

# **ATTACHMENT BOOKLET 3**

**ORDINARY COUNCIL MEETING**

**TUESDAY 23 APRIL 2013**





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**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)

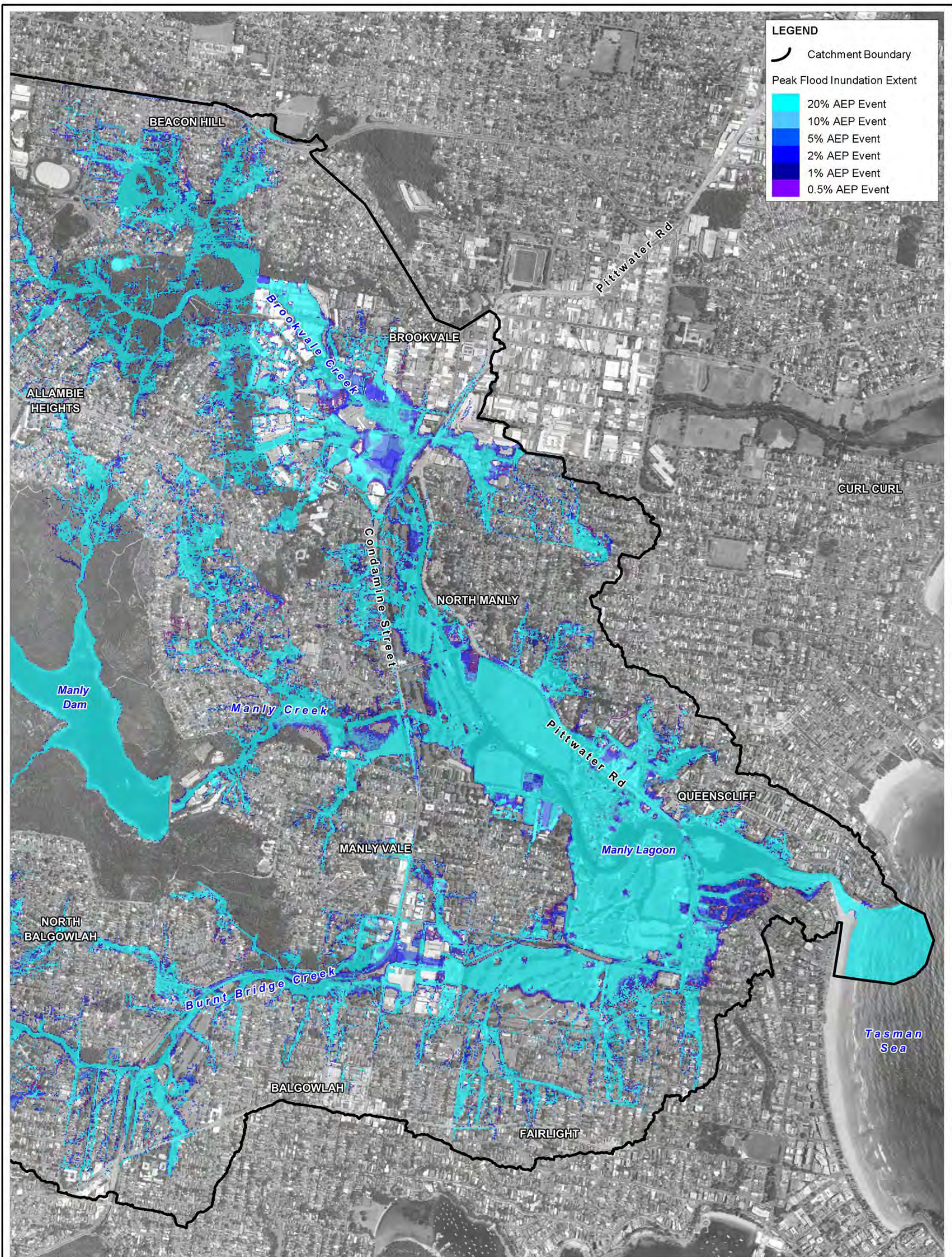
A41 - Decreased Manning's by 25% - 1% AEP Catchment Event  
A42 - Increased Manning's by 25% - 1% AEP Catchment Event  
A43 - Lower Initial Rainfall Losses - 1% AEP Catchment Event  
A44 - Higher Initial Rainfall Losses - 1% AEP Catchment Event  
A45 - Lower Initial Berm Height - 1% AEP Catchment Event  
A46 - Higher Initial Berm Height - 1% AEP Ocean Event  
A47 - Lower Initial Berm Height - 1% AEP Catchment + 5% AEP Ocean Event  
A48 - Higher Initial Berm Height - 1% AEP Catchment Event  
A49 - Higher Initial Berm Height - 1% AEP Catchment + 5% AEP Ocean Event  
A50 - Structure Blockage - 1% AEP Catchment Event

**Climate Change Scenario Mapping**

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

A51 - 10%, 20%, 30% Rainfall Intensity Increase – 5% AEP Catchment Event  
A52 - 10%, 20%, 30% Rainfall Intensity Increase – 1% AEP Catchment Event  
A53 - 10%, 20%, 30% Rainfall Intensity Increase – 5% AEP Catchment + 1% AEP Ocean Event  
A54 - 10%, 20%, 30% Rainfall Intensity Increase – 1% AEP Catchment + 5% AEP Ocean Event  
A55 - 0.4m, 0.9m Sea Level Rise – 5% AEP Catchment Event  
A56 - 0.4m, 0.9m Sea Level Rise – 1% AEP Catchment Event  
A57 - 0.4m, 0.9m Sea Level Rise – 5% AEP Catchment + 1% AEP Ocean Event  
A58 - 0.4m, 0.9m Sea Level Rise – 1% AEP Catchment + 5% AEP Ocean Event  
A59 - 0.4m, 0.9m Sea Level Rise – 5% AEP Ocean Event  
A60 - 0.4m, 0.9m Sea Level Rise – 1% AEP Ocean Event  
A61 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 5% AEP Catchment Event  
A62 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 1% AEP Catchment Event  
A63 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 5% AEP Catchment + 1% AEP Ocean Event  
A64 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 1% AEP Catchment + 5% AEP Ocean Event  
A65 - 10%, 20%, 30% Rainfall Intensity Increase + 0.4m Sea Level Rise – 5% AEP Catchment Event  
A66 - 10%, 20%, 30% Rainfall Intensity Increase + 0.9m Sea Level Rise – 1% AEP Catchment Event  
A67 - 10%, 20%, 30% Rainfall Intensity Increase + 0.9m Sea Level Rise – 5% AEP Catchment + 1% AEP Ocean Event  
A68 - 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**

Rev:  
**A DRAFT**

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.

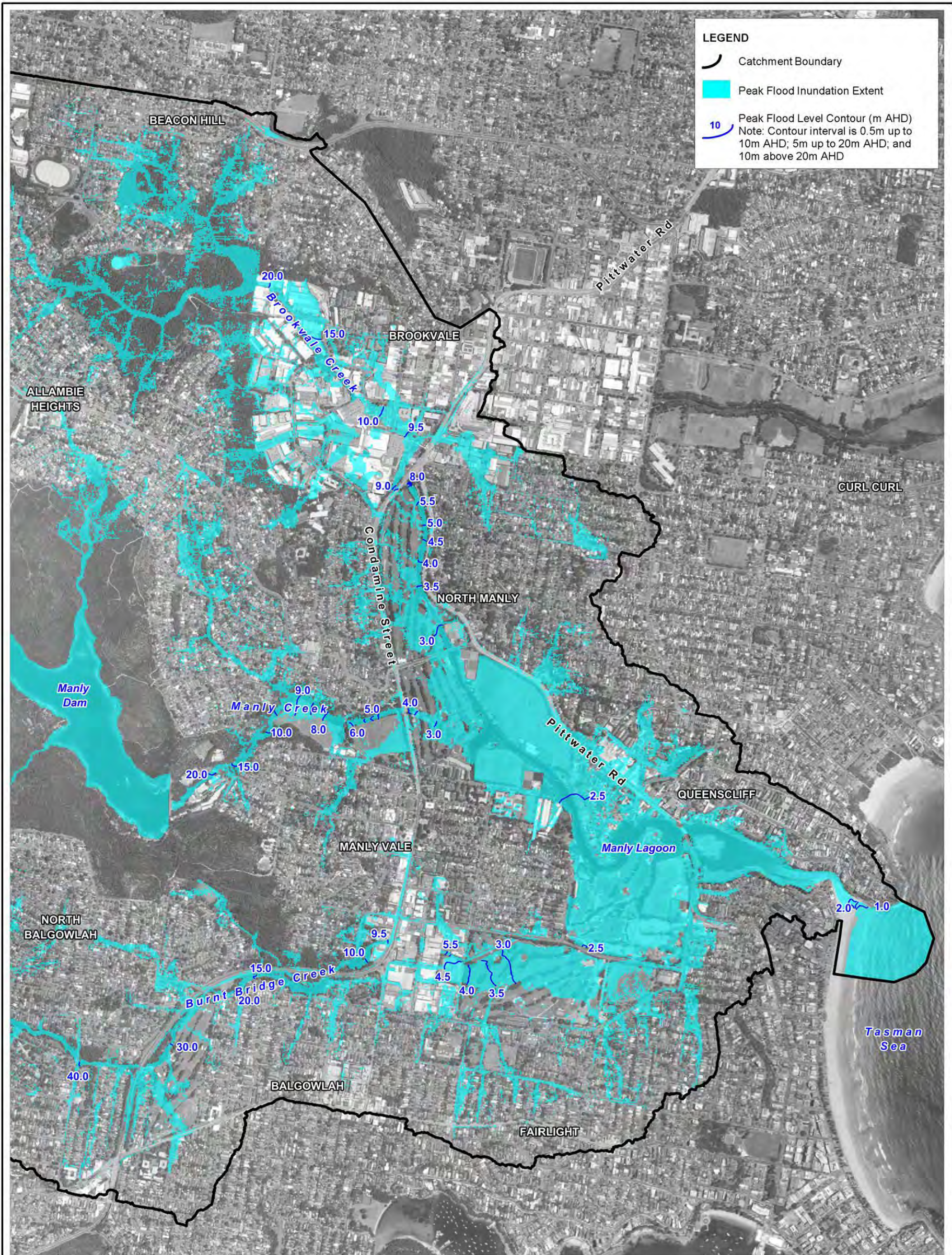


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Approx. Scale



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Title:

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

Figure:

**A-2**

Rev:

**A DRAFT**

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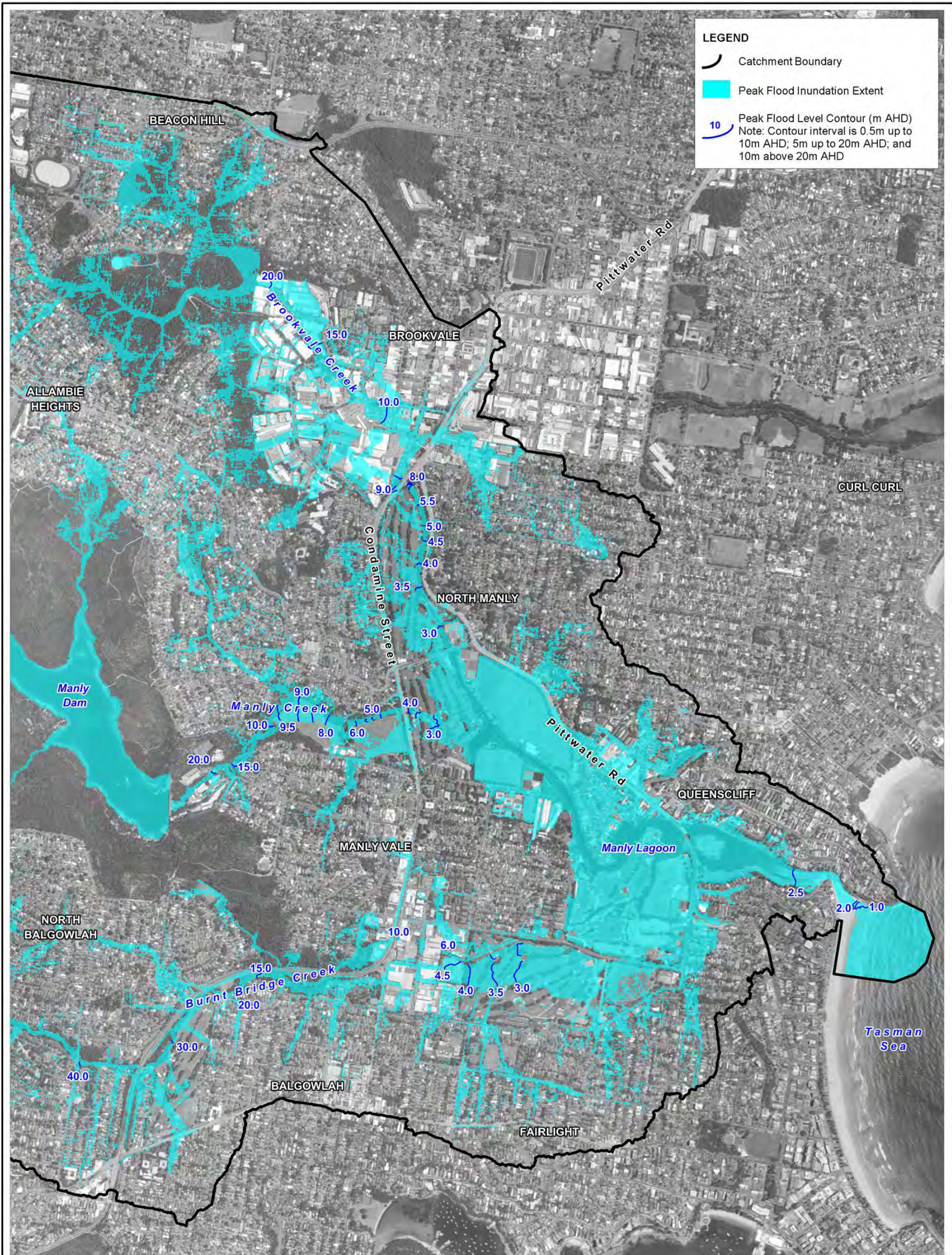


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Title:

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

Figure:

**A-3**

Rev:

**A DRAFT**

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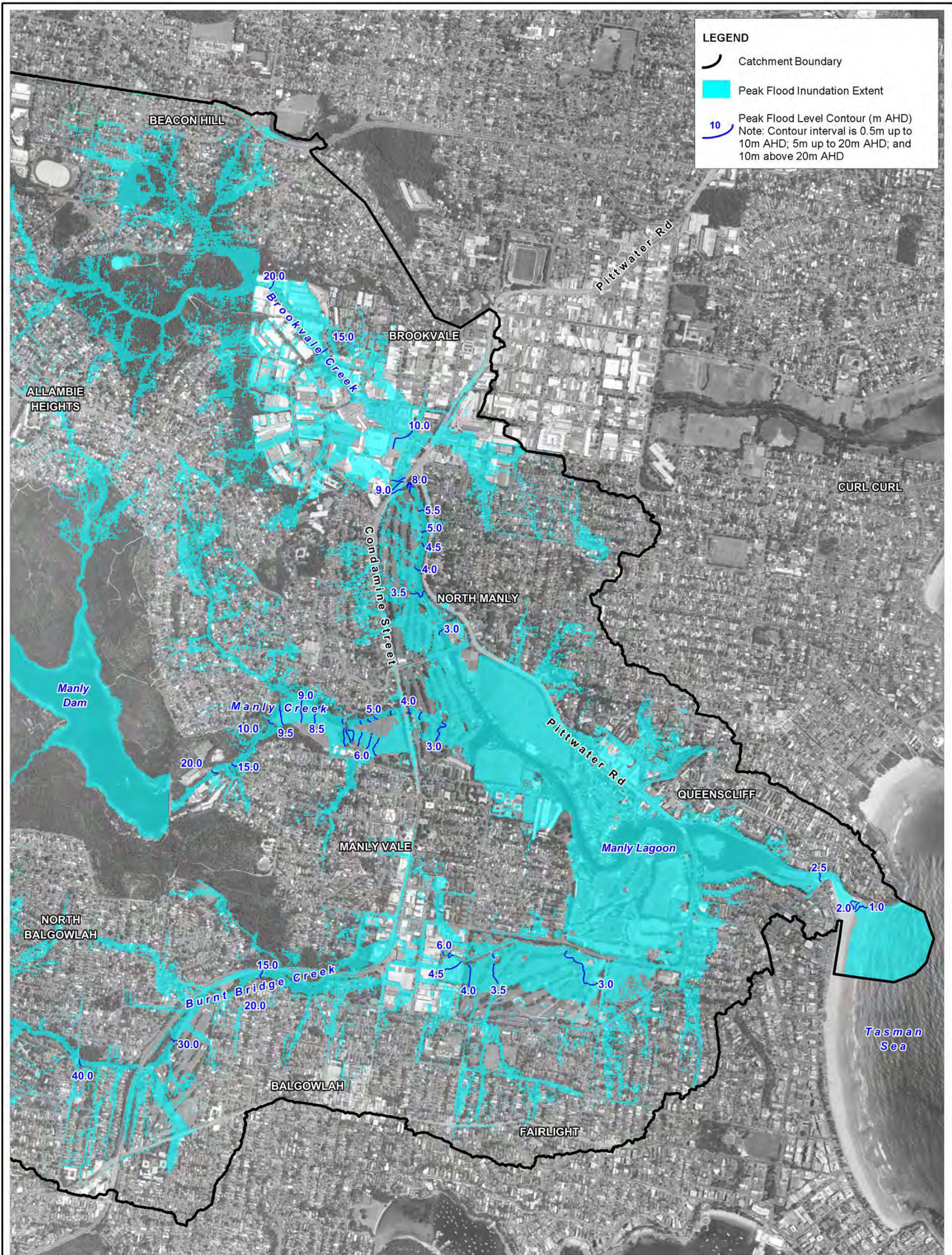


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Approx. Scale



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Title:

**Manly Lagoon Flood Study - Peak Flood Water Level:  
5% AEP Catchment Derived Event**

Figure:

**A-4**

Rev:

**A DRAFT**

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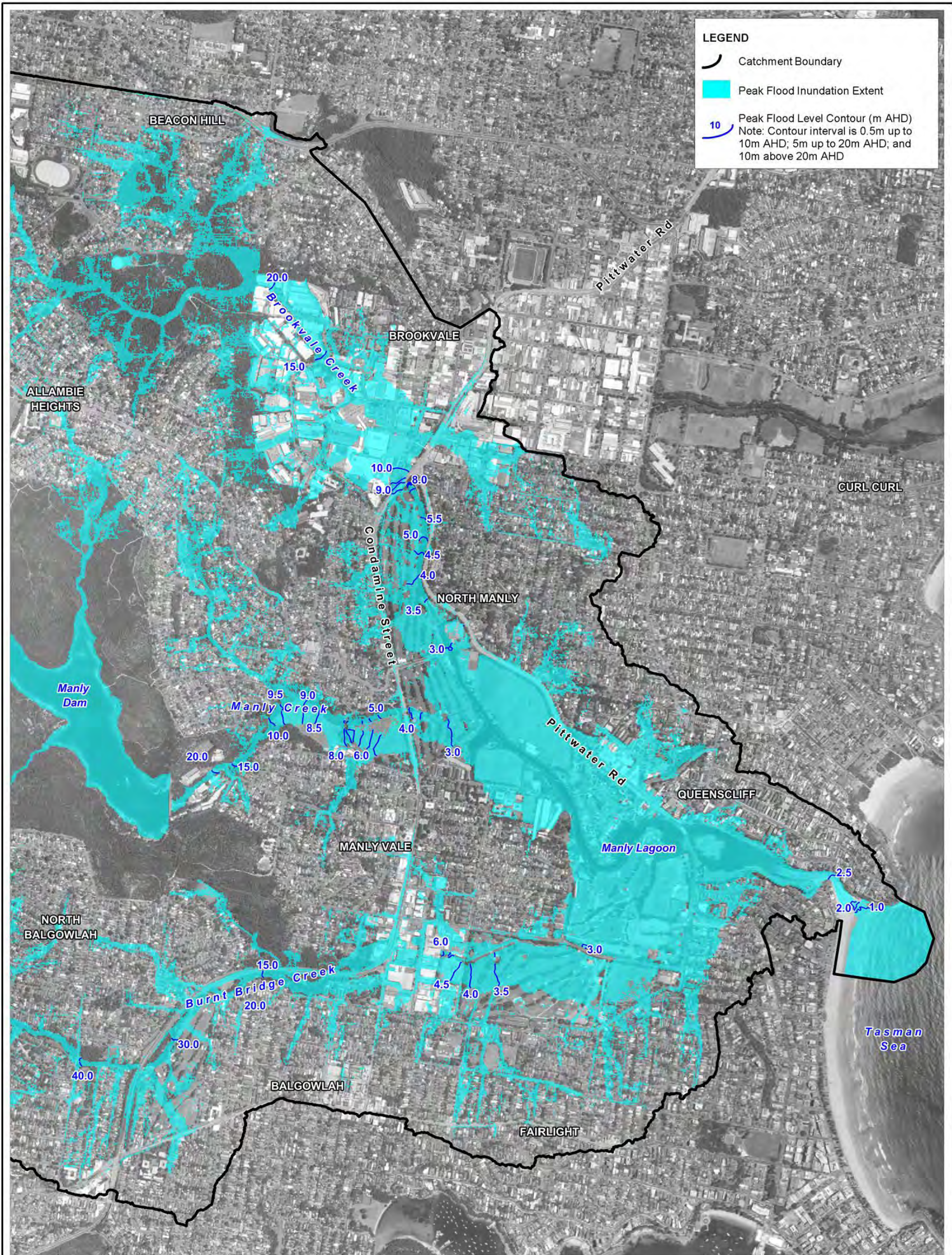


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Title:

**Manly Lagoon Flood Study - Peak Flood Water Level:  
2% AEP Catchment Derived Event**

Figure:

**A-5**

Rev:

**A DRAFT**

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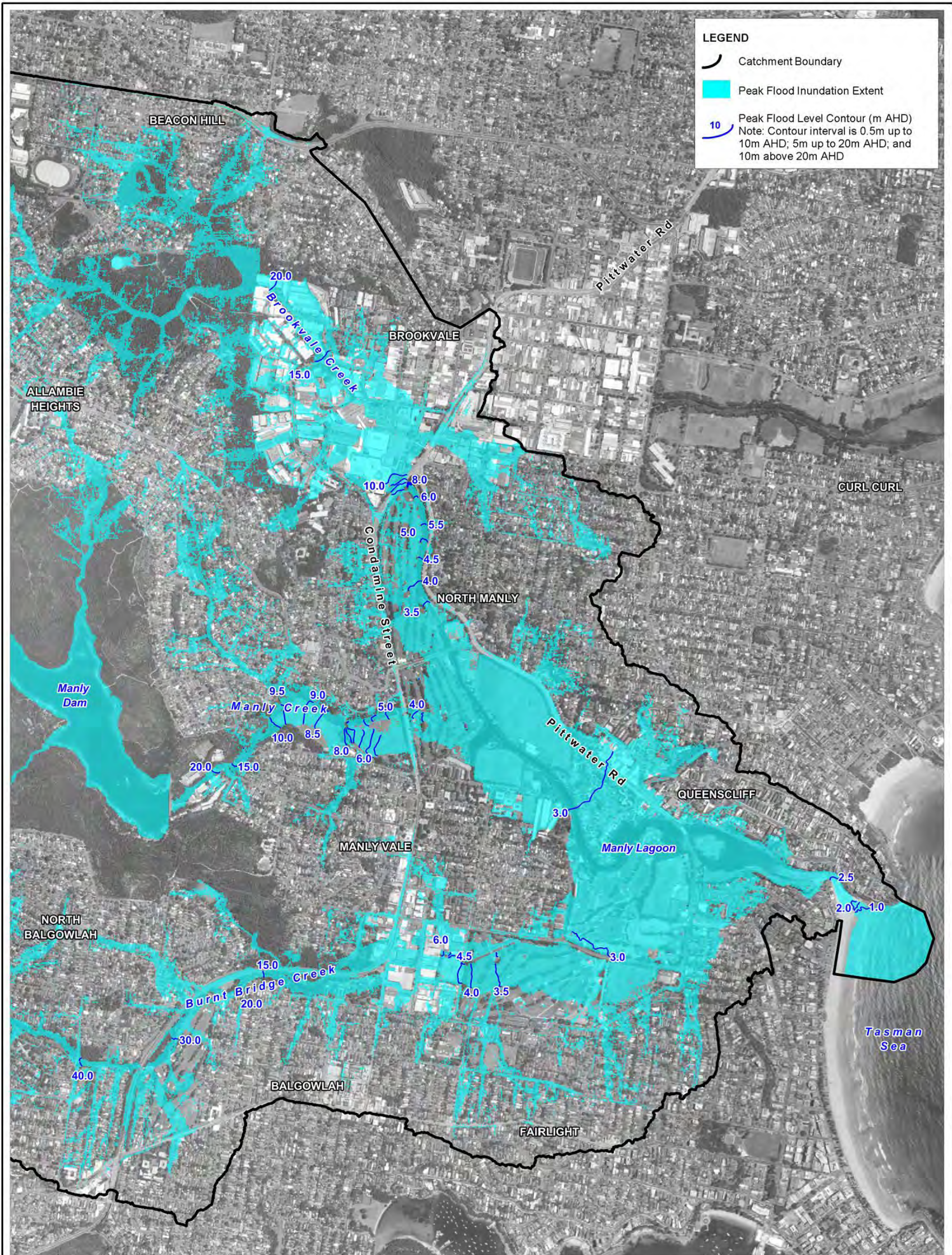


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Title:

**Manly Lagoon Flood Study - Peak Flood Water Level:  
1% AEP Catchment Derived Event**

Figure:

**A-6**

Rev:

**A DRAFT**

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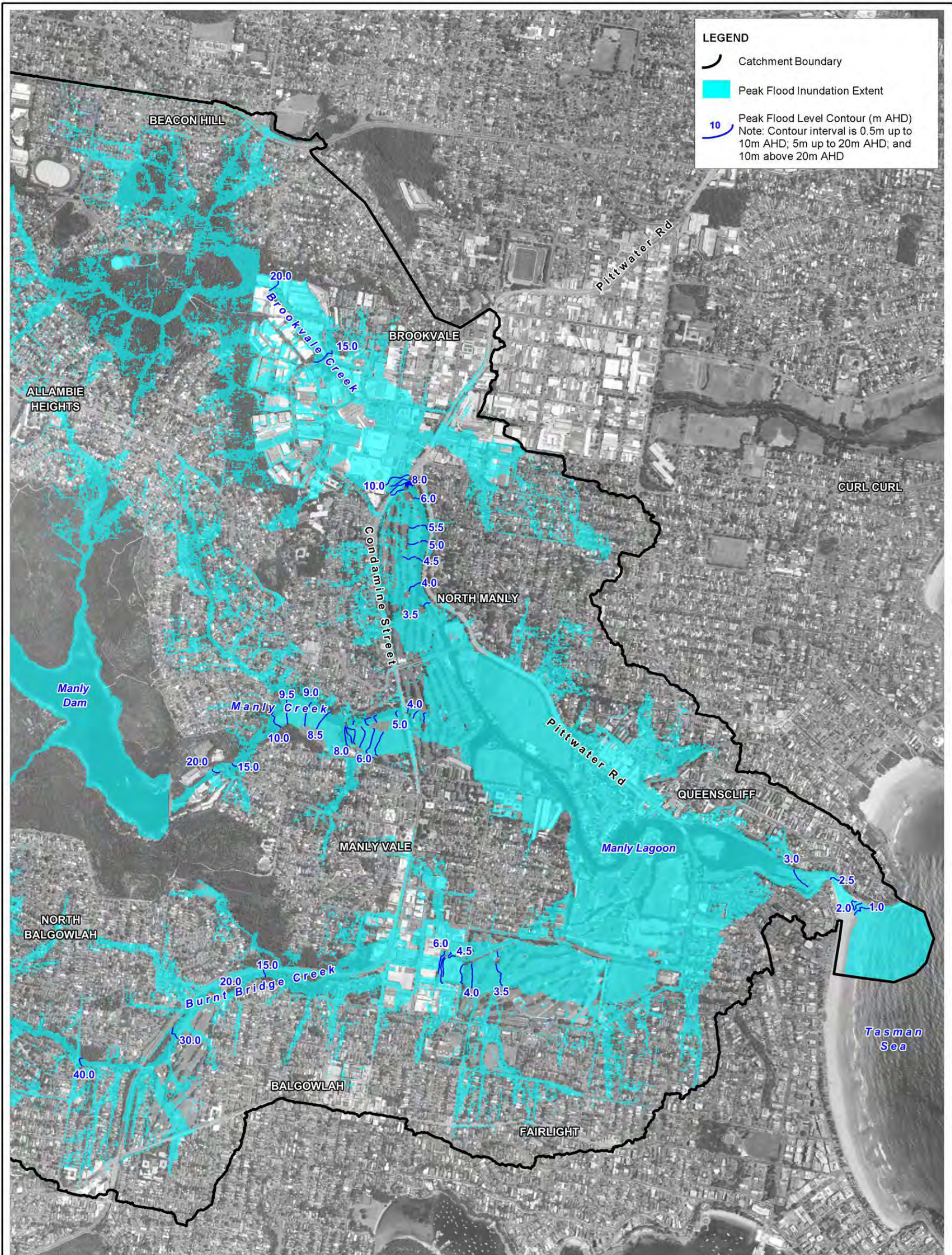


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Title:  
**Manly Lagoon Flood Study - Peak Flood Water Level:  
0.5% AEP Catchment Derived Event**

Figure:  
**A-7**

Rev:  
**A DRAFT**

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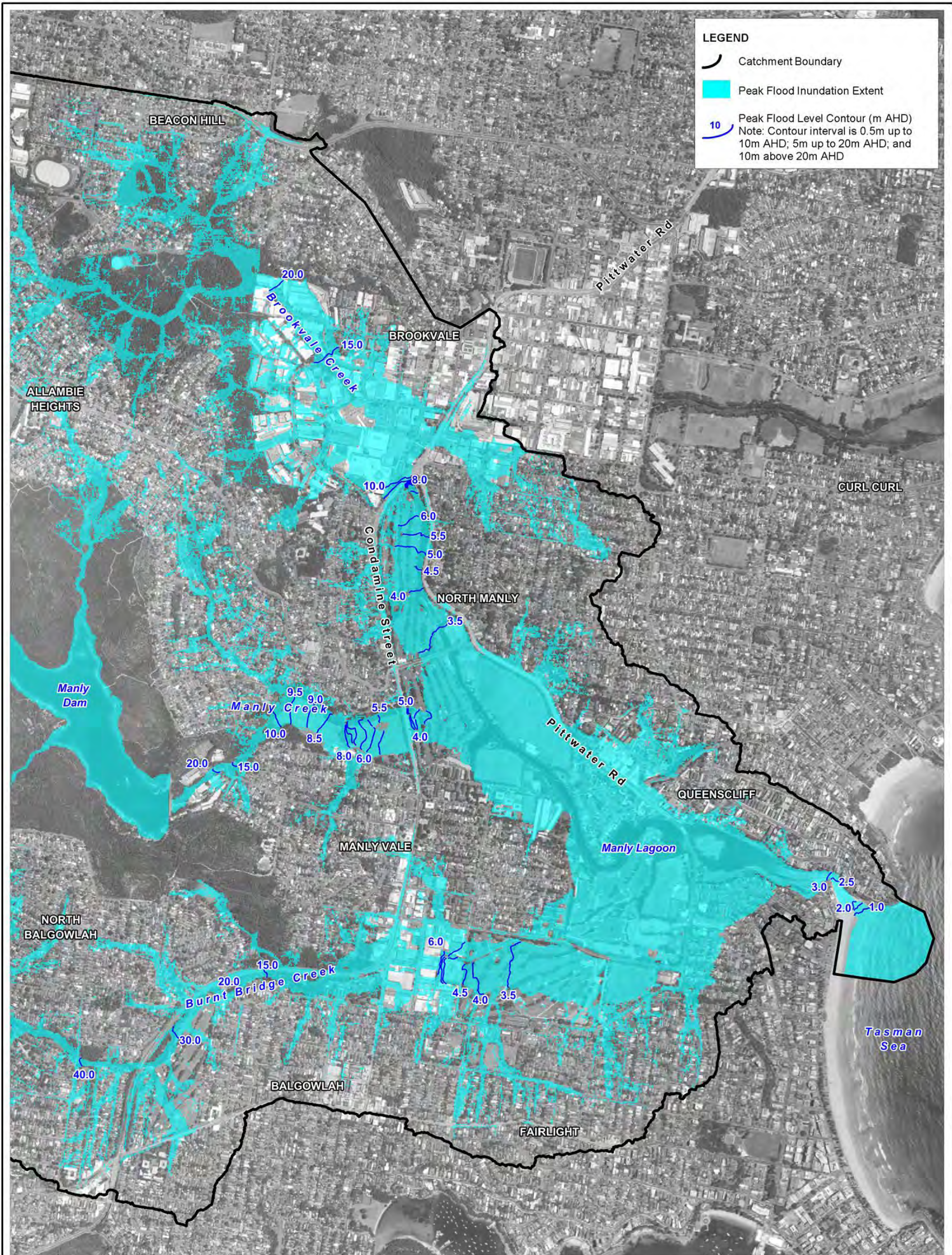


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Title:

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

Figure:

**A-8**

Rev:

**A DRAFT**

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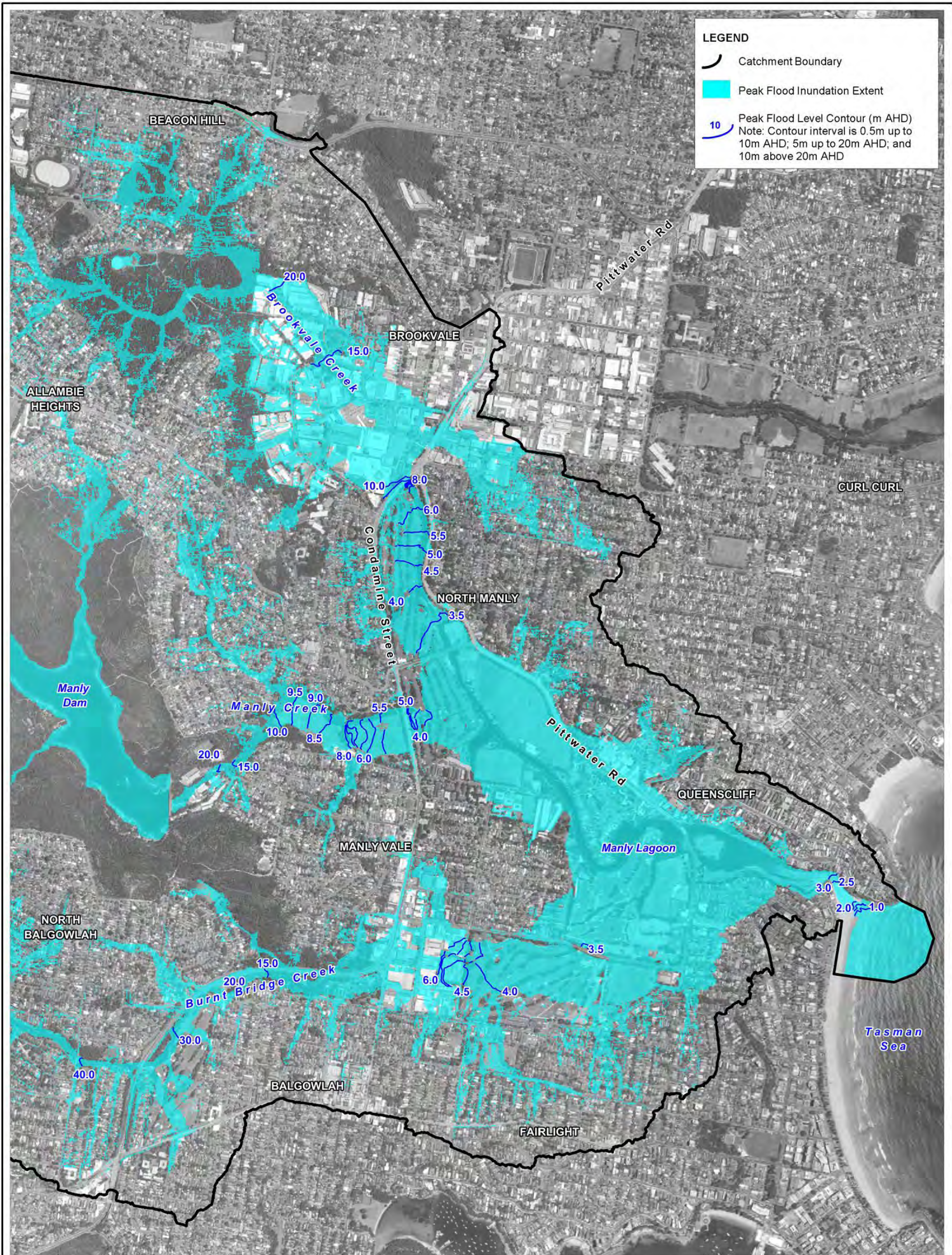


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Title:

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

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Figure:

**A-9**

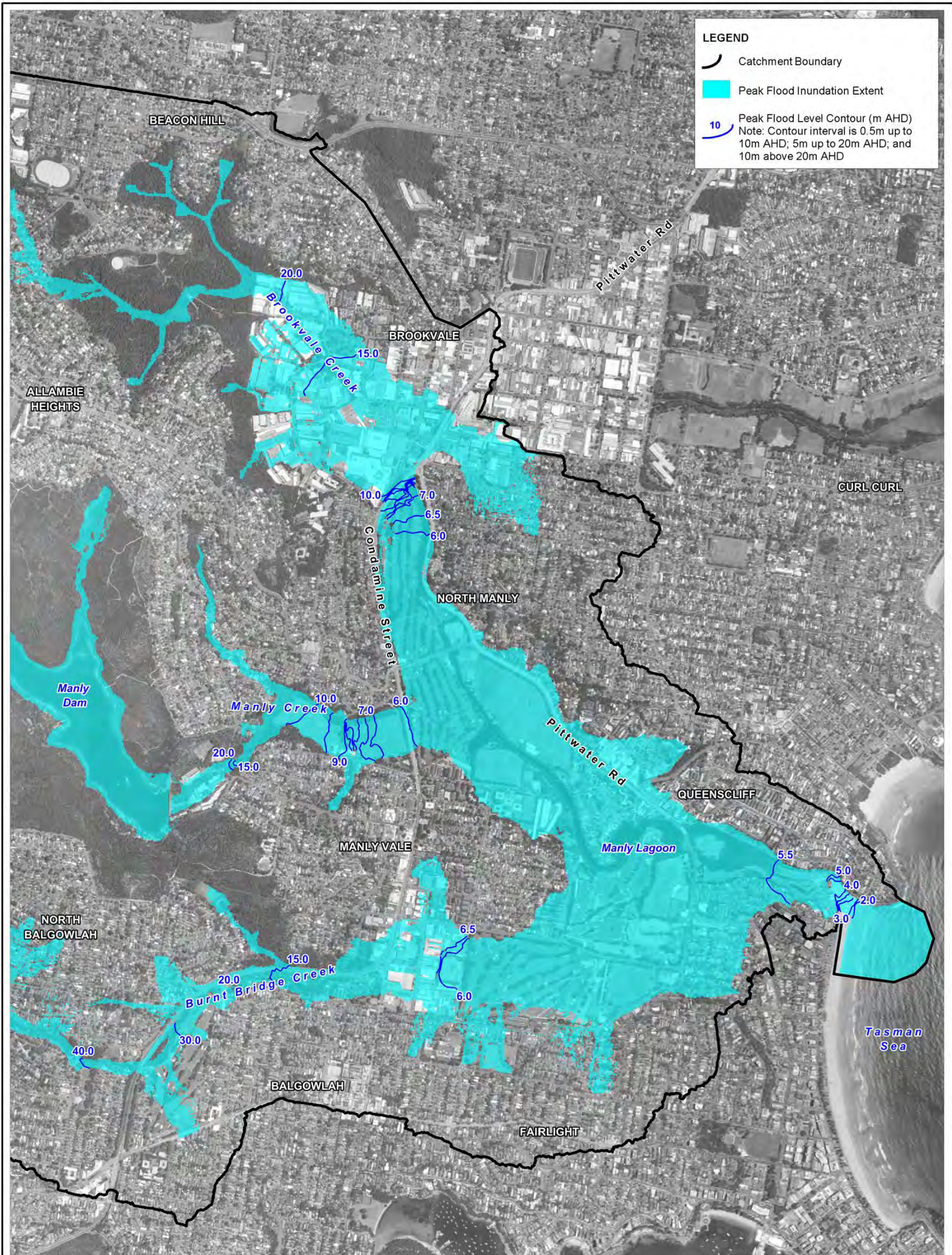
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Title:

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

Figure:

**A-10**

Rev:

**A DRAFT**

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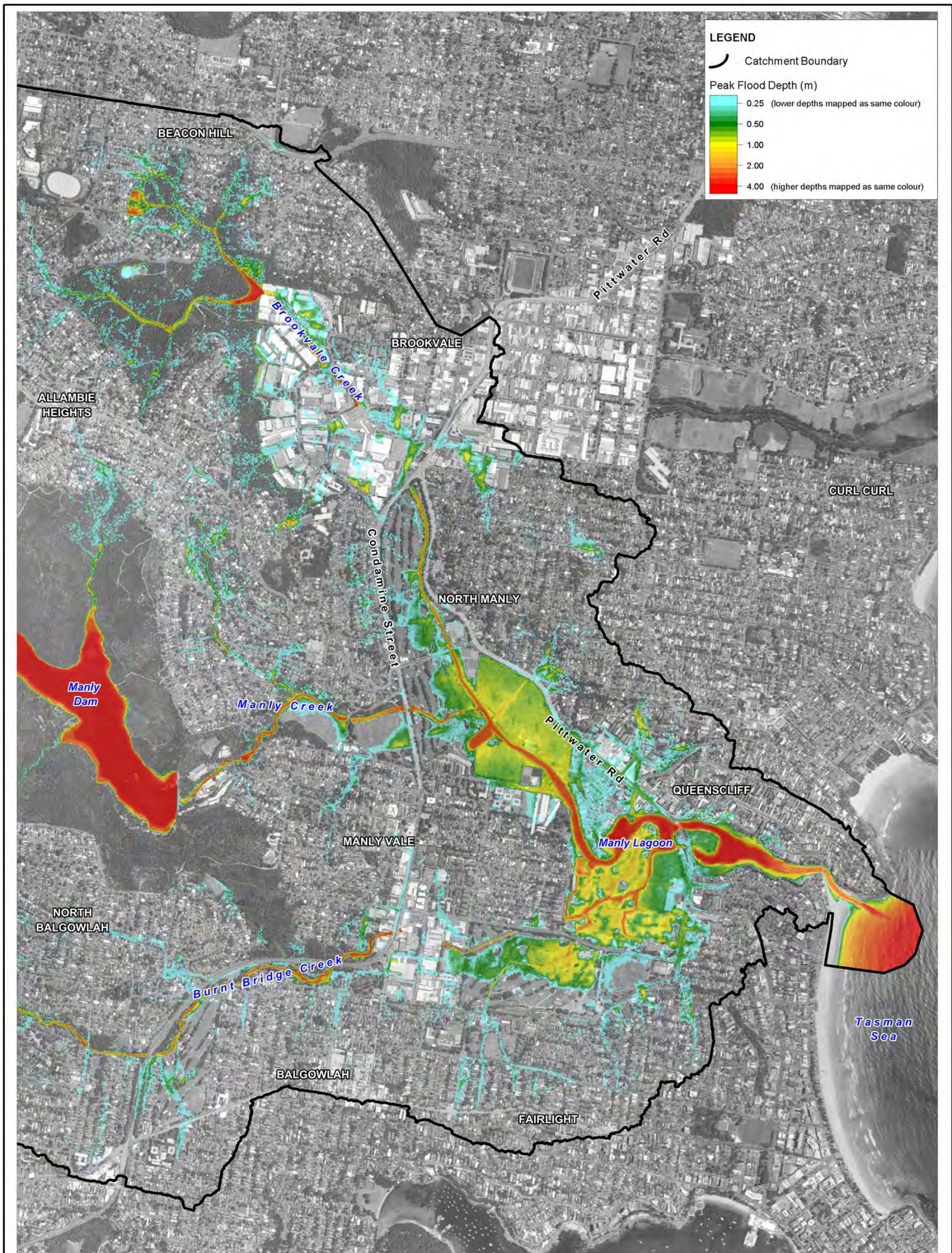


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
20% AEP Catchment Derived Event**

Figure:  
**A-11**

Rev:  
**A DRAFT**

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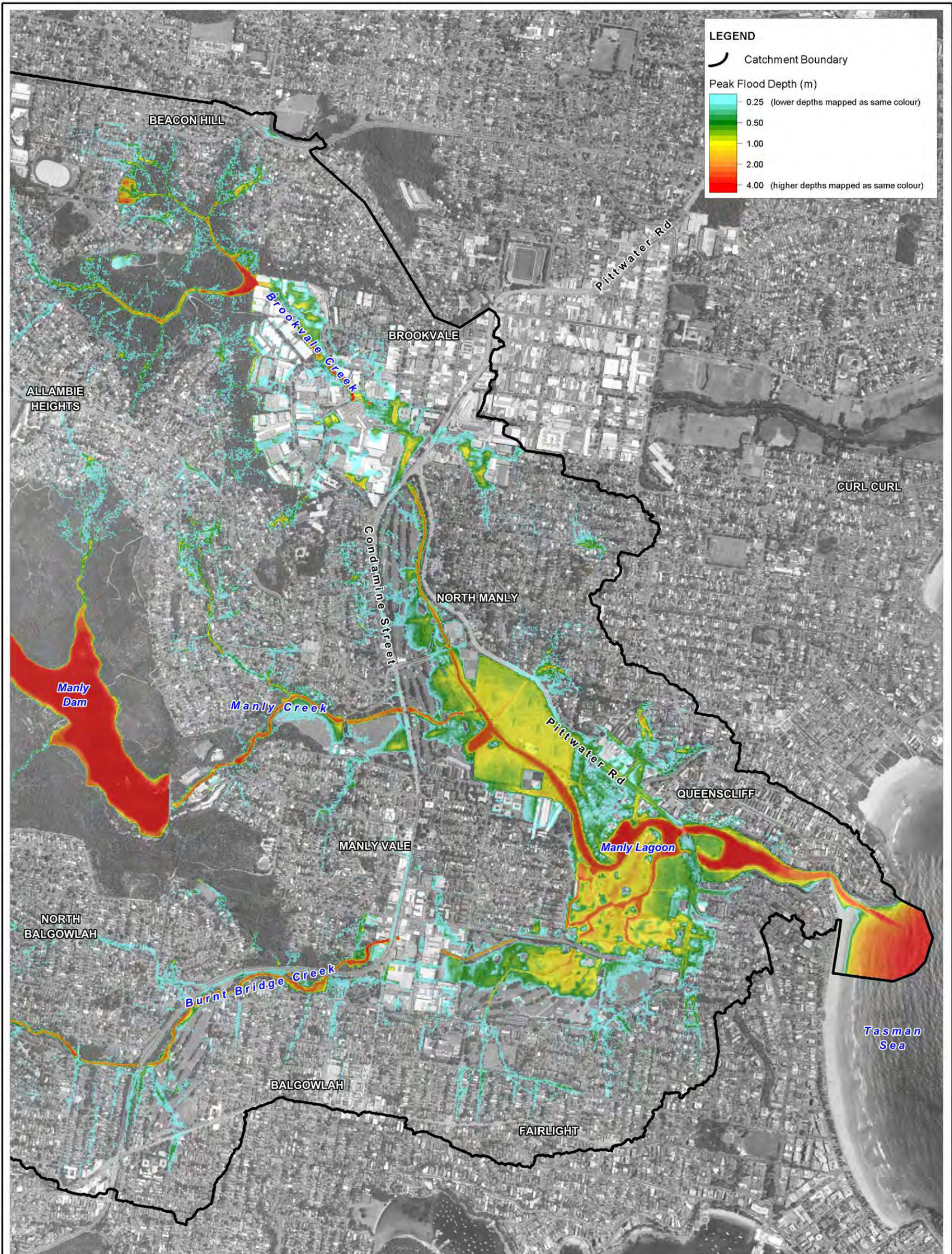


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
10% AEP Catchment Derived Event**

Figure:  
**A-12**

Rev:  
**A DRAFT**

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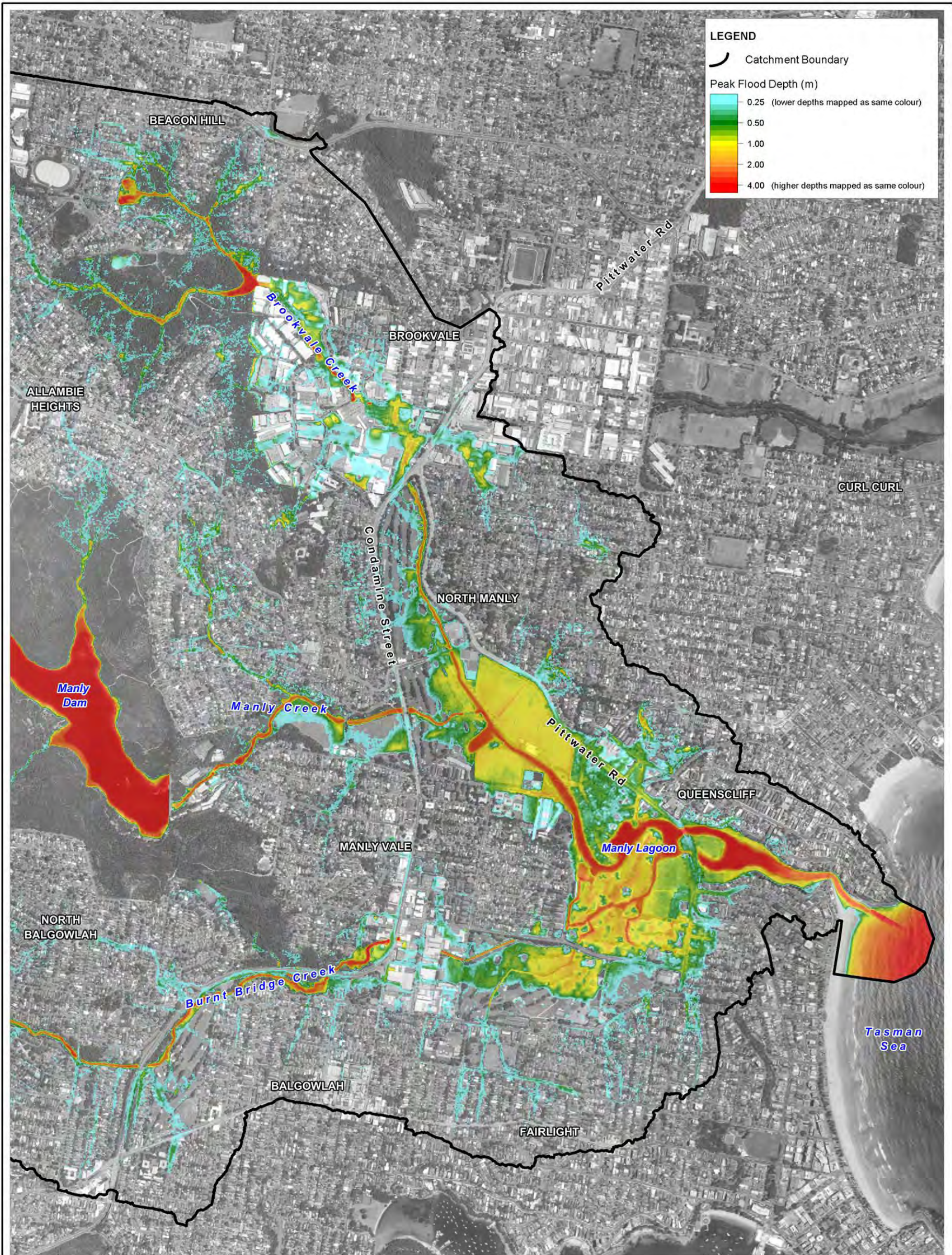


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
5% AEP Catchment Derived Event**

Figure:  
**A-13**

Rev:  
**A DRAFT**

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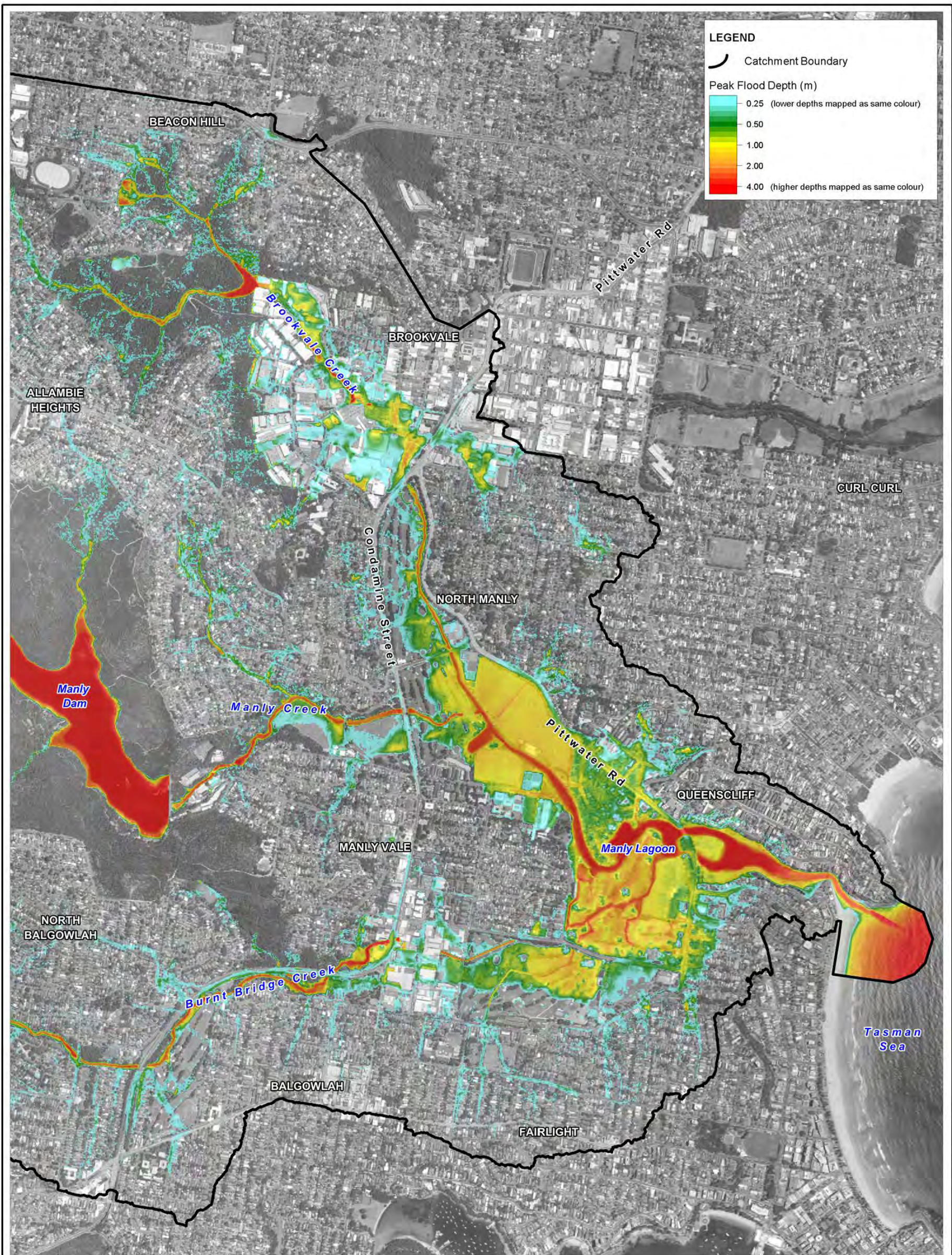


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
2% AEP Catchment Derived Event**

Figure:  
**A-14**

Rev:  
**A DRAFT**

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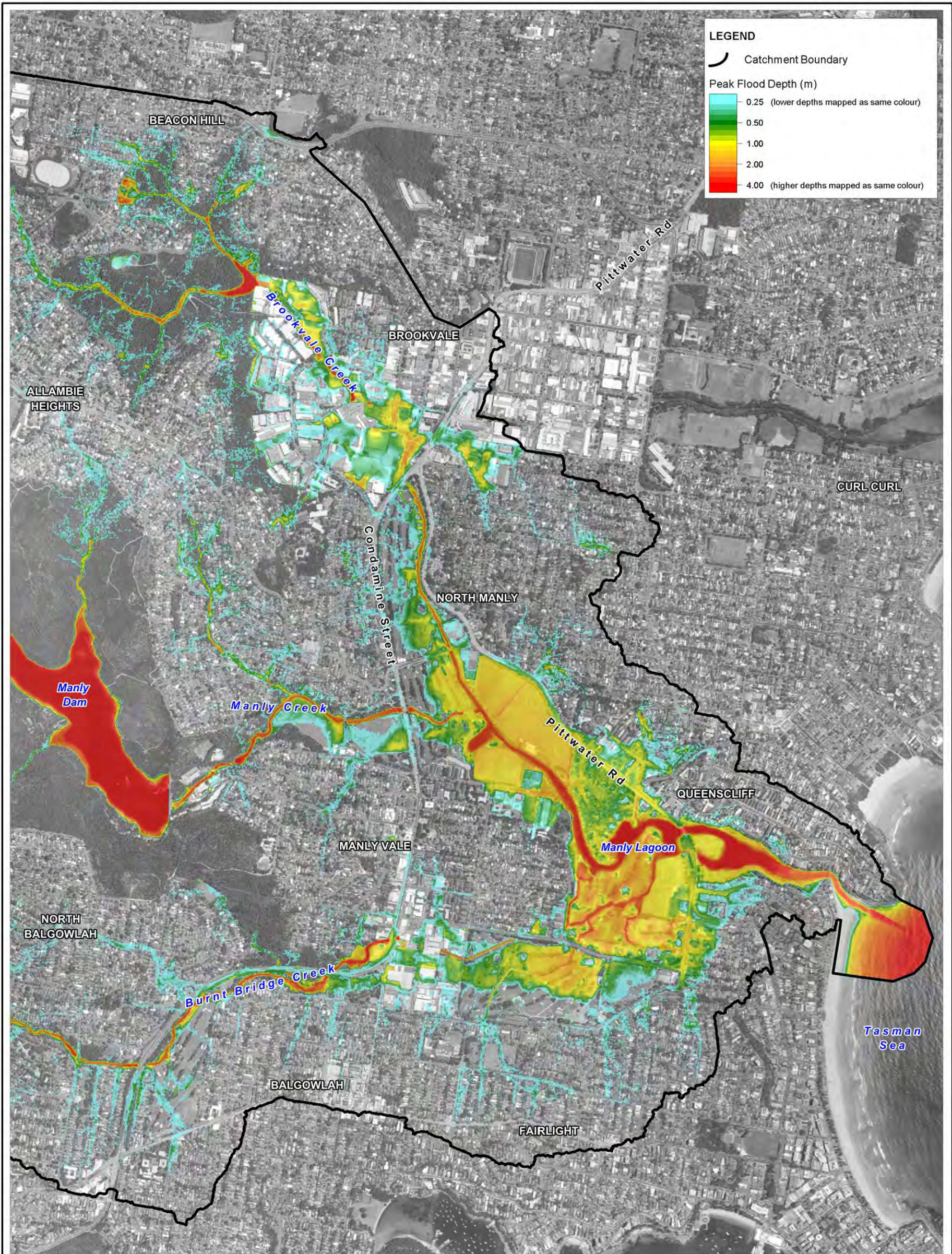


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
1% AEP Catchment Derived Event**

Figure:  
**A-15**

Rev:  
**A DRAFT**

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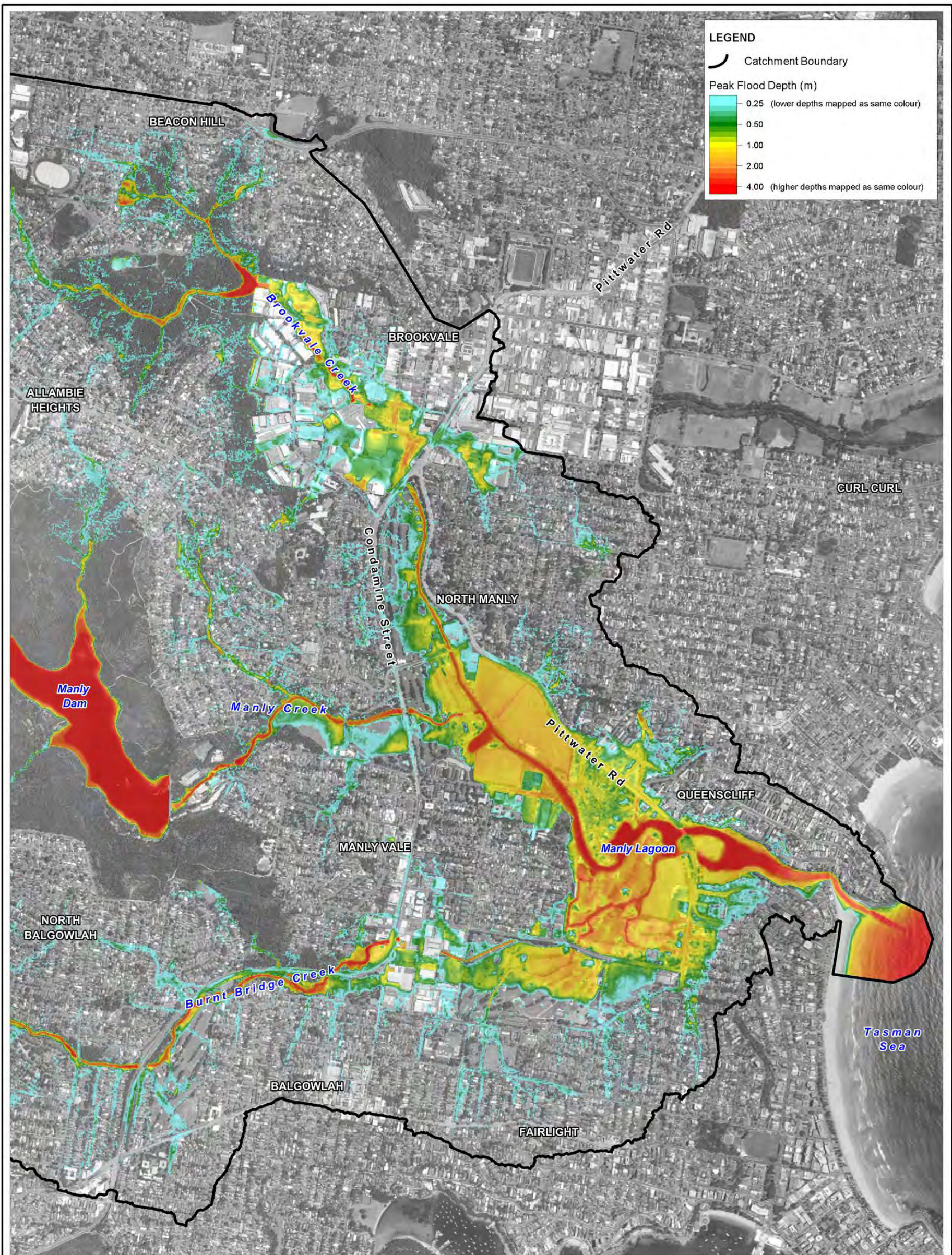


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
0.5% AEP Catchment Derived Event**

Figure:  
**A-16**

Rev:  
**A DRAFT**

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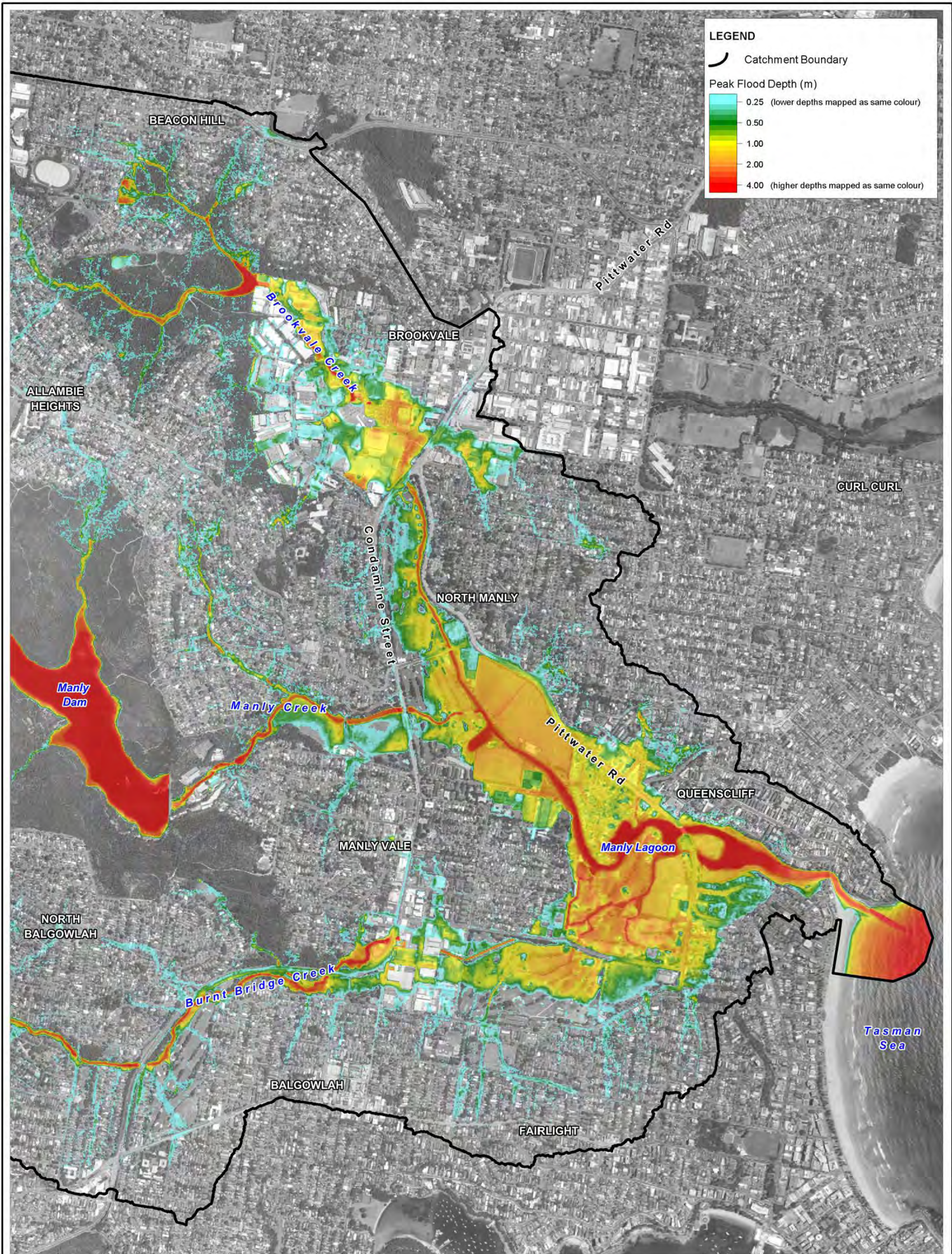


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
0.2% AEP Catchment Derived Event**

