APPENDIX D

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APPENDIX D: MODELLING QUALITY REPORT

Technical Note

From:	Richard Sharpe	To:	Moreton Bay Regional Council
Date:	18 May 2012	CC:	
Subject:	Modelling Quality Report; Redcliffe		

1 Background

As part of Moreton Bay Regional Council's (MBRC) Regional Floodplain Database (RFD) project, a detailed TUFLOW model of the Redcliffe catchment has been developed. This technical note has been prepared to demonstrate that the Redcliffe model has been reviewed, 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 18th May 2011);

5 MBRC provided feedback from their review of the TUFLOW model on 7th 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 development of the draft model. The following changes were implemented:

1 MBRC were concerned that the flood behaviour did not match up to expectations in some areas; based on anecdotal evidence and their knowledge of the catchment. The hypothesis for this discrepancy was that in some areas the spread of flood water may be significantly influenced by the storm water drainage network, which was not included in the model. To resolve this issue, MBRC provided storm water network details for

specific portions of the catchment, which were appended to the 1D model network with associated links to the 2D domain at stormwater pits;

2 The edge of the model extent in the south east corner of the catchment intersected the extent of flooding in the model; i.e. the model limit was not extensive enough, and blocked the spread of floodwater. The active area in the 2D domain was therefore extended in the south eastern corner.

3 Additional survey data was used to update the details on some structures, including Humpybong Drain.

Particular consideration was given to the arrangement of the outfall on Humpybong Drain. This structure is important as it controls the flow through Humpybong Creek. MBRC surveyed the structure, which includes a weir at its entrance to develop supercritical flow conditions through the entrance of the outfall culvert. The outfall structure was designed to convey approximately 27m³/s (email communication with Hester van Zijl – 22 December 2011), which is similar to the flow capacity achieved in the TUFLOW model (see Figure 1).

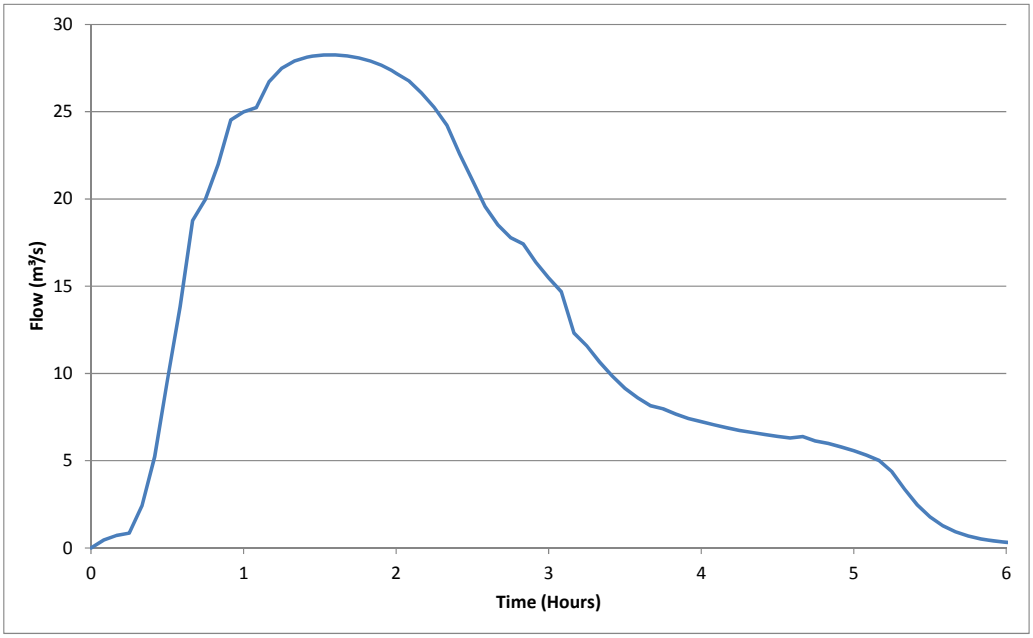


Figure 1: Flow through Humpybong Outfall (100 year ARI; 1 hour storm duration)

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. Sharp 'kinks' in the downstream boundary were smoothened, to eliminate instabilities that occurred during large tidal events (i.e. for sensitivity tests on the downstream boundary).

5 Model Performance

The following model performance checks have been undertaken:

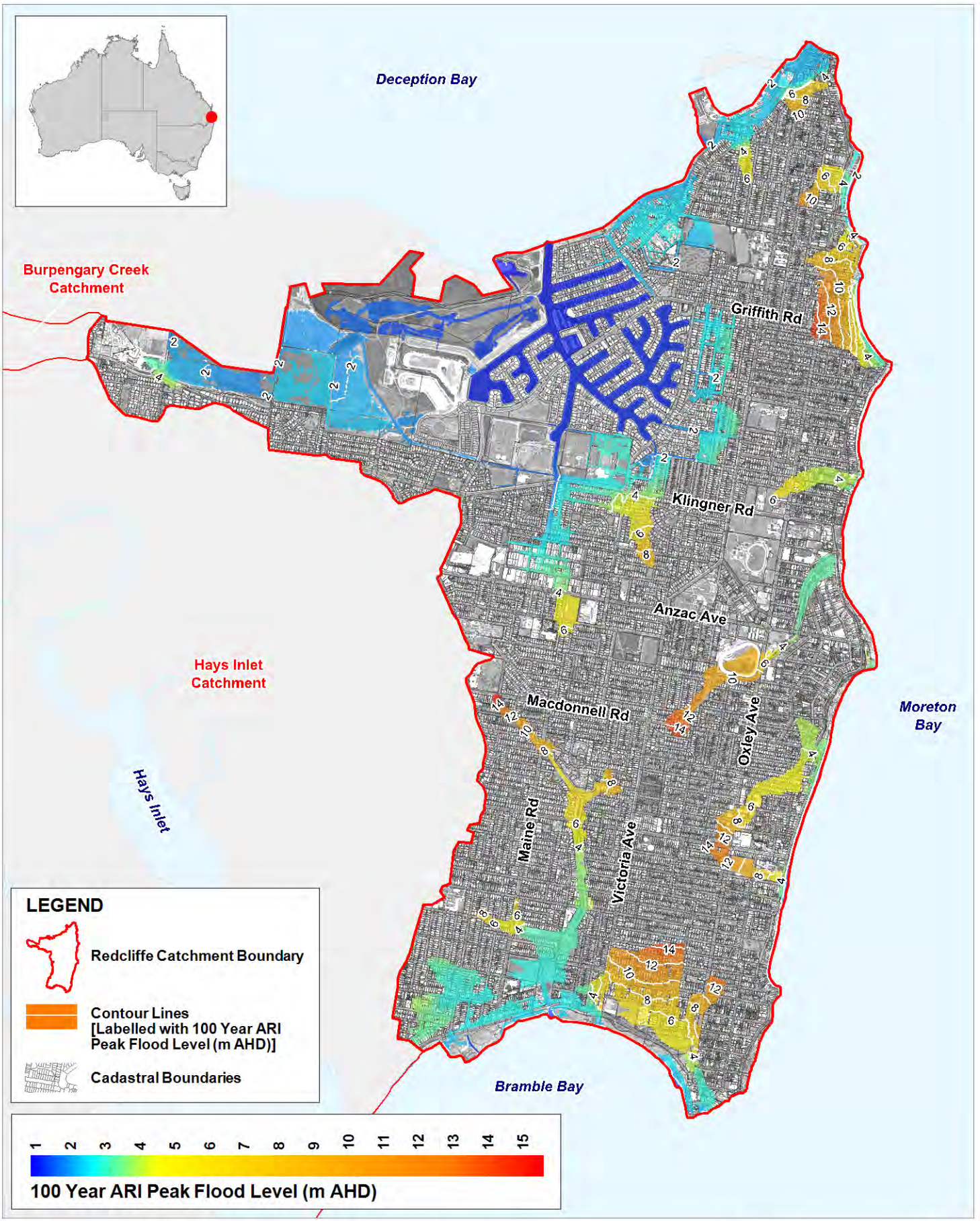
- Stability of flow through key structures (e.g. Figure 1) was checked during model development. The arrangement of SX connections, structures and embankments has been edited to ensure that stable flows have been achieved where necessary;
- TUFLOW warning messages have been minimised. A few negative depth warning messages remain on steep 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 0.7% for the small flood events.

