

From: Glenn Stevens <Glenn.Stevens@tasman.govt.nz>
Sent on: Friday, November 18, 2022 1:15:18 AM
To: Anna McKenzie <anna.mckenzie@tasman.govt.nz>
Subject: Plan Change 76 - Wakefield - G Stevens evidence

Follow up: Follow up

Start date: Friday, November 18, 2022 12:00:00 AM

Due date: Friday, November 18, 2022 12:00:00 AM

Qualifications/experience

My full name is Glenn John Stevens. I have a Bachelor of Science degree from University of Auckland and a Master of Applied Science (Hons) degree from Lincoln University. I have worked at Tasman District Council for over 20 years, holding the position of Resource Scientist since 2005 and Senior Resource Scientist (Natural Hazards) since 2019. Previous to that I have worked as a Resource Scientist at Taranaki Regional Council. For much of my time at Tasman District Council my duties have included providing information and technical expertise on natural hazards throughout the District and across a range of Council functions.

Plan Change 76 - Wakefield

Jean Gorman

The flood hazard presented by the Pitfure Stream and its tributaries (Gossy Stream and Jenkins Creek) is recognised and has been accounted for in developing the proposed re-zoning. Whilst the entire development area is to be rezoned residential it does include an indicative reserve area along the active flood of the Pitfure Stream plain (i.e. the low terrace adjacent to the active channel). One of the purposes of this reserve is provide a "floodway" that is not encroached upon by houses. Residential development will require a resource consents (even with residential zoning). Such resource consents will need to address the flood hazard and ensure that there is sufficient capacity for flood flows along the Pitfure Stream.

A key point is that the indicative reserve is indicative which entails some flexibility to the final boundaries of such a reserve. The active flood plain is bounded by a terrace riser that has an irregular alignment. It is anticipated that parts of this terrace riser will be realigned in places to allow a better residential layout. Any such realignment will have to account for the flood flow capacity. It may be necessary that some land outside of the indicative reserve will be needed to achieve this. Any such realignment will require resource consent.

Accommodating the flood hazard present in the triangular area bounded by the cycleway, Edward Street and the stream channel is likely to restrict how this area can be developed (for example it is unlikely to be suitable for high density housing). The expectation is that this will be addressed through the resource consents needed for development.

Homes

The 1% annual exceedance probability (AEP) flood (i.e. a 100 year return period or "one in a hundred year" flood) is a common design or benchmark flood that is used for various planning purposes. From a planning perspective the occurrence of a large flood will not change this, in that the 1% AEP flood can still be used as a design flood. The magnitude (i.e. the size of the flow) of a 1% AEP flood for a given location is determined from river flow records (ideally recorder sites with several decades of flow data). When a large flood occurs, or if there is a long period without a large flood, that is then included in the flow record the resultant flood statistics will change. The longer the flow record the less influence this will have. For locations where there are no or limited flow records there are various methods for estimating the "long term" magnitude of floods of a particular frequency. Whilst the August 2022 floods will have some effect on the magnitude of a 1% AEP flood, it is still appropriate to use the 1% AEP flood for planning purposes.

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BEFORE THE TASMAN DISTRICT COUNCIL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER Proposed Plan Change 76: Wakefield - Residential
Growth

**Statement of Evidence of Wouter Woortman, Water Resource Consultant
on behalf of the Tasman District Council**

Introduction

1. My full name is Wouter Woortman. I hold a Bachelor of Science degree in Land, Water and Environmental Management from Larenstein, University of Applied Science in the Netherlands. I have 20 years of experience in water resource management, stormwater management, flood risk management and infrastructure planning in The Netherlands and New Zealand.
2. I am currently employed by Tonkin & Taylor Ltd (T+T) as a Principal Water Resource Consultant. Prior to this role I worked in the stormwater management and infrastructure planning as a staff member at Tasman District Council (TDC) where my roles included Senior Planning Advisor – Stormwater and Rivers and Team Leader – Infrastructure Planning.
3. During my time at TDC I have worked at a strategic level, supporting Council's planning processes such as Long-Term Plan, Infrastructure Strategy, Activity Management Plans, Future Development Strategy, Urban Stormwater Strategy and Catchment Management Plans. I was involved in the development of the Nelson Tasman Land Development Manual 2019 (NTLDM) and was leading the preparation of the stormwater section of the NTLDM. As a technical specialist I have supported Council planners with consideration and processing of resource consent applications.
4. I appear on behalf of the Infrastructure Planning team (Strategy and Policy Department) of Council.
5. I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that this evidence is within my area of expertise, except where I state that I am relying on the evidence of another person.

