APPENDIX D

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DISCLAIMER

APPENDIX D: MODELLING QUALITY REPORT

BMT WBM

Technical Note

From:	Richard Sharpe	To:	Moreton Bay Regional Council
Date:	25 May 2012	CC:	
Subject:	Modelling Quality Report; Hays Inlet		

1 Background

As part of Moreton Bay Regional Council's (MBRC) Regional Floodplain Database (RFD) project, a detailed TUFLOW model of the Hays Inlet catchment has been developed. This technical note has been prepared to demonstrate that the Hays Inlet model has been reviewed, and that the model performance is suitable for the intended use and that the sensibility of the results has been checked.

2 Model Development Process

The following procedure has been implemented in the development of the model:

1 A site visit was undertaken prior to commencing development of the model to gain an appreciation for the catchment;

2 An infrastructure assessment was undertaken. A report was produced from this assessment and submitted to MBRC for their consideration on structure data requirements. This approach ensured that sufficient data was captured for the level of accuracy required from the model;

3 The catchment delineation used in the hydrology was reviewed. This review indicated that the catchment delineation was suitable;

4 A draft TUFLOW model was developed, focussing on the 100 year ARI flood event, and submitted to MBRC for review (on 13th May 2011);

5 MBRC provided feedback from their review of the TUFLOW model on 25th July 2011. Alterations following this review are discussed later in this note;

6 A final model was developed and used to simulate all the design and sensitivity events; and

7 Further checking was undertaken to ensure that the model was suitable for simulating the full range of flood events.

Throughout model development, model stability, warnings messages and mass errors were monitored to ensure that the model performance was acceptable. Careful attention was provided to ensuring that flow through the 1D structure elements in the model was stable, as well as flow across the floodplain in the 2D domain.

3 Model Amendments – Post Draft Model Review

Various enhancements were recommended by both BMT WBM and MBRC following the development of the draft model. The following changes were implemented:

1 A number of structures were incorporated at the North Lakes Golf Club area, in particular at the creek crossing at Endeavour Boulevard (email communication with Hester van Zijl – 14 December 2011). A site inspection was undertaken by MRBC who provided the dimensions for the culverts. In addition, the site inspection demonstrated that the Endeavour Boulevard detention basin was dry, which has been modelled as such.

2 Additional survey data was used to update the details on some culverts structures.

4 Additional Amendments

Additional amendments were necessary for simulating the extreme events. The extent of the active 2D domain was further extended to ensure that the PMF flows were fully captured.

5 Model Performance

The following model performance checks have been undertaken:

- Stability of flow through key structures (e.g. Figure 1) was checked during model development. The arrangement of SX connections, structures and embankments has been edited to ensure that stable peak flows have been achieved where necessary;
- Stability of overland flow hydrographs were checked at several locations in the floodplain; (e.g. Figure 1);
- TUFLOW warning messages have been minimised. A few negative depth warning messages remain in parts of the catchment. But these are localised and limited to short time periods in the overall simulation; and
- Mass balance errors have been minimised. Mass balance errors range from 0.1% for the extreme and large events to 0.3% for the small flood events.

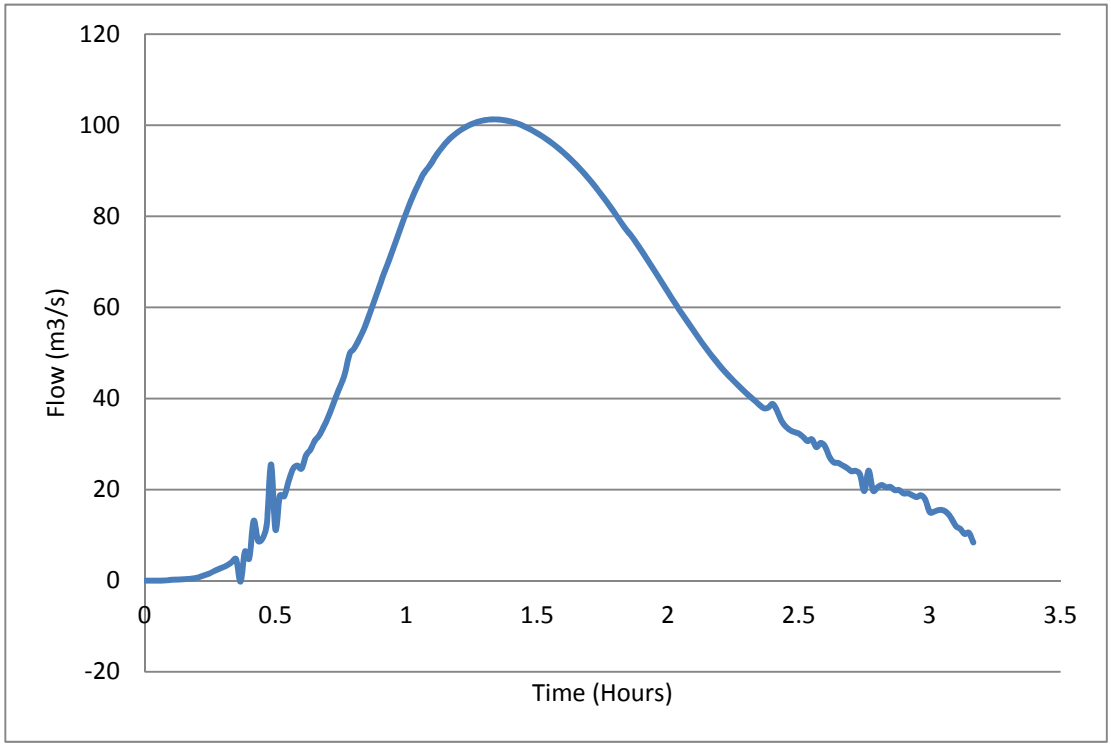


Figure 1: Flow through Culvert ID 128 at Bruce Highway (100 year ARI; 1 hour storm duration)

