



# North West Coastal Highway



Shire of Northampton  
SLK 145.7

## Material Pit Rehabilitation Plan

Revision 0.0  
June 2011

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## 1. PROJECT INFORMATION

### 1.1 Project Location

Main Roads has identified a potential material site within Eurardy Station, located along North West Coastal Highway approximately 30 km north of the Murchison River. The proposed material site has been vested to Main Roads through Section 19 approvals for material extraction, in accordance with the *Mining Act 1978*.

### 1.2 Road History

Main Roads Western Australia (MRWA) over a number of years has slowly been exhausting material stockpiles required for road construction and maintenance. Main Roads is currently in the process of developing a region wide strategic plan to identify potential future material sites. The identification of material sites will help the region locate required road building material for road construction and maintenance as well as for use during emergency situations that may arise after events such as natural disasters and vehicle accidents.

### 1.3 Proposed Works

Main Roads proposes to extend an initial section of this potential material site for the purpose of grave extraction. The total area of native vegetation proposed to be cleared during this initial stage of grave extraction is 4.5ha. The area identified in blue in figures 2 & 3, will be cleared, with the material to be stockpiled in the green section. This allows the for the blue section to be rehabilitated.

### 1.4 Vegetation Description

A Biological Survey was conducted in 30 July 2009, the results of which were referred to in the PEIA.

The results of the survey concluded that:

In summary, the following conclusions on environmental aspects are made:

» The vegetation of the Project Area is identified by Beard (1976) as likely to contain vegetation association 365, which is described as 'Shrublands; bowgada and jam scrub with scattered York gum and red mallee'.

– This vegetation type is considered to be of *Least Concern*, with 81.1% (11,128.9 ha) of the preEuropean extent considered to be remaining in the Geraldton Sandplains Interim Biogeographic Regionalisation for Australia (IBRA) region (Shepherd, 2005).

» No Declared Rare Flora species were recorded during the field survey. However, three Priority species, *Thryptomene ninghanensis* (Priority 1); *Philotheca kalbarriensis* (Priority 2); and *Wurmbea murchisoniana* (Priority 4) were recorded within the Project Area. Consultation with DEC is recommended with regards to the recorded presence of these species.

» Kalbarri National Park and Toolonga Nature Reserve are located approximately 10 km to the west and 50 km to the northeast of the Project Area respectively.

These conservation areas are a significant distance from the Project Area. Clearing of vegetation within the Project Area is not likely to have an impact on the environmental values of these conservation areas.

» Vegetation condition throughout the Project Area ranged from Condition 12 (*Pristine or Nearly So Excellent*) to Condition 6 (*Completely Degraded*). The main disturbance factor was from historical clearing for the purpose of material extraction. During the flora survey it was noted that areas of vegetation within the Project Area exhibited signs of fire and drought disturbance.

» A total of 72 species from 31 families were recorded in the Project Area, which represents a moderate native species diversity.

» Two weed species, *\*Polycarpon tetraphyllum* and *\*Hypochaeris* sp. (insufficient material) were identified during the field survey. No Declared Plants listed under the *Agriculture and Related Resources Act* (1976) were recorded in the Project Area.

» 8 fauna species (5 birds and 3 mammals) were recorded during the reconnaissance fauna survey. Two introduced species, the European rabbit and feral goat, were recorded in the Project Area. Potential clearing within the Project Area is not expected to negatively impact upon the local populations of any of these or other fauna species present in the area;

» No threatened fauna species were recorded in the Project Area during the reconnaissance fauna survey. Threatened fauna species known to occur in the general area, as identified in the desktop assessment, are unlikely if present, to be impacted by clearing of vegetation in the Project area; and

» Based on the findings of the desktop and field assessment, clearing is considered likely to be at variance (but not significantly so) with one ('c3') of the DEC's "Ten Clearing Principles".

See Table 1 for a list of species identified in the vicinity of the project.

