Weed Management Plan
Sisters Hills Gravel Pits

Dip Ranges Regional Reserve

May 2018

Prepared for:

Mineral Resources Tasmania

Plan prepared by:

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Cover photo: View of weed colonisation in Management Area 5. Facing South, M.Rose, 02/05/18.

Cite as: Rose, M. (2018) Weed Management Plan Sisters Hills Gravel Pits Dip Ranges Regional Reserve. Natural State, Ulverstone, TAS.

Introduction

Natural State was approached by Mineral Resources Tasmania (MRT), to provide a weed management plan for the abandoned Sisters Hills gravel pits within the Dip Ranges Regional Reserve; located between Sisters Creek and Montumana, Tasmania.

The project brief required the following information to be included in the plan:

- Document the current status of weed infestation/distribution within the project area.

- Identify declared weeds in the context of relevant weed management legislation.

- Make recommendations for control of weeds, including:

    - Prioritise weed management areas;
    - Provide information on control methods;
    - Provide information on timing of control (critical dates), and;
    - Recommend methods for disposal and handling of weeds;

- Document the surrounding vegetation communities and threatened species observations.

- Make recommendations to enhance the existing Whites Road rehabilitation, where appropriate.

- Estimate the resources (labour and money) required to achieve realistic outcomes in the short term.

The recommendations in this plan cover a 5 year period. This plan aims to set realistic expectations for what can be achieved in the short term, based on the author's 20+ years' of field experience. A total budget of around $21,000 will be required to manage and monitor the 5 sites over the next 5 years.

Weed species present

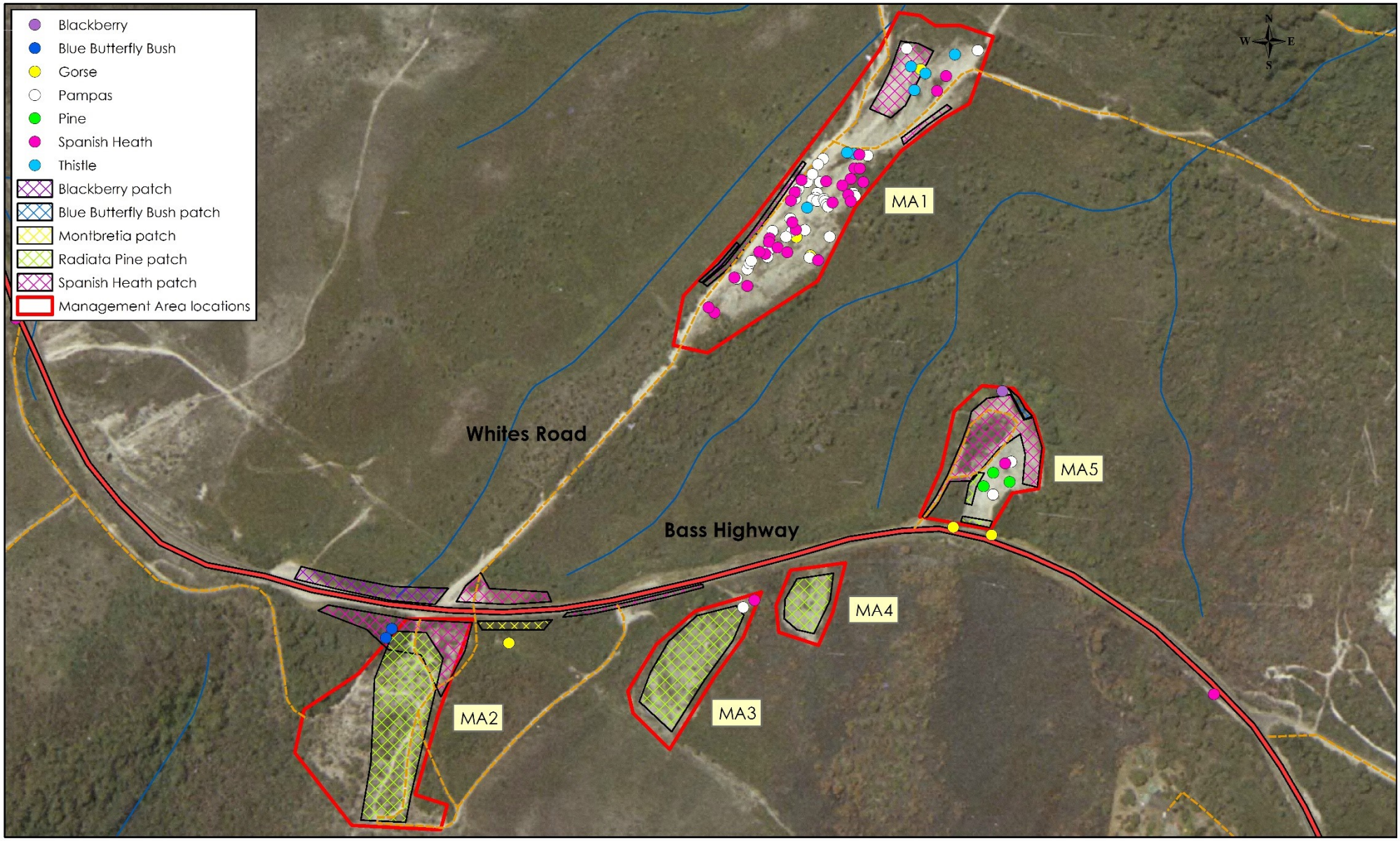
Several invasive environmental weed species were recorded within the Sisters Hills abandoned gravel pits. These weed infestations are threatening the condition and integrity of native vegetation communities within the Dip Ranges Regional Reserve, whilst also negatively impacting upon the natural regeneration and previous rehabilitation works at each site.

Table 1: Environmental weeds recorded during site survey

Scientific Name	Common Name	Declared weed in TAS	Weed of National Significance (WoNS)
Cirsium vulgare	Spear Thistle		
Cortaderia selloana	Common Pampas Grass	YES – Zone A	
Crocosmia x crocosmiiflora	Montbretia		
Erica lusitanica	Spanish Heath	YES – Zone A	
Pinus radiate	Radiata Pine		
Psoralia pinnata	Blue Butterfly Bush		
Rubus fruticosus L. agg.	Blackberry	YES – Zone B	YES
Ulex europaeus	Gorse	YES – Zone B	YES

The maturity of the weeds within each Management Area varies from immature small seedlings to large flowering and seeding bushes or trees. The density varies from isolated plants to almost a complete groundcover. The weeds appear to have established due to the ground disturbance associated with quarrying activities, roadside slashing, and through the dumping of soil and gravels on Whites Road.

Sisters Hills Gravel Pits - Weed Species Observations



Project: Weed Management Plan Sisters Hills Gravel Pits	Drawn by: Matt Rose
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Declared weeds and weed management legislation

In Tasmania, when a weed is declared under the Weed Management Act 1999, it is then classified into appropriate management zones for each Council area, Zone A - for eradication, or Zone B – for containment.

The Sisters Hills Gravel Pits are located within the Circular Head Municipality. Landowners within the Circular Head Council area have legal responsibilities for managing the declared weeds Blackberry, Gorse, Pampas Grass and Spanish Heath.

