

Clarendon Reservoir Reserve

Negative perceptions around
fire risk associated with
revegetation and how to
address this.

Shaun Kennedy
SA Water Corporation

Wednesday, 19 March 2014

Outline

- Background: SA Water Fire Management
- Clarendon Case Study - Community consultation
- Design responses
- On ground works
- Bushfire Prevention meets Grassy Woodland Restoration
- Lessons learnt

Fire Management – SA Water context

- 2002-03 WA Fire: 2.1 million ha
- 2002-03 ACT Fires: four people killed, 500 homes destroyed, water supply interrupted
- 2005 Tulka Fire: 145,000 ha, nine people killed
- 2007 Mt. Bold arson fire: 500 ha reservoir reserve, 500 ha farmland
- 2014 Bangor Fire: 30,000 ha+ (Bundaleer Reservoir)

Fire Management – an evolving capability

- Expansion of SA Water land & fire mgt team
- Detailed asset knowledge
- Fire mgt planning system
- Fire suppression partnerships with DEWNR, FSA & CFS
- Fire suppression vehicles & equipment
- 2009 Fuel Reduction Burn Program

Case Study: Clarendon Biosequestration / Restoration Project

One of several projects in the:

“SA Water Carbon Biosequestration Program 2004 – 2015”

Projects to date...

Project No.	Project title	Year est.	ha	GHG sequestered at maturity (tonne CO ₂ -e)
C8387	Mt. Bold / Scott Creek Land Management	2005-8	450 (250)	159,240
C2606	Millbrook	2006-7	45	30,465
C9189	Myponga Stage 1	2007-8	40	36,690
C9220	Little Para Ph1	2008-9	30	11,100
C9209	Mobilong River Flats - Stage 1	2008-9	5.8	1,740
C9282	Myponga Stage 2	2009-10	67	51,550
C9283	Little Para Ph2	2009-10	40	14,800
C9208	Mobilong and Toora Phase 2	2009-10	3	900
C9284	Little Para Ph3	2010-11	70	30,350
C9285	Little Para Ph4	2011-12	100	43,385
C9291	Clarendon Carbon Biosequestration Project	2012-15	238 (160)	112,643

1089 (811)

492,863

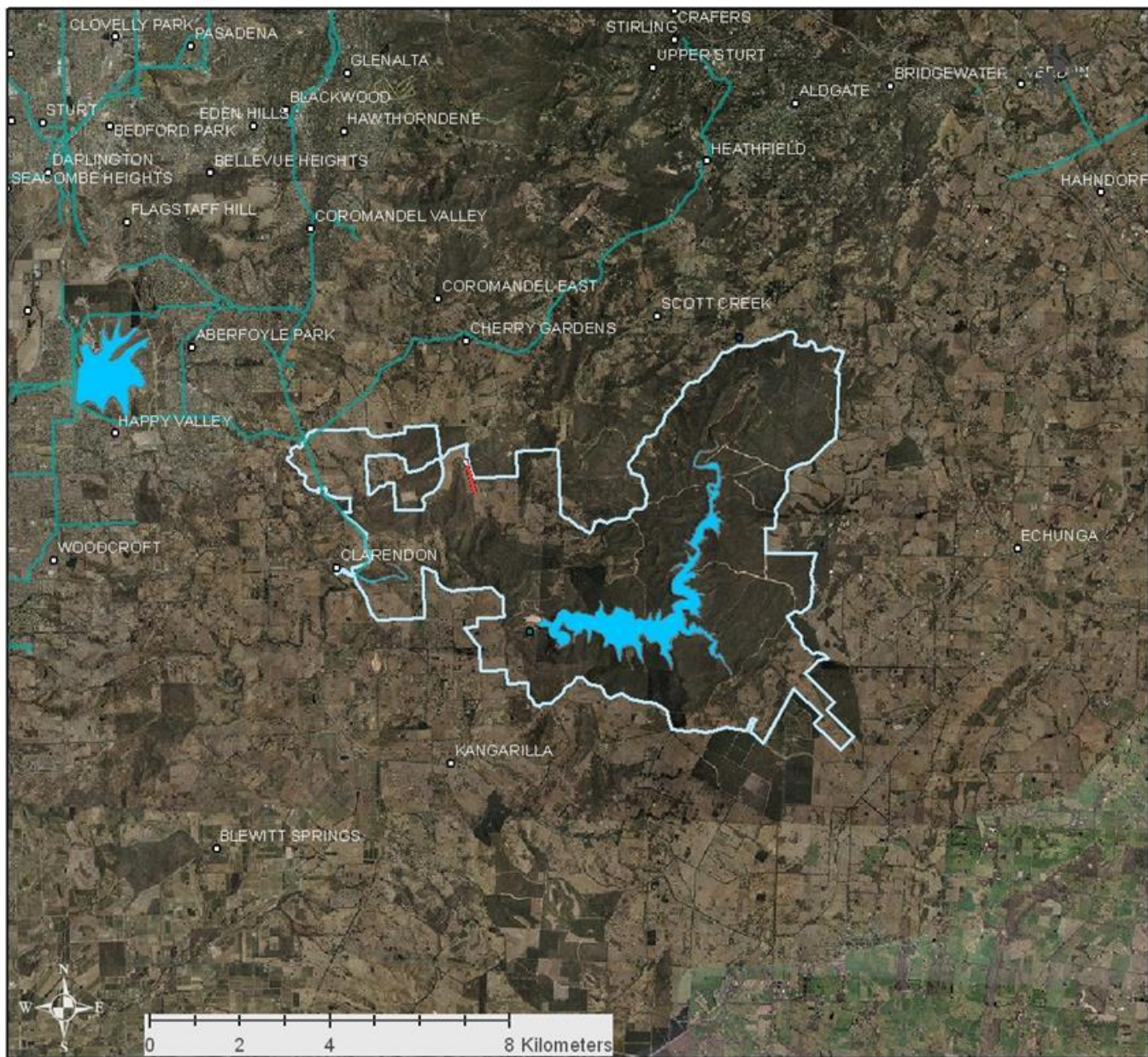
Case Study:

Clarendon Biosequestration / Restoration Project

One of several projects in the
SA Water Carbon Biosequestration Program

Biosequestration Program Objectives

- To deliver value-for-money **carbon** offsets for our GHG emissions
- **Environmental co-benefits** in one or more of the following core land management areas:
 - Improving the quality of water runoff
 - Improved gully erosion protection for the reservoir
 - Fire risk management
 - Lasting control of declared and environmental weeds
 - Enhanced biodiversity and ecosystem function in the reservoir reserve

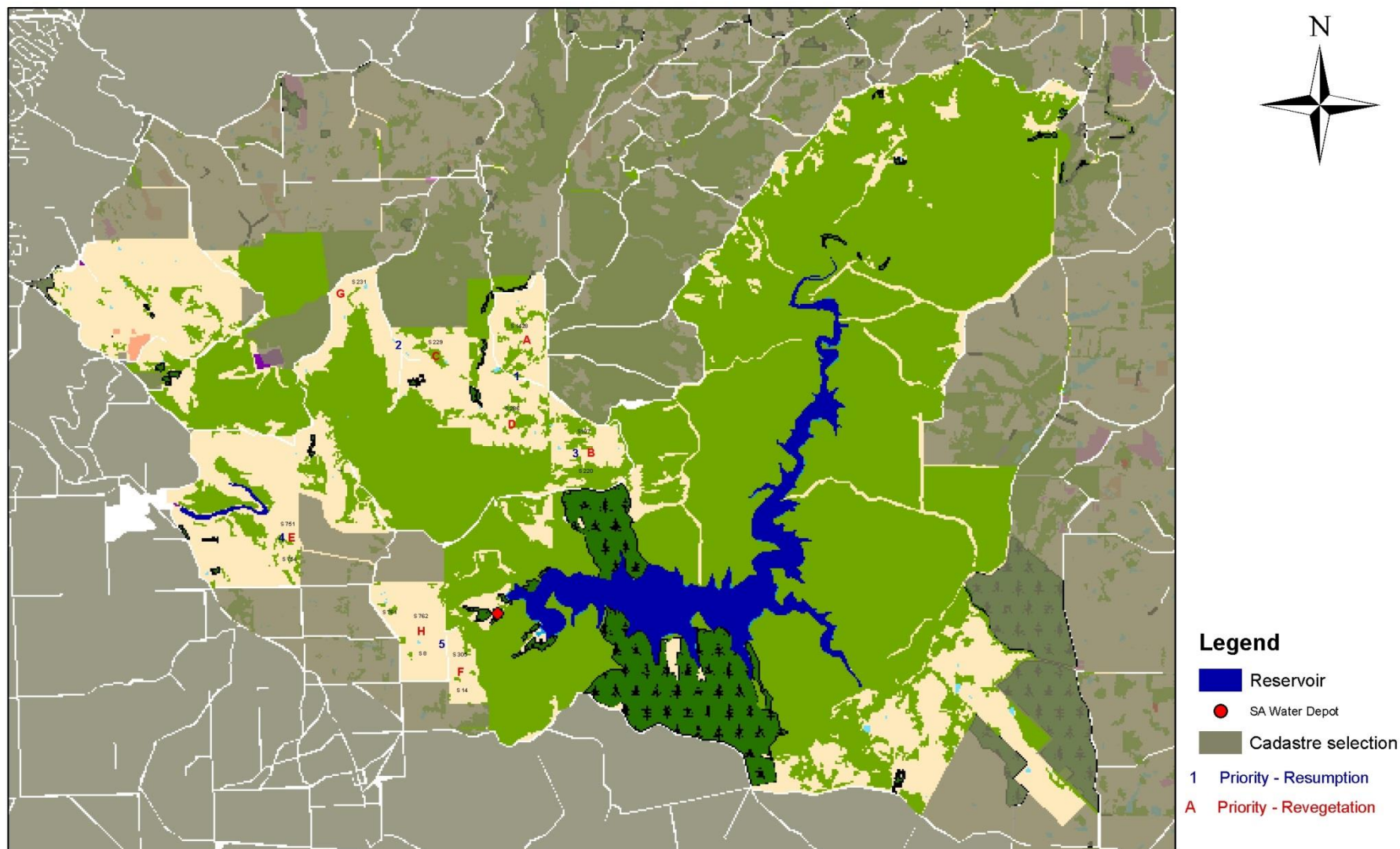


CLARENDON RETIRED LEASE CONCEPT MAP

Legend

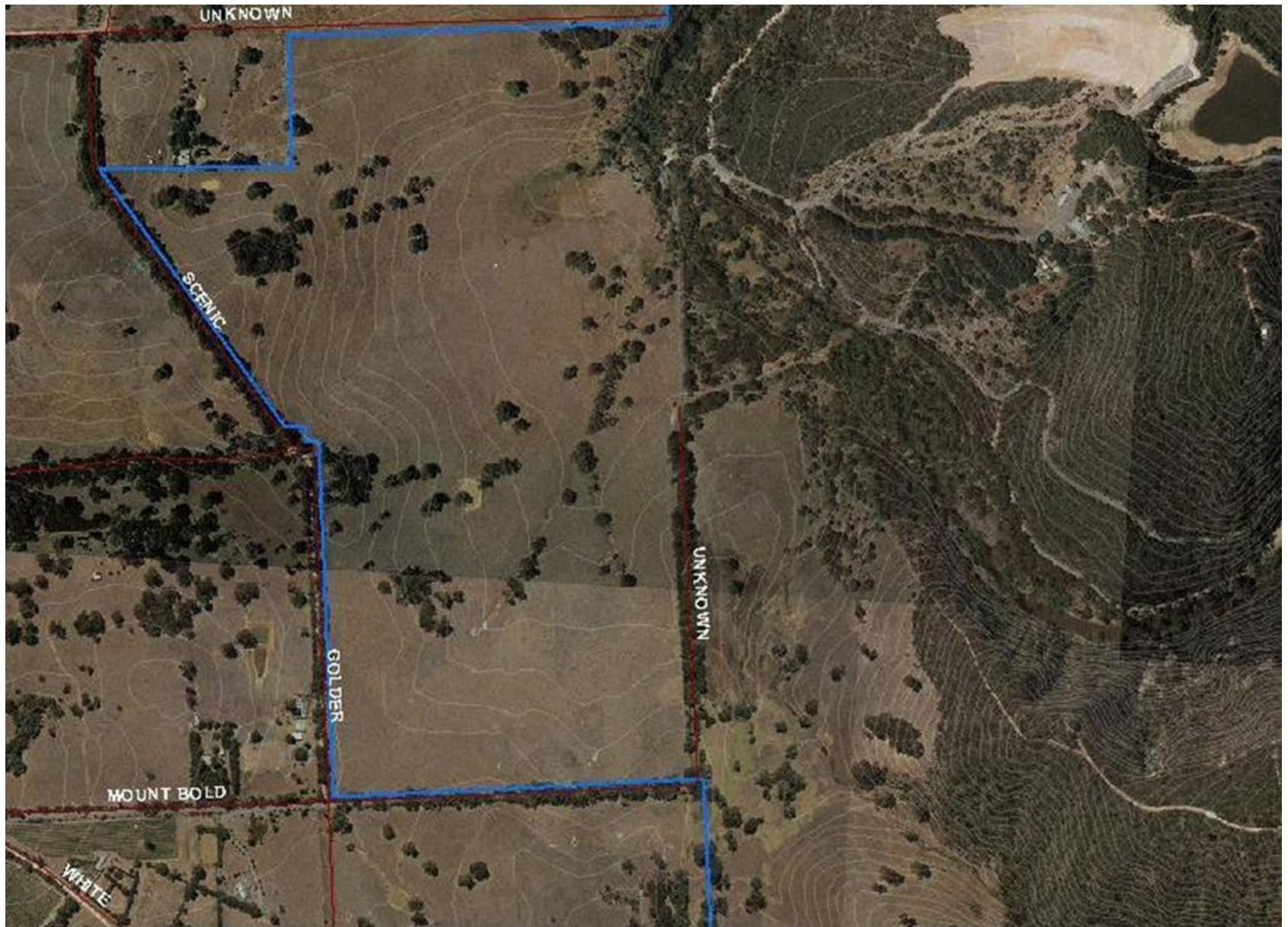
- Towns
- Reservoir
- Transmission Main
- Airstrip
- SAW Reserve Boundary

