

REVEGETATION PLAN
Banana Wells Gravel Pit



Printed copies are uncontrolled unless marked otherwise

CONTENTS

1. PROJECT DESCRIPTION	3
1.1 PURPOSE.....	3
1.2 BACKGROUND	3
1.3 PREVIOUS ASSESSMENT WORK	3
1.4 PROJECT DESCRIPTION	6
1.5 EXISTING VEGETATION	7
1.6 WEEDS	7
2. SITE PREPARATION.....	7
2.1 VEGETATION CLEARING, MULCHING AND RE-USE.....	7
2.2 TOPSOIL STRIPPING AND RE-USE	7
3. WEED CONTROL	7
4. REVEGETATION THROUGH REGENERATION	8
4.1 REVEGETATION OBJECTIVES	8
4.2 REQUIRED VEGETATION COVER	8
4.3 REVEGETATION TECHNIQUES	8
4.4 TIMING AND STAGING OF REVEGETATION WORKS.....	9
5. VEGETATION ESTABLISHMENT PERIOD.....	10
6. ONGOING MAINTENANCE AND MONITORING.....	10
6.1 MAINTENANCE AND MONITORING.....	10

BANANA WELLS GRAVEL PIT

REVEGETATION PLAN

1. PROJECT DESCRIPTION

1.1 Purpose

Main Roads Western Australia (Main Roads) has a policy aim to “protect and enhance the environmental values of road reserves”. This document has been prepared to ensure compliance with Main Roads’ Environmental Policy and Main Roads’ statewide Purpose Permit CPS 818/6.

In the process of establishing new roads and upgrading existing roads, there is often a need to undertake revegetation of the road reserve or other affected areas. Where clearing of native vegetation is to occur under Main Roads’ statewide Purpose Permit CPS 818/6, a revegetation plan is required for temporary clearing (eg. borrow pits, access tracks, camps etc.). Where the temporary clearing exceeds 0.5ha, the revegetation plan needs to be forwarded to the Department of Environment and Conservation prior to clearing.

This revegetation plan sets out the rehabilitation requirements for the Banana Wells gravel pit area which will be exposed to excavation of material. This material will be utilised for upgrade works associated with the Broome-Cape Leveque Road.

The purpose of the revegetation plan is to identify effective revegetation practices that help accelerate the natural succession processes that occur following the clearing of native vegetation and soil disturbance.

1.2 Background

The Banana Wells gravel pit, located approximately 140km north of Broome, is composed of suitable gravel material for future upgrade works programmed for the Broome-Cape Leveque Road.

The gravel pit is approximately 200ha in size. Large sections of the gravel pit have been previously disturbed or excavated prior to Main Roads being required to obtain statutory environmental approval to clear native vegetation.

Depending upon material requirements associated with the Broome-Cape Leveque Road upgrade works, an area of no larger than 20 ha approximately will be established annually within the Banana Wells gravel pit. As one area is excavated and exhausted of material it will be rehabilitated prior to a further material extraction area being established.

Figures 1 & 2 identify the location of the project area.

1.3 Previous Assessment Work

Main Roads Western Australia (January 2012) Preliminary Environmental Impact Assessment and Environmental Management Plan Banana Wells Gravel Pit.