**Table 1 – Species List**

<b>Table 2 Flora species recorded during the field survey July 2009</b>
<i>Cheilanthes adiantoides</i>
<i>Ptilotus obovatus</i> (Cotton Bush)
<i>Ptilotus schwartzii</i>
<i>Cthonocephalus pseudevax</i> (Woolly Groundheads)
<i>Olearia dampieri</i> subsp. <i>dampieri</i>
<i>Rhodanthe stricta</i>
<i>Senecio pinnatifolius</i>
<i>Senna artemisioides</i> subsp. <i>filifolia</i>
<i>Spergularia marina</i>
<i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i>
<i>Enchylaena tomentosa</i> Barrier Saltbush
<i>Sclerolaena glabra</i>
<i>Wurmbea inframediana</i>
<i>Wurmbea murchisoniana</i> P4
<i>Crassula colorata</i> (Dense Stone Crop)
<i>Callitris canescens</i>
<i>Isolepis congrua</i>
<i>Lepidosperma tenue</i>
<i>Hibbertia glomerosa</i>
<i>Drosera macrantha</i> subsp. <i>macrantha</i>
<i>Ecdeiocola monostachya</i>
<i>Dampiera incana</i> var. <i>fuscescens</i>
<i>Scaevola spinescens</i> Currant Bush
<i>Dianella revoluta</i> (Blueberry Lily)
<i>Pityrodia verbascina</i> (Golden Bush)
<i>Acacia coolgardiensis</i> Spinifex Wattle
<i>Acacia neurophylla</i> subsp. <i>erugata</i>
<i>Acacia ramulosa</i> var. <i>ramulosa</i> Horse Bush
<i>Acacia rhodophloia</i>
<i>Acacia</i> sp. <i>narrow phyllode</i> (B.R.Maslin 7831)
<i>Acacia stereophylla</i> var. <i>stereophylla</i>
<i>Acacia tetragonophylla</i> (Kurara)
<i>Eremophila clarkei</i> (Turpentine Bush)
<i>Baeckea pentagonantha</i>
<i>Eucalyptus eudesmioides</i> Mallallie
<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> (York Gum)
<i>Eucalyptus rigidula</i> Stiffleafed Mallee
<i>Malleostemon peltiger</i>
<i>Melaleuca fulgens</i> subsp. <i>steadmanii</i> (Scarlet Honeymyrtle LS)
<i>Melaleuca atroviridis</i>
<i>Melaleuca cordata</i>
<i>Melaleuca eleuterostachya</i>
<i>Thryptomene ninghanensis</i> P1
<i>Thryptomene</i> sp. <i>Billabong</i> (M.E. Trudgen 12858)
<i>Pterostylis scabra</i> (Bronze Shell Orchid)
<i>Leptosema daviesioides</i> LS
<i>Mirbelia microphylla</i> LS
<i>Bursaria occidentalis</i>

<i>Monachather paradoxus</i>
<i>Hakea minyma</i>
<i>Hakea recurva</i> Djarnokmurd
<i>Philothea kalbarriensis</i> P2
<i>Santalum acuminatum</i> Quandong
<i>Santalum spicatum</i> Sandalwood
<i>Brachychiton gregorii</i> Desert Kurrajong
<i>Hannafordia quadrivalvis</i> subsp. <i>quadrivalvis</i>
<i>Keraudrenia velutina</i> subsp. <i>velutina</i>
<i>Rulingia luteiflora</i> Yellowflowered <i>Rulingia</i>

## **2. REVEGETATION INFORMATION**

The revegetation of this material pit will be contained within the areas detailed in figures 2 & 3 and comprise of seeding with locally occurring indigenous species. The total area to be revegetated is approximately 9 ha.

The proposed species list for the revegetation (see Table 2).

### **2.1 Weed Control**

Weed control will involve herbicide treatments to reduce the amount of weeds present. This will reduce the competition for available water and nutrients with the native seedlings, leading to a more successful revegetation outcome. Weed control will be carried out once the annuals emerge and at least several weeks prior to planting. Herbicide will be applied from a boom spray unit where accessible and hand sprayed in other areas. A herbicide application record sheet will be completed for all weed spray operations (Appendix 1).

Areas to be planted with tube stock will ideally be sprayed before planting with a residual herbicide (e.g. Simazine) and knockdown (e.g. Glyphosate) mix. Simazine will be sprayed at 2 kg/ha and Roundup PowerMax will be sprayed at a minimum 1 L/ha, with the carrier 100 litres of water per hectare, Roundup Bi-Active will be used in the areas closer to waterways and a decision will be made if Simazine will be used near these waterways as well.