6 Conclusion

The Redcliffe 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



Title:

Peak Flood Level Map – 100 Year ARI

Figure: **E1**

Rev: **A**

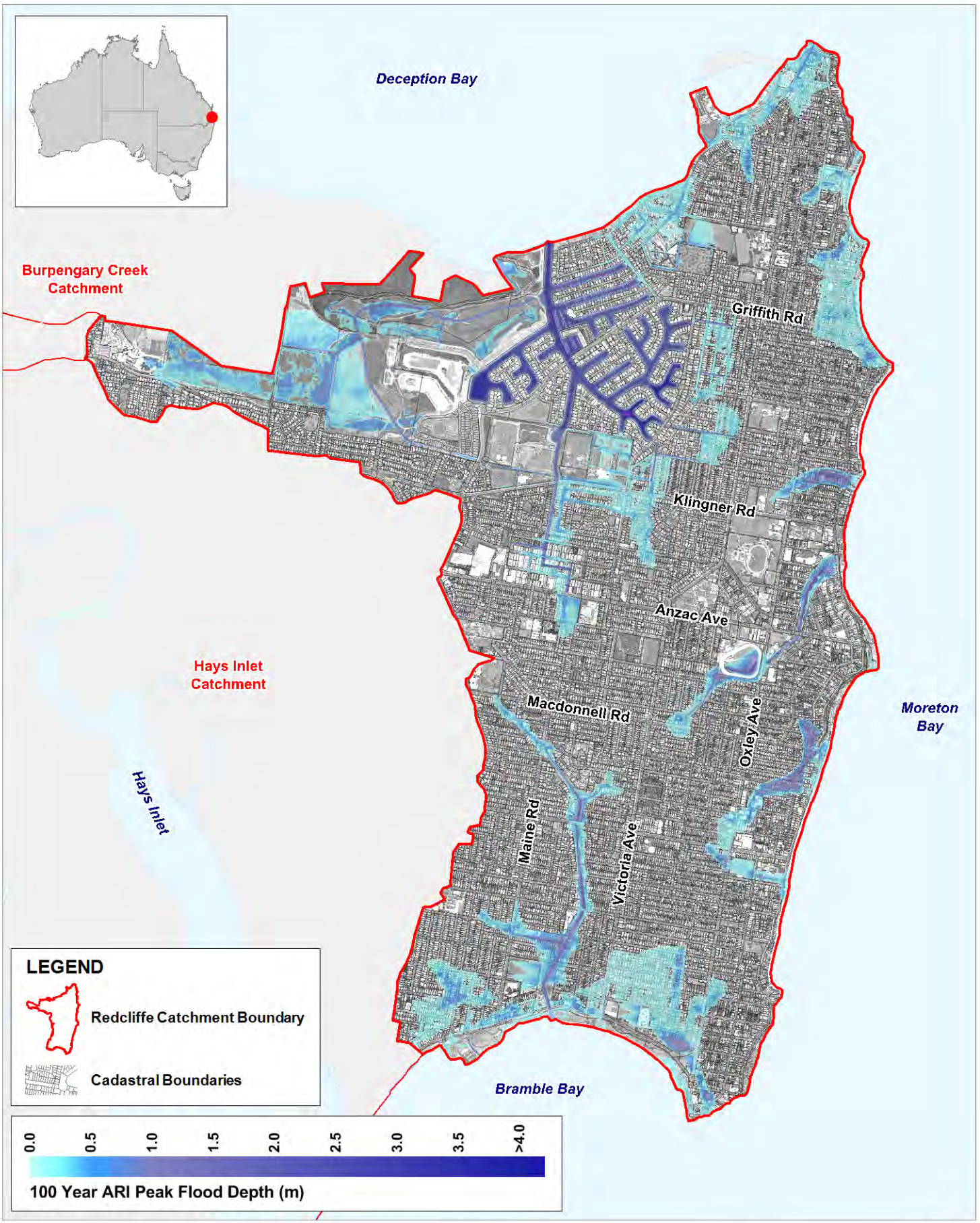
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_006_120516_Peak Flood Level 100Year ARI.WOR



Title:

Peak Flood Depth Map – 100 Year ARI

Figure: **E2**

Rev: **A**

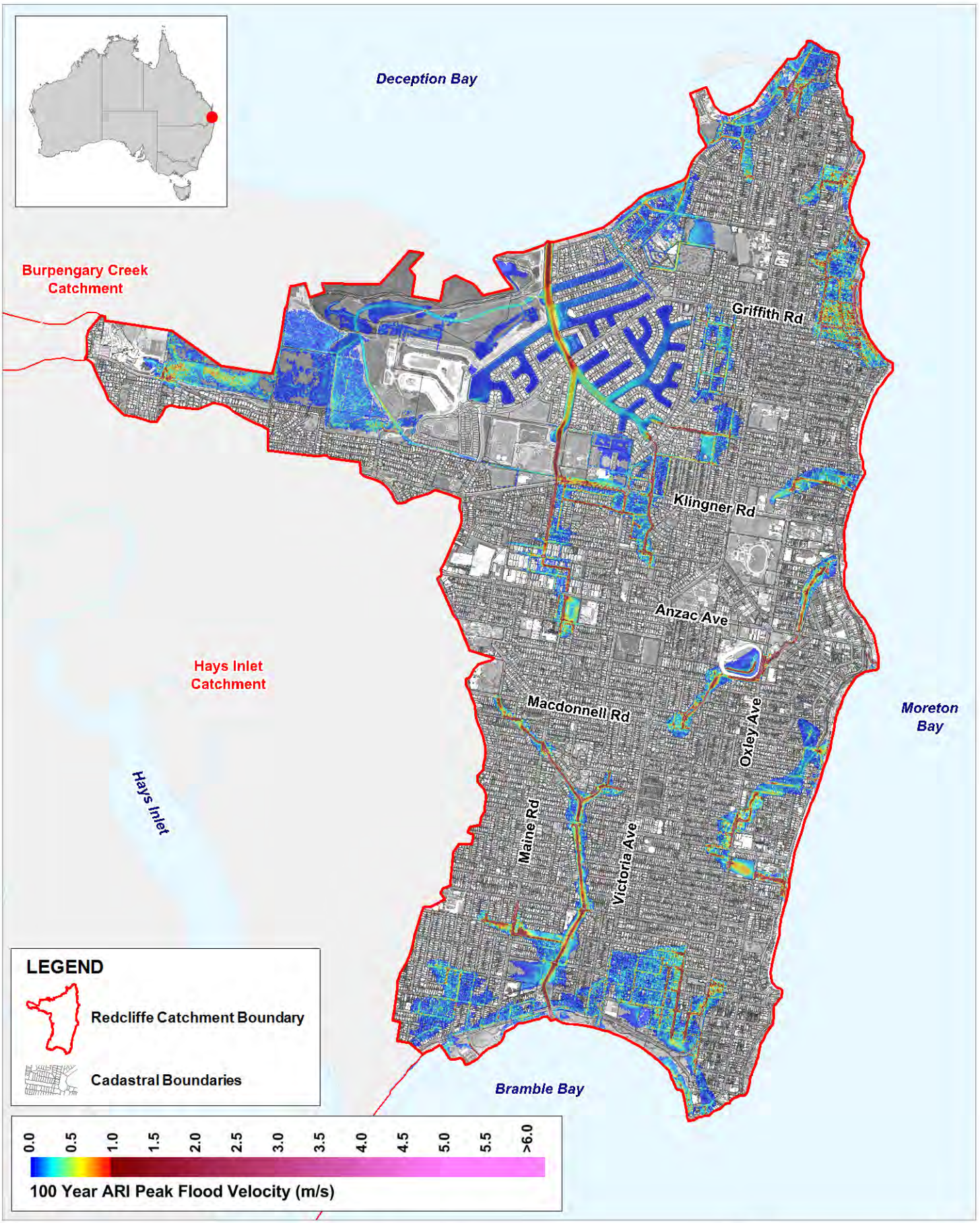
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_007_120517_Peak Flood Depth 100Year ARI.WOR



Title:

Peak Flood Velocity Map – 100 Year ARI

Figure: **E3**

Rev: **A**

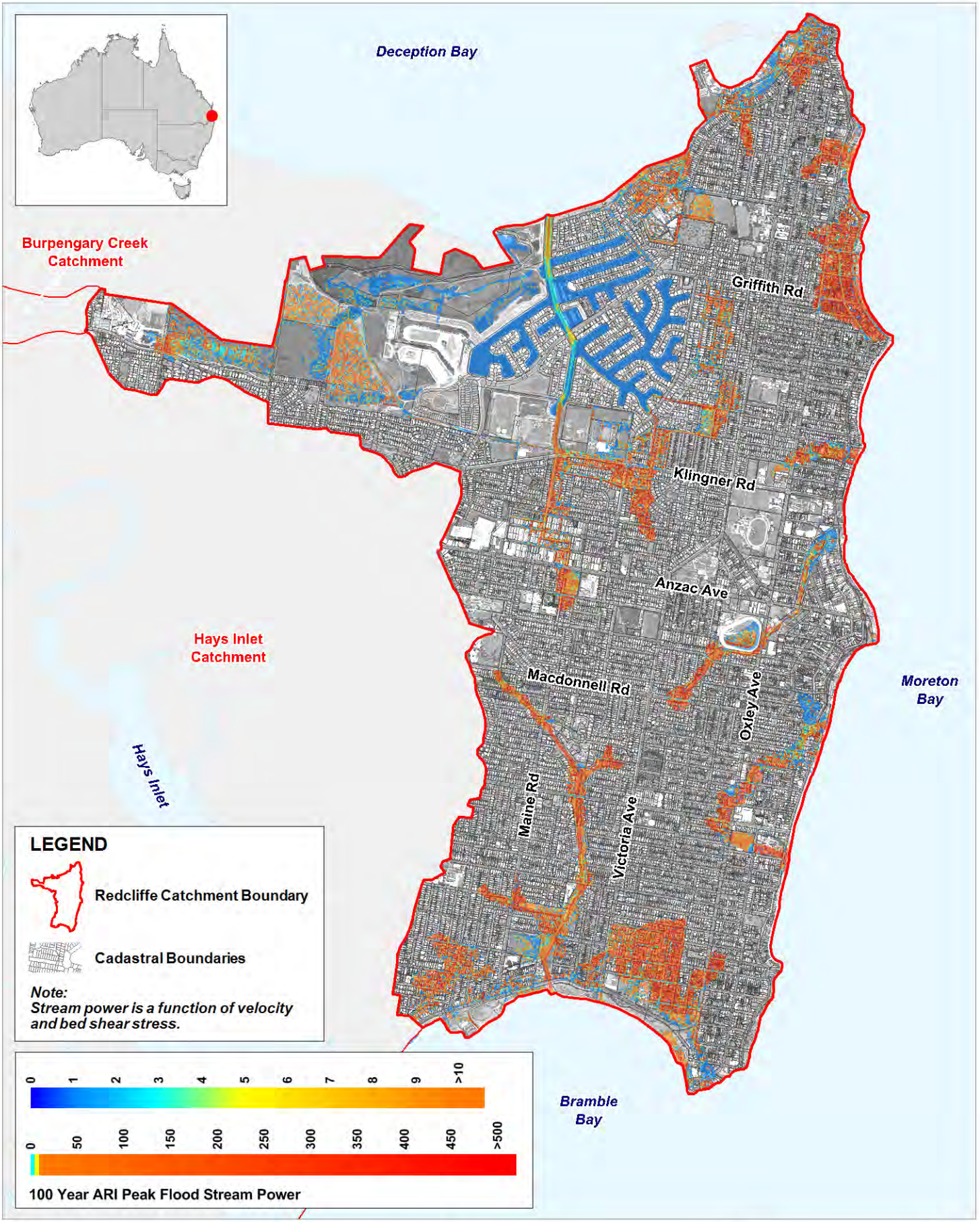
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_008_120517_Peak Flood Velocity 100Year ARI.WOR



Title:

Peak Flood Stream Power Map – 100 Year ARI

Figure: **E4**

Rev: **A**

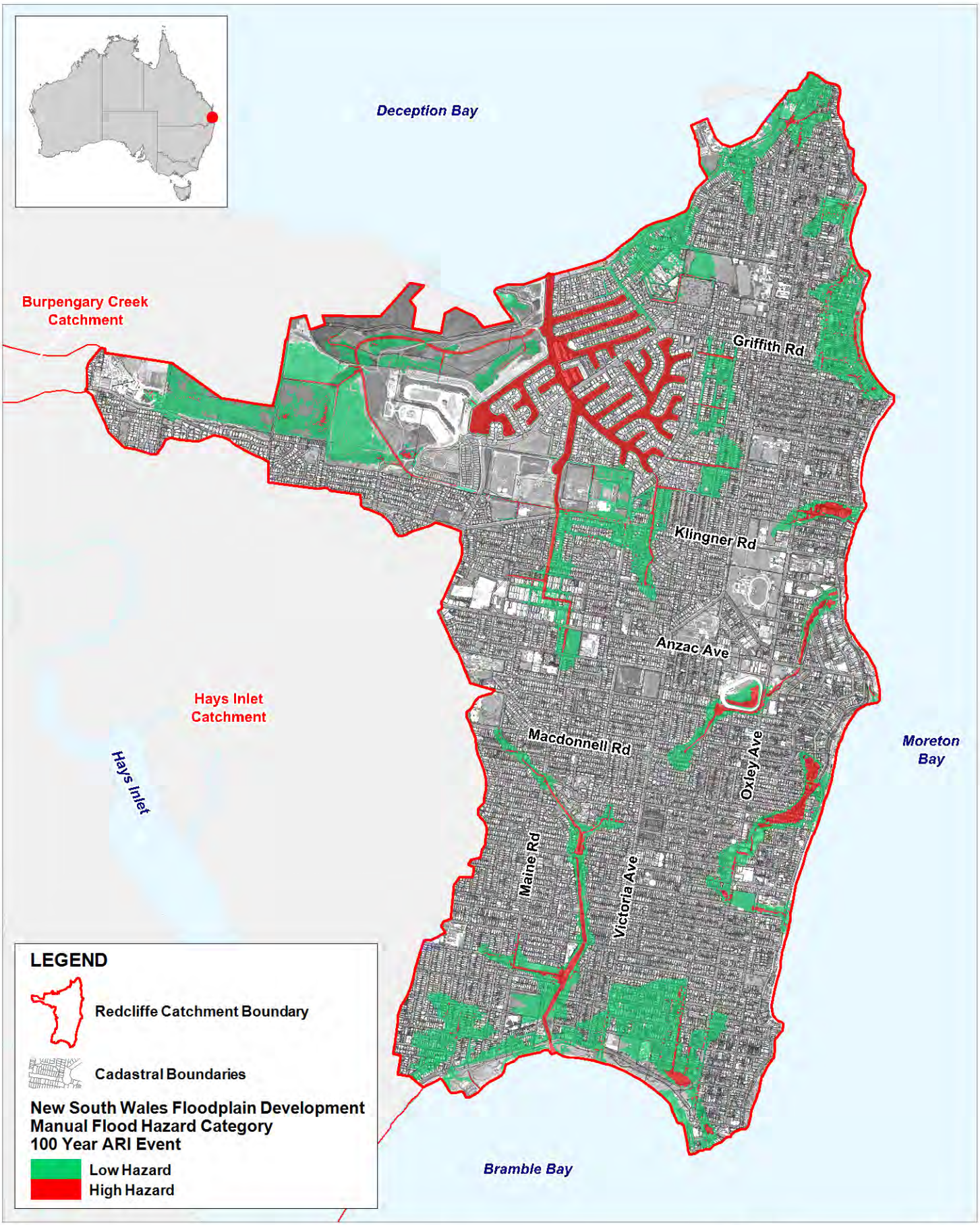
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_009_120517_Peak Flood Stream Power 100Year ARI.WOR



Title:

Peak Flood Hazard Map – 100 Year ARI

Figure: **E5**

Rev: **A**

N

0km 1 2

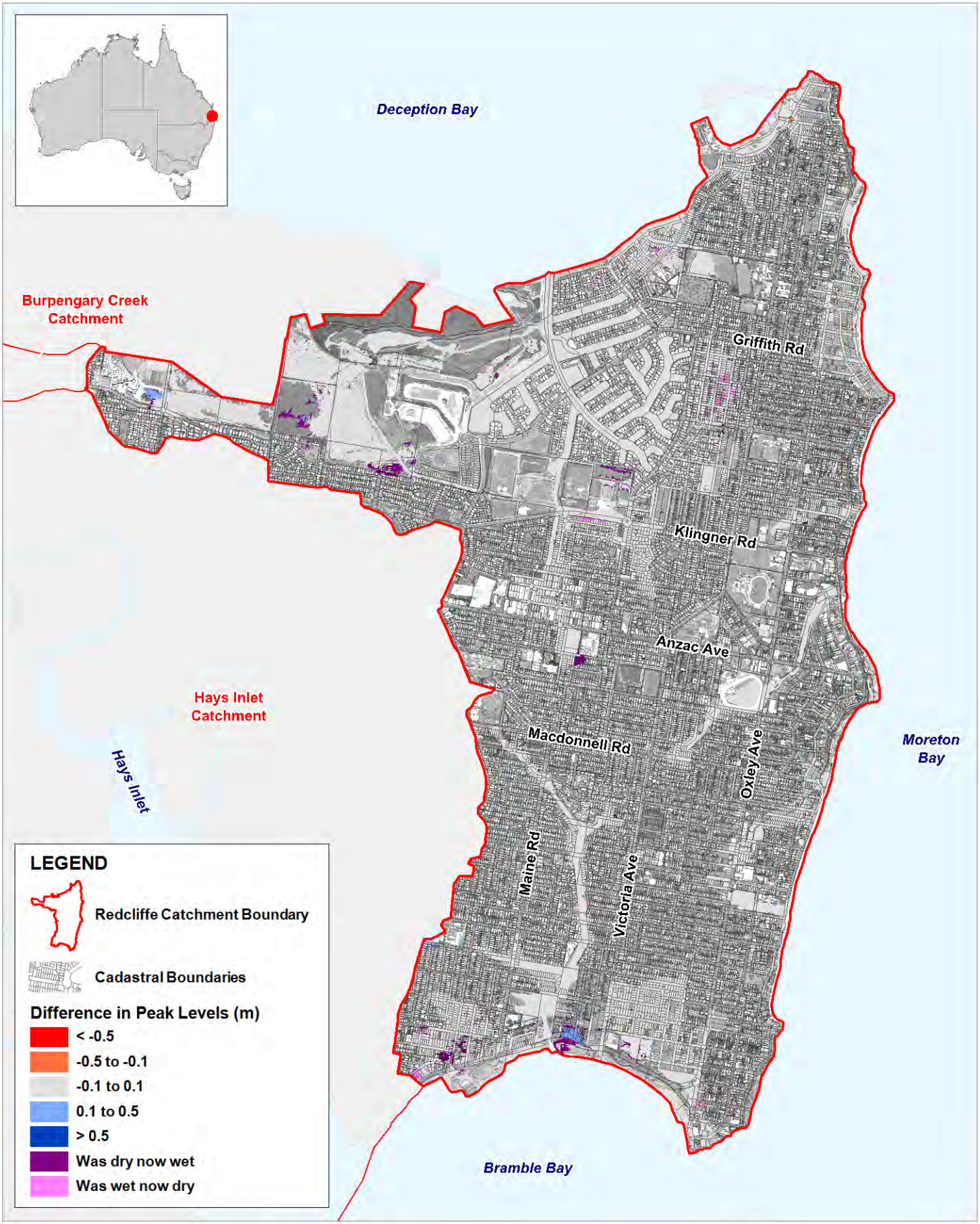
Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_010_120517_Peak Flood Hazard 100Year ARI.WOR