Figure 1...Broad Locality Image of Project Area

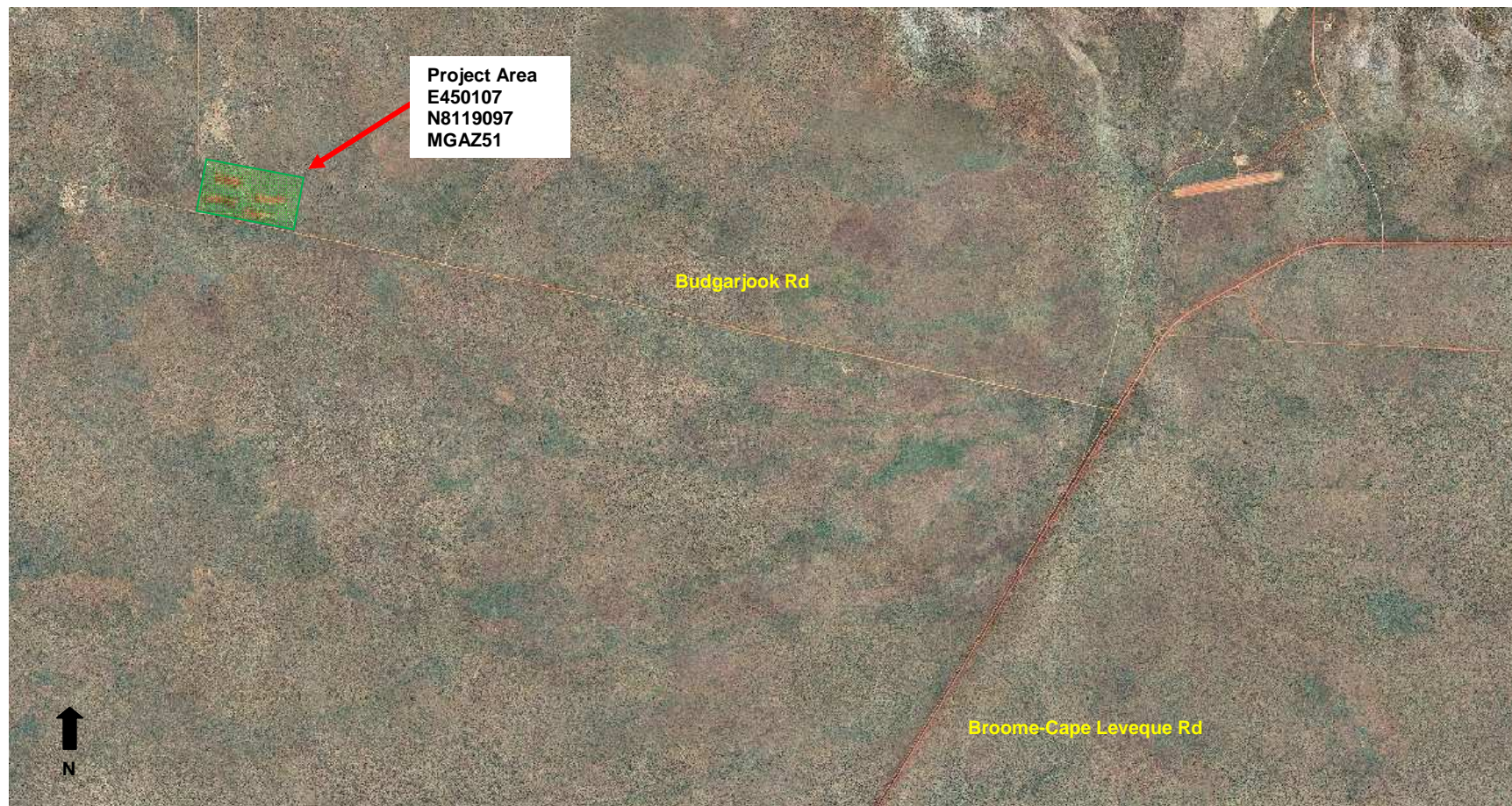


Figure 2... Close-up image of project area.

1.4 Project Description

It is proposed to investigate the Banana Wells gravel pit area and locate naturally occurring gravel material suitable for upgrade of the Broome-Cape Leveque Road. The whole area under investigation will not require clearing and excavation but the best available materials will be sourced from within the project area. Materials may be extracted from one or several locations within the proposed investigation area. Areas cleared of native vegetation for extraction purposes will be no larger than 20 hectares approx. All areas that are cleared and disturbed will be rehabilitated once gravel extraction is complete. The gravel area will likely remain open for the duration of construction activities associated with the upgrade of the Broome-Cape Leveque Road, potentially three years. Construction works are planned to proceed April 2013.