Priority Areas for the Retirement of Grazing Leases





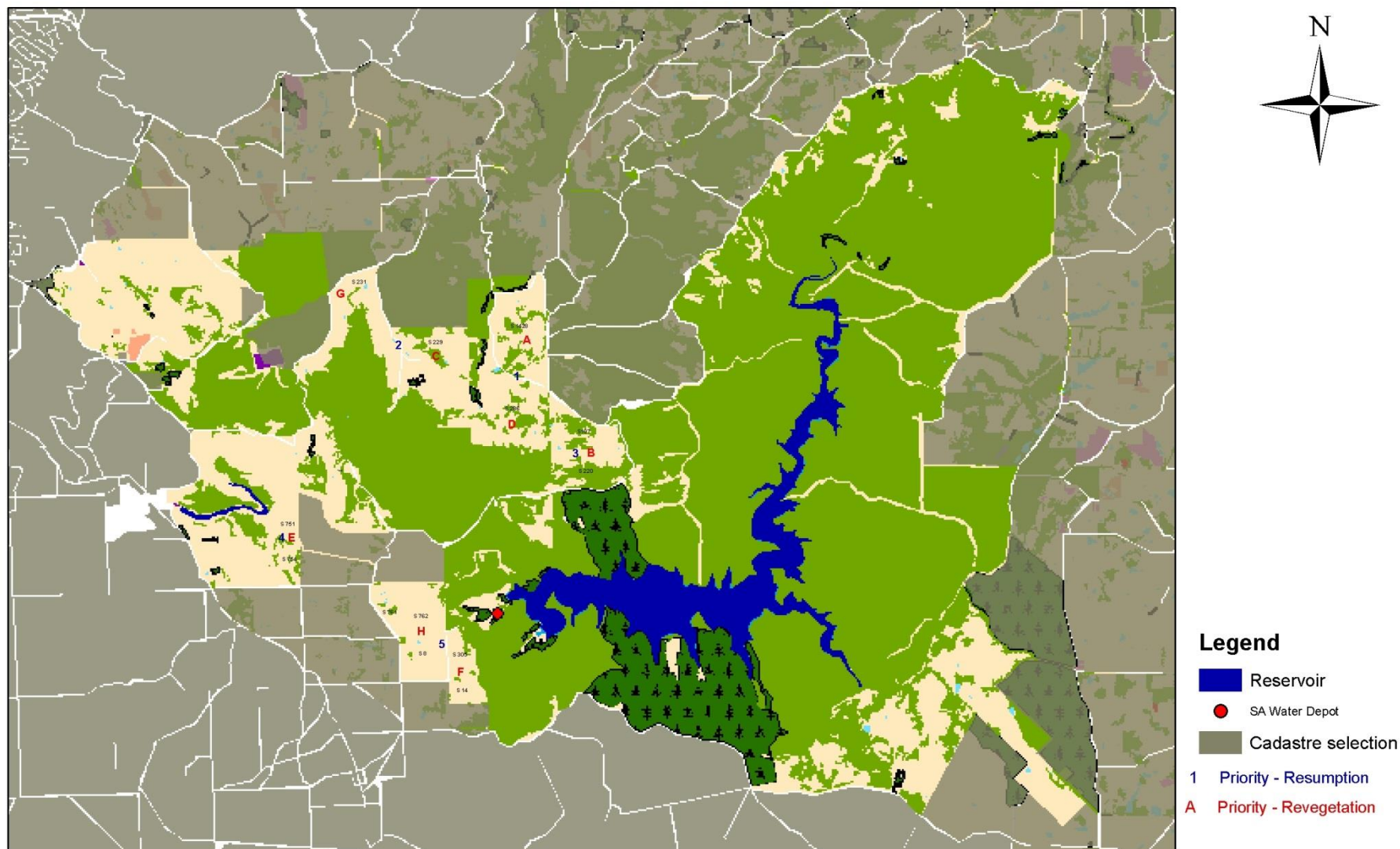


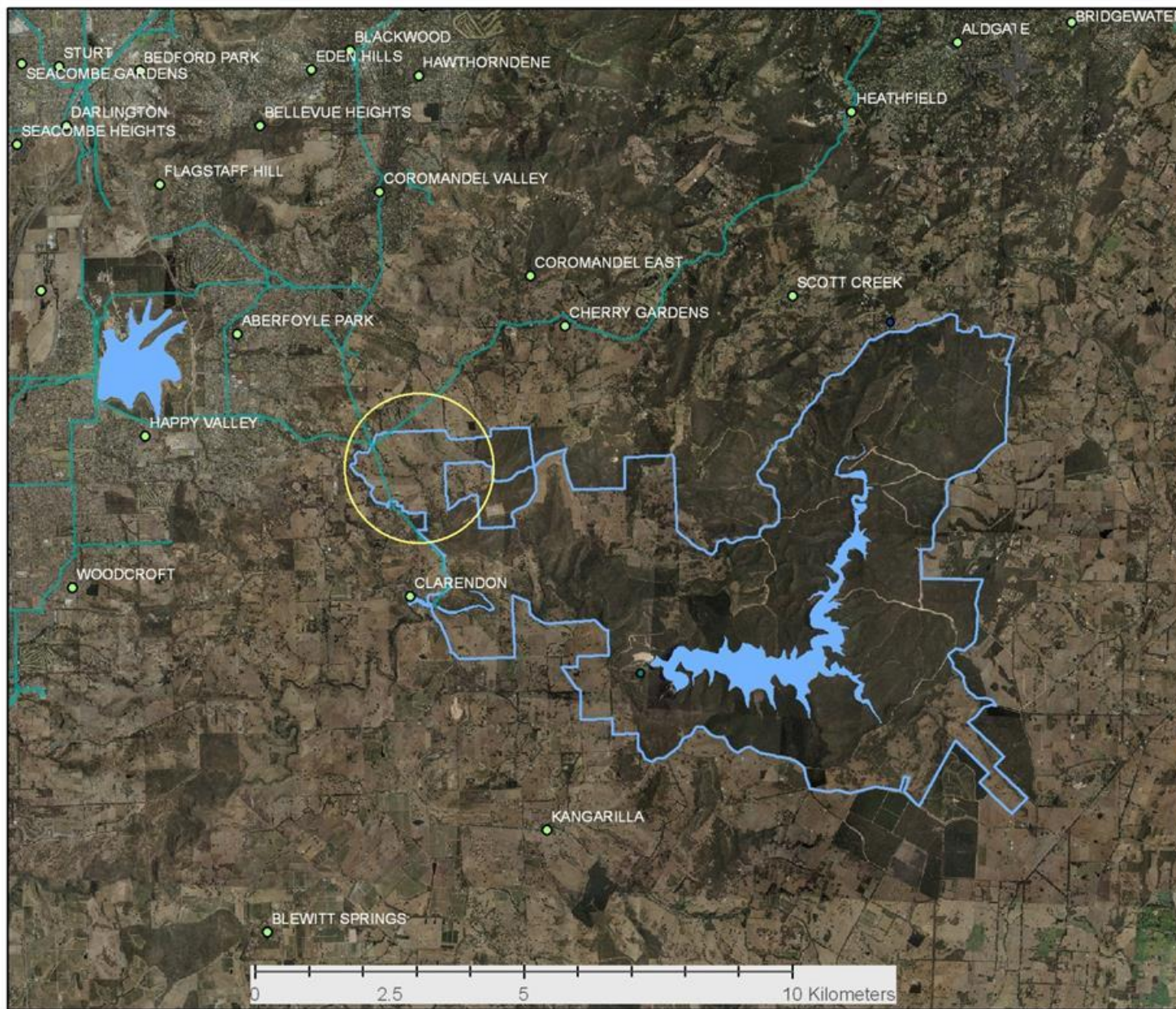






Priority Areas for the Retirement of Grazing Leases





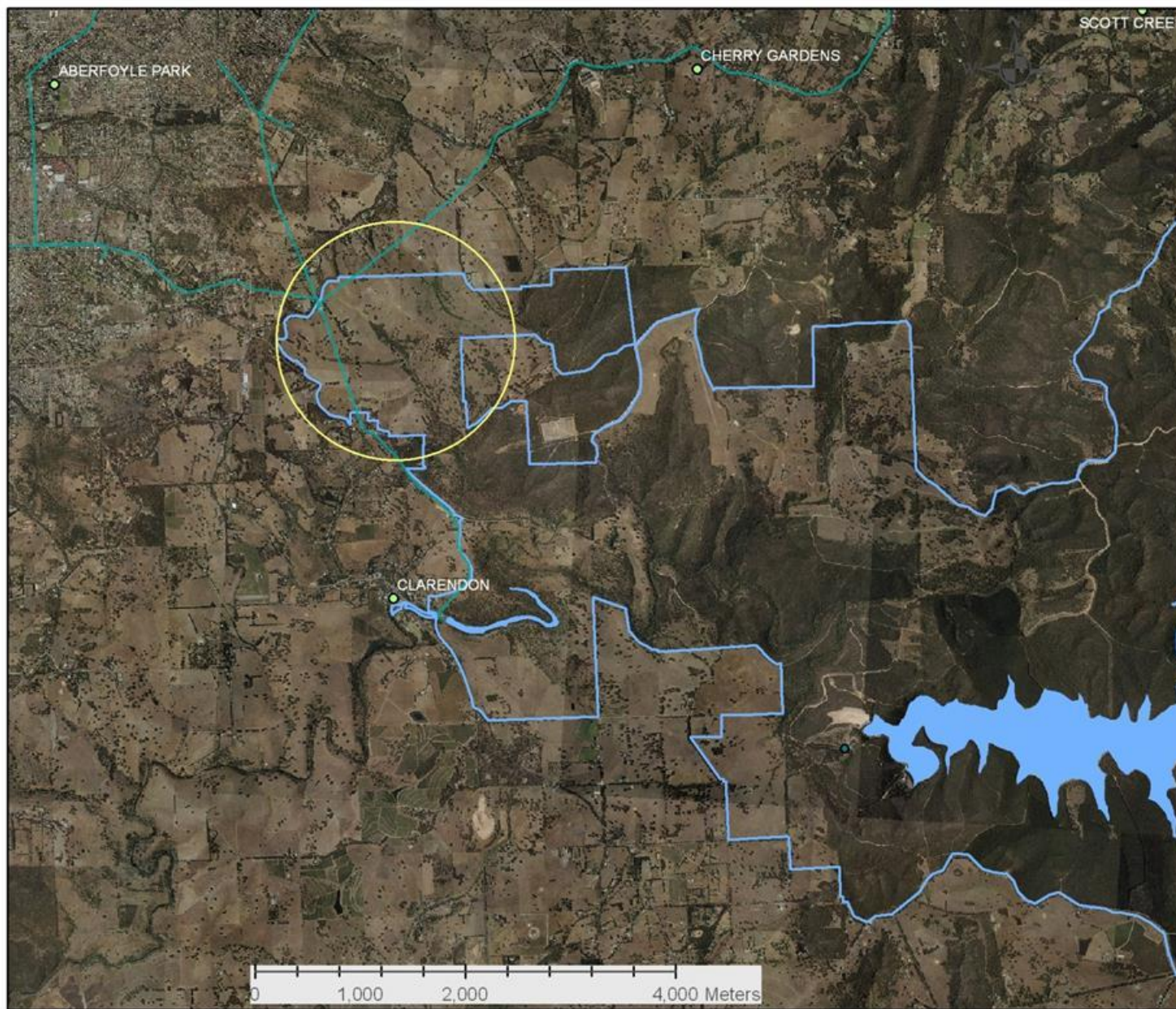
CLARENDON / MT BOLD RESERVOIR RESERVE



Legend

- Towns
- Reservoir
- Transmission Main
- SA Water Reserve Boundary

Aerial Photo: Aerometrix 2003
 Projection: LCC
 Coordinate System: GDA 1994
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CLARENDON / MT BOLD RESERVOIR RESERVE



Legend

- Towns
- Reservoir
- Transmission Main
- SA Water Reserve Boundary

Aerial Photo: Aerometrix 2003
Projection: LCC
Coordinate System: GDA 1994
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Community Consultation Process

- Initial Response:

- Reiterate SA Water's commitment to fire prevention
- Commit to undertaken proper engagement with
 - Clarendon community
 - Onkaparinga Council
 - Country Fire Servicei.e. Full and open discussion of our plans for the area
- Provide sufficient time
 - an assurance that no plantings were likely until 2012
- Adopt a formal Project Management approach:
 - Seek clear project objectives (incorporating stakeholder needs)
 - Define scope (what, where, how much)
 - Define measurable targets

Our internal objectives for Community Engagement:

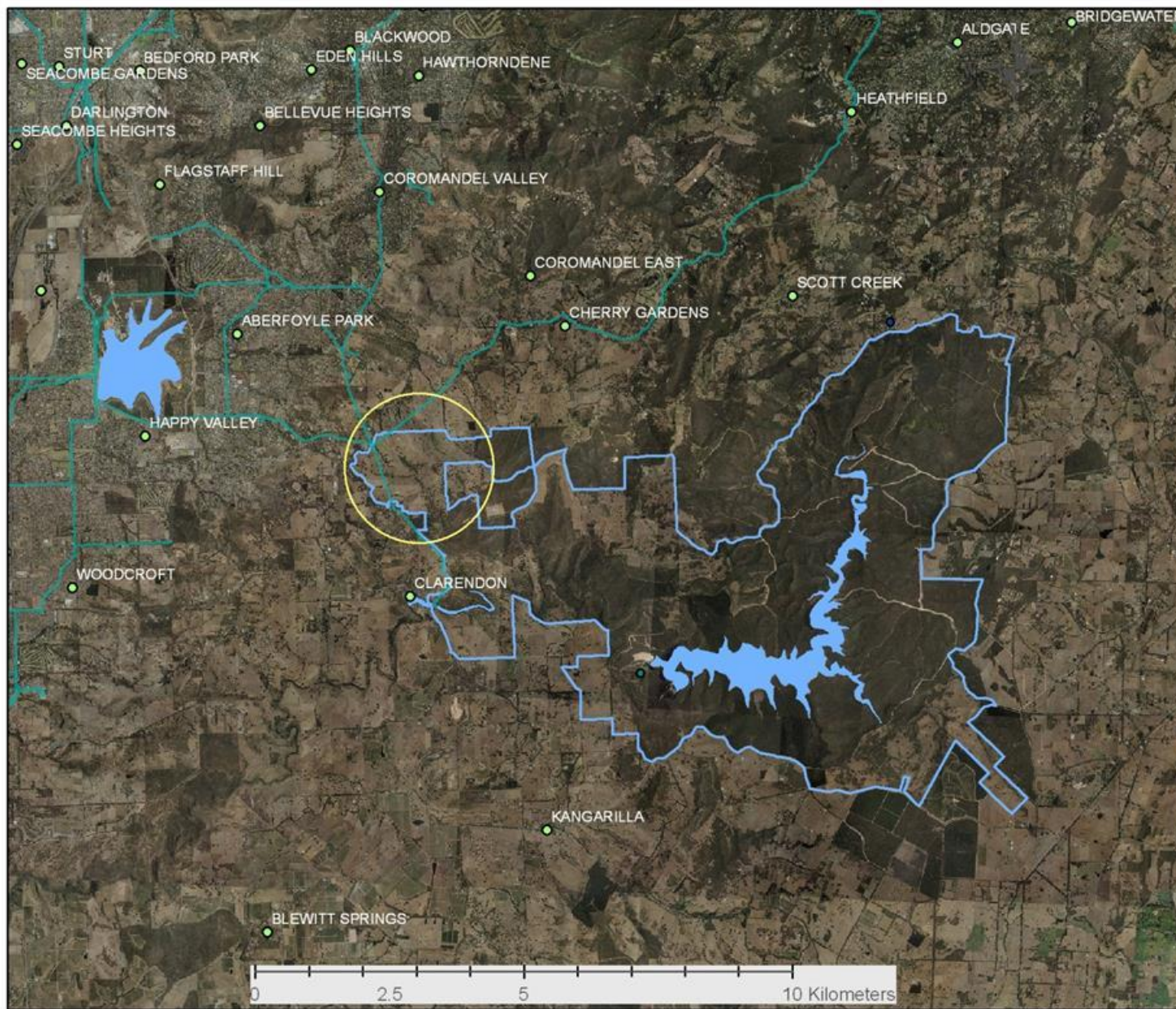
- Inform the community of the details of the project and SA Water's intentions
- Document and address key community concerns and issues in planning and implementing the project
- Obtain acceptance of the project by the Country Fire Service City of Onkaparinga and the community

