampled) 0.4m, PFC < 1%. Associated species <i>Cyperus bulbosa</i> 15 cm, <i>Poaceae</i> spp. x 2 annual (seedlings).
Healthy	1	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland	<i>Atriplex</i> sp. Yeelirrie Station 0.6m, PFC 20 to 25%, Associated species: <i>Lawrenzia densiflora</i> (seedling) dominant, <i>Frankenia cinerea</i> 0.15m, <i>Chenopod</i> (? <i>Maireana</i> sp.) seedling 2 cm, <i>Poaceae</i> sp. (annual) seedling 3 cm, <i>Eragrostis</i> sp. Yeelirrie Calcrete (1 plant, 2 cm). Soil surface is red-brown self mulching clay.
Healthy	5	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland	<i>Atriplex</i> sp. Yeelirrie Station 0.6m, PFC 25%, with occasional emergent <i>Lycium australe</i> 0.8 to 1.5m PFC < 1%, Associated species: <i>Lawrenzia densiflora</i> (seedling) dominant, <i>Poaceae</i> sp. (annual) seedling 3 cm, <i>Frankenia</i> sp. (as at site 4) 0.2m, Soil surface is red-brown self mulching clay with prominent cracks and settling of clay within.
Unhealthy	13	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland	
Unhealthy	14	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland	<i>Atriplex</i> sp. Yeelirrie Station 0.5m, PFC 5%. Sparse population of <i>Atriplex</i> sp. Yeelirrie Station, level site.
Unhealthy	15	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland	
	7	EtAv	<i>Eragrostis tenellula</i> grassland, <i>Atriplex vesicaria</i> Shrubland	<i>Eragrostis tenellula</i> 0.1 (grazed) to 0.3m (flowering) PFC 10%, <i>Atriplex vesicaria</i> 0.25m PFC 5%. Associated species of <i>Poaceae</i> sp. annual (seedling), <i>Chenopod</i> sp. perennial Indet 0.1m. <i>Eragrostis tenellula</i> has been grazed to approx. 10 cm high, basal leaves not eaten. Lots of cow dung present, probably preferentially grazed.

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Population Condition	Site #	Veg Code	Vegetation Association	Vegetation Description
	11	EtAv	<i>Eragrostis tenellula</i> grassland, <i>Atriplex vesicaria</i> Shrubland	<i>Atriplex vesicaria</i> 0.3m, PFC 25%, <i>Eragrostis tenellula</i> 0.2m, PFC 5%. Associated species occasional <i>Atriplex bunburyana</i> 0.6m, <i>Lawrenca helmsii</i> 0.8m, Poaceae sp. annual (seedling), <i>Lawrenca densiflora</i> (seedling), <i>Frankenia cinerea</i> 0.1m, <i>Chenopod</i> sp. Indet (seedling), collective PFC < 1%.
	3	FcS	<i>Frankenia cinerea</i> low Shrubland	<i>Frankenia cinerea</i> 5 to 10 cm high, PFC 5 to 10%, occasional emergent <i>Lycium australe</i> 1.5m, <i>Acacia oswaldii</i> 2.5m, <i>Atriplex bunburyana</i> 0.5m, PFC < 1%.
	12	LaAbTect	<i>Lycium australe</i> , <i>Atriplex bunburyana</i> , <i>Tecticornia laevigata</i> , <i>Tecticornia indica</i> subsp. <i>bidens</i> WB37320 Shrubland complex	<i>Lycium australe</i> 1 to 1.5m, PFC 8%, <i>Atriplex bunburyana</i> 0.6 to 1 m, PFC 15%, <i>Tecticornia laevigata</i> 0.4m, <i>Tecticornia indica</i> subsp. <i>bidens</i> WB37320 0.8m, PFC 5% collectively. Associated species: <i>Frankenia</i> sp. branched heads (as at site 9) 0.4m, <i>Eremophila glabra</i> subsp. Inland (AP Brown reference) 1.2m, <i>Solanum nummularium</i> 0.5m, <i>Scaevola spinescens</i> terete leaf form (GC & CR LCH 14560) 1m, <i>Pittosporum angustifolium</i> 1 to 8m, <i>Cratystylis subspinescens</i> 1.2m, <i>Eremophila</i> aff. <i>eriocalyx</i> 2m, <i>Senna artemisioides</i> subsp. <i>filifolia</i> 1.5m, <i>Cratystylis subspinescens</i> 1.2m, <i>Solanum lasiophyllum</i> 0.6m, <i>Ptilotus obovatus</i> 0.6m, <i>Eremophila hygrophana</i> 0.6m, PFC collectively < 2%. Associated species <i>Cyperus bulbosus</i> 15cm, <i>Bulbostylis barbata</i> 5cm, Poaceae spp. (seedlings), Goodeniaceae sp. (seedling), Fabaceae (Pea sp.) (seedling), <i>Marsilea drummondii</i> 0.25m, <i>Sida</i> sp. Indet (sampled).
Healthy	2	LaAsYS	<i>Lycium australe</i> , <i>Atriplex</i> sp. Yeelirrie Stn. Shrubland	<i>Lycium australe</i> 2m PFC 8% over <i>Atriplex</i> sp. Yeelirrie Station 0.6m PFC 5% with associated species Poaceae sp. annual (seedling) dominant, Goodeniaceae sp. annual seedling, <i>Lawrenca densiflora</i> seedling, <i>Tribulus</i> sp. (?terrestris) seedling, <i>Zygophyllum aurantiacum</i> seedling, <i>Z. compressum</i> seedling, Fabaceae (Pea) species seedling.
Unhealthy	16	LaAsYS	<i>Lycium australe</i> , <i>Atriplex</i> sp. Yeelirrie Stn. Shrubland	<i>Lycium australe</i> 1.5m PFC 10% over <i>Atriplex</i> sp. Yeelirrie Station 0.5m PFC 5 to 10%. Soil is a red clacking clay. Lots of dead <i>Atriplex</i> sp. Yeelirrie Station in this area, live plants mostly with dead parts in the canopy (drought effect?) and also leafless lower branches to approx. 15 cm (flooding effect due to recent rains and inundation).
	4	LhS	<i>Lawrenca helmsii</i> Shrubland	<i>Lawrenca helmsii</i> 0.8m PFC 5% <i>Frankenia</i> sp. (sampled) 0.2m PFC 10% with occasional <i>Atriplex bunburyana</i> 0.6m, <i>Atriplex vesicaria</i> 0.4m, <i>Maireana pyramidata</i> 0.5, <i>Sclerolaena fimbriolata</i> 0.3m, PFC <1% collectively.

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Population Condition	Site #	Veg Code	Vegetation Association	Vegetation Description
	10	LhS	<i>Lawrencia helmsii</i> Shrubland	<i>Lawrencia helmsii</i> 0.6 to 0.8 m, PFC 10%. Occasional <i>Sclerolaena fimbriolata</i> 0.2m, <i>Eragrostis tenellula</i> 0.3m, <i>Atriplex vesicaria</i> 0.2m, Unknown sp. (G Cockerton & J Warden WB37341) to 10 cm high, Collective PFC < 1%. Site is a gypsum flat (not a lunette).
	6	TLS	<i>Tecticornia laevigata</i> Shrubland	<i>Tecticornia laevigata</i> 0.4m, PFC 30 to 40%. Occasional <i>Atriplex vesicaria</i> 0.3m, PFC 2 to 3%. Associated species <i>Zygophyllum compressum</i> (seedling), <i>Lawrencia densiflora</i> (seedlings), <i>Chenopod</i> sp. Indet (seedling) to 2 cm. Site lies adjacent to (i) <i>Atriplex</i> sp. Yeelirrie Station Eastern population on red smectite clay to the east, (ii) <i>Lawrencia helmsii</i> shrubland on Gypsum lunette to the south and (iii) <i>Atriplex vesicaria</i> shrubland to the south-west.

Table 3. Site Characteristics, Yeelirrie Station: *Atriplex* sp. Yeelirrie Station Eastern Population and adjacent Vegetation Associations.

Site	Veg Code	Veg Name	Soil Profile	Colour & Texture	pH	EC (micro siemens per metre)	Soil Moisture	Comments
8	AbS	Atriplex bunburyana Shrubland	0 to 5 cm	Red 5YR 5/6 Sandy Loam	n/a	n/a	dry	
			5 to 30 cm	Red 5YR 5/6 Sandy Loam	6.56	1,948	moist	Same soil texture throughout, surface 5 cm dried out. Fine roots throughout the 5 to 30 cm stratum, absent in dry surface.
9	AbS	Atriplex bunburyana Shrubland	0 to 22 cm	Red 2.5YR 5/6 clayey sand	6.44	415	moist	Relatively low salinity, lots of fine roots throughout.
1	AsYS	Atriplex sp. Yeelirrie Station shrubland Healthy	0 to 2 cm	red medium clay (MC)	6.56	485	dry	
			2 to 16 cm	red medium clay (MC)	6.67	144	moist	
			16 cm +	pale cream fine sandy loam (FSL)	6.57	2,314	moist	Nodular gypsum present, fine roots present
			20 cm	orange cream fine sandy loam (FSL)	6.5	2,440	moist	Fine roots present

Initial Review of Lake Mason for Potential Translocation Sites for *Atriplex* sp. Yeelirrie Station

Site	Veg Code	Veg Name	Soil Profile	Colour & Texture	pH	EC (micro siemens per metre)	Soil Moisture	Comments
5	AsYS	<i>Atriplex</i> sp. Yeelirrie Station shrubland Healthy	0 to 40 cm	red medium clay (MC)	6.68	1,069	moist	No stratigraphy noted, medium clay throughout to approx. 0.5m. Site is adjacent to one of the Demography Assessment quadrats. Thick lateral roots at 5 to 10 cm, finer roots at 20 cm.
11	AvS	<i>Atriplex vesicaria</i> shrubland	0 to 0.5 cm	red fine silty sand	n/a	n/a	dry	Site has a thin veneer of red silty sand over gypsum over fine sandy loam
			0.5 to 11 cm	Pink 2.5YR 8/4 clayey sand with cobbles of aggregated gypsum	6.63	2,160	dry	
			11 to 25 cm	Reddish yellow 5YR 7/6 fine sandy loam	6.45	2,250	moist	
13	AsYS	<i>Atriplex</i> sp. Yeelirrie Station Shrubland Unhealthy	0 to 2 mm	White crusted surface sandy clay (SC)	6.49	540	dry	Taken from adjacent to a live <i>Atriplex</i> sp. Yeelirrie Station plant, on a non-vegetated mound
			2 mm to 8 cm	Dark red silty sand (texture of sand when dry)	6.64	14,750	dry	Taken from under a live <i>Atriplex</i> sp. Yeelirrie plant. Massive clay, lots of fine roots present
			8 to 16 cm	Dark red 2.5 YR 3/6 heavy clay	6.46	5,630	Moist	Taken from under a live <i>Atriplex</i> sp. Yeelirrie plant. Massive clay, no roots noted

Initial Review of Lake Mason for Potential Translocation Sites for *Atriplex* sp. Yeelirrie Station

