



Community Guide to the Manly Lagoon Flood Study

May 2013



Introduction

Warringah and Manly Councils are carrying out a flood study to understand flood risks in the Manly Lagoon catchment. The study includes areas draining to Manly Lagoon such as Manly Dam, Manly Creek, Brookvale Creek, and Burnt Bridge Creek. This study updates the 1992 Manly Lagoon Flood Study and provides a holistic assessment of flooding within the catchment. The draft Manly Lagoon Flood Study is on public exhibition from Wednesday 1 May to Wednesday 29 May, 2013.

Flooding in the Manly Lagoon Catchment

The main aim of the study is to define current and future flood behaviour in the Manly Lagoon catchment.

Flooding in Manly Lagoon comes from two main sources:

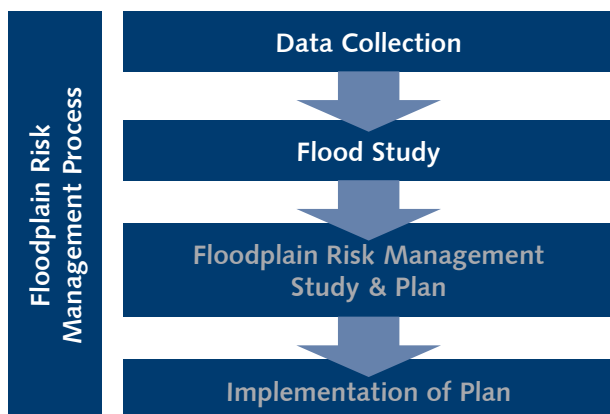
1. significant catchment rainfall
2. oceanic inundation (tide and storm surge)

Floodplain Risk Management Process

Under the NSW Government's Flood Prone Land Policy, councils have the primary responsibility for managing flood prone areas, with financial and technical support provided by the State Government.

Floodplain risk management considers the consequences of flooding on the community and aims to develop appropriate actions to minimise and mitigate the impacts of flooding.

The Flood Prone Land Policy specifies a staged approach to the floodplain management process:



What happens next?

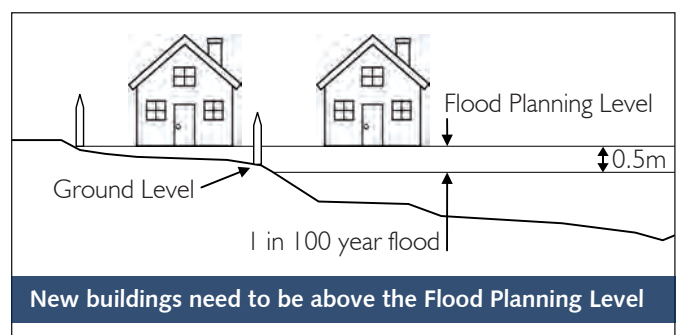
After the public exhibition of the draft Manly Lagoon Flood Study, all comments will be reviewed and final amendments to the study made. Once adopted by both Warringah and Manly Councils, the study will be used in the preparation of the Manly Lagoon Floodplain Risk Management Study and Plan.

The Floodplain Risk Management Study will outline what can be done to manage flooding in the Manly Lagoon catchment, through the identification, assessment and comparison of various risk management options.

The Floodplain Risk Management Plan will contain a number of management measures and strategies. These will help guide and coordinate the responsibilities of government and the community in undertaking flood management works and initiatives. Preferred options will be publicly exhibited and subject to revision in light of community response.

How am I affected?

The Flood Study Map shows the extent of flood prone land, which is defined as the area affected by the Probable Maximum Flood (i.e. the largest flood that could conceivably occur). Properties affected by the Flood Planning Level (i.e. the 1 in 100 year flood plus 0.5m freeboard, (see image and explanation in FAQs below) are shaded on the map.



Certain flood related development controls may apply to flood prone properties, for instance residential properties affected by the Flood Planning Level may be subject to minimum floor level requirements. For further information visit warringah.nsw.gov.au or manly.nsw.gov.au.

Community Input




Community involvement in managing flood risks is essential for:

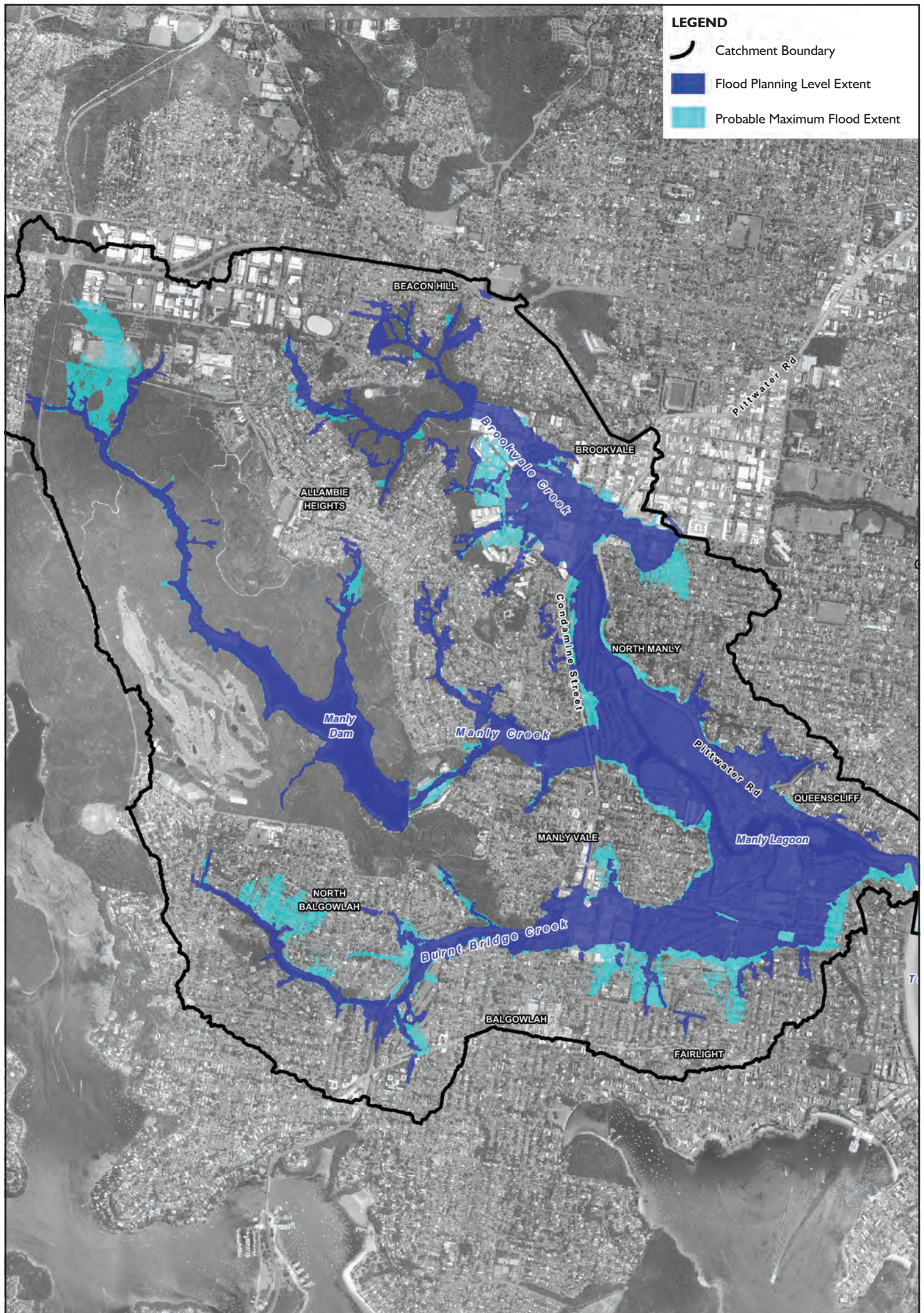
- raising awareness in the community about the potential for flooding in the catchment
- improving the decision making process
- identifying local concerns and values

As part of the community consultation, the draft Manly Lagoon Flood Study is on public exhibition from Wednesday 1 May to Wednesday 29 May, 2013. You are invited to participate in the study by providing comment on the draft report, available from warringah.nsw.gov.au, manly.nsw.gov.au, Council Chambers and libraries.



LEGEND

-  Catchment Boundary
-  Flood Planning Level Extent
-  Probable Maximum Flood Extent



What can I do?

To make a submission on the draft Manly Lagoon Flood Study, write to the General Manager of your local Council marked

'Submission – Draft Manly Lagoon Flood Study':

Warringah Council
725 Pittwater Road
Dee Why NSW 2099

or email council@warringah.nsw.gov.au

Manly Council
PO Box 82
Manly NSW 1665

or email records@manly.nsw.gov.au

Submissions close Wednesday 29 May, 2013.

One-on-one community information sessions

North Manly Bowling Club - Wednesday 8 & 15 May, 2013.

Queenscliff Surf Life Saving Club - Saturday 11 & 18 May, 2013.

Council contacts:

Warringah Council – Valerie Tulk, 9942 2111

Manly Council – Michael Galloway, 9976 1500



Manly Dam

Frequently Asked Questions

1. Why does Council study flooding?

NSW Local Governments have responsibility for identifying and then managing the risk to life and property from flooding, and have a duty of care to disclose this information to the community. Local Governments must act in accordance with the NSW Flood Prone Land Policy, which aims to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property. One of the most important steps in this process is increasing our community's awareness of flooding so that people are better able to understand and plan for the flood risks they face.

2. What areas are included in the draft Manly Lagoon Flood Study?

Manly Lagoon is fed primarily by Burnt Bridge Creek, Brookvale Creek and Manly Creek. As a result the study includes all, or part of, Allambie Heights, Frenchs Forest, Beacon Hill, Brookvale, North Manly, Manly Vale, Queenscliff, North Balgowlah, Seaforth, Balgowlah and Fairlight.

3. Which areas could be flooded?

The draft Manly Lagoon Flood Study Map shows land that would be affected by the Probable Maximum Flood (i.e. the largest flood that could conceivably occur). Properties affected by the Flood Planning Level (i.e. the 1 in 100 year flood plus 0.5m freeboard) are also shaded on the map.

4. What is a 1 in 100 year flood?

A 1 in 100 year flood is a major rain event that occurs on average once every 100 years, i.e. there is a 1% chance of a flood of this size occurring at a particular location in any given year. This does not mean that if a location floods one year, it will definitely not flood for the next 99 years. Nor, if it has not flooded for 99 years that it will necessarily flood the next year. Some parts of Australia have received a couple of 1 in 100 year floods within a decade of each other.

5. What is Freeboard?

Freeboard is included in the Flood Planning Level as a buffer, to account for factors such as wind, waves, unforeseen blockages, other localised hydraulic effects and uncertainties in the modelling and determination of flood levels. Freeboard is typically 0.5m above a flood level.

6. What does this mean for property owners?

For most people, there is nothing for you to do in response to this flood study, as there is no immediate change to your situation. However property owners who are planning redevelopment of their property may need to take some additional steps as part of the consent process because flood related development controls apply. This could include the requirement to have the floor levels of new residential developments set at or above the Flood Planning Level and out of flood danger.

7. My property was never classified as 'flood prone' or 'flood liable' before. Now it is. Why?

The 1992 flood study for Manly Lagoon focused on flooding on the Lagoon floodplain (i.e. only the bottom part of the catchment). The current draft study assesses flooding in the whole Manly Lagoon catchment. The majority of the additional properties identified as flood affected are located in the upper catchment, which was not included in the 1992 Manly Lagoon Flood Study.



Queenscliff

The flood levels from this draft flood study are also slightly higher than those previously adopted for the 1992 Manly Lagoon Flood Study. The main reasons for this difference include; more advanced models and calibration data, better understanding of entrance conditions, improved surveys and changes in land use.

8. What are Councils doing to manage flood risk?

Councils prepare Flood Studies and Plans according to the NSW Government's Floodplain Development Manual (2005), and implement associated recommendations with the financial and technical assistance of NSW Government through its Flood Prone Land Policy. Land use planning through development controls is one of the most effective means of managing flood risk in the catchment. Additional flood mitigation measures in the catchment currently include: maintenance of flood storage capacity in Manly Dam, the management of the Manly Lagoon entrance, implementing a flood warning network and raising flood awareness in the community.

9. Will this affect property values?

Studies show that an actual flood event, rather than a flood planning notation on a Section 149 Certificate, is more likely to have an effect on property values.

10. Will this affect my insurance premiums?

Individual insurance companies typically identify Flood Prone Land and assess risk through their own flood studies, analysis and flood mapping exercises, irrespective of whether Council has undertaken a flood study. These calculations are outside Council's control. The information is then used to set policies and premiums.

Councils have responsibility for identifying and then managing the risk to life and property from flooding, and have a duty of care to disclose this information to the community. The draft Manly Lagoon Flood Study represents significant advances since the 1992 Flood Study and is a public document, which all members

of the community, including insurance companies, are able to access. Flood Studies conducted by Councils may be used by insurance companies to refine their flood profiles, potentially excluding properties that would otherwise be included through more risk-averse calculations.

11. What should I do in the event of a flood?

If it is a life threatening situation call 000. In the event of floods, storms or tsunamis, please contact the State Emergency Service (SES) on 132 500 or visit their website at ses.nsw.gov.au.

12. What can I do to prepare in case of a flood?

The State Emergency Service has a useful website providing advice on how to manage flood risk. Visit www.floodsafe.com.au for more information.

13. Where can I find out about Council's flood related development controls?

Links to flood related development controls can be found at warringah.nsw.gov.au and manly.nsw.gov.au.

Further information

The draft Flood Study Report and more Frequently Asked Questions can be found at warringah.nsw.gov.au and manly.nsw.gov.au.



Warringah Council



Office of
Environment
& Heritage

This project is supported by the NSW Government's Floodplain Management Program

Manly Lagoon Flood Study

Final
R.N2069.005.02.compendium .docx
August 2013

Mapping Compendium



LIST OF MAP SERIES INCLUDED IN THIS COMPENDIUM

Design Catchment Flood Mapping

A1 - Inundation Extent Map (Multiple Events)

A2 - 20% AEP Peak Flood Water Level
A3 - 10% AEP Peak Flood Water Level
A4 - 5% AEP Peak Flood Water Level
A5 - 2% AEP Peak Flood Water Level
A6 - 1% AEP Peak Flood Water Level
A7 - 0.5% AEP Peak Flood Water Level
A8 - 0.2% AEP Peak Flood Water Level
A9 - 0.1% AEP Peak Flood Water Level
A10 - PMF Peak Flood Water Level

A11 - 20% AEP Peak Flood Water Depth
A12 - 10% AEP Peak Flood Water Depth
A13 - 5% AEP Peak Flood Water Depth
A14 - 2% AEP Peak Flood Water Depth
A15 - 1% AEP Peak Flood Water Depth
A16 - 0.5% AEP Peak Flood Water Depth
A17 - 0.2% AEP Peak Flood Water Depth
A18 - 0.1% AEP Peak Flood Water Depth
A19 - PMF Peak Flood Water Depth

A20 - 1% AEP Peak Flood Velocity
A21 - PMF Peak Flood Velocity

A22 - 20% AEP Hydraulic Categories
A23 - 5% AEP Hydraulic Categories
A24 - 1% AEP Hydraulic Categories
A25 - PMF Hydraulic Categories

A26 - 20% AEP Provisional Flood Hazard
A27 - 5% AEP Provisional Flood Hazard
A28 - 1% AEP Provisional Flood Hazard
A29 - PMF Provisional Flood Hazard

Design Ocean Flood Mapping

A30 - Inundation Extent Map (Multiple Events)

A31 - 20% AEP Peak Flood Water Level
A32 - 5% AEP Peak Flood Water Level
A33 - 1% AEP Peak Flood Water Level

A34 - 20% AEP Peak Flood Water Depth
A35 - 5% AEP Peak Flood Water Depth
A36 - 1% AEP Peak Flood Water Depth

Coincident Catchment and Ocean Flood Mapping

A37 - 1% AEP Catchment + 5% AEP Ocean Event Peak Flood Water Depth
A38 - 5% AEP Catchment + 1% AEP Ocean Event Peak Flood Water Depth
A39 - 1% AEP Catchment + 5% AEP Ocean Event Hydraulic Categories
A40 - 1% AEP Catchment + 5% AEP Ocean Event Provisional Flood Hazard

Design Flood Sensitivity Impact Mapping

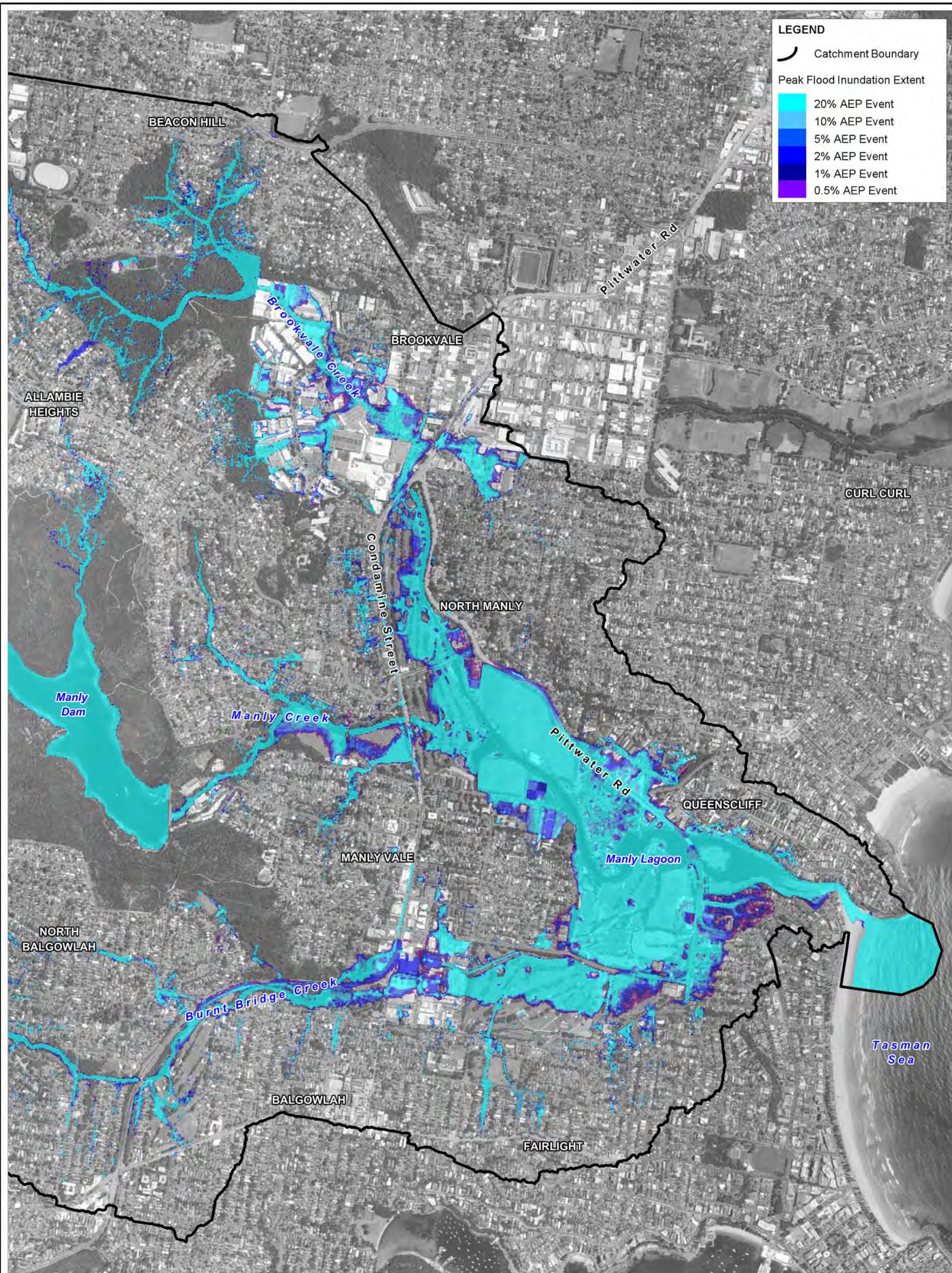
(Mapping provides for change in peak flood level compared to baseline conditions)

A41 - Decreased Manning's by 25% - 1% AEP Catchment Event
A42 - Increased Manning's by 25% - 1% AEP Catchment Event
A43 - Lower Rainfall Losses - 1% AEP Catchment Event
A44 - Higher Rainfall Losses - 1% AEP Catchment Event
A45 - Lower Initial Berm Height - 1% AEP Catchment Event
A46 - Lower Initial Berm Height - 1% AEP Catchment + 5% AEP Ocean Event
A47 - Higher Initial Berm Height - 1% AEP Catchment Event
A48 - Higher Initial Berm Height - 1% AEP Catchment + 5% AEP Ocean Event
A49 - Structure Blockage - 1% AEP Catchment Event
A50 - Lagoon Initial Water Level (0.5m AHD) - 1% AEP Catchment Event
A51 - Manly Dam Initial Water Level (34.1m AHD) - 1% AEP Catchment Event

Climate Change Scenario Mapping

(Mapping provides for inundation extent overlays for climate change tests above baseline conditions)

A52 - 10%, 20%, 30% Rainfall Intensity Increase – 5% AEP Catchment Event
A53 - 10%, 20%, 30% Rainfall Intensity Increase – 1% AEP Catchment Event
A54 - 10%, 20%, 30% Rainfall Intensity Increase – 5% AEP Catchment + 1% AEP Ocean Event
A55 - 10%, 20%, 30% Rainfall Intensity Increase – 1% AEP Catchment + 5% AEP Ocean Event
A56 - 0.4m, 0.9m Sea Level Rise – 5% AEP Catchment Event
A57 - 0.4m, 0.9m Sea Level Rise – 1% AEP Catchment Event
A58 - 0.4m, 0.9m Sea Level Rise – 5% AEP Catchment + 1% AEP Ocean Event
A59 - 0.4m, 0.9m Sea Level Rise – 1% AEP Catchment + 5% AEP Ocean Event
A60 - 0.4m, 0.9m Sea Level Rise – 5% AEP Ocean Event
A61 - 0.4m, 0.9m Sea Level Rise – 1% AEP Ocean Event
A62 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 5% AEP Catchment Event
A63 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 1% AEP Catchment Event
A64 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 5% AEP Catchment + 1% AEP Ocean Event
A65 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 1% AEP Catchment + 5% AEP Ocean Event
A66 - 10%, 20%, 30% Rainfall Intensity Increase + 0.9m Sea Level Rise – 5% AEP Catchment Event
A67 - 10%, 20%, 30% Rainfall Intensity Increase + 0.9m Sea Level Rise – 1% AEP Catchment Event
A68 - 10%, 20%, 30% Rainfall Intensity Increase + 0.9m Sea Level Rise – 5% AEP Catchment + 1% AEP Ocean Event
A69 - 10%, 20%, 30% Rainfall Intensity Increase + 0.9m Sea Level Rise – 1% AEP Catchment + 5% AEP Ocean Event



Title:
**Manly Lagoon Flood Study - Peak Flood Inundation Extent:
 Catchment Derived Events**

Figure:
A-1

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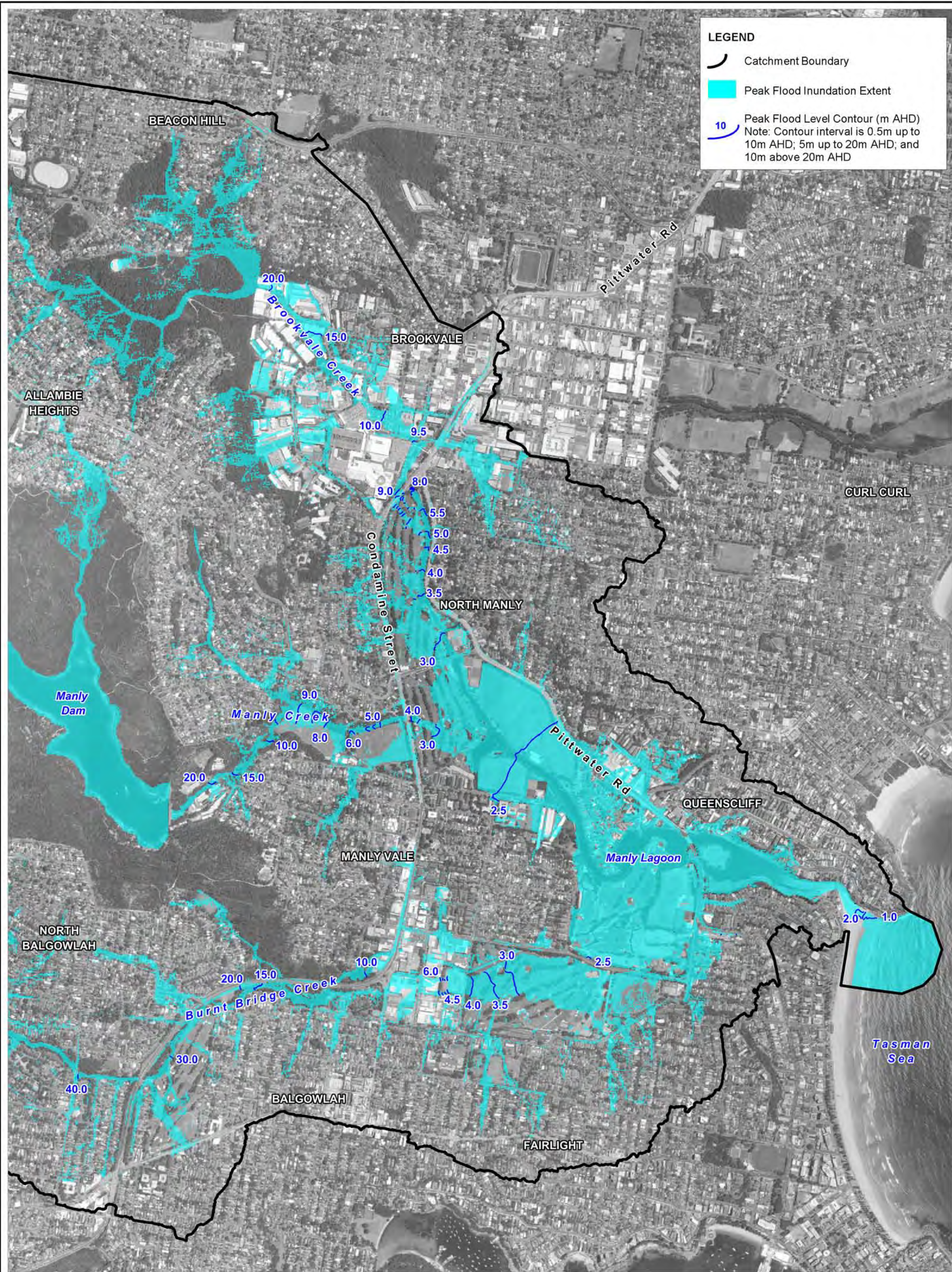
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Title:
**Manly Lagoon Flood Study - Peak Flood Water Level:
 20% AEP Catchment Derived Event**

Figure:
A-2

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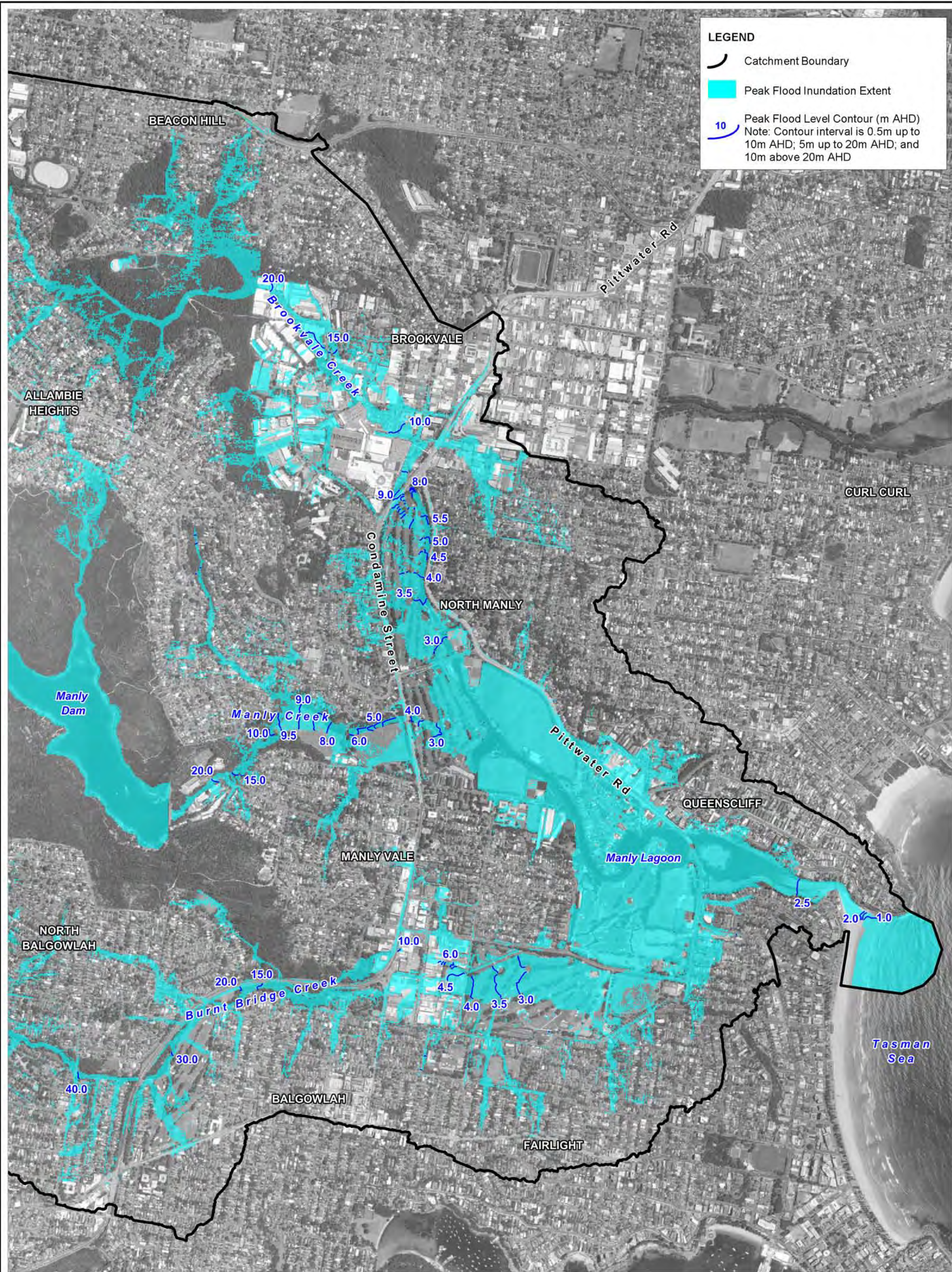
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Title:
**Manly Lagoon Flood Study - Peak Flood Water Level:
 10% AEP Catchment Derived Event**

