greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Pinehaven stream: Building a flood map

What is flood mapping?

Greater Wellington Regional Council uses flood mapping to help communities understand flood risk from the rivers they live by and to help inform decisions about how to manage that flood risk and develop their communities in a safe and sustainable way. Flood mapping turns data about potential flooding from rivers and streams into an image, making it easier to understand where water might end up in the event of a flood.

Rivers and streams naturally flood when the rain is heavy. Computer programmes called "models" help us to understand how the river will behave – how much water it can carry downstream, or where it might run over river banks, using information about the geography of the area, as well as actual floods and rainfall data. This information helps river managers predict areas at risk of flooding in extreme weather conditions.

How is a flood map made?

Making a flood map begins with gathering and analysing all available data relevant to the river catchment. Scientists gather data and observations about topography, river character and flow information, infrastructure along the river, land use within the catchment, rainfall intensity, and past floods.

Using internationally recognised methodologies engineers create a 'computer model' or numerical representation of reality. Firstly a theoretical model is created from this information, showing what flooding might look like during specific rain fall events if the river channel operated without any blockages and the water ran evenly from river source to river mouth.

The next step is to add local knowledge for example about blockage points or observations of floods that have happened.

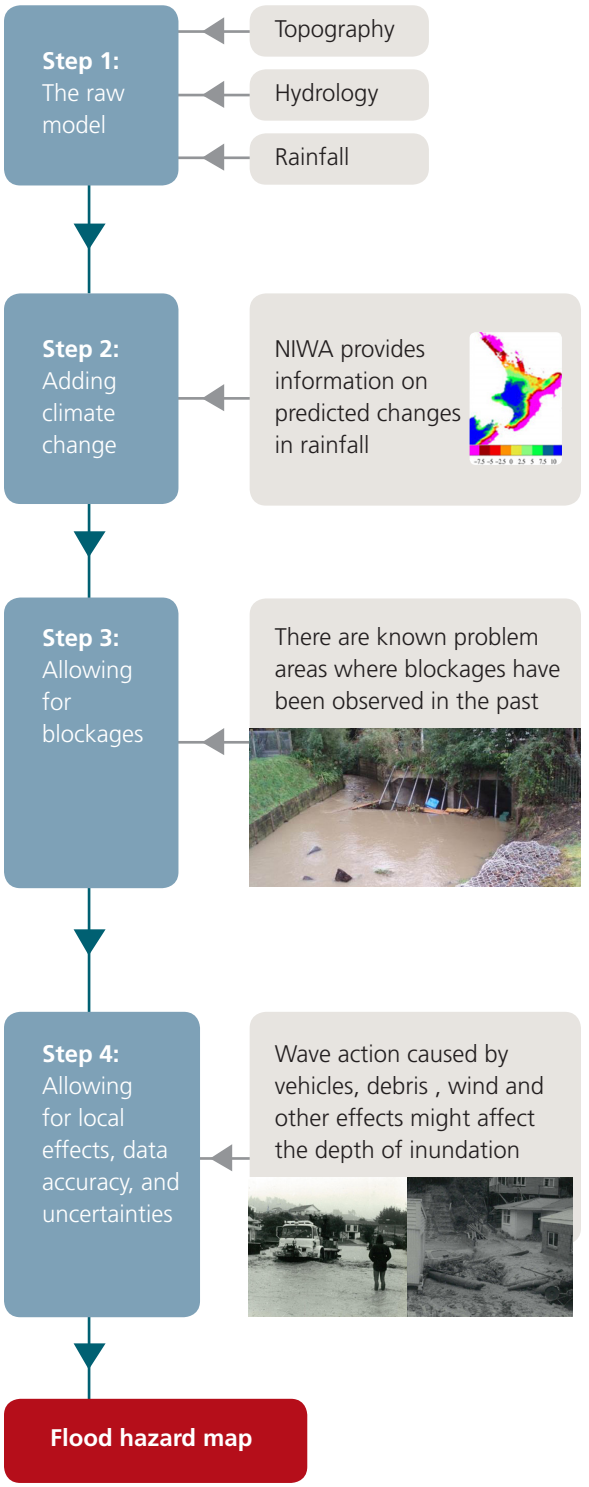
Climate change predictions are also added to create a full picture of flood hazard for that area as it may look in the next century.