Site	Veg Code	Veg Name	Soil Profile	Colour & Texture	pH	EC (micro siemens per metre)	Soil Moisture	Comments
			16 cm +	'pale creamy' loam (gypsum)	not tested			
14	AsYS	Atriplex sp. Yeelirrie Station Shrubland Unhealthy	0 to 8 cm	dark red 2.5YR 5/6 strongly pedal heavy clay	6.69	4,760	Dry	blocky strongly pedal cracking clay
			8 to 16 cm	Pink 2.5YR 8/4 loam (L)	6.69	11,790	Moist	gypseous loam
15	CF	Clay Flat, no vegetation (adjacent to Atriplex sp. Yeelirrie Station Shrubland)	0 to 10 cm	Dark red medium clay (MC)	6.49	30,600	Moist	No Atriplex sp. YS growing here, site is between the Atriplex sp. Yeelirrie Station population to the west and <i>Lawrenzia helmsii</i> population on gypsum to the east. No living perennial plants in this area.
7	EtAvS	<i>Eragrostis tenellula</i> Grassland, <i>Atriplex vesicaria</i> Shrubland	0 to 0.5 cm	Clay and cryptogammic crusting, grey algal crust	6.5	587	Dry	Upper crustal surface very variable. Where gypsum crust is at surface, Algal cryptogammic crust is present. Where clumps of <i>Eragrostis tenellula</i> are present, these are growing in cracks in the gypsum, filled with up to 9 cm of red fine silty sand.
3	FcS	Frankenia cinerea shrubland	0 to 2 cm	Pale orange silty sand	6.66	580	Dry	
			2 to 15 cm	Red silty loam (SL)	6.76	830	Moist	

Initial Review of Lake Mason for Potential Translocation Sites for *Atriplex* sp. Yeelirrie Station

Site	Veg Code	Veg Name	Soil Profile	Colour & Texture	pH	EC (micro siemens per metre)	Soil Moisture	Comments
			15 cm +	Creamy orange fine sandy loam (FSL)	6.73	2,138	moist	
2	LaAsYS	Lycium australe, Atriplex sp. Yeelirrie Station shrubland Healthy	0 to 2 cm	Red loam (L)	6.47	515	dry	
			2 to 20 cm	Red clay-loam (CL)	6.64	89	moist	Lots of roots noted
			20 to 25 cm	Pale orange-cream Light sandy loam (SCL-)	6.64	2,500	moist	No roots noted in limited sample
16	LaAsYS	Lycium australe - Atriplex sp. Yeelirrie Station shrubland Unhealthy	0 to 11 cm	Red 2.5 YR 5/8 medium clay (MC)	6.55	77	dry	
			11 to 32 cm +	Red 2.5 YR 5/8 medium clay (MC)	6.6	2,365	moist	Fine roots from 10 cm +; thicker lateral roots at 15 cm
12	LaAbTect	Lycium australe, Atriplex bunburyana, Tecticornia laevigata, Tecticornia indica subsp. bidens WB37320 Shrubland complex	0 to 0.5 cm	Cryptogammic crust, thallic lichens and black algal crusts	n/a	n/a	dry	Non-saline site, low in landscape, has a wide range of species that elsewhere are found in both saline and non-saline environments.
			0.5 to 12 cm	Yellowish red 5YR 5/6 light sandy clay (SCL-)	6.59	197	moist	

Initial Review of Lake Mason for Potential Translocation Sites for *Atriplex* sp. Yeelirrie Station

Site	Veg Code	Veg Name	Soil Profile	Colour & Texture	pH	EC (micro siemens per metre)	Soil Moisture	Comments
			12 to 40 cm	Dark red 2.5YR 6/6 sandy clay (SC)	6.47	72	moist to wet	Large lateral roots to 5 mm diameter noted at 20 cm depth
4	LhS	Lawrencia helmsii Shrubland	0 to 0.5cm	Crust and silty sand lag			dry	
			0.5 to 30 cm +	Pale cream loam (L)	6.7	2,520	moist	Roots present
10	LhS	Lawrencia helmsii Shrubland	0 to 0.5 cm	White gypsum hard cemented crust with Algal cryptogams and lag of fine red silty sand				
			0.5 to 10 cm	White gypsum sandy loam with aggregate cobbles and crystalline cemented gypsum			dry	Few lateral roots noted at interface between dry and moist sandy loam at 10 cm depth
			10 to 25 cm	Pinkish white 2.5YR 8/2 sandy loam	6.55	3,900	moist	Massive moist sandy loam, no roots noted
6	TIS	Tecticornia laevigata Shrubland	0 to 2 cm	5YR 6/6 loamy sand	6.55	1,728	dry	Clay crust with fine cracks and salt crystals
			2 to 9 cm	5YR 5/6 loam fine sandy	6.62	1,832	moist	Dark coloured fine to medium roots to 2 mm diameter present

Initial Review of Lake Mason for Potential Translocation Sites for *Atriplex* sp. Yeelirrie Station

Site	Veg Code	Veg Name	Soil Profile	Colour & Texture	pH	EC (micro siemens per metre)	Soil Moisture	Comments
			9 to 35 cm	2.5YR 4/6 sandy clay	6.58	4,720	moist	This soil stratum with numerous white crystalline inclusions ?NaCl. Site appears to be slightly lower in landscape than the adjacent <i>Atriplex</i> sp. Yeelirrie Stn. population. No roots present.
			0.5 to 13 cm	5YR 8/1 fine silty sand with gypsum nodules	6.47	2,325	moist	Lots of grass roots
			13 to 30 cm	5YR 6/8 fine clayey sand with crystalline gypsum	6.61	2,530	moist	Few fine roots
			22 +??	white gypsum hard, cemented, coarse to medium sand	6.48	4,470	moist	Firm cemented saline gypsum, no roots present

Table 4. *Atriplex* sp. Yeelirrie Station, Western Population, adjacent vegetation description

Site	Veg Code	Veg Name	Soil Profile	Colour & Texture	pH	EC (micro siemens per metre)	Soil Moisture	Comments
17	MxW	Melaleuca xerophila Woodland	0 to 35 cm	Light brown (no colour chart in the field) clay loam (CL)	6.45	108	moist	This stratum dry in the upper 10 cm, lots of fine roots throughout this stratum
			35 cm +	Red clayey sand with hard gravely subrounded nodules 0.5 to 1 cm diameter	6.48	3,260	moist	Few larger roots in this stratum

The eastern population of *Atriplex* sp. Yeelirrie Station occurs on the Carnegie Land System, saline lake beds and associated fringing vegetation on alluvial plains and kopi (gypsum) platforms and dunes. The sites assessed within and adjacent to populations of *Atriplex* sp. Yeelirrie Station fall into two broad categories; (i) Lake Fringe communities and (ii) Lake Bed Communities. *Atriplex* sp. Yeelirrie Station occurs exclusively in the latter. These sites are also described in Appendix 1.

Lake Fringe communities:

The *Atriplex bunburyana* shrublands (sites 8, 9) lie highest in the landscapes investigated and represent the sandy banks of the lake systems, immediately down slope of the *Acacia ayersiana* (Mulga) woodlands. They occur on dry siliceous silty sands which are moderately saline (1,948 to 4,470 micro Siemens per metre). Though occurring nearby, *Atriplex* sp. Yeelirrie Station is absent from this community.



Image P3254111

The *Frankenia cinerea* (site 3) low shrubland occur downslope of the *Atriplex bunburyana* Shrubland and grow on saline pale orange silty sands with low to moderate salinity (580 to 2,138 micro Siemens per metre. Though occurring nearby, *Atriplex* sp. Yeelirrie Station is absent from this community.



Image P3244068

Lawrencia helmsii shrublands on low gypsum mounds lie adjacent to *Atriplex* sp. Yeelirrie Station populations and occur on highly saline soils 2,520 to 3,900 micro Siemens per metre. Though occurring nearby, *Atriplex* sp. Yeelirrie Station is absent from this community.



Image P3244071

Lake Bed Communities:

Healthy populations of *Atriplex* sp. Yeelirrie Station (sites 1, 2, 5) occur on deep red-brown self mulching clays or duplexes of red-brown self mulching clay over gypsum that appear well drained and, though inundated in recent heavy rainfall events, were dry at the surface at the time of assessment approximately 3 weeks after rainfall. Here plants had full healthy canopies and were flowering. Soil was consistently a massive red-brown self mulching medium clay with EC's in the range of 89 to 2,500 micro Siemens per metre. Where *Atriplex* sp. Yeelirrie Station co-occurs with *Lycium australe* (site 2), the soil EC is in the range of 89 to 2500 micro Siemens per metre and soils are fine sandy loam to clay loam.



Image P3244075

Unhealthy populations of *Atriplex* sp. Yeelirrie Station (sites 13, 14, 15 (bare clay lake bed) and 16) showed signs of environmental stress, many dead *Atriplex* sp. Yeelirrie Station plants and remnants of dead *Atriplex* sp. Yeelirrie Station plants on low soil mounds. These had soil EC measures in the range of 2,365 to 14,750 micro Siemens per metre. It is suggested that increasing salinity is the major cause of decline in these parts of the *Atriplex* sp. Yeelirrie Station population. These sites would have been inundated in the recent

rainfall event. Where *Atriplex* sp. Yeelirrie Station co-occurs with *Lycium australe* (site 16), the soil EC is in the range of 77 to 2,365 micro Siemens per metre and soils are fine sandy loam to clay loam. The *Lycium* plants are healthy while the *Atriplex* is sub-optimal in condition.



Image P3264123, Unhealthy population (remnants of dead plants) in foreground.

Given there is some overlap on soil salinities between the healthy and unhealthy populations of *Atriplex* sp. Yeelirrie Station, salinity per-se may not be the only determining factor in population health.

The *Eragrostis tenellula* grassland - *Atriplex vesicaria* Shrublands (sites 7, 11) occur on moderately saline (2250 micro Siemens per metre) fine silty sands with gypsum inclusions. These sites seem well drained, were slightly raised in the landscape compared with *Tecticornia* spp. and *Atriplex* sp. Yeelirrie Station populations and showed no signs of recent inundation. Though occurring nearby, *Atriplex* sp. Yeelirrie Station is absent from this community.



Image P3254106

The Samphire (*Tecticornia laevigata*) Shrubland (site 6) occurs adjacent to the *Atriplex* sp. Yeelirrie Station population, however, occurs on massive red saline loamy sand to sandy clay at depth, EC 1728 to 4720 micro Siemens per metre. Though occurring immediately adjacent, *Atriplex* sp. Yeelirrie Station is largely absent from this community except on the fringing ecotone between communities.



Image P3254089

The *Lycium australe*, *Atriplex bunburyana*, *Tecticornia laevigata*, *Tecticornia indica* subsp. *bidens* WB37320 Shrubland complex occurs on a non-saline (EC 92 to 197 micro Siemens per metre) light sandy clay to sandy clay in a depression high in the landscape with a wide range of associated species. The absence of *Atriplex* sp. Yeelirrie Station from this site is perplexing.



Image P3254120

The brief assessment of the above sites, communities supporting *Atriplex* sp. Yeelirrie Station and adjacent communities where the species is absent, reinforces the strong correlation between the presence of red-brown self mulching clay (at least at the surface), low to moderate salinities, minimal tendency for inundation and the presence of *Atriplex* sp. Yeelirrie Station.

3.2.2. Site Assessments at Lake Mason

Twenty-two sites across Lake Mason were assessed for suitability as *Atriplex* sp. Yeelirrie Station translocation sites. Of the original list of targets, sites 5 and 12b could not be accessed due to surface water and boggy conditions and are also therefore considered inappropriate for potential translocation. Four of the sites assessed, sites 1c, 4a, 5 and 14b are considered candidates for translocation and are discussed here while 18 sites were rated as marginal or not suitable for a range of reasons (soil type, salinity) and are not discussed in detail with site data presented in Appendix 1. Results of site assessment and identification of candidate translocation sites are presented in Table 5.

