Appendices

Appendix A – Drawings - Queanbeyan City Council Dunns Creek Road Alignment Study Option 1B and Option 5

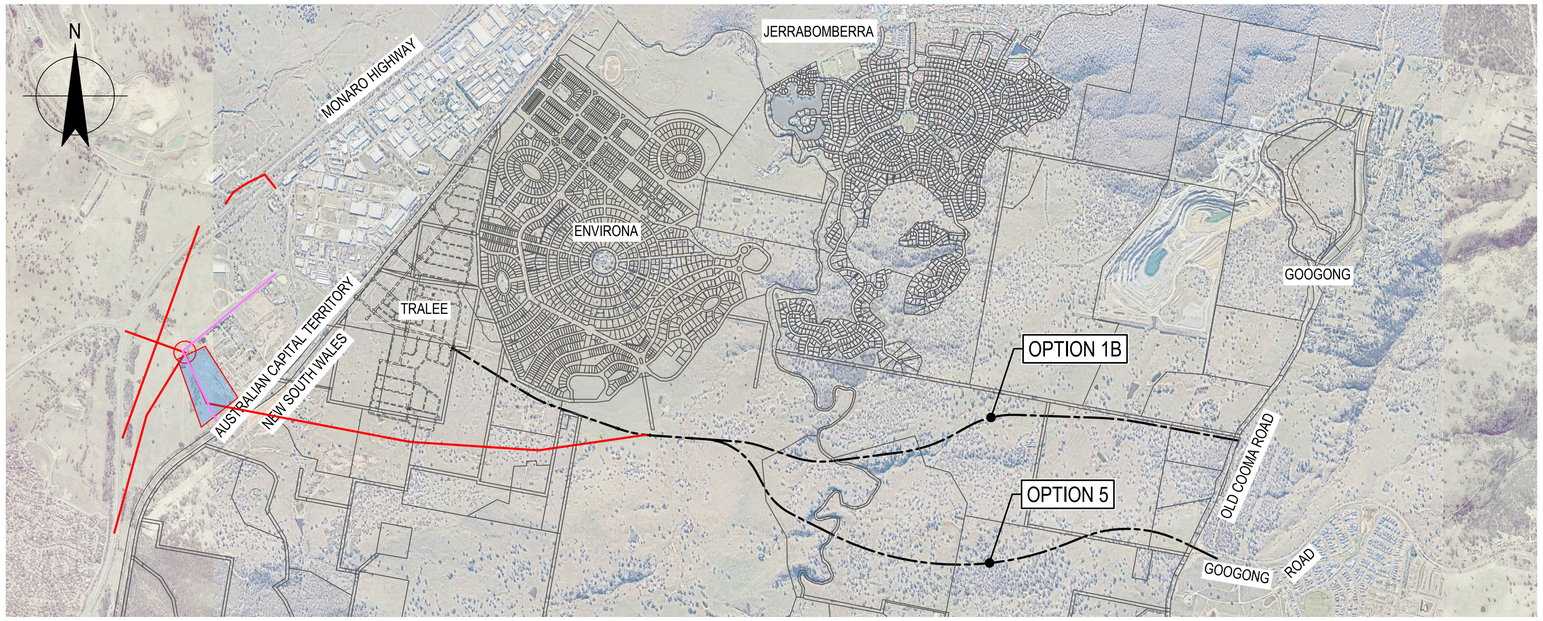
GHD Drawing Set:

23-15485-SK001	Cover Sheet, Locality Plan and Drawing List
23-15485-SK010	Typical Sections
23-15485-SK015	Option 1B Plan and Longitudinal Section – Sheet 1 of 2
23-15485-SK016	Option 1B Plan and Longitudinal Section – Sheet 2 of 2
23-15485-SK020	Option 5 Plan and Longitudinal Section – Sheet 1 of 2
23-15485-SK021	Option 5 Plan and Longitudinal Section – Sheet 2 of 2
23-15485-SK025	Option 1B Land Resumption Plan
23-15485-SK026	Option 5 Land Resumption Plan

Supplementary Drawing Set:

C135085-D020 (B)	South Tralee Estate Concept Development Application Street Hierarchy and typical Cross Section locations

QUEANBEYAN CITY COUNCIL
DUNNS CREEK ROAD ALIGNMENT STUDY
OPTION 1B & OPTION 5
23-15485



LOCALITY PLAN
1:20000

DRAWING LIST

DRAWING NO.	DRAWING TITLE
23-15485-SK001	COVER SHEET, LOCALITY PLAN AND DRAWING LIST
23-15485-SK010	TYPICAL SECTIONS
23-15485-SK015	OPTION 1B PLAN AND LONGITUDINAL SECTION - SHEET 1 OF 2
23-15485-SK016	OPTION 1B PLAN AND LONGITUDINAL SECTION - SHEET 2 OF 2
23-15485-SK020	OPTION 5 PLAN AND LONGITUDINAL SECTION - SHEET 1 OF 2
23-15485-SK021	OPTION 5 PLAN AND LONGITUDINAL SECTION - SHEET 2 OF 2
23-15485-SK025	OPTION 1B LAND RESUMPTION PLAN
23-15485-SK026	OPTION 5 LAND RESUMPTION PLAN

PRELIMINARY

No	Revision	Drawn	Job Manager	Project Director	Date
D	REVISED AERIAL AND SKETCH SK012 REMOVED	GSP	GSP*	CW*	05.07.15
C	REVISED ISSUE	LDS	JE*	CW*	15.05.15
B	REVISED LAYOUT	LDS	GSP*	CW*	13.04.15
A	PRELIMINARY ISSUE	LDS	GSP*	CW*	24.03.15

Note: * indicates signatures on original issue of drawing or last revision of drawing

0 200 400 600 800 1000m
SCALE 1:20,000 AT ORIGINAL SIZE

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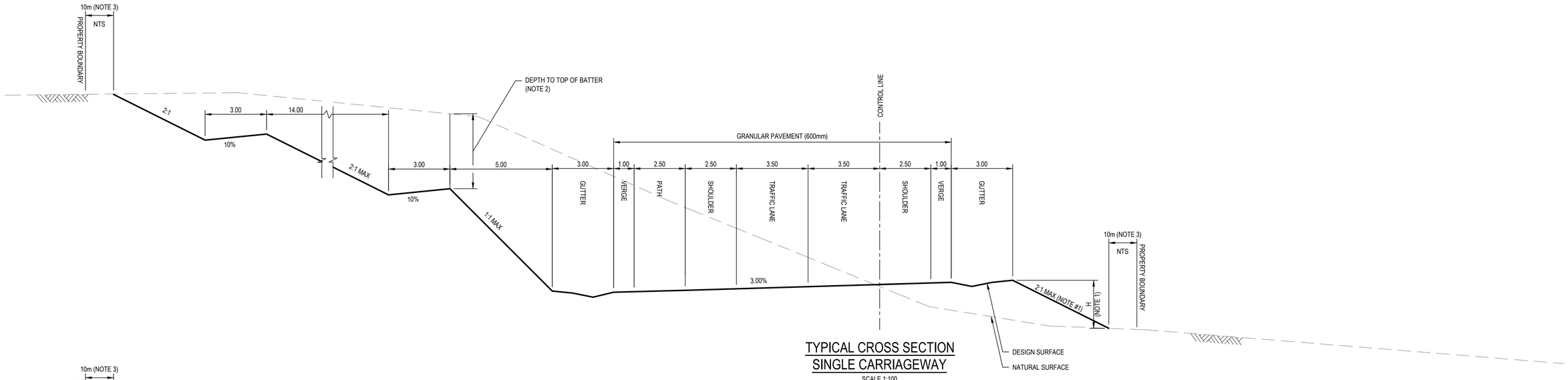
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Drafting Check | Design Check
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Date
Scale 1:20000
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Client QUEANBEYAN CITY COUNCIL
Project DUNNS CREEK ROAD ALIGNMENT STUDY
Title COVER SHEET, LOCALITY PLAN AND DRAWING LIST

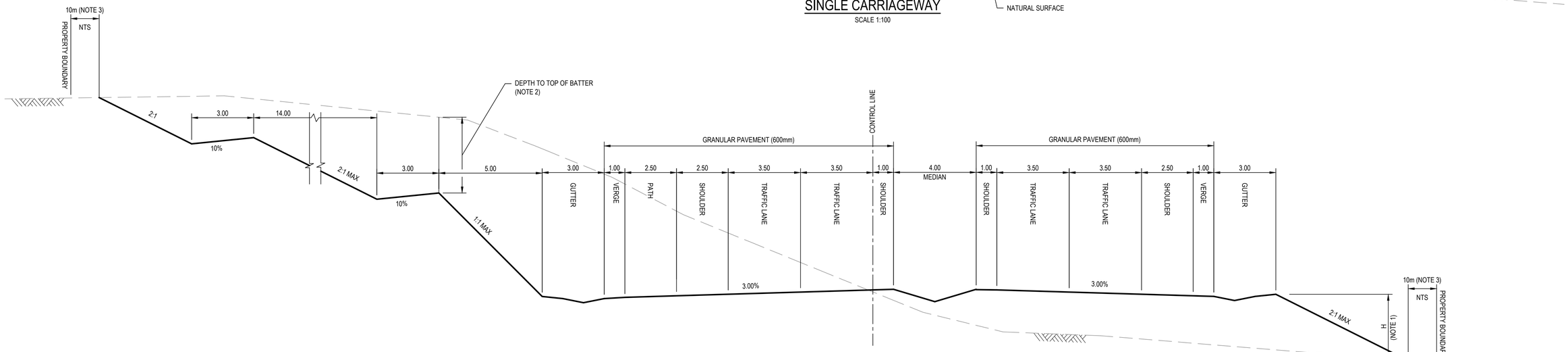
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Rev: D

Plot Date: 6 July 2015 - 12:49 PM
Plotted by: Glenn Pocknee
Cad File No: G:\23\15485\CADD\Drawings\23-15485-SK001.dwg



TYPICAL CROSS SECTION
SINGLE CARRIAGEWAY

SCALE 1:100



TYPICAL CROSS SECTION
POSSIBLE FUTURE DUAL CARRIAGEWAY

SCALE 1:100

NOTES:

1. FILL BATTERS TO HAVE THE FOLLOWING SLOPES:
   H < 3m THEN X = 6
   H > 3m THEN X = 2

2. WHERE DEPTH TO TOP OF FIRST CUT BATTER IS GREATER THAN 5m BELOW NATURAL SURFACE, A 5m HIGH AND 1 ON 1 BATTER WILL BE ADOPTED.

3. MINIMUM ROAD RESERVE SET AT 65m.
   4m OFFSETS ADOPTED WHERE SMALL CUTS AND FILLS EXIST.
   10m OFFSETS ADOPTED IN LARGE CUTS.

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
B	UPDATED SECTION VERGE AND MEDIAN		LDS	GSP*	CW*	13.04.15
A	PRELIMINARY ISSUE		LDS	GSP*	CW*	24.03.15

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

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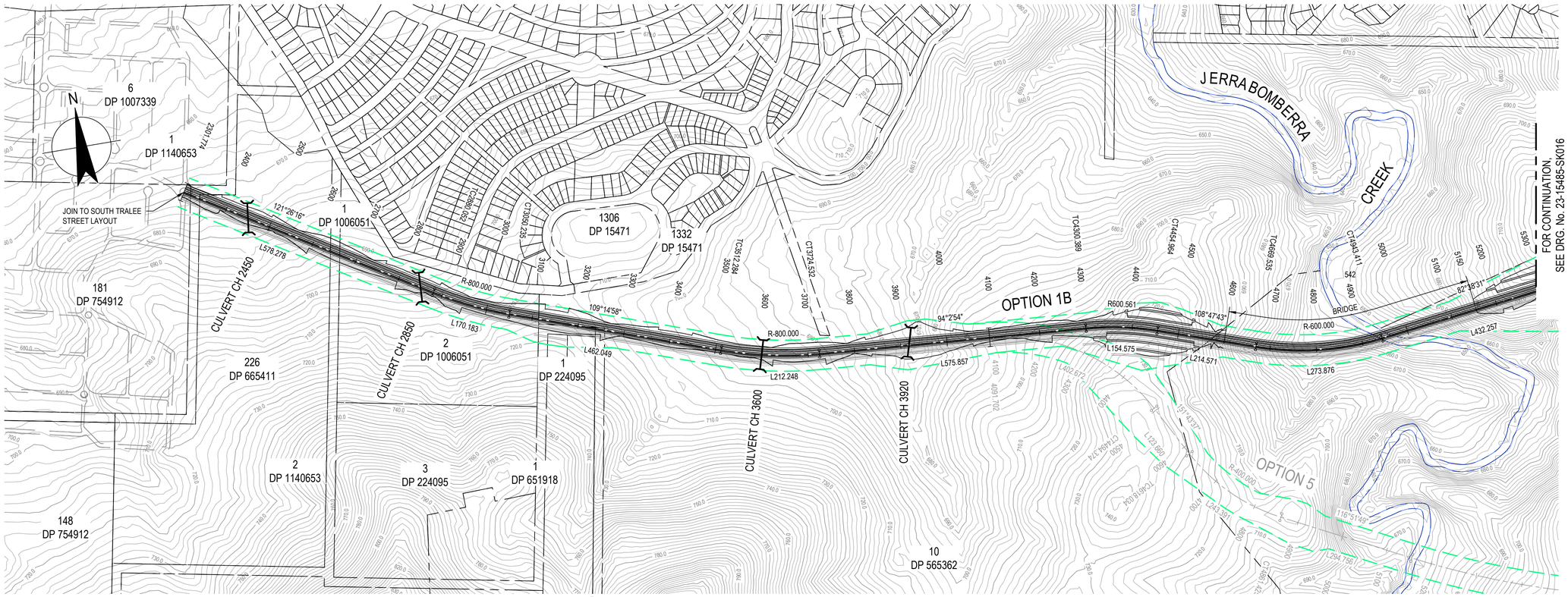
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Approved (Project Director)			
Date			
Scale	1:100	This Drawing must not be used for Construction unless signed as Approved	

Client: **QUEANBEYAN CITY COUNCIL**
Project: **DUNNS CREEK ROAD ALIGNMENT STUDY**
Title: **TYPICAL SECTIONS**

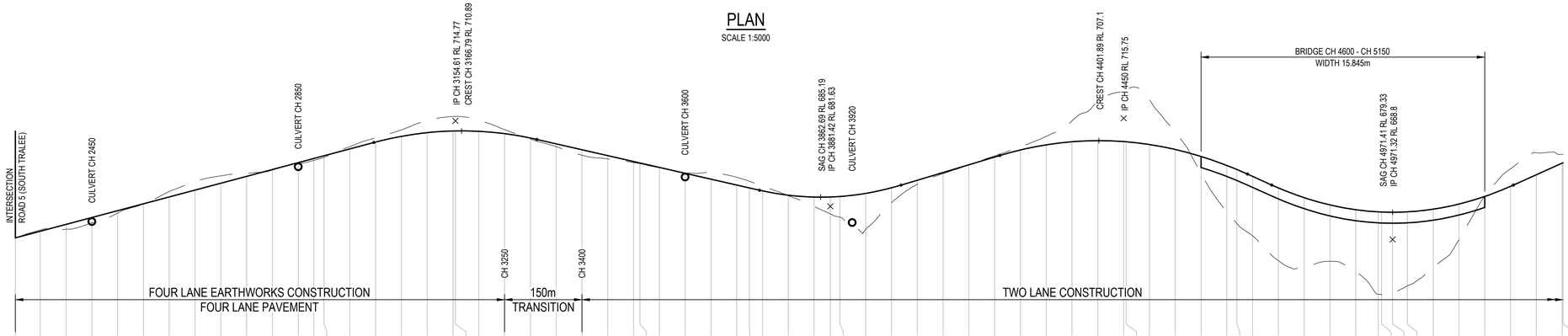
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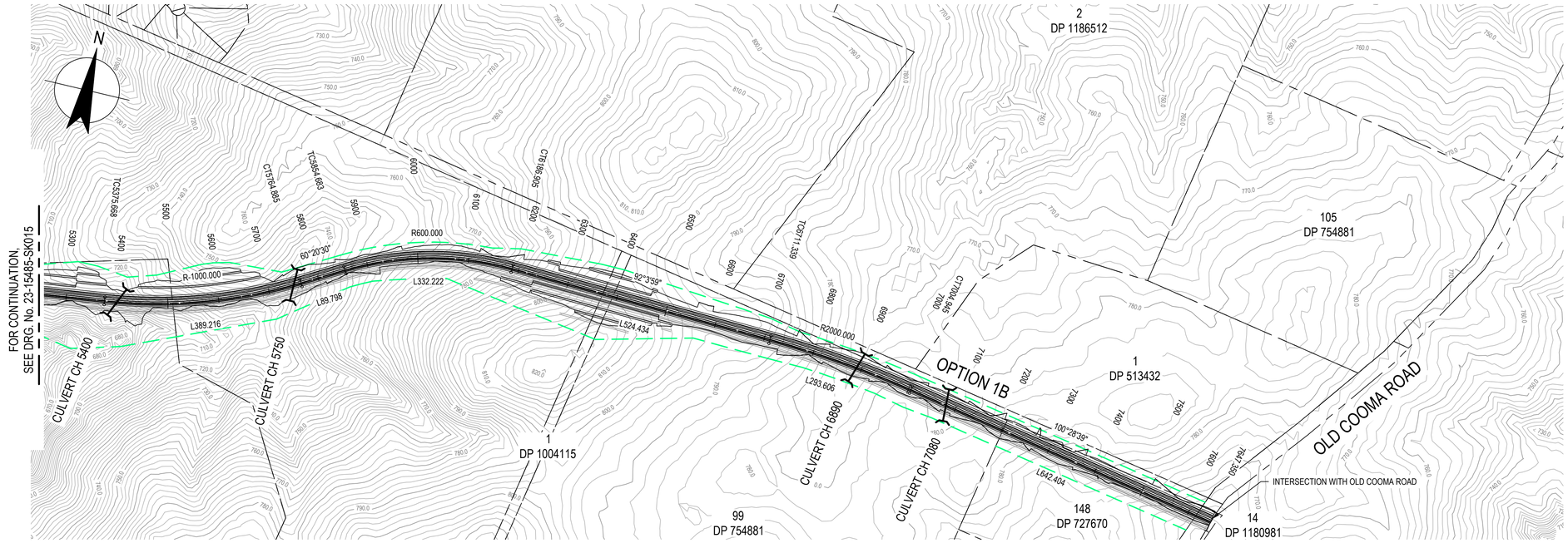
PLAN

SCALE 1:5000



DATUM RL. 631.00

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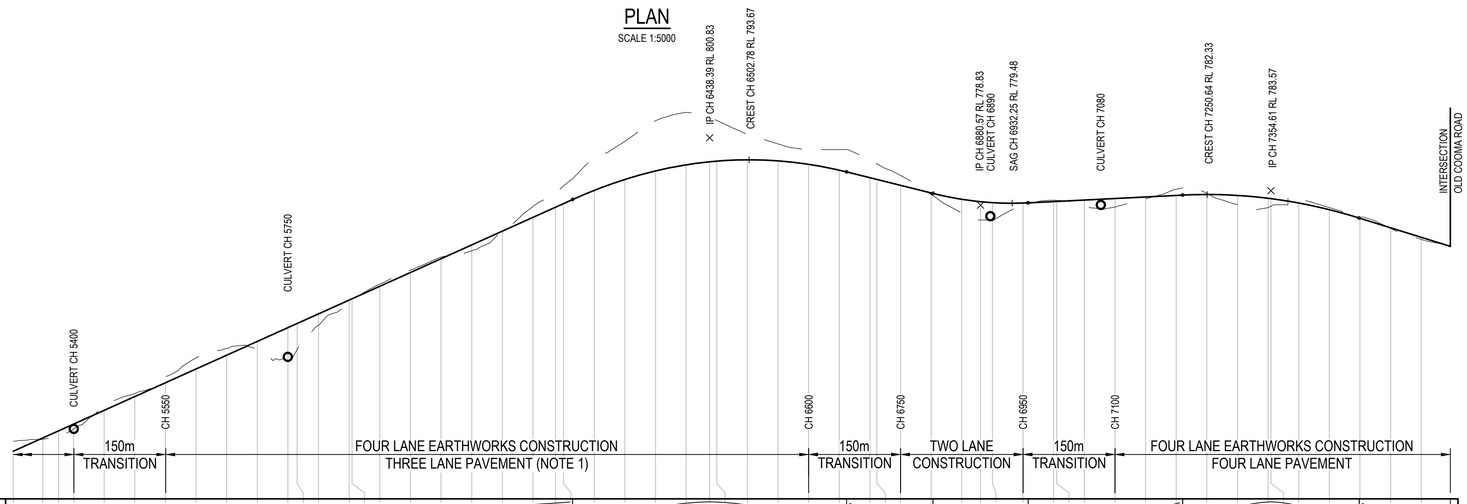


LEGEND:

- WATERWAY
- QUEANBEYAN CADASTRAL BOUNDARIES
- PROPOSED RESUMPTION BOUNDARY
- CULVERT (PLAN VIEW)
- CULVERT (SECTION VIEW)

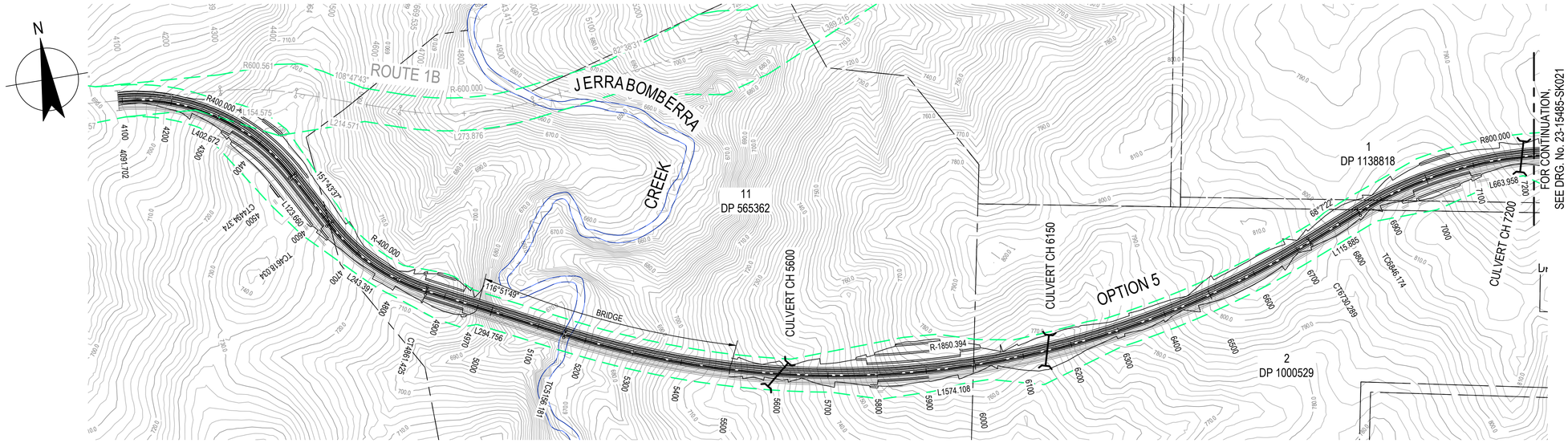
PLAN

SCALE 1:5000



DATUM RL. 683.00

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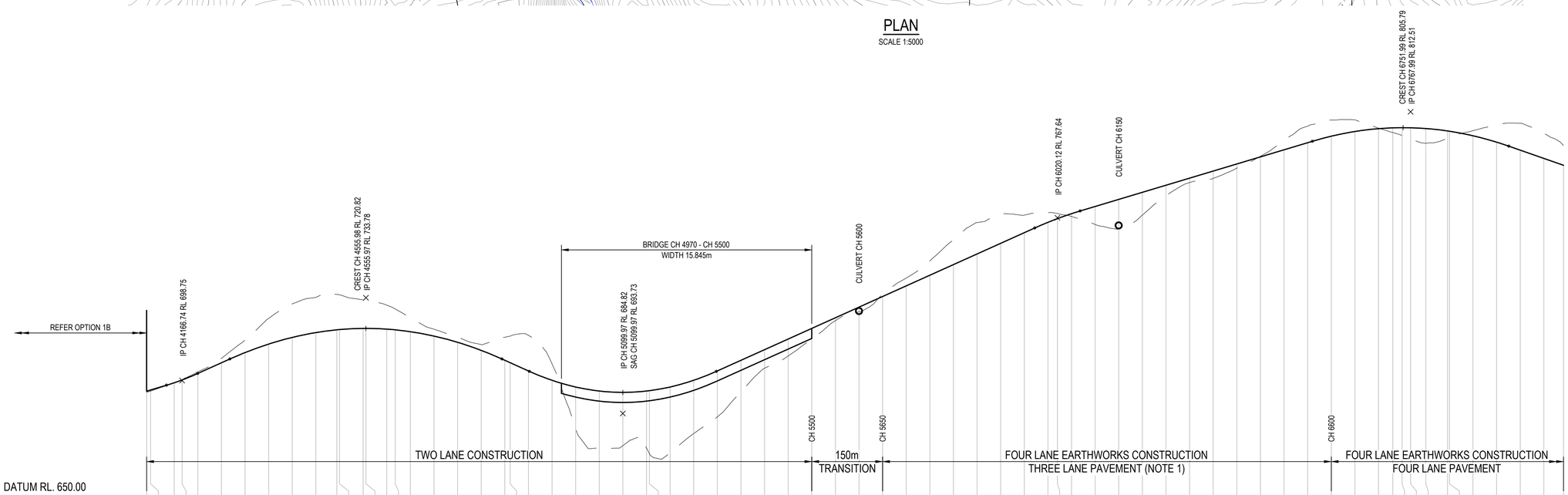