Community engagement – Step 1

- Find the community
 - Get a spot on the CFS Group meeting agenda
 - Find existing community groups
 - Public meeting at Town Hall
 - Send letters to neighbouring property owners
 - Plus any known vocal locals

Community engagement – Step 1

- Find the community
- Explain SA Water's broad land management objectives and responsibilities
 - Why we own reservoir reserves
 - Manage our land for a sustainable and secure water supply
 - Protect public health, environment, and mitigate bushfire risks



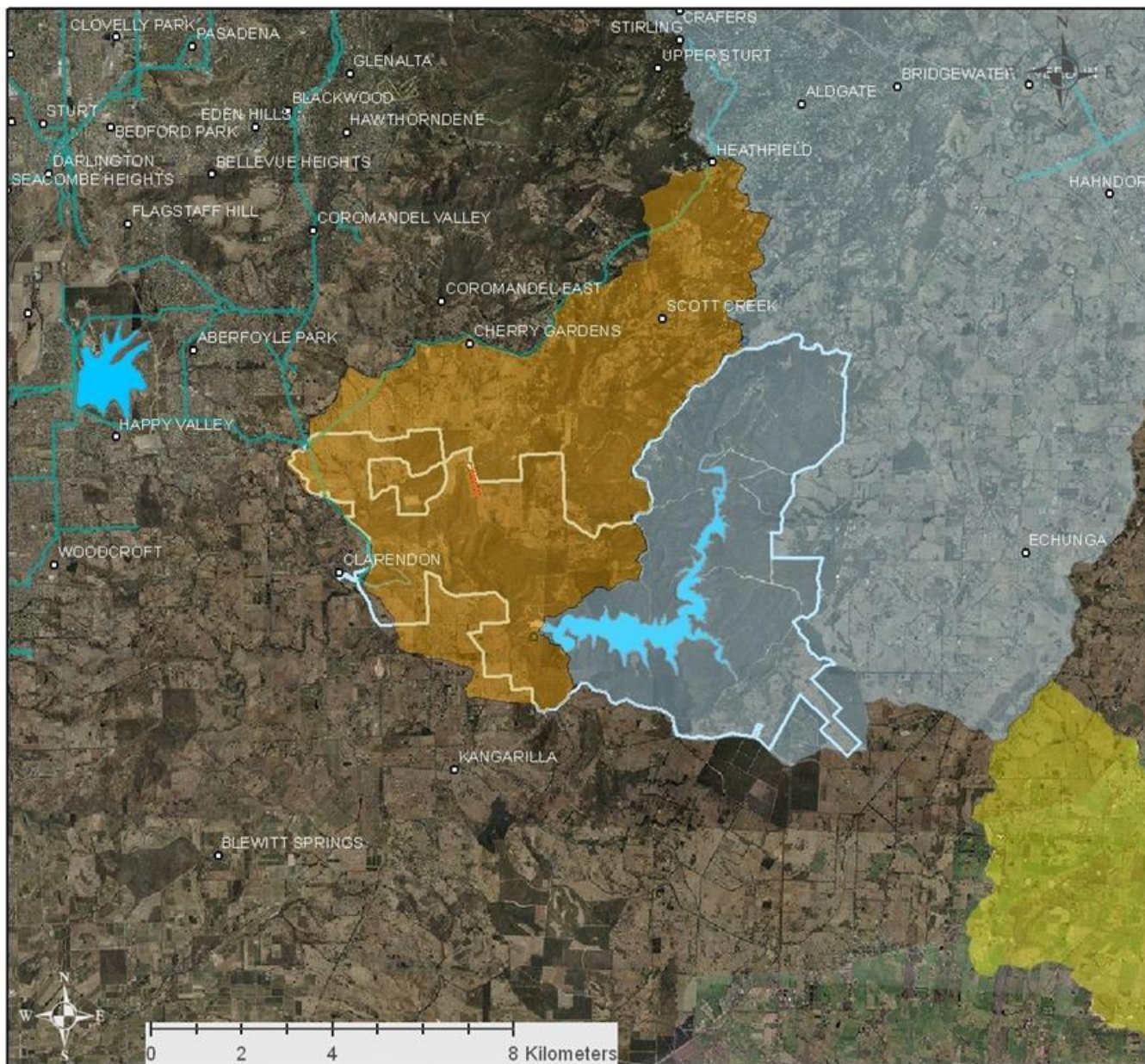
CLARENDON / MT BOLD RESERVOIR RESERVE



Legend

- Towns
- Reservoir
- Transmission Main
- SA Water Reserve Boundary

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CLARENDON RETIRED LEASE CONCEPT MAP

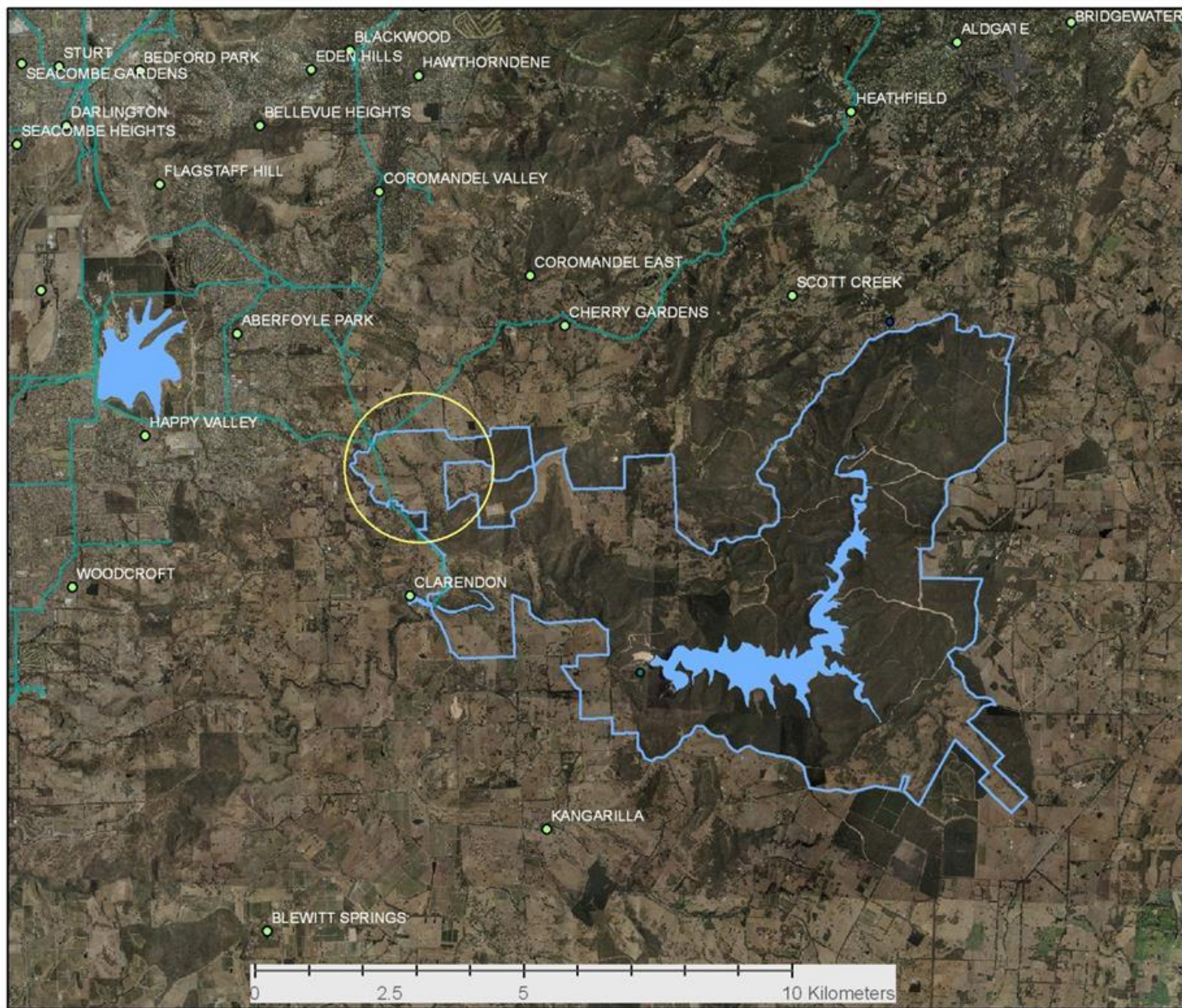
Legend

- Towns
- Reservoir
- Transmission Main
- Airstrip
- SAW Reserve Boundary

Community engagement – Step 1

- Find the community
- Explain SA Water's broad land management objectives and responsibilities
- Dispel myths
 - Highlight degree of joint-agency preparedness for fire in this location and reiterate SAW commitment to fire prevention
 - Not all Vegetation Types are “high risk”

Revegetation Concept Plan: Vegetation types



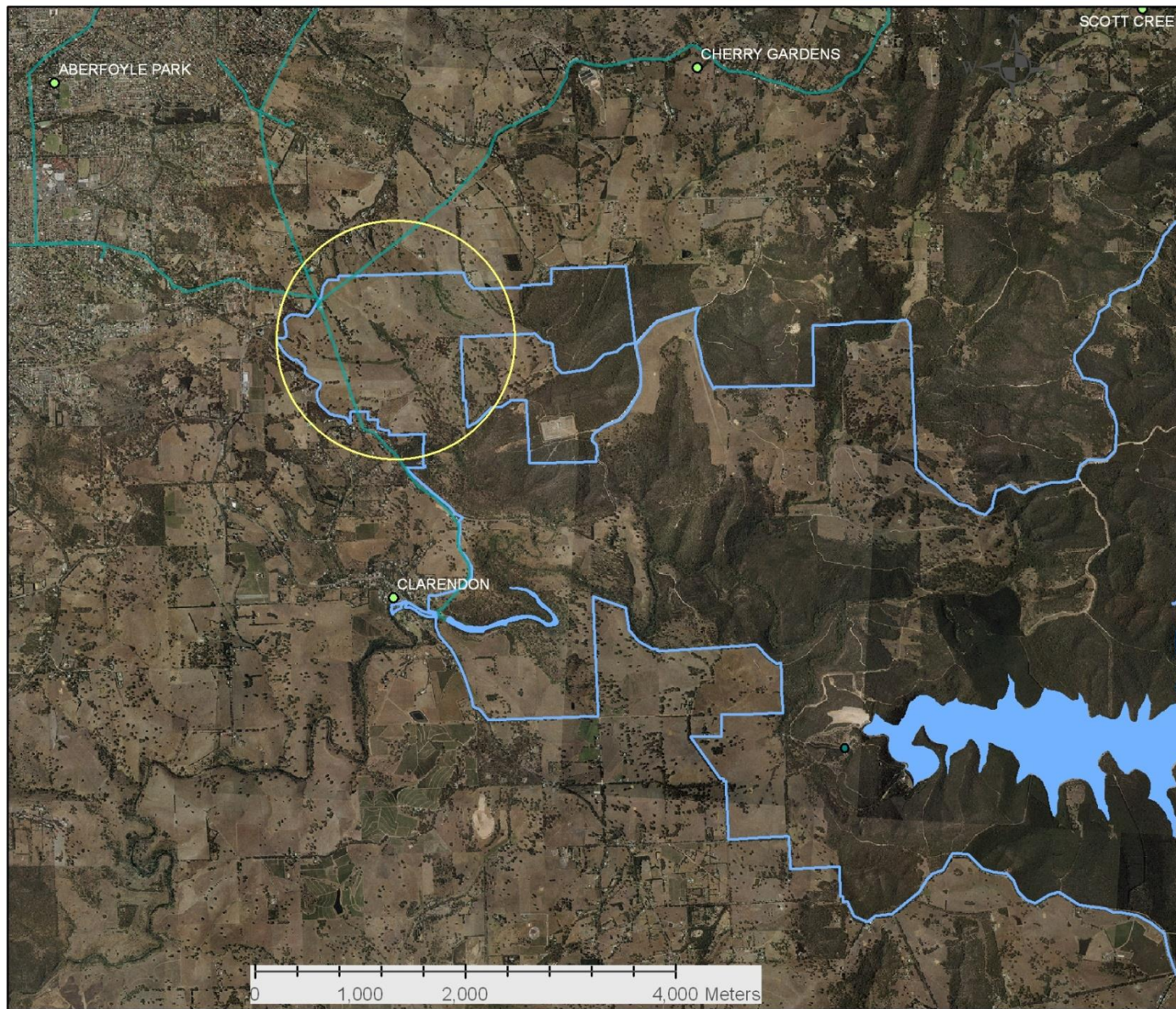
CLARENDON / MT BOLD RESERVOIR RESERVE



Legend

-  Towns
-  Reservoir
-  Transmission Main
-  SA Water Reserve Boundary

Aerial Photo: Aerometrix 2003
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SCOTT CREEK