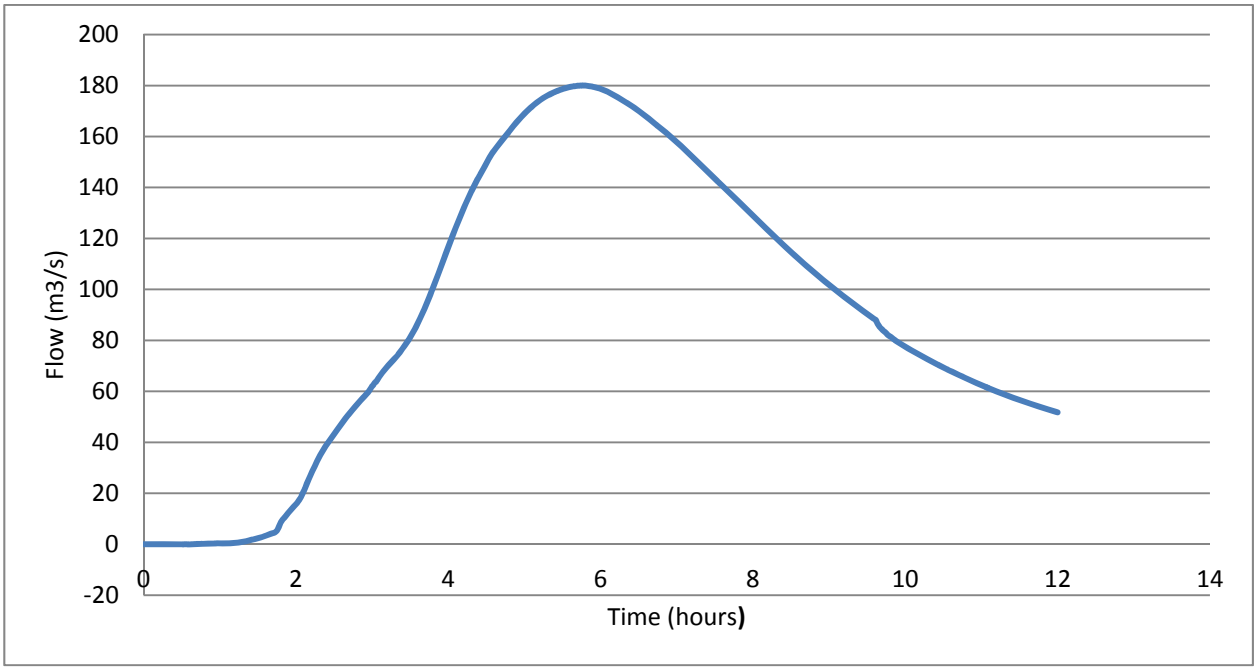


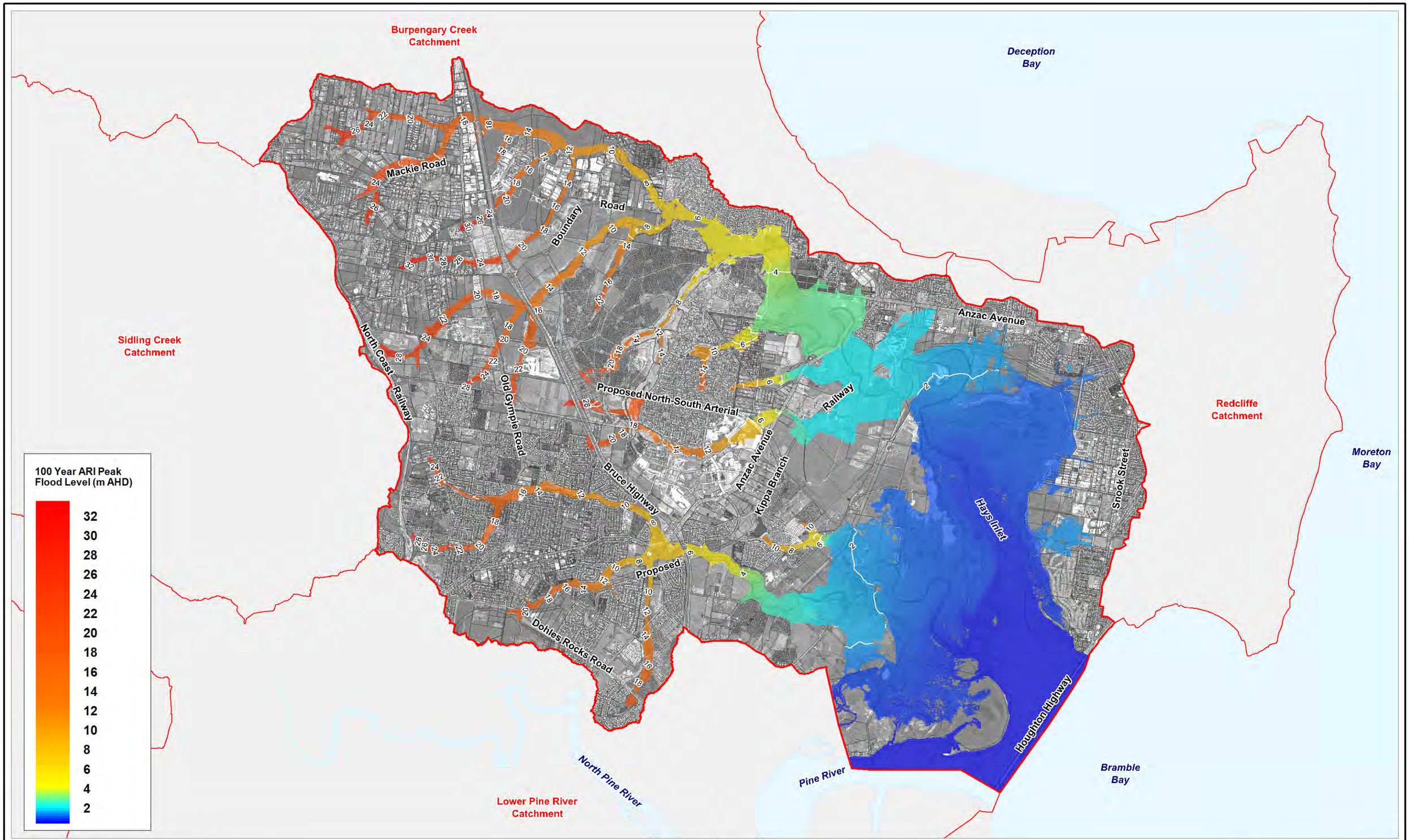
Figure 2: Overland Flow Hydrograph at the Downstream End near Hays Inlet Conservation Park (100 year ARI; 3 hour storm duration)

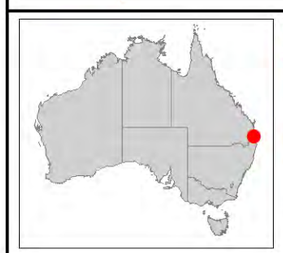
6 Conclusion

The Hays Inlet model has been developed with due consideration given to ensuring the quality of the model. The model has been reviewed internally and externally by MBRC. Amendments have been made in light of these reviews, and the overall model performance is suitable for the intended use of the model.

APPENDIX E

APPENDIX E: FLOOD MAPS – 100 YEAR ARI





LEGEND

Hays Inlet Catchment Boundary

Contour Lines [Labelled with 100 Year ARI Peak Flood Level (m AHD)]

Cadastral Boundaries

Title:

Peak Flood Level Map – 100 Year ARI

Figure: **E1**

Rev: **A**

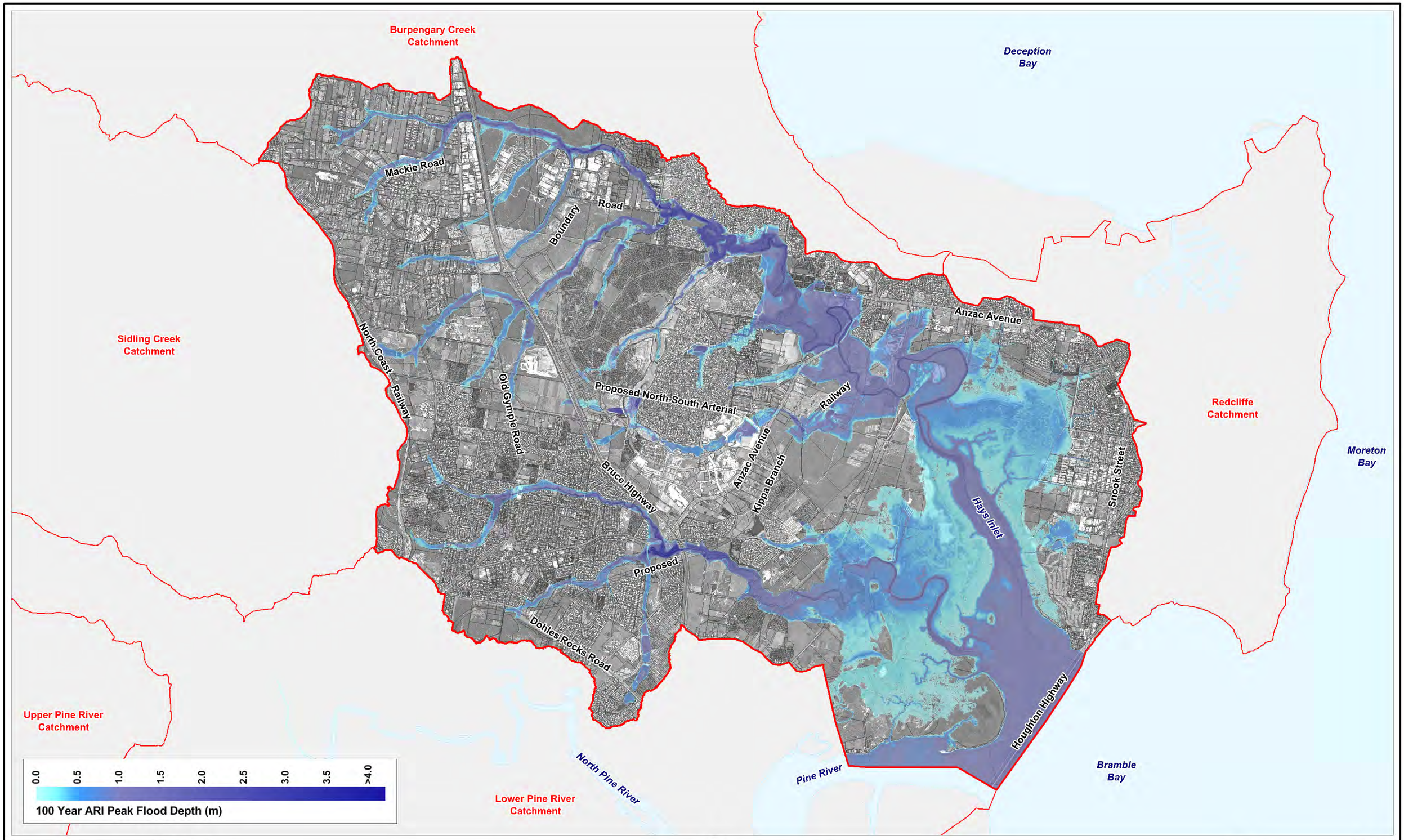
N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_006_120524_Peak Flood Level 100Year ARI.WOR



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Title:

Peak Flood Depth Map – 100 Year ARI

Figure: **E2**

Rev: **A**

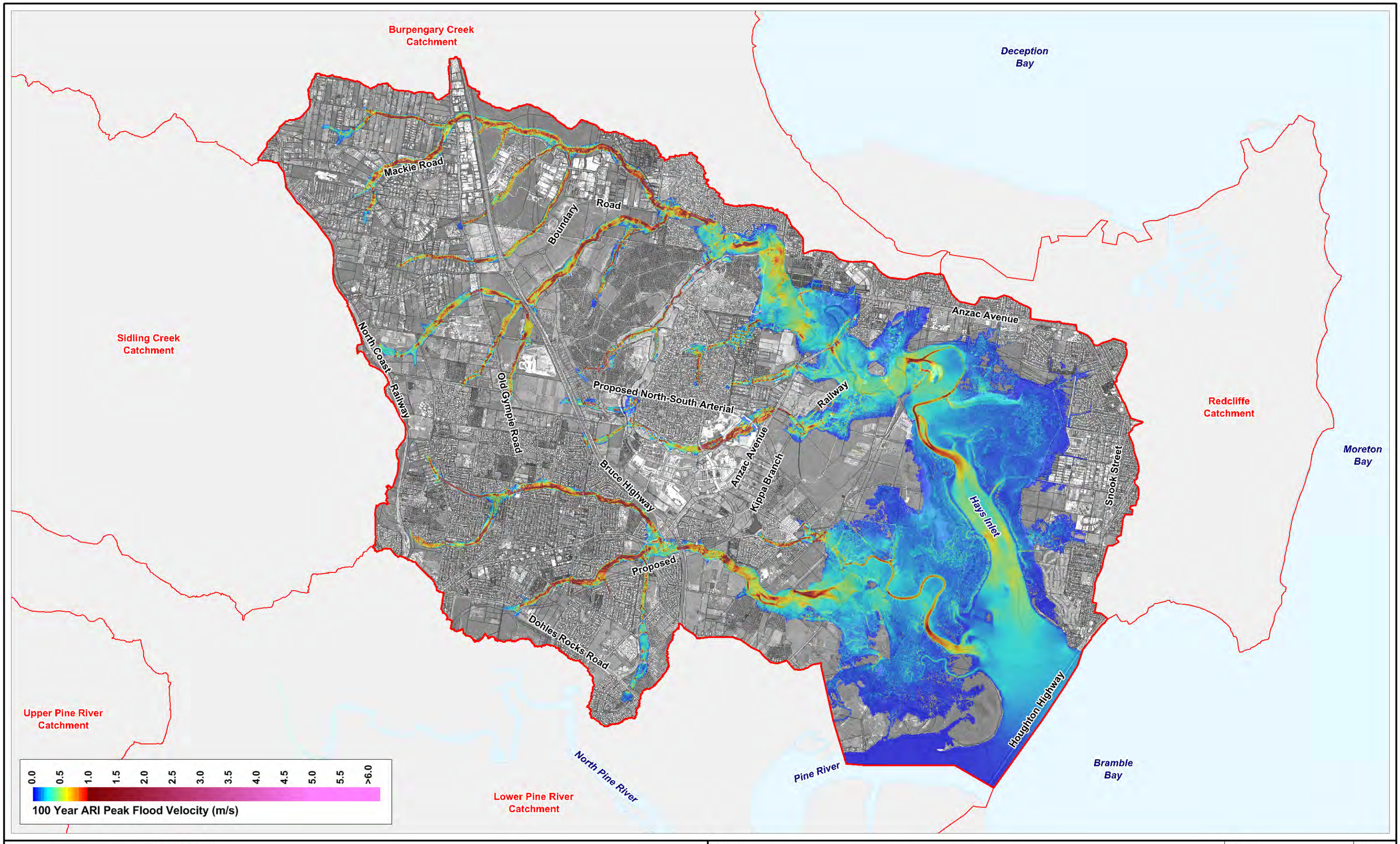
N

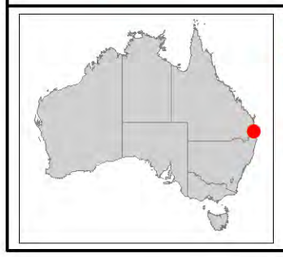
0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_007_120524_Peak Flood Depth 100Year ARI.WOR





LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Title:

Peak Flood Velocity Map – 100 Year ARI

Figure: **E3**

Rev: **A**

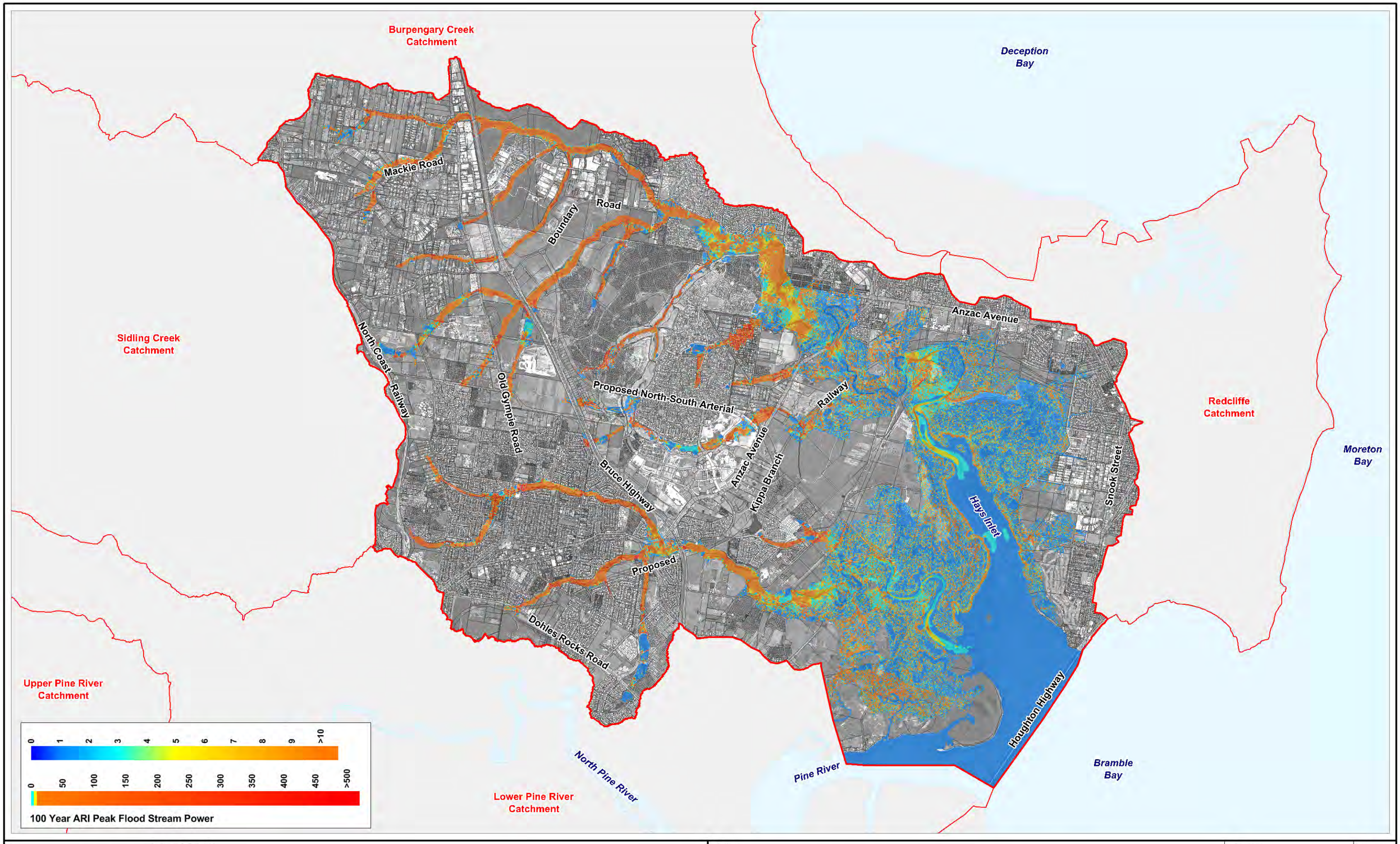
N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_008_120524_Peak Flood Velocity 100Year ARI.WOR



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Note:
Stream power is a function of velocity and bed shear stress.

Title:

Peak Flood Stream Power Map – 100 Year ARI

Figure: **E4**

Rev: **A**

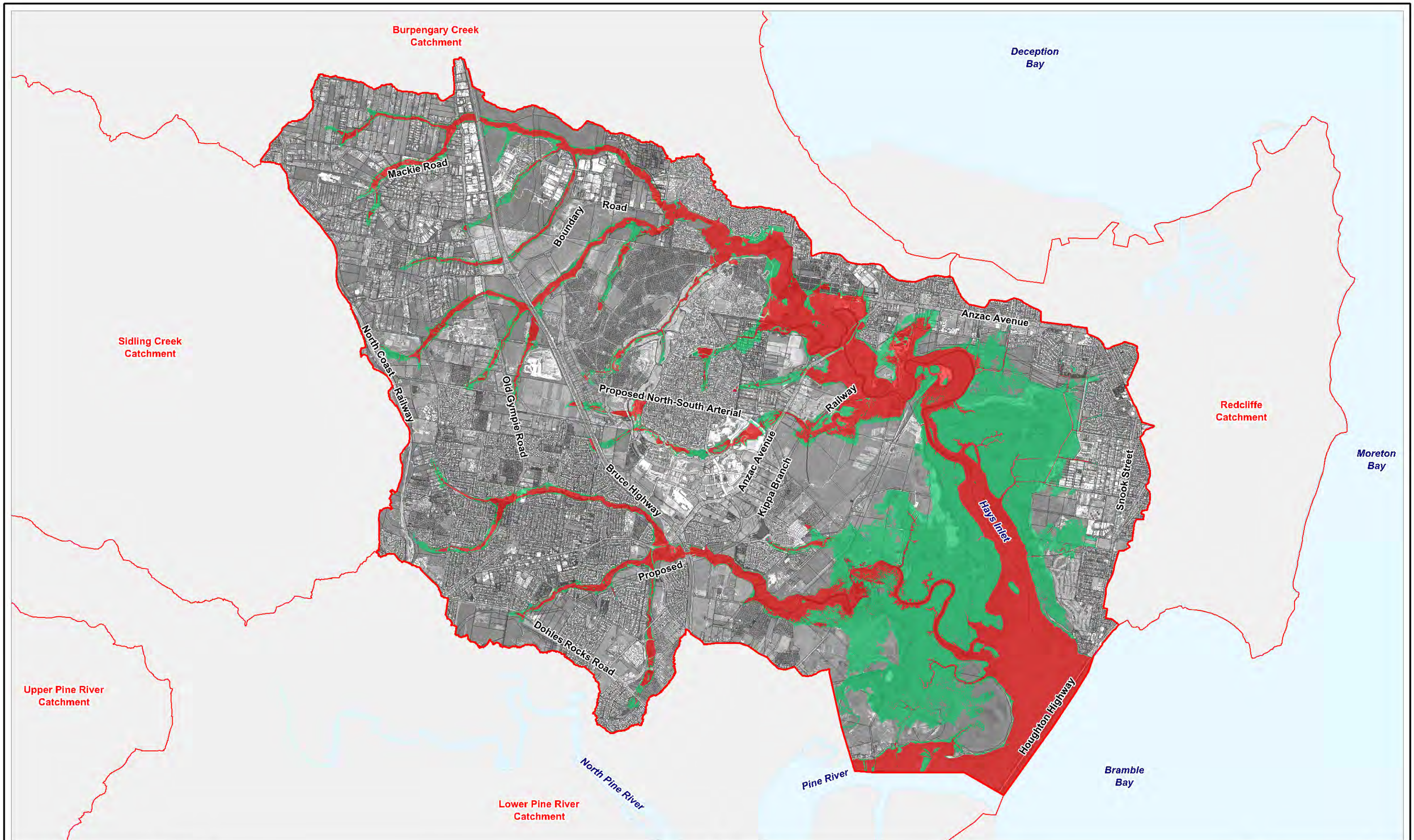
N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_009_120524_Peak Flood Stream Power 100Year ARI.WOR