Figure:  
**A-17**

Rev:  
**A DRAFT**

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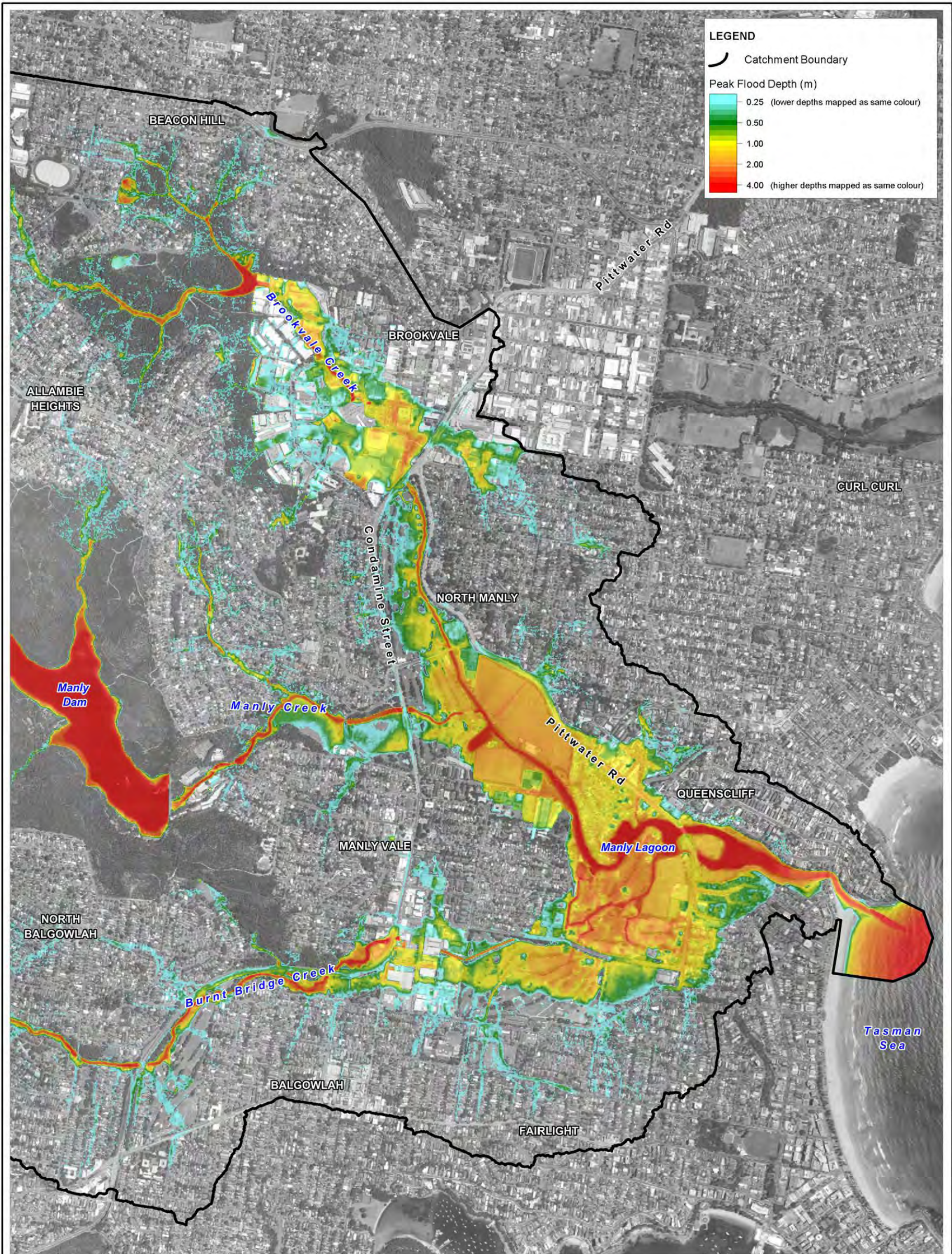


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
0.1% AEP Catchment Derived Event**

Figure:  
**A-18**

Rev:  
**A DRAFT**

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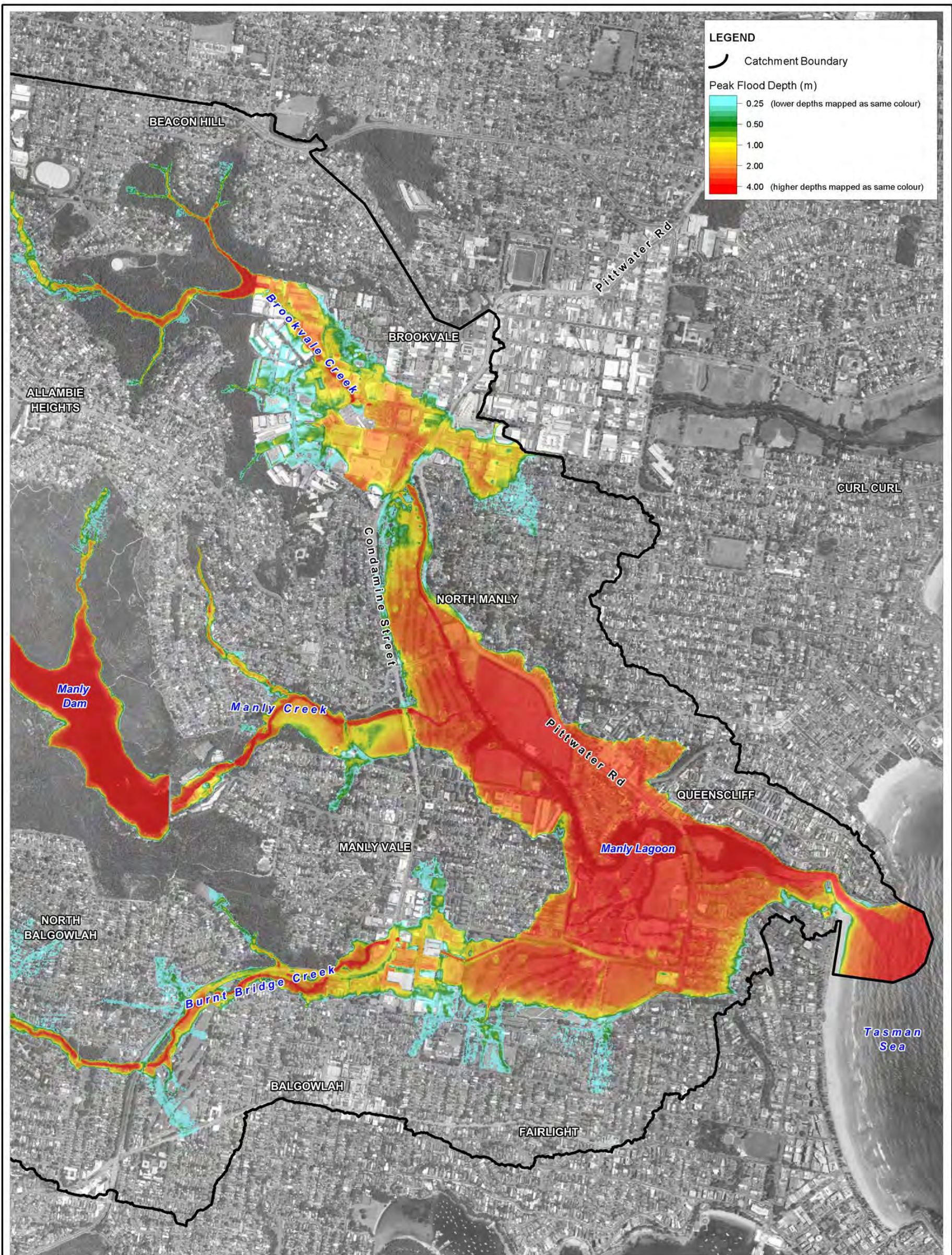


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Title:  
**Manly Lagoon Flood Study - Peak Flood Depths:  
PMF Catchment Derived Event**

Figure:  
**A-19**

Rev:  
**A DRAFT**

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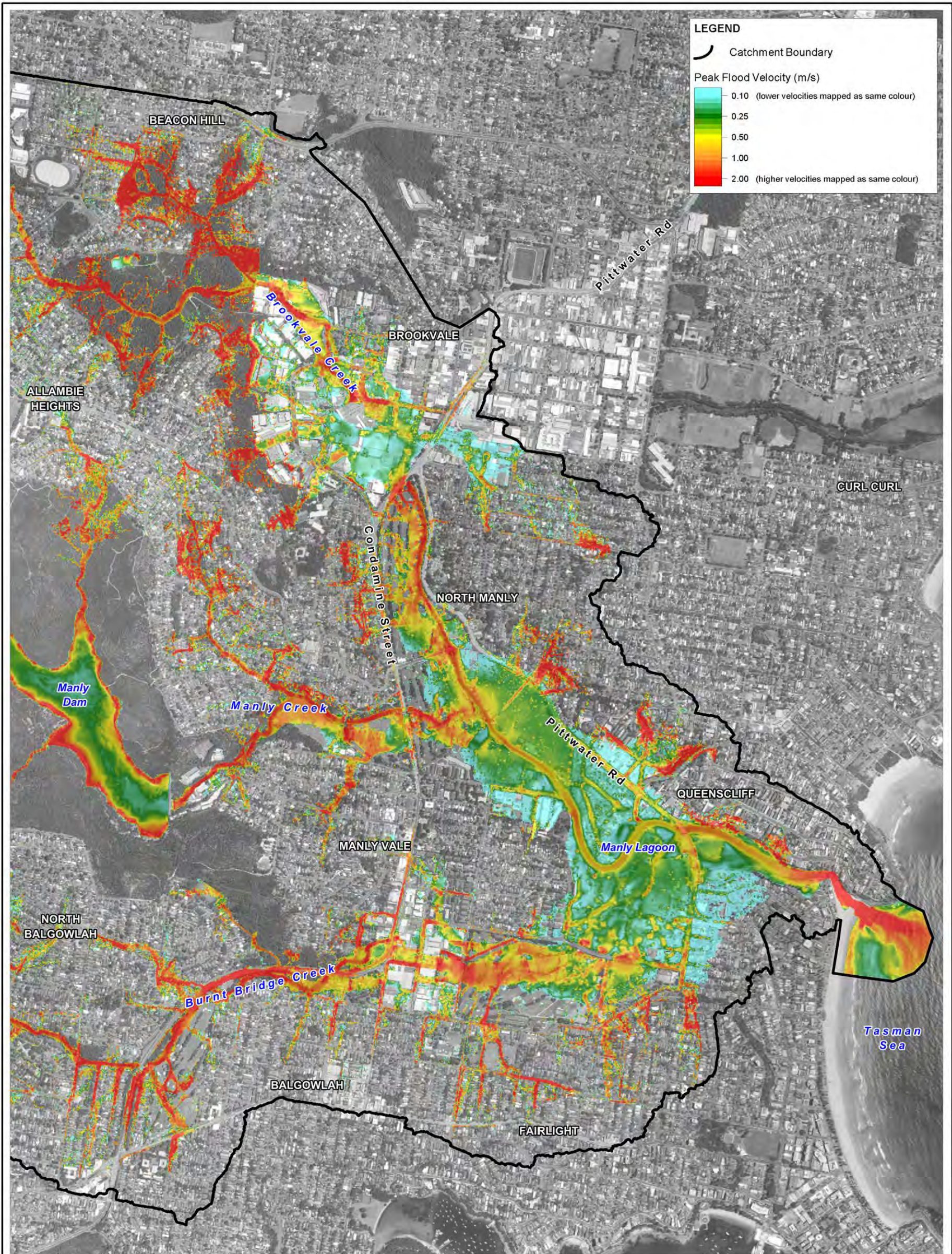


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Title:  
**Manly Lagoon Flood Study - Peak Flood Velocity:  
1% AEP Catchment Derived Event**

Figure:  
**A-20**

Rev:  
**A DRAFT**

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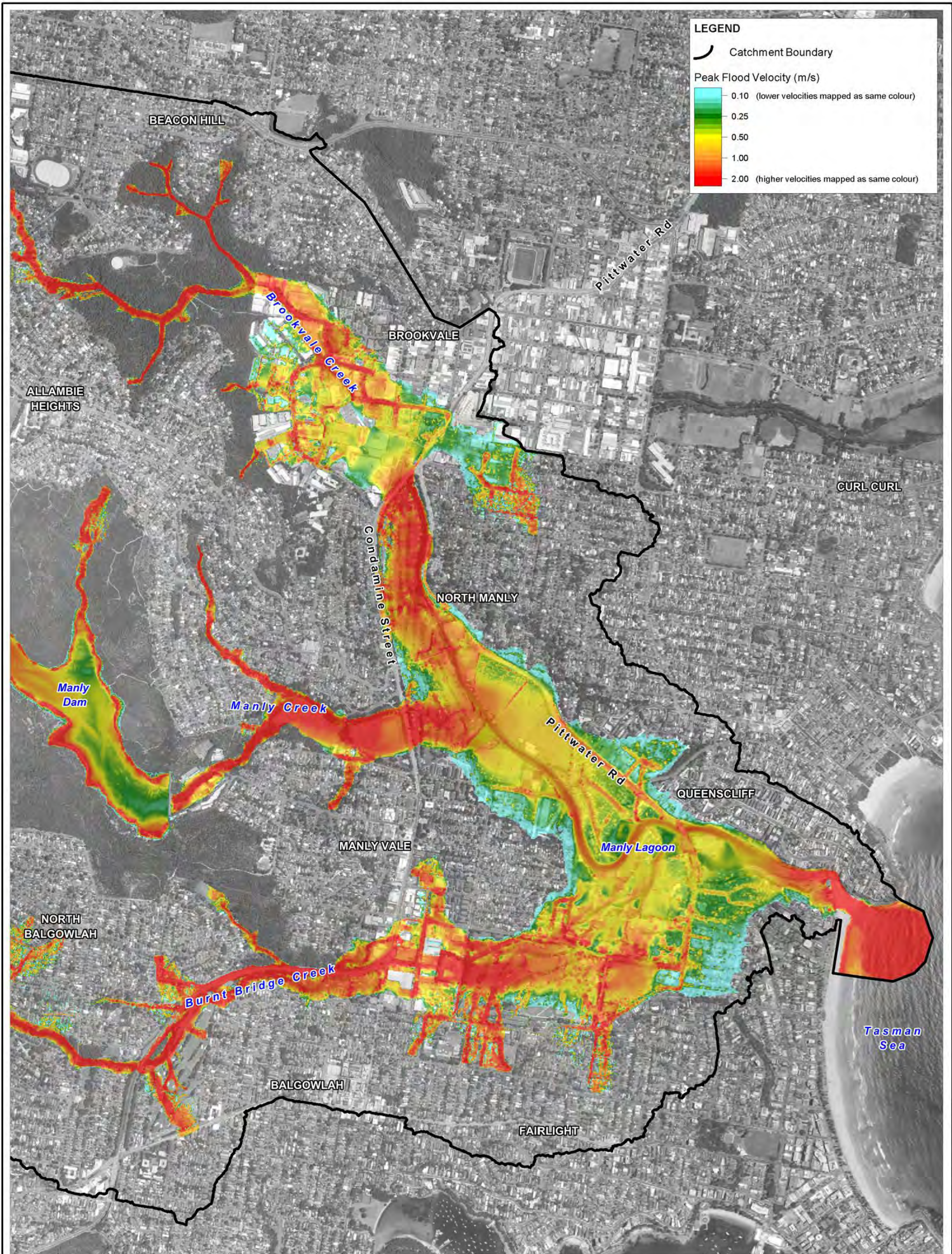


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Title:  
**Manly Lagoon Flood Study - Peak Flood Velocity:  
PMF Catchment Derived Event**

Figure:  
**A-21**

Rev:  
**A DRAFT**

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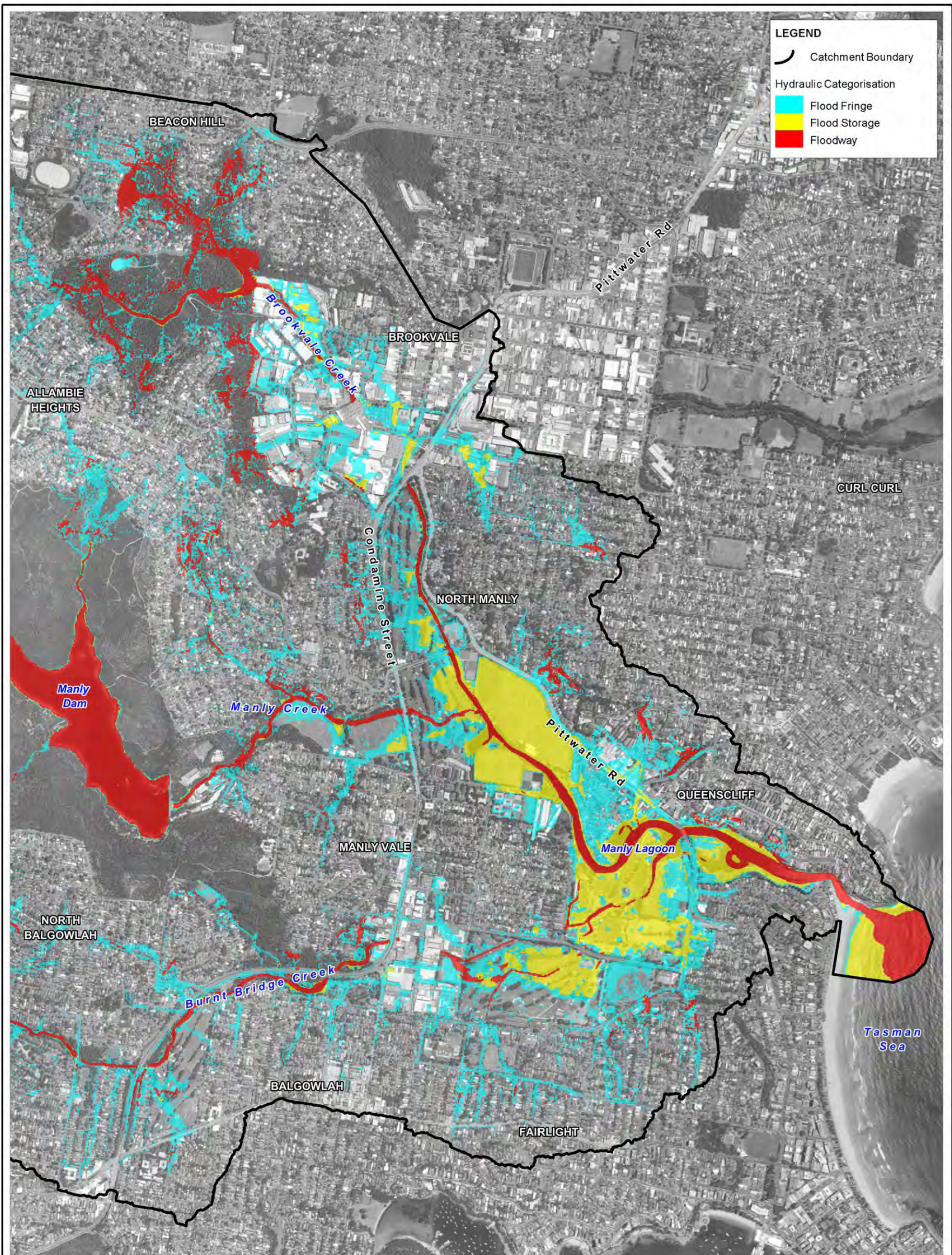


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Title:  
**Manly Lagoon Flood Study - Hydraulic Categories:  
20% AEP Catchment Derived Event**

Figure:  
**A-22**

Rev:  
**A DRAFT**

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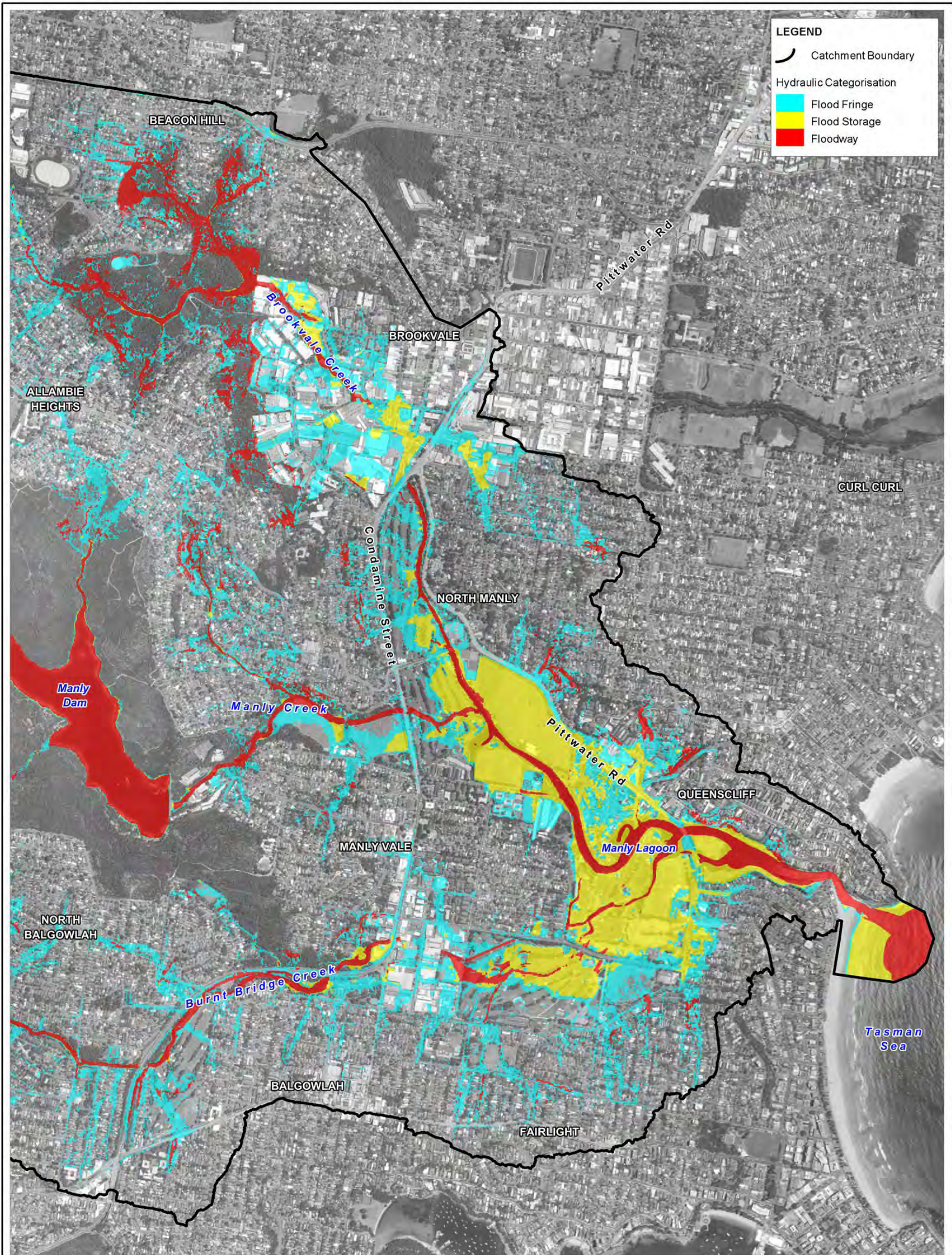


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Title:  
**Manly Lagoon Flood Study - Hydraulic Categories:  
5% AEP Catchment Derived Event**

Figure:  
**A-23**

Rev:  
**A DRAFT**

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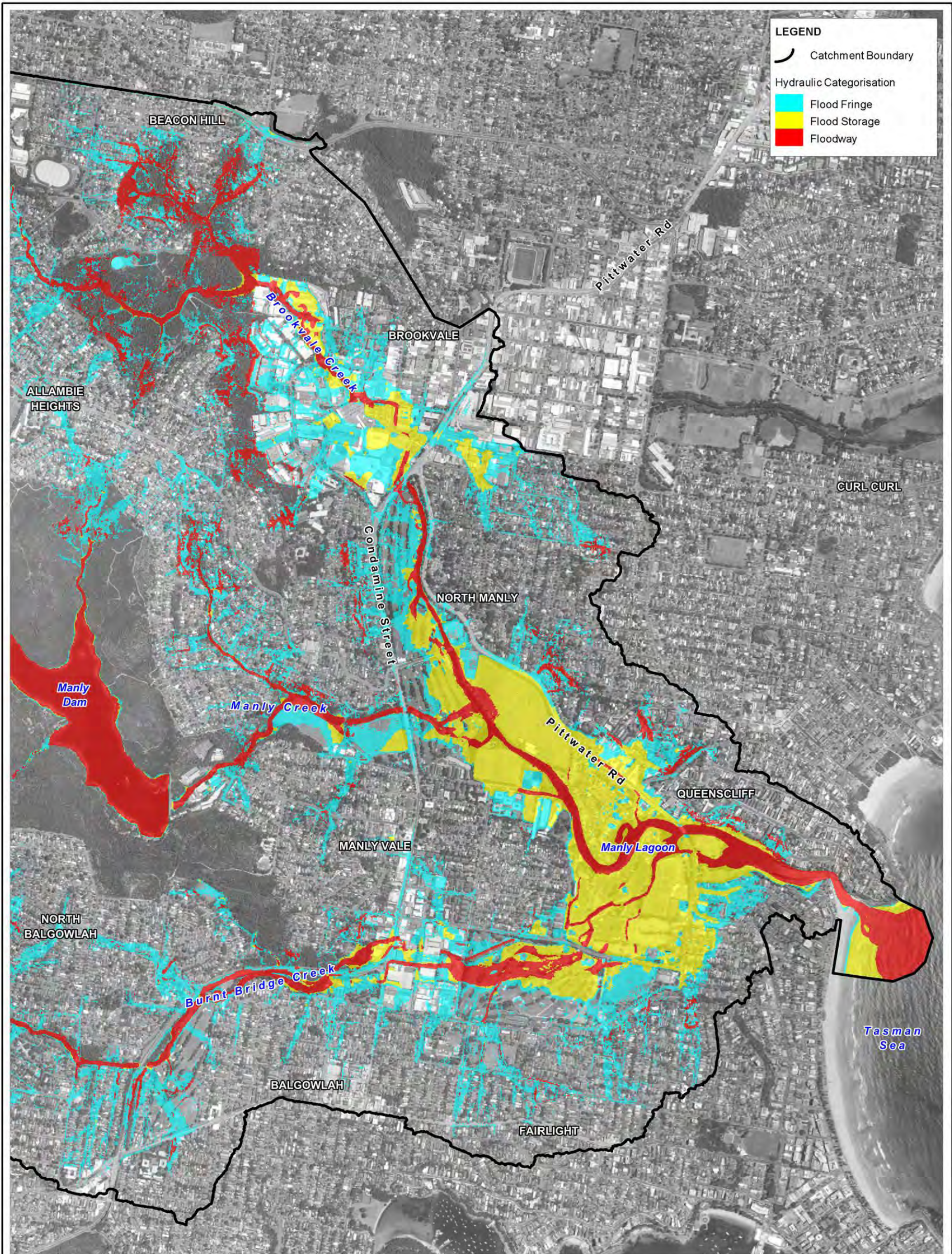


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**LEGEND**

Catchment Boundary

Hydraulic Categorisation

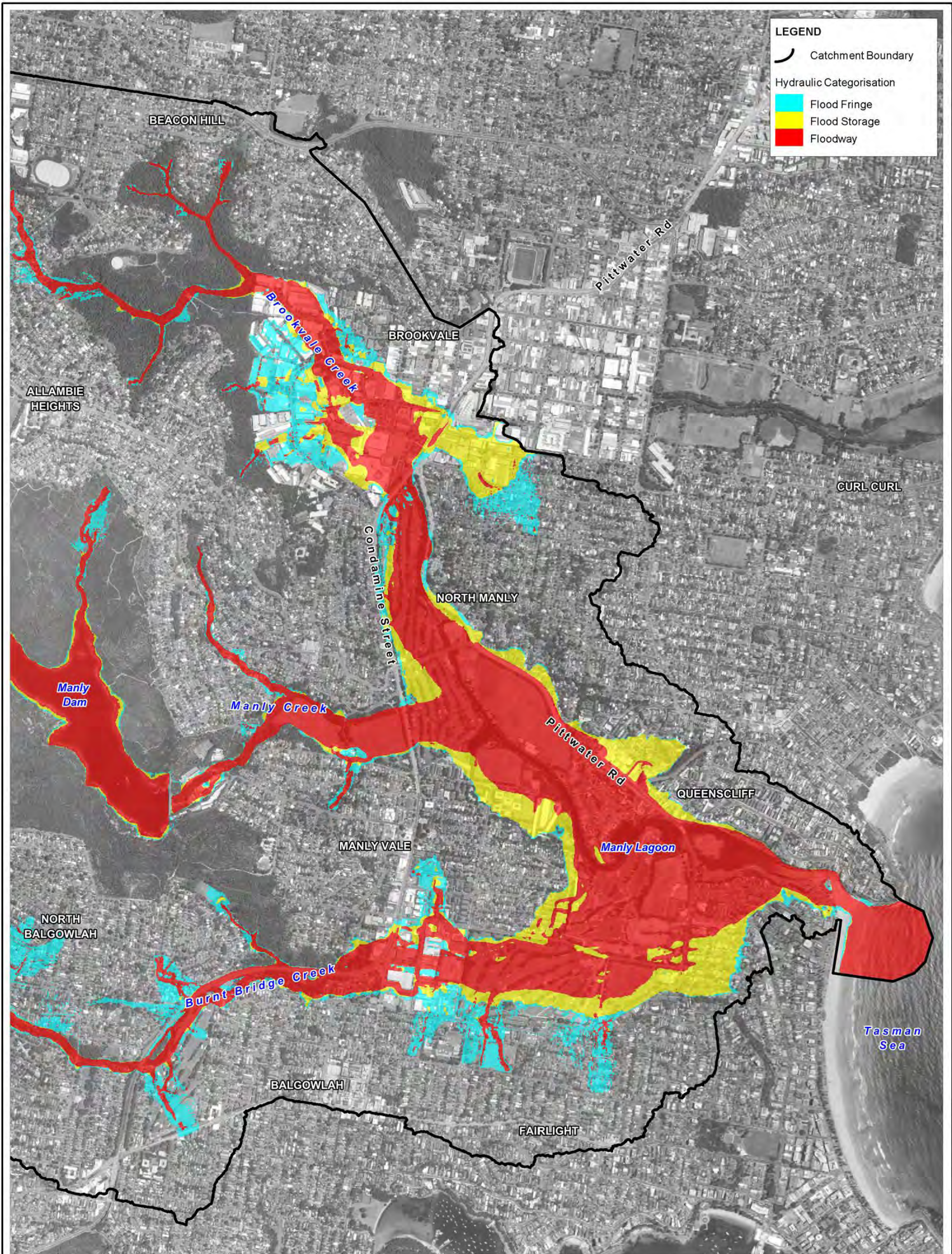
Flood Fringe

Flood Storage

Floodway

<p>Title:</p> <p><b>Manly Lagoon Flood Study - Hydraulic Categories: 1% AEP Catchment Derived Event</b></p>	<p>Figure:</p> <p><b>A-24</b></p>	<p>Rev:</p> <p><b>A DRAFT</b></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>	<p> N</p> <p>0 375 750m</p> <p>Approx. Scale</p>	<p> <b>BMT WBM</b> www.bmtwbm.com.au</p>
<p>Filepath : K:\N2069_Manly_Lagoon_Flood_Study\MI\Workspaces\Design_Mapping\Final_A3\Fig_A24_1%AEH_HydCat.WOR</p>		





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

Figure:  
**A-25**

Rev:  
**A DRAFT**

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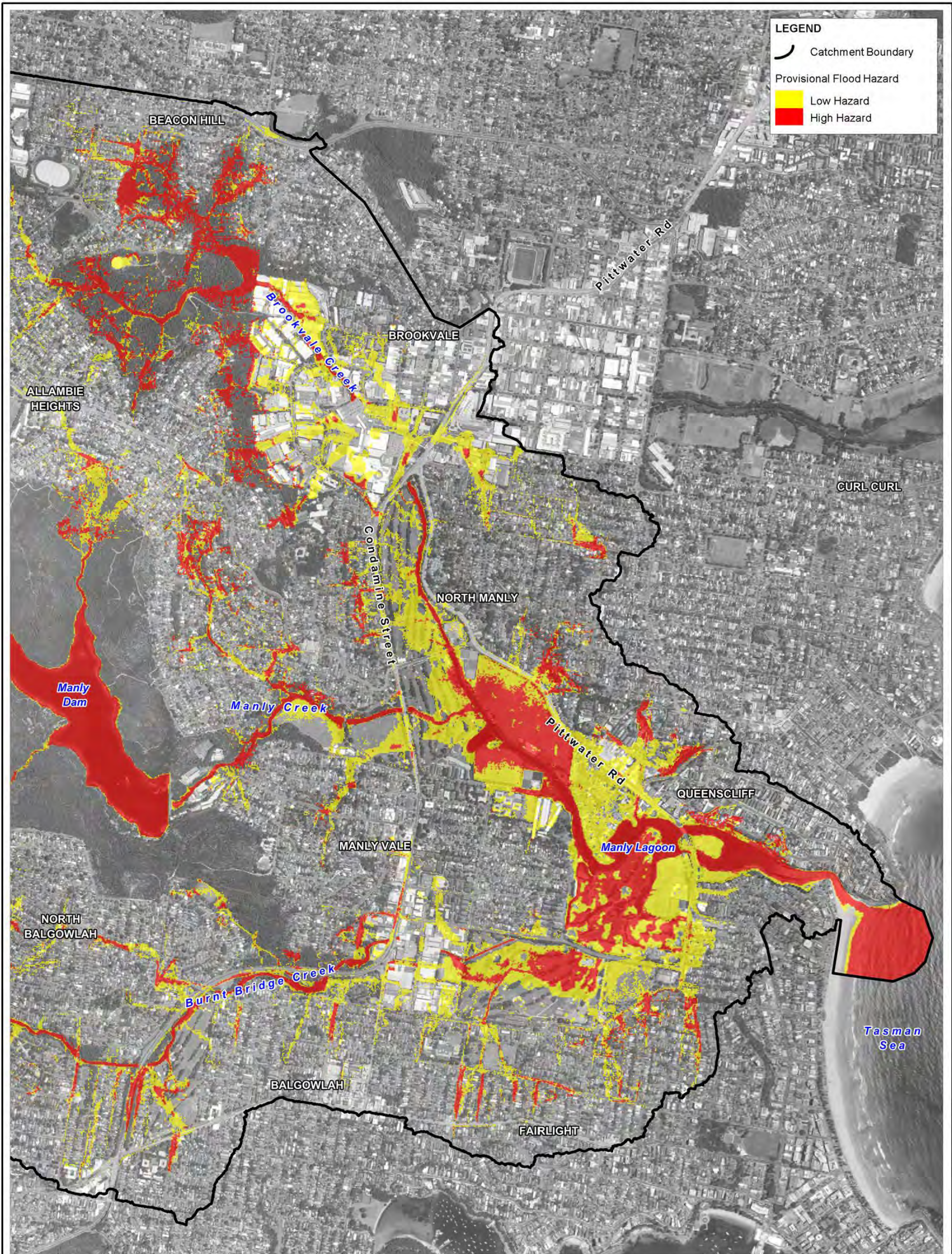


