

APPENDIX Q2

OPERATIONAL REVEGETATION PLAN

ANGAS PROCESSING FACILITY

MISCELLANEOUS PURPOSES LICENSE APPLICATION

2019/0826



ABN | 67 062 576 238

Unit 7 / 202-208 Glen Osmond Road | Fullarton SA 5063

Angas Zinc Revegetation Plan

SECTION 1. - FRONT AREAS NEAR ROADSIDE, northern boundary

Timing : Year 1

Revegetation: This section should be machine direct seeded. Filling this area with taller trees and shrubs will help in screening the site from the road and may help with reducing noise and controlling dust. This method will be the cheapest option for this area.

Species: Indigenous native plants

Species	Common name	Quantity
<i>Acacia acinacea</i>	Gold Dust Wattle	50g
<i>Acacia paradoxa</i>	Kangaroo Thorn	150g
<i>Acacia pycnantha</i>	Golden Wattle	200g
<i>Allocasuarina verticillata</i>	Weeping Sheoak	175g
<i>Atriplex semibacata</i>	Spreading Saltbush	100g
<i>Bursaria spinosa</i>	Christmas Bush	50g
<i>Callitris gracillis</i>	Southern Cypress Pine	125g
<i>Dodonaea viscosa ssp. spatulata</i>	Sticky Hopbush	175g
<i>Enchylaeana tomentosa</i>	Ruby Saltbush	100g
<i>Eucalyptus fasciculosa</i>	Pink Gum	125g
<i>Eucalyptus leucoxylon</i>	SA Blue Gum	125g
<i>Eucalyptus odorata</i>	Peppermint box	150g
<i>Melaleuca lanceolata</i>	Dryland Teatree	250g
<i>Pittosporum angustifolium</i>	Native Apricot	50g
<i>Senna artemisioides ssp. coriacea</i>	Desert Cassia	50g
<i>Senna artemisioides ssp. petiolaris</i>	Punty Bush	50g
Total		2kg

Estimated area: 1.5 Hectares. Approximately 4km of seeding with 2kg of native seed required.

Irrigation: This revegetation area will not need any irrigation after seeding.

Weed control: An initial knockdown application of Roundup CT and Brushoff with a surfactant like Pulse is required 3 weeks to a month before seeding commences.

After seeding it will be necessary to do another application of Roundup CT with a guarded boom on an ATV or equivalent. This will be applied in Spring.

The following year will need an overspray at a reduced rate of Roundup CT and Oust. This will not kill the native seedlings but will control the weeds. It may also be necessary to undertake another ATV guarded spray at least once.

Ongoing maintenance will be required.

SECTION 2. - BACK FENCE LINE, southern boundary

Timing: Year 3

Revegetation: Machine planting will be the quickest and cheapest option to get plants established here. The soil is nice and deep which will allow a light ripping at the time of planting in one pass. I recommend using taller trees with bushy shrubs within this corridor.

Species: Indigenous native plants

Species	Common name	Seed required	Quantity
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<i>Allocasuarina verticillata</i>	Weeping Sheoak	30g	200
<i>Eucalyptus fasciculosa</i>	Pink Gum	20g	100
<i>Eucalyptus leucoxylon</i>	SA Blue Gum	20g	150
<i>Eucalyptus odorata</i>	Peppermint box	10g	100
<i>Melaleuca lanceolata</i>	Dryland Teatree	10g	90

Estimated area: 1.1 Hectares, 700m x 15m with 3 rows @ 4m spacings = Approximately 525 plants.

Irrigation: The back fence line planting should be watered with a watering truck by hand, when required. The planting machine will make a furrow to concentrate rainfall towards plant roots.

Weed control: It is best to use a planting machine with a v-blade which removes the weed seed bank at the same time as planting. It can reduce the need to do any spraying around the trees in the first season. Follow up over spraying may be required the year after planting.

Ongoing maintenance will be required.