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

New South Wales Floodplain Development Manual Flood Hazard Category
100 Year ARI Event

Low Hazard
High Hazard

Title:
Peak Flood Hazard Map – 100 Year ARI

Figure: **E5**

Rev: **A**

N

0km 1.5 3

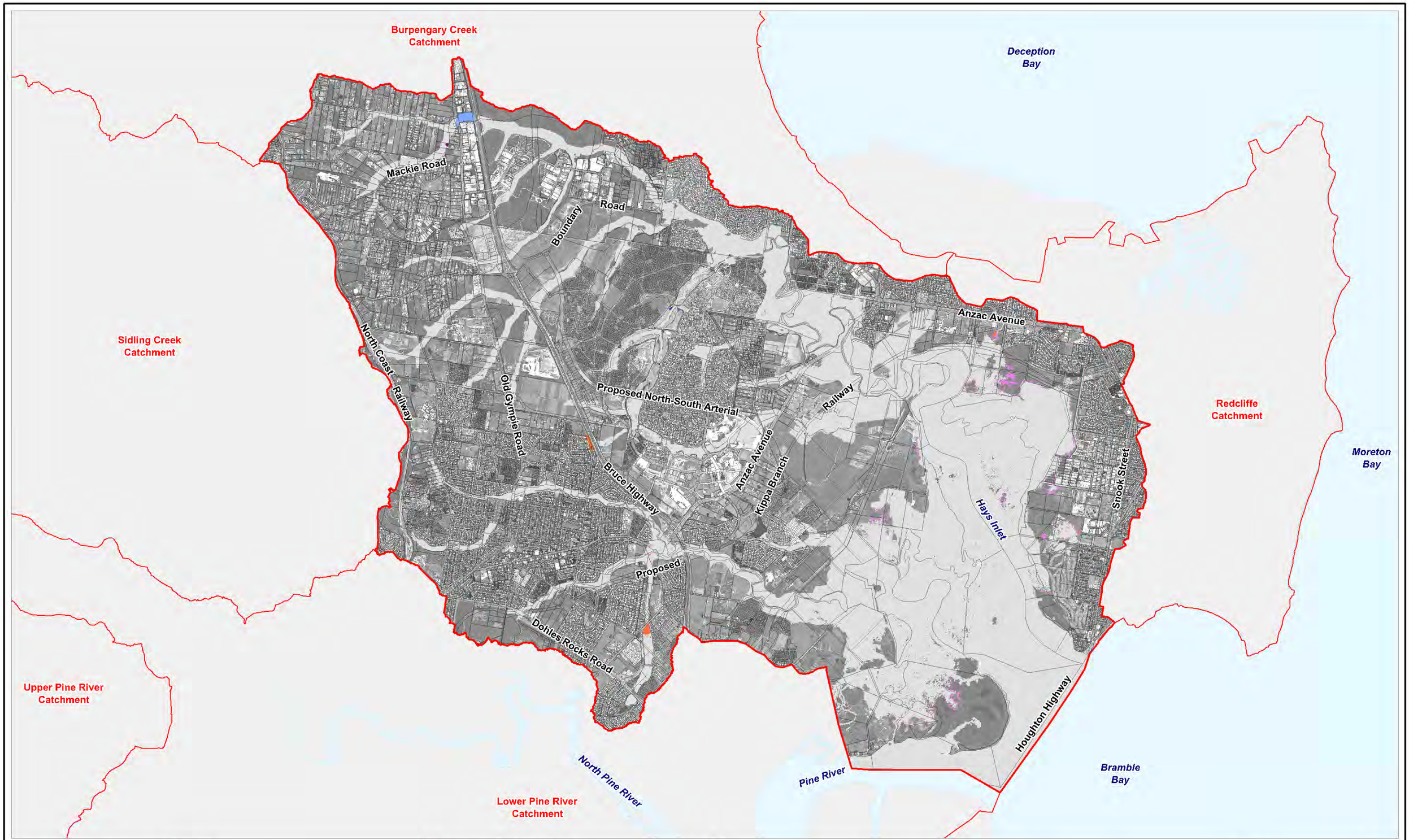
Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_010_120524_Peak Flood Hazard 100Year ARI.WOR

APPENDIX F

APPENDIX F: MODEL SENSITIVITY ANALYSIS MAPS



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

100 Year EDS Minus 100 Year 1 Hour, 3 Hour and 6 Hour Storm

Figure: F1

Rev: A

N

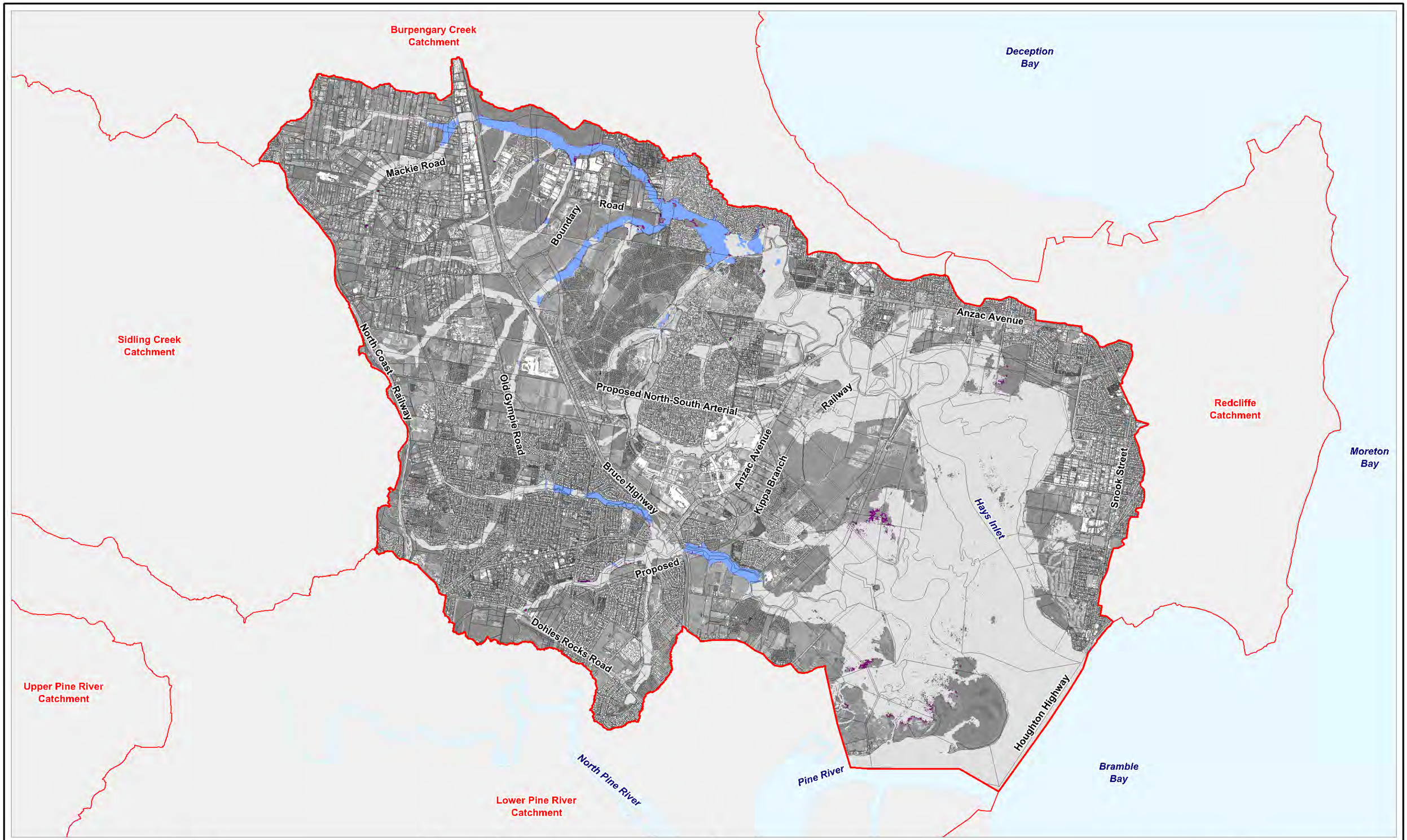
0km 1.5 3

Approx. Scale

BMT WBM

www.bmtwbm.com.au

Filepath : file://I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_011_120524_Flood Level Diff Bet EDS and Selected Critical Storm Durations 100Year ARI.WOR



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Increased Roughness Scenario (S2) Minus 100 Year EDS