Target 11 (site 34) was also considered potentially suitable for *Atriplex* sp. Yeelirrie Station translocation and had a red 10R 4/6 medium self-mulching clay soil and an EC of 8390 micro Siemens per meter. However, this site supports a species of *Atriplex* that has not been identified fully (*Atriplex* sp. aff. *A. amnicola* WB37343). It has leaves and fruits atypical of *A. amnicola* and requires the collection of fresh flowering and fruiting material. If this is a form of *A. amnicola*, it would represent a slight southern range extension for the species but site 11 is the only site supporting this species known at Lake Mason to date. For this reason, Target 11 has been discounted as a potential translocation site, pending verification of the identification of *Atriplex* sp. aff. *A. amnicola* WB37343. The potential for hybridisation between *Atriplex* sp. aff. *A. amnicola* WB37343 and *A. sp.* Yeelirrie Station is unknown at this stage and a precautionary approach is recommended.

The areas (ha) of each of the potential translocation receptor sites were not mapped or estimated in the field.

Table 5. Summary of site assessment results of candidate translocation sites.

Target #	Size (ha)	Location	Soil / Landscape	Depth	Soil pH	Soil EC	Vegetation	Comments	Photo Plate #
1c	Small	Lake Mason East	Red-brown self mulching medium clay. Soil surface shows mosaic of dark red clay and lighter slightly raised clay with higher salt content. Less saline clay is crumbly and granular like the soil supporting <i>Atriplex</i> sp. Yeelirrie Station on the orebody area.	0 to 2 cm	6.42	1,170	Clay flat with dead <i>Lawrencia densiflora</i> prevalent, up to 0.6m high x 0.8m wide and would have been up to 50% PFC when alive. Lots of <i>L. densiflora</i> seedlings to 2 cm present.	Red-brown self mulching medium clay. Soil surface shows mosaic of dark red clay and lighter slightly raised clay with higher salt content. Less saline clay is crumbly and granular like the soil supporting <i>Atriplex</i> sp. Yeelirrie Station on the orebody area.	168 to 170
			Red medium clay (MC)	2 to 12 cm	6.45	17,570		This site looks like the eastern population of <i>Atriplex</i> sp. Yeelirrie Station where the <i>Atriplex</i> sp. Yeelirrie Station plants are dying due to high salinity. The salinity here makes it less suitable for a translocation program though the soil is similar in many respects.	
			Red medium clay (MC)	12 to 25 cm	6.4	11,200	Site has very similar soil to the red-brown self mulching clay of the Yeelirrie Orebody area. No other perennials are present.		
			Red 2.5YR 6/8 sandy clay (SC) with gravel to 5mm	25 +	6.5	5,740		Similar soil, no other perennials, however, may be too saline but may still be worthy of further investigation and trial.	

Initial Review of Lake Mason for Potential Translocation Sites for *Atriplex* sp. Yeelirrie Station

Target #	Size (ha)	Location	Soil / Landscape	Depth	Soil pH	Soil EC	Vegetation	Comments	Photo Plate #
4a	Small	Lake Mason Central	Strong brown 7.5YR 4/6n medium clay	0 to 2 cm	6.52	513	<i>Frankenia</i> sp. #2 Shrubland on the northern margin of a bare clay flat, and on the southern margin of a <i>Melaleuca xerophila</i> low shrubland. Vegetation of <i>Frankenia</i> sp. #2 PFC 5 to 10% in patches.	Moderate area but devoid of perennial vegetation, fringed on southern side by <i>Tecticornia</i> sp. Shrubland.	204 to 206
			Strong brown 7.5YR 4/6n medium clay	2 to 15 cm	6.44	1780			
5	Small	Lake Mason Central	Reddish brown 5YR 5/4 medium clay, flocculated, moderately dispersive	0 to 5 cm	6.09	274	Area with most perennial vegetation dead due to recent flooding event. A few survived the recent flooding and are growing well.	May be suitable for <i>Atriplex</i> sp. Yeelirrie Station translocation	197 to 199
							Massive regeneration of <i>Lawrenzia densiflora</i> (seedlings), a few live <i>Frankenia cinerea</i> 0.2m, <i>Maireana</i> sp. Lake Mason (WB37339) 0.2m. Additional annuals: <i>Atriplex codonocarpa</i> (seedlings).		
				5 to 15 cm	6.17	2,380	Site is fringed by <i>Tecticornia</i> sp. #3 (WB37332) Shrubland.		
14b	Small	Lake Mason South-West	Clay crust, medium clay (MC), massive, non-pedal, low dispersive	0 to 2 cm	not tested	not tested	<i>Tecticornia tenuis</i> WB37336 shrubland. <i>Tecticornia tenuis</i> WB37336 0.7 to 1 m high, PFC 3 to 40%, growing in a ring around the inner margin of a red cracking clay flat, surrounded by <i>Tecticornia laevigata</i> 0.3m, PFC 30 to 40%. Very healthy population of both <i>Tecticornia</i> spp. Extensive recruitment of <i>Lawrenzia densiflora</i> and <i>Atriplex codonocarpa</i> seedlings.	Lateral roots noted at 10 to 15 m depth. If <i>Atriplex</i> sp. Yeelirrie Station can be established within the bare central part of the clay flat then this would be a good site, however, may be too saline for the species?	294 to 298

Initial Review of Lake Mason for Potential Translocation Sites for *Atriplex* sp. Yeelirrie Station

Target #	Size (ha)	Location	Soil / Landscape	Depth	Soil pH	Soil EC	Vegetation	Comments	Photo Plate #
			Red 2.5 YR 5/8, medium clay (MC), massive, non-pedal, low dispersive	2 to 7 cm	not tested	not tested			
			Red 2.5 YR 5/8, medium clay (MC), massive, non-pedal, low dispersive	7 to 30 cm +	6.16	6,540	Centre of the clay flat has no perennials very few annuals growing within it.		

Representative images of sites are presented overleaf.

Target 1c Site 22 CF LdS Clay Flat with annual *Lawrenxia densiflora*



Image P3274169

Clay flat with dead *Lawrenxia densiflora* prevalent, up to 0.6m high x 0.8m wide and would have been up to 50% PFC when alive. Lots of *L. densiflora* seedlings to 2 cm present. Site is a self mulching clay very similar to that of the Yeelirrie Orebody area and no other perennials are present.

Profile Depth	Soil description	pH	EC
0 to 2 cm	dry crust of red / white medium clay (MC)	6.42	1,170
2 to 12 cm	red medium clay (MC)	6.45	17,570
12 to 25 cm	red medium clay (MC)	6.4	11,200
25 +	red 2.5YR 6/8 sandy clay (SC) with gravel to 5mm	6.5	5,740

Red-brown self mulching medium clay. Soil surface shows mosaic of dark red clay and lighter slightly raised clay with higher salt content. Less saline clay is crumbly and granular like the soil supporting *Atriplex* sp. Yeelirrie Station on the orebody area. This site looks like the eastern population of *Atriplex* sp. Yeelirrie Station where the *Atriplex* sp. Yeelirrie Station plants are dying due to high salinity. The high salinity here makes it less suitable for a translocation program though the soil is similar in many respects.

Target 4a Site 29 Fsp#2 S *Frankenia pauciflora* Shrubland



Image P3284204

This site represents a narrow band between a *Melaleuca xerophila* woodland to the right of frame (north) and a bare clay flat to left of screen (south).

Frankenia pauciflora Shrubland on the northern margin of a bare clay flat, and on the southern margin of a *Melaleuca xerophila* low shrubland. *Frankenia pauciflora* PFC 5 to 10% in patches. Moderate area but devoid of perennial vegetation, fringed on southern side by *Tecticornia* sp. Shrubland.

Profile Depth	Soil description	pH	EC
0 to 2 cm	strong brown 7.5YR 4/6 medium clay (MC)	6.52	513
2 to 15 cm	strong brown 7.5YR 4/6 medium clay (MC)	6.44	1,780

Target 5 Site 27 CF LdS Clay Flat with annual *Lawrenxia densiflora*



Image P3284197

Area with most perennial vegetation dead due to recent flooding event. A few survived the recent flooding and are growing well. Massive regeneration of *Lawrenxia densiflora* (seedlings), a few live *Frankenia cinerea* 0.2m, *Maireana* sp. Lake Mason (WB37339) 0.2m. Additional annuals: *Atriplex codonocarpa* (seedlings). Site is fringed by *Tecticornia* sp. #3 WB37332 Shrubland.

Profile Depth	Soil description	pH	EC
0 to 5 cm	reddish brown 5YR 5/4 medium clay, flocculated, dispersive	6.0 9	274
5 to 15 cm	reddish brown 5YR 5/4 medium clay	6.1 7	2,380

Target 14b Site 36 Tec tenuis S *Tectornia tenuis* WB37336 Shrubland



Image P3304294

Tectornia tenuis WB37336 shrubland. *Tectornia tenuis* WB37336 0.7 to 1 m high, PFC 3 to 40%, growing in a ring around the inner margin of a red cracking clay flat, surrounded by *Tecticornia laevigata* 0.3m, PFC 30 to 40%. Very healthy population of both *Tecticornia* spp. Extensive recruitment of *Lawrenzia densiflora* and *Atriplex codonocarpa* seedlings. Centre of the clay flat has very few annuals growing within it.

Profile Depth	Soil description	pH	EC
0 to 2 cm	clay crust medium clay (MC), massive, non-pedal, low dispersivity	not tested	
2 to 7 cm	red 2.5 YR 5/8 medium clay (MC), massive, non-pedal, low dispersivity	not tested	
7 to 30 cm +	red 2.5 YR 5/8 medium clay (MC), massive, non-pedal, low dispersivity	6.16	6,540

3.3. Species with Taxonomic or Conservation Significance

Any translocation of *Atriplex* sp. Yeelirrie Station must consider pre-existing flora at and around translocation sites. Table 2 presents conservation significant species and species with taxonomic interest recorded at Lake Mason based on the limited specimens collected during the field assessment.

Table 6. Conservation significant species and species of interest recorded at Lake Mason.