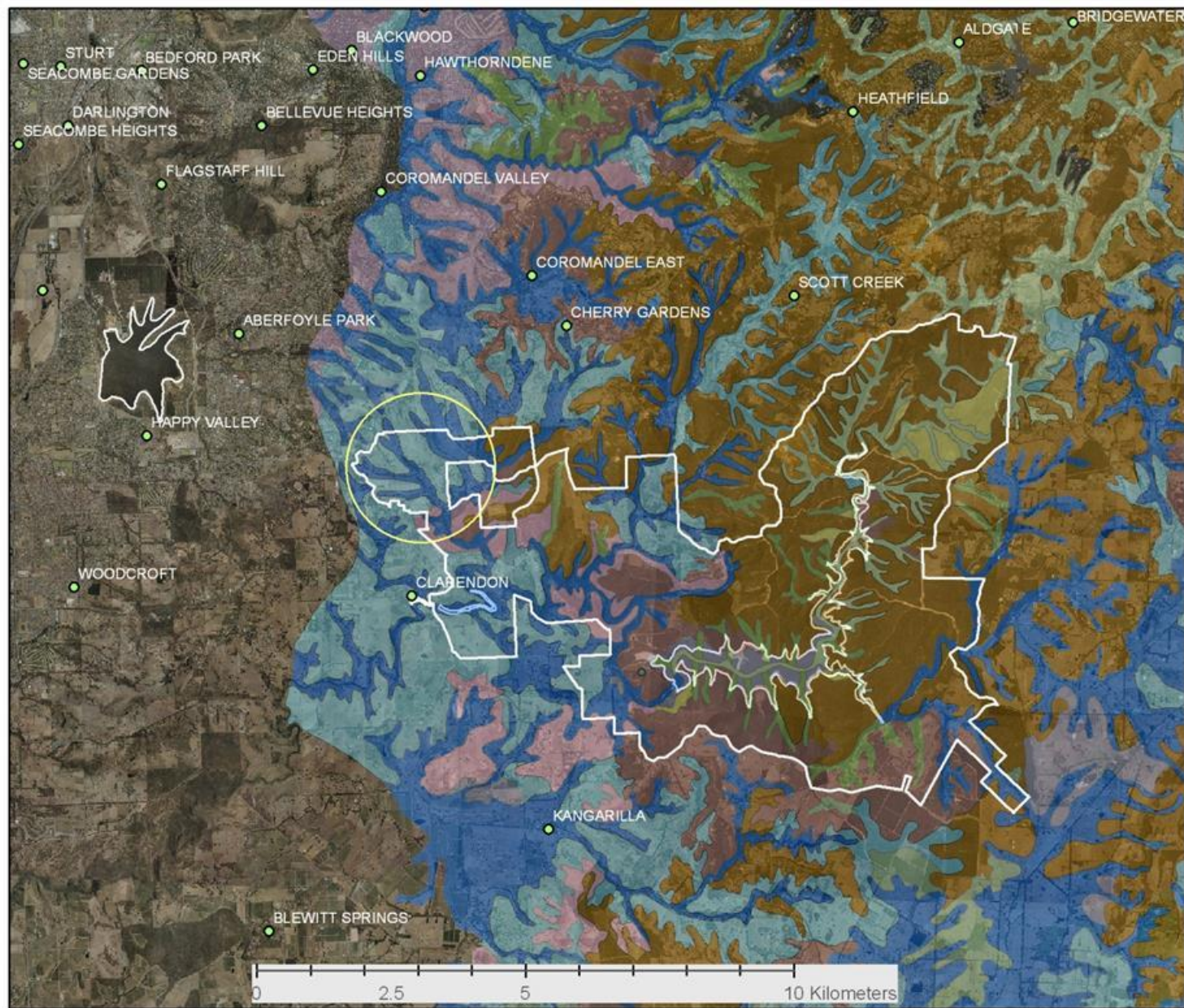
CLARENDON / MT BOLD RESERVOIR RESERVE



Legend

- Towns
- Reservoir
- Transmission Main
- SA Water Reserve Boundary

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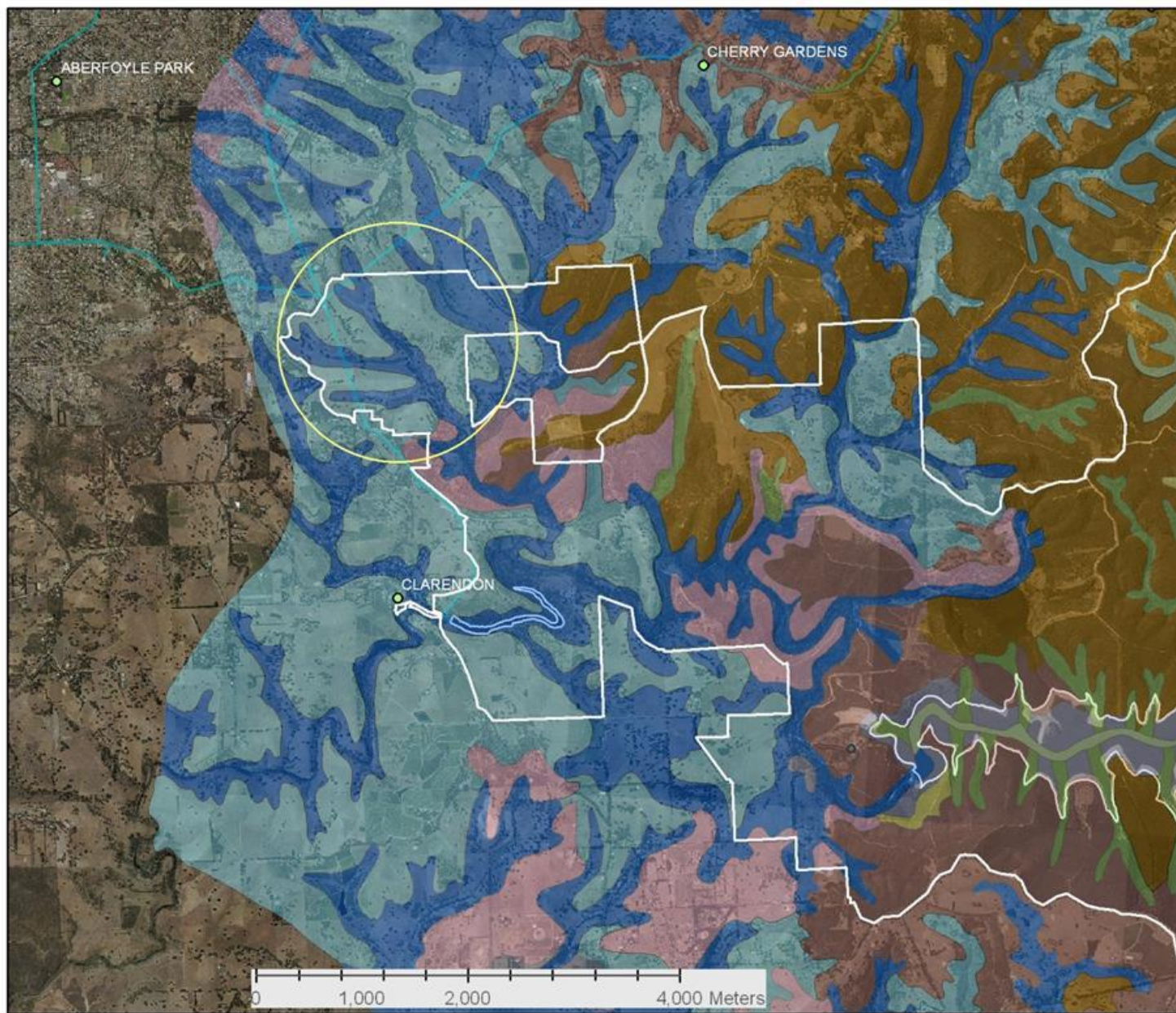


CLARENDON / MT BOLD RESERVOIR RESERVE

PRE-EUROPEAN NATIVE VEGETATION TYPES (DENR)



- Legend**
- Town
 - SA Water Reserve Boundary
 - VEG_STABILITY_PE
 - BRJ_50
 - E. laevis Low Woodland
 - E. obliqua Open Forest, eucalyptus/ironbark understorey
 - E. obliqua, E. tarcinosa Open Forest, eucalyptus/ironbark understorey
 - E. leucopylla Woodland, grassy heath/scrub understorey & sparse shrubs
 - Eucalyptus leucopylla ssp. leucopylla, E. tarcinosa Woodland
 - E. samabellensis Woodland
 - Eucalyptus venusta ssp. repens, E. leucopylla ssp. leucopylla
 - E. venusta ssp. repens Woodland
 - E. venusta ssp. venusta Woodland
 - E. microcarpa Woodland, grassy heath/scrub understorey
 - E. microcarpa Woodland
 - E. tarcinosa Woodland
 - E. tarcinosa Low Woodland, over a sclerophyll shrub understorey
 - Eucalyptus coccinifolia, + E. tarcinosa
 - Reserve



CLARENDON / MT BOLD RESERVOIR RESERVE

PRE-EUROPEAN NATIVE VEGETATION TYPES (DENR)



Legend

- Town
- SA Water Reserve Boundary
- VEG_Shaml_ofly_PE
- MRI_50
- E. banksii Low Woodland
- E. albiga Open Forest, sclerophyll shrub understorey
- E. albiga, E. fasciculosa Open Forest, sclerophyll shrub understorey
- E. leucophylla Woodland, grassy heath understorey & grassy shrub
- Eucalyptus leucophylla ssp. leucophylla, E. fasciculosa Woodland
- E. camaldulensis Woodland
- Eucalyptus viminalis ssp. reginae, E. leucophylla ssp. leucophylla
- E. viminalis ssp. reginae Woodland
- E. viminalis ssp. viminalis Woodland
- E. microcarpa Woodland, grassy heath understorey
- E. indurata Woodland
- E. fasciculosa Woodland
- E. fasciculosa Low Woodland, over a sclerophyll shrub understorey
- Eucalyptus cosmophylla, ssp. E. fasciculosa
- Reserve
- Transmission Main



E. leucoxylon woodland, grassy herbaceous understorey and sparse shrubs

(Remnant north of Frith Road, Clarendon)



E. obliqua Open Forest, sclerophyll shrub understorey

(Remnant at Mt Bold Reservoir, Bradbury)

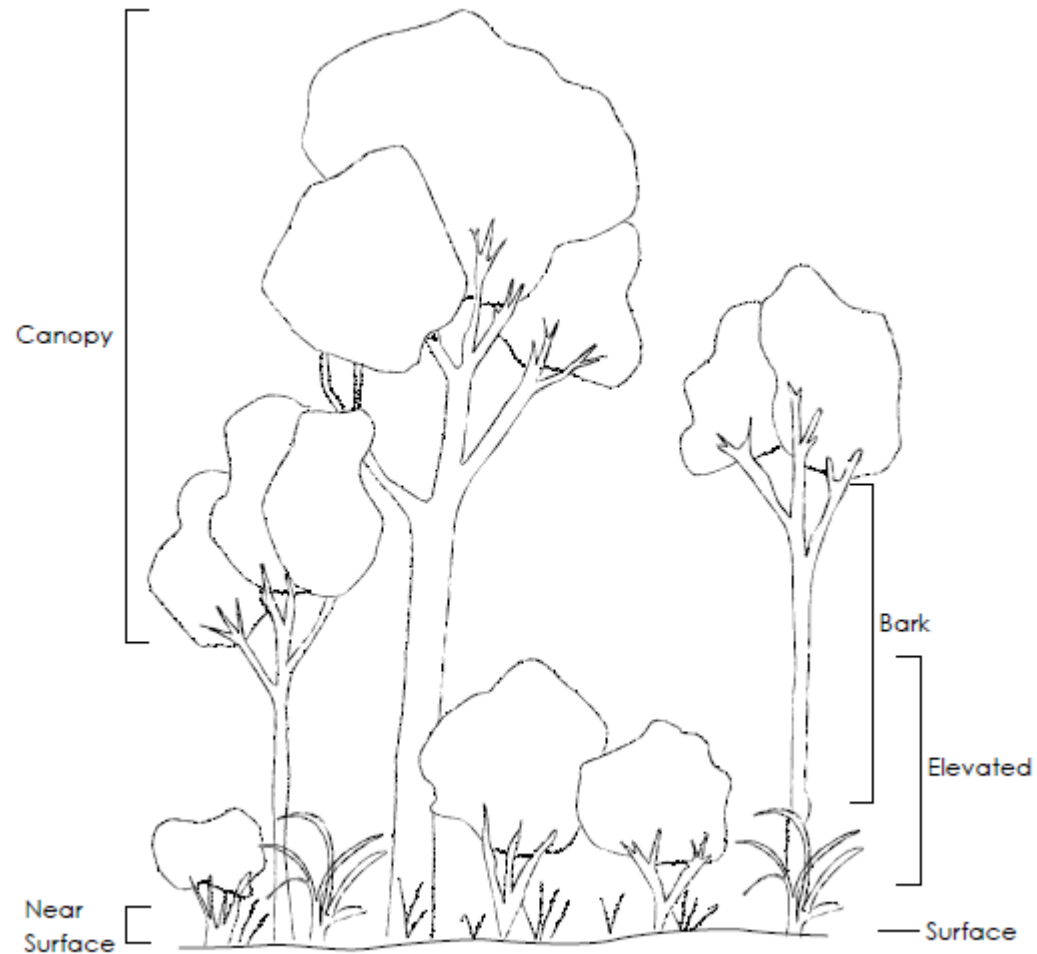
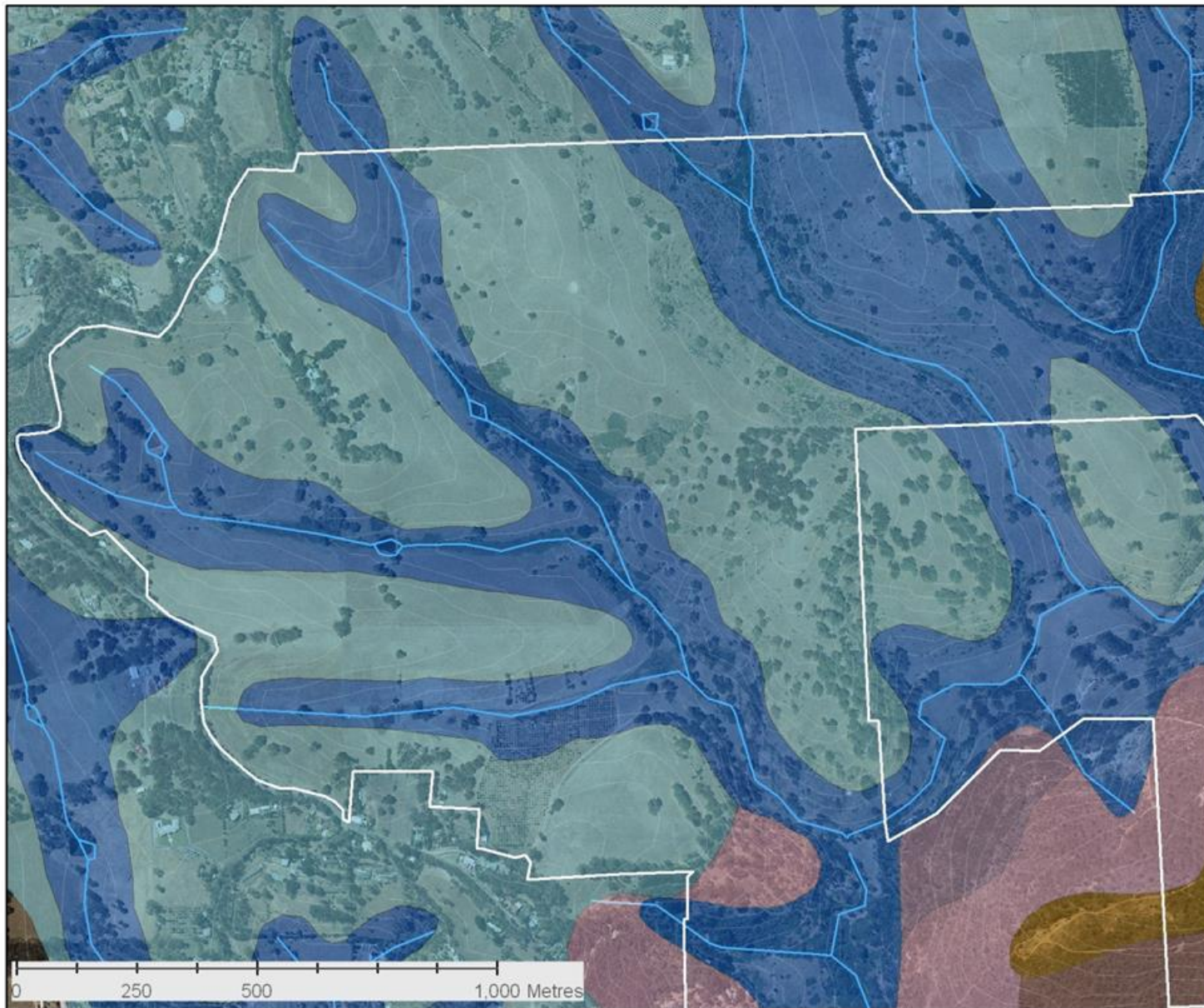


