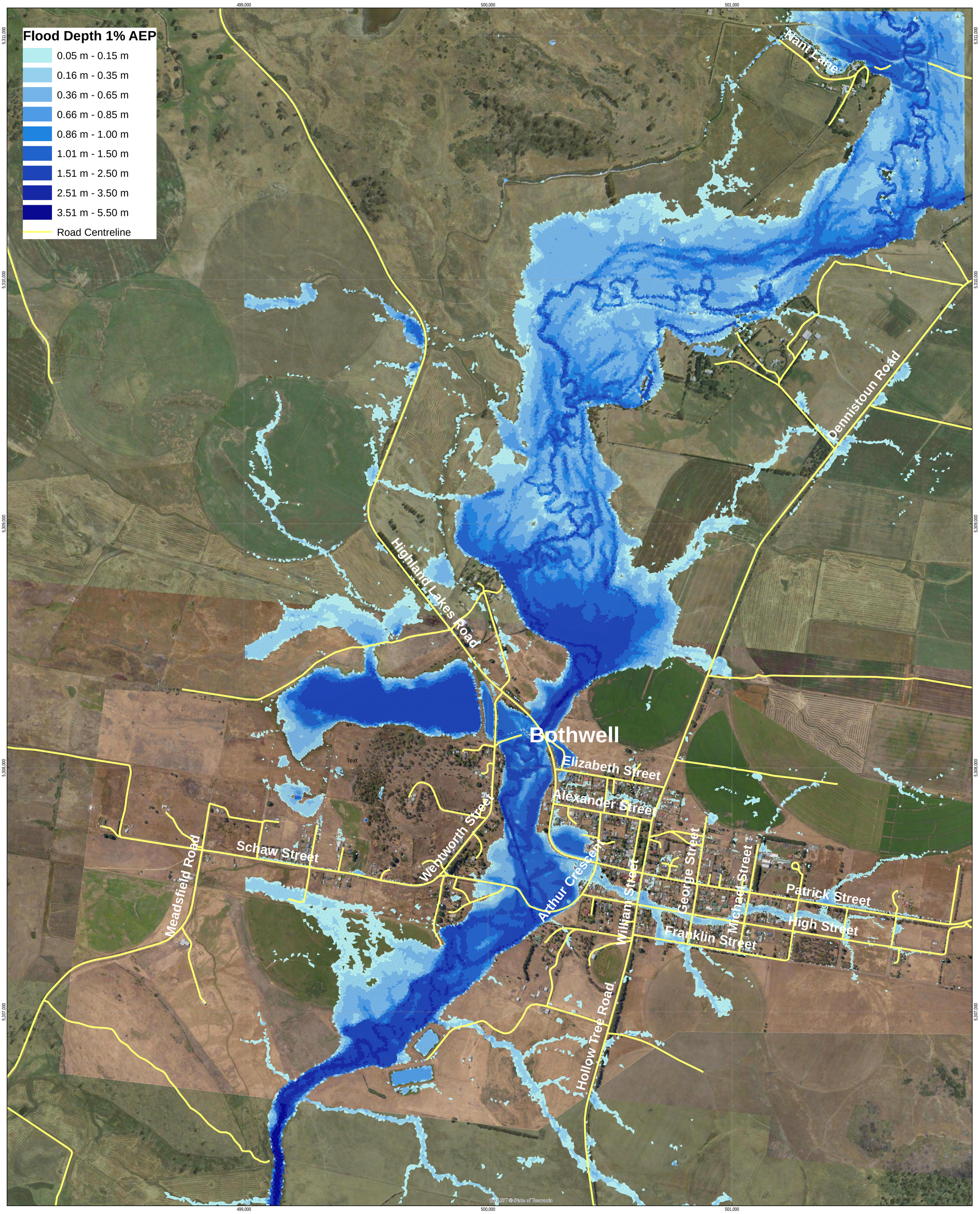
Appendix A

Flood Depth Maps 1% and 5% AEP- Project Area, Bothwell, Nant Lane



Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 1% AEP

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 1

C:\Users\EKISEL~1\AppData\Local\Temp\arcC43D\12571871_001_Clyde_A1_1pct_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

Flood Depth 5% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline

499,000 500,000 501,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Avant Lane
Dennistoun Road
Highland Lakes Road
Bothwell
Elizabeth Street
Alexander Street
Wentworth Street
Arthur Crescent
William Street
George Street
Michael Street
Patrick Street
High Street
Franklin Street
Schaw Street
Meadsfield Road
Hollow Tree Road
Text

the LIST © State of Tasmania

Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 5% AEP

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 2

C:\Users\EKISEL~1\AppData\Local\Temp\arc4C07\12571871_002_Clyde_A1_5pct_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

Paper Size A1

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Bothwell Flood Map 1% AEP

Job Number	12571871
Revision	0
Date	09 Mar 2023

Figure 4

C:\Users\EKISEL~1\AppData\Local\Temp\arc1C4A\Bothwell_Map_A1_Willow_removal_2yr.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

499,000 500,000 501,000

5,309,000 5,308,000 5,307,000

Highland Lakes Road
Wentworth Street
Adelaide Street
Barrack Street
Elizabeth Street
Alexander Street
Dennistoun Road
Queen Street
Market Place
George Street
Keeling Road
Schaw Street
Logan Street
Arthur Crescent
William Street
Michael Street
Mary Street
Patrick Street
High Street
Franklin Street
Hollow Tree Road

DRAFT

Flood Depth 5% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline
- Property Boundary

Paper Size A1

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mapping Study

Bothwell Flood Map 5% AEP

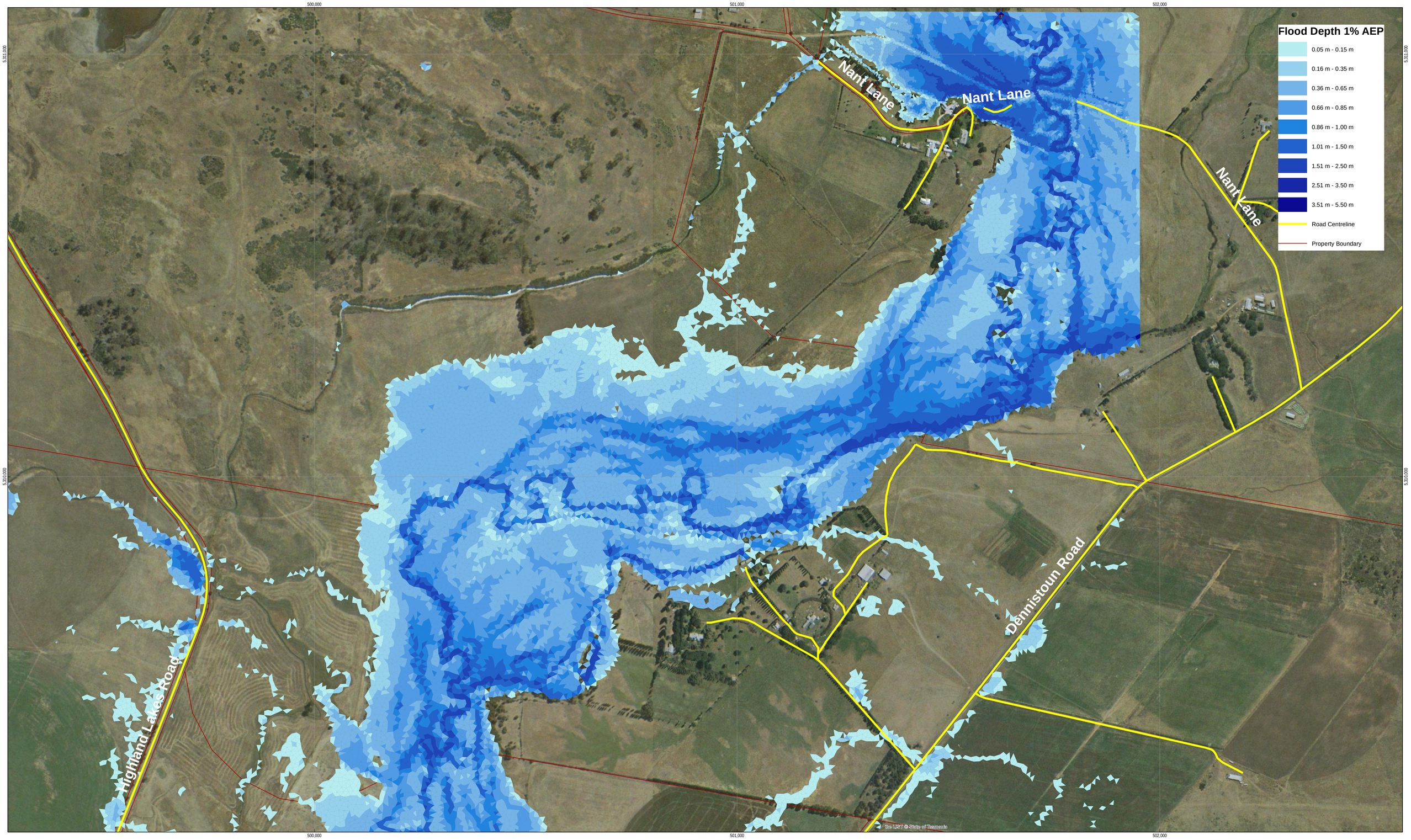
Job Number	12571871
Revision	0
Date	09 Mar 2023

Figure 5

C:\Users\EKISEL~1\AppData\Local\Temp\arcCE4\12571871_005_Bothwell_A1_5pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com



Paper Size A1

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council

River Clyde Flood Mappring Study

Nant Lane Flood Map 1% AEP

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 7

C:\Users\EKISEL~1\AppData\Local\Temp\arc3969\12571871_007_Nant_L_A1_1pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

500,000
501,000
502,000
5,311,000
5,310,000

Nant Lane
Nant Lane
Nant Lane
Dennistoun Road
Highland Lakes Road

Flood Depth 5% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline
- Property Boundary

Paper Size A1

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Nant Lane Flood Map 5% AEP

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 8

C:\Users\EKISEL~1\AppData\Local\Temp\arc85A4\12571871_008_Nant_L_A1_5pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Appendix B

Flood Depth Map 1% and 5% AEP – Sensetivity Test

Flood Depth 5% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline

499,000 500,000 501,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Avant Lane
Dennistoun Road
Highland Lakes Road
Bothwell
Elizabeth Street
Alexander Street
Wentworth Street
Arthur Crescent
William Street
George Street
Michael Street
Patrick Street
High Street
Franklin Street
Schaw Street
Meadsfield Road
Hollow Tree Road
P
F
A
EMP
S
Text

the LIST © State of Tasmania

Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 5% AEP Surface Roughness Increase

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 12

C:\Users\EKISEL~1\AppData\Local\Temp\arc7918\12571871_012_Clyde_Roughness_+20_A1_5pct_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

Flood Depth 5% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline

499,000 500,000 501,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Grant Lane
Dennistoun Road
Highland Lakes Road
Bothwell
Text
Elizabeth Street
Alexander Street
Wentworth Street
Arthur Crescent
William Street
George Street
Michael Street
Patrick Street
High Street
Franklin Street
Schaw Street
Meadsfield Road
Hollow Tree Road

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Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 5% AEP Surface Roughness Decrease

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 13

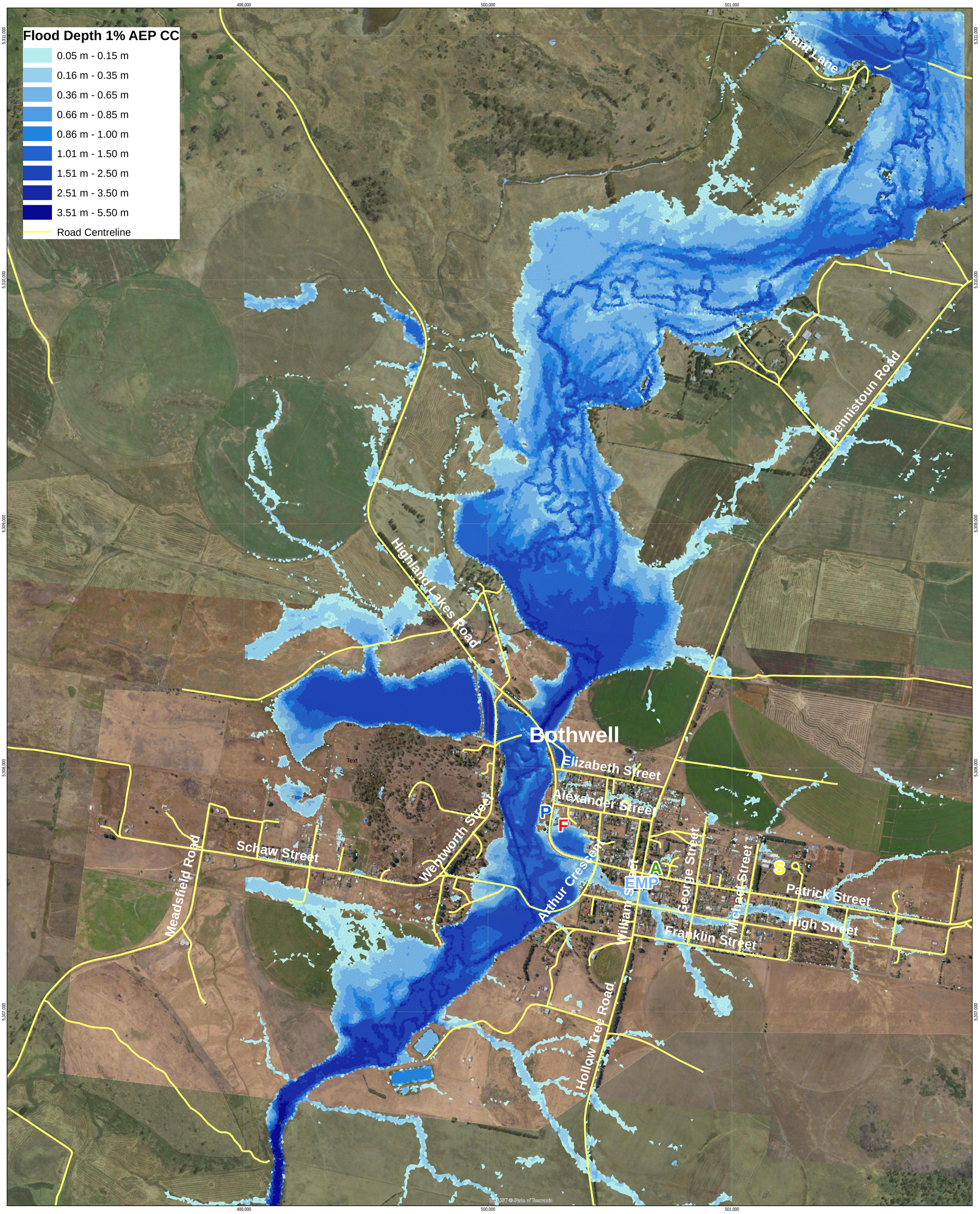
C:\Users\EKISEL~1\AppData\Local\Temp\arc800D\12571871_013_Clyde_Roughness_-20_A1_5pct_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

Appendix C

Flood Depth Map 1% AEP - Climate Change



Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 1% AEP Climate Change

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 10

C:\Users\EKISEL~1\AppData\Local\Temp\arc5F75\12571871_010_Clyde_A1_1pctCC_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

Appendix D

Aerial Imaging and 63% AEP Flood Map

Flood Depth 63% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline

499,000 500,000 501,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Nant Lane
Dennistoun Road
Highland Lakes Road
Bothwell
Elizabeth Street
Alexander Street
Wentworth Street
Arthur Crescent
William Street
George Street
Michael Street
Patrick Street
High Street
Franklin Street
Text

Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 63% AEP

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 3

C:\Users\EKISEL~1\AppData\Local\Temp\arc1BEE\12571871_003_Clyde_A1_63pct_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Aerial (UDM Group), Roads (LIST), Flood Model (GHD). Created by:ekiseleva

499,000 500,000 501,000 502,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Road Centreline

Nant Lane

Nant Lane

Highland Lakes Road

Dennistoun Road

Bothwell

Elizabeth Street

Alexander Street

Wentworth Street

Arthur Crescent

William Street

George Street

Michael Street

Franklin Street

Patrick Street

High Street

Highland Lakes Road

Text

Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Drone Aerial Image (UDM Group)

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 11

C:\Users\EKISEL~1\AppData\Local\Temp\arc757E\12571871_011_Clyde_A1_Drone_Aerial_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Aerial (UDM Group), Roads (LIST). Created by:ekiseleva

499,000 500,000 501,000

5,309,000

5,307,000

Flood Depth 63% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline
- Property Boundary

Highland Lakes Road
Wentworth Street
Adelaide Street
Barrack Street
Elizabeth Street
Alexander Street
Dennistoun Road
Queen Street
Market Place
George Street
Michael Street
Patrick Street
High Street
Mary Street
Franklin Street
William Street
Arthur Crescent
Hollow Tree Road
Logan Street
Schaw Street
Keeling Road

DRAFT

Paper Size A1

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Bothwell Flood Map 63% AEP

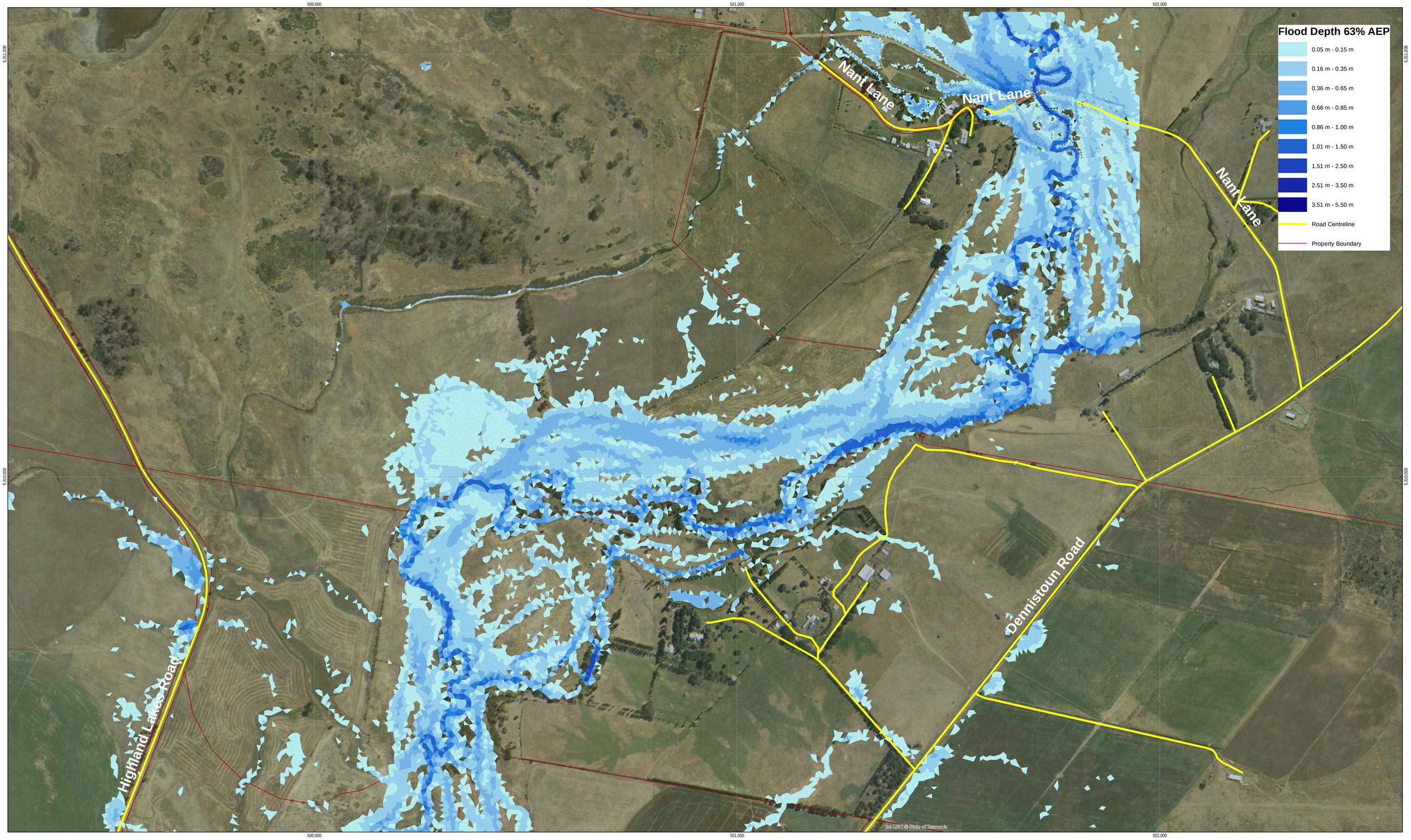
Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 6

C:\Users\EKISEL~1\AppData\Local\Temp\arc362D\12571871_006_Bothwell_A1_63pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com



Paper Size A1

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Nant Lane Flood Map 63% AEP

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 9

C:\Users\EKISEL~1\AppData\Local\Temp\arc821A\12571871_009_Nant_L_A1_63pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Appendix E

Flood Hazard Maps 1% and 5% AEP

Flood Hazard 1% AEP

- H1
- H2
- H3
- H4
- H5
- H6
- Road Centreline

499,000 500,000 501,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Nant Lane
Dennistoun Road
Highland Lakes Road
Bothwell
Elizabeth Street
Alexander Street
Wentworth Street
Arthur Crescent
William Street
George Street
Michael Street
Patrick Street
High Street
Franklin Street
Hollow Tree Road
Schaw Street
Meadsfield Road
Text

the LIST © State of Tasmania

Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Hazard Map 1% AEP

Job Number	12571871
Revision	0
Date	20 Mar 2023

Figure 14

C:\Users\EKISEL~1\AppData\Local\Temp\arc8647\12571871_014_Clyde_Hazard_A1_1pct_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

Flood Hazard 5% AEP

- H1
- H2
- H3
- H4
- H5
- H6
- Road Centreline

499,000 500,000 501,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Nant Lane
Dennistoun Road
Highland Lakes Road
Bothwell
Elizabeth Street
Alexander Street
Wentworth Street
Schaw Street
Meadsfield Road
Arthur Crescent
William Street
George Street
Michael Street
Patrick Street
High Street
Franklin Street
Hollow Tree Road
Text

the LIST © State of Tasmania

Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Hazard Map 5% AEP

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 15

C:\Users\EKISEL~1\AppData\Local\Temp\arcA37\12571871_015_Clyde_Hazard_A1_5pct_Rev_B.mxd

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

499,000 500,000 501,000

5,309,000 5,307,000

Flood Hazard 1% AEP
- H1
- H2
- H3
- H4
- H5
- H6
- Road Centreline
- Property Boundary

Highland Lakes Road
Wentworth Street
Adelaide Street
Barrack Street
Elizabeth Street
Alexander Street
Dennistoun Road
Keeling Road
Schaw Street
Logan Street
Arthur Crescent
Queen Street
Market Place
George Street
William Street
Michael Street
Mary Street
Patrick Street
High Street
Franklin Street
Hollow Tree Road

the LIST © State of Tasmania

Paper Size A1

0 30 60 120 180 240
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mapping Study
Bothwell Flood Hazard Map 1% AEP

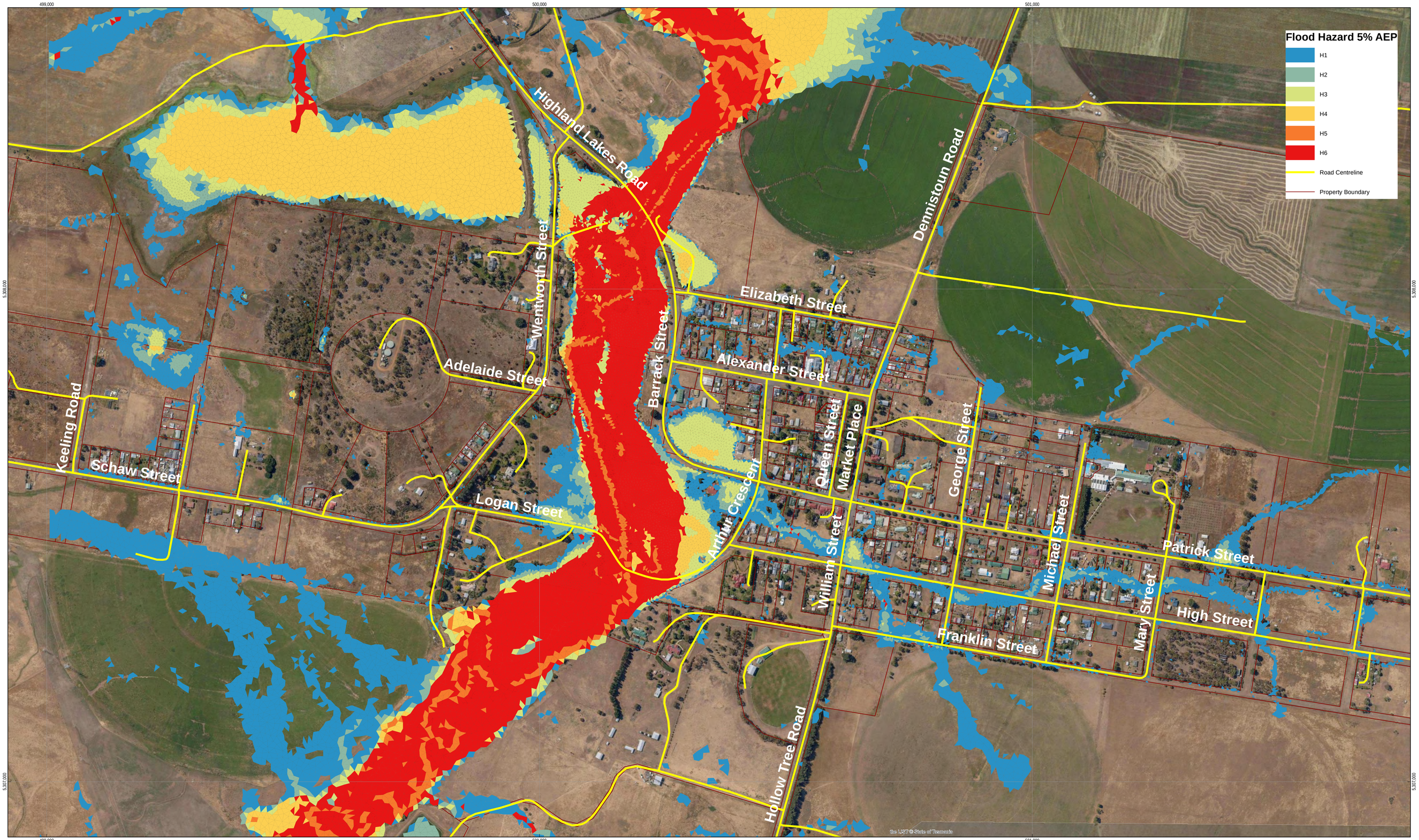
Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 16

C:\Users\EKISEL~1\AppData\Local\Temp\arc4CF8\12571871_016_Bothwell_Hazard_A1_1pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com



Paper Size A1

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Bothwell Flood Hazard Map 5% AEP

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 17

C:\Users\EKISEL~1\AppData\Local\Temp\arc5073\12571871_017_Bothwell_Hazard_A1_5pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

500,000 501,000 502,000

5,311,000 5,310,000

Nant Lane

Nant Lane

Nant Lane

Dennistoun Road

Highland Lakes Road

Flood Hazard 1% AEP

- H1
- H2
- H3
- H4
- H5
- H6
- Road Centreline
- Property Boundary

Paper Size A1

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council

River Clyde Flood Mappring Study

Nant Lane Flood Hazard Map 1% AEP

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 18

C:\Users\EKISEL~1\AppData\Local\Temp\arc540D\12571871_018_Nant_Hazard_A1_1pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

500,000
501,000
502,000
5,311,000
5,310,000

Flood Hazard 5% AEP

- H1
- H2
- H3
- H4
- H5
- H6
- Road Centreline
- Property Boundary

Nant Lane
Nant Lane
Nant Lane
Dennistoun Road
Highland Lakes Road

The LIST © State of Tasmania

Paper Size A1

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Nant Lane Flood Hazard Map 5% AEP

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 19

C:\Users\EKISEL~1\AppData\Local\Temp\arc8B0B\12571871_019_Nant_Hazard_A1_5pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Appendix F

Consultation and Engagement Summary

River Clyde Flood Mapping Study

Consultation and Engagement Summary

Central Highlands Council

18 May 2023

→ **The Power of Commitment**

Project name		River Clyde Flood Mapping Study					
Document title		River Clyde Flood Mapping Study | Consultation and Engagement Summary					
Project number		12571871					
File name		12571871-RPT-A-River Clyde Flood Mapping Study Consultation and Engagement Summary DRAFT A .docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	A Rees R Hall	M Ulph		E Gruber		

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Contents

Table index

Figure index

Appendices

1. Introduction

The Central Highlands Council's flood map for the township of Bothwell was developed over 50 years ago. The town and surrounding districts have experienced several large flood events since that time, resulting in major infrastructure damage, property loss, destruction of crops, loss of livestock, and health impacts owing to waterborne diseases which have negatively impacted the social fabric of the community.

The Central Highlands Council sought funding through the Australian Government's *Preparing Australian Communities* program to undertake a River Clyde Flood Mapping Study (the Study). The Study collected data to better predict the likelihood and location of future flood events to improve decision making around land use, and future development. The Study also identifies the most effective mitigation measures that can be taken to reduce the negative impacts of flood events such as damage to major infrastructure and property, agricultural productivity losses and activity, and risks to public health.

