



Member of the Surbana Jurong Group

Review of Brooks Creek Flood Study

Wollongong City Council
Final Draft Flood Study Presentation

29 March 2018



Background

Combined Mullet & Brooks Creek Floodplain Risk Management Study and Plan (2010).

Reasons for the review:

- Check for diversion of flow onto the F6 Freeway, just upstream of Emerson Road (as noted in an Addendum to the 2010 Flood Study).
 - Ⓜ Potentially results in downstream flooding and flooding along the Freeway
- Extend the hydraulic model to show overland flooding in other areas of the catchment that were not assessed in the 2010 Flood Study.

Need for Updated Modelling

The current review showed that both the hydrologic and hydraulic models needed to be updated to provide a more complete definition of flooding within the catchment.

Revised models included:

- More detailed catchment delineation (hydrologic model)
- Expanded model extent (hydraulic model)
- Shorter model time steps

The updated models were also used to assess the impact of Council's revised blockage policy (compared to the 2002 Policy).

Study was based on ARR1987 – as the study was started before ARR2016 was released

Overall Flood Behavior

- ÿ Revised modelling enabled more detailed analysis of major overland flow paths.
- ÿ This enabled more accurate definition of the properties that are potentially flood affected.
- ÿ Additional areas were identified as flood affected:
 - Ø Mainly due to hydrological flows being input directly into Brooks Creek in the 2010 model
 - Ø The 2016 model input flows at various locations upstream of main tributaries to capture all flowpaths

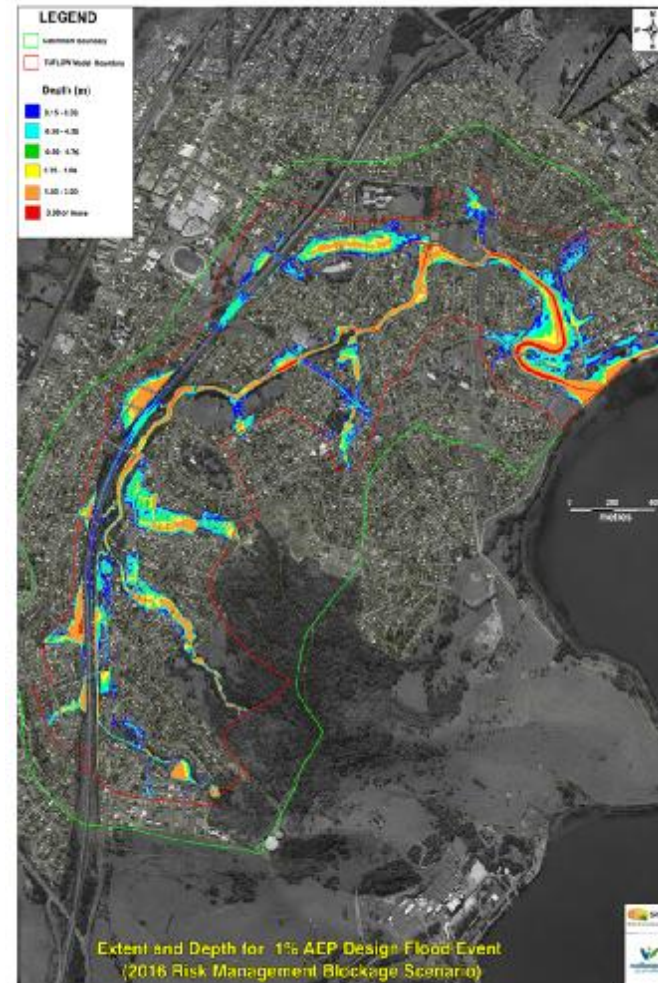
Overall Findings

Study results generally confirm flood behavior along the main alignment of Brooks Creek (as reported in 2010 study)

Additional flooding identified as follows:

- Along and on the North-Western side of the F6 Motorway
- Along the major tributaries draining to Brooks Creek

These areas of flooding were not reflected in the 2010 study as they were outside the hydraulic model extent