Fig 1 Fuel layers (after Gould & Sullivan 2004)

Fuel load assessment in reference sites





CLARENDON RESERVOIR RESERVE

PRE-EUROPEAN NATIVE VEGETATION TYPES (DENR)



Legend

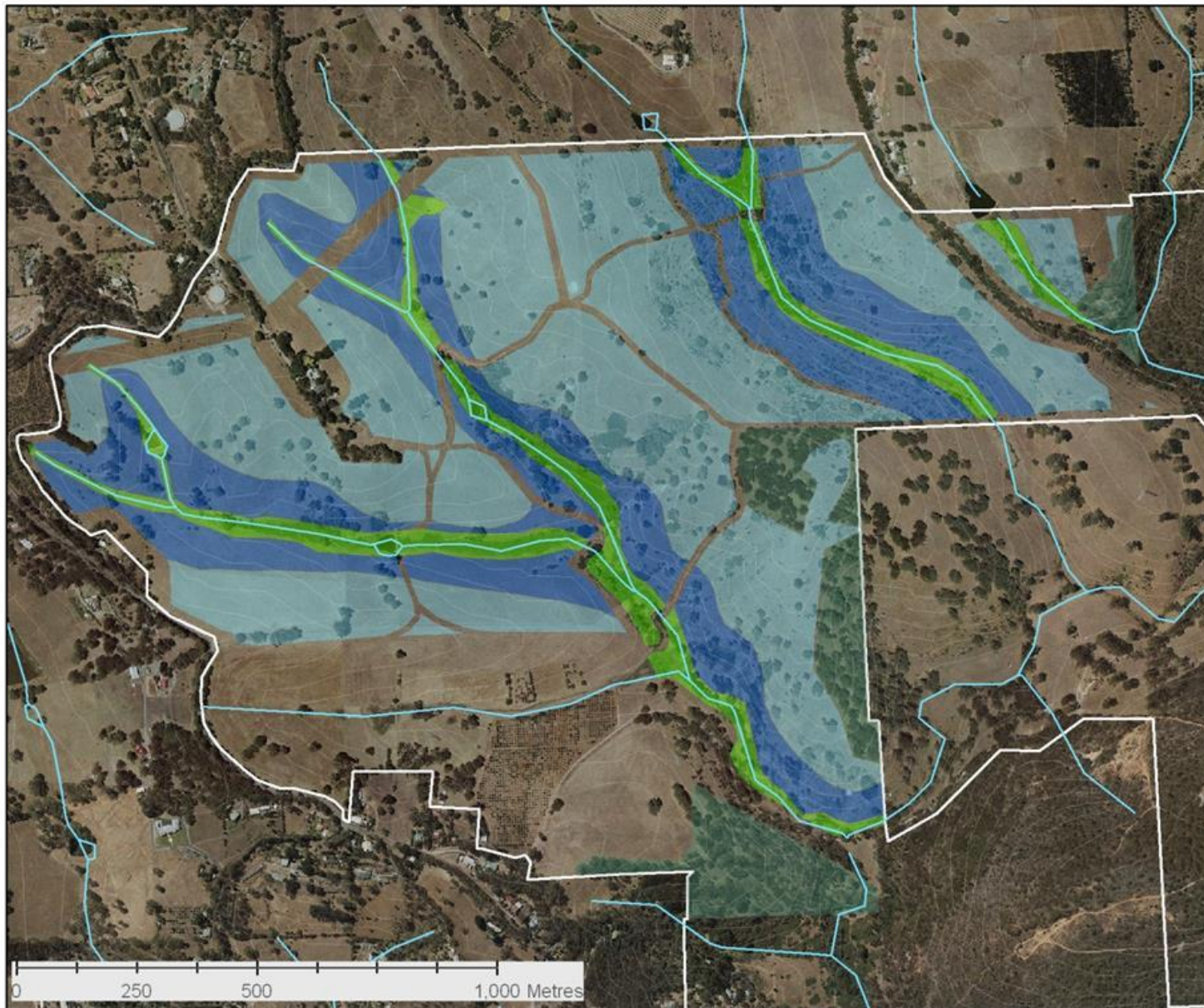
Contours 10 m

SAW Reserve Boundary

VEG.SthMtLofty_PE

MU_50

- E. baxteri Low Woodland
- E. obliqua Open Forest, sclerophyll s
- E. obliqua, E. fasciculosa Open Forest
- E. leucoxylon Woodland, grassy herba
- Eucalyptus leucoxylon ssp. leucoxylon
- E. camaldulensis Woodland
- Eucalyptus viminalis ssp. cygnetensis,
- E. viminalis ssp. cygnetensis Woodland
- E. viminalis ssp. viminalis Woodland
- E. microcarpa Woodland, grassy herba
- E. odorata Woodland
- E. fasciculosa Woodland
- E. fasciculosa Low Woodland, over a s
- Eucalyptus cosmophylla, +/- E. fascicu
- Watercourse



CLARENDON RESERVOIR RESERVE

REVEGETATION CONCEPT



Legend

- Contours 10 m
- Watercourse

Reveg Poly

Type

-  remnant mgt
-  terrestrial
-  lower slope
-  riparian
-  SAW Reserve Boundary

SA Blue Gum woodland (*Eucalyptus leucoxylon*)











River Red Gum woodland (*Eucalyptus camaldulensis*)





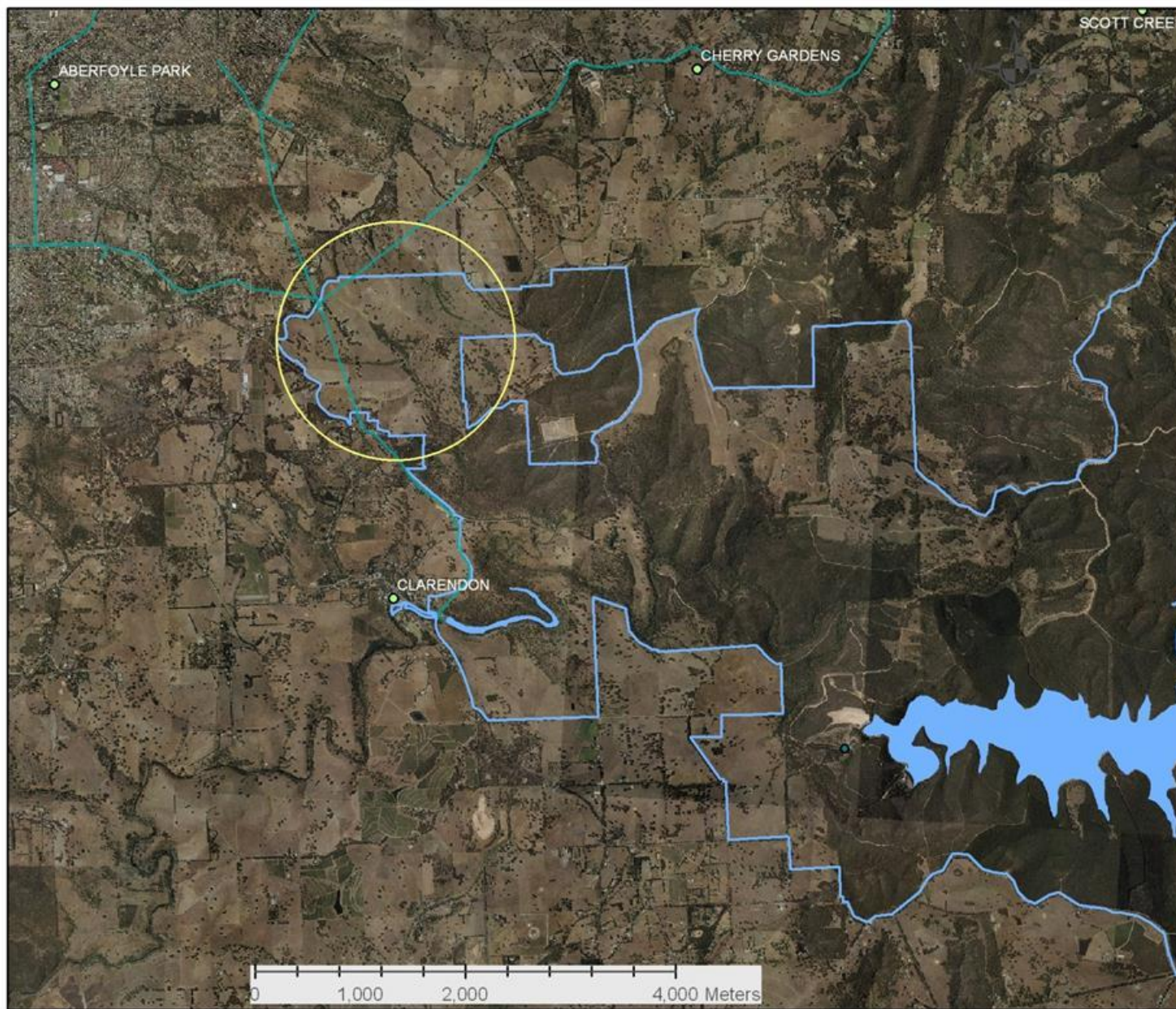






Community engagement – Step 1

- Find the community
- Explain SA Water's broad land management objectives and responsibilities
- Dispel myths
- Take a fairly “blank page” approach to site design
 - Facilitate discussion

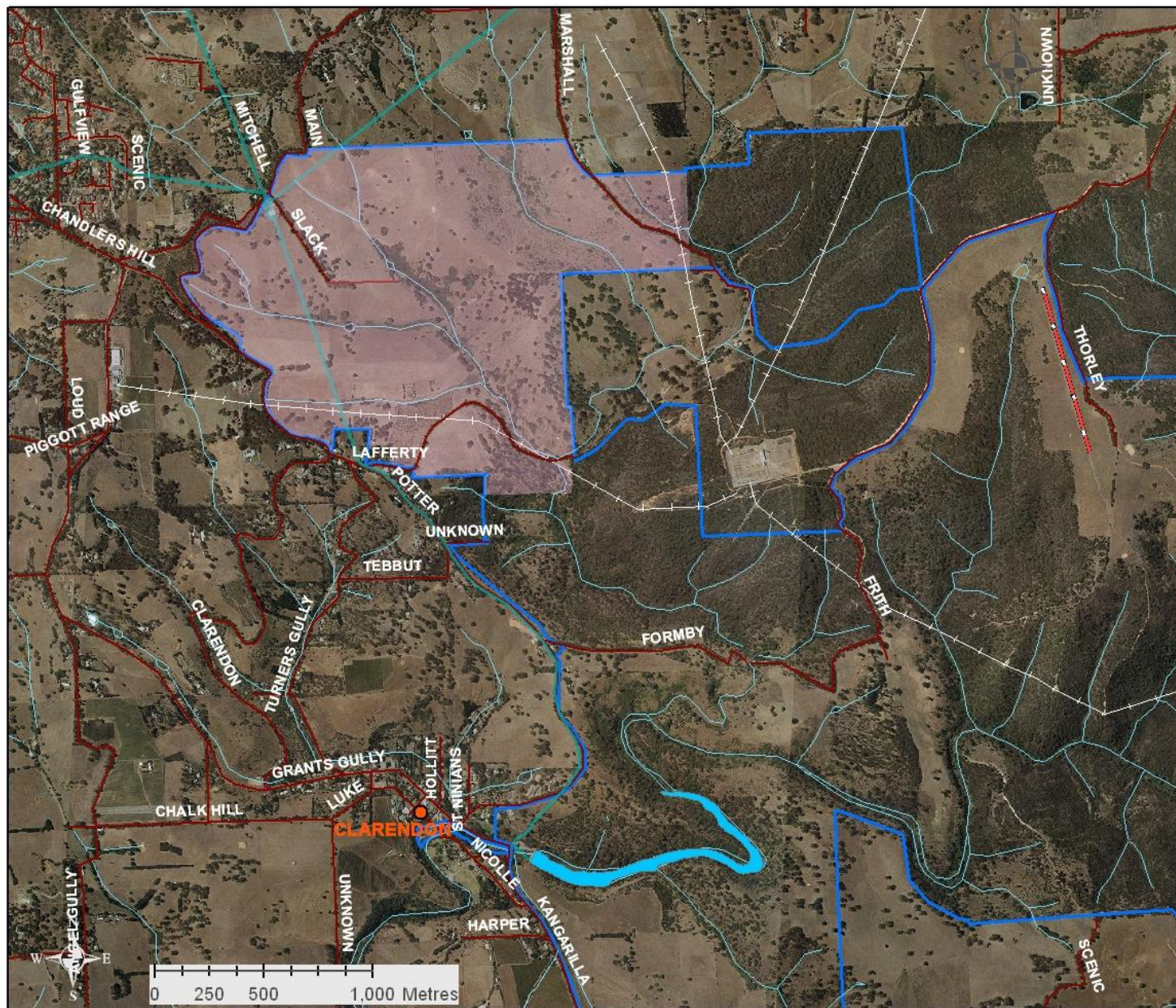


CLARENDON / MT BOLD RESERVOIR RESERVE



Legend

- Towns
- Reservoir
- Transmission Main
- SA Water Reserve Boundary



CLARENDON RETIRED LEASE CONCEPT MAP

Legend

-  Towns
-  Clarendon_Lease_Parcel's
-  Reservoir
-  Watercourse
-  Transmission Main
-  Roads
-  Electricity_Transmission
-  Airstrip
-  SAW Reserve Boundary

Community engagement – Step 1

- Find the community
- Explain SA Water's broad land management objectives and responsibilities
- Dispel myths
- Take a fairly “blank page” approach to site design
- Translate objectives in terms of
 - Opportunities & Benefits