A follow up spray in spring with Fusilade or Verdict may be required to control narrow leaf grasses. If narrow leaf grasses are prevalent on the site it would be anticipated this herbicide treatment would be required. Fusilade will be sprayed at a maximum 3.3 L/ha and if Verdict is used this will be sprayed at a maximum 0.4 L/ha, with the carrier 100 litres of water per hectare.

### **2.2 Topsoil Management**

The area already contains several stockpiles of topsoil, which will be a valuable seed source for the rehabilitation. There is one stockpile to the south which will require the removal of weeds prior to the topsoil being respread.

### **2.3 Fauna Management**

The proposed revegetation in this area, will provide an excellent opportunity to enhance vegetation corridors linking these remnant areas, thus strengthening the alternative routes for wildlife.

To increase fauna habitat any large boulders and wood debris brought to the surface during ripping will be left for habitat. Suitable large tree trunks that can be placed in the revegetation site following ripping may also be available from adjacent project clearing.

### **2.4 Dieback Management**

The project area falls within the 400-600mm rainfall zone in which dieback may occur. Hygiene measures will be in place to reduce any possible spread if the disease is present, which include:

- All machinery, plant and equipment shall be free of soil and vegetative matter prior to entering the road reserve and when leaving the site.
- No entry will be permitted to vegetated areas outside of the road reserve boundary.

- The movement of soil in wet conditions will be avoided or kept to an absolute minimum where the work is essential.
- Soil or mulch brought from offsite into the revegetation area must be from a dieback free location.

These hygiene measures will also help to reduce the spread of weeds.

## **2.5 Machinery**

Large earthmoving machinery and tractors will be required to prepare the site for planting/seeding. It is a requirement for the project that:

- Oil changes will not be carried out within the revegetation site.
- All machinery to be fitted with fire extinguishers.
- Any soil contaminated by oil or fuel will be removed from site and disposed of at an approved location.
- Fuel will not be stored on site.
- The road reserve and surrounding area will be kept free of rubbish and litter.

## **2.6 Site Preparation**

- Removal of stockpiled material in the southern section that contains weeds.
- The extent of the proposed clearing area should be flagged on site to accurately identify the extent of the area of disturbance by the MRWA project manager;
- Project areas will be ripped to a minimum depth of 200mm deep with rip lines approximately 500mm apart. Where slopes are present, rip lines shall follow natural contours.
- Overburden and then topsoil will be uniformly and evenly spread over the disturbed areas of the pit. Depending on the slope of drainage lines within the pit, small swales from the topsoil will be formed to reduce erosion velocities and encourage the deposition of seeds.
- The whole of the existing pit floor, including drainage lines, will be ripped to a depth of 300-500mm deep with rip lines between 500-800mm apart (if the material in the pit is able to be ripped).
- All stockpiled vegetation will be spread along the contour and the pit floor to help promote seed deposition and to reduce erosion velocities.
- The side slopes shall be incorporated into the shaping operation and upon completion shall be no steeper than 1 vertical to 15 horizontal.
- Material that is unsuitable shall be removed to spoil.
- The replacement of topsoil requires the distribution to a minimum depth of 100mm over the entire pit area (or as best with the material available).
- Steps to minimise compaction of the topsoil are to be incorporated.
- Ripping shall be done with the contours to decrease water erosion.
- Vegetation within 5-10 metres from the outskirts of the area identified for rehabilitation may be cleared and ripped back into the centre of the rehab area.

All ripping will be undertaken by a machine with a multi shank ripper to reduce the number of passes required and fitted with new Ground Engaging Tools (ripper boots) on the ripping shanks to further improve the quality of the site preparation.



## 2.7 Revegetation

Seeding will occur, ideally in June at a rate of 3kg/ha.

The rates for the species list (see [Table 3](#)) have been chosen based on a species breakdown of roughly 10 % upper storey, 80 % upper storey and 10% understory.

## 2.8 Ongoing Maintenance & Monitoring

Monitoring of the revegetation effort will determine if follow up plantings will be required. The revegetation site will be inspected in November after seeding to assess if infill plantings are required during the following winter. The site might still have a good survival rate in November but it is important to inspect the site early as seedling orders for the following winter are required at nurseries by December. If no infill is proposed a second inspection will occur in April/May of the following year. By this time the seedlings would have gone through their first summer and at this time species density, diversity and weed load can be assessed (use monitoring sheet at [Appendix 2](#)).