Finally, the last step is to consider other local effects that may occur during a flood event and affect the spread and depth of flooding, and allow for the uncertainties inherent in flood modelling.

The following pages show the step by step process of producing a flood map.

Why would you need a flood map?

A flood map is the first step in understanding flood risk. GWRC's main focus is to make sure people are aware of risk on their property so that they can make informed decisions. It is provided for your awareness of a potential hazard. For instance, you might need this information while planning for emergencies. If your property is located within a mapped flood area you will likely be interested to obtain more information (e.g. likelihood of floods, depth of inundation, flow velocities, etc.). More specific flood maps are available on our website or you are welcome to contact us with a specific request



PINEHAVEN STREAM - Flood Map

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Date Plotted : 11:47:00 a.m., 10/06/2016

Map 0 – Flood Map

This map is the standard style of flood map produced to identify properties that may be at risk of flooding. It is designed to be a simple map to use and therefore contains no information about depth or hazard category. A property can quickly be determined as either within or outside of the mapped flood area.

This is a 'flag raising' type map that should be used as a first step in determining if a property is at risk of flooding.

DISCLAIMER:
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Legend

- Stream centreline
- Pipe network

100 year flood event

- Flood spread

A1 Scale: 1:3,500

0 50 100 200 300 400 500 Metres

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Map 1a - PINEHAVEN STREAM - Building a flood map
Step 1 of 4: The raw model stage

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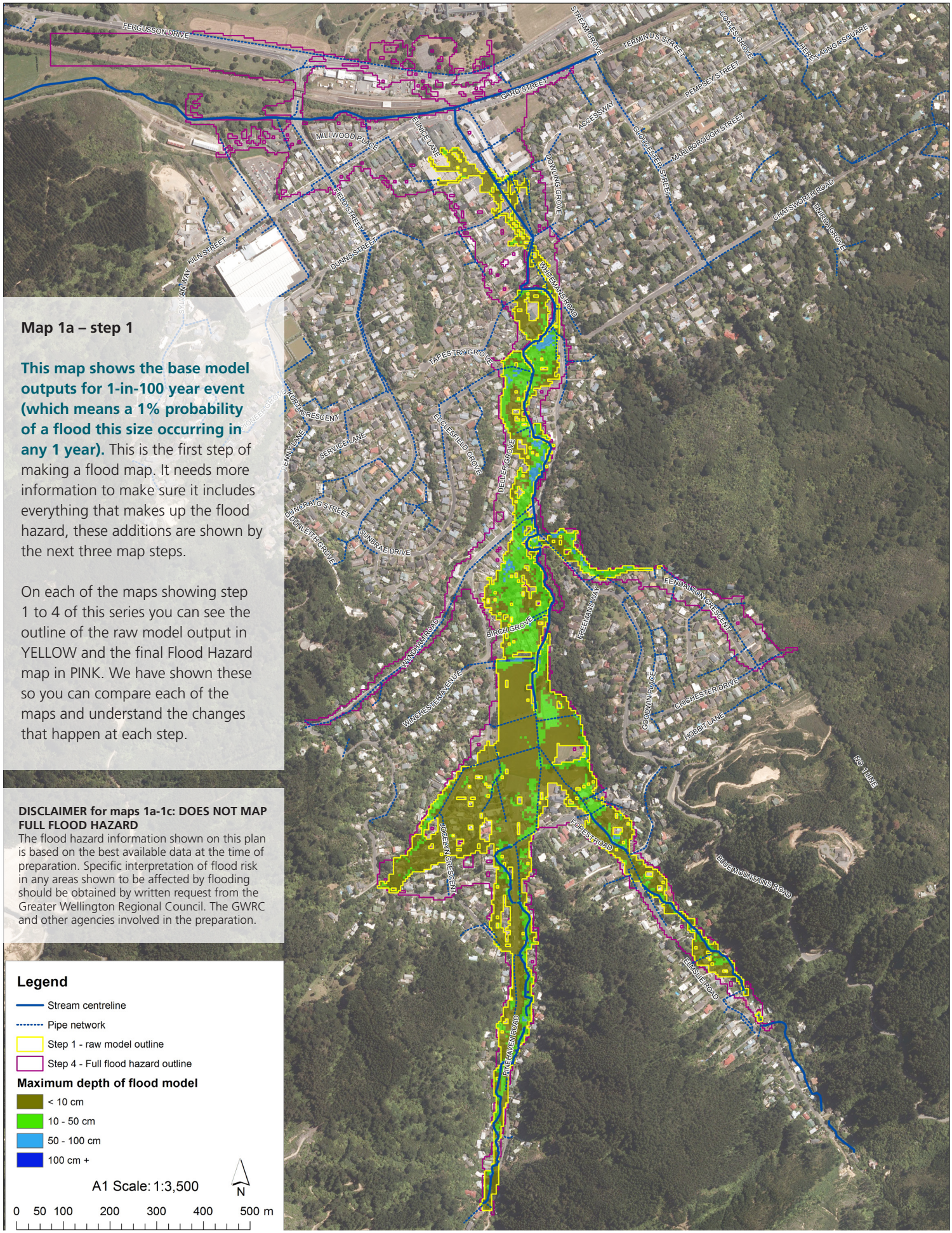