Figure: **F2**

Rev: **A**

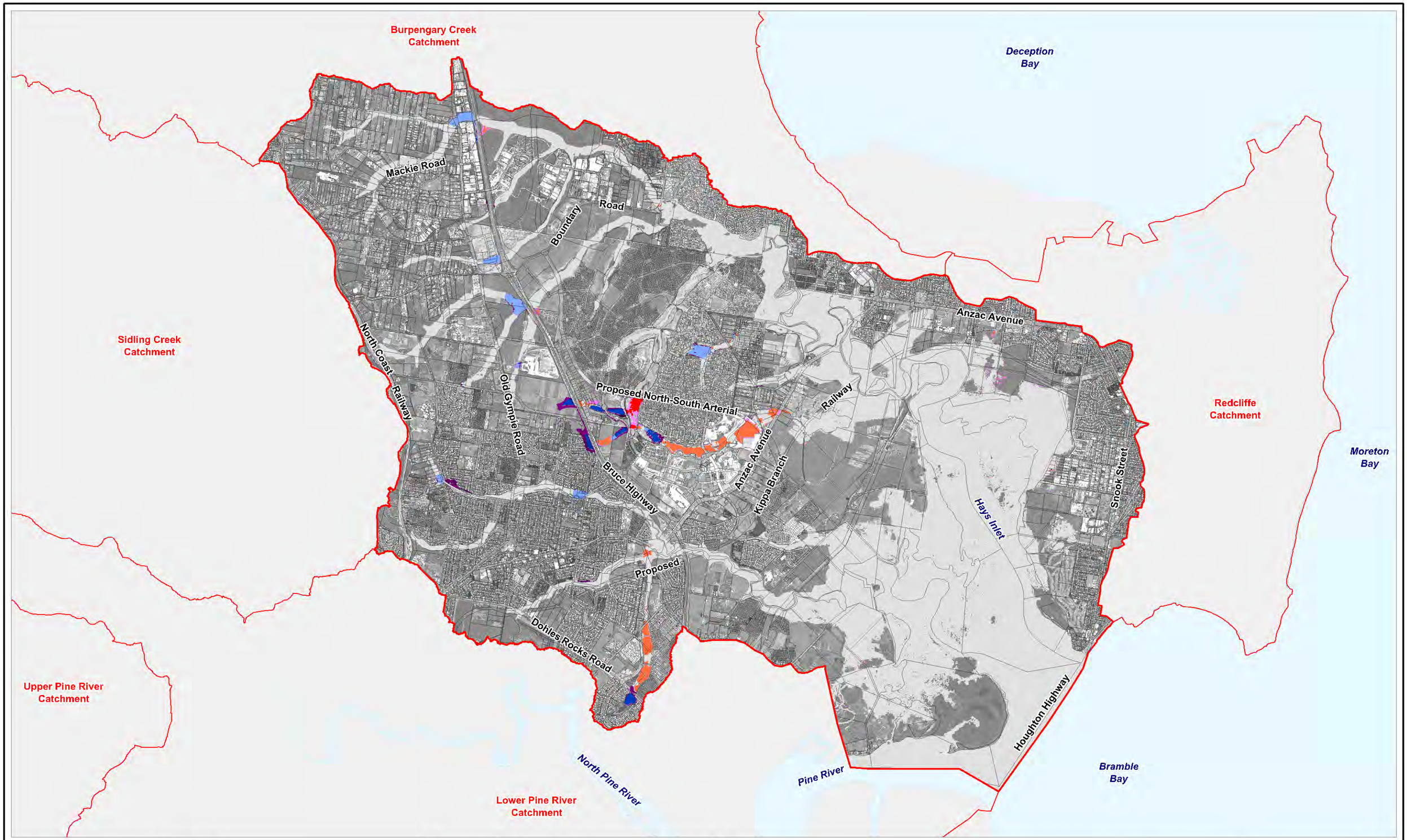
N

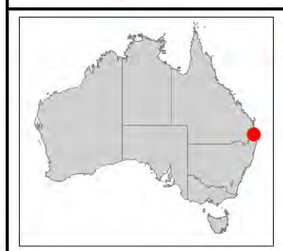
0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_012_120523_Increase in Roughness Flood Level Impact 100Year ARI.WOR





LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Culvert Blockage Scenario (S3) Minus 100 Year EDS

Figure: **F3**

Rev: **A**

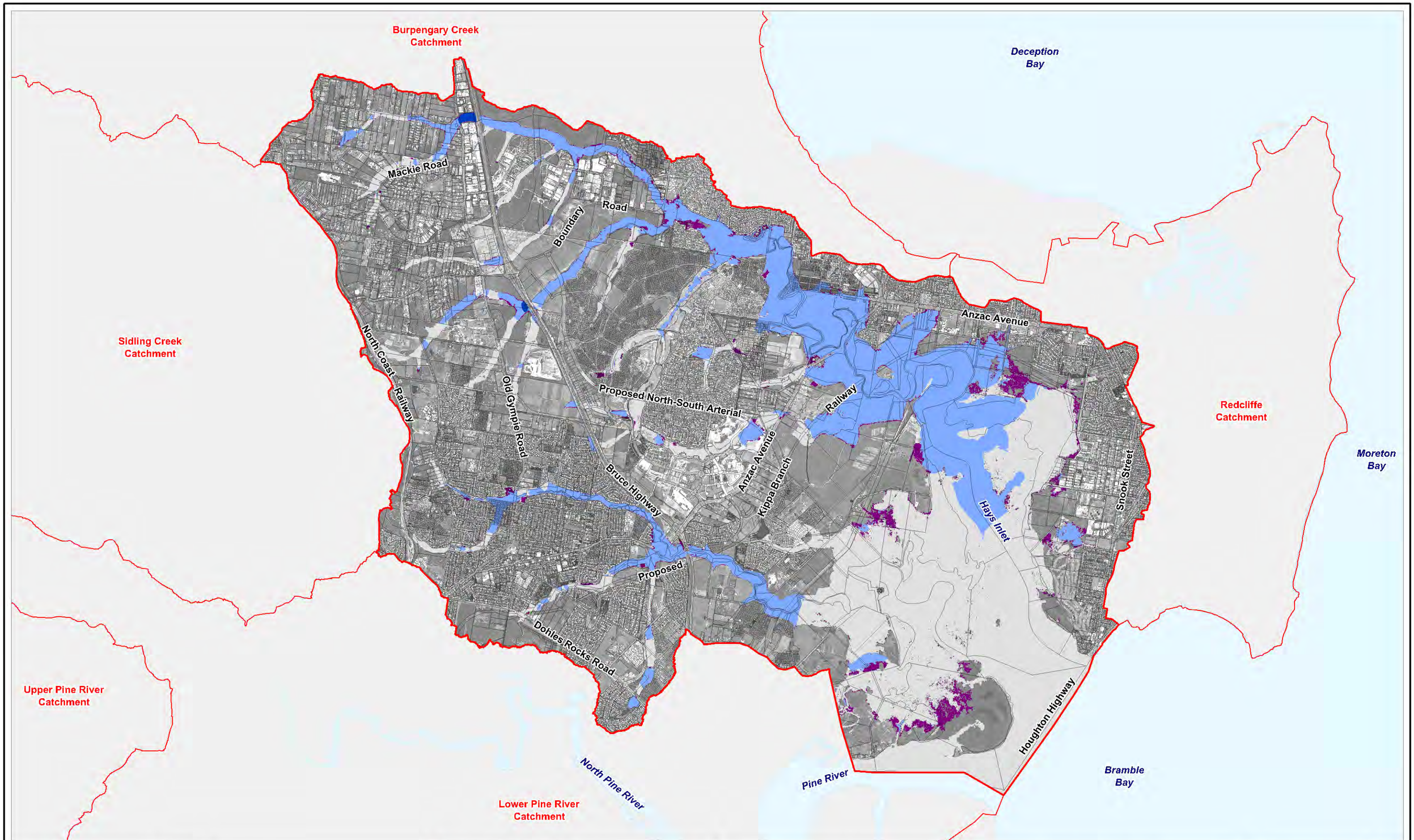
N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_013_120523_Structure Blockage Flood Level Impact 100Year ARI.WOR



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Increased Rainfall Scenario (S4) Minus 100 Year EDS