Ongoing monitoring will ensure the successful establishment of the revegetated rehabilitated areas. *Monitoring and associated infill planting and weed control* will occur prior, during and after clearing for the duration 5 years.

Criteria for success: Follow-up herbicide treatment will take place when the weed cover (non-indigenous species) exceeds 30% and these weed species are assessed by the Main Roads' Environment Officer during the ongoing monitoring (up to 2016) are deemed to be having a detrimental impact on the survival of the revegetation that will result in the quantity and species diversity dropping below the set completion criteria.

Criteria for success: Follow-up herbicide treatment will take place when the weed cover (non-indigenous species) exceeds 25% and these weed species are assessed by the Main Roads' Environment Officer during the ongoing monitoring (up to 2016) are deemed to be having a detrimental impact on the survival of the revegetation that will result in the quantity and species diversity dropping below the set completion criteria.

Target density: 17 stems per 100m<sup>2</sup>, with a 75% survival rate five years after establishment.

Target composition: 12 indigenous species present consistent with mapped vegetation 5 years after establishment. It is aimed to have 10% Upper Story and 80% Mid Story and 10% Low Story.

The revegetated areas will be fenced to ensure protection from pests and the areas will be monitored for evidence of pests and control applied when required.

If the species density or diversity has dropped significantly below these amounts infill planting will be required. At the time of this inspection (April/May) there are still several months to ring around to nurseries in an attempt to locate seedlings for infill planting during June/July. There is also time to arrange follow up weed control if the weed load is determined to be detrimental to [achieving/maintaining](#) species density and diversity in the future. This weed control will again be through the use of herbicide and will either be in the form of broadscale weed control or spot treatment of affected areas.

For follow up weed control if using a Simazine/Roundup mix (see [Weed Control](#) section) in planted areas this will be spot sprayed on target weeds to avoid overspray onto native plants. Broadscale application will again be through a boom using a [Simazine/Fusilade or Simazine Verdit](#) mix, Roundup should be avoided in a boom spray situation as if sprayed over the planted vegetation this will kill the native plants as well. The only time spraying Roundup over planted vegetation would be considered is in areas with a large amount of broadleaf weed. Roundup can be used when these weeds first germinate at a rate of 0.1 L/ha, however timing is crucial as spraying must occur before these weeds become established. At this rate the leaves on the planted vegetation will slightly burn and growth might be set back for a few months, so this Roundup option should only be used as a last resort for controlling broadleaf weed in existing revegetation sites.

For three years after [seeding](#) the health and quantity of the revegetation will be monitored (example monitoring sheet at [Appendix 2](#)). If determined during this monitoring that weed control is required then follow up herbicide applications will occur on problem weeds also for up to three years after [seeding](#). This monitoring may result in further plantings if species density or diversity has diminished. Generally infill planting is only a viable option for the year following the initial [seeding](#). This is because two years after the initial works the canopy and root systems are beginning to develop, making it hard for newly planted seedlings to take hold. Direct seeding sites that are below the completion criteria will be infill planted rather than spreading more seed. This is because after the site preparation for the initial seeding the soil surface will become hard over the years and possibly weedy. These conditions are not conducive to seed germination so tube stock plantings are favoured.

## 2.9 Signage

Revegetation sites will be signed with Main Roads' standard sign MR-GM-14 ([http://standards.mainroads.wa.gov.au/NR/ronlyres/F1263FEB-1A85-496D-8FDB-65C7292770E6/0/E27029\\_20090310130158697.PDF](http://standards.mainroads.wa.gov.au/NR/ronlyres/F1263FEB-1A85-496D-8FDB-65C7292770E6/0/E27029_20090310130158697.PDF)).