The Council is seeking to gain a better understanding of flood behaviour, extent, likely water levels, velocities and depths within the study area to develop a *Stormwater System Management Plan* that will improve emergency management planning and the response to flood events.

An important part of the Study has been engaging with stakeholders, including government departments, industry, landowners, businesses and residents to gather important historical flooding information and gain an understanding of community priorities, awareness and perception of flood risk. The information that the Study provides aids Council to identify potential mitigation options that address community priorities and reduce the negative impacts of future flood events.

1.1 Purpose of this report

The purpose of this report is to capture and summarise the activities undertaken, and feedback received from stakeholders and community members in relation to the River Clyde Flood Study project community engagement scope.

1.2 Scope and limitations

The scope of this project included:

- Undertake a workshop with Council members
- Consultation with landowners
- Preparation of materials for and attendance at public information sessions
- Meetings with business owners and utility/infrastructure
- Development of communication materials for website, Facebook, newsletters
- Development of Consultation and Engagement Summary (this report)

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

GHD has prepared this report on the basis of information provided by Central Highlands Council and others who provided information to GHD (including Government authorities, community members and landowners), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.3 Assumptions

In preparing this report the following assumptions have been made:

- Feedback and information provided through engagement sessions and online surveys is true and correct;
- Opportunities for feedback have reached a substantial portion of the community (distribution via multiple avenues) and therefore the number of responses received reflects the communities understanding and/or interest in the issue

2. Stakeholder engagement summary

Engagement activities for this Study focused on gathering information from stakeholders and community about past flood behaviour and impacts, key priorities and concerns and sharing information to increase community awareness and preparedness for flood events.

2.1 Consultation objectives

The engagement objectives for this project were to:

- gather valuable local insight and knowledge about the history of flooding in the area by involving the community who have lived experience
- better understand the community's main concerns and priority areas for dealing with flooding events
- increase the community's awareness of the risk of flooding within the study area by educating and informing them about flood risk
- improve public perception of the risk and impacts of flooding to encourage proactive behaviours
- discuss flood mitigation measures with the community to increase preparedness for flooding events.

This process was an opportunity for Council to involve the community in a discussion around the impacts of flooding and inform the community of flood risks to improve measures to reduce the negative impacts of flooding in the area.

2.2 Summary of consultation

A Stakeholder and Community Engagement Plan was developed identifying key stakeholders, outlining key messages, activities, project timing and feedback opportunities to support the project objectives. Stakeholder engagement content was prepared to provide information around why the Flood Mapping Study was being undertaken and how it will enable the council to prepare a Stormwater System Management Plan. Content was prepared to inform the community about the Study and invite them to contribute information about flooding.

Two community drop-in sessions were held coinciding with community events – the Bothwell Bicentennial and Bushfest. Project information was shared and the public were encouraged to share stories and photographs and to fill out an online survey.

The surveys collected information around flood awareness, emergency planning and impacts. A total of eight survey responses were collected.

Surveys and pop-up sessions were promoted via traditional media, social media, the council website, the Bothwell District High School newsletter, the Highlands Digest, a postcard mailout to every Bothwell post office box holder and posters around the township.

Two stakeholder workshops were held to share project details and gather information from industry, government departments, landowners, residents and business owners. The workshops discussed past flood levels and impacts, and involved a risks, priorities and opportunities analysis. Resulting community feedback from both online and face to face consultation was collated and analysed providing additional data for the Study.

A summary of the stakeholder engagement activities and outputs can be seen in the table following.

2.3 Stakeholder engagement activities

Table 1 Stakeholder engagement activities summary

Activity	Description/output
Survey	Questions on prior flood history and impacts, emergency planning, flood awareness and level of risk perception.
Public poster	Posters around Bothwell township sharing project information, survey link and advertising community drop-in sessions. Please refer to Figure 1
Project postcard	300 postcards sent to all Bothwell post office box holders sharing project information, survey link and advertising community drop-in sessions. Please refer to Figure 2
Community Pop Up Sessions	Three community sessions to share project detail, gather historical flood information and share key findings of the Study: Bothwell Bicentennial – 15 October 2022 Landowner Meeting at Bothwell town hall – 27 October 2022 Bushfest – 19 November 2022
Photographs/Stories	Past flood information gathered from community
Newsletter	Sent to Bothwell District School, Highlands Digest to share project information, survey link and advertising community drop-in sessions.
Online stakeholder workshop	Workshop attended by representatives from the Department of Natural Resources and Environment, TasWater, Derwent Catchment Project, Inland Fisheries and Heritage Tasmania to share project information, gather historical flood data and undertake a risks, priorities, and opportunities analysis
Face to face stakeholder workshop	Workshop at the Bothwell Town Hall attended by landowners, residents, and business owners to share project information, gather historical flood data and undertake a risks, priorities and opportunities analysis
Media	Media release to newsprint media and radio
Webpage	Project information page on the Central Highlands Council website
Email	participate@ghd.com email address used to capture feedback
Phone number	62100662 phone number used to capture feedback

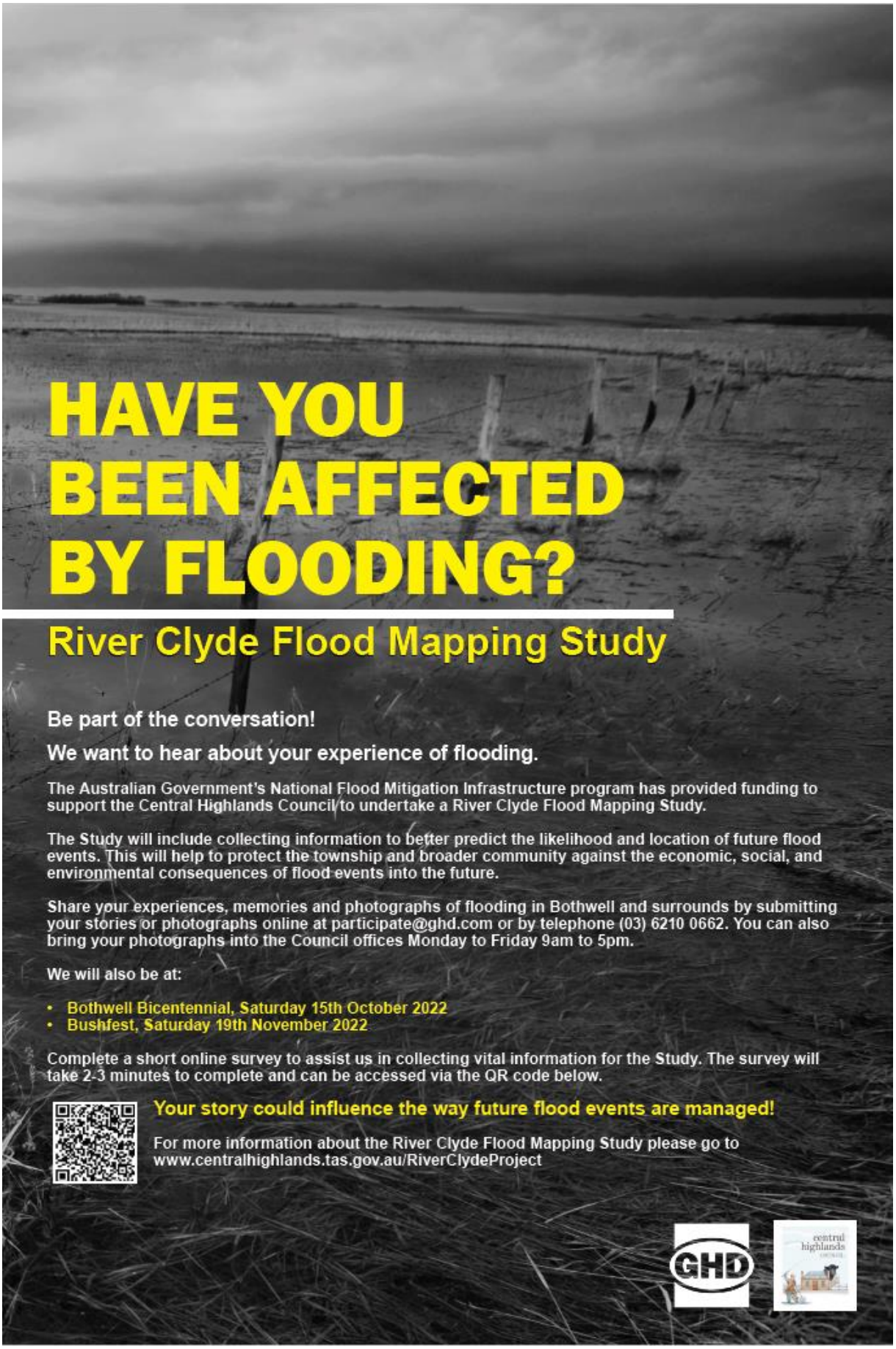


Figure 1 ***Public Poster***

Figure 2 *Project postcard*

3. Survey results

3.1 What is the perception of flood risk within the Study area?

Based on the survey results, the majority of respondents have experienced flooding in the past. The results show that six out of the seven respondents who answered the question regarding where they reside, live less than one kilometre away from the River Clyde. Five of the respondents also work less than one kilometre away from the river.

When asked what they thought the likelihood of flooding would be in the area, six respondents said they were almost certain that flooding would take place while two answered that it would be unlikely. Six respondents also provided information about where they had experienced flooding, most indicating that it had taken place on their property. Three experienced flooding levels of less than a metre, however the other three had experienced flood levels of more than a metre.

3.2 What are some examples of associated impacts of flooding?

Examples collected from the survey show the associated impacts of flooding are

- Damages or loss of infrastructure, assets and or utilities
- Impacts to future developments or land use
- Disruptions to access roads to critical services
- Loss of productivity (agriculture and or manufacturing)
- Loss of income, customers, and services
- Increased insurance premiums

Both ‘damages or loss of infrastructure, assets and or utilities’ and ‘disruptions to access roads to critical services’ were chosen by four respondents. Three respondents indicated that impacts of flooding had been minor however there were no responses which indicated that there had been zero impact.

3.3 What are some examples of concerns/priorities around flooding?

Examples of the concerns and priorities of flooding collected in the survey are:

- Damages or loss of infrastructure, assets and or utilities
- Damages or loss of historical buildings or sites
- Impacts to future developments or land use
- Impacts to access roads to critical services
- Reduced productivity (agriculture and or manufacturing)
- Impacts to unemployment and employees
- Health impacts such as stress, anxiety and or wellbeing.

3.4 Level of flooding preparedness within the study area?

The Survey shows that while the majority of respondents know who to call in the case of an emergency, the same majority do not currently have a flood emergency plan in place. Only two respondents out of eight identified what actions they would take to prevent the impacts of flooding on their property.

All survey respondents have indicated that they would like to receive more information about the River Clyde Flood Mapping Study.

3.5 How would people like to receive information about flooding?

Examples collected from the survey results show:

- Websites, apps and online (chosen by four respondents)
- Police, SES, TasFire Service and Bureau of Meteorology and the Central Highlands Council (chosen by four respondents)
- Radio (chosen by two respondents)
- Social media (chosen by two respondents)
- Word of mouth through friends, neighbours, or family (chosen by two respondents).

When asked how they would like to receive future information about flooding six respondents chose websites, apps and online, three respondents chose radio, a further three chose T.V. and just one chose social media.

3.6 Profile of respondents

Gender

Table 2 Gender profile of respondents

Gender	Age Under 18	18-25	26-35	36-50	51-65	66+	Total
Woman							
Man				2	2	4	8
Non-binary							
Prefer not to say							

Where respondents reside

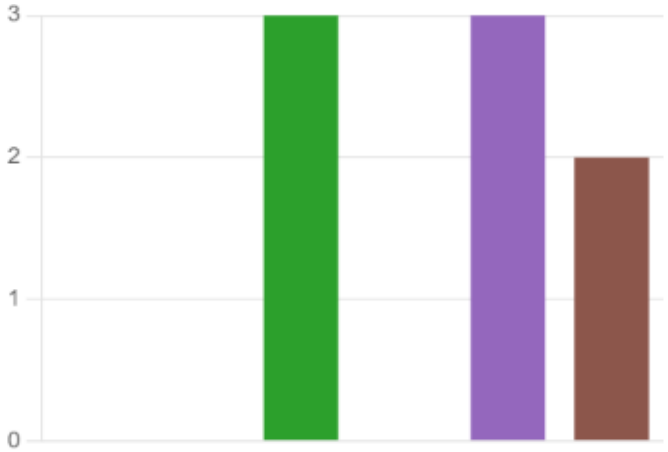
Bothwell township (central within 1km of town)	4
Bothwell township (outskirts 2-5kms from town)	1
River Clyde valley (north of Bothwell)	1
River Clyde valley (south of Bothwell)	0
Other	1

Where people work

Bothwell township (central within 1km of town)	2
Bothwell township (outskirts 2-5kms from town)	1
River Clyde valley (north of Bothwell)	0
River Clyde valley (south of Bothwell)	1
Other	2

Length of time lived/worked/visited Bothwell

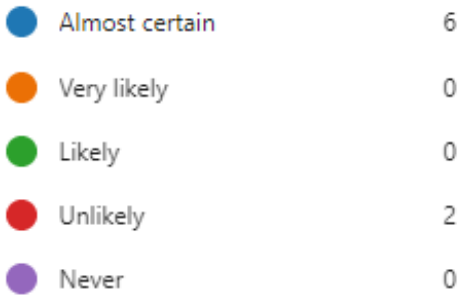
Less than a month	0
Less than 1 year	0
1-5 years	3
5-10 years	0
10-20 years	3
20+ years	2



Distance of residence from river

Less than 1km	6
2-5kms	0
5-10kms	0
More than 10kms	1

Perceived likelihood of flooding



Past experience of flooding

Past experience of flooding

Table 3 Respondent experience of flooding

ID	Response
1	*Our property has been inundated at ground level on four occasions in two and a half years. Once in 2019, twice in 2020 and once in 2021.*
2	*Annually*
3	*Several times a year*
4	*November 2016, 2021, 2023*
5	*Every second year*
6	*More or less every winter, sometimes other seasons (e.g., this year, 2022)*

Location of past flooding

Table 4 Location of past flooding experience

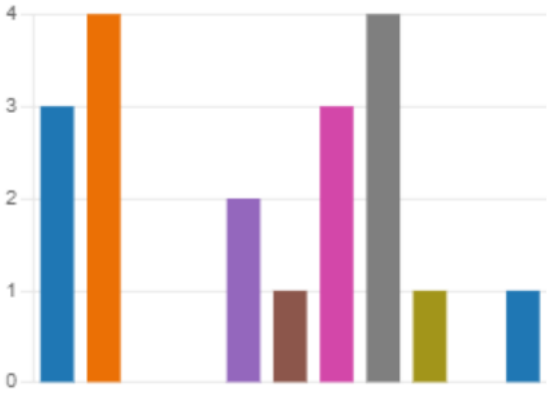
ID	Response
1	*P*atrick Street
2	*Farmland south of Bothwell*
3	*In the vicinity of* Alexander Bridge Nant Lane
4	*Nant*
5	*All over our farm*
6	*On the eastern* boundary of our property

Level of flooding

Less than 10cm	0
10-30cm in height	0
30-50cm	2
50-100cm	1
More than 1m	3

Impact of flooding

Minor impact	3
Damage/loss of infrastructure/assets/property	4
Damage/loss of buildings/historical locations	0
Interruption of services (power, water, telephone)	0
Future development/land use	2
Loss of income/customers/services	1
Loss of productivity (agriculture/manufacturing)	3
Disruption to access/roads to critical services	4
Increase to insurance premiums	1
No impact	0
Other	1

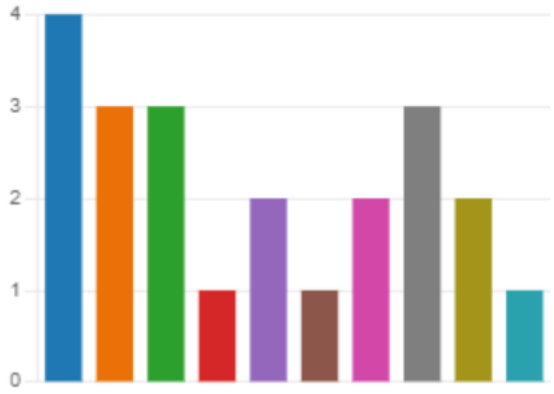


Whether there is a level of concern around flooding

Yes	5
No	3

Areas of concern

Damage/loss of infrastructure/assets/property	4
Damage/loss of buildings/historical locations	3
Future development/land use	3
Loss of tourism income/visitors	1
Reduced productivity (agriculture/manufacturing)	2
Access to locations visited for business/leisure	1
Impact upon employment and employees	2
Access/roads to critical services	3
Anxiety, stress, health and my well-being	2
Other	1



Level of preparation for future flooding

Very prepared	1
Somewhat prepared	4
Neither prepared nor unprepared	3
Somewhat unprepared	0
Very unprepared	0

Flood mitigation actions taken

Table 5 *Flood mitigation actions by respondents*

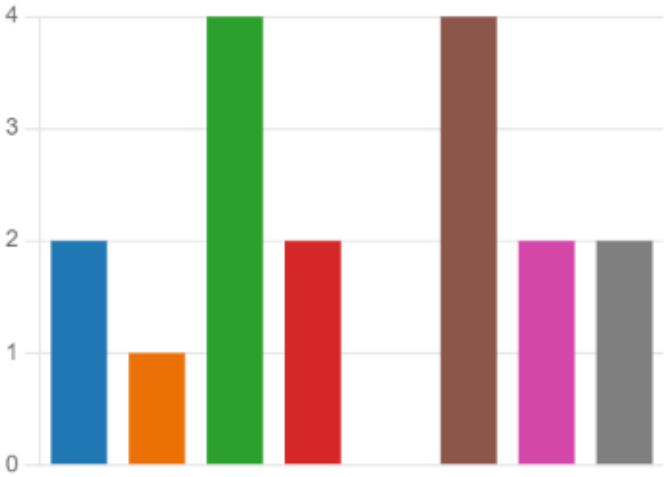
ID	Response
1	*Paddock and* fencing design, moving livestock away from affected areas when flooding is imminent
2	*Pumps high. Don't have stock or crops on the marshes. Stop water flowing around irrigation channel*

Emergency flood plan

Yes	6
No	2

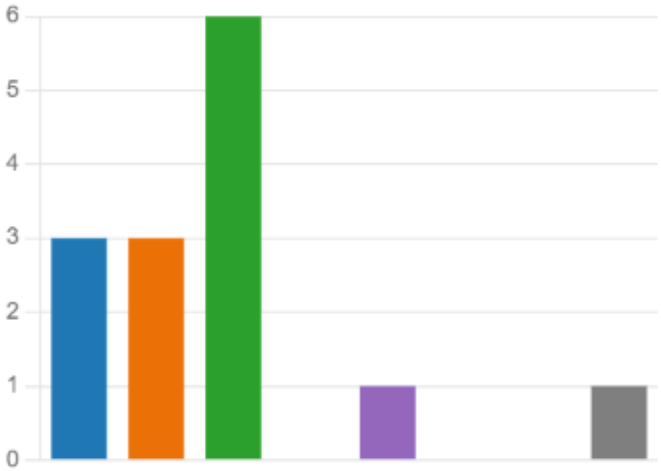
Current source of flood information

Radio	2
TV	1
Websites, apps, online	4
Social media	2
Newspaper	0
Police, SES, TasFire Service, BOM, Council	4
Friends, neighbours, family	2
Other	2



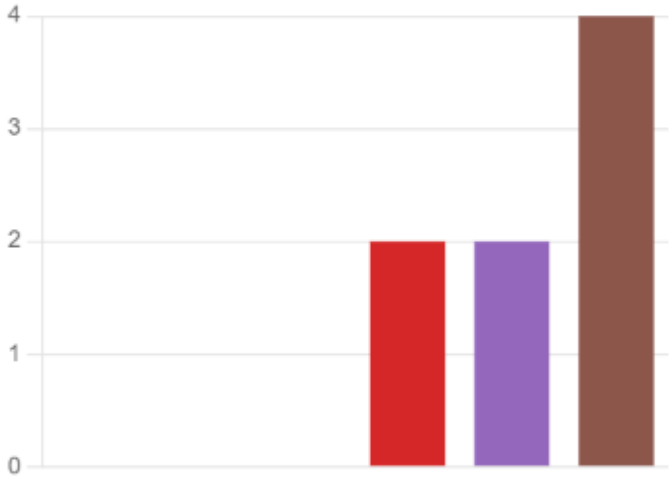
Preferred source of flood information

Radio	3
TV	3
Website, apps, online	6
Printed brochure	0
Social media	1
Newspaper	0
Community newsletter	0
Other	1



Age

Under 18 years	0
18-25	0
26-35	0
36-50	2
51-65	2
66+	4



4. Community engagement and findings

4.1 Bothwell Bicentennial

On Saturday 15 October 2022 the GHD Stakeholder Engagement team, attended the Bothwell Bicentennial to talk to the community about past flooding events and raise awareness of the project. Most members of the community were approachable and willing to talk about their experiences of flooding.

The majority of local community members that were engaged with suggested that the GHD team visit the 1960 flood marker located on Patrick Street. Many had stories that indicated that this was the worst flooding they had experienced in the area.

Attendance for the event was mostly made up of people from outside of the flood mapping area and visitors from other towns. However, amongst the visitors were people who had previously lived in the area. GHD engaged with one woman who grew up just outside of the flood mapping area but would travel down to Hobart to attend boarding school. She recounted that there would be occasions in which the area where she lived would be so badly flooded, she wouldn't be able to visit home as the bus service couldn't run.

Additionally, GHD engaged with the Country Women's Association (CWA) Tasmania at the Bothwell Bicentennial. A couple of members who had also grown up in the area when the 1960 flood occurred spoke of how the town was divided by the flood waters and boats were used to deliver goods to people on each side of the river.

Figure 3 1960 flood marker

Figure 4 Flooding at Croakers Alley (15 October 2022)

Another member of the public at the Bicentennial was able to show GHD photos of flooding on his property and in the centre of town during December 2021. Unfortunately, he did not pass on his photos to the project team as indicated, but the conversation provided insight into the level of impact on the community.

4.2 Government stakeholders' workshop

On Wednesday 26 October 2022, GHD provided a project briefing and ran a risk workshop with the following key stakeholders:

- TasWater (TW)
- The Derwent Catchment Project (DCP)
- Department of Natural Resources & Environment (DNRE)
- State Emergency Service of Tasmania (SES)
- Heritage Tasmania (HT).

The workshop was an opportunity for the above groups to provide input on potential risks, impacts and mitigation measures.

A summary of the perceived risks and opportunities from each group are as follows:

– **TasWater** – the pump at Arthurs Crescent is raised so there is minimal risk of impact due to flooding, however access to the pump during flooding can be an issue. The sewage ponds further down the river are also low risk.

– **Derwent Catchment Project** - would like willow management to be taken into consideration as part of any mitigation measures, with upstream management critical. They expressed that there is no point clearing willows downstream from the flood mapping area without upstream action also. DCP indicated it would be useful to talk to landowners and find out which areas they consider to be choke points and additionally, find out what they are doing on their land to assist with willow management.

– **Department of Natural Resources and Environment** - advised that there are works happening to put a flood levee on the Dennistoun property opposite former Councillor, Anthony Archer's dam, with a levee extended down to Fordell Creek. The levee is proposed to have an embankment and some benching of the river to provide additional flood capacity, although this work is just outside of the flood mapping area. Previous levees built in this area were washed away by the 2016 floods.

– **State Emergency Service** - the main concerns raised by the SES are the impact on residential areas and concerns for those in the community who may not have a flood emergency plan in place. The SES's 'Storm and Flood Ready' program draws upon previous flood studies and focusses on creating more flood resilient properties. The SES are working with the Red Cross to implement this plan. The SES has shown a particular interest in the River Clyde Flood Mapping Study as they want to see more community protection plans integrated into flood mapping studies.

– **Heritage Tasmania** – presented where heritage buildings and sites are located within the study area.

4.3 Drop-in session for landowners

On Thursday the 27 October 2022, GHD invited landowners from the flood mapping study area to the Bothwell Town Hall to discuss the project's objectives and gather information. GHD presented preliminary flood maps and requested feedback. The ten Landowners in attendance were predominantly made up of farmers and residents who had all experienced flooding within the Study area.

Landowners were prompt to inform GHD of factors that impact flooding in the area, the most raised factor being willow management. Some landowners recalled that due to the lack of willow management south of the flood mapping area they have experienced flooding despite a lack of rainfall.

There was a distinct divide in the room with regard to what year the flooding was worse, 1960 or 2016. In 1960, one landowner recalled that the flooding had come up to the windowsills of the houses along Arthur Crescent and the Jordan River Bridge was washed away. The same landowner also recounted stories of a flying fox being used to send supplies to those on either side of the river.

Landowners were forthcoming with their concerns, detail about the impacts and measures they would like to see put in place for flood mitigation.

Critical assets and sites

The landowners' main areas and sites of concern during flooding are as follows:

- Housing / residential areas
- Farmland
- Old Brewery house as it sits on stone foundations, Thorp Mill, the Golf Course, and the Maid's House
- Sewage Treatment Ponds
- Health centres and accessing essential services
- Access roads.

I**mpacts**

Landowners identified the below impacts:

- Damage to roads as a result of flooding
- Loss of productivity on farmland
- Impacts to crops due to topsoil erosion
- Damage to infrastructure
- Flood damage impacting existing security measures
- Flood debris clean up, especially around fencing, trees and vegetation
- Clean up costs, time and logistics
- Potential for landslides and power failure.

Flood mitigation

Landowners recalled the previous flood mitigation measures taking place:

- The Central Highland Council spent $680,000 on fixing the drainage around Bothwell
- Around 25 years ago willows were removed using excavation through 10 metres of the river's channel.

Landowners suggested that flood levees and willow management should be put in place as future flood mitigation measures.

Emergency management

Landowners expressed that they would like flood warnings included for the River Clyde from the Bureau of Meteorology, as this is where they get the majority of their information when planning for major weather events. They believe landowners along the River Ouse also experience the same issues.

Figure 5 River Clyde flooding 27 October 2022

Figure 6 Arthurs Crescent 27 October 2022

4.4 Bushfest

On Saturday 19 November 2022 GHD attended Bushfest, to again raise awareness of the project amongst community members and gather information about flooding in the area. Like the Bothwell Bicentennial, attendance was largely made up of visitors to the area. However, GHD was able to talk to members of the Trout Fishing Guides Association, including the President who provided insight into the affects flooding has on the water quality of the River Clyde, and the negative impacts that poor river management has had on fishing in the area.

The Trout Fishing Guide Association representatives were surprised to find out that the Central Highlands Council were driving the Flood Mapping Study and indicated they have previously felt let down by council and Inland Fisheries when trying to bring attention to river management in the past. This perception may explain the Association's absence at the stakeholder workshops.

While not from Bothwell or the flood mapping area, visitors that GHD spoke to at Bushfest provided further insights into the level of awareness about flooding in the area. One particular member of the public was adamant that the area was not prone to flooding, despite several areas of the town experiencing visible flooding at the time. One vendor who had travelled down from the north of Tasmania was pleased to see that the Council were taking a proactive approach to improving flood awareness as she was personally dealing with the impacts of flooding to her home as a result of the October 2022 floods in north-west Tasmania.

5. Community feedback

Community feedback around flood risk and awareness indicated that community members are aware of flood events happening in the area, even if they are not directly impacted. However, based on the survey results and community members who spoke with our Stakeholder Engagement officers, there is limited community interest when it comes to taking action to assist with the prevention of flooding.

Landowners taking part in the workshops indicated that although flooding is of concern that it is not a major priority in comparison to other extreme weather events such as drought. Landowners intimated that access to water is an important resource that they do not want restricted. Proposed flood mitigation measures will need to take this into consideration.

The low number of responses received for the online survey despite the post card drop to all Bothwell post boxes, school newsletter, Highlands Digest notification, workshops, community drop-in sessions and posters displayed around town suggests that community interest in flooding is low. Responses received suggest that flood awareness is greater amongst those with lived experience of flooding. Based on the responses received, the survey also suggests that those who took part are most likely to be farmers as flood mitigation methods selected were prioritised around livestock and crops.

Landowners who attended the drop-in session on the 27 October 2022 showed that they have a high awareness of flooding and have emergency management plans in place for when flooding events occur. They expressed that they would like to see more willow management in the area with the addition of flood levees to help prevent the severity of floods. Moreover, they would like to see flood warnings for the River Clyde included in alerts by the Bureau of Meteorology.

Broadly speaking, the engagement feedback received suggests that community awareness of flooding is high, however community understanding of how they can be better prepared and mitigate the impact of flooding is low. The community may be more inclined to take action to be better prepared with further education and engagement.

Some people have shown concern that the Flood Mapping Study will affect their insurance premiums.

6. Next steps

Based upon survey responses, feedback received at stakeholder workshops and community drop-in sessions it is suggested that the community would benefit from further engagement and education around how they can be better prepared. This may be most effective if targeted at younger members of the community, including working with students and teachers at Bothwell District High School.

The Derwent Catchment Project indicated that combining environmental education and flood mitigation programs can be very effective for encouraging positive community action. They suggested that working with Landcare to educate about willow control and broader river management practices would be advantageous to any mitigation measures the Council decide to take forward.