Scope of Evidence

6. Growth Plan Change 76 was notified on 16 September 2022 submissions were received by 17 October 2022 and further submissions by 11 November 2022. My evidence responds to the matters raised in submissions and further submissions as they relate to stormwater management and flood risk management.
7. The purpose of Plan Change 76 is to provide additional land for residential development within the Wakefield Development Area, where it encourages intensification and a variety of housing densities.
8. Submissions relating to stormwater management and flood hazards across the development area were received from J. Gorman, Homes for Wakefield and Wakefield Village Development Ltd. I have responded to each of these below. The submissions and my response refer to street names and watercourses as located on the map in Figure 1 below.



Figure 1: Location of watercourses

Table 1 includes the submissions and further submissions that relate to stormwater and flood management, the relief sought and my recommendations.

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
J. Gorman 3653 76.0-5	Natural Hazards (General)	Housing footprints should be limited to be exclusively beside the existing road at Edwards Street due to inundation during large rainfall events from Jenkins Creek, Pitfure Stream and the creek from Gossey Drive.	1	<p>No change</p> <p>T+T was engaged recently (May 2024) by TDC to extend the model boundary of the existing hydraulic stormwater model to include the upper catchments of the Pitfure Stream, Jenkins Creek and Cossey Creek so that flood risks within the Wakefield Development Area would be better represented, and in particular the area between Edward Street, Gossey Creek and Jenkins Creek, which was upstream of the existing model extent. More details on the updated flood model and differences with previously modelling are provided in Appendix B.</p> <p>The updated flood modelling indicates that the area between Edward Street, Jenkins Creek and Gossey Creek could get inundated in a future 1% AEP flood event with flood depths varying between 0.05m and 1 m as shown in Appendix A, figure 1 (Max Flood Depth – 1%AEP event – 6hr duration- RCP8.5 2090). It is important to note that this scenario does not represent any changes in landform or land use that might occur in the future.</p> <p>The updated model indicates that the flood extent throughout the Wakefield Development Area is similar to previous results even though modelled flows from the upper Pitfure, Jenkins and Cossey Catchments are significantly higher than previously modelled. The flood extent does not change significantly due to how the river is confined within the higher terraces. Higher flows do result in higher flood depths throughout the flood plain. The differences in flow between previous and updated flood modelling can be attributed to a different modelling methodology (rain on grid as opposed to lumped catchment) as well as different assumption for infiltration in the</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				<p>catchment.</p> <p>The most recent flood modelling results in appendix A, figure 1 can be considered a reasonable representation of a future 1% AEP event (6 hour duration, climate change RCP8.5 2090) based on the currently available information. It is recommended to consider flows and associated flood depths within a range, rather than absolute numbers until more certainty is obtained through validation and/or calibration exercises.</p> <p>As part of the plan change, the zoning of the land between Edward Street, Gossey Creek and Jenkins Creek is proposed to change from Rural 2 to <i>deferred</i> Residential. The lifting of the deferment is subject to servicing of the site with required infrastructure, including stormwater. This process ensures that the site cannot be developed until appropriate stormwater servicing is in place or programmed.</p> <p>Local purpose esplanade reserves along Gossey Creek, Jenkins Creek and Pitfure Stream are proposed as shown on amended map 76/1. The <i>minimum</i> width for the purpose of esplanade reserve is 20 m from the top of the bank on either side. These esplanade reserves can be used for mitigation of flood risks from the streams that pass through the development. It should be noted that the minimum required reserve space is indicative only and a greater width may be required for flood mitigation and stormwater purposes. All open channels will need to be designed in accordance with the Nelson Tasman Land Development (NTLDM) and include specifications around future flood flows, freeboard, ecological enhancements, maintenance access etc.</p> <p>The NTLDM also sets out a process for setting minimum ground and floor</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				<p>levels for future developments, with specific guidance provided in the Nelson Tasman Inundation Practice Note (March 2019).</p> <p>The potential effects of filling in the flood plain and confining river flow within a narrower channel may result in downstream flooding effects. An assessment of effects will be required at resource consent stage. Future developments within the Wakefield Development Area are required to demonstrate effective flood risk management by considering policy 6.17.3.2A of the Tasman Resource Management Plan (TRMP) as well as all relevant rules of section 16.3 - Subdivision and section 36.4 - Discharges or Diversions to Land or Water. Natural hazards that subdivision might be exposed to are assessed under S106 of the Resource Management Act (RMA) at the time of resource consent.</p> <p>The combined provisions of the RMA, TRMP and NTLDM will ensure that flood risks, both on-site and off-site, are addressed through the resource consent and subdivision design process.</p> <p>On this basis my recommendation is that no further changes are required.</p>
J.Gorman (further submission)	Natural Hazards (General)	Residential development should be limited to the higher terraces	2	<p>No change</p> <p>The flood plain of the Pitfure Stream within the Wakefield Development Area is well defined by the contours of river terraces and as shown on the flood map in Figure 1. The risk of allowing development in flood plains is well known in New Zealand and a precautionary approach that limits residential development to the upper terraces would therefore be preferential. This is also mentioned in section 6.17.30 of the TRMP (principle reasons and</p>