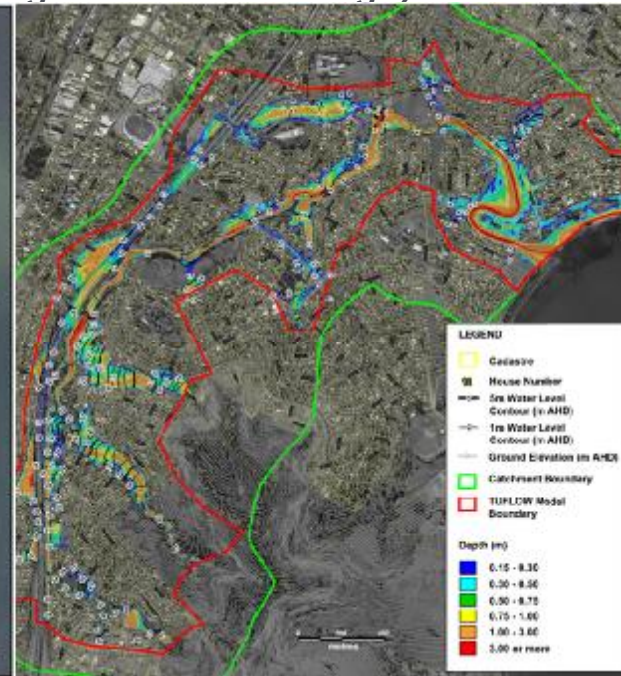
1%AEP Flood Extent (2016 design blockage scenario)

Comparison of 2010 and current Flood Study results

(1%AEP flood extents (based on envelope of blockage and no blockage))



2010 Flood Study - 1%AEP Flood Extent (2002 design blockage)



Current Flood Study - 1%AEP Flood Extent (2002 design blockage)

Events Modelled

Modelling completed for a range of design events (based on 1987 ARR):

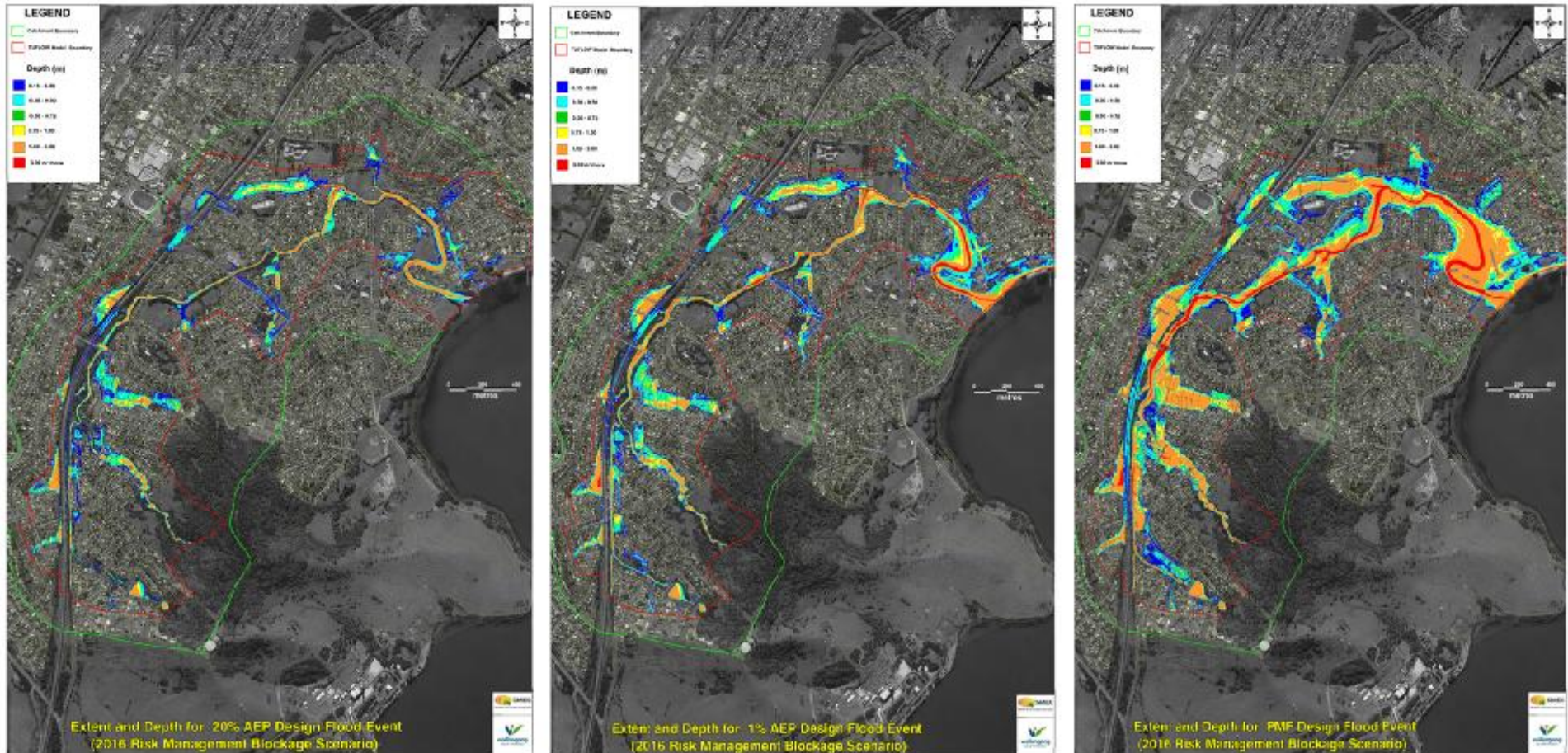
- 20% AEP
- 10% AEP
- 5% AEP
- 1% AEP
- PMF
- Impact of climate change