SECTION 3. - BUNTING AREAS, around mine

Timing: Year 1

Revegetation: Tubestock is recommended for the bunting sections, planted by hand.

This will allow a quicker growth rate of the chosen species whilst also giving a more even composition. The planting lay out will be 3 rows, staggered. It is still unclear whether planting will occur on the sides and top of the mound or on the sides and bottom of mound. This can be determined later and will probably only change the species composition slightly.

At the time of planting each plant will benefit from a light application of slow release fertiliser and water holding crystals at the bottom of each hole. An application of a mix of wetting agent, fulvic acid and humate will benefit the water holding capacity and the lack of nutrients in the soil.

Please note: The bunted areas will need at least 200mm of friable soil on the planting slopes to allow quicker and easier establishment. The only real challenge for this revegetation project is having enough soil to plant into on the bunting walls.

There will need to be fill in plantings over the following years to replace any deaths that will occur. Hand seeding in rockier areas where access is difficult is also an option.

Species: Australian and indigenous natives

Species	Common name	Seed required	Quantity
<i>Acacia argyrophylla</i>	Silver Mulga	25g	74
<i>Acacia glaucoptera</i>	Clay Bush Wattle	25g	74
<i>Acacia ligulata</i>	Umbrella Wattle	25g	74
<i>Acacia paradoxa</i>	Kangaroo Thorn	25g	74
<i>Acacia pycnantha</i>	Golden Wattle	25g	74
<i>Allocasuarina verticillata</i>	Weeping Sheoak	30g	74
<i>Alyogyne hakeifolia</i>	Native Yellow Hibiscus	Cuttings	74
<i>Atriplex semibacata</i>	Spreading Saltbush	25g	74
<i>Callistemon viminalis 'Harkness'</i>	Gawler Hybrid	Cuttings	74
<i>Correa reflexa</i>	Native Fuchsia	Cuttings	74
<i>Dodonaea viscosa ssp. spatulata</i>	Sticky Hopbush	25g	74
<i>Eremophila glabra</i>	Tarbush	Cuttings	74
<i>Eremophila longifolia</i>	Weeping Emu Bush	Cuttings	74
<i>Eremophila maculata</i>	Spotted Emu Bush	Cuttings	74
<i>Grevillea olivacea</i>	Olive Grevillea	Cuttings	74
<i>Grevillea 'Winpara Gem'</i>	Winpara Red	Cuttings	74
<i>Hakea laurina</i>	Pincushion Hakea	25g	74
<i>Kennedia nigricans</i>	Black Coral Pea	25g	74
<i>Melaleuca armillaris</i>	Bracelet Honey Myrtle	10g	74
<i>Melaleuca heugellii</i>	Chenille Honey Myrtle	10g	74
<i>Melaleuca nesophila</i>	Pink Melaleuca	10g	74
<i>Myoporum parvifolium</i>	Creeping Boobialla	Cuttings	74
<i>Senna artemisioides ssp. coriacea</i>	Desert Cassia	30g	74
<i>Senna artemisioides ssp. petiolaris</i>	Punty Bush	30g	74
<i>Templetonia retusa</i>	Cockies Tongue	25g	74

SECTION 3. - BUNTING AREAS, around mine continued

Estimated area: 2.78 Hectares. 1850m long x 3 rows @ 3m apart. Approximately 1850 plants.

Irrigation: The whole bunting plantings should be irrigated with poly pipe to maximise the success rate of the plantings. The recommended size is 19mm poly with side branching of 13mm or 4mm.

The pressure will need to be measured closer to planting and a basic irrigation plan for the site worked out to ensure the plantings have sufficient pressure. The source of water will need to be confirmed also.

Weed control: A knock down spray may be necessary after the bunting mounds have been put in place. More than likely it will take a year before weeds start to germinate depending on the time of year that the bunting takes place.

Handline spraying before / after planting is recommended where weeds are present. This will be with a Roundup CT, (Brushoff if required) and Pulse mix. Ongoing maintenance will be required.

