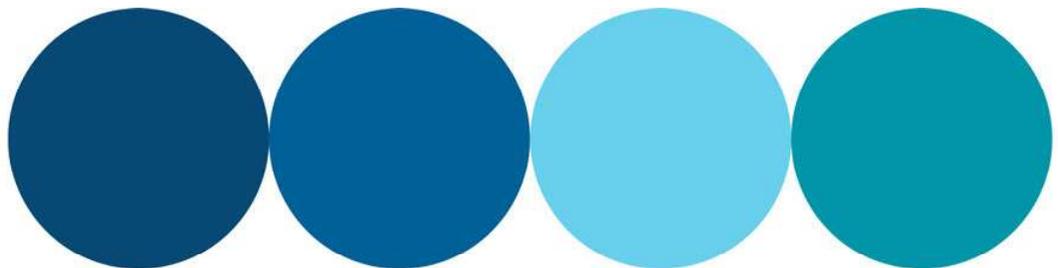


# Ghooli Heritage Pump Station Remediation

Revegetation Plan





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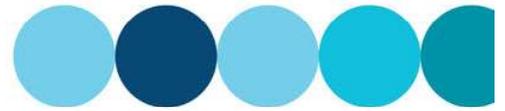
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# Contents

<b>1.</b>	<b>Purpose.....</b>	<b>5</b>
<b>2.</b>	<b>Scope .....</b>	<b>5</b>
<b>3.</b>	<b>Project Summary .....</b>	<b>5</b>
3.1.	Background	5
3.2.	Site Location	5
<b>4.</b>	<b>Site Description .....</b>	<b>6</b>
4.1.	Vegetation Description	6
4.2.	Vegetation Condition	6
4.3.	Weeds	6
4.4.	Landform and Soil Type	7
4.5.	Climate	7
4.6.	Dieback Status	7
<b>5.</b>	<b>Revegetation Plan.....</b>	<b>8</b>
5.1.	Objectives	8
	Revegetation Design	8
5.2.	Soil Amendment	8
5.3.	Site Preparation Techniques	8
5.4.	Regeneration Techniques	8
5.4.1.	<i>Natural Regeneration</i>	8
5.4.2.	<i>Mulching</i>	8
<b>6.</b>	<b>Post Installation Management.....</b>	<b>9</b>
6.1.	Monitoring	9
6.2.	Maintenance	9
6.3.	Completion Criteria and Success Targets	10
6.3.1.	<i>Plant Density</i>	10
6.3.2.	<i>Weeds</i>	10
6.4.	Reporting	10
<b>7.</b>	<b>Glossary.....</b>	<b>11</b>
<b>8.</b>	<b>References.....</b>	<b>12</b>



# Appendices

**APPENDIX A – REVEGETATION MAP ..... Error! Bookmark not defined.**

**APPENDIX B – INDICATIVE SPECIES LIST ..... 15**

**APPENDIX C – FLORA, VEGETATION AND FAUNA ASSESSMENT ..... 19**



## 1. Purpose

The purpose of this document is to provide a preliminary plan for the revegetation of areas cleared for the Ghooli Heritage Pump Station Remediation project. The document details the revegetation, the ongoing monitoring and management requirements and the completion criteria.

## 2. Scope

This Revegetation Management Plan is limited to areas cleared for the Ghooli Heritage Pump Station Remediation project that are no longer required for the purpose they were initially cleared for.

The Plan has been developed in accordance with the Department of Water and Environmental Regulation (DWER) document *A guide to preparing revegetation plans for clearing permits*.

## 3. Project Summary

### 3.1. Background

The Ghooli Heritage Pump Station has been reported to the DWER as contaminated under the *Contaminated Sites Act 2003* due to the presence of friable and bonded asbestos materials. A human health risks prior to the remediation of the site.

Impacts across the site consist of friable asbestos within ash material related to the former operation of the Heritage Pump Station's steam boilers, asbestos containing material (ACM) fragments associated with the on-site settlement, creosote coal tar pipe coating drums and general waste incorrectly disposed at the site from both the operation of the pump station and dumping by the public.

In order to address the contaminated site classification for the area and to reduce the residual human health posed by the material, remedial works comprised of the following will be undertaken:

- Clearing, grubbing and topsoil stripping.
- Construction of two containment cells designed to receive contaminated material and co-mingled vegetation.
- Collection of contaminated material and wastes with deposition within the containment cells.
- Validation of the remedial works to ensure the site has been adequately remediated to achieve the desired end point classifications under the *Contaminated Sites Act*.
- Construction of the containment cell capping layer and installation of permanent signage around the perimeter of the cells.
- Reinstatement and revegetation of the site to discourage and restrict future illegal dumping.

