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Australia

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Our ref: L.N20951.009.00_45_Warriewood_Rd_FIA.docx

21 December 2023

Planning & Environment
Macpherson Kelley
Level 21, 20 Bond Street
Sydney
NSW 2000

Attention: Emma Fleming

Dear Emma

RE: 45 WARRIEWOOD ROAD, WARRIEWOOD – REVISED FLOOD IMPACT ASSESSMENT

BMT have been engaged to update the flood impact assessment for the development of 45 Warriewood Road based on a revised development layout provided by ACOR Consultants in December 2023. This letter report documents the following:

- Updated flood modelling results showing flood impacts along Narrabeen Creek; and
- New flood model results for PMF runoff from Warriewood Road to Narrabeen Creek.

This letter is supplementary to the following documents previously prepared by BMT for this proposed development:

- '45 Warriewood Road, Warriewood Flood Impact Assessment' dated 4 February 2021 (ref. L.N20951.005.01_45_Warriewood_Rd_FIA.pdf)
- '45 Warriewood Road, Warriewood Flood Impact Assessment – Response to Council Comments on Natural Environment (Flooding)' dated 18 May 2021 (ref. LN20951.006.01_45_Warriewood_Rd_FIA.pdf).
- '45 Warriewood Road, Warriewood Flood Impact Assessment – Response to Council Comments on Flooding' dated 8 July 2022 (ref. L.N20951.007_Warriewood_Rd_FloodingRFI.pdf).

Updated flood impact assessment

The regional flood model of Narrabeen Creek, as used for the previous flood impact assessments for this Site, has been updated to include the development layout and bio-retention basins as per the December 2023 design layout.

Flood impact maps are presented in figures A-01 through to A-08 for the 2 year ARI, 5 year ARI, 10%, 5%, 2%, 1% AEP flood events, as well as 1% AEP with climate change and the PMF. For all events, modelling indicates no adverse flood impacts as per previous reporting.

PMF runoff from Warriewood Road

To assess the overland flow from Warriewood Road to Narrabeen Creek during a PMF event, a localised TUFLOW 2D flood model has been developed. The model is based on a 1m grid resolution, in order to capture the design surface of the proposed development and its interface with Warriewood Road. The model incorporates the grated inlet pits and pipes and box culverts shown on the December 2023 design plans, to collect runoff from Warriewood Road and convey to Narrabeen Creek. The model represents the pipe/culvert arrangements as well as the 3.5m wide overland flow path along the south-eastern site boundary.

The peak flow rate of runoff from the upstream catchment in a PMF event is 3.59m^3/s. Considerable effort was applied by ACOR Consultants to develop a drainage and earthworks design that could allow the full PMF discharge to enter the pipe/culvert drainage network and the overland flow path. Modelling of the optimal design shows minor ponding on Warriewood Road during the PMF event, as the PMF discharge is greater than the capacity of the drainage network. However, catering for PMF flows is beyond the design requirements for a stormwater network, and ponding can be expected during such an event. In the case of ponding on Warriewood Road, the depth over the inlet grate at pit P34 does not exceed 0.26m and the duration would be short (in the order of 14 minutes). The deepest ponding is 0.43m, along the kerb line. Flow in the culverts is 3.0m^3/s with the remaining 0.6m^3/s passing overland along the flowpath.

A map of inundation extents in the PMF event is shown on Figure 1. The depth and low velocity of inundation represents a low hazard (H1-H2) environment.