Figure:
A-3

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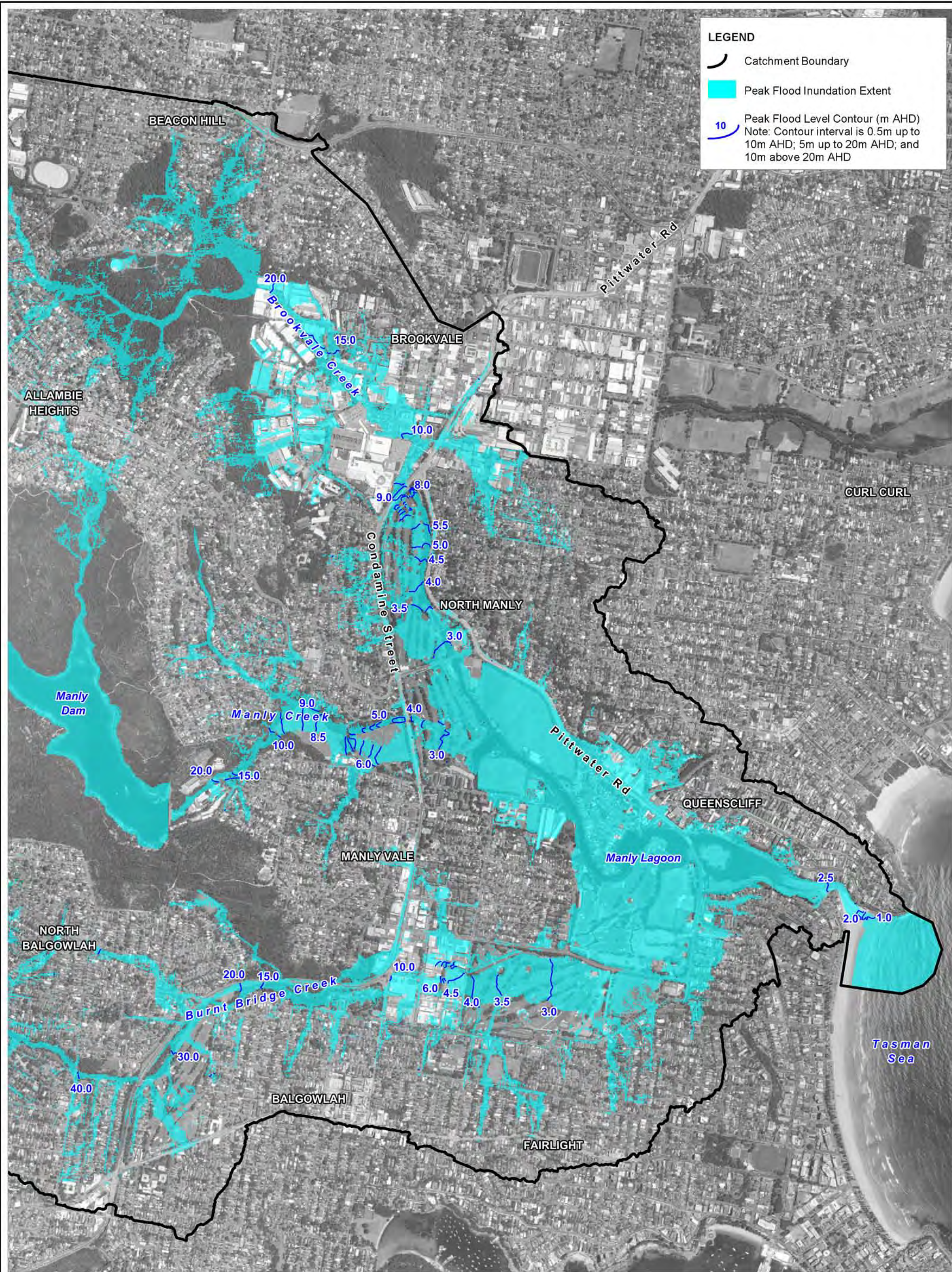
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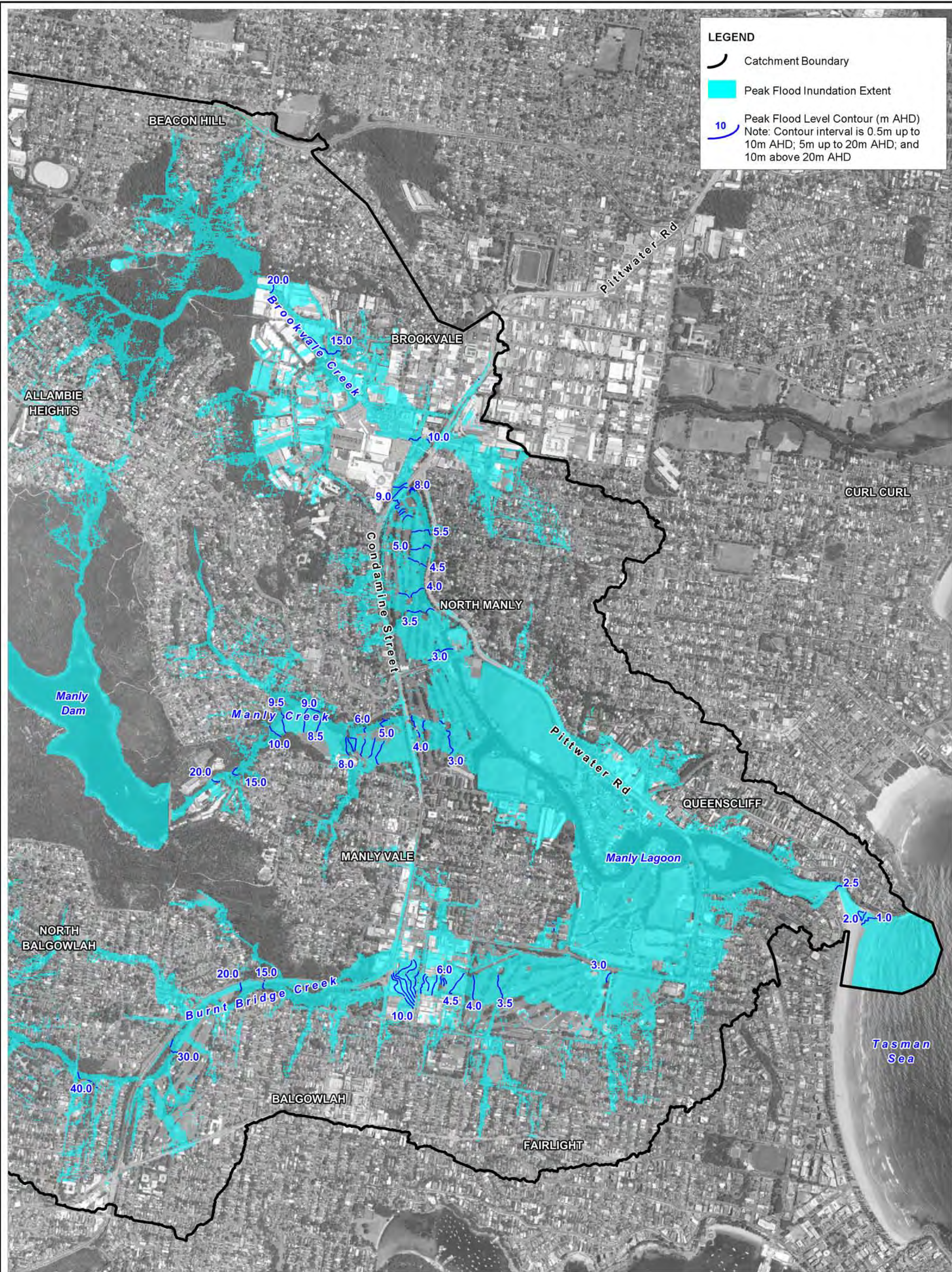
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<p>Title:</p> <p>Manly Lagoon Flood Study - Peak Flood Water Level: 5% AEP Catchment Derived Event</p>		<p>Figure:</p> <p>A-4</p>	<p>Rev:</p> <p>A</p>
<p>BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</p>	<div><div></div><div><div>0375750m</div><div>Approx. Scale</div></div></div>		<div><div>BMT WBM www.bmtwbm.com.au</div></div>
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Title:
**Manly Lagoon Flood Study - Peak Flood Water Level:
 2% AEP Catchment Derived Event**

Figure:
A-5

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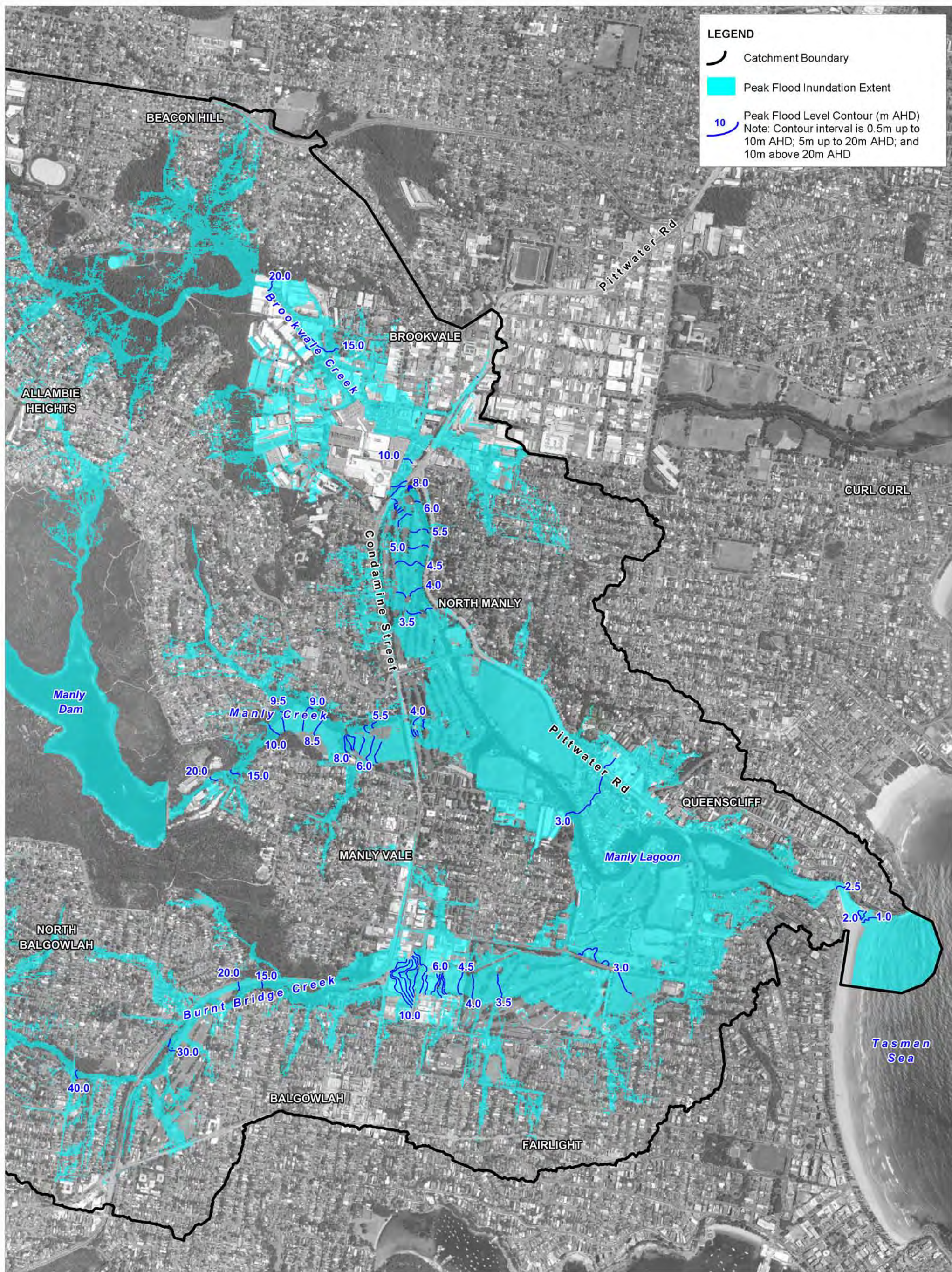
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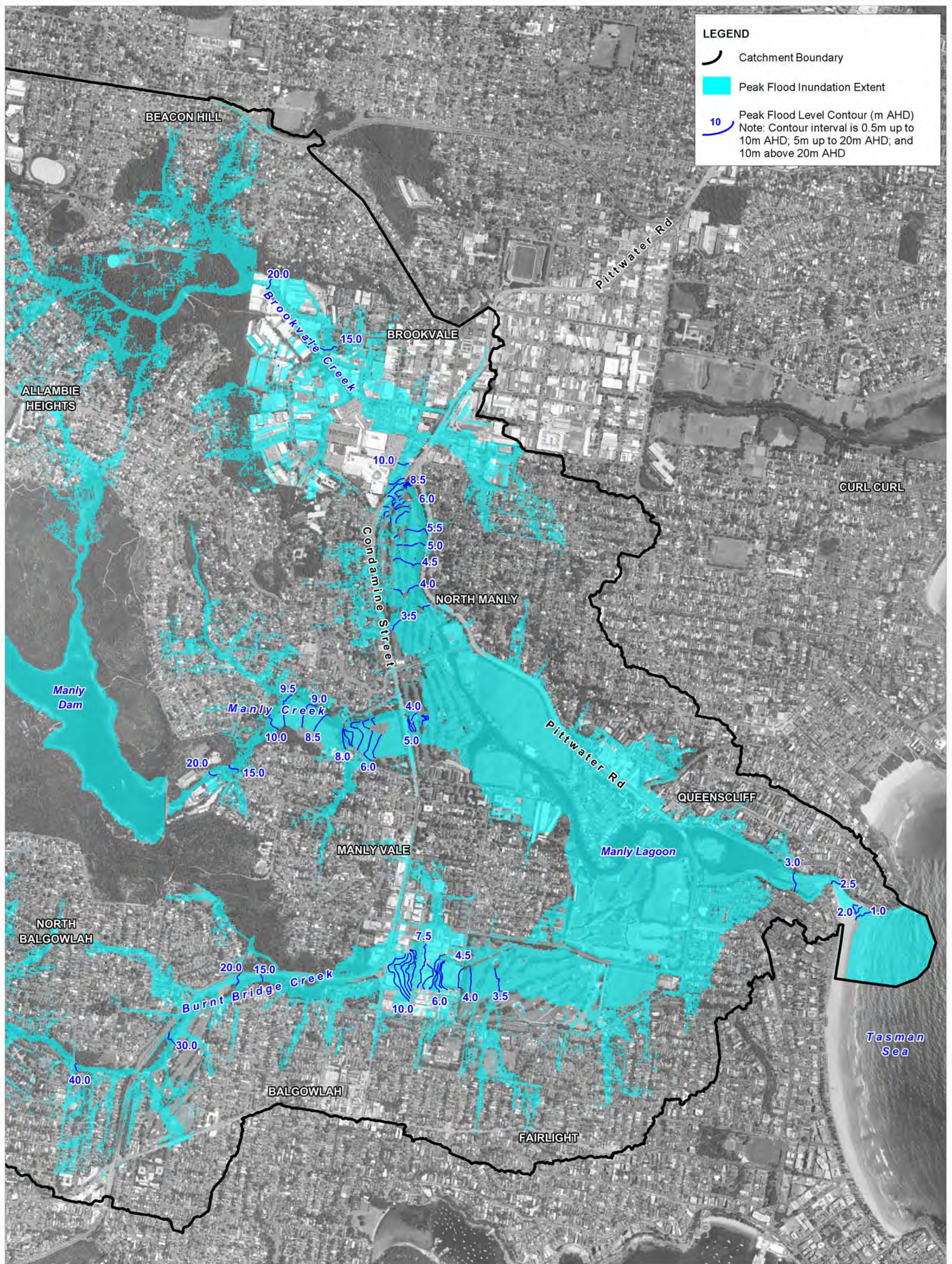


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Title:
**Manly Lagoon Flood Study - Peak Flood Water Level:
 0.5% AEP Catchment Derived Event**

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A-7

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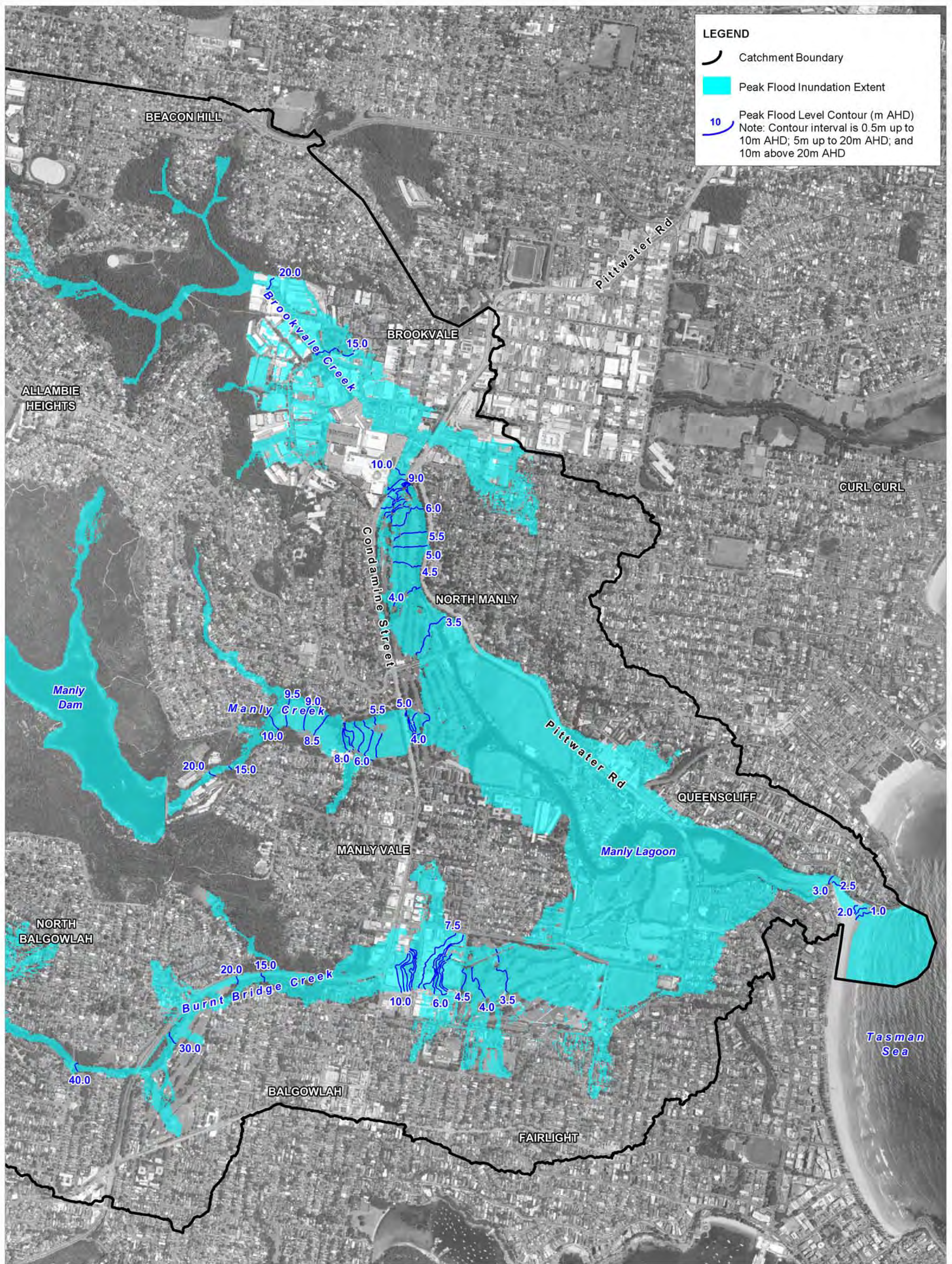
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Title:
**Manly Lagoon Flood Study - Peak Flood Water Level:
 0.2% AEP Catchment Derived Event**

Figure:
A-8

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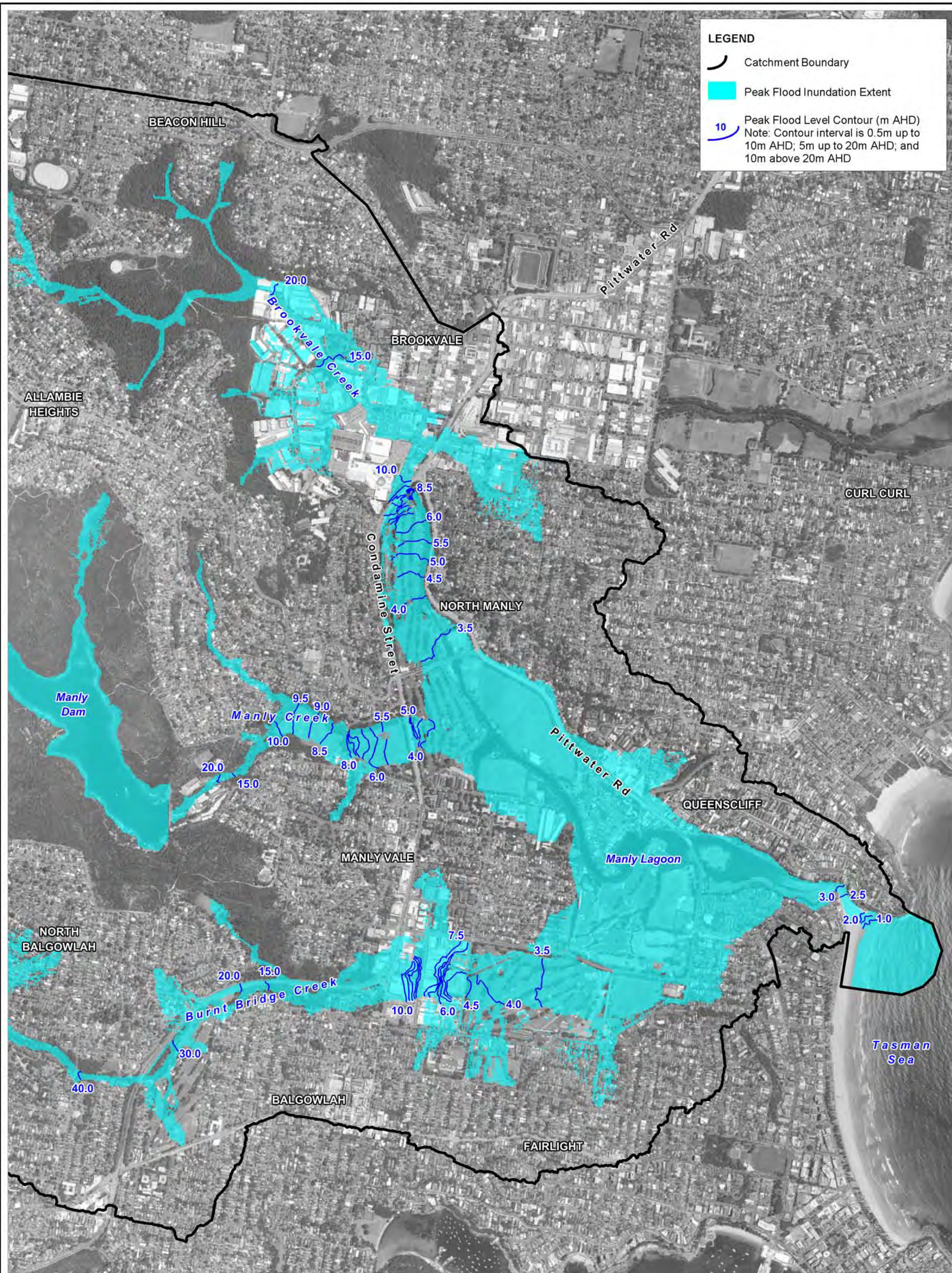
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Title:
**Manly Lagoon Flood Study - Peak Flood Water Level:
 0.1% AEP Catchment Derived Event**

Figure:
A-9

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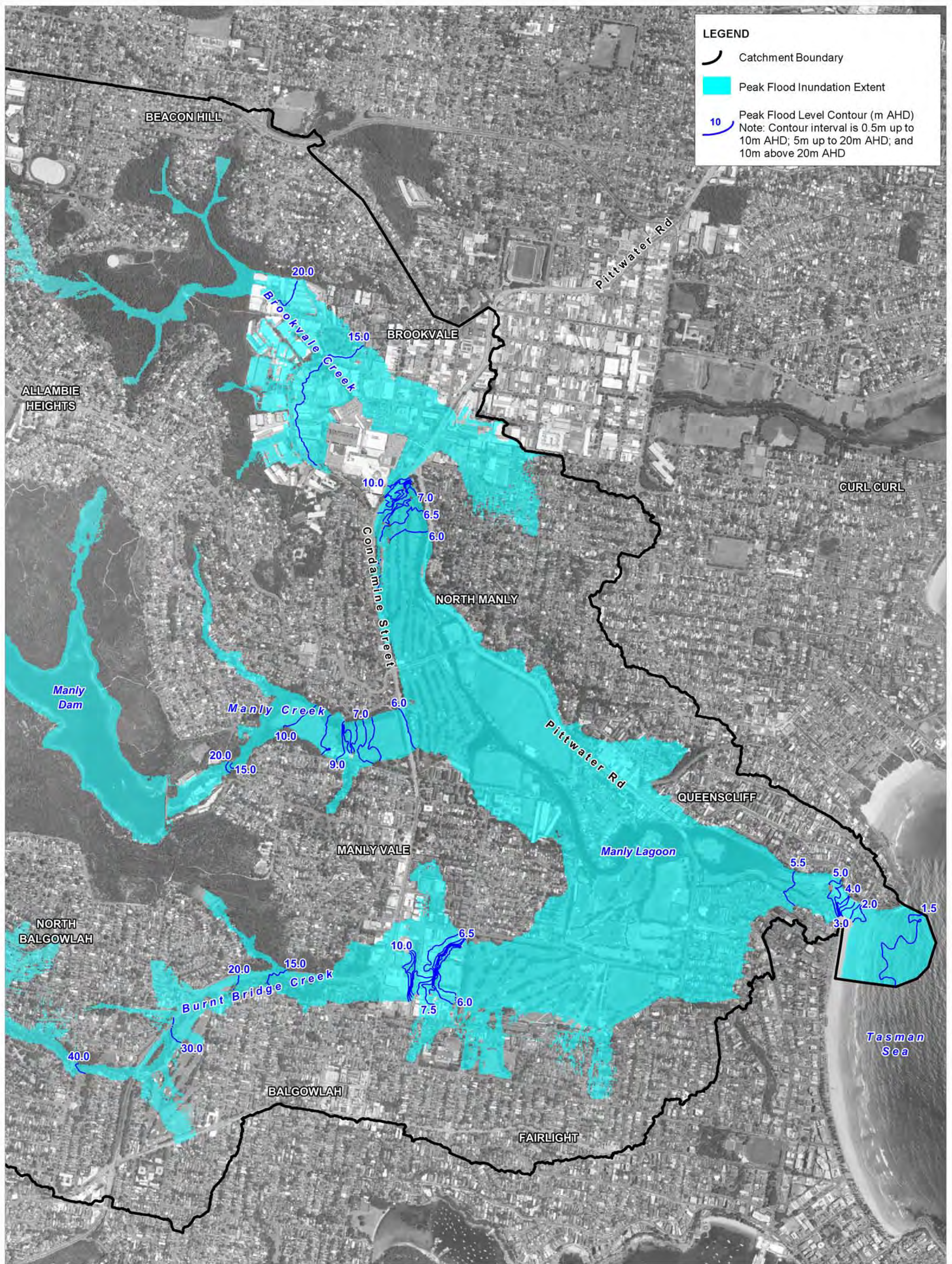
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Title:
**Manly Lagoon Flood Study - Peak Flood Water Level:
 PMF Catchment Derived Event**

Figure:
A-10

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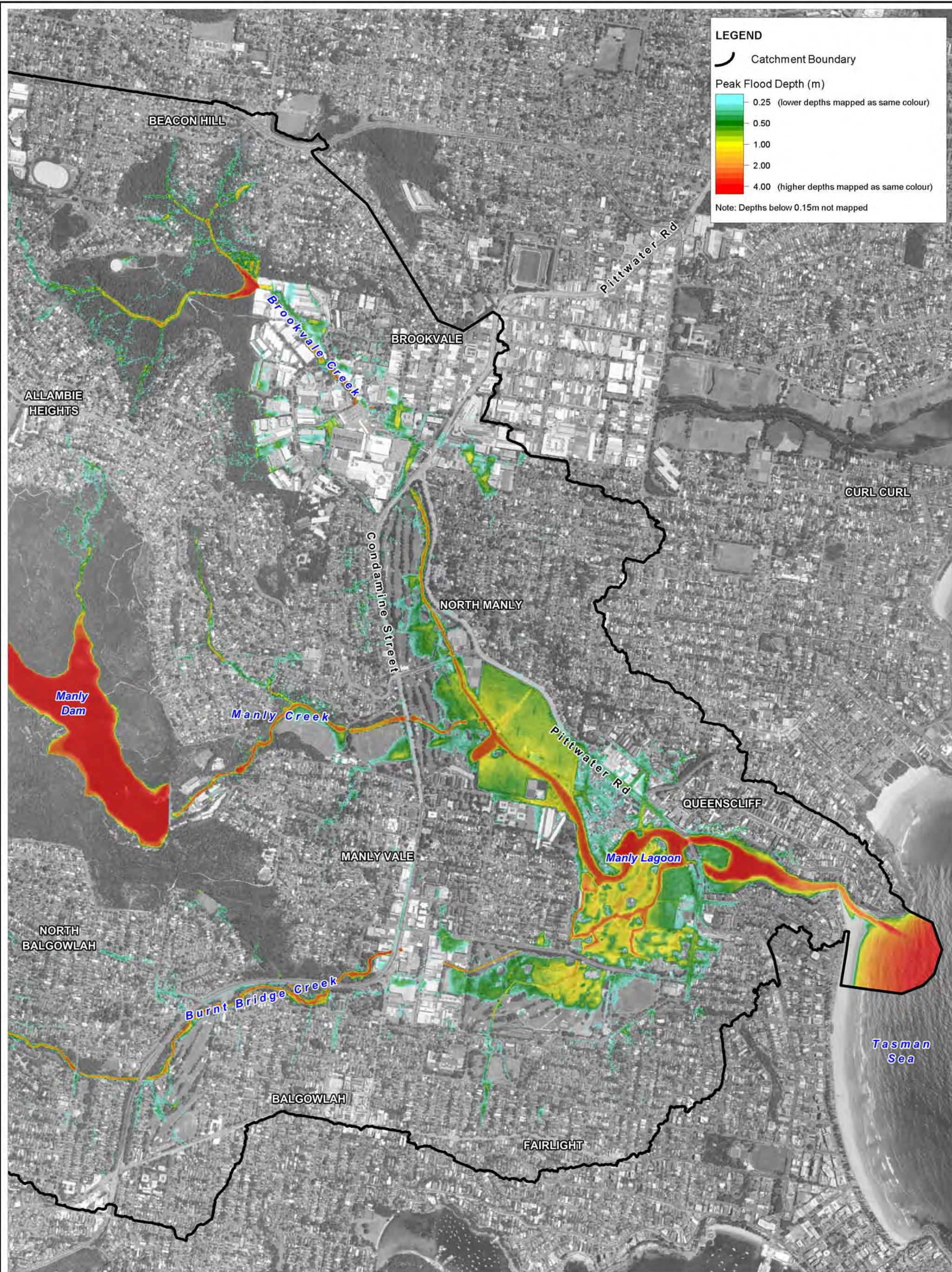
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 20% AEP Catchment Derived Event**

Figure:
A-11

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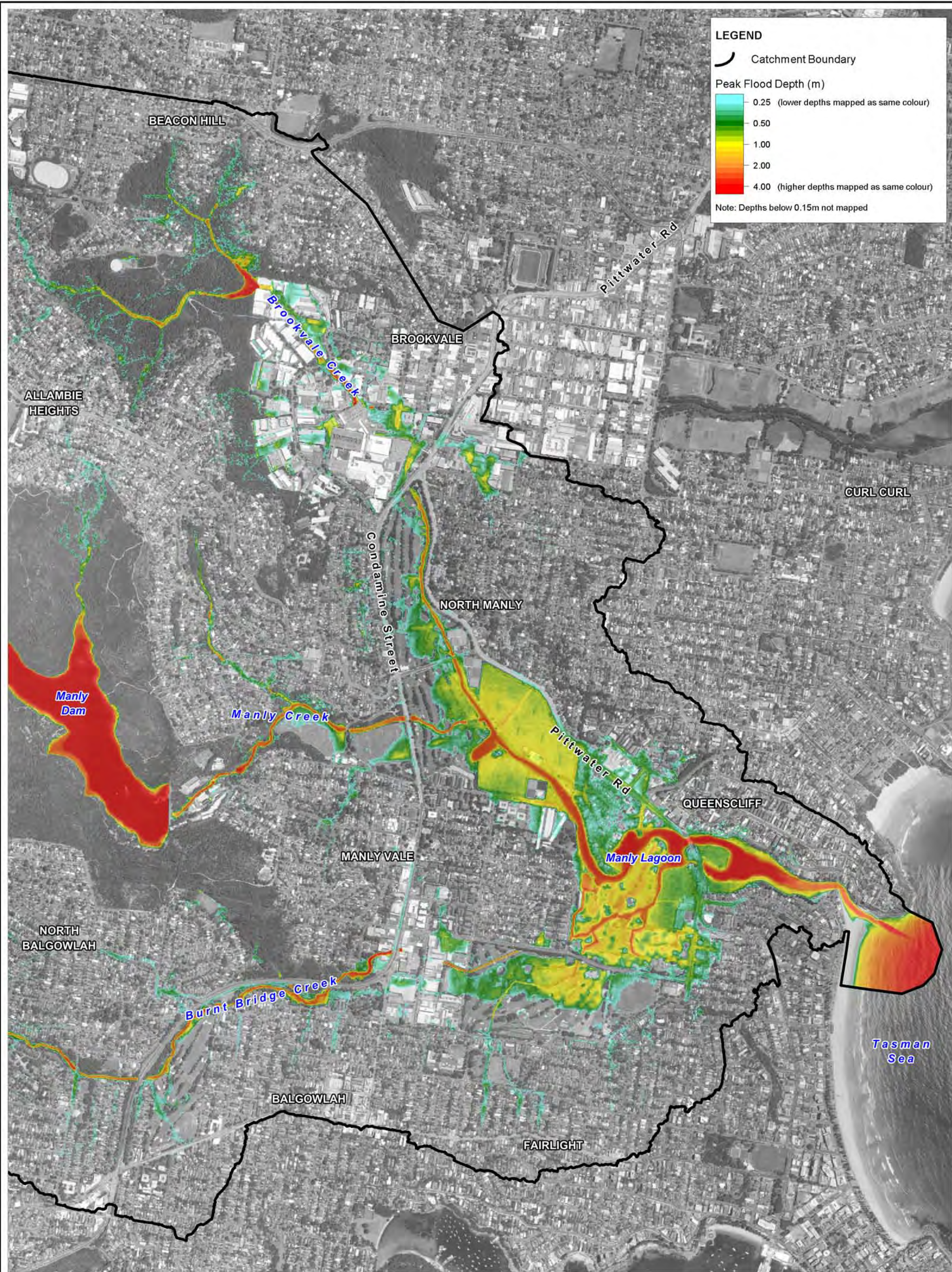
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
10% AEP Catchment Derived Event**