Species	Comments	Location (WGS84)
Species with Taxonomic Interest		
<i>Eragrostis</i> sp. Yeelirrie Calcrete (S. Regan LCH 26770)	Abundant perennial grass noted on Calcrete platforms under <i>Casuarina pauper</i> woodlands, <i>Eucalyptus gypsophila</i> woodlands, and in open <i>Eragrostis</i> sp. Yeelirrie Calcrete dominated grasslands.	Central and western parts of Lake Mason, abundant on calcrete platforms
<i>Lawrencia</i> sp. Lake Mason (G Cockerton & J Warden WB37340)	An annual or facultative perennial herb to 0.5m growing on red-brown self mulching clay. Represented by one sterile specimen, recognised as a potential new species by Bill Barker, Adelaide Herbarium, a specialist in <i>Lawrencia</i> species. No similar specimens held at WA Herbarium or known at Adelaide Herbarium.	Saline clay lake bed 50J 776980 mE, 6949497 mN.
	Found at one site: Lake Mason, Target 2, site 26, which is considered unfavourable as a potential translocation site due to high near-surface salinity.	
	This species may be more prevalent than the initial data indicates as few larger plants were observed and only one sampled. Flowering and fruiting material is required for taxonomic verification and description.	
<i>Maireana</i> sp. Lake Mason (G Cockerton & J Warden WB37339) aff. <i>M. luehmanii</i>	An unresolved species which has been submitted to the WA Herbarium for review. A low, somewhat spiny perennial shrub to 0.4m, often to 0.2m high with stiff short lateral branches, small fleshy, rounded hairy leaves. Plants seem to be killed by prolonged inundation.	Saline clay lake bed Yeelirrie: 51J 224249 mE, 6975972 mN
	Found at one site at Yeelirrie (eastern <i>Atriplex</i> population) and at 7 sites at Lake Mason:	Lake Mason: 51J 224249 mE, 6975972 mN
	<ul style="list-style-type: none"> • Yeelirrie east, with <i>Lawrencia helmsii</i> on gypsum. • Lake Mason: Found on saline lake beds supporting <i>Lawrencia</i> and <i>Tecticornia</i> species; Targets 1a (site 19), 1c (site 22), 2 (site 26), 4b (site 28), 5 (site 27), Targets 9a and 9b (sites 30, 31 respectively). May have occurred at up to 11 sites (noted as <i>Lawrencia densiflora</i> seedlings). 	50J 785558 mE, 6948767 mN 50J 781416 mE, 6948150 mN 50J 776980 mE, 6949497 mN 50J 761050 mE, 6949615 mN 50J 758563 mE, 6946985 mN
	Has affinities to <i>M. luehmanii</i> but is not typical of that species.	50J 745904 mE, 6935231 mN
	This species may be more prevalent than the initial data indicates as few larger plants were observed and only one sampled. Flowering and fruiting material is required for taxonomic verification and description.	50J 745864 mE, 6934515 mN
<i>Scaevola spinescens</i> terete leaf form (G. Cockerton & C. Ringrose LCH14560)	Scattered shrubs and clumps of shrubs on Calcrete platforms under <i>Casuarina pauper</i> woodlands, <i>Eucalyptus gypsophila</i> woodlands, and in open <i>Eragrostis</i> sp. Yeelirrie Calcrete dominated grasslands.	Central and western parts of Lake Mason, occasional on lake fringes.

Species	Comments	Location (WGS84)
Priority Species		
<i>Acacia lapidosa</i> P1	Outside but adjacent to the survey area. New population of this restricted species, dominant on a low basalt range west of Lake Mason. Previously known from two locations NW of this site.	Rocky Basalt Hill 50J 744835 mE, 6933674 mN
<i>Eremophila arachnoides</i> subsp. <i>arachnoides</i> P3	Scattered shrubs and clumps of shrubs on Calcrete platforms under <i>Casuarina pauper</i> woodlands, <i>Eucalyptus gypsophila</i> woodlands, and in open <i>Eragrostis</i> sp. Yeelirrie Calcrete dominated grasslands.	Central and western parts of Lake Mason, occasional to common on calcrete platforms.
<i>Grevillea inconspicua</i> P4	Known population on Lake Mason Station, south of lake on a low basalt hill.	Rocky Basalt Hill. 50J 745146 mE, 6929542 mN
<i>Melaleuca nanophylla</i> P3	Common on selected gypsum dunes in the eastern part of Lake Mason, southern shores. The second record of this species in Western Australia. Not fully surveyed at Lake Mason as it's conservation status was not recognised until specimen identification was completed.	Eastern part of Lake Mason, co-dominant with <i>M. xerophila</i> on gypsum dunes. 50J 784165 mE, 6948395 mN
<i>Tecticornia cymbiformis</i> P3	Samphire shrubland west of regional target 9. A new population within the known extent of occurrence of this species, previously known from 4 locations in W.A. Not fully surveyed at Lake Mason as its conservation status was not recognised until specimen identification was completed after fieldworks.	Saline Clay Lake Bed 50J 745899 mE, 6935228 mN

3.4. Unresolved species

In addition to the above species with taxonomic interest in Table 6, the taxonomy of 12 specimens including one *Atriplex*, four *Frankenia* and five *Tecticornia* species remain unresolved at this stage. These are noted in Table 7.

Table 7. Unresolved taxa requiring further investigation.

Species	Notes
<i>Atriplex</i> sp. Lake Mason aff. <i>A. amnicola</i> (WB 37343)	Co-dominant shrub at Target 11, site 34. May prove to be a range extension of <i>A. amnicola</i> and the only record of this species at Lake Mason.
<i>Frankenia</i> sp. aff. <i>cordata</i> (sampled at Wpt 4) (WB37362)	Requires detailed review at WA Herbarium
<i>Frankenia</i> sp. aff. <i>pauciflora</i> #2 sessile heads in terminal stem leaf axils (WB37360)	Requires detailed review at WA Herbarium

Species	Notes
<i>Frankenia</i> sp. pedicellate flowers in branched heads (WB 37356)	Requires detailed review at WA Herbarium
<i>Frankenia</i> sp. tall and wiry at Wpt 7 (sampled) (WB37358)	Requires detailed review at WA Herbarium
<i>Sida</i> sp. Indet. (sampled)	Sterile specimen, unable to resolve taxonomy. Requires flowers and fruits for ID.
<i>Tecticornia</i> sp. #3 (G Cockerton & J Warden WB37332)	Requires collection of flowering and fruiting material, referral to Dr. Kelly Shepherd for ID.
<i>Tecticornia</i> sp. #4 (G Cockerton & J Warden WB37333)	Reviewed by Dr. Kelly Shepherd. Determined as <i>Tecticornia</i> sp. aff. <i>halocnemoides</i> 'tuberculate seed'. A potential new species, segregate from the <i>T. halocnemoides</i> complex that needs more work to resolve.
<i>Tecticornia tenuis</i> (G Cockerton & J Warden WB37336)	Confirmed by Dr. Kelly Shepherd as <i>Tecticornia tenuis</i> .
<i>Tecticornia</i> sp. aff. <i>undulata</i> (G Cockerton & J Warden WB37335)	Confirmed by Dr. Kelly Shepherd as <i>Tecticornia indica</i> subsp. <i>bidens</i> .
<i>Tecticornia</i> sp. aff. <i>undulata</i> (small fruit) (G Cockerton & J Warden WB37320)	Confirmed by Dr. Kelly Shepherd as <i>Tecticornia indica</i> subsp. <i>bidens</i> .
Unknown sp. (G Cockerton & J Warden WB37341)	Sterile specimen, unable to resolve taxonomy. Requires flowers and fruits for ID.

Further, there remains confusion over the identification of some grasses with more time required to fully review the good material collected. These are not considered to likely have conservation significance.

4. Limitations

Limitations of the study included:

- The works undertaken and reported here represents an initial assessment of potential translocation receptor sites. Species noted at each site are those that were present at the time of survey.
- Many perennial shrubs were lacking flowering or fruiting material and those that remain unresolved are noted.
- Most annuals were at the very young seedling stage and a list of annual species is therefore not presented other than in site descriptive text and is not complete.
- The soils data is considered preliminary and indicative only. Field pH is likely to be reasonably accurate, however, field EC readings are considered to be indicative only and likely inaccurate. Lab based EC assessments are recommended.
- One field survey was performed and the re-collection of species with taxonomic interest or of uncertain identity was not possible at this stage.
- No effort was made to map the numbers or distribution of *Eremophila arachnoides* subsp. *arachnoides* P3 at Lake Mason as field time did not allow for this. The species is reasonably common, as is *Eremophila pantonii*, and the two are readily confused. Any assessment should take care to effectively identify the two taxa which grow together in many cases.
- Soil colour descriptions are largely made using the Munsell soil color charts, however, the text was not available in the first 2 days of the survey and therefore some soil colours described do not follow the Munsell colour description convention.
- The assessment of soils and vegetation at the western population of *Atriplex* sp. Yeelirrie Station (on the orebody area) was limited to one afternoon and therefore only one site was described.

5. Conclusion

The potential translocation of *Atriplex* sp. Yeelirrie Station to suitable receptor sites at Lake Mason is possible but there remain some limitations to the proposal. Suitable sites would have the following characteristics: sites represent lake beds with significant sub-soil moisture available during dry seasons; soils being red-brown self mulching clays or with characteristics similar to those preferred by *Atriplex* sp. Yeelirrie Station in its natural habitat; sites not inundated at the time of assessment but may be inundated for short periods following high intensity rainfall events; low to moderate salinities; sites do not support other species with conservation significance that may be displaced by *Atriplex* sp. Yeelirrie Station; sites are reasonably accessible; sites represent sufficient area to ensure a translocated population is viable.

Sites assessed as being moderately suitable for potential translocation are noted below:

Target #	Site #	Vegetation Association Code	Vegetation Association Name	Location
Target 1c	22	CF LdS	Clay Flat with annual Lawrenca densiflora	Lake Mason east 50J 781301mE, 6946768mN
Target 4a	29	Fsp#2 S	Frankenia pauciflora Shrubland	Lake Mason east 50J 758589mE, 6947053mN
Target 5	27	CF LdS	Clay Flat with annual Lawrenca densiflora	Lake Mason Central 50J 761077mE, 6949718mN
Target 14b	36	Tec tenuis S	Tectornia tenuis WB37336 Shrubland	Lake Mason South- west 50J 737670mE, 6927856 mN

Potential hybridisation with other *Atriplex* species is not likely given that the perennial *Atriplex vesicaria* and *A. bunburyana* and the annual *A. codonocarpa* noted at Lake Mason are also present at Yeelirrie Station in close proximity to existing populations of *Atriplex* sp. Yeelirrie Station. However, the presence of *Atriplex* sp. aff. *A. amnicola* (WB37343) is noted at Target 11, site 34 and this site should be avoided until the taxonomy of this species is resolved. A conservative buffer, of a dimension yet to be ascertained, should also be placed around this site in case potential cross pollination with translocated *Atriplex* sp. Yeelirrie Station is possible.

The area (ha) of potential suitable receptor sites has not been ascertained, however, field observations indicate that they are relatively small in area.

6. Recommendations

The investigation undertaken by Western Botanical was an initial assessment of potential translocation receptor sites. Therefore, the following recommendations are offered to help guide future assessments and the eventual translocation of *Atriplex* sp. Yeelirrie Station:

- A review of species with taxonomic interest that remain unresolved is recommended. In particular those species that may represent species new to science and inhabit potential translocation receptor sites for *Atriplex* sp. Yeelirrie Station.
- Avoidance of use of Target 11 at this stage as it supports the only population of *Atriplex* sp. aff. *amnicola* (WB37343) known at Lake Mason to date. This represents a slight range extension for this species.
- An assessment of the area (ha) of each of the potentially suitable translocation sites at Lake Mason to determine the physical space available for future translocation programs.
- Planning in conjunction with the Department of Parks and Wildlife, to commence translocation trails at agreed suitable sites at Lake Mason.
- Further assessment of the vegetation associations and their supporting soil profiles at the western population of *Atriplex* sp. Yeelirrie Station is required to fully address these communities in the same degree of detail as has been done at the eastern population of the species.

7. Bibliography

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8. List of Participants

Project Manager, Senior Botanist	Geoff Cockerton
Senior Botanists	Jono Warden, Dr. David Leach

Appendix 1. Descriptions of sites (i) Natural populations of *Atriplex* sp. Yeelirrie Station at Yeelirrie and (ii) Considered for *Atriplex* sp. Yeelirrie Station translocation at Lake Mason.