PLAN

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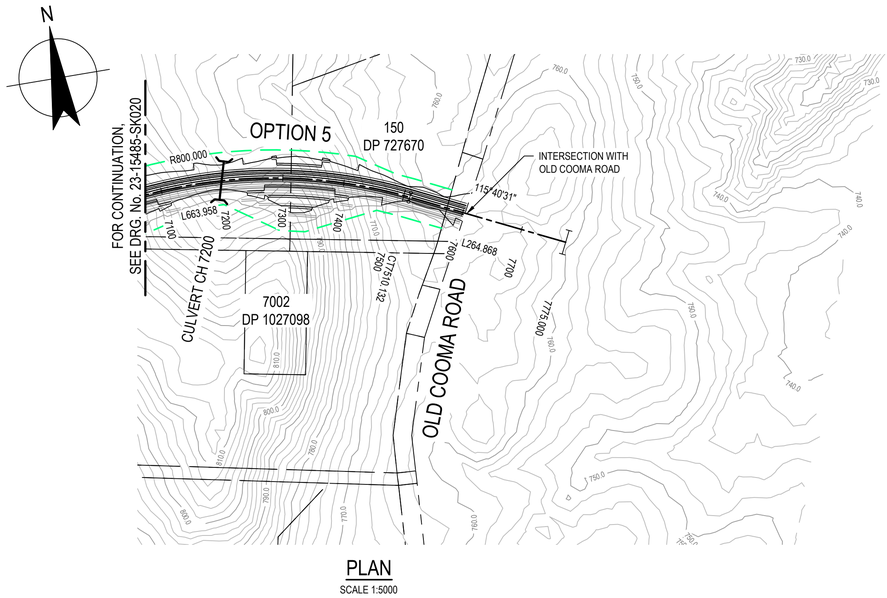
LEGEND:

- WATERWAY
- QUEANBEYAN CADASTRAL BOUNDARIES
- PROPOSED RESUMPTION BOUNDARY
- CULVERT (PLAN VIEW)
- CULVERT (SECTION VIEW)



DATUM RL. 650.00

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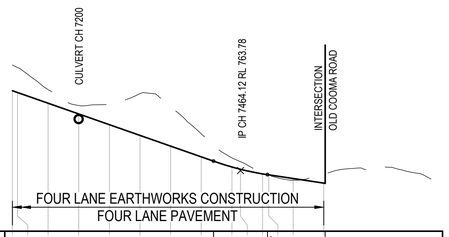


PLAN

SCALE 1:5000

LEGEND:

- WATERWAY
- QUEANBEYAN CADASTRAL BOUNDARIES
- PROPOSED RESUMPTION BOUNDARY
- CULVERT (PLAN VIEW)
- CULVERT (SECTION VIEW)



DATUM RL. 744.00

VERTICAL ALIGNMENT	L=444.13m G=-7%								K=22 L=88m		L=94.16m G=-3%											
HORIZONTAL ALIGNMENT	L=663.96m R=800.00m										L=264.87m											
LEVEL DIFFERENCE CUT - / FILL +	-8.41	-8.17	-4.44	-2.76	-6.77	-13.61	-12.86	-7.51	-2.96	-2.46	-0.35	0.08	0.56	-2.90								
DESIGN SURFACE LEVEL	789.851	789.270	785.770	782.270	778.770	775.270	771.770	768.270	764.972	764.221	762.720	762.401	761.205	759.705								
EXISTING SURFACE LEVEL	798.27	797.44	790.21	785.03	785.54	788.88	784.63	775.78	767.93	766.68	763.07	762.32	760.64	762.60								
CHAINAGE	7091.69	7100.00	7150.00	7200.00	7250.00	7300.00	7350.00	7400.00	7450.00	7464.12	7500.00	7510.13	7550.00	7600.00								

LONGITUDINAL SECTION - OPTION 5

SCALE 1:5000H, 1:1000V

PRELIMINARY

No	Revision	Drawn	Job Manager	Project Director	Date
E	ARCHAEOLOGICAL DEPOSITS AND CONSTRAINTS REMOVED	GSP	GSP*	CW*	06.07.15
D	QCC COMMENTS	LDS	JE*	CW*	15.05.15
C	UPDATED DETAILS	ESP	GSP*	CW*	15.04.15
B	UPDATED ALIGNMENT	LDS	GSP*	CW*	13.04.15
A	PRELIMINARY ISSUE	LDS	GSP*	CW*	24.03.15

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VERTICAL 1:1000 AT ORIGINAL SIZE — 0 10 20 30 40 50m

HORIZONTAL 1:5000 AT ORIGINAL SIZE — 0 50 100 150 200 250m

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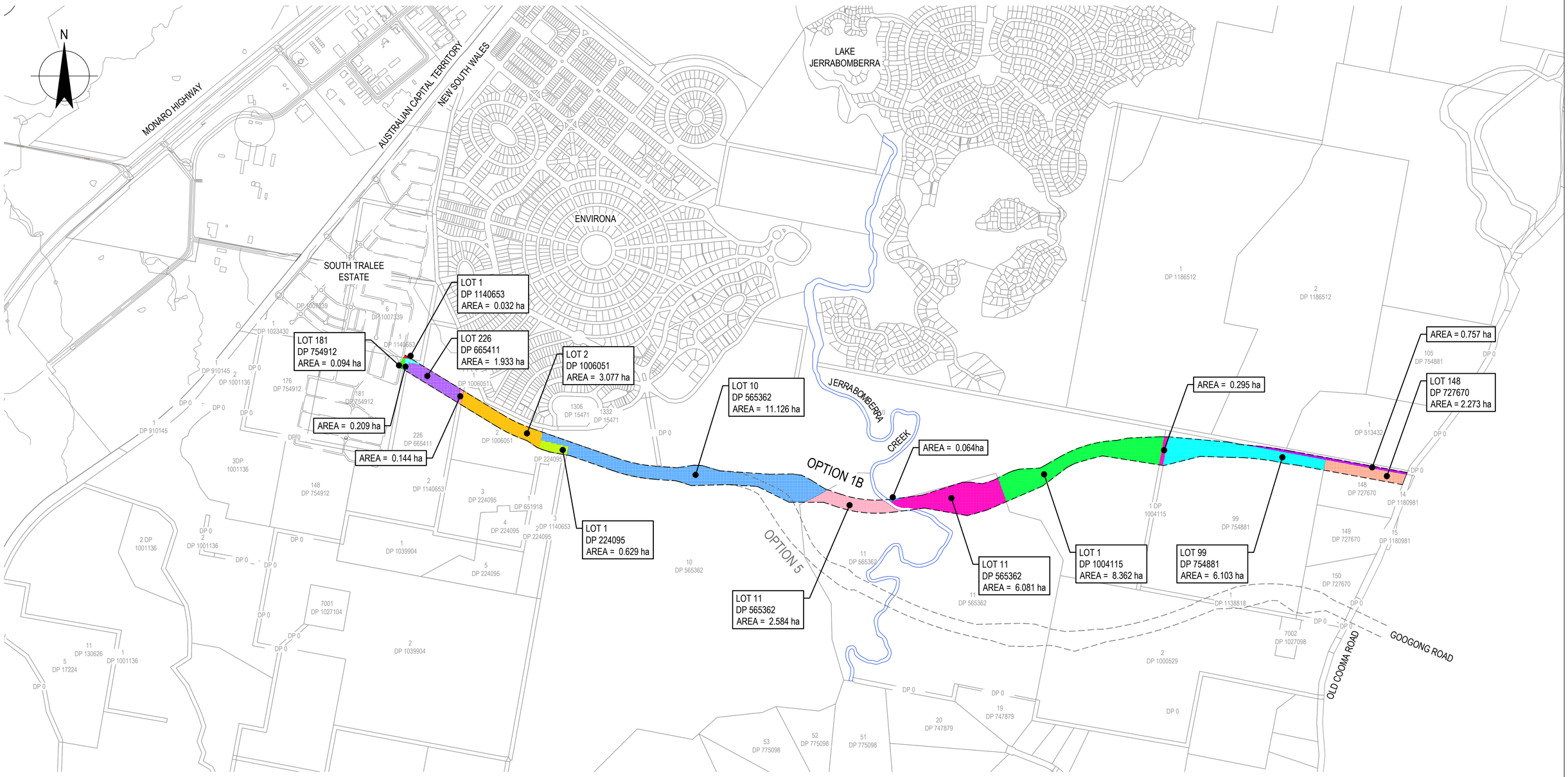
Drawn L SOBREVILLA | Designer G POCKNEE
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Date
Scale AS SHOWN

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Client QUEANBEYAN CITY COUNCIL
Project DUNNS CREEK ROAD ALIGNMENT STUDY
Title OPTION 5 - PLAN AND LONGITUDINAL SECTIONS SHEET 2 OF 2

Original Size A1 | Drawing No: 23-15485-SK021 | Rev: E

Plot Date: 6 July 2015 - 12:42 PM | Plotted by: Glenn Pocknee | Cad File No: G:\23\15485\CADD\Drawings\23-15485-SK020-SK021.dwg



LEGEND:

PROPOSED RESUMPTION BOUNDARY

WATERWAY

PRELIMINARY

No	Revision	Drawn	Job Manager	Project Director	Date
B	REVISED ISSUE	LDS	JE*	CW*	15.05.15
A	PRELIMINARY ISSUE	ESP	GSP*	CW*	14.04.15

Note: * indicates signatures on original issue of drawing or last revision of drawing

0 100 200 300 400 500m

SCALE 1:10,000 AT ORIGINAL SIZE

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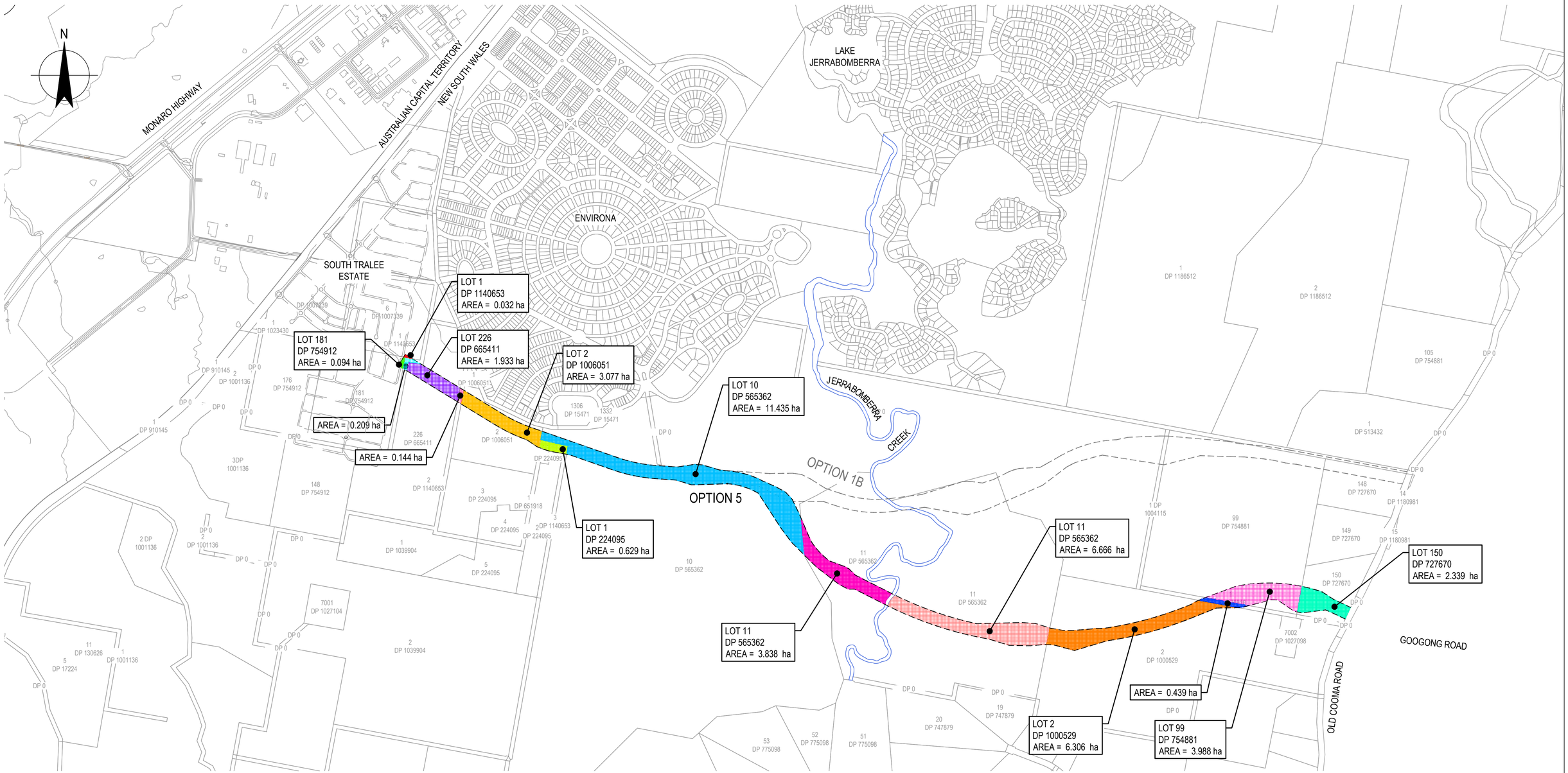
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Date
Scale 1:10000
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Client **QUEANBEYAN CITY COUNCIL**
Project **DUNNS CREEK ROAD ALIGNMENT STUDY**
Title **OPTION 1B - LAND RESUMPTION PLAN**

Original Size **A1** Drawing No: **23-15485-SK025** Rev: **B**

Plot Date: 14 May 2015 - 11:02 AM Plotted by: Ma. Rizalina De Rivera Cad File No: G:\23\15485\CADD\Drawings\23-15485-SK025.dwg



LEGEND:

PROPOSED RESUMPTION BOUNDARY

WATERWAY

PRELIMINARY

No	Revision	Drawn	Job Manager	Project Director	Date
B	REVISED ISSUE	LDS	JE*	CW*	15.05.15
A	PRELIMINARY ISSUE	ESP	GSP*	CW*	14.04.15

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SCALE 1:10,000 AT ORIGINAL SIZE

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Approved (Project Director)			
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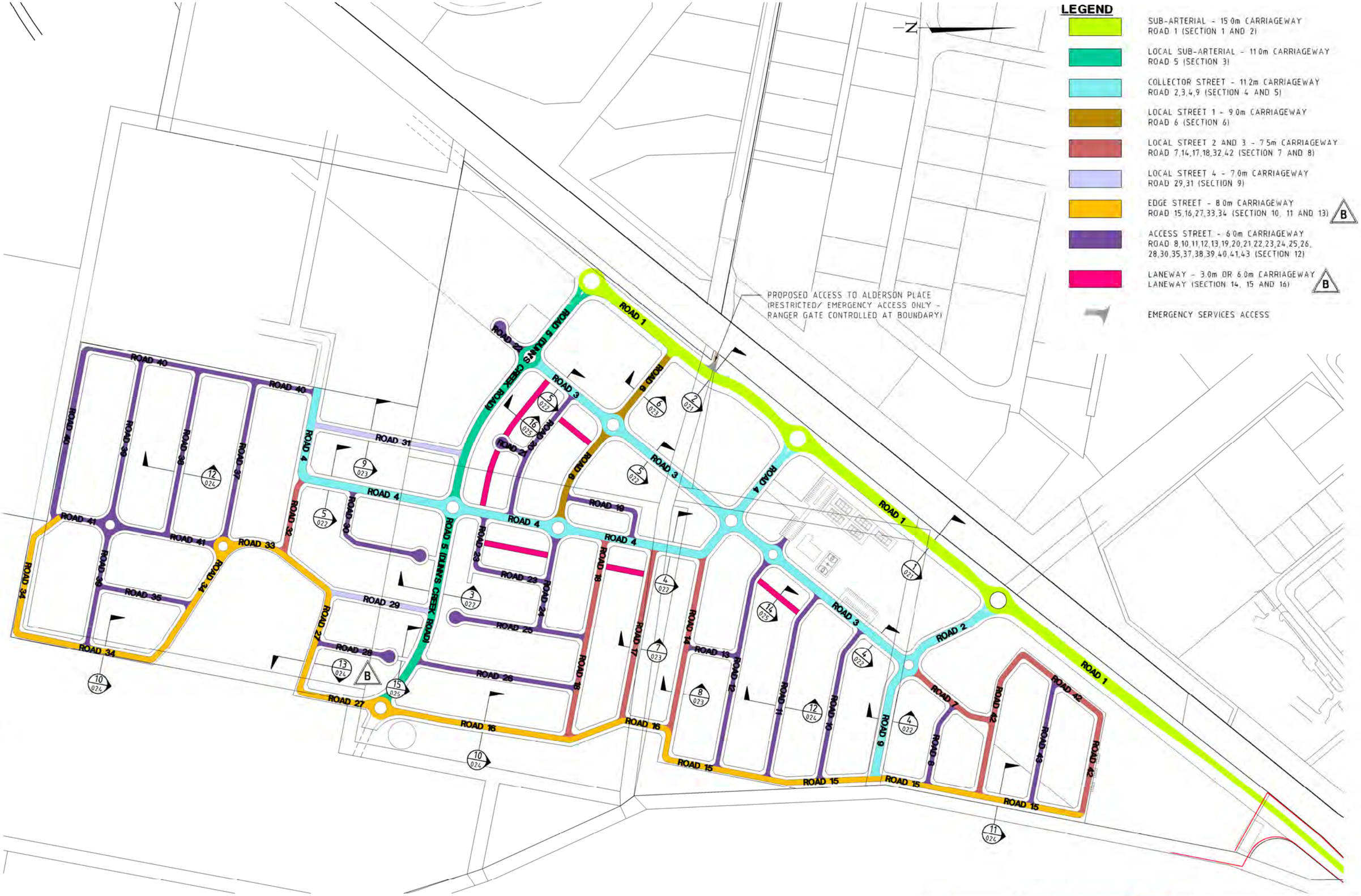
Client **QUEANBEYAN CITY COUNCIL**

Project **DUNNS CREEK ROAD ALIGNMENT STUDY**

Title **OPTION 5 - LAND RESUMPTION PLAN**

Original Size **A1** Drawing No: **23-15485-SK026** Rev: **B**

Plot Date: 13 May 2015 - 10:08 AM Plotted by: Ma. Rizalina De Rivera Cad File No: G:\23\15485\CADD\Drawings\23-15485-SK026.dwg



FIRST ISSUE		DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
		AMK	EH			05/11/13	
AMENDMENTS	A	NPB	EH			28/11/13	ADDED SECTION 15 TAG AND ROAD LAYOUT REVISED
	B	NPB	EH			04/12/13	ADDED SECTION 13 TAG
	C						
	D						
	E						
	F						

WAE No.

PROJECT No.

A3 PLOT SCALE (METRES) A1 PLOT
1:5000 50 0 50 100 1:2500

CONSULT AUSTRALIA

CLIENT
Villa-ge

PROJECT
SOUTH TRALEE ESTATE
CONCEPT DEVELOPMENT APPLICATION

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DRAWING TITLE
STREET HIERARCHY & TYPICAL CROSS SECTION LOCATIONS

DRAWING NUMBER
C13085-D020+

AMEND.
B

FILE: H:\C13000\C13085\drawing\Concept DA\C13085-D020 ST HIERARCHY.dwg 4th-Dec-2013 5:24PM USER: edmond hoang
Xref's X-A1 C13085 X-BLOCK_EX-C13085 X-REV8_EX-C13085 X-RDNAME-C13085 X-BLOCK-C13085 X-REV8-C13085

Appendix B – M Raven North Dunns Creek Road Estimate Report

Dunns Creek Road – Estimate Report

Date:

08th July 2015



Prepared for:
GHD, on Behalf of Queanbeyan Council
Prepared by:

M RAVEN
NORTH
M Raven North
Suite 7.02
75 Miller St
North Sydney
NSW 2060

Quality Information

Dunns Creek Road

PROJECT REFERENCE: 15041

PURPOSE OF ISSUE: Estimate Report

ISSUE	DESCRIPTION OF AMENDMENT	AUTHOR	CHECKED	APPROVED	DATE
Rev0	Estimate Report	JA/SR	SR	SR	15/05/2015
Rev1	Include Client Comments	JA	SR	SR	05/06/2015
Rev 2	Alteration to report alignment descriptions	JA	SR	SR	08/07/2015

Previous issues of this document shall be destroyed or marked SUPERSEDED

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1.2 Estimate Process *5*
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1.4 Scope of Works *5*
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Executive Summary

Queanbeyan City Council (QCC) engaged GHD to undertake a corridor study connecting Monaro Highway in the ACT and Old Cooma Road in NSW. The final alignment and new road will be referred to as Dunns Creek Road.

The study was commissioned in response to increasing traffic volumes associated with new land developments in South Queanbeyan. The object of this study is to inform the decision to construct the Dunns Creek Road link as part of the overall road network for the southern area of Queanbeyan.

M Raven North was commissioned as a sub consultant to GHD to prepare estimates of cost for two preferred road alignments.

1.1 Estimate Overview

The estimates were prepared by M Raven North in May 2015 and are based upon current day's costs as at the first quarter of 2015. This estimate for Dunns Creek Road commences at the South East corner of South Tralee Development and connects to Old Comma Road.

M Raven North prepared estimates of cost for two preferred road alignments based upon Concept drawings prepared by GHD. The table below details the respective costs of the two alignments.

Estimate of Cost 20% Strategic	Estimate Date	$ Million (P50)	$ Million (P90)
Alignment 1B	12/05/2015	$ 181 incl 39% contingency	$ 205 incl 58% contingency
Alignment 5	12/05/2015	$ 169 incl 40% contingency	$ 192 incl 59% contingency

All Costs exclude GST

1.2 Alignment Options

Two road alignment options were identified as preferred and estimates of cost were prepared for Option 1B and Option 5.

- Option 1B is the northern most alignment considered and runs along the northern side of a major ridge rising from Jerrabomberra Creek, passing within about 400 metres of residences in Aspen Rise in Jerrabomberra and close to the Quarry.

- Option 5 crosses Jerrabomberra Creek south of the Option 1 crossing point passing within about 300 metres of the nearest residential property boundaries in Fernleigh Park and follows an alignment generally along the southern edge of the study corridor joining Old Cooma Road opposite Googong Road.

–

1 Introduction

1.1 Project Background

Queanbeyan City Council (QCC) engaged GHD to undertake a corridor study connecting Monaro Highway in the ACT and Old Cooma Road in NSW. The final alignment and new road will be referred to as Dunns Creek Road.