SECTION 4. - SCREENING AREAS, northern, eastern and western boundaries

Timing: Year 1

Revegetation: Tubestock is recommended for this area, planted by hand.

These areas are extremely rocky and will need a rock breaker to break open the rock to allow the roots to penetrate deeper. On these sites we fill each of the opened holes with local soil to help the plants get established and to assist in planting.

Some of the existing tree rows could be added to instead of starting again which will reduce costs. A few sections have 1 or 2 rows existing, these areas would only need thickening up and another row or two added. I recommend leaving as much of the existing tree lines as possible and enhancing them.

Species: Indigenous native plants and Australian natives

Species	Common name	Seed required	Plants
<i>Acacia argyrophylla</i>	Silver Mulga	25g	130
<i>Acacia ligulata</i>	Umbrella Wattle	25g	125
<i>Allocasuarina verticillata</i>	Weeping Sheoak	25g	140
<i>Alyogyne hakeifolia</i>	Native Yellow Hibiscus	Cuttings	125
<i>Atriplex nummularia</i>	Old Man Saltbush	Cuttings	125
<i>Dodonaea viscosa ssp. spatulata</i>	Sticky Hopbush	25g	125
<i>Eremophila alternifolia</i>	Emubush	Cuttings	125
<i>Eremophila longifolia</i>	Weeping Emu Bush	Cuttings	125
<i>Eucalyptus lehmannii</i>	WA Mallee	25g	120
<i>Eucalyptus leucoxylon</i>	SA Blue Gum	25g	135
<i>Eucalyptus platypus</i>	Platypus Gum	25g	120
<i>Eucalyptus porosa</i>	Mallee Box	25g	120
<i>Grevillea olivacea</i>	Olive Grevillea	Cuttings	125
<i>Grevillea 'Winpara Gem'</i>	Winpara Red	Cuttings	125
<i>Melaleuca armillaris</i>	Bracelet Honey Myrtle	25g	120
<i>Melaleuca heugellii</i>	Chenille Honey Myrtle	25g	120
<i>Melaleuca lanceolata</i>	Dryland Teatree	25g	150
<i>Melaleuca nesophila</i>	Pink Melaleuca	25g	120
<i>Myoporum insulare</i>	Coastal Boobialla	Cuttings	125

Estimated area: 4.8 Hectares. 3200m x 3 rows @ 4m apart = 2400 plants

Irrigation: The whole screening plantings should be irrigated with poly pipe to maximise the success rate of the plantings. The recommended size is 19mm poly pipe.

The pressure will need to be measured closer to planting and a basic irrigation plan for the site worked out to ensure the plantings have sufficient pressure. The source of water will need to be confirmed also.

Weed control: This section should be easy enough to apply a knockdown spray with an ATV fitted with a boom. The gap between the rows should be enough to manoeuvre around reasonably well. The same chemicals should be used - Roundup CT, Pulse and Brushoff if necessary.

SECTION 5A. - TAILINGS DAM WALL AREA

Timing: Year 3 – Year 8

Revegetation: Tubestock, planted by hand for dam wall.

Species for planting:

Species name	Common name	Seed required	Quantity
<i>Acacia acinacea</i>	Gold Dust Wattle	25g	130
<i>Acacia argyrophylla</i>	Silver Mulga	25g	140
<i>Acacia microcarpa</i>	Manna Wattle	25g	130
<i>Acacia paradoxa</i>	Kangaroo Thorn	25g	130
<i>Acacia pycnantha</i>	Golden Wattle	25g	130
<i>Atriplex semibacata</i>	Spreading Saltbush	25g	130
<i>Bursaria spinosa</i>	Christmas Bush	25g	130
<i>Callistemon rugulosus</i>	Scarlet Bottlebrush	25g	130
<i>Dodonaea viscosa ssp. spatulata</i>	Sticky Hopbush	25g	130
<i>Enchylaeana tomentosa</i>	Ruby Saltbush	25g	130
<i>Melaleuca lanceolata</i>	Dryland Teatree	25g	130
<i>Pittosporum angustifolium</i>	Native Apricot	25g	130
<i>Senna artemisiodes ssp. coriacea</i>	Desert Cassia	25g	140
<i>Senna artemisiodes ssp. petiolaris</i>	Punty Bush	25g	130