Some bird species that have declined in the Mount Lofty Ranges

Beautiful Firetail

Black-chinned Honeyeater

Brown Treecreeper

Chestnut-rumped Hylacola

Crested Shrike-tit

Diamond Firetail

Dusky Woodswallow

Fantail Cuckoo

Hooded Robin

Jacky Winter

Red-rumped Parrot

Restless Flycatcher

Rufous Whistler

Scarlet Robin

Southern Emu-wren

Southern Whiteface

Square-tailed Kite

Tawny-crowned Honeyeater

Tree Martin

Willie Wagtail

Yellow Thornbill

















Community engagement – Step 1

- Find the community
- Explain SA Water's broad land management objectives & responsibilities
- Dispel myths
- Take a fairly “blank page” approach to site design
- Translate objectives in terms of Opportunities & Benefits
- Listen & document stakeholder concerns

Community engagement – Step 2

- Digest stakeholder concerns and discuss internally
- Return to all community reps with Concept Plan and explain how concerns are to be addressed
- Seek acceptance of the Concept Plan

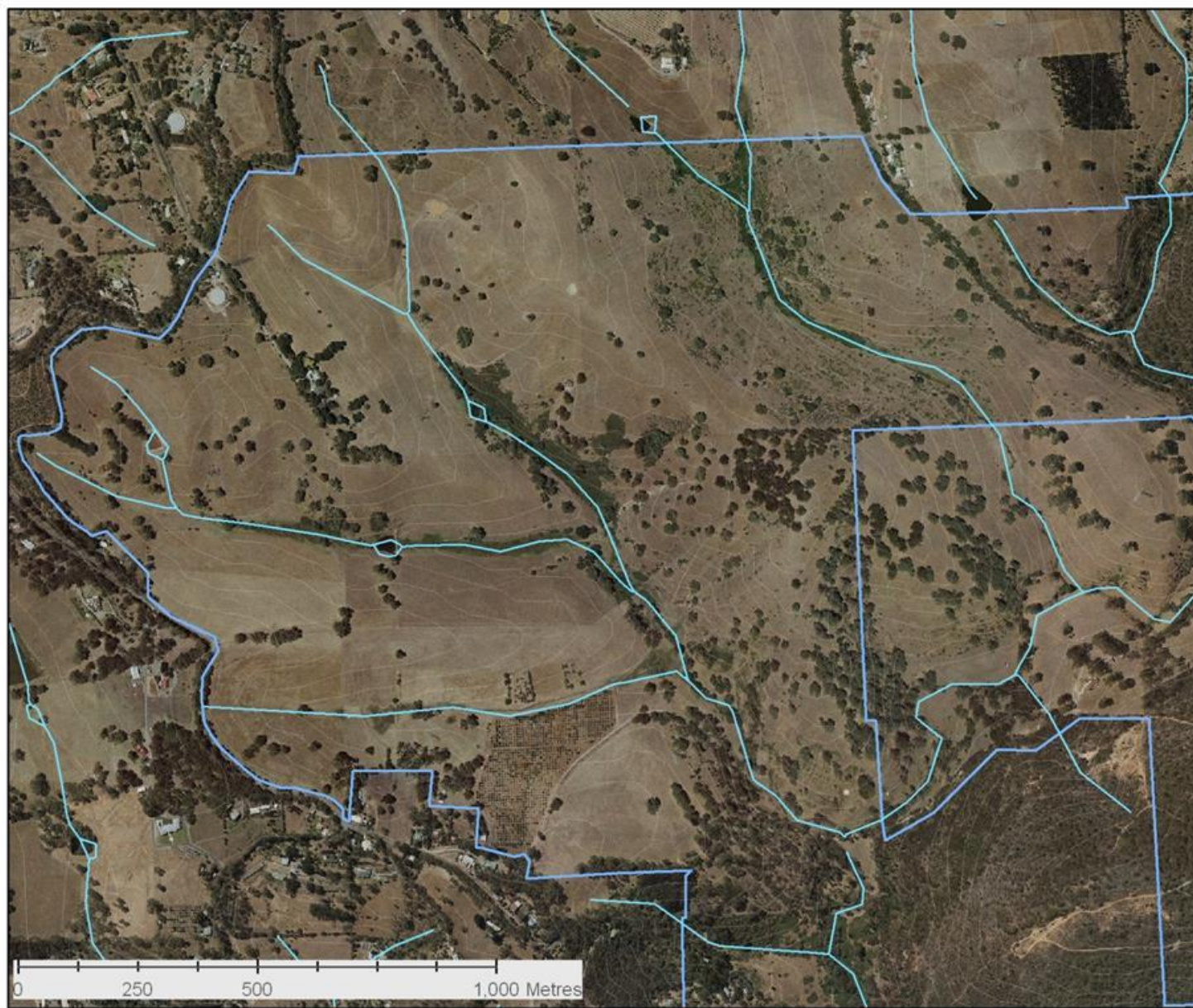
Community Feedback – Key Issues:

- **Bushfire risk management**
- Long-term maintenance of SA Water land
- Revegetation species selection
- Security / public access SA Water land
- Biodiversity and conservation

Bushfire Risk Management

1. Asset Identification
2. Fire Mgt Zoning (Buffers)
3. Fire Access Tracks

CLARENDON RESERVOIR RESERVE

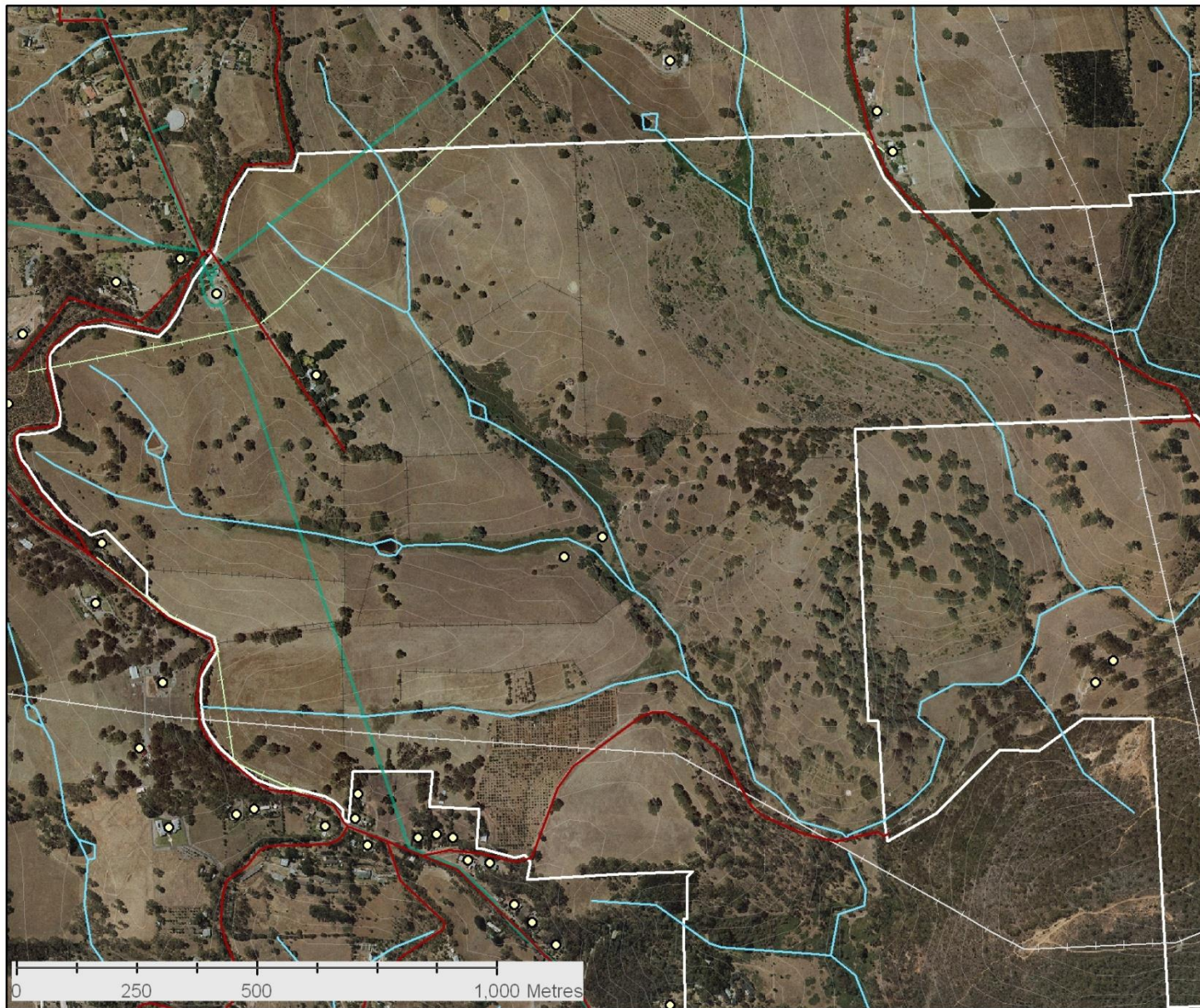


Legend

- Contours 10 m
- Watercourse
- SAW Reserve Boundary

CLARENDON RESERVOIR RESERVE

ASSET IDENTIFICATION

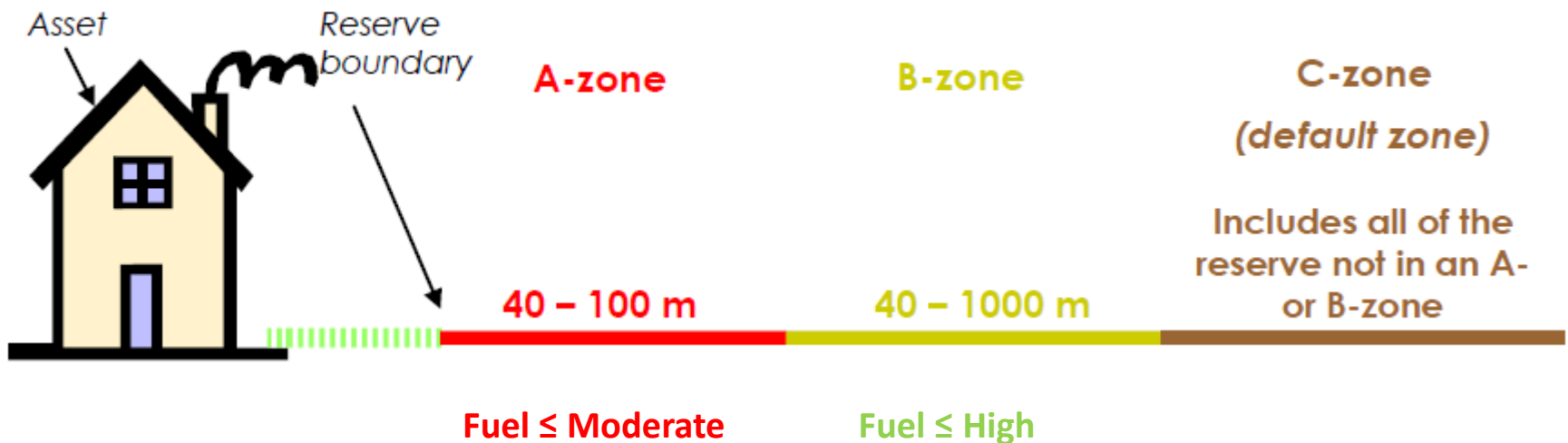


Legend

- +— Fence
- Roads
- ETSA Transmission
- ElectraNet Transmission
- Assets
- Contours 10 m
- Watercourse
- Transmission Main
- SAW Reserve Boundary

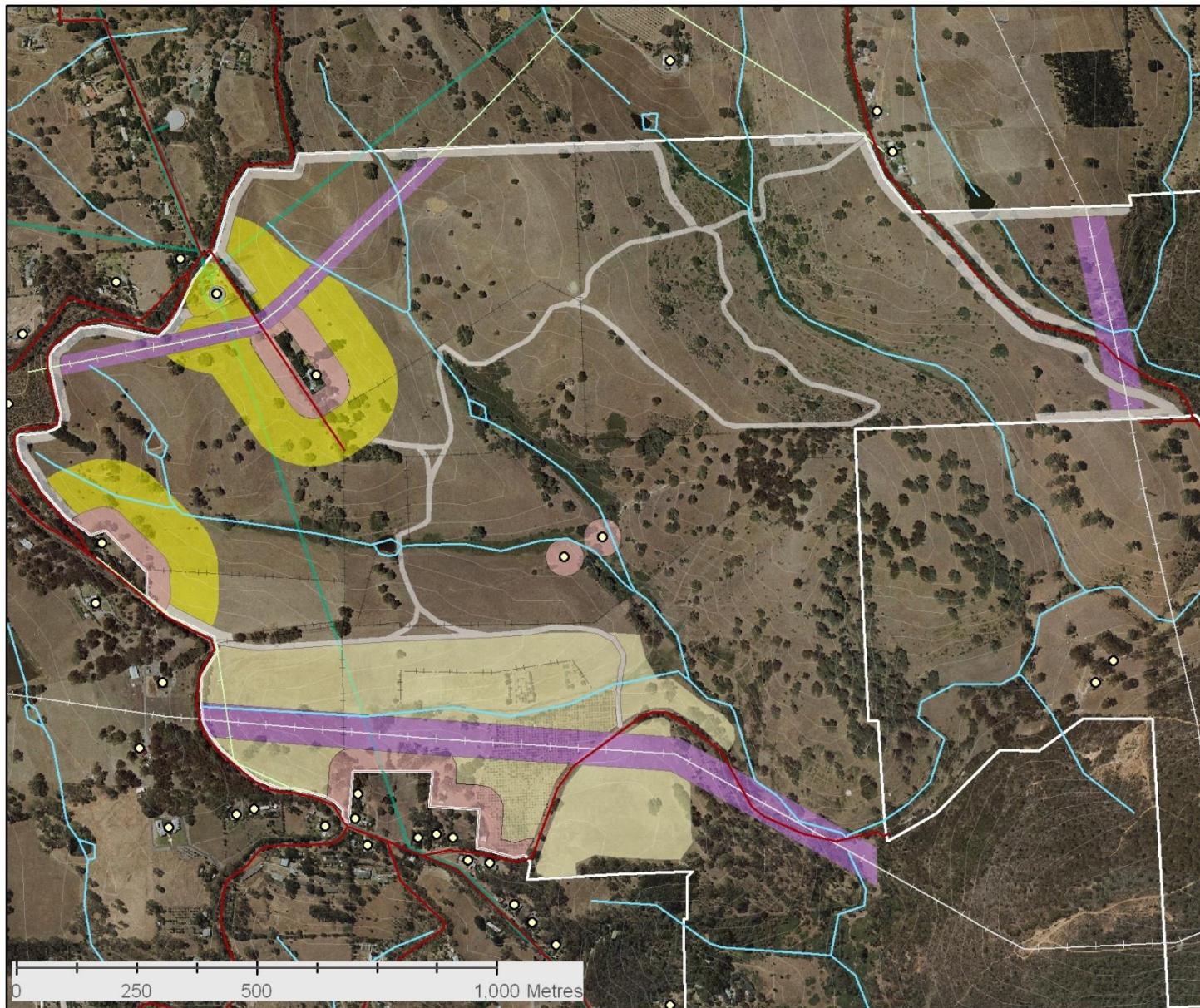
Fire Management Zoning

- DEWNR FIRE POLICY AND PROCEDURE MANUAL



CLARENDON RESERVOIR RESERVE

ASSET PROTECTION



Legend

- +— Fence
- Roads
- ETSA Transmission
- ElectraNet Transmission
- Assets
- Contours 10 m
- Watercourse