Figure:
A-12

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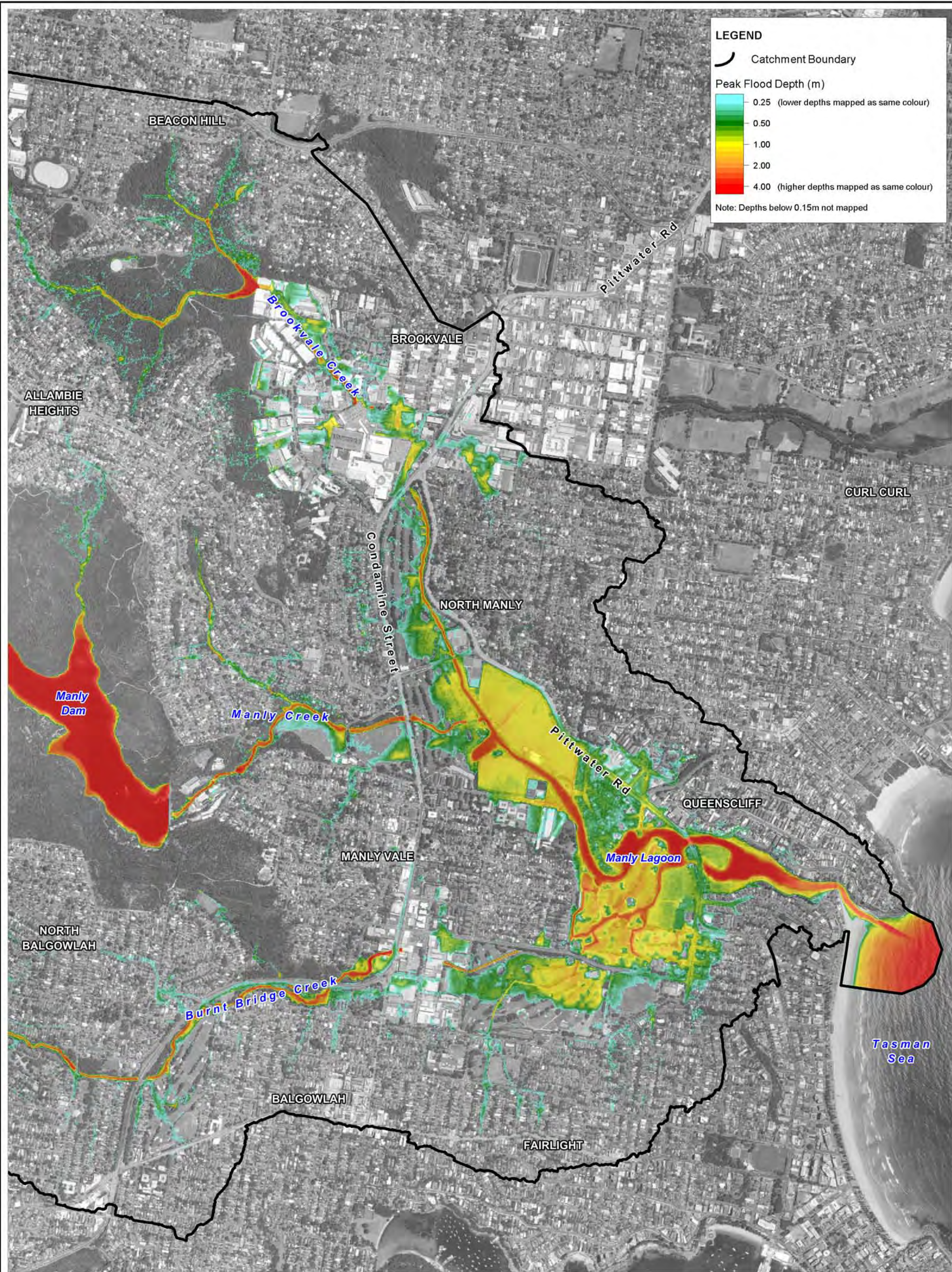
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 5% AEP Catchment Derived Event**

Figure:
A-13

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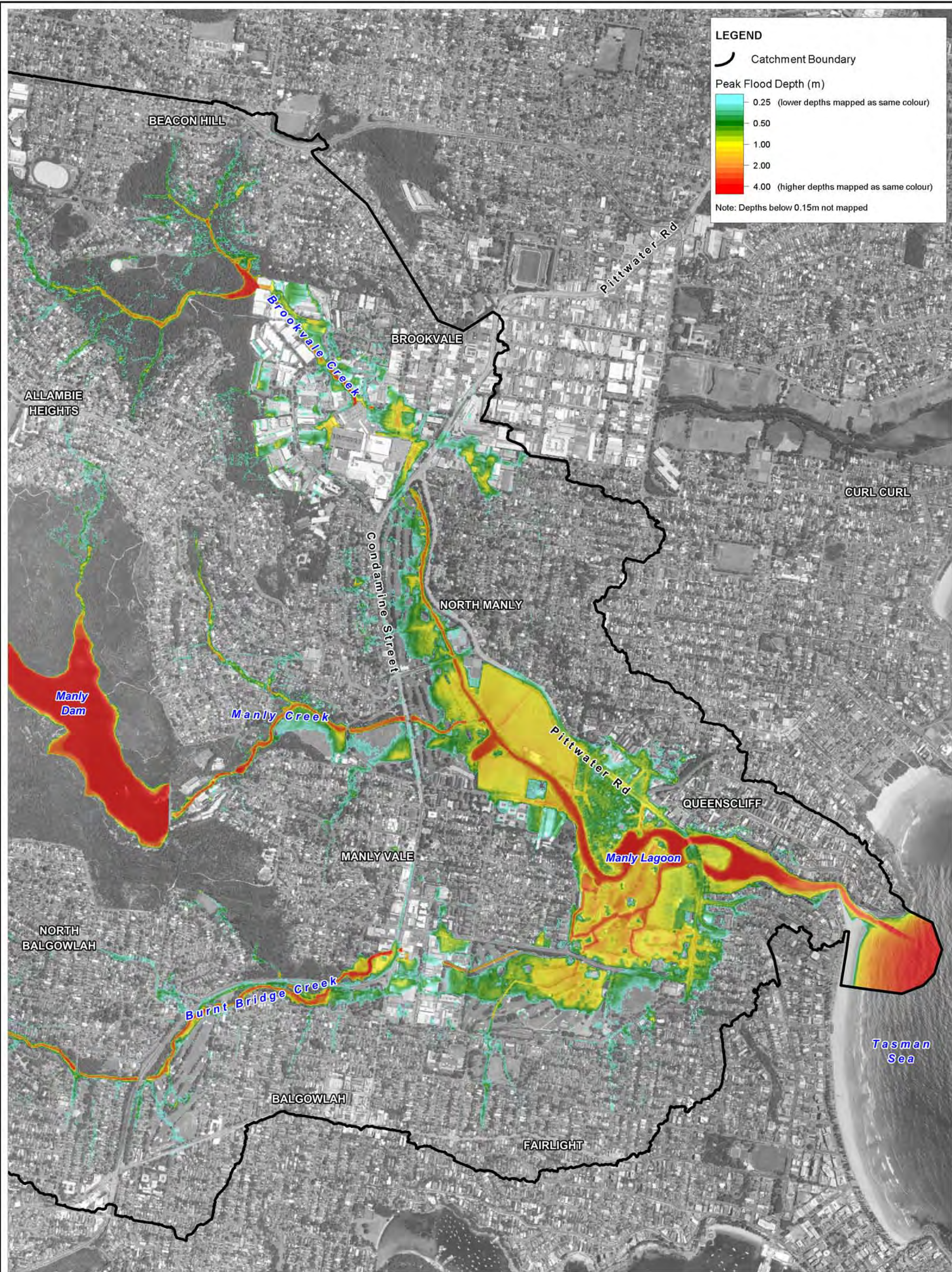
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
2% AEP Catchment Derived Event**

Figure:
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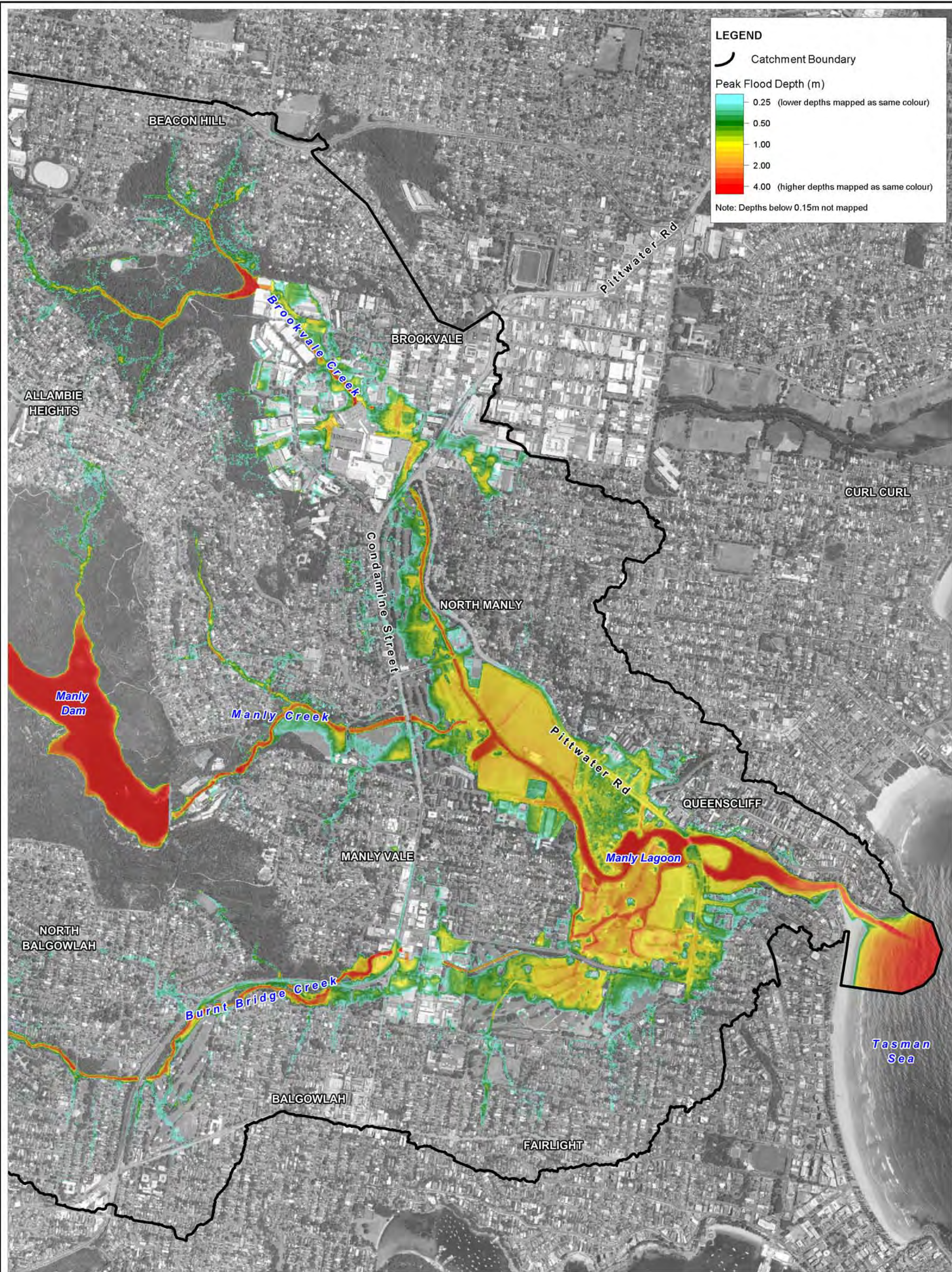
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
1% AEP Catchment Derived Event**

Figure:
A-15

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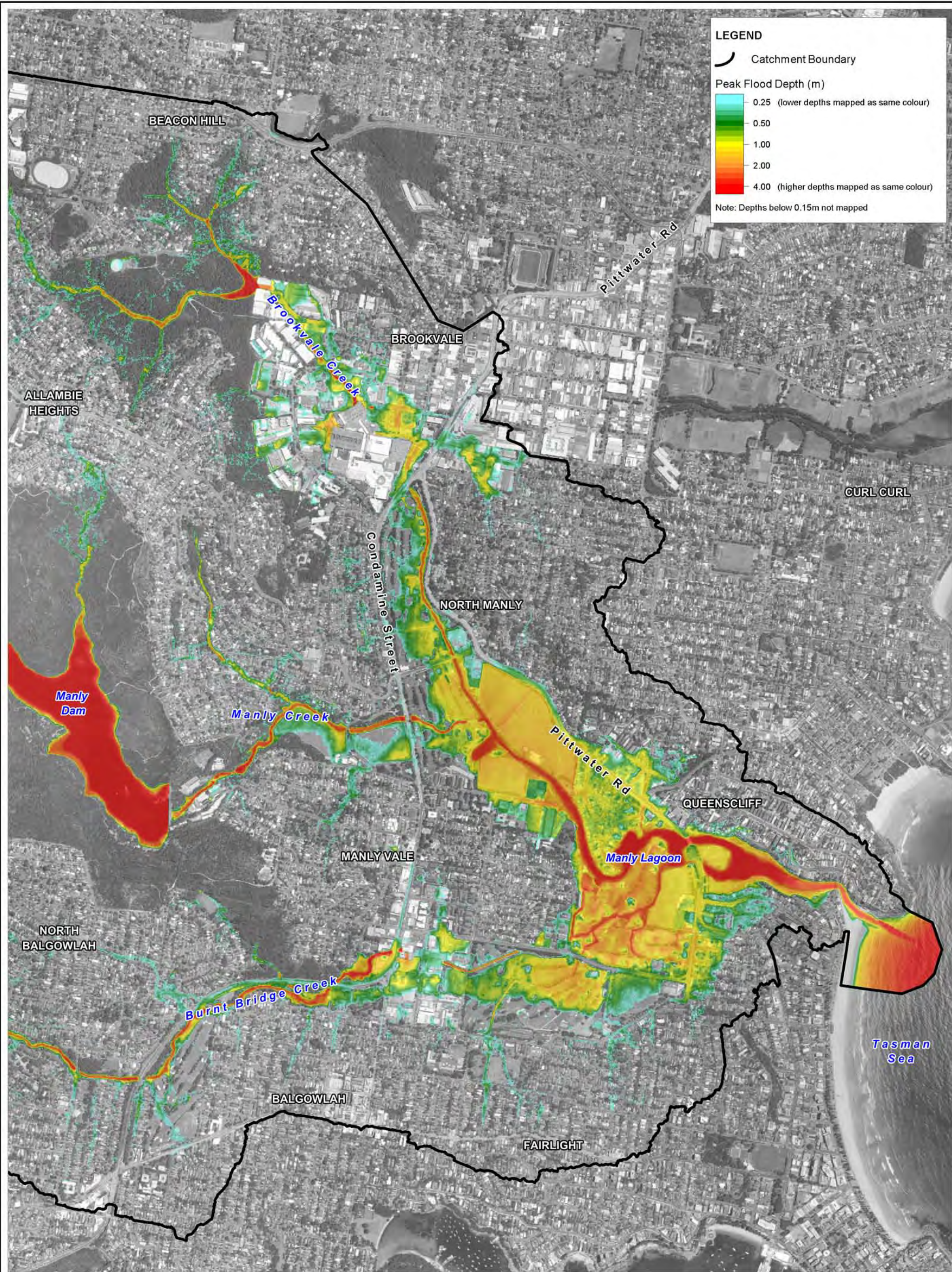
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 0.5% AEP Catchment Derived Event**

Figure:
A-16

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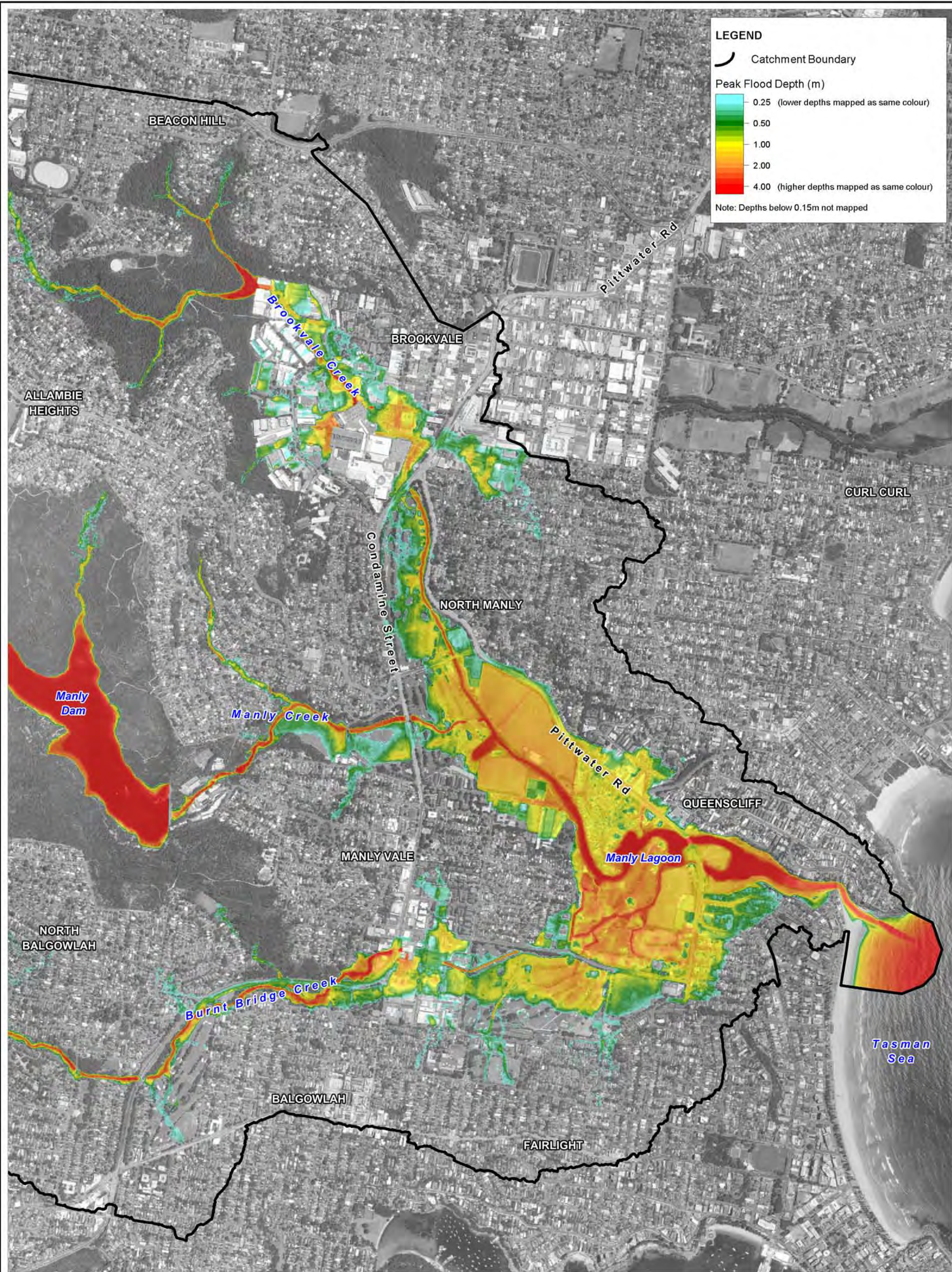
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**Manly Lagoon Flood Study - Peak Flood Depths:
 0.2% AEP Catchment Derived Event**

Figure:
A-17

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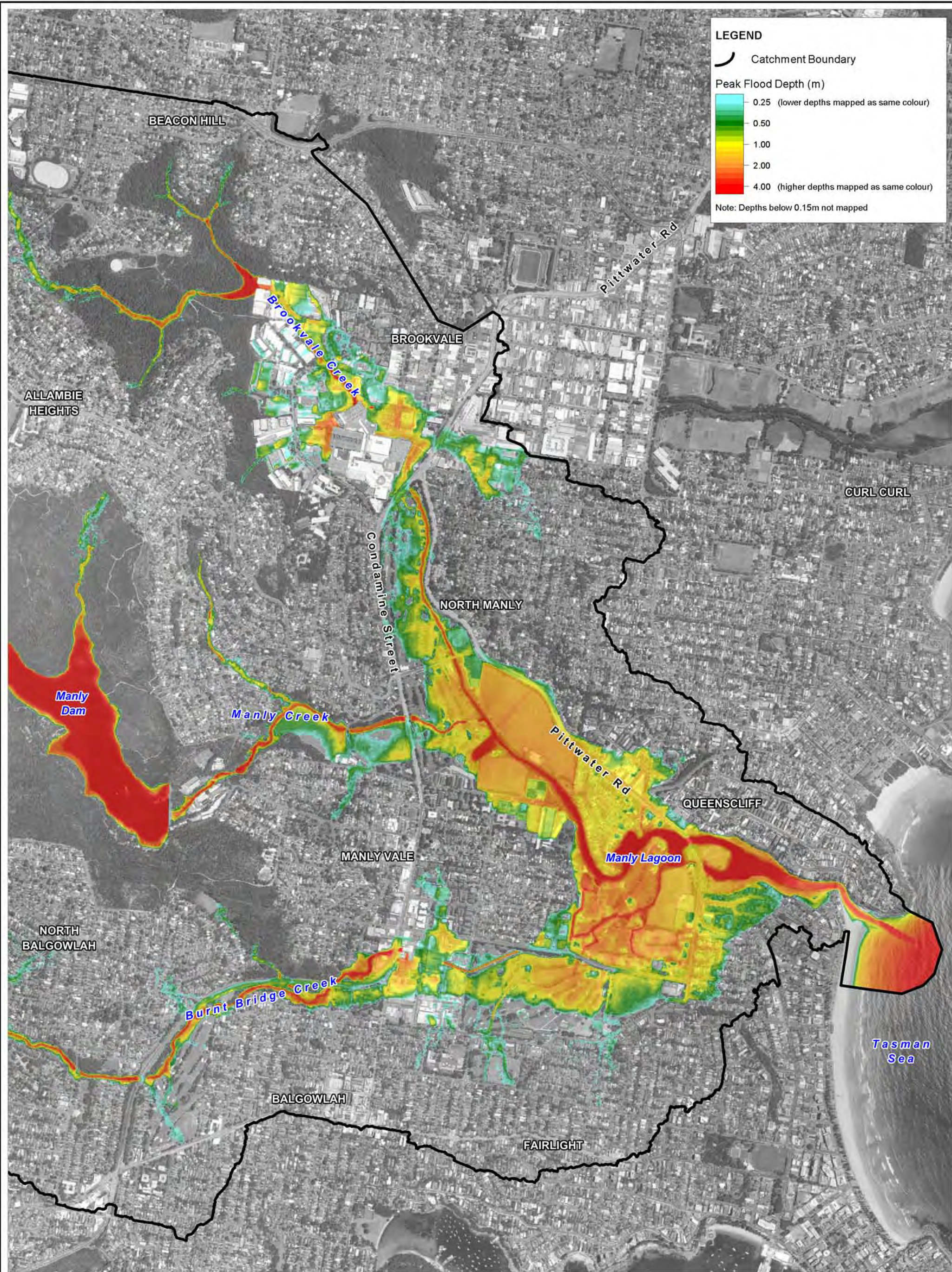
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 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A17_0.2%AEP_Depth.WOR



Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 0.1% AEP Catchment Derived Event**

Figure:
A-18

Rev:
A

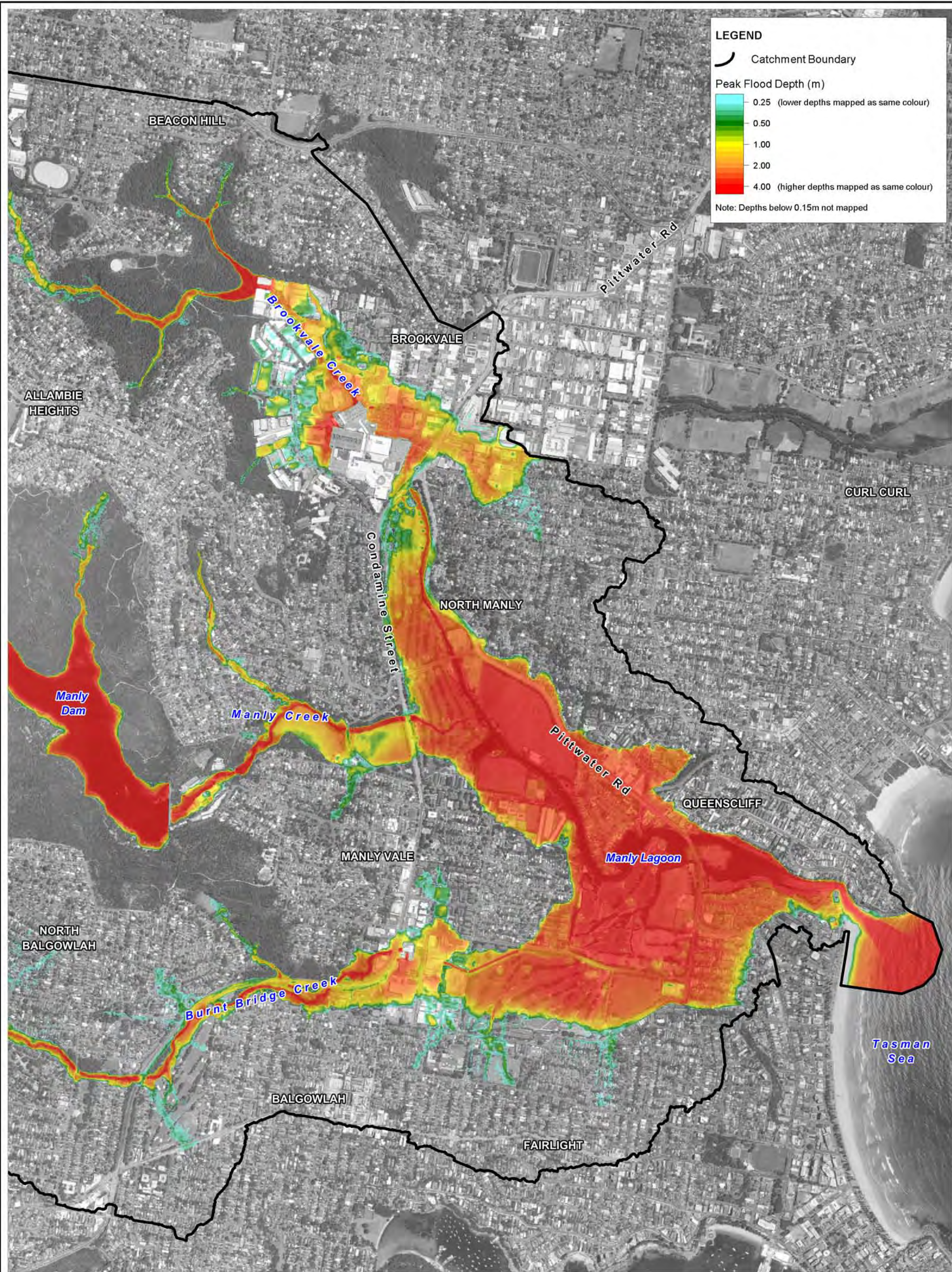
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 PMF Catchment Derived Event**

Figure:
A-19

Rev:
A

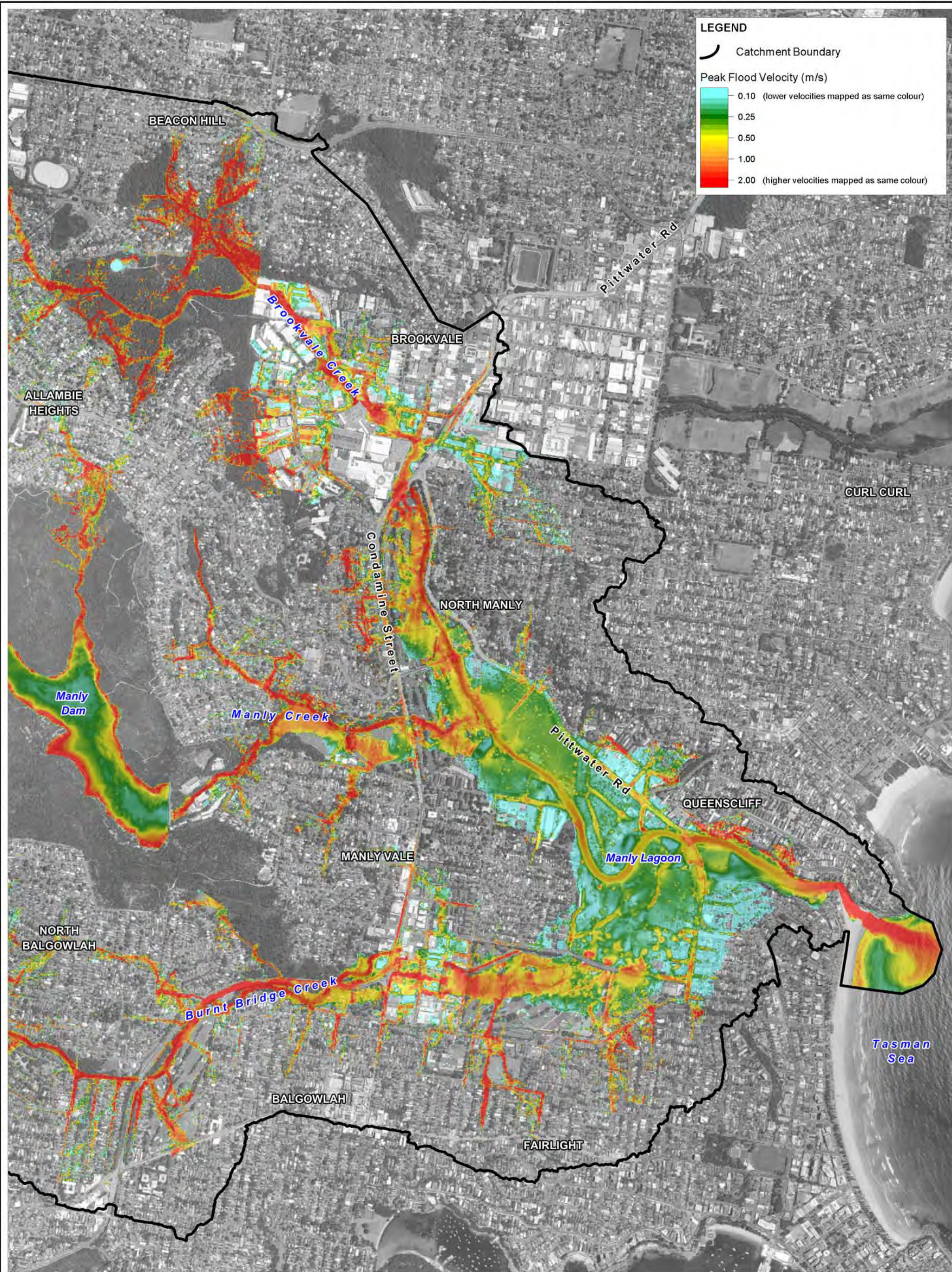
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A19_PMF_Depth.WOR



Title:
**Manly Lagoon Flood Study - Peak Flood Velocity:
 1% AEP Catchment Derived Event**