Map 1a – step 1

This map shows the base model outputs for 1-in-100 year event (which means a 1% probability of a flood this size occurring in any 1 year). This is the first step of making a flood map. It needs more information to make sure it includes everything that makes up the flood hazard, these additions are shown by the next three map steps.

On each of the maps showing step 1 to 4 of this series you can see the outline of the raw model output in YELLOW and the final Flood Hazard map in PINK. We have shown these so you can compare each of the maps and understand the changes that happen at each step.

DISCLAIMER for maps 1a-1c: DOES NOT MAP FULL FLOOD HAZARD
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Legend

- Stream centreline
- Pipe network
- Step 1 - raw model outline
- Step 4 - Full flood hazard outline

Maximum depth of flood model

- < 10 cm
- 10 - 50 cm
- 50 - 100 cm
- 100 cm +

A1 Scale: 1:3,500

N

0 50 100 200 300 400 500 m

Map 1b - PINEHAVEN STREAM - Building a flood map
Step 2 of 4: Adding climate change

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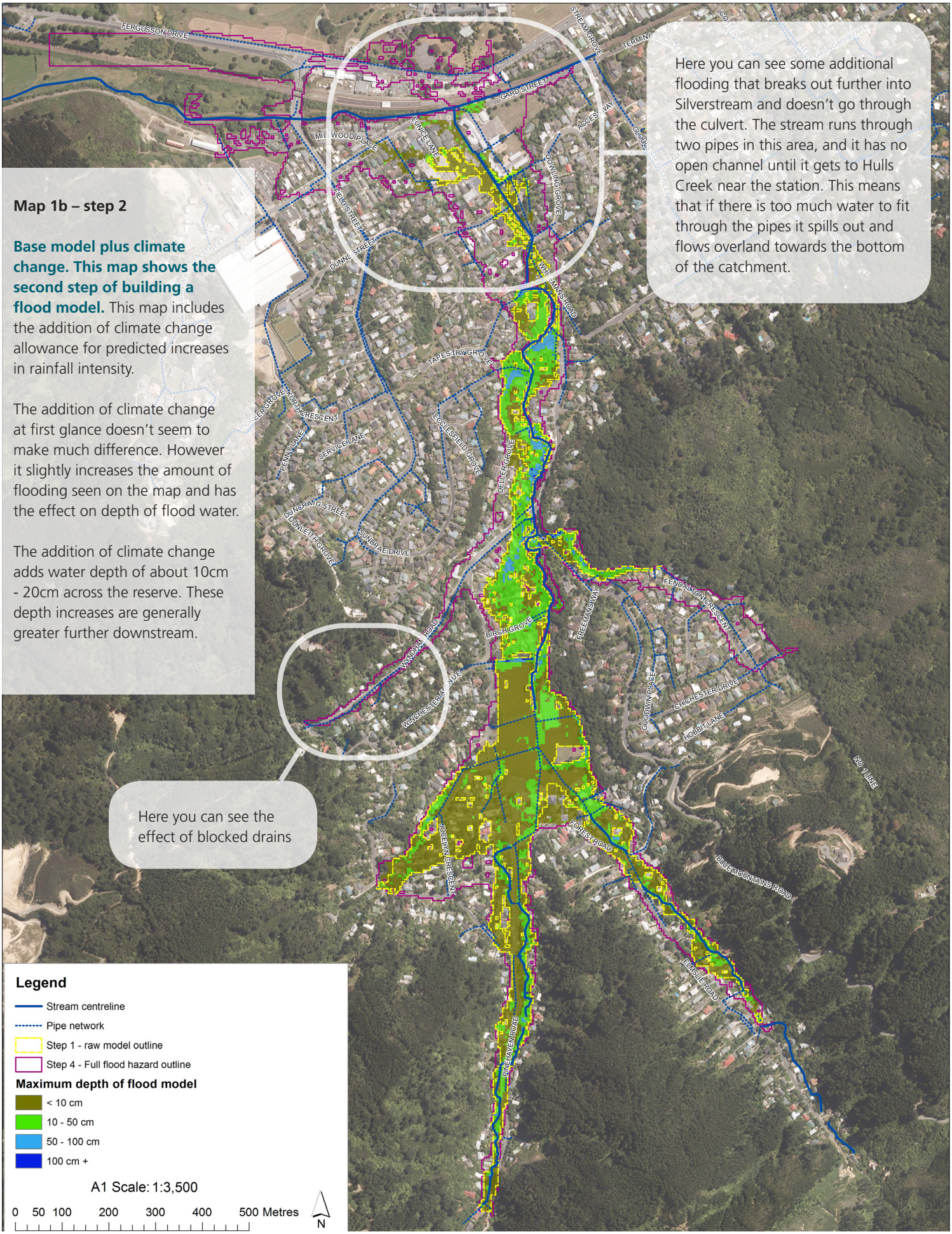

Map 1b – step 2

Base model plus climate change. This map shows the second step of building a flood model. This map includes the addition of climate change allowance for predicted increases in rainfall intensity.

The addition of climate change at first glance doesn't seem to make much difference. However it slightly increases the amount of flooding seen on the map and has the effect on depth of flood water.

The addition of climate change adds water depth of about 10cm - 20cm across the reserve. These depth increases are generally greater further downstream.

Here you can see some additional flooding that breaks out further into Silverstream and doesn't go through the culvert. The stream runs through two pipes in this area, and it has no open channel until it gets to Hulls Creek near the station. This means that if there is too much water to fit through the pipes it spills out and flows overland towards the bottom of the catchment.

Here you can see the effect of blocked drains

Legend

- Stream centreline
- Pipe network
- Step 1 - raw model outline
- Step 4 - Full flood hazard outline

Maximum depth of flood model

- < 10 cm
- 10 - 50 cm
- 50 - 100 cm
- 100 cm +

A1 Scale: 1:3,500

0 50 100 200 300 400 500 Metres

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Map 1c - PINEHAVEN STREAM - Building a flood map
Step 3 of 4: Allowing for blockages