The SES would like to support the council by developing a draft community protection plan and are an important stakeholder to include with any community engagement moving forward.

Once the *Stormwater System Management Plan* is complete and flood mitigation measures have been determined it would be beneficial share next steps with key stakeholders and community to demonstrate how community feedback has informed decision making, emergency planning and management for future flooding events.

Appendix A

Landowner photos

Figure 7 *Credit: Landowner, Robert Cassidy – Looking southeast from Mount Adelaide, 19 October 2021*

Figure 8 *Credit: Landowner, Robert Cassidy – Looking southeast from Mount Adelaide, 19 October 2021*

Figure 9 *Credit: Landowner, Robert Cassidy – Ariel view of Bothwell surrounding areas in flood*

Figure 10 *Credit: Landowner, David Dyson*

Figure 11 *Credit: Landowner, David Dyson*

Figure 12 *Credit: Landowner, David Dyson*

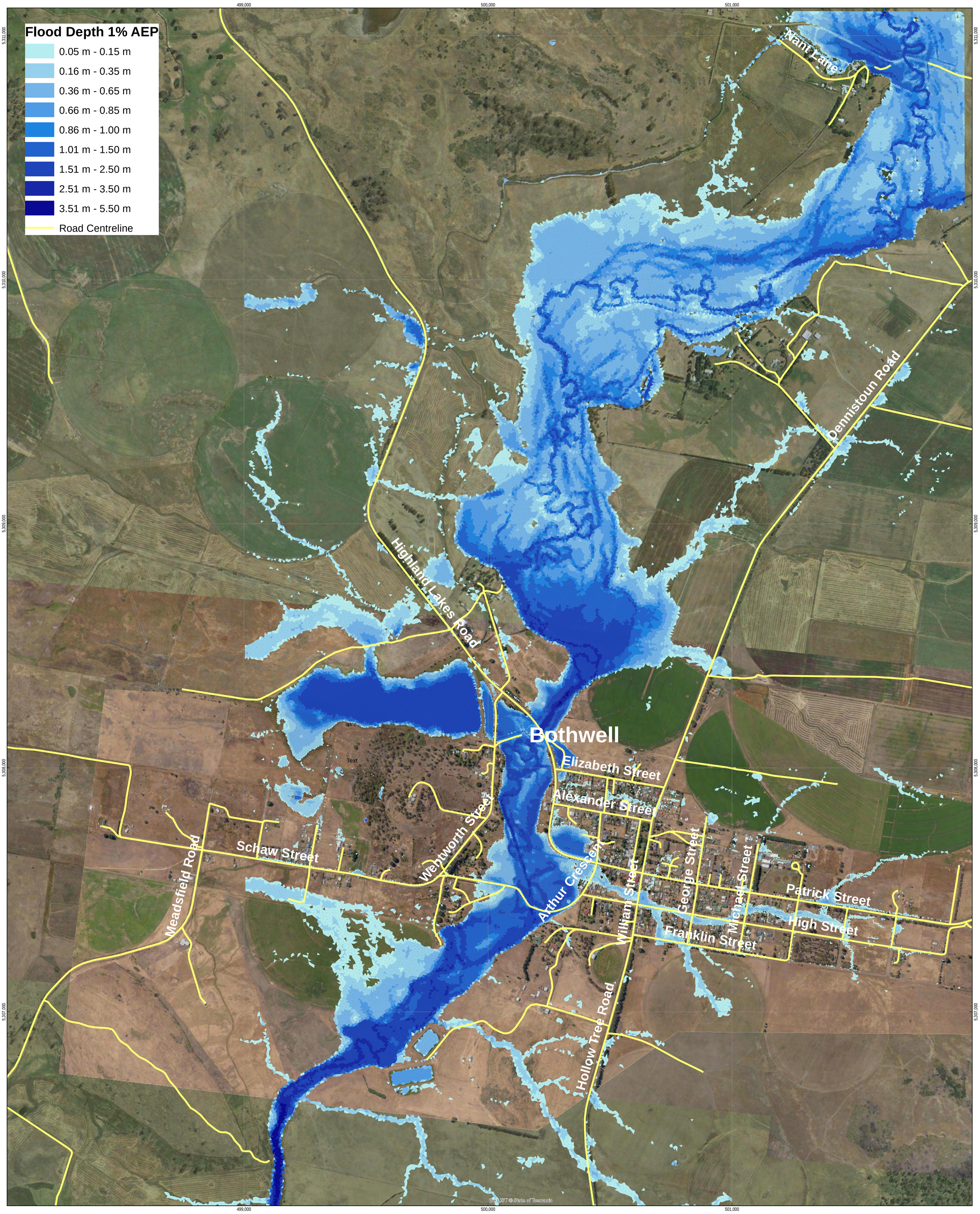
Figure 13 *Credit: Landowner, David Dyson*

Figure 14 *Credit: Landowner, David Dyson*


THIS PLAQUE MARKS
THE LEVEL
OF FLOOD WATERS
ON THE NIGHT OF
22ND APRIL
1960.
FLOOD LEVEL

Appendix G

Flood Depth Maps 5% AEP- Mitigation Options



Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 1% AEP Willow Removal

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 22

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2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

Flood Depth 63% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline

499,000 500,000 501,000

5,311,000 5,310,000 5,309,000 5,308,000 5,307,000

Avant Lane
Dennistoun Road
Highland Lakes Road
Bothwell
Elizabeth Street
Alexander Street
Wentworth Street
Arthur Crescent
William Street
George Street
Michael Street
Patrick Street
High Street
Franklin Street
Schaw Street
Meadsfield Road
Hollow Tree Road
Text

the LIST © State of Tasmania

Paper Size A1

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

River Clyde Flood Map 63% AEP Willow Removal

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 23

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2 Salamanca Square, Hobart Tasmania 7000 Australia **T** 61 3 6210 0600 **E** hbamail@ghd.com **W** www.ghd.com

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

499,000 500,000 501,000

5,308,000 5,307,000

Flood Depth 5% AEP
- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Road Centreline
- Property Boundary

Highland Lakes Road
Wentworth Street
Adelaide Street
Keeling Road
Schaw Street
Logan Street
Barrack Street
Elizabeth Street
Alexander Street
Dennistoun Road
Queen Street
Market Place
George Street
Arthur Crescent
William Street
Michael Street
Mary Street
Patrick Street
High Street
Franklin Street
Hollow Tree Road

the LIST © State of Tasmania

Paper Size A1

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Bothwell Flood Map 5% AEP Mitigation Option 1

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 20

C:\Users\EKISEL~1\AppData\Local\Temp\arc836A\12571871_020_Bothwell_Mitig_Option1_A1_5pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

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499,000 500,000 501,000

5,308,000 5,307,000

Highland Lakes Road
Wentworth Street
Adelaide Street
Barrack Street
Elizabeth Street
Alexander Street
Dennistoun Road
Keeling Road
Schaw Street
Logan Street
Arthur Crescent
Queen Street
Market Place
George Street
William Street
Minstrae Street
Mary Street
Patrick Street
High Street
Franklin Street
Hollow Tree Road

Flood Depth 5% AEP

- 0.05 m - 0.15 m
- 0.16 m - 0.35 m
- 0.36 m - 0.65 m
- 0.66 m - 0.85 m
- 0.86 m - 1.00 m
- 1.01 m - 1.50 m
- 1.51 m - 2.50 m
- 2.51 m - 3.50 m
- 3.51 m - 5.50 m
- Mitigation Option Area
- Pipe
- Pit
- Open Channel
- Road Centreline
- Property Boundary

Paper Size A1

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Central Highlands Council
River Clyde Flood Mappring Study

Bothwell Flood Map 5% AEP
Mitigation Option 2 - Open Channel

Job Number	12571871
Revision	0
Date	21 Mar 2023

Figure 21

C:\Users\EKISEL~1\AppData\Local\Temp\arc7F91\12571871_021_Bothwell_Mitig_Option2_A1_5pct_Rev_B.mxd

Data source: Roads (LIST), Flood Model (GHD). Created by:ekiseleva

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Appendix H

Natural Values Desktop Assessment

River Clyde Mapping Study

Desktop Assessment

Central Highlands Council

18 May 2023

→ The Power of Commitment

Project name		River Clyde Flood Mapping Study					
Document title		River Clyde Mapping Study | Desktop Assessment					
Project number		12571871					
File name		12571871_REP_River Clyde Mapping Study_Desktop Assessment.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	Mickey Dwyer	Nick Priest		Ed Gruber		

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1. Introduction

1.1 Purpose of this report

As part of the River Clyde Flood Study, the Central Highlands Council and GHD are investigating potential mitigation options to reduce the risk of flooding on the River Clyde. The purpose of this report is to examine and assess the existing environment within the survey area and identify the extent of any environmental values that may constrain the suitability and implementation of any proposed mitigation options for the River Clyde mapping study and flood mitigation strategies. Potential constraints assessed include conservation significant vegetation communities, flora species, fauna species and habitat.

The scope of work covered in this report included a desktop assessment aiming to interrogate all relevant databases (e.g. Natural Values Atlas [NVA] and Protected Matters Search Tool [PMST]) to identify any threatened flora, fauna or vegetation communities that may potentially occur within, or near the survey area and help inform the impact assessment and any additional .

Information obtained during the desktop assessment was used to develop this report, including:

– Outlining potential impacts of the proposed works on ecological values.
– An evaluation of the proposed works against relevant ecological policy and legislation.
– Provision of recommendations to minimise impacts of the proposed works on ecological values.

1.2 Scope and limitations

This report: has been prepared by GHD for Central Highlands Council and may only be used and relied on by Central Highlands Council for the purpose agreed between GHD and Central Highlands Council as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Central Highlands Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

The following assumptions should be noted when considering the results and recommendations outlined in this report:

– the desktop assessment collates data from verified publicly available databases
– no field assessment or site investigation was conducted in association with the works outlined in this report
– small scale variations in vegetation, flora composition, fauna habitat and general condition of the site are unlikely to be represented in the modelled mapping

2. Background

2.1 Project Description

GHD Pty Ltd (GHD) was engaged by the Central Highlands Council to undertake a flood study of the River Clyde for the township of Bothwell.

The Clyde River rises in the reservoirs of Lake Sorell and Lake Crescent, near Interlaken and flows generally west by south, through the settlements of Bothwell and Hamilton, joined by nine minor tributaries before reaching its mouth and emptying into the River Derwent at Lake Meadowbank. The river drains a catchment area of 1,120 km sq in an agricultural region of Tasmania and descends 744 metres over its 97 km course.

The River Clyde flood mapping aims to provide Council with a better understanding of the flood behaviour, set to establish the flooding extent, water levels, velocities, depths within the study area, which will ultimately inform a revised floodplain management strategy within the study area, improve the community's understanding of flood risk/hazard of the River Clyde floodplain (to guide land use planning and development) and recommend a flood risk management strategy for the floodplain , emergency response planning and increase community awareness of flood risk.

As part of the project, GHD has developed an options analysis for flood management and mitigation measures, including any required staging whilst taking into consideration the constructability of any new infrastructure. The options analysis required the provision a natural values assessment and a land use planning assessment to inform the options and highlight any risks in the options.

2.1.1 Willow Removal

Driven through GHD discussions with Central Highlands Council, willow (*Salix spp.)* tree removal has been proposed as a flood mitigation option that involves the removal of invasive willow trees from flood-prone areas. Willow trees are known for their ability to grow quickly and form dense stands, which can reduce water flow and increase the risk of flooding. By removing these trees, it is possible to restore natural water flow and increase the capacity of waterways to handle floodwaters.

Willow removal as a flood mitigation option offers several benefits. Firstly, willow removal can help to increase the capacity of rivers and streams to carry water, which can reduce the risk of flooding. By removing willows, the flow of water can be increased, allowing water to move more quickly through the river system. Secondly, willow removal can improve the ecological health of river systems by increasing the amount of sunlight that reaches the riverbed. This can encourage the growth of native plant species, which in turn can provide habitat for a range of aquatic and terrestrial species. Thirdly, removing willows can reduce the amount of sediment that accumulates in rivers and streams, which can improve water quality. Finally, willow removal can help to reduce the risk of damage to infrastructure such as bridges and roads, which can be costly to repair or replace in the event of a flood. Overall, willow removal as a flood mitigation option offers a range of benefits that can help to reduce the impact of flooding and improve the ecological health of river systems.

For the purposes of this report, willow removal is discussed as a management option in relation to the potential environmental impact as a result e.g. sedimentation, removal of habitat, etc.

2.2 Survey Area

For the purpose of this report, the 'survey area' is defined as the area outlined in , extending from the intersection of Patrick Street & Mary Street, southward towards High Street and Franklin Street, and west the River Clyde. The survey was calculated to cover approximately 19.75 ha. This area covers several properties including private freehold land, road reserve, crown land and council land and encompasses the potential siting of flood mitigation options. The cadastral parcels intersected by the survey area are outlined in the table below.

Table 1 Summary of cadastral parcels intersected by the survey area

CID	Volume	Folio	PID	Cadastre Parcel Type	Land Tenure
964877	16898	1	5013329	Private Parcel	Freehold Title
964908	93962	2	5012609	Private Parcel	Freehold Title
964912	135485	2	2033826	Private Parcel	Freehold Title
964917	15903	1	5012924	Private Parcel	Freehold Title
964928	205924	1	7114078	Private Parcel	Freehold Title
964953	18	4642	5012270	Private Parcel	Freehold Title
964959	226153	10	5012270	Private Parcel	Freehold Title
964961	107602	15	5012385	Private Parcel	Freehold Title
964963	22912	14	5012238	Private Parcel	Freehold Title
964964	228128	1	5012422	Private Parcel	Freehold Title
964965	44848	1	7680897	Private Parcel	Freehold Title
964967	44848	2	1555307	Private Parcel	Freehold Title
964969	213687	4	1555307	Private Parcel	Freehold Title
964971	232397	1	5012828	Private Parcel	Freehold Title
964972	13327	4	7271487	Private Parcel	Freehold Title
964974	216377	1	5012414	Private Parcel	Freehold Title
964975	233761	1	5012262	Private Parcel	Freehold Title
1109762	18586	1	5011593	Private Parcel	Freehold Title
1109763	220354	8	5012625	Private Parcel	Freehold Title
1192725	124600	1	1745282	Private Parcel	Freehold Title
1193585		0	0	Road (type unknown)	Unknown
1198216	126980	1	1805046	Private Parcel	Freehold Title
1319988		0	0	Road (type unknown)	Unknown
1321616	150194	1	5013310	Department of Education	Crown Land
1323732		0	0	Road (type unknown)	Unknown
1370279	15903	3	0	LGA Subdivision Road	Freehold Title
1370280	15903	2	0	LGA Subdivision Road	Freehold Title
1401636	161435	1	5010486	Local Government Authority	Council
1436016	166515	1	3257215	Private Parcel	Freehold Title
1463805	167795	1	3361565	Private Parcel	Freehold Title

Descriptions for the headings from the above table are as follows:

– CID: Cadastral Persistent Identifier; the unique database identifier for each cadastral polygon

– Volume: The registered number for a volume (plan) which together with the folio forms the Folio of the Register (sometimes referred to as Certificate of Title)

– Folio: The registered number for a folio (lot) which together with the volume forms the Folio of the Register (sometimes referred to as Certificate of Title)

– PID: The unique Property Identification number relating to a (live) current rateable property. Property information is maintained against the PID in the VISTAS valuation property database

– Cadastre Parcel Type: The description for the primary classification of a cadastral area

– Land Tenure: The description for the Tenure Type – a broad tenure classification i.e. Private, Crown, Commonwealth, Local Government

2.3 Vegetation

The survey area was mapped to intersect two TASVEG[1] communities, both representing modified land. These communities are outlined in the table below.

Table 2 ***Summary of the TASVEG communities mapped within the survey area***

TASVEG Community	TASVEG Code	Description	Area (ha)
Agricultural land	FAG	Agricultural land (FAG) includes exotic grassland pastures and croplands. The pastures are dominated by mixtures of exotic temperate grasses and clovers. Crops range from common temperate vegetables and orchard fruits and nuts through to crops	14.03
Urban areas	FUR	Urban areas (FUR) include urban and suburban landscapes. These areas are largely or wholly devoid of vegetation apart from areas such as suburban gardens, street trees and parks.	5.72

2.4 Climate

The nearest Bureau of Meteorology weather station of similar geographical setting capturing current weather data is the Ouse Fire Station. The mean annual maximum and minimum temperature for that station is 18.4°C and 5.6°C (1998-2022), while the mean annual rainfall is 522.6mm for the same time period (see Figure 1). The prevailing wind at 9am at this station is north-west to north (from 8776 observations).

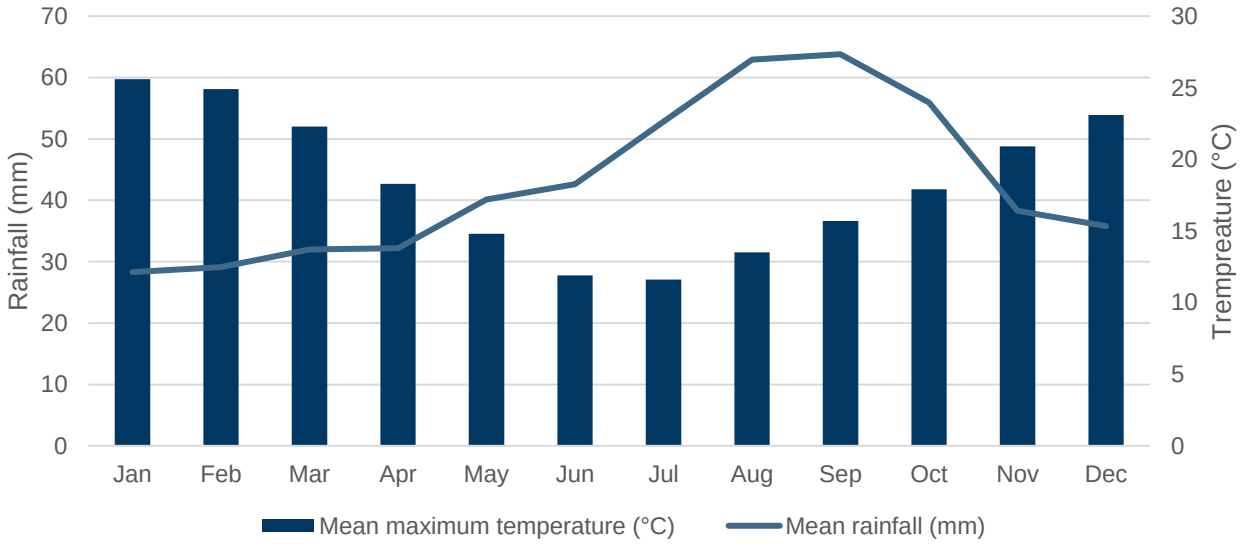

Figure 1 ***Mean rainfall and mean maximum temperature data from Bureau of Meteorology (BOM) monitoring site at the Ouse Fire Station for the period 1998 - 2022***

2.5 IBRA Region

The survey area is located within the Tasmanian Southeast Interim Biogeographic Regionalisation for Australia (IBRA) region (TSE01), described as 'Subhumid cool to subhumid warm coastal plains on a highly indented coastline, bordered inland by low mountain ranges formed from Jurassic dolerite and Permo-Triassic sediments. Soils predominantly clay to sandy loams. Vegetation is predominantly dry sclerophyll forest, with patches of wet sclerophyll forest, relict rainforest, coastal heath and dry coniferous forest. Extensive areas have been converted to improved pasture and cropland. Land use is primarily agriculture (grazing) and forestry.'[2]

[1] Kitchener & Harris 2013
[2] Environment Australia 2000

2.6 Soils and Geology

According to the Reconnaissance Soil Map Series of Tasmania[3] from LISTmap, the survey area is mapped on 'Undifferentiated soils developed on Quaternary alluvium'. As such, an exact soil classification is unknown. The underlying geology of the site is mapped as:

Table 3 Summary of underlying geology mapped to intersect the survey area

Geology Symbol	Description
Qh	Sand gravel and mud of alluvial, lacustrine and littoral origin
Tb	Basalt (tholeiitic to alkalic) and related pyroclastic rocks
Q	Undifferentiated Quaternary sediments
Ts	Dominantly non-marine sequences of gravel, sand, silt, clay and regolith
R	Undifferentiated Triassic fluviolacustrine sequences of sandstone, siltstone and mudstone.

Given the historical modifications and land uses (e.g. pastoral activities, development, etc) within the survey area, a range of sub-surface geological classifications may be present across the survey area including basalt, sandstone, mudstone and siltstone.

[3] Spanswick & Kidd 2001

3. Methods

3.1 Background Research

The primary data sources accessed during the background research included:

– The Natural Values Atlas (NVA) database[4] – which is the most authoritative repository of information on natural values in Tasmania. A NVA Report will identify threatened fauna and flora records within 500 m and 5000 m from the edge of the survey area. The report will also provide lists of TASVEG vegetation communities, geoconservation sites listed on the Tasmanian Geoconservation Database for any site or area within the State;

– The *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* PMST[5] – which provides a PMST Report that identifies any matters listed under the EPBC Act within a 5000 m buffer around the survey area;

– The Land Information System Tasmania (LIST) database[6] – a web-based repository of the State's comprehensive spatial data resources including property and land title information, satellite imagery, topographic maps, geological maps and natural values data; and

– The Department of Natural Resources and Environment (NRE) website – which contains links to biological and ecological information on many of the State's threatened species as well as biosecurity and invasive species information.

– The Tasmanian Threatened Species Link – contains management and conservation advice on Tasmania's threatened species, including species-specific information on survey periods, habitat, activities most likely to cause an impact, and links to DPIPWE note sheets and species recovery plans[7].

Further literature review in relation to key threatened fauna known to utilise the survey area was also undertaken, and a complete reference list is provided at the end of this report.

3.2 Desktop Assessment

A detailed desktop assessment was undertaken to identify any potential matters of conservation significance and to assess the need for any field surveys required at the site.

The desktop assessment was informed by the Tasmanian Natural Values Atlas (NVA) and the Commonwealth Protected Matters Search Tool (PMST). A buffer distance of 500 m and 5 km was used for database searches and is considered appropriate for detecting conservation significant species in the 'Tasmanian South East' Interim Biogeographic Regionalisation for Australia (IBRA) regions. The likelihood of occurrence was determined for all conservation significant vegetation communities identified, using categories outlined in the table below.

Table 4 Categories of likelihood of occurrence for conservation significant vegetation communities

Likelihood Category	Assessment
Present	Individuals recorded within the survey area during the field assessment or any previous assessment within the boundaries of the survey area
Possible	Suitable habitat occurs within the survey area
Unlikely	Suitable habitat unlikely to occur within the survey area, or suitable habitat substantially modified, or suitable habitat present but species not recorded for over 50 years within 5 km of the survey area

The likelihood of occurrence was determined for all conservation significant flora and fauna species identified, using categories outlined in the table below.

[4] BCB 2012
[5] Australian Government 2020
[6] Service Tasmania 2020
[7] TSS 2021

Table 5 Categories of likelihood of occurrence was determined for all conservation significant flora and fauna species

Likelihood Category	Assessment
Present	Individuals recorded within the survey area during the field assessment or any previous assessment within the boundaries of survey area
Possible	Suitable habitat occurs or is likely to occur within the survey area
Unlikely	Suitable habitat unlikely to occur within the survey area, or suitable habitat substantially modified, or suitable habitat present but species not recorded for over 50 years within 5km of the site
Highly Unlikely	No suitable habitat present within the survey area, and individuals not recorded within the survey area during current or any previous assessment

3.3 Nomenclature and Assessment of Significance

All plants are identified in accordance with *A Census of the Vascular Plants of Tasmania*[8]. Flora and fauna conservation significance was determined in accordance with the Tasmanian *Threatened Species Protection Act 1995* (TSP Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The vegetation mapping of the survey area was identified in accordance with the most current TASVEG 4.0 mapping from LISTmap. Conservation significance of vegetation communities was assessed in accordance with the TASVEG 4.0 and *Regional Forestry Agreement* (RFA) classification and associated criteria[9]. Conservation significance of other ecological communities was determined in accordance with the Commonwealth EPBC Act.

Significance of impacts on Matters of National Environmental Significance (MNES) were assessed in accordance with the Australian Government's Significant Impact Guidelines[10].

4. Results

4.1 Vegetation Communities

The results of the NVA report (Appendix B) identified ten vegetation communities within 1000 m of the survey area. Of those, one threatened community is listed as threatened under the Tasmanian NC Act. The PMST report (Appendix C) identified four Commonwealth listed Threatened Ecological Communities (TEC).

Of these five communities, the likelihood assessment indicated none of the threatened communities have the potential to be impacted by these works as they are not mapped within the survey area.

Table 6 Summary of protected vegetation communities identified by the NVA and the PMST within 1 km and 5 km of the survey area and an assessment of their likelihood.

Community Name	Source	Tasmanian Status – NC Act	Commonwealth Status – EPBC Act	Likelihood
Alpine Sphagnum Bogs and Associated Fens	PMST	-	Endangered	Unlikely – no mapped occurrences of this community within the survey area.
Lowland Native Grasslands of Tasmania	PMST	-	Critically endangered	Unlikely – no mapped occurrences of this community within the survey area.

[8] Baker & de Salas 2016
[9] DPIPWE 2014
[10] DotE 2013

Community Name	Source	Tasmanian Status – NC Act	Commonwealth Status – EPBC Act	Likelihood
Tasmanian white gum (*Eucalyptus viminalis*) wet forest	PMST	Threatened	Critically endangered	Unlikely – community absent within 1000 m of survey area.
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata/ E. brookeriana*)	PMST	Threatened	Critically endangered	Unlikely – community absent within 1000 m of survey area.
Eucalyptus tenuiramis forest and woodland on sediments	NVA	Threatened	-	Unlikely – community not mapped within the survey area.

4.2 Threatened Flora

Based on the results of the NVA report (Appendix B), a total of 201 state listed flora from 21 species have been previously recorded within 5 km of the survey area. Four of those species are also listed under the Commonwealth EPBC Act, including *Barbarea australis* (riverbed wintercress), *Glycine latrobeana* (clover glycine), *Lepidium hyssopifolium* (soft peppercress) and *Leucochrysum albicans subsp. tricolor* (grassland paperdaisy). The most abundant species, *L. hyssopifolium*, has been recorded 107 times within 5 km with the nearest record located 62 m from the survey area.

According to the PMST report (Appendix B), 12 EPBC listed flora species, or their habitat have the potential to occur within the survey area. Combining the NVA and PMST indicates a total of 28 state and/or Commonwealth listed flora species with the potential to occur in the survey area. The results of the likelihood analysis indicated one species was considered likely to occur, ten species were possible, 16 were unlikely and one species highly unlikely. Species likelihoods were assessed based on the known habitat preferences for each species and the likely vegetation, habitat, soils and landforms present based on the available information.

Table 7 Summary of threatened flora species identified from within 5 km based on the results from the NVA and PMST

Species Name	Common Name	Source	TSP Act	EPBC Act	Suitable Habitat	Likelihood
Acacia axillaris	Midlands mimosa	PMST	v	VU	Mainly confined to riparian habitats such as dense riparian scrub and associated floodplains but also extends to paddocks and open grassy forests in frost hollows and areas of poor drainage, but also occasionally occurs on rocky slopes (there is a somewhat anomalous population on the mid-slopes of Mt Barrow in the north-east). All populations are strongly associated with dolerite soils. Records outside the core of the range (e.g. Prosser River, Broad River, River Clyde) need to be treated carefully as they may represent the more recently described *Acacia derwentiana*.	Unlikely – some suitable habitat may be present, albeit likely sub-optimal and on the fringes of the survey area.
Acacia siculiformis	dagger wattle	NVA	r		Found near watercourses (e.g. dense shrubby riparian scrubs along major rivers in the Midlands	Unlikely – some suitable habitat may be present

Species Name	Common Name	Source	TSP Act	EPBC Act	Suitable Habitat	Likelihood
					and surrounding uplands) and in dry sclerophyll forest. It is often associated with rocky dolerite sites. Care needs to be taken with outlier records not supported by herbarium specimens.	at the western extent of the survey area, albeit likely sub-optimal.
Anogramma leptophylla	annual fern	NVA	v		Grows in shallow soil layers over rock, on exposed or semi-exposed outcrops in dry or damp sclerophyll forest. Plants are mostly found on rock ledges, often on, or just inside, the drip line of the overhead rock-face. The substrate is variable, including dolerite, basalt and sandstone.	Unlikely – no suitable habitat present within the survey area.
Asperula scoparia subsp. scoparia	prickly woodruff	NVA	r		Widespread in Tasmania and is mainly found in native grasslands and grassy forests, often on fertile substrates such as dolerite-derived soils. Forested sites are usually dominated by *Eucalyptus globulus* and *E. viminalis* (lower elevations) and *E. delegatensis* (higher elevations).	Possible – some suitable habitat may be present within the survey area.
Austrostipa bigeniculata	doublejointed speargrass	NVA	r		Found mainly in the southeast and Midlands in open woodlands and grasslands.	Unlikely – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Barbarea australis	riverbed wintercress	NVA, PMST	e	EN	Riparian species found near river margins, creek beds and along flood channels. It tends to favour the slower reaches and has not been found on steeper sections of rivers. Juveniles predominantly occur on flood deposits of silt, and gravel deposited as point bars and at the margins of base flows, or more occasionally or between large cobbles on sites frequently disturbed by fluvial processes; however, few plants in these open habitats make it to maturity. Flowering plants tend to occur in protected niches, which can include relatively coarse surrounding vegetation like bracken. Some of the sites are a considerable distance from the river, in flood channels scoured by previous flood action, exposing river pebbles. Most populations are in the Central Highlands, but other populations occur in the northeast and upland areas in the central north.	Unlikely – some suitable habitat may be present, albeit likely sub-optimal and on the fringes of the survey area.
Brachyscome rigidula	cutleaf daisy	NVA	v		Found in the Midlands, East Coast and in parts of the eastern Central	Possible - some suitable habitat

Species Name	Common Name	Source	TSP Act	EPBC Act	Suitable Habitat	Likelihood
					Highlands of Tasmania, where it occurs in rough pasture, grassland and grassy woodland on dry rocky hills and flats. Has been observed in pasture and agricultural areas known to be grazed.	may be present, albeit likely degraded or modified through historic pastoral activities or development.
Caladenia anthracina	black-tipped spider-orchid	PMST	e	CR	Restricted distribution in the Powranna/Campbelltown/Ross area, occurring in grassy woodland with *Acacia dealbata* (silver wattle) and bracken on well-drained sandy soil. Two historical sites from the Derwent Valley are presumed extinct.	Unlikely – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Calocephalus lacteus	milky beautyheads	NVA	r		Occurs in open, dry sites in lowland areas of eastern and northern Tasmania and on lower altitudes of the Central Plateau. It requires bare ground for recruitment and may benefit from disturbance. It is often found on roadsides and beside tracks.	Possible – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Colobanthus curtisiae	Curtis' colobanth	PMST	r	VU	Occurs in lowland grasslands and grassy woodlands but is also prevalent on rocky outcrops and margins of forest on dolerite on the Central Highlands (including disturbed sites such as log landings and snig tracks).	Unlikely – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development. No previous records within 5km.
Cryptandra amara	pretty pearlflower	NVA	e		Grows in some of the driest areas of the State and is typically associated with fertile rocky substrates (e.g., basalt). Its habitat ranges from near riparian rockplates to grasslands or grassy woodlands.	Unlikely – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Dianella amoena	grassland flax-lilly	PMST	r	EN	Occurs mainly in the northern and southern Midlands, where it grows in native grasslands and grassy woodlands. Has been previously observed within roadsides and verges, open pasture under grazing pressure.	Possible - some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development. Survey area within the western range of the species indicating possible presence.