Circular Head Council is classified as a Zone A municipality where eradication is the most appropriate management objective for Pampas Grass & Spanish Heath. The ultimate management outcome for Zone A municipalities is achieving and maintaining the total absence of Pampas Grass & Spanish Heath from within municipal boundaries.

Circular Head Council is classified as a Zone B municipality where containment is the most appropriate management objective for Blackberry and Gorse. The management outcome for Zone B municipalities is ongoing prevention of the spread of these weeds from existing infestations to areas free, or in the process of becoming free, of these species.

All weeds must be controlled, where they impact negatively upon any vegetation community, flora or fauna species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, the Tasmanian Threatened Species Protection Act 1995, or the Tasmanian Nature Conservation Act 2002.

Blackberry, Gorse and Montpellier Broom are classified as Weeds of National Significance. Weeds of National Significance or (WoNS) are weeds that are considered to require a national response for their management due to their degree of invasiveness, high potential to spread, and their high social, environmental and economic impacts. There are currently 32 species in Australia classed as WoNS; and each of these species has a National Strategy and Best Practice Management Guidelines. The National Strategies and Best Practice Management Guidelines can be downloaded from the Weeds Australia website :

Blackberry - http://www.weeds.org.au/WoNS/blackberry/
Gorse - http://www.weeds.org.au/WoNS/gorse/

Photo 1: Management Area 5 showing large Blue Butterfly Bush plants on the left and a dense stand of Spanish Heath in the middle.

Photo 2 & 3: Declared weeds with a high risk of spread further into surrounding native vegetation at Management Area 1. Top photo - Pampas Grass with mature seed heads. Bottom photo - Spanish Heath sprayed to prevent further spread down the hill.

Vegetation communities present

The TASVEG Version 3.0 digital vegetation map of Tasmania, records the following vegetation communities within 1Km of the Sisters Hills Gravel Pits:

Table 2: Vegetation communities surrounding the Sisters Hills Gravel Pits
(Source: TheLIST, TASVEG 3.0 layer)

TASVEG code	Vegetation community description
DNI	*Eucalyptus nitida* dry forest and woodland
DOB	*Eucalyptus obliqua* dry forest
FAG	Agricultural land
FPE	Permanent easements
FPF	Pteridium esculentum fernland
FRG	Regenerating cleared land
FUM	Extra-urban miscellaneous
FWU	Weed infestation
MBU	Buttongrass moorland undifferentiated
NAF	*Acacia melanoxylon* swamp forest
OAQ	Water, sea (farm dams)
RMS	*Nothofagus - Phyllocladus* short rainforest
SHW	Wet heathland
SLS	*Leptospermum scoparium* heathland and scrub
SLW	*Leptospermum scoparium* scrub
SWW	Western wet scrub
WNU	*Eucalyptus nitida* wet forest undifferentiated
WOU	*Eucalyptus obliqua* wet forest undifferentiated

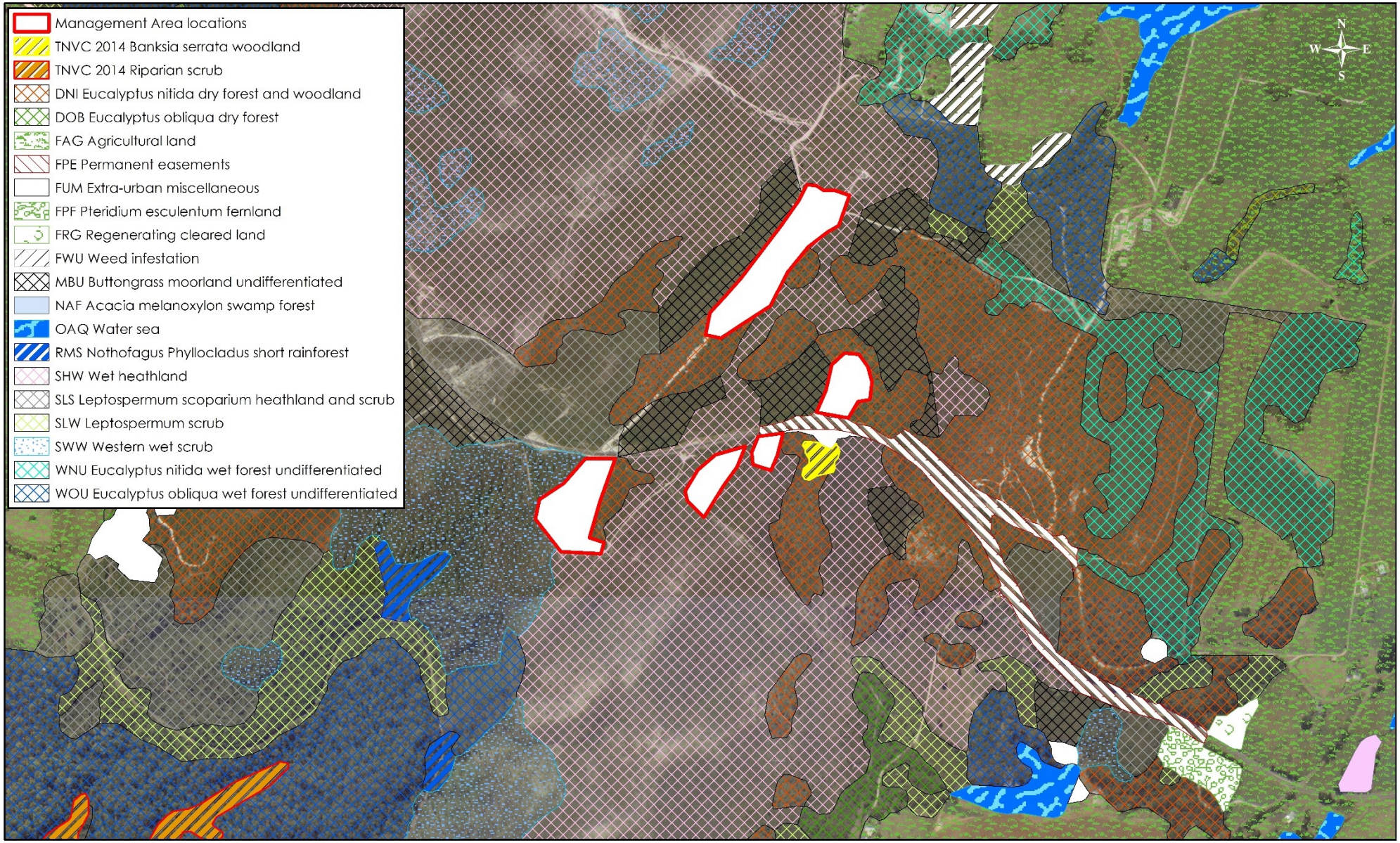
Two nearby vegetation communities are listed under Schedule 3A – Threatened native vegetation communities of the Nature Conservation Act (2002).