**Table 4 Revegetation Timeline**

Aspect	Winter 2010	Summer 2010	Autumn 2011	Winter 2011	Spring 2011	Summer 2011	Autumn 2012	Winter 2012	Spring 2012	Summer 2012	Autumn 2013	Winter 2013	Spring 2013	Summer 2013	Autumn 2014	Winter 2014	Spring 2014
Initial weed control	Yellow		Yellow														
Seed order		Yellow				Yellow				Yellow				Yellow			
Site preparation	Yellow		Yellow														
Weed control				Yellow													
Seeding				Yellow													
Follow up Weed control				Yellow				Yellow				Yellow				Yellow	
Monitoring	Yellow		Yellow	Yellow		Yellow		Yellow		Yellow		Yellow		Yellow		Yellow	
Infill planting								Yellow				Yellow				Yellow	
Maintenance Weed control								Yellow				Yellow				Yellow	

Aspect	Summer 2014	Autumn 2015	Winter 2015	Spring 2015	Summer 2015	Autumn 2016	Winter 2016	Spring 2016	Summer 2016
Initial weed control	Yellow		2011						
Seed order		Yellow		Yellow					
Site preparation	Yellow		Yellow						
Weed control			Yellow						
Seeding			Yellow						
Follow up Weed control							Yellow		Yellow
Monitoring	Yellow		Yellow		Yellow		Yellow		Yellow
Infill planting								Yellow	Yellow
Maintenance Weed control								Yellow	Yellow