The study was commissioned in response to increasing traffic volumes associated with new land developments in South Queanbeyan. The object of this study is to inform the decision to construct the Dunns Creek Road link as part of the overall road network for the southern area of Queanbeyan.

M Raven North (MRN) was commissioned as a sub consultant to GHD to prepare estimates of cost for two preferred road alignments.

These will be referred to as the Project Works for the purposes of this report.

1.2 Estimate Process

On 26 February 2015, GHD confirmed the engagement of M Raven North to undertake an independent estimate of costs for the two preferred option alignments known as Option 1B and Option 5.

At that time the status of the project was:

- Concept Design under development

MRN Estimate Process consisted of:-

- Assessment of the available design information
- Review of existing Design reports
- Preparation of Independent Quantities
- Preparation Independent Estimate of the works (all rates are prepared from first principles)
- Assessment of Contingency based upon the available design detail.

1.3 Design Status and Scope of Works

The current estimate prepared by MRN is based upon the 20% Strategic Design information provided by GHD.

1.4 Scope of Works

Two road alignment options were identified as preferred and estimates of cost were prepared for Option 1B and Option 5. Both road alignments connect the South East corner of South Tralee Development to Old Comma Road.

1. Option 1B is the northern most alignment considered and runs along the northern side of a major ridge rising from Jerrabomberra Creek, passing within about 400 metres of residences in Aspen Rise in Jerrabomberra and close to the Quarry.

   The bridge over Jerrabomberra Creek is 550m long super T Bridge 15.845m wide (internal dimension between barriers).

2. Option 5 crosses Jerrabomberra Creek south of the Option 1 crossing point passing within about 300 metres of the nearest residential property boundaries in Fernleigh Park and follows an alignment generally along the southern edge of the study corridor joining Old Cooma Road opposite Googong Road.

The bridge over Jerrabomberra Creek is 530m long super T Bridge 15.845m wide (internal dimension between barriers).

1.5 Drawings

Title	Drawing No./ Revision
Typical Sections	2315485-SK010 B
Option 1B Plan & Longitudinal Section	2315485-SK015 D
Option 1B Plan & Longitudinal Section	2315485-SK016 D
Option 5 Plan & Longitudinal Section	2315485-SK020 D
Option 5 Plan & Longitudinal Section	2315485-SK021 D
Option 1B Land Resumption Plan	2315485-SK025 B
Option 5 Land Resumption Plan	2315485-SK026 B

1.6 Geotechnical

No Geotechnical Report was available for the estimate.

Foundation treatments are based upon an allowance. Further design development of the foundations will occur once the geotechnical investigations have been completed.

1.7 Environmental

The estimate has an allowance for:-

- Silt fencing to full length and site monitoring.
- Hay bales, pit traps and truck cleaning facilities.
- Sedimentation basins.

1.8 Earthworks

The preferred option will not require the importation of fill. It has been assumed that a large proportion of excavated material could be used as fill. Screening of excavated materials will be required to produce suitable fill.

All excess excavated material is assumed to be non-contaminated and disposed off-site.

1.9 Structures Jerrabomberra Creek

Bridge lengths adopted are:

Option 1B - 550m (Ch 4600 – Ch 5150)

Option 5 – 530m (Ch 4970 – Ch 5500)

The bridge width adopted for both options is 15.845 m (internal dimension between barriers). MRN has assumed the bridges can be constructed as simply supported super T construction with bearing not exceeding 30m.

1.10 Pavements

The pavement depths utilized in the modelling were based on 600mm of granular pavement.

The main alignment Pavement (CBR 3 existing):-

- 14/7 double /double seal (class 320), 150 DGB20, 160 DGS20, 290 Select (min CBR 10).

The intersections (CBR 4 existing assumed)

- 40mm SMA14(A10E) plus 230mm AC20-HD (Class 320) and 100mm DGS 20 Sub-base.

1.11 Utility Adjustments

Allowance has been made to introduce traffic signals at the intersection of Old Cooma Road for both Option 1B and Option 5.

The corridor study prepared by GHD in September 2008 did not identify any major services that needed to be relocated as part of the project. No allowance has been made to adjust existing Utilities. The presence of existing utilities is currently unknown.

The provision of Street lighting has been confined to the intersections at each end of the proposed alignments only.

1.12 Property Impact

Property impacts for each alignment option are listed below. The areas listed are to the extents of the proposed road reserve boundary for four lane dual carriageway construction.

The property impact was assessed by the following criteria:

- Boundaries to be minimum corridor width of 65 m for the whole route.
- Where low cut batter or a fill batter, width to property boundary is batter extent plus 4 m
- Where high cut (benched), width to property boundary is batter extent plus 10 m

1.12.1 Property Impacts Option 1B

Lot No / DP Land	Resumption Area (ha)
Lot 181 / DP 754912	0.094
Lot 1 / DP 1140653	0.032
Lot 226 / DP 665411	1.933
Lot 2 / DP 1006051	3.077
Lot 1 / DP 224095	0.629
Lot 10 / DP 565362	11.126
Lot 11 / DP 565362	2.584 (west of Jerrabomberra Ck)
Lot 11 / DP 565362	6.081 (east of Jerrabomberra Ck)
Lot 1 / DP 1004115	8.362
Lot 99 / DP 754881	6.103
Lot 148 / DP 727670	2.273

1.12.2 Property Impacts Option 5

Lot No / DP Land	Resumption Area (ha)
Lot 181 / DP 754912	0.094
Lot 1 / DP 1140653	0.032
Lot 226 / DP 665411	1.933
Lot 2 / DP 1006051	3.077
Lot 1 / DP 224095	0.629
Lot 10 / DP 565362	11.435
Lot 11 / DP 565362	3.838 (west of Jerrabomberra Ck)
Lot 11 / DP 565362	6.666 (east of Jerrabomberra Ck)
Lot 2 / DP 1000529	6.306
Lot 99 / DP 754881	3.988
Lot 150 / DP 727670	2.339

Allowance was included for 10 No property adjustments at $10,000 per property and $20,000 per Ha for the acquisition of land.

2 Design Standards

2.1 Design speed

The design speed adopted for the two road alignments is 80 km/hr. The maximum grade for both options is 9%.

2.2 Cross section

The adopted cross section for the two lane single carriageway road is:

- 3.5 m lane width
- 2.5 m shoulder width
- 1.0 m verge
- 2.5 m path reserve
- 3.0 m gutter

The adopted cross section for the four lane dual carriageway road is:

- 3.5 m lane width
- 2.5 m shoulder width
- 1.0 m verge
- 2.5 m path reserve
- 3.0 m gutter
- 6.0 m median (includes 1.0 m shoulder width)

Earthworks volumes were calculated by GHD from their design model and provided to M Raven North for inclusion in the cost estimate.

2.3 Road Design

2.3.1 Alignment changes

The alignments for Options 1B and 5 were adopted from the previous study completed in 2008 for the majority of the length, but with some modifications to the lengths and vertical alignments. These were undertaken to improve geometry, ride and appearance together with, avoidance of environmentally sensitive areas.

2.3.2 Climbing Lanes

GHD completed a review of truck climbing / truck descending lanes which was undertaken in line with Austroads Part 3 - Geometric design manual.

The truck climbing / truck descending lanes configuration is designed as final four-lane dual carriageway earthworks and pavement with a switch provided to the two lane single carriageway configuration over a transition length of 150 metres. The additional fourth lane of pavement was allowed for descending requirements as truck speed regularly match those of climbing while descending over steep gradients.

The proposed two / four lane configuration is detailed on the plan and longitudinal sections, provided to MRN for the estimate.

2.3.3 Future second carriageway

MRN understands that the additional earthworks extents were modelled for the entire alignments to be four lane configurations. This allowed for the property acquisitions to be assessed now for these future requirements. These additional earthworks were not considered and are excluded from the current cost estimates.

2.4 Drainage

2.4.1 Culvert road crossings

GHD undertook a preliminary assessment of the road cross drainage with the appropriate catchments and based on a 100 year average return interval (ARI) event. The details of the culvert location and catchment areas we confirmed to M Raven North and used in the preparation of the estimate.

2.5 Review of Risks

- No geotechnical report.
- Terrain and Construction Access.
- Foundation treatments.
- Existence of Unknown Utilities.
- Endangered Ecological communities and the presence of threatened species.
- Aboriginal and Non-Aboriginal cultural heritage.

3 Exclusions

GST, Escalation

No allowance for Utilities, Cableways, Contaminated Materials

4 Objectives

Objectives for this project have been determined as follows:

- Improve road safety
- Improve road transport productivity, efficiency and reliability of travel
- Minimise the impact on the natural, cultural and built environment
- Provide value for money.

5 Construction

At this stage, it is expected the project will be delivered by construct only contract.

It is expected a Tier 1 contractor will be required due to the size of the bridge.

5.1 Dates

MRN has assumed for the purposes of preparing this estimate that construction will commence in 2017.

MRN understand at the time of this report that no formal decision has been made by Queanbeyan Council on the commencement of Detailed Design or Construction.

5.2 Studies and Reports

Queanbeyan City Council commission a Corridor Study and Alignment Planning Report which is dated September 2008 from GHD.

The report identified significant constraints in the study area for the proposed new road alignment options including:

- Topography
- Ecology
- Aboriginal and Non-Aboriginal cultural heritage at various locations across the study area
- Property.

None of these constraints lead to any potential route being discarded in its own right. However, it is combinations of desirable and non-desirable attributes of routes that lead to their recommendation or discard as a feasible route.

Signatures

NAME		*NAME*
Estimator	Stephen Rowe	*POSITION*
Date:	08/07/2015	Date:

Appendices

Estimate

Copies of the P50/P90 Estimates are included in Appendix A

Risk Analysis

M Raven North has not seen a risk analysis for this project. No Probability estimates have been carried out on the Estimates of Cost provided.

Appendix A

Independent Estimates – Option 1B and 5

PROJECT SUMMARY

DUNNS CREEK ROAD OPTION 1B, (Old Cooma Road to eastern edge of South Tralee Estate)

Client: GHD **Prepared by: *JA***

Project Summary **Rev B**

Project No: **DATE: May 2015** **Estimate Stage: 20% Strategic**

Item	Estimate (excluding contingency)	Contingency %	Contingency Amount	Estimate (including contingency)	% of Total Estimate	Comments/Assumptions
1. Project Development						
1 (a) Route/Concept/EIS or REC	$1,604,639	55%	$882,551	$2,487,190		1.5% of 5a
1 (b) Project Management Services	$128,371	55%	$70,604	$198,975		8% of 1a
1 (c) Client Representation	$12,837	55%	$7,060	$19,898		10% of 1b
1 (d) Community Relations	$50,000	55%	$27,500	$77,500		
Sub total	**$1,795,847**	**55%**	**$987,716**	**$2,783,563**	**1.4%**	
2. Investigation and Design						
2 (a) Investigation and Design	$7,488,314	55%	$4,118,573	$11,606,887		7% of 4a, 5a
2 (b) Project Management Services	$599,065	55%	$329,486	$928,551		8% of 2a
2 (c) Client Representation	$59,907	55%	$32,949	$92,855		10% 2b
Sub total	**$8,147,285**	**55%**	**$4,481,007**	**$12,628,293**	**6.2%**	
3. Property Acquisitions						
3 (a) Acquire Property	$874,460	60%	$524,676	$1,399,136		Client to confirm
3 (b) Professional Services For Property	$65,585	60%	$39,351	$104,935		7.5% of 3a
3 (c) Project Management Services	$5,247	60%	$3,148	$8,395		8% of 3b
3 (d) Client Representation	$525	60%	$315	$839		10% of 3c
Sub total	**$945,816**	**60%**	**$567,490**	**$1,513,305**	**0.7%**	
4. Public Utility Adjustments						
4 (a) Adjustment to Utilities	$0	0%	$0	$0		
5 (b) Insurance	$0	0%	$0	$0		0.55% of 4a
4 (c) Project Management Services	$0	0%	$0	$0		8% of 4a
4 (d) Client Representation	$0	0%	$0	$0		10% 4b
Sub total	**$0**	**0%**	**$0**	**$0**	**0.0%**	
5. Construction						
5 (a) Infrastructure						
5 (ai) Schedule of Rates	$106,975,913	59%	$62,887,613	$169,863,526		
5 (aii) Schedule of Prices	$0	0%	$0	$0		
5 (b) Primary Testing						Incl in SOR
5 (c) Insurance	$588,368	55%	$323,602	$911,970		0.55% of 5a
5 (d) Project Management Services	$8,558,073	55%	$4,706,940	$13,265,013		8% of 5a
5 (e) Client Representation	$855,807	55%	$470,694	$1,326,501		10% of 5b
Sub total	**$116,978,160**	**58%**	**$68,388,850**	**$185,367,010**	**90.8%**	
6. Handover						
6 (a) Handover and finalisation	$80,000	50%	$40,000	$120,000		
6 (b) Project data and performance	$1,069,759.13	50%	$534,880	$1,604,639		1% of 4a, 5a
6 (c) Project Management Services	$85,581	50%	$42,790	$128,371		8% of 6b
6 (d) Client Representation	$8,558	50%	$4,279	$12,837		10% of 6c
Sub total	**$1,243,898**	**50%**	**$621,949**	**$1,865,847**	**0.9%**	
TOTAL	**$129,111,007**	**58%**	**$75,047,011**	**$204,158,018**	**100%**	**RMS require 40% to 70%**
		P90		**$205,000,000**		
Project Management	$9,376,337			$14,529,305	7.1%	
Client Representation	$937,634			$1,452,931	0.7%	
Reality Checks						
1. Project Cost (Incl Contingency)/ km	$24,268,986	5.3		$38,375,567		
2. Project Cost / lane-km	$7,651,930	16.9		$12,099,687		
3. Earthw orks -Cut/Fill	465,371	m3		$27 /m3		Excl Contingency
4. Earthw orks -Import	0	m3		$0 /m3		Excl Contingency
5. Pavements	95,103	m2		$47 /m2		Excl Contingency
6. Bridges	8,715	m2				

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No allow ance for GST,Escalation

PROJECT SUMMARY

DUNNS CREEK ROAD OPTION 1B, (Old Cooma Road to eastern edge of South Tralee Estate)

Client: GHD Prepared by: *JA*

Project Summary Rev B

Project No: DATE:May 2015 Estimate Stage: 20% Strategic

Item	Estimate (excluding contingency)	Contingency %	Contingency Amount	Estimate (including contingency)	% of Total Estimate	Comments/Assumptions
1. Project Development						
1 (a) Route/Concept/EIS or REC	$1,604,639	35%	$561,624	$2,166,262		1.5% of 5a
1 (b) Project Management Services	$128,371	35%	$44,930	$173,301		8% of 1a
1 (c) Client Representation	$12,837	35%	$4,493	$17,330		10% of 1b
1 (d) Community Relations	$50,000	35%	$17,500	$67,500		
Sub total	**$1,795,847**	**35%**	**$628,546**	**$2,424,393**	**1.3%**	
2. Investigation and Design						
2 (a) Investigation and Design	$7,488,314	35%	$2,620,910	$10,109,224		7% of 4a, 5a
2 (b) Project Management Services	$599,065	35%	$209,673	$808,738		8% of 2a
2 (c) Client Representation	$59,907	35%	$20,967	$80,874		10% 2b
Sub total	**$8,147,285**	**35%**	**$2,851,550**	**$10,998,835**	**6.1%**	
3. Property Acquisitions						
3 (a) Acquire Property	$874,460	40%	$349,784	$1,224,244		Client to confirm
3 (b) Professional Services For Property	$65,585	40%	$26,234	$91,818		7.5% of 3a
3 (c) Project Management Services	$5,247	40%	$2,099	$7,345		8% of 3b
3 (d) Client Representation	$525	40%	$210	$735		10% of 3c
Sub total	**$945,816**	**40%**	**$378,326**	**$1,324,142**	**0.7%**	
4. Public Utility Adjustments						
4 (a) Adjustment to Utilities	$0	0%	$0	$0		
5 (b) Insurance	$0	0%	$0	$0		0.55% of 4a
4 (c) Project Management Services	$0	0%	$0	$0		8% of 4a
4 (d) Client Representation	$0	0%	$0	$0		10% 4b
Sub total	**$0**	**0%**	**$0**	**$0**	**0.0%**	
5. Construction						
5 (a) Infrastructure						
5 (ai) Schedule of Rates	$106,975,913	40%	$42,790,365	$149,766,278		
5 (aii) Schedule of Prices	$0	0%	$0	$0		
5 (b) Primary Testing						Incl in SOR
5 (c) Insurance	$588,368	40%	$235,347	$823,715		0.55% of 5a
5 (d) Project Management Services	$8,558,073	40%	$3,423,229	$11,981,302		8% of 5a
5 (e) Client Representation	$855,807	40%	$342,323	$1,198,130		10% of 5b
Sub total	**$116,978,160**	**40%**	**$46,791,264**	**$163,769,425**	**91.0%**	
6. Handover						
6 (a) Handover and finalisation	$80,000	40%	$32,000	$112,000		
6 (b) Project data and performance	$1,069,759	20%	$213,952	$1,283,711		1% of 4a, 5a
6 (c) Project Management Services	$85,581	20%	$17,116	$102,697		8% of 6b
6 (d) Client Representation	$8,558	20%	$1,712	$10,270		10% of 6c
Sub total	**$1,243,898**	**21%**	**$264,780**	**$1,508,678**	**0.8%**	
TOTAL	**$129,111,007**	**39%**	**$50,914,466**	**$180,025,473**	**100%**	**RMS require 40% to 70%**
		P50		**$181,000,000**		
Project Management	$9,376,337			$13,073,383	7.3%	
Client Representation	$937,634			$1,307,338	0.7%	
Reality Checks						
1. Project Cost (Incl Contingency)/km	$24,268,986	5.3		$33,839,375		
2. Project Cost / lane-km	$7,651,930	16.9		$10,669,441		
3. Earthworks -Cut/Fill	465,371	m3		$27	/m3	Excl Contingency
4. Earthworks -Import	0	m3		$0	/m3	Excl Contingency
5. Pavements	95,103	m2		$47	/m2	Excl Contingency
6. Bridges	8,715	/m2			/m2	Excl Contingency

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No allowance for GST,Escalation

PROJECT SUMMARY

DUNNS CREEK ROAD OPTION 5, (Old Cooma Road to eastern edge of South Tralee Estate)

Client: GHD **Prepared by: *JA***

Project Summary **Rev B**

Project No: **DATE: May 2015** **Estimate Stage: 20% Strategic**

Item	Estimate (excluding contingency)	Contingency %	Contingency Amount	Estimate (including contingency)	% of Total Estimate	Comments/Assumptions
1. Project Development						
1 (a) Route/Concept/EIS or REC	$1,505,087	55%	$827,798	$2,332,885		1.5% of 5a
1 (b) Project Management Services	$120,407	55%	$66,224	$186,631		8% of 1a
1 (c) Client Representation	$12,041	55%	$6,622	$18,663		10% of 1b
1 (d) Community Relations	$50,000	55%	$27,500	$77,500		
Sub total	**$1,687,535**	**55%**	**$928,144**	**$2,615,679**	**1.4%**	
2. Investigation and Design						
2 (a) Investigation and Design	$7,023,741	55%	$3,863,058	$10,886,798		7% of 4a, 5a
2 (b) Project Management Services	$561,899	55%	$309,045	$870,944		8% of 2a
2 (c) Client Representation	$56,190	55%	$30,904	$87,094		10% 2b
Sub total	**$7,641,830**	**55%**	**$4,203,007**	**$11,844,837**	**6.2%**	
3. Property Acquisitions						
3 (a) Acquire Property	$822,580	60%	$493,548	$1,316,128		Client to confirm
3 (b) Professional Services For Property	$61,694	60%	$37,016	$98,710		7.5% of 3a
3 (c) Project Management Services	$4,935	60%	$2,961	$7,897		8% of 3b
3 (d) Client Representation	$494	60%	$296	$790		10% of 3c
Sub total	**$889,703**	**60%**	**$533,822**	**$1,423,524**	**0.7%**	
4. Public Utility Adjustments						
4 (a) Adjustment to Utilities	$0	0%	$0	$0		
5 (b) Insurance	$0	0%	$0	$0		0.55% of 4a
4 (c) Project Management Services	$0	0%	$0	$0		8% of 4a
4 (d) Client Representation	$0	0%	$0	$0		10% 4b
Sub total	**$0**	**0%**	**$0**	**$0**	**0.0%**	
5. Construction						
5 (a) Infrastructure						
5 (ai) Schedule of Rates	$100,339,156	60%	$59,717,589	$160,056,745		
5 (aii) Schedule of Prices	$0	0%	$0	$0		
5 (b) Primary Testing						Incl in SOR
5 (c) Insurance	$551,865	55%	$303,526	$855,391		0.55% of 5a
5 (d) Project Management Services	$8,027,133	55%	$4,414,923	$12,442,055		8% of 5a
5 (e) Client Representation	$802,713	55%	$441,492	$1,244,206		10% of 5b
Sub total	**$109,720,867**	**59%**	**$64,877,530**	**$174,598,398**	**90.8%**	
6. Handover						
6 (a) Handover and finalisation	$80,000	50%	$0	$80,000		
6 (b) Project data and performance	$1,003,392	50%	$501,696	$1,505,087		1% of 4a, 5a
6 (c) Project Management Services	$80,271	50%	$40,136	$120,407		8% of 6b
6 (d) Client Representation	$8,027	50%	$4,014	$12,041		10% of 6c
Sub total	**$1,171,690**	**47%**	**$545,845**	**$1,717,535**	**0.9%**	
TOTAL	**$121,111,625**	**59%**	**$71,088,348**	**$192,199,973**	**100%**	**RMS require 40% to 70%**
		P90		**$192,000,000**		
Project Management	$8,794,646			$13,627,934	7.1%	
Client Representation	$879,465			$1,362,793	0.7%	
Reality Checks						
1. Project Cost (Incl Contingency)/ km	$22,851,250	5.3		$36,264,146		
2. Project Cost / lane-km	$9,467,023	12.8		$15,023,839		
3. Earthw orks -Cut/Fill	224,472	m3		$28	/m3	Excl Contingency
4. Earthw orks -Import	0	m3		$0	/m3	Excl Contingency
5. Pavements	96,873	m2		$48	/m2	Excl Contingency
6. Bridges	8,398	m2				

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No allow ance for GST,Escalation

PROJECT SUMMARY

DUNNS CREEK ROAD OPTION 5, (Old Cooma Road to eastern edge of South Tralee Estate)

Client: GHD **Prepared by: *JA***

Project Summary **Rev B**

Project No: **DATE: May 2015** **Estimate Stage: 20% Strategic**

Item	Estimate (excluding contingency)	Contingency %	Contingency Amount	Estimate (including contingency)	% of Total Estimate	Comments/Assumptions
1. Project Development						
1 (a) Route/Concept/EIS or REC	$1,505,087	35%	$526,781	$2,031,868		1.5% of 5a
1 (b) Project Management Services	$120,407	35%	$42,142	$162,549		8% of 1a
1 (c) Client Representation	$12,041	55%	$6,622	$18,663		10% of 1b
1 (d) Community Relations	$50,000	35%	$17,500	$67,500		
Sub total	**$1,687,535**	**35%**	**$593,045**	**$2,280,580**	**1.3%**	
2. Investigation and Design						
2 (a) Investigation and Design	$7,023,741	35%	$2,458,309	$9,482,050		7% of 4a, 5a
2 (b) Project Management Services	$561,899	55%	$309,045	$870,944		8% of 2a
2 (c) Client Representation	$56,190	35%	$19,666	$75,856		10% 2b
Sub total	**$7,641,830**	**36%**	**$2,787,020**	**$10,428,851**	**6.2%**	
3. Property Acquisitions						
3 (a) Acquire Property	$822,580	40%	$329,032	$1,151,612		Client to confirm
3 (b) Professional Services For Property	$61,694	40%	$24,677	$86,371		7.5% of 3a
3 (c) Project Management Services	$4,935	40%	$1,974	$6,910		8% of 3b
3 (d) Client Representation	$494	40%	$197	$691		10% of 3c
Sub total	**$889,703**	**40%**	**$355,881**	**$1,245,584**	**0.7%**	
4. Public Utility Adjustments						
4 (a) Adjustment to Utilities	$0	0%	$0	$0		
5 (b) Insurance	$0	0%	$0	$0		0.55% of 4a
4 (c) Project Management Services	$0	0%	$0	$0		8% of 4a
4 (d) Client Representation	$0	0%	$0	$0		10% 4b
Sub total	**$0**	**0%**	**$0**	**$0**	**0.0%**	
5. Construction						
5 (a) Infrastructure						
5 (ai) Schedule of Rates	$100,339,156	40%	$40,135,663	$140,474,819		
5 (aii) Schedule of Prices	$0	0%	$0	$0		
5 (b) Primary Testing						Incl in SOR
5 (c) Insurance	$551,865	40%	$220,746	$772,612		0.55% of 5a
5 (d) Project Management Services	$8,027,133	40%	$3,210,853	$11,237,986		8% of 5a
5 (e) Client Representation	$802,713	40%	$321,085	$1,123,799		10% of 5b
Sub total	**$109,720,867**	**40%**	**$43,888,347**	**$153,609,214**	**90.9%**	
6. Handover						
6 (a) Handover and finalisation	$80,000	40%	$0	$80,000		
6 (b) Project data and performance	$1,003,392	20%	$200,678	$1,204,070		1% of 4a, 5a
6 (c) Project Management Services	$80,271	20%	$16,054	$96,326		8% of 6b
6 (d) Client Representation	$8,027	20%	$1,605	$9,633		10% of 6c
Sub total	**$1,171,690**	**19%**	**$218,338**	**$1,390,028**	**0.8%**	
TOTAL	**$121,111,625**	**40%**	**$47,842,632**	**$168,954,257**	**100%**	**RMS require 40% to 70%**
		P50		**$169,000,000**		
Project Management	$8,794,646			$12,374,714	7.3%	
Client Representation	$879,465			$1,228,642	0.7%	
Reality Checks						
1. Project Cost (Incl Contingency)/ km	$22,851,250	5.3		$31,878,162		
2. Project Cost / lane-km	$9,467,023	12.8		$13,206,774		
3. Earthw orks -Cut/Fill	224,472	m3		$28	/m3	Excl Contingency
4. Earthw orks -Import	0	m3		$0	/m3	Excl Contingency
5. Pavements	96,873	m2		$48	/m2	Excl Contingency
6. Bridges	8,398	/m2			/m2	Excl Contingency

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Appendix C – Queanbeyan City Council Report for Dunns Creek Road Corridor Study and Alignment Planning Preliminary Design for Preferred Option, September 2008

CLIENTS | PEOPLE | PERFORMANCE

Queanbeyan City Council

Report for Dunn's Creek Road Corridor Study and Alignment Planning

Preliminary Design for Preferred Option

September 2008

DRAFT



INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

Queanbeyan City Council (QCC) engaged GHD to undertake a corridor study including an alignment planning phase investigation of a new road referred to as Dunn's Creek Road connecting Monaro Highway in the ACT and Old Cooma Road in NSW. The study area showing the limits of investigation corridor is shown on Figure 1.