Species Name	Common Name	Source	TSP Act	EPBC Act	Suitable Habitat	Likelihood
Discaria pubescens	spiky anchorplant	NVA	e		Found sporadically in the Midlands and more abundantly in drier parts of the Central Highlands. It grows on sandy or gravelly soil, in basalt talus slopes and clefts amongst fractured dolerite rocks and flood channels. Many sites are in rough pasture, and it also grows on roadsides. Recent collections indicate the species is occasionally associated with sandstone outcrops.	Possible – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Glycine latrobeana	clover glycine	NVA, PMST	v	VU	Occurs in a range of habitats, geologies and vegetation types. Soils are usually fertile but can be sandy when adjacent to or overlaying fertile soils. The species mainly occurs on flats and undulating terrain over a wide geographical range, including near-coastal environments, the Midlands, and the Central Plateau. It mainly occurs in grassy/heathy forests and woodlands and native grasslands.	Possible – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Lepidium hyssopifolium	soft peppercress	NVA, PMST	e	EN	Known from the growth suppression zone beneath large trees in grassy woodlands and grasslands (e.g. over-mature black wattles and isolated eucalypts in rough pasture). *Lepidium hyssopifolium* is now found primarily under large exotic trees on roadsides and home yards on farms. It occurs in the eastern part of Tasmania between sea-level to 500 metres above sea level in dry, warm and fertile areas on flat ground on weakly acid to alkaline soils derived from a range of rock types. It can also occur on frequently slashed grassy/weedy roadside verges where shade trees are absent.	Likely – suitable habitat present within the survey area and 107 records within 5km. Nearest record located <70m from the study area.
Leptorhynchos elongatus	lanky buttons	NVA	e		Occurs on Tertiary basalt or Quaternary sediments in *Themeda triandra* (kangaroo grass) grassland, as well as open grassy shrubland. It is extant at cemeteries in Bothwell and Jericho, an area of grassland in the Northern Midlands, and at a higher elevation site at Liawenee Moor on the Central Plateau.	Unlikely – some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Leucochrysum albicans subsp. tricolor	grassland paperdaisy	NVA, PMST	e	EN	Occurs in the west and on the Central Plateau and the Midlands, mostly on basalt soils in open grassland. This species would have originally occupied *Eucalyptus pauciflora* woodland and tussock grassland, though most of this habitat is now converted to improved pasture or cropland.	Unlikely – only one record from 1911 within 5km and not recorded since. Some suitable habitat may be present, albeit likely degraded

Species Name	Common Name	Source	TSP Act	EPBC Act	Suitable Habitat	Likelihood
						through historic pastoral activities or development.
Pellaea calidirupium	hotrock fern	NVA	r		Found in inland, rocky habitats in areas of low to moderate rainfall predominantly in the eastern half of Tasmania. It grows in crevices and on ledges on exposed or semi-exposed rock outcrops. A large sterile colony occurs on the bare summit of Casaveen Bluff (east of York Plains), while nearby, on a tributary of the Little Swanport River plants grow under more favourable conditions on a rock ledge within the protection of a rock gully.	Unlikely – suitable habitat unlikely to be present, and only one record within 5km from 1993.
Pseudocephalozia paludicola	alpine leafy liverwort	PMST		VU	Occurs on wet ground in subalpine grassland in the west of the State and on its central and eastern mountains. Species of *Pseudocephalozia* mostly occur on permanently damp mineral soil or over peat and are frequently found in moorland and sphagnous areas.	Highly Unlikely – suitable habitat not likely present in the survey area and no records within 40km.
Pterostylis commutata	Midland greenhood	PMST	e	CR	Restricted to Tasmania's Midlands, where it occurs in native grassland and *Eucalyptus pauciflora* grassy woodland on well-drained sandy soils and basalt loams.	Unlikely – outside of the known range of the species and suitable habitat not likely present in survey area.
Pterostylis ziegeleri	grassland greenhood, Cape Portland greenhood	PMST	v	VU	Occurs in the State's south, east and north, with an outlying occurrence in the north-west. In coastal areas, the species occurs on the slopes of low stabilised sand dunes and in grassy dune swales, while in the Midlands it grows in native grassland or grassy woodland on well-drained clay loams derived from basalt.	Unlikely – some suitable habitat may be present, however likely substantially modified. Additionally, no previous records from within 25km.
Rhodanthe anthemoides	chamomile sunray	NVA	r		Occurs in montane grasslands, heath and heathy scrub in central and north-western Tasmania.	Unlikely – some suitable habitat may be present, however likely converted to pasture or residential land.
Scleranthus fasciculatus	spreading knawel	NVA	v		Only recorded from a few locations in the Midlands and south-east. The vegetation at most of the sites is *Poa* grassland/grassy woodland. Appears to need gaps between the tussock spaces for its survival and both fire and stock grazing maintain the openness it requires. Often found in areas protected from grazing such as fallen trees and branches.	Possible - some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.

Species Name	Common Name	Source	TSP Act	EPBC Act	Suitable Habitat	Likelihood
Vittadinia burbidgeae	smooth new-holland-daisy	NVA	r		Known to occur from native grassland and grassy woodland. Can also occupy cleared or disturbed areas where it can be an early establishing species. Often observed from roadsides, verges and other disturbed sites.	Possible - some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Vittadinia cuneata var. cuneata	fuzzy new-holland-daisy	NVA	r		Known to occur from native grassland and grassy woodland. Can also occupy cleared or disturbed areas where it can be an early establishing species. Often observed from roadsides, verges and other disturbed sites.	Possible - some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Vittadinia gracilis	woolly new-holland-daisy	NVA	r		Known to occur from native grassland and grassy woodland. Can also occupy cleared or disturbed areas where it can be an early establishing species. Often observed from roadsides, verges and other disturbed sites.	Possible - some suitable habitat may be present, albeit likely degraded or modified through historic pastoral activities or development.
Westringia angustifolia	narrowleaf westringia	NVA	r		Occurs mainly in mid elevations, always on dolerite (but can be close to dolerite-sediment contact zones), in dry to wet sclerophyll forest on broad ridges, slopes and dense riparian shrubberies.	Unlikely – suitable habitat unlikely to be present.
Xerochrysum palustre	swamp everlasting, swamp paper daisy	PMST	v	VU	Scattered distribution with populations in the north-east, east coast, Central Highlands and Midlands, all below about 700 m elevation. It occurs in wetlands, grassy to sedgy wet heathlands and extends to associated heathy *Eucalyptus ovata* woodlands. Sites are usually inundated for part of the year.	Unlikely – suitable habitat unlikely to be present.

Note: Likelihood of occurrence of threatened flora is assessed on a 4-tier scale:

1. Present - individuals recorded within the survey area during the field assessment or any previous assessment within the boundaries of survey area;
2. Possible - suitable habitat occurs within the survey area;
3. Unlikely - suitable habitat unlikely to occur within the survey area, or suitable habitat substantially modified, or suitable habitat present but species not recorded for over 50 years within 5km of the site;
4. Highly unlikely - no suitable habitat present within the survey area, and individuals not recorded within the survey area during current or any previous assessment.

4.3 Threatened Fauna

The results of the NVA report (Appendix B) indicated a total of 66 threatened fauna individuals from six species have been previously recorded within 5 km of the survey area. Several of those species have been recorded from within the survey area including *Aquila audax subsp. fleayi* (Tasmanian wedge-tailed eagle), *Neophema chrysogaster* (orange-bellied parrot) and *Perameles gunnii* (Eastern barred bandicoot).

The results of the PMST report (Appendix C) identified 14 EPBC listed fauna species, or their habitat have the potential to occur within the survey area. This included seven birds, one fish, one amphibian, one invertebrate and four mammals.

The combined results of the PMST and NVA indicated a total of 15 state and/or Commonwealth listed flora species potentially occurring within the survey area. The results of the likelihood analysis indicated two species were considered as present within the survey area given previous records, four species were considered possible to occur within the survey area, seven were unlikely and three species highly unlikely. Species likelihoods were assessed based on the known habitat preferences for each species and the likely vegetation, habitat and landforms present based on the available information.

An additional reptile species, *Pseudemoia pagenstecheri* - tussock skink (TSP: vulnerable / EPBC: -) was considered for assessment. As per the table below, the species habitat includes medium to long grass tussocks in open grasslands where trees are absent or sparse. Relevant literature indicates the species may be present where vegetation consists of a grassy ground layer. The species is known from widely scattered locations, ranging from The Domain near Hobart, through the lowland Midlands, extending to higher elevations near Cradle Mountain, and a single island in Bass Strait. The survey area is located within the known range of the species, suggesting species presence is possible where suitable habitat exists.

Table 8 Summary of threatened fauna species identified from within 5 km based on the results from the NVA and PMST

Species Name	Common Name	Source	TSP Act	EPBC Act	Habitat	Likelihood
Amphibians						
Litoria raniformis	Green and gold frog	PMST	V	VU	Breeding habitat for the Green and Gold Frog includes the following elements: still or slow-moving water bodies (lagoons, lakes, farm dams, ponds, irrigation channels, swamps, and slow-moving sections of rivers and streams); the species prefers the shallow part of lagoons (to approx. 1.5m) with a complex vegetation structure, often containing vegetation communities dominated by emergent plants such as water ribbons (*Triglochin*) and spikerush (*Eleocharis*), and submerged plants such as watermilfoil (*Myriophyllum*), marsh-flower (*Villarsia*), and pondweed (*Potamogeton*); however, other plant communities can also form suitable breeding habitat.	Unlikely – suitable habitat no mapped within the survey area and no known records within 5 km.
Birds						
Aquila audax subsp. fleayi	Tasmanian wedge-tailed eagle	NVA, PMST	E	EN	Nesting habitat includes the following elements: patches of mature (including old-growth) forest, or forest with mature/old-growth elements, normally greater than 10 ha in area; nest trees usually tall (25-75 m), large and robust mature eucalypts, generally taller than the canopy; nests are often constructed in the tallest and largest tree at a site, and usually located within the canopy even when the nest tree is taller; nests typically occur on the lee (sheltered) aspect of the site (or where hills shelter an otherwise exposed site), with the nest situated below the ridge level for protection from prevailing winds.	Present – species may be observed within the survey area in a transient nature, however, highly unlikely to nest or breed given the lack of remnant forested patches containing suitable nesting trees/habitat. Previous sighting of the species within the survey area, however details unknown

Species Name	Common Name	Source	TSP Act	EPBC Act	Habitat	Likelihood
						(e.g. observer, date, etc)
Calidris ferruginea	Curlew sandpiper	PMST		CR	In Australia, curlew sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Unlikely – no suitable habitat mapped within the survey area and the species has not been recorded within 50km of the survey area.
Hirundapus caudacutus	White-throated needletail	PMST		VU	In Australia, the white-throated needletail can occur over most types of habitat, although they are recorded most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they have been observed flying over sandy beaches or mudflats, and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes. The species roosts in trees amongst dense foliage in the canopy or in hollows.	Unlikely – the species may be observed flying over the site, however, no roosting habitat is mapped within the survey area. No previous records mapped within 5km of the survey area.
Lathamus discolor	Swift parrot	PMST	E	CR	Habitat includes flowering Tasmanian blue gum and black gums (foraging habitat) and any eucalypt forest containing hollow-bearing trees (nesting habitat). Hollow-bearing trees are typically large and old with dead limbs or branches and at least some visible hollows.	Highly Unlikely – no suitable foraging or breeding habitat mapped within the survey area, and no previous records mapped within 5km. Species may be observed flying over the survey area, however would only be transiting through.
Neophema chrysogaster	Orange-bellied parrot	NVA	E	CR	The known breeding range of the Orange-bellied parrot is mostly confined to near-coastal areas of south-west Tasmania between Birchs Inlet in Macquarie Harbour, and Louisa Bay on the southern coast. Most breeding activity occurs within 20 km of Melaleuca and 5 km	Highly Unlikely – not within the known breeding or foraging range of the species and no suitable habitat present within the survey area.

Species Name	Common Name	Source	TSP Act	EPBC Act	Habitat	Likelihood
					of Birchs Inlet. Non-breeding (migratory) habitat for Orange-bellied Parrot includes the following elements: dunes, heathland, coastal grasslands, saltmarsh and pasture; on King Island, the species favours saltmarsh dominated by Beaded Glasswort *Sarcocornia quinqueflora*, flanked by tall dense Swamp Paperbark *Melaleuca ericifolia* forest. Nesting habitat for Orange-bellied parrot includes the following elements: a mosaic of eucalypt forest, rainforest, and extensive fire dependant moorland and sedgeland plains, intersected by wooded creeks, rivers and estuaries; nesting occurs predominantly in the hollows of live Smithton Peppermint, *Eucalyptus nitida* in patches of forest.	
Numenius madagascariensis	Eastern curlew, far eastern curlew	PMST	E	CR	During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Zosteraceae). Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms.	Unlikely – no suitable habitat mapped within the survey area and the species has not been recorded within 50 km of the survey area.
Pterodroma leucoptera leucoptera	Gould's petrel, Australian Gould's petrel	PMST		EN	Gould's Petrel breeds on Cabbage Tree Island, 1.4 km offshore from Port Stephens, NSW. This 30 ha island was thought to be the sole breeding locality for this species, but a few nesting birds were discovered on nearby Boondelbah Island in 1995. The non-breeding range and feeding areas of Gould's Petrel is unknown, but it appears that the species forages predominantly within the Tasman Sea. Beach washed specimens and sightings at sea extend as far north as the Queensland border and as far west as Eyre on the Western Australian south coast.	Highly Unlikely – no suitable habitat within the survey area, and no previous records within 5 km.

Species Name	Common Name	Source	TSP Act	EPBC Act	Habitat	Likelihood
Tyto novaehollandiae subsp. castanops	Tasmanian masked owl	NVA, PMST	E	VU	Habitat for the Tasmanian Masked Owl includes the following elements: foraging habitat - a diverse range of forest, woodland and non-forest vegetation including agricultural and forest mosaics; nesting habitat - eucalypt forests and woodlands containing old growth trees with suitable hollows for nesting/roosting, but will also nest in isolated old growth trees with suitable hollows. This species requires a mosaic of forest and open areas for foraging and large old-growth hollow-bearing trees for nests. The core range covers all habitat below 600 m a.s.l, but significant habitat is dry forest with mature habitat elements within that range. Forests with relatively open understoreys, particularly when these habitats adjoin areas of open or cleared land, are particularly favoured	Possible – species may be observed within the survey area in a transient nature, however, highly unlikely to nest or breed given the lack of remnant forested patches containing suitable nesting trees/habitat.
Fish						
Prototroctes maraena	Australian grayling	PMST	V	VU	Habitat for the Australian Grayling includes the following elements: adult Australian Grayling inhabit and breed in rivers and streams, usually in cool waters often with alternating pool and riffle zones; larvae and juveniles inhabit estuaries and coastal seas, although their precise habitat requirements are poorly known.	Unlikely – no suitable habitat mapped within the survey area.
Invertebrates						
Oreixenica ptunarra	Ptunarra Brown, Ptunarra Brown, Butterfly, Ptunarra xenica	PMST	V	EN	Endemic to Tasmania and restricted to five areas of the state: the Midlands, Steppes, Northwest Plains, Eastern Highlands and the Central Plateau. It is generally a montane to alpine species being restricted to sites above 400 m. It does not extend into the lowland plains of the Midlands, where it may be too warm for the butterfly and where it is too dry for its food plant to flourish. Throughout its range the Ptunarra brown butterfly is found in areas where there is a significant cover of *Poa* tussock. Some apparently excellent sites do not carry butterflies and this may be due to the history of the site. It is possible that the species has been eradicated from the western Central Plateau by a European history of over-firing and overgrazing. The preferred habitat ranges from *Poa* tussock grassland to *Hakea microcarpa* grassy	Unlikely – survey area located below the topographic range limit for the species (>400m ASL).

Species Name	Common Name	Source	TSP Act	EPBC Act	Habitat	Likelihood
					shrubland to *Eucalyptus* grassy open woodland.	
Mammals						
Dasyurus maculatus	Spotted-tailed quoll	NVA, PMST	R	VU	Spotted-tailed quolls can be found in numerous types of vegetation. However, forest elements such as rainforest, and wet and dry eucalypt forest are important components of their habitat. They can also be found in non-forest vegetation types such as coastal scrub and heath, and pastoral areas. This wide range of vegetation types are generally characterised by relatively high and predictable seasonal rainfall.	Possible – individuals of the species may be present area for foraging purposes (e.g. carcasses, small mammals), however no suitable denning habitat mapped within the survey area. 2 records from within 5 km, both located in forested areas of remnant vegetation.
Dasyurus viverrinus	eastern quoll	PMST		EN	The species' distribution is associated with areas of low rainfall and cold winter minimum temperatures. Within this distribution, it is found in a range of vegetation types including open grassland (including farmland), tussock grassland, grassy woodland, dry eucalypt forest, coastal scrub and alpine heathland, but is typically absent from large tracts of wet eucalypt forest and rainforest. Dens in burrows, hollow log or rock crevice.	Possible - individuals of the species may be present in area for foraging purposes (e.g. carcasses, insects, etc.). Some suitable denning habitat may be present in the survey area. No previous records mapped within 5 km of the survey area.
Perameles gunnii	eastern barred bandicoot	NVA, PMST		VU	Habitat for the eastern barred bandicoot includes the following elements: within agricultural districts, mosaic habitats of pasture and remnant native forest, often with a significant amount of cover provided by dense-growing weeds such as gorse, blackberry, blackthorn, rose briar, etc; small remnant populations may occur in remnant native grassland and grassy woodland; all records occur below 950 altitude.	Present – previously recorded within the survey area. Individuals may be present within the survey area for foraging or nesting purposes. Three records within 5 km, all from 1987.
Sarcophilus harrisii	Tasmanian devil	NVA, PMST	E	EN	Habitat includes the following elements contained across an area of several square kilometres: denning habitat for daytime shelter (e.g. dense vegetation, hollow logs, burrows or caves), open forests and woodlands are preferred, while devils are less commonly found in tall or dense wet forests; hunting habitat (open understorey mixed with patches of dense vegetation); breeding den habitat (areas of well-drained soil or sheltered overhangs such as cliffs, rocky outcrops, knolls, caves and earth banks, free from risk	Possible - individuals of the species may be present area for foraging purposes (e.g. carcasses, small mammals), however no suitable denning habitat mapped within the survey area.

Species Name	Common Name	Source	TSP Act	EPBC Act	Habitat	Likelihood
					of flooding; windrows and log piles may also be used).	
Reptiles						
Pseudemoia pagenstecheri	Tussock skink	-	V		Known from treeless tussock grassland and grassy open woodland at virtually any elevation where suitable habitat is present; typical habitat in the warmer lowland part of the range is native grassland dominated by *Poa labillardierei (*tussock grass) and species of *Rytidosperma* (wallaby grasses), *Themeda triandra* (kangaroo grass) and *Microlaena stipoides* (weeping grass).	Possible – survey area located within the known range of the species and some suitable habitat may be present, albeit likely degraded through historic pastoral activities or development.

Note: Likelihood of occurrence of threatened flora is assessed on a 4-tier scale:

1. Present - individuals recorded within the survey area during the field assessment or any previous assessment within the boundaries of survey area;
2. Possible - suitable habitat occurs within the survey area;
3. Unlikely - suitable habitat unlikely to occur within the survey area, or suitable habitat substantially modified, or suitable habitat present but species not recorded for over 50 years within 5km of the site;
4. Highly unlikely - no suitable habitat present within the survey area, and individuals not recorded within the survey area during current or any previous assessment.

4.4 Raptors

According to the NVA report, *Aquila audax subsp. fleayi* (Tasmanian wedge-tailed eagle) and *Falco cenchroides* (nankeen kestrel) have been previously sighted within 500 m of the survey area. Additionally, three wedge-tailed eagle (ID – 1096, 2222, 2524) and one *Falco peregrinus* (peregrine falcon) nest (ID – 266) have been identified within 5 km of the survey area. All mapped eagle nests are located greater than 1000 m from the survey area.

4.5 Weeds and Pathogens

According to the NVA report (Appendix B), one and eleven Declared weeds, pursuant to the Tasmanian *Weed Management Act 1999* (WM Act), have been recorded within 500 m and 5000 m, respectively. These include:

– *Carduus pycnocephalus* – slender thistle
– *Carduus tenuiflorus* – winged thistle
– *Cirsium arvense var. arvense* – creeping thistle
– *Cytisus scoparius* – English broom
– *Elodea canadensis* – Canadian pondweed
– *Erica Lusitanica* – Spanish heath
– *Genista monspessulana* – Montpellier broom/canary broom
– *Marrubium vulgare* – white horehound
– *Salix x fragilis var. fragilis* – crack willow
– *Salix x rubens* – basket willow
– *Ulex europaeus* – gorse

Several of those species, including *U. europeaus, C. scoparius, G. monspessulana* & *Salix spp.,* are listed as Weeds of National Significance (WoNS). Under the WM Act, landowners have a responsibility to control and manage declared weeds on their property in accordance with the relevant statutory weed management plan.

5. Threatening Processes

The TSP Act defines a threatening process as any action which poses a threat to the natural survival of any native taxon of flora or fauna. The Tasmanian *Threatened Species Strategy 2000*, prepared under the TSP Act, has identified six threatening processes as having the greatest impact on Tasmania's native flora and fauna:

– Native vegetation clearance
– Pests, weeds and diseases
– Degradation of water systems
– Inappropriate use of fire
– Bycatch and illegal harvesting
– Impacts of livestock

The Commonwealth EPBC Act also provides for the identification and listing of key threatening processes. A threatening process is defined under the EPBC Act as a key threatening process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community. The implications of listed key threatening processes are different for each state and territory. Those currently listed under the EPBC Act (and relevant to this project) are shown in the table below.

Table 9 Summary of listed Key Threatening Processes under the EPBC Act

Listed Key Threatening Process
Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*)
Competition and land degradation by rabbits
Competition and land degradation by unmanaged goats
Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)
Infection of amphibians with chytrid fungus resulting in chytridiomycosis
Land clearance
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases
Novel biota and their impact on biodiversity
Predation by European red fox
Predation by feral cats
Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs
Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species

Ecological values, such as those outlined in section 4 of this document, may be adversely affected by threatening processes. Key threatening processes potentially present within the survey area have been outlined below, and those relating more specifically to any proposed developments associated with this project (e.g. introduction of invasive flora) are discussed in Section 5.

5.1 Invasive Species

5.1.1 Invasive Flora

Key Threatening Process: Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants; Novel biota and their impact on biodiversity.

Eleven species listed as declared weeds under the Tasmanian *Weed Management Act 1999*, including eight Weeds of National Significance (WONS), have been previously recorded or are predicted to occur within 5 km of the survey area.

The NVA Report also identified two additional priority weeds (not listed as a declared weed) that have been recorded within 5 km of the survey area; *Tradescantia fluminensis* (wandering creeper) and *Verbascum thapsus* (great mullein).

5.1.2 Invasive Fauna

Key Threatening Process: Competition and land degradation by rabbits; Predation by European red fox; Predation by feral cats

The NVA report (Appendix B) did not identify any known species of biosecurity risk within 1000 m of the survey area, however, it's expected that feral cats and rabbits would be present in the local area given the abundance of open pasture, the proximity to residential properties and the likely abundance of prey in the form of native and invasive small mammals (e.g. bandicoots, rats, mice etc.).

5.2 Pathogen Infestation/s

Key Threatening Process: Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*); Infection of amphibians with chytrid fungus resulting in chytridiomycosis.

Phytophthora cinnamomi (root rot fungus or cinnamon fungus) is an introduced pathogen that attacks the roots of over 130 Tasmanian plant species. It can change the structure and composition of vegetation, and reduce plant species diversity and resources, with resultant flow-on effects to fauna. As such, it is the only pathogen listed as a 'threatening process' on the EPBC Act. *Phytophthora cinnamomi* can be introduced to an area by spores carried on vehicles and machinery, with human activities primarily responsible for introducing the pathogen into new areas. Once established, it can spread rapidly by water transport, root-to-root infection and animal digging, and is impossible to eradicate[11].

Given the relatively low rainfall of the survey area, it's likely that *P. cinnamomi* is unable to spread and affect any present flora species.

Additional plant and fauna pathogens known from Tasmania include myrtle wilt (*Chalara australis*), myrtle rust (*Austropuccinia psidii*) and chytrid fungus (*Batrachochytrium dendrobatidisi*). Myrtle wilt and myrtle rust are not expected to impact ecological values in the survey area as given their relevant host species and/or known habitat are not mapped within the survey area. Chytrid fungus has the potential to impact on any local frog populations, however, the majority of the survey area is expected to be free of standing water bodies. As such, any impacts would be short-lived and not pose an ongoing threat the local species.

[11] FPA 2009

6. Potential Impacts

6.1 Vegetation Communities

According to TASVEG 4.0, none of the mapped vegetation communities within the survey area represent a threatened community under either state or Commonwealth legislation. As such, impacts to any known threatened vegetation communities were considered highly unlikely as a result of the proposed development.

6.2 Threatened Flora

According to the available databases, the closest threatened flora observations are known from 62 m north-west of the survey area. This record consisted of *Lepidium hyssopifolium* (soft peppercress). This species is listed as Endangered under both the TSP Act and EPBC Act.

Based on the results of the desktop assessment, a total of 11 state and/or Commonwealth listed flora species have the potential to be located within the survey area. These species include:

– *Asperula scoparia subsp. scoparia* - prickly woodruff (TSP: rare / EPBC: -)
– *Brachyscome rigidula* - cutleaf daisy (TSP: vulnerable / EPBC: -)
– *Calocephalus lacteus* - milky beautyheads (TSP: rare / EPBC: -)
– *Dianella amoena* - grassland flax-lilly (TSP: rare / EPBC: endangered)
– *Discaria pubescens* - spiky anchorplant (TSP: endangered / EPBC: -)
– *Glycine latrobeana* - clover glycine (TSP: vulnerable / EPBC: vulnerable)
– *Lepidium hyssopifolium* - soft peppercress (TSP: endangered / EPBC: endangered)
– *Scleranthus fasciculatus* - spreading knawel (TSP: vulnerable / EPBC: -)
– *Vittadinia burbidgeae* - smooth new-holland-daisy (TSP: rare / EPBC: -)
– *Vittadinia cuneata var. cuneata* - fuzzy new-holland-daisy (TSP: rare / EPBC: -)
– *Vittadinia gracilis* - woolly new-holland-daisy (TSP: rare / EPBC: -)

Given the known range and preferred habitat of the above flora species, the results of this desktop assessment are unable to definitively determine the potential presence and subsequent impacts to some flora species. As such, a number of the threatened flora species may be present in the survey area given the nearby records of the species. Therefore, a flora survey should be conducted to identify the presence/absence of any threatened flora species and assess any potential impacts.

Several of the above species are listed under the EPBC Act indicating their conservation significance on a national scale. Where impacts and/or removal of these species is possible, a referral to the Commonwealth Minister for Environment and the Department of Climate Change, Environment, Energy & Water (DCCEEW) may be required.