APPENDIX F

APPENDIX F: MODEL SENSITIVITY ANALYSIS MAPS



Title:

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

Figure: **F1**

Rev: **A**

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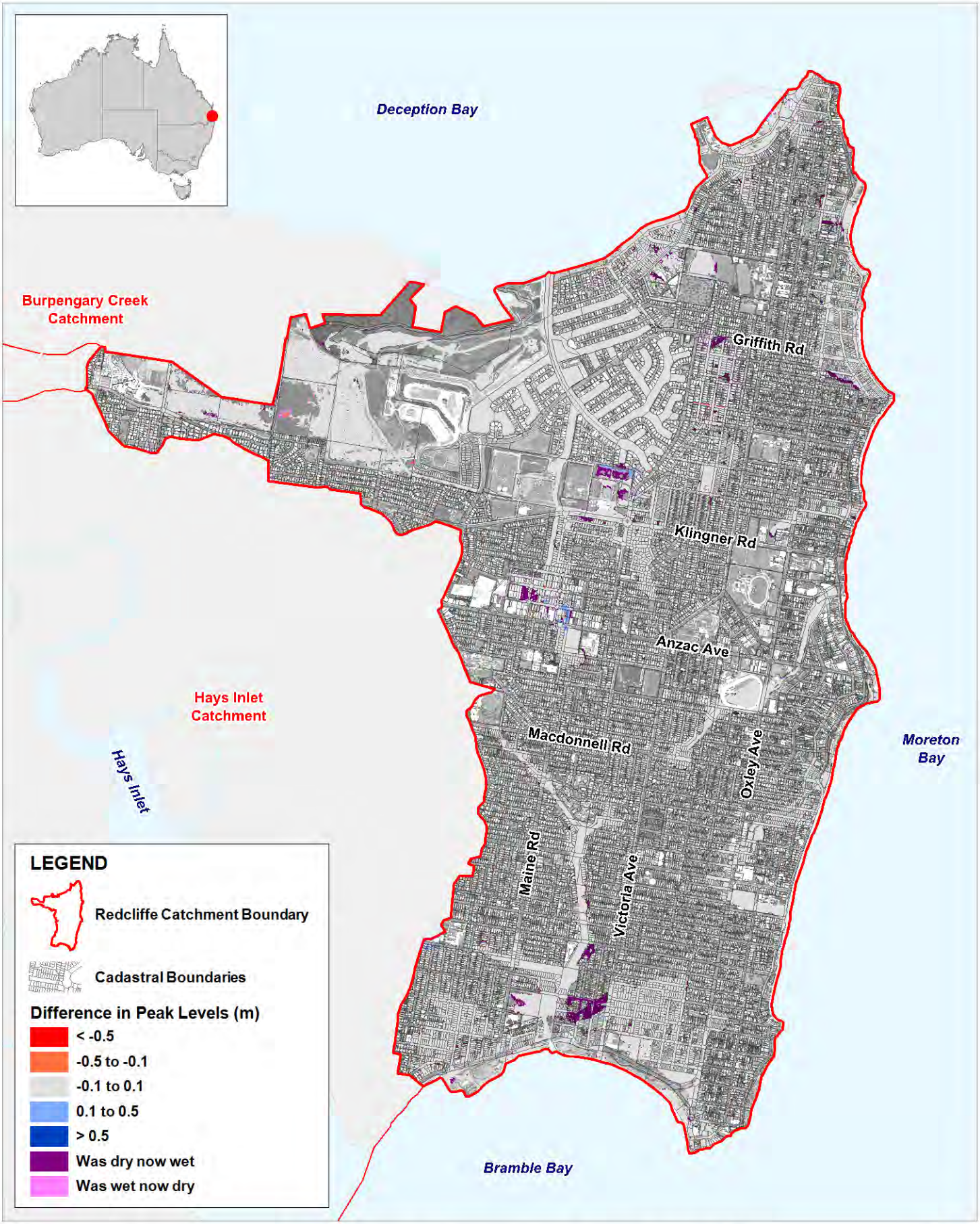
Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_011_120517_Flood Level Diff Bet EDS and Selected Critical Storm Durations 100Year ARI.WOR



Title:

Increased Roughness Scenario (S2) Minus 100 Year EDS

Figure: **F2**

Rev: **A**

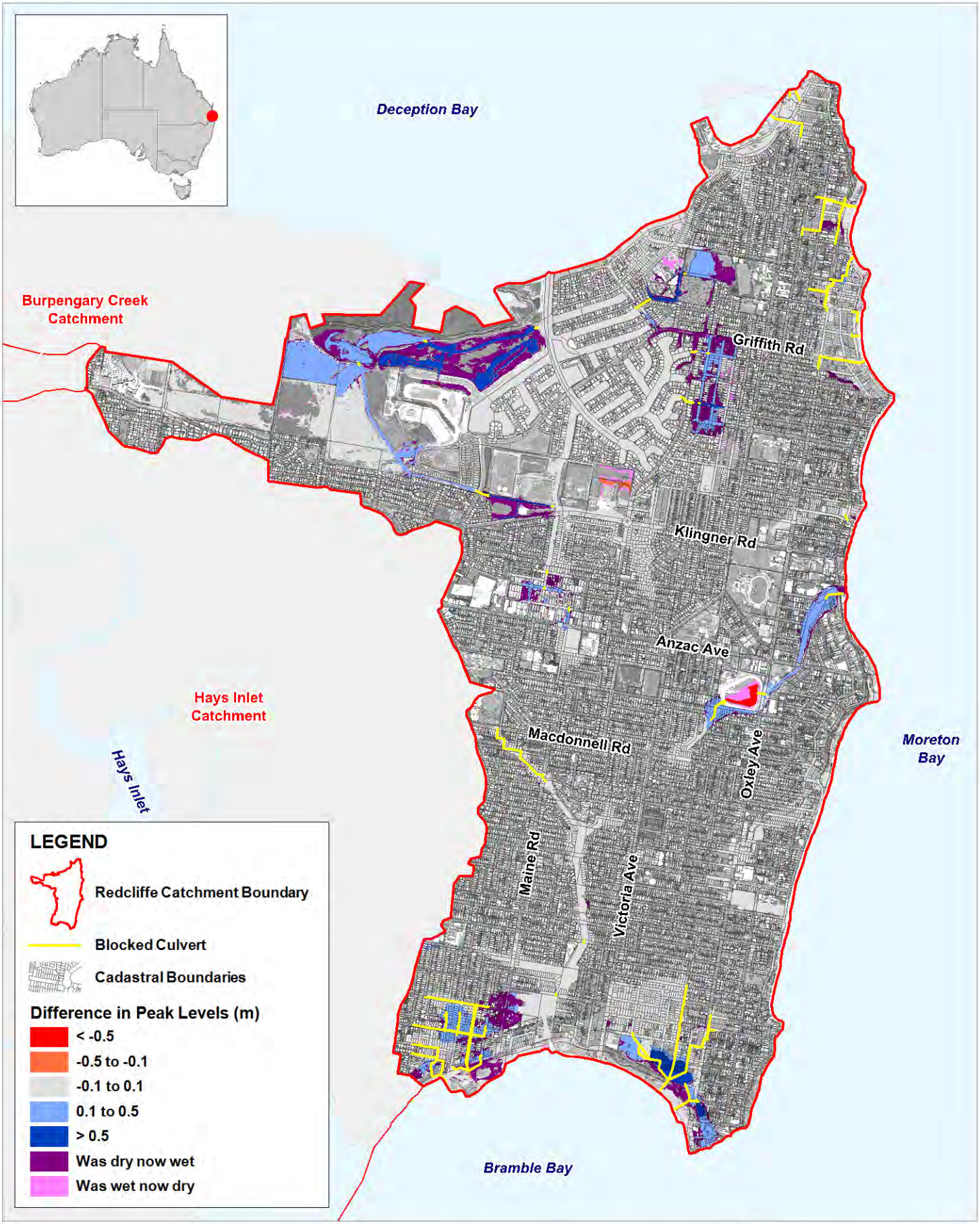
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_012_120518_Increase in Roughness Flood Level Impact 100Year ARI.WOR