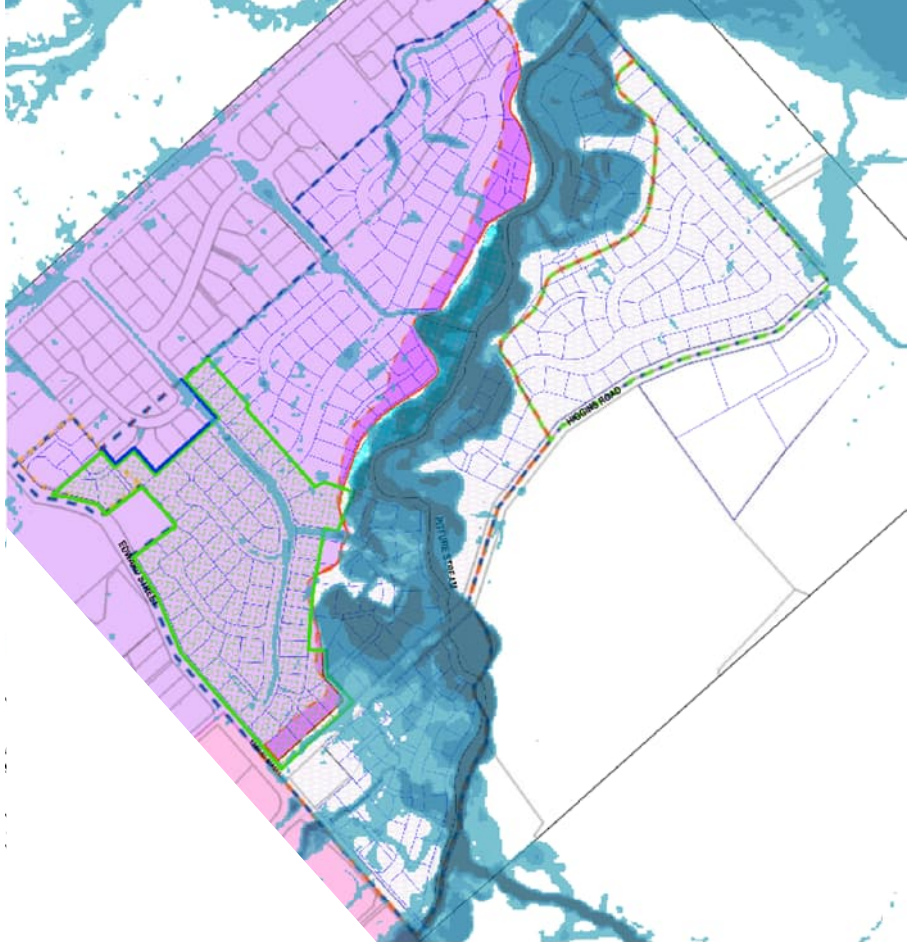
Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				<p>explanation).</p> <p>As per the response to the submission point above, future developments within the Wakefield Development Area are required to demonstrate effective flood risk management by considering policy 6.17.3.2A of the TRMP as well as all relevant rules of section 16.3 - Subdivision and section 36.4 - Discharges or Diversions to Land or Water. Natural hazards that subdivision might be exposed to are assessed under S106 of the RMA at the time of resource consent.</p> <p>Some development on the lower terraces could therefore be considered as part of future resource consent applications, provided that all the requirements in the plans and rules set out above can be met and that any downstream effects are mitigated appropriately.</p> <p>On this basis my recommendation is that no further changes are required.</p>
J.Gorman (further submission)		Roofwater collection should be required to reduce runoff from the development	3	<p>No change</p> <p>Sections 5.4.13 to 5.4.15 of the NTLDM set out detention requirements and acceptable solutions to meet these requirements. Developers may consider rainwater tanks, detention basins, ponds and wetlands (or a combination of these solutions) to meet detention requirements provided that these are designed in accordance with the standards in the NTLDM.</p> <p>On this basis my recommendation is that no further changes are required.</p>
J.Gorman (further		Residents lower down the valley will suffer worse	4	<p>No change</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
submission)		flooding if there is an increase in runoff. The streams drain many square kilometers and they need space.		<p>In relation to worsening flooding downstream:</p> <p>Future developments within the Wakefield Development Area are required to demonstrate effective flood risk management by considering policy 6.17.3.2A of the TRMP as well as all relevant rules, in particular the rules in chapter 36.4, Discharges or Diversions to Land or Water.</p> <p>Developments are also required to meet minimum engineering standards of the NTLDM. In particular clause 5.4.13 which sets out standards to mitigate the effects on downstream properties and the stormwater network. These include provisions for greenfield development to provide detention so that post-development peak flows do not exceed pre-development peak flows for the 10% AEP and 1% AEP.</p> <p>In relation to streams needing space:</p> <p>Streams and rivers need to be designed in accordance with table 5.5 (NTLDM section 5.4.6) with a secondary flow corridor to convey the future 1% AEP storm in accordance with section 5.4.6.2 and 5.5.1 of the LDM.</p> <p>Section 5.5.1 outlines design standards for open channel design including requirements to address recreational spaces, habitat for aquatic flora and fauna, appropriate riparian vegetation, and natural in-stream features. The design shall include maintenance access without compromise of ecological values. Piping and modification of natural water courses should be avoided in accordance with NTLDM 5.5.2.1.</p> <p>The combined requirements and designs standards set out above will ensure that sufficient space is allocated for streams and rivers.</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				On this basis my recommendation is that no further changes are required.