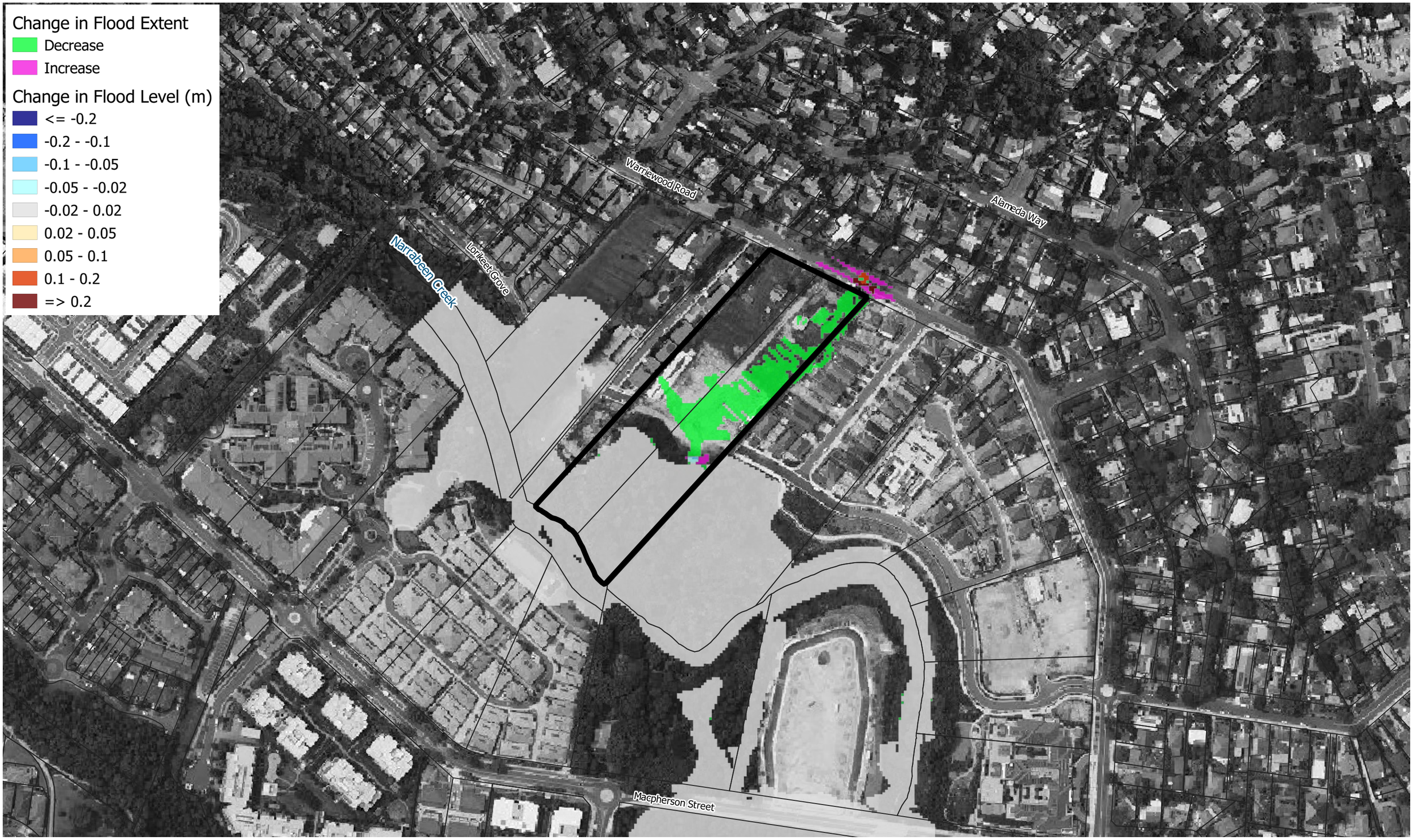
Figure 1: PMF inundation extent on Warriewood Road

We trust the information presented in the above table and previously referenced flood assessments meets the needs of Northern Beaches Council in relation to this development.

I confirm that I am familiar with the requirements of the Practice Note for Class 1 Development Appeals, Division 2 of Part 31 of the Uniform Civil Procedure Rules and the Expert Witness Code of Conduct in Schedule 7 of the Uniform Civil Procedure Rules and agree to be bound by them.