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Approx. Scale



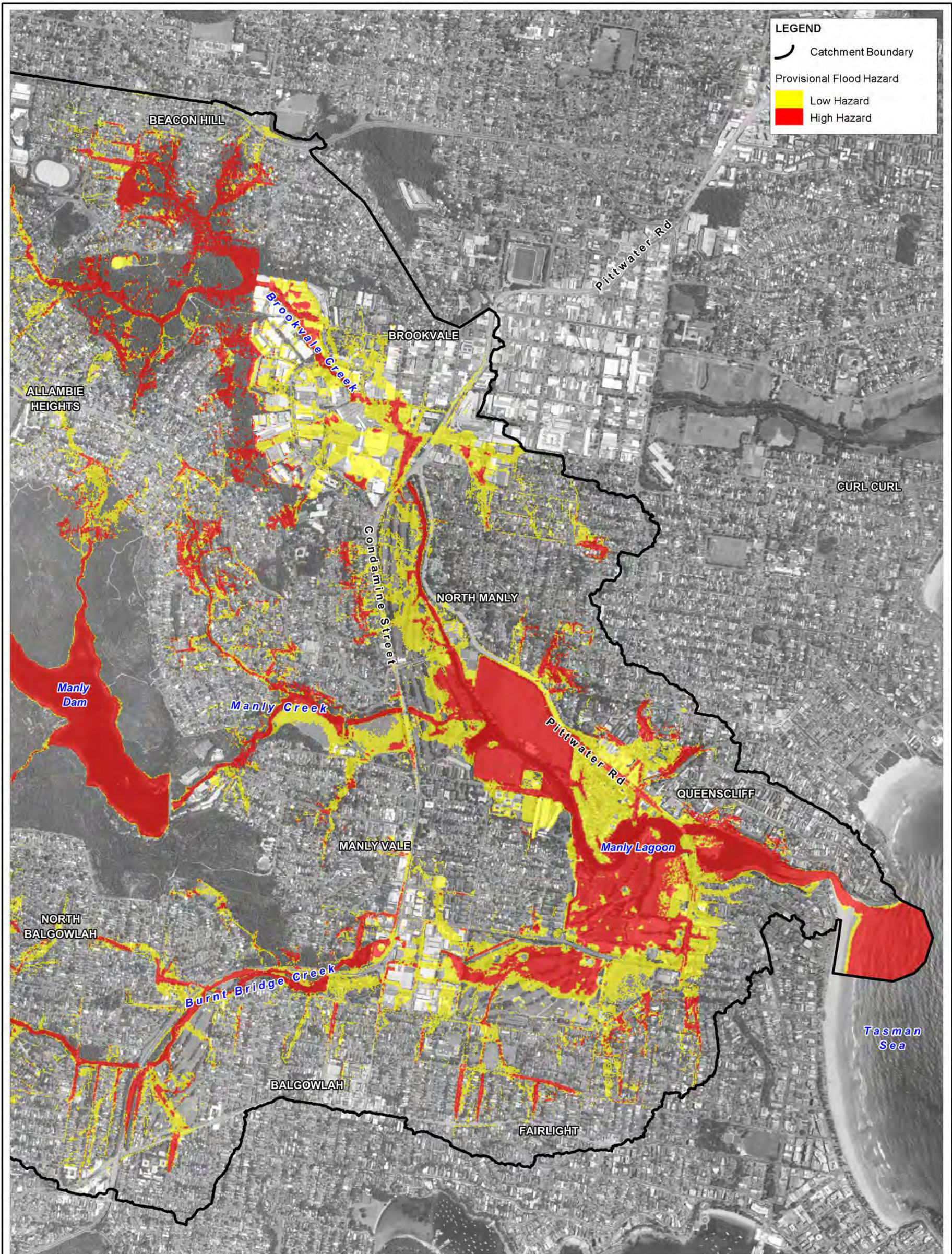
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Title: <b>Manly Lagoon Flood Study - Provisional Flood Hazard: 20% AEP Catchment Derived Event</b>		Figure: <b>A-26</b>	Rev: <b>A DRAFT</b>
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Title:

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

Figure:

**A-27**

Rev:

**A DRAFT**

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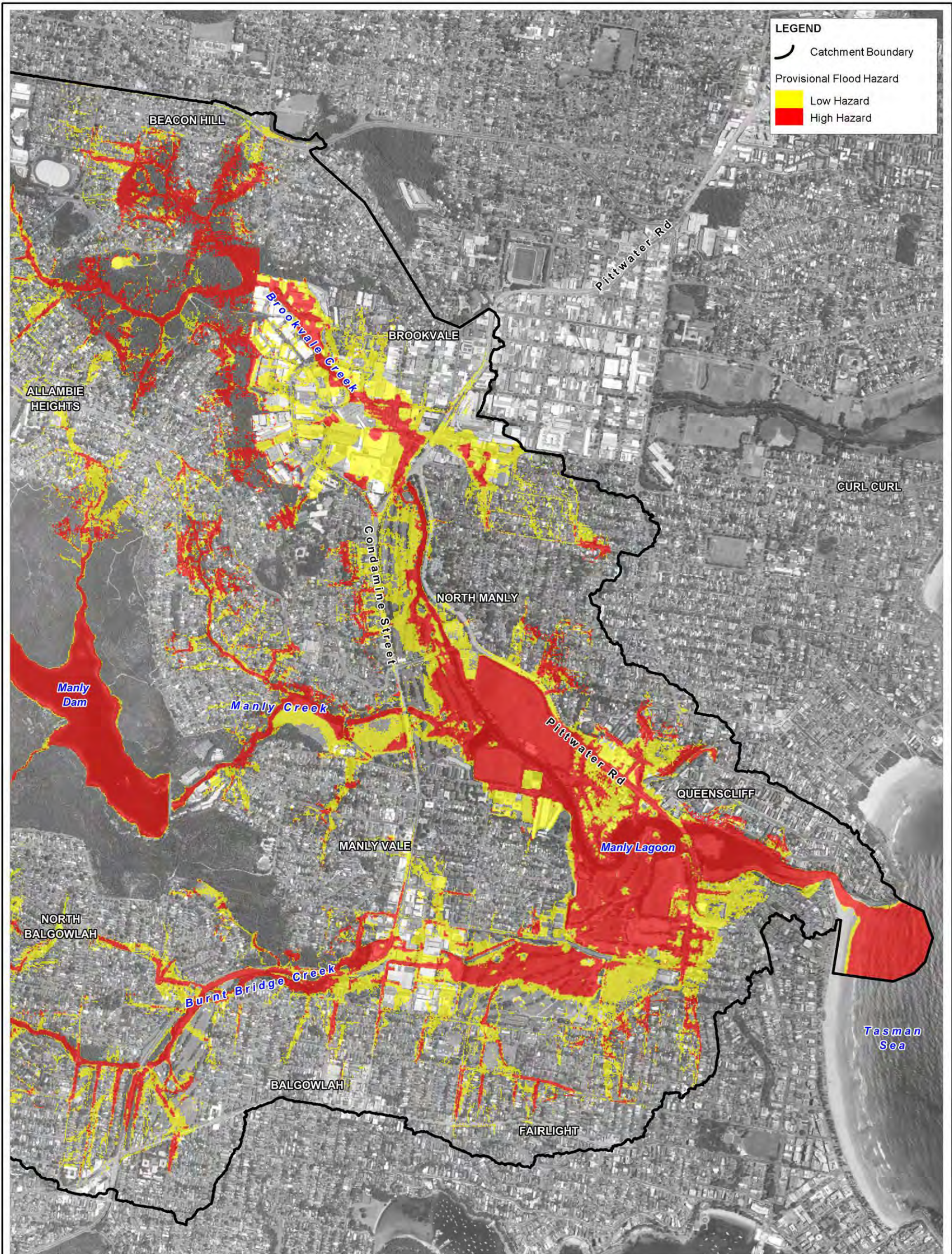


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Approx. Scale



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Title:

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

Figure:

**A-28**

Rev:

**A DRAFT**

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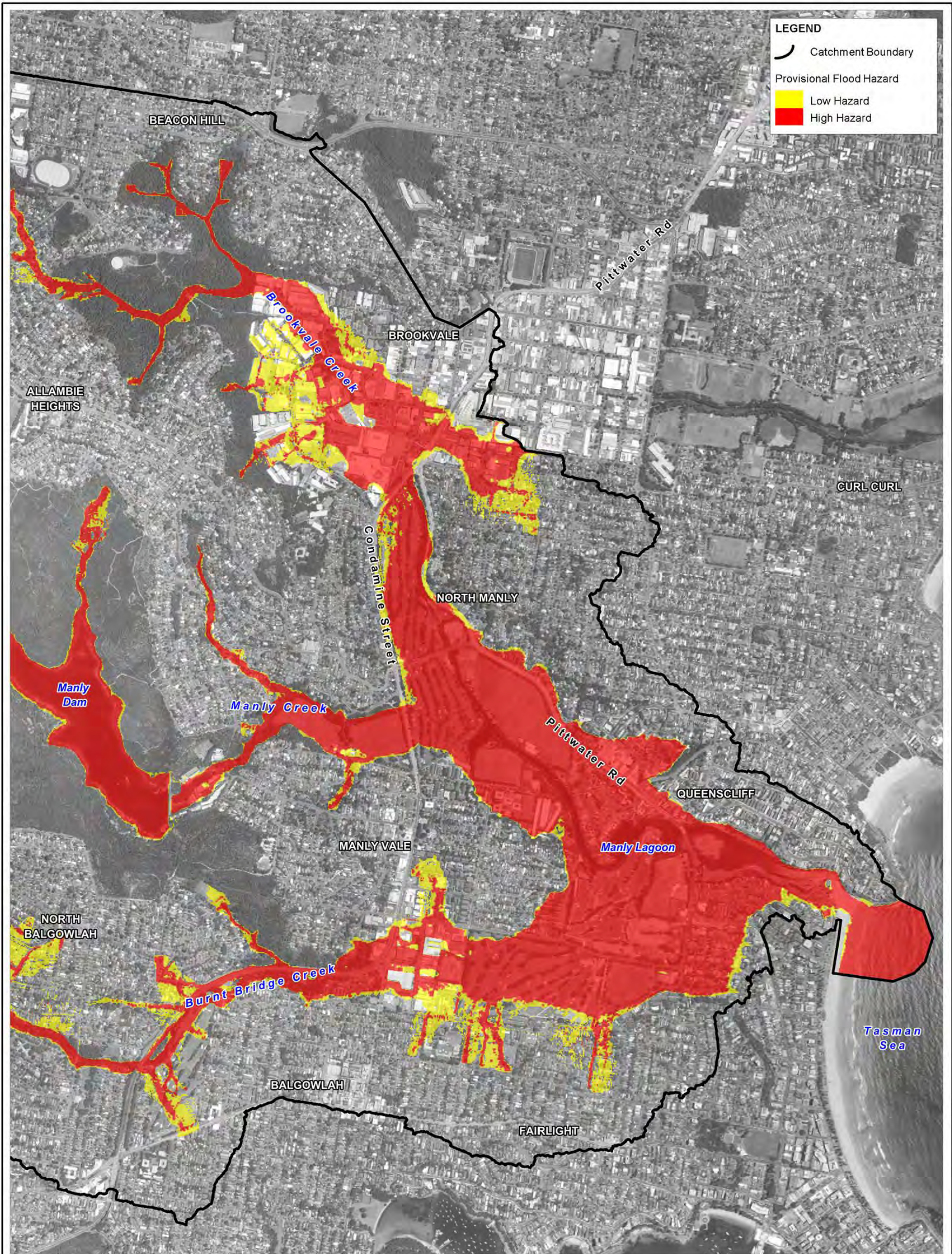


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Title:  
**Manly Lagoon Flood Study - Provisional Flood Hazard:  
PMF Catchment Derived Event**

Figure:  
**A-29**

Rev:  
**A DRAFT**

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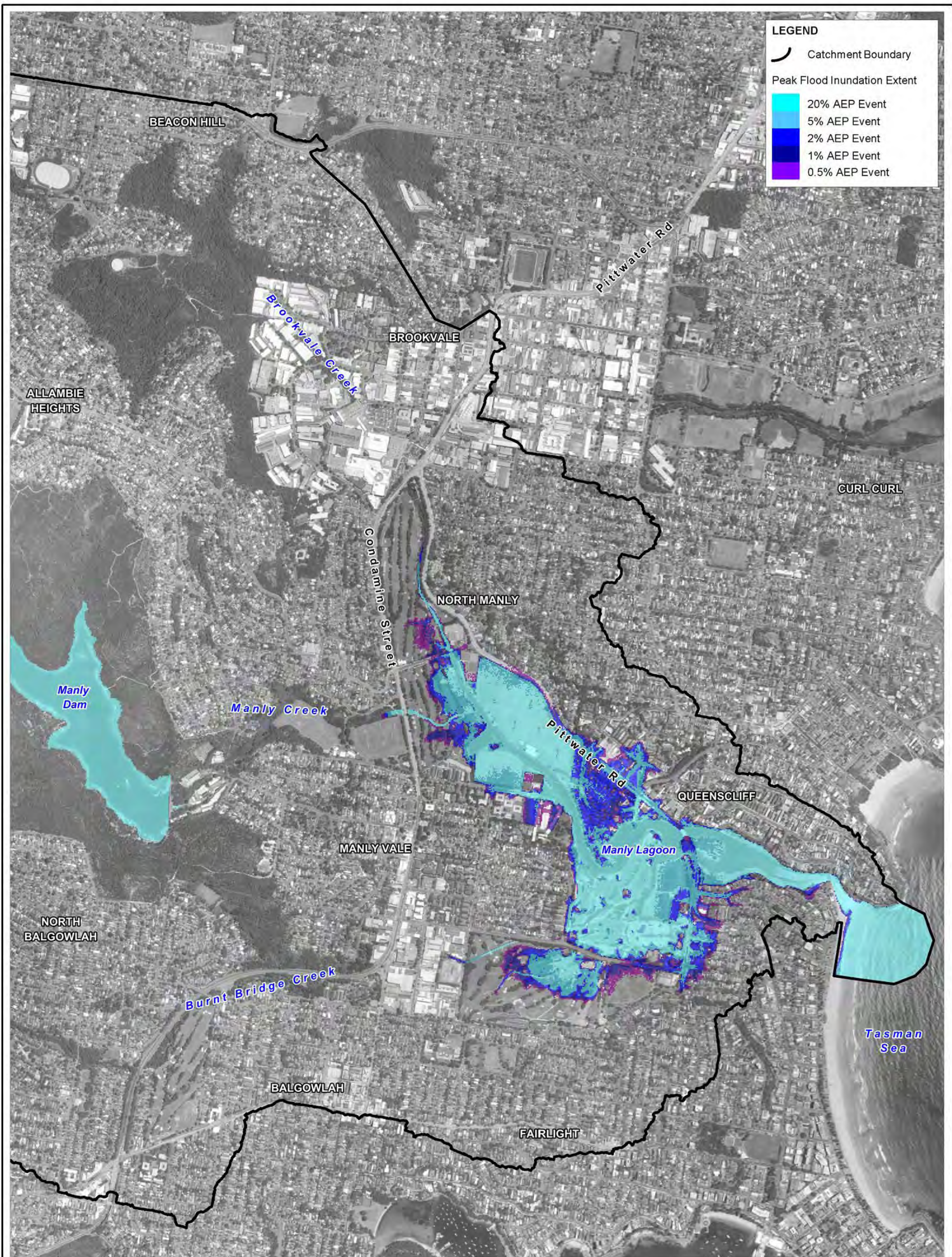


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Title:  
**Manly Lagoon Flood Study - Peak Flood Inundation Extent:  
Ocean Derived Events**

Figure:  
**A-30**

Rev:  
**A DRAFT**

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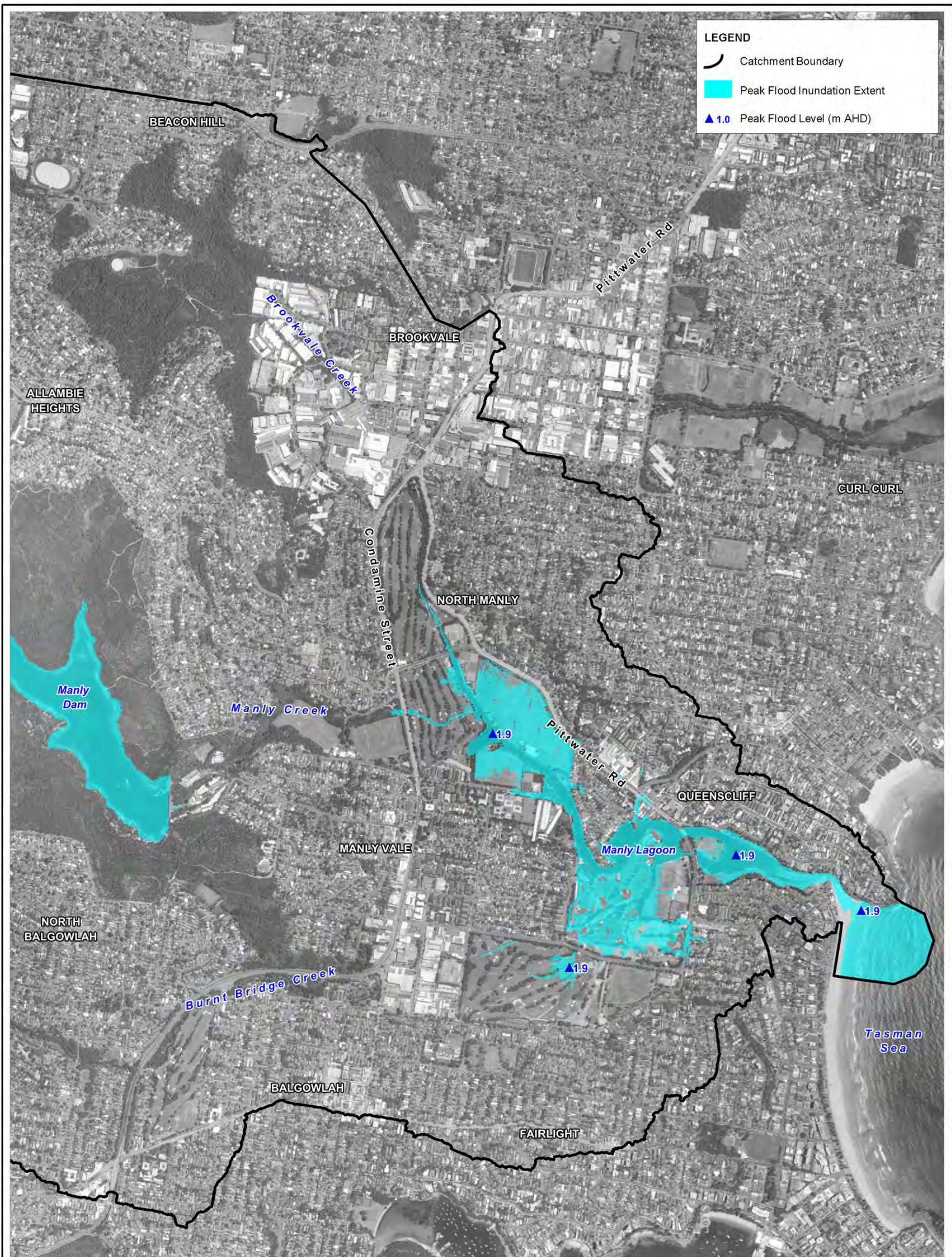


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Approx. Scale



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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 DRAFT**

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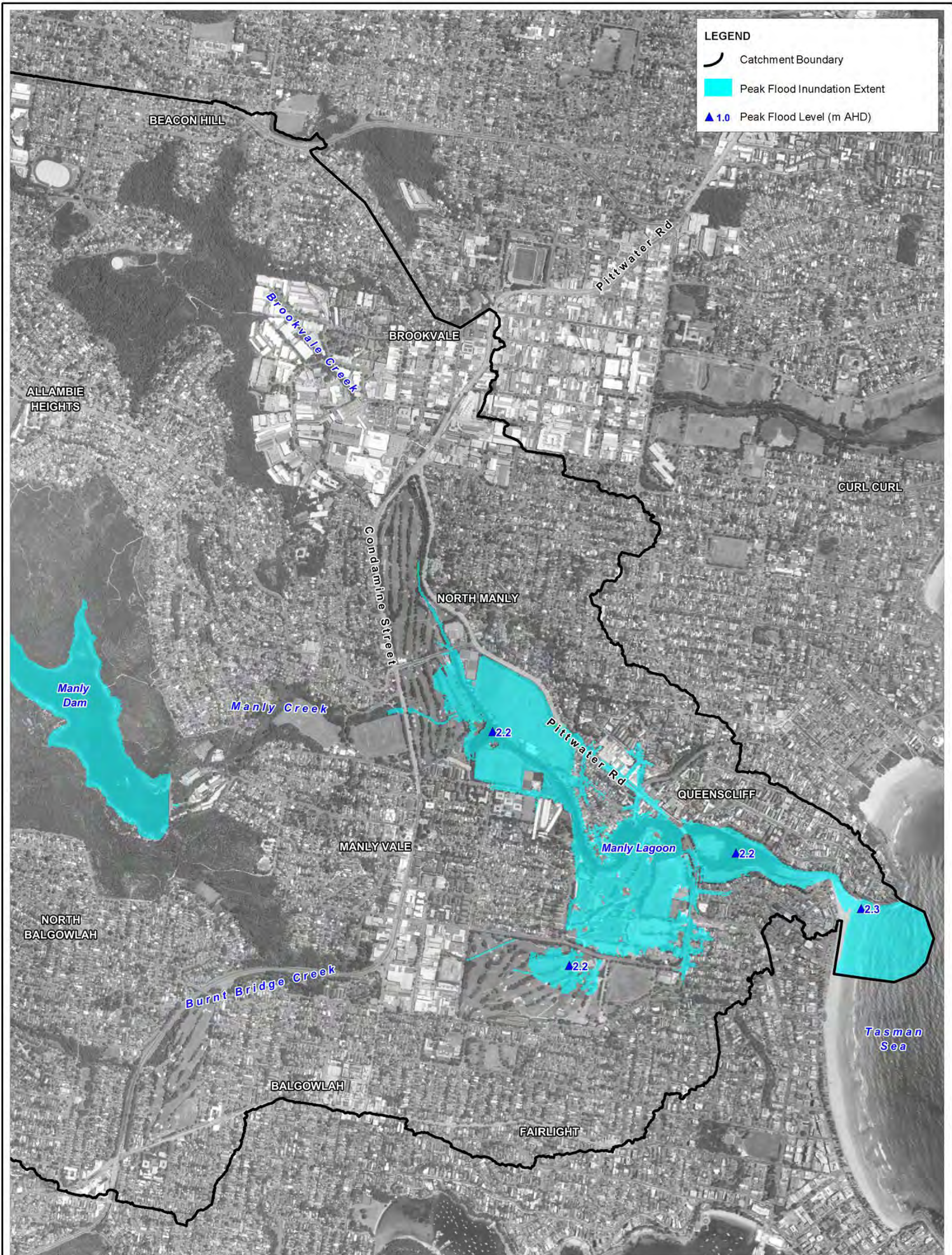


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Approx. Scale



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Title:

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

Figure:

**A-32**

Rev:

**A DRAFT**

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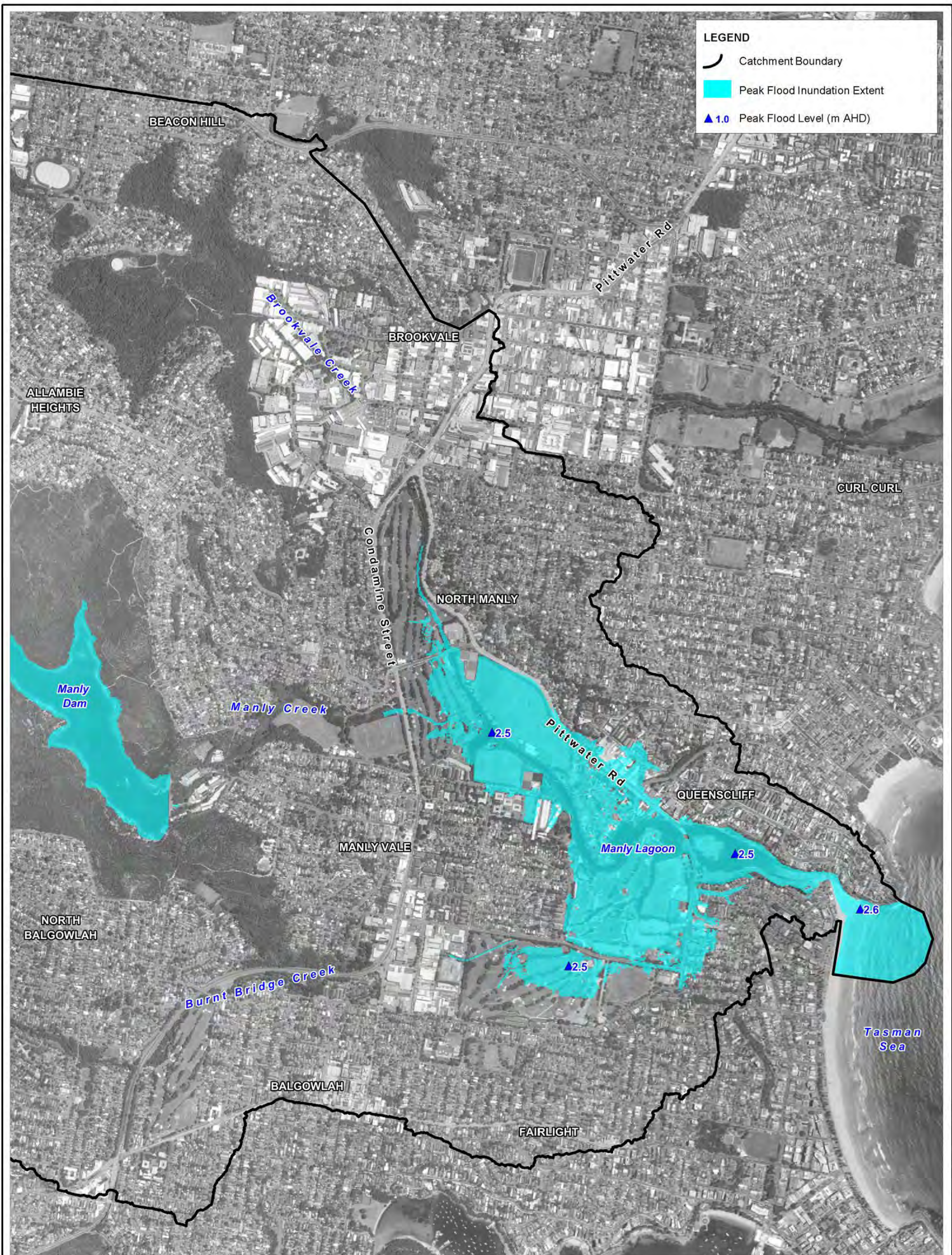



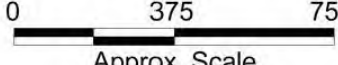

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Approx. Scale



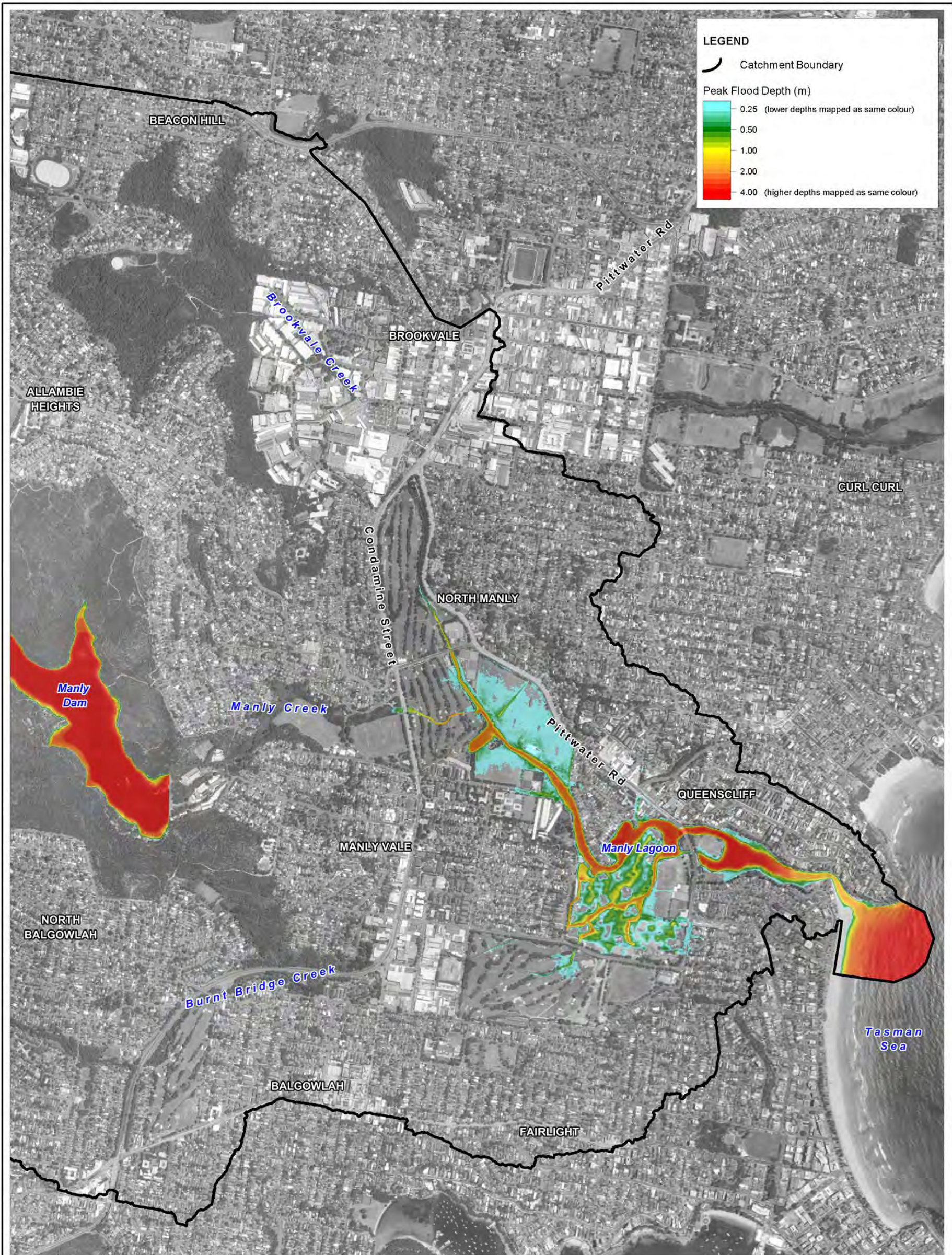
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Title: <b>Manly Lagoon Flood Study - Peak Flood Extent and Peak Flood Levels: 1% AEP Ocean Derived Event</b>		Figure: <b>A-33</b>	Rev: <b>A DRAFT</b>
BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.	<div><div><div>N</div><div></div></div><div><div>0375750m</div><div></div><div>Approx. Scale</div></div></div>		<div><div><b>BMT WBM</b> www.bmtwbm.com.au</div></div>
Filepath : K:\N2069 Manly Lagoon Flood Study\MI\Workspaces\Design Mapping\Final A3\Fig A33 1%AEP WaterLevel Ocean.WOR			





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

Figure:  
**A-34**

Rev:  
**A DRAFT**

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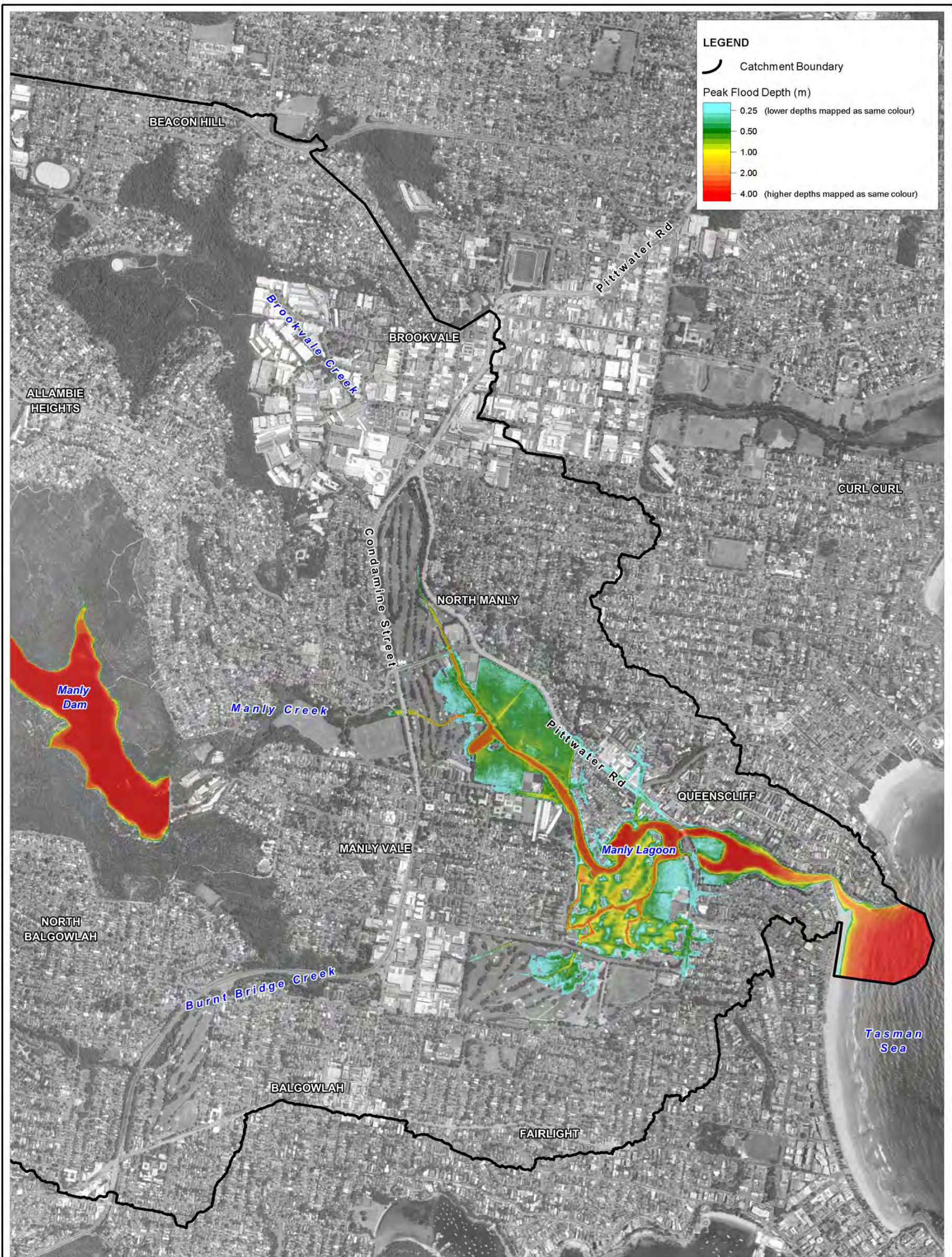


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Approx. Scale



Filepath : K:\N2069\_Manly\_Lagoon\_Flood\_Study\MI\Workspaces\Design\_Mapping\Final\_A3\Fig\_A34\_20%AEP\_Depth\_Ocean.WOR