Yeelirrie Station sites				
Location	Health of <i>Atriplex</i> sp. Yeelirrie Station Population	Site #	Vegetation Association Code	Vegetation Association Name
Yeelirrie Stn East		8	AbS	<i>Atriplex bunburyana</i> Shrubland
Yeelirrie Stn East		9	AbS	<i>Atriplex bunburyana</i> Shrubland
Yeelirrie Stn East	Healthy	1	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland
Yeelirrie Stn East	Healthy	5	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland
Yeelirrie Stn East	Unhealthy	13	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland
Yeelirrie Stn East	Unhealthy	14	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland
Yeelirrie Stn East	Unhealthy	15	AsYS	<i>Atriplex</i> sp. Yeelirrie Stn. Shrubland
Yeelirrie Stn East		7	EtAv	<i>Eragrostis tenellula</i> grassland, <i>Atriplex vesicaria</i> Shrubland
Yeelirrie Stn East		11	EtAv	<i>Eragrostis tenellula</i> grassland, <i>Atriplex vesicaria</i> Shrubland
Yeelirrie Stn East		3	FcS	<i>Frankenia cinerea</i> low Shrubland
Yeelirrie Stn East		12	LaAbTect	<i>Lycium australe</i> , <i>Atriplex bunburyana</i> , <i>Tecticornia laevigata</i> , <i>Tecticornia</i> sp. aff. <i>undulata</i> (small fruit) WB37320 Shrubland complex
Yeelirrie Stn East	Healthy	2	LaAsYS	<i>Lycium australe</i> , <i>Atriplex</i> sp. Yeelirrie Stn. Shrubland
Yeelirrie Stn East	Unhealthy	16	LaAsYS	<i>Lycium australe</i> , <i>Atriplex</i> sp. Yeelirrie Stn. Shrubland
Yeelirrie Stn East		4	LhS	<i>Lawrenzia helmsii</i> Shrubland
Yeelirrie Stn East		10	LhS	<i>Lawrenzia helmsii</i> Shrubland
Yeelirrie Stn East		6	TLS	<i>Tecticornia laevigata</i> Shrubland
Yeelirrie Stn West		17	MxW	<i>Melaleuca xerophila</i> woodland

Lake Mason Sites			
Target #	Site #	Vegetation Association Code	Vegetation Association Name
Target 1a	18	LaS	<i>Lycium australe</i> Shrubland
Target 1a	19	Tec2S	<i>Tecticornia pergranulata</i> subsp. <i>pergranulata</i> Shrubland
Target 1a	20	CF (Tec pp S)	Clay Flat with occasional <i>Tecticornia pergranulata</i> subsp. <i>pergranulata</i> WB37331
Target 1b	21	CF (Tec sp. WB37333 & WB37335 S)	Clay Flat with dead <i>Tecticornia</i> sp. WB37333 & <i>T. sp. aff undulata</i> WB37335 Shrubs
Target 1c	23	CF EtG	Clay Flat with <i>Eragrostis tenellula</i> Grassland
	24	CF Tec sp. WB3733 S	Clay Flat with <i>Tecticornia</i> sp. WB37332 Shrubland
Target 2	25	CF-B	Clay Flat, no vegetation
Target 2	26	CF L sp. LM WB37340 S	Clay Flat with annual <i>Lawrencia</i> sp. Lake Mason (WB37340) herb land
Target 2	27	CF-B	Clay Flat, no vegetation
Target 3	28	CABs	Calcrete <i>Acacia burkittii</i> Shrubland
Target 8	26A	Tec pp S	<i>Tecticornia pergranulata</i> subsp. <i>pergranulata</i> Shrubland
Target 8	26B	Tec pp S	<i>Tecticornia pergranulata</i> subsp. <i>pergranulata</i> Shrubland
Target 6		CpW	<i>Casuarina pauper</i> Woodland
Target 6		EgW	<i>Eucalyptus gypsophila</i> Woodland
Target 4b	28	CF LdS	Clay Flat with annual <i>Lawrencia densiflora</i>
Target 9a	30	Tec tenuis S	<i>Tecticornia tenuis</i> (WB37336) Shrubland
Target 9b	31	Tec tenuis S	<i>Tecticornia tenuis</i> (WB37336) Shrubland
Target 9c	32	Tec tenuis S	<i>Tecticornia tenuis</i> (WB37336) Shrubland
Target 9d	33	EtG	<i>Eragrostis tenellula</i> Grassland

Lake Mason Sites			
Target #	Site #	Vegetation Association Code	Vegetation Association Name
Target 10	no site	MxS	Melaleuca xerophila Shrubland
Target 11	34	CF AsLM	Clay Flat Atriplex sp. aff. A. amnicola Shrubland
Target 12	no site	CEspYC	Calcrete, Eragrostis sp. Yeelirrie Calcrete plain
Target 12b	no site		Flooded lake bed
Target 13	35	AvS	Atriplex vesicaria Shrubland
Target 14		Tec tenuis S	Tectornia tenuis (WB37336) Shrubland

Site 1

Date 24/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Atriplex* sp. Yeelirrie Station shrubland.** *Atriplex* sp. Yeelirrie Station 0.6m, PFC 20 to 25%, Associated species: *Lawrenzia densiflora* (seedling) dominant, *Frankenia cinerea* 0.15m, Chenopod (*Maireana* sp.) seedling 2 cm, Poaceae sp. (annual) seedling 3 cm, *Eragrostis* sp. Yeelirrie Calcrete (1 plant, 2 cm). Soil surface is red self mulching clay.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	red	medium clay (MC)	6.56	485	26.0	dry	1-1		
2 to 16 cm	red	medium clay (MC)	6.67	144	26.0	moist	1-2		
16 cm +	pale cream	fine sandy loam (FSL)	6.57	2,314	26.0	moist	1-3	nodular gypsum	fine roots present
20 cm	orange cream	fine sandy loam (FSL)	6.5	2,440	26.0	moist	1-3		fine roots present

Health of Natural Population of *Atriplex* sp. Yeelirrie Station: Healthy



Image # P3244060



Image # P3244062

Site 2

Date 24/3/2015

Geographical Region:

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Lycium australe* and *Atriplex* sp. Yeelirrie Station Shrubland.** *Lycium australe* 2m PFC 8% over *Atriplex* sp. Yeelirrie Station 0.6m PFC 5% with associated species Poaceae sp. annual (seedling) dominant, Goodeniaceae sp. annual seedling, *Lawrenica densiflora* seedling, *Tribulus* sp. (?terrestris) seedling, *Zygophyllum aurantiacum* seedling, *Z. compressum* seedling, Fabaceae (Pea) species seedling.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	red	loam (L)	6.47	515	26.0	dry	2-1		
2 to 20 cm	red	clay-loam (CL)	6.64	89		moist	2-2		lots of roots
20 to 25 cm	pale orange-cream	Light sandy loam (SCL-)	6.64	2,500		moist	2-3		no roots noted in limited sample

Health of Natural Population of *Atriplex* sp. Yeelirrie Station: Healthy



Image # P3244066



Image # P3244067

Site 3

Date 24/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

Frankenia cinerea low shrubland. *Frankenia cinerea* 5 to 10 cm high, PFC 5 to 10%, occasional emergent *Lycium australe* 1.5m, *Acacia oswaldii* 2.5m, *Atriplex bunburyana* 0.5m, PFC < 1%

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	pale orange	silty sand	6.66	580		dry	3-1		
2 to 15 cm	red	silty loam (SL)	6.76	830		moist	3-2		
15 cm +	creamy orange	fine sandy loam (FSL)	6.73	2,138		moist	3-3		



Image # P3244068



Image # P3244070

Site 4

Date 24/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

Lawrencia helmsii Shrubland. *Lawrencia helmsii* 0.8m PFC 5% *Frankenia* sp. (sampled) 0.2m PFC 10% with occasional *Atriplex bunburyana* 0.6m, *Atriplex vesicaria* 0.4m, *Maireana pyramidata* 0.5, *Sclerolaena fimbriolata* 0.3m, PFC <1% collectively.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 0.5cm		crust and silty sand lag				dry			
0.5 to 30 cm +	pale cream	loam (L)	6.7	2,520	26.0	moist	4-1		roots present



Image # P3244071



Image # P3244073

Site 5

Date 24/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Atriplex* sp. Yeelirrie Station shrubland.** *Atriplex* sp. Yeelirrie Station 0.6m, PFC 25%, with occasional emergent *Lycium australe* 0.8 to 1.5m PFC < 1%, Associated species: *Lawrenzia densiflora* seedling) dominant, Poaceae sp. (annual) seedling 3 cm, *Frankenia* sp. (as at site 4) 0.2m. Soil surface is red self mulching clay with prominent cracks and settling of clay within.

Site is adjacent to Demography site East Plot 5

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 40 cm	red	medium clay (MC), self mulching	6.68	1,069	26.0	moist	5-1	no stratigraphy noted, medium clay throughout to approx. 0.5m..	thick lateral roots at 5 to 10 cm, finer roots at 20 cm

Health of Natural Population of *Atriplex* sp. Yeelirrie Station: Healthy



Image #P3244075

Image #

Site 6

Date 24/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Tecticornia laevigata* Shrubland.** *Tecticornia laevigata* 0.4m, PFC 30 to 40%. Occasional *Atriplex vesicaria* 0.3m, PFC 2 to 3%. Associated species *Zygophyllum compressum* (seedling), *Lawrenzia densiflora* (seedlings), *Chenopod* sp. Indet (seedling) to 2 cm.

Site appears to be slightly lower in landscape than the adjacent *Atriplex* sp. Yeelirrie Stn. population. Site lies adjacent to (i) *Atriplex* sp. Yeelirrie Station Eastern population on red smectite clay to the east, (ii) *Lawrenzia helmsii* shrubland on Gypsum lunette to the south and (iii) *Atriplex vesicaria* shrubland to the south-west.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	5YR 6/6	loamy sand	6.55	1,728	22.2	dry	6-1	clay crust with fine cracks and salt crystals	
2 to 9 cm	5YR 5/6	loam fine sandy	6.62	1,832	22.5	moist	6-2		dark coloured fine to medium roots to 2 mm diameter present
9 to 35 cm	2.5YR 4/6	sandy clay	6.58	4,720	22.8	moist	6-3	This soil stratum with numerous white crystalline inclusions ?NaCl.	no roots present



Image # P3254089



Image # P3254091

Site 7

Date 25/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Eragrostis tenellula* Grassland, *Atriplex vesicaria* Shrubland.** *Eragrostis tenellula* 0.1m (grazed) to 0.3m (flowering) PFC 10%, *Atriplex vesicaria* 0.25m PFC 5%. Associated species of Poaceae sp. annual (seedling), Chenopod sp. perennial Indet 0.1m (sampled). *Eragrostis tenellula* has been grazed to approx. 10 cm high, basal leaves not eaten. Lots of cow dung present, probably preferentially grazed. Where clumps of *Eragrostis tenellula* are present, these are growing in cracks in the gypsum, filled with up to 9 cm of red fine silty sand.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 0.5 cm		clay and cryptogammic crusting, grey algal crust	6.5	587	26.5	dry	7-1	Upper crustal surface very variable. Where gypsum crust is at surface, Algal cryptogammic crust is present.	
0.5 to 13 cm	Red 5YR 8/1	fine silty sand with gypsum nodules	6.47	2,325	26.2	moist	7-2		lots of grass roots
13 to 30 cm	Red 5YR 6/8	fine clayey sand with crystalline gypsum	6.61	2,530	26.1	moist	7-3		few fine roots



Image # P3254105



Image # P3254103

Site 8

Date 25/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

Atriplex bunburyana Shrubland. *Atriplex bunburyana* 0.8m, PFC 15 to 20%, occasional emergent *Lycium australe* 1.5m, *Maireana pyramidata* 1m, *Rhagodia drummondii* 1m, PFC < 2%, occasional emergent *Acacia oswaldii* 2.5m PFC < 1%. Site represents the sloping bank of the playa system with *Acacia ayersiana* over *Atriplex bunburyana* Shrubland to the east and lies immediately up-slope of the *Frankenia cinerea* Shrubland (site 3).