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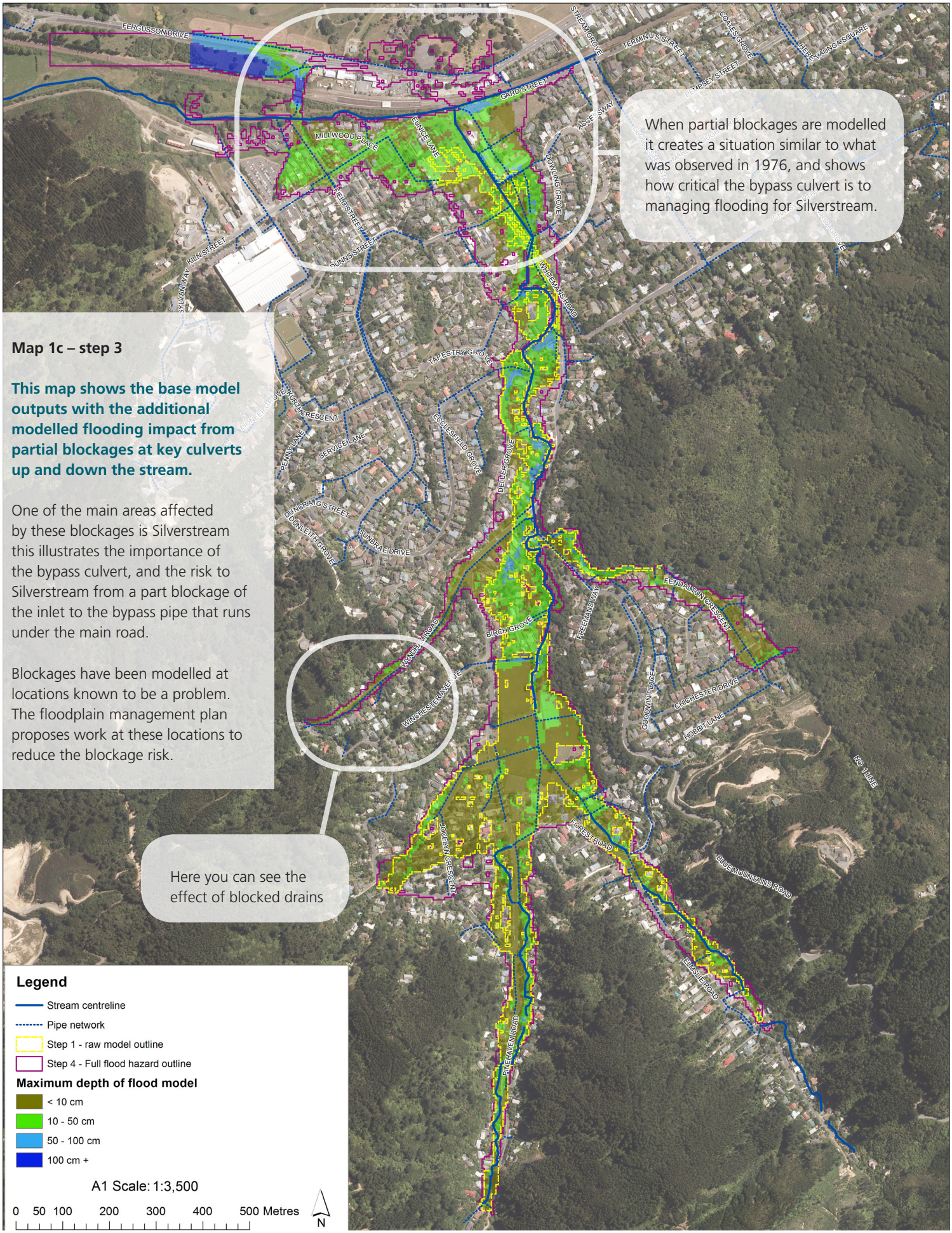

Map 1c – step 3

This map shows the base model outputs with the additional modelled flooding impact from partial blockages at key culverts up and down the stream.

One of the main areas affected by these blockages is Silverstream this illustrates the importance of the bypass culvert, and the risk to Silverstream from a part blockage of the inlet to the bypass pipe that runs under the main road.

Blockages have been modelled at locations known to be a problem. The floodplain management plan proposes work at these locations to reduce the blockage risk.

Map 1d - PINEHAVEN STREAM - Building a flood map
Step 4 of 4: Allowing for local effects