The study is in response to increasing traffic volumes associated with new land developments in South Queanbeyan. The findings of this study will inform the decision to construct the Dunn's Creek Road link as part of the overall road network for the southern area of Queanbeyan.

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1:20,000

0 250 500 750 1,000

Metres (at A3)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

LEGEND

State Border

SiteBoundary

Queanbeyan City Council
Dunn's Creek

Dunn's Creek
Study Area

Job Number	22-12266
Revision	A
Date	5 Dec 2007

Figure 1

G:\23\12266\CADD\GIS\ArcView\Wkspace\StudyArea.mxd

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2. Scope

The scope of the investigation is:

- Investigation of options for the alignment of Dunn's Creek Road between Jerrabomberra Creek and Old Cooma Road;
- Preparation of a preliminary design for Dunn's Creek Road between Monaro Highway and Old Cooma Road, adopting the alignment provided by QCC for the section between Monaro Highway and Jerrabomberra Creek;
- Assessment of the alignment options on engineering design, environmental, ecological, archaeological, heritage, cultural and cost bases;
- Investigations of the feasibility and impact of providing for a future carriageway parallel to the initial carriageway to form a dual carriageway road;
- Assessment of the road reserve requirement for the dual carriageway road;
- Preparation of preliminary project cost estimates for the single carriageway two-way two-lane road;
- Agreement with Council on an alignment option suitable for the development of a Preliminary Sketch Plan submission in a subsequent project;
- Identification of the boundaries of the final road reserve to enable land acquisition to be commenced;
- Estimation of required land-take and estimated land acquisition cost;
- Recommendations for proposed junction configuration for connections to the Monaro Highway and Old Cooma Road;
- Investigation of the feasibility of a cycleway from Monaro Highway to Old Cooma Road and the preparation of its alignment;
- Liaison with RTA for the location and configuration of intersection with Cooma Road;
- Liaison with ACT Government for intersection with Monaro Highway;
- Liaison with The Village Building Co and Canberra Investment Corporation.

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3. Corridor Constraints

3.1 Introduction

The study has investigated a range of constraints to the location of a road within the defined corridor. These are mapped on the plan at Appendix B and include:

- Ecological constraints;
- Archaeological and heritage constraints; and
- Topographical constraints.

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3.2 Terminal Points

Isabella Drive

Dunn's Creek Road is to connect to Monaro Highway at Isabella Drive.

This intersection presently carries a large volume of traffic between Tuggeranong and the City. The intersection also has significant traffic movements with origins and destinations at Hume Industrial Area and Queanbeyan.

The Southern Broadacre Planning Study (SMEC) proposed a long-term concept that included the grade-separation of Monaro Highway and Isabella Drive. The proposed connection of Dunn's Creek Road to Monaro Highway at Isabella Drive is consistent with this concept. For the purposes of this study it is assumed that Dunn's Creek Road will approach Monaro Highway on a grade sufficient to pass over the highway. There may be opportunities to stage construct this connection as an at-grade signalised junction, however the feasibility of such a connection would need to be further investigated and is beyond the scope of this study.

Old Cooma Road

Dunn's Creek Road is to connect to Old Cooma Road between Googong Road and the quarry. Old Cooma Road connects Queanbeyan to the Monaro Highway near Royalla. It also carries local traffic generated by rural residential subdivisions and other properties in Palerang Shire.

3.3 Existing Development

There are a number of existing developments and features along the road corridor that need to be considered in locating possible alignment for the road. They include:

- **Hume Industrial Area** - located near the western end of the proposed Dunn's Creek Road and is a significant employment node in the area that would attract traffic to use the proposed link.
- **The railway line** - is occasionally used for tourist and recreational purposes. There are no formal crossings of the railway line south of the Lanyon Drive Bridge. A single lane underpass at Arnott Street in Hume provides property access across the border.
- **South Jerrabomberra** - Residential development in South Jerrabomberra is close to the proposed corridor.

- **Existing rural properties** – there are a number of private land holdings along the corridor; these are listed in Table 1.
- **The Quarry** - The owners of the quarry to the north of the study corridor also own some of the land within the corridor.

3.4 Topography

3.4.1 Major Drainage Features

Jerrabomberra Creek

Jerrabomberra Creek is a major creek with its source near Royalla about 15 kms to the south of the corridor. It crosses the study corridor about 3 kilometres to the west of Old Cooma Road. The location of the crossing of Jerrabomberra Creek is a significant control.

Barracks Creek

Barracks Creek is also a major north flowing stream with its catchment within the study corridor.

3.4.2 Terrain

On the eastern side of Jerrabomberra Creek the terrain is steep, rising to a north-south ridgeline about midway between the Creek and Old Cooma Road. The level difference of approximately 150m between the creek crossing and the ridgeline is a major obstacle to achieving an acceptable alignment for the proposed road.

3.5 Major Services

A search for major services along the corridor was undertaken using the Dial-Before-You-Dig service. The results of the search indicated that there are no major services along the corridor.

3.6 Ecology

A summary of the ecological assessment is provided in this section. A more detailed account of the ecological findings for the study area is given in Appendix C.

The following material was reviewed to assess options for the Dunns Creek road alignment:

- A Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands, NSW NPWS 2002;
- Canberra Spatial Plan;
- National Recovery Plan for the Natural Temperate Grassland of the Southern Tablelands (NSW and ACT: An Endangered Ecological Community, Environment ACT, Canberra;
- Action Plan 27: ACT Lowland Woodland Conservation Strategy, Environment ACT;
- DECC's wildlife atlas database records;
- DEW's EPBC Act Protected Matters Search Tool;
- Google Earth;

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- O'Sullivan and Mueck (2003) Natural Heritage Assessment of 'Tralee', Queanbeyan, NSW. Biosis Research, Sydney;
- Thompson and Mullins (2004) Environmental Assessment - Googong Urban Investigation Area. Willana Associates, Wagga Wagga; and
- URS (2005) Final Report - Ecological Constraints for 'Tralee' Release Area. Prepared for Queanbeyan City Council, Queanbeyan.

The desktop assessment found that the development of the road would be constrained by ecological values, whichever route is selected. Here, the discussion is separated into two sections east and west of Jerrabomberra Creek. The eastern section considers several options while the western section is based on a single alignment for the road.

Information from various publications, outlined above, has been overlaid as shown at Appendix B.

The assessment is limited by its desktop nature. Mapped figures only indicate previously mapped or known constraints. Areas without mapped ecological assets may include further constraints.

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Western Section

The western section of the road, for which no alignment options are being considered, intersects with known habitat for several State and Commonwealth threatened species or ecological communities. The western section of the road will intersect with the following EPBC Act Protected Matters:

- Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory Endangered Community;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Community;
- Known habitat of the Critically Endangered Golden Sun Moth (*Synemon plana*);
- Known habitat of the Vulnerable Pink-tailed Worm-lizard (*Aprasia parapulchella*); and
- Potential habitat of other endangered grassland and woodland mosaic species including, Striped Legless Lizard, Grassland Earless Dragon, Hoary Sunray and Button Wrinklewort.

Regarding NSW State-listed threatened species, additional to the Commonwealth protected matters, the western section of the road will pass through known habitat for, at least:

- Diamond Firetail (*Stagonopleura guttata*); and
- Hooded Robin (*Melanodryas cucullata cucullata*).

Eastern Section

On the eastern end of Dunns Creek Road, for which several options have been considered, most options are as equally constrained as the western half of the road. A variation on the northern-most option (Option 1) is the preferred route from an ecological viewpoint, with some changes at the west of this section, to avoid woodland habitat. A suggested preferred alignment is shown in Figure 2.

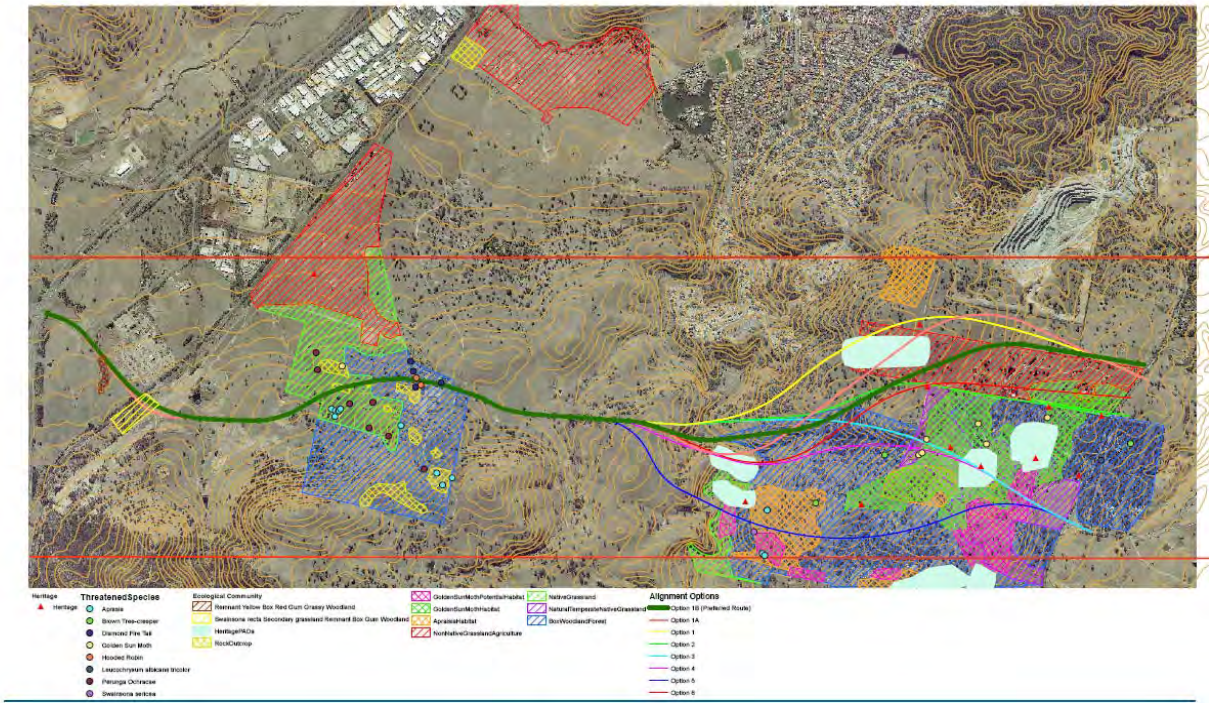


Figure 2 Constraints Map Showing Preferred Alignment

Regardless of the alignment chosen, the eastern half of the road will also pass through Commonwealth protected White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (Critically Endangered Community). Each of the proposed options south of Option 1, also passes through this community, but additionally interacts with other (Commonwealth and / or State) threatened species and endangered communities, similar to the western extent of the road, including:

- Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory Endangered Community;
- Known habitat of the Critically Endangered Golden Sun Moth (*Synemon plana*);
- Known habitat of the Vulnerable Pink-tailed Worm-lizard (*Aprasia parapulchella*);
- Known habitat of the Brown Tree Creeper (*Climacteris picumnus victoriae*);
- Known locations of Silky Swainson-pea (*Swainsona sericea*); and
- Potential habitat of other endangered grassland and woodland mosaic species may also be present, including, Striped Legless Lizard, Grassland Earless Dragon, Hoary Sunray and Button Wrinklewort.

It is unlikely that the project could proceed, on any alignment, without a Referral to the Commonwealth Minister for the Environment, and further detailed ecological assessment for both the Referral and to document species impacts under State legislation.

3.7 Heritage

A desktop cultural heritage study was undertaken by Charles Dearling Archaeological and Cultural Heritage Consultants to ascertain if there are any Aboriginal or European cultural heritage issues that may impinge on route selection. The full report is included at Appendix D.

The study area is essentially a broad corridor between Monaro Highway and Old Cooma Road as defined in the Brief. Investigations are limited to a desktop assessment and more detailed field investigations involving aboriginal groups is beyond the scope of the study.

Based on aerial photographs and various editions of maps the study area has been extensively exploited since European settlement. The uses have generally been confined to rural activities (i.e. farming/agriculture, and stock grazing).

There have been at least three cultural or archaeological assessments carried out within the Dunns Creek Road corridor. These studies have resulted in a large number of Aboriginal (n=9) and European (n=7) cultural heritage sites being recorded. In addition a number of areas of Potential Archaeological Deposit (n=10) have been identified. The majority are at the eastern end of the study area near Old Cooma Road.

Generally the majority of these sites have a moderate to high cultural heritage significance rating on a local level.

Based on the known cultural heritage inventory of the study area there is essentially one management option. This is to avoid the main complex of Aboriginal and European archaeological sites and adopt a route confined to the southern part of the road corridor. It will however be necessary at a later stage to conduct further assessments of any route proposed. It is highly recommended that any route as much as possible, and considering other factors, should avoid the known sites.

Based on the results of the investigations carried out as part of this study and on the obligations outlined in the relevant legislation it is recommended that:

- The route selected avoids as much as possible any previously recorded Aboriginal or European heritage sites, especially those with a high rating or which are complex sites;
- On cultural heritage grounds (both Aboriginal and European) the best route options are located towards the southern boundary of the Dunns Creek Road Corridor;
- If the route will impact on any of the previously identified cultural heritage sites, including PADs further research in those areas will need to be conducted. This may include sub-surface investigations;
- Such surveys and investigations where they involve Aboriginal sites should be carried out in conjunction with representatives of the local Aboriginal community;
- At all stages during the process of final route selection the local Aboriginal community must be consulted and involved in the process. This level of consultation is beyond the scope this study.

3.8 Property

Locations of properties are shown on Figure 3.

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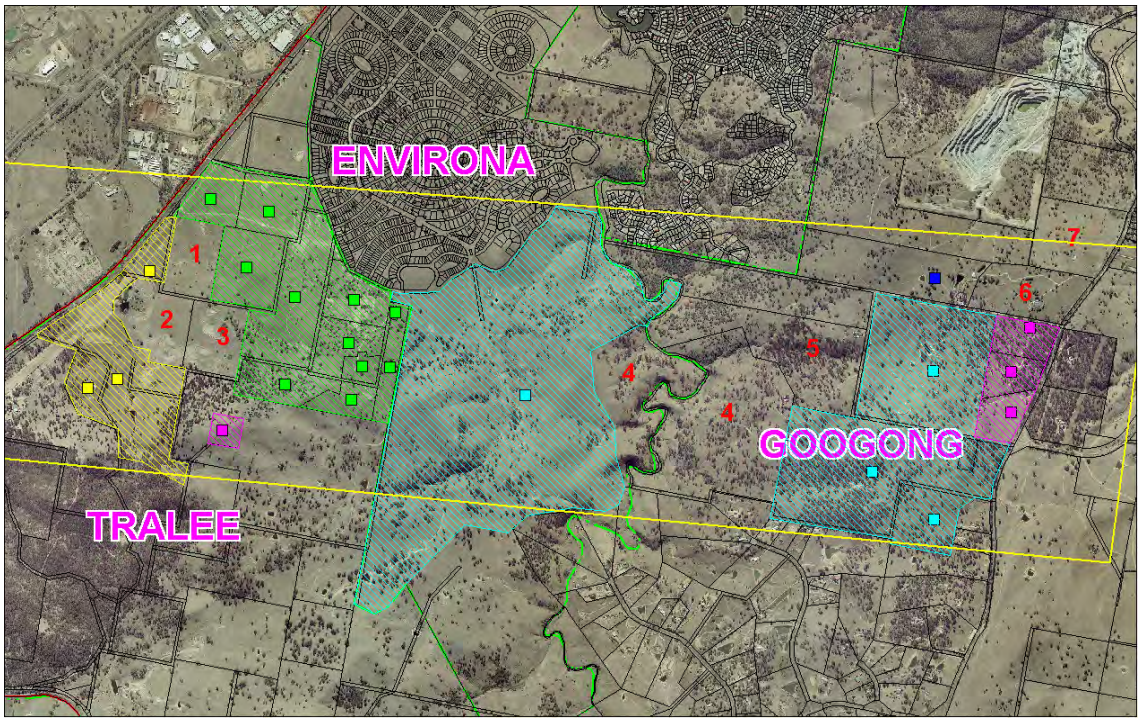


Figure 3 Properties in Corridor

Table 1 lists the property owners and details of their properties.

Table 1 Property Ownership Details

Owner	Lot No.	DP	Map Ref.
Mr. Cornel & Mrs. Hiroe Swen	1	513432	6
Robin PTY LTD			Light Blue
Mr Mark Rodden & Ms Sharon Tein	11	565362	4
Rinker (Quarry)			Dark Blue
Village Building Company			Green
Mr Lawrence Heffernan	105	754881	7
Mrs Anne Forrest	148	754912	3
Mrs Carolyn Larcombe	1	1000529	5
Tuggeranong Investments			Yellow
Mr John Forrest	3	1001136	2

4. Initial Alignment Options

4.1 Description of Options

Six options were investigated during the initial phase of the study to determine the most feasible alignment for the section of the corridor east of Jerrabomberra Creek. They are illustrated in Appendix E.

Option 1 is the northernmost alignment considered and runs along the northern side of a major ridge rising from Jerrabomberra Creek, passing within about 100 metres of residences in Aspen Rise Jerrabomberra and close to the Quarry.

Option 2 crosses Jerrabomberra Creek at the same point as Option 1 then runs along the ridge line from the Creek, through a saddle and then along the access track to Old Cooma Road.

Option 3 follows a similar route to Option 2 but crosses at a saddle further to the south and connects to Old Cooma Road opposite at Googong Road.

Option 4 crosses Jerrabomberra Creek further to the south of the previous options and joins the alignment of Option 4 east of the saddle.

Option 5 crosses Jerrabomberra Creek south of the Option 4 crossing point and follows an alignment generally along the southern edge of the study corridor joining Old Cooma Road opposite Googong Road.

Option 6 is a combination of the western half of Option 4 and the eastern half of Option 2.

4.2 Assessment of Initial Options

The initial assessment of these options was based on consideration of ecological and heritage constraints. The results of the assessment for each of the six options are given in Table 2.

Table 2 Comparison of Initial Alignment Options

Option	1	2	3	4	5	6
Ecological Impact	moderate	moderate	significant	significant	significant	significant
Heritage Impact	significant	significant	significant	significant	minimal	significant

4.2.1 Terrain Limitations

Because the alignments cut across Jerrabomberra Creek and the north-south running ridgeline between the Creek and Old Cooma Road, there are extensive earthworks for all initial alignment options tested. Preliminary alignments for the 6 options are included at Appendix E.

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4.3 Conclusion

A meeting was held with Queanbeyan City Council to review the findings of the initial alignment investigations and a decision to restrict the further investigations to a narrower corridor approximating the alignment of Option 1. This route was selected to avoid ecologically sensitive areas in the southern part of the corridor (refer to Section 3.6) and to refine the alignment in order to achieve lower grades and earthworks. The heritage constraints along this narrower northern corridor appeared to be manageable.

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5. Final Alignment Options

5.1 Introduction

Two alignments (Options 1A and 1B) were developed based on the route of Option 1 and are shown on the map in Appendix F.

5.2 Assessment of Options 1A and 1B

5.2.1 Topography

Road alignments between Jerrabomberra Creek and Old Cooma Road have to negotiate a significant level difference to pass over the ridge about midway between these two features. Option 1A crosses the ridge close to the boundary of the quarry and Option 1B crosses the ridge at a saddle about 300 metres to the south.

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5.2.2 Ecological

The more northerly location of Option 1A has a greater impact on woodland habitat than Option 1B.

The alignment for Option 1B closely follows the route set out in the ecological review (refer to Figure 3 in Appendix C). It minimises the impact on woodland habitat in the western section of the alignment (east of Jerrabomberra Creek) and is generally contained within the area shown as Non Native Grassland Agriculture in the eastern half of the alignment.

5.2.3 Heritage

Option 1A passes through two Potential Archaeological Deposits (PADs), one near Jerrabomberra Creek and one at the ridge line. These would require more detailed investigation if the alignment was adopted. Option 1B avoids both PADs and passes close to, but avoids, an aboriginal site to the south of the PAD on the ridge line.

5.2.4 Summary

Table 3 Comparison of Initial Alignment Options

Option	1A	1B
Earthworks (m^3)	2,250,000	1,800,000
Length (km)	8.3	7.9
Ecological Impact	moderate	minimal
Heritage Impact	significant	minimal

5.3 Conclusion

Option 1B has less earthworks and is shorter and has less impact on both ecological and heritage constraints and is selected as the preferred route.

6. Preliminary Design - Preferred Alignment

6.1 Preliminary Geotechnical Assessment

6.1.1 Desktop Assessment

A desktop study and walk-over inspection of the preferred northern alignment corridor were undertaken to identify the likely geological conditions that will prevail at the site, geotechnical constraints that should be considered and the likely geotechnical investigations that will be required for design of the proposed road.

The desktop study included a review of topographic, geological and soil landscape maps for the study area.

A review of the 1:100,000 scale Soil Landscape Series Sheet for Canberra (2000) indicates that the study area is underlain by four soil landscape units. A review of the 1:50,000 scale geological map for Canberra, Queanbeyan and Environs (1980) indicates that the western half of the alignment is underlain by the Deakin Volcanics.