Estimated area: 1.65 Hectares. 1100m x 15m. 5 rows with plants 3m apart = 1840 plants

Irrigation: The whole tailings dam plantings should be irrigated with poly pipe to maximise the success rate of the plantings. The recommended size is 19mm poly pipe.

The pressure will need to be measured closer to planting and a basic irrigation plan for the site worked out to ensure the plantings have sufficient pressure. The source of water will need to be confirmed also.

Weed control: An initial knockdown application of Roundup CT and Brushoff with a surfactant like Pulse is required 3 weeks to a month before planting commences.

After planting it will be necessary to do another application of Roundup CT with a guarded boom on an ATV or equivalent. This will be applied in Spring.

Ongoing maintenance will be required.

SECTION 5B. - TAILINGS DAM STORAGE AREA

Timing: Year 1 Trials, Year 8 Seeding.

Revegetation: this land area will be returned to cropping and pasture land, so will not be re-vegetated with native species.

Estimated area: 18 Hectares.

Weed control: An initial knockdown application of Roundup CT and Brushoff with a surfactant like Pulse is required 3 weeks to a month before seeding commences.

After seeding it will be necessary to do another application of Roundup CT with a guarded boom on an ATV or equivalent. This will be applied in Spring.

SECTION 6. – MINE SITE AREA

Timing: Year 8

Revegetation: Direct seeding.

Species: Indigenous native species

Species	Common name	Quantity
<i>Acacia acinacea</i>	Gold Dust Wattle	500g
<i>Acacia paradoxa</i>	Kangaroo Thorn	2Kg
<i>Acacia pycnantha</i>	Golden Wattle	2Kg
<i>Allocasuarina verticillata</i>	Weeping Sheoak	1.5Kg
<i>Atriplex semibacata</i>	Spreading Saltbush	1Kg
<i>Bursaria spinosa</i>	Christmas Bush	500g
<i>Callitris gracilllis</i>	Southern Cypress Pine	2Kg
<i>Dodonaea viscosa ssp. spatulata</i>	Sticky Hopbush	3Kg
<i>Enchylaeana tomentosa</i>	Ruby Saltbush	2Kg
<i>Eucalyptus fasciculosa</i>	Pink Gum	1Kg
<i>Eucalyptus leucoxylon</i>	SA Blue Gum	1Kg
<i>Eucalyptus odorata</i>	Peppermint box	1Kg
<i>Melaleuca lanceolata</i>	Dryland Teatree	1.5Kg
<i>Pittosporum angustifolium</i>	Native Apricot	1Kg
<i>Senna artemisioides ssp. coriacea</i>	Desert Cassia	1Kg
<i>Senna artemisioides ssp. petiolaris</i>	Punty Bush	1Kg

Total seed required

22kg

Estimated area: 17.5 Hectares. Approximately 44km of seeding with 22kg of native seed required.

Irrigation: No additional watering will be required.

Weed control: An initial knockdown application of Roundup CT and Brushoff with a surfactant like Pulse is required 3 weeks to a month before seeding commences. After seeding it will be necessary to do another application of Roundup CT with a guarded boom on an ATV or equivalent. This will be applied in Spring.

The following year will need an overspray at a reduced rate of Roundup CT and Oust. This will not kill the native seedlings but will control the weeds. It may also be necessary to undertake another ATV guarded spray at least once.

Ongoing maintenance will be required.

SEED COLLECTION: As there will be a rush to get plants established if official approval is granted, it is recommended that seed be sourced / collected as soon as possible.