### 3.2. Site Location

The Ghooli Heritage Pump Station is located approximately 13 km east of Southern Cross, along the Mundaring to Kalgoorlie pipeline. The area is comprised of the following land parcels (thereafter referred to as 'the site'):

- Lot 350 On Plan 55290 currently owned by Water Corporation and comprised of historical infrastructure
- Lot 1356 On Plan 16117 privately owned
- Section of Unallocated Crown Land (UCL) Landgate PIN 626438, Parcel 74576
- Section of Unallocated Crown Land (UCL) Landgate PIN 626438 Parcel 74576
- Road Reserve Landgate PIN 11714652 ID Number 70082
- Road Reserve Landgate PIN 11714471 ID Number 70083
- Road Reserve Landgate PIN 11714471 Parcel 74577
- Lot 1355 on Plan 161170 - under DPLH Management Order

The Ghooli Heritage Pump Station site is believed to have been part of a larger formal land parcel managed by the State Government which encompassed the above lots.



## 4. Site Description

### 4.1. Vegetation Description

The proposed clearing area is situated in the Eremaen Botanical Province of Western Australia, within the Coolgardie IBRA bioregion and the Southern Cross subregion. Broadscale (1:250,000) pre-European vegetation mapping of the Boorabbin area was completed by Beard (1976) at an association level. The mapping indicates one vegetation associations are present at the site:

- Shrublands; Acacia Casuarina and Melaleuca thicket (association 1413,

A flora and vegetation survey completed for the area in 2017 (GHD 2017) described two native vegetation associations at the site and one modified association:

- Allocasuarina and Acacia shrubland
- *Eucalyptus salubris* woodland

Desktop searches and a field survey did not identify any Threatened or Priority Ecological Communities within the survey area. Similarly no other significant vegetation or vegetation that grows in, or in association with watercourses or wetlands was identified within the area during the field survey.

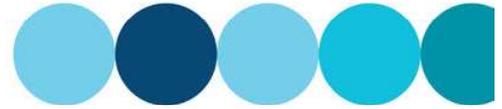
### 4.2. Vegetation Condition

Large parts of the area was rated degraded to completely degraded, with areas to the south side of Great Eastern Highway as excellent with the exception of one area containing dumped rubbish. The accuracy of the vegetation condition ratings were not considered to be at an appropriate scale, as higher quality ratings have been mapped over areas of known contamination that do not correspond with their adapted Trudgen Scale descriptions.

### 4.3. Weeds

The 2017 survey found that introduced flora species at the site were confined to highly disturbed areas located around infrastructure and the former settlement, with one significant weed species being identified. The following species were catalogued:

- *Schinus mole*
- *Phoenix dactylifera*
- *Mesembryanthemum crystallinum*
- *Mesembryanthemum nodiflorum*
- *Ptilotus holosericeus*
- *Asphodelus fistulosus*
- *Arctotheca calendula*
- *Hypochaeris glabra*
- *Hypochaeris radicata*
- *Echium plantagineum* (DP)
- *Brassica tournefortii*
- *Carrichtera annua*
- *Opuntia stricta* (WONS)
- *Triadica setifera*
- *Brachychiton* sp.
- *Malva parvifolia*
- *Oxalis pes-caprae*
- *Avena barbata*
- *Bromus* sp.
- *Cortaderia selloana*
- *Cynodon dactylon*
- *Eragrostis ?minor*
- *Eragrostis curvula*
- *Lolium* sp. (insufficient material)



#### **4.4. Landform and Soil Type**

The site is situated on the undulating plains with some low dunes, seasonal lakes, and clay pans; chief soils are brown and grey-brown calcareous earths.

#### **4.5. Climate**

The Ghooli Heritage Pump Station is within the 'hot dry summer, cold winter' climate zone based on 30-year temperature and humidity climatology data collected by the Bureau of Meteorology (BoM). Information from the nearest weather station collecting temperature data (Kalgoorlie-Boulder Airport 12038) indicates that mean maximum temperature ranges between 16.8°C – 33.7 °C, with minimum temperature ranging from 5.1 °C - 18.3 °C. Mean annual rainfall from the Coolgardie weather station (12018) is listed as 270.7 mm (1893 - 2019), with lowest rainfalls generally occurring within spring.