Site is elevated approximately 1 m above adjacent *Atriplex* sp. Yeelirrie Station population.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 5 cm	Red 5YR 5/6	Sandy Loam	n/a	n/a	n/a	dry	n/a		
5 to 30 cm	Red 5YR 5/6	Sandy Loam	6.56	1,948	27.6	moist	8-1	Same soil texture throughout, surface 5 cm dried out.	fine roots throughout the 5 to 30 cm stratum, absent in dry surface



Image # P3254108



Image # P3254109

Site 9

Date 25/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Atriplex bunburyana* Shrubland.** *Atriplex bunburyana* 0.7 to 1m PFC 35 to 30%, occasional *Lycium australe* 0.5 to 1.2m, *Lawrenzia helmsii* 1m, *Frankenia* sp. (branched flower heads - sampled) 0.4m, PFC < 1%. Associated species *Cyperus bulbosa* 15 cm, Poaceae spp. x 2 annual (seedlings).

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 22 cm	Red 2.5YR 5/6	clayey sand	6.44	415	32.2	moist	9-1	relatively low salinity	lots of fine roots throughout
22 +??	white gypsum	hard, cemented, coarse to medium sand	6.48	4,470	32.1	moist	9-2	firm cemented saline gypsum	no roots present



Image # P3254110



Image # P3254112

Site 10

Date 25/3/2015

Geographical Region

Yeelirrie Station, Atriplex sp. Yeelirrie Station, Eastern Population

Description

Lawrencia helmsii Shrubland. *Lawrencia helmsii* 0.6 to 0.8 m, PFC 10%. Occasional *Sclerolaena fimbriolata* 0.2m, *Eragrostis tenellula* 0.3m, *Atriplex vesicaria* 0.2m, Unknown sp. Yeelirrie Blue-Green WB37341, Collective PFC < 1%. Site is a gypsum flat (not a lunette).

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 0.5 cm	white gypsum	hard cemented crust with Algal cryptogams and lag of fine red silty sand					n/a		
0.5 to 10 cm	white gypsum	sandy loam with aggregate cobbles and crystalline cemented gypsum				dry	? 10-1		few lateral roots noted at interface between dry and moist sandy loam at 10 cm depth
10 to 25 cm	pinkish white 2.5YR 8/2	sandy loam	6.55	3,900	29.9	moist	? 10-2	massive moist sandy loam	no roots noted



Image # P3254113



Image # P3254115

Site 11

Date 25/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Atriplex vesicaria* shrubland.** *Atriplex vesicaria* 0.3m, PFC 25%, *Eragrostis tenellula* 0.2m, PFC 5%. Associated species occasional *Atriplex bunburyana* 0.6m, *Lawrencia helmsii* 0.8m, Poaceae sp. annual (seedling), *Lawrencia densiflora* (seedling), *Frankenia cinerea* 0.1m, Chenopod sp. Indet (seedling), collective PFC < 1%.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 0.5 cm	red	fine silty sand	n/a	n/a	n/a	dry	n/a	site has a thin veneer of red silty sand over gypsum over fine sandy loam	
0.5 to 11 cm	Pink 2.5YR 8/4	clayey sand with cobbles of aggregated gypsum	6.63	2,160	30.9	dry	11-1		
11 to 25 cm	Reddish yellow 5YR 7/6	fine sandy loam	6.45	2,250	31.8	moist	11-2		



Image # P3254116



Image # P3254118

Site 12

Date 25/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Lycium australe*, *Atriplex bunburyana*, *Tecticornia* spp. Shrubland complex.** *Lycium australe* 1 to 1.5m, PFC 8%, *Atriplex bunburyana* 0.6 to 1 m, PFC 15%, *Tecticornia laevigata* 0.4m, *Tecticornia indica* subsp. *bidens* WB37320 0.8m, PFC 5% collectively. Associated species: *Frankenia* sp. branched heads (as at site 9) 0.4m, *Eremophila glabra* subsp. Inland (AP Brown) 1.2m, *Solanum nummularium* 0.5m, *Scaevola spinescens* (terete leaf form G. Cockerton & C. Ringrose LCH14560) 1m, *Pittosporum angustifolium* 1 to 8m, *Cratystylis subspinescens* 1.2m, *Eremophila* aff. *ericalyx* (sampled) 2m, *Senna artemisioides* subsp. *filifolia* 1.5m, *Cratystylis subspinescens* 1.2m, *Solanum lasiophyllum* 0.6m, *Ptilotus obovatus* 0.6m, *Eremophila hygrophana* 0.6m, PFC collectively < 2%. Associated species *Cyperus bulbosa* 15 cm, *Bulbostylis barbata* 5 cm (sampled), Poaceae spp. (seedlings), Goodeniaceae sp. (seedling), Fabaceae (Pea sp.) (seedling), *Marsilea drummondii* 0.25m, *Sida* sp. Indet (sampled).

A non-saline site, low in landscape, has a wide range of species that elsewhere are found in both saline and non-saline environments.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 0.5 cm	cryptogammic crust, thallic lichens and black algal crusts	n/a	n/a	n/a	n/a	dry	n/a		
0.5 to 12 cm	yellowish red 5YR 5/6	light sandy clay (SCL-)	6.59	197	29.7	moist	12-1		
12 to 40 cm	dark red 2.5YR 6/6	sandy clay (SC)	6.47	72	27.2	moist to wet	12-2		large lateral roots to 5 mm diameter noted at 20 cm depth



Image # P3254121



Image # P3254122

Site 13

Date 26/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Atriplex* sp. Yeelirrie Station Shrubland.** *Atriplex* sp. Yeelirrie Station 0.5m, PFC 2 to 5%. Lots of dead *Atriplex* sp. Yeelirrie Station plants in this area.

Adjacent, to the west of this site, *Atriplex* sp. Yeelirrie Station PFC is healthy and has an approx. PFC 30%, (near site 16).

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 mm	white crusted surface	sandy clay (SC)	6.49	540	20.0	dry	13-1	taken from adjacent to a live AsY plant, on a non-vegetated mound	
2 mm to 8 cm	dark red	silty sand (texture of sand when dry)	6.64	14,750	18.7	dry	13-2	taken from under a live <i>Atriplex</i> sp. Yeelirrie plant. Massive clay	lots of fine roots present
8 to 16 cm	dark red 2.5 YR 3/6	heavy clay	6.46	5,630	20.0	moist	13-3	taken from under a live <i>Atriplex</i> sp. Yeelirrie plant. Massive clay	no roots noted
16 cm +	'pale creamy'	loam (gypsum)	not tested						

Health of Natural Population of *Atriplex* sp. Yeelirrie Station: Unhealthy



Image # P3264123 (foreground)

Image #

Site 14

Date 26/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Atriplex* sp. Yeelirrie Station Shrubland.** *Atriplex* sp. Yeelirrie Station 0.5m, PFC 5%. Sparse population of *Atriplex* sp. Yeelirrie Station, level site.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 8 cm	dark red 2.5YR 5/6	strongly pedal heavy clay	6.69	4,760	29.4	dry	14-1	blocky strongly pedal cracking clay	
8 to 16 cm	Pink 2.5YR 8/4	loam (L)	6.69	11,790	19.0	moist	14-2	gypseous loam	

Health of Natural Population of *Atriplex* sp. Yeelirrie Station: Unhealthy



Image # P3264126 showing shallow soil profile under a health individual of *Atriplex* sp. Yeelirrie Station at this site.

Image #

Site 15

Date 26/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

Bare Saline Lake Bed. No *Atriplex* sp. Yeelirrie Station growing here.

Site is between the *Atriplex* sp. Yeelirrie Station population to the west and *Lawrenciac helmsii* population on gypsum to the east. No living perennial plants in this area. Soil is characterised by NaCl crystals in heavy clay.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 10 cm	dark red	medium clay (MC)	6.49	30,600	20.0	moist	no sample		



Image #

Image # P3264127

Site 16

Date 26/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Eastern Population

Description

***Lycium australe* - *Atriplex* sp. Yeelirrie Station shrubland.** *Lycium australe* 1.5m PFC 10% over *Atriplex* sp. Yeelirrie Station 0.5m PFC 5 to 10%. Soil is a red clacking clay. Lots of dead *Atriplex* sp. Yeelirrie Station in this area, live plants mostly with dead parts in the canopy (drought effect?) and also leafless lower branches to approx. 15 cm (flooding effect due to recent rains and inundation).

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 11 cm	red 2.5 YR 5/8	medium clay (MC)	6.55	77	21.2	dry	16-1		
11 to 32 cm +	red 2.5 YR 5/8	medium clay (MC)	6.6	2,365	20.9	moist	16-2		fine roots from 10 cm +; thicker lateral roots at 15 cm

Health of Natural Population of *Atriplex* sp. Yeelirrie Station: Unhealthy



Image # P3264133



Image # P3264137

Site 17

Date 26/3/2015

Geographical Region

Yeelirrie Station, *Atriplex* sp. Yeelirrie Station, Western Population

Description

Melaleuca xerophila woodland. *Melaleuca xerophila* 4 to 5 m, PFC 15 to 20%. Understorey under the canopy of trees of *Dissocarpus paradoxus* 0.2, *Sclerolaena obliquicuspis* 0.3, *Lachnagrostis filiformis* 0.5m, occasional *Atriplex* sp. Yeelirrie Station 0.4m individuals, *Atriplex bunburyana* 0.6m, collective PFC < 1%.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 35 cm	light brown (no colour chart in the field)	clay loam (CL)	6.45	108	25.8	moist	17-1	this stratum dry in the upper 10 cm	lots of fine roots throughout this stratum
35 cm +	red	clayey sand with hard gravely subrounded nodules 0.5 to 1 cm diameter	6.48	3,260	23.9	moist	17-2		few larger roots in this stratum



Image # P3264143



Image # P3264144

Site 18

Date 27/3/2015

Geographical Region

Lake Mason Target 1a

Description

***Lycium australe* shrubland.** *Lycium australe* 1.2m, *Cratystylis subspinescens* 1.5m, *Eremophila arachnoides* subsp. *arachnoides* P3 2m, PFC 15 to 20%, over *Frankenia* sp. branched heads 0.4m over *Eragrostis ?falcata* 0.2m.

Site lies immediately upslope of Site 19 - a narrow band of red self mulching clay supporting a *Tecticornia pergranulata* subsp. *pergranulata* WB37331, 0.5m.

Site 18 is fringed on the northern side by CAbS community (*Acacia burkittii* on calcrete) and occasional *Melaleuca xerophila* 3 to 5 m high.