Figure:
A-20

Rev:
A

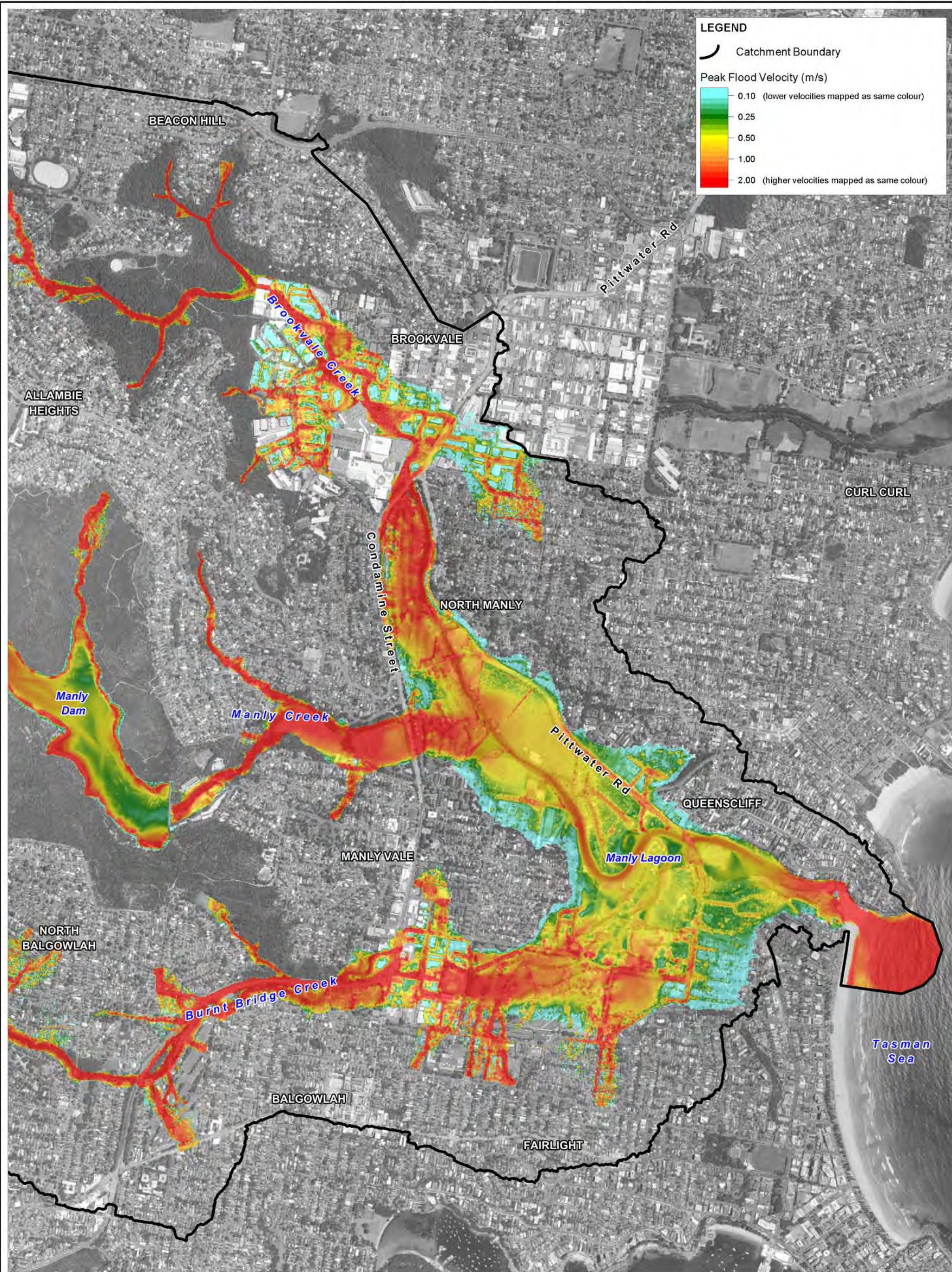
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A20_1%AEP_Velocity.WOR



Title:
**Manly Lagoon Flood Study - Peak Flood Velocity:
 PMF Catchment Derived Event**

Figure:
A-21

Rev:
A

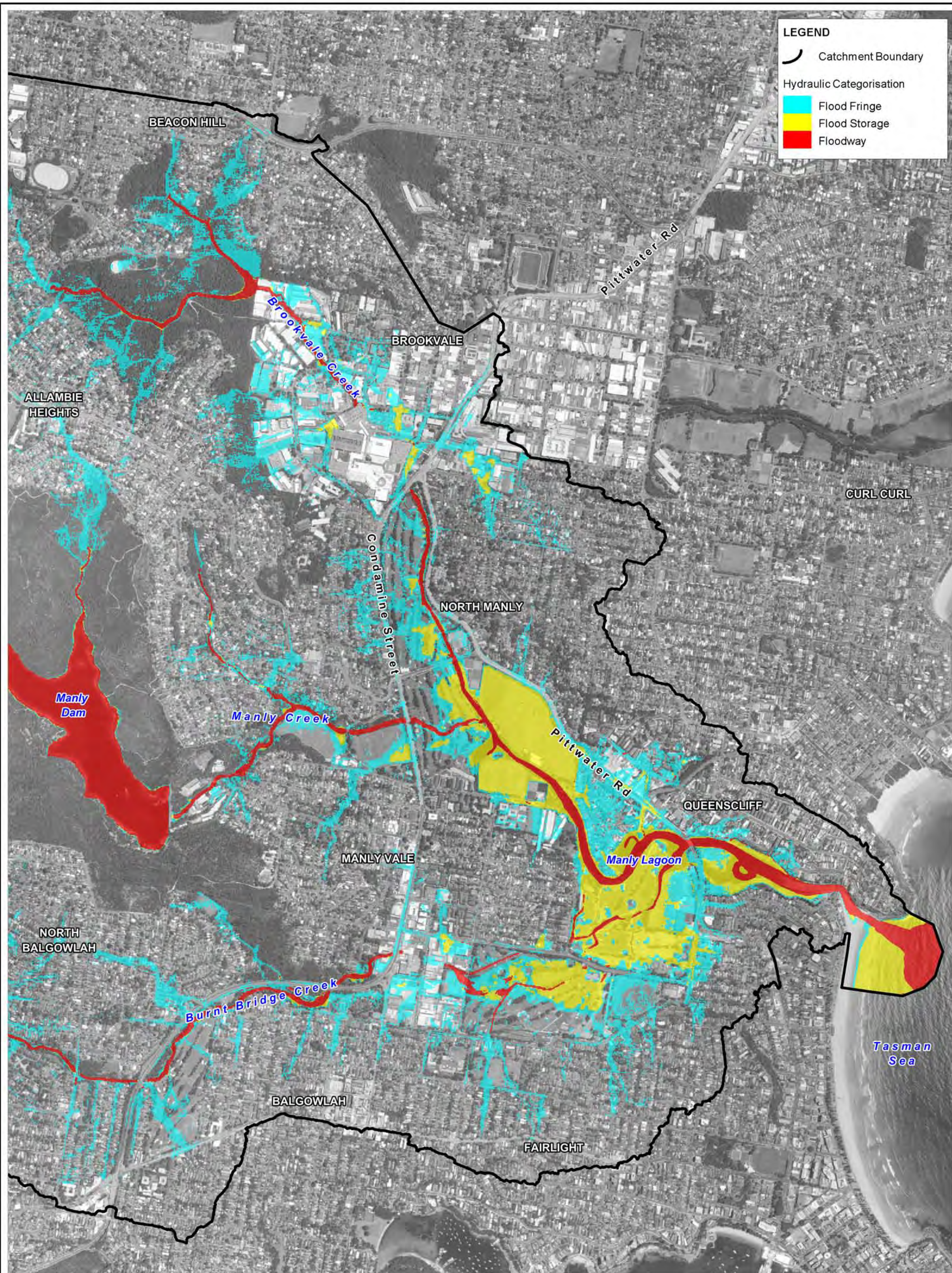
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A21_PMF_Velocity.WOR



Title:
**Manly Lagoon Flood Study - Hydraulic Categories:
 20% AEP Catchment Derived Event**

Figure:
A-22

Rev:
A

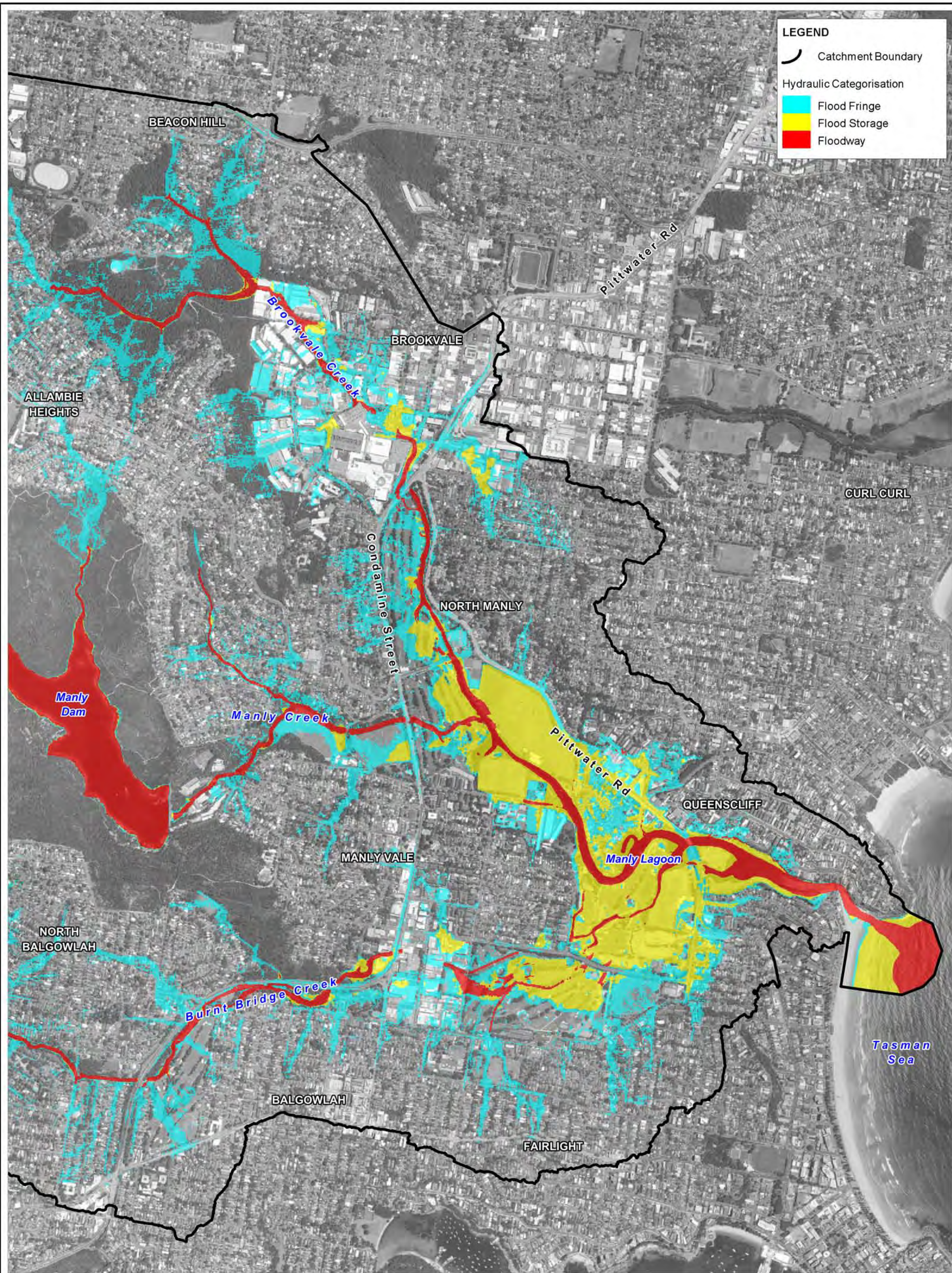
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LEGEND

 Catchment Boundary

Hydraulic Categorisation

 Flood Fringe

 Flood Storage

 Floodway

Title:
**Manly Lagoon Flood Study - Hydraulic Categories:
 5% AEP Catchment Derived Event**

Figure:
A-23

Rev:
A

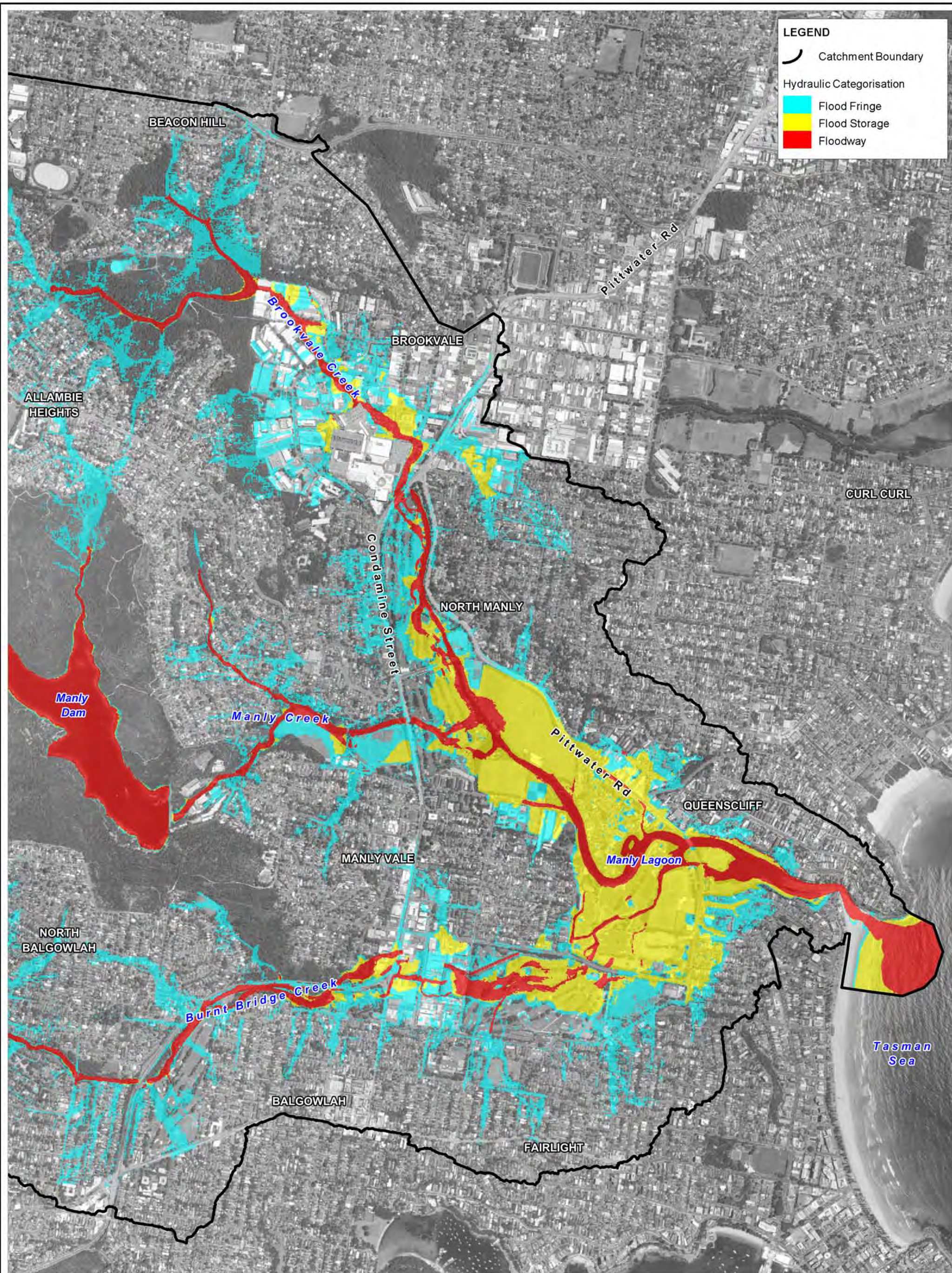
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0 375 750m
 Approx. Scale




Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A23_5%AEP_HydCat.WOR





LEGEND

 Catchment Boundary

Hydraulic Categorisation

 Flood Fringe

 Flood Storage

 Floodway

Title:
**Manly Lagoon Flood Study - Hydraulic Categories:
 1% AEP Catchment Derived Event**

Figure:
A-24

Rev:
A

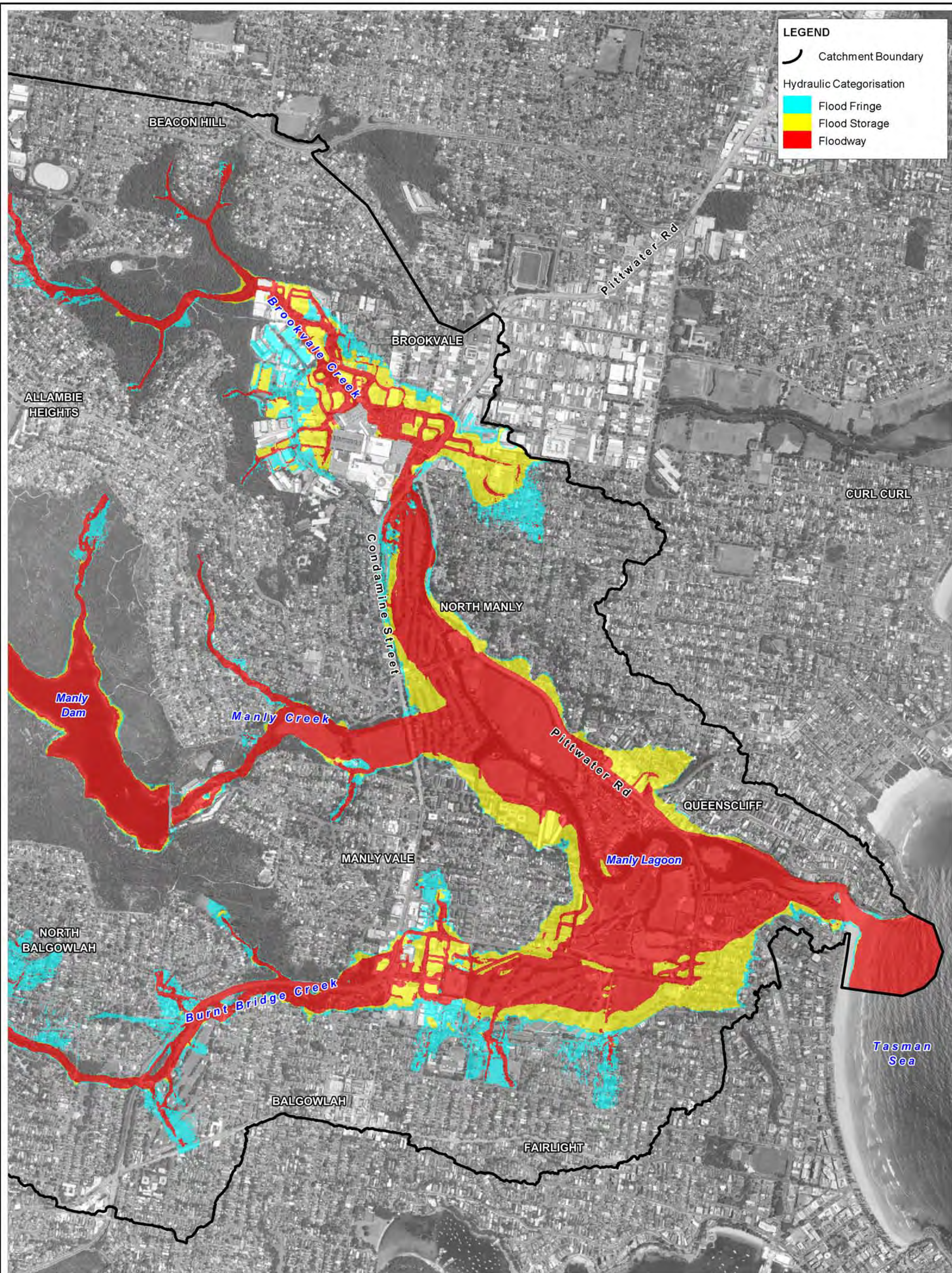
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Title:
**Manly Lagoon Flood Study - Hydraulic Categories:
 PMF Catchment Derived Event**

Figure:
A-25

Rev:
A

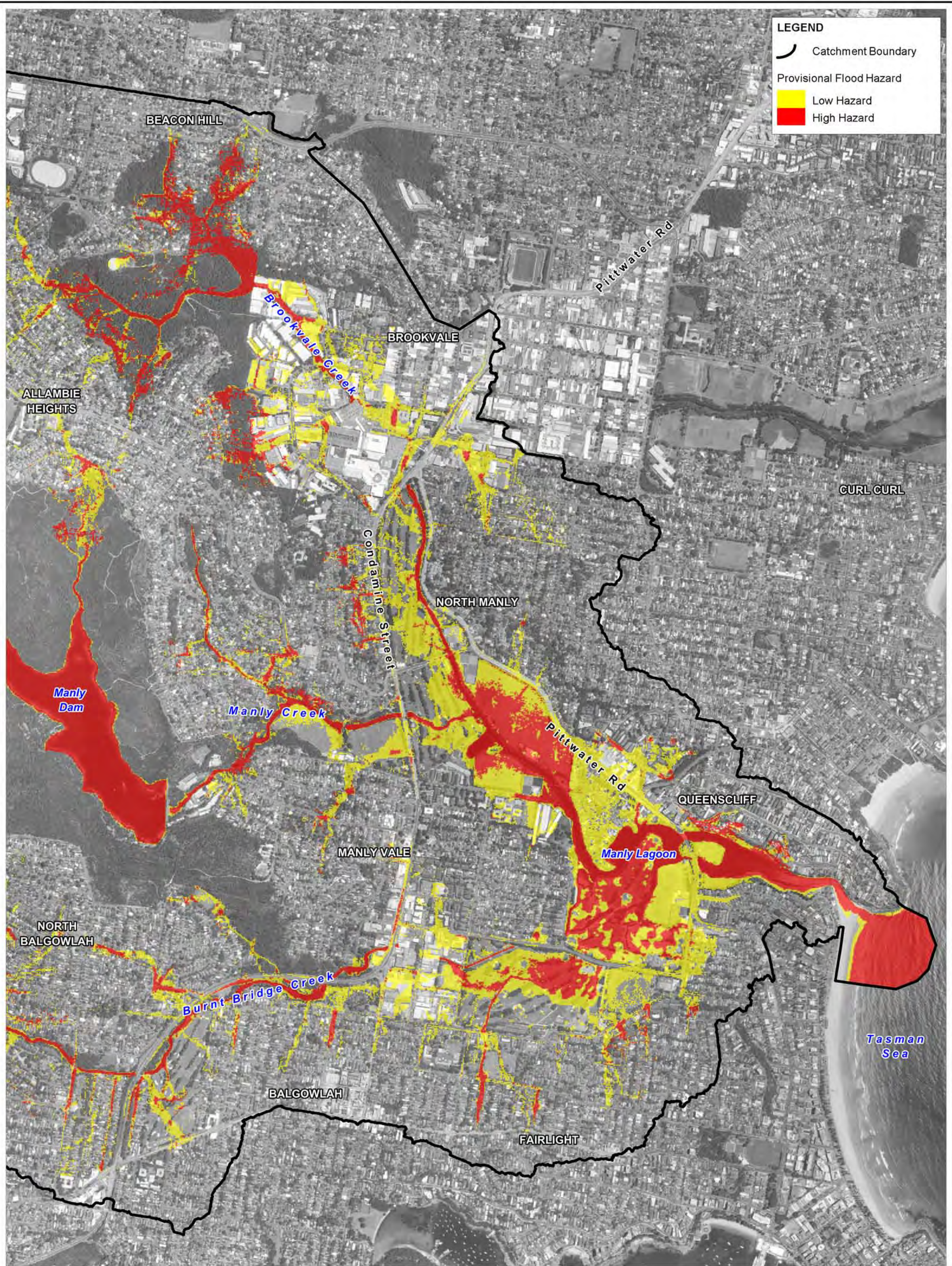
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Title:
**Manly Lagoon Flood Study - Provisional Flood Hazard:
 20% AEP Catchment Derived Event**

Figure:
A-26

Rev:
A

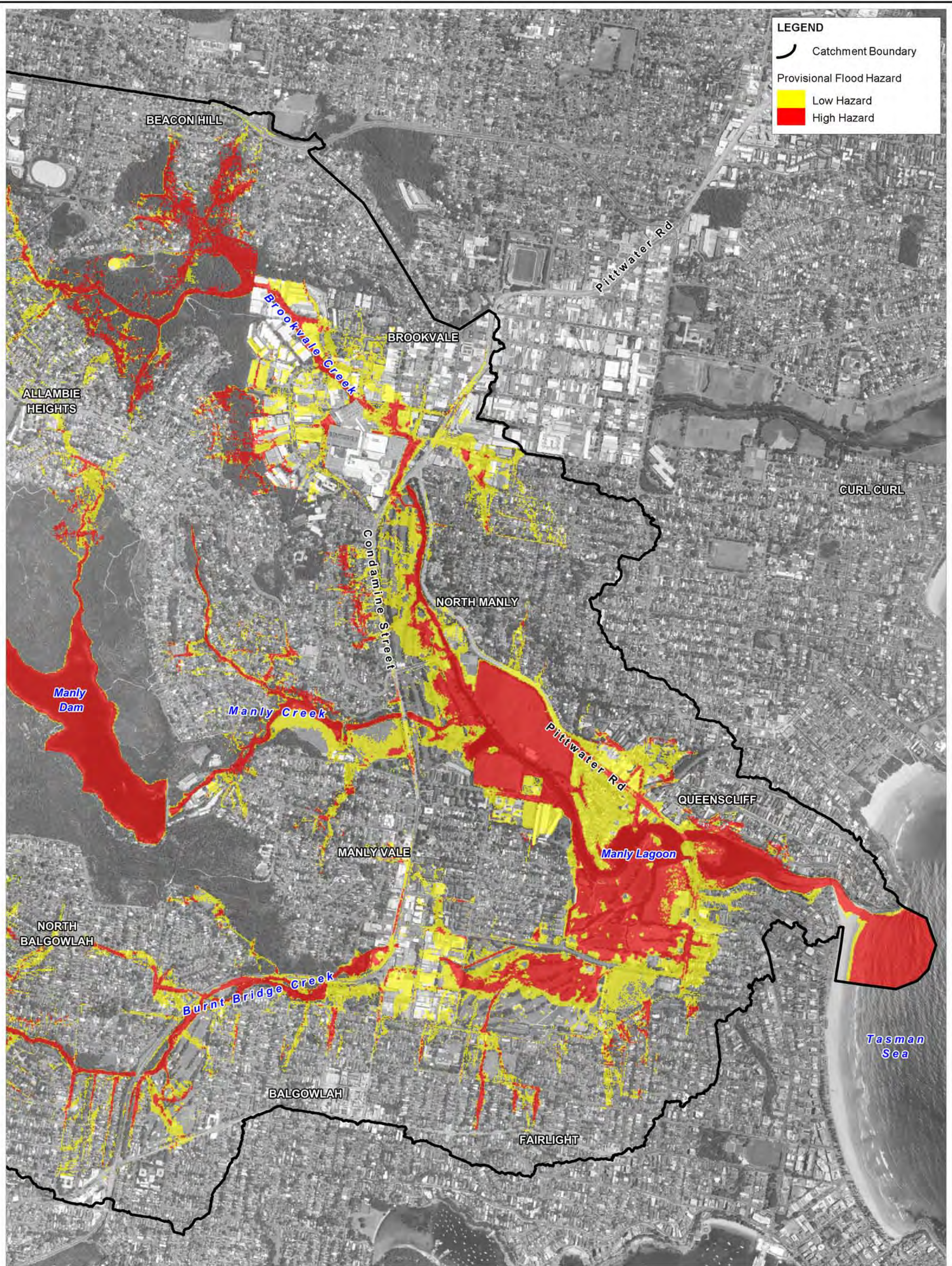
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Title:
**Manly Lagoon Flood Study - Provisional Flood Hazard:
 5% AEP Catchment Derived Event**

Figure:
A-27

Rev:
A

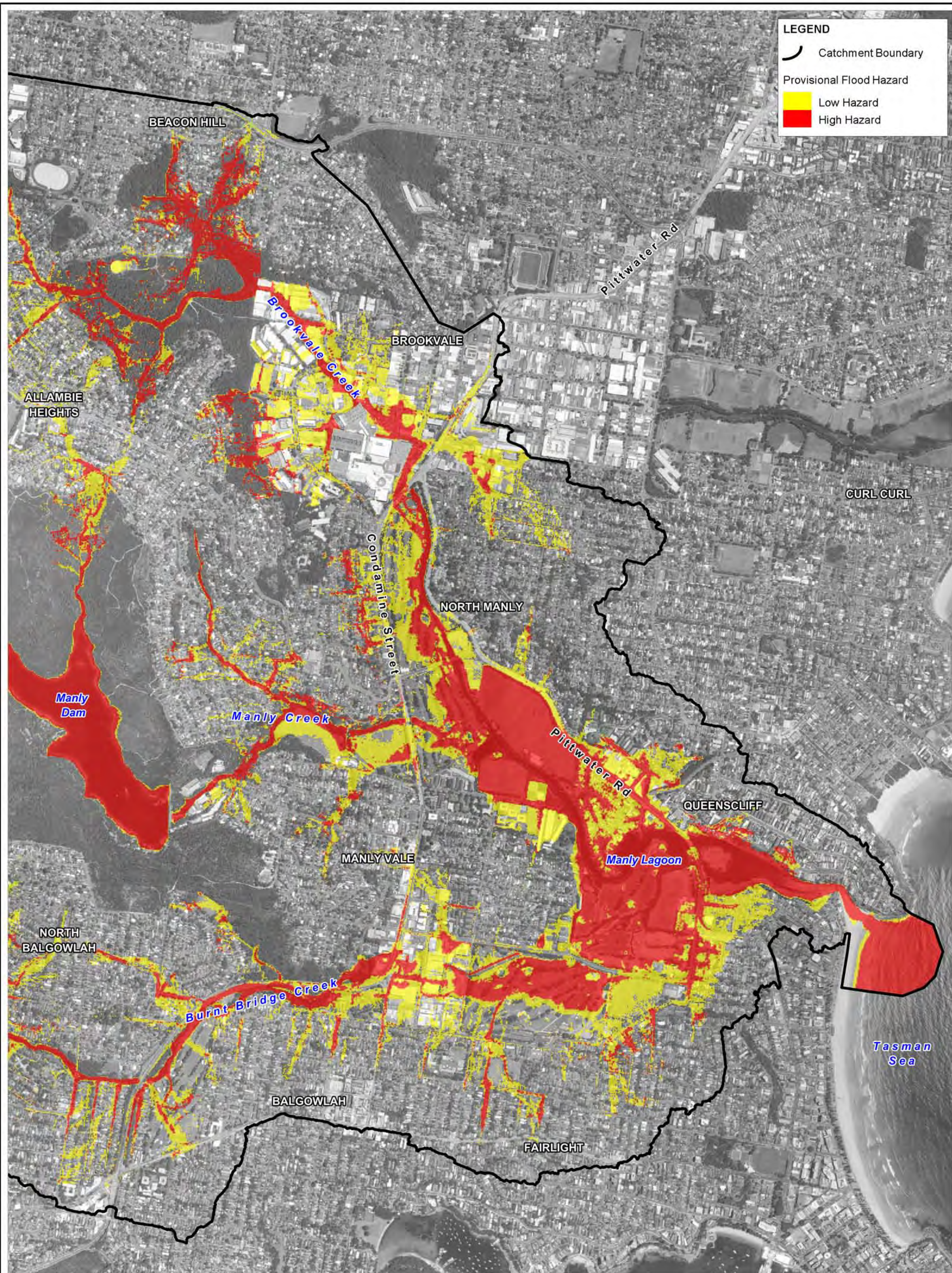
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Title:
**Manly Lagoon Flood Study - Provisional Flood Hazard:
 1% AEP Catchment Derived Event**

Figure:
A-28

Rev:
A

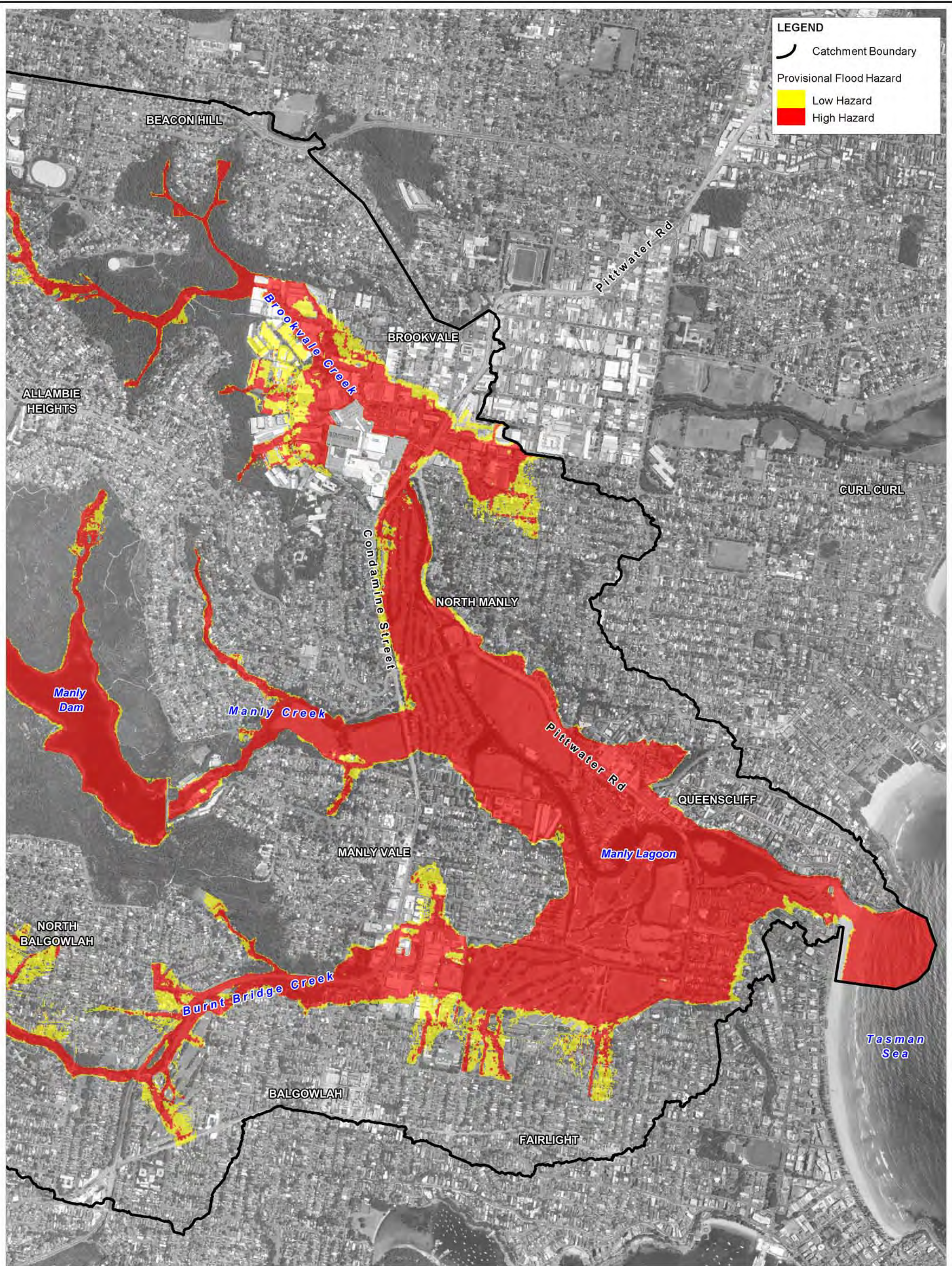
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Title:
**Manly Lagoon Flood Study - Provisional Flood Hazard:
 PMF Catchment Derived Event**