#### **4.6. Dieback Status**

The site is not within the >400mm rainfall isohyet and dieback is not considered to be a risk for the area.



## 5. Revegetation Plan

### 5.1. Objectives

The main objectives of the revegetation program at the Ghooli Heritage Pump Station site are to:

- Provide stability for the containment cell capping layer.
- Restore vegetation within areas cleared for remediation of the site.
- Restrict and discourage future illegal dumping.
- Stabilise soil in cleared areas and prevent wind erosion over time.

### Revegetation Design

Revegetation will be through passive means with the re-use of mulched vegetation, uncontaminated topsoil and encouragement of natural regeneration from the surrounding environment.

### 5.2. Soil Amendment

No soil amendment is currently proposed to be used during the revegetation program.

### 5.3. Site Preparation Techniques

Due to the nature of the remediation works it is possible that imported topsoil may be required to facilitate regeneration. Some areas of remediation require that soil is scraped and disposed of to the containment cells in order to remove asbestos contaminants, other areas where only general waste is being removed it may be possible to retain topsoil.

### 5.4. Revegetation Techniques

#### 5.4.1. Natural Regeneration

Topsoil which has been validated as free from asbestos and metal contaminants shall be respread. Mulched vegetation that have not been contaminated from asbestos will be spread across cleared areas

If contingency seeding is required within areas of natural regeneration the species selected shall be locally native and contained within the species list provided in Appendix B.

#### 5.4.2. Mulching

Cleared vegetation which has been deemed not-impacted by asbestos will be mulched and re-used on the site.



## 6. Post Installation Management

### 6.1. Monitoring

Regeneration will be formally monitored for a period of six years following clearing, with bi-annual monitoring events occurring in spring and being used to assess regeneration progress against completion criteria (Table 1).

**Table 1. Monitoring timing and components (based on site works being completed immediately prior to spring 2022)**

Timing	Components
Spring (2024) Every two years	<ul style="list-style-type: none"> <li>• Completion criteria monitoring</li> <li>• Weed monitoring</li> <li>• <i>Recommendations for management and/or site remedial works</i></li> <li>• 1<sup>st</sup> monitoring report</li> </ul>
Spring (2026)	<ul style="list-style-type: none"> <li>• Completion criteria monitoring</li> <li>• Weed monitoring</li> <li>• <i>Recommendations for management</i></li> <li>• 2<sup>nd</sup> monitoring report</li> </ul>
Spring (2028)	<ul style="list-style-type: none"> <li>• Completion criteria monitoring</li> <li>• Weed monitoring</li> <li>• <i>Recommendations for close-out and/or further management</i></li> <li>• 3<sup>rd</sup> monitoring report</li> </ul>

### 6.2. Maintenance

Weed control will be undertaken as required based on the results of the progress report to reduce competition with establishing native vegetation.

Maintenance activities will be undertaken in response to results of formal monitoring events and may include direct seeding where regeneration is not progressing towards the completion criteria and success targets.

No specific herbivory management is currently proposed however portions of the site where informal access tracks currently exist will be fenced off to discourage future access and dumping within newly remediated areas.



### 6.3. Completion Criteria and Success Targets

The remediation site has a long history of disturbance and alteration. The rehabilitated areas will be left to regenerate naturally via recruitment from the surrounding undisturbed vegetation, mulched vegetation and imported topsoil if accessible and required. The aim is to re-establish local native species via recruitment from surrounding vegetation and minimise weed establishment.

In order to assess the regeneration program against the desired aim, the following completion criteria and success targets will be adopted:

#### 6.3.1. Plant Density

- Achieve 1 plant per m<sup>2</sup> by year 6

#### 6.3.2. Weeds

- Weed foliage cover is less than 10%.
- No occurrences of *Opuntia stricta* (Prickly Pear) within revegetation zones.

If 1 plant per m<sup>2</sup> density is not achieved by year 6, the project will be re-assessed and the option of planting seedlings to make up for this shortfall will be undertaken if considered viable.

### 6.4. Reporting

Three formal monitoring reports will be prepared for the regeneration program according to the timing specified in Table 1. All reports will detail information on:

- Regeneration post construction.
- Weed occurrence and proposed management.
- Other impacts affecting regeneration (erosion, herbivory, etc.).
- Maintenance requirements and proposed remedial works program.
- Future contingency actions to achieve Completion Criteria.