Table 3: Threatened native vegetation communities 2014
(Source: TheLIST, Threatened Native Vegetation Communities TNVC 2014 layer)

Schedule ID	Scheduled name
Community 10	*Banksia serrata* woodland
Community 34	Riparian scrub

Photo 3: Looking South-West over a range of vegetation communities and fire-effected Eucalyptus copses.

Sisters Hills Gravel Pits - Vegetation Communities TASVEG 3.0



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Metres

Threatened species observations

The area surrounding the Sisters Hills Gravel Pits contains several species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the Tasmanian Threatened Species Protection Act 1995 (TSP Act). The tables below list the threatened fauna and flora species which have been recorded within 1Km of the sites.

Table 4: Threatened fauna species observations recorded within 1Km

Scientific Name	Common Name	TSP Act listing	EPBC Act listing
Dasyurus maculatus subsp. maculatus	Spotted-tailed Quoll	Rare	Vulnerable
Sarcophilus harrisii	Tasmanian Devil	Endangered	Endangered

Other threatened fauna species which potentially utilise the area for foraging, nesting or refuge include : *Accipiter novaehollandiae* -Grey Goshawk, *Aquila audax subsp. fleayi* - Wedge-tailed Eagle, *Astacopsis gouldi* - Giant Freshwater Crayfish, *Haliaeetus leucogaster* - White-bellied Sea Eagle, *Lathamus discolour* - Swift Parrot & *Perameles gunnii* - Eastern Barred Bandicoot.

Table 5: Threatened flora species observations recorded within 1Km

Scientific Name	Common Name	TSP Act listing	EPBC Act listing
Banksia serrata	Saw Banksia	Rare	
Caladenia campbellii	Thickstem Fairy Fingers	Endangered	Critically Endangered
Comesperma deoliatum	Leafless Milkwort	Rare	
Corunastylis brachystachya	Shortspike Midge-orchid	Endangered	Endangered

Mitigation strategies to avoid impacts to threatened species

The Spotted-tailed Quoll, Tasmanian Devil and Saw Banksia are the threatened species located or recorded in closest proximity to the recommended works in this plan. The Whites Road site has a number of *Banksia* seedlings present which were planted as part of the rehabilitation works also.

Where work sites are near known populations of threatened or conservation significant species, risk mitigation measures should be implemented. Practical solutions to avoid impacts to the local threatened species include :

- aiming to use herbicides with no Withholding Period, particularly for Tasmanian Devil & Spotted-Tailed Quoll.

- careful and diligent use of herbicides following best practice guidelines and relevant Codes of Practice,

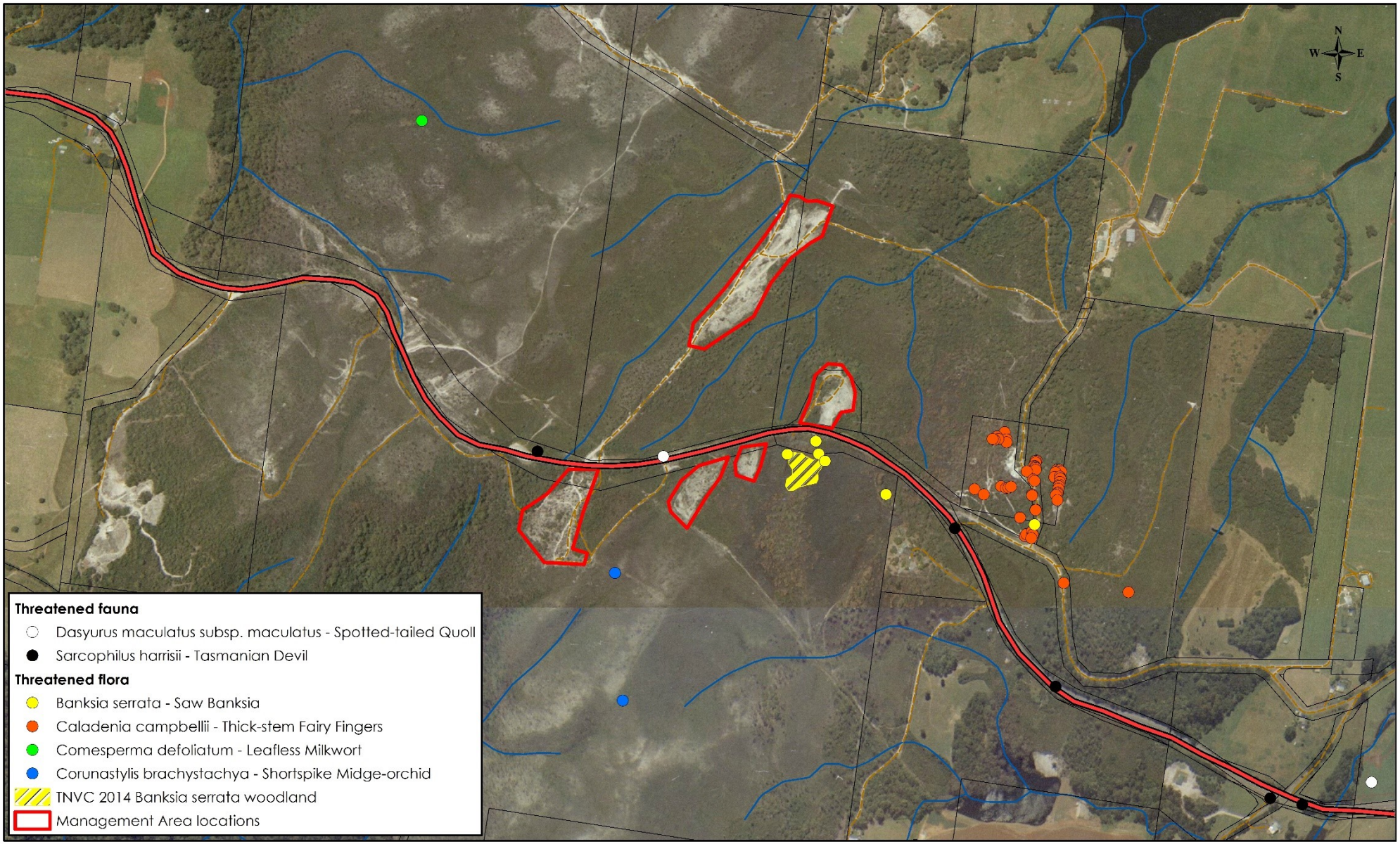
- using the most appropriate methodology for the situation e.g. cut / paint, hand pull or spot spraying,

- engaging contractors who have previous experience with protecting threatened species,

- building capacity of local contractors or neighbouring landowners through onsite training, where relevant.

If these steps are followed, potential impacts to any threatened species nearby will be avoided.

Sisters Hills Gravel Pits - Threatened Species Observations within 1Km



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Project logistics

Biosecurity procedures

Phytophthora cinnamomi has been recorded at 2 locations within 1Km of the project sites. Vehicles and machinery are a common vector for weed & disease dispersal. This can easily be managed through system controls such as rigorous field hygiene procedures. Contractors should comply with the 'Weed and Disease Planning and Hygiene Guidelines (DPIPWE, 2015)' and 'Keeping it Clean field hygiene manual (DPIPWE, 2010)' as minimum standards.