6.3 Threatened Fauna

Based on the results of the desktop assessment, a total of seven state and/or Commonwealth listed fauna species (two birds, four mammals & one reptile) are potentially present within the survey area based on previous records, their known habitat preferences and the habitat identified during the desktop assessment. These species include:

– *Aquila audax subsp. fleayi* - Tasmanian wedge-tailed eagle (TSP: endangered / EPBC: Endangered)
– *Dasyurus maculatus maculatus* – spotted-tailed quoll (TSP: rare / EPBC: Vulnerable)
– *Dasyurus viverrinus* - eastern quoll (TSP: - / EPBC: Endangered)
– *Perameles gunnii gunnii* - eastern barred bandicoot (TSP: - / EPBC: Vulnerable)
– *Pseudemoia pagenstecheri* - tussock skink (TSP: vulnerable / EPBC: -)
– *Sarcophilus harrisii* - Tasmanian devil (TSP: endangered / EPBC: Endangered)
– *Tyto novaehollandiae subsp. castanops* - Tasmanian masked owl (TSP: endangered / EPBC: Vulnerable)

Four of the above threatened species have the potential to be present within the survey area given the abundance of generalised foraging habitat (e.g. open pasture, roadsides, roadkill carcasses, etc.). These species include the Tasmanian devil, spotted tailed-quoll, Tasmanian wedge-tailed eagle, and Tasmanian masked owl. All of these species are conservation significant carnivorous species with site specific habitat requirements for nesting or denning. The survey was not considered to provide suitable nesting or denning habitat for those species given the lack of representative suitable habitat. Given the lack of suitable nesting/denning/breeding habitat for these carnivorous species, any individuals or populations in proximity of the survey area would likely be in very low abundances and any proposed flood mitigation options are not likely to impact on significant habitat for those species.

However, those species are known to forage across a broad range of landscapes, vegetation types and landforms. As such, it's possible these species may be present throughout the survey area, however, their presence would likely be brief in duration, more likely for transit or foraging purposes. Additionally, the foraging resources within the survey are likely to remain accessible post construction. As such, those species (Tasmanian devil, spotted tailed-quoll, Tasmanian wedge-tailed eagle, and Tasmanian masked owl) were not considered for further assessment.

Of those species listed above, suitable nesting/denning habitat for the eastern quoll, eastern barred bandicoot and the tussock skink may be present within the survey area, and as such those species are discussed further below.

6.3.1 Eastern Quoll

The eastern quoll (*D. viverrinus*) is widespread in Tasmania and was previously widespread in mainland south-eastern Australia, including New South Wales, Victoria and eastern South Australia[12]. The species is considered extinct on the mainland, with the last confirmed mainland sighting at Vaucluse (NSW) in 1963. The species is now restricted to Tasmania, occurring in most parts of Tasmania, but is recorded infrequently in the wetter western third of the state.

The species' distribution is associated with areas of low rainfall and cold winter minimum temperatures[13] [14]. Within this distribution, the species is known from a range of vegetation types including open grassland (including farmland), tussock grassland, grassy woodland, dry eucalypt forest, coastal scrub and alpine heathland, but is typically absent from large tracts of wet eucalypt forest and rainforest[15] [16] [17].

According to the NVA database, no records of the species have been recorded within 5km and a total of 23 records within 20km. The survey area is located within the known range of the species and within the core range of the species according to the FPA.

The species is commonly associated with dry grassland and forest mosaics which are bounded by agricultural land, particularly where pasture grubs are common[18] [19] [13]. The species is known to nest in dens made under rocks, in underground burrows or fallen logs[12], but anecdotal evidence suggests the species may nest in man-made structures.

Threats to the eastern quoll are outlined in the below:

– predation by feral cats
– disease
– climate change
– predation by red foxes
– non-target poisoning associated with 1080
– non-target poisoning associated with rodent control
– predation by dogs
– road mortality

[12] TSSC 2015
[13] Fancourt 2015
[14] Fancourt et al. 2015a
[15] Rounsevell et al. 1991
[16] Taylor & Comfort 1993
[17] Fancourt et al. 2015b
[18] Blackhall 1980
[19] Godsell 1983

The majority of the survey area is mapped as agricultural land (FAG) with urban areas (FUR - e.g. residential property/dwellings). Elements of optimal denning habitat (e.g. large tracts of remnant open grassland or woodland containing fallen trees, rock piles or underground burrows) are unlikely to be available within the survey area given the mapped TASVEG communities and historical modifications (e.g. pastoral activities, grazing, residential developments, clearing, roadside maintenance). As such, it is considered the survey area is likely to provide sub-optimal or low-quality denning habitat for the eastern quoll. Higher quality denning habitat may be available in the large remnant forest patches (mapped as *Eucalyptus tenuiramis* forest and woodland on sediments - DTO) located approx. 1-2 km to the west.

Non-developed portions of the survey area may provide access to foraging habitat with abundant access to agricultural invertebrate pests (e.g. cockchafer beetles, southern army worms and corbie grubs)[18] [19] [20]. Access to the foraging habitat (e.g. open pasture) within the survey area is likely to remain post the implementation of any flood mitigation measures.

As such, the implementation of the proposed development is unlikely to generate a significant impact to the eastern quoll. To further mitigate against any risk of impacts to the species, the proponent should conduct pre-clearance surveys to ensure the development footprint is free of any suitable denning structures that may be utilised by any present eastern quolls.

6.3.2 Eastern Barred Bandicoot

The eastern barred bandicoot (*P. gunnii gunnii*) was previously widely distributed in northern, central and south-eastern Tasmania, however, it has now declined in the central part of this range in the Midlands region[21] [22] [23]. The species is now most abundant in the south-eastern quarter of the state with lower numbers in the north-eastern and north-western coastal regions and least abundant in the midland and eastern coastal areas[21] [24]. According to the FPA range boundaries, the survey area is located near the northern-western extent of the core range of the species distribution in Tasmania.

The known threats to the species include:

– clearing of habitat, in particular loss of ground cover
– overgrazing
– urban development
– predation by feral cats (*Felis catus*) and dogs (*Canis familiaris*)

The species occurs in open habitats including woodlands and open forests with a grassy understorey, and native and exotic grasslands[21], and requires understorey plants to provide shelter, nest sites and food[25]. Suitable native plants which form a dense ground cover include saggs *(Lomandra* and *Lepidosperma sp.)*, *Gahnia* species and species of *Acacia, Grevillia, Hakea* and *Correa*, whereas invasive flora including gorse and blackberries also provide shelter for bandicoots. According to the FPA, significant habitat for the eastern barred bandicoot is dense tussock grass, sagg, sedge, swords, piles of coarse woody debris and denser patches of low shrubs (especially those that are densely branched close to the ground providing shelter)[26]. Therefore, the survey area is unlikely to represent significant habitat for the species due to the mapped TASVEG communities and historical modifications (e.g. pastoral activities, grazing, residential developments, clearing, roadside maintenance).

The species is known to feed on earthworms and invertebrates (including pasture pests like corbie grubs) and plant material, such as underground fungi and berries[27]. As such, the majority of the survey area is likely to provide suitable foraging habitat for the species, albeit sub-optimal (given the lack of refugia) and in the form of open pasture/grassland. Access to foraging habitat (e.g. open pasture) within the survey area is likely to remain post the implementation of any flood mitigation measures.

[20] Jones & Barmuta 1998
[21] Hocking 1990
[22] Robinson et al. 1991
[23] Mallick et al. 1998
[24] Mallick et al. 1997
[25] Parks and Wildlife Service Tasmania 2007
[26] FPA 2021
[27] Bryant & Jackson 1999

Given the above, the implementation of any proposed flood mitigation measures is unlikely to significantly impact on the eastern barred bandicoot. To further mitigate against any risk of impacts to the species, the proponent should conduct pre-clearance surveys to ensure the development footprint is free of any suitable nesting/burrow structures that may be utilised by any present individuals.

6.3.3 Tussock Skink

The tussock skink (*P. pagenstecheri*) is a ground-dwelling lizard, occurring in grassland and grassy woodland habitats at a range of elevations[28]. Potential habitat for the tussock skink is described as grassland and grassy woodland (including rough pasture with paddock trees) at virtually any elevation, generally with a greater than 20% cover of native grass species, especially where medium to tall tussocks are present[26]. According to the FPA species range boundaries, the survey area is within the potential range of the tussock skink. The core range of the species is restricted to 550 m buffer areas around the previous records[26].

Suitable habitat features in the warmer lowland part of the range includes native grassland dominated by *Poa labillardierei* (tussock grass) and species of *Rytidosperma* (wallaby grasses), *Themeda triandra* (kangaroo grass) and *Microlaena stipoides* (weeping grass). Records of the species in Tasmania are located in small, disconnected patches of habitat in the Midlands, inland near Cradle Mountain and the eastern Bass Strait islands[28].

According to the NVA, two previous records of the species are located 12 km south, both from 2009. These records are listed as species sightings and located in areas of open pasture mapped as 'agricultural land' (FAG)[1], suggesting the species may persist in rough pasture known to be anthropogenically modified. Two additional records are located 29 km (recorded in 2010) and 32 km south-west (recorded in 2000). This confirms previous research suggesting the vegetation structure of grasslands appears more important for tussock skinks than the floristic composition e.g. individuals are recorded relatively regularly in invasive species dominant grassland vegetation[29].

Given the above, the survey area may provide some suitable habitat for the species, although its unlikely to represent optimal habitat given the mapped TASVEG communities and historical modifications (e.g. pastoral activities, grazing, residential developments, clearing, roadside maintenance). A definitive assessment of the potential impacts is unable to be determined from the desktop level given the unknown potential for the presence of the species within the survey area. As such, a field survey is recommended to identify the presence/absence of any suitable habitat for the tussock skink, identify the presence/absence of any individuals and assess any potential impacts relating to the implementation of any proposed flood mitigation options.

6.4 Weeds and Pathogens

Given the previous records of declared weeds and/or WoNS within or near the survey area, the proponent should develop and implement a Weed & Hygiene Management Plan (WHMP). The data collected during a field survey should inform the location, density and abundance of any significant weeds present within the survey area that require active management.

This documentation should include:

– Control of weeds prior to construction where appropriate
– Washdown and inspection of vehicles, machinery and boots before leaving/entering the site to avoid transporting viable plant materials or large clods of soil
– Washdown to be conducted in accordance with the *Tasmanian Washdown Guidelines for Weed and Disease Control*[30]
– Control of material brought onto the site, to make sure it is free from weed seeds or diseases

Weed control in or near aquatic habitat, or areas of poor drainage, must consider the potential presence of frogs and/or other aquatic species, with manual removal preferable. Otherwise, low-toxicity non-residual herbicides registered as suitable for watercourses (e.g. Roundup Bioactive®) may be appropriate for use in a targeted manner such as spot spraying. Care also needs to be taken in order to avoid impacting any native flora species

[28] TSS 2023
[29] Turner 2012
[30] DPIPWE 2004

during weed control works; make sure that such works are undertaken by an appropriately qualified person with the ability to accurately distinguish the relevant weed species from any native flora.

6.4.1 Willow Removal

As per section 2.1.1, a component of the overall project proposes the woody weed removal specifically targeting willow species (*Salix spp.*). This works will require the removal of relatively large and established trees from the banks of the River Clyde. Worldwide, there are over 330 accepted willow species with over 170 accepted hybrids[31]. Relevant species may include *S. cinerea*, crack willow (*S. fragilis var. fragilis*), basket willow (*S. x rubens*) and black willow (*S. nigra*).

As per the Tasmanian *Weed Management Act 1999* and the relevant statutory Weed Management Plan, willow species (*S. alba var. vitellina, S. matsudana, S. X pendulina var. pendulina, S. X sepulcralis var. chrysocoma, S. X rubens*) the Central Highlands municipality is listed under Zone A. Eradication is the most appropriate management objective for Zone A municipalities which have little or no prohibited willow, or when a credible plan for eradicating existing infestations is being developed and implemented. The ultimate management outcome for Zone A municipalities is achieving and maintaining the total absence of prohibited willow from within municipal boundaries.

Willow control can be dangerous, and if done poorly, may result in additional localised environmental damage. Chemical treatment is the most effective method for killing mature willows, with an adaptive approach incorporating physical and mechanical removal where necessary. The proponent should develop a Woody Weed Management Plan aimed to effectively control and remove targeted willow populations along the River Clyde. GHD can assist in the development of this plan and should be guided by the relevant resources including the Willow – *Salix spp.* Weed Management Guide found on the Department of Natural Resources and Environment Tasmania (DNRET) website, the Willows - Weed Management Plan as per the WM Act, the Weed and Disease Planning and Hygiene Guidelines[32], Tasmanian Washdown Guidelines for Weed and Disease Control[33], Waterways & Wetlands Works Manual - Environmental Best Practice Guidelines[34] and the Waterways & Wetlands - Works Manual[35]. Where required, the Invasive Species Branch of DNRET should be contacted for advice.

In order to reduce the risk of sedimentation and localised impacts to waterways and fauna habitat, all woody weed removal should be guided by sediment and erosion mitigation measures.

6.5 Legislative Implications

6.5.1 Tasmanian *Threatened Species Protection Act 1995*

Threatened flora and fauna listed under this Act are protected under section 51, whereby a permit would be required to 'take, keep, trade in or process' any listed species. Under this Act, any unauthorised activities which may impact on those species listed under the Act would be considered an offence.

Given the desktop assessment has determined several state listed flora and/or fauna species may be present, a field survey should be conducted to confirm the presence absence of those species and/or their habitat.

6.5.2 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Under the Commonwealth EPBC Act, an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance (MNES). MNES considered under the EPBC Act include listed migratory species, Ramsar wetlands of international importance, Commonwealth marine environment, world heritage properties, national heritage places, the Great Barrier Reef

[31] DSEWPC 2007
[32] DPIPWE 2017
[33] DPIPWE 2004
[34] DPIPWE 2003
[35] DPIWE 2003

Marine Park, nuclear actions and a water resource, in relation to coal seam gas development and large coal mining development.

Where an action is likely to have a significant impact on a matter protected under the EPBC Act, the proponent may be required to refer the proposed action to the Department of Climate Change, Environment, Energy and Water (DCCEEW) for assessment.

Based on the information outlined in section 6, the proposed development has the potential to impact on eastern quolls and eastern barred bandicoots, both of which are listed under the EPBC Act.

The DCCEEW provides a *Significant Impact Guidelines* policy statement[36] to determine if referral to the department is required. The *Guidelines* consider a "significant impact" to comprise loss that is likely to lead to a long-term decrease in the size of an important population of a species ; reduce the area of occupancy of an important population ; fragment an existing important population into two or more; adversely affect habitat critical to the survival of a species; disrupt the breeding cycle of an important population ; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline ; result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat ; introduce disease that may cause the species to decline ; or interfere substantially with the recovery of the species.

Where field surveys identify the presence of individuals or habitat for any MNES, a significant impact test should be conducted by the proponent once the final project footprint of any proposed mitigation works and the associated impacts has been determined.

6.5.3 Tasmanian *Nature Conservation Act 2002*

Schedule 3A of the Act lists vegetation types classified as threatened within Tasmania. The survey area does not support any such vegetation types.

6.5.4 Tasmanian *Weed Management Act 1999*

Under the Tasmanian Weed Management (WM) Act, landowners have obligations to control and manage declared weed species in accordance with the relevant species statutory management plans. As per section 4.5, one and eleven declared weeds have been recorded within 500 m and 5000 m respectively. Therefore, the field survey will inform the need for weed control activities in accordance with the WM Act.

6.5.5 Tasmanian *Land Use Planning and Approvals Act 1993*

The applicable planning scheme for the survey area is the Tasmanian Planning Scheme under the Central Highlands Local Provisions Schedule. Note that the following should not be considered a detailed interpretation of the provisions of the *Scheme* or constitute legal advice and may not necessarily align to the views of Central Highlands Council.

The survey area intersects several zones including rural, utilities, rural living Zone A, village, agriculture, recreation and community purpose. Additionally, the survey area covers several codes including:

– Local Historical Heritage Code - Local heritage precinct
– Natural Assets Code – Priority vegetation & waterway and coastal protection area
– Bushfire-Prone Areas Code - Bushfire-prone areas

The overall project footprints of the proposed flood mitigation options should be finalised prior to assessment against any of the codes or zones under the relevant planning scheme.

[36] CofA 2013

6.5.6 Tasmanian *Forest Practices Act 1985* and associated *Forest Practices Regulations 2017*

The Act provides the following definition of the concept of "clearing": *clearing of trees* means the removal of trees by – (a) clearing, cutting, pushing or otherwise removing; or (b) destroying the trees in any way. The Act provides the following definition of the concept of "trees": *trees* means – (a) any woody plants with a height or potential height of 5 metres or more, whether or not living, dead, standing or fallen, that are – (i) native to Tasmania; or (ii) introduced into Tasmania and used for the processing or harvesting of timber; and (b) tree ferns [where *tree fern* means a plant of the species *Dicksonia antarctica*].

Within the survey area, the vegetation is mapped as agricultural and urban areas. As such, it's unlikely the trees within this area are native and are more likely planted. As such, it is considered unlikely that a Forest Practices Plan (FPP) is required.

7. Recommendations

7.1 Further Assessments

As discussed in section 6.2 and 6.3.3, a natural values survey by a suitably qualified ecologist is recommended to map and record the baseline ecological values within the survey area. The aim of the proposed survey will be to:

- Ground truth the results of the desktop assessment
- Identify and record the local vegetation communities according to the TASVEG 4.0[1] descriptions
- Identify evidence of any conservation significant flora, fauna or communities that were not detected during the desktop assessment
- Identify any present threatened flora species with a specific focus on those flora species identified in section 6.2
- Identify any present threatened fauna species and/or their habitat with a particular focus on *P. pagenstecheri* (tussock skink)
- Identify any key threatening processes within the survey area, including but not limited to the presence of weeds and invasive fauna species.
- Assess the impacts of the implementation of the proposed flood mitigation measures on any present significant natural values
- Identify any potential additional relevant legislative approvals related to the implementation of the proposed flood mitigation measures

Field survey methods should be developed in accordance with the NRE *Guidelines for Natural Values Surveys - Terrestrial Development Proposals*[37]. Flora surveys should ideally be conducted during the spring/early summer flowering period for most Tasmanian flora species as this will increase the likelihood of positive identifications. Some species may be identified without reproductive material (flowers/seeds), however, conducting surveys during the optimal flowering period will increase the likelihood of observing all present species, including those annual species (e.g. those which only occur ephemerally). Where baseline flora surveys identify the likely presence of potential threatened flora species, or some flora species are unable to be identified in the field, additional targeted flora surveys may be required.

Fauna survey methods should be developed to target the relevant species, including the tussock skink. Baseline surveys should aim to identify and assess any potentially suitable habitat for the tussock skink. Where suitable habitat is identified, targeted surveys may be required including pitfall trapping and use of temporary artificial habitat (e.g. tiles placed amongst tussock grass) to identify the presence/absence of any individuals within the habitat.

[37] NCH 2021

7.2 Finalise Project Footprint

Once the preferred flood mitigation option has been selected, the final project footprint should be determined. The project footprint should aim to avoid or minimise impacts to any ecological values as identified during the desktop assessment and any field surveys conducted over the area. The following recommendations should be incorporated to the design:

– Development should be directed to degraded areas (e.g. where exotic species dominate the vegetation composition, where there are no suitable habitat features e.g. logs, rock piles)
– Any remnant native vegetation potentially providing habitat for threatened flora and fauna species, and impacts to these habitats should be avoided
– Utilise current tracks for routing access road(s)
– Similarly, project design should make sure that drainage and vegetation is not altered to the detriment of any local flora and fauna species

All of the above avoidance measures should be informed by the survey activities proposed under section 7.1.

7.3 Additional Documentation

As per section 6.4, a WHMP should be developed to control and manage any populations of declared and un-declared weeds within and in close proximity to the survey, including the willow removal a discussed under section 6.4.1. All weed management activities should be informed by the survey activities proposed under section 7.1.

Woody weed removal should be guided by the development sediment and erosion control measures with the aim to limit the risk of impacts to freshwater habitat on the River Clyde. Sediment and erosion control measures to limit the risk of impacts to freshwater habitat may include:

– Location and amount of ground disturbance (see Ground Disturbance, Retain Vegetation)
– Initial and final contours
– Location of watercourses and surface drainage
– Location of roads, drains, buildings and other public and private assets
– Location of significant natural values (e.g. environmental values listed under the *Threatened Species Protection Act 1995* or *Nature Conservation Act 2002*)
– A table identifying the likely potential sources of sediment and their potential impact, risk level and the proposed mitigation measure
– Location of all proposed temporary drainage control measures (temporary drainage control measures)
– Location of vegetation to be retained and removed, including within the area to be inundated
– Location of material stockpiles
– Location and details of all proposed erosion control measures. (e.g. erosion control mats and blankets, drainage control measures, retain vegetation, revegetation and limit ground disturbance, dust control)
– Location and details of all proposed sediment control measures. (e.g. sediment fences & fibre rolls, erosion control mats and blankets, sediment basins and instream sediment control techniques)
– A statement of who is responsible for establishing and maintaining all erosion and sediment control measures
– The installation and un-installation sequence of the different sediment and erosion controls
– The maintenance program of the sediment and erosion controls
– Where required, revegetation of disturbed areas to establish a mix of native understory species including reeds, sedges, shrubs and trees

7.3.1 Significant Impact Test

As per section 6.5.2, where field surveys indicate any MNES are likely to be present, the proponent should conduct a self-assessment in accordance with the *Guidelines.* The self-assessment will assess the project against the ‘significant impact criteria’ to determine if a significant impact is likely and the project requires referral. It should

be noted that a self-assessment is only required where MNES (or habitat for a specific MNES) are identified and have the potential to be impacted.

7.4 Permits and Approvals

Once the final project options and subsequent footprint is confirmed, the likely impacts to listed flora, fauna and vegetation communities should be confirmed to inform the need for any relevant permits and approvals.

Where any threatened flora have the potential to be impacted as a result of the roadworks, a permit to take under the *Threatened Species Protection Act 1995* may be required. Additionally, a permit may be required where any products of wildlife (e.g. burrows, nests, dens) are proposed to be removed as part of the works.

Where a self-assessment determine impacts to MNES are likely, a referral to Commonwealth Minister and DCCEEW will be required. If the Minister decides the action is likely to have a significant impact on a MNES, then the project is a ‘controlled action’ and will require approval under the EPBC Act. However, should the Minister determine the action unlikely to have a significant impact on any MNES, the project is not a ‘controlled action’ and will not require approval under the EPBC Act.

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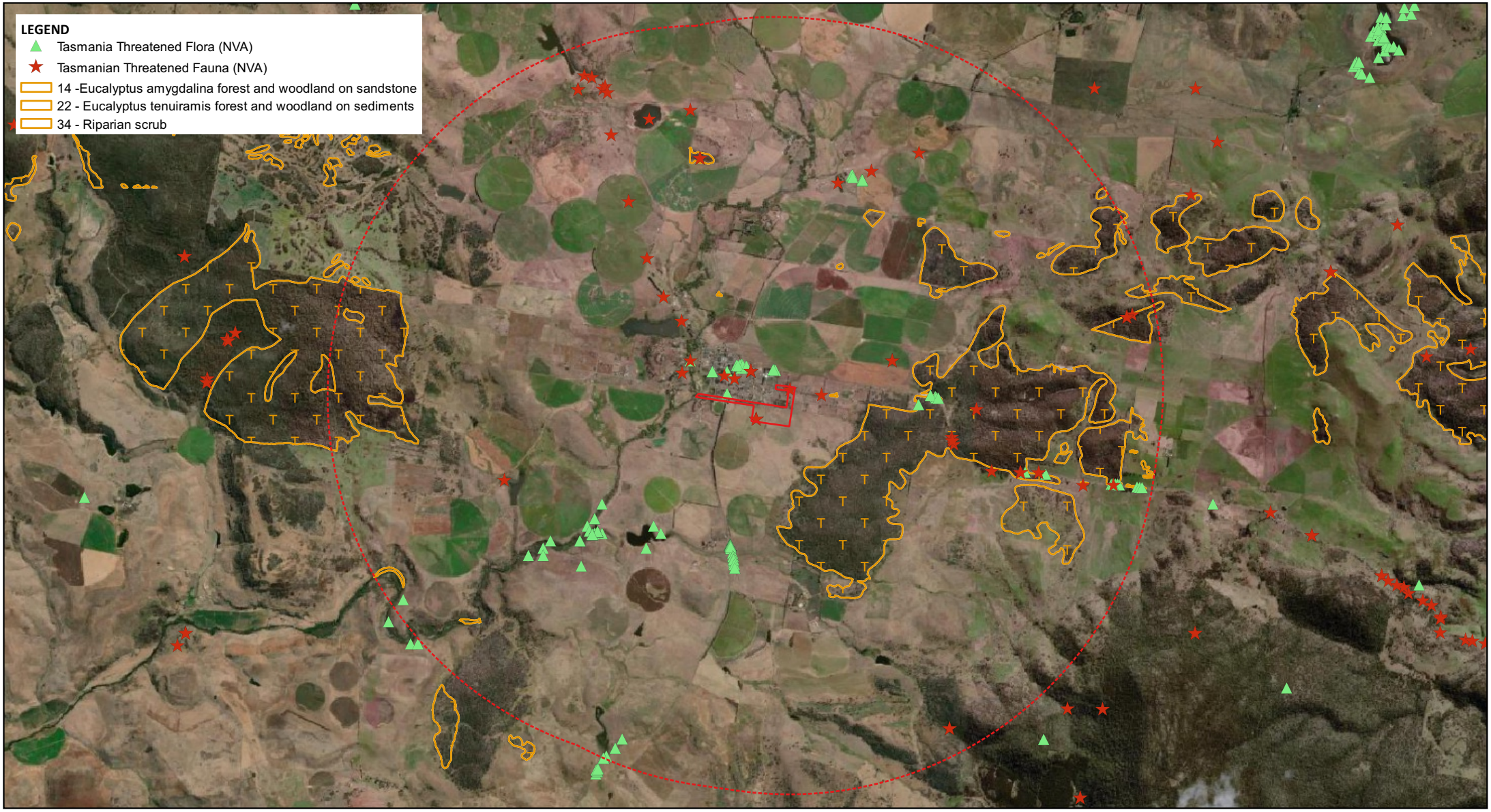
Appendices

Appendix A

Maps & Figures



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

LEGEND
Survey Area
5km Buffer

Central Highlands Council
River Clyde Mapping Study
Desktop Assessment

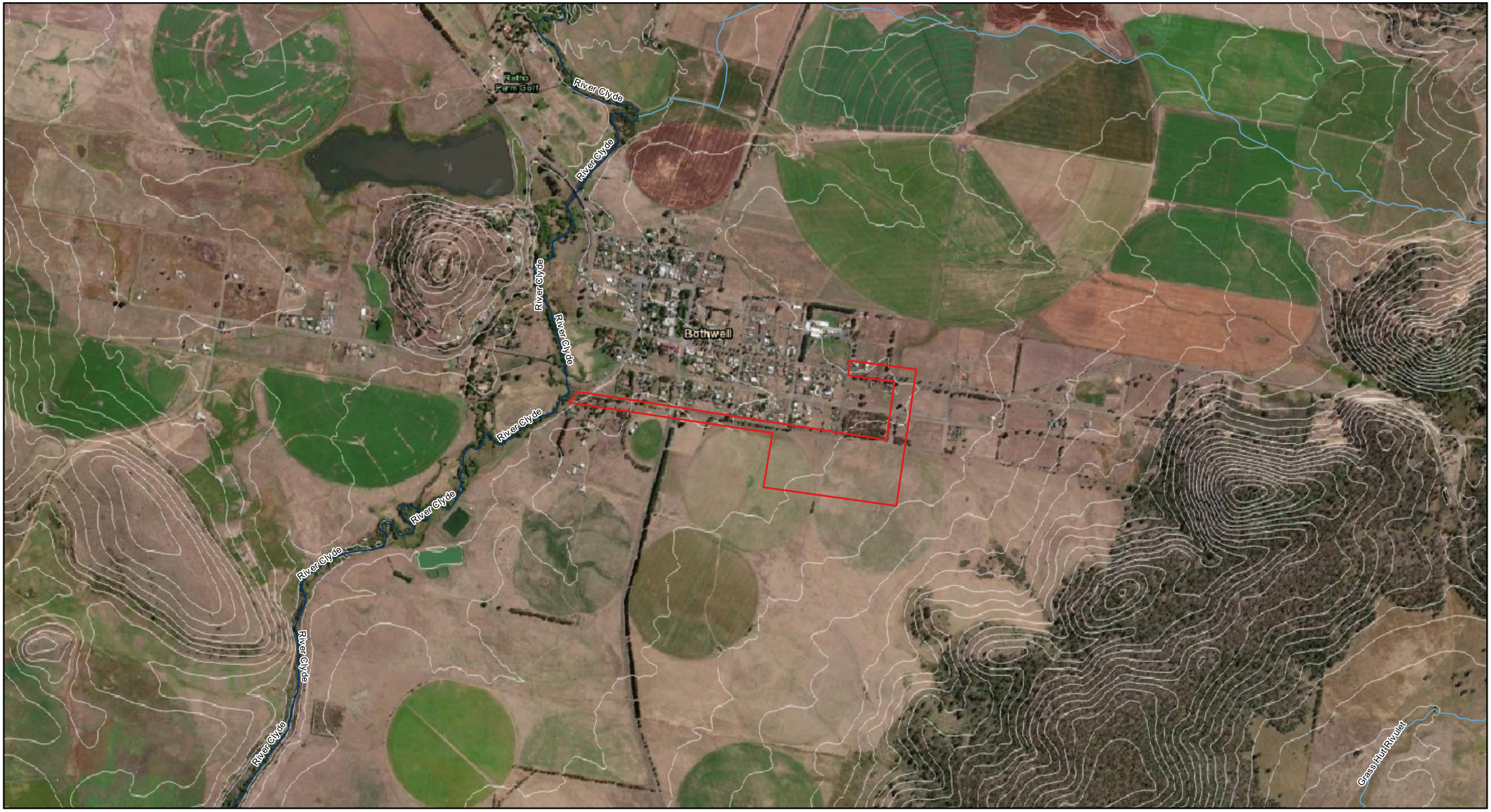
Project No. 12571871
Revision No. A
Date: 20/12/2022

Desktop Assessment
Results - Flora & Fauna

Figure 2

N:\AU\hobart\Projects\32\12571871\GIS\Maps\Working\12571871_River Clyde Flood Mitigation_Desktop Assessment

2 Salamanca Square, Hobart Tasmania 7000 Australia T 61 3 6210 0600 E hbamail@ghd.com W www.ghd.com



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

LEGEND

Survey Area

Central Highlands Council
River Clyde Mapping Study
Desktop Assessment

Project No. 12571871
Revision No. A
Date: 20/12/2022

Survey Area Overview

Figure 2

N:\AU\hobart\Projects\32\12571871\GIS\Maps\Working\12571871_River Clyde Flood Mitigation_Desktop Assessment

2 Salamanca Square, Hobart Tasmania 7000 Australia T 61 3 6210 0600 E hbamail@ghd.com W www.ghd.com

1:20,000 @ A4

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

LEGEND

- Survey Area
- (FAG) Agricultural land
- (FUR) Urban areas
- (FWU) Weed infestation

Central Highlands Council
River Clyde Mapping Study
Desktop Assessment

Project No. 12571871
Revision No. A
Date: 20/12/2022

Desktop Assessment Results - Vegetation

Figure 1

N:\AU\hobart\Projects\32\12571871\GIS\Maps\Working\12571871_River Clyde Flood Mitigation_Desktop Assessment

2 Salamanca Square, Hobart Tasmania 7000 Australia T 61 3 6210 0600 E hbamail@ghd.com W www.ghd.com

Appendix B

NVA Report

Natural Values Atlas Report

Authoritative, comprehensive information on Tasmania's natural values.