Yours Sincerely
BMT

Ben Caddis
Principal Flood Engineer



Legend

Site Boundary Cadastral Boundary

Title:

2 year ARI event - Developed Scenario - Change in Peak Design Flood Levels

Drawing: **A-01**

Rev: **A**

0 60 120 m

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Legend

Site Boundary Cadastral Boundary

Title:

5 year ARI event - Developed Scenario - Change in Peak Design Flood Levels

Drawing: **A-02**

Rev: **A**

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Site Boundary Cadastral Boundary

Title:

10 % AEP event - Developed Scenario - Change in Peak Design Flood Levels

Drawing: **A-03**

Rev: **A**

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Change in Flood Extent
- Decrease
- Increase

Change in Flood Level (m)
- <= -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.02
- -0.02 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- => 0.2

Warriewood Road
Alameda Way
Narrabeen Creek
Lorikeet Grove
Macpherson Street

Legend
- Site Boundary
- Cadastral Boundary

Title:
5 % AEP event - Developed Scenario - Change in Peak Design Flood Levels

Drawing: **A-04**

Rev: **A**

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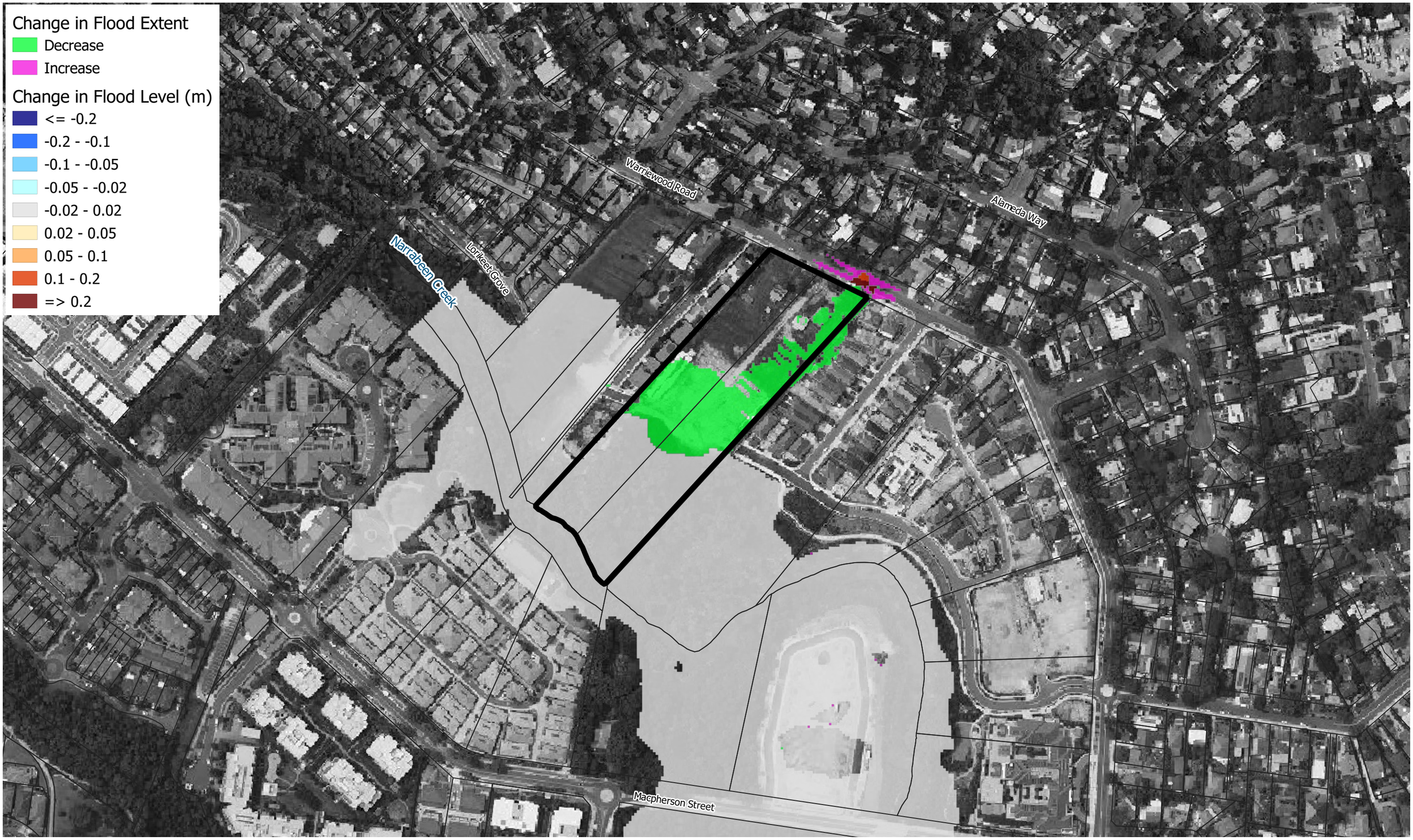