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6.1.2 Walk Over Site Inspection

The site walkover was used to confirm the findings of the desktop study, identify any geotechnical constraints and identify possible geotechnical investigations that may be required.

The walkover inspection generally confirmed the nature and distribution of soil landscape and geological units as identified by the desktop study.

The eastern end of the alignment (east of the central ridgeline) was dominated by foliated dacite. Areas of residual soil showed evidence of erodibility as indicated in the desktop study. The dacite outcrops were typically observed to be medium strong and highly weathered.

The western end of the alignment was typically underlain by rhyodacite as indicated by the desktop study. Less rock outcrop was observed along the western half of the alignment. Those areas of rock outcrop appeared to have similar rock mass defects as described for the eastern parts of the alignment.

Large areas of steep colluvial soils were observed along the western parts of the alignment. The areas of colluvial soils were typically characterised by hummocky ground.

Cuttings

Cuttings are expected to encounter residual and colluvial soils overlying a weathered igneous bedrock profile. The depth of soil is expected to vary considerably along the alignment.

East of the central ridgeline rock was observed to be at or near the existing ground surface. The depth to rock is expected to be deeper west of the ridgeline where colluvial soil masses were observed along much of the alignment.

The soil profile will need to be carefully addressed in the future cutting designs. These materials will likely require significantly lower batter angles than the underlying rock to maintain long term stability.

One of the prominent rock mass defects observed during the site walkover was a steeply dipping foliation, striking in a north-east direction. For the sections of road that trend in a north-east direction

these foliation defects will be parallel to the rock batter face. Near vertical defects of this nature will typically lead to toppling failure of the rock cutting. Block failures may generally be quite small (<0.2m diameter) but larger block failures are likely. Likewise, joints that were observed to have a moderate dip towards the west could lead to sliding failure of the cutting rock mass where the road alignment trends in a north-south direction.

Each of the rock mass defects naturally occurring at the site have the potential to create instability and resulting safety hazards if not identified and addressed in the design. The cutting design should carefully consider the rock mass conditions, and incorporate appropriate avoidance, stabilisation or failure protection measures. These may include the adoption of appropriate batter angles, benches, use of rock bolts and shotcrete to stabilise unstable masses or seams, rock fall catch zones at the toe of the cutting and rock fall protection fencing. The appropriate design elements should be identified during a detailed geotechnical investigation.

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Fill Embankments

It is expected that deep fill embankments will be required to infill deep gully crossings along the alignment. Consideration will need to be given to the existing foundation conditions and how much material may need to be stripped prior to construction of engineered fill above. This is particularly the case where deep colluvial soils are present along the alignment.

It is expected that the rock materials extracted from cuttings will provide material that is suitable for use as engineered fill. This will need to be confirmed by field investigations and laboratory testing of materials.

6.1.3 Geotechnical Investigations Required

Geotechnical investigations are likely to include a combination of test pits and boreholes.

For a road of this nature, test pits would typically be excavated every 100 metres along the road alignment. The test pits would typically be excavated using a small excavator to a maximum depth of about 5 metres.

Boreholes would be used more selectively (due to the increased cost of investigation) to target bridge locations, deep cuttings and any other critical areas of the alignment. Inclined boreholes may be required for some of the deeper cuttings to enable the extracted rock core to be oriented and the rock mass defect orientations measured.

The geotechnical investigation report will be required to provide the factual results of the investigation and comments / recommendations on:

- The expected subsurface conditions along the alignment;
- Excavatability of the encountered materials;
- Re-use of excavated materials for engineered fill;
- Appropriate batter angles for the various materials;
- Soil and rock slope instability risk mitigation measures;
- Embankment foundation conditions and preparation;
- Serviceability bearing pressures for bridge structures;

- Groundwater conditions; and
- Other geotechnical issues that may impact on construction time and cost.

6.2 Design Standards

6.2.1 Design Speed

The Brief requires a design speed of at least 80 km/hr. For the section of road west of Jerrabomberra Creek, the horizontal alignment provided by the client is adopted without alteration. For the section of road east of the Creek, a desirable minimum horizontal radius of 600 metres is adopted and the absolute maximum grade is 9%. The design was undertaken based on the requirements of the RTA Road Design Guide.

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6.2.2 Cross Section

The Brief requires the development of the design for a single carriageway road with a road reserve width sufficient to accommodate a four-lane dual carriageway road.

The adopted cross section for the single carriageway road is:

- Lane width: 3.5 metres;
- Shoulder width: 2.5 metres;
  - This is consistent with Austroads requirements for road speeds up to 100km/h;
- As discussed later in this section, a climbing lane is allowed for in one section of the single carriageway case.

The adopted cross section for the dual carriageway road is:

- Lane width: 3.5 metres;
- Outer shoulder width: 2.5 metres;
- Median width: 6 metres (including one metre median shoulders).

Fill and cut slopes:

- 2:1 where embankment heights are greater 2 metres;
- 4:1 where embankment heights are less than or equal to 2 metres;
- 2:1 cut slopes where cut depth is less than 5 metres;
- 1:1 cut slopes for bottom 5 metres of high cuts and provision for berms.

These assumptions have been made based on preliminary geotechnical advice and would need to be confirmed by further detailed investigations.

Typical cross sections are included in Appendix I.

6.2.3 Cycle Path

The horizontal and vertical geometry for the cycle path is based on Austroads Part 14 Bicycles:

- Design speed: 30 km/hr;

- Path width: 1.5 metres;
- Minimum radius: 15 metres;
- Maximum Grade: 5% - a grade steeper than the desirable maximum of 3% has been adopted due to the steepness of the terrain.

The typical cross section for the cycle path is included on the road cross section at Appendix I.

6.3 Road Design

6.3.1 Geometric Design

The road design was undertaken using MX design software. The horizontal alignment for Option 1B was developed by refining the initial alignments to achieve the desirable maximum grade of 9%.

The alignment selected minimises the impact on the heritage constraint (PAD) near Ch 6400 and avoids a heritage constraint to the south at the same chainage.

Because of the long length of maximum grade for the section from Jerrabomberra Creek to the ridge, provision is made in the design of the single carriageway case for a climbing lane for eastbound traffic. This is consistent with the warrant specified in Section 9 of the RTA Road Design Guide.

The geometric design is preliminary only and will require further refinement at later stages of design.

6.3.2 Cycle Path Design

The cycle path alignment was located to find a balance between the maximum permissible grade, the length of the path and the extent of earthworks. The steep terrain requires several ‘switchbacks’ to achieve a grade of 5%. The desirable maximum grade of 3% would have required a significantly longer length of travel and additional ‘switchbacks’.

The resultant design for the cycle path requires cyclists to travel for long distances on steep grade and in some locations along the road formation. As a result, many cyclists are likely to be discouraged from utilising the path as they may find it to be too steep for uphill travel and unsafe for downhill travel.

6.3.3 Future Second Carriageway

The excavation of cuttings for a second carriageway can be done initially or at the time of construction of the second carriageway, assumed to occur 10 years in the future. If the excavation is deferred, it will be done under traffic at a significantly higher cost rate. An assessment was made of the Net Present Value (NPV) of construction costs for both cases. It was found that at a discount rate of 7% the NPV of construction costs for both cases would be similar assuming the cost rate for the deferred construction (10 year deferral) is about three times the initial construction cost rate.

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6.3.4 Drainage

Culvert Crossings

A preliminary assessment was made of cross road drainage culverts for stream catchments intersected by the preferred alignment. An estimate of the required culvert sizes was made based on the Rational Method for a 100 year annual return interval rainfall event. The details of the culvert location and catchment areas are given in Table 3. Also shown are the adopted values for rainfall intensity. A conservative value of 0.9 was adopted for the coefficient of run-off.

Table 4 Culvert Design

Culvert Chainage	Catchment Area (ha)	Time of Concentration (mins)	Intensity (mm/hr)	Design Discharge (cumecs)	Proposed Culvert Size
600	43.9	30	79	8.68	1x1800 RCP
1300	124.2	39	66	20.51	3600x1500 RCBC
2100	42.6	17	109	11.62	1x2100 RCP
2500	9.2	14	121	2.79	1x1200 RCP
2850	15.5	9	151	5.84	3600x900 RCBC
3900	319.6	67	48	38.38	3600x2400 RCBC
4800	19.9	22	95	4.72	1x1500 RCP
5750	17.8	23	93	4.13	1x1350 RCP
7000	78.5	38	68	13.35	1x2100 RCP
7150	12.4	24	92	2.85	1x1200 RCP

Jerrabomberra Creek Crossing

The vertical alignment of the road crossing Jerrabomberra Creek indicates that a bridge structure is appropriate. No flood modelling has been undertaken as part of this study and therefore the bridge waterway requirements are not known. A 100 metre span bridge has been proposed for the Dunns Creek Road alignment, however, where Jerrabomberra Creek crosses Lanyon Drive several kilometres downstream, the bridge span is about 25 metres. This indicates that the 100 metre span bridge proposed is conservative.

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6.3.5 Intersections

Monaro Highway (at Isabella Drive)

The alignment of the approach to the existing intersection of Monaro Highway and Isabella Drive is constrained by the following ecological features:

- *Swainsona recta* and secondary grassland and remnant Box Gum woodland adjacent to the railway line; and
- Remnant Yellow Box Red Gum Grassy Woodland

A modification to the original alignment provided by QCC has been found that avoids or minimises the impact on these features and provides a satisfactory approach to the intersection.

The long-term arrangement for the intersection is shown in Southern Broadacre Planning Study (SMEC) as a grade-separated interchange. It is assumed that the extension of Isabella Drive will pass over the highway. The proposed grade line for Dunn's Creek Road allows for a possible road connection to Tralee Street in Hume to provide access to the southern part of Hume Industrial area.

Old Cooma Road

The intersection of Dunn's Creek Road with Old Cooma Road would be located about 800 metres north of Googong Road. This is sufficient separation to allow for the development of speed change lanes associated with both intersections.

6.3.6 Property Impact

Table 5 sets out the areas of properties that would need to be acquired based on the impact of alignment 1B. The areas listed are to the extents of the proposed road reserve boundary for dual carriageway construction including a 10 metre wide space between the limits of earthworks and the road reserve boundary. The area indicated is generally exclusive of the cycle path. Refer to road design drawings at Appendix I for details of extent of roadworks and the road reserve boundary.

Table 5 Dual Carriageway Road Impact on Properties

Owner	Lot No/DP	Map Ref.[1]	Property Impact (m^2)
Mr. Cornel & Mrs. Hiroe Swen	1/513432	6	0
Robin PTY LTD		Light Blue	95,693
Mr Mark Rodden & Ms Sharon Tein	11/565362	4	96,123
Rinker (Quarry)		Dark Blue	56,453
Village Building Company		Green	58,475
Mr Lawrence Heffernan	105/754881	7	21,272
Mrs Anne Forrest	148/754912	3	23,632

[1] Refer to Appendix G for property impact map.

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Owner	Lot No/DP	Map Ref.[1]	Property Impact (m^2)
Mrs Carolyn Larcombe	1/1000529	5	33,297
Tuggeranong Investments		Yellow	21,288
Mr John Forrest	3/1001136	2	24,351

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7. Cost Estimate

7.1 Qualifications

7.1.1 Cost Estimate

Indicative cost estimates are presented for the proposed roadworks. These are estimated construction costs based on variable quality contour information and give a general indication of construction costs only. They should therefore not be considered to be accurate. The estimates should be subject to further review when preliminary and detailed design investigations are undertaken.

A notional allowance of 50% has been applied to allow for contingencies and for the quality of the base data.

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7.1.2 Concept Design Limitations

No sub-surface investigations have been carried out during the study and therefore the nature of materials to be excavated is not known. Assumptions have been made about the depth of rock and typical sections established accordingly. For the purposes of the earthworks quantities, a depth to rock of 10m was assumed.

No flood studies have been carried out for Jerrabomberra Creek and therefore the span of the bridge across the creek has been conservatively assumed.

7.2 Exclusions

An estimate of cost for the Monaro Highway/Dunn's Creek Road interchange would require the completion of a concept design. This is beyond the agreed scope of works for this study and is not included in the cost estimate. The costs of the Old Cooma Rd intersection are included in the estimate.

7.3 Property Acquisition Costs

In accordance with the Brief, an estimate of property acquisition costs was based on available information for unimproved land value in the vicinity of the study area. The rate adopted for cost estimating purposes is $50,000 per hectare of unimproved land. The area of land take was based on the impact of a four lane dual carriageway road as described in Section 6.2.2 and as shown on the typical cross sections at Appendix I.

Table 6 Property Acquisition Cost Estimate

Owner	Lot No/DP	Estimated Acquisition Cost
Mr. Cornel & Mrs. Hiroe Swen	1/513432	-
Robin PTY LTD		$92,900
Mr Mark Rodden & Ms Sharon Tein	11/565362	$57,550
Rinker (Quarry)		-

Owner	Lot No/DP	Estimated Acquisition Cost
Village Building Company		$44,350
Mr Lawrence Heffernan	105/754881	$24,000
Mrs Anne Forrest	148/754912	$17,600
Mrs Carolyn Larcombe	1/1000529	$37,050
Tuggeranong Investments		$9,050
Mr John Forrest	3/1001136	$36,300
Total		**$318,800**

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7.4 Cost Estimate

An indicative cost estimate is presented in Table 7. The estimate is based on a concept design using approximate topographical information. At this concept design stage there is no subsurface geotechnical information available and therefore the cost rates for affected items may be subject to significant variation during subsequent stages of the project. For earthworks quantities, it is assumed that the average depth to hard rock is 10 metres. The earthworks cost is based on the single carriageway earthworks only.

Table 7 Cost Estimate - Option 1B

Item	Cost
Preliminaries	$400,000
Earthworks (Single c'way)	$21,000,000
Pavement	$4,000,000
Drainage	$2,000,000
Bridges	$6,000,000
Roadside Furniture (including Landscape and lighting)	$2,500,000
Line Marking And Signs	$200,000
Old Cooma Road Intersection	$500,000
Contingencies (50%)	$18,300,000
Sub-total Construction Costs	**$54,900,000**
Design and Contract Administration (10%)	$5,490,000
GST	$6,039,000
Total (incl GST)	**$66,429,000**

8. Conclusion

This study has investigated alignment options for Dunn's Creek Road between Monaro Highway and Old Cooma Road. The results of desktop studies of ecological, heritage and topographical constraints indicate that the preferred route for the alignment is in the northern portion of the corridor. This conclusion is subject to further detailed investigations beyond the scope of this study.

Of the two alignments considered in the northern section of the corridor, Option 1B has the lower impact on ecological and heritage constraints and has the lower earthworks and overall length.

The steepness of the terrain is a major issue in assessing the feasibility of the preferred alignment. Maximum allowable grades were applied to minimise earthworks. A 1.2 km section of the road east of Jerrabomberra Creek has a continuous grade of 9% and a climbing lane is recommended for the single carriageway construction.

The future carriageway will be more difficult and costly to construct under traffic. An assessment of the need for a second carriageway should be confirmed prior to construction to determine whether or not to construct the ultimate earthworks concurrently with the initial carriageway.

The grade on the off-road cycle path is generally on the maximum permissible grade of 5% and follows a circuitous route around the contours in some sections to achieve this grade. However, Austroads Part 14 Bicycles, states that a 5% gradient should be restricted to a length of approximately 110m with flat sections provided along the route. This was not able to be achieved due to the topography along the route, thus cyclists may find this path to be too steep for uphill travel and unsafe for downhill travel.

The estimated cost of construction is approximately $67 million and the estimated cost of property acquisition is $318,800.

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Appendix A

Cost Estimate

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Projectum Pty Ltd

DUNN'S CREEK ROAD

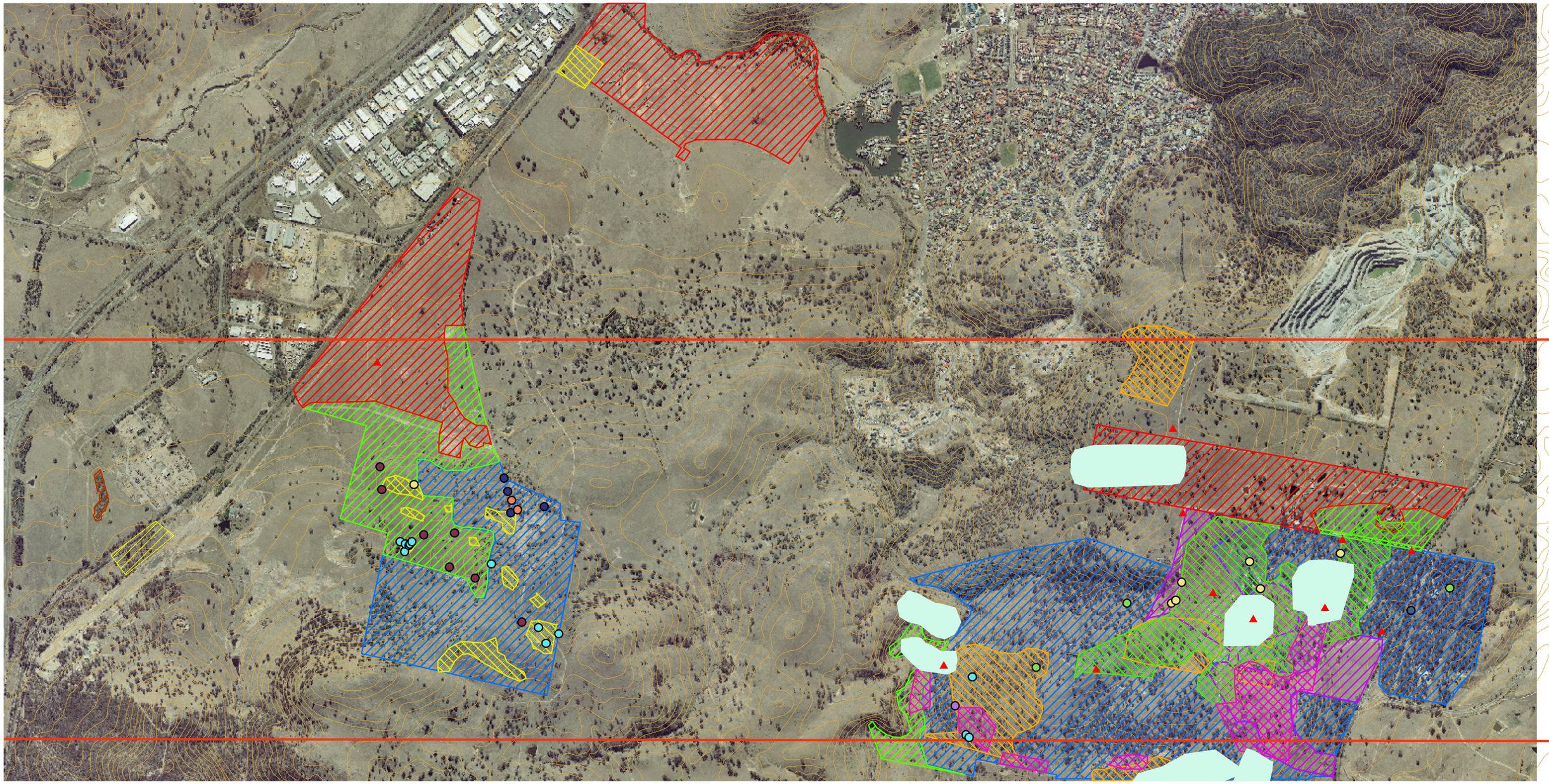
CONSTRUCTION COST ESTIMATE

			BASE ESTIMATE			RISK		BUDGET ESTIMATE	
Item	**Description**	**Unit**	**Quantity**	**Unit rate**	**Amount**				
	PRELIMINARIES								
P1	Site establishment	Item	1	94,238	94,238				
P2	Demolition	Item	1	24,717	24,717				
P3	Traffic management	Item	1	19,773	19,773				
P4	Erosion and sediment control	Item	1	123,274	123,274	50%	61,637	$	400,000.00
1.1	**EARTHWORKS**								
1.1	Topsoil stripping	m3	30,969.00	5.38	166,613				
1.2	Excavation in OTR	m3	789,952.00	10.01	7,907,420	33%	2,609,448		
1.3	Excavation in rock	m3	115,653.00	16.00	1,850,448	100%	1,850,448		
1.4	Embankments filling	m3	960,349.00	4.41	4,235,139	33%	1,397,596		
1.5	Cut-off drains, dental concrete	Item	1	258,226	258,226	50%	129,113	$	21,000,000.00
2.0	**SERVICES**	PSum	1	0	40,000			$	-
3.0	**DRAINAGE**								
3.1	Box Culvert 3600 x 900	m	25	5,097	127,435				
3.2	Box Culvert 3600 x 1500	m	48	5,751	276,048				
3.3	Box Culvert 3600 x 2400	m	65	5,801	377,038				
3.4	Pipe Culvert 1200 dia	m	82	1,116	91,531				
3.5	Pipe Culvert 1350 dia	m	50	1,352	67,599				
3.6	Pipe Culvert 1500 dia	m	133	1,471	195,666				
3.7	Pipe Culvert 1800 dia	m	36	1,675	60,316				
3.8	Pipe Culvert 2100 dia	m	93	2,312	215,015				
3.9	Erosion protection measures	Item	1	112,479	112,479				
4.0	Subsoil drainage	m	5,000.00	30.75	153,750			$	2,000,000.00
4.0.	**BRIDGES**								
4.1	Jerrabomberra Creek	m2	1,000.00	3,707	3,707,480				
4.2	Railway	m2	300	3,213	963,945			$	6,000,000.00
5.0	**PAVEMENT**								
5.1	Sealed surface	m2	70,200.00	9.39	659,178				
5.2	Base, subbase, subgrade trim	m2	93,600.00	22.83	2,136,888				
5.3	Cycle path pavements	m2	16,658.00	40.76	678,980	50%	339,490	$	4,000,000.00
6.0	**ROAD FURNITURE**								
6.1	Guard railing	m	7,200.00	154.48	1,112,256				
6.2	Guide posts	no.	320	46.96	15,027				
6.3	Road reserve fencing	m	15,600.00	19.16	298,896			$	2,500,000.00 (incl landscape)
7.0	**INTERSECTION UPGRADE**								
7.1	Old Cooma Road	PSum	1	0	500,000			$	500,000.00
8.0	**LINE MARKING AND SIGNS**								
8.1	Line marking	m	36,000.00	1.24	44,640				
8.2	Signage	PSum	1	0.00	50,000			$	200,000.00
9.0	**LANDSCAPING**								
9.1	Topsoiling	m2	160,000.00	1.69	270,400	50%	135,200		
9.2	Grassing and tree planting	m2	160,000.00	1.43	228,800	50%	114,400	$	-
	SUBTOTAL FOR PROJECT							$	36,600,000.00
10.0	**CONTINGENCY**	Item	1	0	0			$	18,300,000.00
	TOTAL FOR PROJECT							**$**	**54,900,000.00**

Appendix B

Existing Constraints

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Heritage

- Heritage

ThreatenedSpecies

- Aprasia
- Brown Tree-creeper
- Diamond Fire Tail
- Golden Sun Moth
- Hooded Robin
- Leucochrysum albicans tricolor
- Perunga Ochracae
- Swainsona sericea

Ecological Community

- Remnant Yellow Box Red Gum Grassy Woodland
- Swainsona recta Secondary grassland Remnant Box Gum Woodland
- HeritagePADs
- RockOutcrop
- GoldenSunMothPotentialHabitat
- GoldenSunMothHabitat
- ApraisiaHabitat
- NonNativeGrasslandAgriculture
- NativeGrassland
- NaturalTemperateNativeGrassland
- BoxWoodlandForest

1:20,000

0 250 500 750 1,000

Metres (at A3)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

LEGEND

- SiteBoundary
- Contour (10m interval)

Queanbeyan City Council
Dunn's Creek

Existing Constraints

Job Number	22-12266
Revision	A
Date	5 Dec 2007

Figure A1

G:\23\12266\CADD\GIS\ArcView\Wkspace\Ecological_Constraints.mxd

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Data source: Dept of Lands NSW: 2006, QCC: 2007, ACT Government: 2007, DEH: 2007. Created by: C Charalambou

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Appendix C

Ecological Report

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Dunns Creek Road Corridor Desktop – Ecological Constraints

The following material was reviewed to assess options for the Dunns Creek road alignment:

- A Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands, NSW NPWS 2002;
- Canberra Spatial Plan;
- National Recovery Plan for the Natural Temperate Grassland of the Southern Tablelands (NSW and ACT: An Endangered Ecological Community, Environment ACT, Canberra;
- Action Plan 27: ACT Lowland Woodland Conservation Strategy, Environment ACT
- DECC's wildlife atlas database records;
- DEW's EPBC Act Protected Matters Search Tool;
- Google Earth;
- O'Sullivan and Mueck (2003) Natural Heritage Assessment of 'Tralee', Queanbeyan, NSW. Biosis Research, Sydney;
- Thompson and Mullins (2004) Environmental Assessment - Googong Urban Investigation Area. Willana Associates, Wagga Wagga; and
- URS (2005) Final Report - Ecological Constraints for 'Tralee' Release Area. Prepared for Queanbeyan City Council, Queanbeyan.