Fuel management

- Asset Protection Zone
- Fuel break
- Buffer zone
- Hay cut
- Powerline Buffer
- Transmission Main
- SAW Reserve Boundary

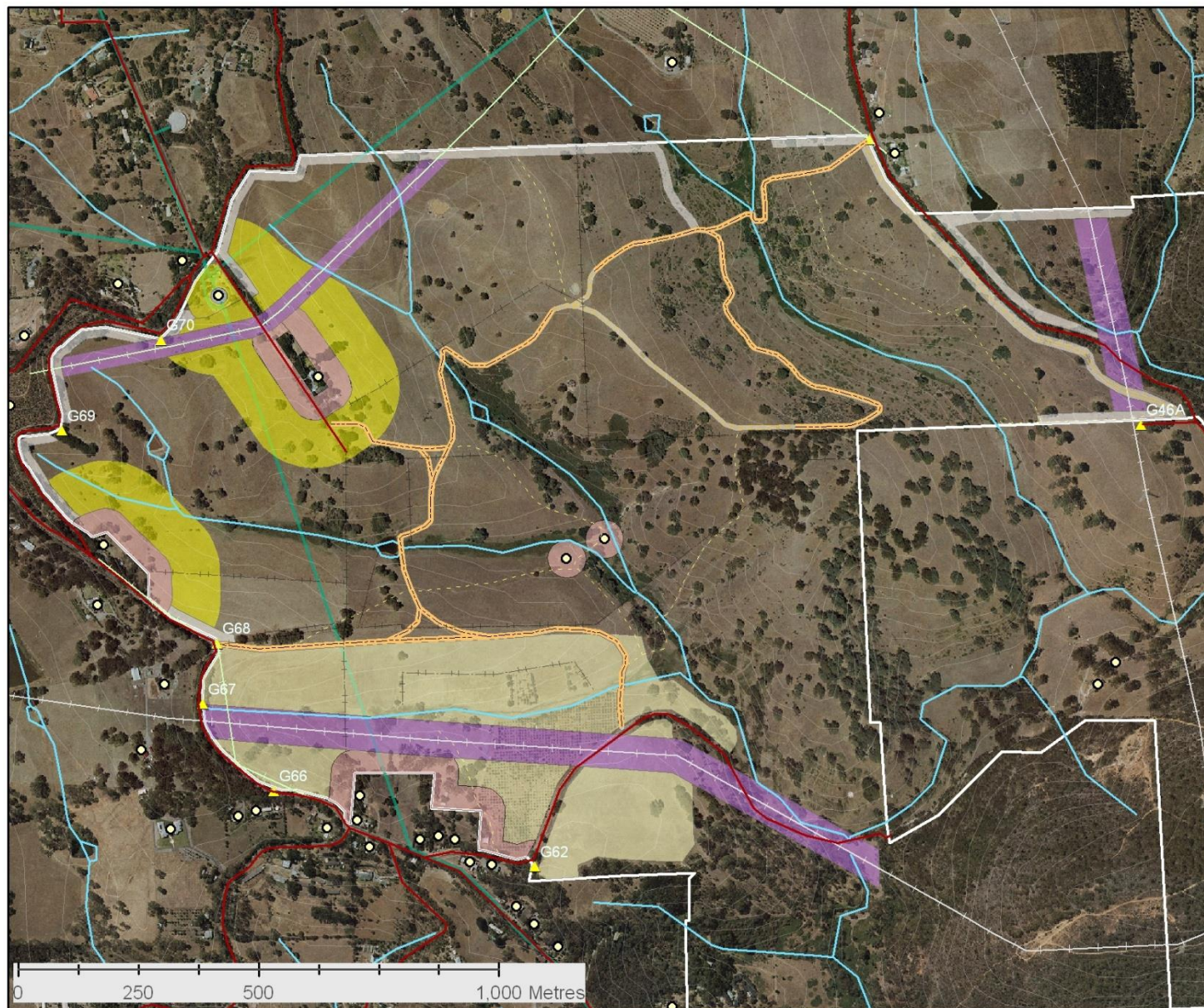
Overall Fuel Hazard – what does it mean?

Range of FDI within which a “Reference First Attack will Succeed”

Overall Fuel Hazard	Forest Fire Danger Index				
	Low 0-4	Moderate 5-12	High 13-24	V High 25-49	Extreme 50-100
Low	100%	100%	100%	100%	100-99%
Moderate	100%	100%	100%	100%	100-96%
High	100%	100%	100%	100-96%	96-64%
Very High	98-96%	96-94%	94-92%	92-70%	70-10%
Extreme	78-74%	74-65%	65-48%	48-18%	18-1%

CLARENDON RESERVOIR RESERVE

FIRE ACCESS TRACKS



Legend

- +— Fence
- Roads

Proposed tracks

- Minor Fire Track - Gravel
- Minor Fire Track - Dirt
- Service Track
- ETSA Transmission
- ElectraNet Transmission
- Assets
- Contours 10 m
- Watercourse

Fuel management

- Asset Protection Zone
- Fuel break
- Buffer zone
- Hay cut
- Powerline Buffer
- Transmission Main
- SAW Reserve Boundary

Fire Management Reference	Revegetation Concept Plan
Regulations under the Electricity Act 1996	Complies
SA Firebreaks, Fire Access Tracks and Sign Standards Guidelines - Government Agencies Fire Liaison Committee 2008	Complies with/exceeds firebreak standards and 'Minor Tracks' specifications
SA Water Fire Management Plan Zoning Guidelines 2006	Complies
Dept. Environment Fire Policy and Procedure Manual Fire Management Zoning 2009	Exceeds recommended minimum asset protection and buffer zone widths
Royal Commission into Victorian Bushfires 2009	Exceeds advised distance between bushland and buildings

CLARENDON RESERVOIR RESERVE

REVEGETATION CONCEPT



Legend

- Fords
- Watercourse
- Contours 10 m
- Fence
- Roads
- ETSA Transmission
- ElectraNet Transmission

Proposed tracks

- Minor Fire Track - Gravel
- Minor Fire Track - Dirt
- Service Track

Assets

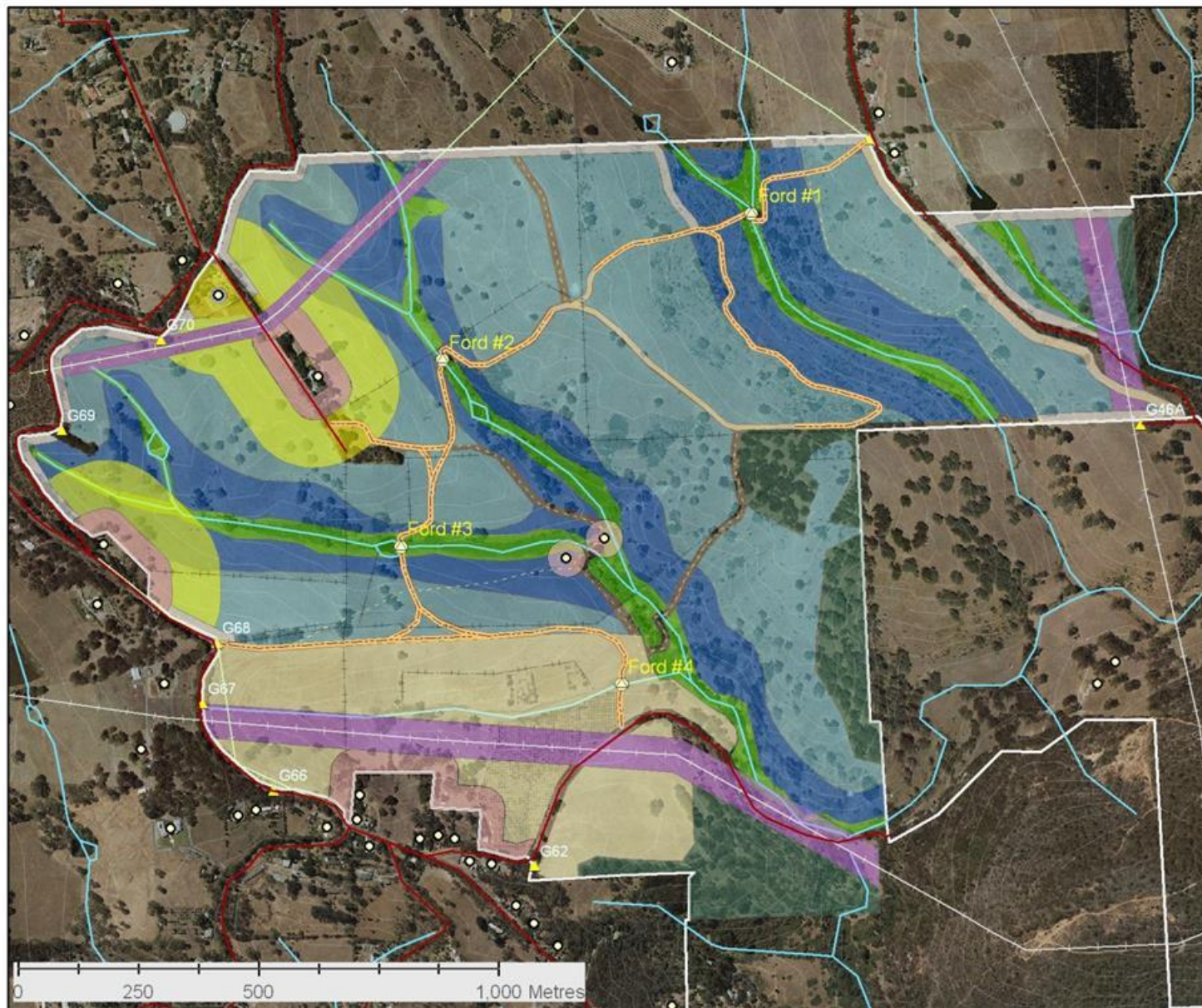
Fuel management

- Asset Protection Zone
- Fuel break
- Buffer zone
- Hay cut
- Powerline Buffer

Reveg Poly

Type

- remnant mgt
- terrestrial
- lower slope
- riparian
- SAW Reserve Boundary



CLARENDON RESERVOIR RESERVE - RETIRED GRAZING LEASE LAND

VEG TYPES

Legend

Proposed tracks

Name

- Minor Fire Track - Gravel, Crowned
- Minor Fire Track - Gravel, Cut in
- Minor Fire Track - Dirt
- Service Track
- Abandoned track
- ▲ Gates
- ElectraNet Transmission
- ETSA Transmission
- Fence - removed

Reveg PolyAW

Type

- Weeded Area
- Red Gum Swamp 250
- Red Gum Wdl 250
- Blue Gum - Manna Gum Wdl 251
- Blue Gum Wdl 249
- Grey Box Wdl 220
- Remnant mgt
- Apple orchard

Fuel management

- Asset Protection Zone
- Fuel break
- Buffer zone
- Buffer zone Extra
- Hay cut
- Roads
- Contours 5 m
- SAW Reserve Boundary



SA Water

Sept 2011 S Kennedy
Aerial Photo: Aerometrix 2011
Projection: LCC
Coordinate System: GDA 1994
Copyright SA Water Corporation 2011

Project objectives

Establish a native woodland to delivery multiple benefits.

- Change the land-use to protect water quality in Clarendon Weir
- Cost effective offset for some of SA Water's carbon dioxide emissions
- Lasting control of environmental weeds
- Improved gully erosion protection
- Fire access track network to enable access for fire suppression
- Vegetation designed for responsible management of bushfire risks
- Enhanced biodiversity and ecosystem function
- Opportunities for community involvement and education

Outline

- Background: SA Water Fire Management
- Clarendon Case Study - Community consultation
- Design responses
- On ground works
- Bushfire Prevention meets Grassy Woodland Restoration
- Lessons learnt

On-ground Works

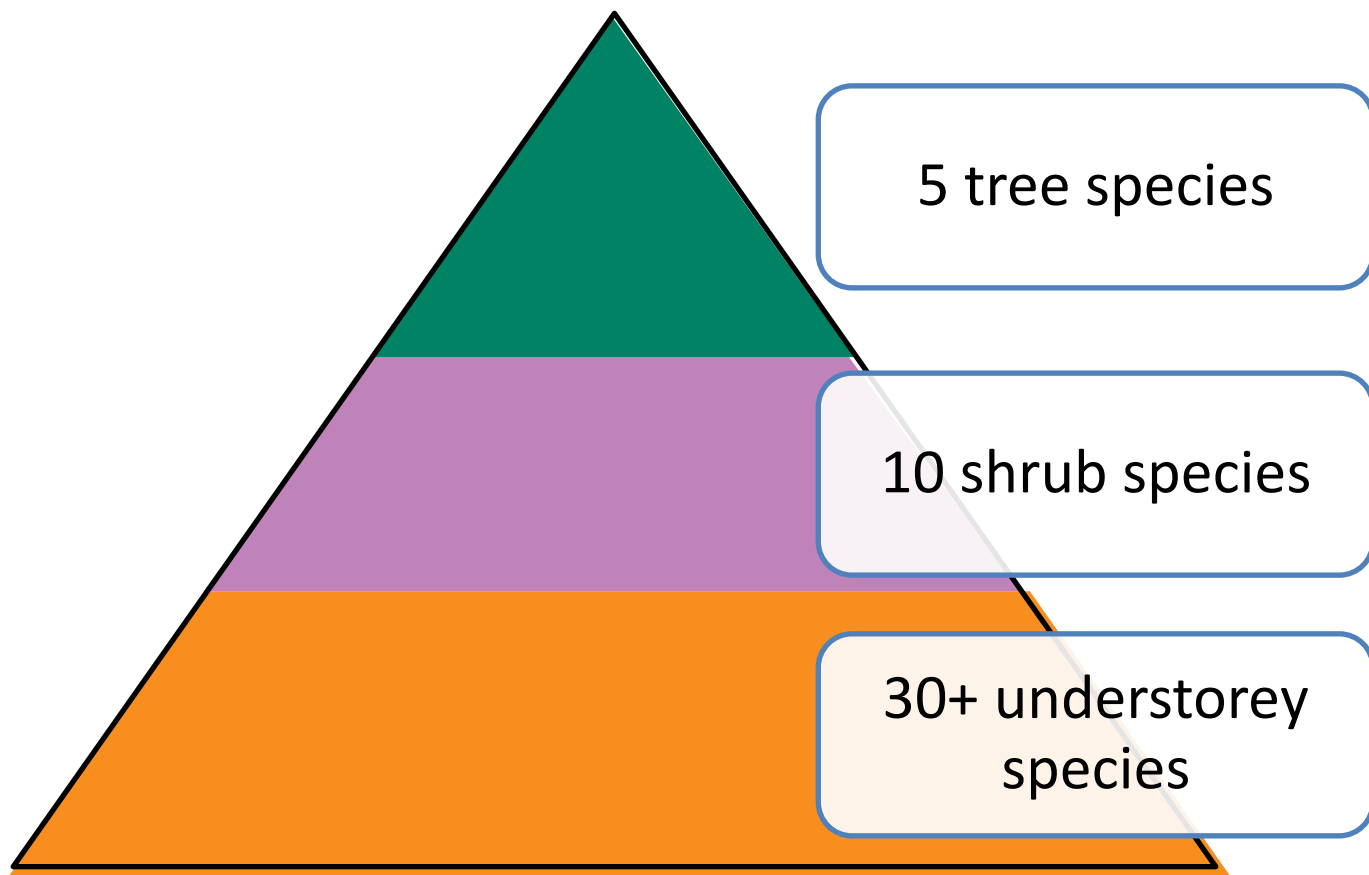
- Grassy Woodland Restoration & Reconstruction
- Strategy informed by:
 - Topography - water relations – target veg types
 - Past projects
 - Pasture mapping
 - Soil testing
 - Available time and money