Title:

Culvert Blockage Scenario (S3) Minus 100 Year EDS

Figure: **F3**

Rev: **A**

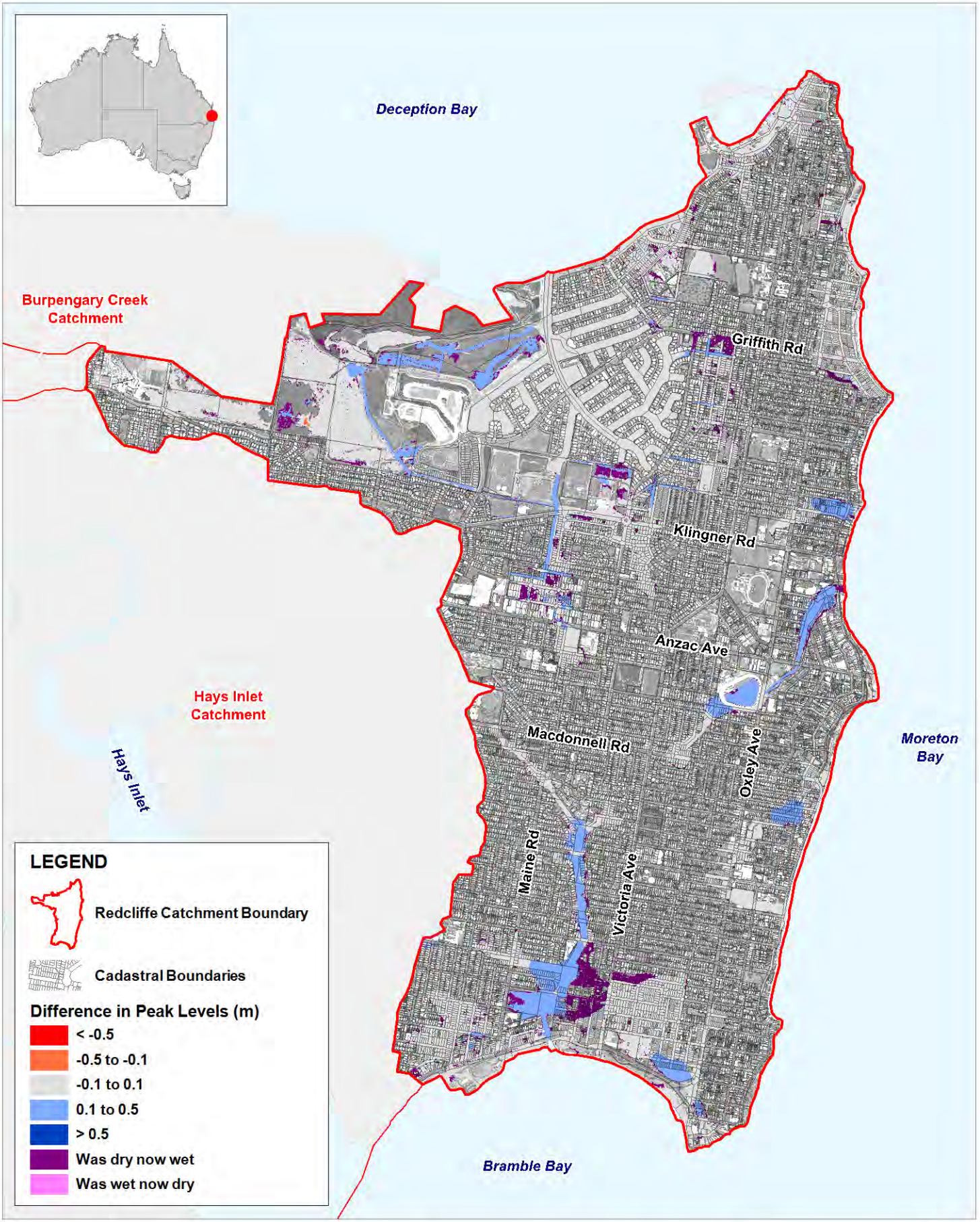
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_013_120518_Structure Blockage Flood Level Impact 100Year ARI.WOR



Title:

Increased Rainfall Scenario (S4) Minus 100 Year EDS

Figure: **F4**

Rev: **A**

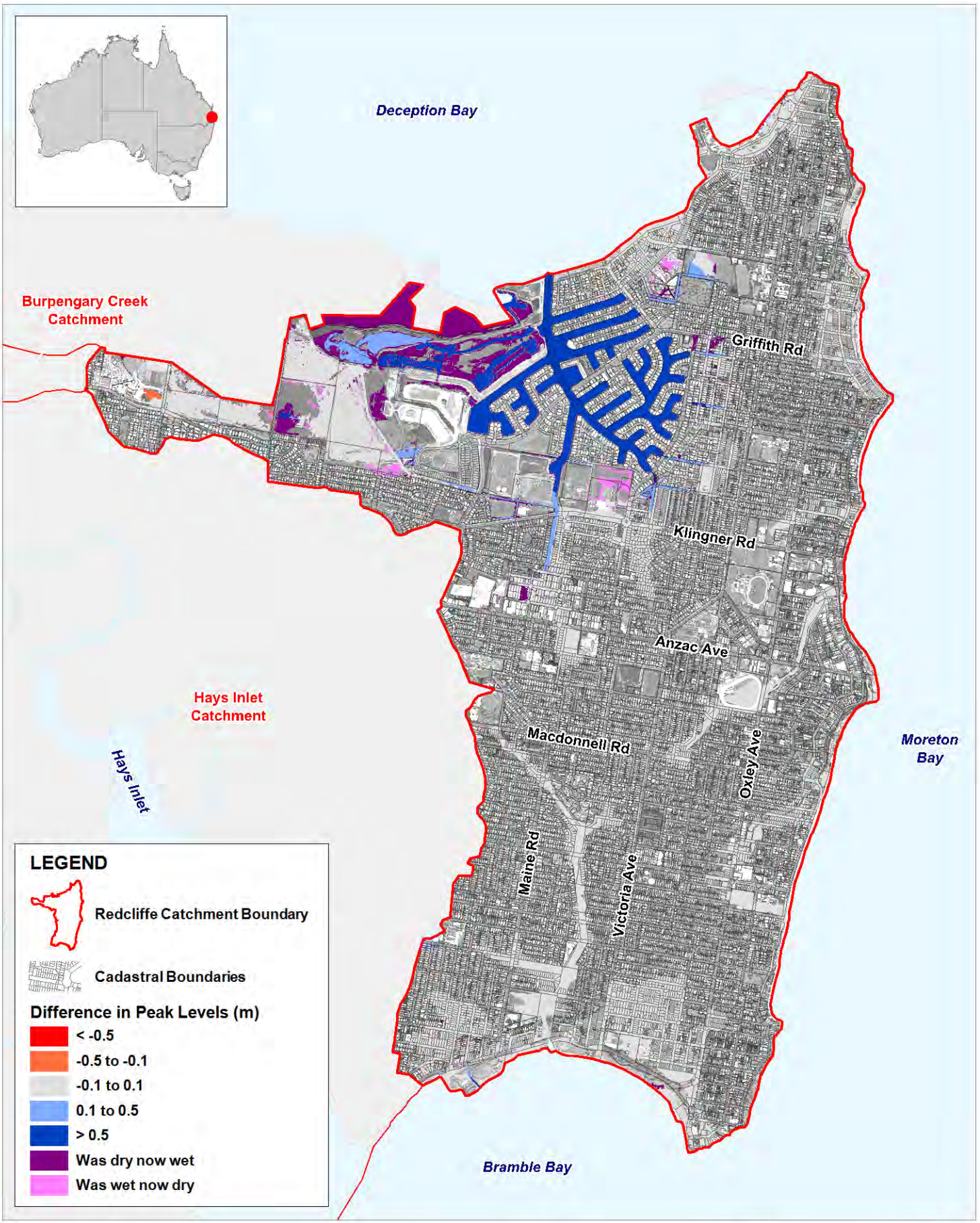
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_014_120518_Increase in Rainfall Flood Level Impact 100Year ARI.WOR



Title:

Increased Downstream Boundary Scenario (S5) Minus 100 Year EDS

Figure: **F5**

Rev: **A**

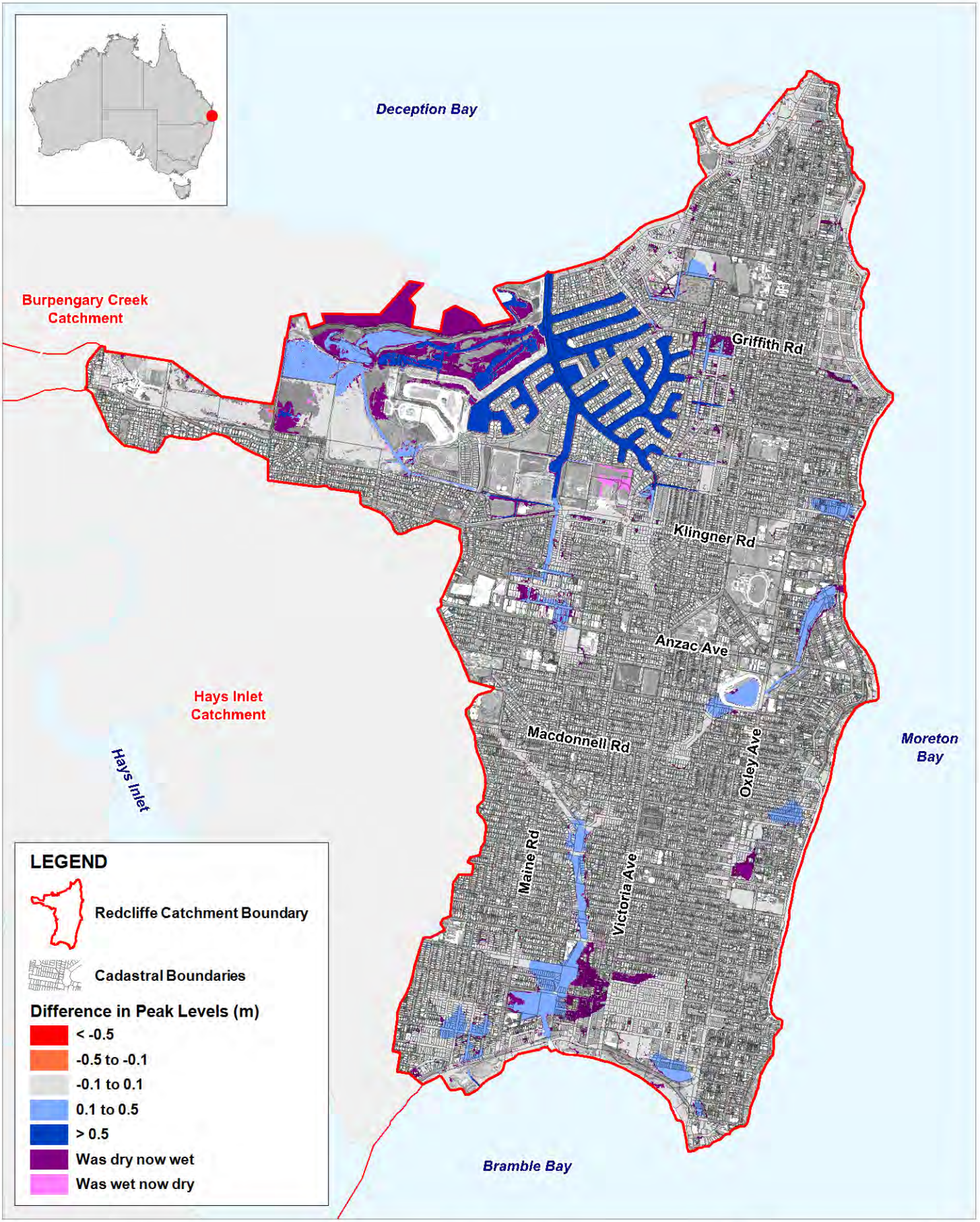
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_015_120518_Increase in Downstream Boundary Flood Level Impact 100Year ARI.WOR



Title:

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

Figure: **F6**

Rev: **A**

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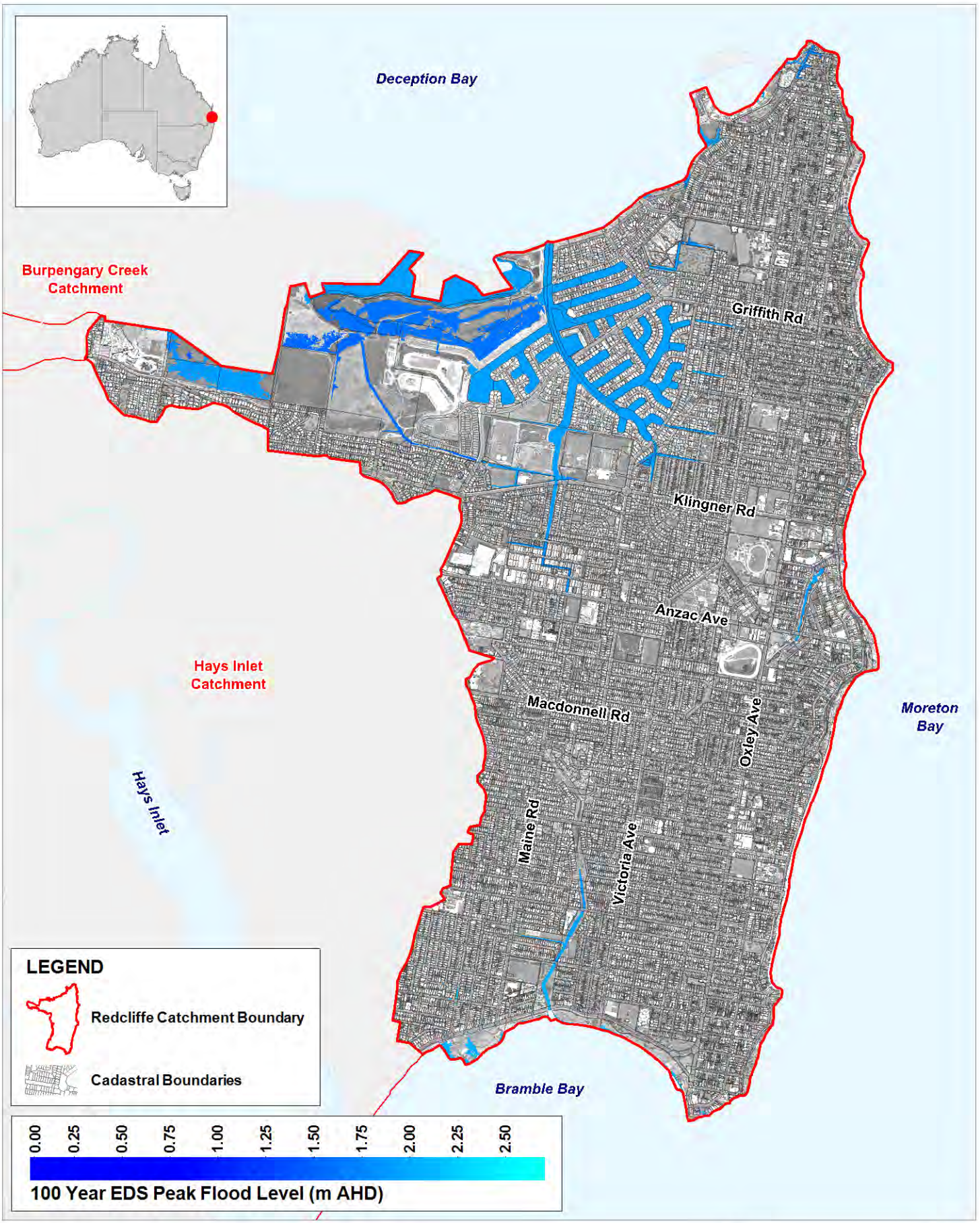
0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_016_120518_Increase in Rainfall and Downstream Bdy Flood Level Impact 100Year ARI.WOR



Title:

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

Figure:	Rev:
F7	A

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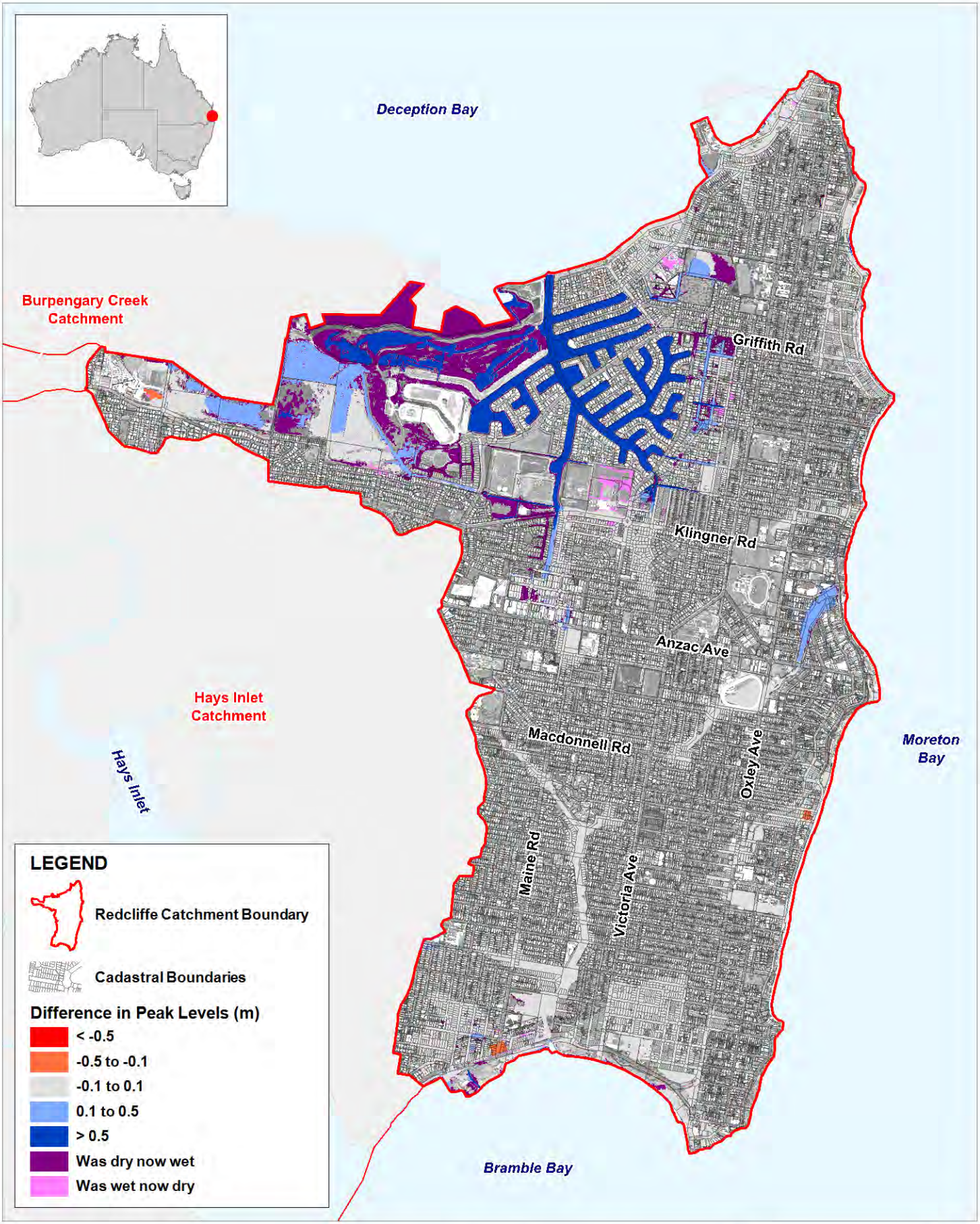
Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_017_120518_Dynamic Storm Tide Peak Flood Level 100Year ARI.WOR



