

***The unconfirmed minutes are subject to confirmation at the Council meeting to be held on 11 April 2018.***

**MINUTES of an EXTRAORDINARY MEETING of COUNCIL held in the Council Chambers, Level 2, Civic Centre, 838-842 Fergusson Drive, Upper Hutt on TUESDAY 27 MARCH 2018 commencing at 4.30pm**

**PRESENT: HIS WORSHIP THE MAYOR MR W N GUPPY (CHAIR), CRS C B G CARSON, R B T CONNELLY, J B GRIFFITHS, J C GWILLIAM, P E LAMBERT, G T MCARTHUR, A R MCLEOD, H SWALES AND D V WHEELER**

**APOLOGY: CR S P TAYLOR**

**IN ATTENDANCE: CHIEF EXECUTIVE, DIRECTOR OF ASSET MANAGEMENT AND OPERATIONS, DIRECTOR OF PLANNING AND REGULATORY SERVICES, PERFORMANCE AND CAPABILITY MANAGER, MANAGER POLICY AND PLANNING, SENIOR POLICY PLANNER, PLANNING CONSULTANT, POLICY PLANNER, CONSENTS PLANNER, ADMINISTRATION OFFICER PLANNING, RESOURCE CONSENTS AND COMPLIANCE MANAGER, ECONOMIC DEVELOPMENT MANAGER, SENIOR POLICY ADVISOR, AND DEMOCRATIC SERVICES ADVISOR**

### **PUBLIC BUSINESS**

His Worship the Mayor highlighted that Council was required to make a decision based on information that was produced at the hearing. He said it followed that any information presented following the completion of the hearing process should not be taken into account. He further outlined the Resource Management Act process to date and the options available to Council at the meeting.

His Worship the Mayor advised that related planning maps had been tabled to assist elected members with their consideration of the Plan Change 42 documentation. He said the maps provided context for the strike-through chapters that were provided in Appendix 2 of the agenda documents and would form part of the plan change. He noted the maps had been publicly available prior to the hearing as Appendix 5 of the officer's s42a report.

### **APOLOGY**

**RESOLVED: C 180201(2)**

**THAT the apology received from Cr Taylor be accepted and leave of absence granted.**

Moved

Cr Griffiths/Cr Swales

**CARRIED**

### **CONFLICT OF INTEREST**

Councillors Carson and McLeod declared a conflict of interest in the matter.

### **1. PUBLIC FORUM**

Nicola Robinson tabled a written submission and spoke to it (attached as pages 5-24 to the minutes).

Bob McLellan tabled a written submission and spoke to it (attached as page 25 to the minutes).

Noeline Berkett, resident of Mangaroa considered there was a lack of consultation with residents about the flood maps from 2005. She said that the experience of residents in the area was not taken into account when generating the flood maps and considered the maps inaccurate as they did not reflect what was going to happen in an event. She said an area of concern was the area south east of Barkers Bridge called the Whitemans Valley Bridge to Gorrie Road and along Gorrie Road. She noted the 'accurate' maps from 2006 were suddenly inaccurate following a review. She further said that no submission from an individual had been accepted by Council since 2005.

Alan Jefferies considered that the hazard maps generated by Greater Wellington Regional Council for Plan Change 15: Mangaroa should have had the river bed superimposed on them. Due to this, he believed the hazard maps' footprints used for Plan Change 15 were incorrect then and had followed through to Plan Change 42. He said the maps showed an anomaly in relation to his property noting Plan Change 15 identified the flooding would be 2metres deep and under Plan Change 42 was now approximately 20 metres deep in areas. When he queried this anomaly he was advised there had been some smoothing of the map lines. He considered the two consultants involved in the Plan Change 42 work had conflicts of interest.

Sue Pattinson tabled a written submission and spoke to it (attached as pages 26-43 to the minutes).

In response to questions from members, Mrs Pattinson confirmed that Mr R J Hall was the expert witness quoted in her written submission. She said Mr Hall came to support the Pattinson's on the second day of the hearing but had not advised them he would be attending. She said when they were aware he was present they asked if he would like to speak and he said he had presented his written submission and did not feel the need to speak. She said the Commissioner had said he would phone Mr R J Hall and undertake site visits of properties.

Stephen Pattinson on behalf of Darryl Longstaffe, tabled a written submission and spoke to it (attached as pages 44-55 to the minutes).

His Worship the Mayor noted that on page 67 of the Commissioner's recommendation he commented on future assessment of hydraulic neutrality.

In response to a question from a member, Mr Pattinson said the scope of the Hulls Creek catchment had not been raised during the RMA hearing process.

**RESOLVED:**

**C 180202(2)**

**THAT Public Forum be extended for an additional five minutes.**

Moved

His Worship the Mayor/Cr Gwilliam

**CARRIED**

Stephen Pattinson, representing Save Our Hills tabled a written submission and spoke to it (attached as pages 56-57 to the minutes).

In response to questions from members, Mr Pattinson confirmed that Mr R J Hall did not provide oral evidence during the hearing. He said the map provided by Mr Hall had been tabled by Ms Robinson. He said a mapping change had been applied to his property where 300mm freeboard was added onto the water level and then 100mm taken off the freeboard. He considered this was incorrect and should have taken the 100mm off before applying the freeboard. He considered the timing of this change to be irregular.

**2. PROPOSED PLAN CHANGE 42: MANGAROA AND PINEHAVEN FLOOD HAZARD EXTENTS (351/12-046)**

Report from the Policy Planning Manager through the Director of Planning and Regulatory Services dated 21 March 2018.

Councillors Carson and McLeod declared a conflict of interest and took no part in the discussion or voting on the matter.

In response to a question from Councillor Gwilliam, the Director of Planning and Regulatory Services confirmed that the maps available as part of the officer's s42a report did include the removal of 100mm of the flood extent.

In response to a question from His Worship the Mayor, the Director of Planning and Regulatory Services confirmed that a user's guide to provisions would be available electronically and in hard copy to provide clear information to affected property owners, prospective buyers, insurers, lenders and other interested parties.

Councillor Connelly spoke in support of the recommendations. She said the purpose of the plan change was to provide for the Pinehaven Stream and the Mangaroa River floodplains, avoid development in high hazard areas and incorporate mitigation measures. She said the current provisions did not provide for flood risk in these areas. She noted it was Council's role to consider what the Commissioner was presenting and not to re-hear submissions or consider new evidence. She considered the Commissioner had addressed most of the concerns raised by submitters. She noted that while the Commissioner found community consultation adequate, Council could always learn from previous consultation processes for future ones.

Councillor Gwilliam spoke in support of the recommendations. He noted the introduction of the user's guide to assist interest parties. He said that the plan change did not prevent development on certain parts of individual properties.

Cr Swales advised she had sat through the hearing and noted her concern that oral evidence was not presented by Mr R J Hall. She considered the process had provided all submitters a fair opportunity to speak. She said she would be supporting the recommendations.

**RESOLVED****C180203(2)**

- 1. THAT Council adopts the recommendation of the Hearing Commissioner as outlined in section 5.0 of his report, gives a decision on the provisions and matters raised in submissions on proposed Plan Change 42 in accordance with clause 10 of the First Schedule of the Resource Management Act 1991 and approves proposed Plan Change 42 in accordance with clause 17 of the First Schedule of the Resource Management Act 1991 for the reasons set out in the Hearing Commissioner's report.**
- 2. THAT pursuant to clause 10 of the First Schedule of the Resource Management Act 1991, Council gives notice of its decision on proposed Plan Change 42 in accordance with the Hearing Commissioner's recommendations as set out in the Hearing Commissioner's report.**
- 3. THAT Council delegate authority to the Chief Executive to correct minor errors to the operative Plan Change as may be required.**
- 4. THAT if no appeals are received by the close of the appeal period, proposed Plan Change 42 be made operative in accordance with clause 20 of the First Schedule of the Resource Management Act 1991.**

Moved Cr Swales/Cr Griffiths

**CARRIED**

The meeting concluded at 5.35pm.

Confirmed this 11<sup>th</sup> day of April 2018.W N Guppy  
**MAYOR**

27 March 2018  
UPPER HUTT CITY COUNCIL EXTRAORDINARY COUNCIL MEETING  
Expressions Theatre - 4:30pm

**To: UHCC Mayor & Councillors**

**From: NICOLA ROBINSON, 70A Pinehaven Road, Pinehaven, Upper Hutt.**

**PROPOSED PLAN CHANGE 42 – The Non-Standard Use of Freeboard in the Flood Maps**

Chairperson and Councillors, thank you for the opportunity to address this meeting.

I understand Council has 3 options today regarding a decision on Plan Change 42 - to decline it, approve it, or approve it with amendments.

The Commissioner's recommendation is to approve it with amendments. That recommendation is **based on an incorrect use of freeboard**, a significant issue in the proposed Plan Change maps.

Either the Commissioner is unaware of, or is ignoring, standard industry practice regarding the application of freeboard. Consequently, his endorsement of UHCC's flood maps may expose Council to risk of class action by the many ratepayers whose properties, due to misuse of freeboard, are falsely shown in a 100-year flood hazard zone.

I therefore **request that Council decline Plan Change 42 and develop flood maps that apply freeboard according to standard practice.**

Quoting Mike Law: *"Freeboard is a term that's used to cover uncertainty ... in the [flood] modelling... you've got uncertainties, so ... you put your building platform a bit higher than the flood level."*

See Appendix 1 – Flood extent Diagrams attached:

Upper Diagram: Standard Industry Practice is to provide flood hazard maps for a 100-year flood that show the predicted flood water level (blue) without freeboard; freeboard is added on top of the water level as a factor of safety for setting floor levels;

Lower Diagram: GWRC's Non-Standard Practice is to portray freeboard as flood water, applying it even over non-hazardous surface water up to 100mm deep, making it look like properties are in a 100-year flood hazard zone when in fact they are not.

Examples:

- Appendix 2: Pinehaven Stream Flood Hazard Map – shows my property at 70A Pinehaven Rd. The 300mm freeboard is represented as blue floodwater

added on to non-hazardous surface water up to 100mm deep, thereby **falsely showing flooding** as 400mm deep;

- Appendix 3: Both #70 & 70A Pinehaven Road are falsely shown to be in a 100-year flood hazard zone. Other properties in this vicinity are also being falsely shown in the 100-year flood zone;
- Appendix 4: **R J Hall's expert evidence** for #27 Elmslie Road refutes Council's freeboard-inflated flood map for this property. Robert Hall is a flood engineer with 40 years experience. His map for #27 Elmslie shows the true extent of a 100-year flood on this property. Even after adding 300mm freeboard (dashed lines), flooding is all contained within the upper banks of the stream channel on this property.

The Commissioner, being a Planner and not a flood engineer, has relied on misleading advice from Council's flood expert Kyle Christensen. Mr Christensen is at odds with standard practice when he claims in his expert evidence that if *"the modelled flood depth is 100 mm, and 300 mm freeboard is considered appropriate then the design flood depth is 400 mm not 100 mm."*

In fact, usual practice is to remove modelled water up to 100mm deep because it is not hazardous. It is also standard practice NOT to include freeboard in flood hazard maps, the initial purpose of which is to show depth and velocity of flood water, without freeboard. This is standard practice throughout the United States of America, England, New South Wales, Queensland and the rest of New Zealand (see Appendices 5, 6, 7 & 8).

The Commissioner correctly states *"the application of freeboard is an industry accepted tool for compensating for inherent imperfections and unknowns in flood models"* [3.151]. However, he is incorrect in finding *"that freeboard has been appropriately applied for the purposes of [this] plan change"* and that 100mm has been removed from the flood modelling and mapping *"us[ing] industry-accepted practice"* [3.137a]. These errors of judgement demonstrate he is either unaware of, or is ignoring, standard industry practice.

I therefore request that this Council decline Plan Change 42 and develop flood maps that apply freeboard according to standard practice. When freeboard is added for setting floor levels, it should be differentiated so that properties are not falsely shown in floodwater.

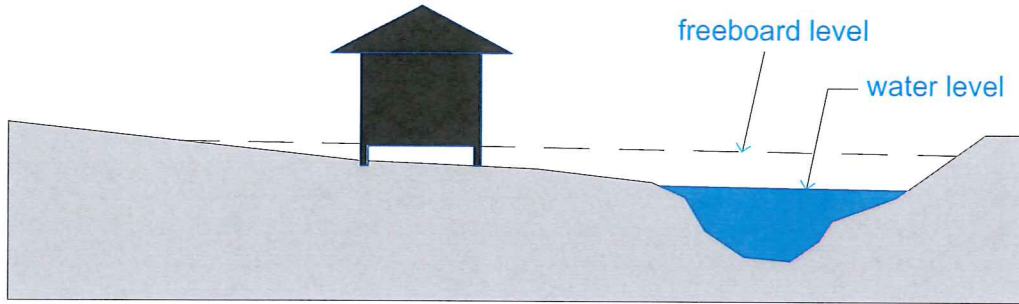
I ask that this hardcopy of my address today and the eight appendices be noted in and appended to the Minutes of this meeting please. Thank you.

#### **Appendices:**

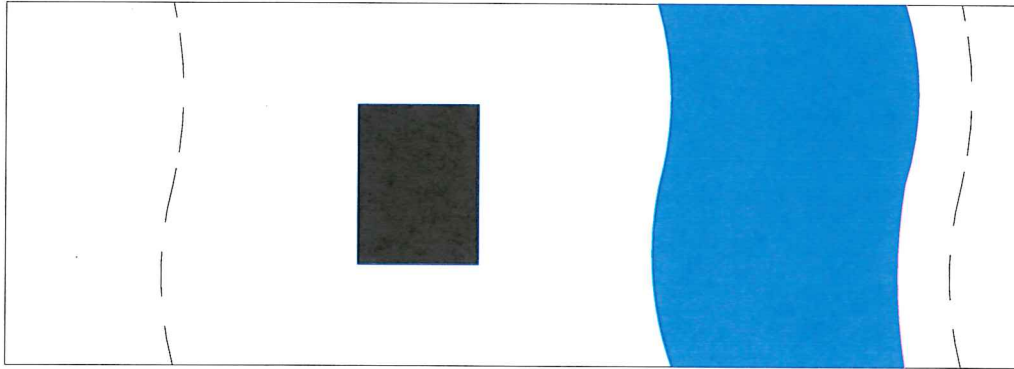
- 1 SOH Diagrams:  
Upper Diagram: Standard Industry Practice – 100 Year Flood  
Lower Diagram: GWRC's Non-Standard Practice
- 2 Example - Pinehaven Stream Flood Hazard Map - 70A Pinehaven Rd

- 3 Example – UHCC GIS online map - #70 & 70A Pinehaven Road
- 4 Example – Upper map – GWRC’s 100 year flood map for #27 Elmslie Road
  - Lower map - R J Hall’s 100 year flood map for #27 Elmslie Road
- 5 Standard Practice regarding Freeboard
- 6 NZ Regional & Local Authorities\_ Freeboard in Flood Hazard Mapping
- 7 “Towards Uniformity in Flood Mapping” - Mike Law
- 8 Nigel Mark-Brown – “Flood hazard evaluation of subdivisions ...”

### Standard Industry Practice: 100 year Flood



Section View - NTS

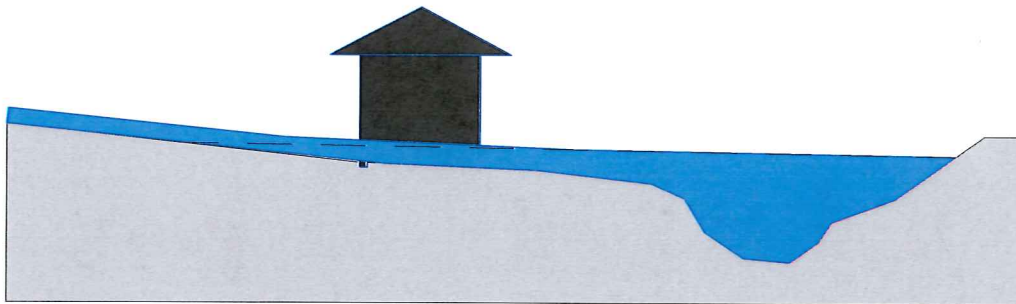


apply freeboard to 100-year water level  
to find safe height for floor level

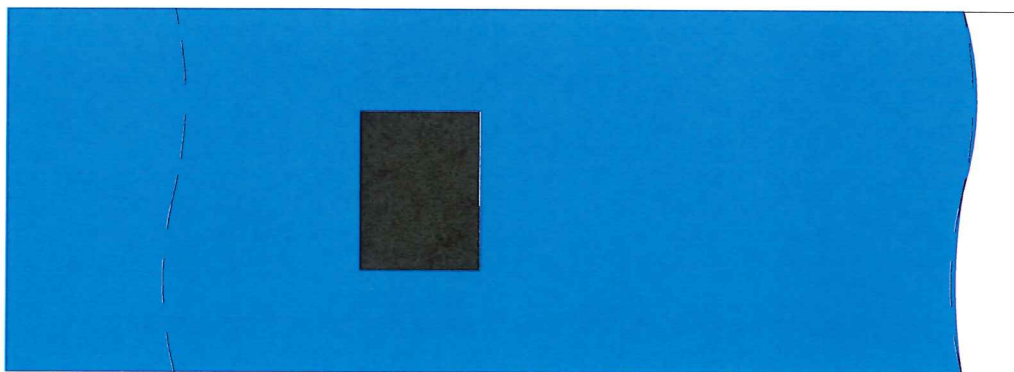
flood water extent

Plan View - NTS

### GWRC's Non-Standard Practice



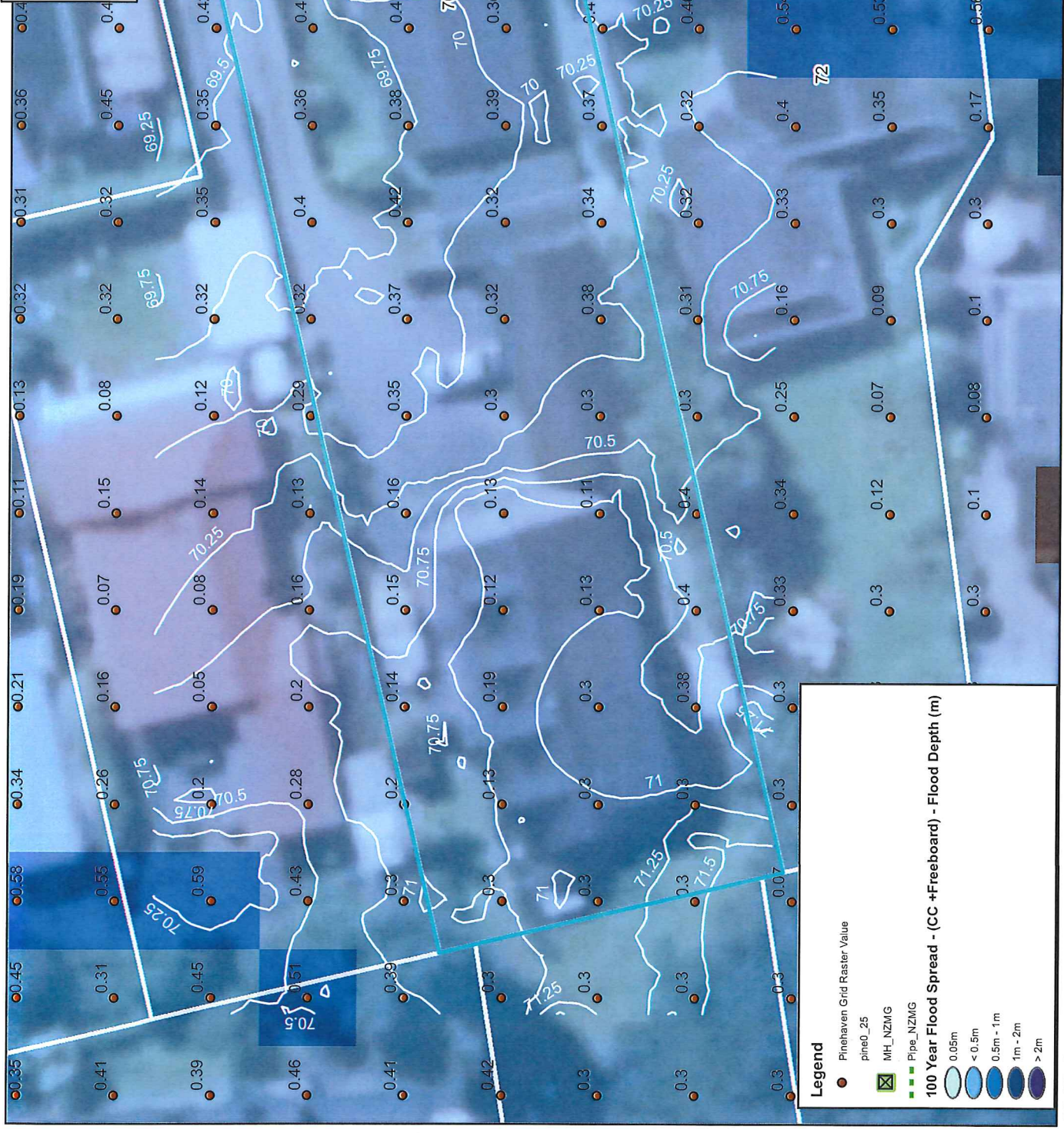
Section View - NTS



Plan View - NTS



**DISCLAIMER:**  
 The flood hazard information shown on this plan is based on the best available data at the time of preparation. Specific interpretation of flood risk in any areas shown to be affected by flooding should be obtained by written request from the Greater Wellington Regional Council. The GWRC and other agencies involved in the preparation of this plan assume no responsibility for any interpretation or action taken by any agency or individual in relation to information provided on the plan.