Workplace safety

Workplace Health and Safety legislation requires Safe Work Method Statements (SWMS) or Job Safety Analysis (JSA) to be completed before commencing weed control work. Risk management measures will need to cover the job tasks, potential hazards, and hazard controls to be implemented, communications plans, public safety, first aid provisions, Personal Protective Equipment (PPE) requirements, and working on steep, or in remote areas of the region.

Engaging contractors

Where contractors are engaged they should have a current Commercial Operators License issued by DPIPWE, hold current public liability insurance cover for at least $10,000,000, and should be qualified, competent and experienced in the services being offered. If the contractors employ staff, they will also need Workers Compensation Insurance.

Traffic management qualifications are required for work on roadsides. The minimum qualifications required are 'Traffic Control with a Stop/Slow Bat' and 'Implement Traffic Management Plan'. This extra responsibility may add further costs to the estimated budgets due to the traffic management requirements.

There are a limited number of qualified and licensed contractors available in North West Tasmania that can be called upon to provide these services and deliver effective results, when needed. Scheduling contractors in to do the work can require a lead up time of at least several months' notice.

Weather

The ideal conditions for spraying are dry weather, with little to no wind. Constant analysis of long term weather forecasting to monitor wind speed and direction will help to maximise efficiency when planning any spraying work. Early morning starts are often necessary to make the most of the suitable conditions.

Timing

Every effort should be made to control the more invasive weeds Blackberry, Gorse, Pampas Grass, Spanish Heath and Thistle, to prevent further seed set.

The best time for control work will be between Spring and Autumn. It may be necessary to undertake a primary treatment in Spring and then follow up during Autumn throughout the first few years to get the sites to a more manageable level. An annual monitoring and follow up regime can be expected from years 3 -5.

The seed heads of the Pampas Grass should be cut and bagged ASAP and then taken to the tip to be buried at least 1m deep. If this plan is implemented, the Pampas Grass will not have an opportunity to mature to the stage of flowering again.

Recommendations for weed management areas

The objectives of this project are to eradicate the Zone A Declared Weeds, contain the Zone B Declared Weeds and other environmental weeds, and to encourage the native vegetation to regenerate.

Although weed management activities at these sites will be an ongoing medium term proposition, significant progress can be achieved through a targeted allocation of resources over the next 5 years.

One of the major threats to the success of this project is the issue of continual dumping, storage and loading of soil and gravels at the Whites Road site. See the photo below.

The recommended approach is to control the weed infestations using a combination of mostly chemical and mechanical control techniques.

Annual costs associated with the works have been estimated, as a guide, for each management area, over a 5 year period. The actual budgets required will be subject to the effectiveness of treatments, level of weed regrowth and germination.

The contractor labour and herbicide costs are estimated at the current market rates as of May 2018, and may increase over time. Spraying rates have been calculated at $100 per hour for an 8 hour day. Cut and paint rates have been calculated at $65 per hour for an 8 hour day. Prices do not include traffic management requirements, travel time, accommodation and meal allowances.

The costs shown exclude Goods and Services Tax (GST) and are a guide only. Quotes for works should be sought before confirming budgets.

Photo 4: Contaminated soil and gravels regularly dumped, stored and loaded in the middle of the Whites Road site, note the Spear Thistle rosettes.

Management Area 1 - Whites Road

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Management Area 1 – Whites Road

Total area: 2.00 hectares.

Target species : Blackberry, Gorse, Pampas Grass, Spanish Heath & Spear Thistle.

Timing for control : Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides : Broadleaf selective for woody weeds (Grazon) - Triclopyr and Picloram, or (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl. For Pampas Grass use (Weedmaster Duo) – Glyphosate. For Thistles use (Lontrel) – Clopyralid, or (KambaM) – MCPA.

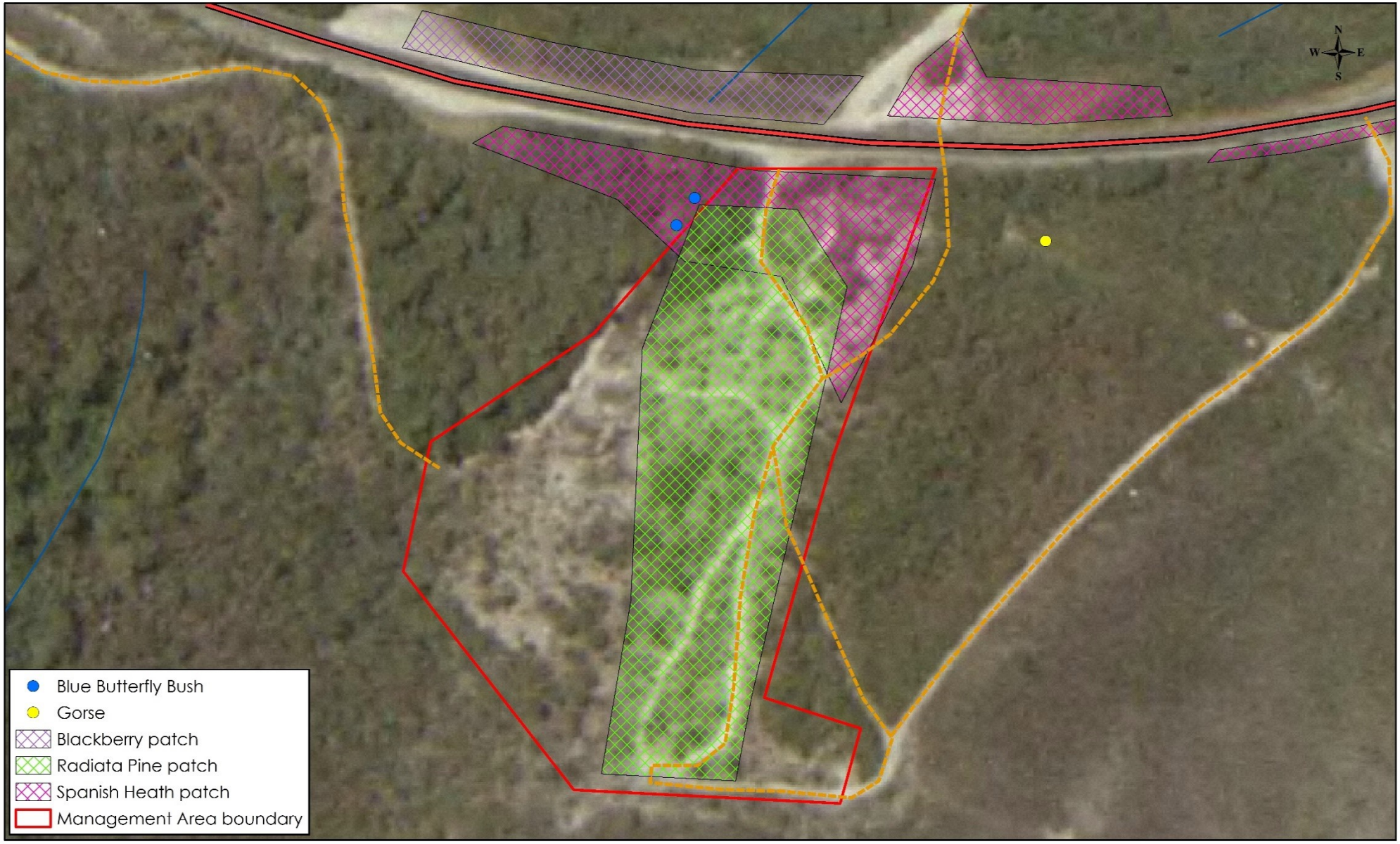
The use of a surfactant and marker dye can improve the efficiency of herbicide application.