Soil Characteristics not assessed, no photographs taken.

Site 19

Date 27/3/2015

Geographical Region

Lake Mason, Target 1a

Description

***Tecticornia pergranulata* subsp. *pergranulata* Shrubland.** *Tecticornia pergranulata* subsp. *pergranulata* WB37331, 0.2m, Maireana sp. Lake Mason (G Cockerton & J Warden WB37339)0.2m, *Frankenia cinerea* 0.1m, PFC 30% Annuals include *Lawrenzia densiflora* (seedlings) and *Atriplex codonocarpa* (seedlings).

Site 19 is fringed on it's southern side by CMxS *Melaleuca xerophila* shrubland.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 40 cm	yellowish red 5YR 5/6	heavy clay	6.31	2,041	25.5	moist	19-1		



Image # P3274156



Image # P3274153

Site 20

Date 27/3/2015

Geographical Region

Lake Mason, Target 1a

Description

Clay flat (bare). Clay flat supporting a few scattered *Tecticornia pergranulata subsp. pergranulata* WB37331, PFC 2% with a few scattered *Atriplex codonocarpa* (seedlings.)

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 12 cm	red 5YR 5/6	heavy clay				moist	20-1	salty clay crust on surface	fine roots noted
12 to 20 cm +	pink 5YR 7/4	mottled loam	6.6	9,540	24.5	moist	20-2		fine roots noted



Image # P3274157



Image # P3274159

Site 21

Date 27/3/2015

Geographical Region

Lake Mason Target 1b

Description

Clay Flat with dead *Tecticornia* sp. # 4 (WB37333) and *Tecticornia* aff. *undulata* (WB37335) shrubs, 99% dead plants.
Highly saline site with salt crust at surface.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 5 cm	red	cracking medium clay	6.41	4,330	25.0	dry at surface, moist below	21-1		



Image # P3274166

Image #

Site 22

Date 27/3/2015

Geographical Region

Lake Mason Targe 1c

Description

Clay Flat, *Lawrencia densiflora* Herbland. Clay flat with dead *Lawrencia densiflora* prevalent, up to 0.6m high x 0.8m wide and would have been up to 50% PFC when alive. Lots of *L. densiflora* seedlings to 2 cm present. Site is a self mulching clay very similar to that of the Yeelirrie Orebody area and no other perennials are present.

Adjacent vegetation

West and South: *Lawrencia helmsii* shrubland on Gypsum flat, approx. 10 to 20 cm above the clay flat

North and East: *Eucalyptus gypsophila* and *Melaleuca xerophila* on gypsum lunette, 8 to 10 m above clay flat.

This site looks like the eastern population of *Atriplex* sp. Yeelirrie Station where the *Atriplex* sp. Yeelirrie Station plants are dying due to high salinity. The salinity here makes it less suitable for a translocation program though the soil is similar in many respects.

Soil surface shows mosaic of dark red clay and lighter slightly raised clay with higher salt content. Less saline clay is crumbly and granular like the soil supporting AsY on the orebody area.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	dry crust of red / white	medium clay	6.42	1,170	24.6	dry			
2 to 12 cm	red	medium clay (MC)	6.45	17,570	23.4	dry			

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
12 to 25 cm	red	medium clay (MC)	6.4	11,200	24.0	moist			
25 +	red 2.5YR 6/8	sandy clay (SC) with gravel to 5mm	6.5	5,740	23.5	moist			



Image # P3274168



Image # P3274170.JPG

Site 23

Date 27/3/2015

Geographical Region

Lake Mason Target 1c

Description

***Eragrostis tenellula* grassland** on hard cracking clay, surrounded by *Lawrencia helmsii* shrubland on gypsum flat on all sides with a moderate gypsum hill ~10 m high supporting *Eucalyptus gypsophila* and *Melaleuca xerophila* 200 m East and 400 m North of site.

Entirely the wrong soil type for *Atriplex* sp. Yeelirrie Station.

No photographs, no soil sample

Site 24

Date 27/3/2015

Geographical Region

Lake Mason Site 1c

Description

Bare red medium to heavy clay flat on the north side of a very healthy *Tecticornia* sp. #3 (WB37332) Shrubland.

Probably too saline for *Atriplex* sp. Yeelirrie Station. Clay surface on bare ground is hard and cracking, not self mulching. Few annuals present.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
On Clay Mound 0 to 5 cm	red	medium to heavy clay		1,400					
On Clay Flat 0 to 5 cm	red	medium to heavy clay		3,300					



Image # P3274169



Image # P3274170.JPG

Site 25

Date 28/3/2015

Geographical Region

Lake Mason Target 2

Description

Bare Clay Flat with very little vegetation.

Too saline for *Atriplex* sp. Yeelirrie Station.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	dark red 2.5YR 4/8	medium clay (MC)	6.64	950	20.4			soft, fluffy surface, highly dispersive	0 to 2 cm
2 to 15 cm	dark red 2.5YR 4/8	medium clay (MC)	6.48	5,930	20.3				2 to 15 cm



Image # P3284183

Image #

Site 26 & 27

Date 28/3/2015

Geographical Region

Lake Mason Target 2

Description

There are two soil types present with approximately 50:50 mosaic surface cover of the two soil types:

Site 26: dark red clay, lower lying in landscape;

Site 27 slightly raised (5 cm) patches of pale whitish flocculated crust (salt) on soil.

Site 26: Patches of red cracking clay with *Maireana* sp. Lake Mason (G Cockerton & J Warden WB37339) 0.2m, *Lawrenca densiflora* 0.2 to 0.4m (regrowth), *Lawrenca ?densiflora* or *Lawrenca* sp. Lake Mason (WB37340) (seedlings) 2 cm, Poaceae sp. (annual) 1 cm, *Eragrostis tenellula* 0.1m, *Atriplex codonocarpa* (seedling) 2 cm. Site is not as 'self mulching' as the habitats at Yeelirrie supporting *Atriplex* sp. Yeelirrie Station, however, is similar to the eastern population of *Atriplex* sp. Yeelirrie Station - very patchy.

Site 27: Site 27 is fringed on it's western side by *Tecticornia* sp. #3 (WB37332); to the south and east by *Lawrenca helmsii* shrubland with emergent *Eucalyptus gypsophila* on tall gypsum dune; and on the northern side by *Lycium australe* and *Cratystylis subspinescens* shrubland.

If used as a translocation site, will result in a mosaic of growing vegetation and bare clay flat areas

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
Site 26 0 to 5 cm	dark red 2.5YR 4/8	medium clay (MC)	6.33	172	21.6	dry		Soils in the 0 to 5 and 5 to 15 cm strata are not as dispersive as at other sites.	0 to 5 cm
Site 26 5 to 15 cm	red 2.5YR 6/8	sandy clay with medium sand, crystals, slightly pedal	6.3	1,800	21.2	moist			5 to 15 cm

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
Site 26 15 cm +	pale cream	Gypsum				moist			15 cm +
Site 27 crust			6.4	2,400	23.1	dry			
Site 27 10 cm			6.24	16,700	22.3	moist			



Image # P3284189



Image # P3284186

Site: Not a formal assessment site Date 28/3/2015

Geographical Region Lake Mason Target 3

Description

Dry, flat calcrete plain supporting a grassland of *Eragrostis tenellula*, *Eragrostis* sp. Yeelirrie Calcrete (S Regan LCH25025), *Eragrostis* sp. (Indet) with abundant germination of annual herbs including *Zygophyllum* spp., Poaceae spp., Asteraceae spp., *Salsola tragus*, *Ptilotus obovatus*, *Solanum lasiophyllum*. Emergent scattered *Acacia burkittii* 2 to 3m, PFC 1 to 5%, occasional *Eremophila arachnoides* subsp. *arachnoides* P3 1 to 2.5m (abundant in patches), occasional *Casuarina pauper* trees in groves to 8m, PFC < 1%.

Wholly unsuitable for translocation of *Atriplex* sp. Yeelirrie Station.

Soil Characteristics not assessed



Image # P3284190

Image #

Site 26A

Date 28/3/2015

Geographical Region

Lake Mason Target 8

Description

Tecticornia pergranulata subsp. pergranulata (WB37331) Shrubland on clay flat. Soil is a massive non self-mulching clay, very moist with small (2mm) gypsum inclusions.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 5 cm	yellowish red 5YR 4/6	fine sandy clay (FSC)	6.17	1,602	29.4	moist		moderately dispersive	lots of fine roots
5 to 15 cm	yellowish red 5YR 4/6	medium clay (MC), massive, dispersive, with gypsum crystals	6.27	466	28.1	moist		highly dispersive	lots of fine roots

Low

Space fully occupied by *Tecticornia pergranulata subsp. pergranulata* (WB37331)



Image # P3284193

Image #

Site 26B

Date 28/3/2015

Geographical Region

Lake Mason Target 8

Description

Bare clay flat, no Cyperaceae, few annual grasses, *Tecticornia pergranulata subsp. pergranulata* (WB37331) adjacent (PFC 10%)

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 7 cm	yellowish red 5YR 5/8	fine sandy clay (FSC)	not done						lots of fine roots
7 to 15 cm		fine sandy loam (FSL)	6.17	2,280	29.6	moist			



Image # P3284195



Image # P3284196

Site 27B

Date 28/3/2015

Geographical Region

Lake Mason Target 5

Description

Area with most perennial vegetation dead due to recent flooding event. A few survived the recent flooding and are growing well. Massive regeneration of *Lawrenzia densiflora* (seedlings), a few live *Frankenia cinerea* 0.2m, *Maireana* sp. Lake Mason (G Cockerton & J Warden WB37339) 0.2m. Additional annuals: *Atriplex codonocarpa* (seedlings). Site is fringed by *Tecticornia* sp. #3 (WB37332) Shrubland.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 5 cm	reddish brown 5YR 5/4	medium clay, flocculated	6.09	274	31.3	dry	27-1	moderately dispersive	
5 to 15 cm	reddish brown 5YR 5/4	medium clay	6.17	2,380	31.3	moist	27-2		

Suitability for Translocation Trial:

Moderate may be OK for *Atriplex* sp. Yeelirrie Station translocation



Image # P3284197

Image #

Site: Not a formal assessment site Date 28/3/2015

Geographical Region Lake Mason Target 6

Description

To the north of this point:

Casuarina pauper woodland PFC 5% with *Acacia victoriae* 3m, occasional *Acacia nyssophylla* 1 to 2 m, *Eremophila arachnoides* subsp. *arachnoides* P3 to 2m, PFC 7 to 10% over *Eragrostis ?falcata* 0.3m and germinating annuals on a calcrete flat.

To the south is a *Eucalyptus gypsophila* 8 to 10 m woodland PFC 5 to 10% with scattered *Acacia victoriae* 3m, *Acacia nyssophylla* 1 to 2 m, PFC 5% over *Eragrostis ?falcata* 0.3m, *Eragrostis* sp. Yeelirrie Calcrete (S Regan LCH25025) and annuals on calcrete flat.

Soil Characteristics not assessed.



Image # P3284200

Image #

Wholly unsuitable for *Atriplex* sp. Yeelirrie Station translocation.