**Legend**

- Pinehaven Grid Raster Value
- pine0\_25
- ☒ MH\_NZMG
- Pipes\_NZMG
- 100 Year Flood Spread - (CC +Freeboard) - Flood Depth (m)**
- 0.05m
- <0.5m
- 0.5m - 1m
- 1m - 2m
- > 2m

greater WELLINGTON  
 REGIONAL COUNCIL  
 Te Pane Matua Taiao

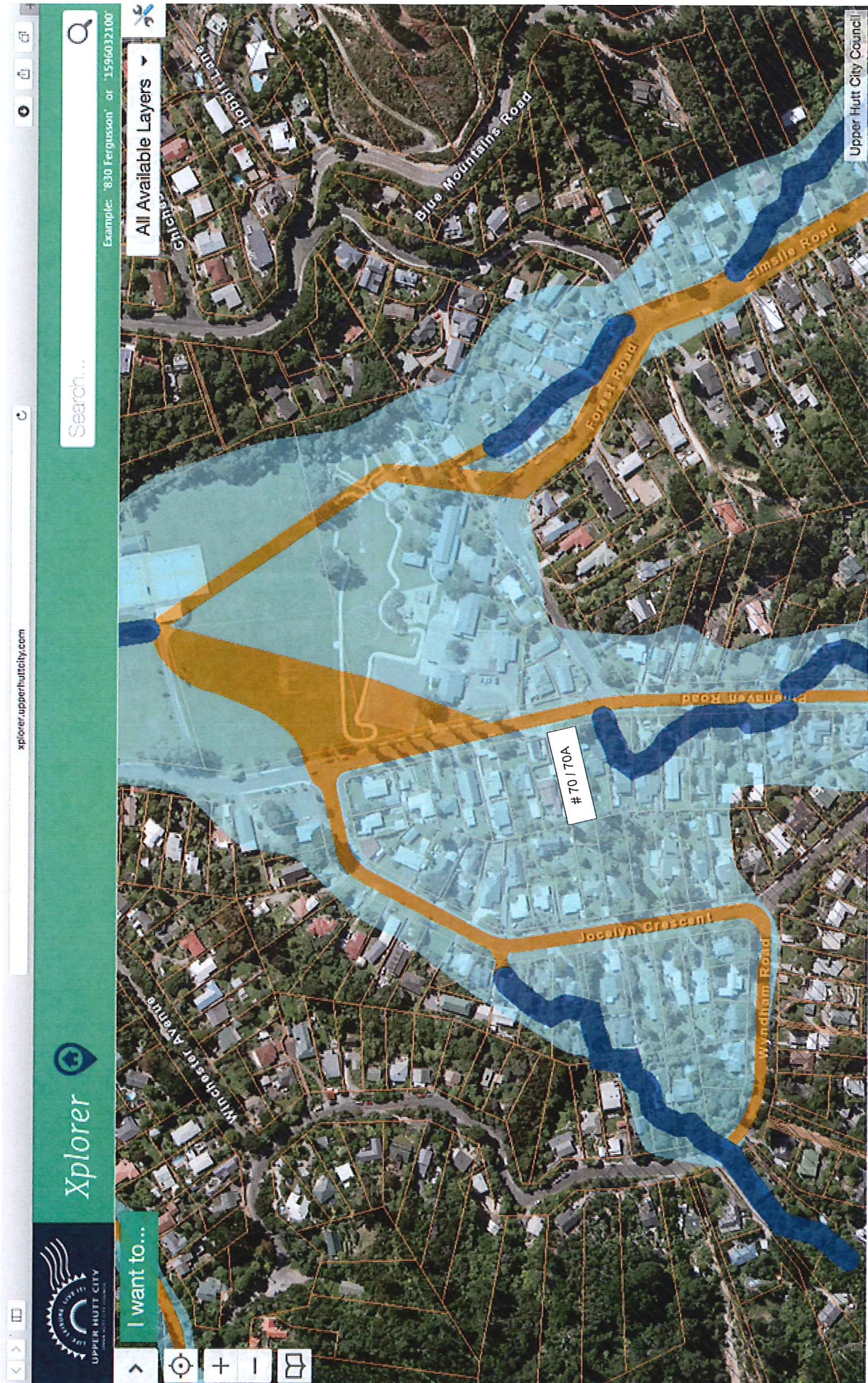
Regional Orthophotography : 2017  
 Topographic and Cadastral data is copyright LINZ  
 0 1 2 4 6 8 10 Metres  
 A4 Scale : 1:300

User Name: flanaganj  
 Plotted 20/4/42 p.m., 1/12/2017  
 SOURCE OF FLOOD LEVELS:  
 gwrasler\_rztm:SDEADMIN:FLOODPROT\_PINEHAVEN\_STM\_Q100CC\_FB\_LEVEL\_2010

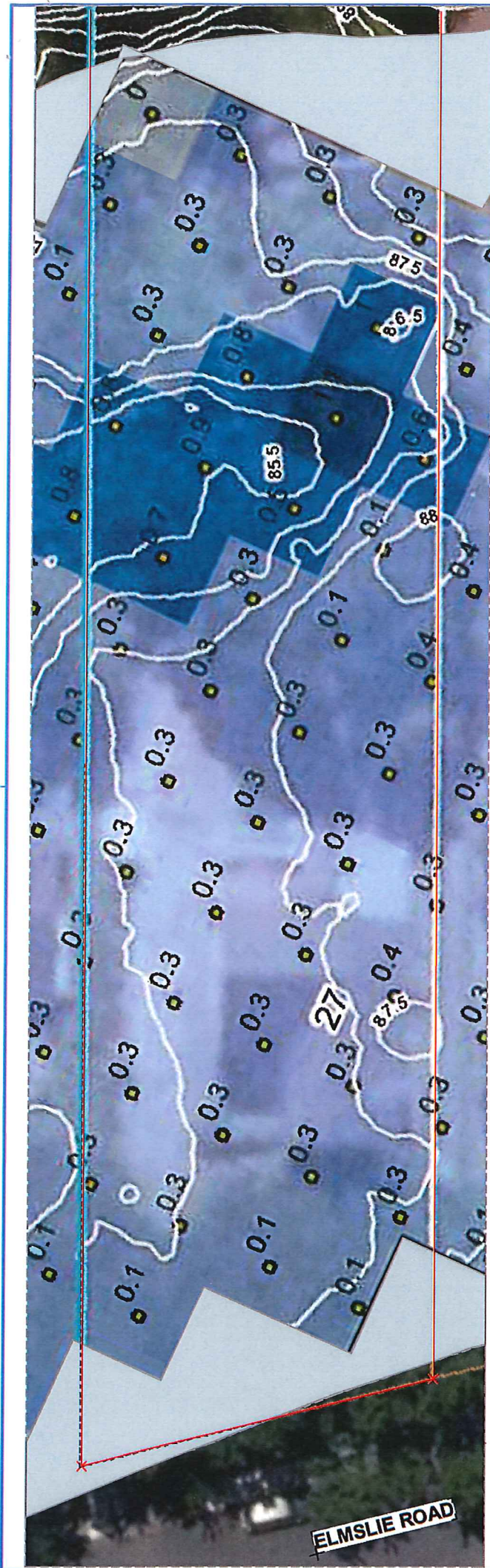
# PINEHAVEN STREAM - Flood Hazard Map

## 70A Pinehaven Road, Pinehaven

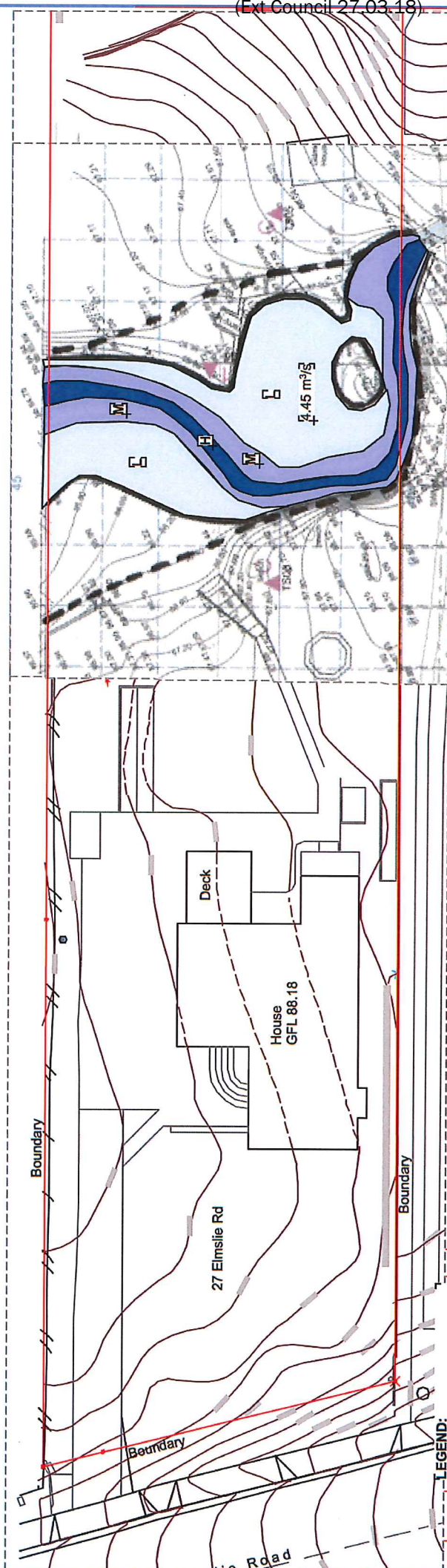




# 70 & 70A Pinehaven Road falsely shown in 100-year flood zone



#27 1:200 @ A3 size



1:200 @ A3 size 1:200 @ A3 size (Ext Council 27.03.18)

LEGEND:

[Light Blue Box]	L = Low Hazard
[Medium Blue Box]	M = Medium Hazard
[Dark Blue Box]	H = High Hazard

**Attachment 5: Standard Practice regarding Freeboard**

Nicky Robinson, to UHCC Extraordinary Council Meeting 27.3.18

**1. USA - Standard Practice:**

**Federal Emergency Management Agency (FEMA), Washington DC, USA**

Reply by email 16.2.18 from FEMA

Subject: FMIX Inquiry #2505517 - [FMS] - Do FEMA flood maps include freeboard?

*"We are responding as a representative of the Department of Homeland Security, Federal Emergency Management Agency (FEMA), to your email message sent to [FEMAMapSpecialist@riskmapcads.com](mailto:FEMAMapSpecialist@riskmapcads.com). The Base Flood Elevation (BFE) does not include freeboard."*

**2. England – Standard Practice:**

**Flood and Coastal Risk Management (FCRM), Environment Agency, England**

Reply by email 03.3.18 from FCRM, EA

Subject: 180219/OM01 FW: Do EA flood maps include freeboard?

*"Following on from your query and earlier conversation with Mark Todd: yes, as per the Accounting for residual uncertainty guide, the residual uncertainty allowance is variable and dependent upon the confidence rating assigned. Therefore it is not included in the flood modelling and needs to be used on top of the predicted flood level for any development planning."*

**3. New South Wales – Standard Practice:**

**BMT Global, New South Wales, Australia**

Reply by email 15.2.18 from Senior Flood Engineer, NSW Flood Lead

Subject: Do NSW flood maps include freeboard?

*"Flood mapping in NSW typically presents the flood levels/depths as derived by the modelling. It does not represent a freeboard allowance. As you state, the allowance of a freeboard is applied for flood planning purposes ..."*

**4. Queensland – Standard Practice:**

**Queensland Reconstruction Authority (QRA), Queensland, Australia**

Reply by email 21.2.18 from QRA

Subject: Do NSW flood maps include freeboard?

*"In response to your query regarding the inclusion of freeboard in flood mapping in Queensland, flood maps produced through 'traditional' modelling usually do not incorporate freeboard – as in other jurisdictions they tend to be representative of historic or 'design' events, such as the 1% Annual Exceedance Probability event. This enables flood maps to be used for a range of purposes including community awareness, disaster management, environmental management, structural options investigations, and the like (i.e. outside a planning scheme)."*

**See Attachment 6: New Zealand's Regional & Local Authorities – Freeboard in Flood Hazard Mapping** – Most authorities do not include freeboard in flood hazard mapping

**See also Attachment 7: Mike Law, "Towards Uniformity in Flood Mapping" Stormwater Conference, 2017** – commenting on standard practice throughout England (p7):

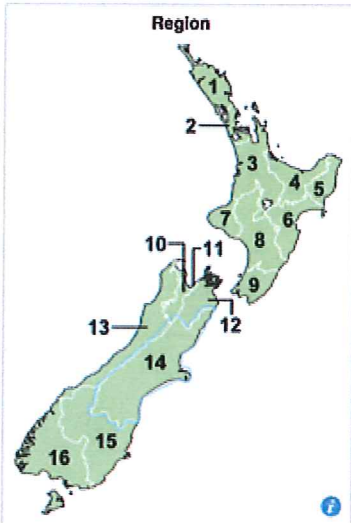
*"Referring to the Flood Zone Maps, it is worth noting that they do not include freeboard ... Rather, an allowance is made for freeboard when setting floor levels ..."*

**See also Attachment 8: Nigel Mark-Brown (Flood Engineer and Planning**

**Commissioner), "Flood Hazard Evaluation for Subdivisions", Stormwater Conference, 2016**

– *"The NSW Government Floodplain Development Manual (NSW, 2005) recommends initial hazard categorization on hydraulic considerations alone ... Depth and velocity of flood waters ... (without any freeboard)"*

**New Zealand’s Regional & Local Authorities – Freeboard in Flood Hazard Mapping**



Beca: "Pinehaven Stream Flood Mapping Audit"  
13 July 2015, p19:

"...one of the recommendations of this audit is that GWRC undertake a thorough review of best practice in New Zealand and overseas."



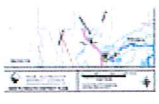








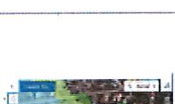

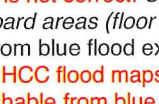


Did GWRC undertake such a review? Apparently not.

Save Our Hills (Upper Hutt) Incorporated carried out a survey of regional and city authorities in New Zealand to find out if including freeboard in the mapped blue hazard extents (as GWRC and UHCC have done for Pinehaven Stream and Mangaroa River catchments) is standard practice. **It definitely is not standard practice to include freeboard in the flood hazard extents.**

Map of Regions (Source: Wikipedia)

**Regional & Some City/District Authorities – Does the blue flood extent include freeboard ?**

	Region	Regional Council	Example of Regional Council flood map	Does blue include freeboard Yes / No ?	City / District Council	Example of District Plan or GIS flood hazard map	Does blue include freeboard Yes / No ?
1	Northland	Northland Regional Council		No	Whangarei District Council		No (?)
2	Auckland	Auckland Council		No	NB: The Beca audit says "For Auckland, the Flood Sensitive Areas are the equivalent of Wellington Region's flood hazard areas" (p21). <b>This is not correct.</b> Auckland's "Flood Sensitive Areas" indicate freeboard, and are distinct from the blue floodplain areas; <b>on GWRC &amp; UHCC flood maps freeboard is indistinguishable from blue flood hazard areas, and extends the blue flood extents.</b>		
3	Waikato	Waikato Regional Council		No	Hamilton City Council		No
4	Bay of Plenty	Bay of Plenty Regional Council		No Eg Whakatane River	Tauranga City Council		No
5	Gisborne	Gisborne District Council		No	GDC is both Regional & District Council		

	Region	Regional Council	Example of Regional Council flood map	Does blue include freeboard Yes / No ?	City / District Council	Example of District Plan or GIS flood hazard map	Does blue include freeboard Yes / No ?
6	Hawke's Bay	Hawke's Bay Regional Council		No	Napier City Council		No
7	Taranaki	Taranaki Regional Council	(TRC has not published flood hazard maps)	---	New Plymouth District Council		No
8	Manawatu-Wanganui	Horizons Regional Council		No	Palmerston North City Council		No
9	Wellington	Greater Wellington Regional Council		Yes	Wellington City Council		No
10	Tasman	Tasman District Council		No	TDC is both Regional & District Council		
11	Nelson	Nelson City Council		No	NCC is both Regional & District Council		
12	Marlborough	Marlborough District Council		No	MDC is both Regional & District Council		
13	West Coast	West Coast Regional Council	(WCRC has not published flood hazard maps)	---	Grey District Council		No
14	Canterbury	Canterbury Regional Council		No	NB: The Beca audit says "Christchurch's flood control areas are the equivalent of Wellington Region's flood hazard areas" (p20). <b>This is not correct.</b> Christchurch's green freeboard areas (floor level controls) are distinct from blue flood extent areas; <b>on GWRC &amp; UHCC flood maps freeboard is indistinguishable from blue flood hazard areas, and extends the blue flood extents.</b>		
15	Otago	Otago Regional Council		No	Dunedin City Council		No
16	Southland	Environment Southland		No	Invercargill City Council		No

# TOWARDS UNIFORMITY IN FLOOD MAPPING

**Mike Law (Senior Associate – Water Resources, Beca Ltd)**

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## **ABSTRACT**

For a country of New Zealand's relatively small size and population, the lack of uniformity in development and presentation of flood maps across the country is striking. In parallel to efforts to promote country-wide uniformity in rainfall-runoff modelling, and drawing on examples and experience from around New Zealand and overseas, a case is presented for greater uniformity in flood mapping and clarity in communicating flood risk.

Flood maps are developed for a range of uses, including high-level hazard identification, integrated catchment management planning and District Plan hazards management. Terminology and the content of information presented on flood maps differ across the country.

Knowing that a map is showing the flood depth and extent does not in itself explain the level of modelling detail and reliability; was the model a simple 2D only rain-on-grid model, or a fully coupled model representing piped networks, open channels, structures and floodplains, and what were the underlying assumptions and constraints? Beyond the raw model output, different approaches are adopted for the inclusion of freeboard or identifying flood sensitive margins.

In addition to their use by stormwater practitioners and planners, the communities we serve are also interested, especially where they are at risk of flooding or it might affect property value and options. Flood maps are a key tool for communication, so communities need to understand the flood maps and have confidence in them.

For this they need to be accessible; an internet search for "flood maps" rarely delivers the desired result. Uniformity of flood mapping terminology and consistency of how councils make their flood maps available would assist, both for community understanding and to assist less well-resourced councils.

Moving towards a uniform approach would result in councils relinquishing local control of flood map specification, but should provide tangible benefits to the country as a whole.

## **KEYWORDS**

**Flood mapping, national policy, community communication**

## **PRESENTER PROFILE**

Mike has 27 years' experience in flood risk management and modelling, hydrology, and water resources, both in the UK and New Zealand. He joined Beca's Christchurch office in 2009, and has undertaken a wide range of hydrological investigation and flood modelling projects throughout New Zealand, Australia, and the Pacific Region.

## 1 INTRODUCTION

I arrived in New Zealand in 2009, having spent the previous nineteen years working in the UK. The majority of my work had been in England but I'd also worked on projects in Wales. Following the 'Easter Floods' of 1998, there had been a concerted drive in the UK to deliver country-wide flood mapping and clear planning guidance to steer vulnerable land uses away from areas at risk of flooding. This goal of nationwide consistency was generally met, and accepted. Therefore, it came as a shock to find that New Zealand's approach to flood modelling and mapping is piecemeal; being dependent on the priorities and resources of the local authority.

In this paper, I will first consider the need for flood mapping and look back at the apparent simplicity of mapping that I left behind in England. I will contrast that with the current range of approaches and outputs in New Zealand, before looking forward to what we need to consider if New Zealand is to move towards uniformity in flood mapping, avoiding some of the problems that others have experienced.

## 2 THE NEED FOR GOOD FLOOD MAPPING

It is assumed that a map is the best method for displaying flood risk or hazard information for an area. That being the case, it is essential that an effective means of communicating the information is used. Flood maps are developed and used for a range of purposes; some part of the planning process and some not. These include:

- High-level flood hazard identification and Integrated Catchment Management Planning;
- District Plan hazards management;
- Owners and prospective buyers checking properties;
- Insurers assessing their exposure to risk;
- Emergency services identifying access and evacuation routes.

So, in addition to their use by stormwater practitioners and planners, the communities we serve are also interested in flood-related information. Flood maps need to allow our communities to understand flood risk and have confidence in the processes that underlie flood mapping and the decisions made because of their use.

The information presented on flood maps depends on the use of the map, and may include flood extent, flood depths, and water surface elevations (Figure 1), as well as water velocities and flood hazard (defined based on a combination of flood depth and water velocity). Areas beyond the modelled flood extent may also be identified, if they are considered at risk due to modelling uncertainties or events larger than the design flood.

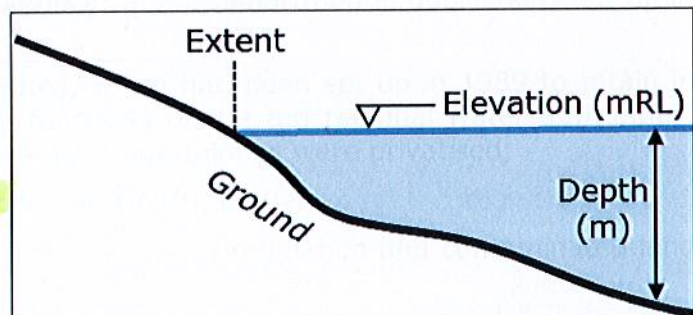


Figure 1: Flood map information

Figure 1: Flood map information



PPG25 was replaced in 2006 by Planning Policy Statement 25 (**PPS 25**), also titled **Development and Flood Risk** (CLG 2010). PPS25 continued the approach of steering development away from flood prone areas using a 'Sequential test', with an 'Exception test' to minimise the consequences of flooding where development had to proceed in flood prone areas.

The introduction of the Flood Zone Maps, FEH and PPG25/PPS25 provided consistency of approach of three of the four key aspects of flood risk management (Figure 3). What was missing from this suite of information, tools and guidance was guidance on flood/stormwater modelling.