Table 6: Recommendations for Management Area 1 over the next 5 years.

Year	Description of activities	Contractor labour cost	Herbicide cost	Annual cost
1	Control Blackberry, Gorse, Pampas Grass, Spanish Heath & Spear Thistle. Methodology – Control through a combination of spot spraying, cut / paint and hand pull.	16 Hrs. x $100/hr. = $1,600	$400	$2,000
2	Monitor and follow-up control works. Methodology – Control through a combination of spot spraying, cut / paint and hand pull.	8 Hrs. x $100/hr. = $800	$0	$800
3	Monitor and follow-up control works. Methodology – Control through a combination of spot spraying, cut / paint and hand pull.	8 Hrs. x $100/hr. = $800	$200	$1,000
4	Monitor and follow-up control works. Methodology – Control through a combination of spot spraying, cut / paint and hand pull.	4 Hrs. x $100/hr. = $400	$400	$800
5	Monitor and follow-up control works. Methodology – Control through a combination of spot spraying, cut / paint and hand pull.	4 Hrs. x $100/hr. = $400	$400	$800
TOTAL COST over 5 years for weed management at this site				**$5,400**

Recommendations : Communicate with Transend and nearby private landholders to raise awareness of the weed control program over the next 5 years. Discuss the issue of recent and continuing dumping of soil and gravel at this site.

Management Area 2 - Bass Highway



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Metres

Management Area 2 – Bass Highway

Total area: 1.00 hectares.

Target species : Blue Butterfly Bush, Gorse, Radiata Pine & Spanish Heath.

Timing for control : Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides : Broadleaf selective for woody weeds (Grazon) - Triclopyr and Picloram, or (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl.

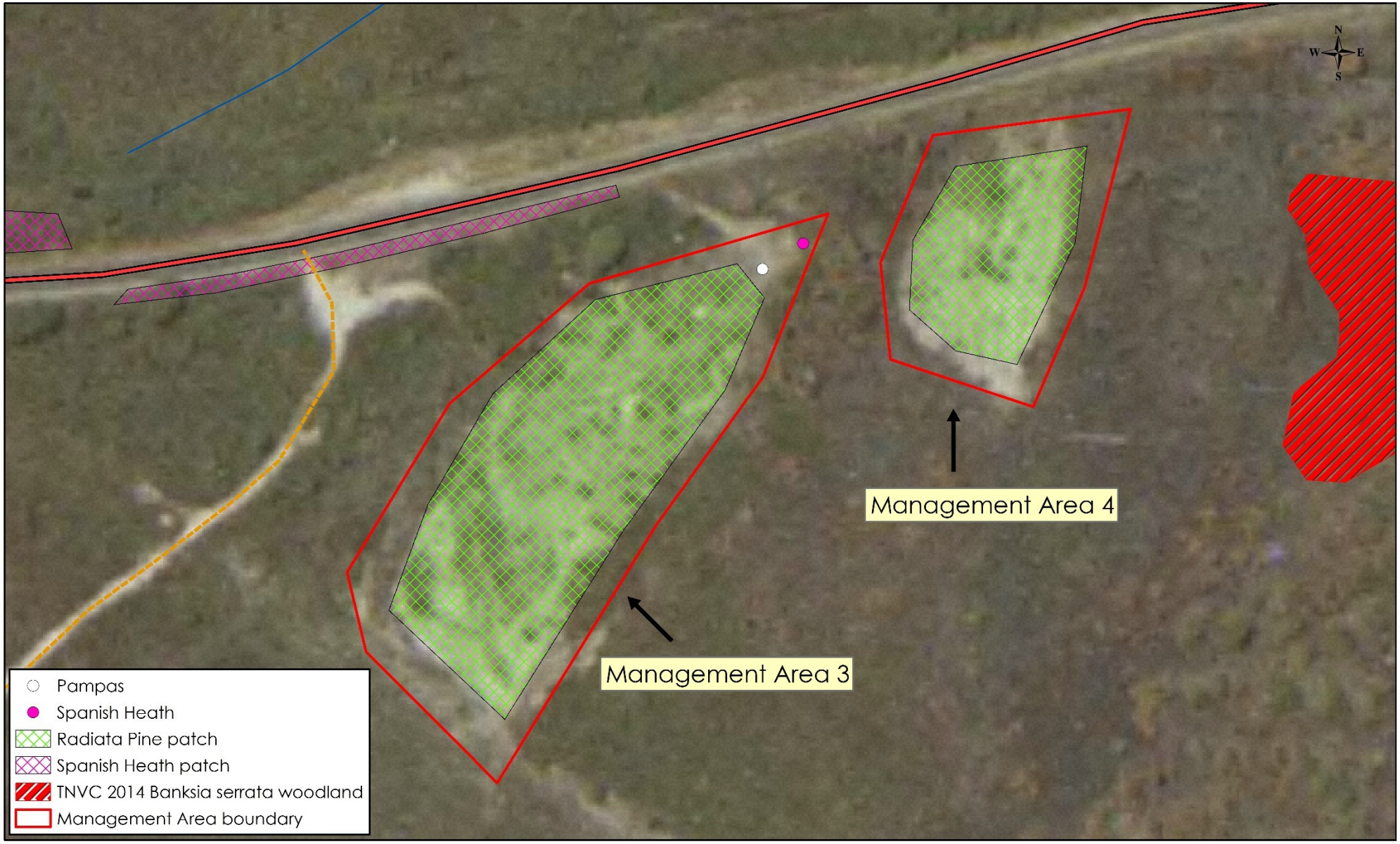
The use of a surfactant and marker dye can improve the efficiency of herbicide application.

Table 7: Recommendations for Management Area 2 over the next 5 years.

Year	Description of activities	Contractor labour cost	Herbicide cost	Annual cost
1	Control Blue Butterfly Bush, Gorse, Radiata Pine & Spanish Heath. Methodology - Control through a combination of spot spraying, cut / paint & ringbarking.	8 Hrs x $100/hr = $800 35 Hrs x $65/hr = $2,080	$400	$3,280
2	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & ringbarking.	4 Hrs x $100/hr = $400 16 Hrs x $65/hr = $1,040	$0	$1,440
3	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & ringbarking.	4 Hrs x $100/hr = $400 8 Hrs x $65/hr = $520	$200	$1,120
4	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & ringbarking.	2 Hrs x $200/hr = $200 6 Hrs x $65/hr = $390	$0	$590
5	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & ringbarking.	2 Hrs x $200/hr = $200 6 Hrs x $65/hr = $390	$0	$590
TOTAL COST over 5 years for weed management at this site				**$7,020**

Recommendations : approach the Department of State Growth to discuss options for integrating weed management resources along the Bass Highway.