Title:

Static Storm Tide Scenario (S8) Minus 100 Year EDS

Figure: **F8**

Rev: **A**

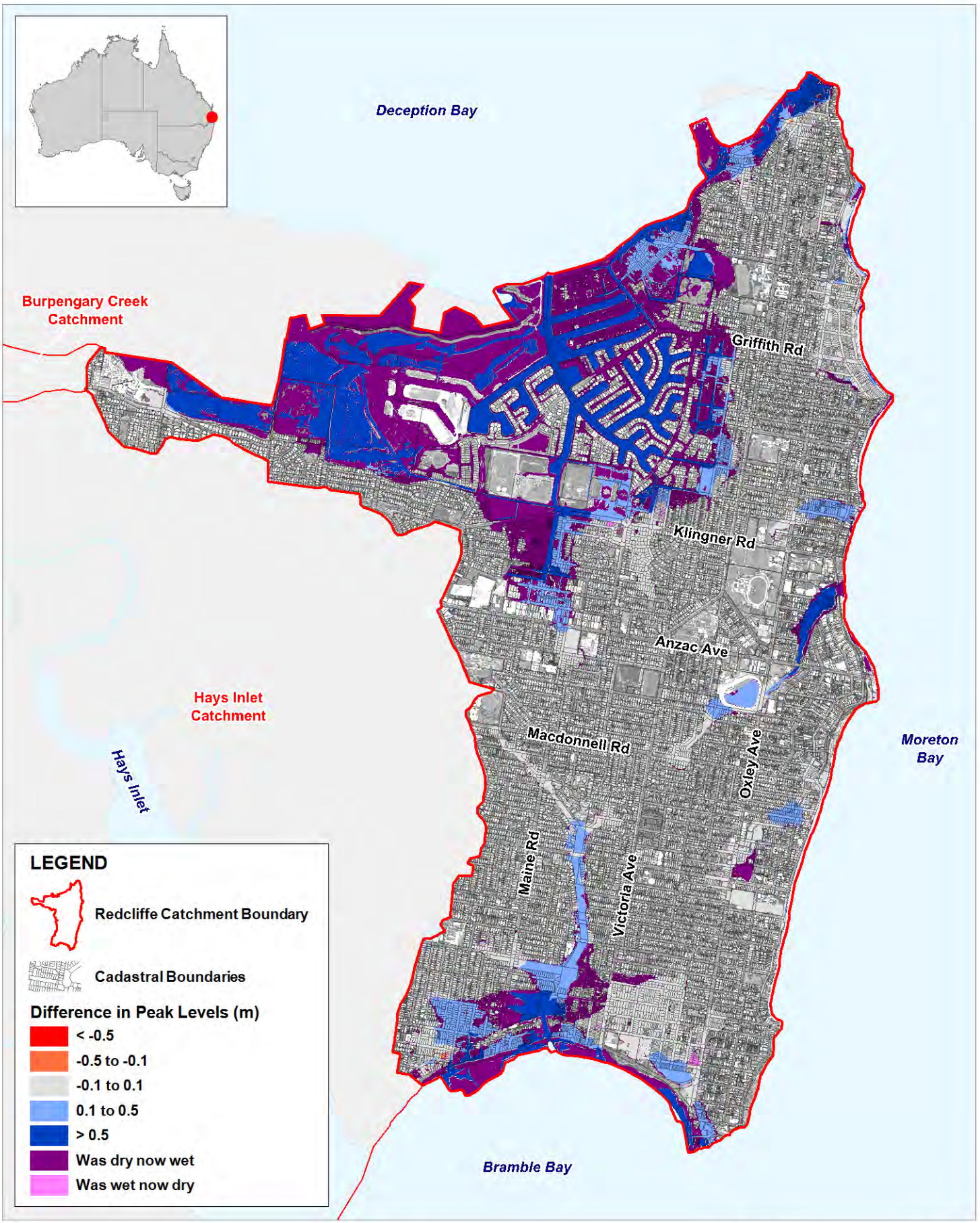
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_018_120518_Static Storm Tide Flood Level Impact 100Year ARI.WOR



Title:

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

Figure: **F9**

Rev: **A**

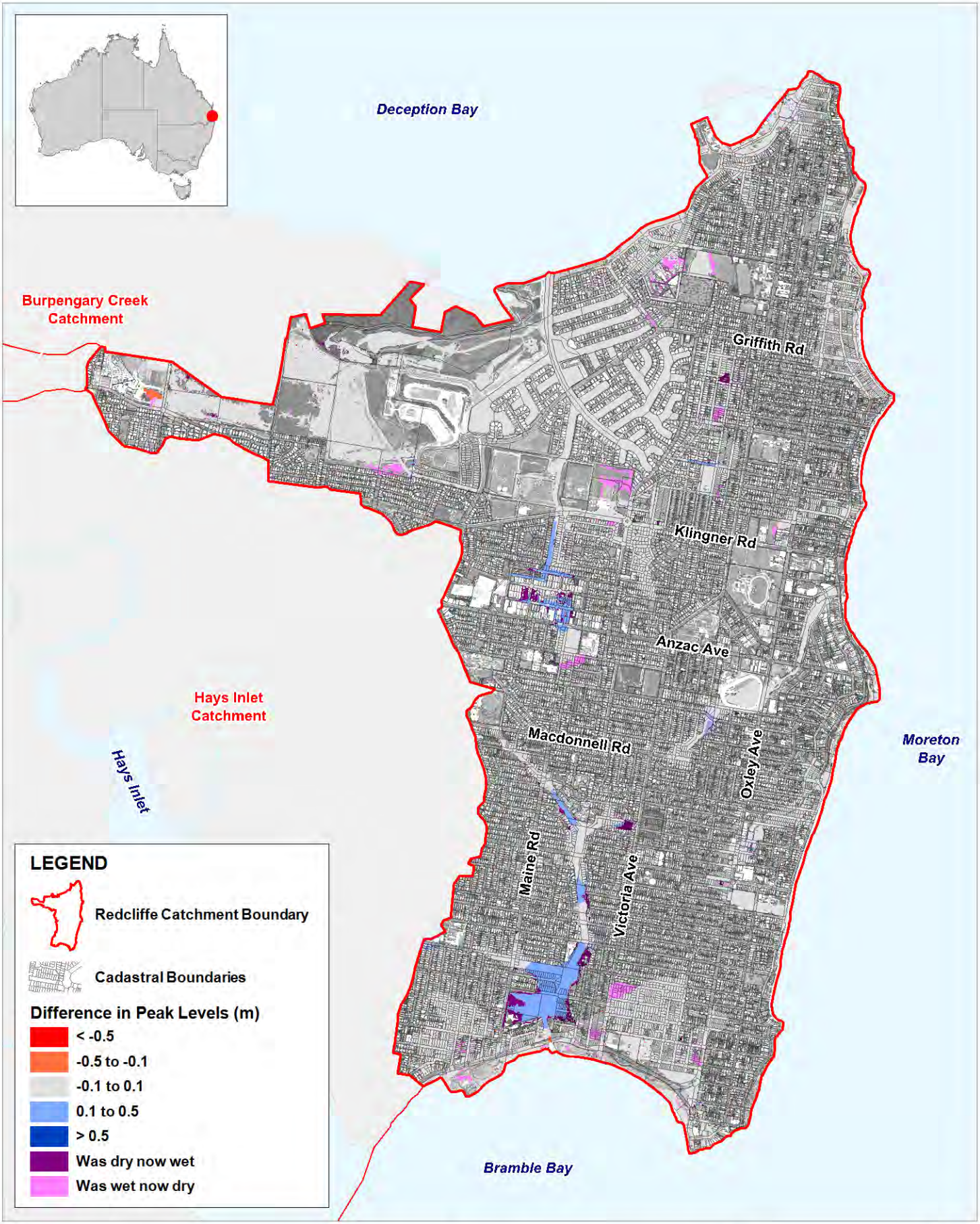
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_019_120518_Static Storm Tide and Climate Change Flood Level Impact 100Year ARI.WOR