Councils revised blockage Policy was also modelled. Two scenarios modelled:

- Design Blockage – Used for design flood modelling
- Risk Management Blockage – Used to set flood planning levels

Based on application of 2016 ARR recommendations.

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Extent and Depth of Flooding – based on 2016 Risk Management Blockage Scenario (20% AEP, 1% AEP & PMF)

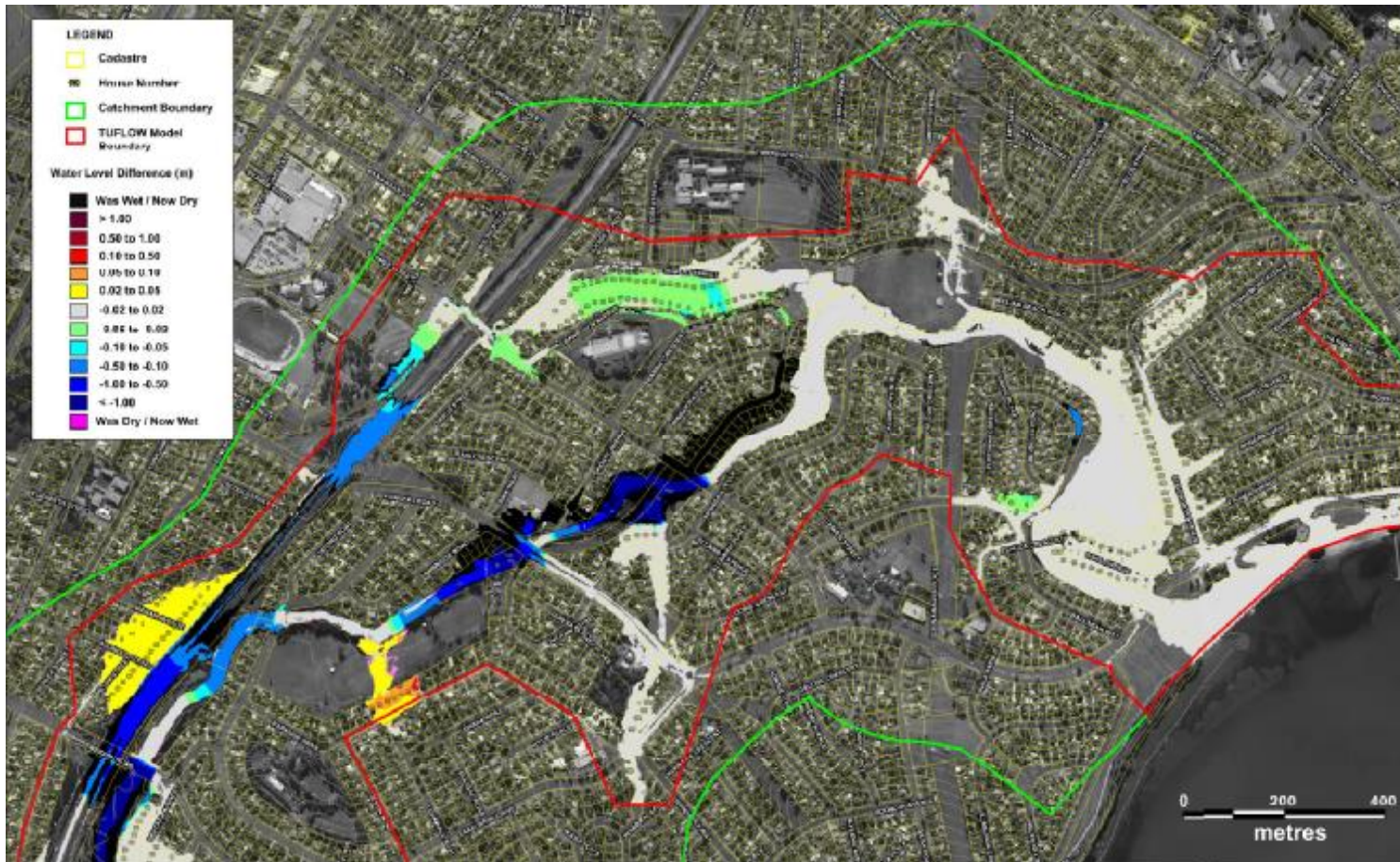
Culvert Blockage

In general terms, the blockage percentages were as follows:

- 2002 Policy – Culverts less than 6m (diagonal) - 100% blocked
 - Culverts greater than 6m (diagonal) – 25% blocked
- 2016 Risk Management Blockage – Varies from 60% to 95% blocked
- 2016 Design Blockage – Varies from 35% to 75% blocked

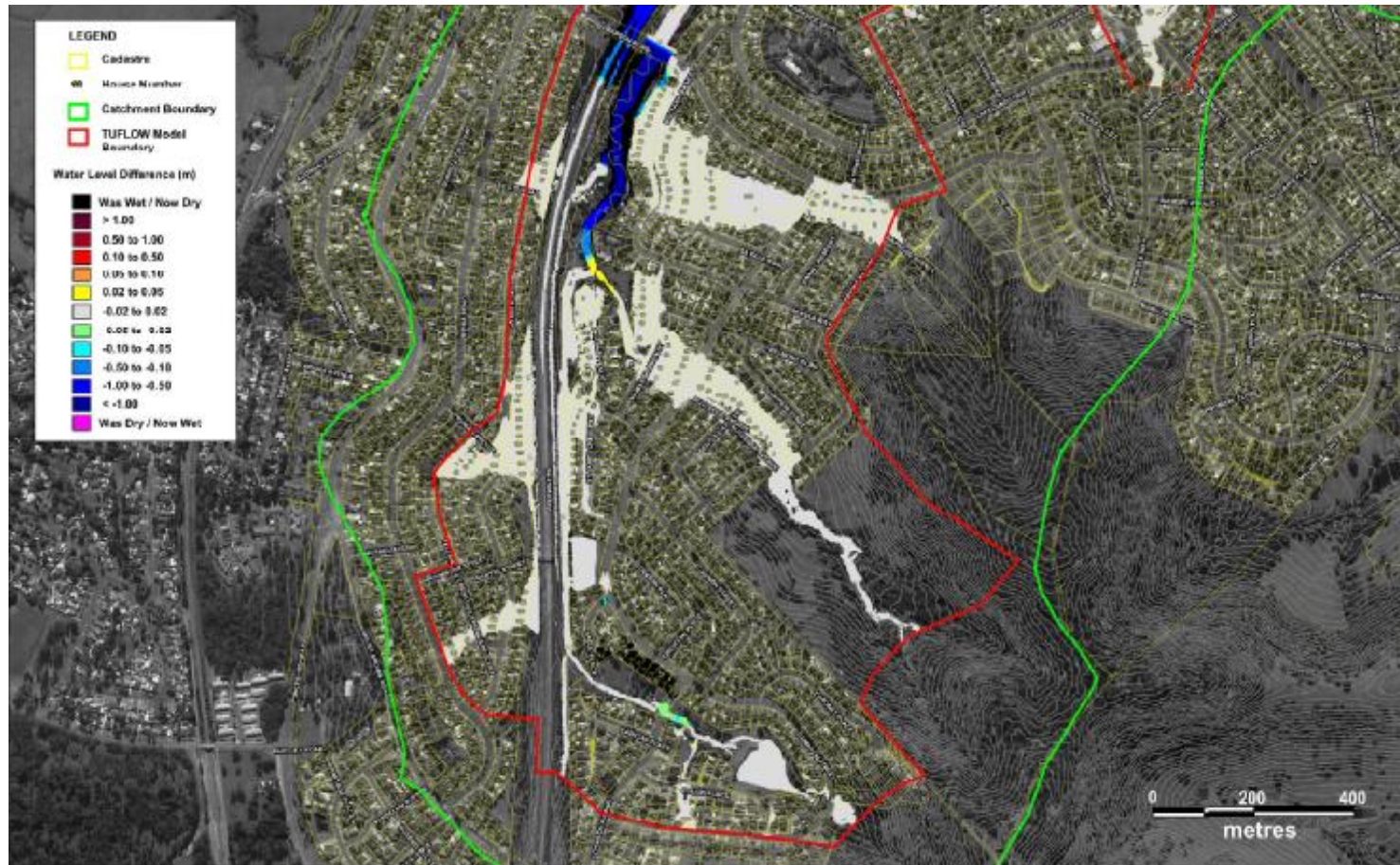
Therefore the 2016 Blockage Policy is less stringent compared to 2002 policy (ie lower blockage percentages).