Legend

Site Boundary Cadastral Boundary

Title:

2 % AEP event - Developed Scenario - Change in Peak Design Flood Levels

Drawing: **A-05**

Rev: **A**

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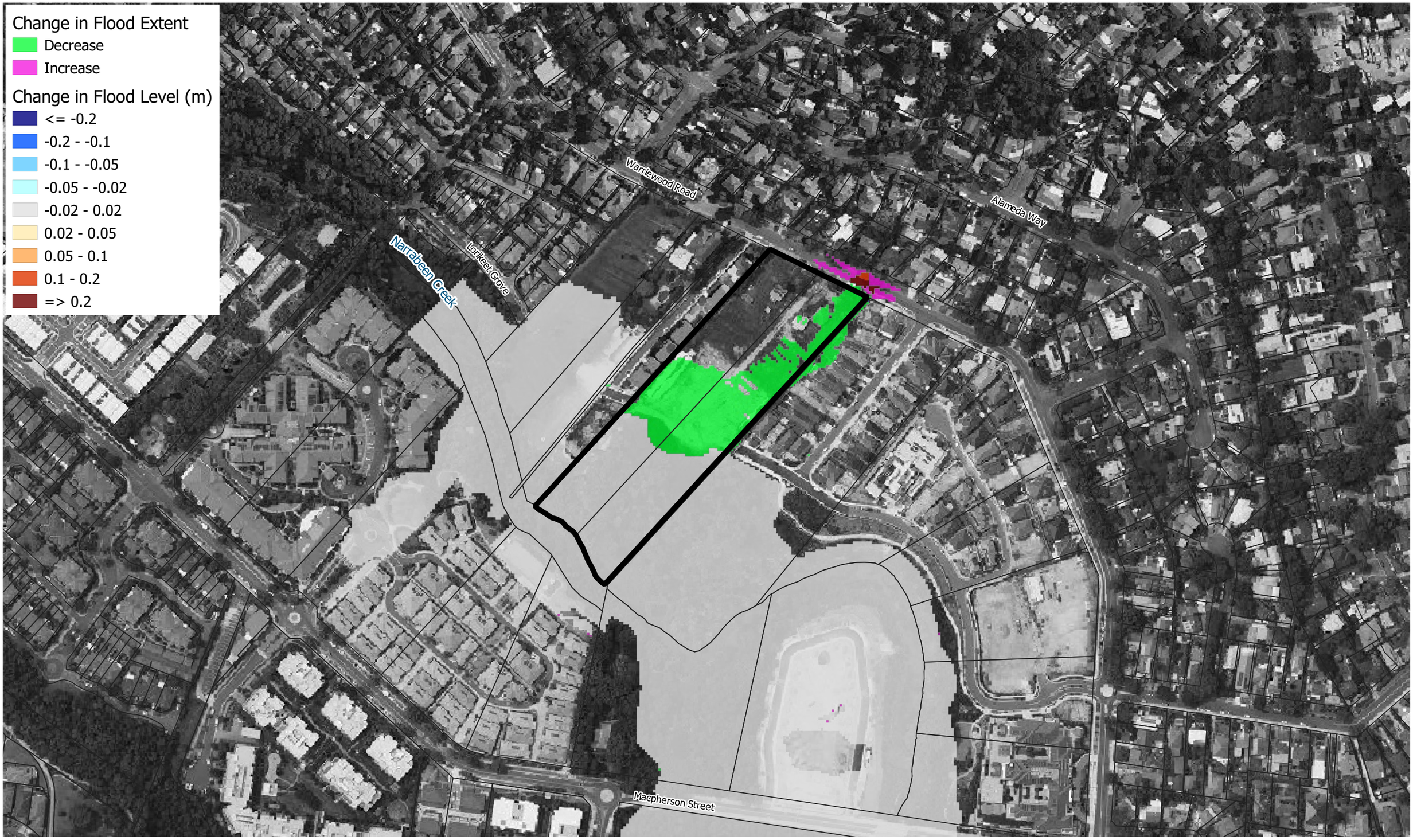