As the indigenous species set seed at different times of the year it is very important that you are well prepared to get the required seed and to get things moving as quickly as possible.

The first step will be sourcing seed from a range of suppliers who collect seed in this area.

If there are species which can not be sourced from local provenance then a revegetation contractor should be employed to collect the seed from as close as possible to the site. They would charge for their time per hour for this provenance service, rather than for the small quantities required.

For the direct seeding sections larger quantities of seed will need to be sourced, approximately 46kg.

Please see the Seed Collection Table for details on the local species collection times.

All Australian native seed / cuttings required should be sourced from suppliers to speed up propagation as the seed / cutting material provenance is not as important.

A total of 48.31 kg of mixed seed is required.

PROPAGATION: As there will be a rush to get plants established as soon as official approval is granted it is recommended that plants be propagated as soon as possible.

It will take 6 - 8 months to grow plants from the seed / cuttings for this job.

It is recommended that plants grown from local provenance seed be sourced as soon as possible. There may be some nurseries that have this stock available but it will be very unlikely especially at this time of year with late notice.

All species should be propagated between October and June of each year. This is the nursery growing season.

Some species will need to be grown from cuttings. Most nurseries will know which method of propagation is required. When sourcing plants and seed send a photo copy or fax of pages 3,4,5,6 of this revegetation plan to potential suppliers.

A total of 6615 plants are required for the areas that I have mapped.

If these areas change, as is probable then the numbers and the costs associated with this project will also change accordingly.

TIMING SCHEDULE –
Revegetation project year 1 - 2006

January	
February	
March	
April	
May	
June	<ul style="list-style-type: none"> - Planning and surveying - Await approval process
July	<ul style="list-style-type: none"> - Await approval process
August	<ul style="list-style-type: none"> - Await approval process - Control winter weeds - Inspect for Rabbits
September	<ul style="list-style-type: none"> - Collect / source seed for propagating - Propagate seed - Wait for earthworks to commence - Control Rabbits
October	<ul style="list-style-type: none"> - Collect seed for propagating - Propagate seed - Wait for earthworks to commence
November	<ul style="list-style-type: none"> - Collect seed for propagating - Propagate seed - Wait for earthworks to finish - Control Rabbits
December	<ul style="list-style-type: none"> - Collect seed for propagating - Propagate seed - Wait for earthworks to finish

TIMING SCHEDULE – Revegetation project year 2 - 2007

January	<ul style="list-style-type: none"> - Collect seed for propagating - Propagate seed - Control summer weeds
February	<ul style="list-style-type: none"> - Collect seed for propagating - Propagate seed - Control summer weeds
March	<ul style="list-style-type: none"> - Start preparing screening areas - Rock breaking and filling holes with soil - Check bunting is sufficient
April	<ul style="list-style-type: none"> - Start preparing bunting areas - Ensure all seed is collected and tubestock grown - Design irrigation plan
May	<ul style="list-style-type: none"> - Start weed and insect control if required - Finish preparation of screening areas - Continue with preparation of bunting areas
June	<ul style="list-style-type: none"> - Start knock down weed and insect control - Finish preparation of bunting areas - Direct seed front paddocks near main road
July	<ul style="list-style-type: none"> - Start planting screening areas - Start planting bunting areas - Start installing irrigation system
August	<ul style="list-style-type: none"> - Finish planting screening and bunting areas - Continue with irrigation system
September	<ul style="list-style-type: none"> - Control winter weeds - Finish irrigation system
October	<ul style="list-style-type: none"> - Ensure irrigation system is working correctly - Propagate plants for back fence section
November	<ul style="list-style-type: none"> - Regularly check irrigation system - Inspect for Rabbits - Propagate plants for back fence section
December	<ul style="list-style-type: none"> - Regularly check irrigation system - Control Rabbits