Management Areas 3 & 4 - Bass Highway



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0 25 50 75 100
Metres

Management Area 3 – Bass Highway

Total area: 0.75 hectares.

Target species : Pampas Grass, Radiata Pine & Spanish Heath.

Timing for control : Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides : Broadleaf selective for woody weeds (Grazon) - Triclopyr and Picloram, or (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl.
For Pampas Grass use (Weedmaster Duo) – Glyphosate.

The use of a surfactant and marker dye can improve the efficiency of herbicide application.

Table 8: Recommendations for Management Area 3 over the next 5 years.

Year	Description of activities	Contractor labour cost	Herbicide cost	Annual cost
1	Control Pampas Grass, Radiata Pine & Spanish Heath. Methodology - Control through a combination of spot spraying & cut / paint.	16 Hrs x $65/hr = $1,040	$200	$1,240
2	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	4 Hrs x $65/hr = $520	$0	$520
3	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	2 Hrs x $65/hr = $130	$0	$130
4	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	1 Hr x $65/hr = $65	$0	$65
5	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	1 Hr x $65/hr = $65	$0	$65
TOTAL COST over 5 years for weed management at this site				**$2,020**

Recommendations : approach the Department of State Growth to discuss options for integrating weed management resources along the Bass Highway.

Management Area 4 – Bass Highway

Total area: 0.25 hectares.

Target species : Radiata Pine.

Timing for control : Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides : Broadleaf selective for woody weeds (Grazon) - Triclopyr and Picloram, or (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl.

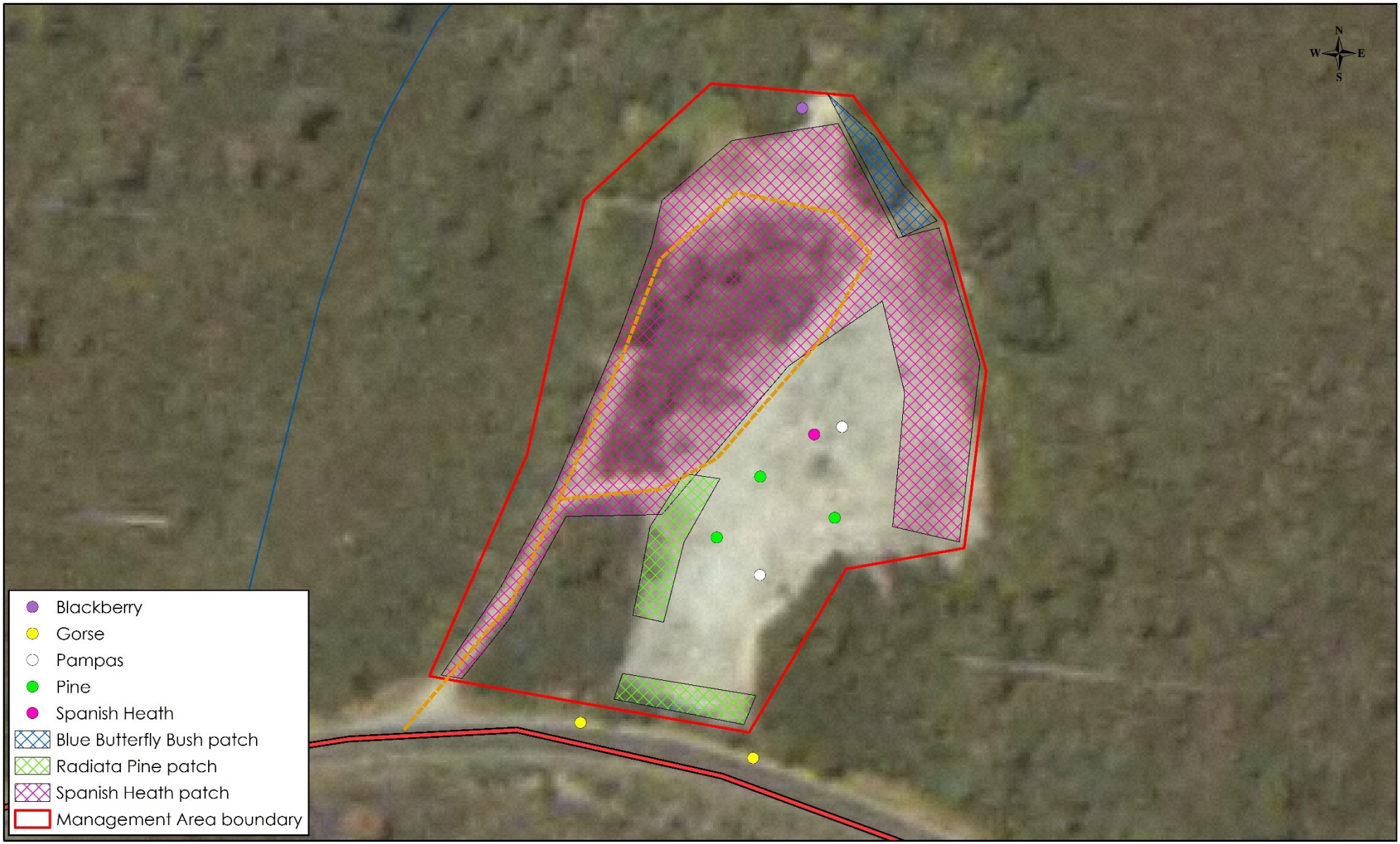
The use of a surfactant and marker dye can improve the efficiency of herbicide application.

Table 9: Recommendations for Management Area 4 over the next 5 years.

Year	Description of activities	Contractor labour cost	Herbicide cost	Annual cost
1	Control Radiata Pine. Methodology - Control through a combination of spot spraying & cut / paint.	8 Hrs x $65/hr = $520	$100	$620
2	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	4 Hrs x $65/hr = $260	$0	$260
3	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	2 Hrs x $65/hr = $130	$0	$130
4	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	1 Hr x $65/hr = $65	$0	$65
5	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying & cut / paint.	1 Hr x $65/hr = $65	$0	$65
TOTAL COST over 5 years for weed management at this site				**$1,140**

Recommendations : approach the Department of State Growth to discuss options for integrating weed management resources along the Bass Highway.

Management Area 5 - Bass Highway



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0 25 50 75 100
Metres

Management Area 5 – Bass Highway

Total area: 1.00 hectares.

Target species : Blackberry, Blue Butterfly Bush, Gorse, Pampas Grass & Spanish Heath.

Timing for control : Spring / Summer / Autumn when actively growing, before flowering to prevent seed-set where possible.

Herbicides : Broadleaf selective for woody weeds (Grazon) - Triclopyr and Picloram, or (Garlon) – Triclopyr, or (Brushoff) – Metsulfuron methyl.
For Pampas Grass use (Weedmaster Duo) – Glyphosate.

The use of a surfactant and marker dye can improve the efficiency of herbicide application.