J. Gorman (further submission)		Large detention areas are needed to slow general runoff from the Pitfure Stream and improve aquifer recharge. There are many bores downstream which are dependent on this shallow unconfined aquifer.	5	<p>No change</p> <p>In relation to detention areas:</p> <p>As per my recommendation in point (4), the effects of development on downstream flooding need to be mitigated by providing detention. Developers may consider different detention solutions, or a combination thereof, to meet the detention requirements of NTLDM clause 5.4.13. Detention solutions may include detention tanks, basins, ponds and wetlands provided that these are designed in accordance with the NTLDM.</p> <p>It should be noted that designers may diverge from mandatory requirements in the NTLDM as per section 1.3 of the NTLDM as the council recognises that in some situations the standards might not be the best way to achieve the performance outcomes sought, due to particularities of the site or situation. In these cases, Council will exercise discretion around the acceptability of a non-standard design. Additional information and engineering design detail may be required by Council at engineering design and resource consent stage.</p> <p>In relation to groundwater recharge:</p> <p>NTLDM clause 5.4.10 sets out infiltration requirements to reduce stormwater runoff and contribute to groundwater recharge. Effects on groundwater and downstream bores should be investigated as part of an assessment of environmental effects at the resource consents stage.</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				On this basis my recommendation is that no further changes are required.
Homes for Wakefield	6.1.3.1 (h)	<p>Managing stormwater run-off.</p> <p>Modelling for flooding - since the September 2022 floods, what are the guidelines now?</p> <p>Have there been changes to TDC flood modelling or does the "Once in 100-years" model remain the default?</p> <p>Other Councils require water collection tanks in new developments to delay the release of stormwater in a large event, has this been considered?</p>	6	<p>No Change</p> <p>In relation to flood modelling:</p> <p>The criteria for flood modelling are set by the Nelson Tasman Land Development Manual; September 2020 Rev1 (NTLDM) and have not changed since the September 2022 floods. Section 5.4.6 of the NTLDM sets out stormwater system design capacity requirements as follows:</p> <ul style="list-style-type: none"> • Primary systems (pipes) 10% AEP + climate change. • Flood management (streams and rivers) 1% AEP + climate change. • Secondary systems 1% AEP + Climate change. <p>1% Annual Exceedance Probability (AEP) is the equivalent of a 1 in 100-year Annual Recurrence Interval (ARI)</p> <p>The