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

Figure:  
**A-35**

Rev:  
**A DRAFT**

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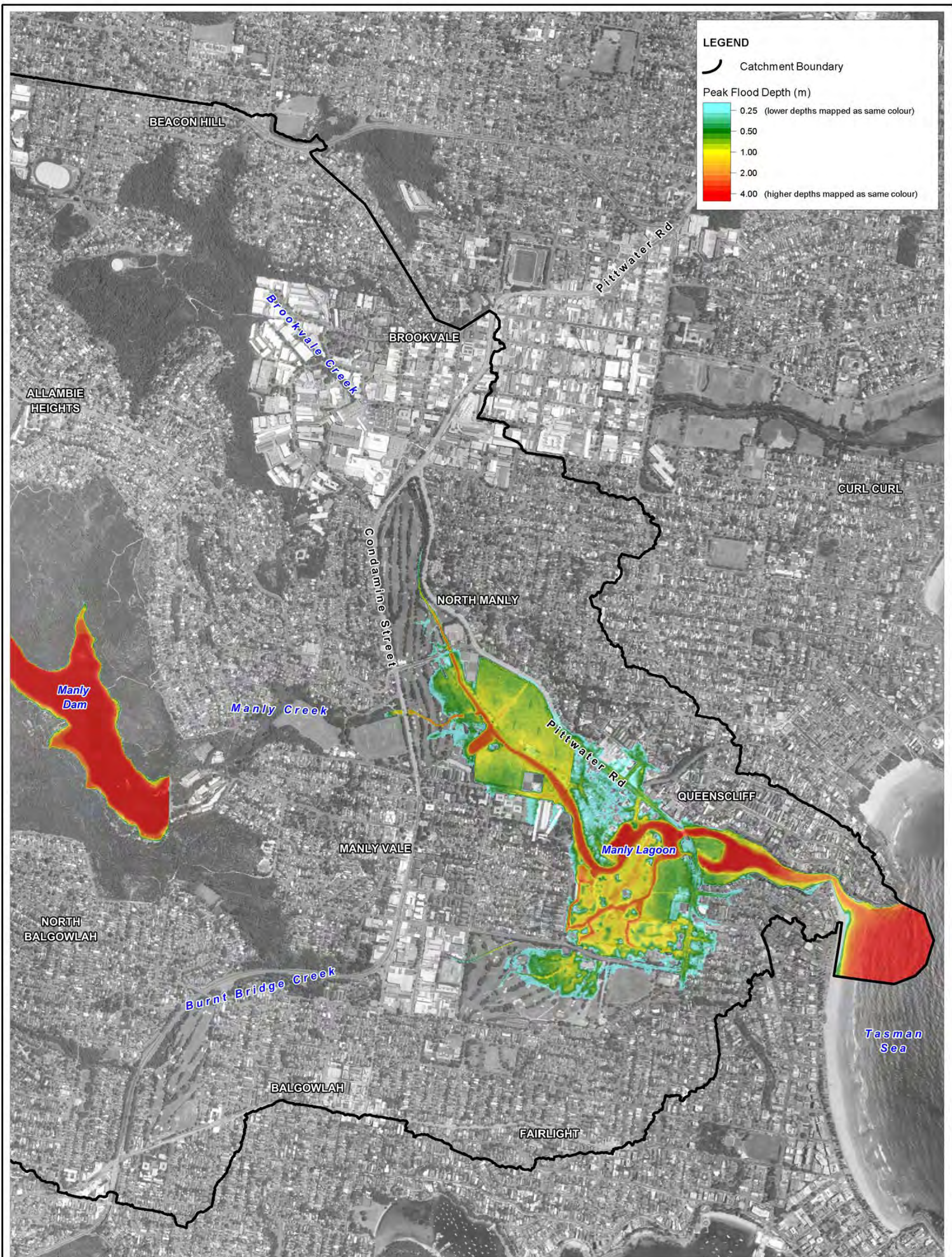


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Approx. Scale



Filepath : K:\N2069\_Manly\_Lagoon\_Flood\_Study\MI\Workspaces\Design\_Mapping\Final\_A3\Fig\_A35\_5% AEP\_Depth\_Ocean.WOR





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

Figure:  
**A-36**

Rev:  
**A DRAFT**

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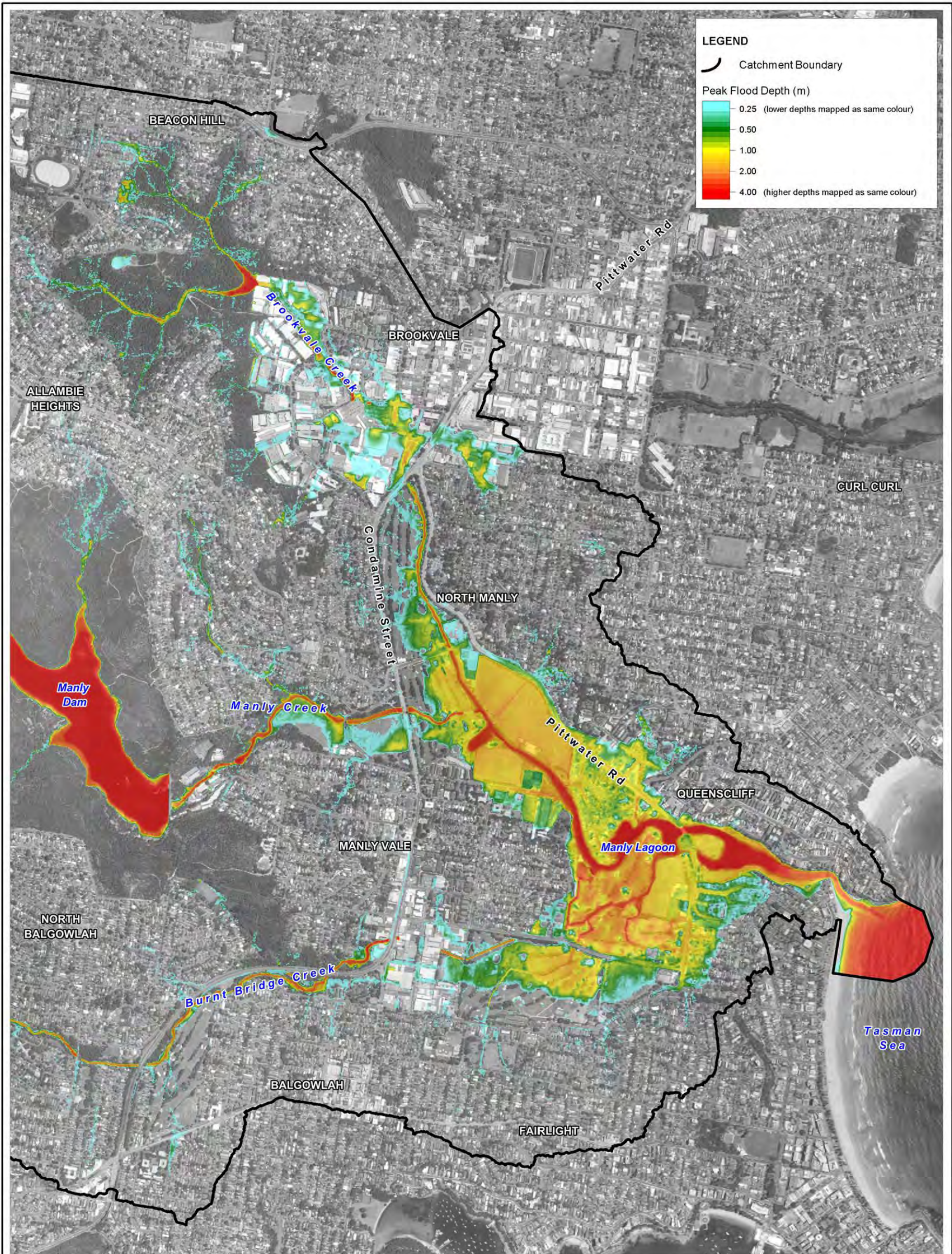


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Approx. Scale



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Title:

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

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0 375 750m  
Approx. Scale

Figure:

**A-37**

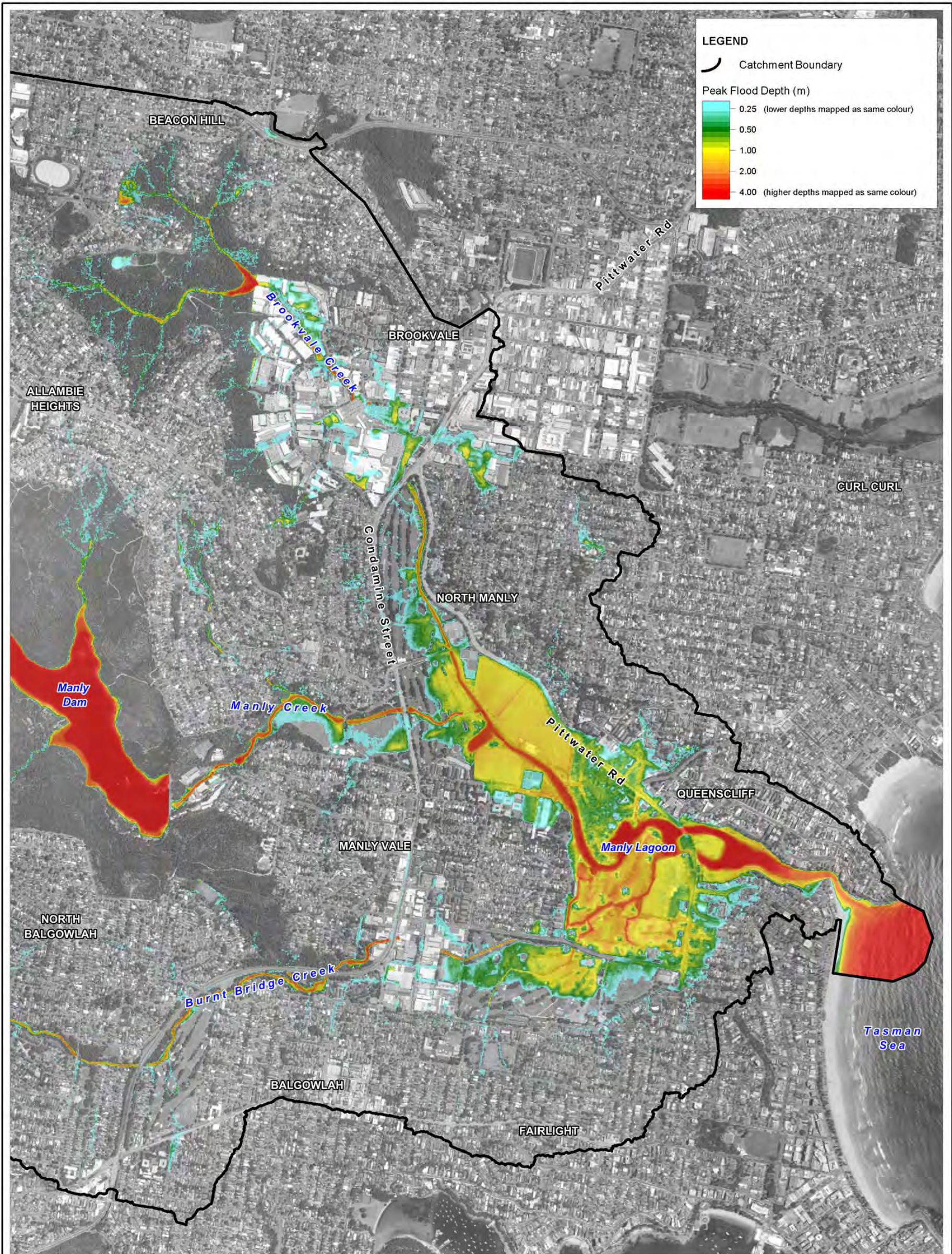
Rev:

**A DRAFT**



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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 DRAFT**

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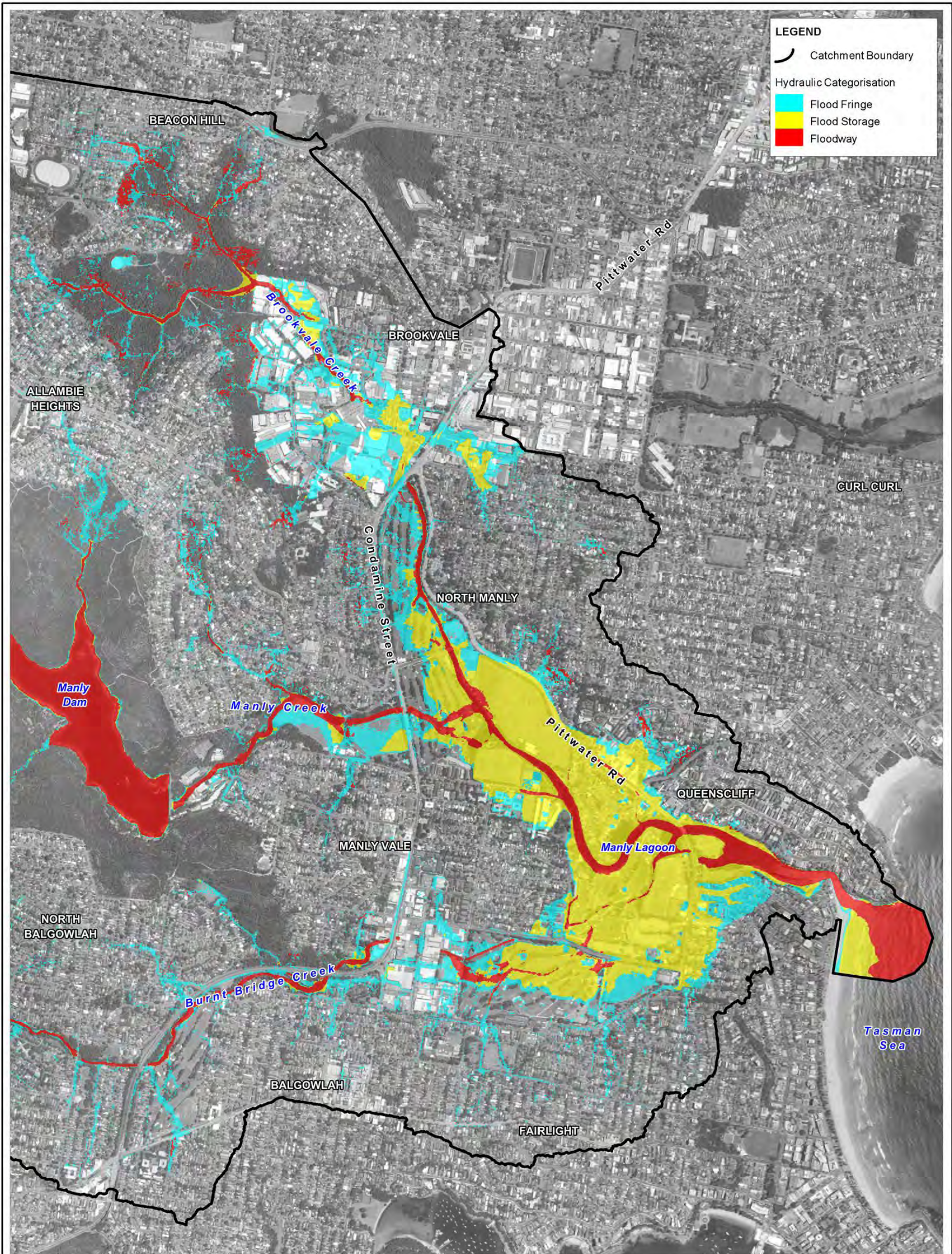


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Approx. Scale



Filepath : K:\N2069\_Manly\_Lagoon\_Flood\_Study\MI\Workspaces\Design\_Mapping\Final\_A3\Fig\_A38\_5%AEPCatchment\_1%AEPOcean\_Depth.WOR





Title:

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

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0 375 750m  
Approx. Scale

Figure:

**A-39**

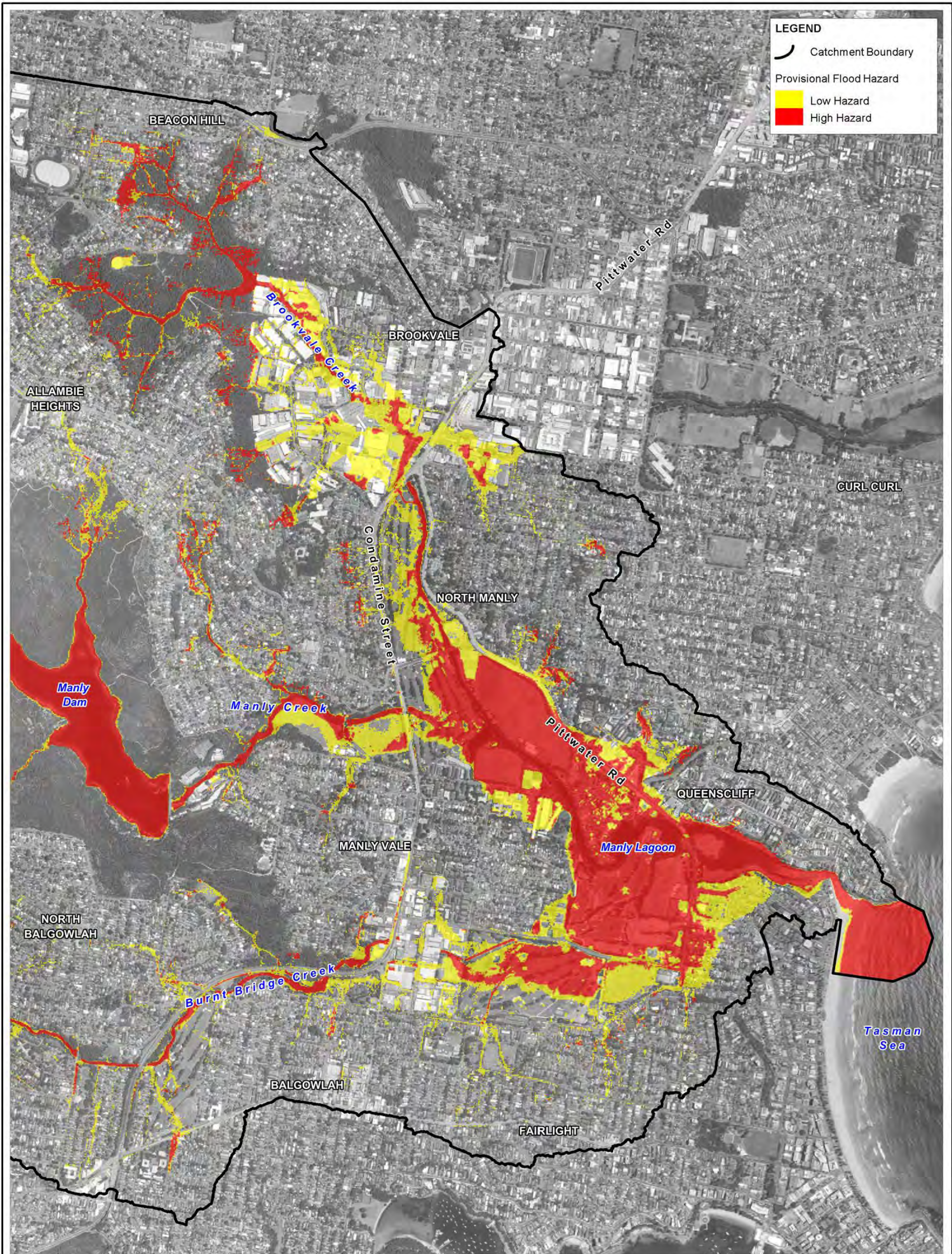
Rev:

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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 DRAFT**

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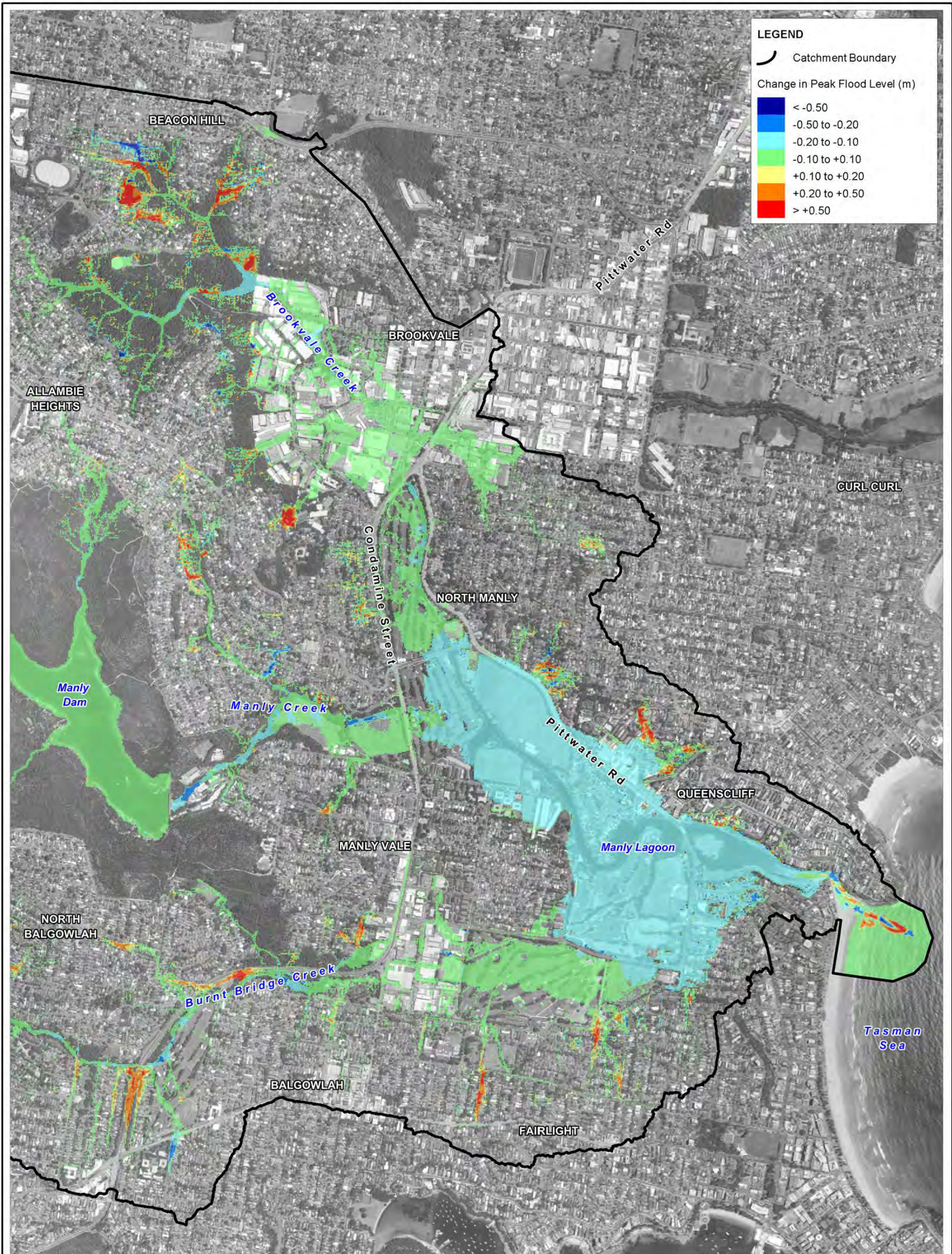


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Approx. Scale



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Title:

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

Figure:

**A-41**

Rev:

**A DRAFT**

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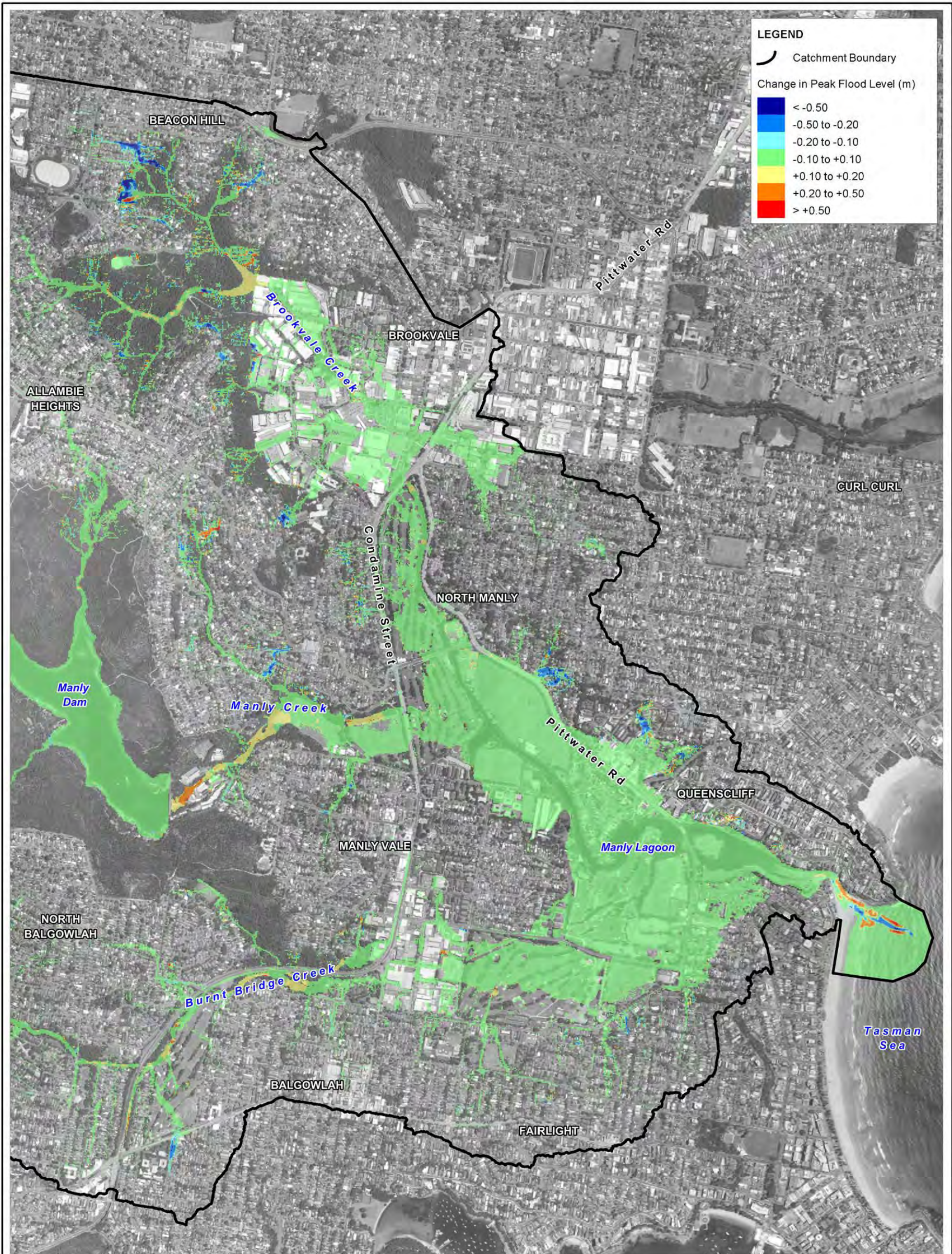


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Approx. Scale



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

Figure:  
**A-42**

Rev:  
**A DRAFT**

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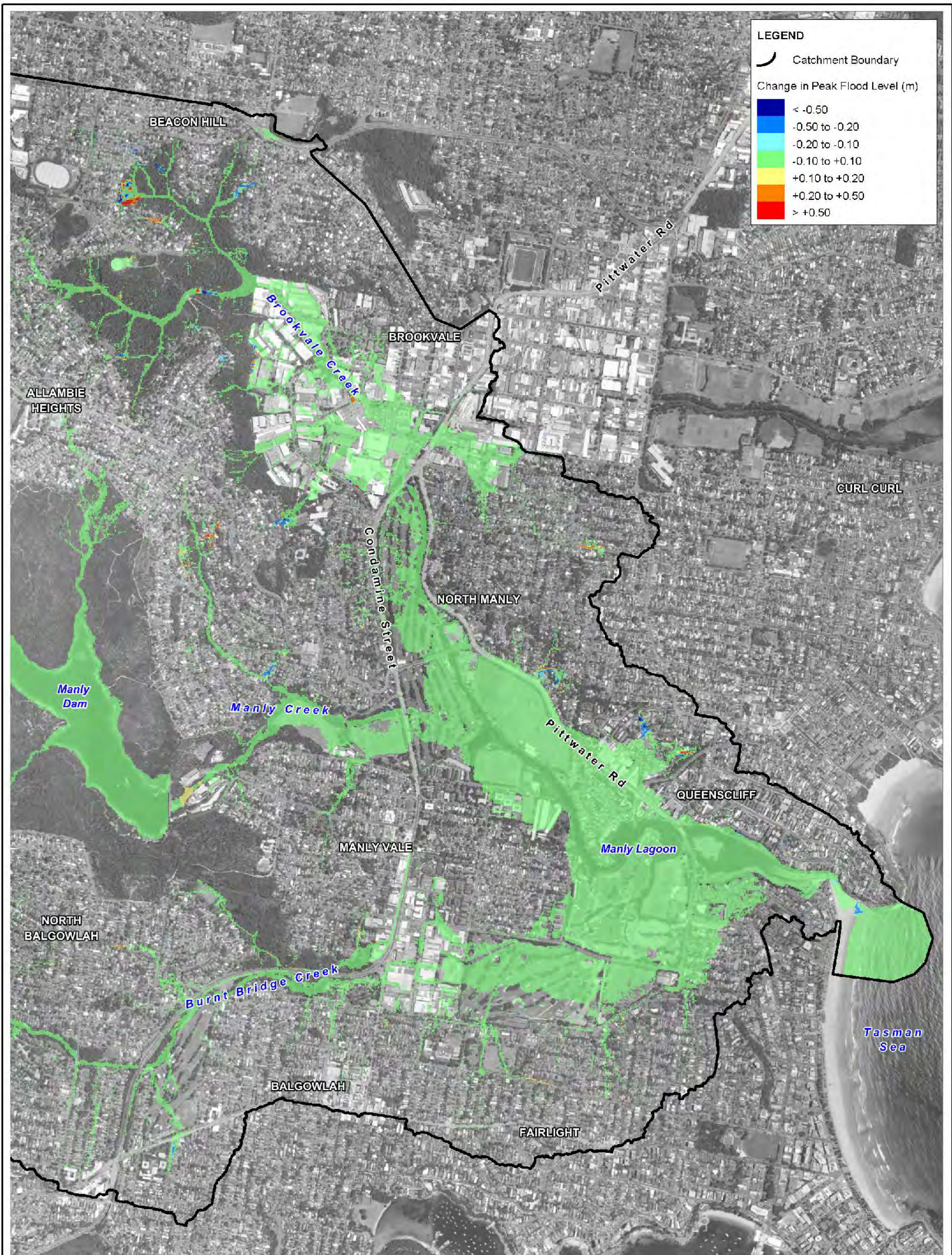


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Approx. Scale



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

Figure:  
**A-43**

Rev:  
**A DRAFT**

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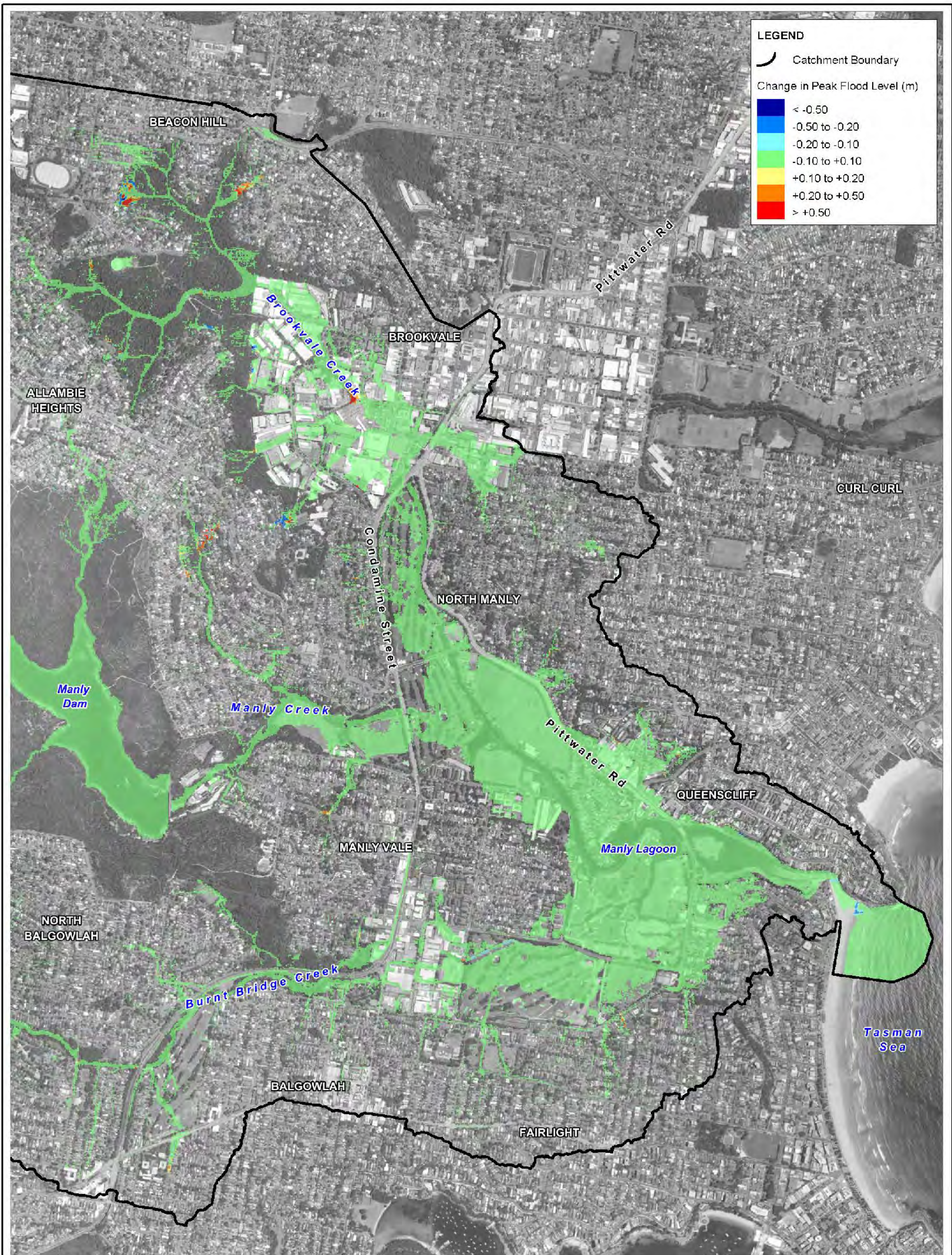