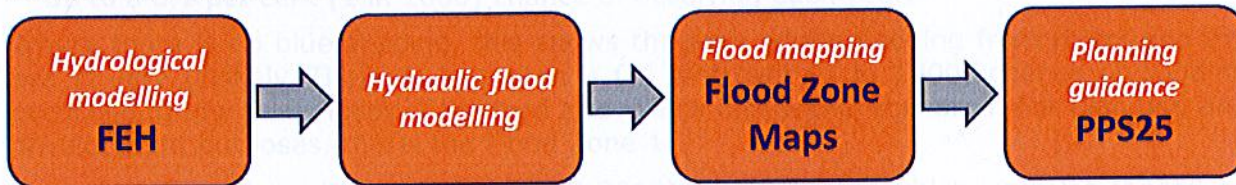


Figure 3: Flood risk management components

### 3.3 FLOOD ZONE MAPS (ENGLAND)

Figure 4 shows a current Flood Zone Map for York in the North of England.

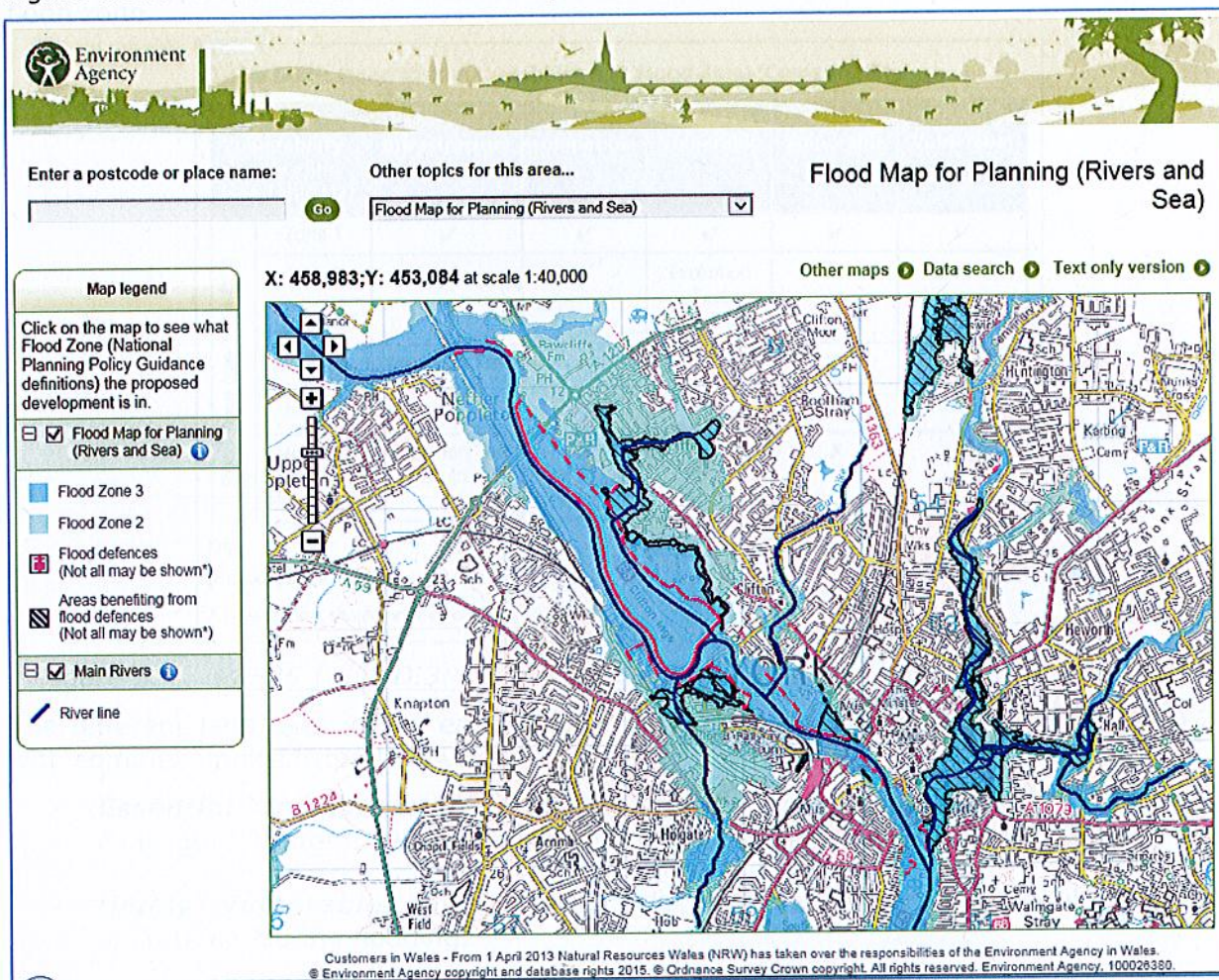


Figure 4: Flood Zone Map

There are two different areas of shading shown on the Flood Zone Map:

- **Less Vulnerable** uses include police, ambulance and fire stations which are **not** required to be operational during flooding, shops and offices, water treatment works which do **not** need to remain operational during times of flood, and wastewater treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
- **Water-compatible Development** includes flood control infrastructure, water and wastewater infrastructure and pumping stations, docks, marinas and wharves, water-based recreation infrastructure.

While providing consistency across England, the Flood Zone Maps are relatively simple. Within each flood zone, they do not indicate flood depth, water velocity, or flood hazard (the combination of flood depth and water velocity, as shown in Figure 6). Where flood extents are large, flood hazard maps can be particularly informative; indicating the effect of deep or fast flowing water in defined flow paths or depressions.

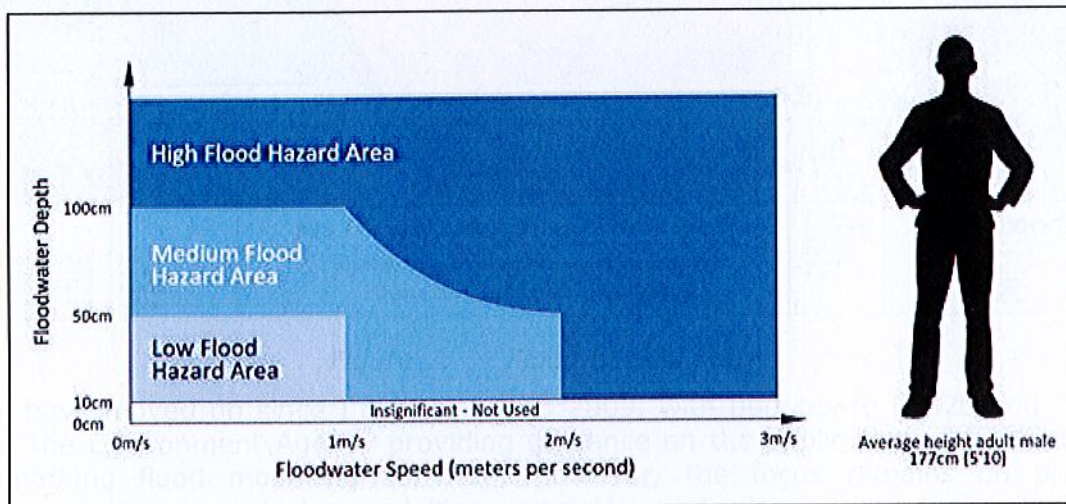


Figure 6: Definition of flood hazard (HCC 2017)

In the absence of more detailed nationwide flood maps in England, maps were developed for individual catchments and flood alleviation schemes by the local authorities or the Environment Agency, or on a site-specific basis for developers. Figure 7 shows an example of a flood hazard map for Canvey Island in Essex (SE England) produced to inform the development of a supermarket on a greenfield site. Though defended by stopbanks, the area is at risk from tidal inundation and the flood hazard map includes the effects of a breach in the flood defences.

Referring to the Flood Zone Maps, it is worth noting that they do not include freeboard to reflect the sensitivity of the underlying modelling to assumption made in the modelling process. Rather, an allowance is made for freeboard when setting floor levels and flood sensitive infrastructure through the development control and planning process.

The overall sensitivity of the area to changes in flood modelling inputs can be inferred by the extent of Flood Zone 2, which represents the area between the 100-year ARI fluvial (or 200-year ARI coastal) and 1000-year ARI flood extents. This is similar to the practice of using an oversize event to represent flood sensitivity, occasionally done in New Zealand.

Accessing flood maps is another point of difference across New Zealand. It should be easy for the community to find flood map information. Internet searches for "Flood Map" for Wellington, Auckland and Christchurch yield varying levels of success in finding flood maps.

Some links lead to web pages stating that flood mapping has been carried out, but all too often there is no link to a map viewer. In other cases, PDF versions of maps are provided at a scale that does not allow close examination of specific addresses or location (although this might be an appropriate approach if the modelling is high-level rapid flood modelling).

## 5 TOWARDS UNIFORMITY IN FLOOD MAPPING

For a country of New Zealand's relatively small size and population, the lack of uniformity in the development and presentation of flood maps across the country is striking. In parallel to efforts to promote country-wide uniformity in rainfall-runoff modelling, greater consistency and uniformity in flood mapping would assist in communicating flood risk to stakeholders and the community.

I have provided the example of how flood maps were presented in England when I left in 2009, and they are essentially the same in 2017. Uniformity of mapping and close linkage to planning guidance, improves clarity and reduces confusion. Yet in their simplicity of only showing flood extents, the Environment Agency's Flood Zone Maps do not contain the detail of information that is evident in many of New Zealand's flood maps, and which is useful.

There is a place for maps showing flood depths, water velocities and flood hazard. However, this needs to be balanced against the danger of producing such a large suite of flood maps that confusion is the inevitable outcome. A balance needs to be struck.

There are differences across New Zealand as to whether (or how) freeboard is applied, including set increases in depth above modelled water levels, applying 'model freeboard' as done for the Waiohine, or modelling oversized events. We need to find a single method that is technically robust, yet transparent and clearly communicated to stakeholders and the general public.

I have touched on the differences in flood mapping terminology used across the country, and the difficulties in accessing current flood maps at the necessary level of detail. In a digital age, flood maps should be readily accessible online.

So, I put out the call for uniformity in flood mapping across New Zealand, which would include:

- An agreed number of critical design (ARI) events to be mapped. *That may mean a review of performance standards for stormwater systems, stopbanks, etc.*
- A uniform approach to applying freeboard and/or defining 'flood sensitive' areas beyond the best estimate of the modelled flood extent;
- Maps available online, and easily found;
- Standard terminology and colour pallets;
- Map text that identifies appropriate uses for (and limitations of) the maps;

## Flood hazard evaluation for subdivisions in areas of coastal inundation hazard

Nigel Mark-Brown BE MIPENZ CEng, Robert Scott, BA, BPlan, Dip Bus Admin, MNZPI

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### ABSTRACT

This paper discusses the outcomes of a recent resource consent hearing and environment court decision for a subdivision consent application for a proposed 66 lot subdivision on low lying land adjacent to the Kaipara Harbour in Auckland. The initial consent application was refused on grounds that the applicant had designed the subdivision to have all building platforms above the future coastal inundation 100 year ARI flood level, but the hazard arising from future coastal inundation on footpaths, roads and reserves had not been appropriately avoided, remedied or mitigated. The decision found that the potential adverse effects would be significant, unacceptable and more than minor. A subsequent appeal to the environment court resulted in the consent being granted subject to raising the road levels to avoid flooding to more than 500 mm depth of water. This was considered acceptable to mitigate the hazard for vehicles and pedestrians in the event of inundation from flooding from the harbour due to extreme tide and wind conditions. The paper discusses the hazard at the site due to coastal inundation, including allowance for future sea level rise. This discussion includes how flood hazard is generally addressed by engineers from consideration of the depth and velocity of floodwater. It also discusses other considerations such as the nature of potentially affected population, their likely expectations of protection against flooding and how their activities might interact with a flood event. It discusses the possible implications of the consent order on planning and engineering practice with respect to assessing acceptable coastal flood hazard for subdivisions.

### KEYWORDS

Flooding, coastal inundation, flood hazards, subdivision

### PRESENTER PROFILE

Nigel is a chartered professional engineer with wide experience in range of environmental and civil engineering projects. He is a certified RMA commissioner with experience in a number of significant infrastructure consent hearings and decisions. He also teaches assessment of water related effects of development at Auckland University and for NZ Planning Institute's CPD programme.

The above agreements were noted in a Memorandum of Consent prepared in August 2015. It noted that the appellant provided updated ground contour and cut/fill plans to reflect the above requirements and the amendments will result in an additional 25,760 m<sup>3</sup> of clean fill being brought into the site, increasing the from 42,240m<sup>3</sup> in the refused proposal to 68,000 m<sup>3</sup>.

The Environment Court subsequently granted consent by way of a Consent Order for the proposed development as amended by proposed additional filling described in the Memorandum of the Parties in Support of Draft Consent Order.

### **3 ASSESSING FLOOD HAZARD FOR COASTAL INUNDATION**

#### **3.1 GENERAL**

The New South Wales Government Floodplain Development Manual for the Management of Flood Liable Land (NSW, 2005) defines hazard as a source of potential harm or a situation with a potential to cause loss. The discussion in this paper focusses on coastal inundation flood hazard with respect to life and health, rather than consideration of loss or damage to property or ecological components of the environment.

For this paper the primary methodology considered for assessing flood hazard is that contained in the NSW Government Floodplain Development Manual (NSWGFPDM), (NSW, 2005). This manual is primarily aimed at carrying out risk management for a whole floodplain, rather than separate individual development, however its discussion of flood hazard is in the author's opinion relevant to this paper, i.e. in consideration of an individual subdivision. The flood hazard assessment part of the manual is used by some Councils in New Zealand.

The NSW Government Floodplain Development Manual (NSW, 2005) recommends initial hazard categorization on hydraulic considerations alone followed by consideration of other factors that affect flood hazard. The figures used for initial categorization on hydraulic considerations are reproduced as Figures 3 and 4 below.

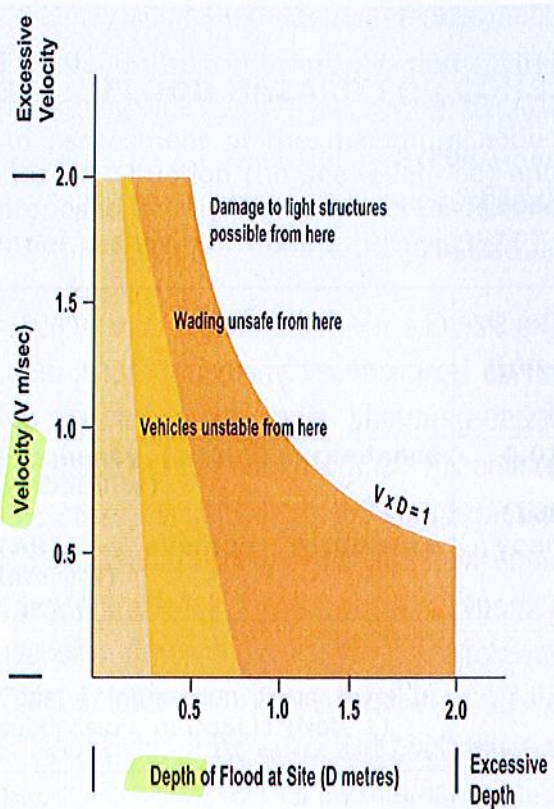
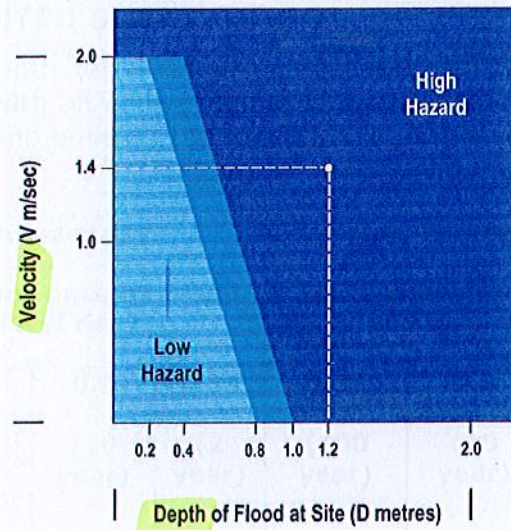


Figure 3 Velocity and Depth Relationships



#### Notes

The degree of hazard may be either -

- reduced by establishment of an effective flood evacuation procedure.
- increased if evacuation difficulties exist.

In the transition zone highlight by the median colour, the degree of hazard is dependant on site conditions and the nature of the proposed development.

Figure 4 Provisional Hydraulic Hazard Categories

The NSW flood manual notes that the provisional hazard categorization based on hydraulic evaluations should be used with a number of other factors to determine the true hazard categories.

The other factors are:

- Size of flood
- Effective warning time
- Flood readiness
- Rate of rise of flood waters
- Depth and velocity of flood waters
- Duration of flooding
- Evacuation problems
- Effective flood access
- Type of development

### 3.2 FLOOD HAZARD FOR CONSENTED SUBDIVISION

An assessment of the maximum flood depth for a range of flood probabilities for the existing situation (no sea level rise) and with an allowance for 1 m sea level rise for the proposed subdivision with increases road and building site levels as set out in the consent order is shown in Table 2.

	Present day (no allowance for sea level rise)			Future (with allowance for 1 m sea level rise)		
	0.01 (100 year)	0.1 (10 year)	0.39 (2 year)	0.01 (100 year)	0.1 (10 year)	0.39 (2 year)
Frequency (annual exceedance probability) (ARI - average recurrence interval)						
Coastal inundation flood level at subdivision, m DoSLI1 (Note 1)	3.33	3.01	2.75	4.33	4.01	3.75
Maximum depth of flood water over roads and building platforms (metres) (Note 2)	nil	nil	nil	0.53	0.21	nil

#### Notes

- (1) Methodology as used by Council officers, i.e. NIWA 2013 report 1% AEP levels plus 1m sea level rise – 200 mm spread (without any freeboard)
- (2) Road level min 3.8 m DoSLI

**Table 2 Flood Levels and Depths for consented subdivision**

Provisional hazard categorization based on hydraulic evaluation cannot be accurately carried out as there is no information on flood velocities. Figure 3 above indicates vehicles may be unstable for depths over 300 mm even in still water. Figure 4 indicates the hazard may be low for a flood depth of 500 mm if the flood flow velocity is less than 1 m/second. The NSW Flood Manual (NSW, 2005) defines a low hazard as should it be necessary, a truck could evacuate people and their possessions; able bodied adults would have little difficulty in wading to safety. Our conclusion is that given uncertainty regarding flood flow velocities it is not possible to confidently set a provisional hazard categorization base on hydraulic evaluation.

For the proposed subdivision a discussion of factors to be considered other than hydraulic evaluations, in order to determine the true hazard categories, is as follows, based on the NSW Flood Manual approach.

- Size of flood – this is related to flood frequency large floods occurring less frequently than small floods; Table 2 shows that flood depths for a 10year ARI event with sea level rise is 0.21 metres which is unlikely to cause a hazard

- Effective warning time - given that the coastal inundation is due to a combination of high astronomical tide and storm surge caused by high winds it is possible to provide warning through civil defence mechanisms. As coastal inundation is only predicted to be a problem some distance in the future, there is time for implementation of civil defence mechanisms to provide adequate warning to residents of a large flood event; note that this assumes flood warning is an appropriate tool to mitigate hazard; our view is that it may not be when consenting green fields development
- Flood readiness - this includes flood education of residents and developing community awareness and readiness for floods with appropriate action set out. For the proposed subdivision this would include explaining that in a significant event houses are expected to be above flood levels but surrounding land will be inundated making evacuation difficult; this will depend on the composition of residents. For example elderly or infirm people may become very stressed and in the event of a large flood event which surrounds their house with water, may want or need to be evacuated.
- Rate of rise of flood waters - based on evidence from council engineers at the consent hearing that the total duration of flooding is related to the tidal cycle then floodwater would rise over approximately 1 to 1.5 hours;
- Depth and velocity of flood waters - this has been addressed under initial categorisation using hydraulic evaluation above;
- Duration of flooding- evidence at the consent hearing from Council engineers was that flooding would be short lived, i.e. 2 to 3 hours;
- Evacuation problems - once flood water are over 300 mm deep evacuation by road can only be done by a truck or similar; there is higher ground a few hundred metres to the west of the site along Fordyce Road;
- Effective flood access - this means an exit route that remains trafficable for sufficient time to evacuate people and possessions, or any other appropriate boat based or air based means of evacuation<sup>2</sup>. This could be addressed through civil defence mechanisms; and
- Type of development- this can include special evacuation needs, e.g. old or infirm people, children, level of occupant awareness; the type of resident of the proposed subdivision is not known at this stage but given it is aimed to provide low cost housing it is probably reasonable to expect some residents would be old, infirm people, or children

In summary the above discussion indicates that it is not possible to assess a robust flood hazard classification for the proposed subdivision due to:

- Inability to assess a provisional hazard categorization based on hydraulic evaluation for vehicles parking or travelling on the roads and pedestrians walking on the roads due to a lack of information on flood velocities at the subdivision
- Uncertainty regarding factors other than hydraulic evaluation as follows:

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<sup>2</sup> Section L6.8 in NSW, 2015  
2016 Stormwater Conference



## Review of PC42 Commissioner's report

Many of the issues raised by the community were about these things

1. The flood extents don't match experience on the ground [3.110, 3.111, 3.114/5/6]
2. The map presentation is confusing or misleading [3.47, 3.50, 3.51, 3.53]
3. The consultation process by GW and UHCC (which relies on the GW result) [3.285/6/7/8/9]

In items 1 and 2 above in particular much of the community's evidence was backed up by clear reasoning and documented facts.

Looking at the conclusions of the Commissioner

The Commissioner agrees with council officers [3.291] that the consultation *'met its obligations under the RMA'* [3.290]. This reduces the consultation to a minimalist objective and ignores the very real issues (3 above) raised by the community. It offers no way to resolving these.