The first report will examine regeneration growth the second-year post construction. If there are any immediate issues that may impact on regeneration success going forward this will be discussed within the report and any remedial requirements will be specified.

The second report will review regeneration 4 years post construction. If any remedial measures were implemented as a result of previous monitoring, their effectiveness will be assessed and recommendations made on any ongoing requirements.

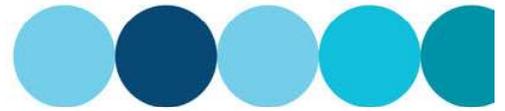
The third report will assess whether the completion criteria and success targets have been achieved. The long term success of regeneration will be discussed and any requirements for further management and/or monitoring of the area will be detailed.

Weed impacts and any follow-up management requirements which are identified during the autumn weed monitoring events will be informally reported to address any required actions.



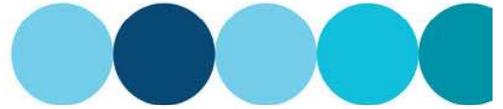
## 7. Glossary

<b>Clearing</b>	The killing of, removal of, severing or ringbarking of trunks or stems of, or the doing of any other substantial damage, including draining or flooding land, burning and grazing of stock, to some or all of the native vegetation in an area. (Clearing does not include pruning of native vegetation, to the extent the pruning does not cause substantial damage to the native vegetation.)
<b>Direct Seeding</b>	A method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species.
<b>Native vegetation</b>	Indigenous aquatic or terrestrial vegetation but does not include vegetation that was intentionally sown, planted or propagated unless: (a) that vegetation was sown, planted or propagated as required under the EP Act or another written law; or (b) that vegetation is of a class declared by regulation to be included in this definition and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation.
<b>Regeneration</b>	Revegetation that can be established from <i>in situ</i> seed banks contained either within the topsoil or seed-bearing mulch.
<b>Rehabilitation</b>	A process where disturbed land is returned to a stable, productive and self-sustaining condition, taking future land use into account (this process differs from the narrower definition of restoration by not aspiring to fully replace all of the original components of an ecosystem) (EPA, 2006).
<b>Restoration</b>	The process of fully repairing the composition, structure, function and dynamics of pre-existing indigenous ecosystems (EPA, 2006).
<b>Revegetation</b>	The re-establishment of a cover of native vegetation in an area such that the species composition, structure and density is similar to pre-clearing vegetation types in that area, and can involve regeneration, direct seeding and/or planting.
<b>Site Preparation</b>	Management of existing site topsoil and preparation of the finished soil surface, for example by ripping or tilling the soil surface and resspreading site topsoil and chipped native vegetation.

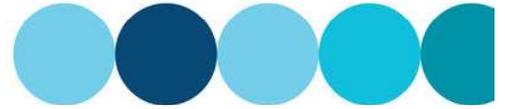


## 8. References

GHD (2017). Dedari and Ghooli Pump Station *Flora, Vegetation and Fauna Assessment*. Unpublished report to Water Corporation, corporate record #47905944







## **APPENDIX B – INDICATIVE SPECIES LIST**



**Indicative Species List (taken from species occurrence in GHD 2017)**

Family	Taxon
Aizoaceae	<i>Carpobrotus modestus</i>
Amaranthaceae	<i>Ptilotus nobilis</i>
Apocynaceae	<i>Alyxia buxifolia</i>
Asparagaceae	<i>Lomandra effusa</i>
Asteraceae	<i>Cratystylis subspinescens</i>
Asteraceae	<i>Olearia muelleri</i>
Asteraceae	<i>Olearia pimeleoides</i>
Asteraceae	<i>Podolepis capillaris</i>
Boraginaceae	<i>Halgania andromedifolia</i>
Casuarinaceae	<i>Allocasuarina acutivalvis subsp. acutivalvis</i>
Casuarinaceae	<i>Allocasuarina corniculata</i>
Chenopodiaceae	<i>Atriplex codonocarpa</i>
Chenopodiaceae	<i>Atriplex vesicaria</i>
Chenopodiaceae	<i>Enchylaena tomentosa var. tomentosa</i>
Chenopodiaceae	<i>Maireana radiata</i>
Chenopodiaceae	<i>Maireana trichoptera</i>
Chenopodiaceae	<i>Maireana villosa</i>
Chenopodiaceae	<i>Rhagodia preissii</i>
Chenopodiaceae	<i>Sclerolaena diacantha</i>
Cupressaceae	<i>Callitris preissii</i>
Cyperaceae	<i>Lepidosperma sanguinolentum</i>
Cyperaceae	<i>Schoenus sp. A1 Boorabbin</i>
Euphorbiaceae	<i>Beyeria sulcata var. sulcata</i>
Fabaceae	<i>Acacia acuminata</i>
Fabaceae	<i>Acacia beauverdiana</i>
Fabaceae	<i>Acacia colletioides</i>
Fabaceae	<i>Acacia enervia subsp. enervia</i>
Fabaceae	<i>Acacia erinacea</i>
Fabaceae	<i>Acacia hemiteles</i>
Fabaceae	<i>Acacia resinimarginea</i>
Fabaceae	<i>Acacia resinistipulea</i>
Fabaceae	<i>Acacia yorkkrakinensis subsp. acrita</i>
Fabaceae	<i>Daviesia benthamii subsp. acanthoclona</i>
Fabaceae	<i>Mirbelia microphylla</i>