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Approx. Scale



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

Figure:  
**A-44**

Rev:  
**A DRAFT**

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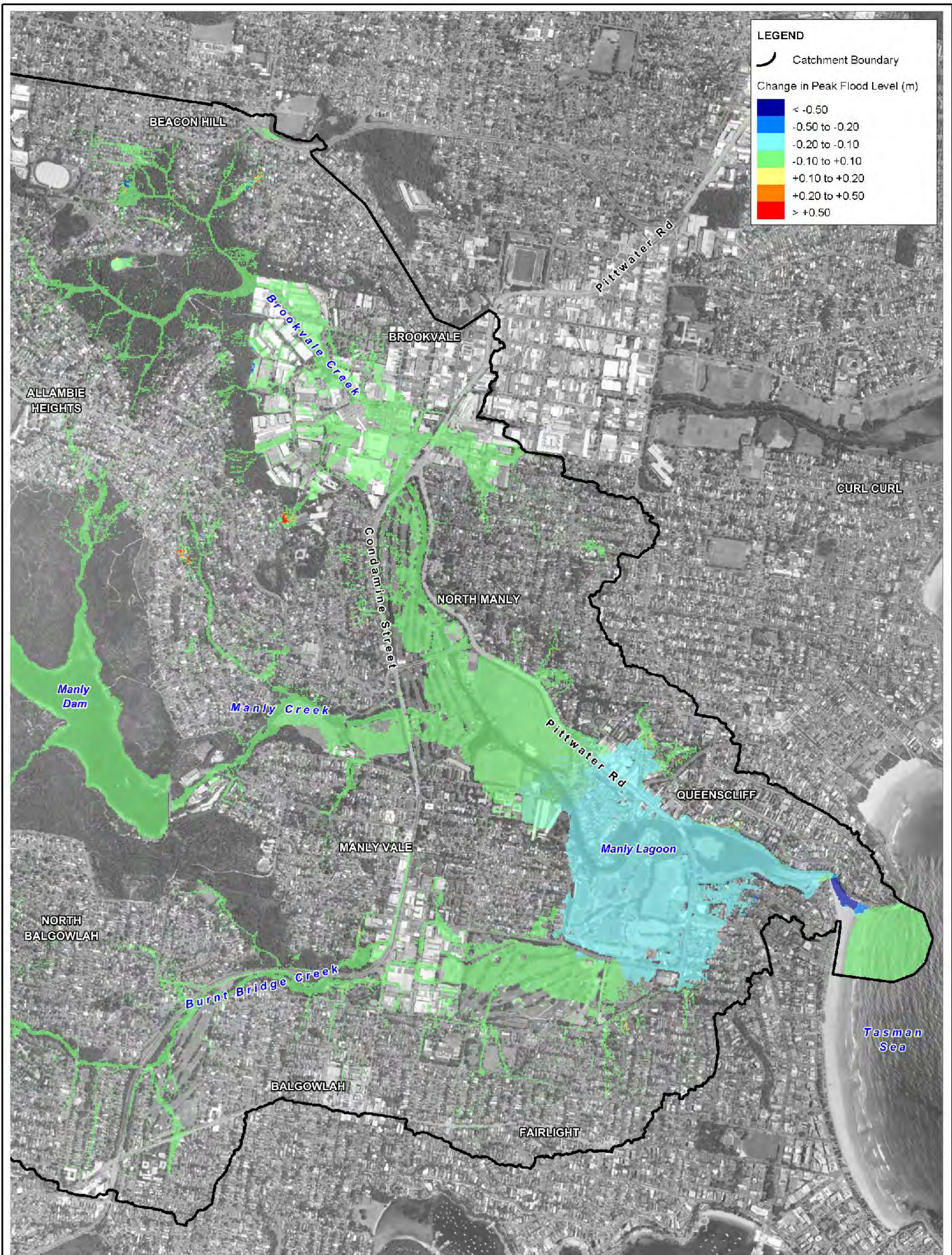


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Approx. Scale



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

Figure:  
**A-45**

Rev:  
**A DRAFT**

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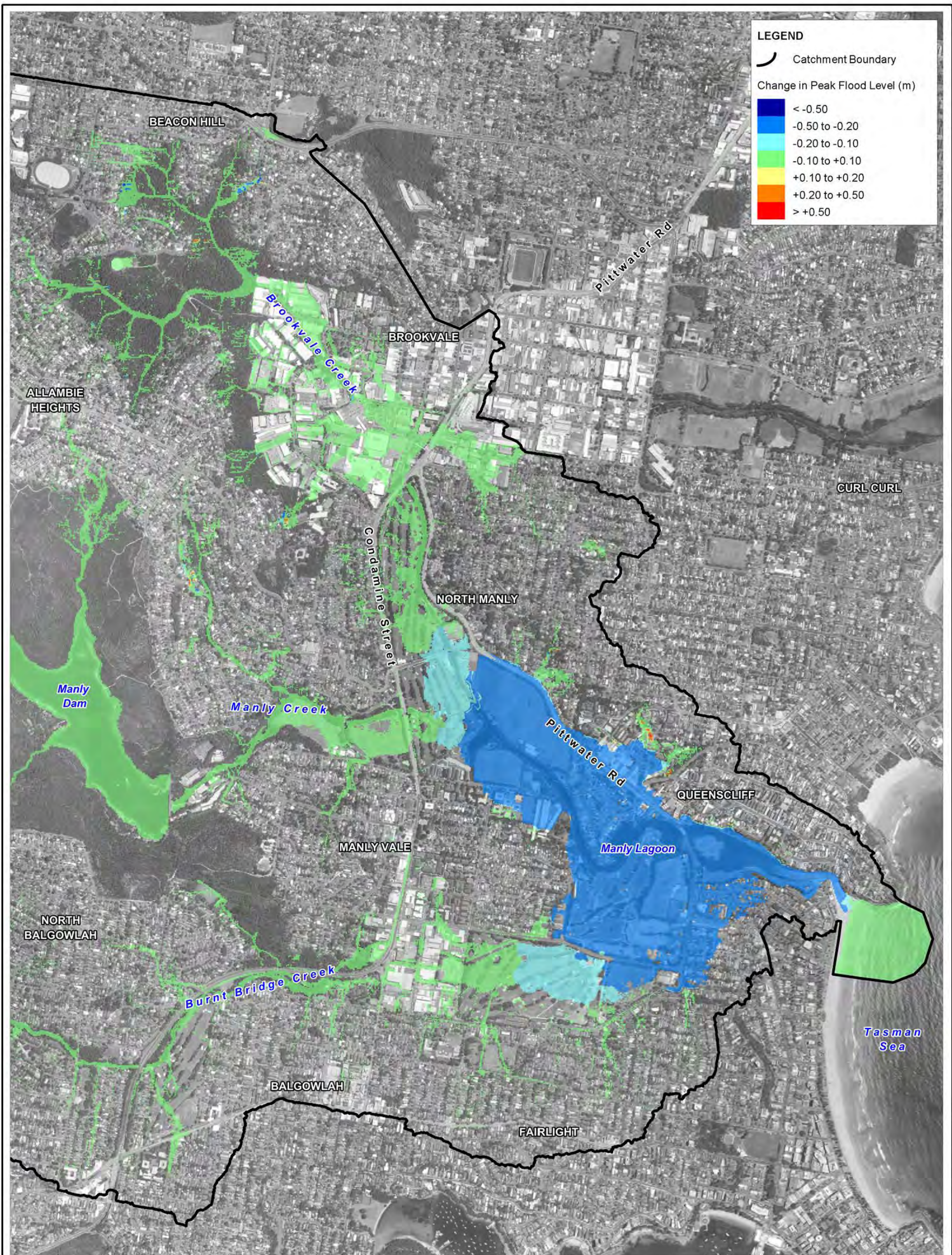


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Approx. Scale



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Title:

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

Figure:

**A-46**

Rev:

**A DRAFT**

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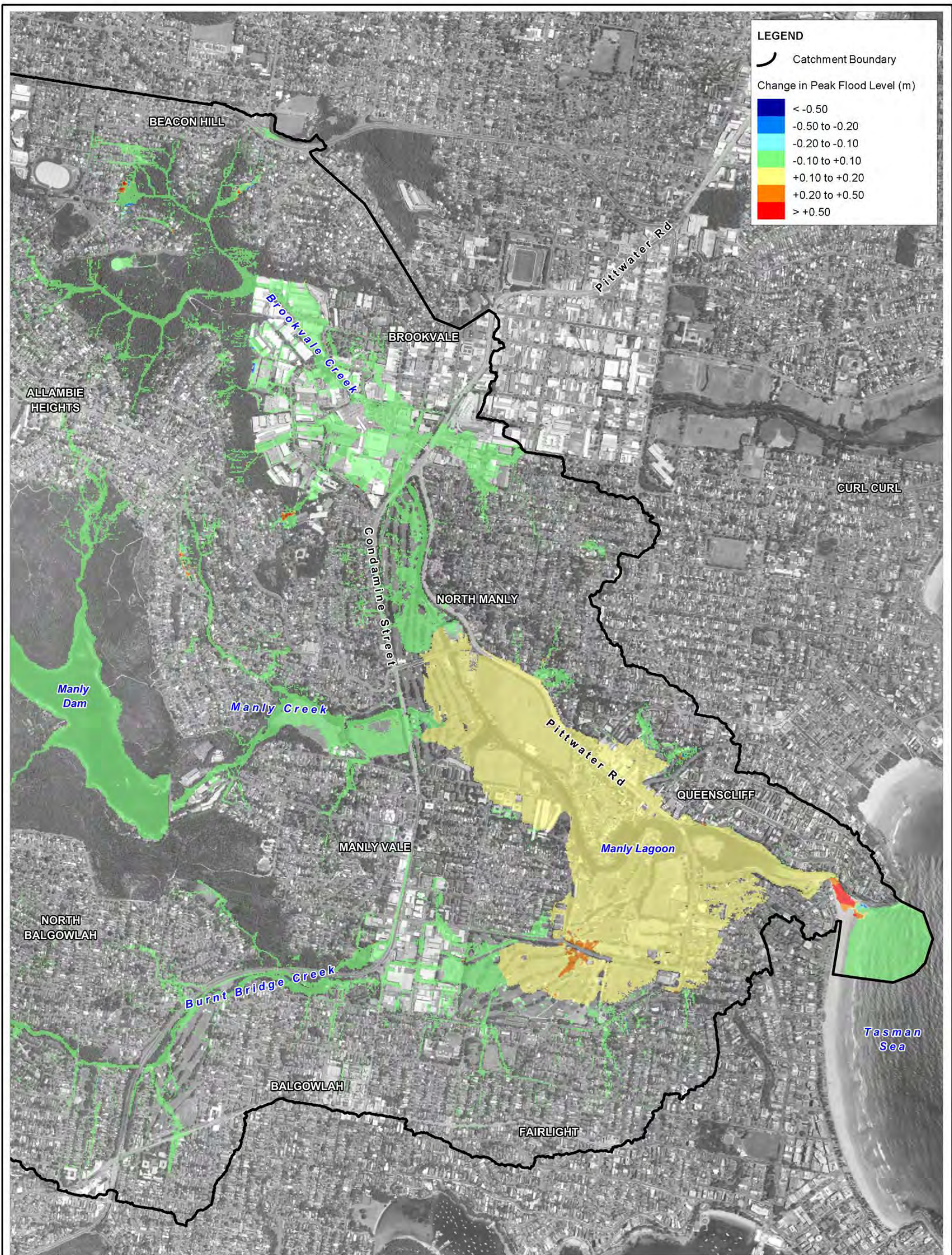


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Approx. Scale



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

Figure:  
**A-47**

Rev:  
**A DRAFT**

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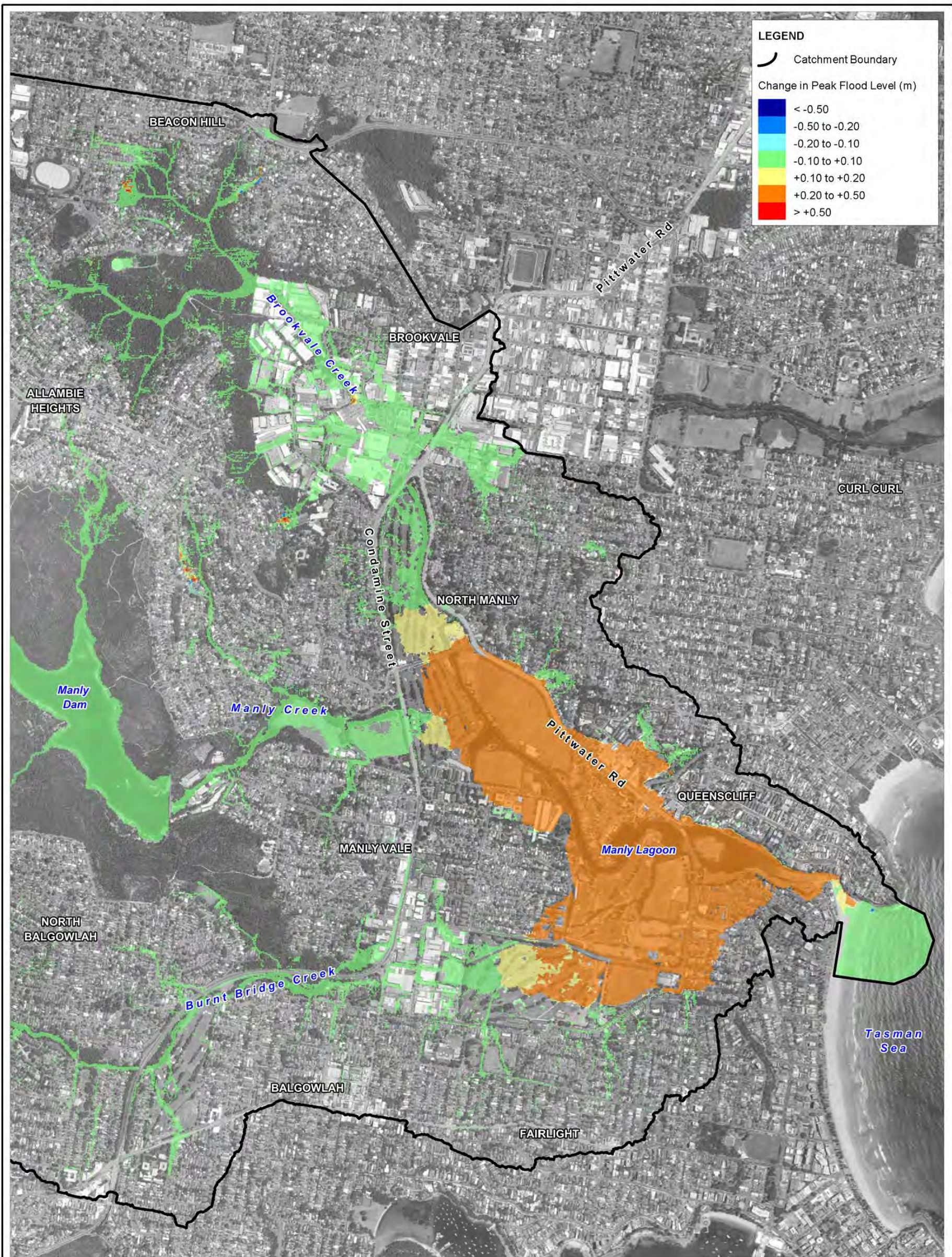


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Approx. Scale



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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 DRAFT**

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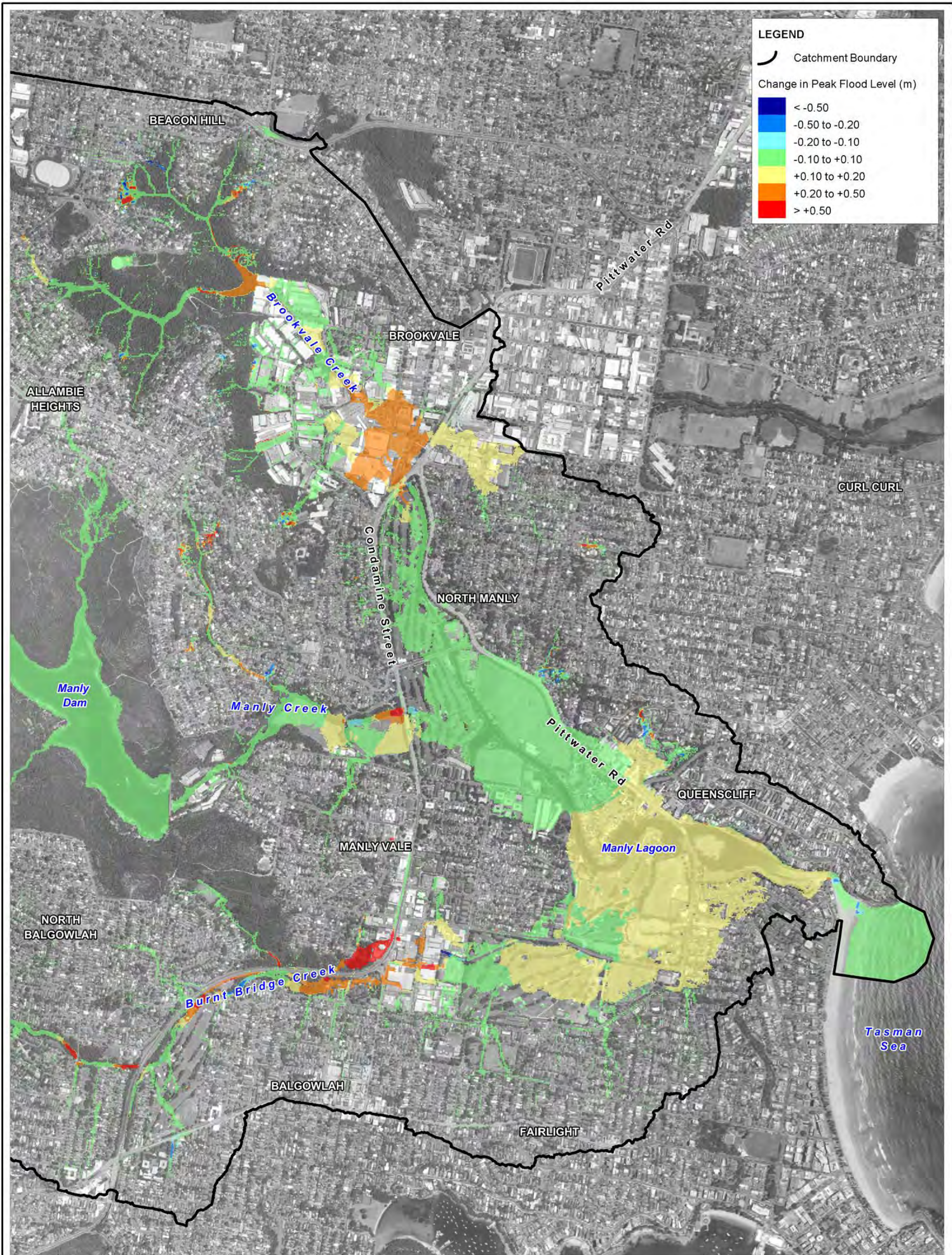


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Approx. Scale



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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:  
**A DRAFT**

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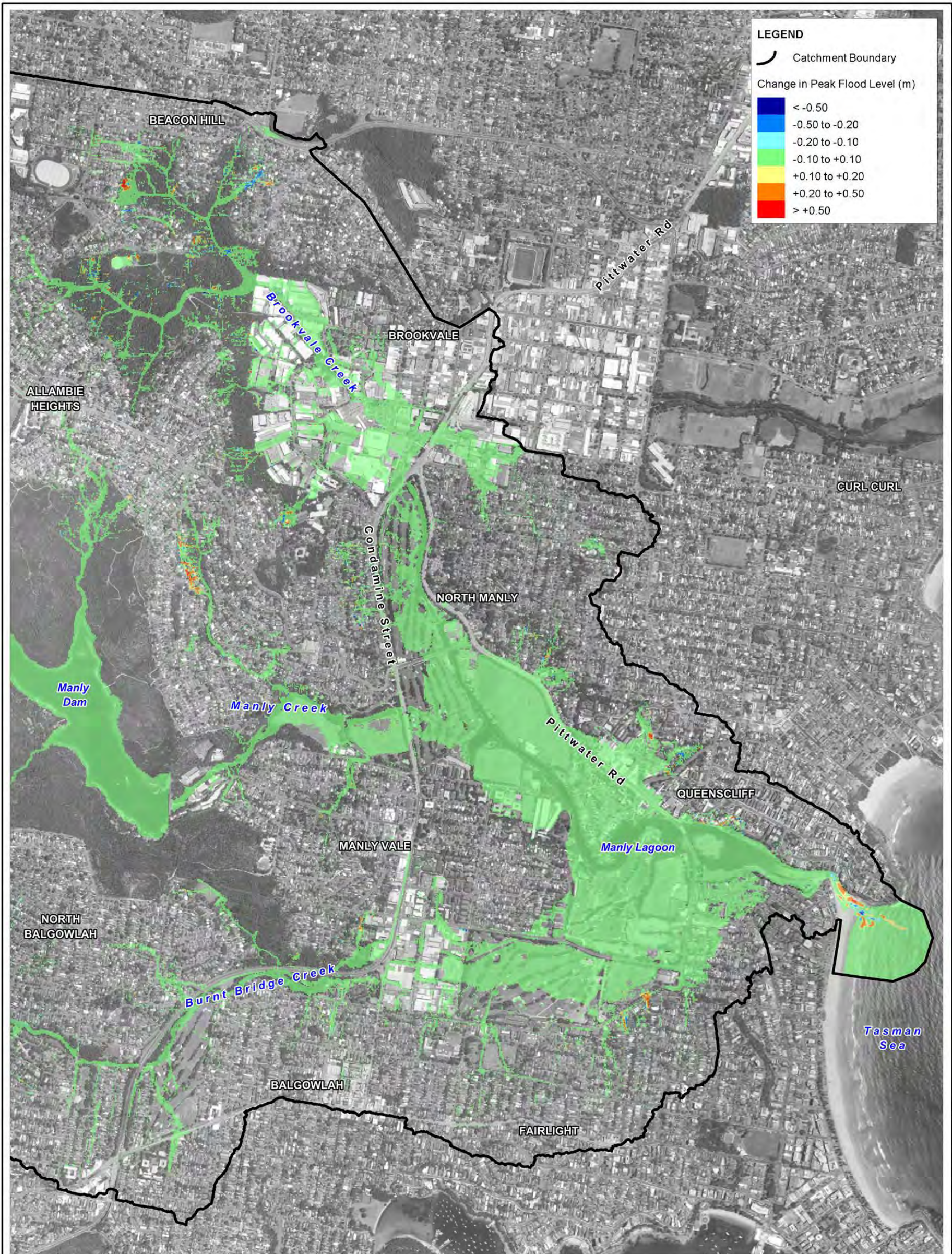


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Approx. Scale



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Title:  
**Manly Lagoon Flood Study - Change in Peak Flood Level:  
Lagoon Initial Water Level (0.5m AHD) (1% AEP Catchment Derived Event)**

Figure:  
**A-50**

Rev:  
**A DRAFT**

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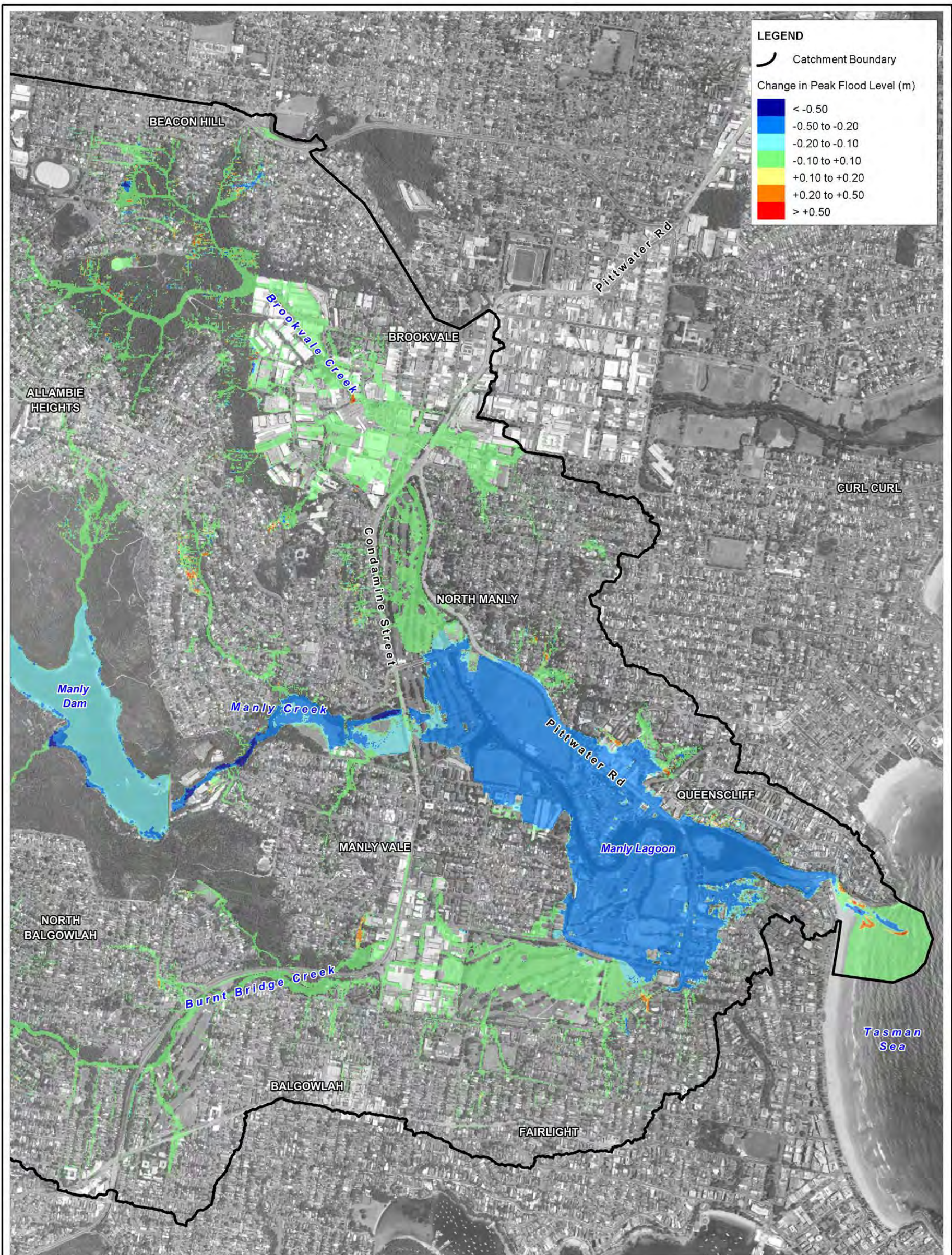


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Approx. Scale



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Title:

**Manly Lagoon Flood Study - Change in Peak Flood Level:  
Manly Dam Initial Water Level (34.1m AHD) (1% AEP Catchment Derived Event)**

Figure:

**A-51**

Rev:

**A DRAFT**

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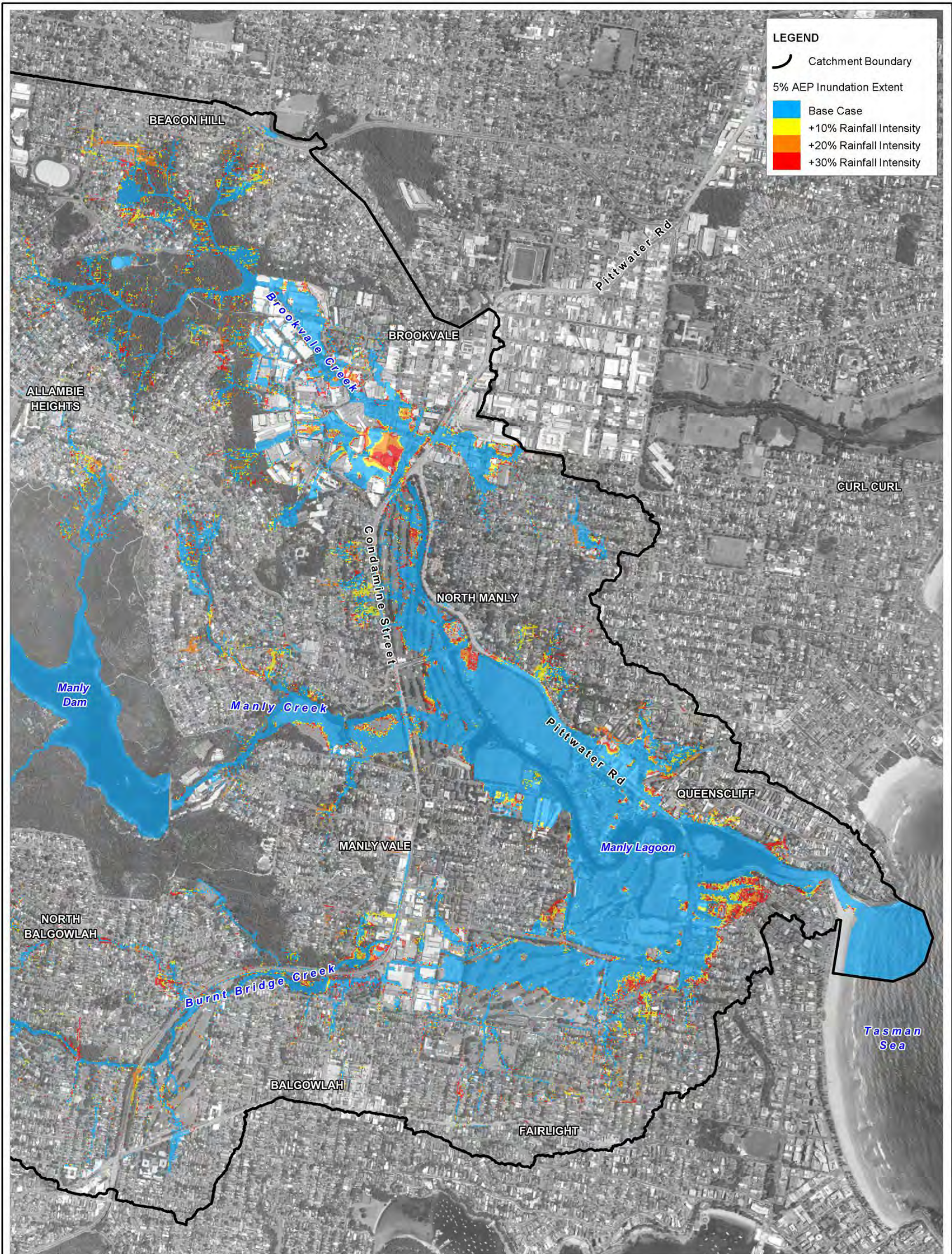


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Approx. Scale



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

Figure:  
**A-52**

Rev:  
**A DRAFT**

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.

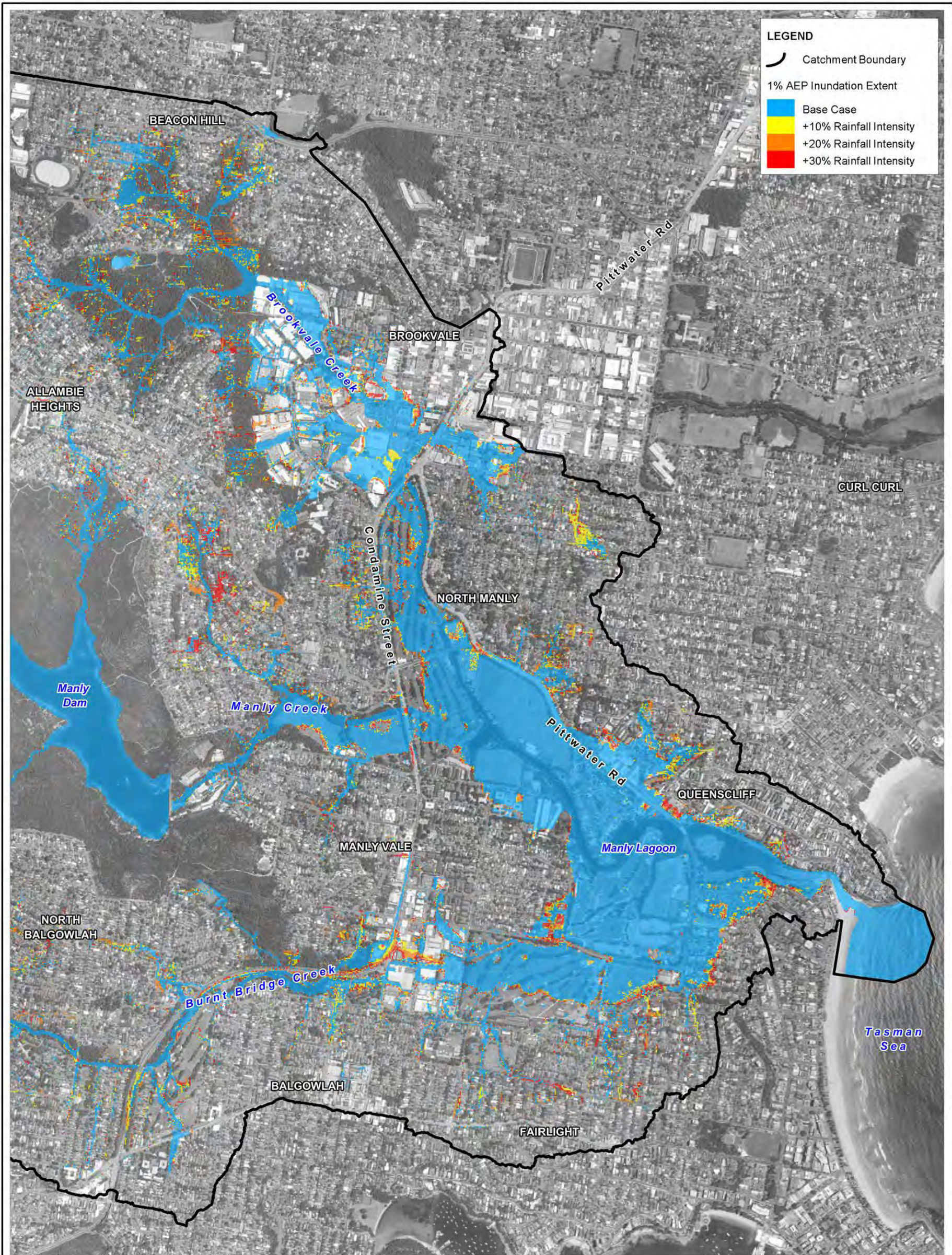


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Approx. Scale



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**

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0 375 750m  
Approx. Scale

Figure:

**A-53**

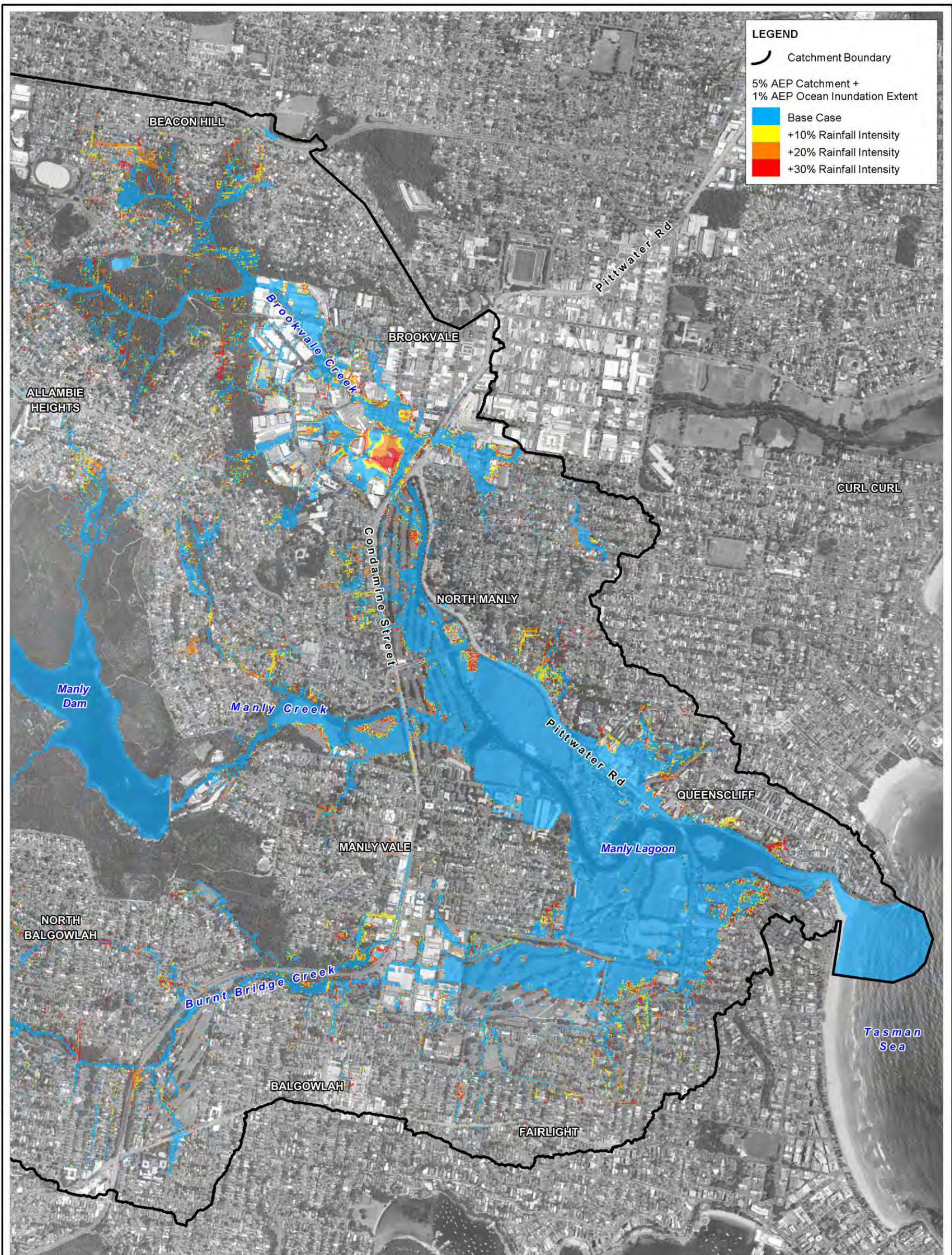
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Title:

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

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.