The Commissioner states [3.292] *'Clearly there are parties who are opposed to the notion of the plan change, to the science underpinning it, and/or the process followed by the Council in arriving at this point. However, that is not evidence that the Council has conducted a poor consultative process or failed to meet its obligations under either the LGA or RMA.'* But this ignores evidence that the maps at the core of this were produced without consultation. And that there is no effective response to issues raised in 1 and 2 above. In other words, in the view of the Commissioner there is no obligation to do anything about these well defined issues. If that is the case then why do we have a 'consultation' at all.

The Commissioner then goes on [3.293] to state *'Too frequently the adequacy of consultation is conflated with the extent of 'wins' or outcomes one party has in respect to the consultation topic as opposed to whether or not there has been a genuine attempt to engage between the parties. The criticisms of the consultation process in this instance appear to reaffirm the likelihood that this has indeed occurred in this instance.'* We are shocked at the attitude shown by this. There is no evidence to back up this conclusion, in fact there is significant evidence to back up the alternative. This denigration of the community's input opens the door to the question of whether the Commissioner's conclusions are based on fact and evidence or not. We would be extremely disappointed if the Council allowed this to stand.

If PC42 is passed as it is, there will be continuing issues of interpretation with regard to insurance, property sales and property development (including consultant capture). This creates the potential for bitterness and frustration for years to come. We ask the Council now the same as we asked at the hearings [3.287] *'that the process be put on hold and that a new, more collaborative approach be adopted to resolved the community concerns about the plan change.'*

UPPER HUTT CITY COUNCIL EXTRAORDINARY COUNCIL MEETING  
27 March 2018 - 4:30pm. Expressions Theatre.

**To: UHCC Mayor & Councillors**

**From: SUSAN PATTINSON, 27 Elmslie Road, Pinehaven, Upper Hutt.**

## **PROPOSED PLAN CHANGE 42**

Thank you Mayor and Councillors for the opportunity to speak.

### **1. The Purpose of the Flood Maps**

The Commissioner wrongly assumes that submitters generally do not understand the difference between the purpose of GW's<sup>1</sup> maps and UHCC's PC42 maps. We do understand the difference.

**GW and UHCC have themselves created confusion and misunderstanding in the community by providing contradictory information to the public about their flood maps.**

GW's flood maps are supposed to show "Flood Hazard" i.e. hydraulic information, such as the depth and velocity of flood water, without freeboard.

Appendices 1–12 show examples of flood hazard maps from Queensland and New South Wales. These maps show the "Existing Condition", i.e. flood water levels without climate change or freeboard. These maps are all freely available online to the public.

We have not been provided with flood hazard maps like this from GW, and people asking for information like this from GW are being refused!

GW's maps show flood extent only - no information about water depths or velocities. How can the public have confidence in UHCC's PC42 maps when the underlying GW maps lack basic hydraulic information like that shown on the Queensland and New South Wales hazard maps?

Council and its experts confuse the purposes of the GW and UHCC flood maps. Council refers to GW's maps as flood "hazard" maps, which they aren't – they are flood extent maps only.

Council also refers to its own Plan Change maps as "hazard" maps, which they aren't – they are supposed to be flood planning maps, for assigning policies and rules to areas or zones, e.g. Appendices 13-15 – Auckland, Christchurch, and UHCC's Mangaroa River flood map (2007). Like these examples, UHCC's PC42 maps should differentiate the freeboard zone. Flood modellers tell us this is easily done. But the PC42 maps fail to do this.

Whilst the Commissioner notes the different purposes of GW and UHCC maps, he does not address Council's confused handling of the respective maps.

## 2. Accuracy of the flood maps

The Commissioner fails to transparently substantiate claims that a major flaw in the modelling has been corrected (concerning flooding from future development on the Guildford land).

Kyle Christensen's descriptions of River Corridor, Overflow Path and Ponding [3.79] do not make any sense, and do not seem to align with recognised standards.

Overflow Paths are random. For example, an overflow path is shown along Elmslie Road where the modelling predicts that there will be no flood water.

Insignificant surface water up to 100mm deep has been removed incorrectly. It has been removed from the freeboard when it should have been removed from the floodwater.

R J Hall challenges the accuracy of the raw model but his evidence is brushed aside with the comment that it has not been peer reviewed. Neither has Mike Law's Pinehaven audit, which the Commissioner so heavily relies upon, been independently peer reviewed.

## 3. Clarity of the Maps – just one example of contradictions in the Commissioner's report:

**Definition of "Ponding"** - The Commissioner wants to amend the notified definition of "Ponding Area" to include the word "shallow", i.e. "*areas of still, shallow or slow moving water*".

According to Mr Christensen, "Ponding" is indeed shallow water, 0.1 to 0.25m deep [3.79c], and he notes: "*The terminology used for these different hazard zones (river corridor, overflow path and ponding) is consistent with those applied across the Wellington region.*" <sup>2</sup>

Really? For the Waiohine River, the definition of 'ponding area' includes "deep" water, quote: "*Ponding Area - This area is usually slow moving water which may be shallow or deep*" <sup>3</sup>

For the Otaki River, quote: "*During a flood there is little or no flow within ponding areas, although floodwaters could reach substantial depths and levels.*" <sup>4</sup>

The Commissioner, apparently unaware of such inconsistencies, fails to address them.

I therefore request that Council decline Plan Change 42 and develop flood planning maps that are based on better underlying hydraulic information prepared by competent and independent experts, that are more appropriate for their purpose, that are accurate, and that are clearer, so the public can better understand what the PC42 flood maps are for and what they mean.

I ask that my address today, including my appendices, be noted in and appended to the minutes of this meeting. Thank you.

Susan Pattinson (See p3 for Footnotes and a list of Appendices)

**Footnotes:**

- 1 GW, i.e. Greater Wellington Regional Council (GWRC)
- 2 (Supplementary Evidence, Mr K Christensen, 19 October 2017, para. 35)
- 3 (GWRC Waiohine River Draft Floodplain Management Plan, Phase 3 report, September 2015)
- 4 (WRC Otaki Floodplain Management Plan, 1998, p25)

**Appendices:**

- Appendix 1: 2017 Guide-flood-studies-mapping-Qld\_Fig 5-8\_Flood Hazard Overlay
- Appendix 2: 2017 Guide-flood-studies-mapping-Qld\_Fig 5-9\_Local Scale - Velocity
- Appendix 3: 2017 Guide-flood-studies-mapping-Qld\_Fig 5-10\_Local Scale - Levels
- Appendix 4: DHI\_Newcastle\_Peak Water Levels\_10% AEP flood
- Appendix 5: DHI\_Newcastle\_Peak Velocity\_10% AEP flood
- Appendix 6: DHI\_Newcastle\_Peak Water Levels\_1% AEP flood
- Appendix 7: DHI\_Newcastle\_Peak Velocity\_1% AEP flood
- Appendix 8: BMT\_Newcastle\_100 year flood\_Water Levels-Existing Conditions – Map Key
- Appendix 9: BMT\_Newcastle\_100 year flood\_Water Levels-Existing Conditions – Map 1
- Appendix 10: BMT\_Newcastle\_100 year flood\_Water Levels-Existing Conditions – Map 2
- Appendix 11: BMT\_Newcastle\_100 year flood\_Water Levels-Existing Conditions – Map 3
- Appendix 12: BMT\_Newcastle\_100 year flood\_Water Levels-Existing Conditions – Map 4
- Appendix 13: Auckland GIS flood map
- Appendix 14: Christchurch GIS flood map
- Appendix 15: UHCC's original Mangaroa River flood maps (2007)

Figure 5-8 Land Use Planning – Flood Hazard Overlay Requirements

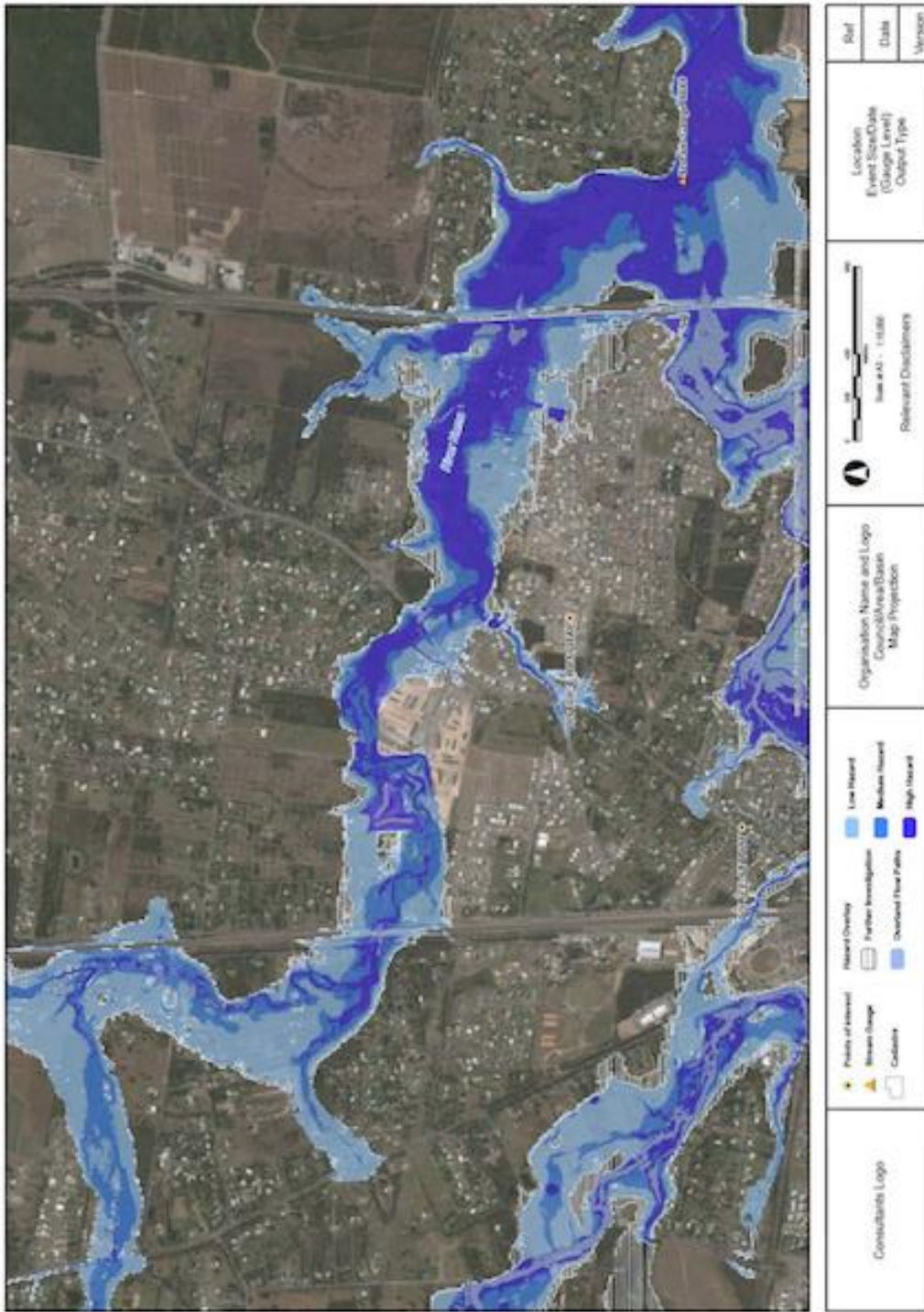


Figure 5-9 Land Use Planning – Local Scale - Velocity

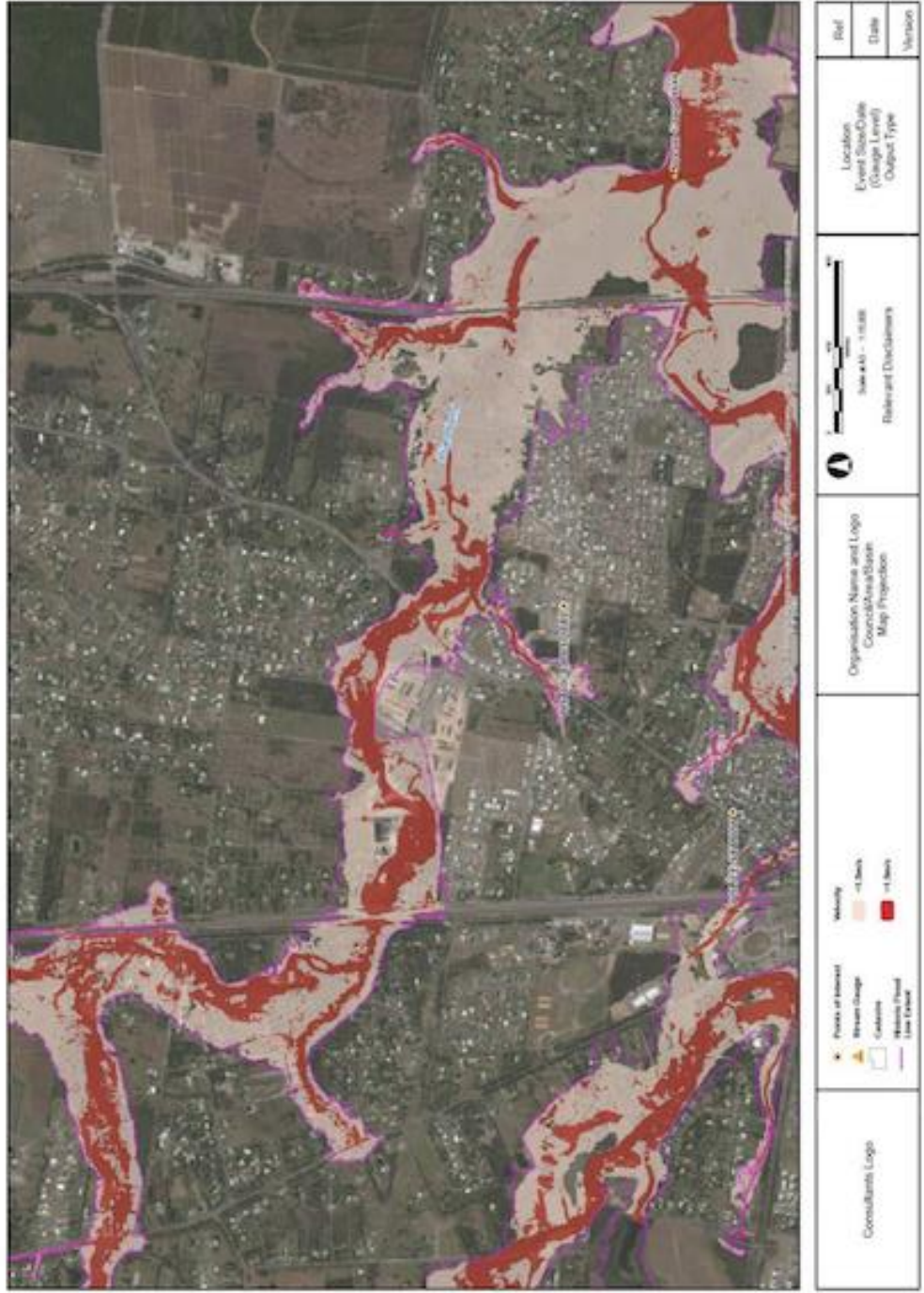
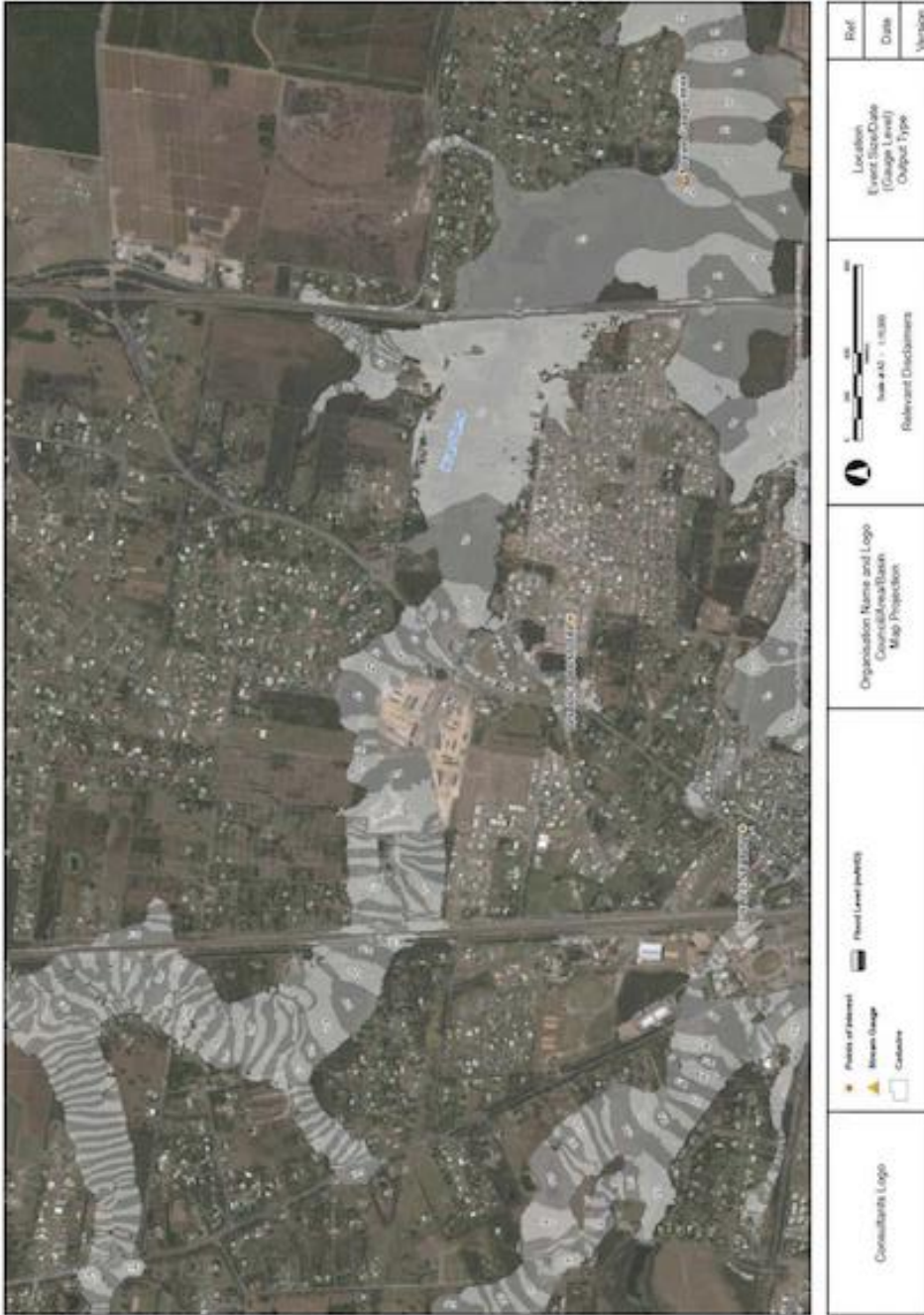
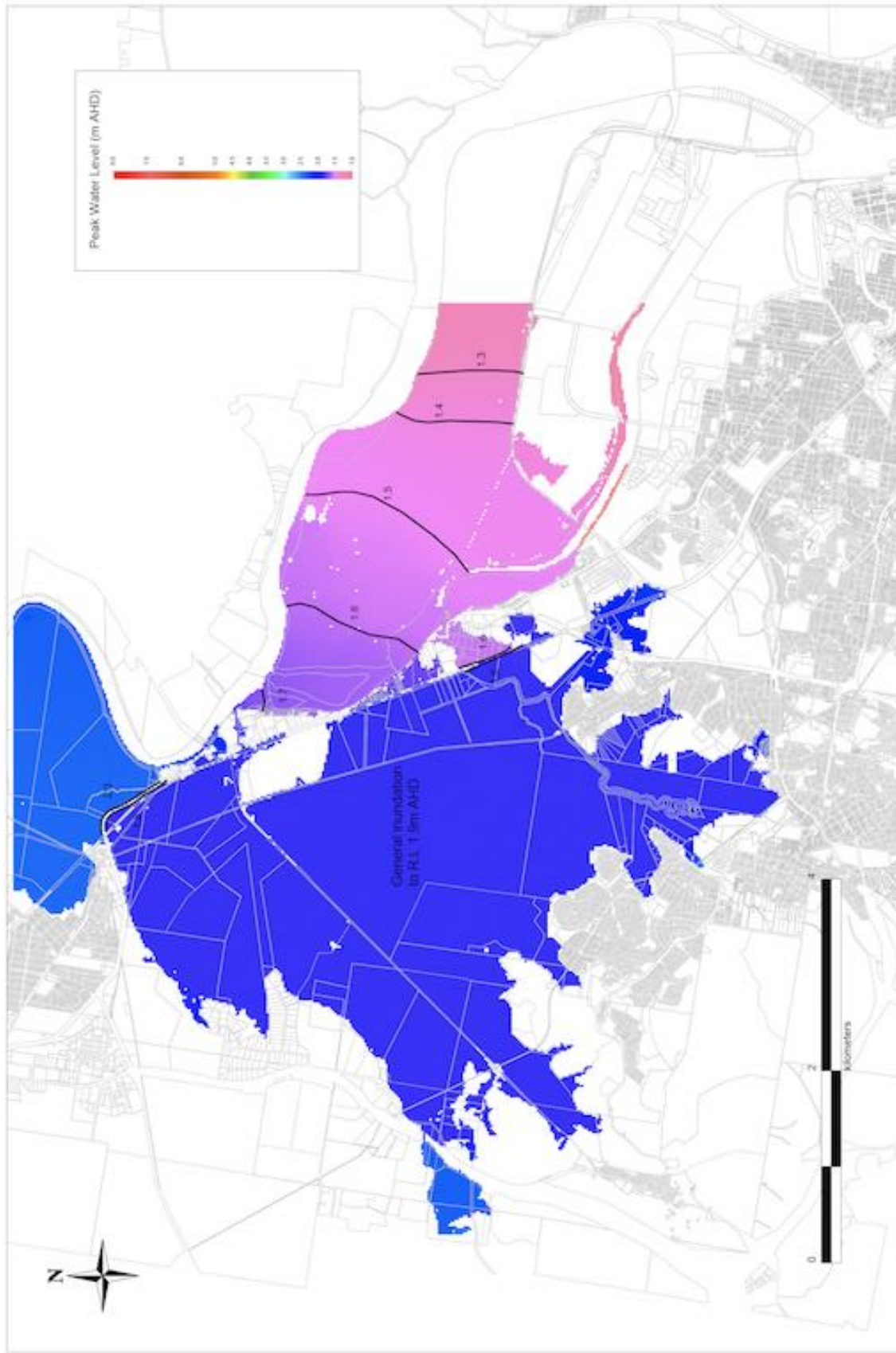