FIGURE 1 MATERIAL SOURCE LOCATION

North West Coastal Highway Proposed Material Pit Expansion Area SLK 145.6





Figure 2 2006 Image of Material Source at SLK 145.7

**North West Coastal Highway Material Source 145.7 - Site Pickup 19/06/11**



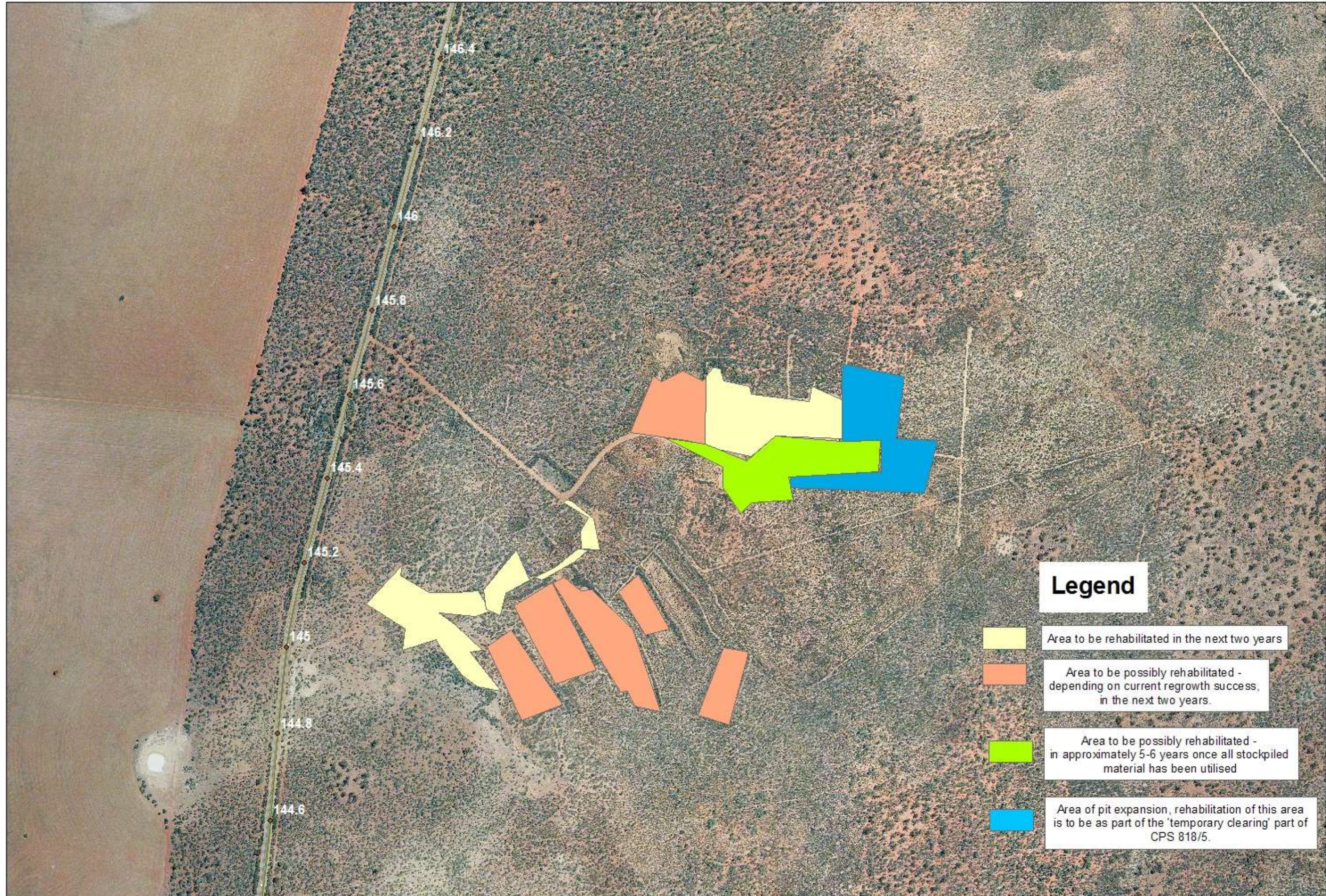
0 125 250 500 Meters

Map by Anna Sutherland 22/06/11



# North West Coastal Highway Material Source 145.7 - Site Pickup 19/06/11

N

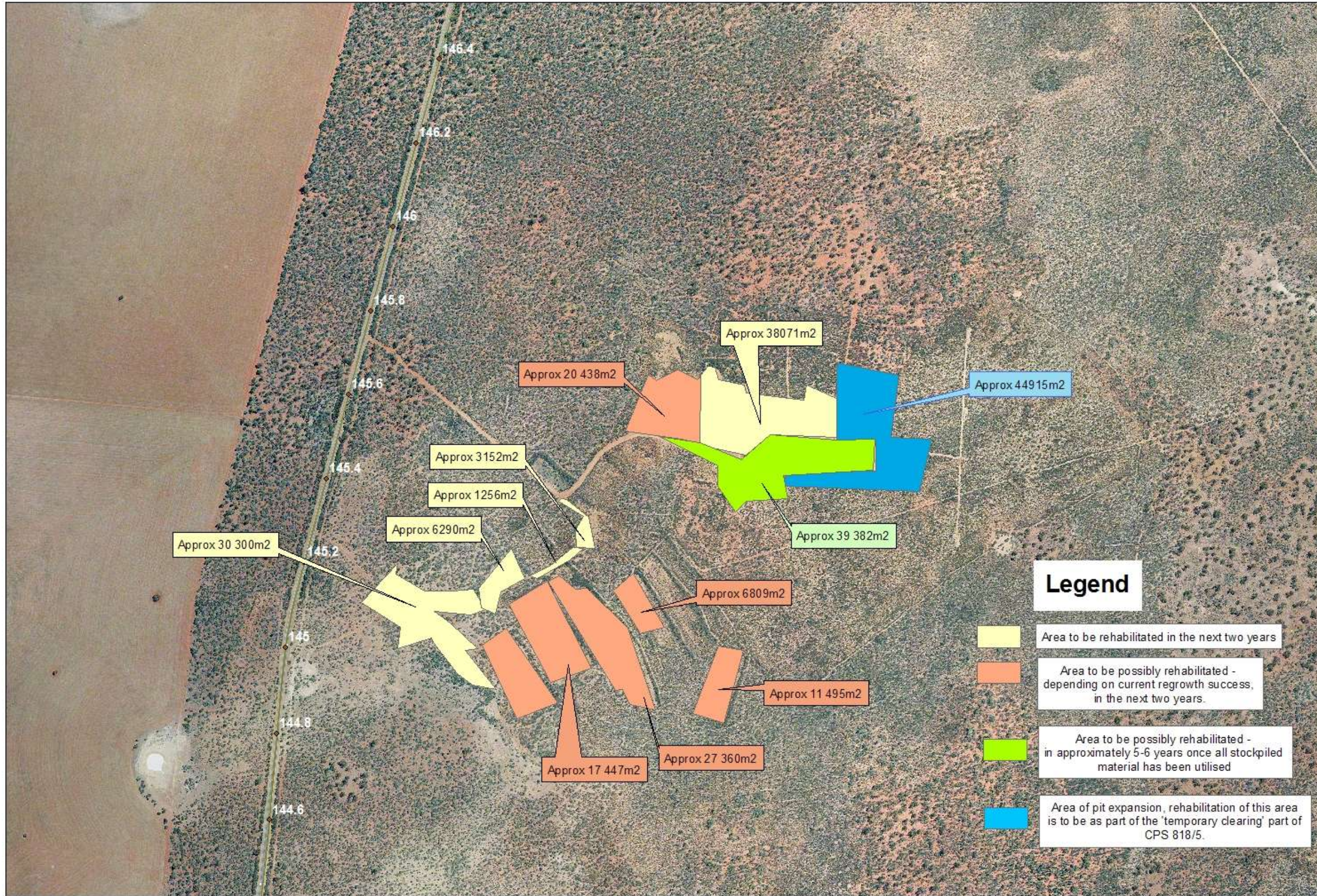


0 125 250 500 Meters

Map by Anna Sutherland 22/06/11



# North West Coastal Highway Material Source 145.7 - Site Pickup 19/06/11



## Legend

- Area to be rehabilitated in the next two years
- Area to be possibly rehabilitated - depending on current regrowth success, in the next two years.
- Area to be possibly rehabilitated - in approximately 5-6 years once all stockpiled material has been utilised
- Area of pit expansion, rehabilitation of this area is to be as part of the 'temporary clearing' part of CPS 818/5.

0 125 250 500 Meters

Map by Anna Sutherland 22/06/11



**APPENDIX 1 HERBICIDE APPLICATION SHEET**

LOCATION AND APPLICATION	SPRAY PARAMETERS	VOLUME OF CHEMICAL PER TANK
Road/Location : _____	Nozzle Type: _____	Carrier Fluid: _____
Tank Capacity (Full): _____	Nozzle Pressure: _____	Herbicide(s): _____
Boom Width: _____	L/Min Output: _____	Surfactant: _____
Hose Reel Description: _____	Vehicle Speed: _____	
	Operators Name: _____	

Date	Start SLK	Finish SLK	Left	Med	Right	Area(Ha)	Spray Hrs	Application (Boom/Hose)	Rate/Ha	Used(L)	Comments
TOTALS											

WEATHER	REMARK / FACTORS AFFECTING PERFORMANCE