0 375 750m  
Approx. Scale

Figure:

**A-54**

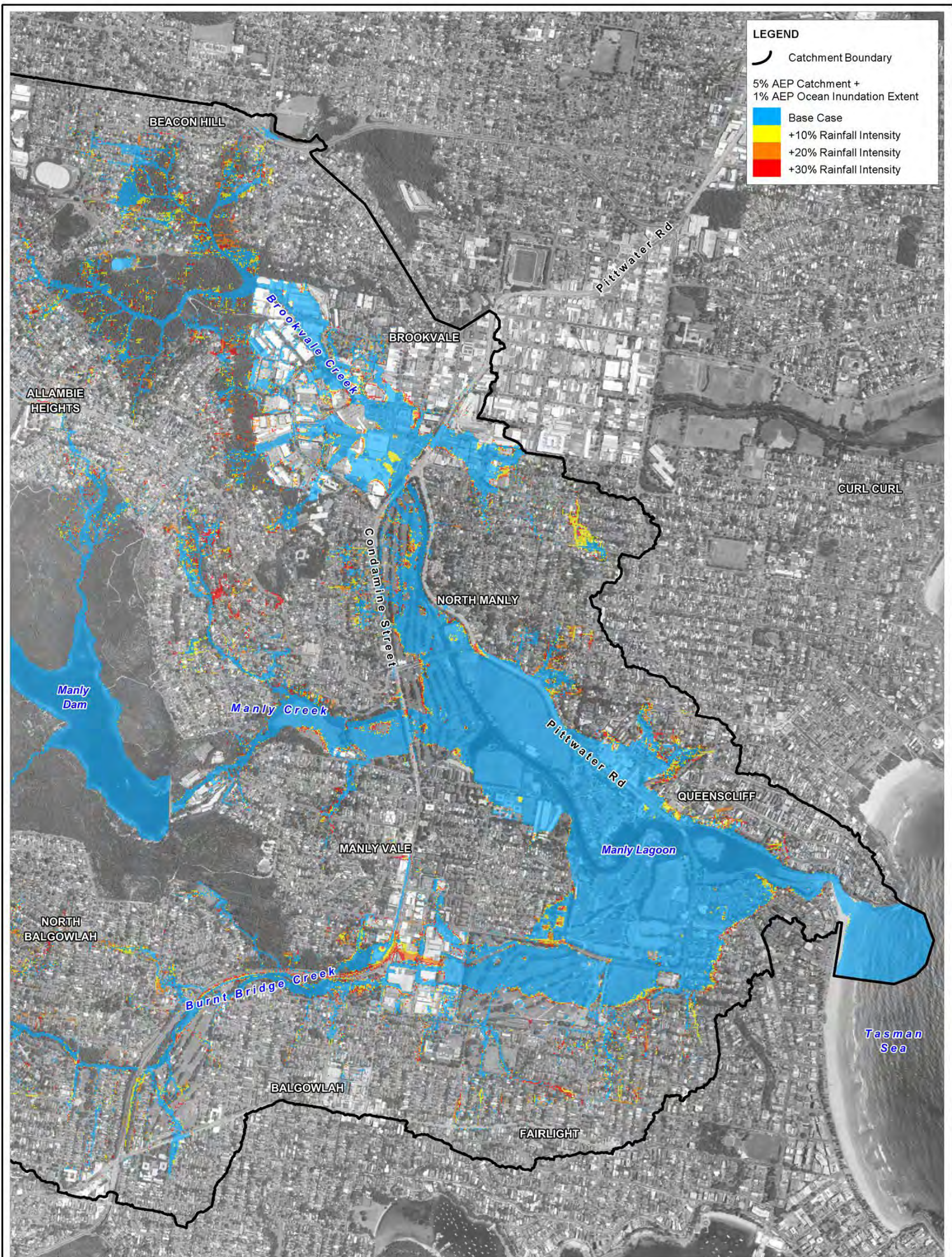
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Title:

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

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0 375 750m  
Approx. Scale

Figure:

**A-55**

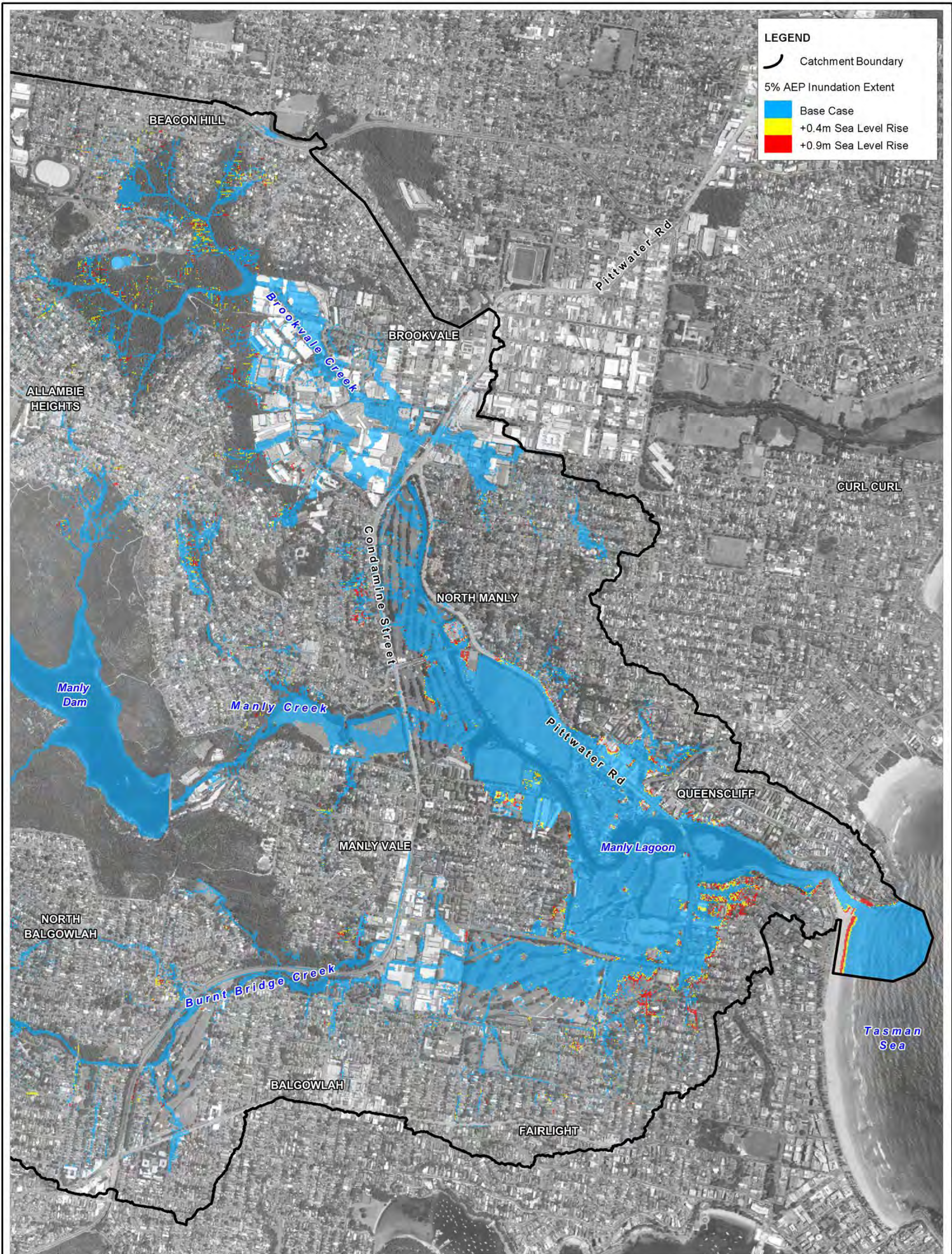
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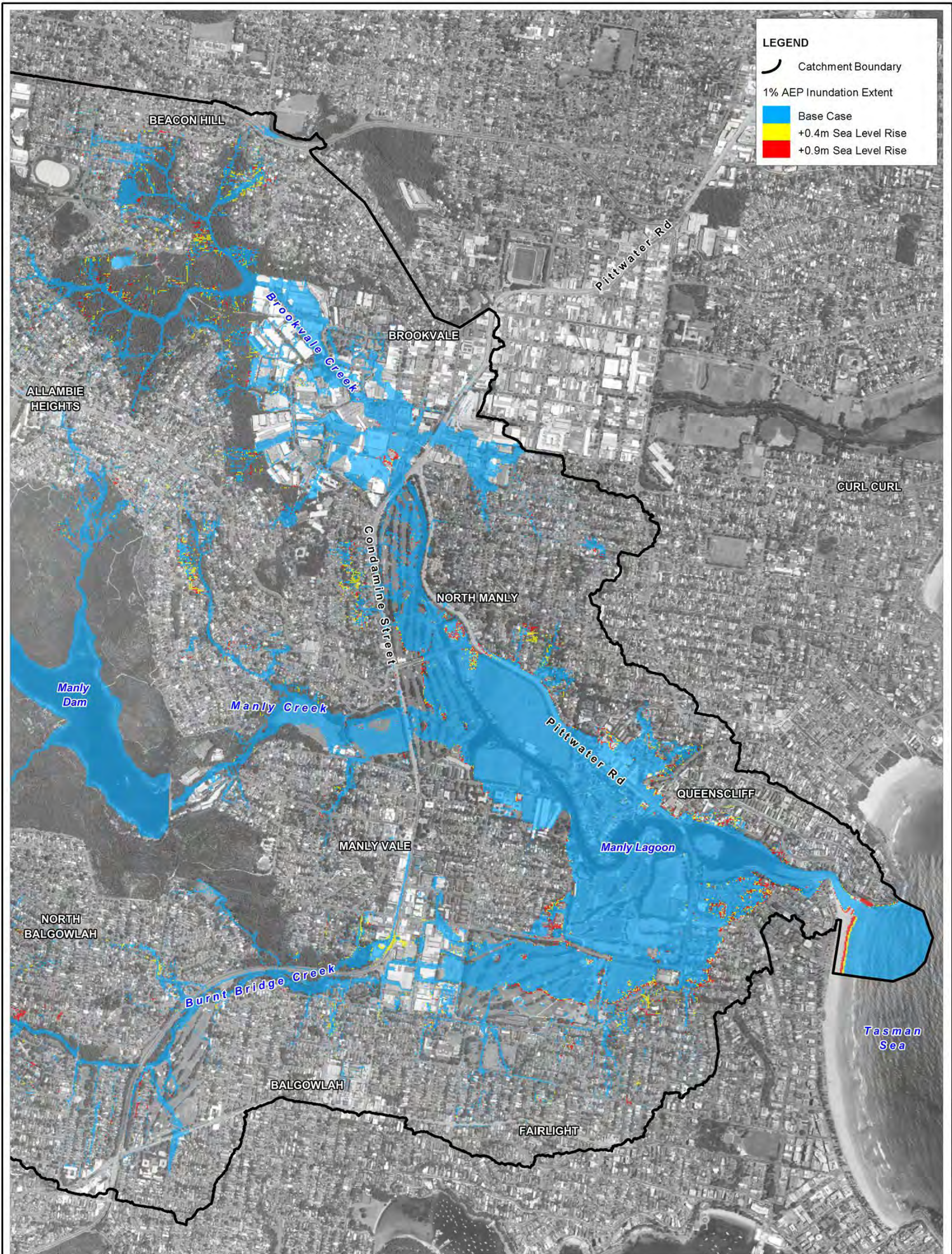
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<p>Title:</p> <p><b>Manly Lagoon Flood Study - Climate Change Scenarios: 5% AEP Catchment Derived Event + Sea Level Rise</b></p>	<p>Figure:</p> <p><b>A-56</b></p>	<p>Rev:</p> <p><b>A DRAFT</b></p>
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Title:

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

Figure:

**A-57**

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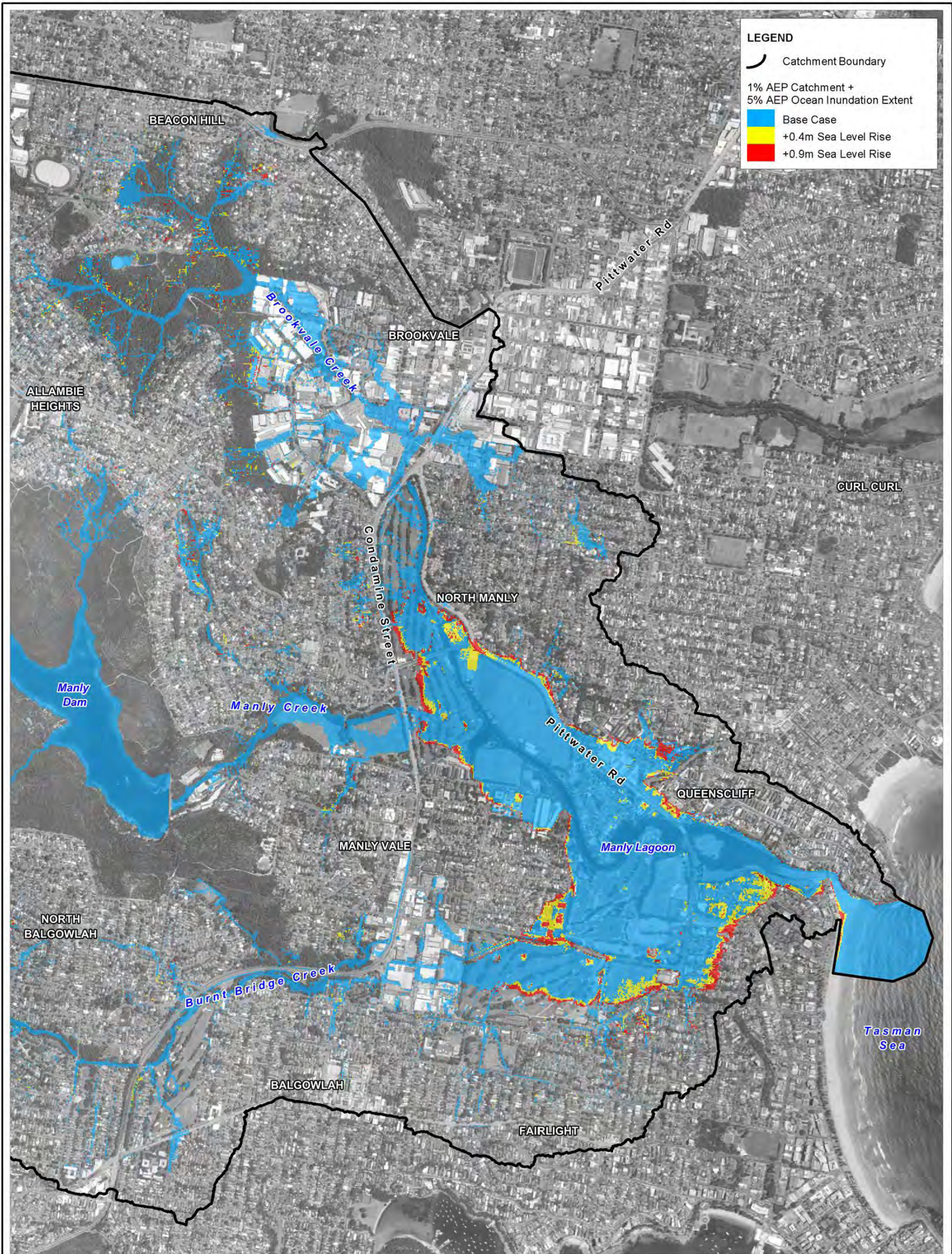


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Title:

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

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Figure:

**A-58**

Rev:

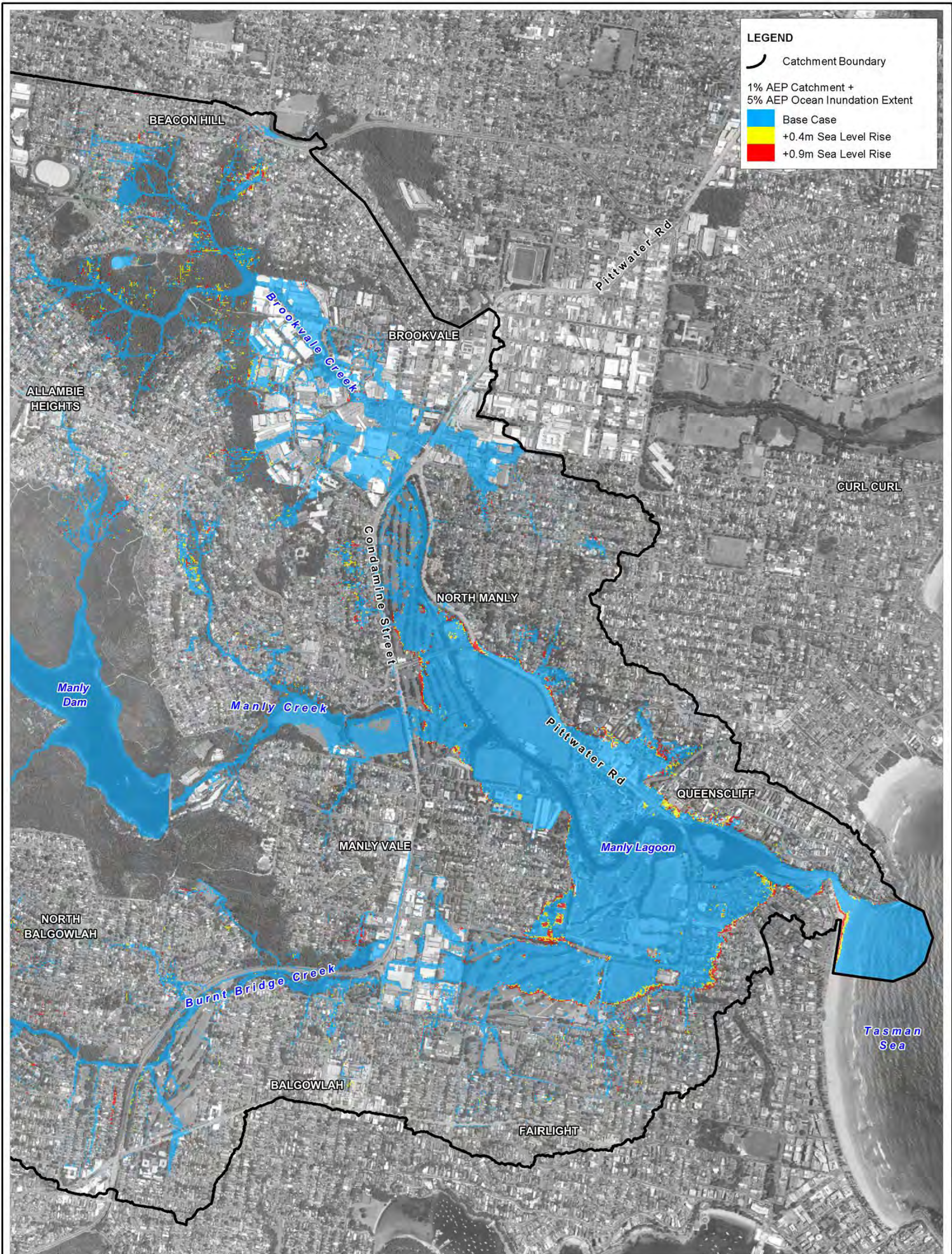
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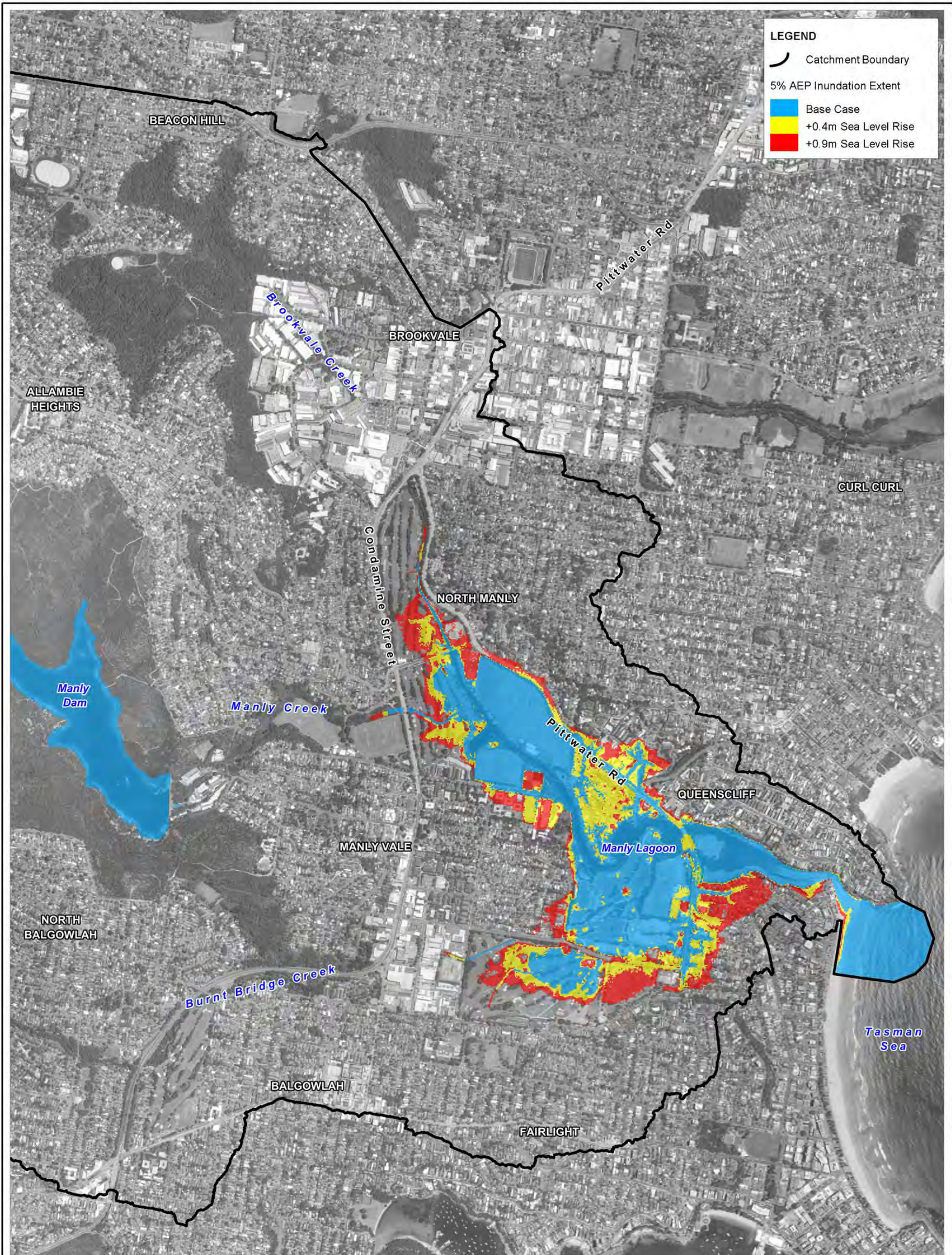
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Title:		Figure:	Rev:
<b>Manly Lagoon Flood Study - Climate Change Scenarios: 1% AEP Catchment + 5% AEP Ocean Coincident Event + Sea Level Rise</b>		<b>A-59</b>	<b>A DRAFT</b>
<p>BMT WBM endeavours to ensure that the information provided in this map 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><div>N</div></div></div><div><div>0</div><div>375</div><div>750m</div><div>Approx. Scale</div></div></div>		
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Filepath : K:\N2069 Manly Lagoon Flood Study\MI\Workspaces\Design Mapping\Final A3\Fig A59 CC 1%AEPCatchment 5%AEPOcean SLR.WOR			





Title:

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

Figure:

**A-60**

Rev:

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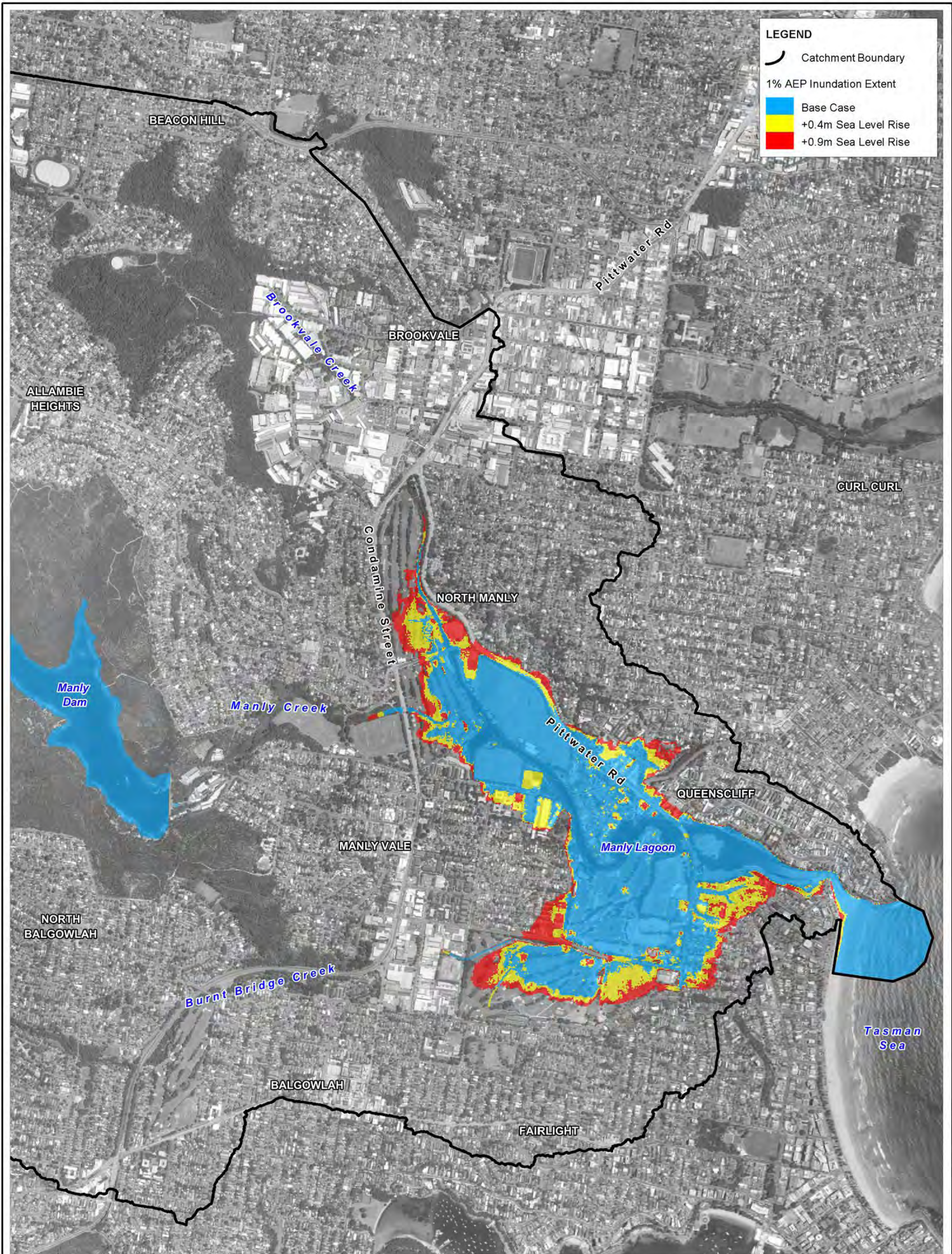


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Approx. Scale



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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 DRAFT**

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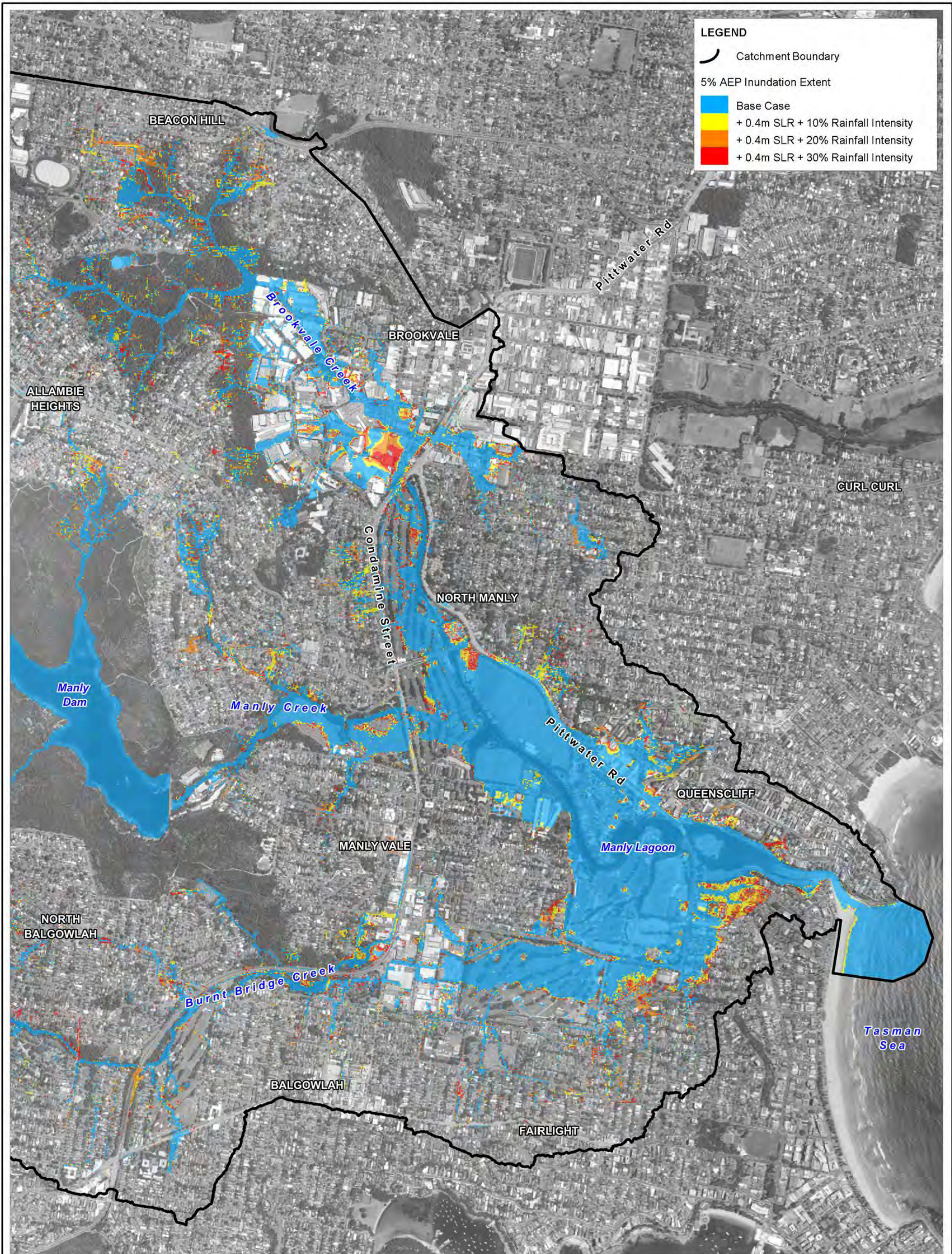


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Title:  
**Manly Lagoon Flood Study - Climate Change Scenarios:  
5% AEP Catchment Derived Event + 0.4 m SLR + Rainfall Intensity Increase**