The following areas to be rehabilitated are shown in Table 1:

Table 1: Revegetation Area Details

Type	Area
Temporary clearing revegetation	20 hectares
Other revegetation	Nil

1.5 Existing vegetation

Vegetation type, extent and conservation status (after Shepherd *et al.*, 2002) for the Banana Wells gravel pit:

Vegetation Association Number	Association Description	% Remaining
750	<i>Shrublands, pindan; Acacia tumida shrubland with grey box & cabbage gum medium woodland over ribbon grass & curly spinifex</i>	99.75

1.6 Weeds

Consultation with the Department of Food and Agriculture confirms the following weed species may be present within a 10 km radius of the project area:

- *Andropogon gayanus* (Gamba Grass);
- *Pennisetum pedicellatum* subsp. *unispiculum* (Hairy Fountain Grass).

2. SITE PREPARATION

2.1 Vegetation clearing, mulching and re-use

All vegetation will be cleared from the works area and non-weed infested vegetation will be stockpiled. Stockpiled vegetation will not be placed on the very edge of the approved cleared area in order to prevent machinery going outside the cleared area to push the stockpile forward again. Weed infested vegetation will be disposed of at an appropriate quarantined site. Burning of the cleared vegetation will not be permitted.

2.2 Topsoil stripping and re-use

Topsoil will be stripped to a maximum depth of 100 mm. Topsoil will be stored in a weed free (as far as possible) area, as close as possible to the area to be rehabilitated. The topsoil will be placed in windrows of less than 1.5m in height and reinstated as soon as possible, to prevent deterioration to the in-situ seeds and maintain seed viability.

3. WEED CONTROL

Weeds can out-compete the local native species and reduce the habitat value. The following management procedures will be implemented to minimise the potential for spread of Declared Plants and environmental weeds:

- Adequate control measures will be incorporated to ensure weeds are killed or not transported to other areas. Control measures include removal of weeds to an approved dump site or treatment of weeds such as using herbicide spraying;
- Herbicide spraying shall only be carried out by licensed operators and herbicide shall be mixed and applied in accordance with manufacturer's instructions;
- Any observed Declared Plant infestations shall be treated prior to clearing if an effective control is available;
- Where practicable, weeds should not be removed when they are in flower or seeding;

- Minimum clearing footprints will be utilised where practicable to avoid creating conditions suitable for weed proliferation;
- Measures to prevent plants, seeds and topsoil being moved to non-infested areas will be implemented;
- All machinery shall be free of built up soil and vegetative material before entering and leaving the site to help minimise the transportation of weeds and their seeds;
- No weed-infested soil material or road-building material shall be imported into the area as fill;
- Exploration of soils should be avoided in those areas affected by infestation;
- Exposed areas such as bare batters and borrow pits shall be promptly rehabilitated to reduce the ingress of weeds;
- Where works are adjacent to good quality vegetation, weeds within the project area will be removed or killed once a year for up to three years.

4. REVEGETATION THROUGH REGENERATION

4.1 Revegetation objectives

The revegetation objectives are to:

- Ensure roadside stability and minimise ongoing maintenance;
- Ensure that conservation values and biodiversity are protected; and
- Ensure local amenity and aesthetics are enhanced.

4.2 Required vegetation cover

The roadside vegetation should be similar in structure and content to comparable naturally occurring vegetation in the local area and will reflect the vegetation communities present in the road reserve and adjacent bushland. The width of the vegetation setbacks and clearances will be appropriate for the specific location and will be dependent on an assessment of the road design speed, road alignment and the roadside batter slopes.

4.3 Revegetation Techniques

The following rehabilitation works shall be undertaken on areas of disturbed earth requiring rehabilitation:

- Topsoil will be uniformly respread to a minimum depth of 100mm over the area; and
- Area to be ripped to a minimum depth of 200mm deep with rip lines approximately 300mm apart. Where slopes are present, rip lines shall be along contours.