Overcast <input type="checkbox"/> Fine <input type="checkbox"/> Temp ° C _____ Humidity    Low <input type="checkbox"/> Med <input type="checkbox"/> High <input type="checkbox"/> Wind         N <input type="checkbox"/> S <input type="checkbox"/> E <input type="checkbox"/> W <input type="checkbox"/> Speed km/hr: _____      Knots: _____	_____ _____ _____ _____



## APPENDIX 2 REVEGETATION MONITORING SHEET

Used for a Monitoring Quadrants

Site Number		SLK		Side of Road	
Current Site Conditions					
Revegetation History					
Revegetation Species Present in 10 m x 10 m					
Number of species present in 10 m x 10 m		Number of individual plants present in 10 m x 10 m		Approximate number of plants present in one ha	
Weed Species Present					
Additional Comments					

Plant Cover	Rating
Good cover > 50%	A
Fair cover 25-50%	B
Poor cover < 25%	C

Weed Cover	Rating
Few weeds present, isolated or small clumps (<10% cover).	1
Some weeds present - weed cover < revegetation cover.	2
Invasive species, grasses - weed cover > revegetation cover.	3

- Use monitoring points selected by GPS by site visit 19/06/11

**Table 1: Seed Collection in 2013**

<b>Plant</b>	<b>Qty/g</b>	<b>Location</b>	<b>Batch</b>	<b>Date</b>
Acacia neurophylla subsp. neurophylla	1.8	Eurardy NWCH		27/02/2013
Acacia scleroperma	198	Eurardy NWCH		27/02/2013
Allocasuarina acutivalvis subsp. acutivalvis	748.7	Eurardy NWCH		27/02/2013
Eucalyptus eudesmioides	44.44	Eurardy NWCH		27/02/2013
Hakea minyma	15.61	Eurardy NWCH		27/02/2013
Melaleuca eleuterostachya	221.82	Eurardy NWCH		27/02/2013
Melaleuca uncinata	13.53	Eurardy NWCH		27/02/2013
Ptilotus obovatus	304	Eurardy NWCH		27/02/2013
Ptilotus schwartzii	7.61	Eurardy NWCH		27/02/2013
Santalum acuminatum	1257.95	Eurardy NWCH		27/02/2013
Santalum spicatum	10.76	Eurardy NWCH		27/02/2013
	2824.22			