Figure:  
**A-62**

Rev:  
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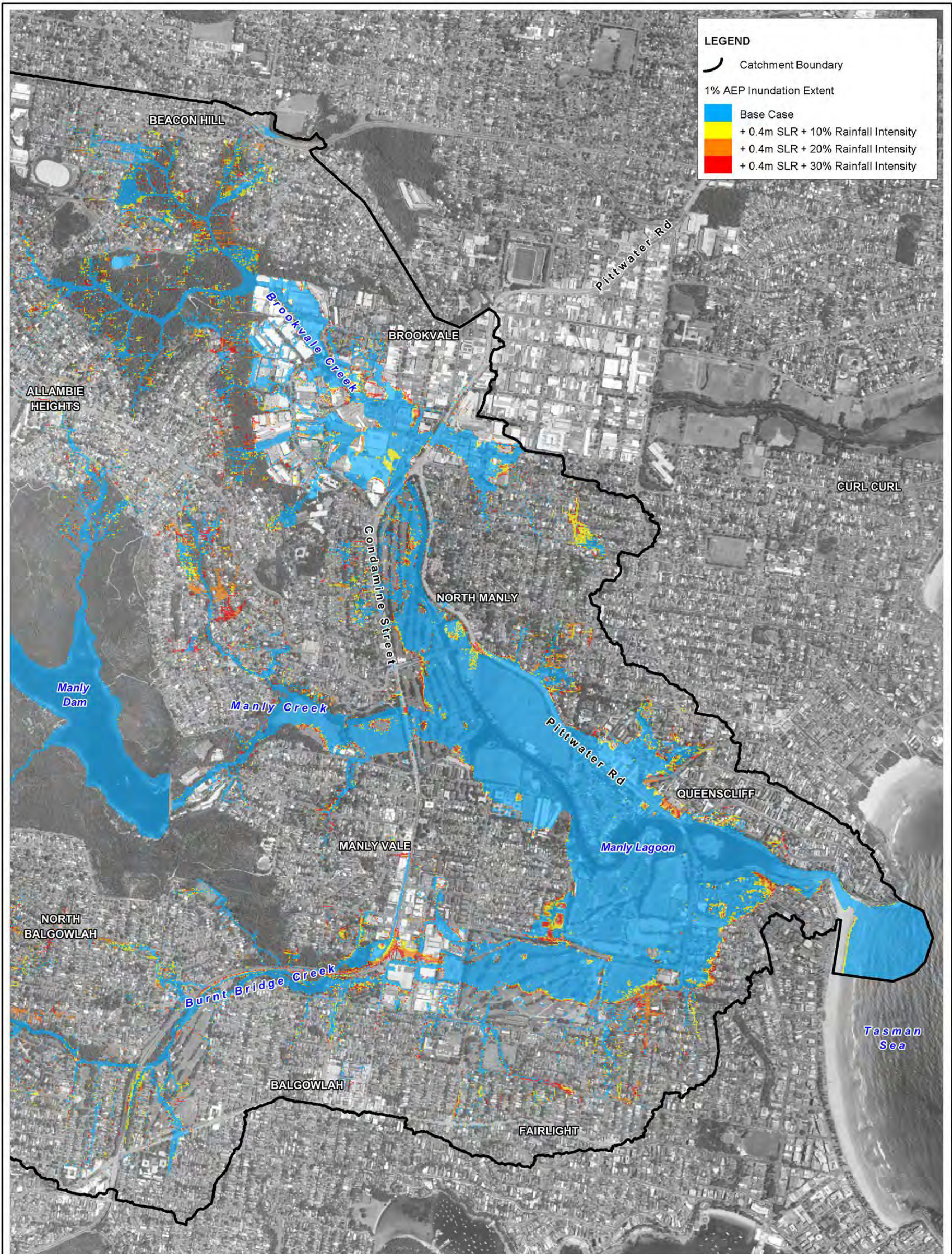


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Title:

**Manly Lagoon Flood Study - Climate Change Scenarios:  
1% AEP Catchment Derived Event + 0.4 m SLR + Rainfall Intensity Increase**

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Figure:

**A-63**

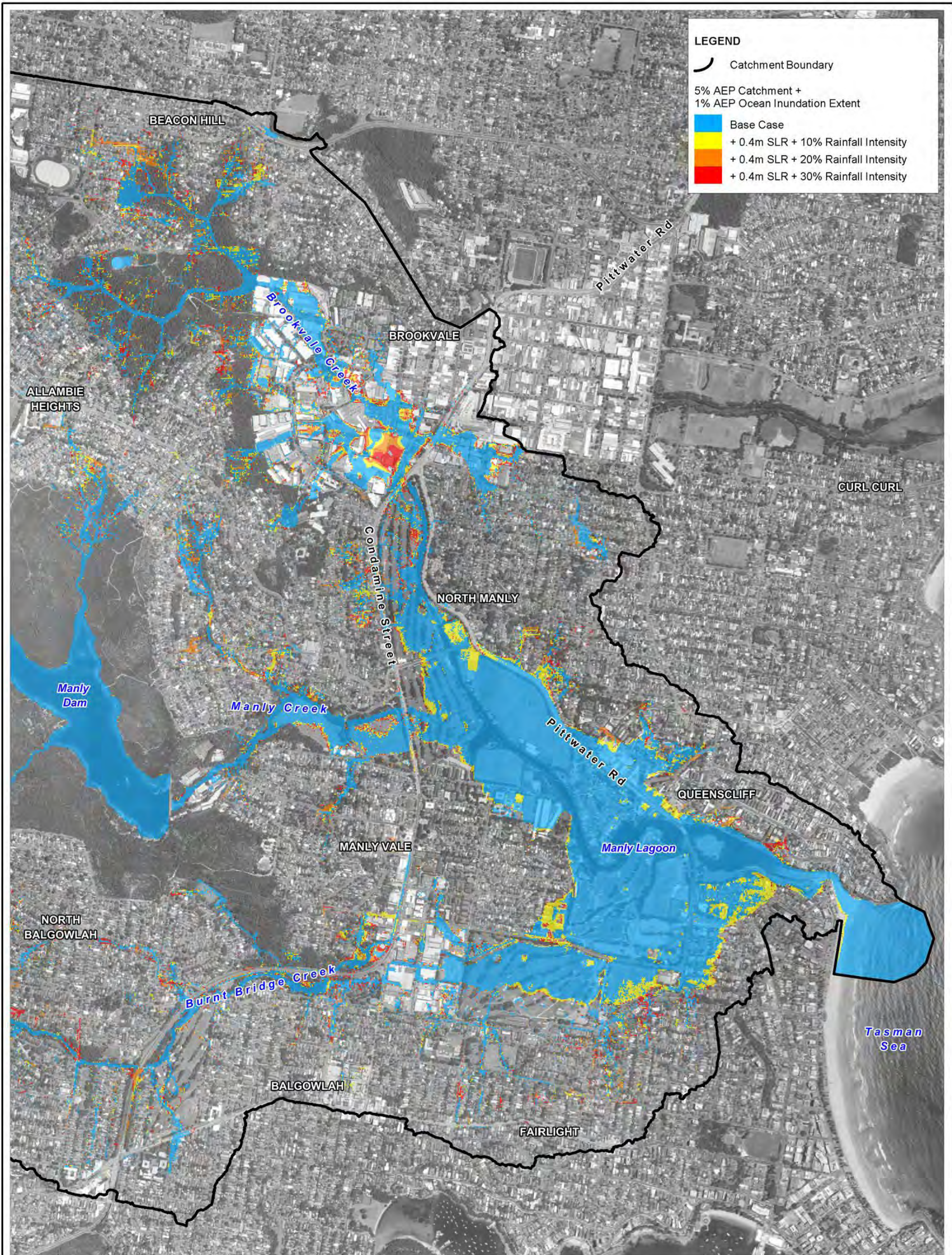
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Title:

**Manly Lagoon Flood Study - Climate Change Scenarios: 5% AEP Catchment + 1% AEP Ocean Coincident Event + 0.4 m SLR + Rainfall Intensity Increase**

Figure:

**A-64**

Rev:

**A DRAFT**

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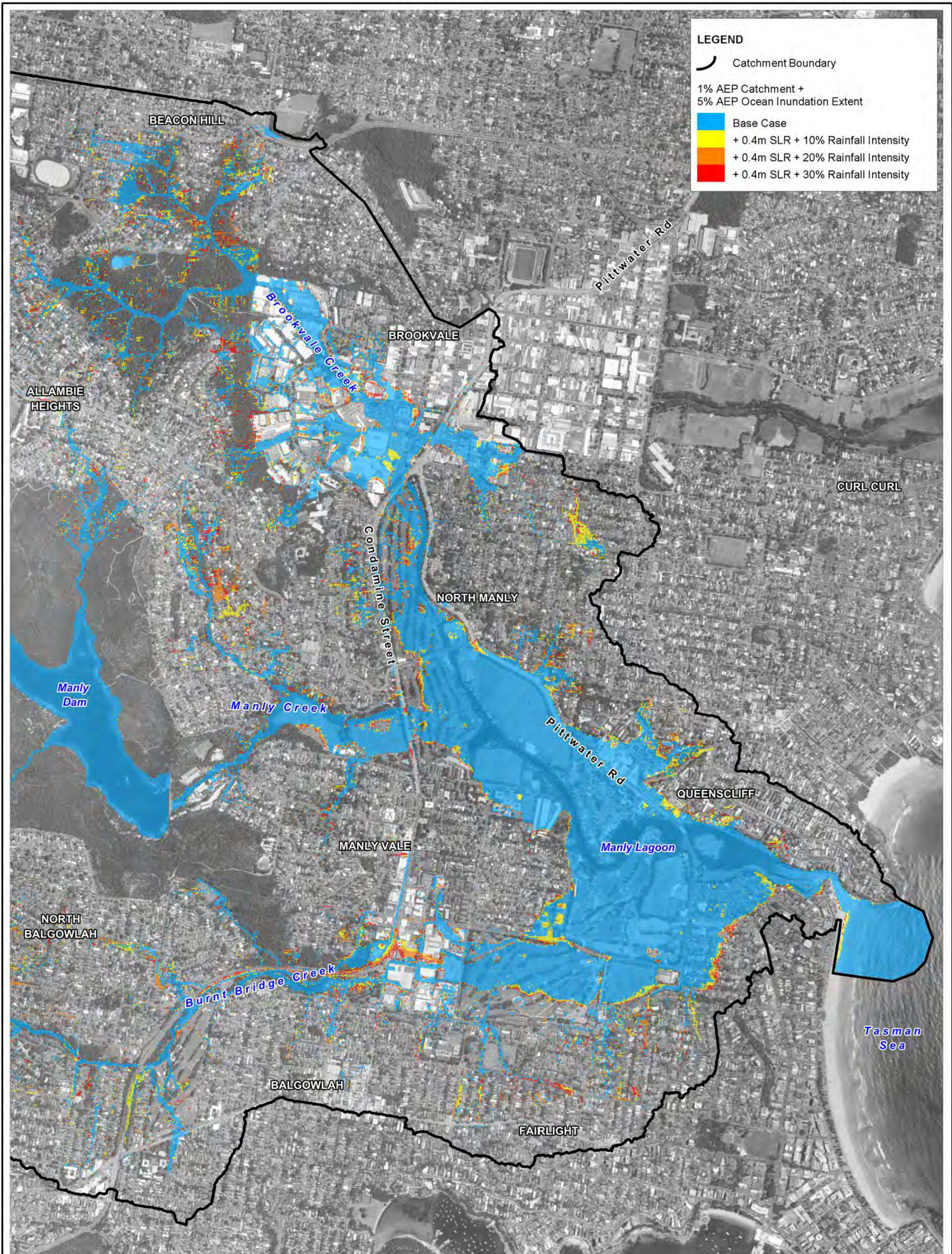


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Title:

**Manly Lagoon Flood Study - Climate Change Scenarios: 1% AEP Catchment + 5% AEP Ocean Coincident Event + 0.4 m SLR + Rainfall Intensity Increase**

Figure:

**A-65**

Rev:

**A DRAFT**

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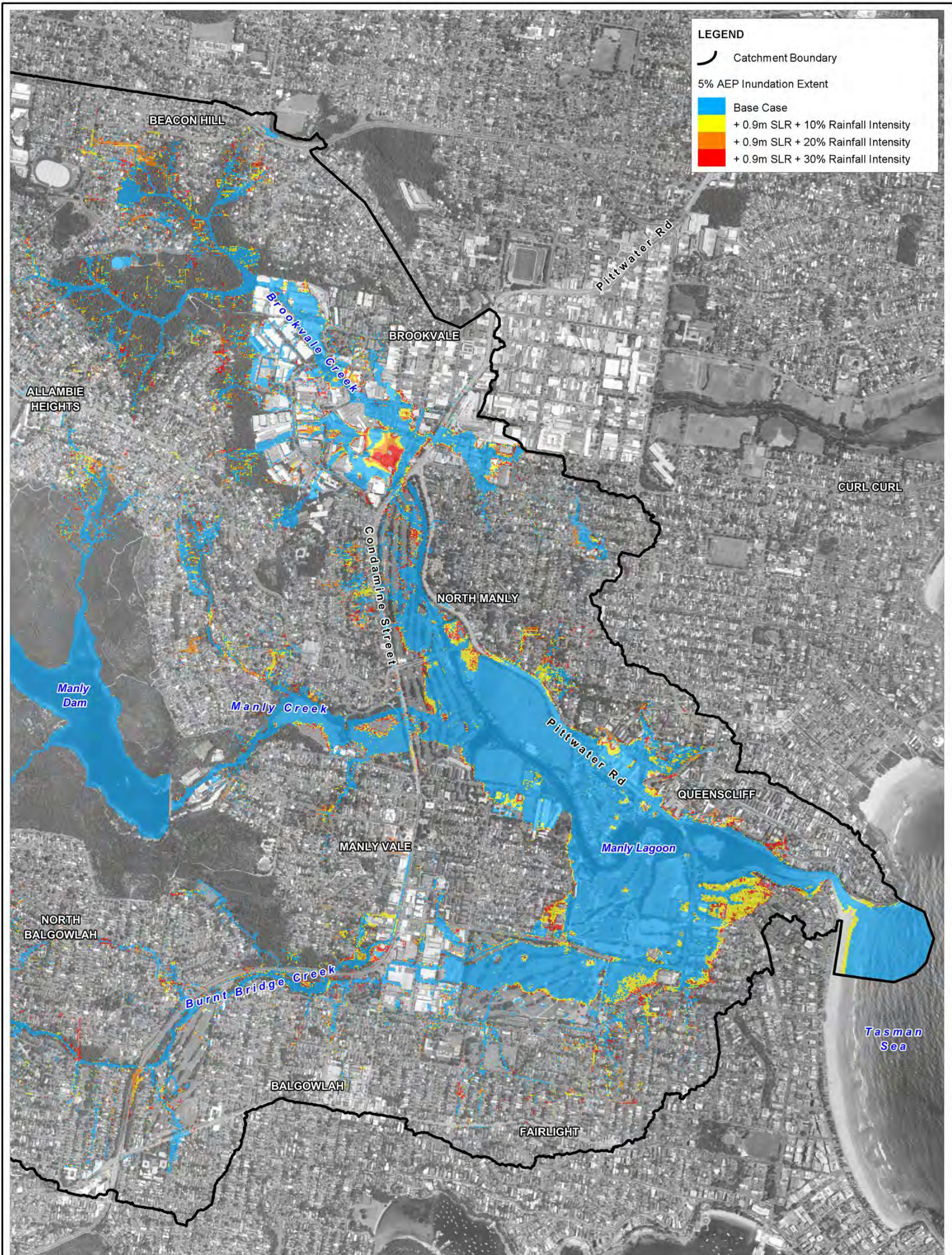


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Title:

**Manly Lagoon Flood Study - Climate Change Scenarios:  
5% AEP Catchment Derived Event + 0.9 m SLR + Rainfall Intensity Increase**

Figure:

**A-66**

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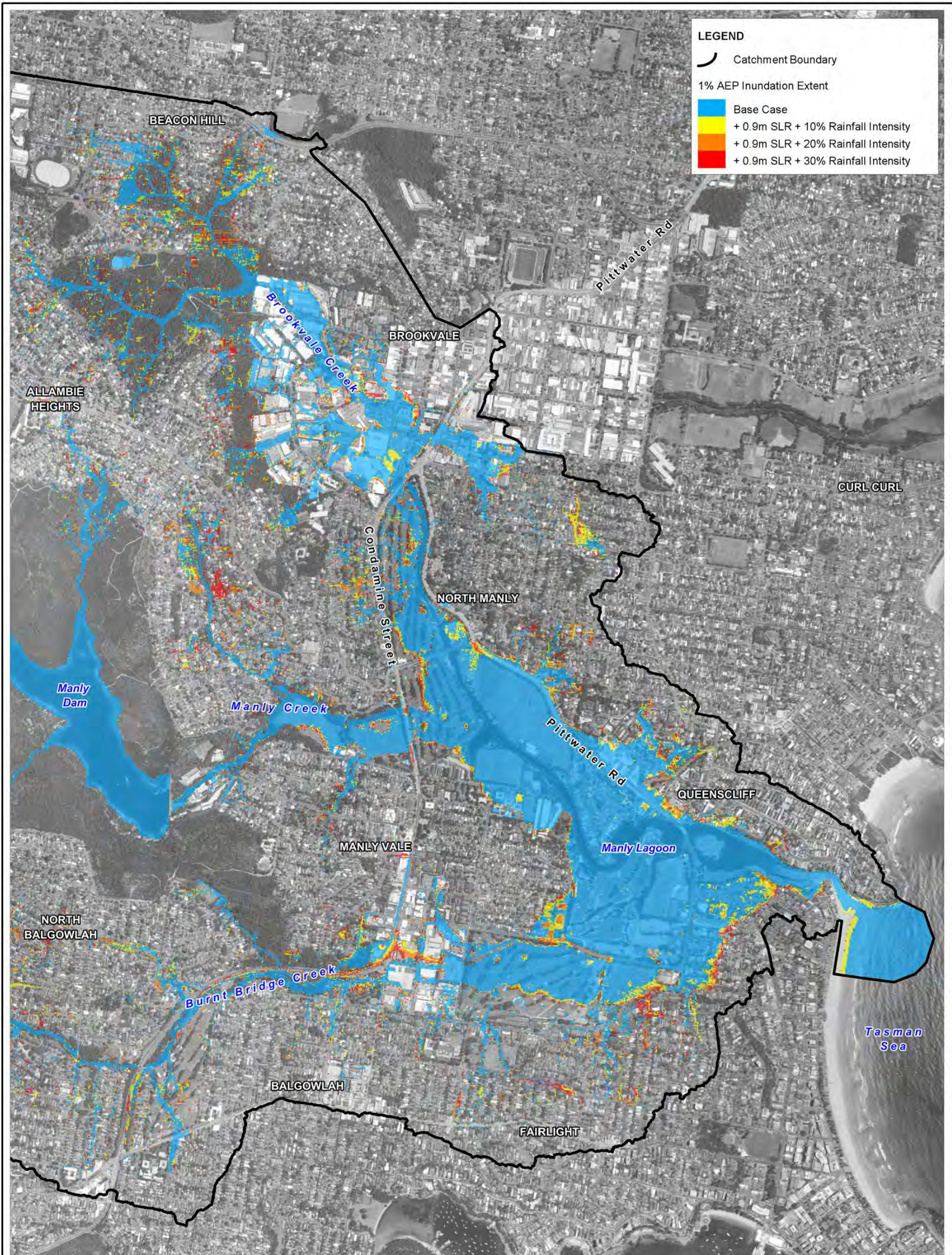


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Title:  
**Manly Lagoon Flood Study - Climate Change Scenarios:  
1% AEP Catchment Derived Event + 0.9 m SLR + Rainfall Intensity Increase**

Figure:  
**A-67**

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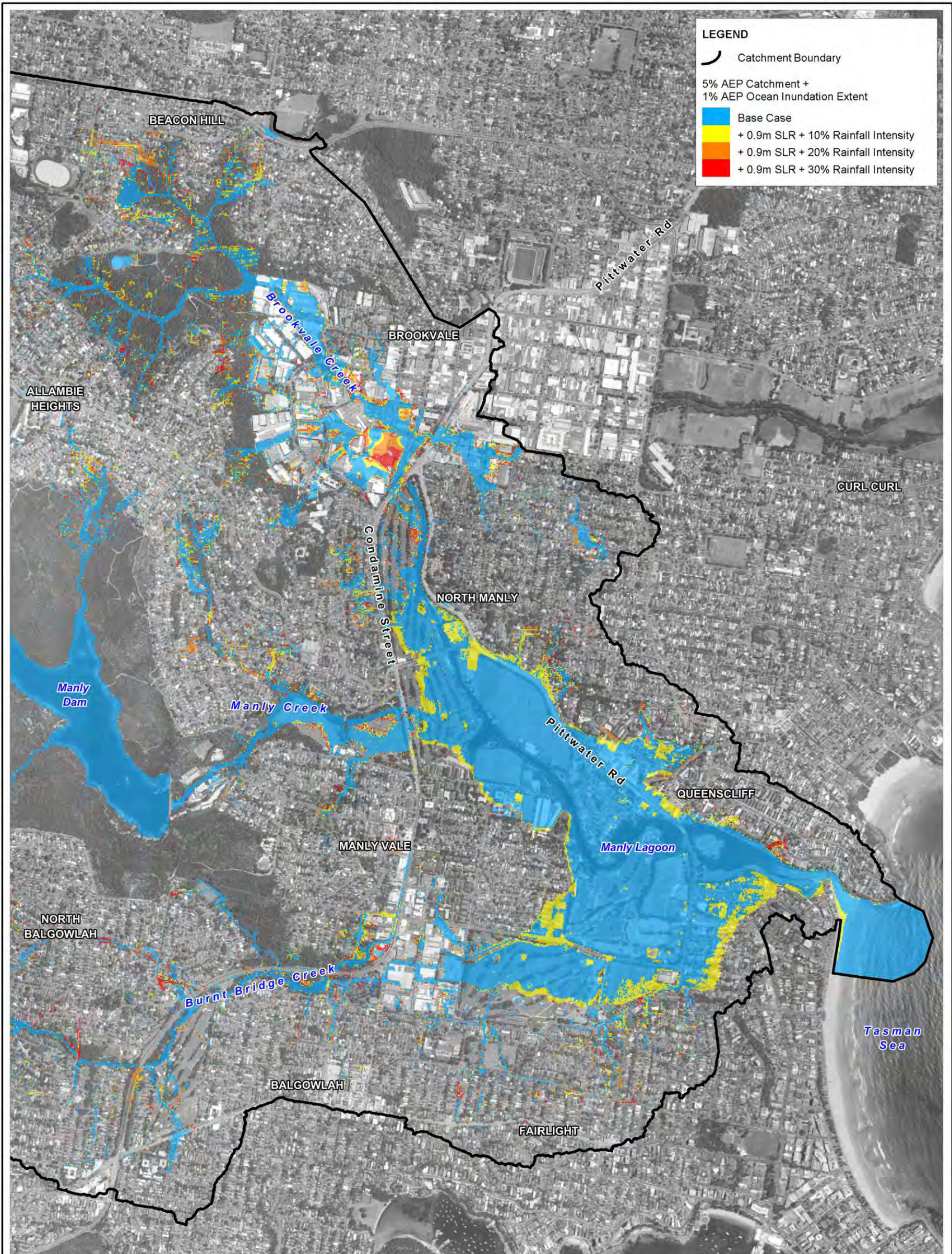


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Title:

**Manly Lagoon Flood Study - Climate Change Scenarios: 5% AEP Catchment + 1% AEP Ocean Coincident Event + 0.9 m SLR + Rainfall Intensity Increase**

Figure:

**A-68**

Rev:

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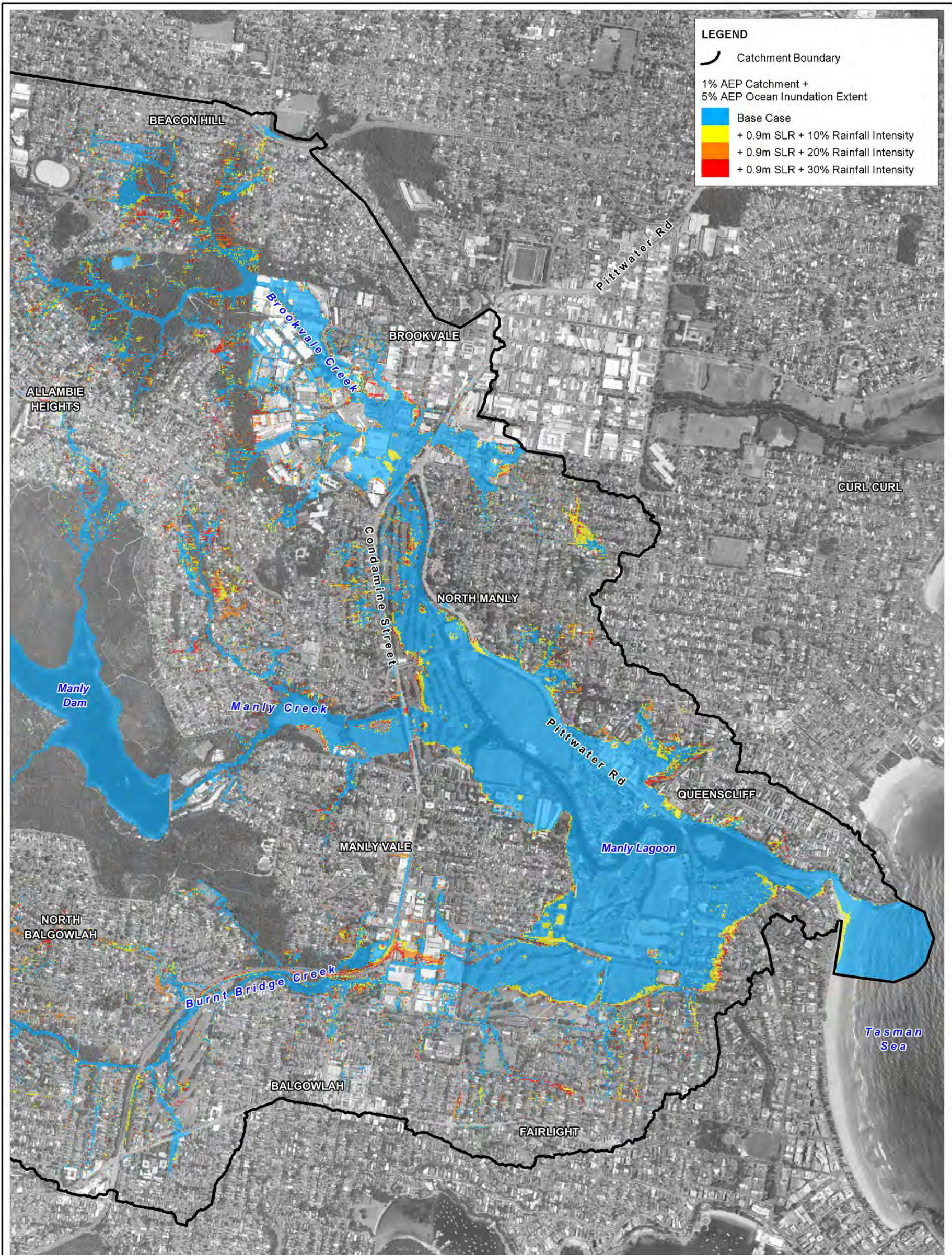


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Title:  
**Manly Lagoon Flood Study - Climate Change Scenarios: 1% AEP Catchment + 5% AEP Ocean Coincident Event + 0.9 m SLR + Rainfall Intensity Increase**

Figure:  
**A-69**

Rev:  
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A part of BMT in Energy and Environment

# Manly Lagoon Flood Study - Flood Planning Levels

Draft Report:  
R.N2069.006.00  
March 2013









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	<b>Client :</b> Warringah Council  <b>Client Contact:</b> Valerie Tulk  <b>Client Reference</b>

<b>Title :</b>	Manly Lagoon Flood Study – Flood Planning Levels Draft Report
<b>Author :</b>	Darren Lyons
<b>Synopsis :</b>	Report for the Manly Lagoon Flood Study covering the establishment of flood planning levels.

#### REVISION/CHECKING HISTORY

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## **1 INTRODUCTION**

The Manly Lagoon Flood Study (BMT WBM, 2013) has been prepared for Warringah Council and Manly Council (The Councils) to define the existing flood behaviour in the Manly Lagoon catchment and establish the basis for subsequent floodplain management activities.

This study updates the previous studies on the Lagoon including the Manly Lagoon Flood Study (MHL, 1992) and smaller localised flood studies, providing a holistic assessment of flooding within the catchment. The current flood study considers land use changes subsequent to previous modelling investigations, the influence of the Manly Lagoon entrance on flood behaviour and the influence of potential climate change.

### **1.1 Flood Planning Levels**

Land use planning and development controls are key mechanisms by which Council can manage flood-affected areas within the Manly Lagoon catchment. Such mechanisms will influence future development (and redevelopment) and therefore the benefits will accrue gradually over time. Without comprehensive floodplain planning, existing problems may be exacerbated and opportunities to reduce flood risks may be lost. The Flood Planning Levels (FPLs) are the flood levels selected for planning purposes, and will directly determine the area of land that should be subject to flood-related building and development controls.

FPLs have been developed with an aim to reduce the likelihood that dwellings are inundated by flooding and to reduce the likelihood of people being exposed to dangerous flood situations. A number of different FPLs may be defined for different land uses. The FPL is defined by an established design flood level of selected magnitude combined with a freeboard considered appropriate for the land use in question. The purpose of a specified freeboard is to account for the risk associated with various uncertainties in the predicted flood level. These risks may include variation between flood modelling results and actual flood events, the effect of localised factors on flood levels and potential wave action. In some instances, a zero freeboard may be adopted.

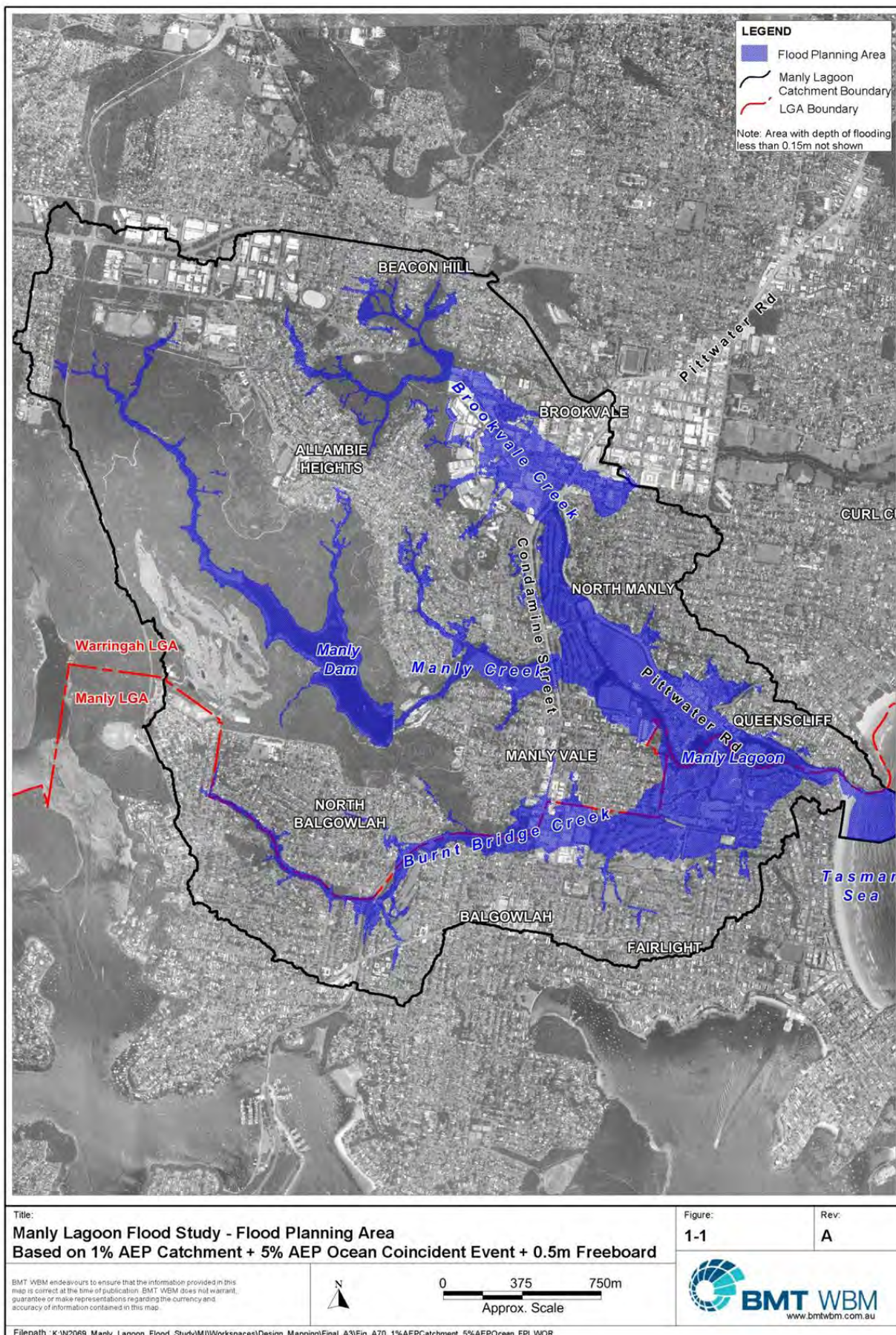
Traditionally, floodplain planning has usually been based on the 1% AEP flood level + 0.5m freeboard for the purposes of applying floor level controls. This criteria is typically reviewed through the completion of detailed flood studies and floodplain risk management plans. Councils adopted FPLs are specified in existing Development Control Plans. A graded set of FPLs are in place dependent on the nature of the development and the appropriate flood risk classification of the floodplain.

### **1.2 Flood Planning Area**

The design flood levels and inundation extents determined through the detailed modelling undertaken in the Manly Lagoon Flood Study (BMT WBM, 2013) provides the basis for establishing the Flood Planning Levels and associated Flood Planning Area.

The Flood Planning Area is the area of land below the FPL and thus subject to flood related development controls. The Flood Planning Area for the Manly Lagoon catchment is based on the 1% AEP Catchment + 5% AEP Ocean Coincident Event + 0.5m freeboard and is shown in Figure 1-1. Areas with depth of flooding less than 0.15m not included.







## 2 REFERENCES

BMT WBM (2013). Draft *Manly Lagoon Flood Study*. Prepared for Warringah Council and Manly Council, NSW.

Manly Hydraulics Laboratory (1992). *Manly Lagoon Flood Study Report MHL603*. Public Works Department NSW. Prepared for Warringah Council and Manly Council, NSW.