Disclaimer:

This assessment is limited by its desktop nature. Mapped figures only indicate previously mapped or known constraints. Areas without mapped ecological assets may include further constraints. Field assessment is recommended once preferred options are refined.

Regional Ecological Values

The Dunn's Creek road corridor is on the edge of the Canberra/Queanbeyan and Royalla landscape units as outlined in the Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands (NPWS 2002). These landscape units contain substantial proportions of the remaining extents of Box-Gum Woodlands and Natural Temperate Grasslands. Several endangered species and ecological communities occur within Canberra/Queanbeyan landscape unit. The major planning issues for this unit, and relevant to this study, are urban developments that lead to clearing of Box-Gum Woodlands and the subsequent conflicts between urban expansion and nature conservation priorities. The Royalla landscape unit similarly contains areas of modified woodland and grasslands, which have been extensively cleared. Similar threatened species and ecological communities occur in this landscape unit, and the main planning issue with regard to this study is the pressure from planned rural subdivisions. At the regional scale, the study site provides an interface between two landscape units, with similar planning issues and conservation values.

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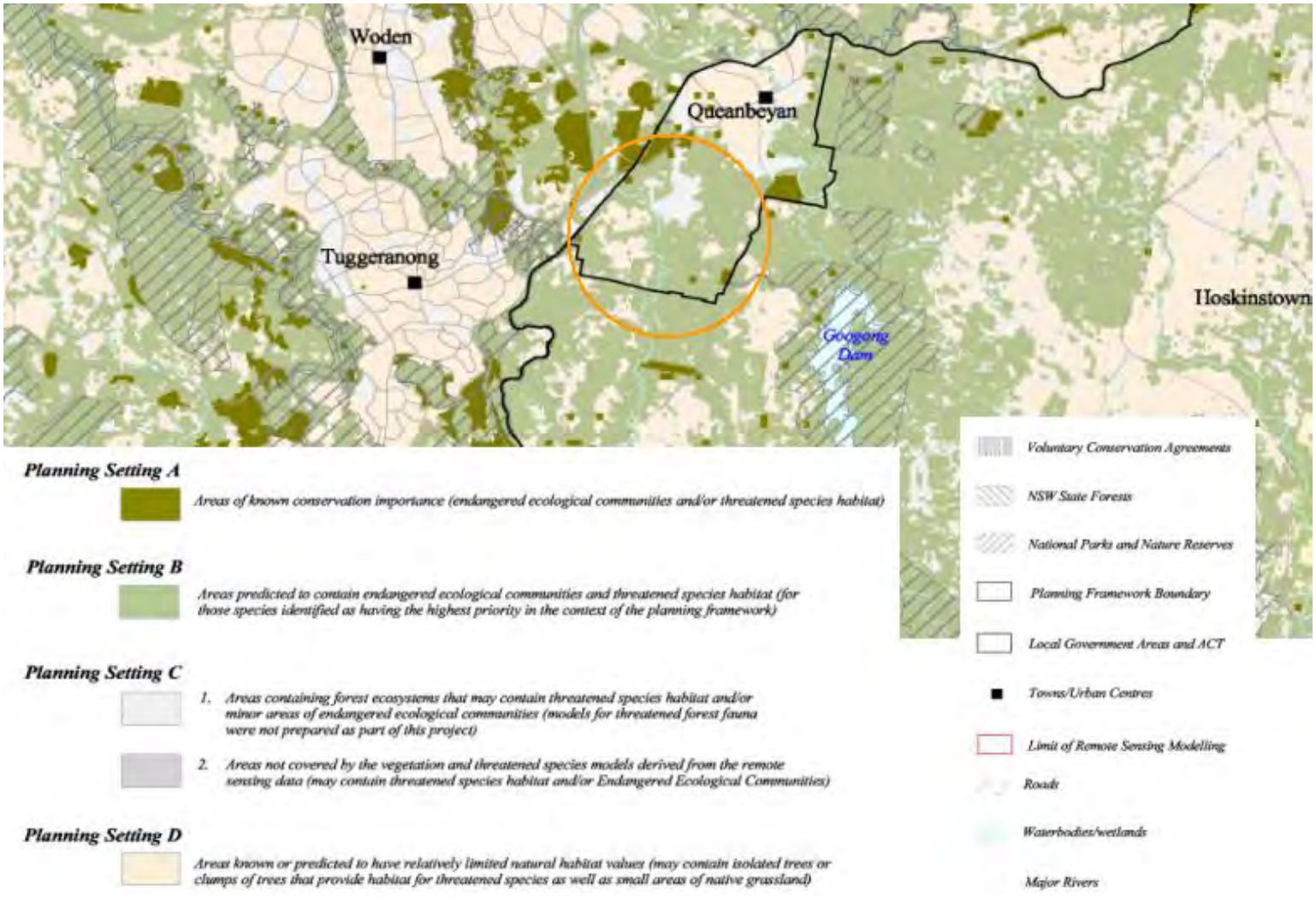


Figure B1 The Study Area Contains a Variety of Planning Settings from a Conservation Perspective

The planning framework (NPWS 2002) identifies areas of Planning Setting A, B and C1 in the study area (see Figure B1). The planning guidelines from the framework for each of these settings has been summarised in Table B1. These planning principles highlight the importance of maintaining corridor values across the area, and developing a footprint for use that maximises connectivity through rehabilitation and protection.

Table B1 Summary of Planning Settings Identified in the Study Area and their Suggested Planning Principles (from NPWS 2002)

Planning Setting (NPWS 2002)	Suggested Planning and Development Principles
Setting A	Areas important for conservation, which should be appropriately managed in cooperation with landowners or land managers. There should be minimal development if any. If any further land subdivision of development is to occur, it must proceed with extreme care and would require detailed scientific assessment. Management plans and conservation incentives should be encouraged.
Setting B	Areas important for conservation, which should be appropriately managed in cooperation with landowners and/or managers. There should be minimal development, land use change or site disturbance. Any further land subdivision or development that is to occur must only proceed with care and requires evaluation and scientific assessment. Management plans and conservation incentives should be encouraged. May be important for rehabilitation. Field checking is required to determine: (1) whether the site contains an EEC, (2), if so, what condition it is in, and (3) value of the site as habitat for threatened species.
Setting C1	Requires more adequate field survey before making development decisions. May have threatened species and contain important areas for rehabilitation to maintain connectivity and natural ecosystems. Development may be suitable, subject to criteria outlined for landscape units. Further fragmentation of natural ecosystems should be avoided, impacts on adjacent areas of conservation importance minimised and development designed to maintain and enhance biodiversity values.

The Canberra Spatial Plan similarly recognises the importance of this area with a 'key… wildlife corridor that will be protected under the Spatial Plan' entering the road corridor area in the west, and linking the local landscape with the Googong reservoir. The proposed east-west road should not interfere with this landscape link.

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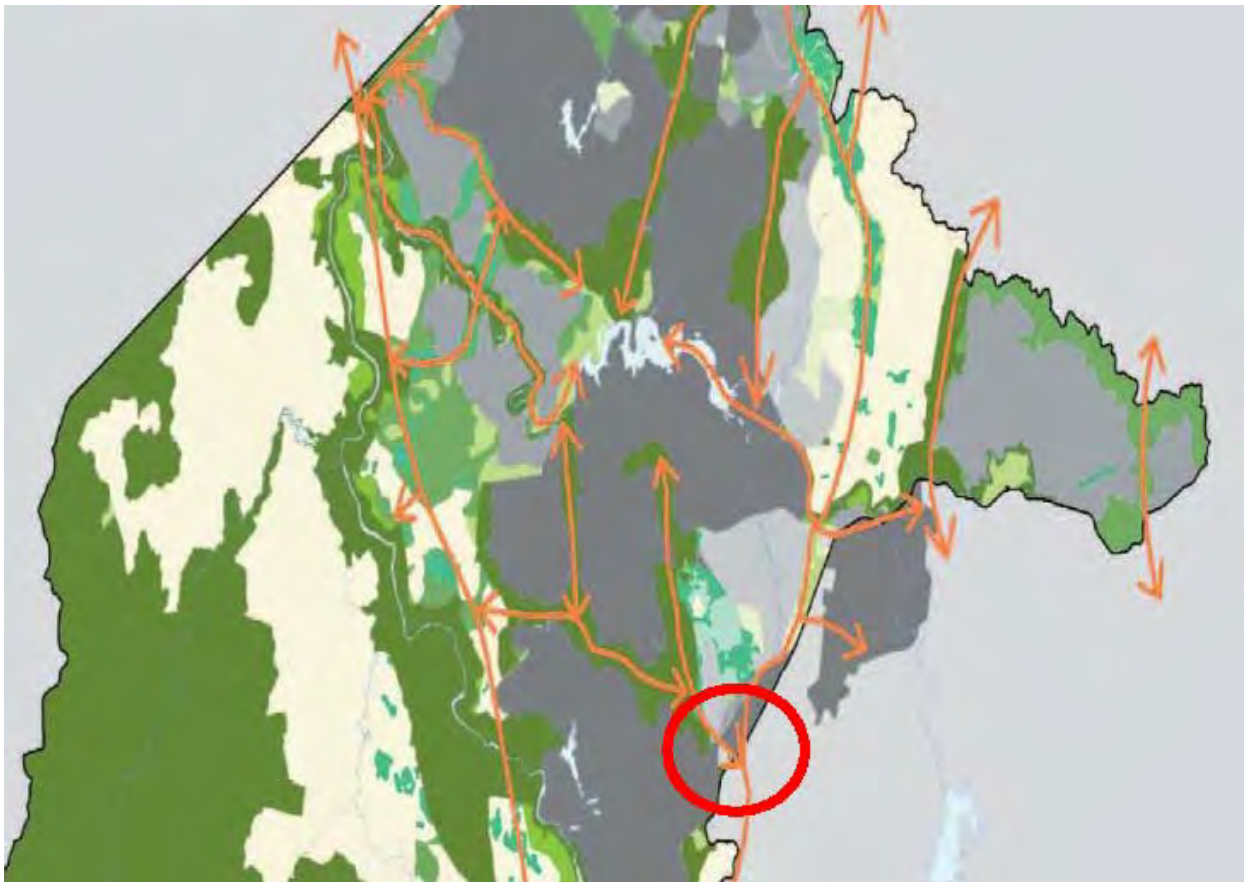


Figure B2 Biodiversity Corridor Map from the Canberra Spatial Plan, Identifying Biodiversity Corridors into the Study Area

Site-scale Ecological Constraints

The regional ecological value of the area is also represented at the site scale. The development of the road will be constrained by ecological values, whichever route is selected. Here, the discussion is separated into the 'western section' and the 'eastern section', the latter extending eastward from the point where several options are available. Information from various publications, outlined above, has been overlaid in Figure B3.

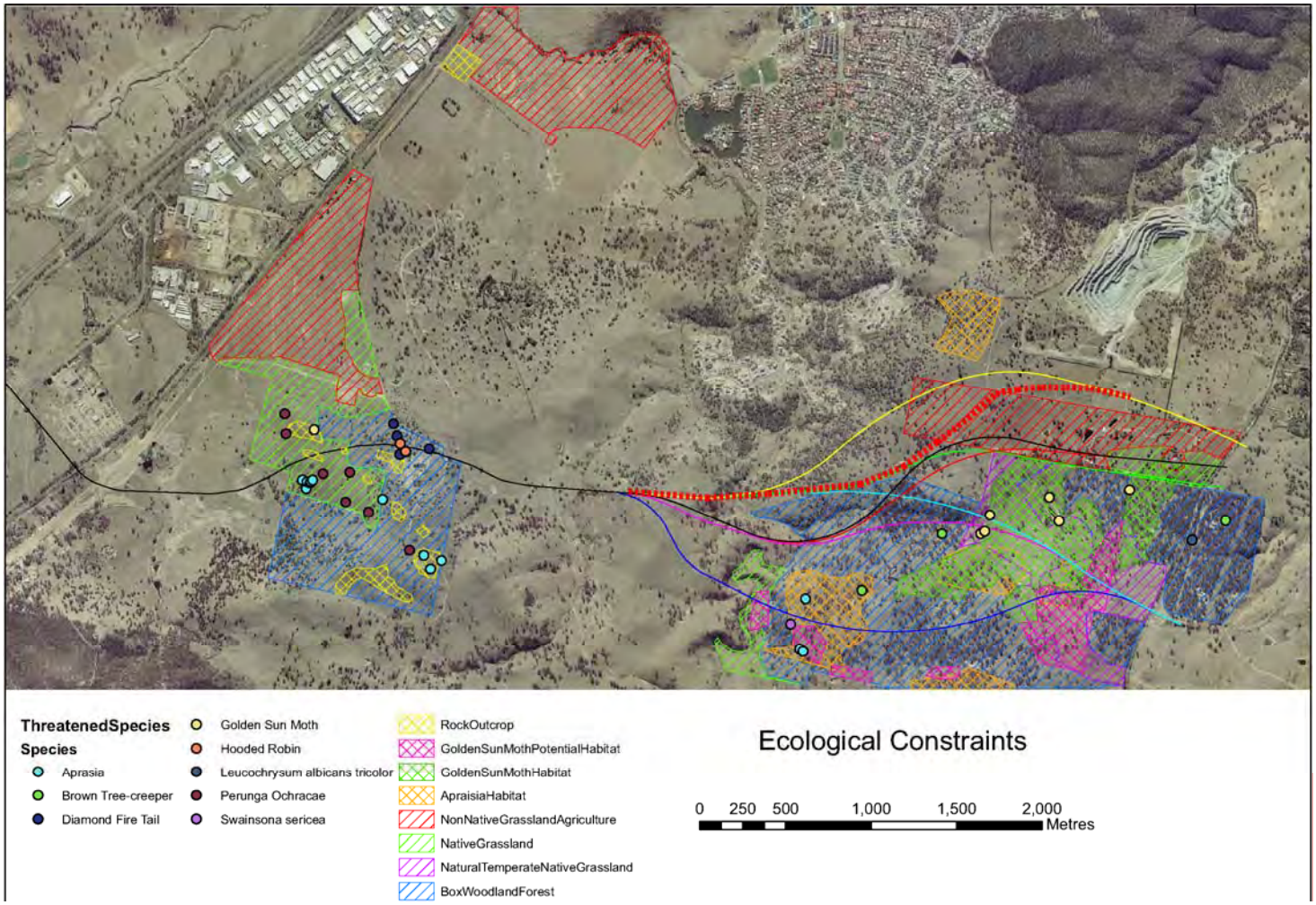


Figure B3 Known Ecological Constraints for the Dunns Creek Road Corridor

The western section of the road, for which no alignment options are being considered, intersects with known habitat for several State and Commonwealth threatened species or ecological communities. The western section of the road will interest with the following EPBC Act Protected Matters:

- Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory Endangered Community;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Community;
- Known habitat of the Critically Endangered Golden Sun Moth (*Synemon plana*);
- Known habitat of the Vulnerable Pink-tailed Worm-lizard (*Aprasia parapulchella*); and
- Potential habitat of other endangered grassland and woodland mosaic species including, Striped Legless Lizard, Grassland Earless Dragon, Hoary Sunray and Button Wrinklewort.

Regarding NSW State-listed threatened species, additional to the Commonwealth protected matters, the western section of the road will pass through known habitat for, at least:

- Diamond Firetail (*Stagonopleura guttata*); and
- Hooded Robin (*Melanodryas cucullata cucullata*).

Regarding the eastern end of Dunns Creek road, for which several options are presented, most options are as equally constrained as the western half of the road. A variation on the northern-most option (yellow) is the preferred route, with some changes at the west of this section, to more closely correspond with the beginning of the green route to avoid woodland habitat (see red dashed line on Figure B3). Regardless, this half of the road will also pass through Commonwealth protected White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (Critically Endangered Community). Each of the proposed options south of the yellow route, also passes through this community, but additionally interacts with other (Commonwealth and / or State) threatened species and endangered communities, similar to the western extent of the road, including:

- Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory Endangered Community;
- Known habitat of the Critically Endangered Golden Sun Moth (*Synemon plana*);
- Known habitat of the Vulnerable Pink-tailed Worm-lizard (*Aprasia parapulchella*);
- Known habitat of the Brown Tree Creeper (*Climacteris picumnus victoriae*); and
- Known locations of Silky Swainson-pea (*Swainsona sericea*).

Potential habitat of other endangered grassland and woodland mosaic species may also be present, including, Striped Legless Lizard, Grassland Earless Dragon, Hoary Sunray and Button Wrinklewort.

Once a preferred option has been selected, based on the variety of constraints, further habitat assessments should be undertaken to refine the route locally. However, it is unlikely that the project could proceed, on any alignment, without a Referral to the Commonwealth Minister for the Environment, and further detailed ecological assessment for both the Referral and to document species impacts under State legislation.

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Appendix D

Heritage Report

Archaeological and Heritage Assessment

Desktop Study

Proposed New Road – Dunns Road, Jerrabomberra, NSW

Charles Dearling

October 2007

Report to: GHD Canberra Pty Ltd
59 Cameron Avenue
BELCONNEN ACT 2617

CHARLES DEARLING ARCHAEOLOGICAL AND CULTURAL HERITAGE CONSULTANTS

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SUMMARY

Introduction

The Queanbeyan City Council in conjunction with the NSW RTA is investigating possible routes for a new road between the Monaro Highway in the ACT and Old Cooma Road in NSW. At this stage of the project the cultural heritage and archaeological assessment is a desktop study. As a route has not been finalized the study area is essentially a broad corridor between the two roads. The only route stipulation within the corridor was that the junction with the Monaro Highway was fixed.

The area under investigation is located at the southern end of the Jerrabomberra urban area at what is essentially the southern margins of Queanbeyan NSW. Within the ACT the area to the north of the route is occupied by the Hume Industrial Area. The final route options will need to cross two significant features in the landscape: the Queanbeyan-Cooma Railway Line, and Jerrabomberra Creek. The creek is the major stream in the study area.

Based on aerial photographs and various editions of maps the study area has been extensively exploited since European settlement. The uses have generally been confined to rural activities (ie farming/agriculture, and stock grazing).

This report documents the results of the above study, and includes:

- Outlines and discusses the significance of previous research carried out in the region and in the vicinity of Hume which is located within the southern Monaro Region.
- Presents a predictive model for various Aboriginal Site Types based on previous research in the region.
- Discusses the environmental background, previous research, survey methodology, surveys, and survey results for the study.
- Outlines Management issues for Aboriginal and European sites and culturally sensitive landscapes within the road corridor.

Archaeology of the Study Area

There have been at least three cultural or archaeological assessments carried out within the Dunns Creek Road corridor. These studies have resulted in a large number of Aboriginal (n=9) or European (n=7) cultural heritage sites being recorded. In addition a number of areas of Potential Archaeological Deposit (n=10) have been identified. The majority are at the western end of the study area near Old Cooma Road.

Generally the majority of these sites have a moderate to high cultural heritage significance rating on a local level.

Management Recommendations

Based on the known cultural heritage inventory of the study area there is essentially one management option. This is to avoid the main complex of Aboriginal and European archaeological sites and adopt a route confined to the southern part of the road corridor. It will however be necessary at a later stage to conduct further assessments of any route proposed. It is highly recommended that any route as much as possible, and considering other factors, should avoid the known sites.

Recommendations

Based on the results of the investigations carried out as part of this study and on the legislative obligations outlined in the relevant legislation it is recommended that:

- The route selected avoid as much as possible any previously recorded Aboriginal or European heritage sites, especially those with a high rating or which are complex sites.
- On cultural heritage grounds (both Aboriginal and European) the best route options are located towards the southern boundary of the Dunns Creek Road Corridor. The route can leave the roundabout on the Monaro Highway and terminate at, or to the south of, the roundabout at the junction of Old Cooma Road and Googong Road.
- Once the individual route options have been identified, as part of the final selection process, those routes should be subjected to archaeological investigation/survey. This includes within the areas that have already been surveyed.
- If the route will impact on any of the previously identified cultural heritage sites, including PADs further research in those areas will need to be conducted. This may include sub-surface investigations.
- Such surveys and investigations where they involve Aboriginal sites should be carried out in conjunction with representatives of the local Aboriginal community.
- At all stages during the process of final route selection the local Aboriginal community must be consulted and involved in the process.

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1. INTRODUCTION

The Project

The Queanbeyan City Council in conjunction with the NSW RTA is investigating possible routes for a new road between the Monaro Highway in the ACT and Old Cooma Road in NSW. At this stage of the project the cultural heritage and archaeological assessment is a desktop study. As a route has not been finalized the study area is essentially a broad corridor between the two roads (see Fig 1 and 2). The only route stipulation within the corridor was that the junction with the Monaro Highway was fixed.

The area under investigation is located at the southern end of the Jerrabomberra urban area at what is essentially the southern margins of Queanbeyan NSW. Within the ACT the area to the north of the route is occupied by the Hume Industrial Area (HIA). The final route options will need to cross two significant features in the landscape: the Queanbeyan-Cooma Railway Line, and Jerrabomberra Creek. The creek is the major stream in the study area.

Based on aerial photographs and various editions of maps the study area has been extensively exploited since European settlement. The uses have generally been confined to rural activities (ie farming/agriculture, and stock grazing).

As part of the planning for the project, a Desktop Cultural Heritage Study was commissioned by GHD on behalf of the QCC and NSW RTA to ascertain if there are any Aboriginal or European cultural heritage issues that may impinge on route selection. This report documents the results of the study, the aims of which were to:

- Carry out a desktop study aimed at identifying Aboriginal or European archaeological sites and associated features within or near the road corridor.
- Develop predictive models for Aboriginal sites and sensitive landscapes within the corridor (based on the results of previous research in the region);
- Assess the significance of any sites and features identified during the study; and
- Identify route options based on the location of known Aboriginal and European cultural heritage sites. And
- Identify management options for sites and sensitive areas based on present and predicted impacts.

Historical Setting

The historical back ground for the study area will not be explored in detail during the present study. A fairly comprehensive coverage can be found in two reports prepared in 2003 by Navin Officer Cultural Heritage Management Pty Ltd (Navin Officer 2003a; 2003b). European use of the area has been ongoing since the 1820s. Initially estates were established near Canberra, notably Robert Campbell's "Duntroon". The western section of the study area was part of a land grant made to John Palmer. During the early period of settlement grazing was the dominant industry. The adjacent eastern section appears to have been in the hands of Francis Mowatt.

From the late 1860s the larger holdings were generally broken up into smaller holdings as a result of the Robertson Land Acts of 1861. Generally the land taken up by the new settlers were the more marginal lands. By the end of the 19th Century the area had become one of a mix of small holdings held as either Conditional Purchases or Conditional Leases, or as rumps of the original large land grants from earlier in the Century.

The Report

This report documents the results of the above study, and includes:

- Outlines and discusses the significance of previous research carried out in the region and in the vicinity of Hume which is located within the southern Monaro Region.
- Presents a predictive model for various Aboriginal Site Types based on previous research in the region.
- Discusses the environmental background, previous research, survey methodology, surveys, and survey results for the study.
- Outlines Management issues for Aboriginal and European sites and culturally sensitive landscapes within the road corridor.