Table 10: Recommendations for Management Area 5 over the next 5 years.

Year	Description of activities	Contractor labour cost	Herbicide cost	Annual cost
1	Control Blackberry, Blue Butterfly Bush, Gorse, Pampas Grass & Spanish Heath.. Methodology - Control through a combination of spot spraying, cut / paint & hand pulling.	8 Hrs x $100/hr = $800 8 Hrs x $65/hr = $520	$600	$1,920
2	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & hand pulling.	8 Hrs x $100/hr = $800	$0	$800
3	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & hand pulling.	4 Hrs x $100/hr = $400	$200	$600
4	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & hand pulling.	2 Hrs x $100/hr = $200	$0	$200
5	Monitor and follow-up control works. Methodology - Control through a combination of spot spraying, cut / paint & hand pulling.	2 Hrs x $100/hr = $200	$0	$200
TOTAL COST over 5 years for weed management at this site				**$3,720**

Recommendations : approach the Department of State Growth to discuss options for integrating weed management resources along the Bass Highway.

Registered herbicides and mix rates

The registered herbicides (and mix rates) for use in Tasmania for the Declared Weeds recorded are available in detail on the DPIPWE Invasive Species website. For more information, or future reference, a web link for each species is provided below:

Herbicides for Blackberry control

http://dpipwe.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/blackberry/blackberry-herbicides-for-control

Herbicides for Gorse control

http://dpipwe.tas.gov.au/invasive-species/weeds/weeds-index/weeds-index-declared-weeds/gorse/gorse-herbicides-for-control

Herbicides for Pampas Grass control

http://dpipwe.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/pampas/pampas-herbicides-for-control

Herbicides for Spanish Heath control

http://dpipwe.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/spanish-heath/spanish-heath-herbicides-for-control

Permits required for off-label herbicide use

Some herbicides are not registered for certain uses in Tasmania, which will not be mentioned on product labels. The herbicides recommended in this plan require copies of the following Australian Pesticides and Veterinary Medicines Authority (APVMA) Permits to be kept to allow off-label herbicide use : APVMA Permit PER 8949, PER 10741 & PER 13160.

For more information visit the APVMA website - http://apvma.gov.au/.

Please note: at the time of writing this document these permits and other relevant permits for weed control in non-crop situations have expired. They are currently in the process of being renewed by DPIPWE.

Recommended Rehabilitation Areas

Natural regeneration is the only feasible option at Management Areas 2,3 &4 due to the exposed bedrock and rocky outcrops. Regeneration can be encouraged further by laying Radiata Pine trees across the contour to capture the available moisture and seed.

An excavator has already created regeneration niches at Management Areas 1 & 5 when the site was originally rehabilitated. The recommended method for revegetation at Management Area 1 is hand direct seeding using the following species and quantity of seeding spots:

Table 11: Recommended hand direct seeding species mix for Management Area 1

Species name	Common name	Spot quantity
Acacia longifolia ssp. sophorae	Coastal Wattle	25
Acacia melanoxylon	Blackwood	25
Acacia suaveolens	Sweet- Scented Wattle	25
Acacia verticillata	Prickly Moses	25
TOTAL SPOTS		**100**

With hand seeding the topsoil is disturbed using a mattock or fire rake then pre-soaked heat-treated seed is broadcast into the disturbed ground and lightly covered. Germination should be expected within 6 months.

The recommended method for revegetation at Management Area 5 is to plant tubestock using the following species and seedling quantity:

Table 12: Recommended tubestock species mix for Management Area 5

Species name	Common name	Seedling quantity
Acacia melanoxylon	Blackwood	25
Eucalyptus obliqua	Messmate Stringybark	25
TOTAL SEEDLINGS		**50**

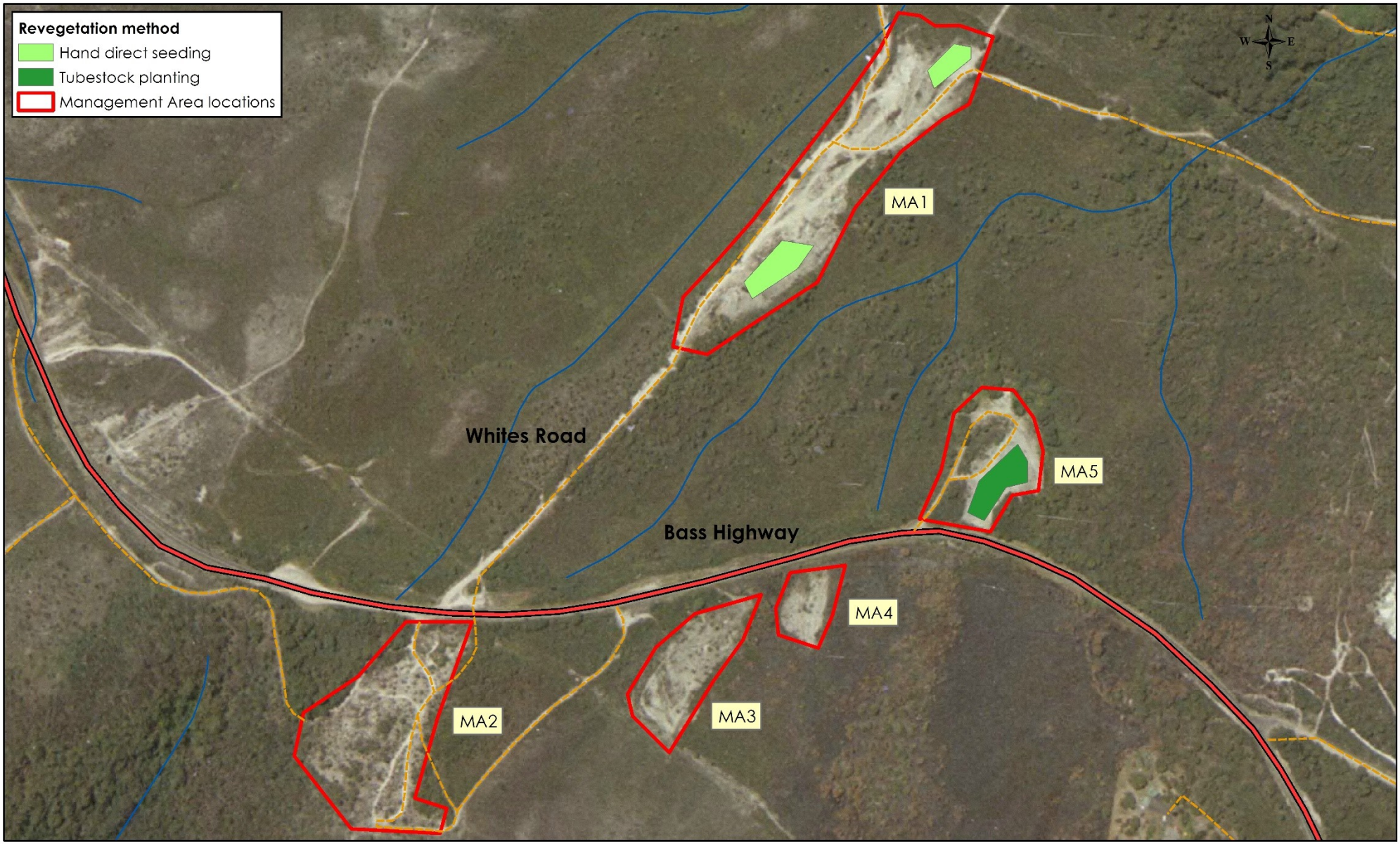
Management Areas 1 & 5 will initially require several years' of spot spraying to reduce the weed burden before planting or seeding. For this reason the revegetation activities should commence from Year 4 of this program.