Fabaceae	<i>Senna artemisioides subsp. filifolia</i>
Fabaceae	<i>Senna artemisioides subsp. petiolaris</i>
Fabaceae	<i>Senna glutinosa subsp. x luerssenii</i>
Fabaceae	<i>Senna pleurocarpa var. angustifolia</i>
Goodeniaceae	<i>Dampiera lavandulacea</i>
Goodeniaceae	<i>Scaevola spinescens</i>
Lamiaceae	<i>Dicrastylis parvifolia</i>
Lamiaceae	<i>Micromyrtus obovata</i>
Lamiaceae	<i>Pityrodia lepidota</i>
Malvaceae	<i>Seringa velutina</i>
Montiaceae	<i>Calandrinia eremaea</i>
Myrtaceae	<i>Baeckea sp. Boorabbin</i>
Myrtaceae	<i>Eucalyptus eremophila</i>
Myrtaceae	<i>Eucalyptus sheathiana</i>
Myrtaceae	<i>Eucalyptus griffithsii</i>
Myrtaceae	<i>Eucalyptus leptopoda subsp. leptopoda</i>
Myrtaceae	<i>Eucalyptus pileata</i>
Myrtaceae	<i>Eucalyptus salmonophloia</i>
Myrtaceae	<i>Eucalyptus salubris</i>
Myrtaceae	<i>Eucalyptus yilgarnensis</i>
Myrtaceae	<i>Euryomyrtus maidenii</i>
Myrtaceae	<i>Leptospermum fastigiatum</i>
Myrtaceae	<i>Malleostemon roseus</i>
Myrtaceae	<i>Melaleuca atroviridis</i>
Myrtaceae	<i>Melaleuca cordata</i>
Myrtaceae	<i>Melaleuca pauperiflora</i>
Myrtaceae	<i>Micromyrtus obovata</i>
Myrtaceae	<i>Rinzia rubra</i>
Myrtaceae	<i>Thryptomene kochii</i>
Pittosporaceae	<i>Billardiera coriacea</i>
Poaceae	<i>Austrostipa elegantissima</i>
Poaceae	<i>Neurachne alopecuroidea</i>
Poaceae	<i>Triodia rigidissima</i>
Polygalaceae	<i>Comesperma scoparium</i>
Proteaceae	<i>Grevillea acuaria</i>
Proteaceae	<i>Grevillea didymobotrya subsp. didymobotrya</i>
Proteaceae	<i>Hakea erecta</i>



Proteaceae	<i>Hakea francisiana</i>
Proteaceae	<i>Hakea multilineata</i>
Rutaceae	<i>Phebalium filifolium</i>
Santalaceae	<i>Exocarpos aphyllus</i>
Santalaceae	<i>Santalum acuminatum</i>
Scrophulariaceae	<i>Eremophila caperata</i>
Scrophulariaceae	<i>Eremophila decipiens subsp. decipiens</i>
Scrophulariaceae	<i>Eremophila glabra subsp. glabra</i>
Scrophulariaceae	<i>Eremophila ionantha</i>
Scrophulariaceae	<i>Eremophila scoparia</i>
Solanaceae	<i>Solanum nummularium</i>



## **APPENDIX C – FLORA, VEGETATION AND FAUNA ASSESSMENT**



Document at [#18004919](#)