Figure 5-10 Land Use Planning – Local Scale - Levels



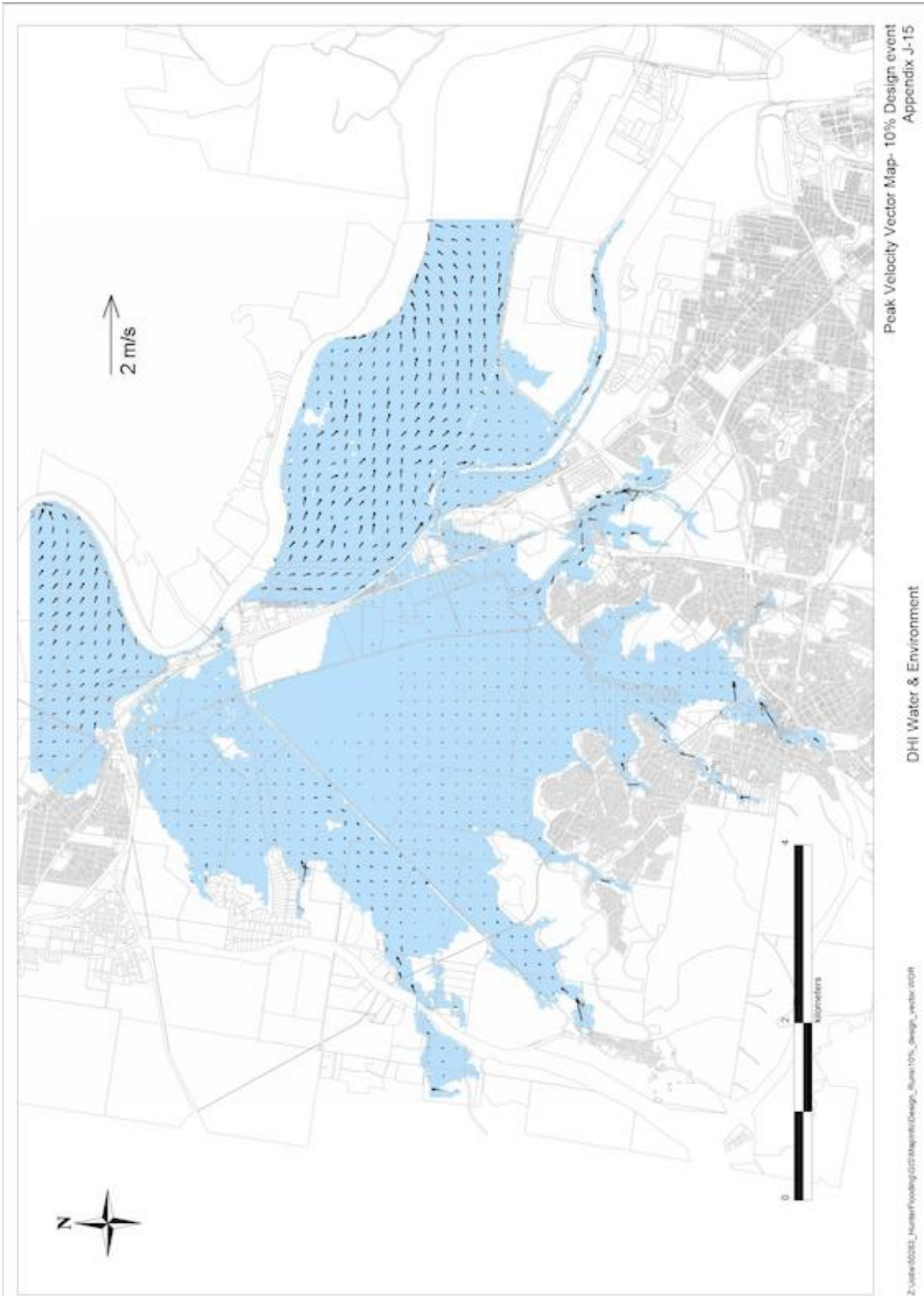


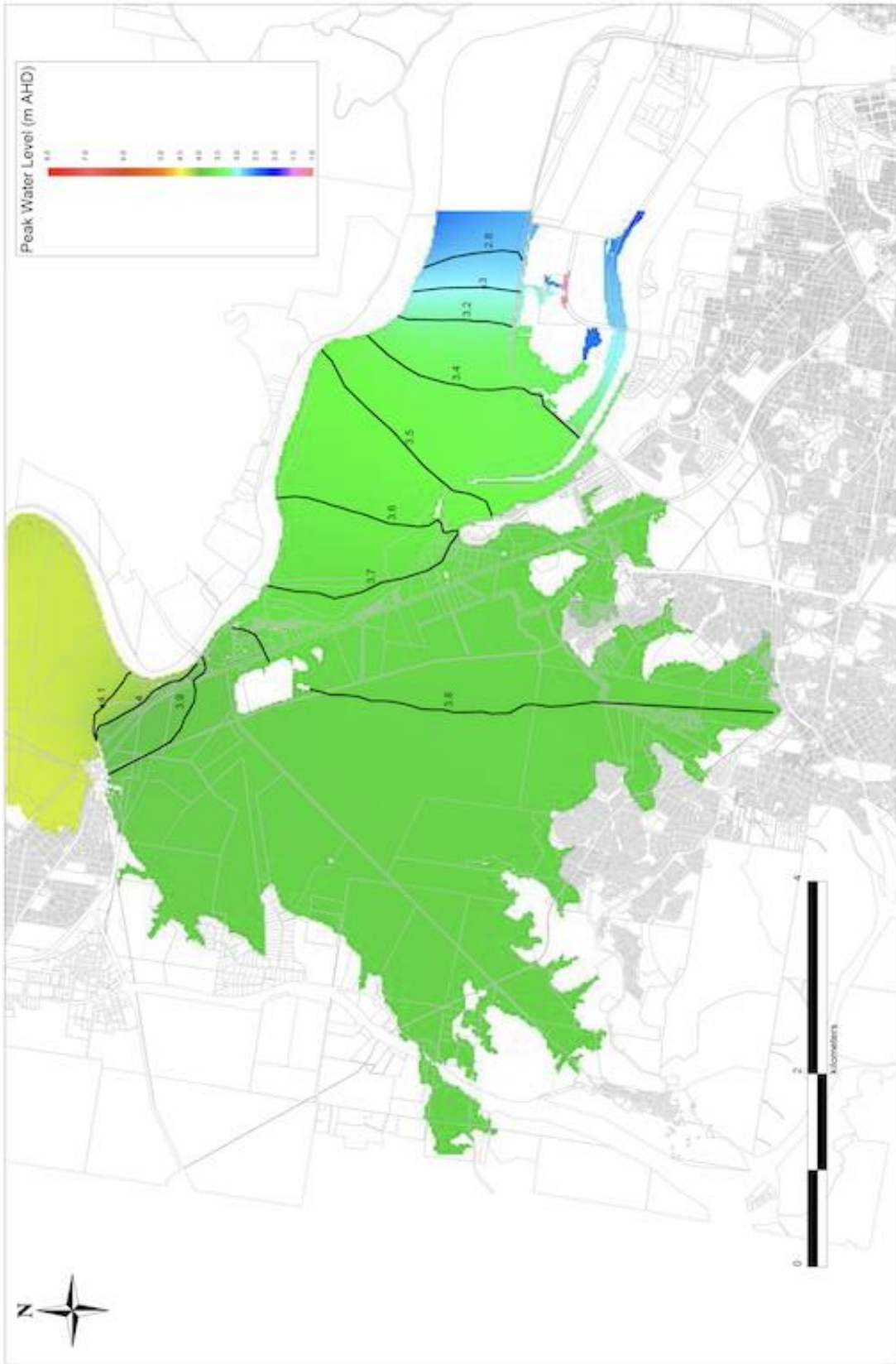
Peak Water Surface Level - 10% Design event  
Appendix J-9

DHI Water & Environment

Peak Water Surface Contour  
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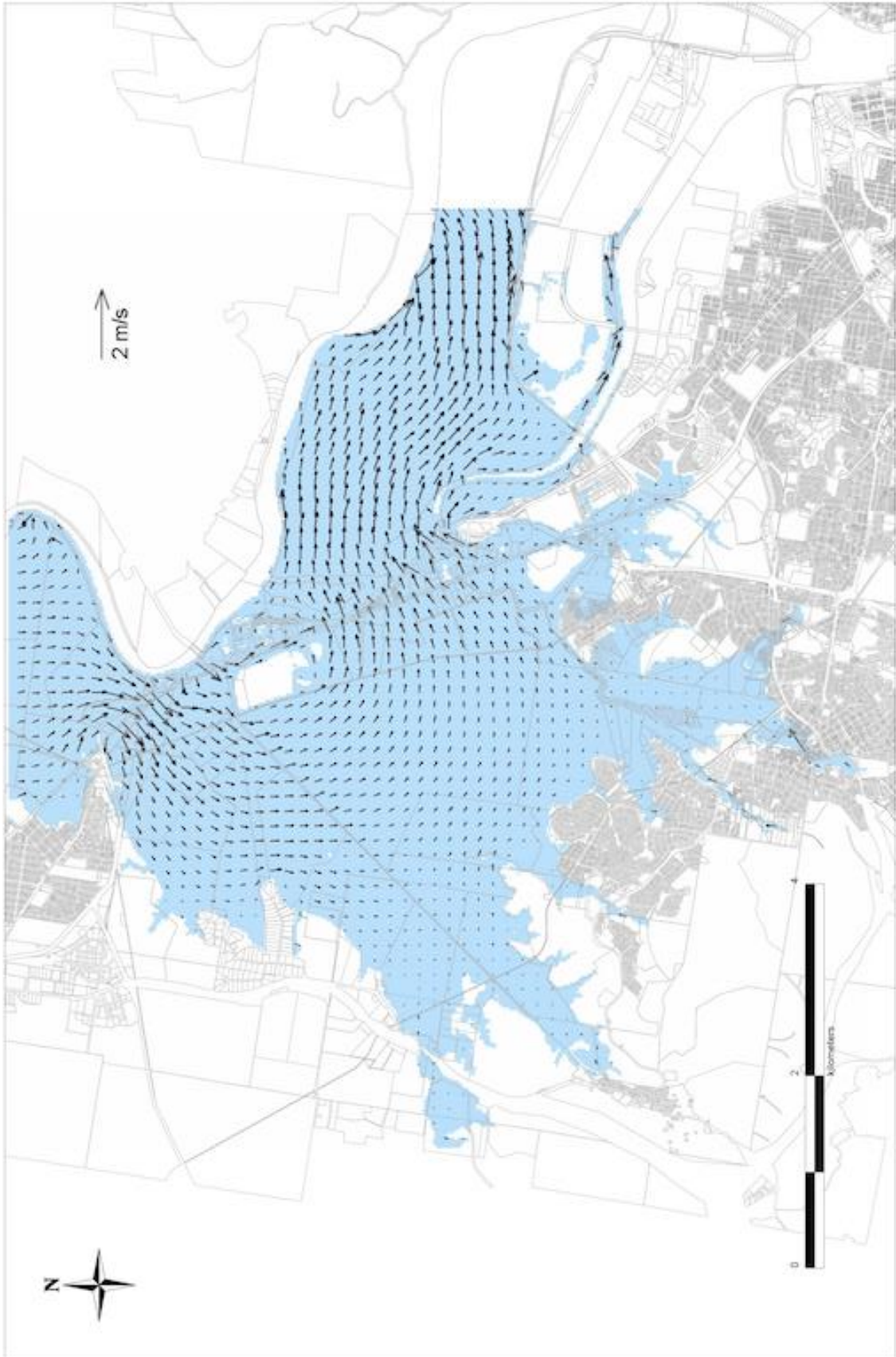


Peak Water Surface Level - 1% Design event  
Appendix J-6

DHI Water & Environment

Peak Water Surface Contour

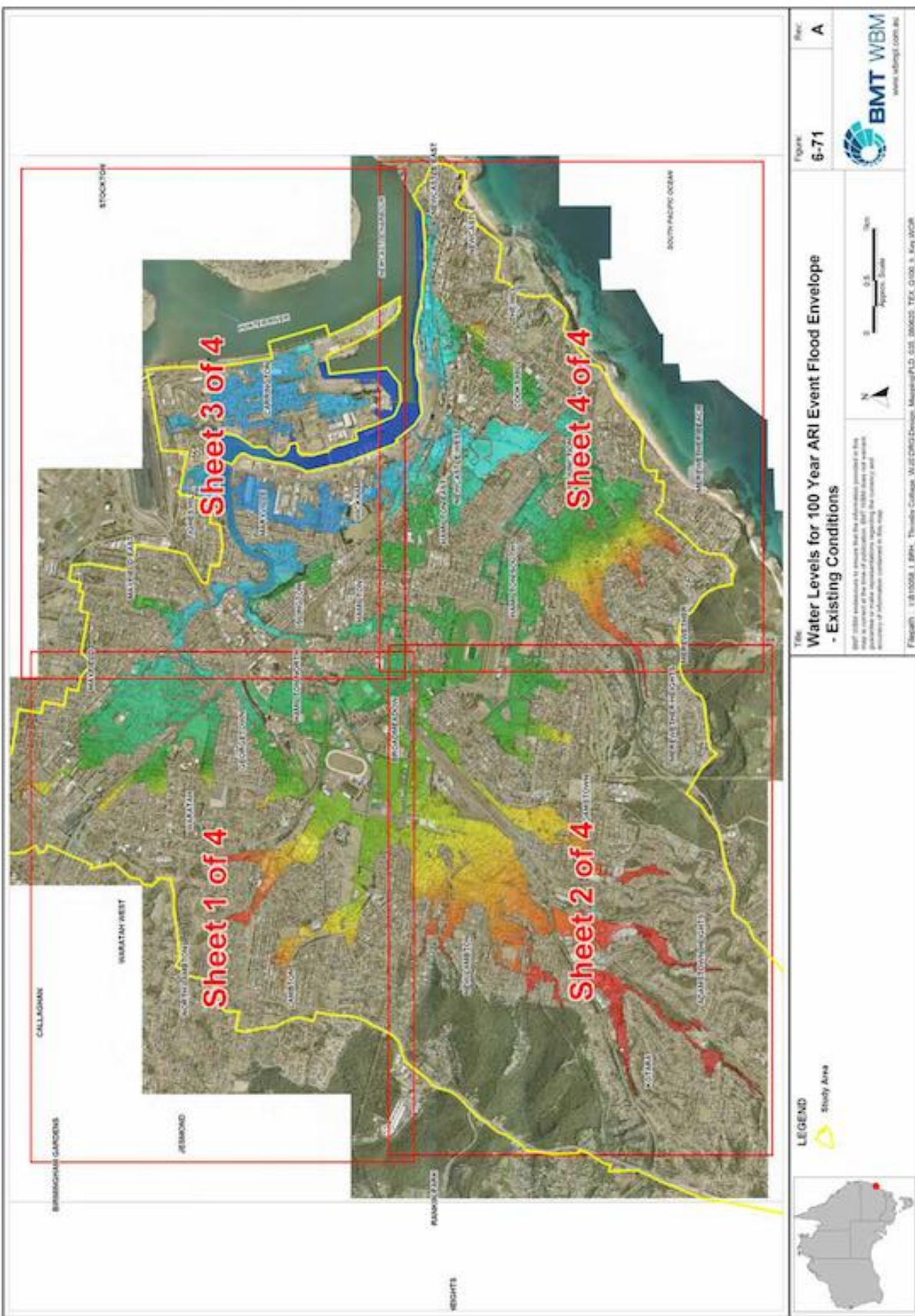
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Peak Velocity Vector Map - 1% Design event  
Appendix J-12

DHI Water & Environment

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**Title:** 100 Year ARI Event Maximum Water Levels - Existing Conditions