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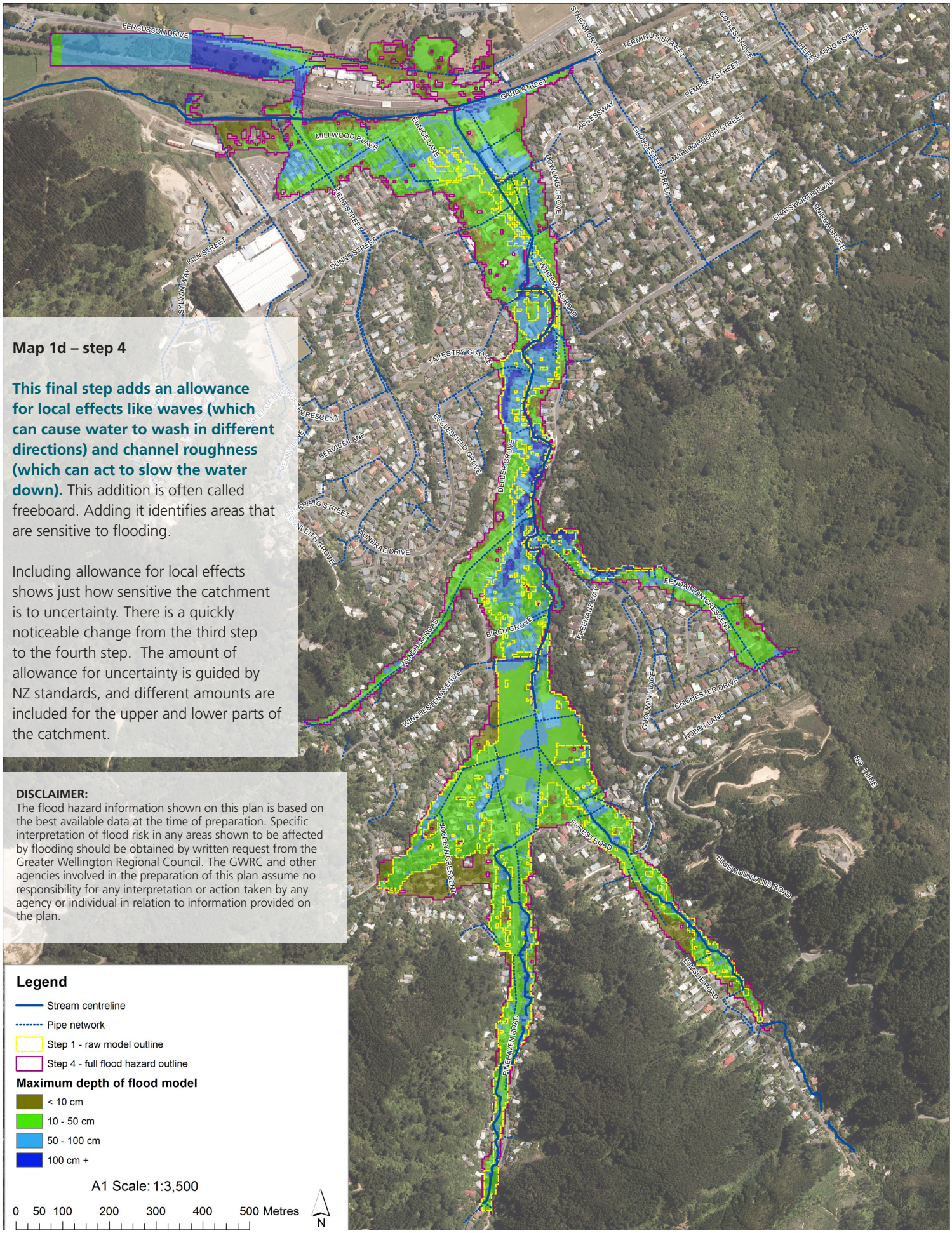

Map 1d – step 4

This final step adds an allowance for local effects like waves (which can cause water to wash in different directions) and channel roughness (which can act to slow the water down). This addition is often called freeboard. Adding it identifies areas that are sensitive to flooding.

Including allowance for local effects shows just how sensitive the catchment is to uncertainty. There is a quickly noticeable change from the third step to the fourth step. The amount of allowance for uncertainty is guided by NZ standards, and different amounts are included for the upper and lower parts of the catchment.