Site 28

Date 28/3/2015

Geographical Region

Lake Mason Target 4b

Description

Clay flat, firm cracked surface. Site shows good recruitment of *Lawrenzia densiflora* seedlings with occasional *Maireana* sp. Lake Mason (G Cockerton & J Warden WB37339) and Unknown sp. Yeelirrie Stn Blue-green WB37341.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm		medium clay (MC)	6.23	4110	31.8	dry		a narrow bank parallel with lake shore, small area	
2 to 15 cm		loam	6.21	3010	30.1	moist			

Suitability for Translocation Trial:

Too saline and too small an area for *Atriplex* sp. Yeelirrie Station Translocation to be worthwhile



Image # P3284202

Image #

Site 29

Date 28/3/2015

Geographical Region Lake Mason Target 4a

Description

Frankenia pauciflora Shrubland on the northern margin of a bare clay flat, and on the southern margin of a *Melaleuca xerophila* low shrubland. *Frankenia pauciflora* PFC 5 to 10% in patches.

Moderate sized area but devoid of perennial vegetation, fringed on southern side by *Tecticornia* sp. Shrubland.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	strong brown 7.5YR 4/6	medium clay (MC)	6.52	513	29.7	dry			
2 to 15 cm	strong brown 7.5YR 4/6	medium clay (MC)	6.44	1,780	27.9	moist			

Suitability for Translocation Trial:

Moderate No impacts on perennial vegetation here, site is not too saline



Image # P3284205

Image #

Site: Not a formal assessment site Date 29/3/2015

Geographical Region

Lake Mason Target 9

Description

A very wet and salty **Samphire flat** on medium to heavy clay. Very difficult to access from the west, try from the east, Impractical for access reasons.

Soil Characteristics not assessed

No soil samples and no photographs.

Site 30

Date 29/3/2015

Geographical Region

Lake Mason Target 9a

Description

***Tecticornia* sp. aff. *tenuis* WB37336 Shrubland** on red self mulching clay. *Tecticornia* sp. aff. *tenuis* WB37336 0.4m, PFC 25%. Site is too small to be of practical use for translocation.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 5 cm	red 2.5YR 5/8	medium clay (MC), self mulching	not tested	?		dry		non-dispersive clay	0 to 5 cm
	red 2.5YR 5/8	medium clay (MC), self mulching	not tested	?		moist			

Low

Too small an area and saline for *Atriplex* sp. Yeelirrie Station Translocation



Image # P3294211

Image #

Site 31

Date 29/3/2015

Geographical Region

Lake Mason Target 9a

Description

***Tecticornia* sp. aff. *tenuis* WB37336 Shrubland.** *Tecticornia* sp. aff. *tenuis* (WB37336) shrubland on yellowish red medium self mulching clay.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 5 cm	yellowish red 2.5YR 5/8	medium clay (MC), self mulching	6.23	not sampled	27.8	dry		non-dispersive clay	
5 to 20 cm	yellowish red 2.5YR 5/8	medium clay (MC), self mulching	6.22	not sampled	27.0	moist			

Low

Too small an area and saline for *Atriplex* sp. Yeelirrie Station Translocation



Image #

Image # P3294225

Site 31B

Date 29/3/2015

Geographical Region

Lake Mason Target 9b

Description

Tecticornia tenuis WB37336 shrubland on yellowish red medium self mulching clay.

A large area of *Tecticornia tenuis* WB37336, a self mulching clay similar to that supporting *Atriplex* sp. Yeelirrie Station.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 5 cm	yellowish red 5YR 5/8	medium clay (MC), self mulching	6.23	7,800	27.8	dry			
5 to 20 cm	yellowish red 5YR 5/8	medium clay (MC), self mulching	6.22	13,620	27.0	moist			

Low

Too small an area, saline and fully occupied by *Tecticornia tenuis* WB37336 for *Atriplex* sp. Yeelirrie Station Translocation



Image # P3294233



Image # P3294232

Site 32

Date 29/3/2015

Geographical Region

Lake Mason Target 9c

Description

On the margin of a *Tecticornia tenuis* WB37336 shrubland. 95% bare ground with *Lawrenia densiflora* seedlings and occasional *Tecticornia tenuis* WB37336 and *Tecticornia laevigata*.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 10 cm	red 5YR 6/6	medium clay (MC), self mulching, slightly pedal, blocky	6.16	7,030	28.0	moist			

Low

Too small an area, saline and fully occupied by *Tecticornia tenuis* WB37336 for *Atriplex* sp. Yeelirrie Station Translocation



Image # P3294238



Image # P3294237

Site 33

Date 29/3/2015

Geographical Region

Lake Mason Target 9d

Description

***Eragrostis tenellula* Grassland.** *Eragrostis tenellula* 20 cm, PFC 10%, grassland. Upslope of site 32 by ~ 20 meters.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 4 cm	dark red 2.5YR 4/8	medium clay (MC)	6.22	250	28.6	dry			
4 to 25 cm	reddish yellow 5YR 6/8	fine sandy loam (FSL)	6.15	2,100	29.1	moist			

Low

Too high in the landscape for *Atriplex* sp. Yeelirrie Station



Image # P3294241



Image # P3294240

Site: Not a formal assessment site Date 29/3/2015

Geographical Region Lake Mason Target 10

Description

Melaleuca xerophila 3m, PFC 10%, *Lycium australe* 1 to 1.5m, *Atriplex bunburyana* 0.6m, *Scaevola spinescens* terete leaf form 1m, *Vittadinia* sp. sp. Lake Mason (WB37338) 0.3m, *Tecticornia cymbiformis* P3 0.4m, *Enchylaena* sp. 0.4m, PFC 1% over *Cyperus bulbosa* 15 cm, *Eragrostis* sp. Blue-green 0.3m, PFC 5%.

Soil Characteristics not sampled

Site is a low gypsum dune and is unsuitable for *Atriplex* sp. Yeelirrie Station translocation.



Image # P3294247

Image #

Site 34

Date 29/3/2015

Geographical Region

Lake Mason Target 11

Description

Clay flat supporting *Atriplex* sp. aff. *A. amnicola*, WB37343 1.5 to 1.8m, PFC 10% with occasional scattered *Atriplex bunburyana* 1m, *Lycium australe* 1m, *Eremophila maculata* subsp. *brevifolia* 0.5m, *Tecticornia tenuis* WB37336 1m, *Scaevola spinescens* (terete leaf form) 1m, *Cratystylis subspinescens* 1m, PFC 5% with occasional emergent *Acacia victoriae* 3m, *Melaleuca xerophila* 3m, PFC < 5% over annuals *Eragrostis dielsii*, *Atriplex codonocarpa*.

Large areas of bare cracking, self mulching clay flat. Soil texture is a good match for *Atriplex* sp. Yeelirrie Station, however, may be too saline and is a relatively small area.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 20 cm	red 10R 4/6	medium clay (MC), self mulching	6.12	8,390	33.9	dry in first 4 cm, moist from 4 to 20 cm+			0 to 20 cm

Moderate but discounted: Soil texture is a good match for *Atriplex* sp. Yeelirrie Station, however, may be too saline and is a relatively small area. Further, the presence of *Atriplex* sp. aff. *amnicola* needs taxonomic clarification and consideration of potential to displace this species or potential hybridisation issues in a translocation program.



Image # P3294281



Image # P3294279

Site: Not a formal assessment site Date 29/3/2015

Geographical Region

Lake Mason Target 12

Description

***Eragrostis* sp. Yeelirrie Station Grassland.** Target 12 is an extensive calcrete plain supporting *Eragrostis* sp. Yeelirrie Station, various annual herbs (chenopods) and annual grasses, PFC overall 30 to 50%. Occasional emergent *Acacia victoriae* 2 to 3m, *Acacia burkittii* 3m, PFC 2 to 5%, denser in some areas. Numerous drainage foci within this community support denser *Acacia victoriae*, *A. tetragonophylla*, *Eremophila longifolia* (glaucous foliage form) to 4m, PFC within drainage foci to 80%, often with an open central area that may be subject to inundation following rainfall. Occasional occurrence of *Casuarina pauper* trees to 8m in patches.

Site is fringed with bands of *Lycium australe* shrubland and *Melaleuca xerophila* shrubland towards the lake edge.

Lake supporting an extensive patch of *Tecticornia* sp. aff. *tenuis* WB37336 on red self mulching clay, however, looks like it is very saline (per previous sites supporting this species) and fully occupied.

Soil Characteristics not sampled, no photographs taken

Unsuitable Too saline for *Atriplex* sp. Yeelirrie Station

Site: Not a formal assessment site Date 29/3/2015

Geographical Region

Lake Mason Target 12b

Description

Flooded lake bed with clay soil.

Soil Characteristics not assessed and no photographs taken

Unsuitable Too waterlogged / inundated for *Atriplex* sp. Yeelirrie Station

Site 35

Date 29/3/2015

Geographical Region Lake Mason Target 13

Description

Extensive gypsum flat supporting low scattered shrubland of *Atriplex vesicaria* 0.3m, *Frankenia cinerea* 0.1m, *Sclerolaena fimbriolata* 0.25m, *Trianthema triquetrum* 0.2m, *Maireana glomerifolia* 0.2m, Poaceae sp. aff. *Eragrostis tenellula* (collected), PFC 10 to 15%. Occasional *Tecticornia* sp. (Indet) to 0.5m, PFC < 1%.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
2 cm crust		medium clay (MC)	not tested						
2 to 12 cm	white gypsum	loamy sand (LS)	not tested			moist	35-1		fine roots present
12 cm +	reddish yellow 5YR 6/6	silt loam (SL)	not tested			moist	35-2		

Unsuitable Wrong soil type for *Atriplex* sp. Yeelirrie Station



Image # P3304290



Image # P3304291

Site: Not a formal assessment site Date 29/3/2015

Geographical Region

Lake Mason Target 14a

Description

***Tecticornia tenuis* WB37336 shrubland.** *Tecticornia tenuis* WB37336 0.7 to 1 m high, PFC 20%, growing in a ring around the margin of a red cracking clay flat. Very healthy population of this species. Evidence of dead *Maireana* sp. Lake Mason (G Cockerton & J Warden WB37339) 0.2m and extensive recruitment of *Lawrenzia densiflora* and *Atriplex codonocarpa* seedlings.

Soil Characteristics not assessed



Image # P3304293

Image #

Site 36

Date 29/3/2015

Geographical Region Lake Mason Target 14b

Description

Tecticornia tenuis WB37336 shrubland. *Tecticornia tenuis* WB37336 0.7 to 1 m high, PFC 3 to 40%, growing in a ring around the inner margin of a red cracking clay flat, surrounded by *Tecticornia laevigata* 0.3m, PFC 30 to 40%. Very healthy population of both *Tecticornia* spp. Extensive recruitment of *Lawrenxia densiflora* and *Atriplex codonocarpa* seedlings. Centre of the clay flat has very few annuals growing within it.

Soil Characteristics

Depth of stratum	Colour	Texture	pH	EC (micro Siemens per metre)	Temp	Moisture?	Sample # (100g)	Comments	Roots present
0 to 2 cm	clay crust	medium clay (MC), massive, non-pedal, low dispersive	not tested			dry			
2 to 7 cm	red 2.5 YR 5/8	medium clay (MC), massive, non-pedal, low dispersive	not tested			dry			
7 to 30 cm +	red 2.5 YR 5/8	medium clay (MC), massive, non-pedal, low dispersive	6.16	6,540	25.6	moist			lateral roots at 10 to 15 m depth

Moderate

If *Atriplex* sp. Yeelirrie Station can be established within the bare central part of the clay flat then this would be a good site, however, may be too saline for the species?



Image # P3304296



Image # P3304298