Figure: **F4**

Rev: **A**

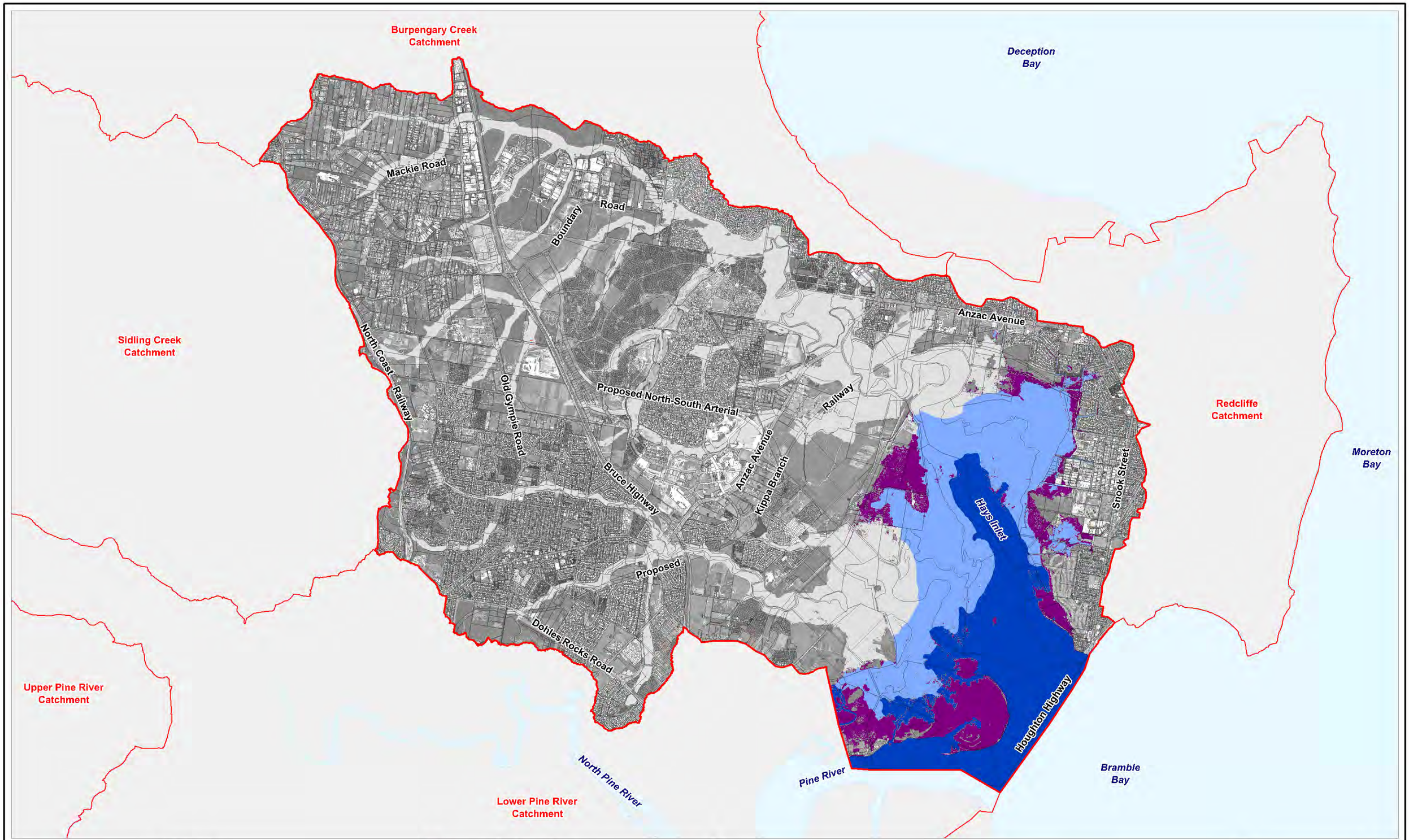
N

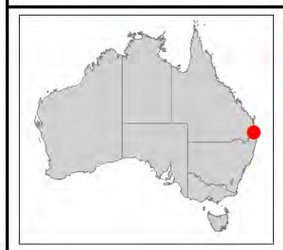
0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_014_120523_Increase in Rainfall Flood Level Impact 100Year ARI.WOR





LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Increased Downstream Boundary Scenario (S5) Minus 100 Year EDS

Figure: **F5**

Rev: **A**

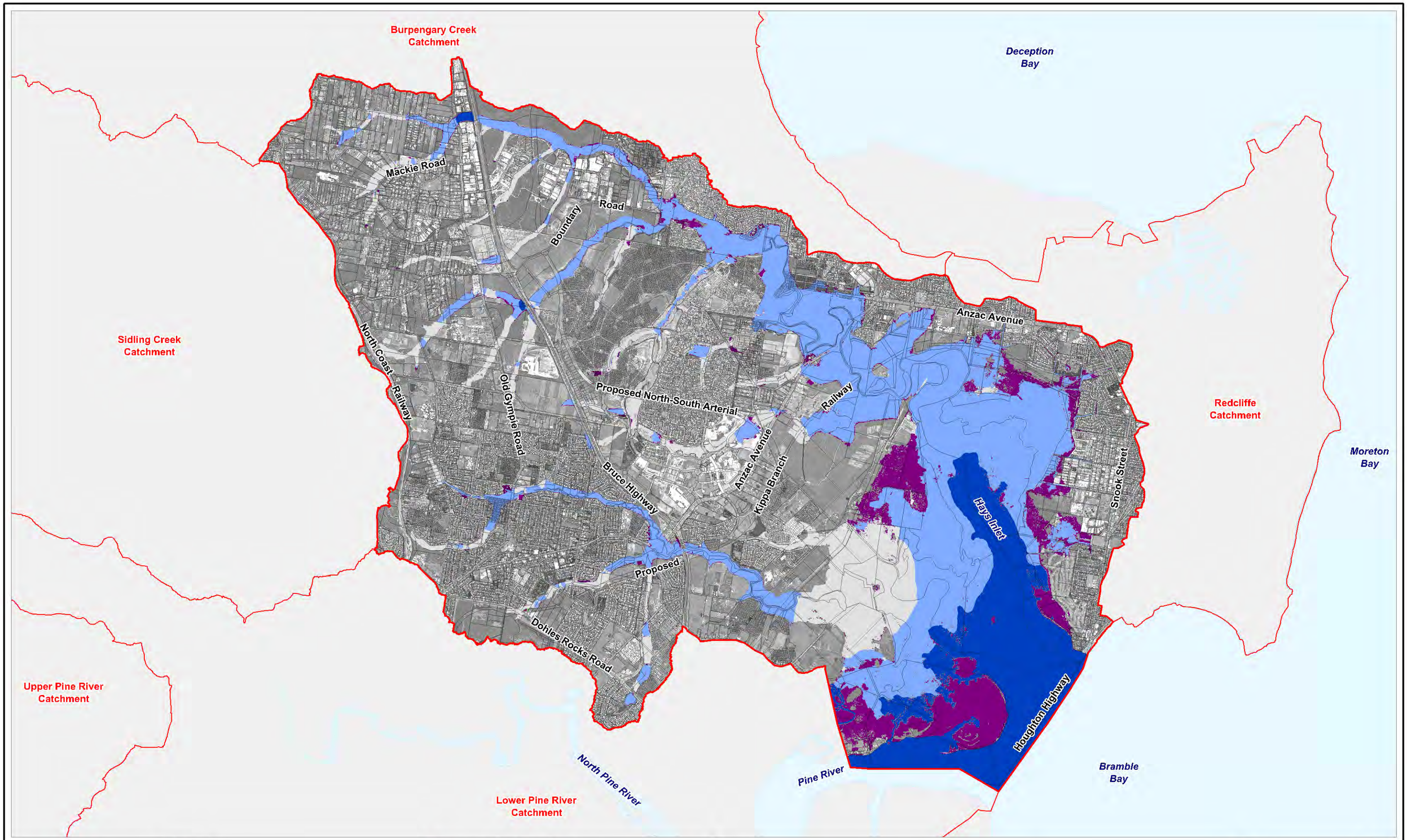
N

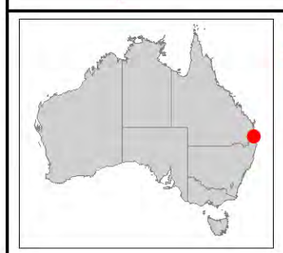
0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_015_120523_Increase in Downstream Boundary Flood Level Impact 100Year ARI.WOR





LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Increased Downstream Boundary and Rainfall Scenario (S6) Minus 100 Year EDS

Figure: **F6**

Rev: **A**

N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_016_120523_Increase in Rainfall and Downstream Bdy Flood Level Impact 100Year ARI.WOR

Burpengary Creek Catchment

Deception Bay

Mackie Road

Boundary Road

Sidling Creek Catchment

North Coast Railway

Old Gympie Road

Proposed North-South Arterial

Anzac Avenue

Railway

Redcliffe Catchment

Moreton Bay

Bruce Highway

Kippa Branch

Hays Inlet

Snook Street

Proposed

Dohles Rocks Road

Upper Pine River Catchment

Houghton Highway

North Pine River

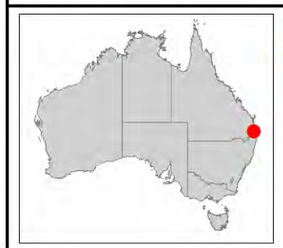
Pine River

Bramble Bay

Lower Pine River Catchment

0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00

100 Year EDS Peak Flood Level (m AHD)



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Title:

Dynamic Storm Tide Peak Flood Level – 100 Year EDS (S7)