Legend

- Stream centreline
- Pipe network
- Step 1 - raw model outline
- Step 4 - full flood hazard outline

Maximum depth of flood model

- < 10 cm
- 10 - 50 cm
- 50 - 100 cm
- 100 cm +

A1 Scale: 1:3,500

0 50 100 200 300 400 500 Metres

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PINEHAVEN STREAM - building a flood map
Summary map of steps 1 to 4

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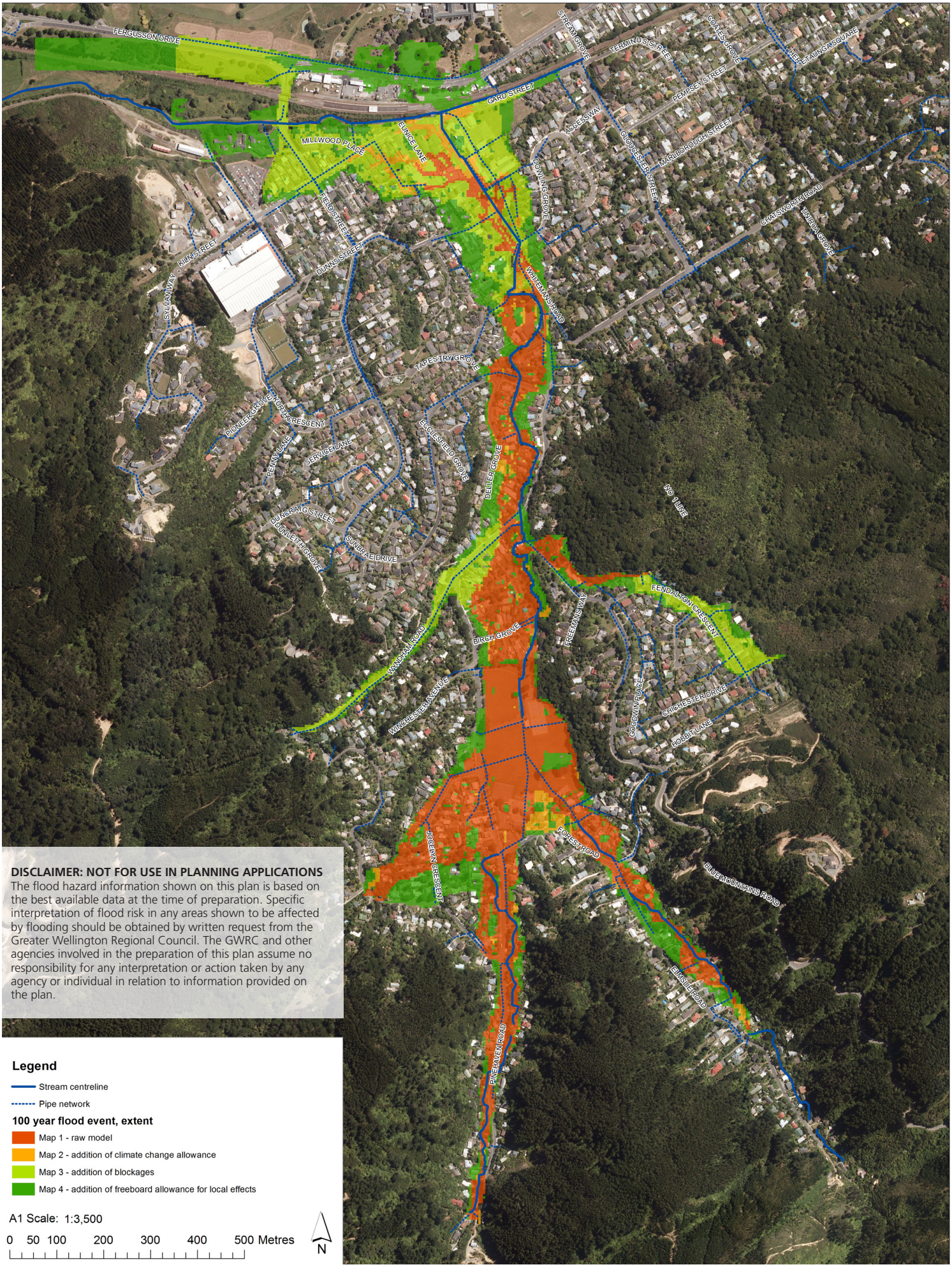

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Legend

- Stream centreline
- Pipe network

100 year flood event, extent

- Map 1 - raw model
- Map 2 - addition of climate change allowance
- Map 3 - addition of blockages
- Map 4 - addition of freeboard allowance for local effects

A1 Scale: 1:3,500

0 50 100 200 300 400 500 Metres

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For more information contact the Greater Wellington Regional Council:

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