The following rehabilitation work shall be undertaken at borrow/gravel pits and to the sidetrack:

- Overburden and then topsoil shall be uniformly and evenly spread over the disturbed areas of the pit. Depending on the slope of drainage lines within the pit, it may be necessary to form small swales from the topsoil to reduce erosion velocities and encourage the deposition of seeds.
- The existing pit floor shall be ripped to a depth of 300 – 500mm deep with rip lines between 500 - 800mm apart, if the material in the floor of the pit is able to be ripped. The whole area of the pit, including drainage lines, shall be ripped.
- All stockpiled vegetation shall be spread along the contour and pit floor to help promote seed deposition and further reduce erosion velocities.

4.4 Timing and Staging of Revegetation Works

The approximate timing and staging of revegetation works is outlined below –

Timing

Clearing and stockpiling of vegetation	September / October 2012
Stripping and stockpiling of topsoil	October / November 2012
Ripping of cleared areas with a backhoe; re-spreading of topsoil and vegetative material over cleared areas	August / September 2013
Monitoring and maintenance	November 2013 April/May 2014 April/May 2015

**Monitoring will continue for a minimum of five years following completion of rehabilitation / revegetation works*

5. VEGETATION ESTABLISHMENT PERIOD

The vegetation establishment period will be for at least twelve months following the completion of the works. During this period, the maintenance and monitoring will be undertaken, see Section 6.

6. ONGOING MAINTENANCE AND MONITORING

Maintenance and monitoring of the project shall be ongoing to measure regeneration effectiveness and to control weeds.

6.1 Maintenance and Monitoring

After rehabilitation activities are undertaken, rehabilitated areas will be inspected for a minimum of five years following completion of works. Rehabilitated areas will be inspected immediately following rehabilitation works (estimated to occur November 2013); in April or May the following year; just prior to the wet season (approximately 12 months after rehabilitation efforts), then every year for five years in April/May to assess rehabilitation performance against the completion criteria outlined below. Monitoring of the rehabilitation activities will determine if follow up seeding will be required.

Monitoring will essentially involve visual assessment to ensure the rehabilitation works have been implemented as planned. Table 2 shall be used as the monitoring guide to assess the success or otherwise of the revegetation / rehabilitation plan.

Table 2: Revegetation Monitoring Guide

Criterion	Target	After six months	After one year	After five years
Mean vegetation foliage cover (%) excluding weeds.	>50	0	20	40
Mean number of stems (excluding weed species) / ha within each rehabilitated area	100 stems / ha	400 stems / ha	300 stems / ha	200 stems / ha
Mean weed foliage cover (%).	<20	<20	<20	<20
Amount of bare soil areas >4m ² (%).	<30	<100	<80	<80
% Overstorey species	20%	0	2%	20%
% Midstorey species	40%	10%	20%	40%
% Understorey species	40%	20%	20%	40%

Monitoring will include:

- Establish monitoring quadrats in rehabilitated areas and control plots in similar, undisturbed areas and assess and compare after one, three and five years following rehabilitation;
- Seed germination rates and plant density;
- Seedling survival;
- Species diversity;
- Weed cover; and,
- Dominant native species present.

At each rehabilitated site up to four randomly selected 50m x 50m quadrats will be established. This will comprise of one control quadrat within adjacent remnant vegetation and

three quadrats within the rehabilitation area. Within the rehabilitation monitoring quadrats, three randomly selected 1m x 1m quadrats will be used to quantify germinants under 10cm. The entire quadrat will be assessed.

If required, follow up herbicide applications will occur on problem weeds for up to three years after topsoil respread or planting/seeding. This herbicide will be spot sprayed on the weeds by hand to avoid overspray onto native plants and will allow these plants to develop without competing with weeds.

Due to the variable rainfall patterns in pastoral areas, revegetation works may not be successful, despite the use of best management practices.