Figure: F7

Rev: A

N

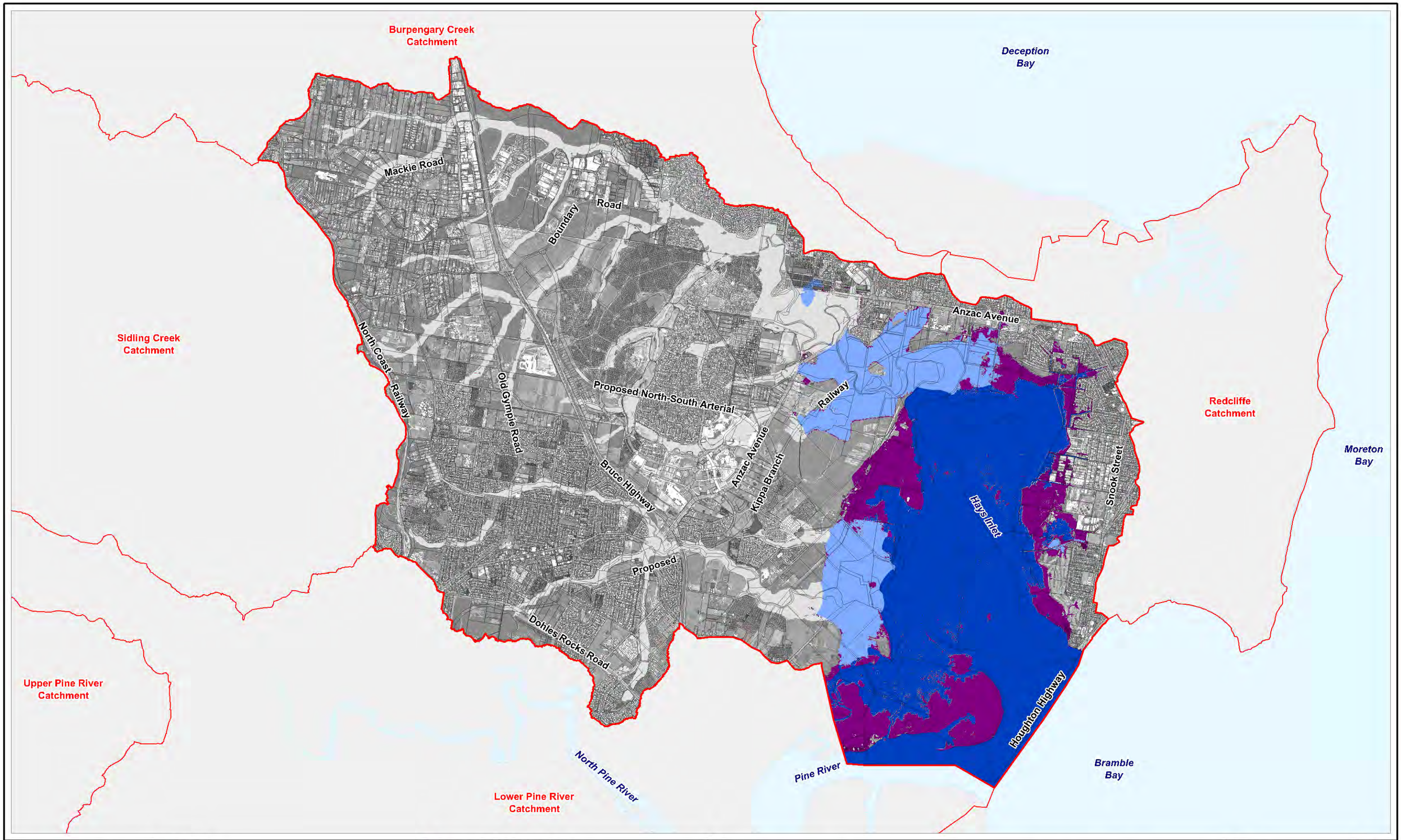
0km 1.5 3

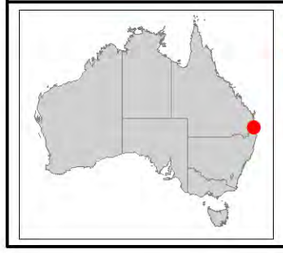
Approx. Scale

BMT WBM

www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_017_120611_REVISED_Dynamic Storm Tide Peak Flood Level 100Year ARI.WOR





LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Static Storm Tide Scenario (S8) Minus 100 Year EDS

Figure: **F8**

Rev: **A**

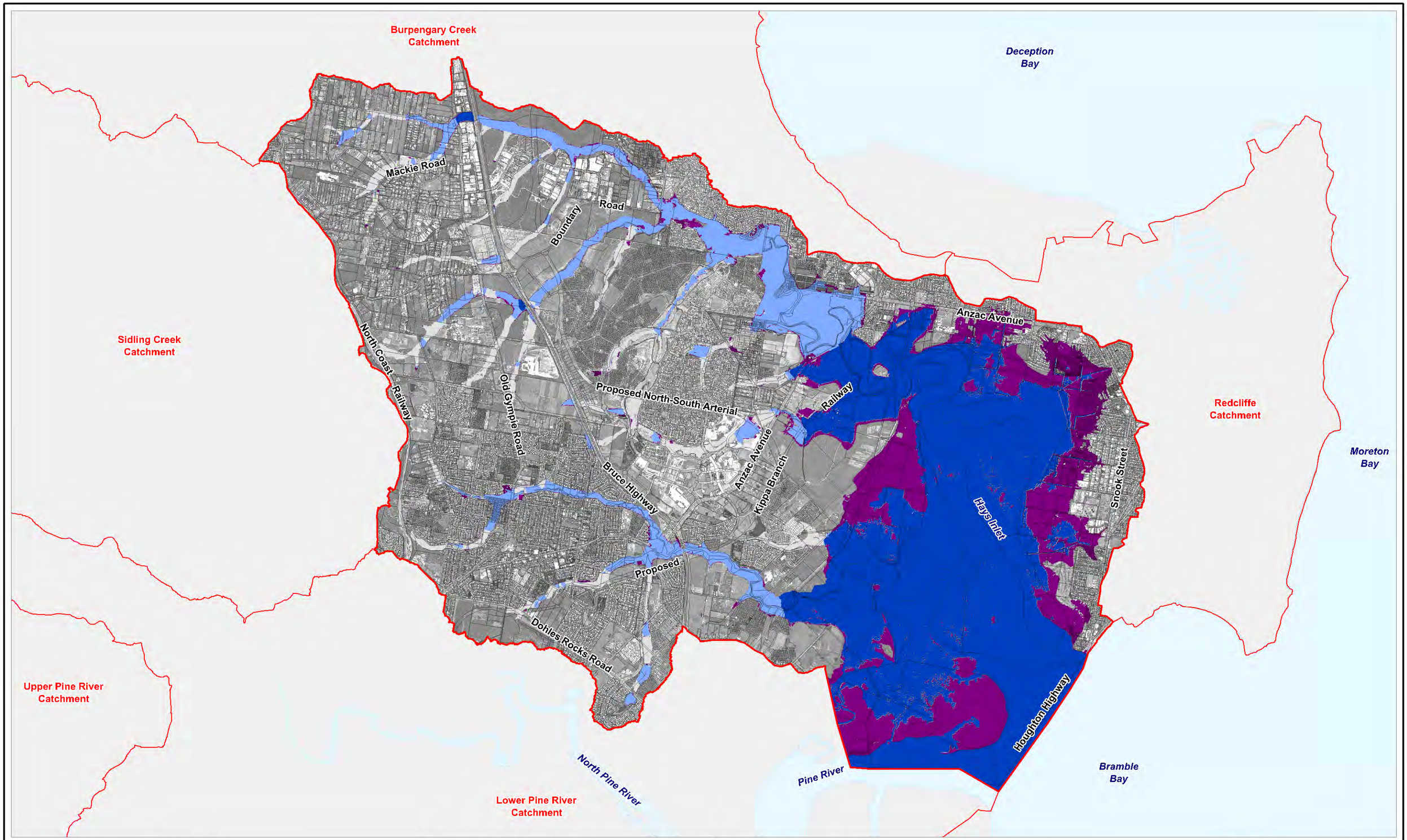
N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_018_120523_Static Storm Tide Flood Level Impact 100Year ARI.WOR



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Static Storm Tide, Increased Rainfall and Sea Level Rise Scenario (S9) Minus 100 Year EDS

Figure: **F9**

Rev: **A**

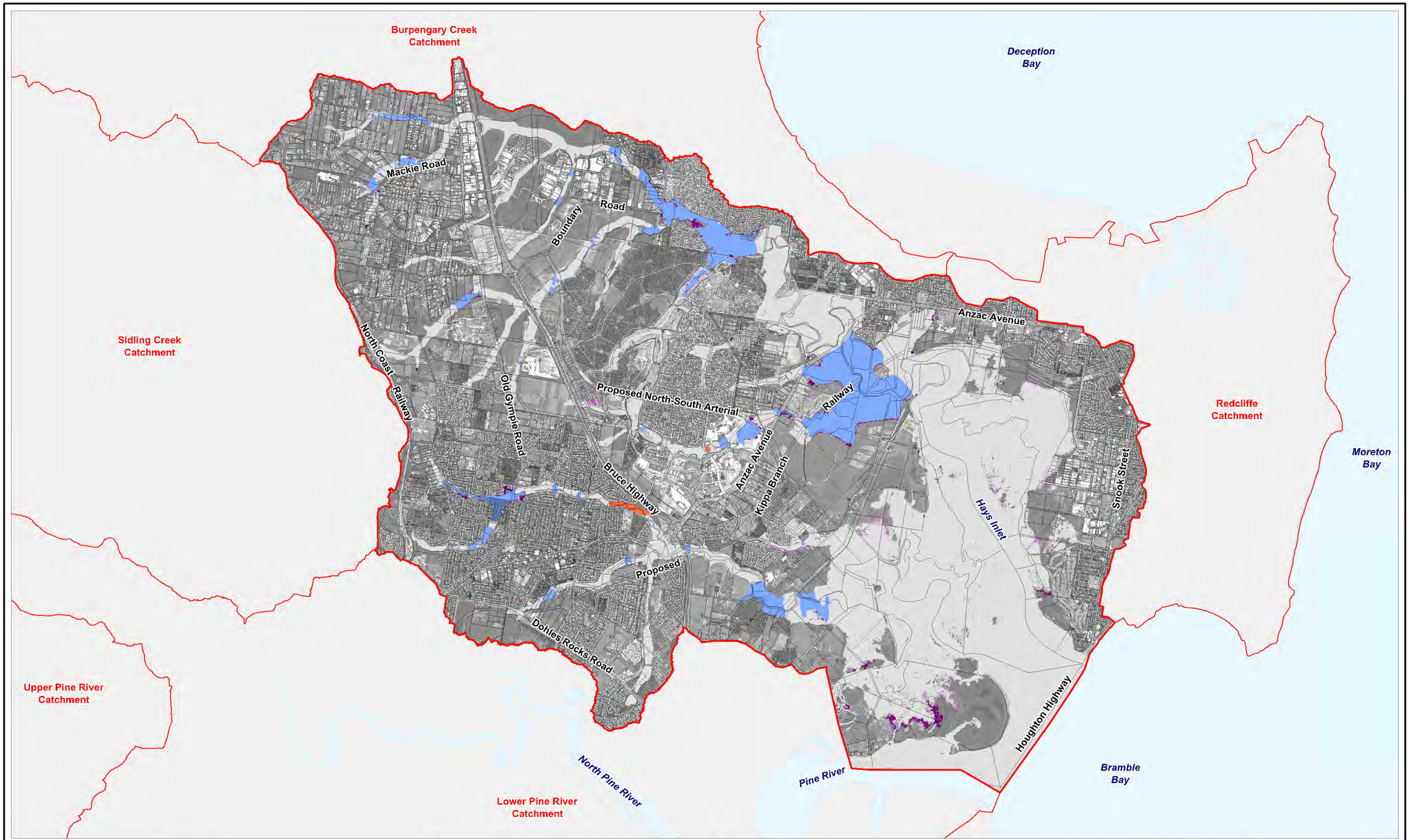
N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_019_120523_Static Storm Tide and Climate Change Flood Level Impact 100Year ARI.WOR