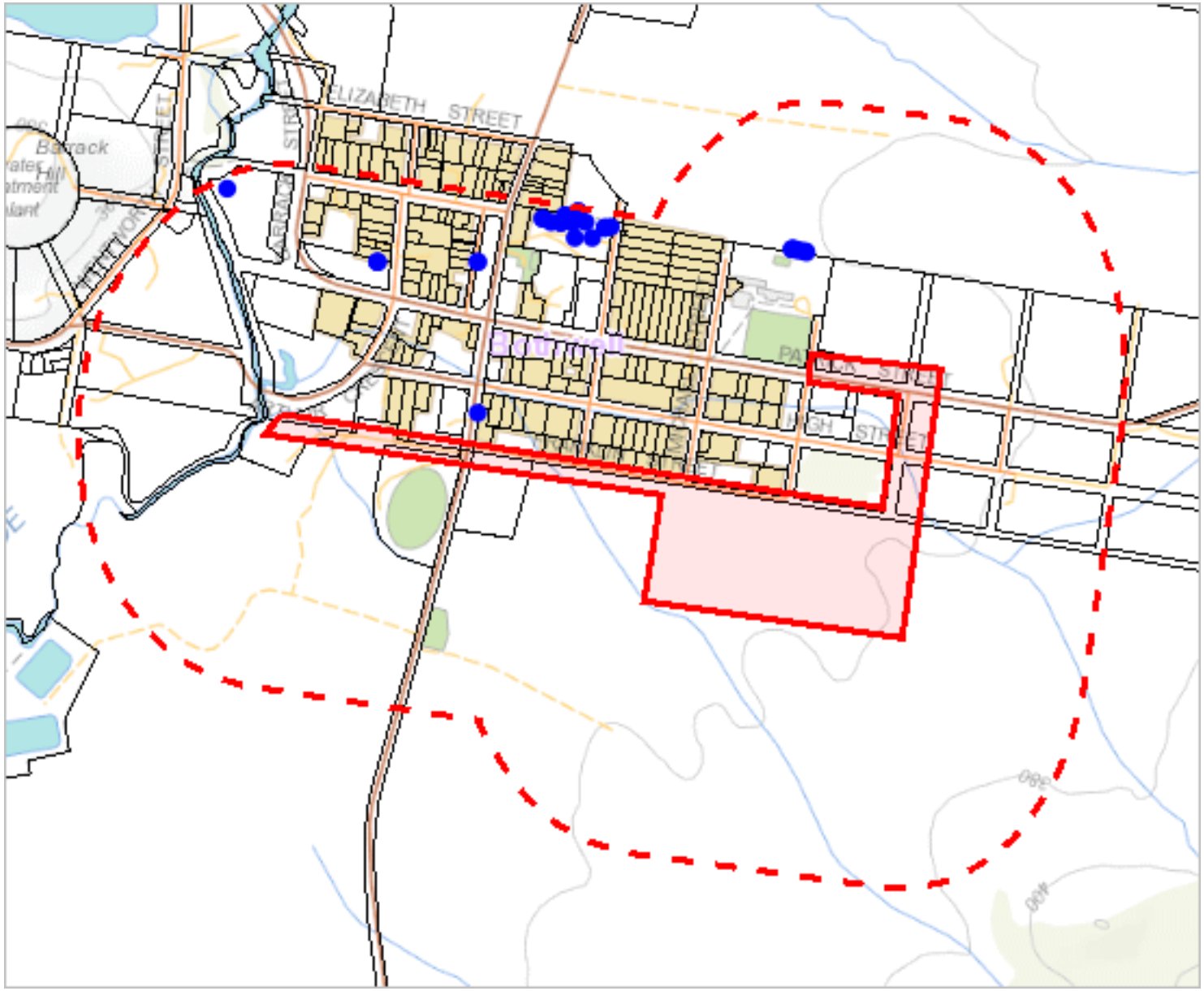
Reference:	
Requested For:	
Report Type:	Summary Report
Timestamp:	10:33:44 AM Tuesday 14 February 2023
Threatened Flora:	buffers Min: 500m Max: 5000m
Threatened Fauna:	buffers Min: 500m Max: 5000m
Raptors:	buffers Min: 500m Max: 5000m
Tasmanian Weed Management Act Weeds:	buffers Min: 500m Max: 5000m
Priority Weeds:	buffers Min: 500m Max: 5000m
Geoconservation:	buffer 1000m
Acid Sulfate Soils:	buffer 1000m
TASVEG:	buffer 1000m
Threatened Communities:	buffer 1000m
Fire History:	buffer 1000m
Tasmanian Reserve Estate:	buffer 1000m
Biosecurity Risks:	buffer 1000m

The centroid for this query GDA94: 501141.0, 5307179.0 falls within:

Property: 3361565

Threatened flora within 500 metres

502053, 5308198



499667, 5306239

Please note that some layers may not display at all requested map scales

Threatened flora within 500 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened flora within 500 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Asperula scoparia subsp. scoparia	prickly woodruff	r		n	1	20-Jan-2018
Brachyscome rigidula	cutleaf daisy	v		n	1	01-Nov-2006
Glycine latrobeana	clover glycine	v	VU	n	1	25-Jan-1993
Lepidium hyssopifolium	soft peppercress	e	EN	n	15	07-Apr-2017
Leptorhynchos elongatus	lanky buttons	e		n	9	01-Nov-2006
Leucochrysum albicans subsp. tricolor	grassland paperdaisy	e	EN	n	1	15-Feb-1911
Rhodanthe anthemoides	chamomile sunray	r		n	1	15-Feb-1911
Vittadinia burbidgeae	smooth new-holland-daisy	r		e	1	01-Nov-1984
Vittadinia cuneata var. cuneata	fuzzy new-holland-daisy	r		n	2	01-Nov-2006
Vittadinia gracilis	woolly new-holland-daisy	r		n	2	20-Jan-2018

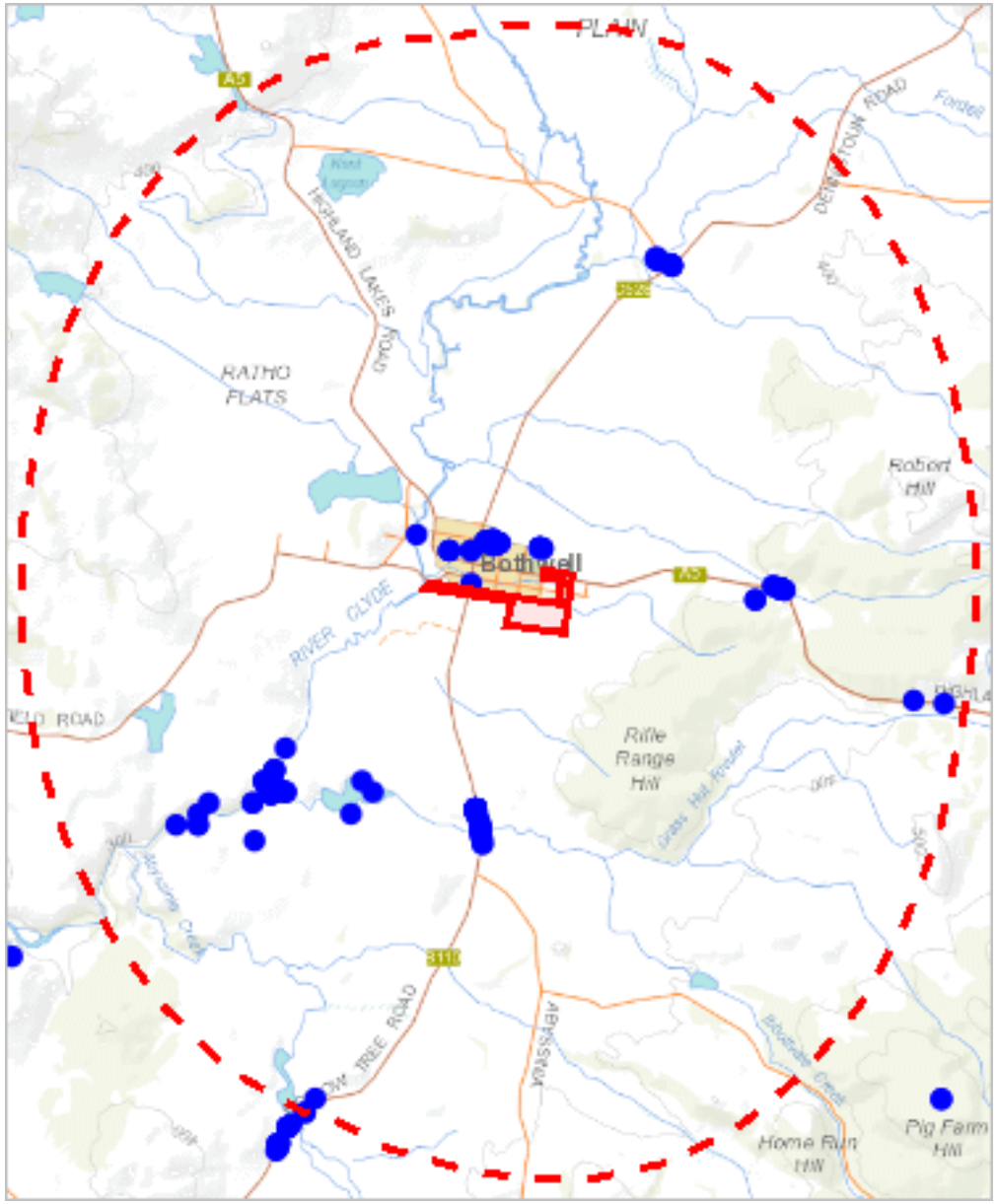
Unverified Records

No unverified records were found!

For more information about threatened species, please contact Threatened Species Enquiries.
Telephone: 1300 368 550
Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened flora within 5000 metres

505392, 5312675



496342, 5301755

Please note that some layers may not display at all requested map scales

Threatened flora within 5000 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened flora within 5000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Acacia siculiformis	dagger wattle	r		n	8	21-Dec-2007
Anogramma leptophylla	annual fern	v		n	2	27-Sep-2004
Asperula scoparia subsp. scoparia	prickly woodruff	r		n	12	20-Jan-2018
Austrostipa bigeniculata	doublejointed speargrass	r		n	1	01-Jan-1992
Barbarea australis	riverbed wintercress	e	EN	e	5	21-Dec-2007
Brachyscome rigidula	cutleaf daisy	v		n	4	21-Dec-2007
Calocephalus lacteus	milky beautyheads	r		n	2	20-Jan-2014
Cryptandra amara	pretty pearlflower	e		n	7	21-Dec-2007
Discaria pubescens	spiky anchorplant	e		n	7	21-Dec-2007
Glycine latrobeana	clover glycine	v	VU	n	1	25-Jan-1993
Lepidium hyssopifolium	soft peppercress	e	EN	n	107	07-Apr-2017
Leptorhynchos elongatus	lanky buttons	e		n	9	01-Nov-2006
Leucochrysum albicans subsp. tricolor	grassland paperdaisy	e	EN	n	1	15-Feb-1911
Pellaea calidirupium	hotrock fern	r		n	1	21-Jul-1993
Rhodanthe anthemoides	chamomile sunray	r		n	3	05-Jun-1990
Scleranthus fasciculatus	spreading knawel	v		n	2	22-Jan-2014
Vittadinia burbidgeae	smooth new-holland-daisy	r		e	2	21-Dec-2007
Vittadinia cuneata var. cuneata	fuzzy new-holland-daisy	r		n	3	01-Nov-2006
Vittadinia gracilis	woolly new-holland-daisy	r		n	16	08-Sep-2020
Vittadinia sp.		p		n	1	01-Jan-1995
Westringia angustifolia	narrowleaf westringia	r		e	7	21-Dec-2007

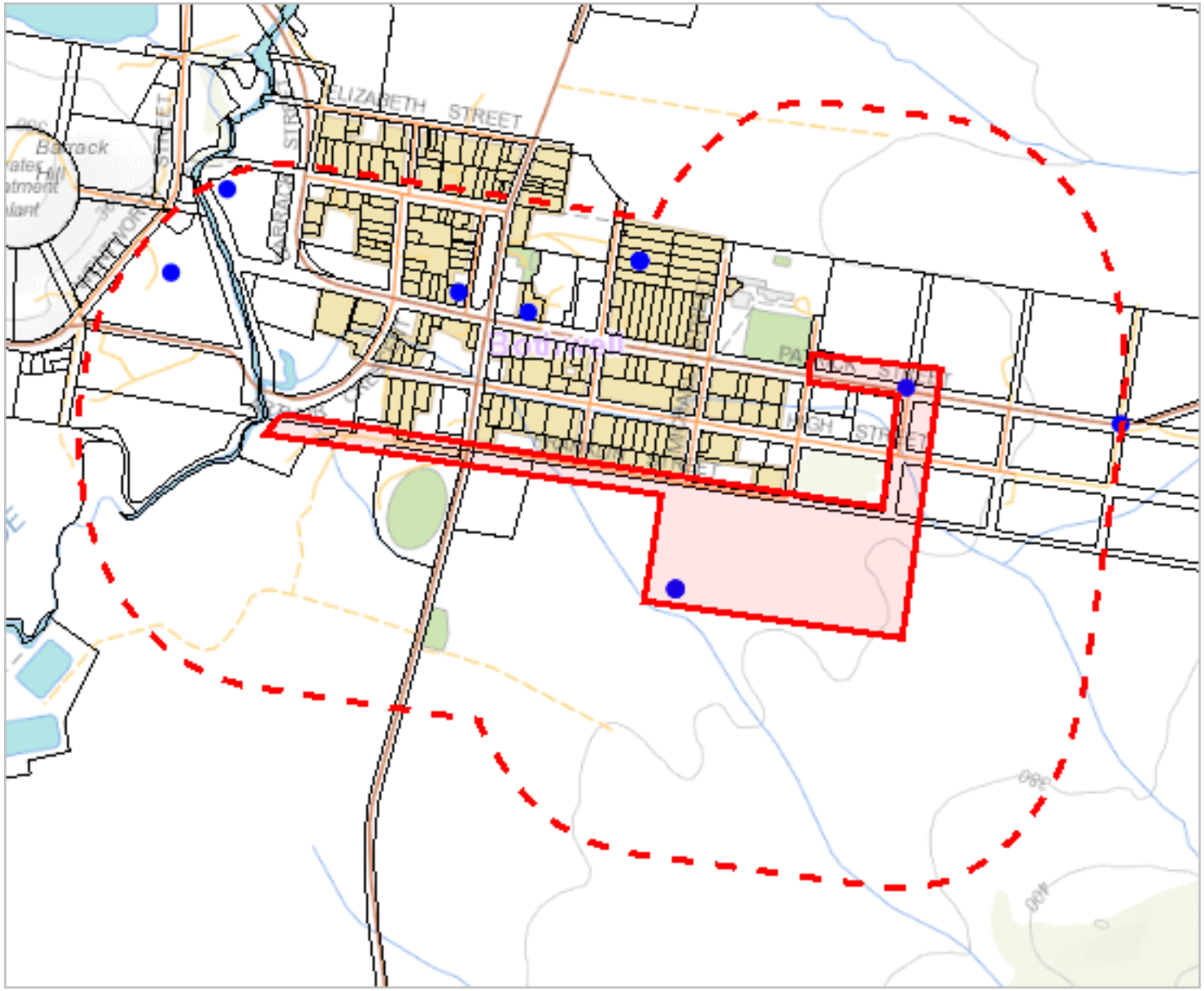
Unverified Records

No unverified records were found!

For more information about threatened species, please contact Threatened Species Enquiries.
Telephone: 1300 368 550
Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened fauna within 500 metres

502053, 5308198



499667, 5306239

Please note that some layers may not display at all requested map scales

Threatened fauna within 500 metres

Legend: Verified and Unverified observations

- Point Verified
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- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened fauna within 500 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Aquila audax	wedge-tailed eagle	pe	PEN	n	5	10-Feb-2017
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	2	16-Jun-1968
Neophema chrysogaster	orange-bellied parrot	e	CR	mbe	1	06-Nov-1898
Perameles gunnii	eastern barred bandicoot		VU	n	1	01-Jul-1987
Sarcophilus harrisii	tasmanian devil	e	EN	e	4	03-Feb-2010

Unverified Records

No unverified records were found!

Threatened fauna within 500 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	BO	Potential	Known	Core
Astacopsis gouldi	lutaralipina or giant freshwater crayfish	v	VU	e	1	0	0
Litoria raniformis	green and gold frog	v	VU	n	1	0	0
Dasyurus maculatus subsp. maculatus	spotted-tail quoll	r	VU	n	1	0	0
Pseudemoia pagenstecheri	tussock skink	v		n	1	0	0
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	1	0	1
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	1	0	0
Sarcophilus harrisii	tasmanian devil	e	EN	e	1	0	0
Accipiter novaehollandiae	grey goshawk	e		n	1	0	0
Perameles gunnii	eastern barred bandicoot		VU	n	1	0	1
Oreixenica ptunarra	ptunarra brown butterfly	e	EN	e	1	0	0
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	1	0	0
Dasyurus viverrinus	eastern quoll		EN	n	0	0	1

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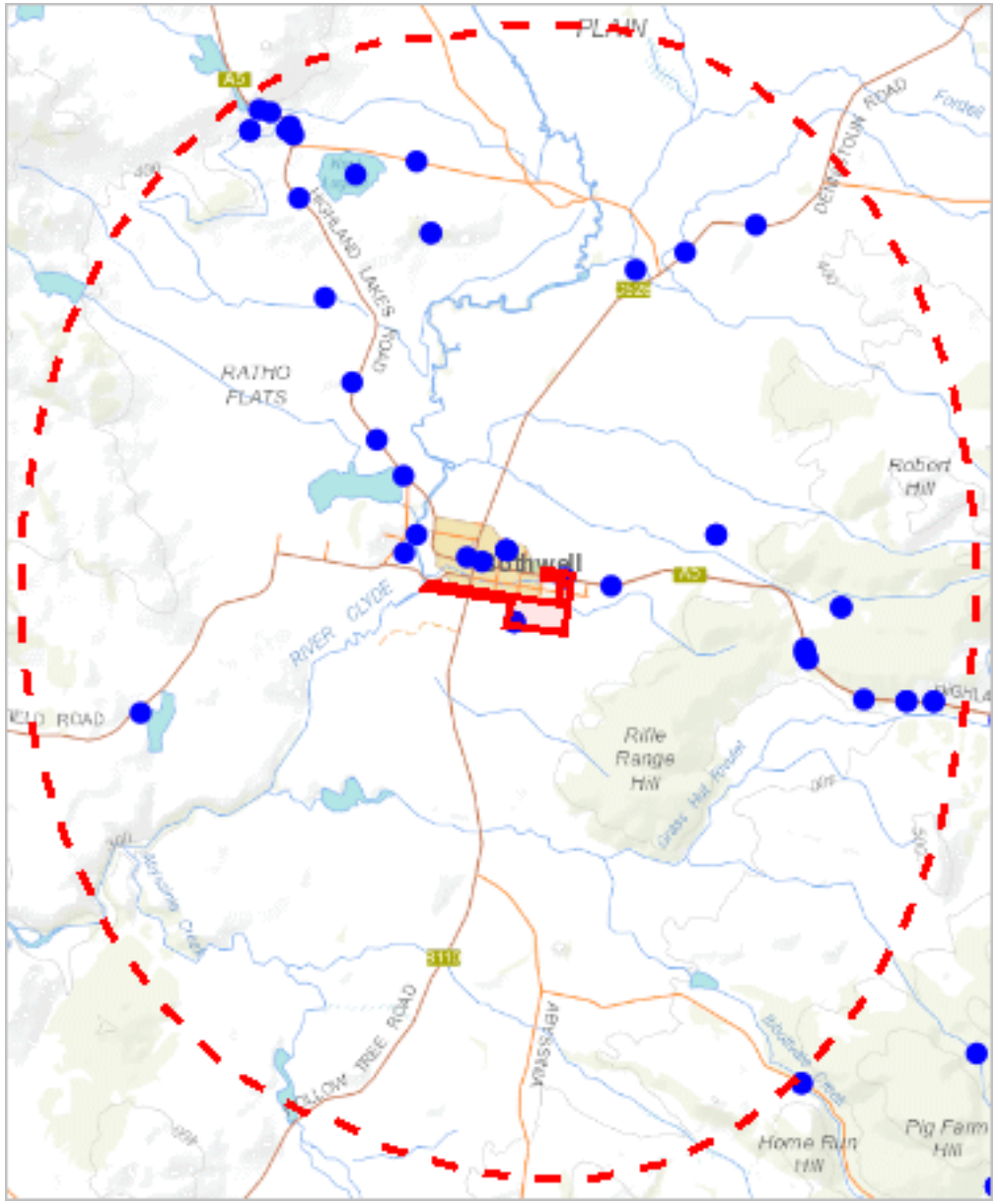
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened fauna within 5000 metres

505392, 5312675



496342, 5301755

Please note that some layers may not display at all requested map scales

Threatened fauna within 5000 metres

Legend: Verified and Unverified observations

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- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened fauna within 5000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Aquila audax	wedge-tailed eagle	pe	PEN	n	9	25-Mar-2018
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	20	21-Jul-2017
Dasyurus maculatus	spotted-tail quoll	r	VU	n	1	01-Feb-2016
Dasyurus maculatus subsp. maculatus	spotted-tail quoll	r	VU	n	1	24-Feb-2012
Neophema chrysogaster	orange-bellied parrot	e	CR	mbe	1	06-Nov-1898
Perameles gunnii	eastern barred bandicoot		VU	n	3	01-Jul-1987
Sarcophilus harrisii	tasmanian devil	e	EN	e	30	26-Nov-2022
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	1	06-Jan-2018

Unverified Records

No unverified records were found!

Threatened fauna within 5000 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	BO	Potential	Known	Core
Dasyurus maculatus subsp. maculatus	spotted-tail quoll	r	VU	n	1	0	1
Astacopsis gouldi	lutaralipina or giant freshwater crayfish	v	VU	e	1	0	0
Litoria raniformis	green and gold frog	v	VU	n	1	0	0
Pseudemoia pagenstecheri	tussock skink	v		n	1	0	0
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	1	0	1
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	1	0	0
Sarcophilus harrisii	tasmanian devil	e	EN	e	1	0	0
Accipiter novaehollandiae	grey goshawk	e		n	1	0	0
Perameles gunnii	eastern barred bandicoot		VU	n	1	0	1
Oreixenica ptunarra	ptunarra brown butterfly	e	EN	e	1	0	0
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	1	0	0
Dasyurus viverrinus	eastern quoll		EN	n	0	0	1

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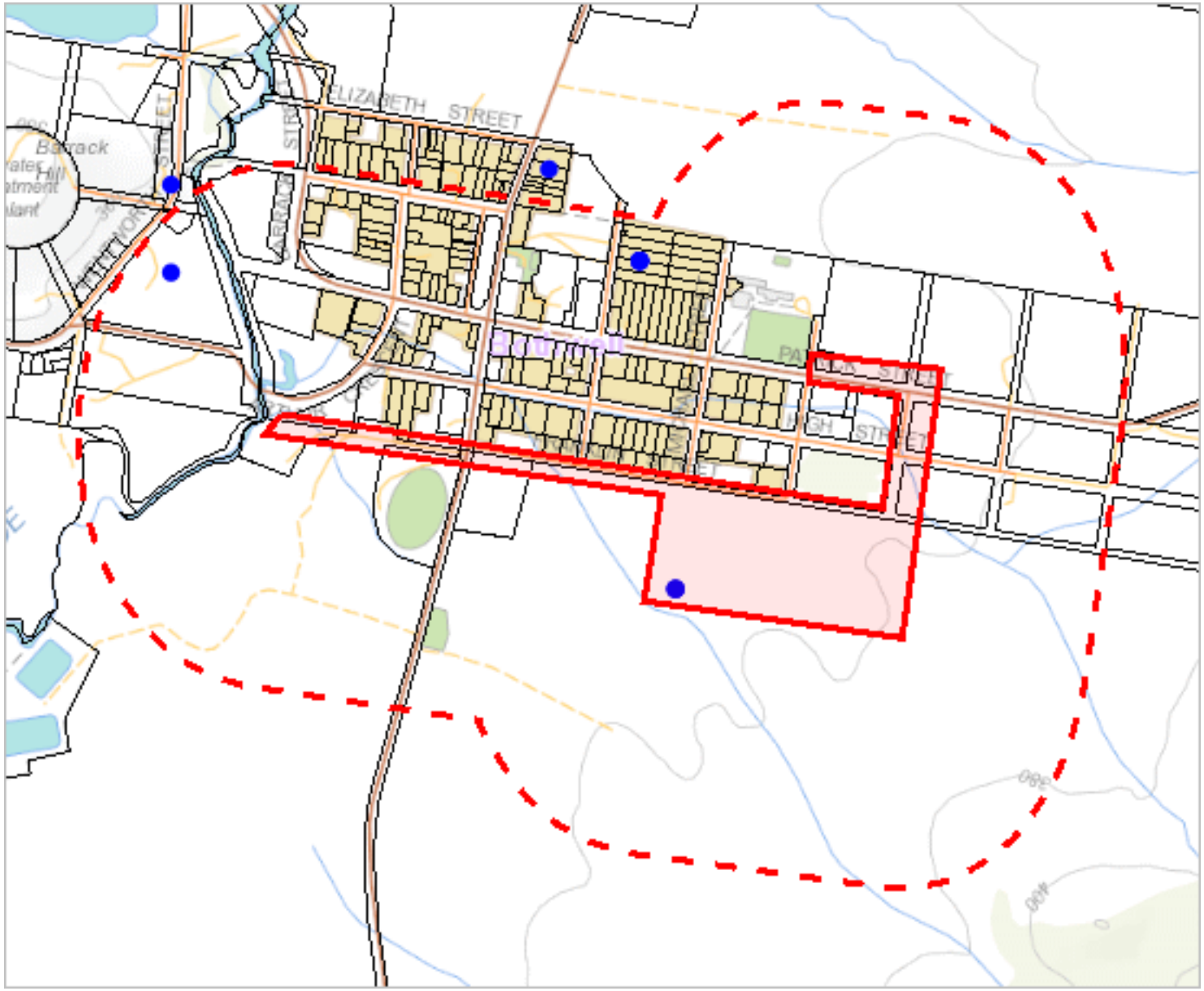
Telephone: 1300 368 550
Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Raptor nests and sightings within 500 metres

502053, 5308198



499667, 5306239

Please note that some layers may not display at all requested map scales

Raptor nests and sightings within 500 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Raptor nests and sightings within 500 metres

Verified Records

Nest Id/Location Foreign Id	Species	Common Name	Obs Type	Observation Count	Last Recorded
	Aquila audax	wedge-tailed eagle	Not Recorded	5	10-Feb-2017
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Sighting	2	16-Jun-1968
	Falco cenchroides	nankeen kestrel	Sighting	1	01-Mar-1893
	Falco peregrinus	peregrine falcon	Not Recorded	1	20-Jan-2016

Unverified Records

No unverified records were found!