Past projects – patch dynamics and ground layer



Past projects – patch dynamics and ground layer





Weed Grass Mgt - brushcutting



Timed tractor slashing

~ \$150/ ha



Fire breaks – timed slashing for annuals x3 years

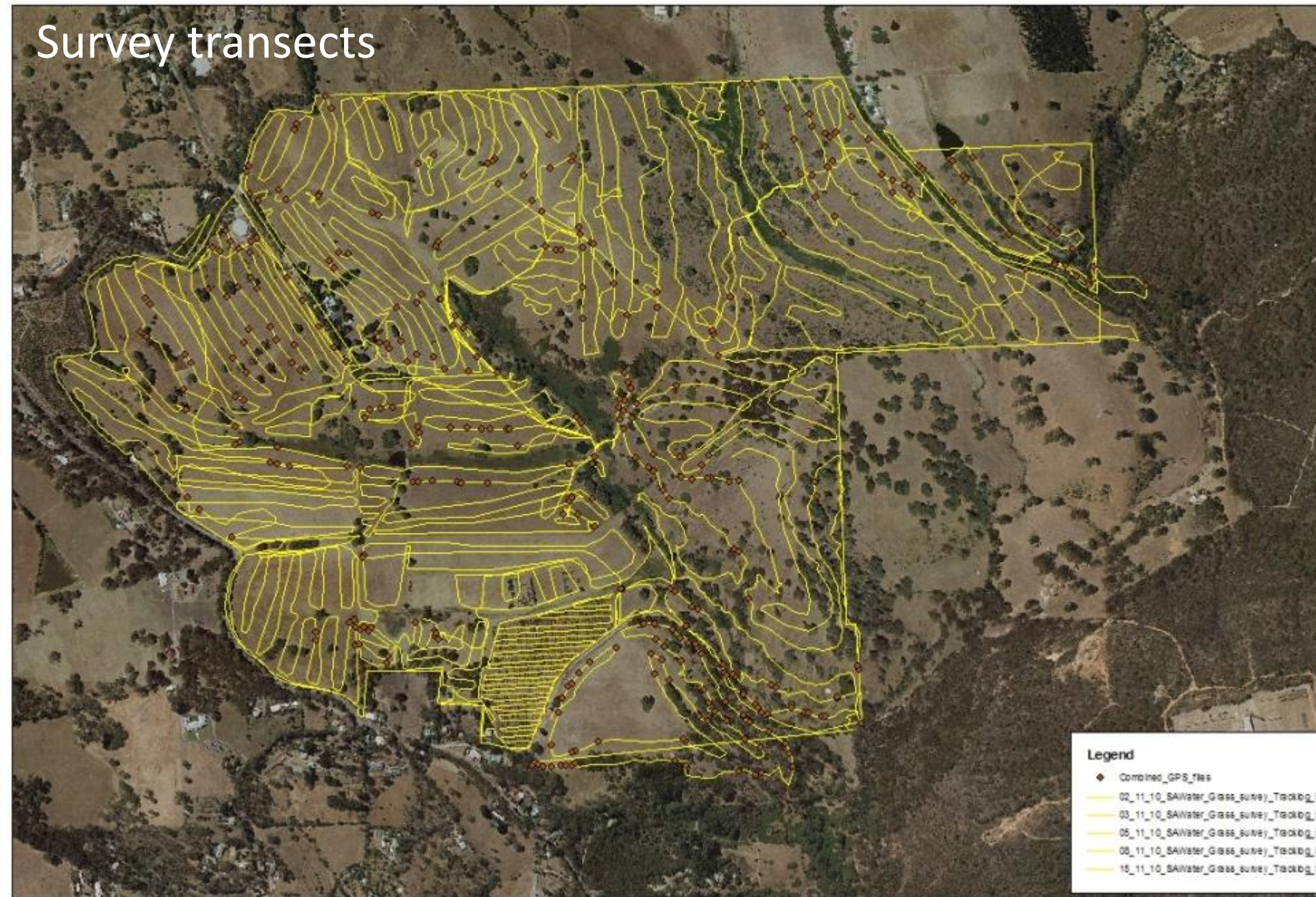


Pasture types



Clarendon Survey - Tracklog and point files from survey

Survey transects



Pasture map

CLARENDON RESERVOIR RESERVE

PASTURE SURVEY MARCH 2011

Legend

- Reveg Poly_v2
CC_Pasture Survey March 2011
Dom_Cover
- Perennial Native
 - Perennial Native/Annual Exotic
 - Perennial Native/Perennial Exotic
 - Annual Exotic/Perennial Native
 - Annual Exotic/Perennial Exotic/Perennial Native
 - Annual Exotic/Perennial Exotic
 - Annual Exotic
 - Perennial Exotic/Perennial Native
 - Perennial Exotic/Annual Exotic
 - Perennial Exotic

Legend

- Fords
- Fence
- Roads
- Proposed tracks**
- Minor Fire Track - Gravel
- Minor Fire Track - Dirt
- Service Track
- ETSA Transmission
- ElectraNet Transmission
- Reveg Poly_v2
- SAW Reserve Boundary

Soil sampling transects

CLARENDON RESERVOIR RESERVE

PASTURE SURVEY
MARCH 2011

Legend

- Soil sample
- Reveg Poly_v2
- CC_Pasture Survey March 2011

Soil_Cover

- Perennial Native
- Perennial Native/Annual Exotic
- Perennial Native/Perennial Exotic
- Annual Exotic/Perennial Native
- Annual Exotic/Perennial Exotic/Perennial Native
- Annual Exotic/Perennial Exotic
- Annual Exotic
- Perennial Exotic/Perennial Native
- Perennial Exotic/Annual Exotic
- Perennial Exotic

Legend

- Fords
- Soil sample
- Fence
- Roads

Proposed tracks

- Minor Fire Track - Gravel
- Minor Fire Track - Dirt
- Service Track
- ETSA Transmission
- ElectraNet Transmission
- Reveg Poly_v2
- SAW Reserve Boundary

Soil results summary

Pasture dominant	Sample depth (cm)	Colwell P mg/kg (Average)
Annual Exotic	(0-5)	28.3
Perennial Exotic	(0-5)	26.8
Annual / Per Exotic / Danthonia	(0-5)	21.2
Perennial Exotic / Danthonia	(0-5)	19.5
Danthonia / Annual Exotic	(0-5)	16.3
Danthonia / Themeda / Stipa	(0-5)	12.7
<i>E. leucoxylon</i> Wdl Remnant	(0-5)	14.9

Contour alleys & patches



Wild seed harvest



Seed-hay processing



Cultivation



Weed control



6 month growth (Nov 2012)



12 month growth (Nov 2013)



Density counts



Fuel load



Clarendon - Structure



Understorey Biodiversity

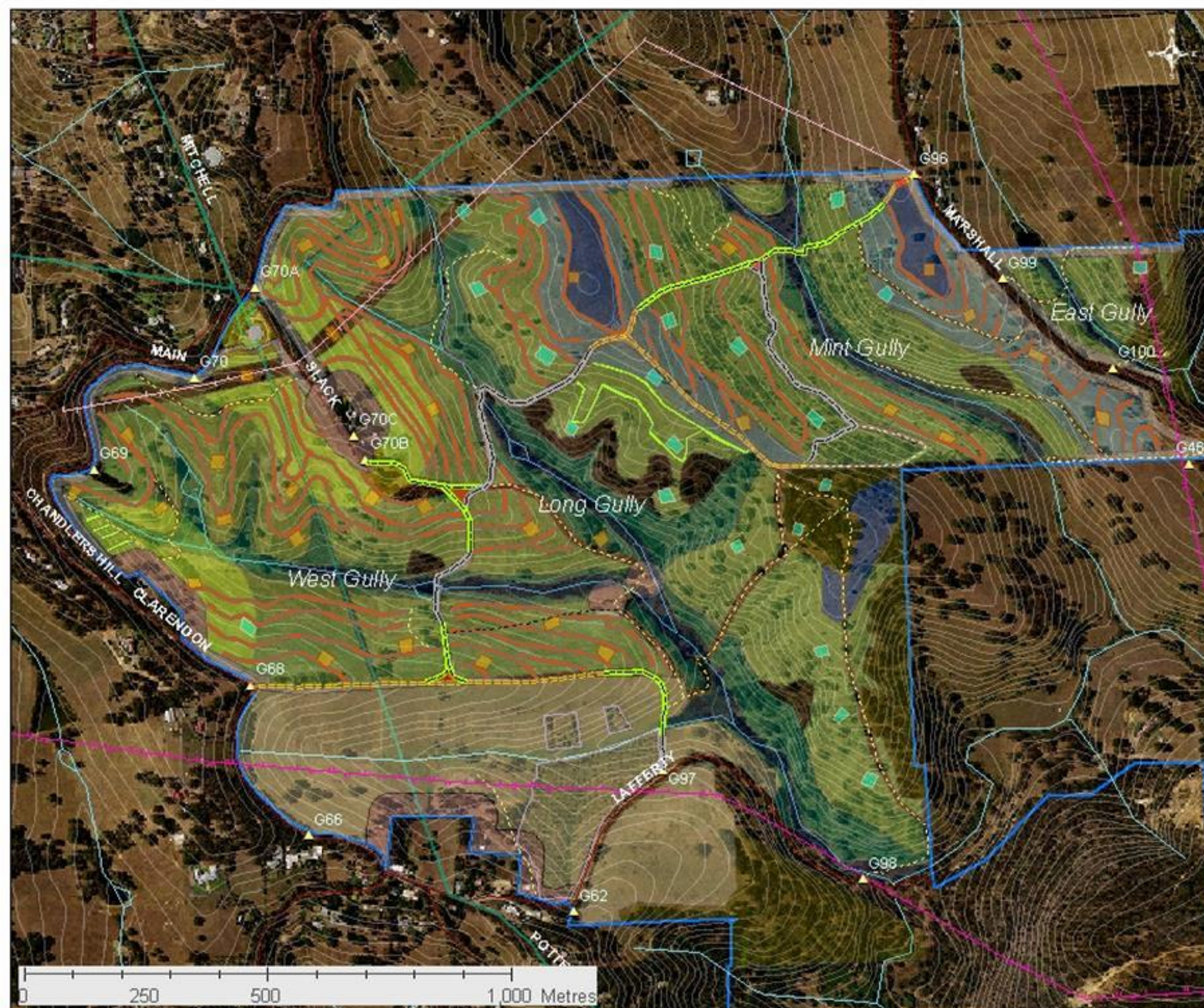


19/03/2014

Understorey Biodiversity



CLARENDON CARBON BIOSEQUESTRATION - WORK ZONES -



Legend

Reveg Zones

- Weeded Area
- Red Gum Swamp 250
- Red Gum Wdd 250
- Blue Gum - Manna Gum Wdd 251
- Blue Gum Wdd 249
- Grey Box Wdd 220
- Remnant mgt

BioD Patch

- Native pasture
- Scraped
- Scraped and grass sown

Alleys - Native Grass

- Scraped and Sown
- Slashed native pasture

Tracks

- Minor Fire Track - Gravel, Crowned
- Minor Fire Track - Gravel, Cut in
- Minor Fire Track - Dirt
- Service Track
- Abandoned track
- ElectraNet Transmission
- ETSA Transmission

Fuel management

- Asset Protection Zone
- Fuel break
- Buffer zone
- Hay cut
- Watercourse
- Transmission Main
- Roads
- Contours 5 m
- Apple orchard - abandoned
- S/W Reserve Boundary

Understorey Biodiversity



Fire breaks – hay cutting for perennials (Kangarilla)



Clarendon – Hay paddock renovation



Clarendon – Hay paddock renovation

Elymus scaber



Invasive weeds – baseline mapping

CLARENDON RESERVOIR RESERVE

PRE-PROJECT WEED EXTENT

Pre-Project Woody Weed
Extent (2009) = 29.2 ha

Excludes herbaceous
and most pasture grass weeds

Legend

- 2009 blackberry extent (controlled)
- Woody Weed Pts Nov 2010
- Woody Weed Survey Nov 2010
- Weed Pt Survey 2011 - various species
- SeedIn Weeds Jan 2013**
 - Acacia dealbata
 - Ash regen
 - Blackberry seedlings
 - Dog rose
 - Dog rose seedlings
 - Fennel
 - Gorse
 - Hawthorn
 - Kikuyu
 - Olive
 - Scabiosa
 - Thistle
 - Dittrichia graveolens
- Olive Survey Jan 2013**
 - olive
 - olive (roadside)
 - Watercourse
 - SAW Reserve Boundary

0 100 200 400 Metres

Feb 2013 M Robinson / S Kennedy
Aerial Photo: Aerometrics 2010
Projection: LCC
Coordinate System: GDA 1994
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Invasive weeds



Invasive weeds – control



19/03/2014

Managing negative perceptions around fire risk associated with revegetation

- Background: SA Water Fire Management
- Clarendon Case Study - Community consultation
- Design responses
- On ground works
- Bushfire Prevention meets Grassy Woodland Restoration
- **Lessons learnt**

Managing negative perceptions around fire risk associated with revegetation

Lessons:

- Topic knowledge is crucial when talking about fire
- Take fire management as serious responsibility
- Balance talk of Risk & Cost with Opportunity & Benefit
- Grassy wdl restoration can deliver land mgt outcomes with low fire risk
- Flexibility in restoration approach is often required
- *Next steps: at what point would a restoration site benefit from a burn?*