Figure:
A-29

Rev:
A

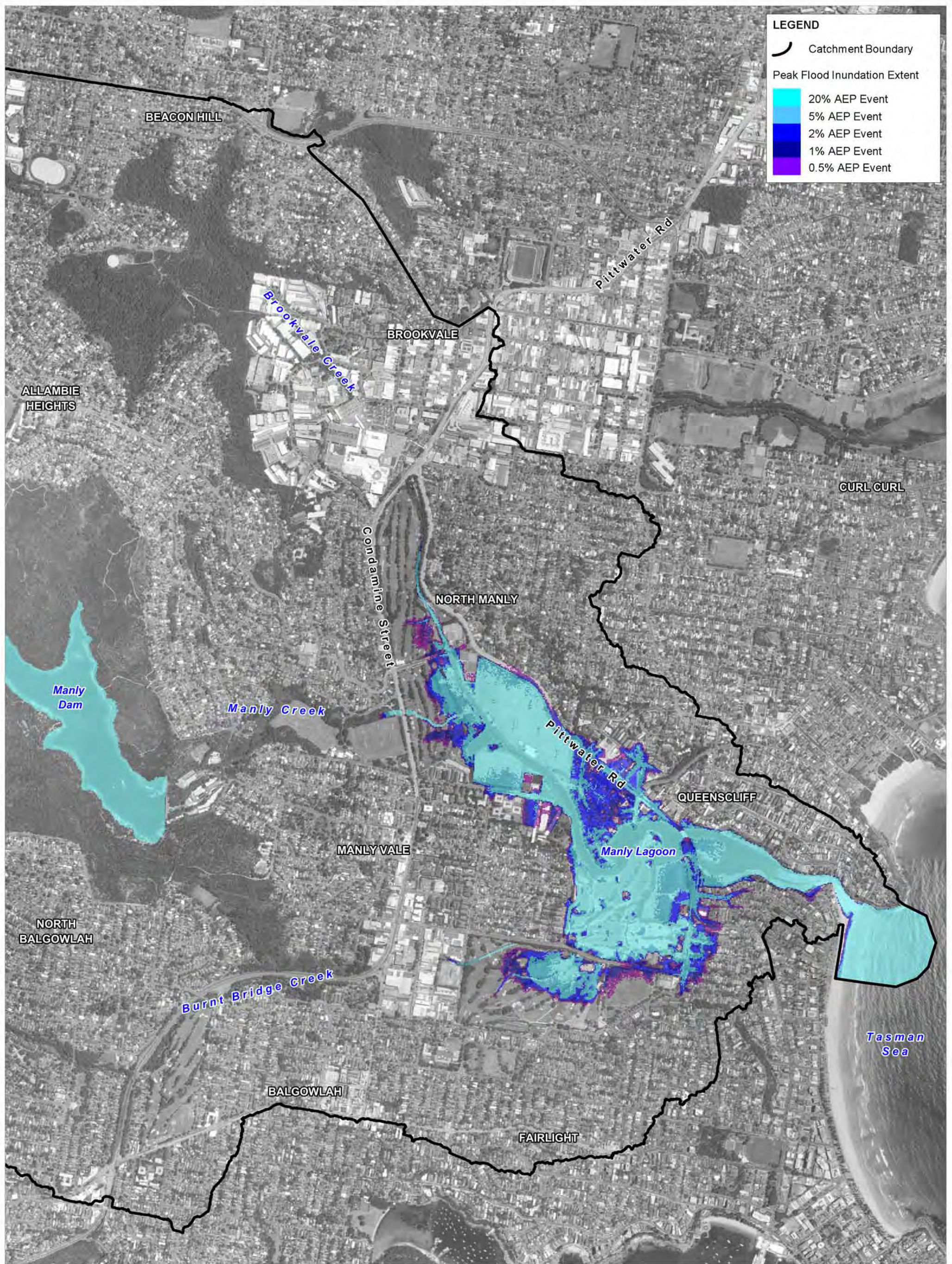
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Title:
**Manly Lagoon Flood Study - Peak Flood Inundation Extent:
 Ocean Derived Events**

Figure:
A-30

Rev:
A

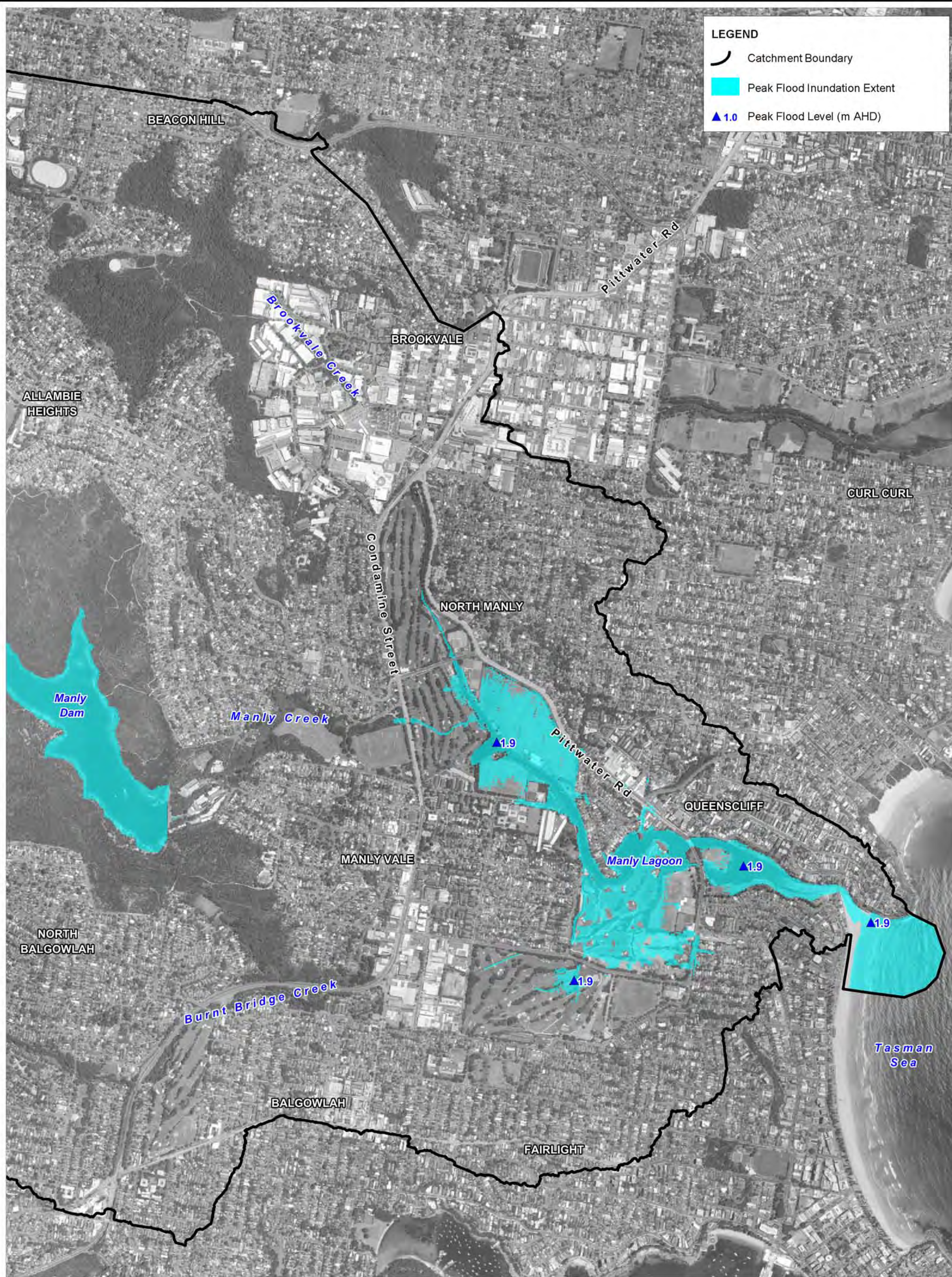
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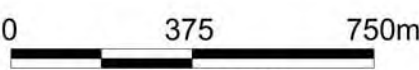



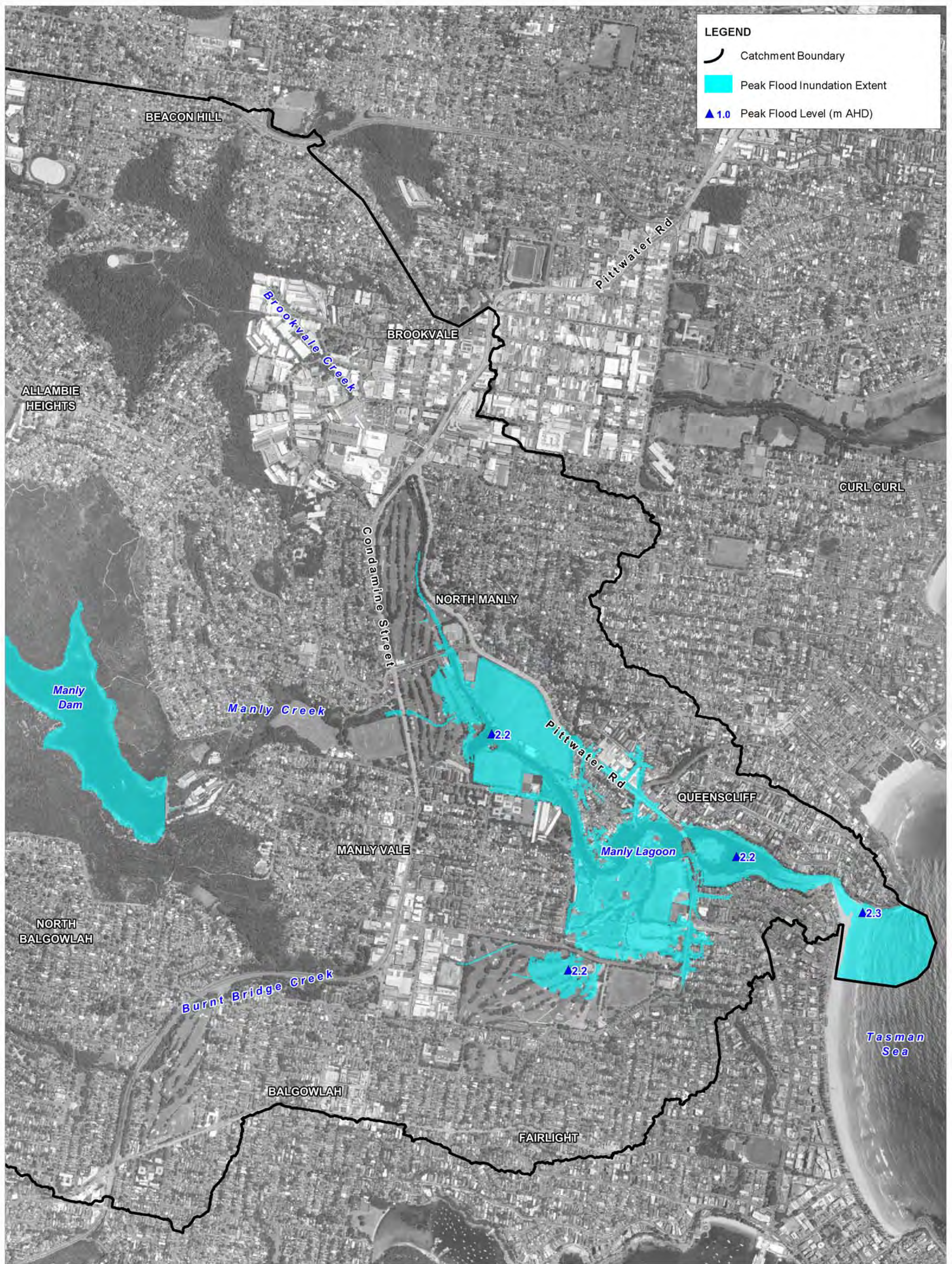
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 Approx. Scale



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Title: Manly Lagoon Flood Study - Peak Flood Extent and Peak Flood Levels: 20% AEP Ocean Derived Event		Figure: A-31	Rev: A
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Filepath : K:\N2069 Manly Lagoon Flood Study\MI\Workspaces\Design Mapping\Final_A3\Fig_A31_20%AEP WaterLevel Ocean.WOR			



Title:
**Manly Lagoon Flood Study - Peak Flood Extent and Peak Flood Levels:
 5% AEP Ocean Derived Event**

Figure:
A-32

Rev:
A

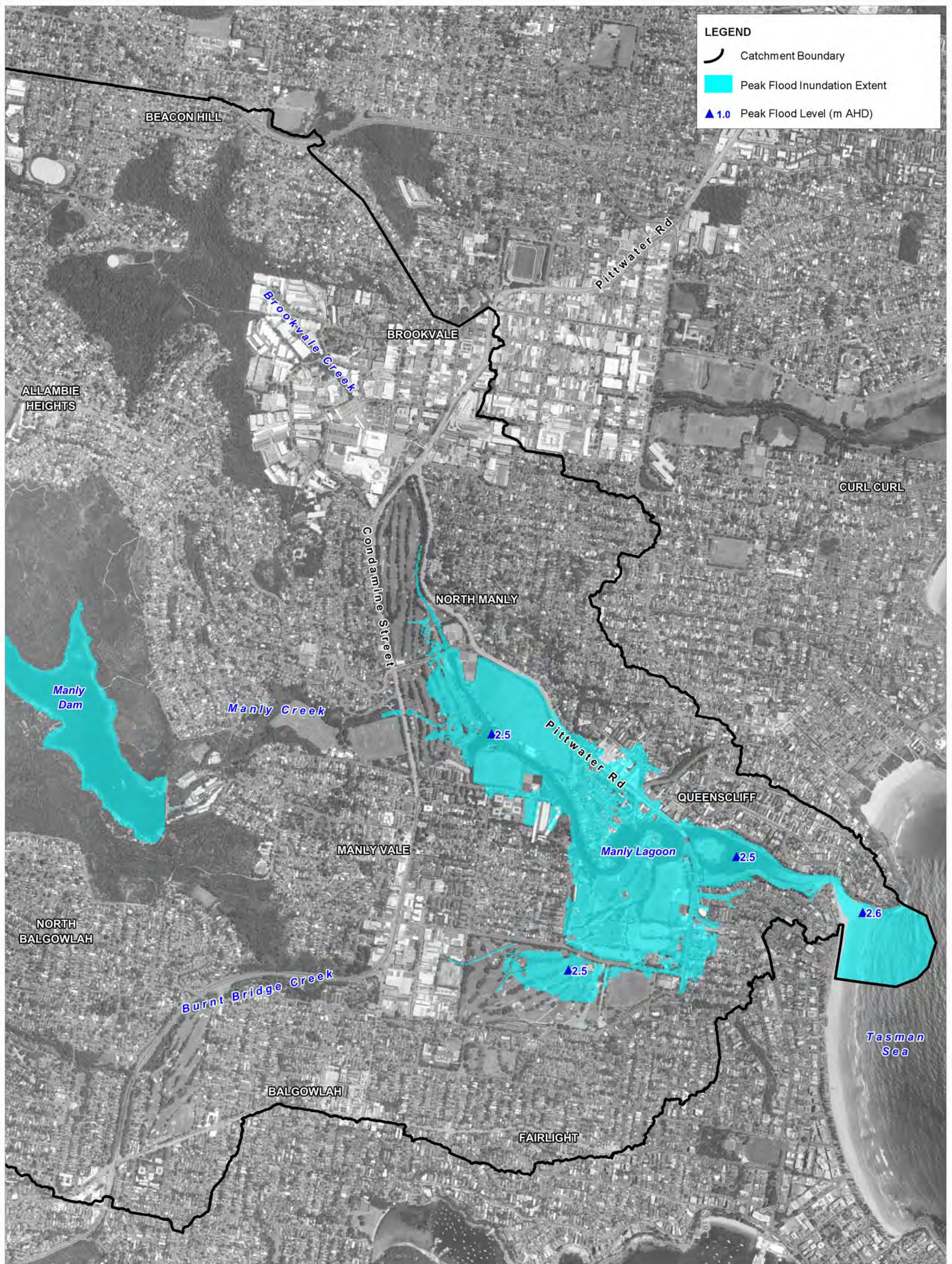
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0 375 750m
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Title:
**Manly Lagoon Flood Study - Peak Flood Extent and Peak Flood Levels:
 1% AEP Ocean Derived Event**

Figure:
A-33

Rev:
A

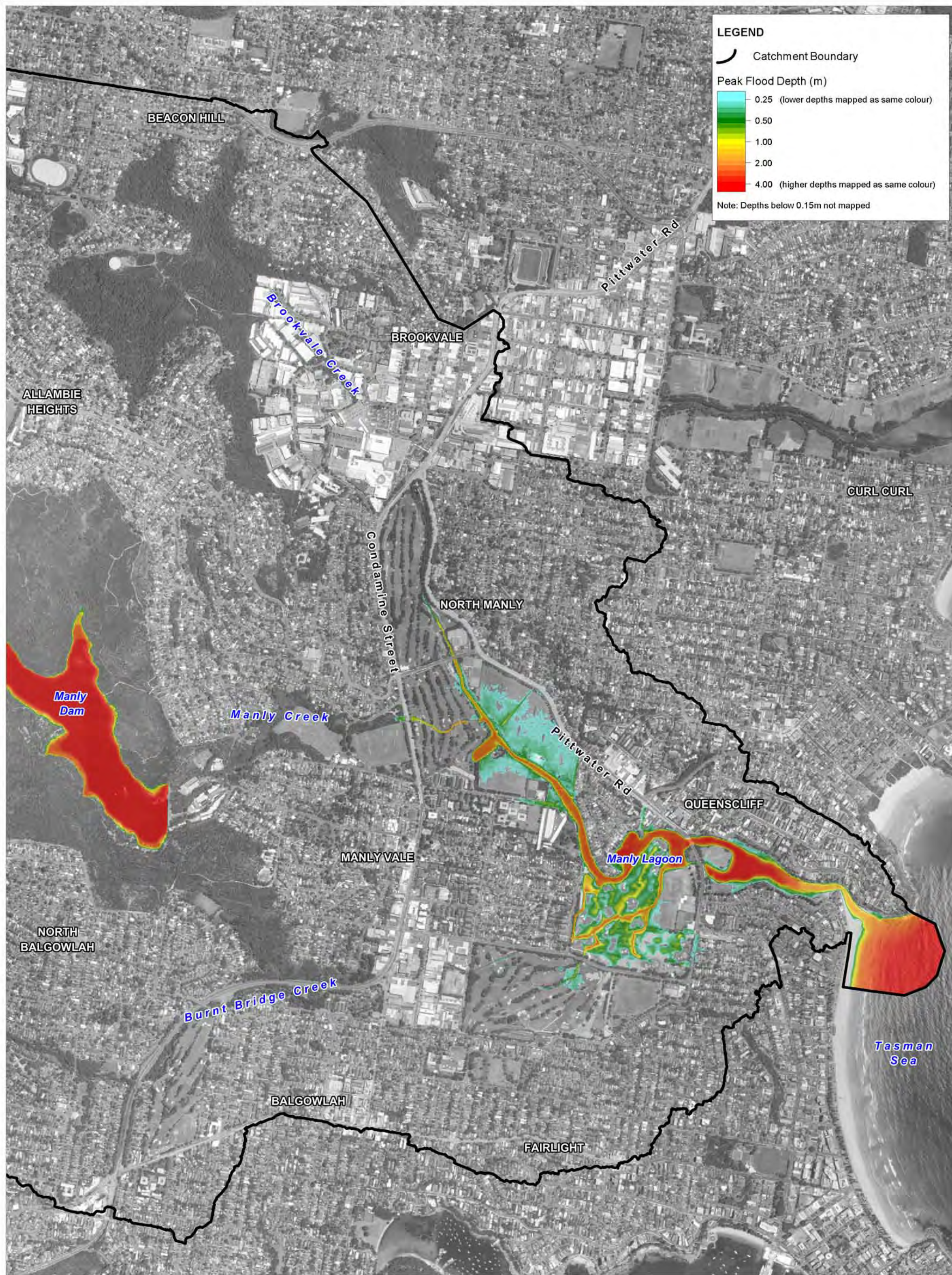
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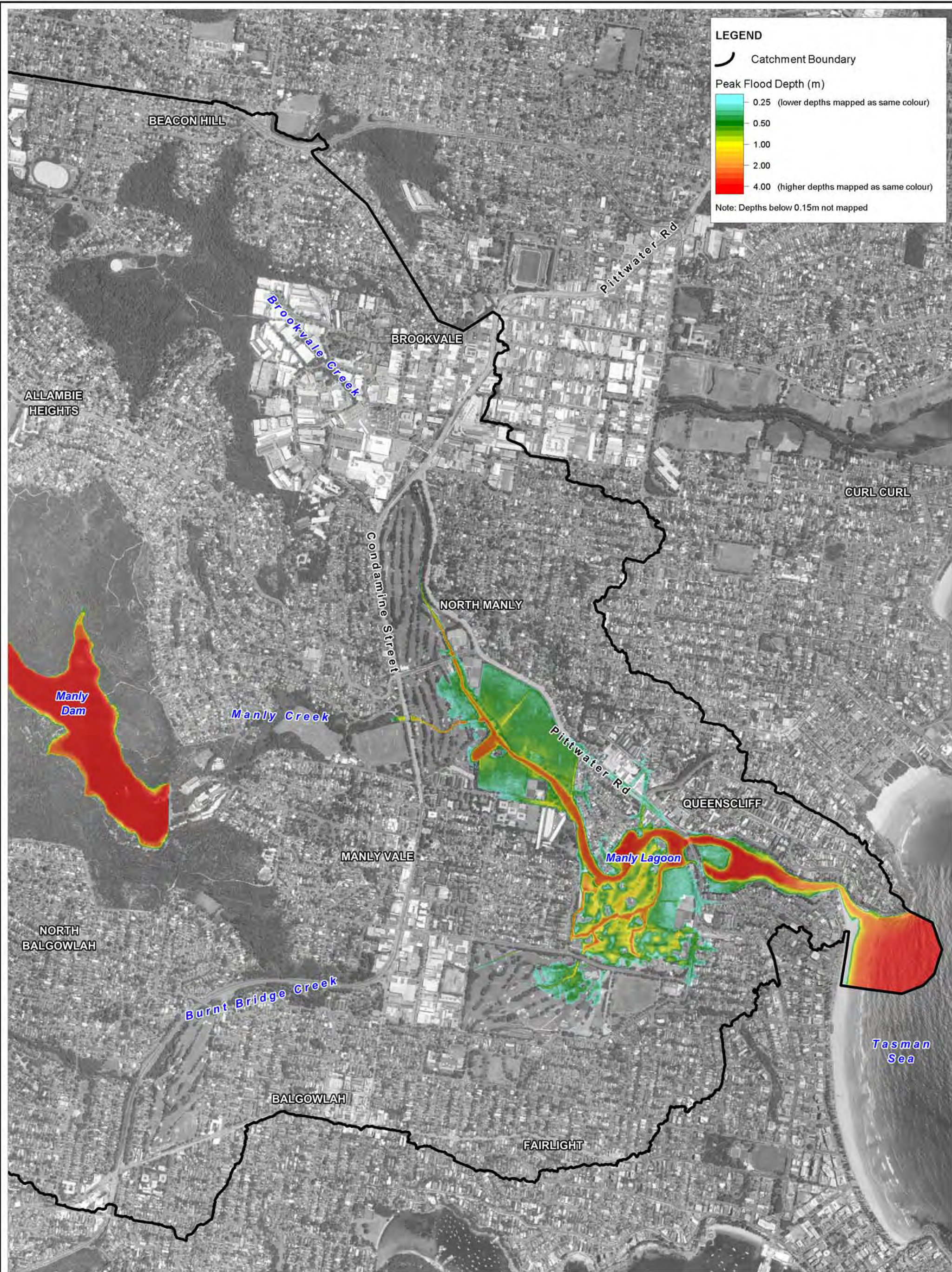


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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 5% AEP Ocean Derived Event**

Figure:
A-35

Rev:
A

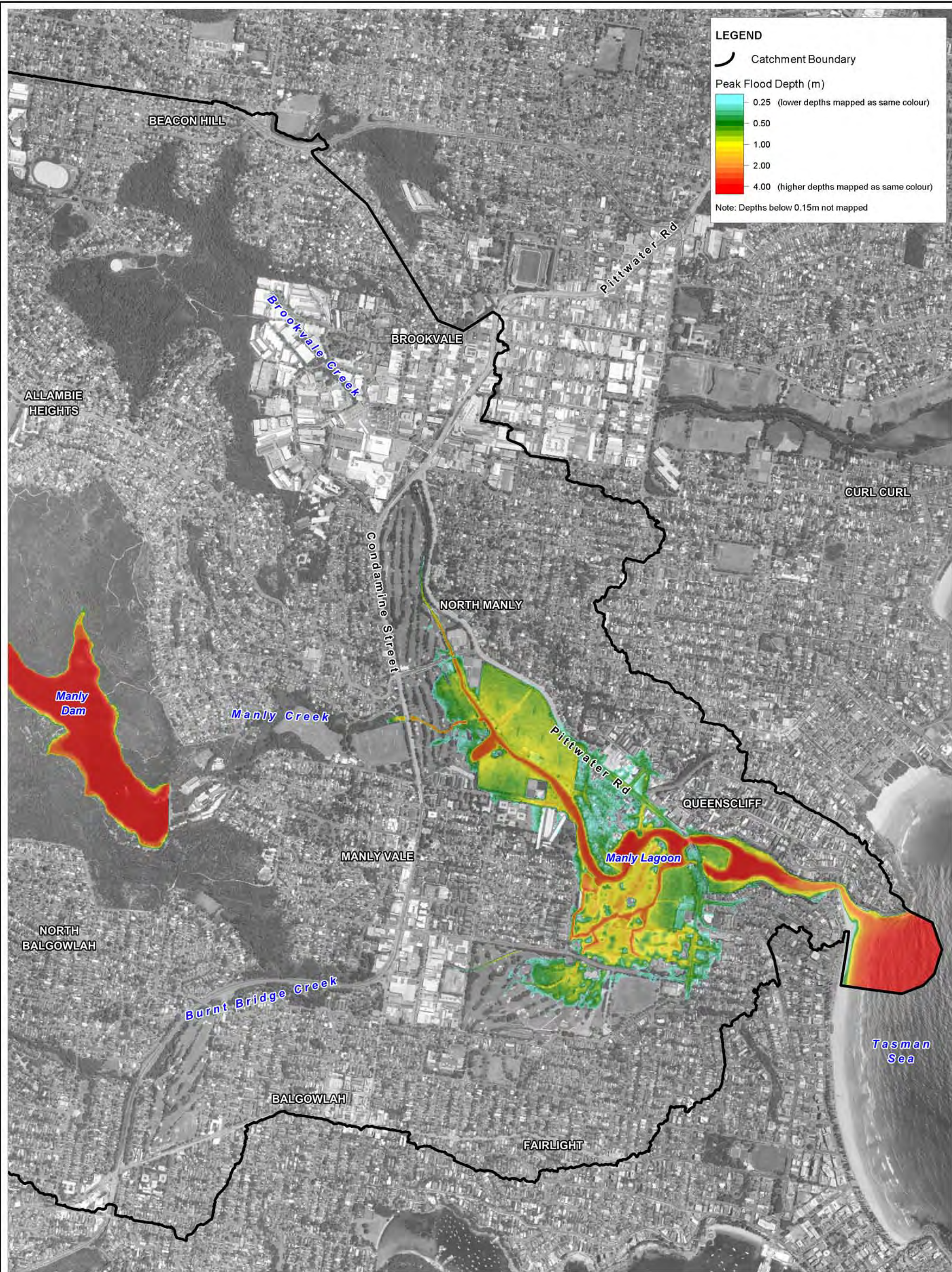
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 1% AEP Ocean Derived Event**

Figure:
A-36

Rev:
A

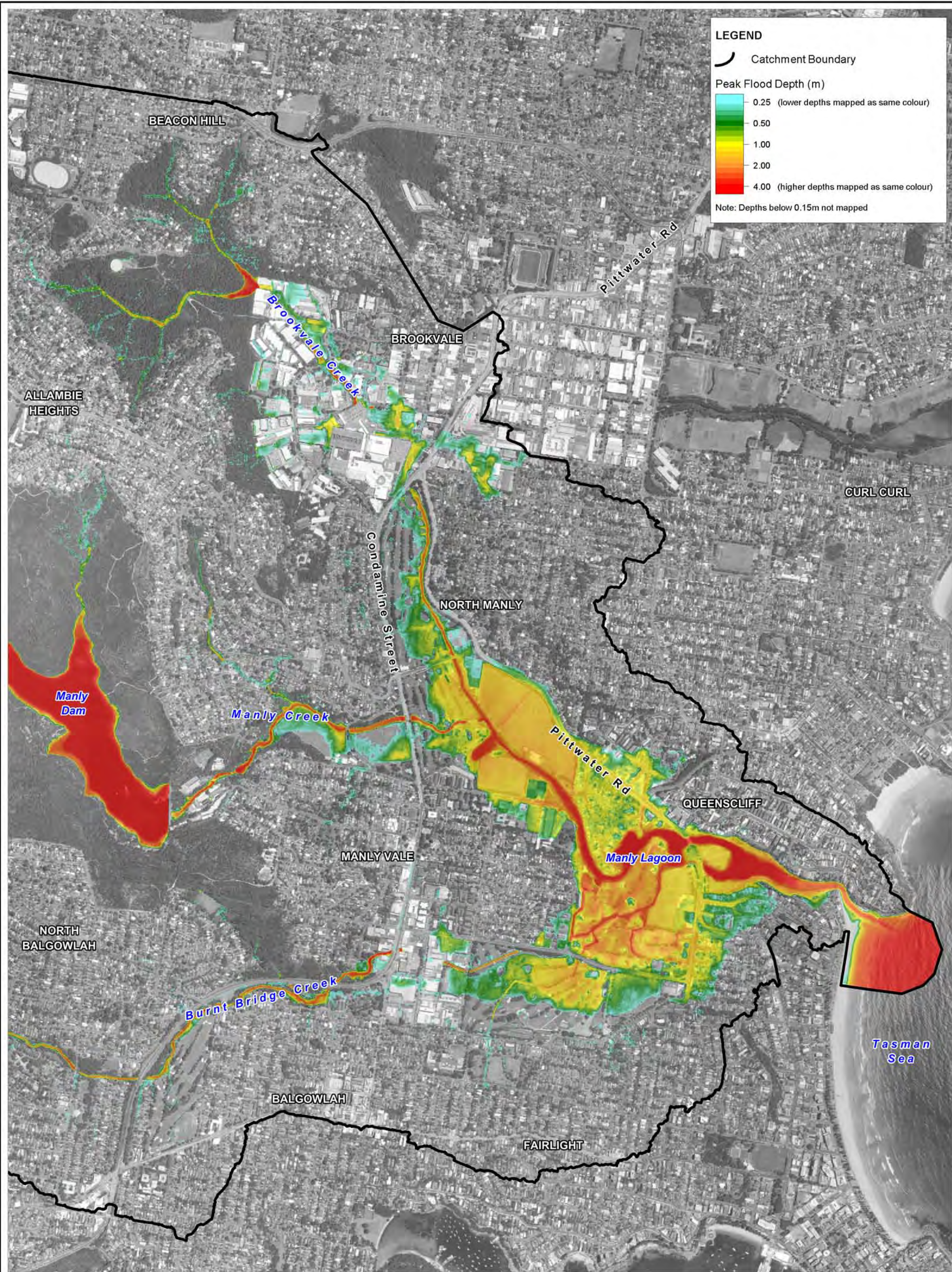
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 1% AEP Catchment + 5% AEP Ocean Coincident Event**