Legend

Site Boundary Cadastral Boundary

Title:

1 % AEP event - Developed Scenario - Change in Peak Design Flood Levels

Drawing: **A-06**

Rev: **A**

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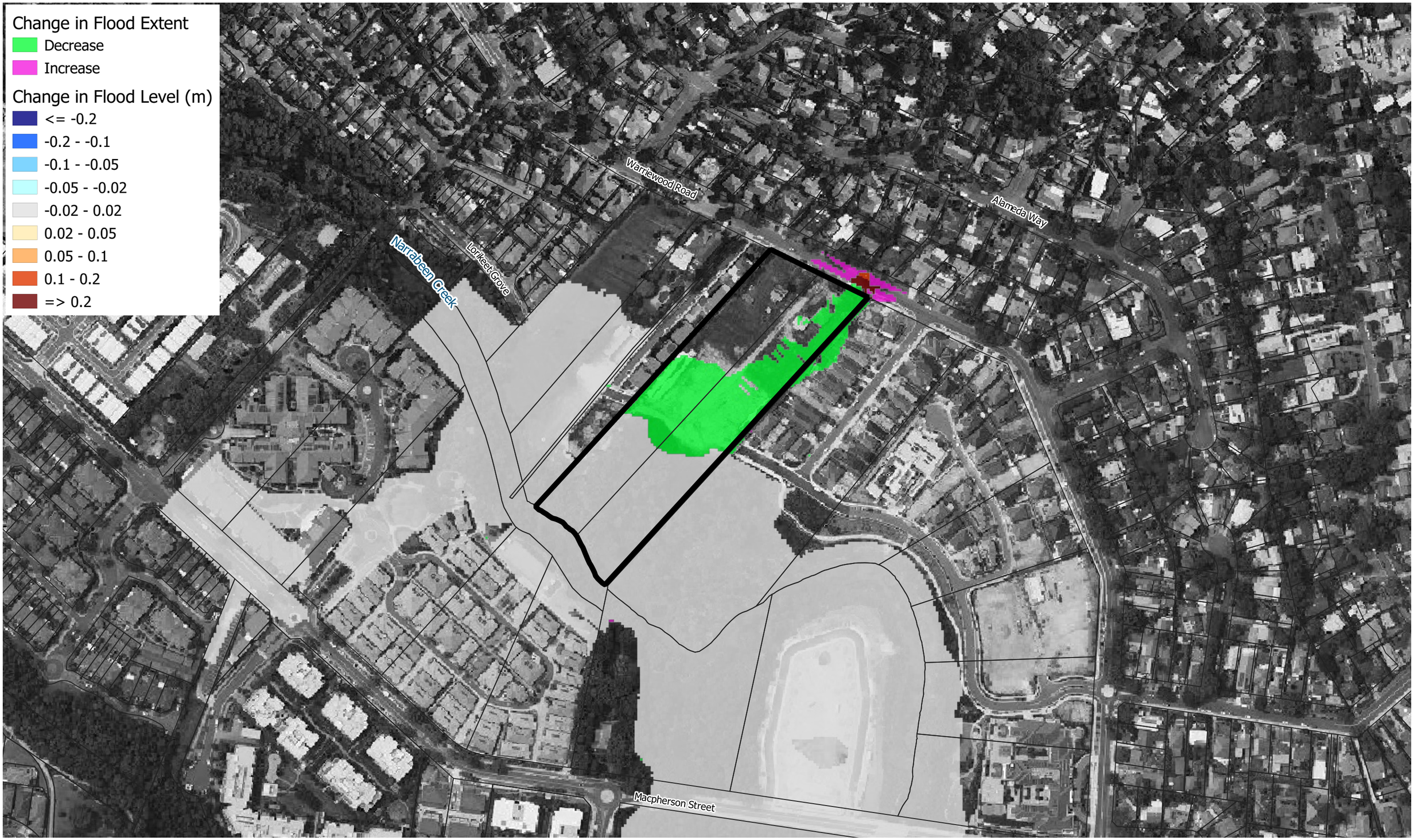

Legend

Site Boundary | Cadastral Boundary

Title:

1% AEP event with climate change - Developed Scenario - Change in Peak Design Flood Levels

Drawing: **A-07**

Rev: **A**

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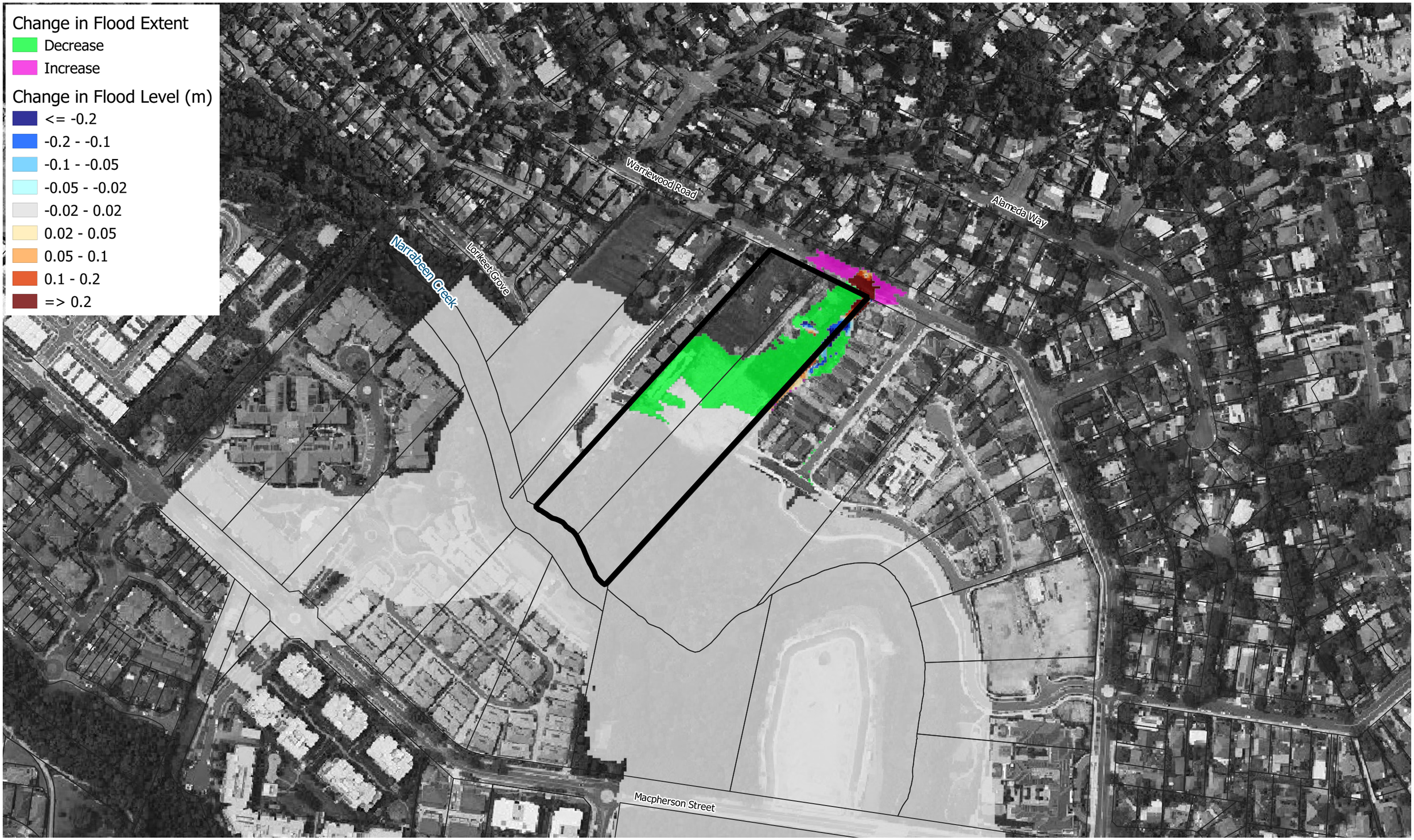

Legend

Site Boundary | Cadastral Boundary

Title:

PMF event - Developed Scenario - Change in Peak Design Flood Levels

Drawing: A-08

Rev: A

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