**Figure:** 6-72

**Rev:** A

**Scale:** 0 400 800m Approx. Scale

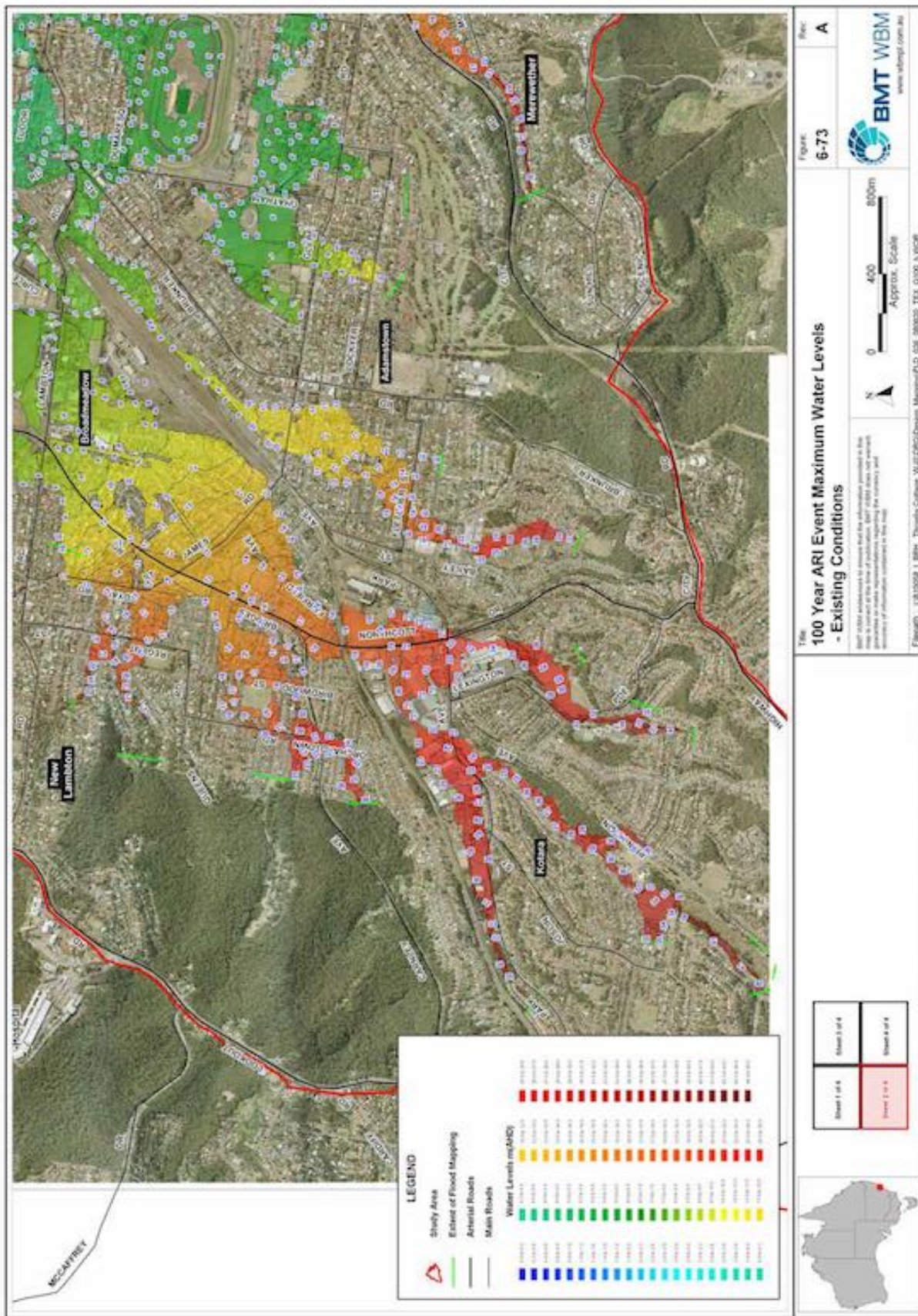
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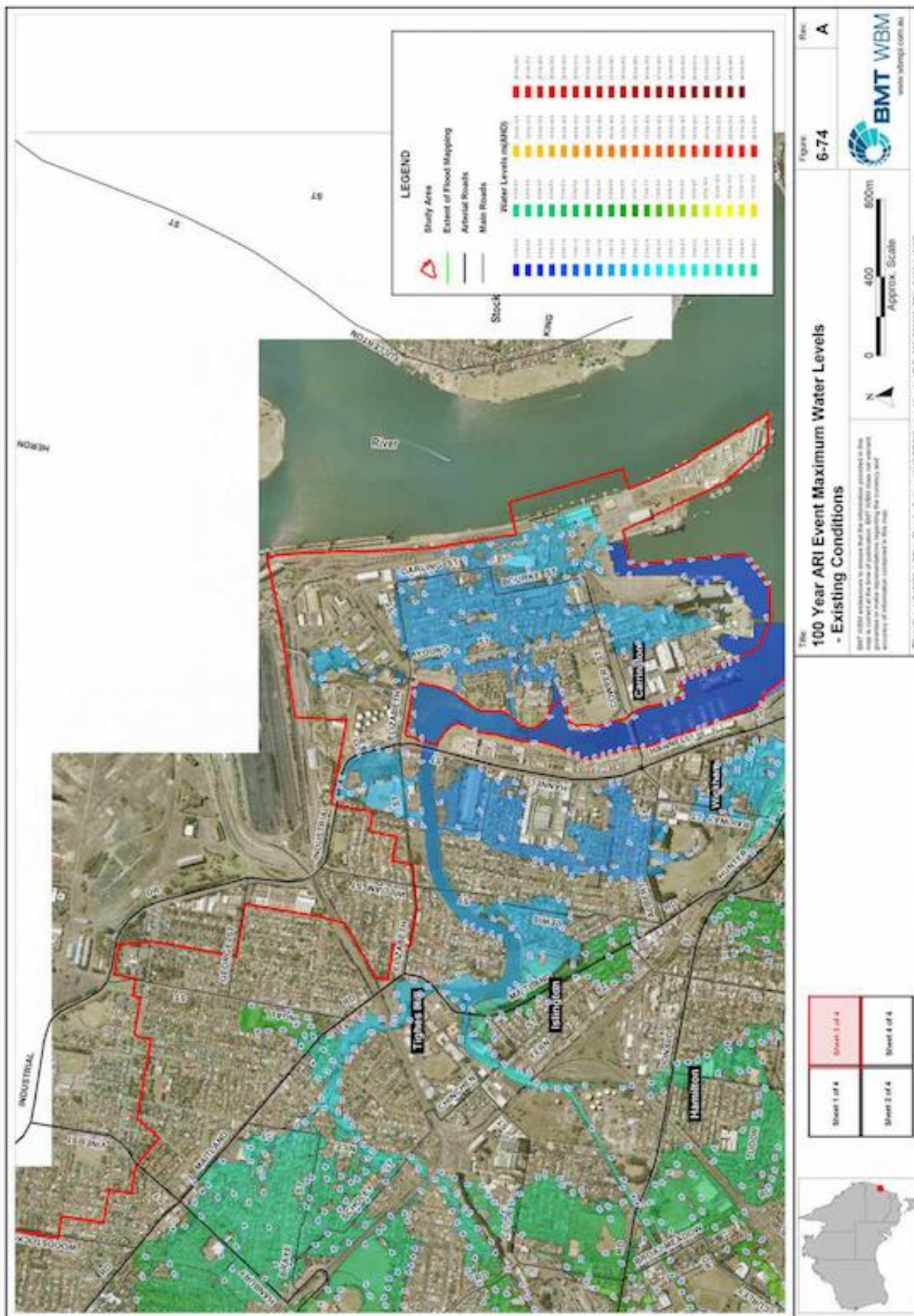
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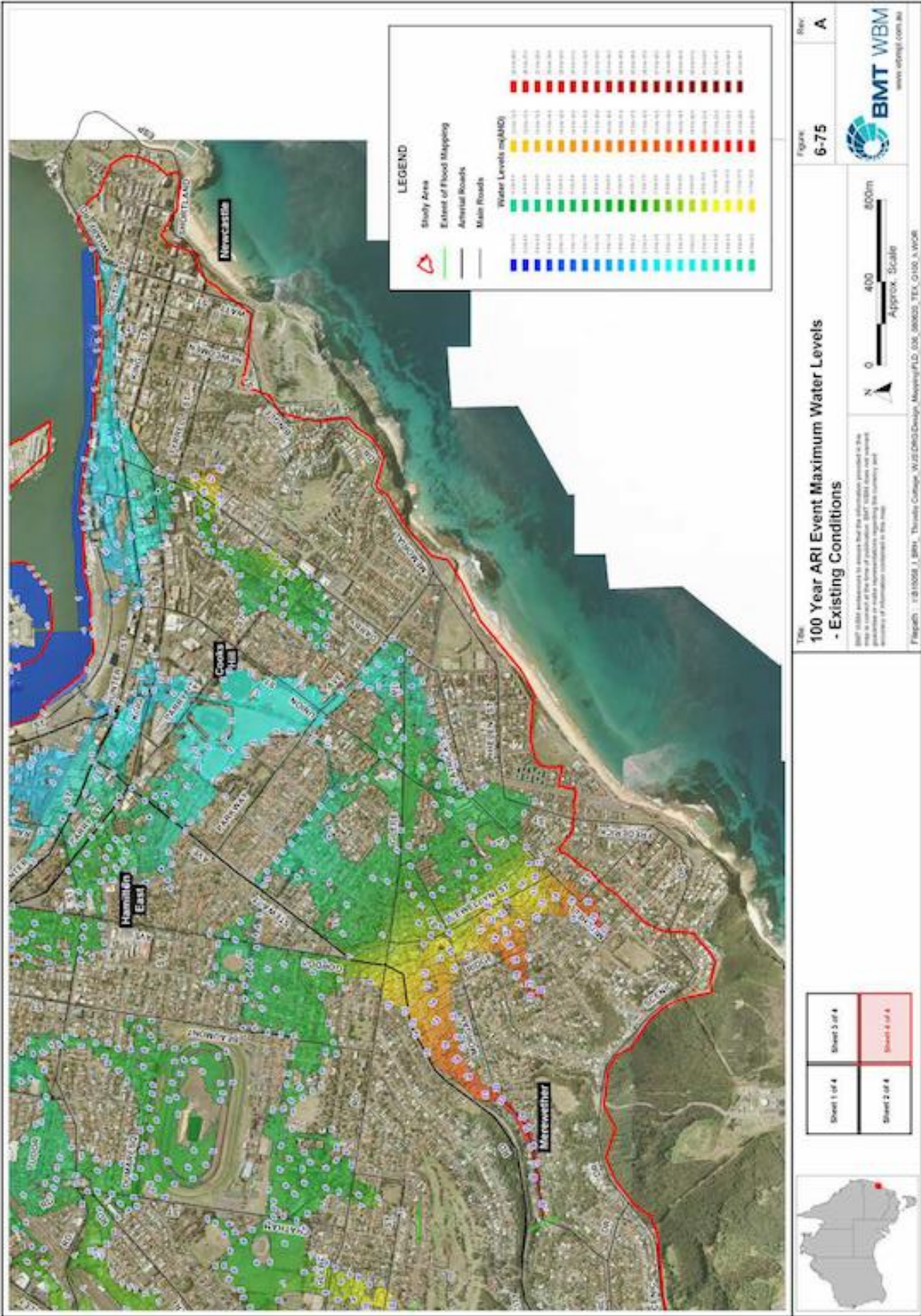
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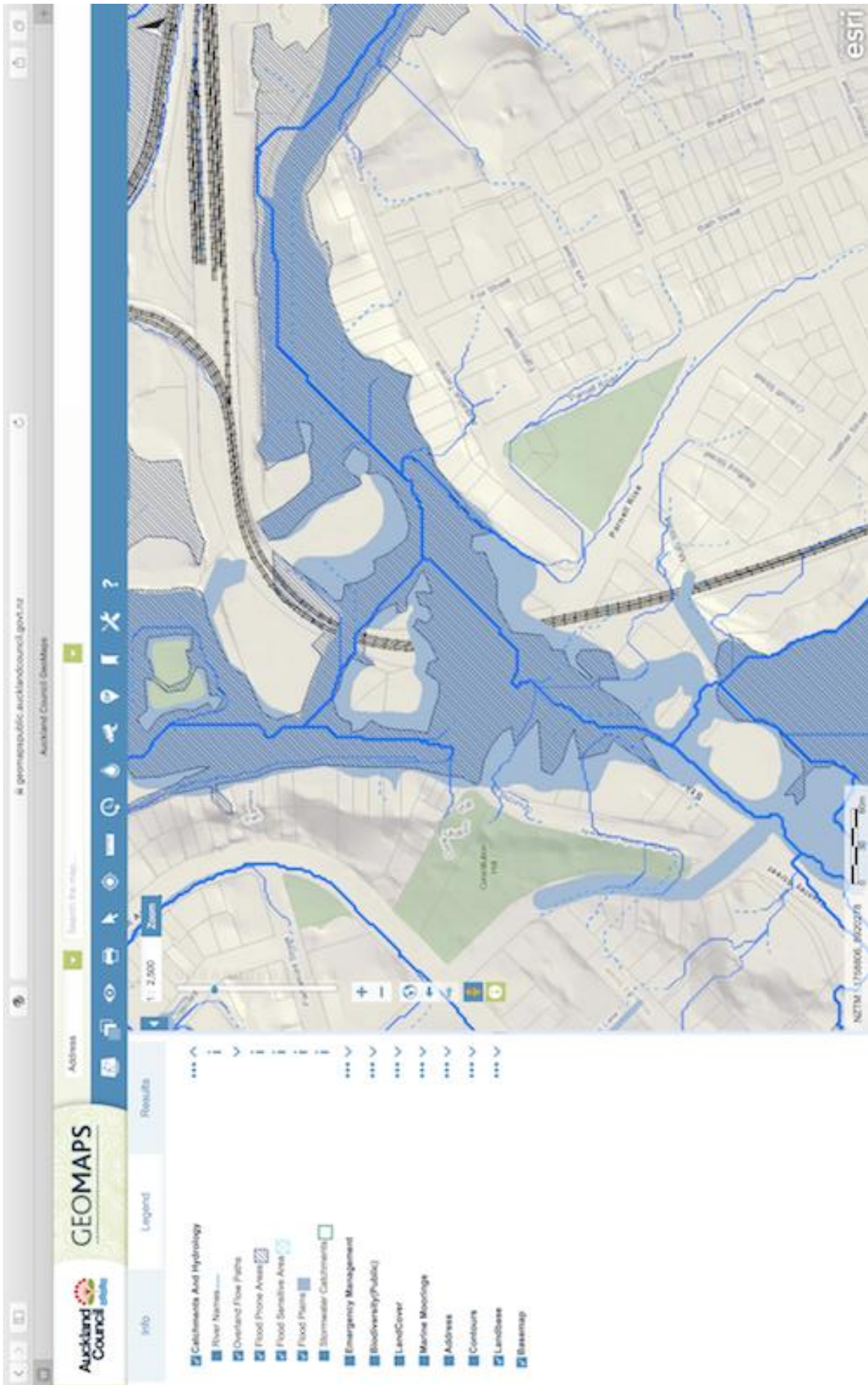
**Sheet 1 of 4** | **Sheet 2 of 4**  
**Sheet 3 of 4** | **Sheet 4 of 4**









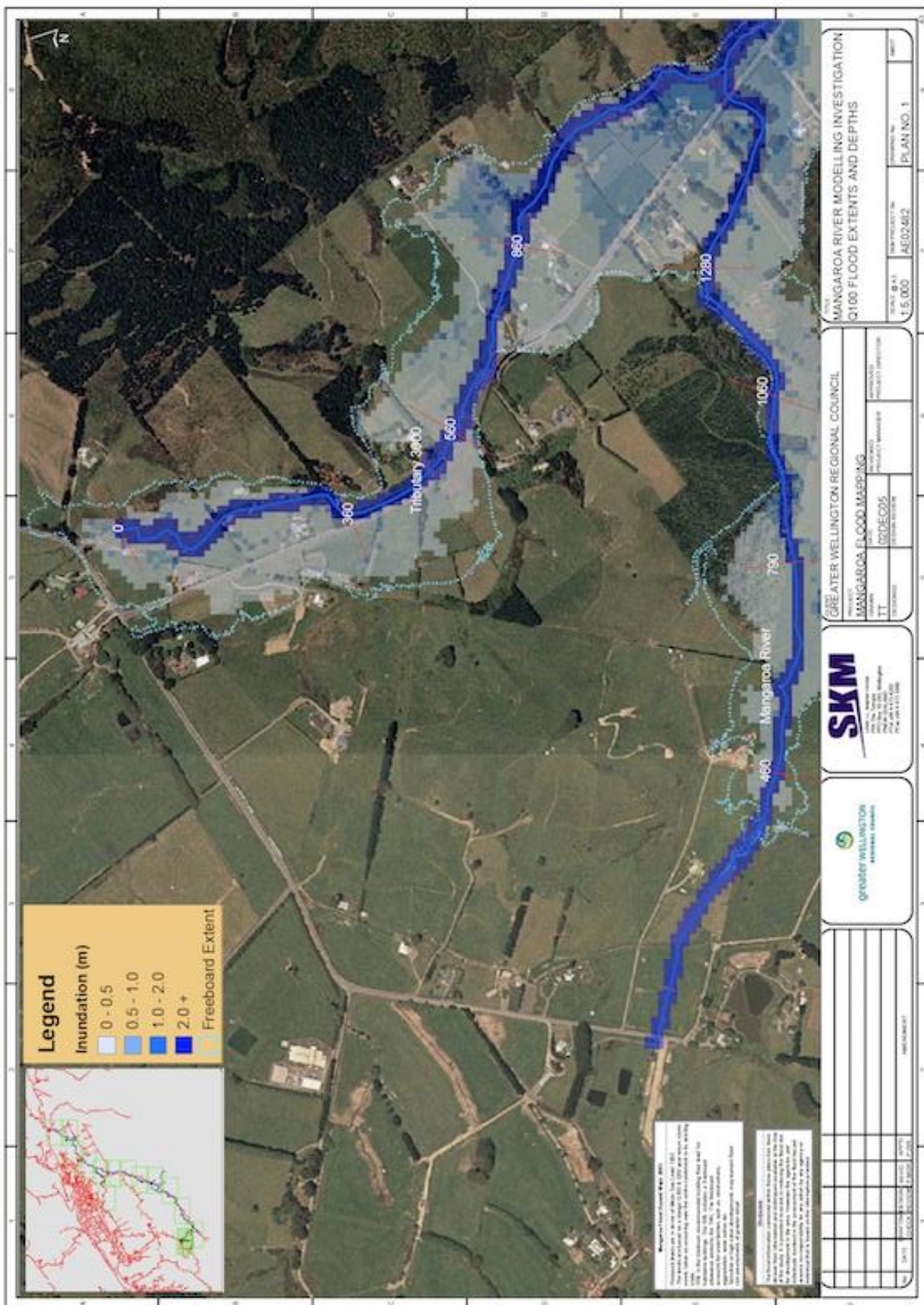




Two events are presented above:

- the one-in-50-year flood event, which includes an allowance for 0.5 metre sea level rise (relevant to Building Code compliance)
- the one-in-200-year flood event, which includes an allowance for 1.0 metre sea level rise (relevant to District Plan compliance).

Floor levels have been calculated based on the above flood information and include a 400 millimetre freeboard. Should the property of interest not be shown, or you require further information, please contact [floorlevels@ccc.govt.nz](mailto:floorlevels@ccc.govt.nz).



UHCC Extraordinary Council Meeting – Tuesday 27 March 2018  
Proposed PC42 Mangaroa & Pinehaven Flood Hazard Extents

Darryl Longstaffe  
25 Elmslie Road, Pinehaven

Mayor and Councillors, thank you for this opportunity to speak today about PC42.

When the Pinehaven Floodplain Management Plan (PFMP) was in its draft stages a few years ago, Council refused to publish baseline data for hydraulic neutrality in the FMP, saying the appropriate time to do that was at Plan Change stage. We tried that with PC40 Wallaceville, where there are only 3 subcatchments (compared with Pinehaven's 15) and where the baseline data for each subcatchment had already been calculated by the Wallaceville developer's consultants, but again Council refused, saying the time to do publish baseline data was at Resource Consent stage for subdivision.

However, we notice that over at Greytown, the local Council and GWRC are making very little, if any, effort to check that stormwater run-off post-development from new subdivisions will not exceed pre-development 100-year flood conditions. The local Council says it will check for hydraulic neutrality for individual properties at Building Consent stage. Yeah right! Too late. Subdivisions have been approved and built by that point.

Do local Councils and GWRC have any intention of enforcing hydraulic neutrality provisions? And will local Councils ever make the process transparent by publishing known baseline data against which hydraulic neutrality will be assessed? It doesn't look like it. The Commissioner for PC42, David McMahon, who was also on the hearing panel that refused this request at PC40 for Wallaceville, has also refused this request for PC42 for Pinehaven.

The Commissioner says it "*is neither necessary nor appropriate*" to publish baseline information [3.194]. He says the proposed Pinehaven Catchment Overlay and the policies, rules and methods in this Plan Change provide for an "*efficient and effective means to ensure that the aim of hydraulic neutrality is implemented*" [3.194].

The Commissioner assumes that "*the plan change provisions are consistent with the ultimate outcome sought by those submitters [who made the request that baseline] data be published*" [3.195]. He should have asked us rather than assuming, because he is wrong. The PC42 provisions do not satisfy our request that Council ensures the transparent achievement of hydraulic neutrality by having baseline (2008) hydrology data published and readily available in the public realm.

There is a major flaw in the Pinehaven flood modelling, to do with run-off from potential future development on the Guildford land on the hills above Pinehaven and Silverstream. The claim by the consultants that large-scale development on the Guildford land will not increase flooding much in the valley is wrong. The flood map showing post- and pre- development comparison of the hypothetical scenario showed very little impact on flooding resulting from 1,665 new houses on just half the Guildford land. This flawed result in the modelling has never been transparently investigated. Claims that it has been fixed have never been substantiated with detailed evidence. It seems the problem still exists, and that any large scale future development on the Guildford land will significantly increase flooding in Pinehaven and Silverstream. The Commissioner disagrees.

The Commissioner states that Mike Law's 2015 audit of the Pinehaven flood maps, which found the flood maps 'fit for purpose', was the "*second independent review*" of the hydraulic modelling for the Pinehaven Stream [2.58]. The Commissioner is wrong again. Quoting Mark Britton, who carried out the earlier DHI review:

*"The scope of the review did not include model outputs, calibration results or design flows. Therefore ... the DHI Methodology Review is not an independent audit of the Pinehaven Stream flood maps."* (Email 8/3/18, Mark Britton to S. Pattinson)

Mike Law's audit is the only audit that has been done of the Pinehaven flood maps. Mr Law's audit acknowledged the flawed data and said our concerns are valid. They are still valid, and still going unheeded. Council refused our request that this "major" flaw in the modelling be included in the Terms of Reference for Mike Law's audit, consequently this "major" flaw was not investigated. The Commissioner is satisfied with Mr Law's statement that he has had another look at the flawed modelling and is satisfied it has now been fixed.

Where is the evidence to support this claim? The Commissioner did not ask for it. He just took Mr Law's word on it, and Council planner's word that the Pinehaven Catchment Overlay and PC42 provisions will suffice to ensure there will be no increased flooding in Pinehaven and Silverstream from any future large-scale development on Guildford land.

This is not correct, as the attached Drawings 1 – 10 will show:

Drawing 1 – The proposed Pinehaven Catchment Overlay: properties within this Overlay must comply with the hydraulic neutrality provisions in proposed PC42.

Drawing 2 – The missing headwaters in the PC42 Mangaroa River flood maps

Drawing 3 – The Guildford Block (approximately 300 ha) superimposed over the Pinehaven Catchment Overlay

Drawing 4 - The Guildford concept (2007): Director Ralph Goodwin told a public audience in Pinehaven that Guildford Timber Company (GTC) still want to develop this

Drawing 5 - The Guildford concept (2016) from UHCC's Land Use Strategy

Drawing 6 – The Pinehaven Catchment Overlay only captures about a third of the proposed Guildford development

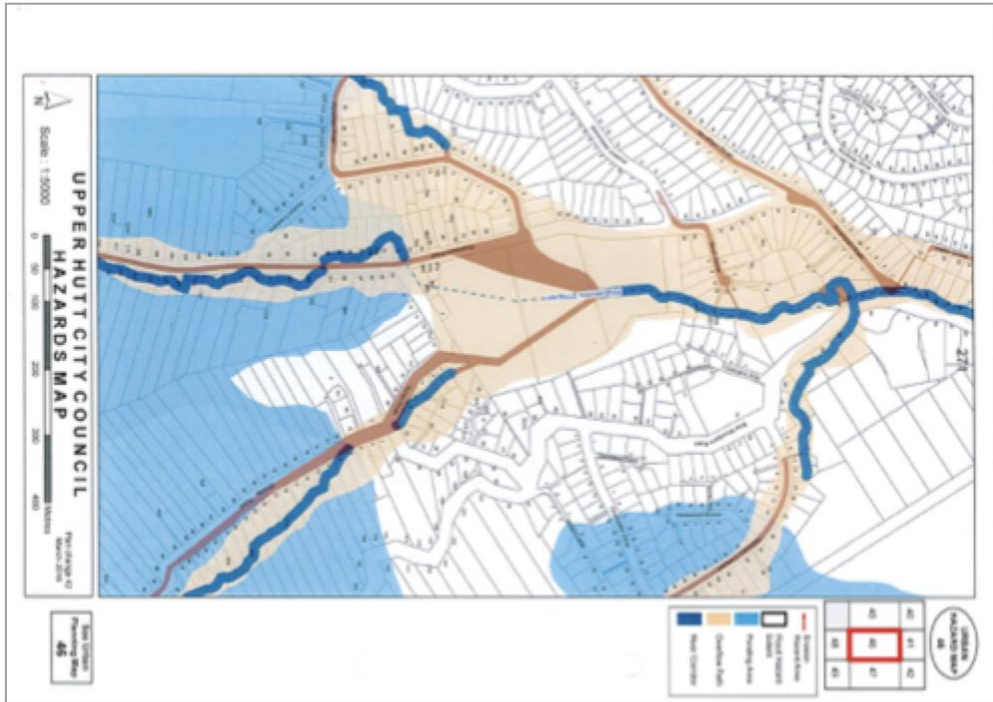
Drawing 7 – Why wasn't the confluence with the Hutt River included in the Pinehaven flood study? Pinehaven flood water has got to go somewhere, it doesn't just magically disappear at Fergusson Drive.