Title:

Increased Vegetation Scenario (S10) Minus 100 Year EDS

Figure: **F10**

Rev: **A**

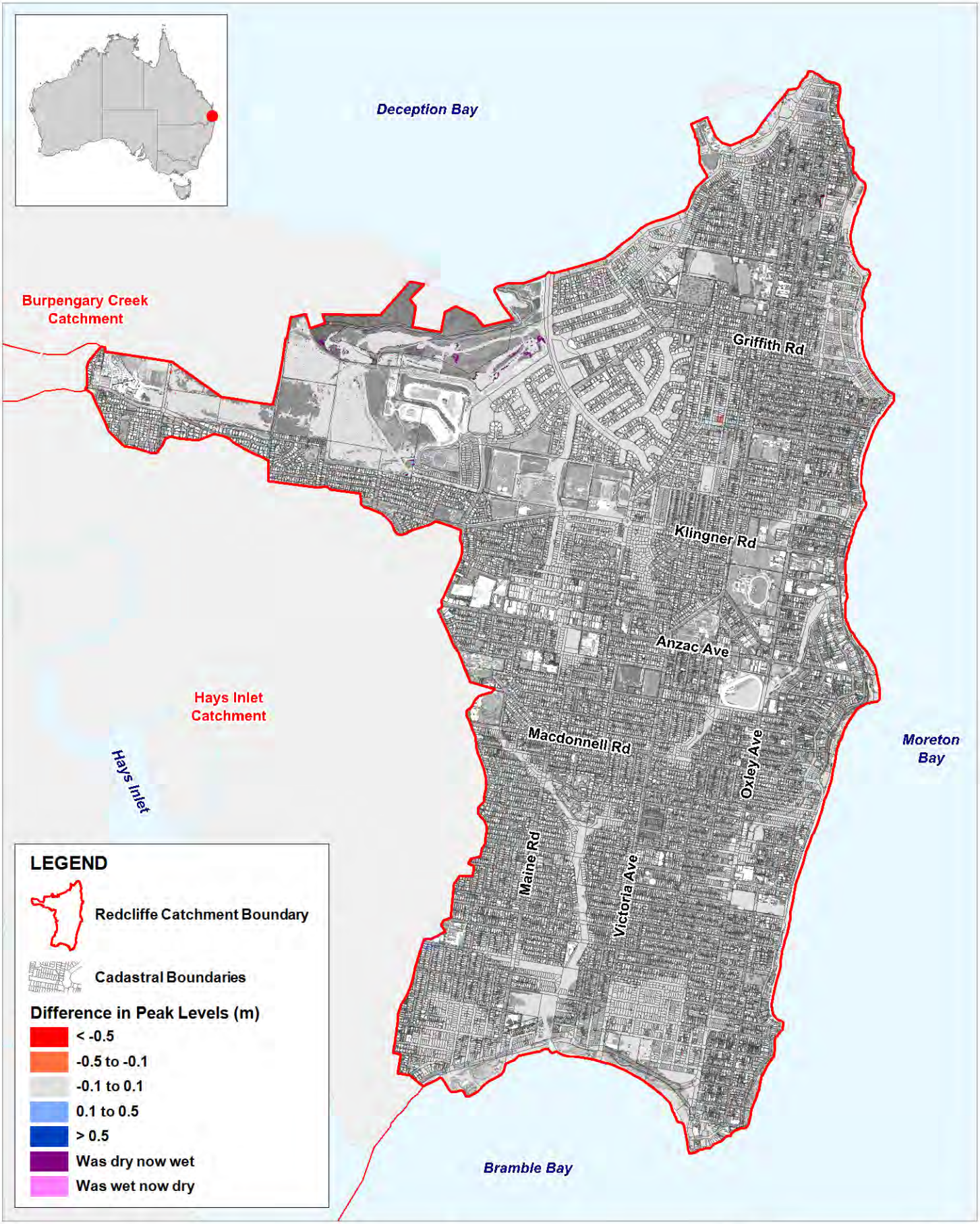
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_020_120518_Increase in Vegetation Flood Level Impact 100Year ARI.WOR



Title:

Increased Residential Development Scenario (S11) Minus 100 Year EDS

Figure: F11

Rev: A

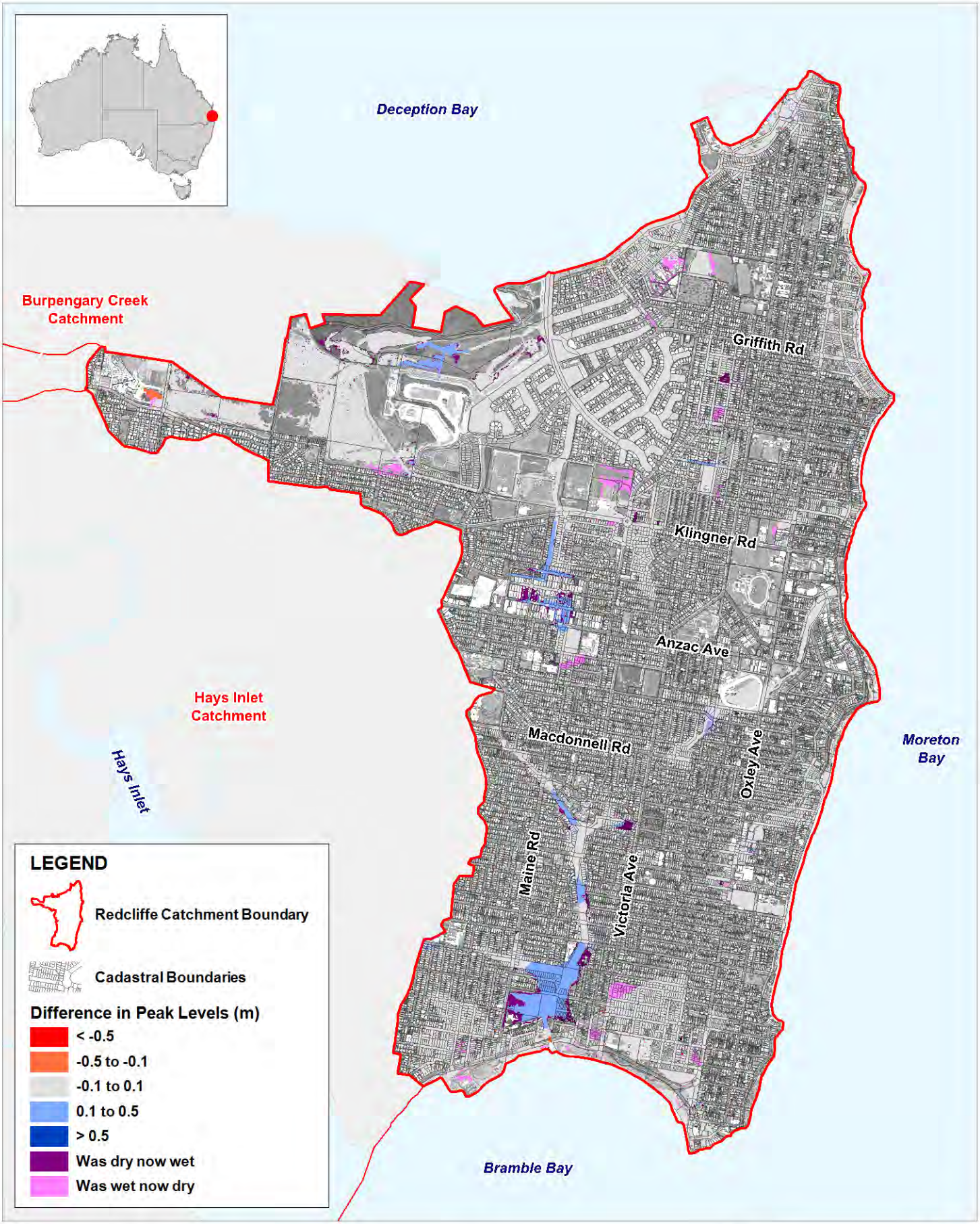
N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_021_120518_Increase in Residential Development Flood Level Impact 100Year ARI.WOR



Title:

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

Figure: **F12**

Rev: **A**

N

0km 1 2

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : I:\B18104_I_BRH Moreton Bay AK\DRG\Redcliffe_Report\FLD_022_120518_Increase in Veg and Residential Development Flood Level Impact 100Year ARI.WOR

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