TIMING SCHEDULE – Revegetation project year 3 – 2008

January	<ul style="list-style-type: none"> - Control summer weeds - Control rabbits if required
February	<ul style="list-style-type: none"> - Control summer weeds
March	<ul style="list-style-type: none"> - Check irrigation system - Control weeds - Ensure plants for tailings dam area are ready
April	<ul style="list-style-type: none"> - Check irrigation system - Control weeds
May	<ul style="list-style-type: none"> - Start weed and insect control - Plan works for tailings dam area
June	<ul style="list-style-type: none"> - Start overspray weed control where appropriate - Control weeds all areas - Machine plant back fenceline - Water in plants after planting
July	<ul style="list-style-type: none"> - Plant tailings dam area - Re - planting screening areas - Re - planting bunting areas
August	<ul style="list-style-type: none"> - Finish re - planting screening and bunting areas - Control weeds - Start irrigation installation for tailings dam
September	<ul style="list-style-type: none"> - Control winter weeds - Check irrigation system - Water back fence line plantings
October	<ul style="list-style-type: none"> - Ensure irrigation system is working correctly
November	<ul style="list-style-type: none"> - Regularly check irrigation system - Inspect for Rabbits - Water back fence line plantings if required
December	<ul style="list-style-type: none"> - Regularly check irrigation system - Control Rabbits - Water back fence line plantings if required

TIMING SCHEDULE – Revegetation project years 4 – 7. 2009-2012

January	<ul style="list-style-type: none"> - Control summer weeds - Check and maintain irrigation system - Water back fence line plantings if required
February	<ul style="list-style-type: none"> - Control summer weeds - Check and maintain irrigation system - Water back fence line plantings if required
March	<ul style="list-style-type: none"> - Maintain plantings
April	<ul style="list-style-type: none"> - Maintain plantings
May	<ul style="list-style-type: none"> - Start weed and insect control if required
June	<ul style="list-style-type: none"> - Start knock down weed and insect control - Replant if necessary
July	<ul style="list-style-type: none"> - Replant if necessary - Ensure irrigation system is working correctly
August	<ul style="list-style-type: none"> - Ensure irrigation system is working correctly
September	<ul style="list-style-type: none"> - Control winter weeds
October	<ul style="list-style-type: none"> - Ensure irrigation system is working correctly
November	<ul style="list-style-type: none"> - Regularly check irrigation system - Inspect for Rabbits - Collect seed for Tailings dam and mine site
December	<ul style="list-style-type: none"> - Regularly check irrigation system - Control Rabbits - Collect seed for Tailings dam and mine site

TIMING SCHEDULE – Revegetation project year 8 - 2013

January	<ul style="list-style-type: none"> - Control summer weeds - Check and maintain irrigation system - Water back fence line plantings if required - Collect seed for Tailings dam and mine area
February	<ul style="list-style-type: none"> - Control summer weeds - Check and maintain irrigation system - Water back fence line plantings if required - Collect seed for Tailings dam and mine area
March	<ul style="list-style-type: none"> - Prepare Tailings dam site - Prepare Mine site
April	<ul style="list-style-type: none"> - Prepare Tailings dam site - Prepare Mine site
May	<ul style="list-style-type: none"> - Finish preparing Tailings dam and mine site - Start weed and insect control if required - Start earthmoving at the Mine site - Weed control at Mine site
June	<ul style="list-style-type: none"> - Start knock down weed and insect control - Direct seed Tailings dam site - Direct seed Mine site
July	<ul style="list-style-type: none"> - Ensure irrigation system is working correctly
August	<ul style="list-style-type: none"> - Ensure irrigation system is working correctly
September	<ul style="list-style-type: none"> - Control winter weeds - Guarded spray of tailings dam and mine site
October	<ul style="list-style-type: none"> - Ensure irrigation system is working correctly
November	<ul style="list-style-type: none"> - Regularly check irrigation system - Inspect for Rabbits
December	<ul style="list-style-type: none"> - Regularly check irrigation system - Control Rabbits