Drawing 8 – Hulls Creek Catchment Map (by GWRC)

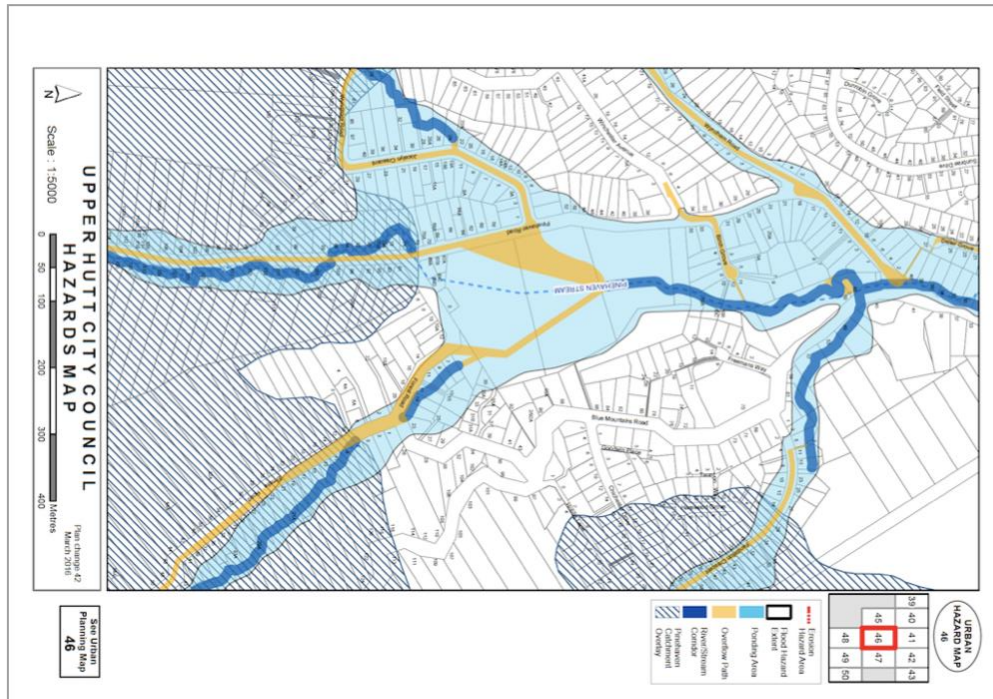
Drawing 9 – 4,000 – 5,000 new houses in Hulls Creek Catchment – why no flood study?

Drawing 10 – I request Council decline PC42 and initiate a flood study for Hulls Creek, and a plan change with a Hulls Creek Catchment Overlay for hydraulic neutrality, plus include a Mangaroa Catchment Overlay for hydraulic neutrality.

As first publicised - 'ponding' on the hills



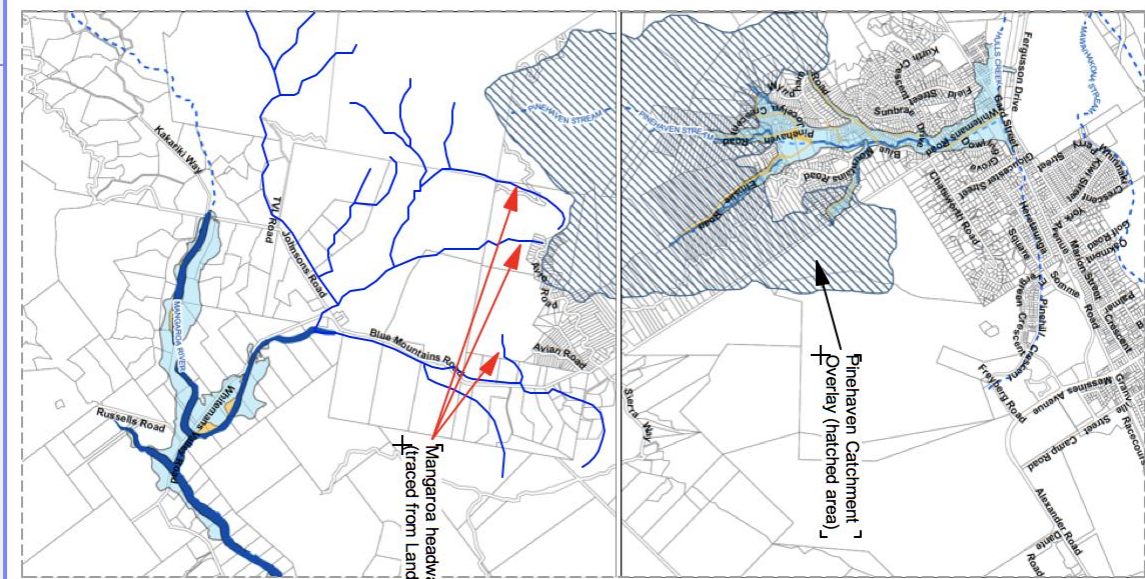
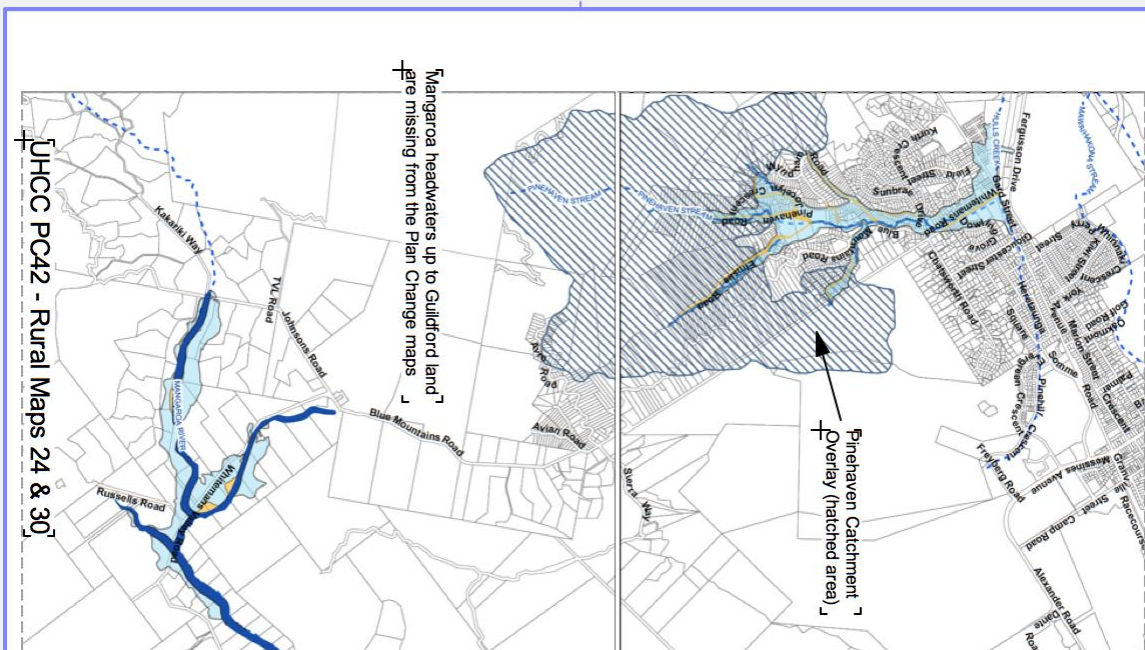
As corrected - 'catchment overlay' on the hills



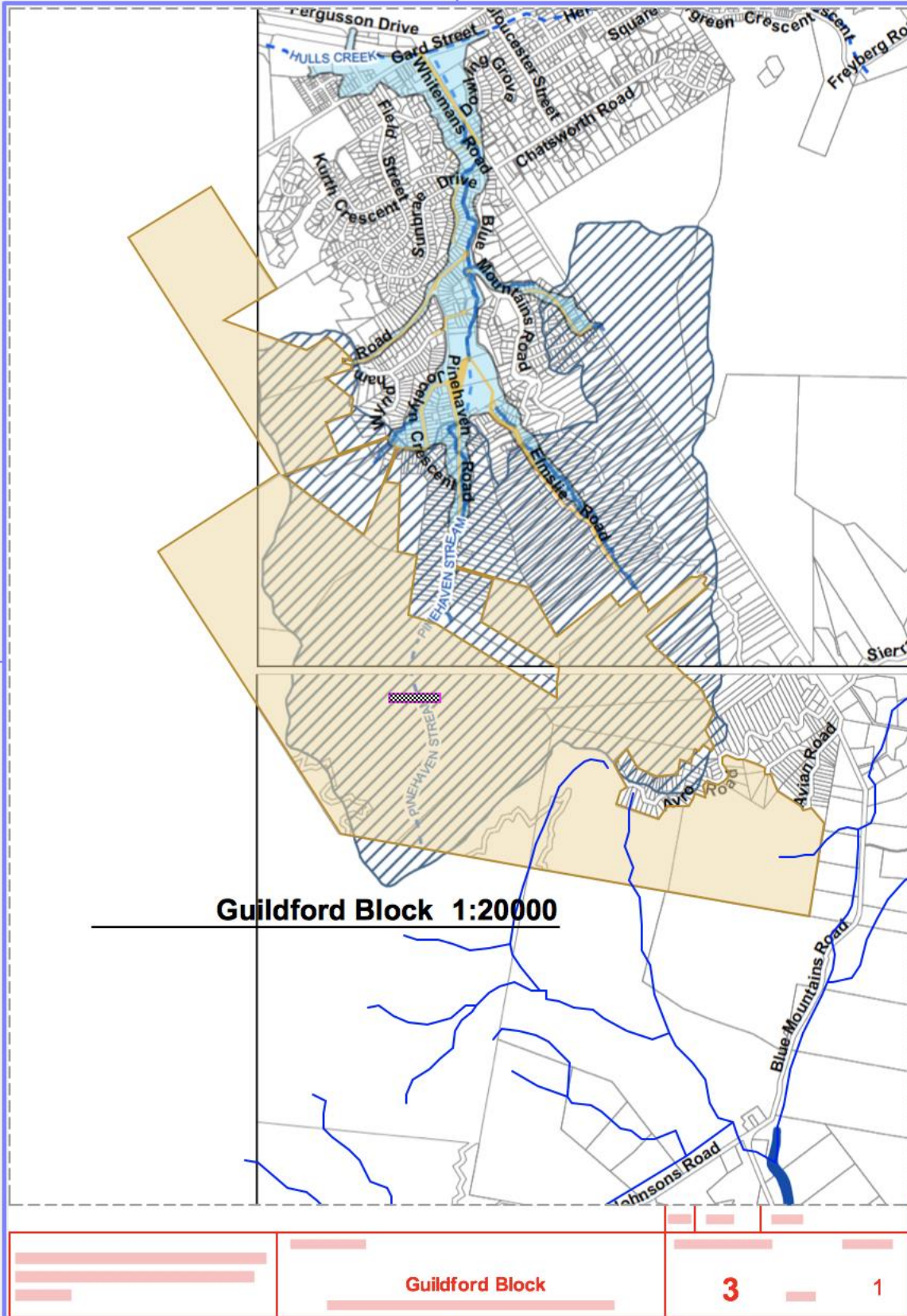
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**UHCC Proposed Plan Change 42: Mangaroa and Pinehaven Flood Extents**

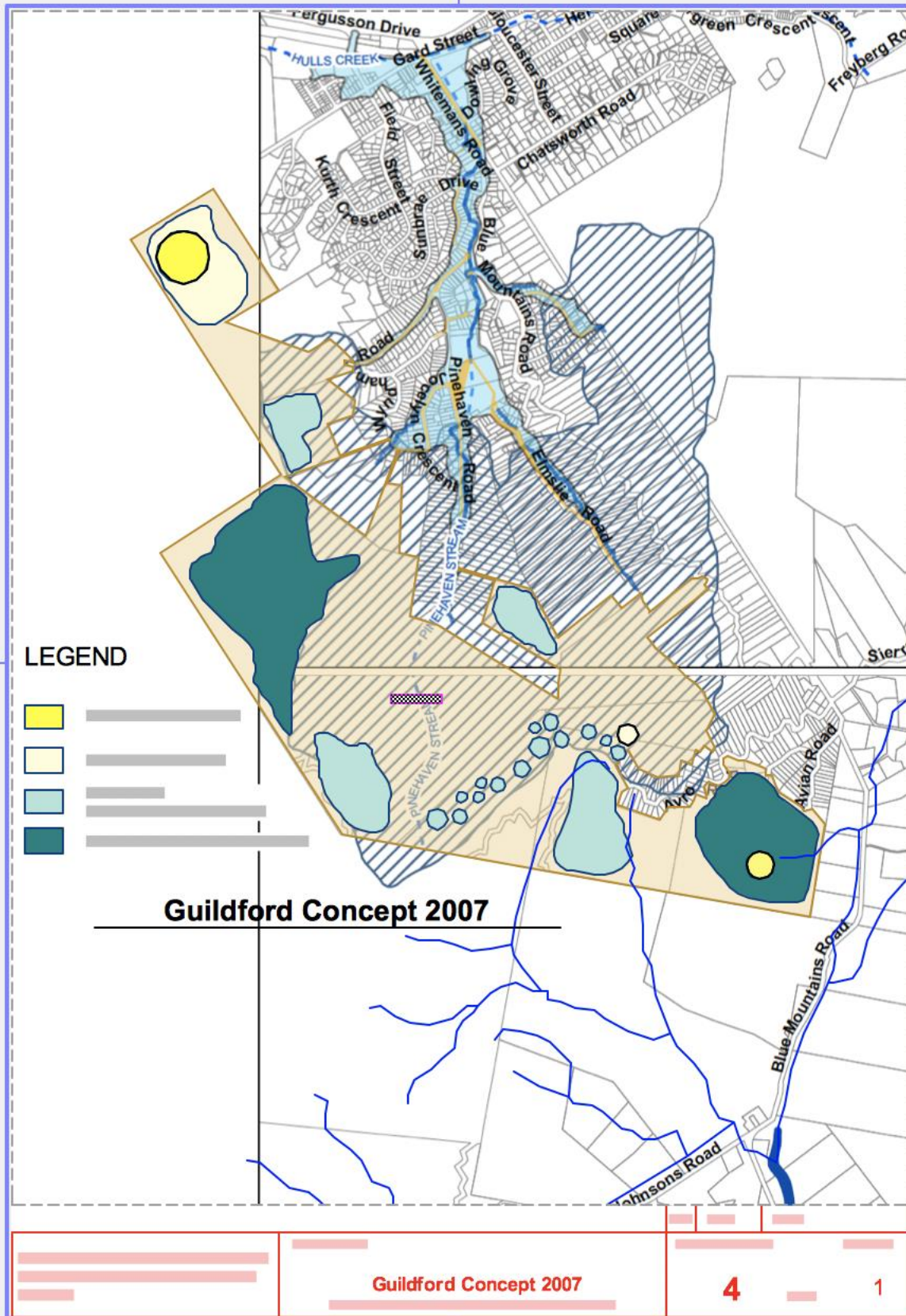
Drawing Title  
**1a\_PC42 map as first publicised,**  
**1b\_PC42 map corrected**  
 © 2018 Save Our Hills (Upper Hutt) Incorporated

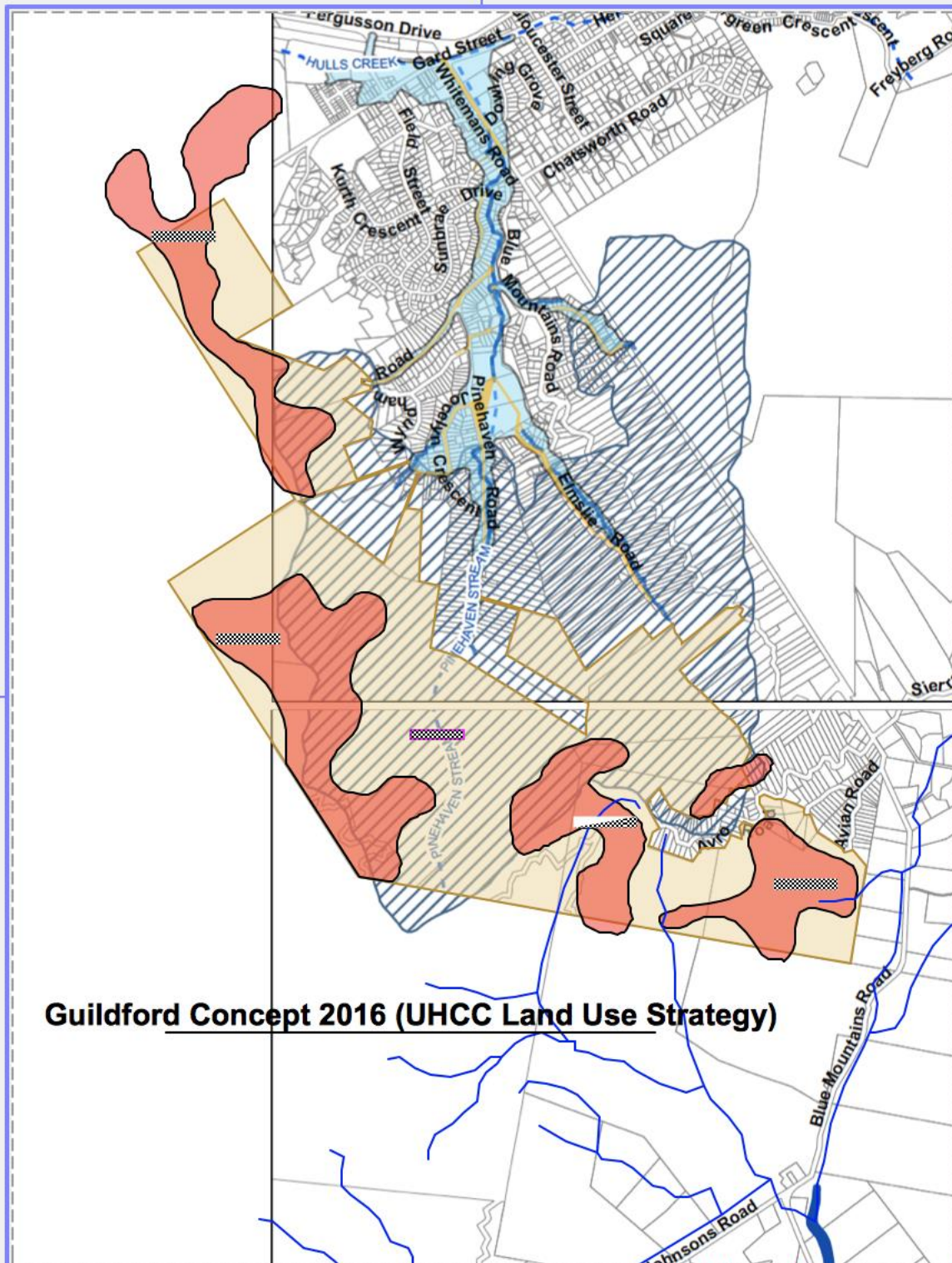


<p><b>UHCC Proposed Plan Change 42: Mangaroa and Pinehaven Flood Extents</b></p>	<p>Drawing Title</p> <p><b>PC42 maps , Missing headwaters</b> © 2018 Save Our Hills (Upper Hutt) Incorporated</p>		<p>1 27.3.18 For Council Meeting</p>
	<p>Rev</p>	<p>Date</p>	<p>Issue</p>
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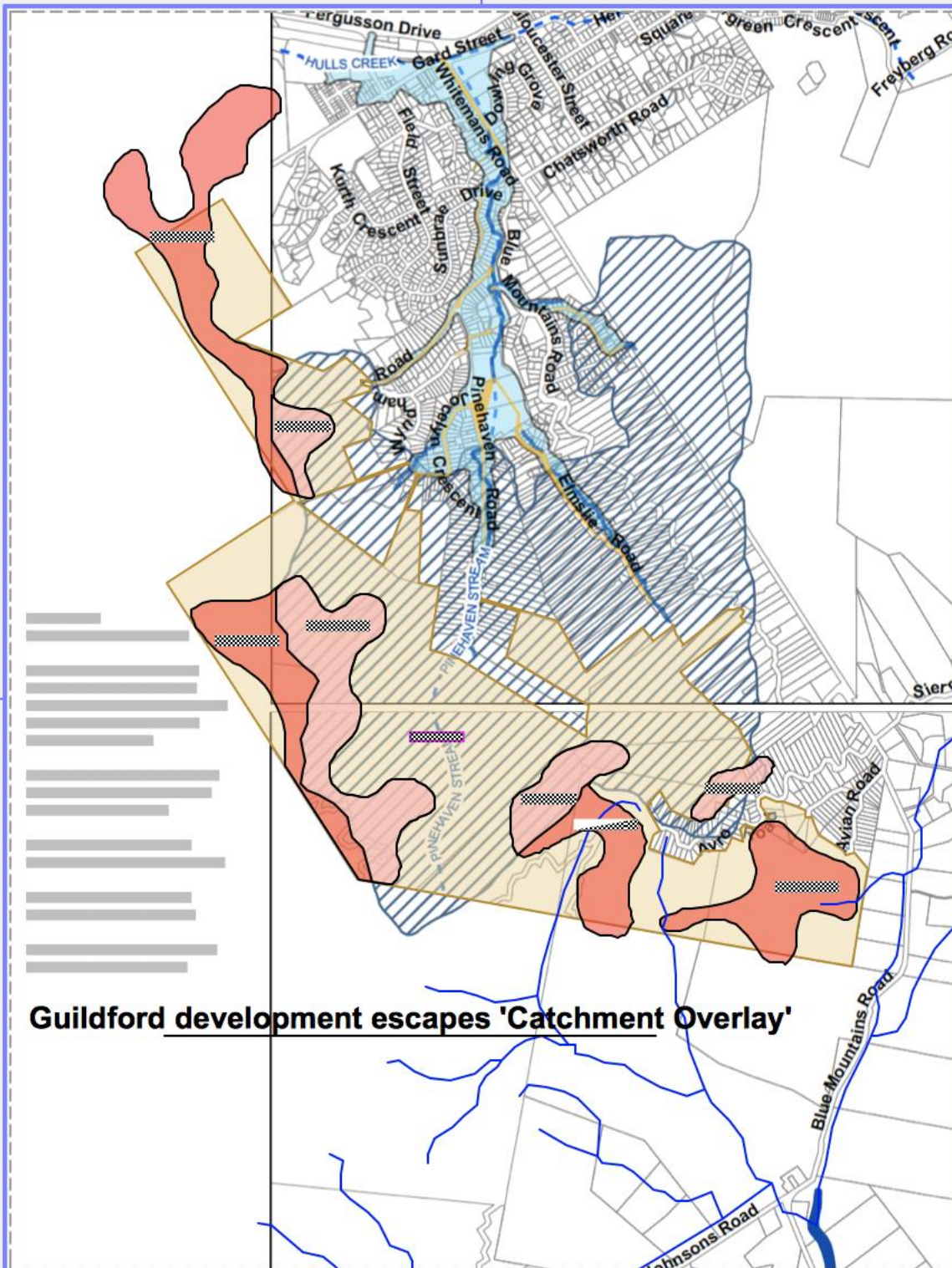