Raptor nests and sightings within 500 metres

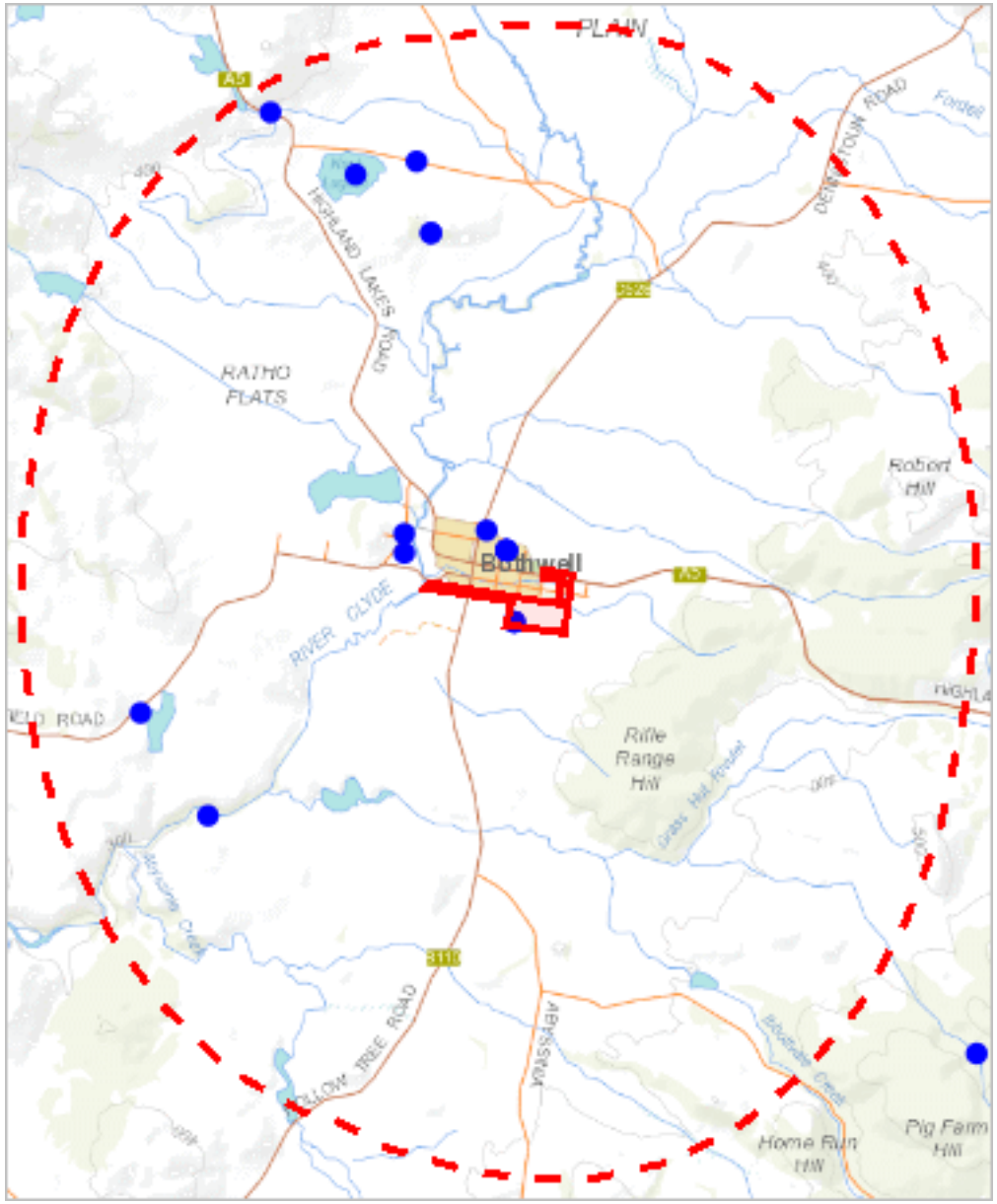
(based on Range Boundaries)

Species	Common Name	SS	NS	Potential	Known	Core
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	0
Haliaeetus leucogaster	white-bellied sea-eagle	v		1	0	0

For more information about raptor nests, please contact Threatened Species Enquiries.
Telephone: 1300 368 550
Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Raptor nests and sightings within 5000 metres

505392, 5312675



496342, 5301755

Please note that some layers may not display at all requested map scales

Raptor nests and sightings within 5000 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Raptor nests and sightings within 5000 metres

Verified Records

Nest Id/Location Foreign Id	Species	Common Name	Obs Type	Observation Count	Last Recorded
1096	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	15	25-Nov-2013
2222	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	26-Jun-2015
2524	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	2	21-Jul-2017
266	Falco peregrinus	peregrine falcon	Nest	1	01-Jan-1985
	Aquila audax	wedge-tailed eagle	Not Recorded	9	25-Mar-2018
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Sighting	2	16-Jun-1968
	Falco cenchroides	nankeen kestrel	Sighting	1	01-Mar-1893
	Falco peregrinus	peregrine falcon	Not Recorded	3	20-Jan-2016

Unverified Records

No unverified records were found!

Raptor nests and sightings within 5000 metres

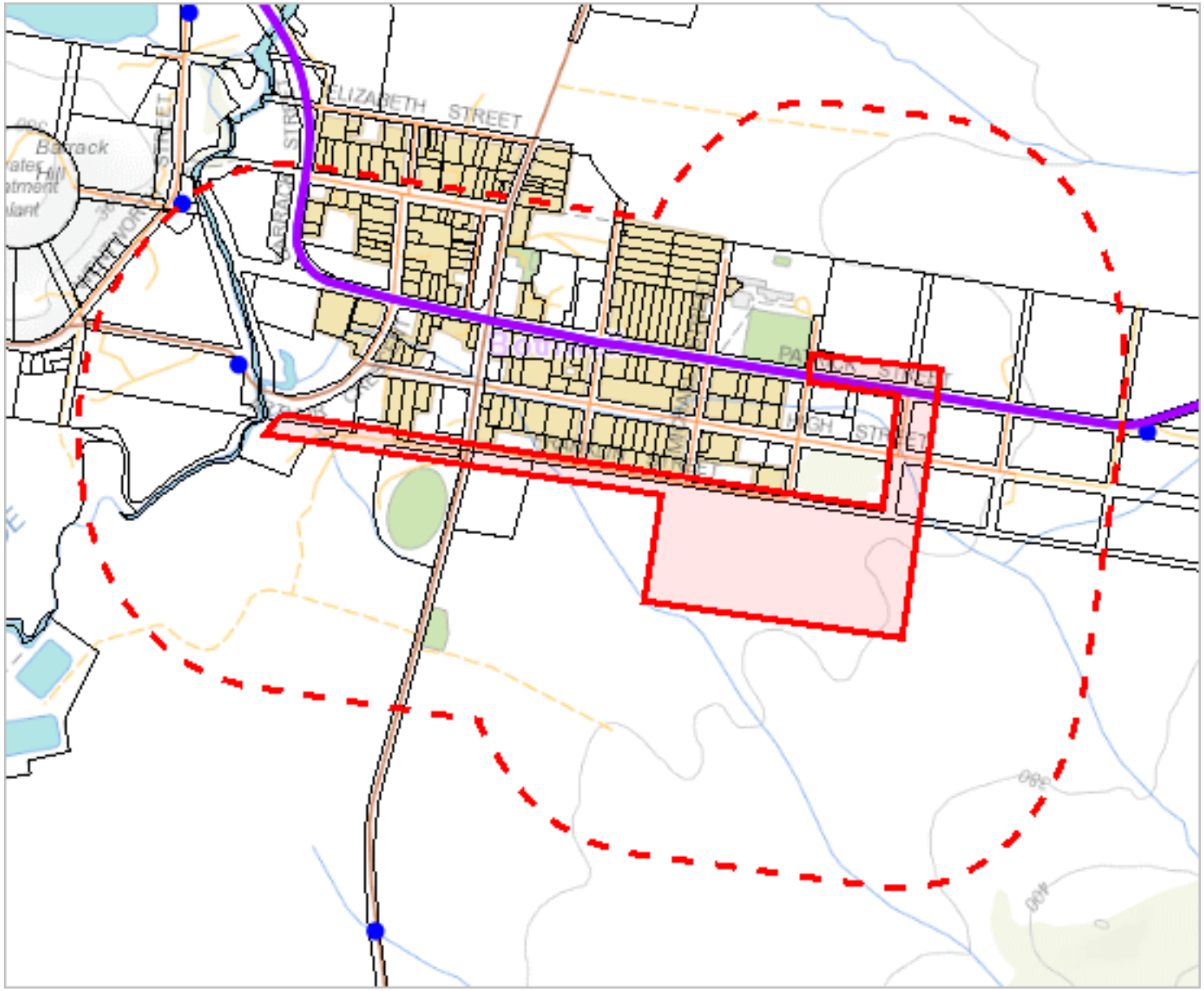
(based on Range Boundaries)

Species	Common Name	SS	NS	Potential	Known	Core
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	0
Haliaeetus leucogaster	white-bellied sea-eagle	v		1	0	0

For more information about raptor nests, please contact Threatened Species Enquiries.
Telephone: 1300 368 550
Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Tas Management Act Weeds within 500 m

502053, 5308198



499667, 5306239

Please note that some layers may not display at all requested map scales

Tas Management Act Weeds within 500 m

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Tas Management Act Weeds within 500 m

Verified Records

Species	Common Name	Observation Count	Last Recorded
Ulex europaeus	gorse	5	24-Jan-2014

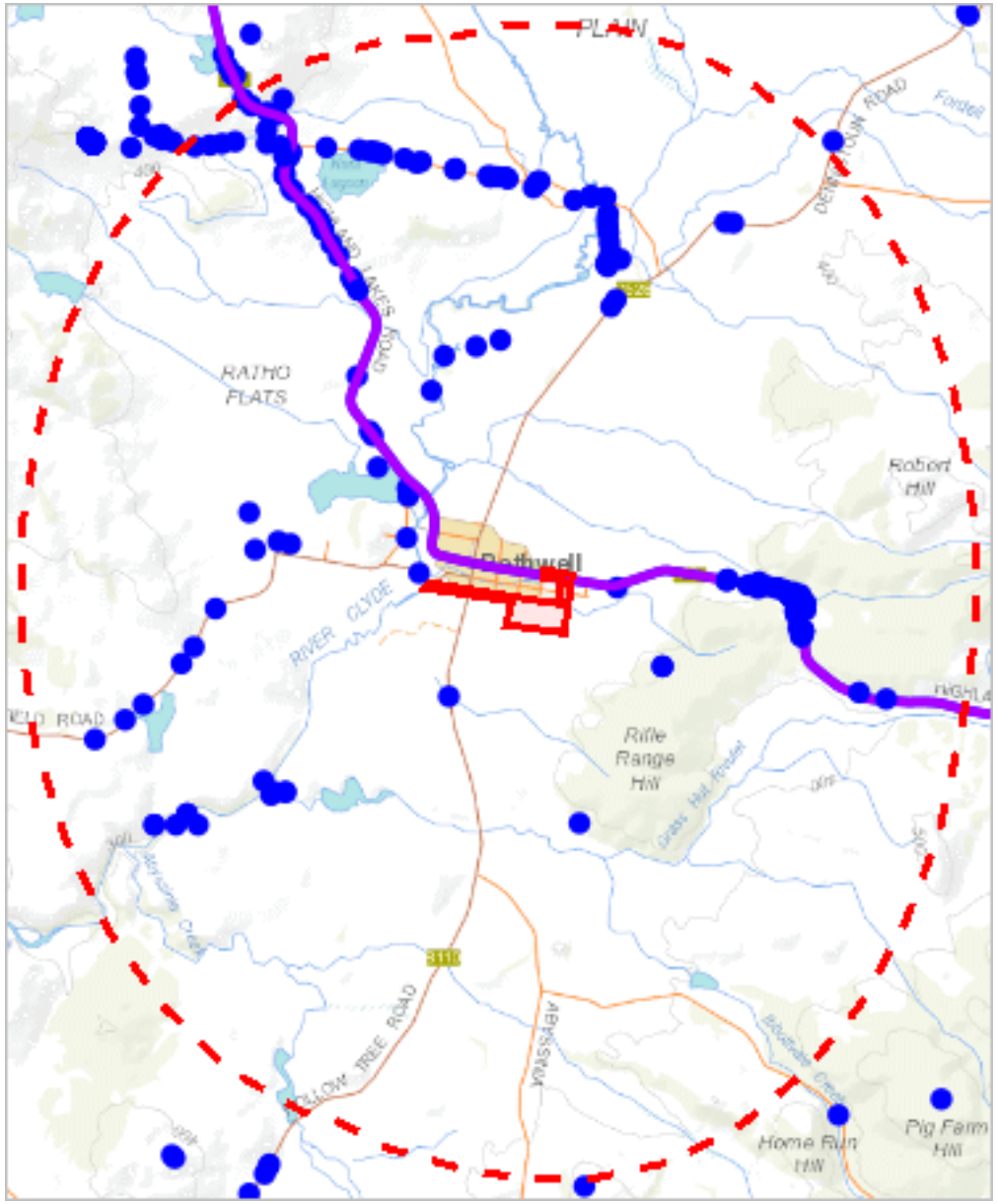
Unverified Records

For more information about introduced weed species, please visit the following URL for contact details in your area:

https://www.nre.tas.gov.au/invasive-species/weeds

Tas Management Act Weeds within 5000 m

505392, 5312675



496342, 5301755

Please note that some layers may not display at all requested map scales

Tas Management Act Weeds within 5000 m

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Tas Management Act Weeds within 5000 m

Verified Records

Species	Common Name	Observation Count	Last Recorded
Carduus pycnocephalus	slender thistle	7	22-Jan-2014
Carduus tenuiflorus	winged thistle	9	24-Jan-2014
Cirsium arvense var. arvense	creeping thistle	5	24-Jan-2014
Cytisus scoparius	english broom	13	31-Jul-2019
Elodea canadensis	canadian pondweed	1	24-Jan-2014
Erica lusitanica	spanish heath	5	31-Jul-2019
Genista monspessulana	montpellier broom or canary broom	1	22-Jan-2014
Marrubium vulgare	white horehound	2	05-Jun-1990
Salix x fragilis nothovar. fragilis	crack willow	6	31-Jul-2019
Salix x rubens	basket willow	1	01-Mar-1993
Ulex europaeus	gorse	116	31-Jul-2019

Unverified Records

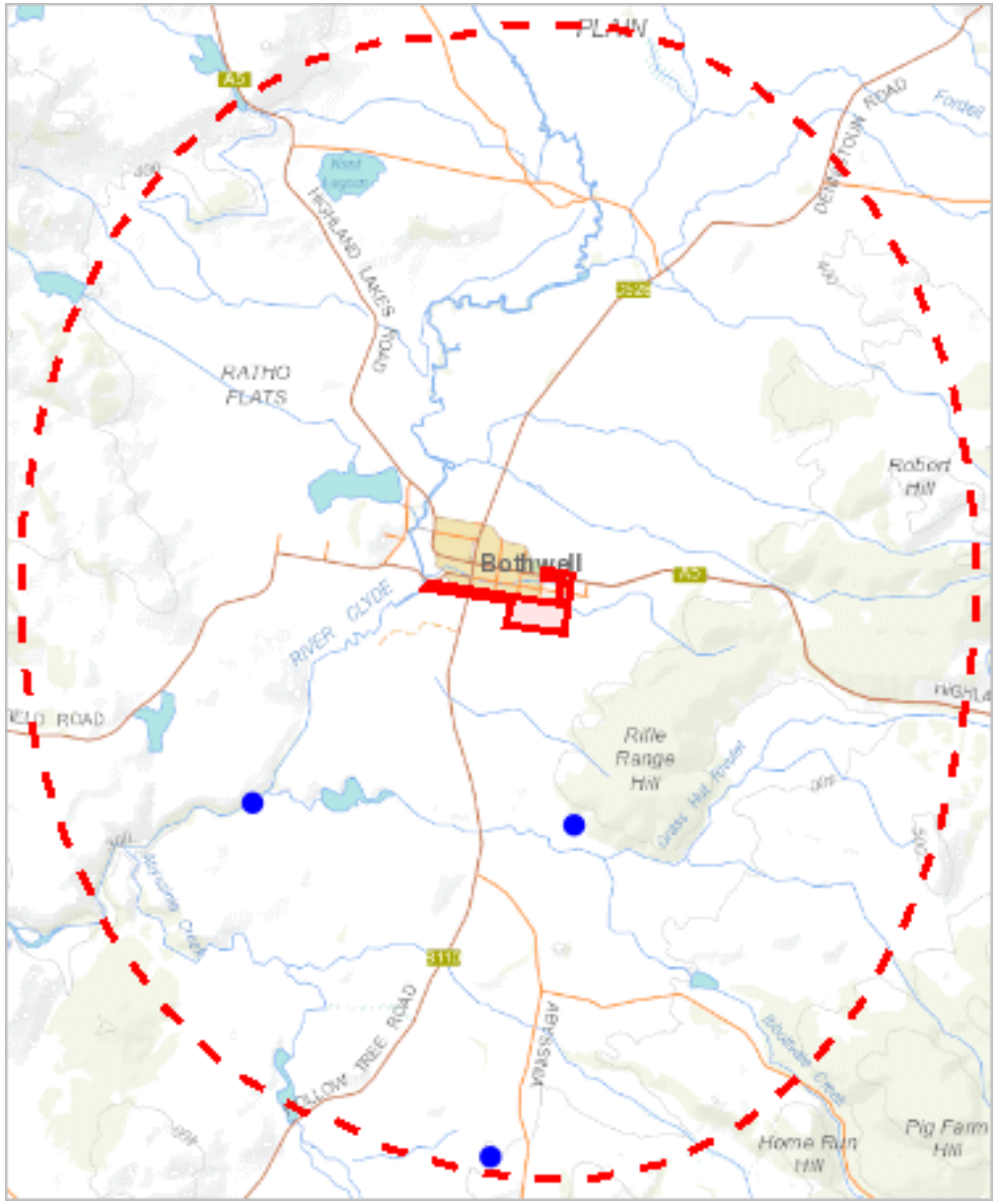
For more information about introduced weed species, please visit the following URL for contact details in your area:

https://www.nre.tas.gov.au/invasive-species/weeds

*** No Priority Weeds found within 500 metres ***

Priority Weeds within 5000 m

505392, 5312675



496342, 5301755

Please note that some layers may not display at all requested map scales

Priority Weeds within 5000 m

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Priority Weeds within 5000 m

Verified Records

Species	Common Name	Observation Count	Last Recorded
Tradescantia fluminensis	wandering creeper	1	17-Jul-2012
Verbascum thapsus	great mullein	2	25-May-2006

Unverified Records

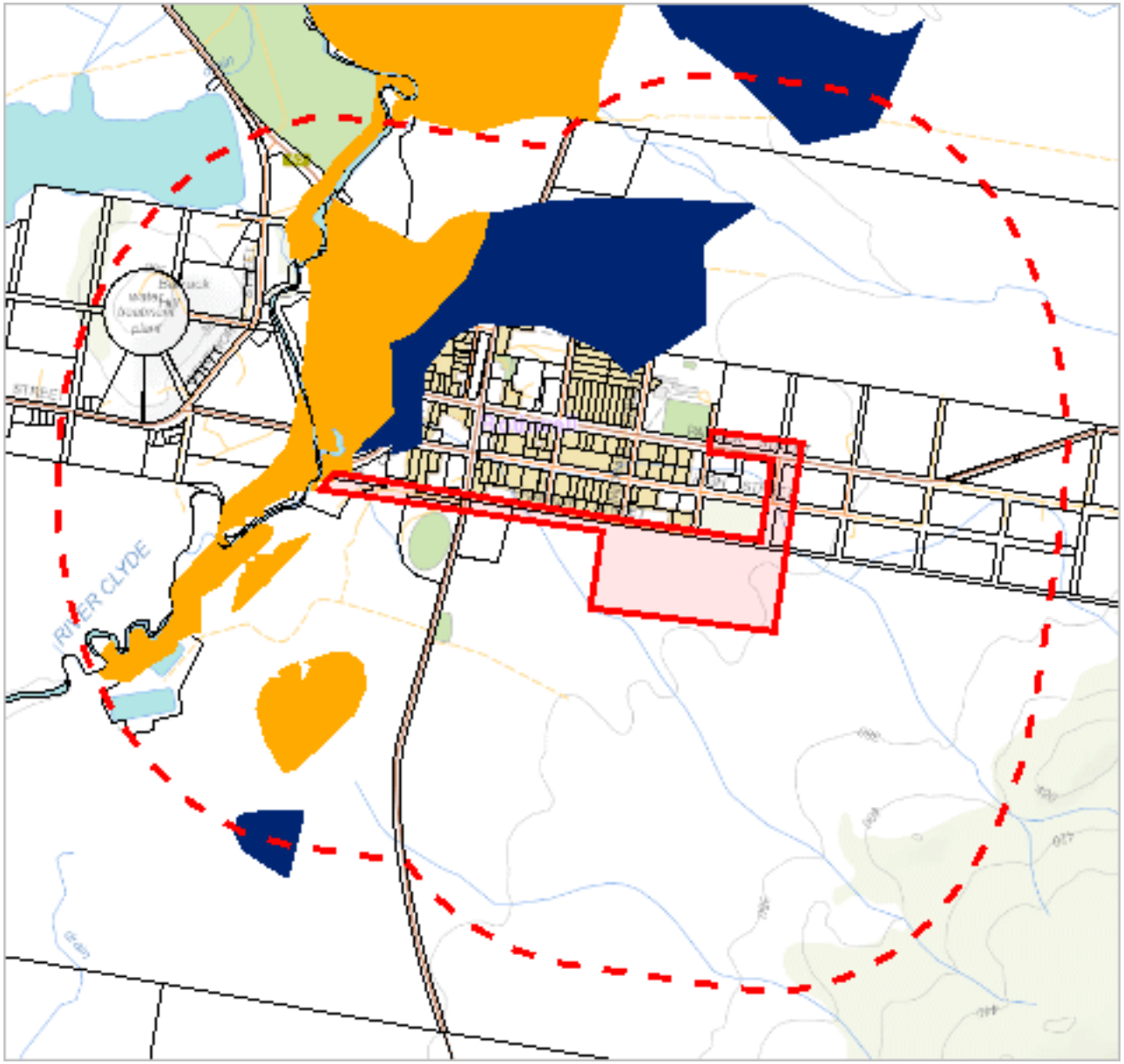
For more information about introduced weed species, please visit the following URL for contact details in your area:

https://www.nre.tas.gov.au/invasive-species/weeds

*** No Geoconservation sites found within 1000 metres. ***

Acid Sulfate Soils within 1000 metres

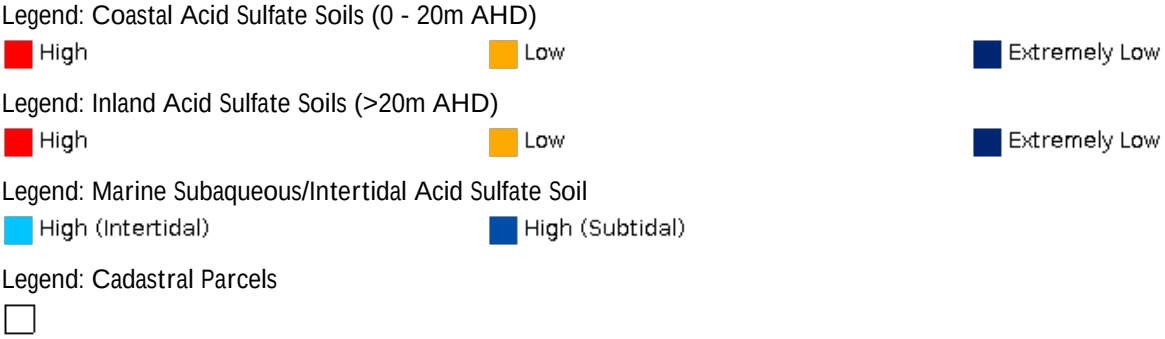
502424, 5308696



499298, 5305741

Please note that some layers may not display at all requested map scales

Acid Sulfate Soils within 1000 metres



Acid Sulfate Soils within 1000 metres

Dataset Name	Acid Sulfate Soil Probability	Acid Sulfate Soil Atlas	Description
Inland Acid Sulfate Soils	Extremely Low	Cn(p4)	Extremely low probability of occurance (1-5% of mapping unit). with occurences in small areas. Sodosols, Chromosols and Dermosols, ASS generally within upper 1m in wet/riparian areas with Sodosols, Chromosols and Dermosols (Isbell 1996). Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available and classifier has little knowledge or experience with ASS, hence classification is provisional.
Inland Acid Sulfate Soils	Extremely Low	Co(p4)	Extremely low probability of occurance (1-5% of mapping unit). with occurences in small areas. Vertosols, ASS generally within upper 1m in wet/riparian areas with Vertosols (Isbell 1996). Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available and classifier has little knowledge or experience with ASS, hence classification is provisional.
Inland Acid Sulfate Soils	Low	Bg(p4)	Low probability of occurance (6-70% chance of occurrence in mapping unit). Floodplains >4m AHD, ASS generally below 3m from the surface.generally forests. Includes plains and levees. Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available and classifier has little knowledge or experience with ASS, hence classification is provisional.
Inland Acid Sulfate Soils	Low	Bj(p4)	Low probability of occurance (6-70% chance of occurrence in mapping unit). Sandplains and dunes >10m AHD, ASS generally below 1m from the surface. Heath, forests. Mainly Pleistocene. Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available and classifier has little knowledge or experience with ASS, hence classification is provisional.
Inland Acid Sulfate Soils	Low	Bo(p4)	Low probability of occurance (6-70% chance of occurrence in mapping unit). Vertosols, ASS generally within upper 1m in wet/riparian areas with Vertosols (Isbell 1996). Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available and classifier has little knowledge or experience with ASS, hence classification is provisional.

For more information about Acid Sulfate Soils, please contact Land Management Enquiries.