Figure:
A-37

Rev:
A

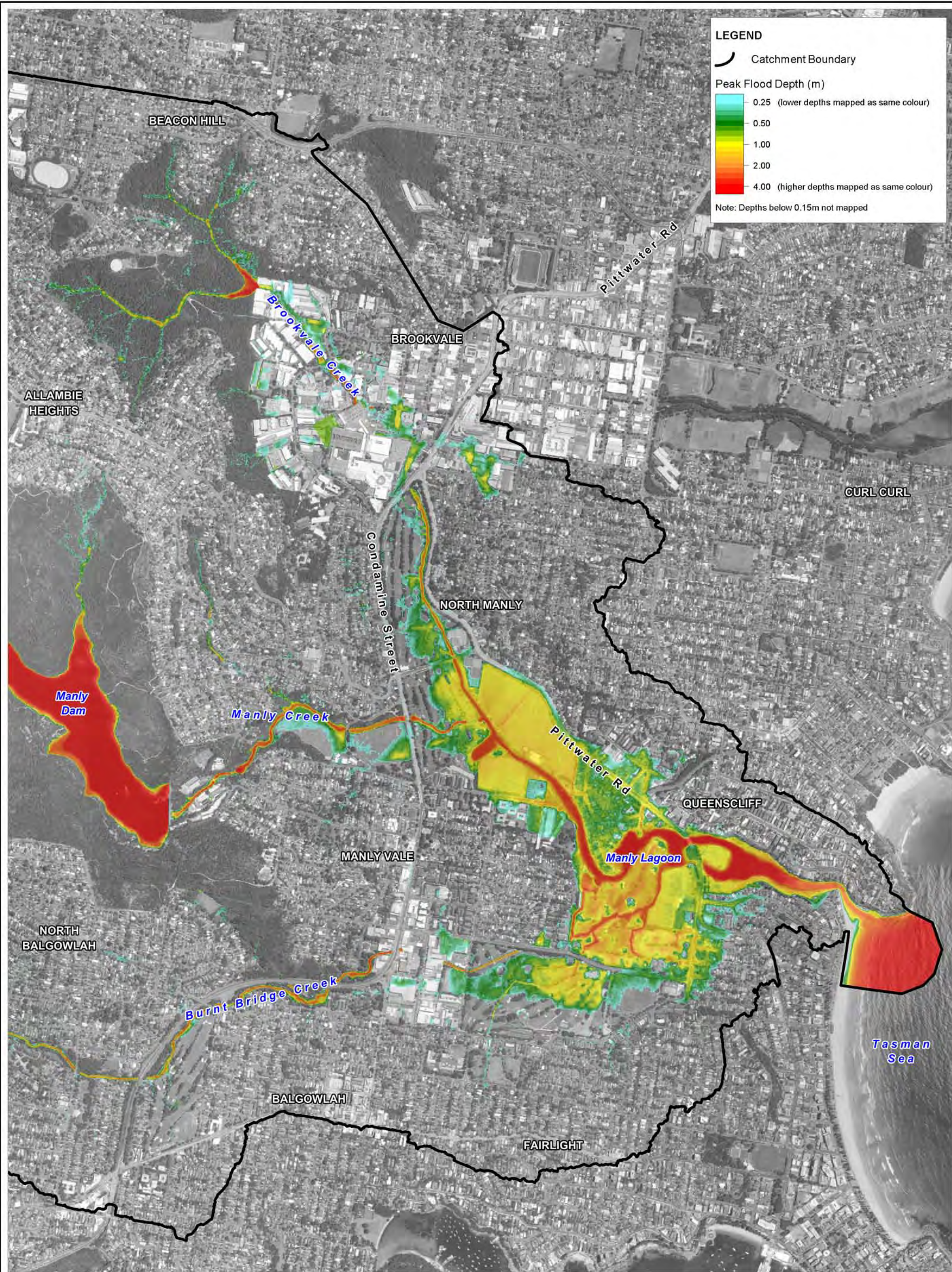
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Title:
**Manly Lagoon Flood Study - Peak Flood Depths:
 5% AEP Catchment + 1% AEP Ocean Coincident Event**

Figure:
A-38

Rev:
A

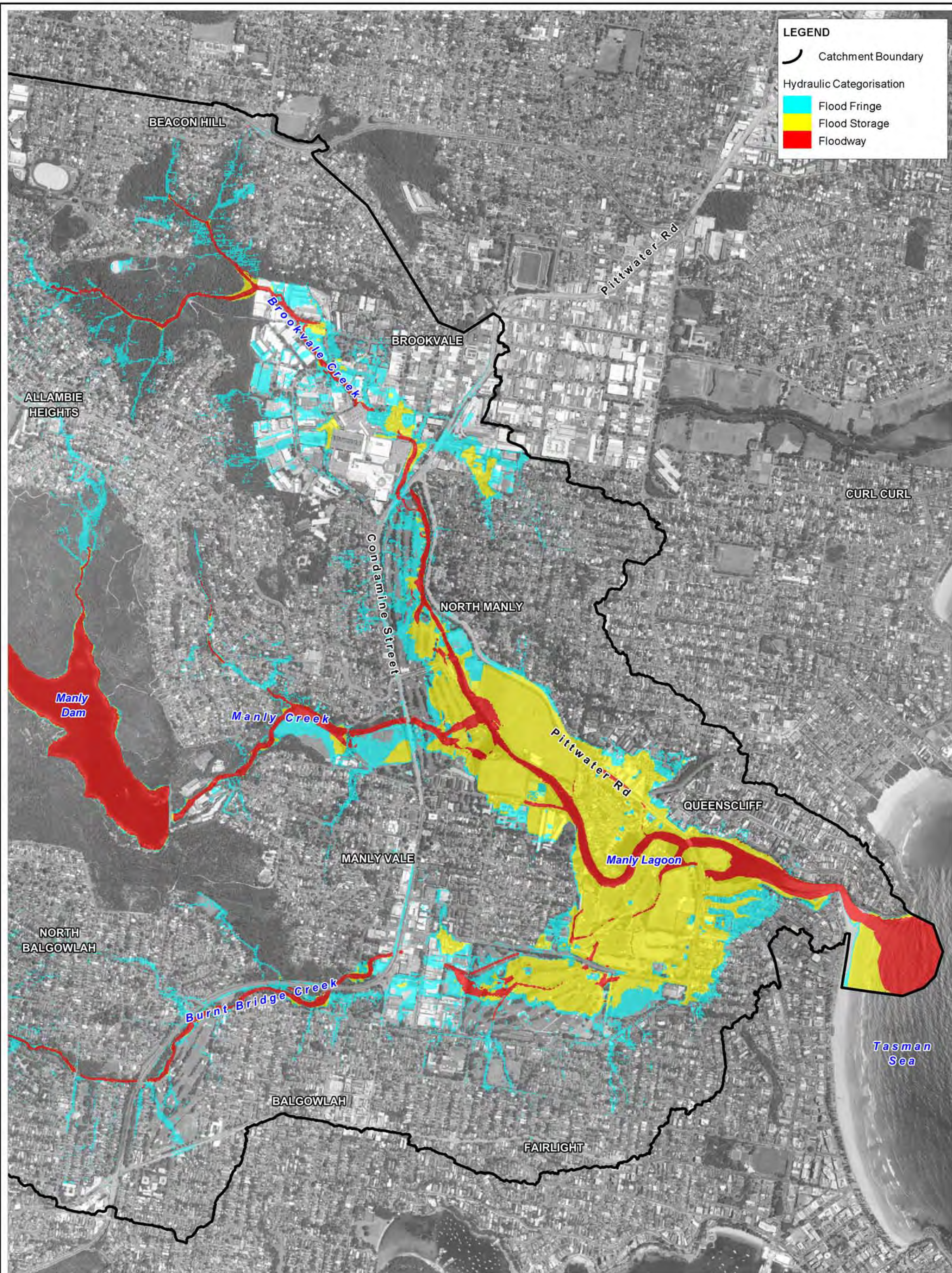
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Title:
**Manly Lagoon Flood Study - Hydraulic Categories:
 1% AEP Catchment + 5% AEP Ocean Coincident Event**

Figure:
A-39

Rev:
A

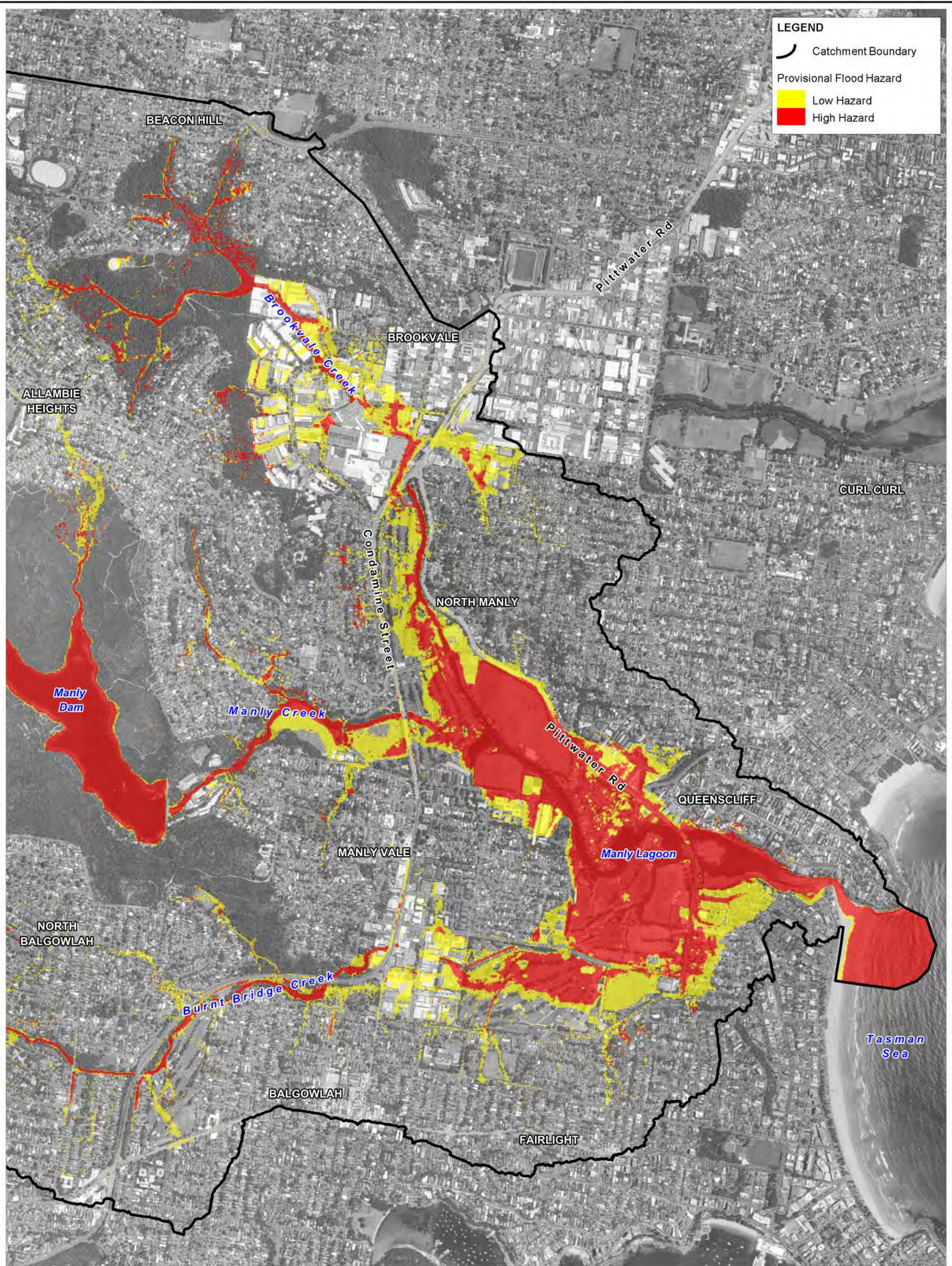
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Title:
**Manly Lagoon Flood Study - Provisional Flood Hazard:
 1% AEP Catchment + 5% AEP Ocean Coincident Event**

Figure:
A-40

Rev:
A

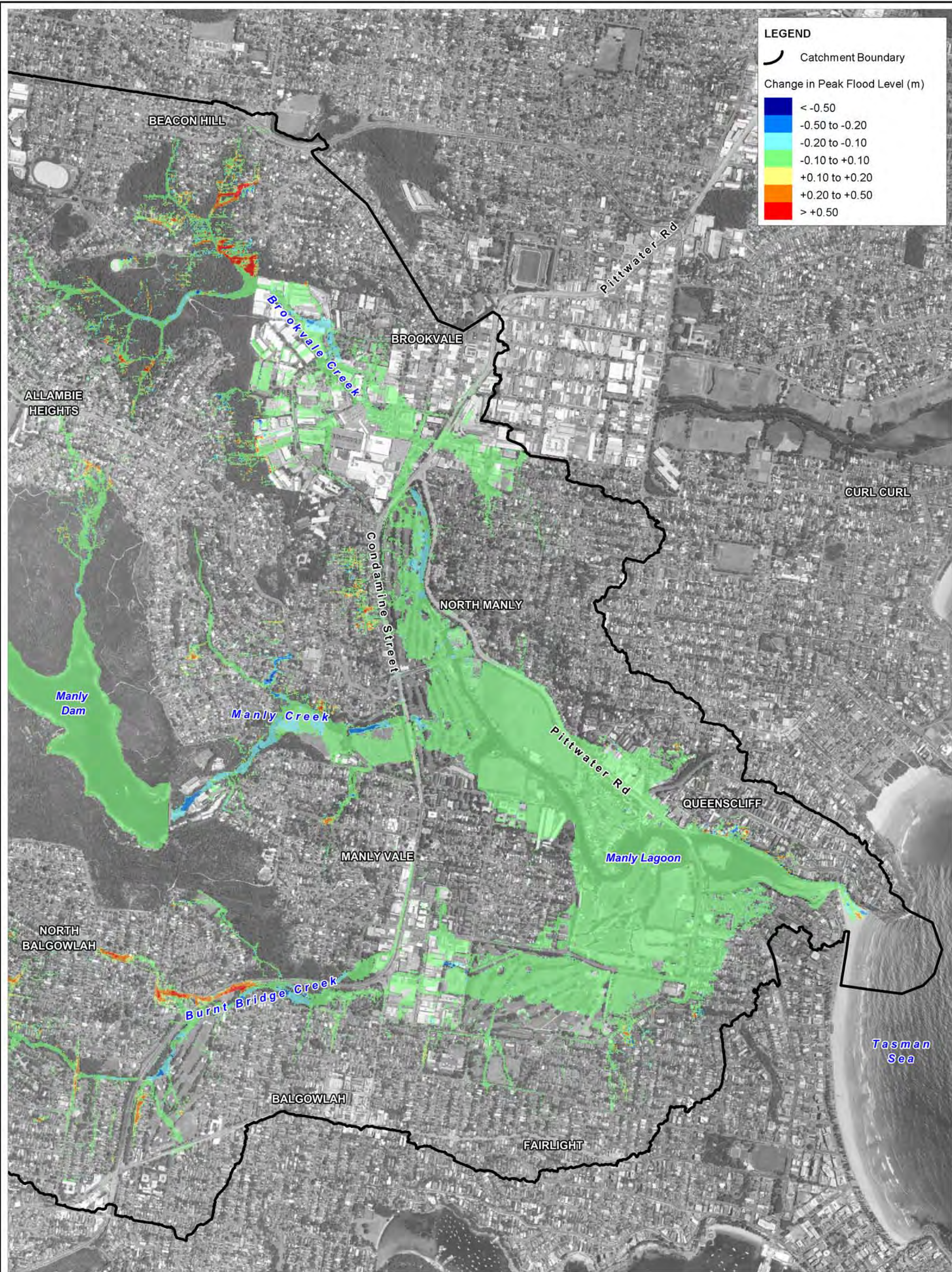
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 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A40_1%AEPCatchment_5%AEPOcean_Hazard.WOR



Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Decreased Hydraulic Roughness (1% AEP Catchment Derived Event)**

Figure:
A-41

Rev:
A

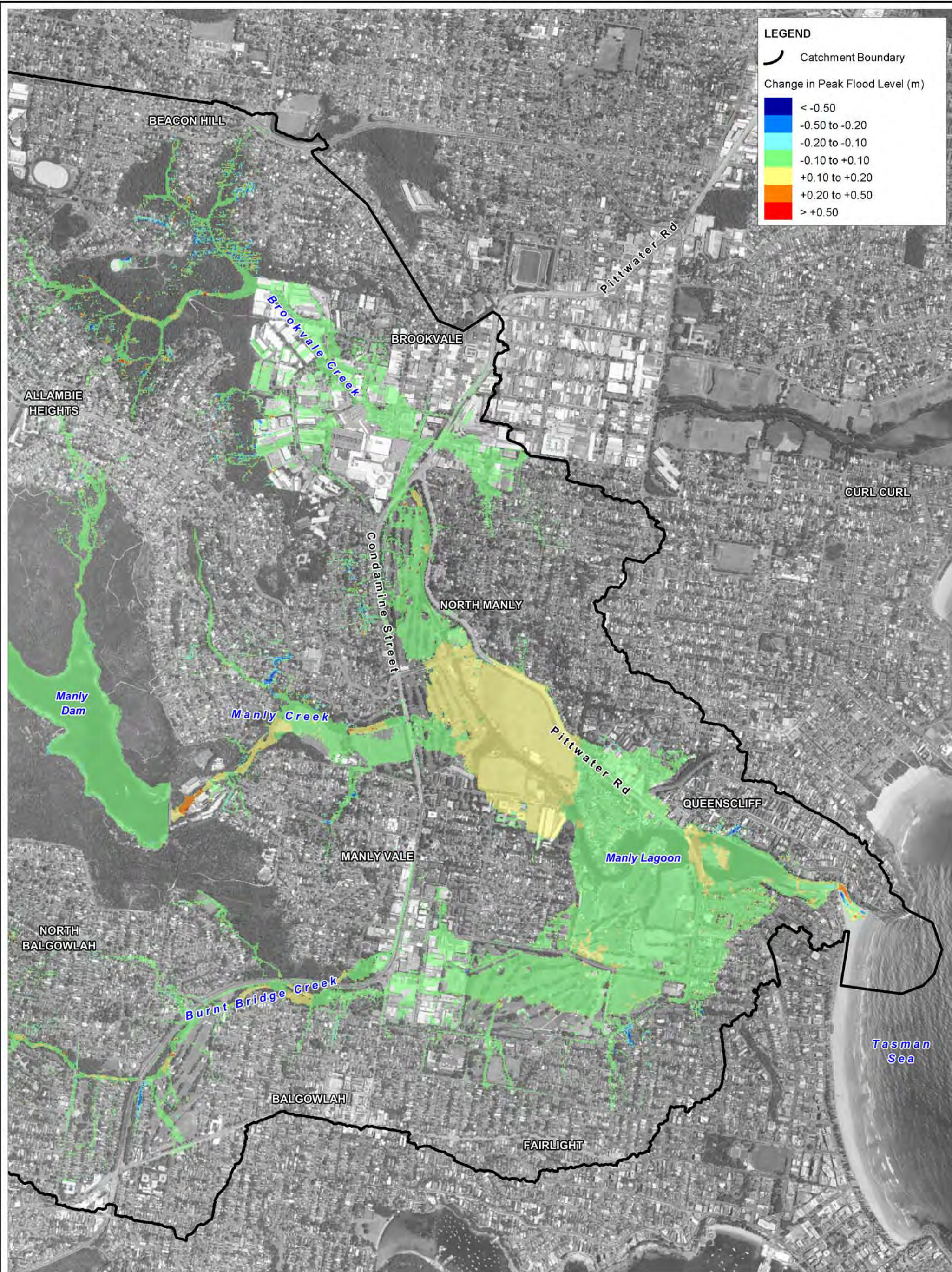
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A41_Sens_1% AEP_LowerMannings.WOR



Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Increased Hydraulic Roughness (1% AEP Catchment Derived Event)**

Figure:
A-42

Rev:
A

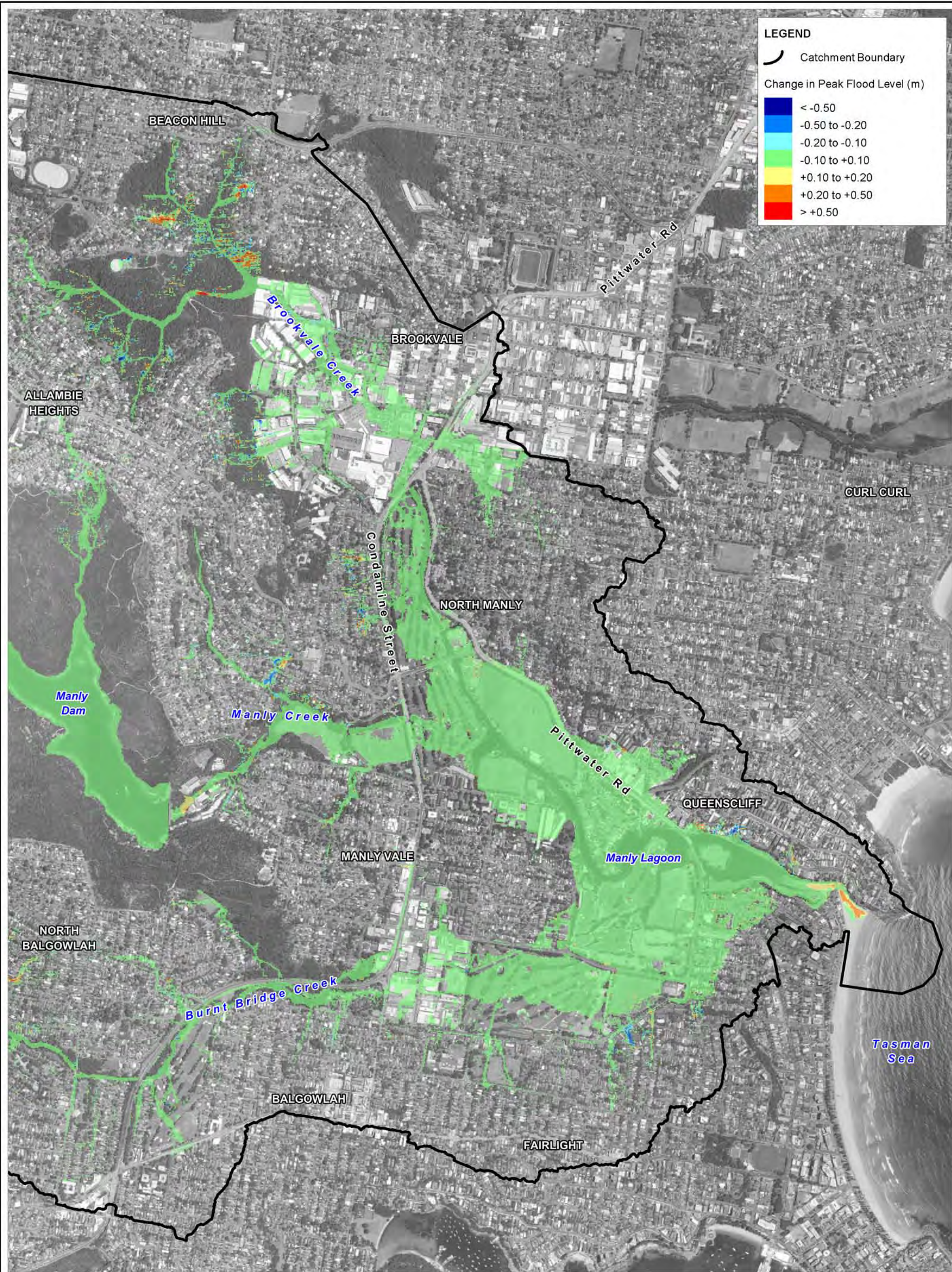
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A42_Sens_1% AEP_HigherMannings.WOR



Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Lower Rainfall Losses (1% AEP Catchment Derived Event)**

Figure:
A-43

Rev:
A

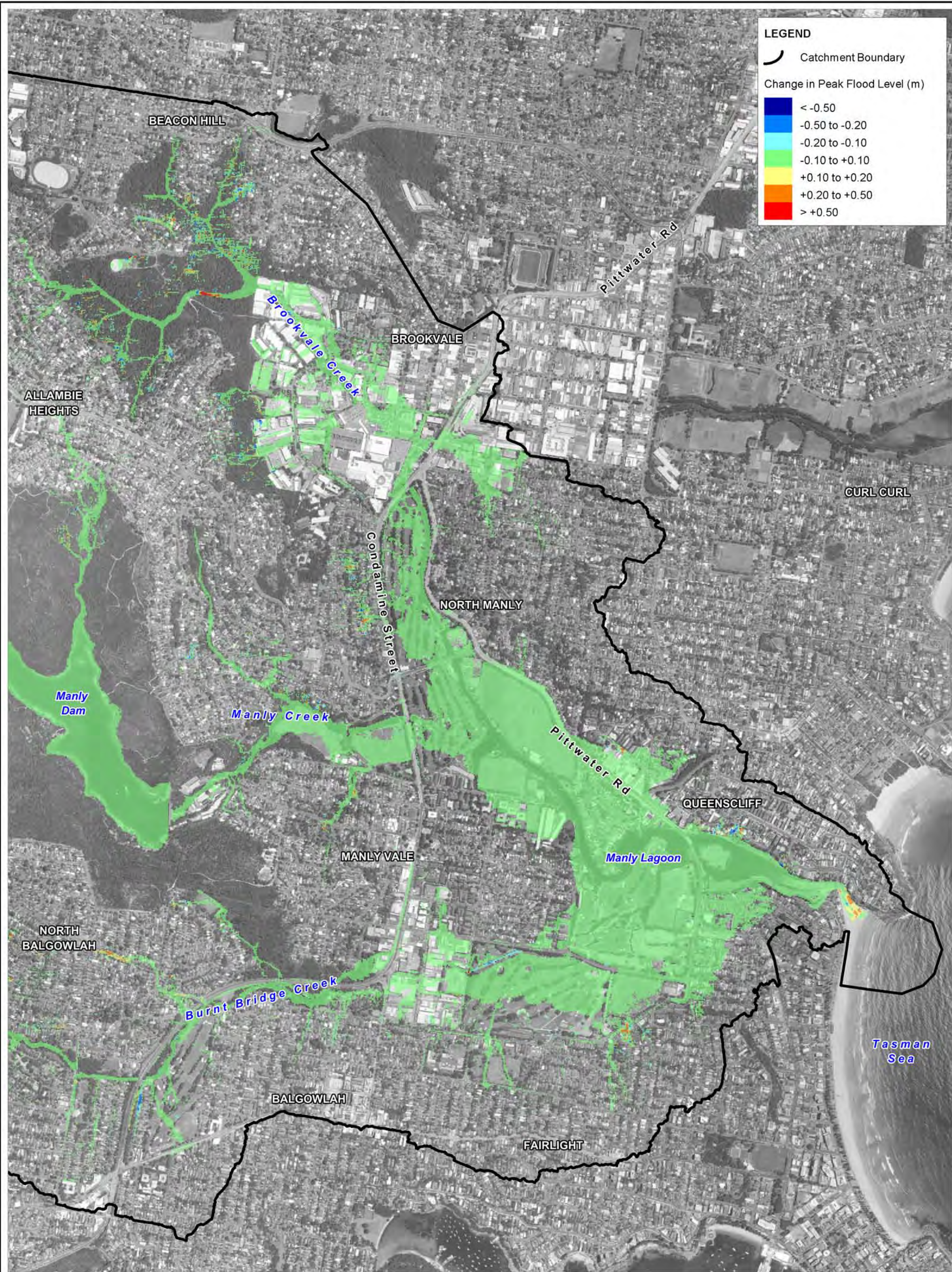
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A43_Sens_1% AEP_LowerRainfallLosses.WOR



Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Higher Rainfall Losses (1% AEP Catchment Derived Event)**

Figure:
A-44

Rev:
A

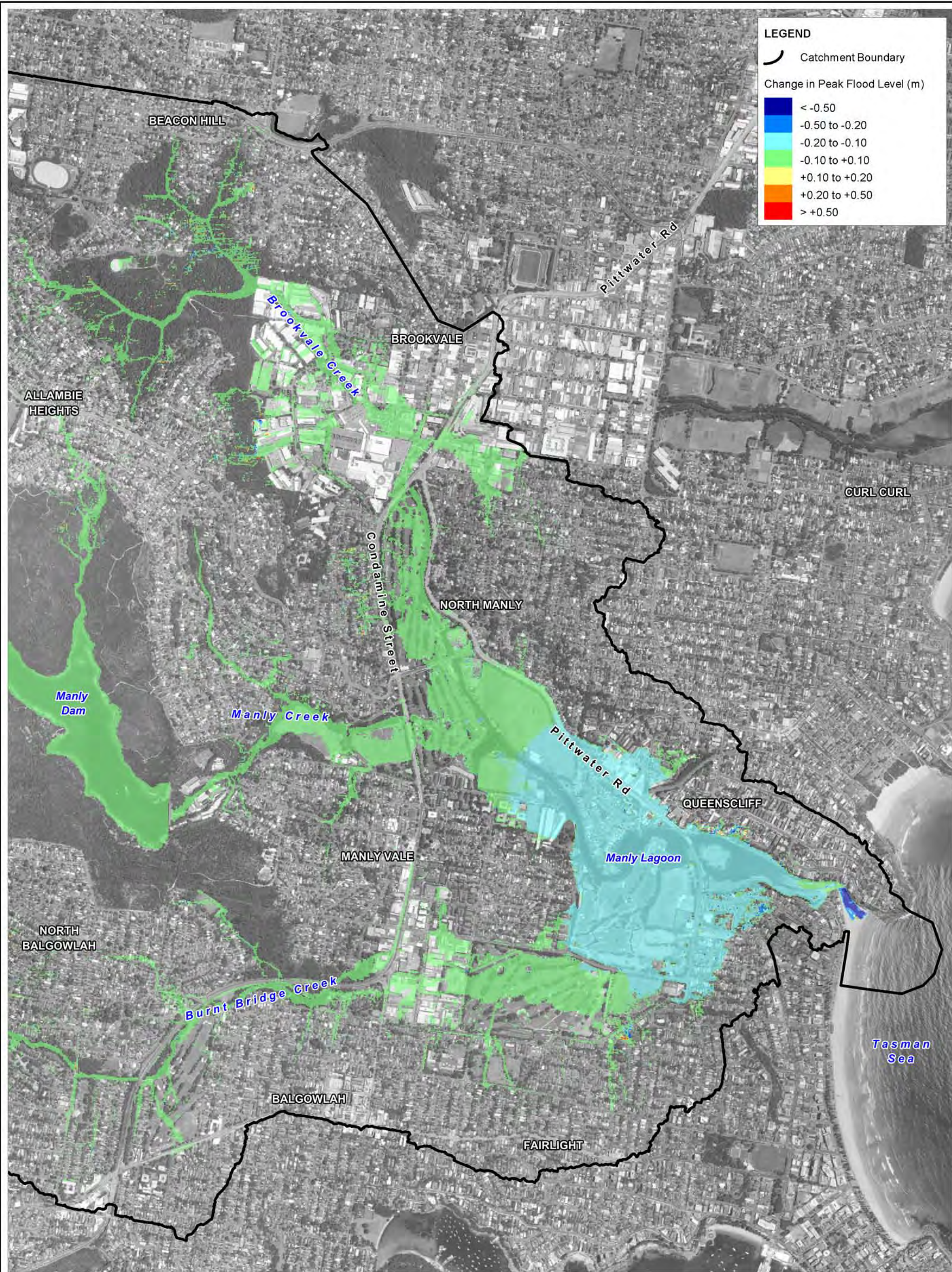
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A44_Sens_1%AEF_HigherRainfallLosses.WOR



Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Lower Initial Berm Height (1% AEP Catchment Derived Event)**