Figure 1: Map Showing study area and Aboriginal and European Cultural Heritage Sites.
(Base Maps Canberra and Tuggeranong 1:25K Topo)

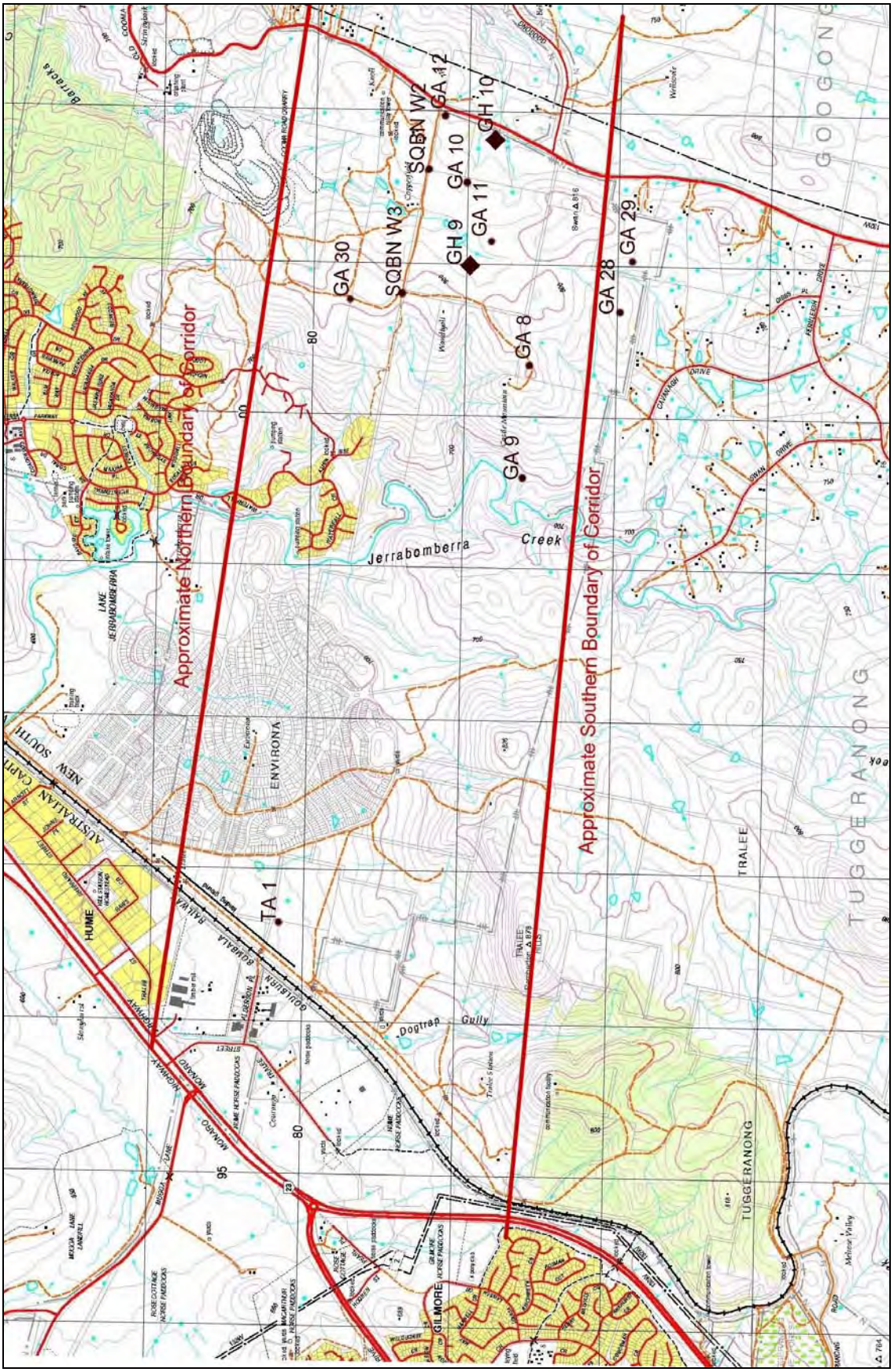


Figure 2: Aerial view of the study area showing road corridor (Source Google Earth).



2. ENVIRONMENTAL FACTORS

Introduction

The study area has been highly modified since European settlement began in the Canberra-Queanbeyan District in the 1830s. The area has been disturbed by various phases of land use including grazing and more recently urban development. Because of the disturbance caused to the soil deposits in the last 180 years it is assessed that much of the original soil layer has been removed or covered by introduced fill, with removal occurring as a result of either water or wind erosion.

Vegetation

The native woodland which once dominated the area has been generally cleared from within the Dunns Creek Road corridor. The area scattered woodland trees (eucalypts) scattered across the area. Where the native vegetation has been removed the land has been turned over to pasture. Its predominant use at present is for grazing and agistment of stock.

Disturbance

Based on the consultants knowledge of the area, and on the evidence contained in satellite and aerial images disturbance within the study area has been extensive. One of the major factors contributing to the disturbance is erosion. Evidence of the effects of erosion either prehistoric or historic was evident: such as the infilled terrace on the main drainage lines through the area. Areas that have been highly disturbed by heavy machinery operation are particularly susceptible to erosion. This is especially so near the Queanbeyan-Cooma Railway Line and on Tralee Station.

The area has been subjected to extensive grazing and other activities for up to at least 180 years. Disturbance within the study area has been caused by:

- Clearance of the native vegetation
- movement and grazing of stock;
- erosion, including sheet erosion and gullying;
- fence, road, utilities construction;
- Railway construction;
- Industrial area development;
- Urban development;
- Activities associated with the old Tralee Speedway; and
- Probable airfield construction.

Water Availability

The Jerrabomberra area is well drained with a large number of drainage lines eventually flowing into either Jerrabombera Creek or the Queanbeyan River which are the dominant streams in the district. The main ridge near the eastern end of the Dunns Creek Road corridor forms the divide between the two systems. Based on observation made along the Edwin Land Parkway easement water flow after heavy rain on both sides of the divide is substantial.

Since European settlement of not only the Canberra-Queanbeyan area, but the southern highlands as a whole, major changes in the form and characteristics of the rivers and streams in the region have occurred. Much of the change has been in the form of channel degradation (White 2000: 112). Explorers in the early 19th Century described the river channels in the Southern Highlands as being predominantly "chains of ponds" with intervening swamps

vegetated by native reeds. At that time the flood plains of these streams consisted of organic rich loam and clay loam overlying a variety of alluvial and colluvial deposits. According to White (2000:114), between 1850 and 1950 almost all the chains-of ponds reaches of the streams were transformed into continuous incised channels in which significant sediments were transported. Many of the rivers were transformed within a couple of decades of European settlement. The cause of increased runoff and modification of the river channels is attributed to the clearance of the native vegetation and the effects of over-grazing by introduced stock.

After rain the drainage lines that feed into Jerrabombera Creek and the Queanbeyan River and which pass through the study area will contain various quantities of water, both static and running. In prehistoric times it is not known how much of this water would have been available as standing water for Aboriginal people.

Conclusion

The area in and around the present study area may have been an ideal locality for Aboriginal people to exploit. Near permanent water may have been available. In addition it is considered that reliable food and other resources would have been available. Since European settlement severe disturbance of the area has occurred. It is assessed that this disturbance will have affected the survivability of Aboriginal cultural heritage material, especially insitu material, which may have been present in the area.

3. METHODOLOGY AND RESULTS OF HERITAGE SEARCHES

Study Methodology

A range of documentation was consulted during the study. The material was reviewed to ascertain the extent of known Aboriginal exploitation of the area and to ascertain the history and heritage significance of the study area and its surrounds. Resources consulted during the study included:

- Department of Environment and Heritage, including Register of the National Estate;
- National Library of Australia (NLA);
- ACT Heritage Unit;
- CHD - DECC;
- Various databases maintained by different organisations including the Land and Information Centre. Some of these sources were consulted via the Internet.

Also reviewed was a large corpus of information (reports and theses) that are within the consultant's collection, or were loaned by other archaeological consulting organisations, or were available from the ACT Heritage Unit and DECC.

Results of Searches

Register of National Estate

A number of items/places (n=40) in or near Hume, ACT and Queanbeyan, NSW are listed on the RNE. The majority of the items are within the Queanbeyan Area (n=39) which include both European Heritage Places and Natural Heritage places. No items of Aboriginal cultural heritage were identified. Of the 40 items, seven are shown as either being destroyed (n=2) or rejected for listing. The Heritage Places close to the Dunns Creek Road corridor are identified in Table 1.

Table 1: Places Listed on the RNE near the Dunn Creek Road Corridor

Site Name	Address	Status
Woden Homestead	Hume, ACT	Registered
Mt Jerrabombera Area (native woodland/grassland)	Jerrabombera, NSW	Registered
Poplars Rutidosis Site (native grassland/woodland)	Jerrabomberra, NSW	Registered
Tralee-Williamsdale Railway Swainsonia Sites (natural grassland communities)	Williamsdale, ACT/NSW	Registered

None of the items are within the present study area. None will be impacted by the proposed upgrade.

ACT Heritage Register

Under the terms of the ACT *Heritage Act 2004* the ACT Heritage Council is required to maintain a register of all Aboriginal and European heritage sites within the ACT. The Heritage Register is maintained by the ACT Heritage Unit, Territory and Municipal Services on behalf of the Council. The aim of the register is to "represent and protect the rich natural and cultural

heritage of the ACT, encompassing both Aboriginal and post European cultural values". Listing on the ACT Heritage Register means that the place or object is:

- of particular importance to the people of the ACT and enriches our understanding of history and identity;
- is legally protected under the Heritage Act 2004 including the application of Heritage Guidelines;
- requires advice by the ACT Heritage Council on development issues to improve conservation outcomes; and

A search of the register was carried out to ascertain if any places within or near Hume were identified on the ACT Heritage Register.

There are a number European Sites listed on the register close to Hume/Jerrabomberra. There are also a large number of minor European sites recorded in the area. The majority are in the corridor between the Monaro Highway and Jerrabomberra Creek north of Lanyon Drive. These minor items include: fence lines, farm machinery, building remains, vehicle remains, and quarries.

In addition there are a number of recorded Aboriginal sites within the ACT. These sites include scarred trees, open artefacts scatters (including Isolated Finds) and quarries

NSW Heritage Register/Inventory

Seven items/places in or near Hume, ACT and Queanbeyan, NSW are listed on the NSW State Heritage Register (SHR). The majority of the items are within the Queanbeyan Urban Area. Similarly a large number of items (n=30) were found on the NSW State Heritage Inventory (SHI). None are close to the present study area. None will be impacted by the proposed upgrade. Items are placed on the SHI if they are identified by Local or State Government agencies as having local or state heritage significance and which are under the control of those agencies. Such listings include Local Environment Plans and the RTA Heritage Register.

AHIMS Register Search

The Cultural Heritage Division, through its Aboriginal Heritage Information Management System (AHIMS), maintains a register of all recorded Aboriginal Sites within the state of New South Wales. A search of the register was requested to ascertain if any sites were known to be in the area of the road corridor, and to identify previously recorded sites in the surrounding area. The areas searched encompassed the 1:25k Topographical Map Sheets on which the study area is located:

- Tuggeranong 1:25k – Sheet 8727-III-S, 1st Edition.

The area requested to be searched generally encompassed an area approximately 10 km out from the study area boundaries. The search produced an incomplete listing of sites in the area. It was known that a number of recorded sites were located in areas in which none were identified. As a result a check was carried out with other consultants and a fuller picture of the extent of sites in the area obtained.

Details of various studies carried out in or near the Dunns Creek Road Corridor are explained in Section 4 or the report. In all these were close to 100 sites identified in the vicinity. Of these nine are within the corridor. The significance and management of these sites will be discussed in detail in later sections of the report.

4. PREVIOUS RESEARCH

Ethnohistory

Introduction

The most comprehensive ethnohistorical analysis and interpretation for the Southern Uplands have been conducted by Flood (1973, 1980). Other researchers including Bulbeck and Boot (1990) and Barber and Williams (1996) have used Flood's research for areas in or near the ACT.

"Tribal" Boundaries

Based on the evidence contained in the works of Tindale the area along the Murrumbidgee River within the ACT appears to have been occupied by up to three Aboriginal groups. The most northerly was the Ngun(n)awal who occupied the northern part of what is now the ACT. Based on Tindale's 1974 Map the southern boundary for the Ngun(n)awal is roughly along a line close to the Molonglo River.

It is highly probable that tribal boundaries, clan estates, and band ranges were fluid, varying over time. Consequently tribal boundaries as delineated today must be regarded as approximations only, and relative to the period of, or immediately before European contact (Syme 2005). As well the lines drawn on Tindale's Map are intended only as a guide to the boundaries he has identified.

South of the Ngun(n)awal were the Wolgal and Ngarigo People. The boundary between the Wolgal and Ngarigo people appears to have been close to, or may have been the Murrumbidgee River with the Wolgal being in the western side of the river. The Ngarigo appear to have occupied the southern Monaro reaching as far north as Queanbeyan. Again the boundaries on Tindale's Map are indicative of the areas occupied by a particular group.

Linguistically, the three groups spoke a language that Dixon (1980) classed as Ngarigo indicating that there was a common underlying link between the people of the southern tablelands and uplands. Bulbeck and Boot (1990) describe the language area as an Aboriginal socio-ecological area with common links including that of Bogong moth exploitation. Others (Knight pers comm) argue that the groups were sub-groups of the Wiradjuri.

Archaeology

Introduction

Since at least the 1970s extensive archaeological research has been carried out within the ACT and surrounding NSW. Much of this research has been initiated by various types of development: residential, rural residential, industrial, and infrastructure. As well a low level of academic research has also taken place. Following the ACT Bushfires of 2003 Environment ACT, the ACT Heritage Unit carried out extensive archaeological surveys of areas affected by the fires or which had been disturbed by the construction of fire containment lines. This later phase of research resulted in a huge number of Aboriginal sites being recorded within the ACT. The results surprised many including those taking part in the surveys. As one consultant archaeologist stated (Paton nd):

> "The results have been somewhat surprising for the archaeologist. … If one looks at the map … with sites plotted, you are left with the impression of Aboriginal occupation clustered in broad valleys, with more inaccessible, higher terrain only used occasionally. … (O)ccupation of a region is a matter of emphasis on different land systems and the uniqueness of adaptations."

Regional Level

Archaeological research has shown that Aboriginal people have occupied Australia for at least 40,000 years and possibly for as long as 60,000 years (Mulvaney and Kamminga 1999: 2). By 35,000 years ago all major environmental zones in Australia, including the periglacial areas of Tasmania, were occupied (Mulvaney and Kamminga 1999: 114). Occupation of south-eastern Australia by Aboriginal people during the Late Pleistocene has been confirmed by radio carbon dating carried out at a number of sites (eg Boot 1996; Bowdler 1970; Lampert 1971, Ossa et. al 1995). Based on dating evidence from at least three locations relatively close to or in the Canberra-Queanbeyan area it could safely be assumed that occupation of the area dates to at least the late Pleistocene. The three locations and their occupation dates are: Birrigai Rockshelter in the ACT dated to between 21,000 and 3,000 years BP (Flood et al); Wombeyan Caves dated to about 10,000 years BP (Navin Officer 2003b); and Bulee Brook and Bob's Cave in the South Coast Hinterland dated to between 10,000 and 12,000 years BP (Boot 1994).

During the early period of Aboriginal occupation of Australia, the climate was moderate. However, between 25,000 and 12,000 years BP (a period known as the Last Glacial Maximum (LGM)) dry and either intensely hot or intensely cold temperatures (depending on the geographical region) prevailed over most of the Australian continent (Mulvaney and Kamminga 1999:114). During the LGM the mean monthly temperatures on land were between 6 to 10^{o} Celsius lower than present. South eastern Australia experienced cold, windy, and dry conditions all of which acted to change the vegetation structure from forest to dry grassy plains and /or shrub lands (Mulvaney and Kamminga 1999: 115-116).

At the end of the glacial conditions, temperatures rose, not only in Australia but throughout much of the world. The warmer conditions resulted in the huge ice masses of the northern hemisphere melting and causing a worldwide rise in sea levels. The melting of the ice sheets took several thousand years to complete. There were fluctuations in the rate of melt dictated by short periods of reversion to cooler temperatures. During the Late Pleistocene, that is before approximately 10,000 years BP, the sea level was as much as 130m below its present level. This resulted in many of the embayments along the coast, including Sydney Harbour being inland riverine valleys.

By about 6000 years BP world sea levels had more of less stabilised to their current position. There were some minor fluctuations after that stabilisation, especially at around 4,000 years BP. With the changes in climate during the last 10,000 years, a period known as the Holocene, Aboriginal people had to deal with a reduced landmass (especially along the coastal fringe), changing vegetation patterns, and changing hydrological systems. Forests again inhabited the grass and shrub lands present at the time of the Late Glacial Maximum.

The majority of recorded sites located in south-eastern Australia date from the mid to late Holocene (Dibden 2004).

Research in the Jerrabomberra Area

In 1984 Lewis (1984) surveyed the proposed 'Jerrabomberra Park' housing estate. Lewis' study area is located near the present study area. The development area included a section of Jerrabomberra Creek and its tributaries. Two open campsites were recorded. Lewis (1985) also surveyed the proposed Eastern Parkway in the ACT. The survey located one artefact scatter 50m east of Jerrabomberra Creek. The scatter contained twenty three artefacts and was associated with the exploitation of fine-grained siliceous stones occurring naturally at the site.

Ballard (1986) located an isolated find during a survey near Mt. Jerrabomberra.

Access Archaeology (1992) surveyed approximately 260ha along the western side of Jerrabomberra Creek beside the proposed Eastern Parkway. Three isolated finds were recorded.

A survey of a proposed Aquatic Facility near Symonston included land on both sides of Jerrabomberra Creek (Klaver 1997). Three open artefact scatters, six isolated finds and a quarry site were recorded. All of the sites were located on slopes away from the creek.

A reconnaissance level vehicular survey of the South Queanbeyan Development Area east of Jerrabomberra located four low density artefact scatters and one isolated find (Saunders 2001b). Raw materials were metamorphosed tuff, quartz, silcrete, volcanic and chert. Three of the sites were located on ridge crests and two were on low gradient basal slopes near a drainage line. Areas of high archaeological potential were identified along the eastern bank of Jerrabomberra Creek. Saunders (2003b) also surveyed a 6.5ha rural block immediately east of suburban Jerrabomberra. No sites were located.

A number of surveys have been conducted in the Hume Industrial area in the ACT. In 1994 Walshe surveyed the Hume Industrial Estate located on the Jerrabomberra Creek floodplain. No Aboriginal sites were located. Kuskie (1995) surveyed 10ha of gentle slopes on Block 6, Section 22. Again no sites were found. Avery (1997) located a possible Aboriginal scarred tree during a survey in Hume.

In 2000, Barber completed a comprehensive archaeological assessment of an 800ha area covering Hume and adjacent areas in the Tuggeranong and Jerrabomberra districts of the ACT. Nineteen Aboriginal sites were recorded. Sites comprised two scarred trees, eight small low density open artefact scatters and ten isolated finds. The study area and all sites are on the opposite side of the Monaro Highway from Hume. Based on topography, Barber (2000) also identified 17 archaeologically sensitive areas, consisting of gently sloping spurs or low rises near drainage lines. He concluded that small artefact scatters and isolated finds are the Aboriginal site types most likely to occur in the Hume area.

Navin Officer (2001) investigated the Mugga Resource Recovery Centre on Block 10 Section 23, Hume. Three previously recorded artefact scatters were re-assessed. The sites contained from three to seven artefacts and were associated with areas of low to moderate archaeological potential (Navin Officer 2001:19-21).

Saunders (2001c) surveyed the area of archaeological sensitivity identified by Barber (2000) on Block 7 Section 21, Hume, as part of a feasibility study for a gas-fired power station. The area was assessed as having low archaeological potential.

Navin Officer (2003) surveyed two proposed residential development areas totalling 229ha at 'Tralee' in NSW immediately south Hume. Part of the southern section of Navin Officer's study area lies within the Dunns Creek Road corridor. A low density scatter of two stone flakes was located in a low gradient simple slope/valley floor context within the proposed southern development area. A program of archaeological test pitting was recommended if the area is to be disturbed by development. The small site is within the corridor. It is assessed that the findings of Navin Officer will have a bearing on the location of the route selected and on further research in the area.

North of Lanyon Drive Navin Officer (2004a, 2004b, and 2005) carried out a number of archaeological surveys and sub-surface testing. The projects were associated with the proposed ACT Prison ('Alexander Maconochie Centre') and the ACT ESB Headquarters and Joint Emergency Services Training Academy. During the surveys and sub-surface testing – no Aboriginal cultural heritage material was recorded or recovered. Navin Officer carried out a small area survey just off Mugga Lane north of the Land Fill site. The study area was within the old Mugga Lane Zoo. 10 artefacts were recorded eroding from a well used vehicle track.

More recently in 2007 Dearling (2007a, 2007b) carried out an archaeological assessment for the proposed Lanyon Drive Upgrade and the proposed Edwin Land Parkway. The first study area

was located on the western side of the existing Lanyon Road and extended from the Monaro Highway in the ACT to Tompsitt Drive in NSW. During the study no Aboriginal cultural heritage material was found. The area was considered too highly disturbed to be able to identify is such material had been present. However three items of European Heritage were found: all associated with a previous alignment of Lanyon Road (Drive). Along the Edwin Land Parkway road reserve five Aboriginal sites were identified. All consisted of a low number of artefacts (n=1 to 8 artefacts) and all had a low density of artefacts.

The Edwin Land Parkway lies about 3 to 4 km north of the present study area and the route more or less parallels the proposed Dunns Creek Road. Both routes cross the same ridge line. In addition the later road crosses Jerrabomberra Creek.

Of immediate importance to the present study was one carried out by Navin Officer in 2003 in the Googong area. That study area straddled Old Cooma Road with the portion on the western side of Old Cooma Road lying within the Dunns Creek Road corridor. The project was carried out on behalf of the Queanbeyan City Council and Yarrowlumla Shire Council who were investigating a proposal to rezone rural land at Googong for a new residential development. The total area under investigation comprised approximately 1000 ha. Prior to the study eighteen previously recorded Aboriginal sites were known to be in the area (Navin Officer 2003). During the field surveys associated with the project 34 Aboriginal sites (identified as GA1 – GA34) were identified in the Googong LES area. In addition 24 areas of potential archaeological deposit (PAD) were identified. The sites located within the Dunns Creek Road corridor are shown on Fig 1.

5. ABORIGINAL SITE LOCATION MODELS

Proposed Exploitation/Site Location Model

Based on previous research in the Jerrabomberra District it is possible to propose a site location model for the region. The generally accepted model of Aboriginal exploitation of the region includes:

- The most common site type expected in the area will be those associated with stone artefacts, that is open artefact scatters and isolated finds. The majority of such sites will tend to be small both spatially, in the number of artefacts, and have a low artefact density.
- Along ridges/spurs sites will be located on relatively flat areas on crests of knolls, in saddles, or on shoulders or benches in mid to upper slope contexts. Such sites would tend to be small in spatial size and in the number of artefacts present.
- Close to major streams more complex sites could be expected. These sites would tend to be larger spatially, in the number of artefacts, and also have a higher density of artefacts. The focus of these sites would be on the relatively level areas close to the streams such as on foot/basal slopes and terraces.
- It is of note that within the Jerrabomberra area there is generally a lack of sites identified close to Jerrabomberra Creek. This phenomena has been commented on during discussions between archaeologist, and between archaeologists and representatives of the Aboriginal community.
- Site size and frequency decreases further away from water.

Site Types

Based on previous research in the surrounding region it can be expected that a number of site types may be found within the study area. The presence of a certain type of site will be dependent on a suitable environment being present. The types of sites that can be expected are outlined below.

Artefact Scatters. It is anticipated that Open Artefact Scatters will be the most common site type within the study area. These sites have been variously described as camping sites, stopping places, and tool maintenance and manufacturing sites. Irrespective of how they were formed they represent evidence of Aboriginal people discarding artefacts made predominantly from stone. It is generally accepted that larger and more complex sites are locations where major stone working took place, and may also be important stopping or camping places. Artefact Scatters may contain not only stone artefacts, but if conditions are suitable, bone material as well. Artefact Scatters may also be associated with other site types such as middens (on riverine and swamp margins) and rockshelters, and can vary in size and in the number and density of artefacts.