Site preparation will require the use of a handheld auger, mattock, spade or Hamilton planter to soften each hole amongst the existing niches. The seedlings will benefit from adding a fertiliser tablet, some soaked water crystals and some water to each hole prior to planting. The seedlings should be watered in after planting also.

Tree guards will need to be used to protect the tubestock from browsing pressure. The 600mm x 200mm triangle coreflute tree guards should be suitable.

Due to the strong winds experienced on the North-West Coast it is necessary to use two hardwood stakes 25mm x 25mm x 900mm long, per tree guard, for added stability.

Sisters Hills Gravel Pits - Rehabilitation Areas



Project: Weed Management Plan Sisters Hills Gravel Pits	Drawn by: Matt Rose
Client: Mineral Resources Tasmania	Date: 16/05/2018

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0 50 100 150 200
Metres

Recommendations for Rehabilitation Areas

Total area : Approximately 0.4 hectares.

Objective : to revegetate areas with local provenance indigenous species in conjunction with weed control program. Establish hardy species that can cope with poor soil structure and compete with weed species germination.

Timing : tubestock planting and hand seeding should occur between June and September, depending on the season.

Maintenance : watering if required, guard / stake removal, replacing dead seedlings where required.

Table 13: Recommendations for the Rehabilitation Areas over the next 5 years.

Year	Description of activities	Contractor labour cost	Materials cost	Annual cost
1	Monitor the results of the weed control works.	$0	$0	$0
2	Monitor the results of the weed control works.	$0	$0	$0
3	Monitor the sites to ensure weed control is sufficient before commencing revegetation activities. Source local provenance seed and order seedlings.	$0	$900	$900
4	Hand direct seed 100 spots using local seed. Plant and guard 50 seedlings. Water seedlings during the first summer if necessary.	16 Hrs x $65/hr = $1,040	$0	$1,040
5	Monitor the revegetation works.	$0	$0	$0
TOTAL COST over 5 years for revegetation at these sites				**$1,940**

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Appendix A: Summary table of estimated costs required for weed management and rehabilitation works over 5 years.

Table 14: Estimated costs required for weed management works over 5 years.

Site	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Management Area 1	$2,000	$800	$1,000	$800	$800	**$5,400**
Management Area 2	$3,280	$1,440	$1,120	$590	$590	**$7,020**
Management Area 3	$1,240	$520	$130	$65	$65	**$2,020**
Management Area 4	$620	$260	$130	$65	$65	**$1,140**
Management Area 5	$1,920	$800	$600	$200	$200	**$3,720**
TOTAL	**$9,060**	**$3,820**	**$2,980**	**$1,720**	**$1,720**	**$19,300**

Table 15: Estimated costs required for rehabilitation works over 5 years.

Site	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Management Area 1	$0	$0	$650	$390	$0	**$1,040**
Management Area 2	$0	$0	$0	$0	$0	$0
Management Area 3	$0	$0	$0	$0	$0	$0
Management Area 4	$0	$0	$0	$0	$0	$0
Management Area 5	$0	$0	$250	$650	$0	**$900**
TOTAL			**$900**	**$1,040**	**$0**	**$1,940**

Appendix B: Additional photos

Photo 5: Mature Spanish Heath hand pulled by Tasmanian Parks & Wildlife Service Rangers to prevent further seeding at Management Area 1 – Whites Road.

Photo 6: Flowering Spanish Heath and mature Radiata Pine trees at Management Area 2 - Bass Highway.

Photo 7: Radiata Pine wildlings at Management Areas 3&4 - Bass Highway.

Photo 8: Rehabilitation niches in the middle of Management Area 5 - Bass Highway.

Appendix C: Indigenous species observed during site surveys

Table 16: Indigenous species observed during site surveys

Scientific Name	Common Name	TSP Act status	EPBC Act status
Acacia dealbata	Silver Wattle		
Acacia longifolia subsp. sophorae	Coastal Wattle		
Acacia melanoxylon	Blackwood		
Acacia mucronata	Caterpillar Wattle		
Acacia myrtifolia	Redstem Wattle		
Acacia suaveolens	Sweet Scented Wattle		
Acacia terminalis	Sunshine Wattle		
Acacia verticillata var. latifolia	Prickly Moses		
Acaena novae-zelandiae	Buzzy		
Allocasuarina monilifera	Necklace Sheoak		
Amperea xiphoclada	Broom Spurge		
Aotus ericoides	Common Aotus		
Astroloma humifusum	Native Cranberry		
Banksia marginata	Silver Banksia		
Banksia serrate	Serrated Banksia	Rare	
Blechnum nudum	Fishbone Fern		
Cassinia aculeata	Dolly Bush		
Dianella tasmanica	Forest Flaxlily		
Dicksonia antarctica	Soft Treefern		
Dillwynia sericea	Showy Parrot-pea		
Empodisma minus	Wire Rush		
Epacris impressa	Common Heath		
Epacris lanuginosa	Swamp Heath		
Eucalyptus nitida	Smithton Peppermint		
Eucalyptus oblique	Messmate Stringybark		
Gahnia grandis	Cutting Grass		
Gleichenia dicarpa	Pouched Coralfern		
Gymnoschoenus sphaerocephalus	Buttongrass		
Juncus pallidus	Pale Rush		
Juncus usitatus	Common Rush		
Lepidosperma filiforme	Common Rapier Sedge		
Leptospermum glaucescans	Smoky Teatree		
Leptospermum scoparium	Manuka		
Leucopogon collinus	Fringed Beard-Heath		
Lomandra longifolia	Sagg		
Melaleuca ericifolia	Swamp Paperbark		
Melaleuca squarrosa	Scented Paperbark		
Microlaena stipoides	Weeping Grass		
Monotoca glauca	Goldey Wood		
Olearia lirata	Forest Daisy		
Persoonia juniperinum	Prickly Geebung		
Poa labillardieri	Silver Tussock Grass		
Pomaderris elliptica	Yellow Dogwood		
Pultenaea stricta	Rigid Bush-Pea		
Pteridium esculentum	Bracken		
Rytidosperma racemosum var racemosum	Stiped Wallaby Grass		
Stylidium graminifolium	Narrowleaf Triggerplant		
Tetraria capillaris	Hair Sedge		
Xanthosia pilosa	Woolly Xanthosia		
Xanthorrhoea australis	Southern Grasstree		

EPBC Act = Commonwealth Environment Protection and Biodiversity Conservation Act 1999
TSP Act = Tasmanian Threatened Species Protection Act 1995