Figure:
A-45

Rev:
A

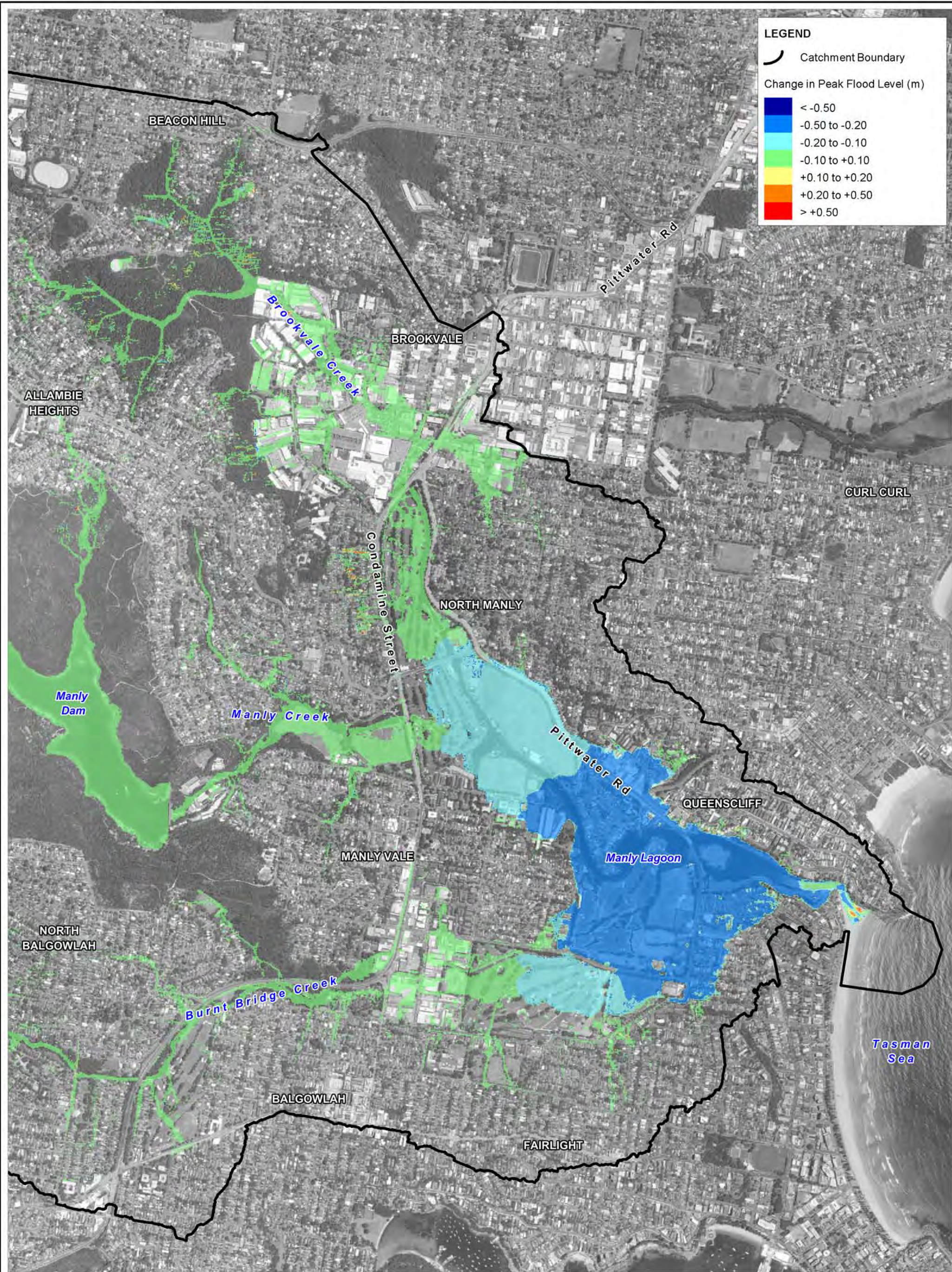
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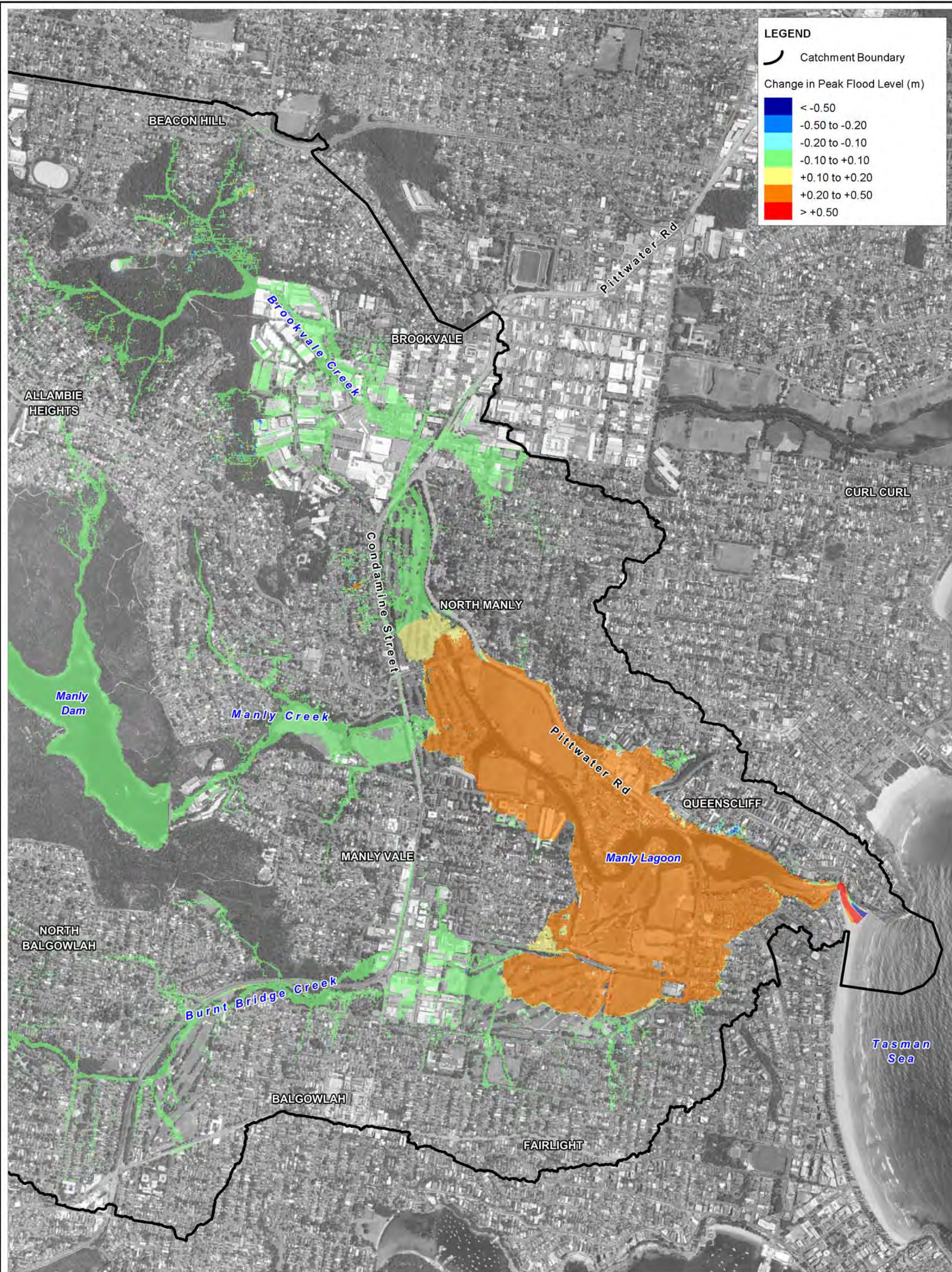


0 375 750m
 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Higher Initial Berm Height (1% AEP Catchment Derived Event)**

Figure:
A-47

Rev:
A

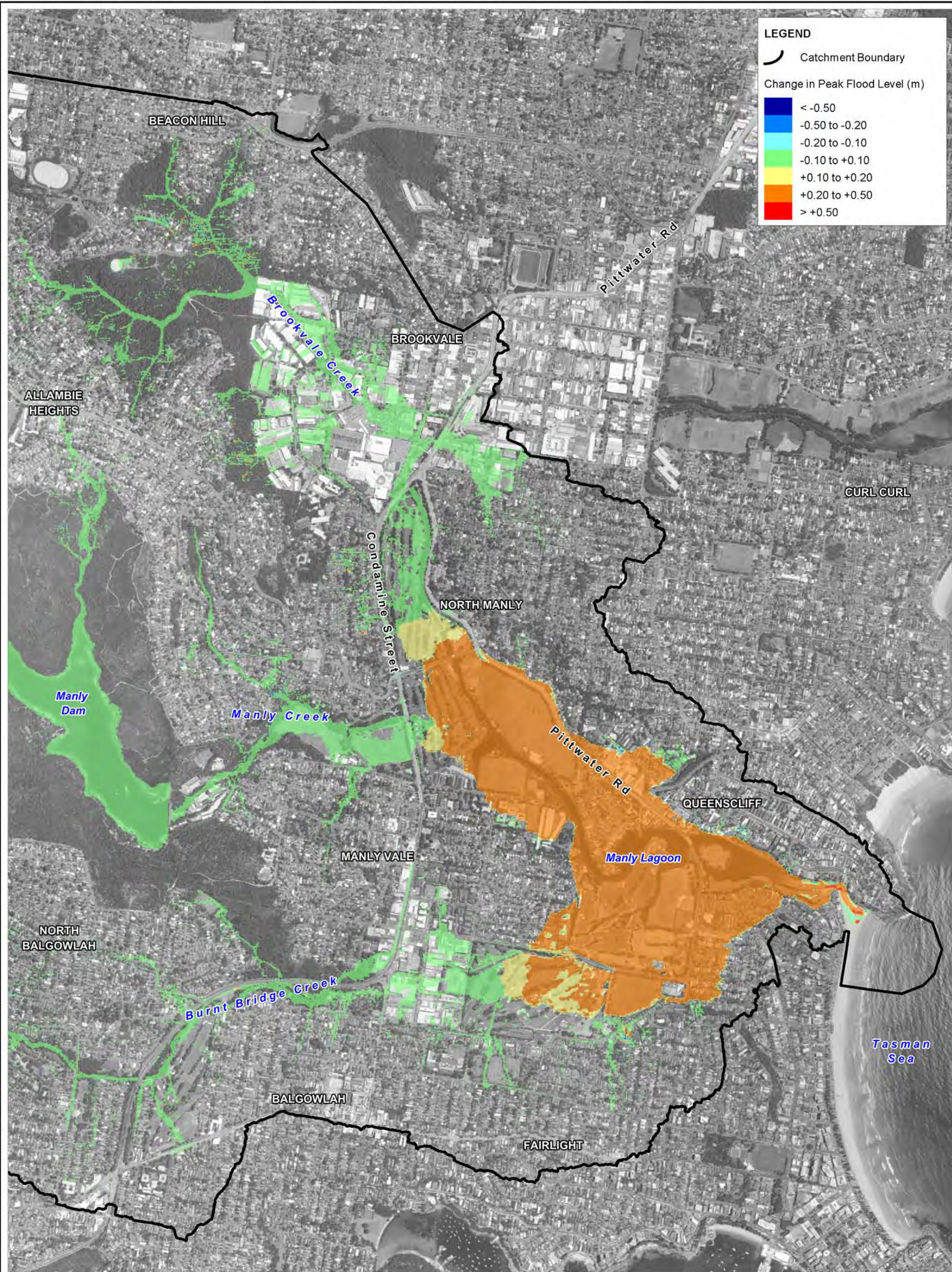
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 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A47_Sens_1%AEPCatchment_HigherBerm.WOR



Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Higher Initial Berm Height (1% AEP Catchment + 5% AEP Ocean Coincident Event)**

Figure:
A-48

Rev:
A

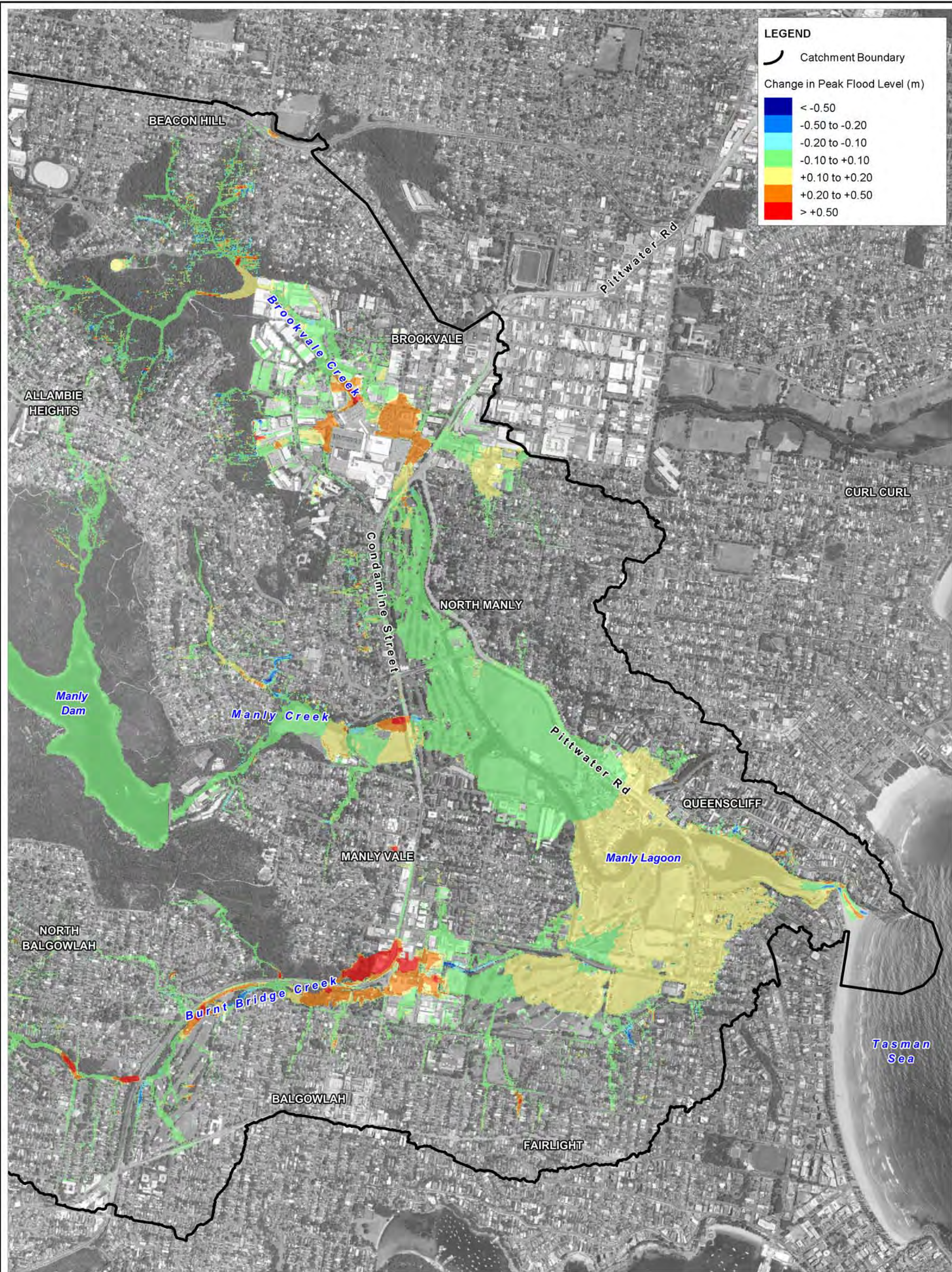
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Change in Peak Flood Level:
 Structure Blockage (1% AEP Catchment Derived Event)**

Figure:
A-49

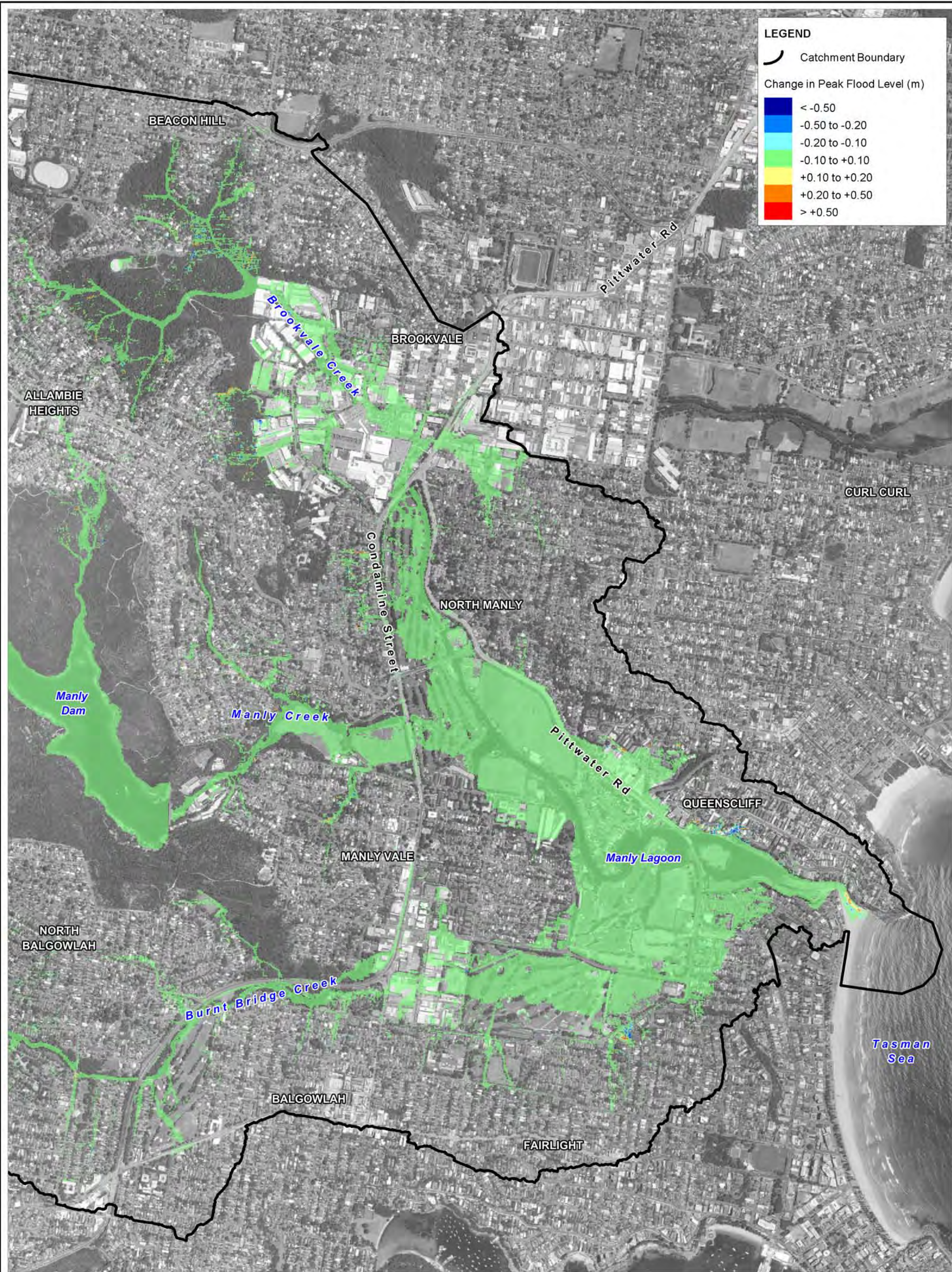
Rev:
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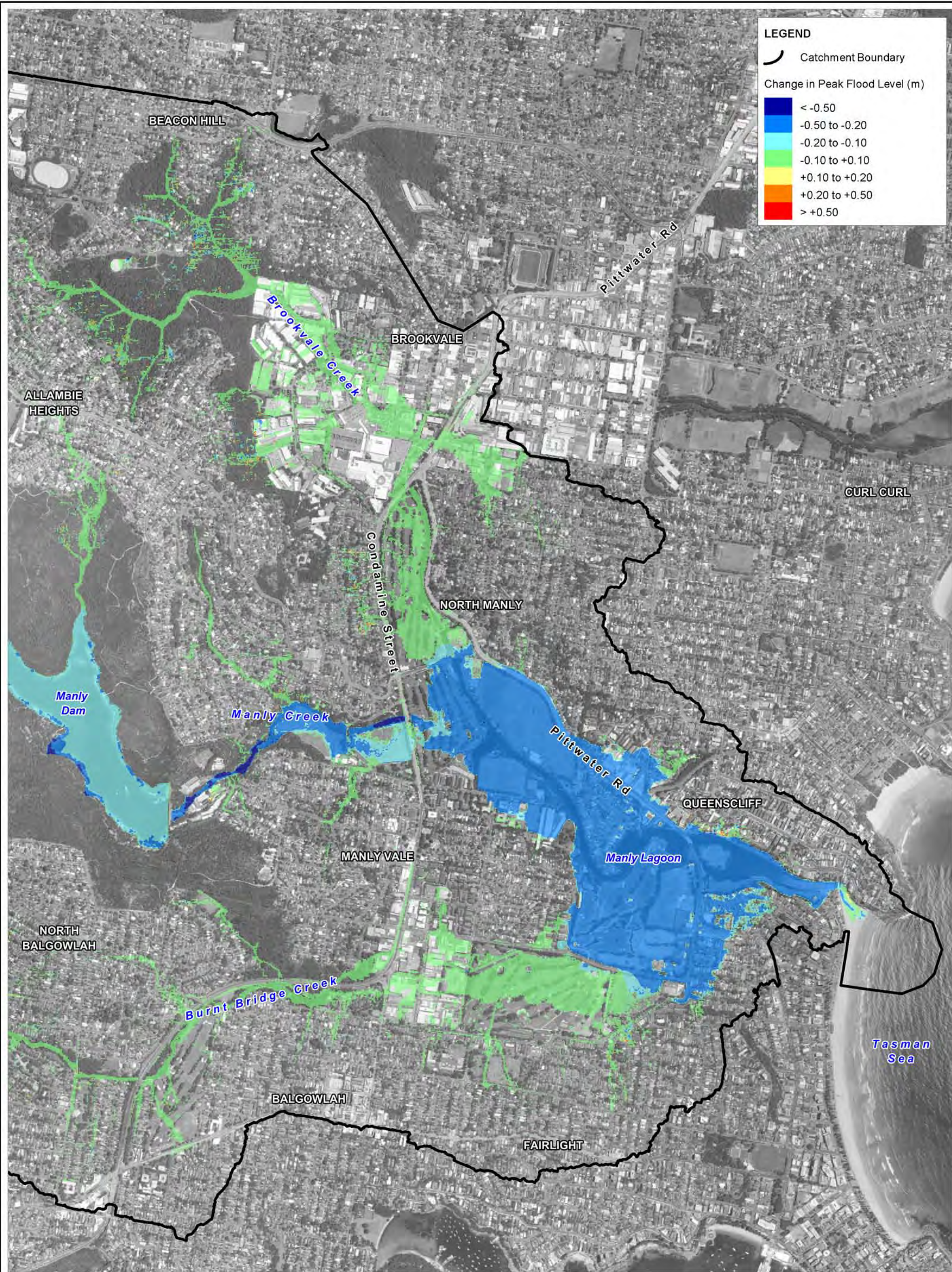
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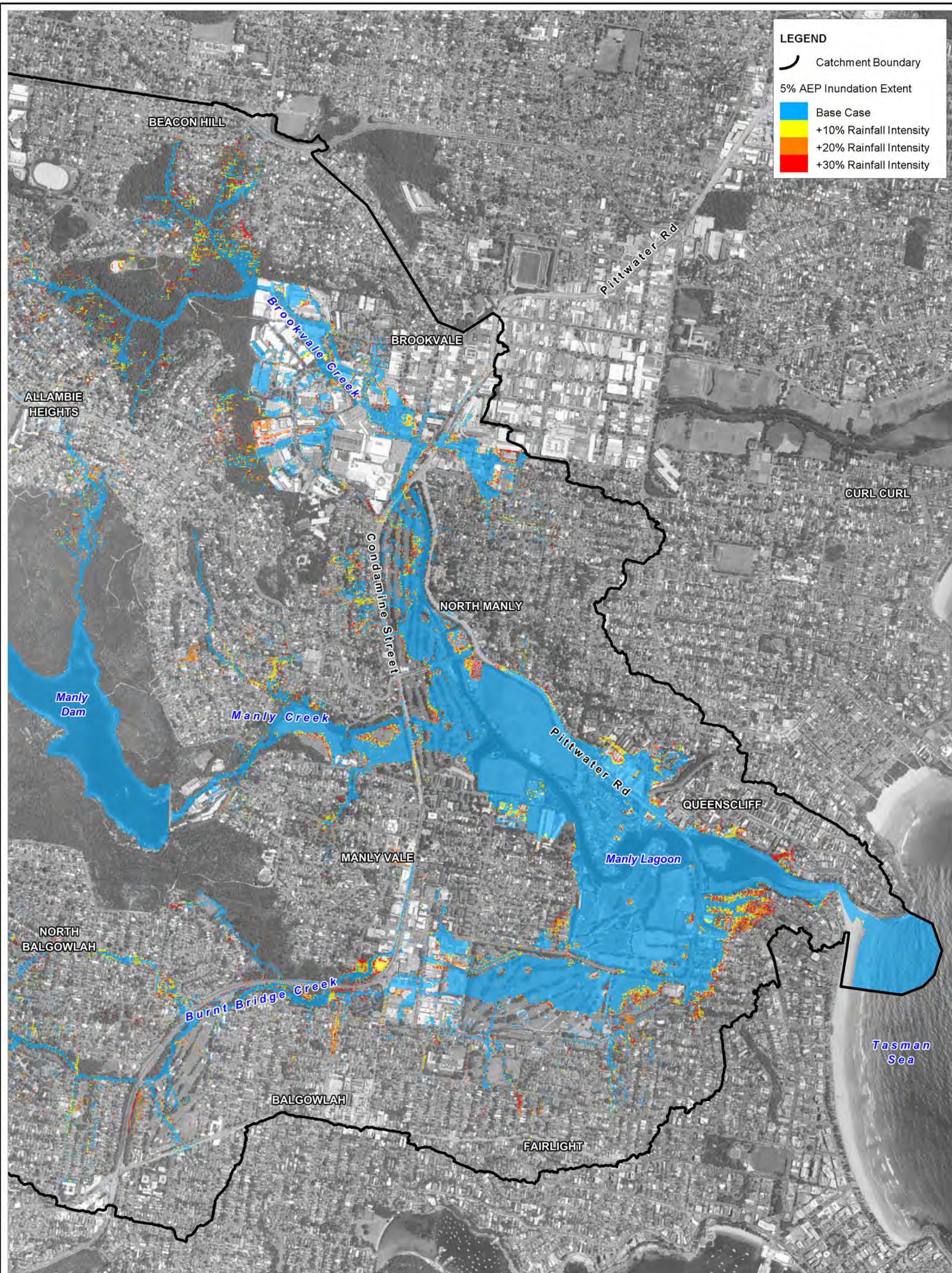


0 375 750m
 Approx. Scale









Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 5% AEP Catchment Derived Event + Rainfall Intensity Increase**

Figure:
A-52

Rev:
A

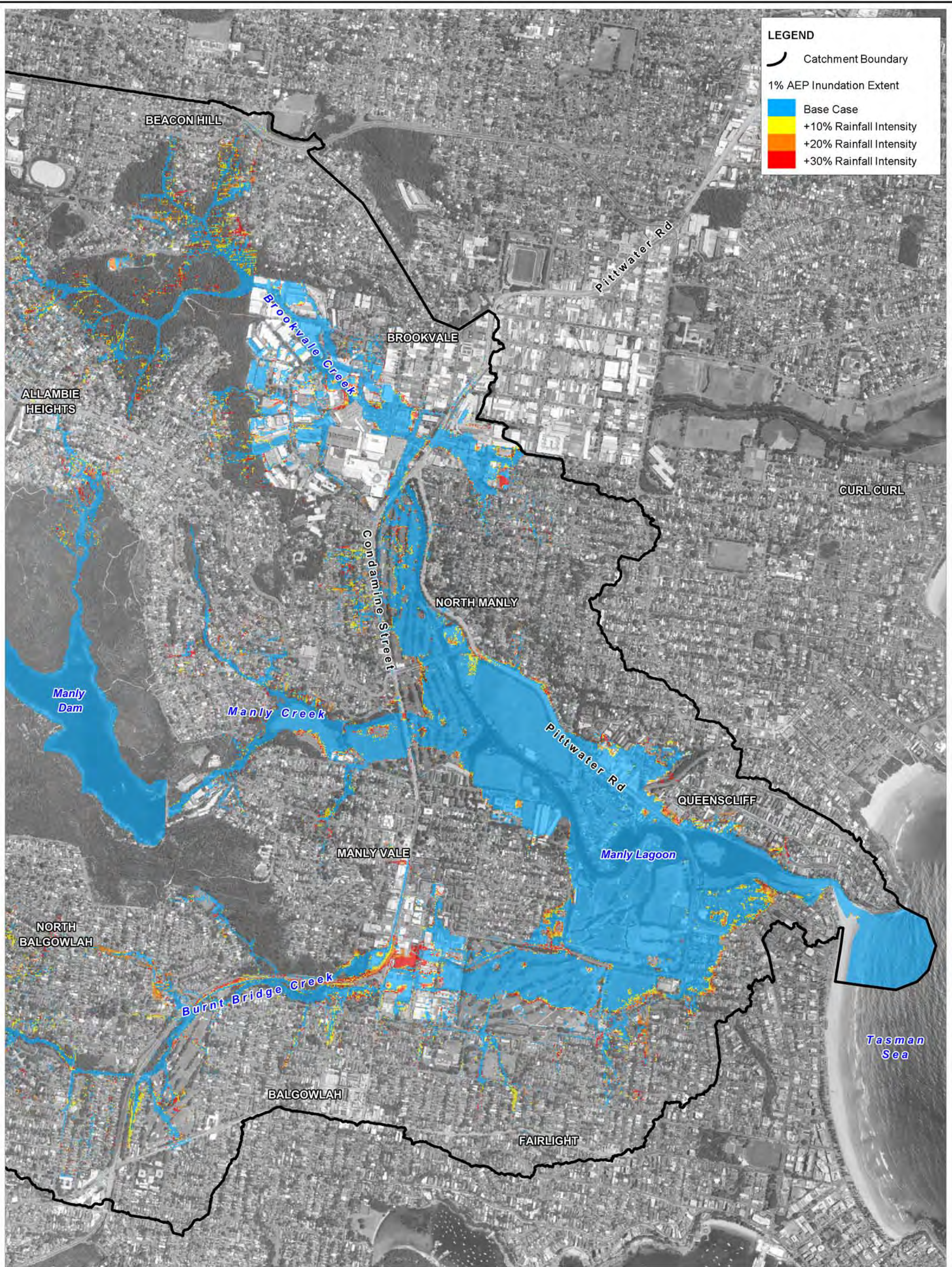
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A52_CC_5%AEPCatchment_Rainfall.WOR



Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 1% AEP Catchment Derived Event + Rainfall Intensity Increase**

Figure:
A-53

Rev:
A

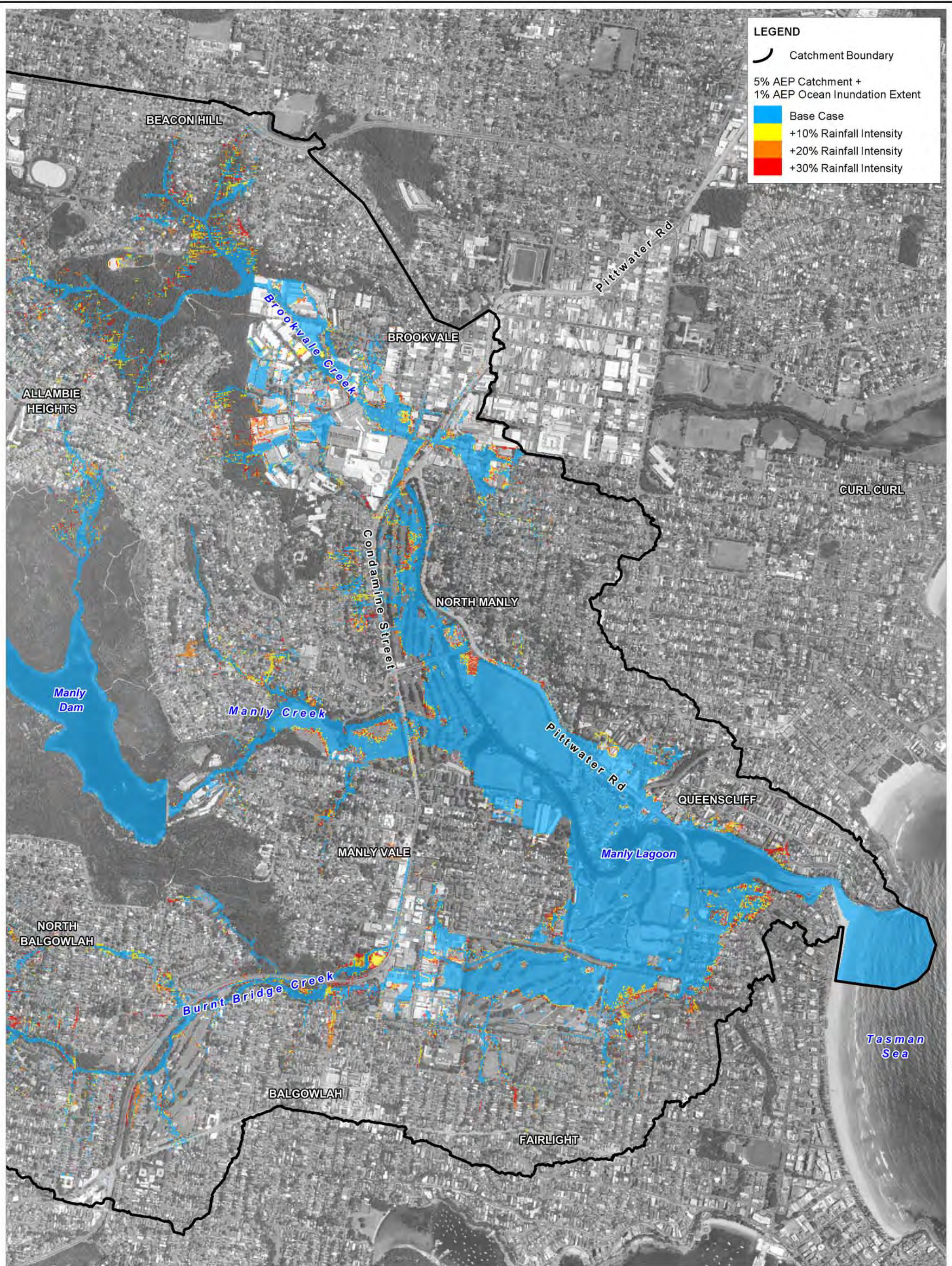
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A53_CC_1%AEPCatchment_Rainfall.WOR



Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 5% AEP Catchment + 1% AEP Ocean Coincident Event + Rainfall Intensity Increase**

Figure:
A-54

Rev:
A

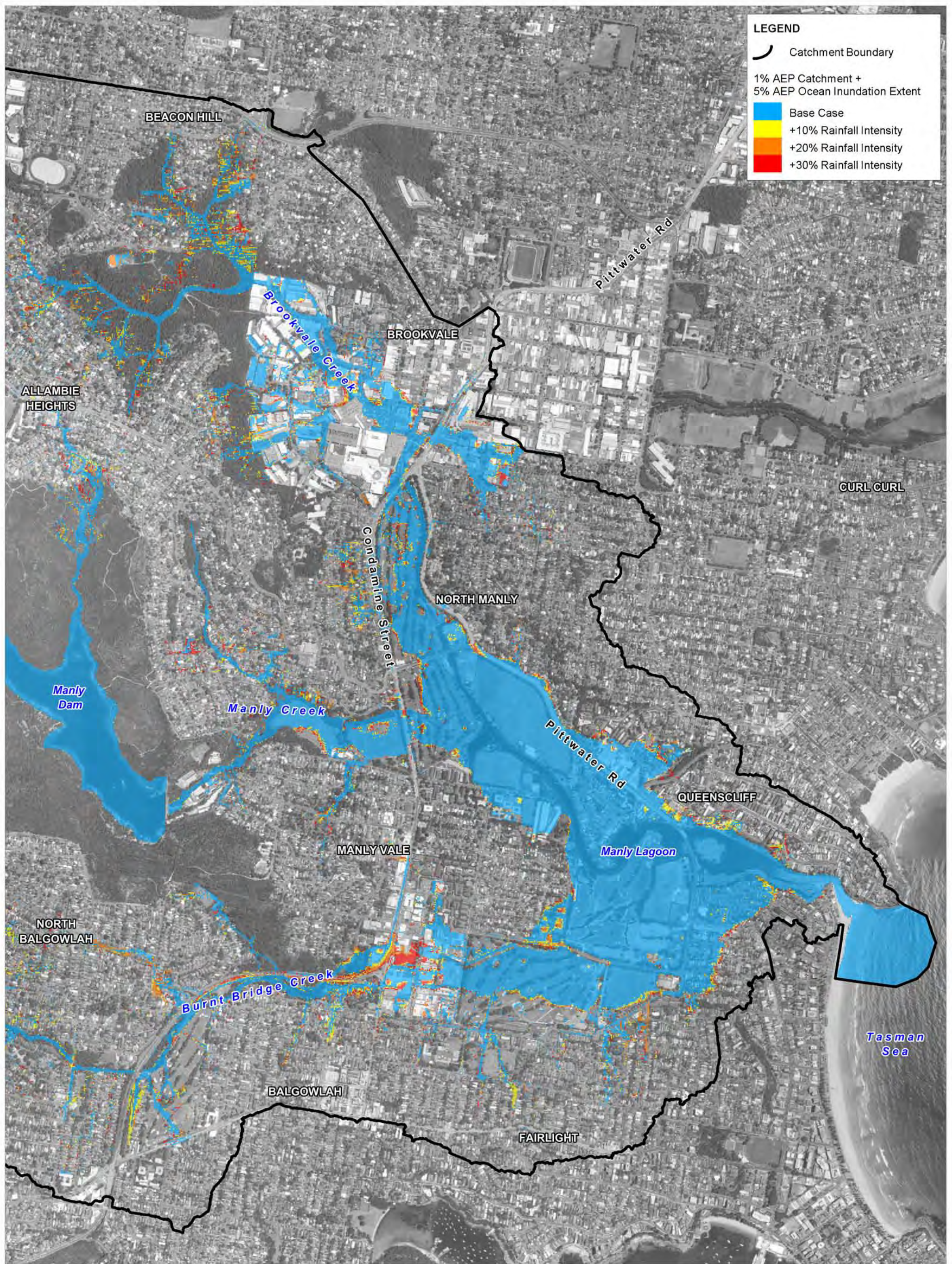
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 1% AEP Catchment + 5% AEP Ocean Coincident Event + Rainfall Intensity Increase**

Figure:
A-55

Rev:
A

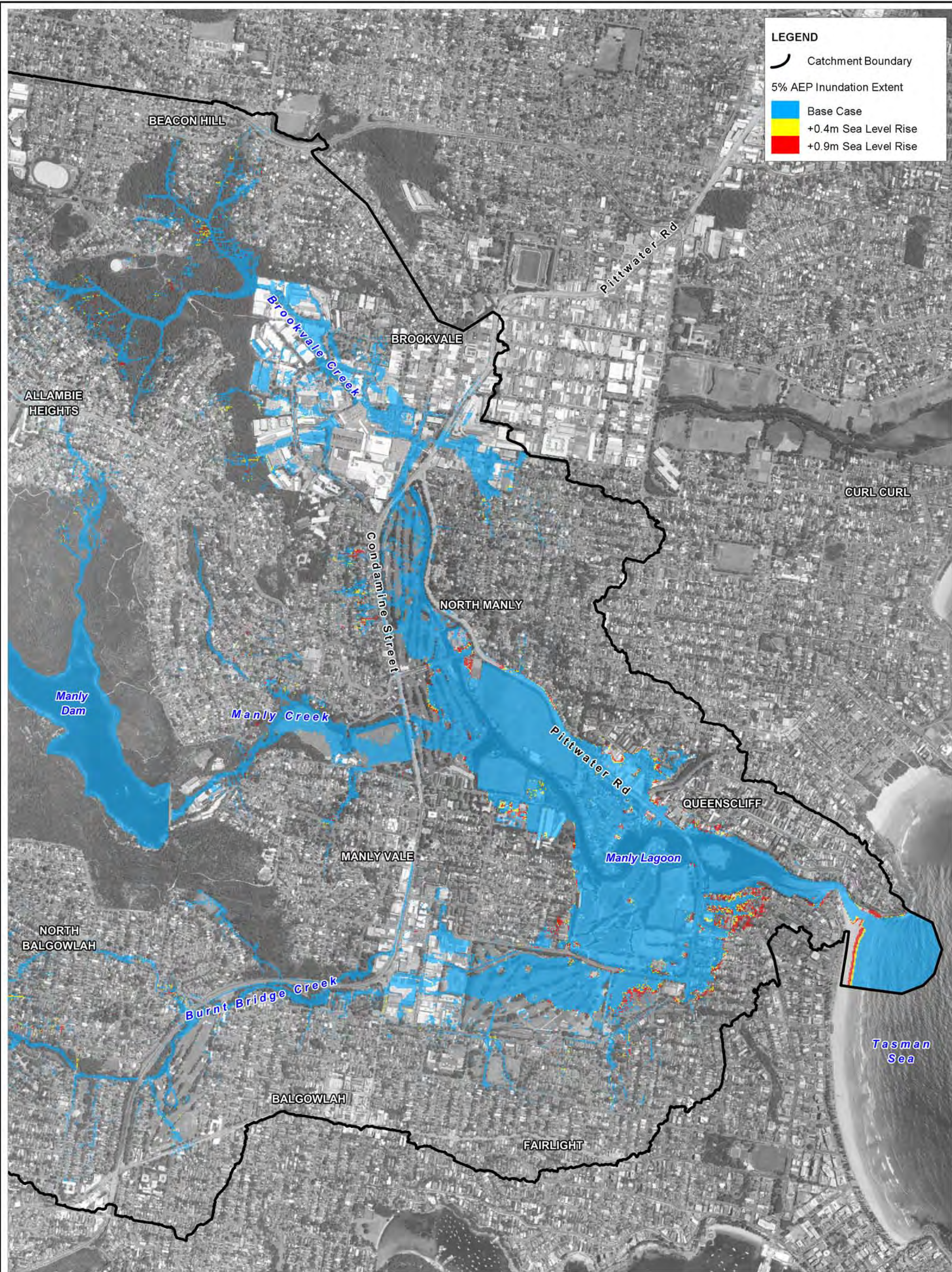
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 5% AEP Catchment Derived Event + Sea Level Rise**

Figure:
A-56

Rev:
A

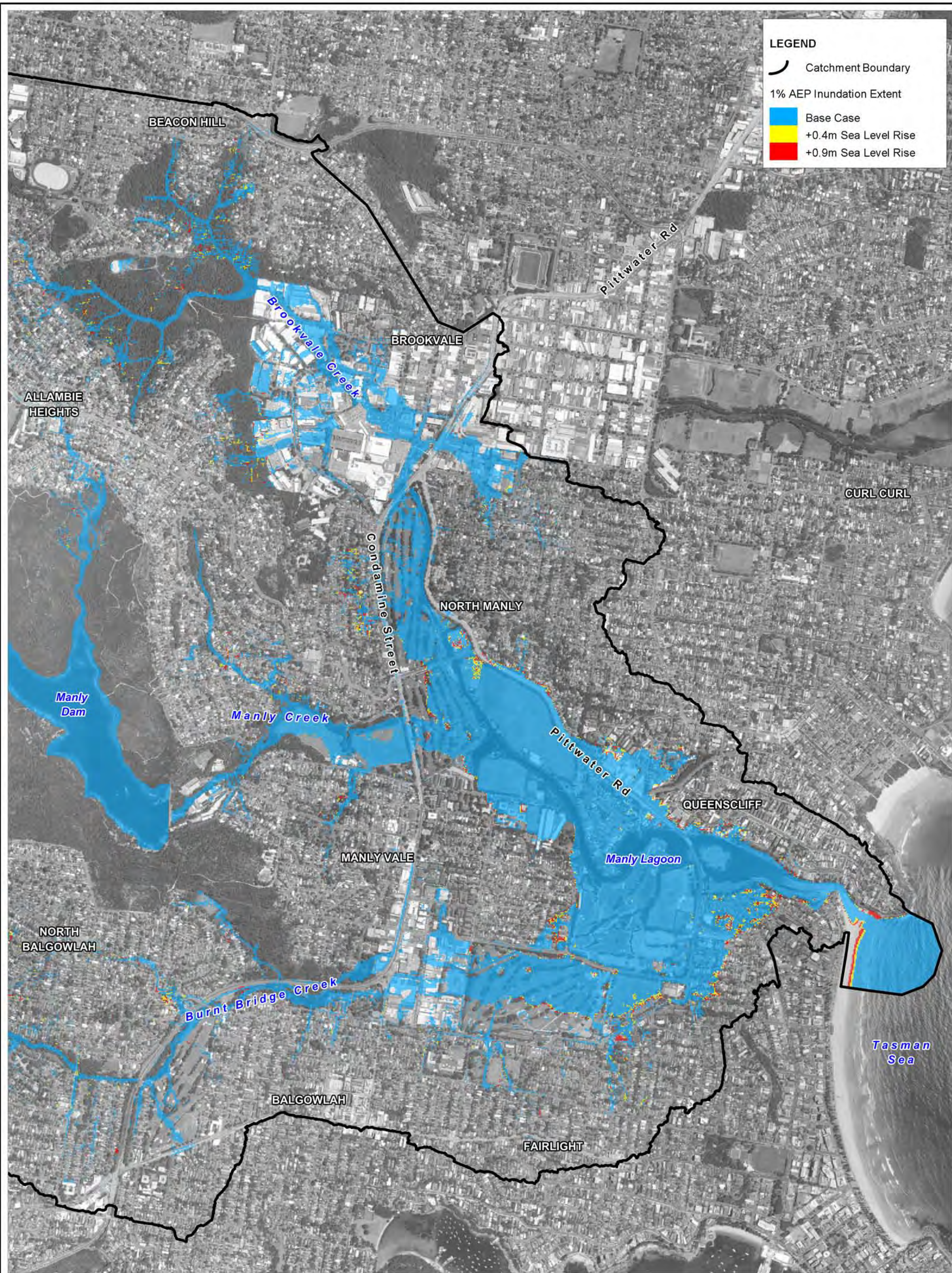
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0 375 750m
 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A56_CC_5%AEPCatchment_SLR.WOR



Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 1% AEP Catchment Derived Event + Sea Level Rise**

Figure:
A-57

Rev:
A

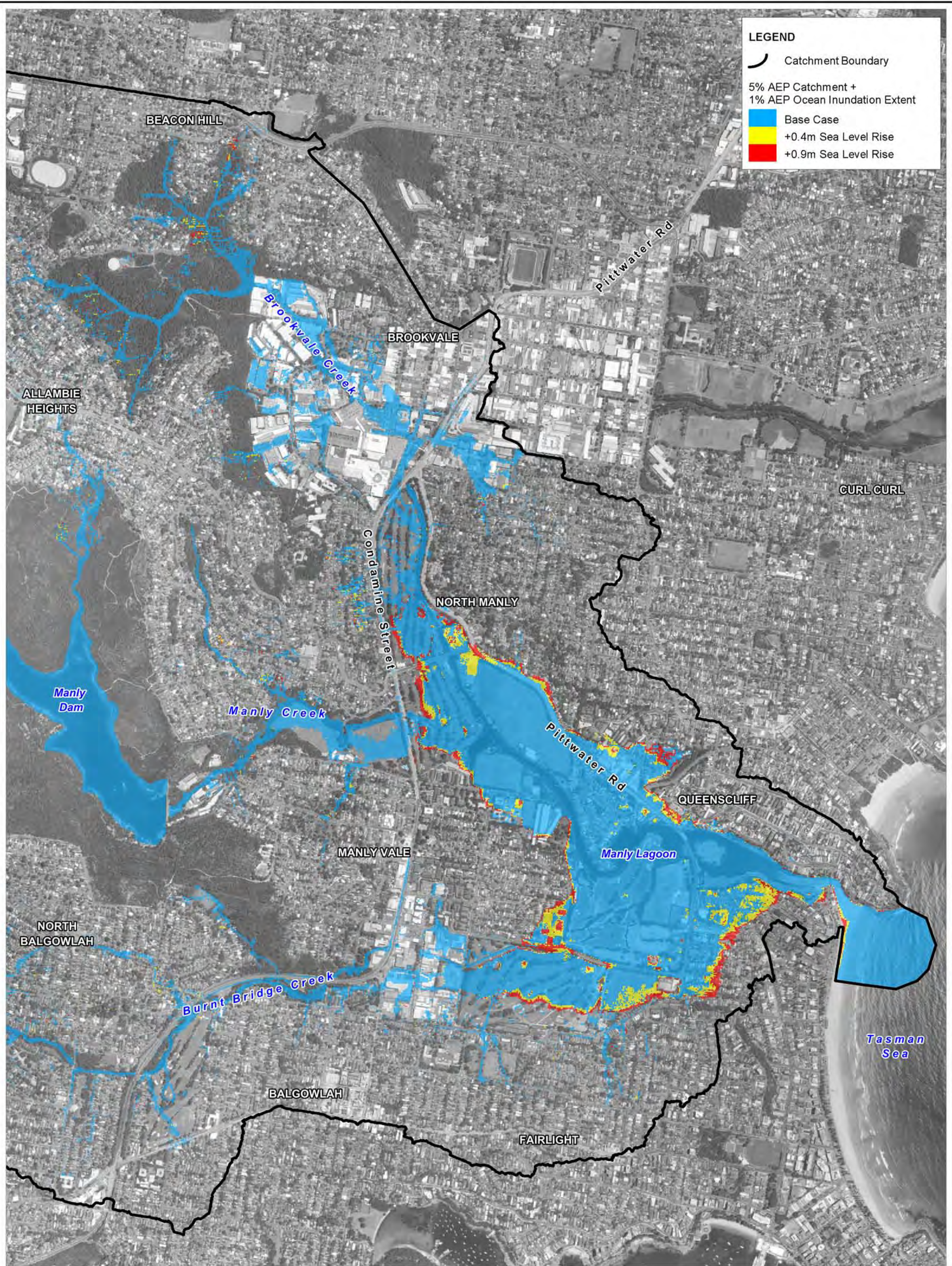
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 5% AEP Catchment + 1% AEP Ocean Coincident Event + Sea Level Rise**

Figure:
A-58

Rev:
A

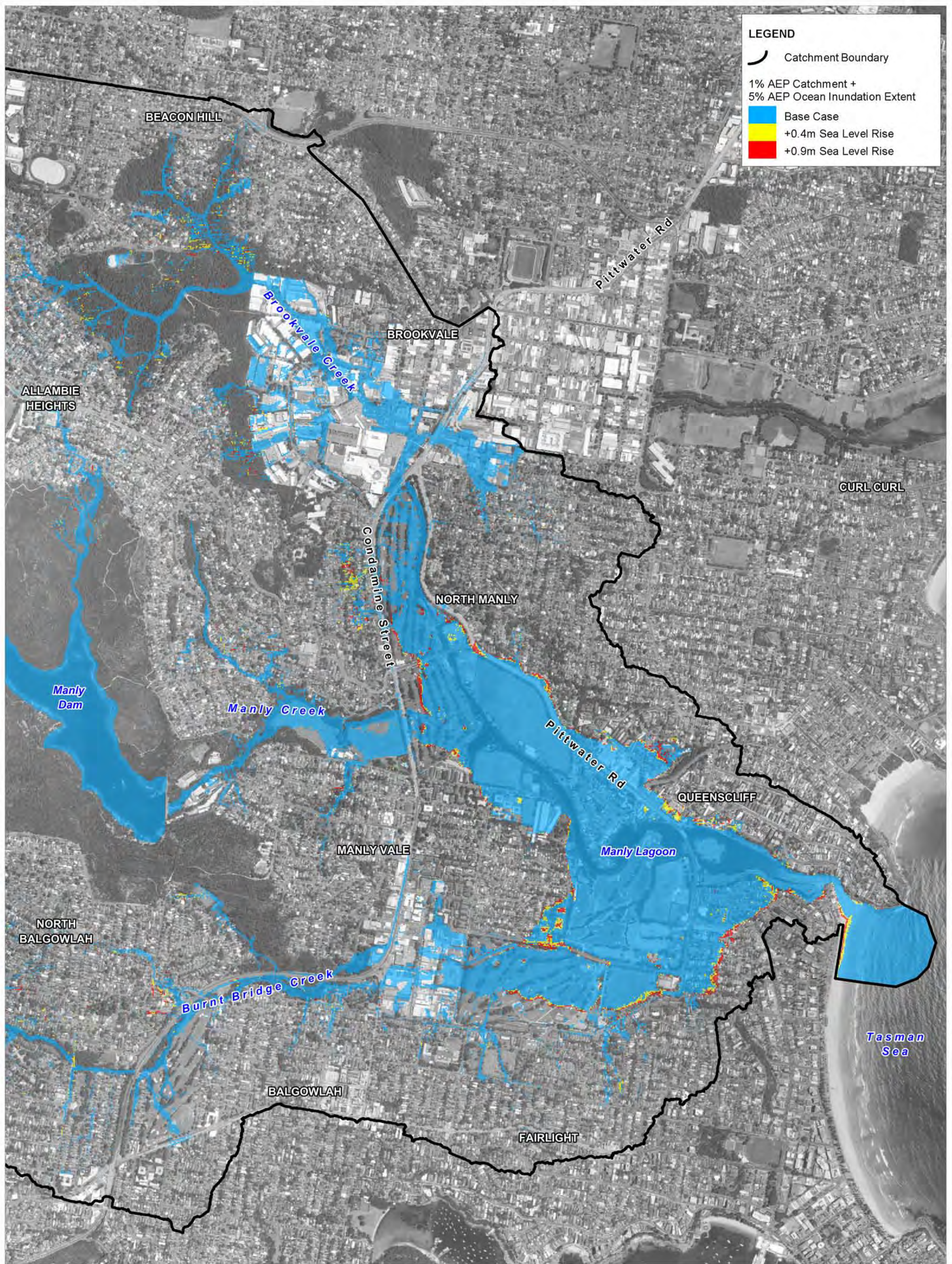
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 1% AEP Catchment + 5% AEP Ocean Coincident Event + Sea Level Rise**

Figure:
A-59

Rev:
A

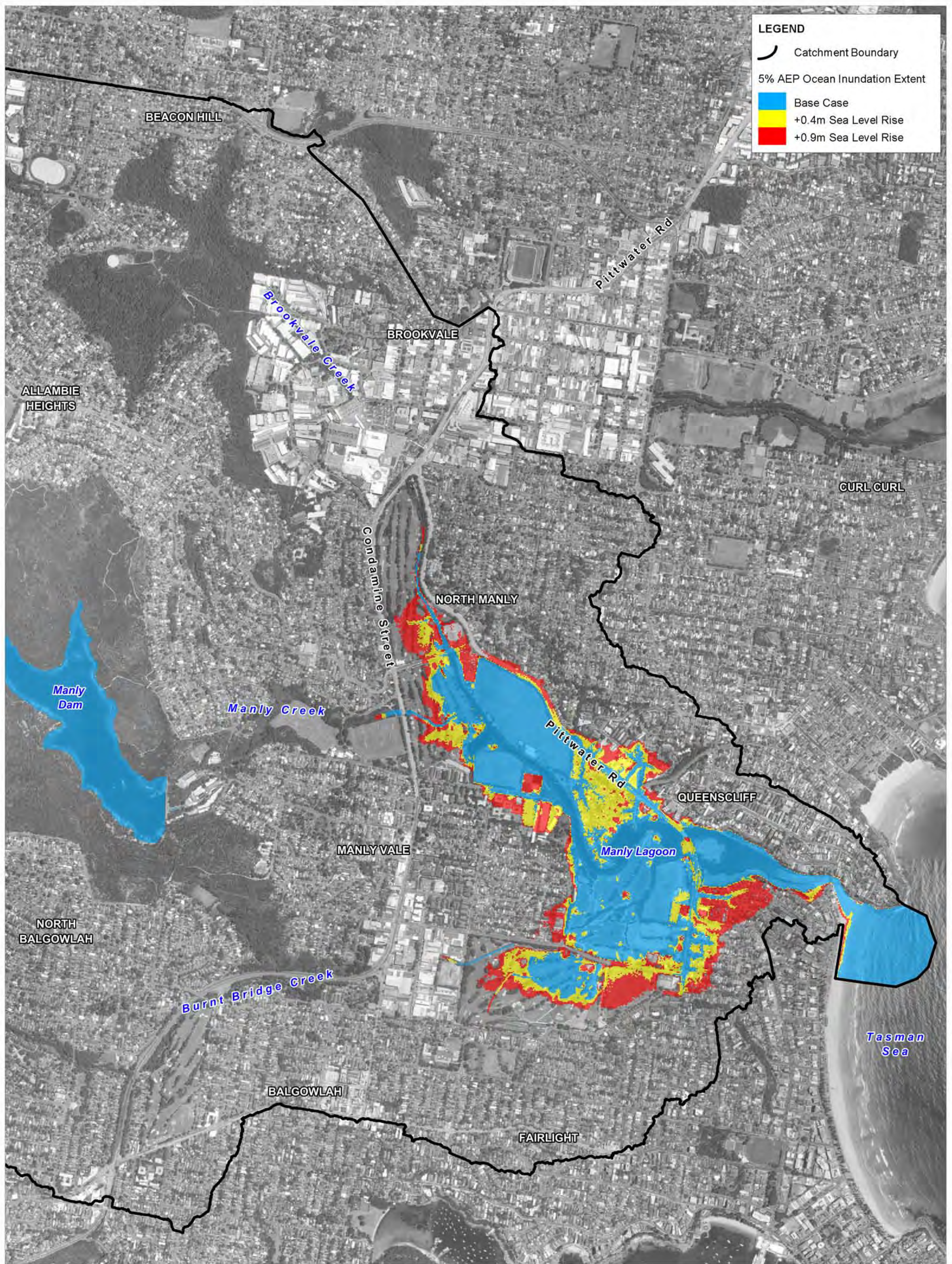
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 5% AEP Ocean Derived Event + Sea Level Rise**

Figure:
A-60

Rev:
A

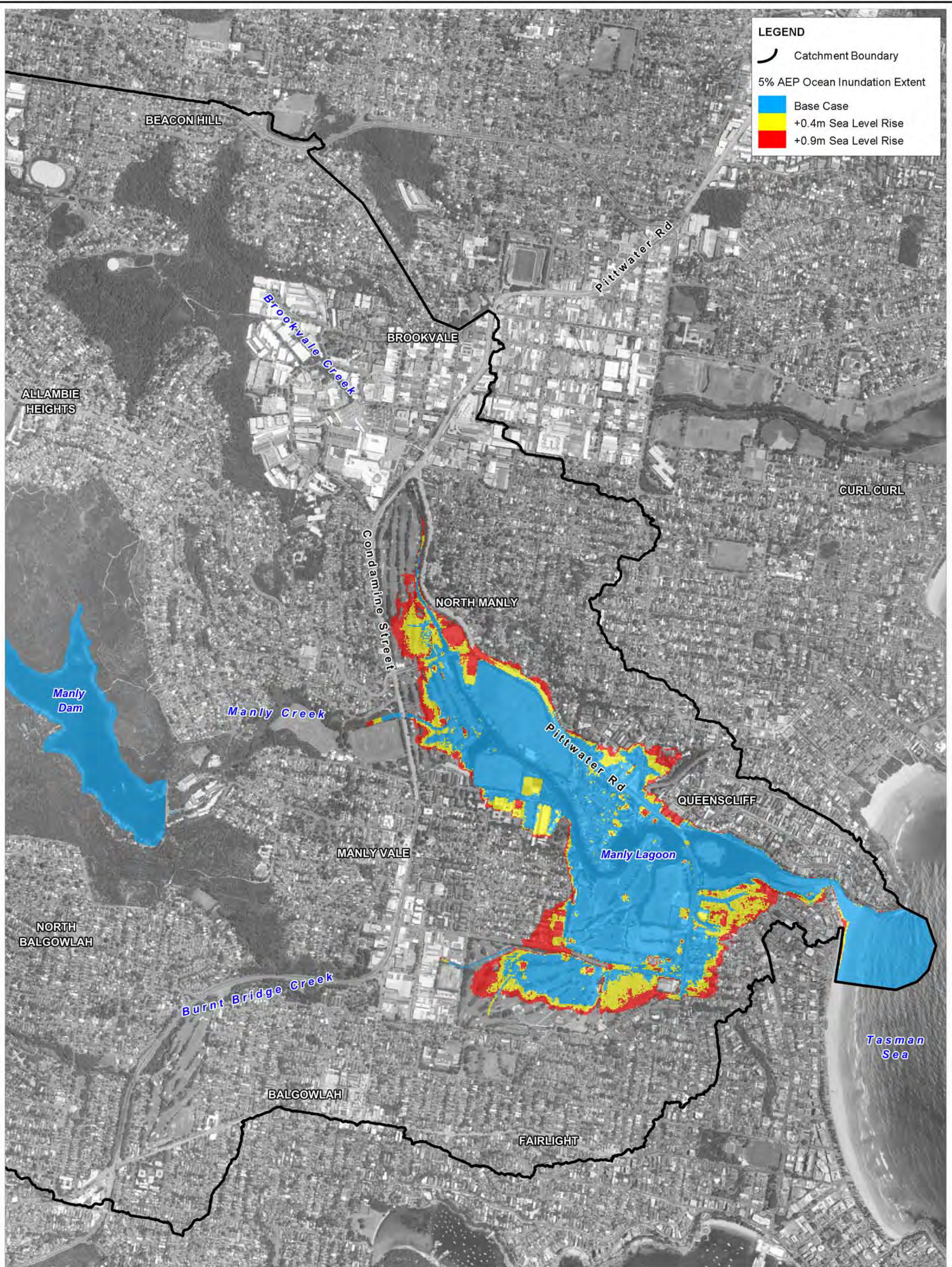
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 1% AEP Ocean Derived Event + Sea Level Rise**

Figure:
A-61

Rev:
A

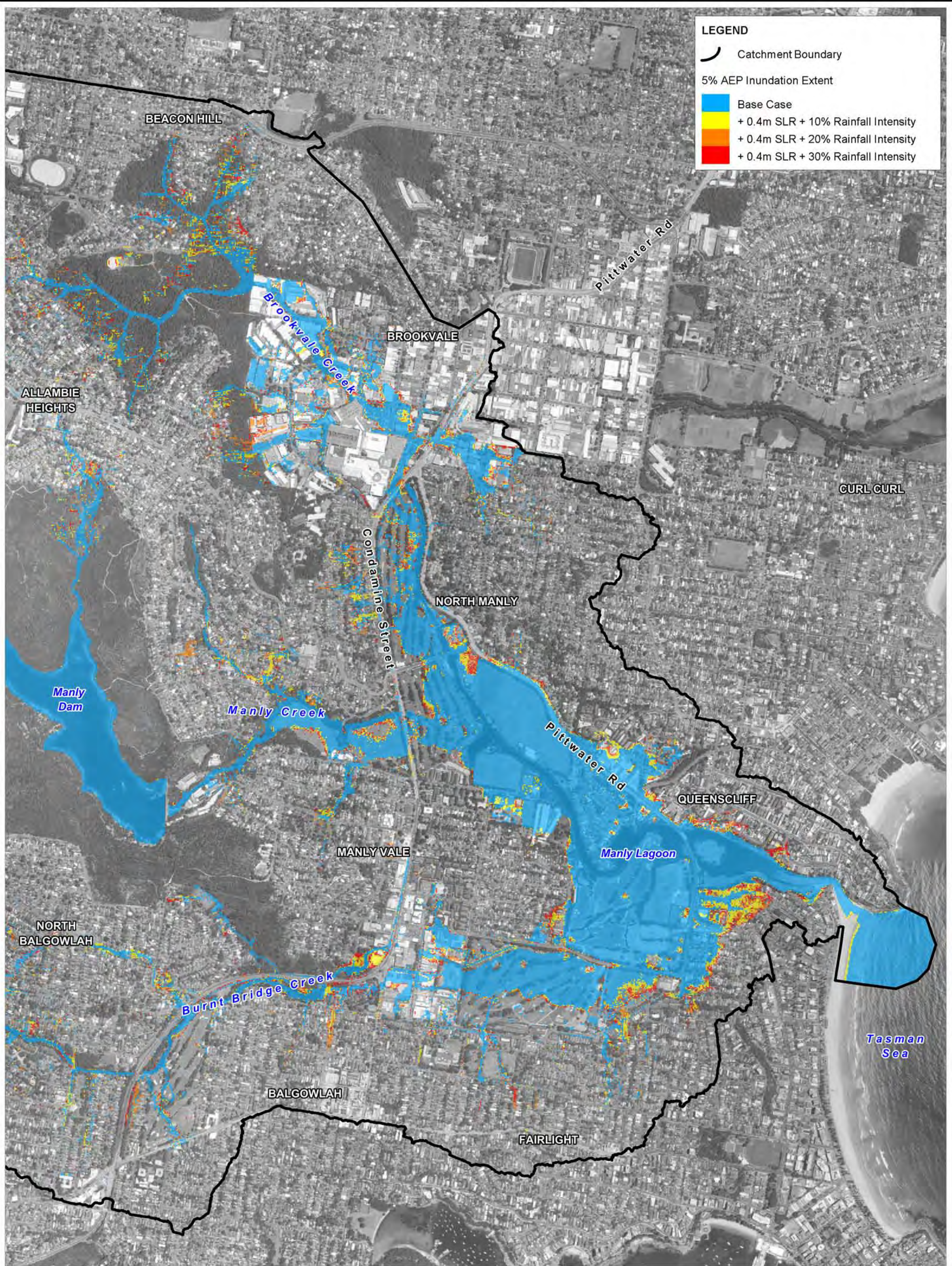
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 Approx. Scale



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Title:
**Manly Lagoon Flood Study - Climate Change Scenarios:
 5% AEP Catchment Derived Event + 0.4 m SLR + Rainfall Intensity Increase**

Figure:
A-62

Rev:
A

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 Approx. Scale



Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A62_CC_5%AEPCatchment_2050SLR_Rainfall.WOR