Isolated Finds. Isolated finds are generally identified as a single Aboriginal artefact with no association with any other archaeological evidence. As with artefact scatters isolated finds are likely to be found anywhere in the landscape. Although having no analytical value on their own, when used as part of a regional assemblage isolated finds can add to our knowledge of prehistoric Aboriginal use of the region. The definition of what constitutes an isolated find has generally been seen as a single artefact at a certain distance from another archaeological manifestation. The distance has varied with 50 metres, 60 metres, or 100 metres being used. During the present study an isolated find is defined as an artefact that has no apparent association with any other archaeological material. For example if two artefacts are located 90 metres apart

but are within the same geographical or topographical location (eg a saddle, or on the crest of a knoll) they are considered to be in association. Isolated finds are seen as either a random discard/loss of an item, or more commonly as an indication of the possibility that other cultural heritage material will be present.

Burial Sites. Burial sites are normally found in areas with soft easily dug deposits such as sand bodies. Another locality where burials may be found is in niches within rockshelters, and other suitable fissures in other rock outcrops. The survival of remains is dependent on a suitable environment being present. It is believed that the highly disturbed nature of the present study area would preclude the finding of burials.

Rockshelters with/without Archaeological Deposit. Rockshelters (or caves) occur where suitable rock outcrops are present. The presence or absence of surface artefacts determines the decision of whether a shelter has or has not archaeological deposit. If the shelter has some deposit within it, but no artefacts it is generally referred to as have Potential Archaeological Deposit. Rockshelters also may or may not have art sites within them. Based on the geology of the present study area it is highly unlikely for rockshelter sites to be located in the study area boundaries.

Art Sites (Pecked and Pigment). Art sites are rare, but present, within the Canberra-Queanbeyan region. The sites will be found where a suitable surface is present for such artwork to be carried out. Pigment art sites consist of varied images painted on the rock surface using pigments of various colours and materials. Pecked art is carried out by removal of the outer surface of rock to form an image, or motif. The pecked art sites can be found on either horizontal or vertical surfaces. Such sites will be highly unlikely to be found in the present study area.

Quarries/Stone Procurement Sites. Quarries are locations at which Aboriginal people obtained the stone raw materials required to manufacture tools and other pieces of equipment. These sites occur only where suitable rock outcrops occur, and can be represented by pebble beds in streams. It is possible that such sites will be present in the study area.

Grinding Groove Sites. These sites are places where some form of grinding was carried out. Such grinding may have been associated with the sharpening of ground edge axes, sharpening of spears, food preparation etc. Again they are normally only found in areas where suitable rock outcrops. Grinding groove sites are normally found on, but not necessarily restricted to, sandstone slab outcrops. Portable grinding slabs are possible in the study area.

Other Site Types. Other sites that may be expected in the region include scarred trees, freshwater middens, ceremonial sites (commonly referred to as Bora Rings), stone arrangements, and carved trees. The survival of these site types can have been compromised by past European land use practices. The presence of such sites can be reinforced by the presence of features such as major rock outcrops that may have had some social or "religious" significance (cf Knight 2001). These types of site are not expected to be present within the study area.

Aboriginal Scarred Trees/Carved Trees.

Aboriginal scarred trees are the result of the removal of bark or timber by Aboriginal people. Carved trees are the result of motifs being carved into trees following the removal of bark, and are normally associated with ceremonial grounds and burials. The identification of Aboriginal carved trees is much easier than that for Aboriginal scarred trees. Trees can have their bark removed by several processes other than by Aboriginal people. These processes include the removal in historical times by European settlers and land managers, and include removal of the bark for use in slab huts and temporary shelters. Natural phenomena that result in scars on trees include: branches falling off and stripping bark; lightning strike; damage from other trees falling;

animal disturbance of the bark; fires; and insect attack. Because of the problems in identifying with certainty if a tree is of Aboriginal origin or not the following criteria are used to assess the tree (cf Irish 2004):

- Aboriginal scars do not normally extend to the ground.
- If the scar does extend to the ground, to be identified as of Aboriginal origin the sides of the scar need to be parallel, or relatively parallel.
- Sides of scar are either parallel or concave, and symmetrical.
- Scar should be regular in outline and with regular regrowth.
- The ends of the scars should have a definite shape – pointed, rounded or squared off.
- If the scar has axe or adze marks it is considered as being of human origin. There is a difference between the marks made by an Aboriginal stone axe and a European steel axe. In the later the cuts are much sharper and more clearly defined. If a steel axe was used it does not discount an Aboriginal origin.
- The tree must be considered old enough to have been modified by Aboriginal people. Generally an age of about 150 years is considered appropriate.
- The tree must be endemic to the region. This excludes historic plantings.

Despite the presence of any or all of the above features it is possible that a scar is of natural origin. It is left to the person recording the tree to determine if it is of Aboriginal origin or not. To assist in the identification, several different categories are used to describe Aboriginal scars. These are:

- **Definite Aboriginal Scar** – conforms to all above criteria and can be supported by other information such as carvings, historical association, and definite adze marks.
- **Aboriginal Scar** – It is considered most likely that the scar is of Aboriginal origin.
- **Probable Aboriginal Scar** – It is considered that the scar is most likely of Aboriginal origin, but other causes cannot be easily discounted.
- **Possible Aboriginal Scar** – The scar has some or all of the above criteria but it is more likely that the tree was caused by natural phenomena.

Determining the Age of Scars. It is the consultant's experience that a reliable indicator of the age of a scar on a tree is the depth of regrowth of the bark. This regrowth can also be referred to as the lateral growth of the bark covering. Based on limited research in southern NSW and the ACT it would appear that for a scar to be old enough to be of Aboriginal origin the depth of regrowth would need to be at least 220 mm and possibly as high as 240 mm. The consultant has carried out limited research using scars of a known date - that is surveyor's marks on trees, to determine the figure. The model appears to hold for all environments investigated so far.

6. KNOWN CULTURAL HERITAGE OF STUDY AREA

Introduction

As discussed earlier there have been at least three cultural or archaeological assessments carried out within the Dunns Creek Road corridor. These studies have resulted in a large number of Aboriginal or European cultural heritage sites being recorded. The majority are at the western end of the study area near Old Cooma Road. For ease of discussion the study area has been divided into two section s, with the dividing line between the two being Jerrabomberra Creek.

Aboriginal Cultural Heritage Sites

Western Section. On the western side of Jerrabomberra Creek there is only one identified Aboriginal site. The site, TA 1, was recorded by survey teams from Navin Officer Heritage Consultants Pty Ltd (2003a). The site is a small low density artefact scatter consisting of two stone flakes which were located in a low gradient valley floor context. The site is within the southern section of the Tralee Development Area. Navin Officer recommended a program of archaeological test pitting if the area is to be disturbed by development. In addition to the single artefact scatter Navin Officer also recorded an area of Potential Archaeological Deposit (PAD) along the margins of Jerrabomberra Creek. The PAD is outside the Dunns Creek Road Corridor lying about 2 km to the north east.

Eastern Section. By far the largest number and concentration of Aboriginal archaeological sites is in the eastern section between Jerrabomberra Creek and Old Cooma Road (see Table 2 for details). This area was extensively surveyed by Navin Officer (2003b)(see Fig ?). Smaller archaeological surveys had previously been conducted over part of the area (Lewis 1984) during investigations for a proposed development at Jerrabomberra Park. Between them these surveys have resulted in eight Aboriginal cultural heritage sites being recorded. In addition Navin Officer (2003b) recorded nine PADs. Of these, four were considered important enough for them to remain undisturbed by development. If not then all nine PADs will need to be further investigated.

Table 2: Aboriginal Cultural Heritage Sites within Road Corridor

Site Name	Recorder	Location	Site Type/Number of Artefacts
SQBN W2	Lewis 1984		
SQBN W3	Lewis 1984		
TA 1	Navin Officer 2003a	696478 6080035	OS (n=2)
GA 8	Navin Officer 2003b	GDA 0700358 6078572	IF
GA 9	Navin Officer 2003b	GDA 0699599 6078580	IF
GA 10	Navin Officer 2003b	GDA 0701410 6078988	OS (n=12+)
GA 11	Navin Officer 2003b	GDA 0701211 6078745	OS (n=3)
GA 12	Navin Officer 2003b	GDA 07019828 6079086	OS (n=3)
GA 30	Navin Officer 2003b	GDA 0703163 6079013	OS (n=3)

European Cultural Heritage Sites

Western Section. At the time of writing there have been few European heritage sites recorded on the western side of Jerrabomberra Creek. In the Tralee study area Navin Officer (2003b) recorded nine European sites. Of these four lie within the Dunns Creek Road corridor (see Table 3). The remaining five lie outside the northern boundary. If a suitable route option is selected only one site the old Tralee Landing Ground (Site H9) will be impacted. Based on observations, either from visits to the area or overhead imagery, the landing ground appears to be highly disturbed.

Eastern Section. Within the eastern section of the Dunns Creek corridor three European heritage sites have been recorded (see Table 3). Of these three site, GH 8 and GH 9 appear to be the most important.

Table 3: Aboriginal Cultural Heritage Sites within Road Corridor

Site Name	Recorder	Location	Site Type/
H6	Navin Officer 2003a		Tralee Homestead Complex
H7	Navin Officer 2003a		Tralee Woolshed
H8	Navin Officer 2003a		Sheep Dip
H9	Navin Officer 2003a		Tralee Landing Ground
GH 8	Navin Officer 2003b	GDA 0701227.6079259	Hearth and Platform Portion 99
GH 9	Navin Officer 2003b	GDA 0701056.6078780	'Copperfields' Portion 99
GH 10	Navin Officer 2003b	GDA 0701814. 6078911	Tractor (Travelling Stock Reserve 27)

Potential Archaeological Deposits

During their archaeological surveys of both Tralee (Navin Officer 2003a) and Googong (Navin Officer 2003b) Development areas Navin Officer recorded a number of areas identified as PADs. A PAD is an area that has no cultural heritage material recorded in it but it is likely for that material to be there. These areas were selected based on the Aboriginal site location models for the Jerrabomberra area and on the researcher's experience. In all cases Navin Officer (2003a; 2003b) recommended further investigations (ie sub-surface investigations) prior to any development work in the area. Within the eastern section they identified four that were considered important enough (PADs 3, 4, 6, and 7) that they should be avoided. The PADs recorded in the road corridor are outlined in Table 4.

Within Table 4 are three PADs that are outside the Dunns Creek Road corridor. They are included for a number of reasons, including:

- They are close to the boundaries of the corridor (GPAD 23 and 24)
- They are considered relevant to discussion (especially PAD 1 at Tralee).

Prior to any development work taking place in any of the PAD areas it has been recommended by the various report authors that further investigation should take place. This is especially so for the four mentioned above (PADs 3, 4, 6, and 7).

Analysis of the survey routes examined by Navin Officer (2003b) during their work in the Googong Development Area indicates that the surveyors inspected the margins of Jerrabomberra

Creek. It is noteworthy that along the southern part of the creek (within the corridor) that no PADs were identified. This is considered an important point as the Navin Officer teams are generally experienced. That no PADs were recorded in the area, but were elsewhere along the creek (GPAD1 and 2, PAD 1 Tralee) suggests that the area is too disturbed or the terrain unsuitable for habitation. Based on image analysis the slopes are fairly steep in the area. It is suggested that this section of the creek, based on archaeological constraints, is the best option for Dunns Creek Road to cross Jerrabomberra Creek. Such a route can be selected to avoid all areas considered to potentially have cultural heritage material present.

Table 4: PADs within Road Corridor

Site Name	Recorder	Location	Recorders Recommendations
GPAD 1	Navin Officer 2003b	GDA 0699500.6078650	Further Investigations if disturbed
GPAD 2	Navin Officer 2003b	GDA 0699500.6078900	Further Investigations if disturbed
GPAD 3	Navin Officer 2003b	GDA 0700500.6079550	Avoid Development if Possible
GPAD 4	Navin Officer 2003b	GDA 0700825.6079400	Avoid Development if Possible
GPAD 5	Navin Officer 2003b	GDA 0701200. 6078750	Further Investigations if disturbed
GPAD 6	Navin Officer 2003b	GDA 0701400.6079150	Avoid Development if Possible
GPAD 7	Navin Officer 2003b	GDA 0701675.6078650	Avoid Development if Possible
GPAD 23	Navin Officer 2003b	GDA 0701075.6076850	Further Investigations if disturbed
GPAD 24	Navin Officer 2003b	GDA 07007506078000	Further Investigations if disturbed
PAD 1 (Tralee)	Navin Officer 2003a	697835 6081200	Further Investigations if disturbed

7. SIGNIFICANCE ASSESSMENT

Introduction

The *Burra Charter of Australia* defines cultural significance as the "… aesthetic, historic, scientific, or social value for past present and future generations (Marquis-Kyle and Walker 1992:69)." Generally the cultural significance of Aboriginal sites is assessed using the following criteria:

- its significance to contemporary Aboriginal people
- its scientific (or archaeological) value (including representativeness);
- aesthetic value;
- historic value; and
- education value;

Determining Aboriginal Significance

Many areas will be significant according to several of the above category. Despite this Aboriginal open campsites are generally only assessed based on their significance to contemporary Aboriginal people; and their scientific value. It has been found that Aboriginal communities value the cultural heritage material found during surveys. Most see such material as a link with the past, a link with their ancestors. The level of significance placed on the Aboriginal sites recorded during the present study is an issue for the local Aboriginal communities to determine. The Aboriginal significance of the sites within the Dunns Creek Road Corridor has not been identified as such action is outside the scope of the present study. Prior to any construction activity the Aboriginal significance will need to be determined through consultation and discussion with representatives of the local Aboriginal community.

Determining Archaeological Significance – Aboriginal Sites

There are two criteria generally used in assessing the scientific significance of artefact scatters: firstly the potential of a site or place to provide information which is of value in the scientific analysis of potential research questions. This is generally seen as being in sites that are relatively undisturbed with *insitu* archaeological material and that are still in good condition. The second criterion is the representativeness of a place. Representativeness is the measure of the degree a place is characteristic of its type, content or location. A place may also be significant under this criterion if it is rare or provides a good example of such a place.

When assessing the Archaeological Significance of an Aboriginal place or site, that assessment is normally carried out at three levels: local, regional, and state. A site can be deemed to have high local significance, but low regional and state significance.

Archaeological Significance Assessment – Aboriginal Sites within Study Area

The level of archaeological significance for the Aboriginal sites within the Dunns Creek Road Corridor is that which has been determined by the recorder or the site. The individual assessments are outlined in Table 5. The present writer does not necessarily endorse the assessed significance levels.

Based on the level of disturbance within the study area the Archaeological Significance Assessment of the known Aboriginal archaeological sites and cultural heritage material has been generally assessed across the entire range from Low to High on a local level, and Low to

moderate on a regional level. It should be said however that the type of artefacts and the type of sites recorded during the study are common throughout not only the Canberra-Queanbeyan area but NSW and Australia. The artefacts types and raw materials used are typical of those found in the region. It is the consultants opinion that the main value that the sites have is when used at a regional level to determine the level of Aboriginal exploitation. That the artefacts and sites have been recorded fulfils this role. None of the sites has any archaeological significance at a state level.

Table 5: Archaeological Significance Level of Aboriginal Sites Recorded known to be in the Dunns Creek Road Corridor

Site Name	Site Type	Regional Significance	Local Significance
TA 1	OS	Low	Low
GA 8	IF	Low	Low to Moderate
GA 9	IF (with PAD)	Low to Moderate	Low to Moderate
GA 10	OS	Moderate to High	High
GA 11	OS	Moderate	Moderate to High
GA 12	OS	Low	Moderate
GA 30	OS	Low	Low to Moderate
SQBN W2	OS	Low	Moderate
SQBN W3	OS (with PAD)	Moderate	moderate-high

Archaeological Significance Assessment – European Sites within Study Area

The heritage significance of European Heritage sites is outlined in Table 6. As with the Aboriginal sites the significance is that which has been placed on the item by the recorders of the sites. It is important to note that the three sites recorded by Navin Officer (2003b) in the Googong Development Area have moderate to high or high rating on a local level. The level of significance placed on the three items is explained by Navin Officer (2003b:98) .

> "In the case of site complexes … this assessment applies to the site as a whole, individual features of the site may in some cases have higher or lower significance than that of the complex. … (s)ite complexes may be of particular significance since they have the potential to convey more comprehensive interpretive value."

(The significance level for the items in Tralee is still being sought).

Table 6: Archaeological Significance Level of European Sites Recorded known to be in the Dunns Creek Road Corridor

Site Name	Site Type	State Significance	Local Significance
GH 8	Hearth and Platform Portion 99	Low to Moderate	Moderate to High
GH 9	'Copperfields' Portion 99	Moderate	High
GH 10	Tractor (Travelling Stock Reserve 27)	Low to Moderate	Moderate to High
H6	Tralee Homestead Complex	Not Known	Not Known
H7	Tralee Woolshed	Not Known	Not Known
H8	Sheep Dip	Not Known	Not Known
H9	Tralee Landing Ground	Not Known	Not Known

9. LEGISLATIVE OBLIGATIONS

Introduction

At the State level Aboriginal cultural heritage is specifically afforded legislative protection in New South Wales under the following legislation:

- *National Parks and Wildlife Act (1974) (As Amended)*; and
- *Environmental Planning and Assessment Act 1979*.

National Parks and Wildlife Act

In NSW Aboriginal cultural heritage is afforded legislative protection under Part 6 of the National Parks & Wildlife Act. The Act makes provision for the protection of Aboriginal *relics* throughout NSW and allows for the responsible Minister to declare places of special significance with respect to Aboriginal culture to be an *Aboriginal place* for the purpose of the Act.

Under Section 90 it is an offence to knowingly destroy, deface or damage a *relic* or Aboriginal place without having first obtained the consent of the Director General of the NSW DEC. Section 90 is applicable to all Aboriginal *relics* across NSW regardless of land tenure.

Environmental Planning and Assessment Act

Indirect protection of Aboriginal heritage is afforded by the *Environmental Planning and Assessment Act 1979* through a requirement to consider the potential environmental impacts, including impacts upon Aboriginal heritage, of certain activities including construction and development activities.

Whilst this protection is associated with specific activities rather than more general or blanket protections. It does result in the consideration of potential impacts upon Aboriginal heritage through the requirement for impact assessment. Aboriginal heritage places and values identified during this assessment process can then be more readily managed under the provisions of the *National Parks & Wildlife Act*.

10. CONCLUSIONS

Conclusions

Despite the high levels of disturbance across the Dunns Road Corridor significant cultural heritage material and sites, both Aboriginal and European are present. The level of cultural heritage significance placed on these places and items varies. In the main they have a fairly high rating on a local level. In addition to the sites a number of PADs have been recorded in the area. All, as with the vast majority of Aboriginal sites, are located on the eastern side of Jerrabomberra Creek. Of these it has been recommended that four be avoided during development of the area. These four PADS are assessed has having potential archaeological significance. It has also been recommended that if these areas are to be disturbed, then they, as with the other PADs, should have further investigation, including sub-surface investigations carried out.

Based on the results of the present study, and the data collected from previous studies in or near the Dunns Creek Road Corridor, it is possible to identify, not a preferred route, but a narrower corridor. This corridor is identified in an effort to avoid interference with a large number of cultural heritage sites, both Aboriginal and European.

Essentially the "narrower" corridor occupies the southern part of the larger corridor. The route can leave the Monaro Highway at the roundabout as indicated and takes a southerly route before connecting with Old Cooma Road (see Fig 3) joining that road at or to the south of the roundabout at Googong Road.

Management Options

Based on the known cultural heritage inventory of the study area there is essentially one management option. This is to avoid the main complex of Aboriginal and European archaeological sites and adopt a route confined to the southern part of the road corridor. It will however be necessary at a later stage to conduct further assessments of any route proposed. It is highly recommended that any route as much as possible, and considering other factors, should avoid the known sites (see Fig 3).

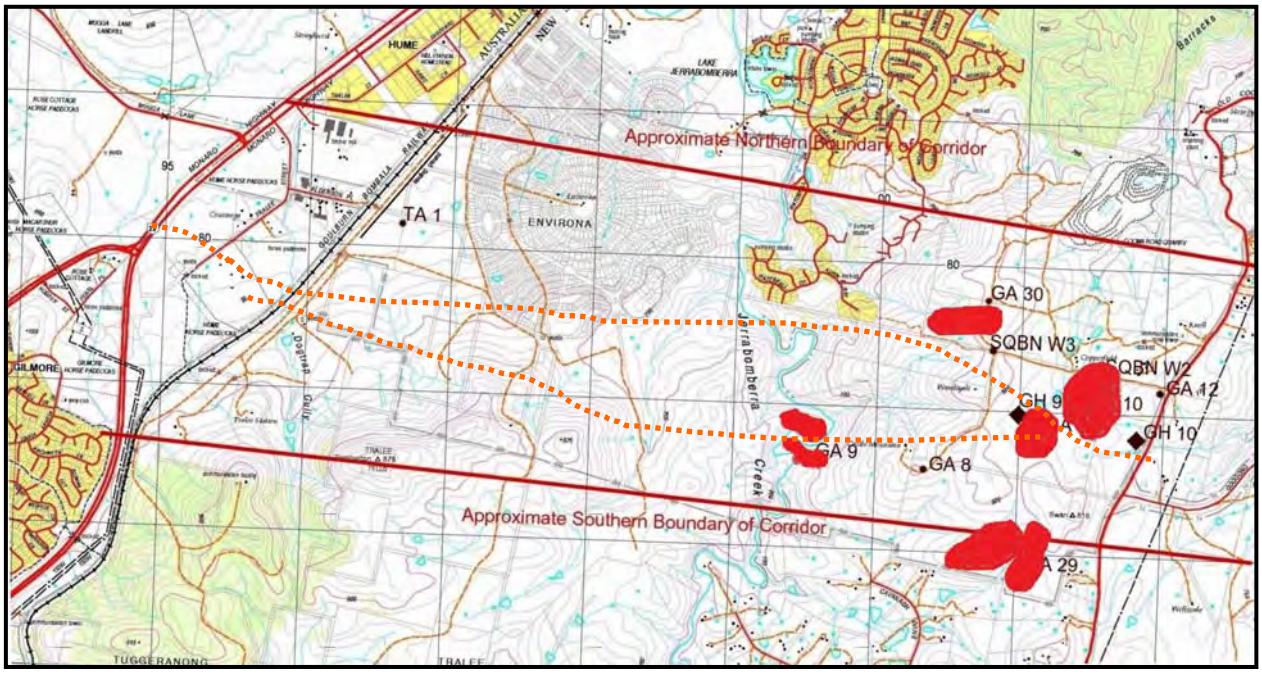


Fig 3: Preferred (approximate) road alignments. The routes (orange dotted lines) have been selected to avoid known Aboriginal and European cultural heritage sites and areas of PAD (red patches).

Recommendations

Based on the results of the investigations carried out as part of this study and on the legislative obligations outlined in the relevant legislation it is recommended that:

- The route selected avoid as much as possible any previously recorded Aboriginal or European heritage sites, especially those with a high rating or which are complex sites.
- On cultural heritage grounds (both Aboriginal and European) the best route options are located towards the southern boundary of the Dunns Creek Road Corridor. The route can leave the roundabout on the Monaro Highway and terminate at, or to the south of, the junction of Old Cooma Road and Googong Road.
- Alternate northern route options be considered only if the southern route options are unsuitable on other grounds such as ecological, geological, and topographical constraints.
- Once the individual route options have been identified, as part of the final selection process, those routes should be subjected to archaeological investigation/survey. This includes within the areas that have already been surveyed.
- If the route will impact on any of the previously identified cultural heritage sites, including PADs further research in those areas will need to be conducted. This may include sub-surface investigations.
- Such surveys and investigations where they involve Aboriginal sites should be carried out in conjunction with representatives of the local Aboriginal community.
- At all stages during the process of final route selection the local Aboriginal community must be consulted and involved in the process.

Copies of this report should be sent to:

Senior Aboriginal Heritage Officer
South Branch, Environment Protection and Regulation Division
Department of Environment and Climate Change (NSW)
PO Box 2115
QUEANBEYAN NSW 2650

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