LEGEND

- Hays Inlet Catchment Boundary
- Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Increased Vegetation Scenario (S10) Minus 100 Year EDS

Figure: **F10**

Rev: **A**

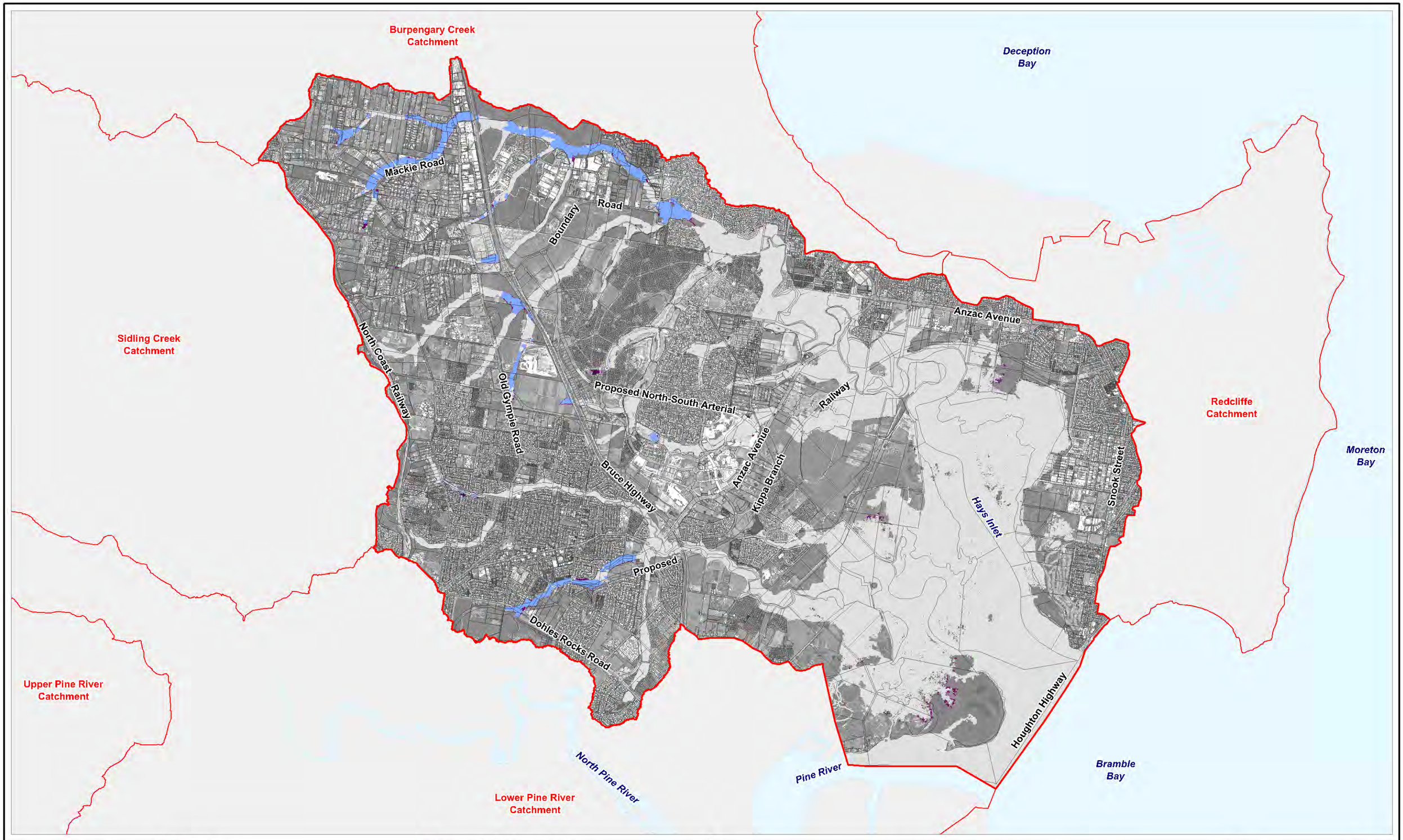
N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_020_120523_Increase in Vegetation Flood Level Impact 100Year ARI.WOR



LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Increased Residential Development Scenario (S11) Minus 100 Year EDS

Figure: F11

Rev: A

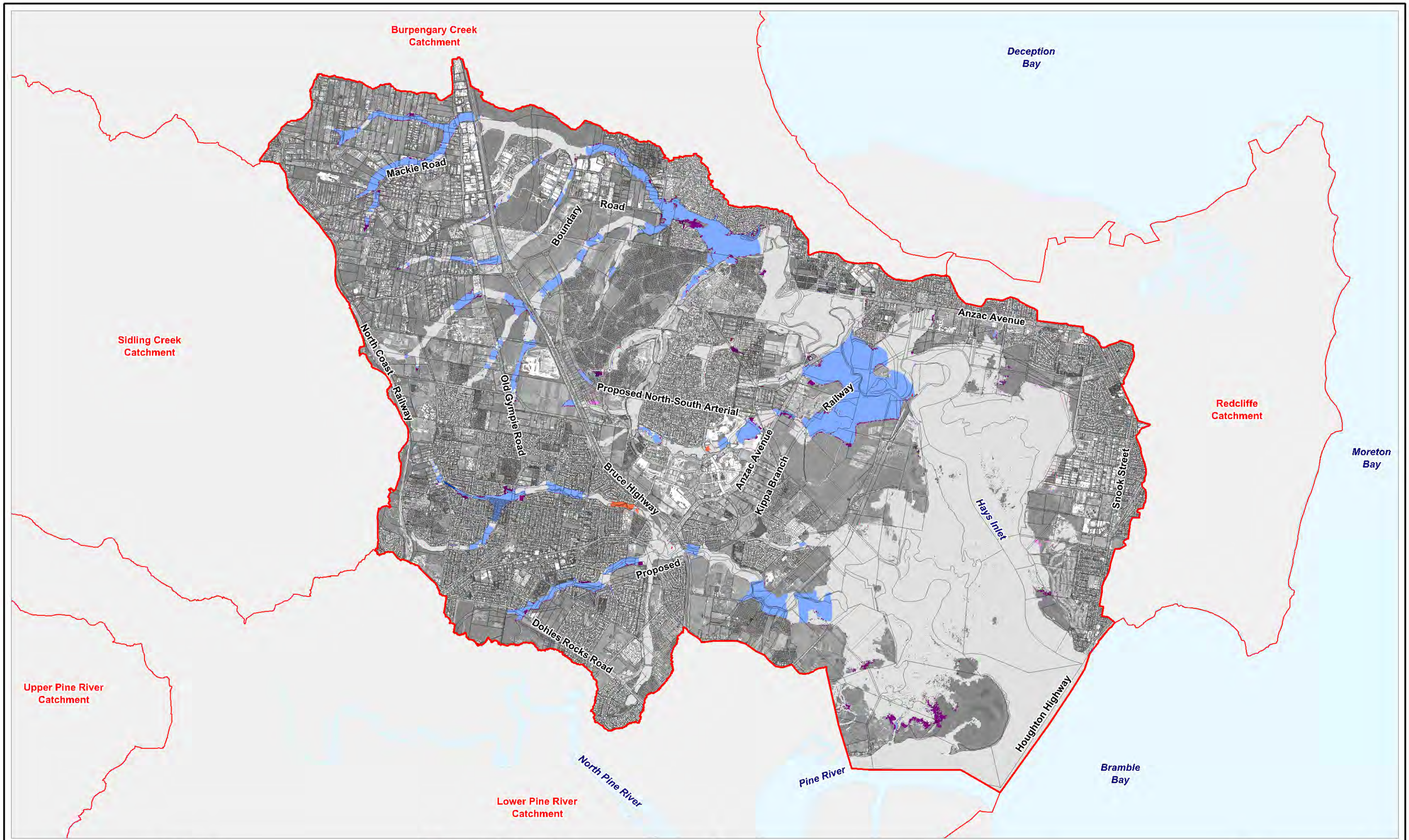
N

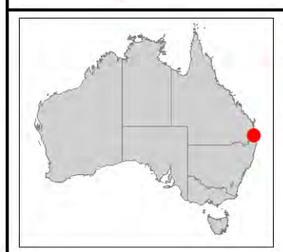
0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_021_120523_Increase in Residential Development Flood Level Impact 100Year ARI.WOR





LEGEND

Hays Inlet Catchment Boundary

Cadastral Boundaries

Difference in Peak Levels (m)

- < -0.5
- -0.5 to -0.1
- -0.1 to 0.1
- 0.1 to 0.5
- > 0.5
- Was dry now wet
- Was wet now dry

Title:

Increased Residential Development and Vegetation Scenario (S12) Minus 100 Year EDS

Figure: **F12**

Rev: **A**

N

0km 1.5 3

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Hays_Inlet_Report\FLD_022_120523_Increase in Veg and Residential Development Flood Level Impact 100Year ARI.WOR

Moreton Bay Regional Council

Emergency Management EMQ Queensland

Australian Goverment
Attorney-General's Department
Emergency Management Australia

Queensland Government