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Water Level Difference – 2016 Design Blockage MINUS 2002 Design Blockage

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Water Level Difference – 2016 Design Blockage MINUS 2002 Design Blockage

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Water Level Difference – 2016 Design Blockage MINUS 2016 Risk Management Blockage

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Water Level Difference – 2016 Design Blockage MINUS 2016 Risk Management Blockage

Implication of Changing the Culvert Blockage Policy

- Revised Policy generally results in lower flood levels upstream of culverts
- 2016 Risk Management Scenario has higher blockage percentages than 2016 Design Blockage Scenario
- But 2016 Percentages are lower than 2002 Policy
- Significant water level differences seen at Byamee Street and Emerson Road for the 2016 Policy

Location (Culvert details)	2010 Study - 2002 blockage (% Blockage)	Current Study - 2002 blockage (% Blockage)	Current Study - 2016 Design blockage (% Blockage)
1-Upstream of Lakeside Drive (bridge)	2.35 (0)	2.38 (0)	2.38 (10)
2-Upstream of Brooks Creek (weir)	3.00 (0)	2.83 (0)	2.83 (0)
3-Upstream of Byamee Street Culvert RCBC (3x3.8x2.4)	8.50 (100)	8.43 (100)	6.44 (35)
4- Upstream Fowlers Road Bridge over Brooks Creek RCBC (2x3.0x3.0)	11.00 (100)	10.71 (100)	10.03 (35)
5-Intersection of Wyndarra Way and Lakelands Drive	N/A*	17.86	17.86
6-At Intersection of Robert Street and Byamee Street	N/A*	10.65	10.65
7-Fowlers Road Culvert Over Princes Highway	N/A*	15.24	15.13
8-Upstream of Lakelands Drive Culvert Pipe (5x1.6)	16.00 (100)	15.28 (100)	15.20 (50)
9-Upstream of Emerson Road Culvert RCBC (3x3.0x3.0)	23.00 (100)	20.36 (100)	17.42 (35)
10-Brown Avenue Cul-de-sac	24.00	25.21	25.21
11-Intersection Bright Parade and Rutledge Avenue	N/A*	37.20	37.20
12-Upstream Cormack Avenue Culvert Pipe (1x1.2)	N/A* (100)	41.21 (100)	41.18 (75)

Public Exhibition of Draft Flood Study Report

- ÿ Draft Report placed on Public Exhibition on 25 September 2017
- ÿ Electronic version of Draft Report uploaded to Council's web site
- ÿ Newsletter and Feedback Form distributed by Council
- ÿ Community information session held on 10 October 2017
- ÿ Flood maps displayed for the 20% AEP, 1% AEP and PMF flood events (based on the Risk Management Blockage Scenario)

Issues Raised During Community Information Session

- Need for regular channel maintenance
- Appropriate planting in areas adjacent to Brooks Creek and tributaries
- Installation of Debris Control Structures'
- Impact of Flood Study on insurance costs
- Development restrictions due to flood affectation

Responses to Newsletter / Questionnaire

- 44 written submissions were received
- Many respondents had not experienced flooding (although they had lived in the area for many years)
- 8 respondents reported flooding in their area – mostly in adjacent streets; 3 of these noted limited property flooding and 1 reported above floor flooding
- Flood affectation (or not) correlated well with model results

Issues Raised in Written Responses

- Impact of vegetation and debris on flooding
- Development / redevelopment restrictions
- Impact of flood affectation on insurance costs

Potential Mitigation Measures Identified by Community

- Many of the respondents noted the need for regular channel maintenance and the removal of vegetation and other debris from Brooks Creek and its tributaries, which contributed to reduced channel conveyance and culvert blockage.
- Culvert blockage and inadequate culvert capacity were seen as the main contributing factors to flooding in the area.
- Keeping the entrance to the Lake open, to reduce flooding, was also raised by a number of respondents.

The TUFLOW model can be used to assess the impact of culvert upgrades and/or blockage mitigation measures in terms of the number of properties that would benefit.

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It is recommended that the Flood Study be adopted by Council