**Guildford Concept 2016 (UHCC Land Use Strategy)**

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**Guildford development escapes 'Catchment Overlay'**

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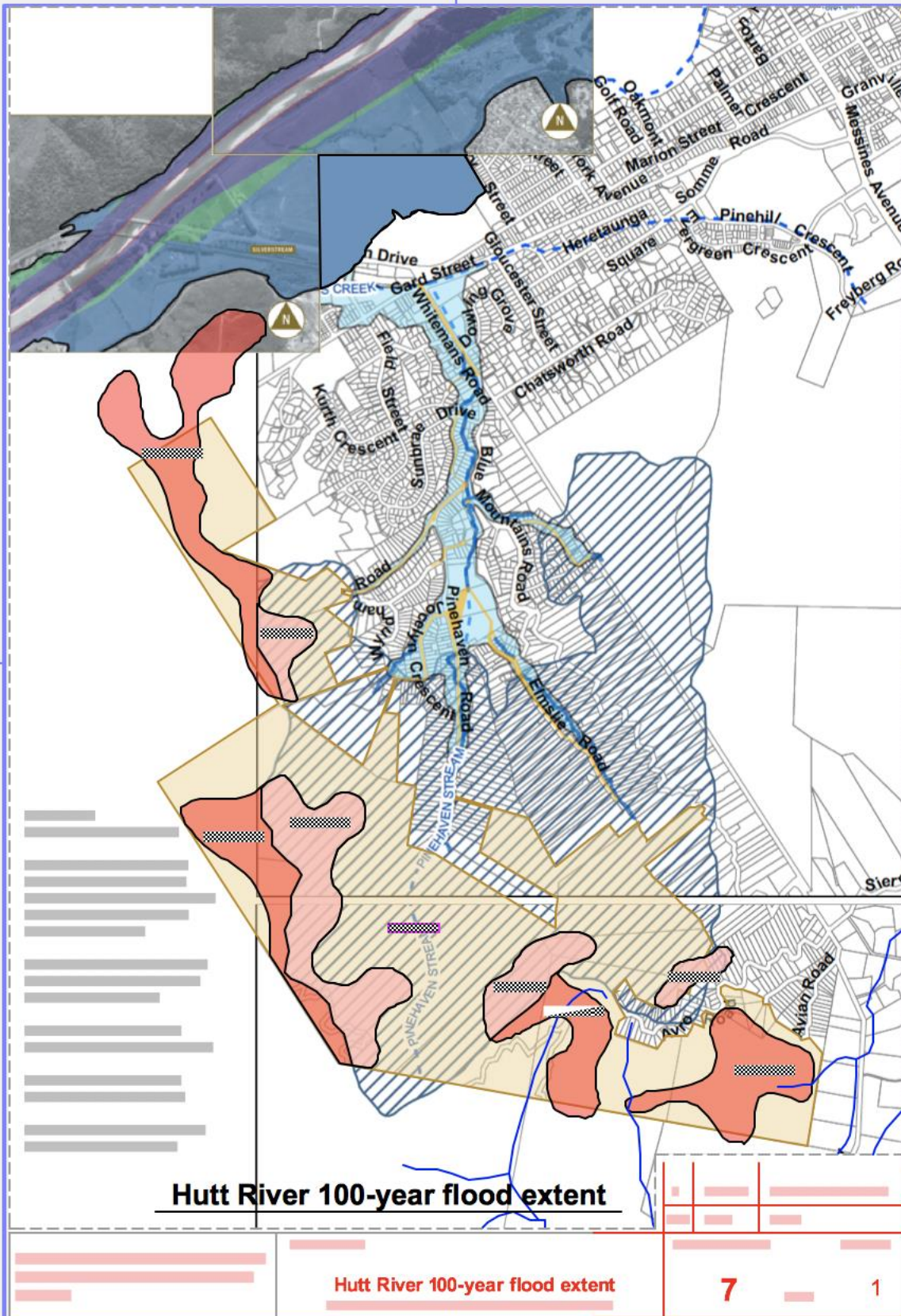
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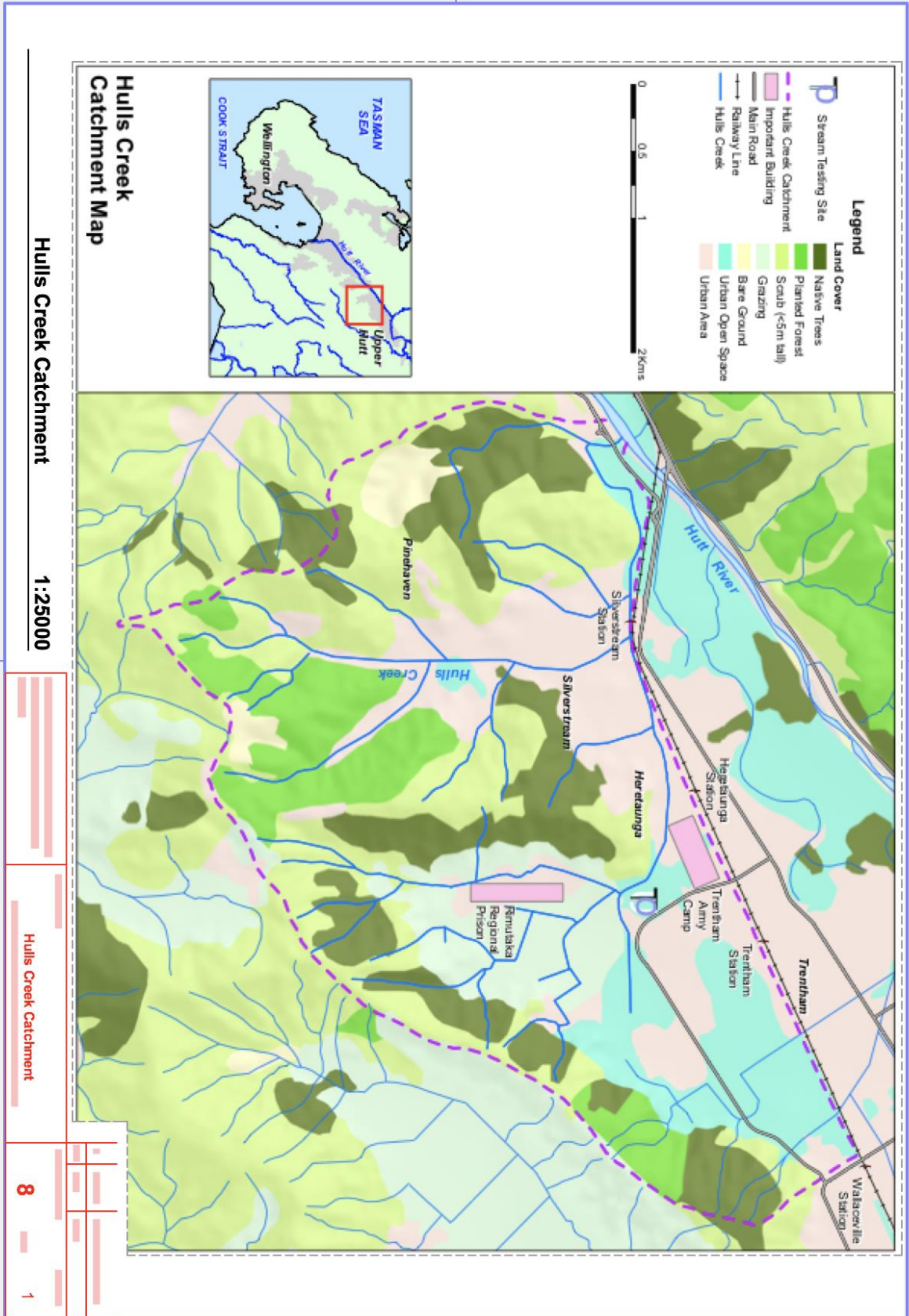
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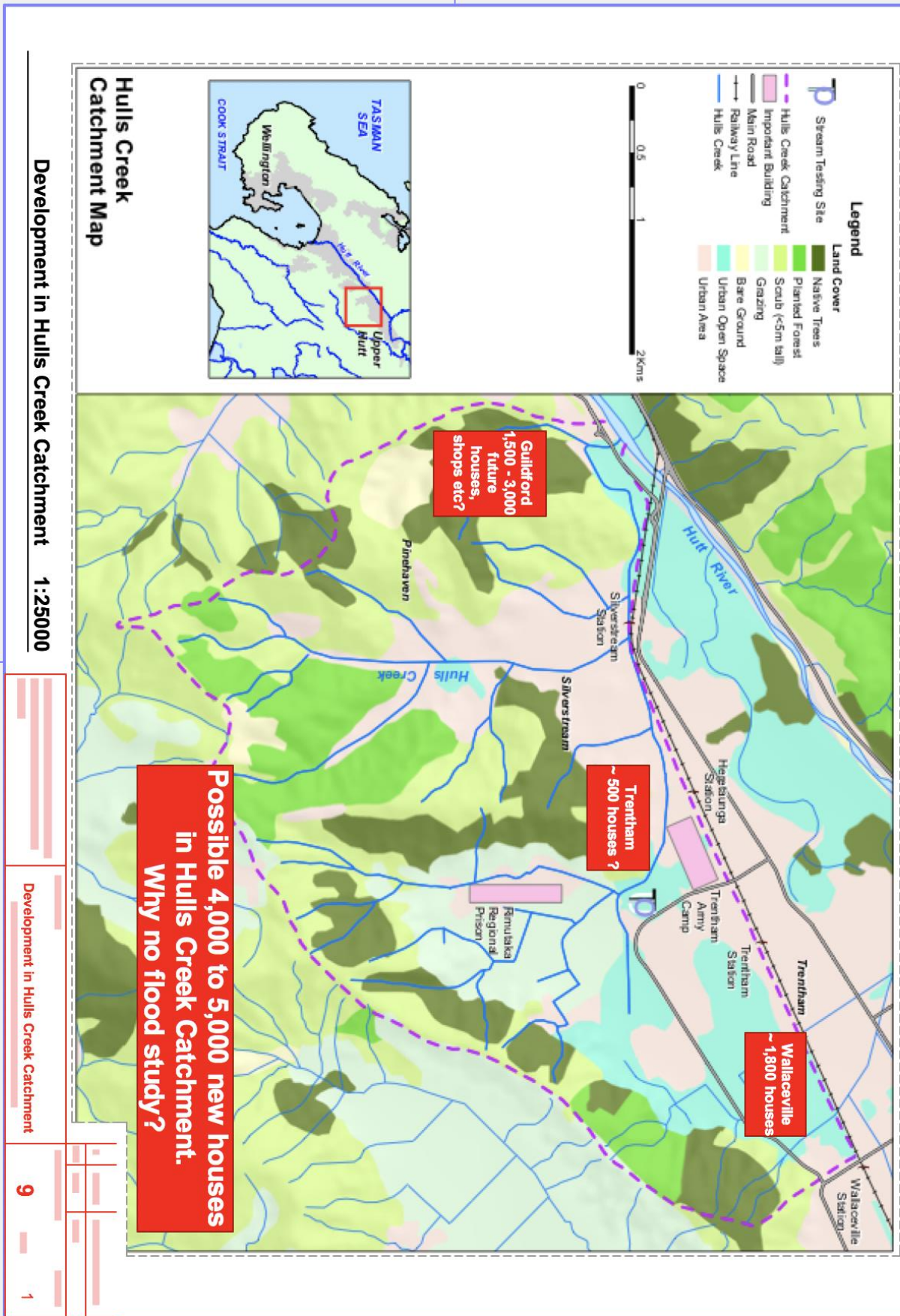
**Guildford development escapes  
'Catchment Overlay'**

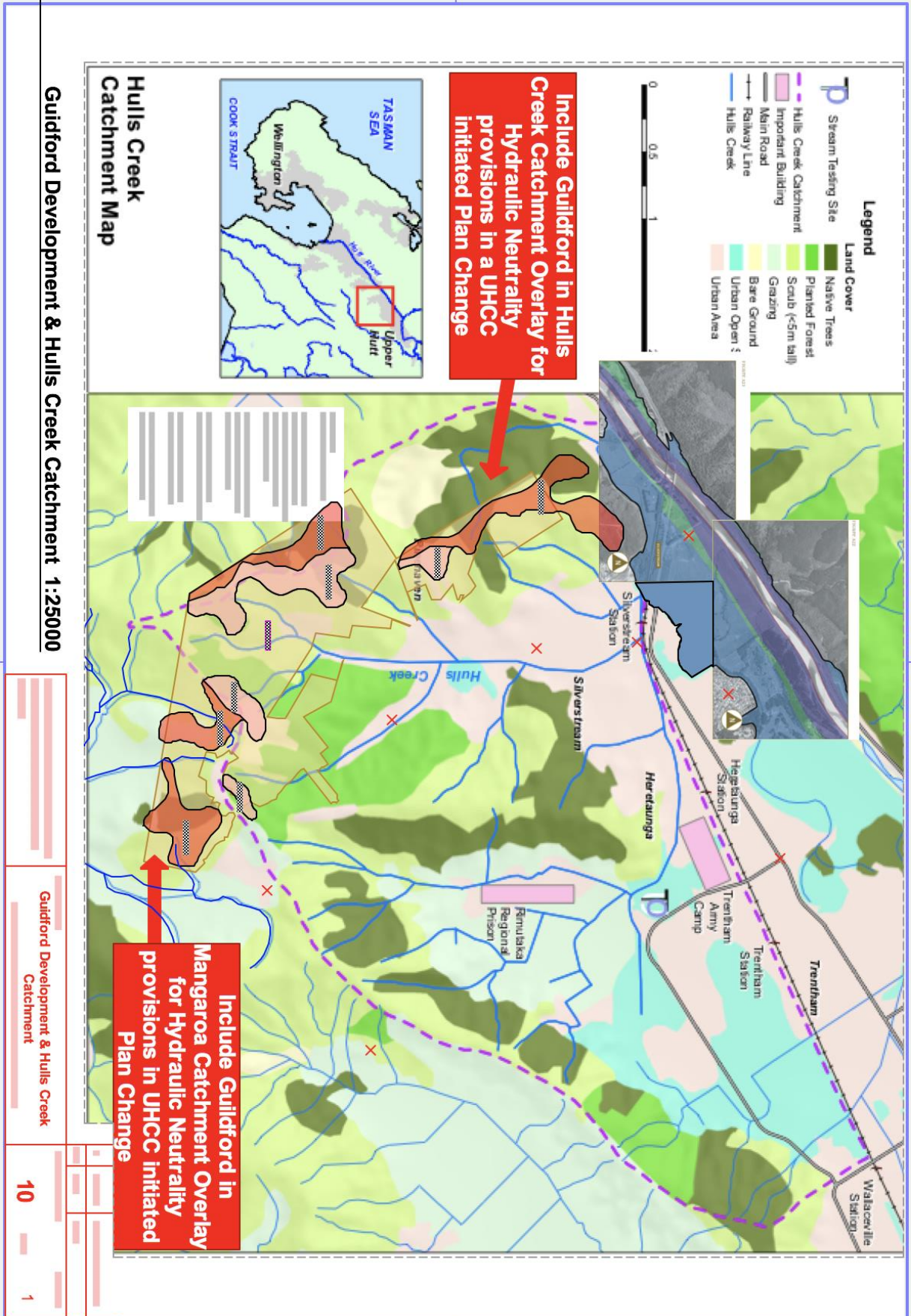
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Stephen Pattinson  
 President, Save Our Hills (Upper Hutt) Inc., Pinehaven, Upper Hutt  
 M: 027 226 3374

T0: MAYOR & COUNCILLORS - Extraordinary Council Meeting  
 Expressions – Gillies Theatre Upper Hutt, Tuesday, 27 March 2018

**RE: Proposed Plan Change 42: Mangaroa and Pinehaven Flood Hazard Extents**

- 1) Save Our Hills (SOH) supports flood protection works and plan changes that achieve good floodplain management and development provisions;
- 2) This proposed Plan Change 42 fails to achieve good floodplain management, and fails to provide adequate provisions for flood protection, development and hydraulic neutrality;
- 3) The Commissioner’s Report and Recommendation glosses over many details and much evidence that casts serious doubt on the efficacy of Plan Change 42, and therefore his Recommendation should be rejected, and Plan Change 42 should be declined;
- 4) The Commissioner’s Recommendation to “accept the plan change with amendments” represents a pre-determined outcome involving irregularities in the hearing process eg
  - a. before the hearing eg
    - i. new sets of flood maps in s42A report which were not notified
    - ii. Commissioner failing to require new or updated s32 report for extensively revised plan change documentation issued in s42A report 3/9/17 (4 months after consultation closed on 8/5/17)
    - iii. denial of a pre-hearing meeting requested by Pattinson/RJ Hall with GWRC/UHCC’s flood engineers who developed the GWRC flood maps which underpin the UHCC PC42 flood maps and the s42A flood maps
  - b. during the presentation of hearing statements (27-29 September, 2017), eg
    - i. critical questions raised by submitters ignored by Commissioner, eg
      1. Commissioner failing to ask Council’s experts for clarification of contradictory Baseline data for assessing stormwater neutrality
      2. Commissioner failing to address conflicting evidence presented by Council’s experts on ‘freeboard’ and its application
      3. Commissioner failing to challenge the incorrect method of removing ‘depth<100mm’ from flood extents by Council’s experts
      4. Commissioner failing to ensure the “Catchment Overlay” for hydraulic neutrality captures all proposed future development on Guildford land as shown in UHCC’s Land Use Strategy 2016
      5. Commissioner failing to include missing headwaters of Mangaroa River in PC42 maps, and hydraulic neutrality for Mangaroa River
  - c. after adjournment and before formal closing of hearing on 17 November 2017 eg
    - i. Commissioner failing to contact Pattinson’s flood expert RJ Hall by telephone as promised;
    - ii. Commissioner failing, as promised, to visit properties of submitters who requested this
    - iii. Commissioner failing to identify the official GWRC flood hazard map that
      1. underpins the UHCC PC42 flood maps for Pinehaven Stream
      2. underpins the UHCC PC42 flood maps for Mangaroa River



- 5) Commissioner has glossed over “Groundtruthing” of GWRC and UHCC flood maps, viz.
  - a. Statements by eye-witnesses of the 1976 Pinehaven 100-year flood
  - b. Several site-specific case studies and topographical surveys
  - c. RJ Hall’s expert evidence for 27 Emslie Road, Pinehaven
  - d. GWRC & UHCC’s mis-use of freeboard - see Nicola Robinson’s presentation today
- 6) Councillors are elected representatives of citizens and as such Councillors have a responsibility to understand the issues and not just ‘rubber stamp’ recommendations which they don’t clearly and fully understand;
- 7) If Council accepts today the Commissioner’s recommendation to adopt PC42 it will adversely affect many properties which are falsely shown in the 100-year flood zone when in fact they actually are not in the 100-year flood zone;
- 8) UHCC can correct the PC42 flood maps **AND ‘save face’** in the process –
  - a. The Resource Legislation Amendment Act 2017 elevated ‘natural hazards’ to the level of ‘national importance’ (Section 6h) – this includes managing flood risk
  - b. Mike Law’s paper (2017) “Towards Uniformity in Flood Mapping” – calling for uniformity in the preparation and presentation of flood maps in New Zealand
  - c. UHCC could respond to the heightened importance of managing flood risk, and the call for uniformity in flood mapping, by requiring GWRC to align itself more with the way flood modelling and mapping is done by other major unitary and regional authorities in New Zealand (GWRC is currently the odd one out by the way GWRC alone models and maps ‘freeboard’ as flood water - see Sue Pattinson’s and Nicola Robinson’s presentations today) to produce new and accurate flood models and maps for Pinehaven and Mangaroa that remove ‘depth <100mm’ correctly and that differentiate freeboard from flood water;
- 9) UHCC’s consultants and experts are not ‘independent’, eg SKM (now Jacobs), who prepared the GWRC flood maps underpinning the PC42 flood maps, were also engaged by Guildford Timber Company for preparing its proposed development concept/vision; Mike Law and Kyle Christensen are Council’s flood experts and also the ‘independent’ auditors of the Pinehaven Stream flood mapping and the Mangaroa River flood modelling respectively, thereby representing a conflict of interest in their evidence;
- 10) In view of all the above, Save Our Hills (Upper Hutt) Incorporated requests that
  - a. Council reject the Commissioner’s Recommendation and decline Plan Change 42
  - b. Council initiate a flood study for Hull’s Creek Catchment (see Darryl Longstaffe’s presentation and maps today) shown in the GWRC Hulls Creek Catchment map, providing new flood modelling and mapping for all Hull’s Creek catchment (i.e. Wallaceville/Trentham/Heretaunga/Silverstream/Pinehaven) and Mangaroa River, in line with industry practice and overseen by truly independent experts,
  - c. Council initiate a wider plan change that:
    - i. includes Hulls Creek and a ‘Hulls Creek Catchment Overlay’ for hydraulic neutrality for all the proposed Guildford development area that drains into the Hull’s Creek catchment (including Silverstream/Pinehaven), and
    - ii. includes Mangaroa headwaters into the Guildford land, and hydraulic neutrality, including Guildford land that drains into Mangaroa River;
  - d. provide accurate and clear flood maps that the public can understand and trust.

Please append this presentation to the Minutes of this Extraordinary Council Meeting.  
Stephen Pattinson, Save Our Hills (Upper Hutt) Inc.