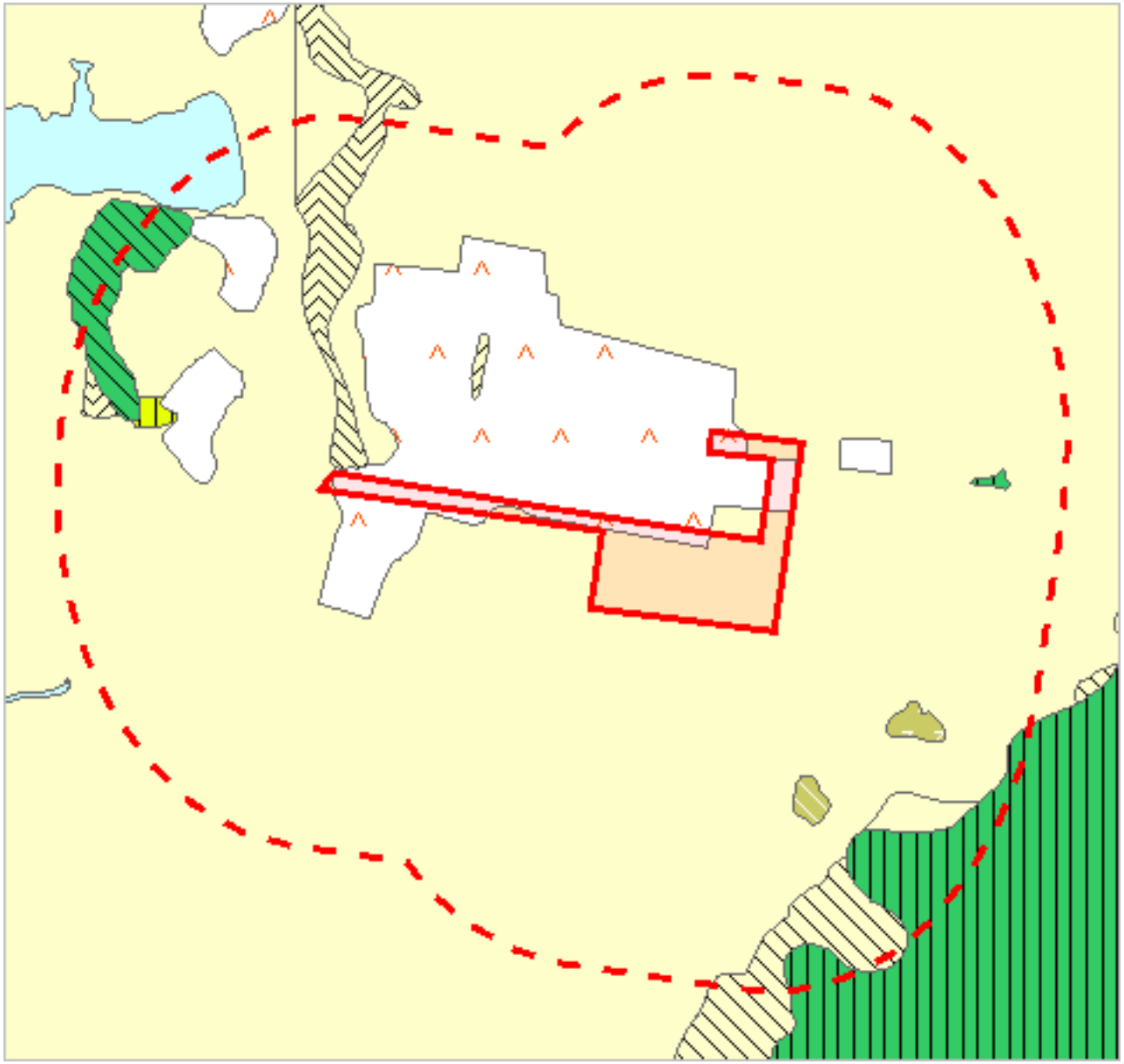
Telephone: (03) 6777 2227

Email: LandManagement.Enquiries@nre.tas.gov.au

Address: 171 Westbury Road, Prospect, Tasmania, Australia, 7250

TASVEG 4.0 Communities within 1000 metres

502424, 5308696



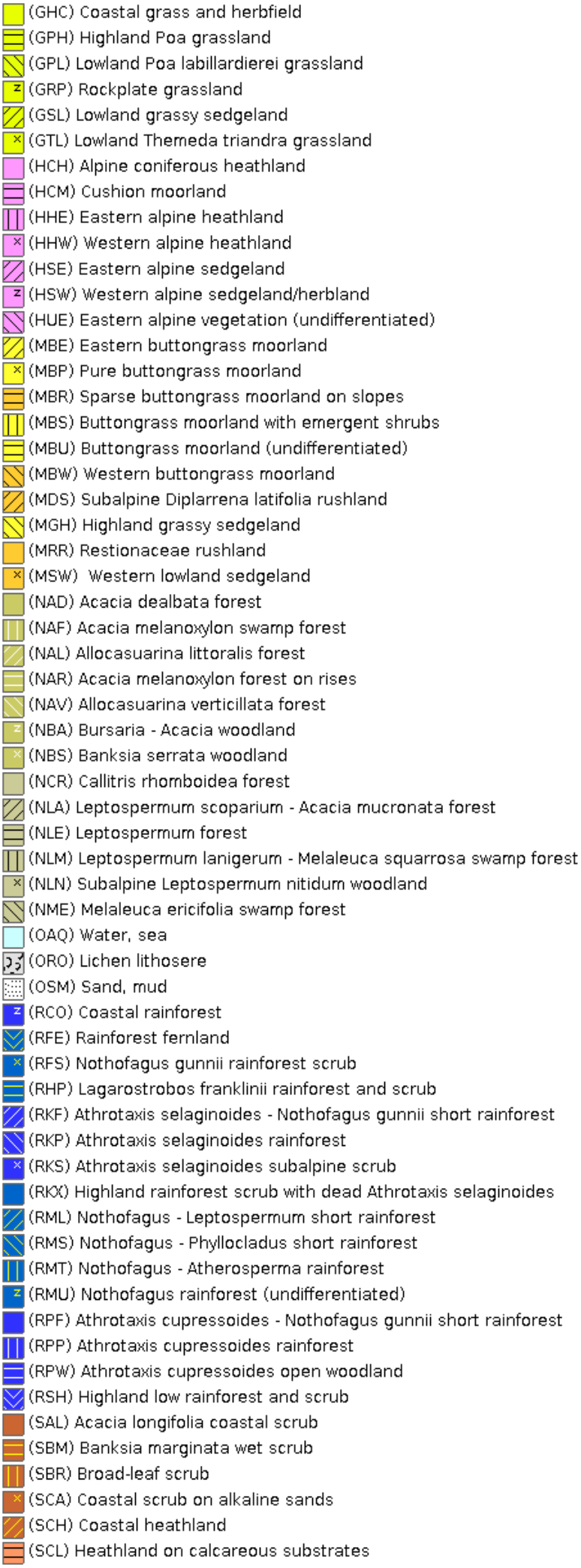
499298, 5305741

Please note that some layers may not display at all requested map scales

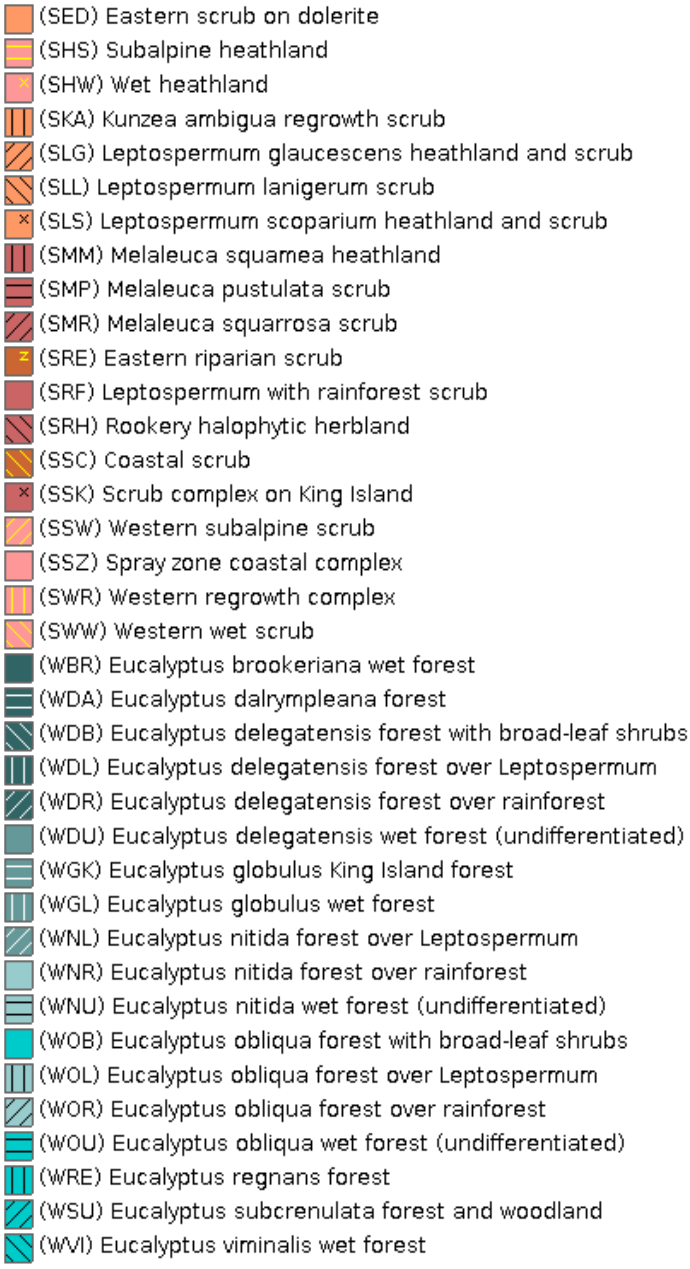
TASVEG 4.0 Communities within 1000 metres

Legend: TASVEG 4.0

TASVEG 4.0 Communities within 1000 metres



TASVEG 4.0 Communities within 1000 metres



Legend: Cadastral Parcels

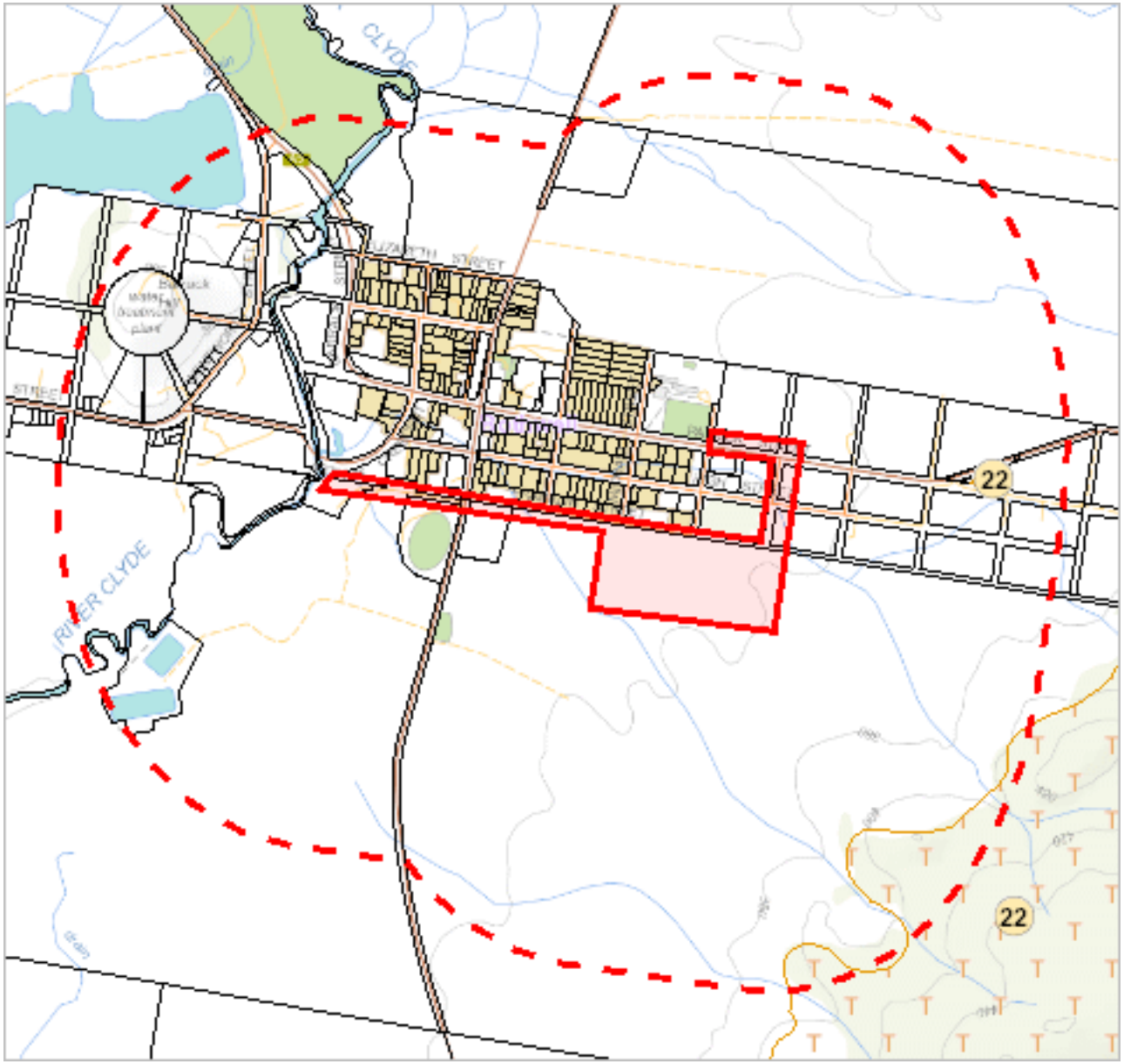
TASVEG 4.0 Communities within 1000 metres

Code	Community	Canopy Tree
DTO	(DTO) Eucalyptus tenuiramis forest and woodland on sediments	
DVG	(DVG) Eucalyptus viminalis grassy forest and woodland	
FAG	(FAG) Agricultural land	
FRG	(FRG) Regenerating cleared land	ET
FUR	(FUR) Urban areas	
FWU	(FWU) Weed infestation	
GCL	(GCL) Lowland grassland complex	EP
NAV	(NAV) Allocasuarina verticillata forest	
NBA	(NBA) Bursaria - Acacia woodland	
OAQ	(OAQ) Water, sea	

For more information contact: Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.
Telephone: (03) 6165 4320
Email: TVMMPSupport@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened Communities (TNVC 2020) within 1000 metres

502424, 5308696



499298, 5305741

Please note that some layers may not display at all requested map scales

Threatened Communities (TNVC 2020) within 1000 metres

Legend: Threatened Communities

- 1 - Alkaline pans
- 2 - Allocasuarina littoralis forest
- 3 - Athrotaxis cupressoides/Nothofagus gunnii short rainforest
- 4 - Athrotaxis cupressoides open woodland
- 5 - Athrotaxis cupressoides rainforest
- 6 - Athrotaxis selaginoides/Nothofagus gunnii short rainforest
- 7 - Athrotaxis selaginoides rainforest
- 8 - Athrotaxis selaginoides subalpine scrub
- 9 - Banksia marginata wet scrub
- 10 - Banksia serrata woodland
- 11 - Callitris rhomboidea forest
- 13 - Cushion moorland
- 14 -Eucalyptus amygdalina forest and woodland on sandstone
- 15 - Eucalyptus amygdalina inland forest and woodland on cainozoic deposits
- 16 - Eucalyptus brookeriana wet forest
- 17 - Eucalyptus globulus dry forest and woodland
- 18 - Eucalyptus globulus King Island forest
- 19 - Eucalyptus morrisbyi forest and woodland
- 20 - Eucalyptus ovata forest and woodland
- 21 - Eucalyptus risdonii forest and woodland
- 22 - Eucalyptus tenuiramis forest and woodland on sediments
- 23 - Eucalyptus viminalis - Eucalyptus globulus coastal forest and woodland
- 24 - Eucalyptus viminalis Furneaux forest and woodland
- 25 - Eucalyptus viminalis wet forest
- 26 - Heathland on calcareous substrates
- 27 - Heathland scrub complex at Wingaroo
- 28 - Highland grassy sedgeland
- 29 - Highland Poa grassland
- 30 - Melaleuca ericifolia swamp forest
- 31 - Melaleuca pustulata scrub
- 32 - Notelaea - Pomaderris - Beyeria forest
- 33 - Rainforest fernland
- 34 - Riparian scrub
- 35 - Seabird rookery complex
- 36 - Sphagnum peatland
- 36A - Spray zone coastal complex
- 37 - Subalpine Diplarrena latifolia rushland
- 38 - Subalpine Leptospermum nitidum woodland
- 39 - Wetlands

Legend: Cadastral Parcels

Threatened Communities (TNVC 2020) within 1000 metres

Scheduled Community Id	Scheduled Community Name
22	Eucalyptus tenuiramis forest and woodland on sediments

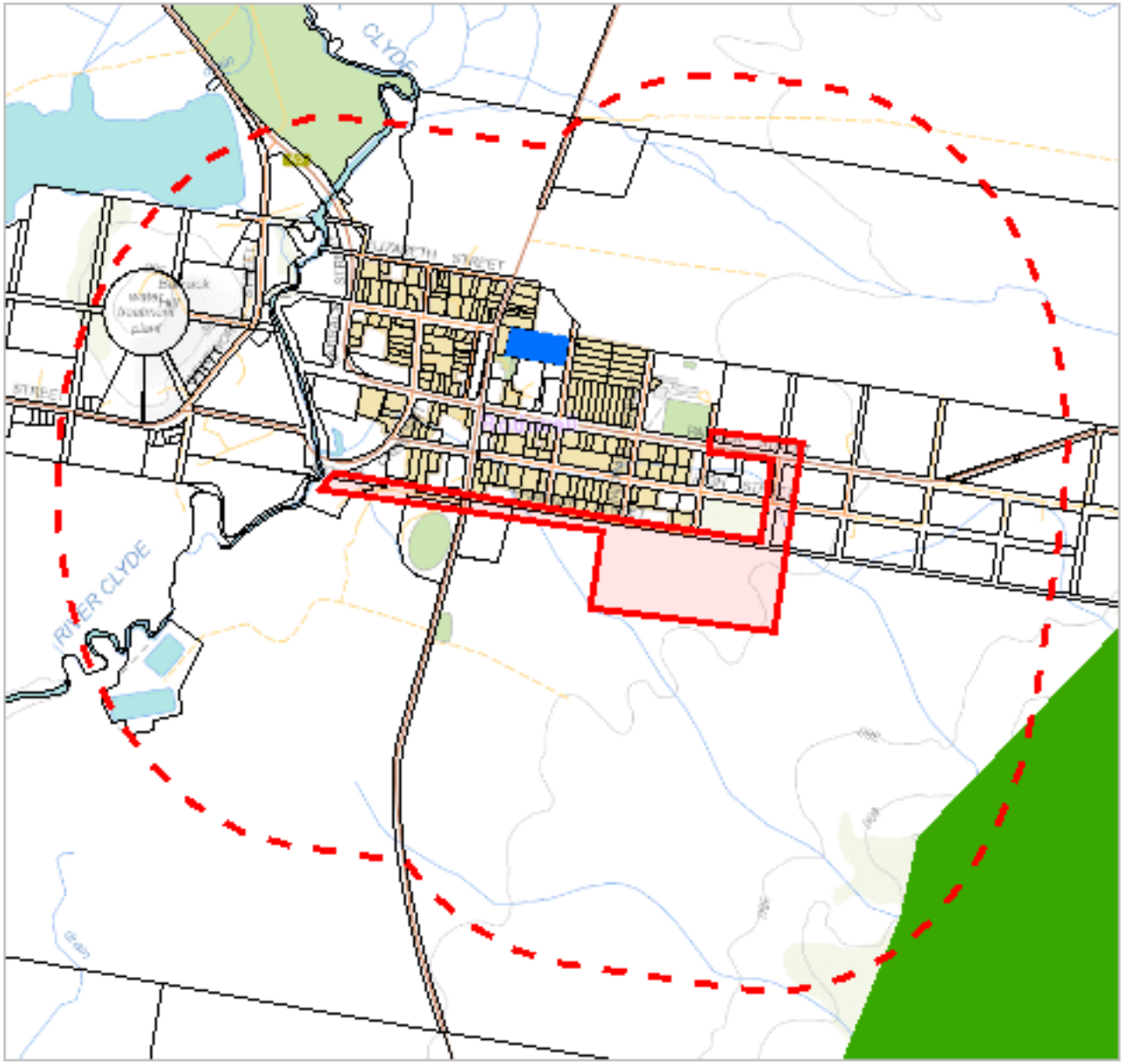
For more information contact: Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.
Telephone: (03) 6165 4320
Email: TVMMPSupport@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

*** No Fire History (All) found within 1000 metres ***

*** No Fire History (Last Burnt) found within 1000 metres ***

Reserves within 1000 metres

502424, 5308696



499298, 5305741

Please note that some layers may not display at all requested map scales

Reserves within 1000 metres

Legend: Tasmanian Reserve Estate

- Conservation Area
- Conservation Area and Conservation Covenant (NCA)
- Game Reserve
- Historic Site
- Indigenous Protected Area
- National Park
- Nature Reserve
- Nature Recreation Area
- Regional Reserve
- State Reserve
- Wellington Park
- Public authority land within WHA
- Future Potential Production Forest
- Informal Reserve on Permanent Timber Production Zone Land or STT managed land
- Informal Reserve on other public land
- Roadside Conservation Site
- Conservation Covenant (NCA)
- Private Nature Reserve and Conservation Covenant (NCA)
- Private Sanctuary and Conservation Covenant (NCA)
- Private Sanctuary
- Private land within WHA
- Management Agreement
- Stewardship Agreement
- Part 5 Agreement (Meander Dam Offset)
- Other Private Reserve

Legend: Cadastral Parcels

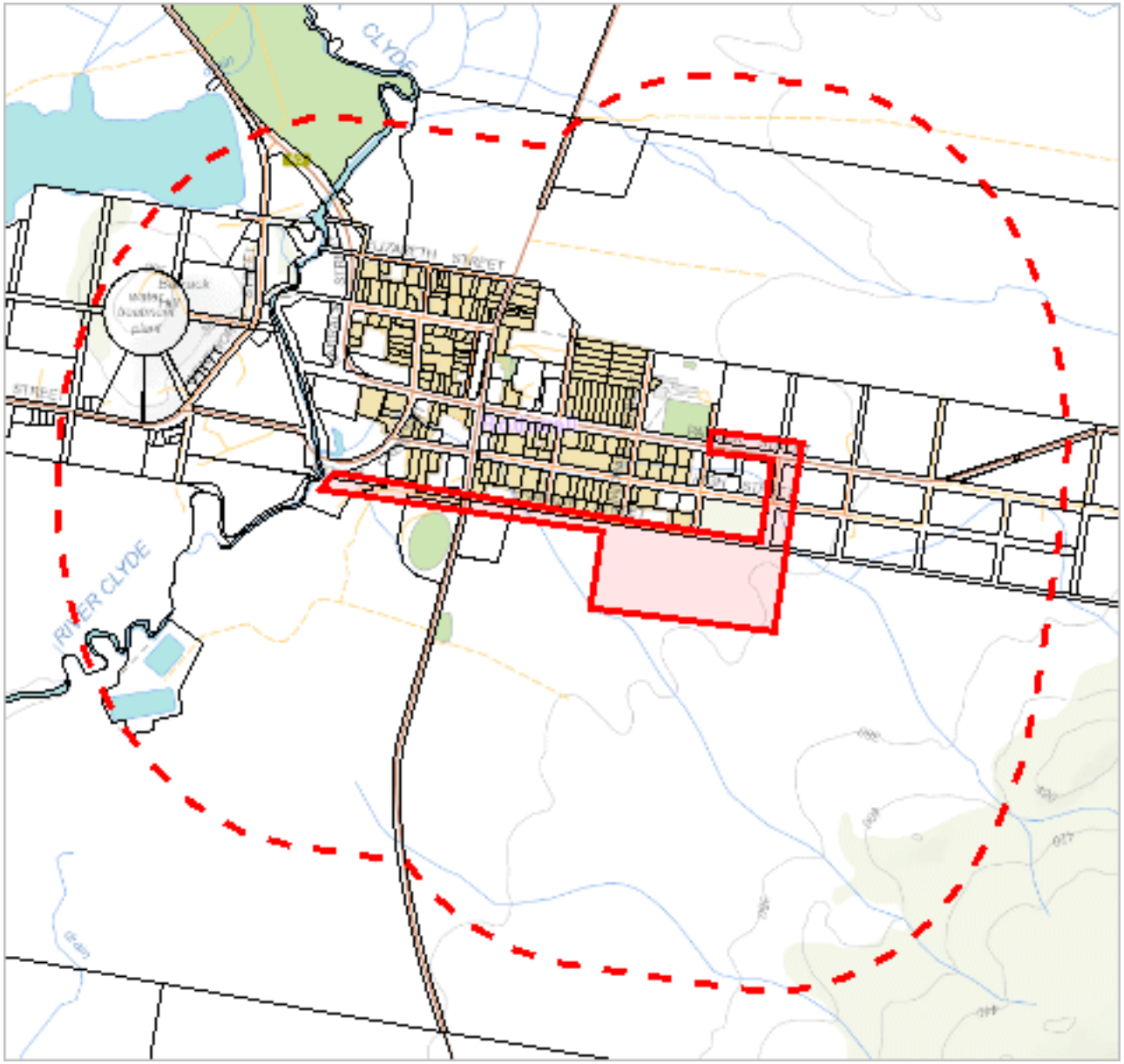
Reserves within 1000 metres

Name	Classification	Status	Area (HA)
	Conservation Covenant (NCA)	Private Reserve (Perpetual)	157.9617169
	Management Agreement	Private Reserve (Variable Term)	1.36640928

For more information about the Tasmanian Reserve Estate, please contact the Natural Values Science Services Branch.
Email: LandManagement.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Known biosecurity risks within 1000 meters

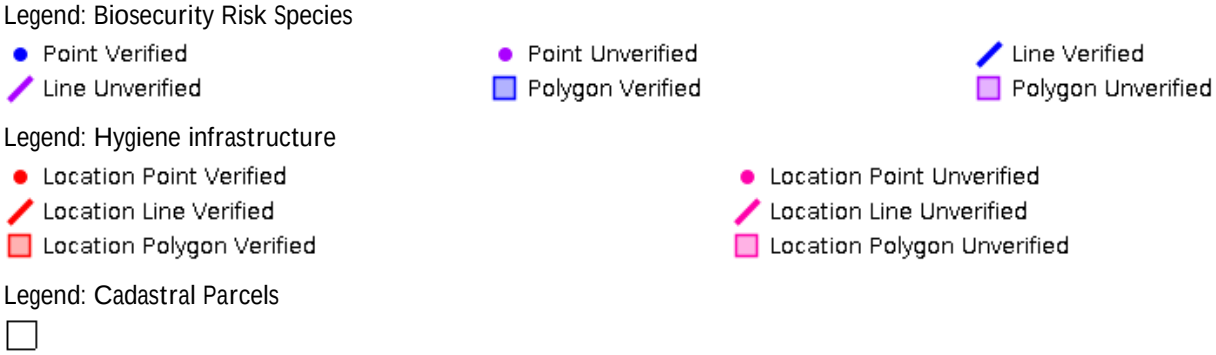
502424, 5308696



499298, 5305741

Please note that some layers may not display at all requested map scales

Known biosecurity risks within 1000 meters



Known biosecurity risks within 1000 meters

Verified Species of biosecurity risk

No verified species of biosecurity risk found within 1000 metres

Unverified Species of biosecurity risk

No unverified species of biosecurity risk found within 1000 metres

Generic Biosecurity Guidelines

The level and type of hygiene protocols required will vary depending on the tenure, activity and land use of the area. In all cases adhere to the land manager's biosecurity (hygiene) protocols. As a minimum always Check / Clean / Dry (Disinfect) clothing and equipment before trips and between sites within a trip as needed https://www.nre.tas.gov.au/invasive-species/weeds/weed-hygiene/keeping-it-clean-a-tasmanian-field-hygiene-manual

On Reserved land, the more remote, infrequently visited and undisturbed areas require tighter biosecurity measures.

In addition, where susceptible species and communities are known to occur, tighter biosecurity measures are required.

Apply controls relevant to the area / activity:

- Don't access sites infested with pathogen or weed species unless absolutely necessary. If it is necessary to visit, adopt high level hygiene protocols.
- Consider not accessing non-infested sites containing known susceptible species / communities. If it is necessary to visit, adopt high level hygiene protocols.
- Don't undertake activities that might spread pest / pathogen / weed species such as deliberately moving soil or water between areas.
- Modify / restrict activities to reduce the chance of spreading pest / pathogen / weed species e.g. avoid periods when weeds are seeding, avoid clothing/equipment that excessively collects soil and plant material e.g. Velcro, excessive tread on boots.
- Plan routes to visit clean (uninfested) sites prior to dirty (infested) sites. Do not travel through infested areas when moving between sites.
- Minimise the movement of soil, water, plant material and hitchhiking wildlife between areas by using the Check / Clean / Dry (Disinfect when drying is not possible) procedure for all clothing, footwear, equipment, hand tools and vehicles https://www.nre.tas.gov.au/invasive-species/weeds/weed-hygiene
- Neoprene and netting can take 48 hours to dry, use non-porous gear wherever possible.
- Use walking track boot wash stations where available.
- Keep a hygiene kit in the vehicle that includes a scrubbing brush, boot pick, and disinfectant https://www.nre.tas.gov.au/invasive-species/weeds/weed-hygiene/keeping-it-clean-a-tasmanian-field-hygiene-manual
- Dispose of all freshwater away from natural water bodies e.g. do not empty water into streams or ponds.
- Dispose of used disinfectant ideally in town though a treatment or septic system. Always keep disinfectant well away from natural water systems.
- Securely contain any high risk pest / pathogen / weed species that must be collected and moved e.g. biological samples.

Hygiene Infrastructure

No known hygiene infrastructure found within 1000 metres

NVA - Desktop Assessment

Appendix C

PMST Report

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 14-Feb-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	26
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	4
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community may occur within area	In buffer area only
Lowland Native Grasslands of Tasmania	Critically Endangered	Community likely to occur within area	In buffer area only
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)	Critically Endangered	Community likely to occur within area	In feature area
Tasmanian white gum (Eucalyptus viminalis) wet forest	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Aquila audax fleayi Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Numenius madagascariensis](#)			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Pterodroma leucoptera leucoptera](#)			
Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area
[Tyto novaehollandiae castanops (Tasmanian population)](#)			
Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat known to occur within area	In feature area
FISH			
[Prototroctes maraena](#)			
Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area	In feature area
FROG			
[Litoria raniformis](#)			
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area	In feature area
INSECT			
[Oreixenica ptunarra](#)			
Ptunarra Brown, Ptunarra Brown Butterfly, Ptunarra Xenica [26327]	Endangered	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
[Dasyurus maculatus maculatus (Tasmanian population)](#)			
Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll (Tasmanian population) [75183]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Dasyurus viverrinus](#)			
Eastern Quoll, Luaner [333]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Perameles gunnii gunnii](#)			
Eastern Barred Bandicoot (Tasmania) [66651]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Sarcophilus harrisii](#)			
Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area	In feature area
PLANT			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Acacia axillaris Midlands Mimosa, Midlands Wattle [13563]	Vulnerable	Species or species habitat may occur within area	In feature area
Barbarea australis Native Wintercress, Riverbed Wintercress [12540]	Endangered	Species or species habitat known to occur within area	In feature area
Caladenia anthracina Black-tipped Spider-orchid [64855]	Critically Endangered	Species or species habitat may occur within area	In feature area
Colobanthus curtisiae Curtis' Colobanth [23961]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dianella amoena Matted Flax-lily [64886]	Endangered	Species or species habitat likely to occur within area	In feature area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat known to occur within area	In feature area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat likely to occur within area	In feature area
Pseudocephalozia paludicola Alpine Leafy Liverwort [66441]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterostylis commutata Midland Greenhood [64535]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Xerochrysum palustre			
Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus			
White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca			
Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area	In feature area
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia			
Common Greenshank, Greenshank [832]		Species or species habitat may occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Humbie	Conservation Covenant	TAS	In buffer area only
Rothamay	Conservation Covenant	TAS	In buffer area only
Wetheron #1	Conservation Covenant	TAS	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Wetheron #2	Conservation Covenant	TAS	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
Tasmania RFA	Tasmania	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
2-D seismic data survey	2001/135	Not Controlled Action	Completed	In feature area
Exploration Seismic survey	2001/516	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Southern Highlands Irrigation Scheme (SHIS), Tasmania	2015/7491	Not Controlled Action	Completed	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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