effects of climate have been taken into account as expected in 2090 based on climate change scenario RCP 8.5 (representative Concentration Pathway). RCP 8.5 is described as the high-risk scenario, with greenhouse gas concentrations continuing to increase at the current or an accelerated rate. In my opinion the use of RCP8.5 1% AEP is conservative and sufficient to meet the needs of a flood assessment for this plan change. This is also the basis for the flood map in Appendix A, Figure 1.</p> <p>In relation to requirements for rainwater detention tanks:</p> <p>See response to point 3.</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				On this basis my recommendation is that no further changes are required.
Wakefield Village Development Ltd 4211 – 76.0-9	General (Map 76/1 and 76/3)	Amend the current residential zone boundary to follow the existing upper terrace (western side) of the Pitfure Stream as shown on attached plans.	7	<p>Amend map 76/2 as shown in Figure 2 for the following reasons:</p> <ul style="list-style-type: none"> a) Accept the zone boundary to follow the contour of the upper terrace as this leaves residentially zoned land outside the modelled flood extent of a future 1% AEP flood event (see dark purple areas in figure 2) b) It should be noted that the proposed <i>deferred</i> residentially zoned areas include land on the lower terraces that <i>is</i> subject to flooding in a future 1% AEP flood event. Lifting the deferment is subject to infrastructure servicing, including stormwater. <p>The submitter has included a conceptual masterplan of a potential subdivision within the development area. It is noted that several lots and a proposed wetland on this masterplan are located on the lower terraces and in areas that are subject to flooding in present day as well as future 1%AEP flood events (see Figure 2).</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				 <p data-bbox="1151 1362 2145 1430">Figure 2: future 1% AEP flood plain in relation to a conceptual masterplan of a potential subdivision (source: submission from Wakefield Village)</p>

Submitter Name No. and Point	Plan Topic Number	Relief Sought	Reference	Recommendation
				<p><i>Developments)</i></p> <p>As mentioned in my response to point (1) a precautionary approach that limits development to the upper terraces would be preferential.</p> <p>For development to occur on the downstream terrace it would need to demonstrate effective flood risk management as part of its resource consent application. It can be anticipated that this would include (but not not limited to):</p> <ul style="list-style-type: none"> • Concept designs of a flood corridor that is capable of passing the future 1% AEP flood flow and in full accordance with NTLDM requirements. • Required earthworks with future ground levels in relation to future flood levels including freeboard. • Potential downstream effects from filling in the flood plain and how these are mitigated. • On site stormwater management and detention requirements.

I am happy to answer any questions.

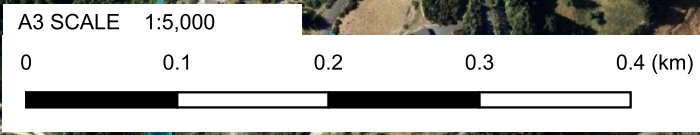
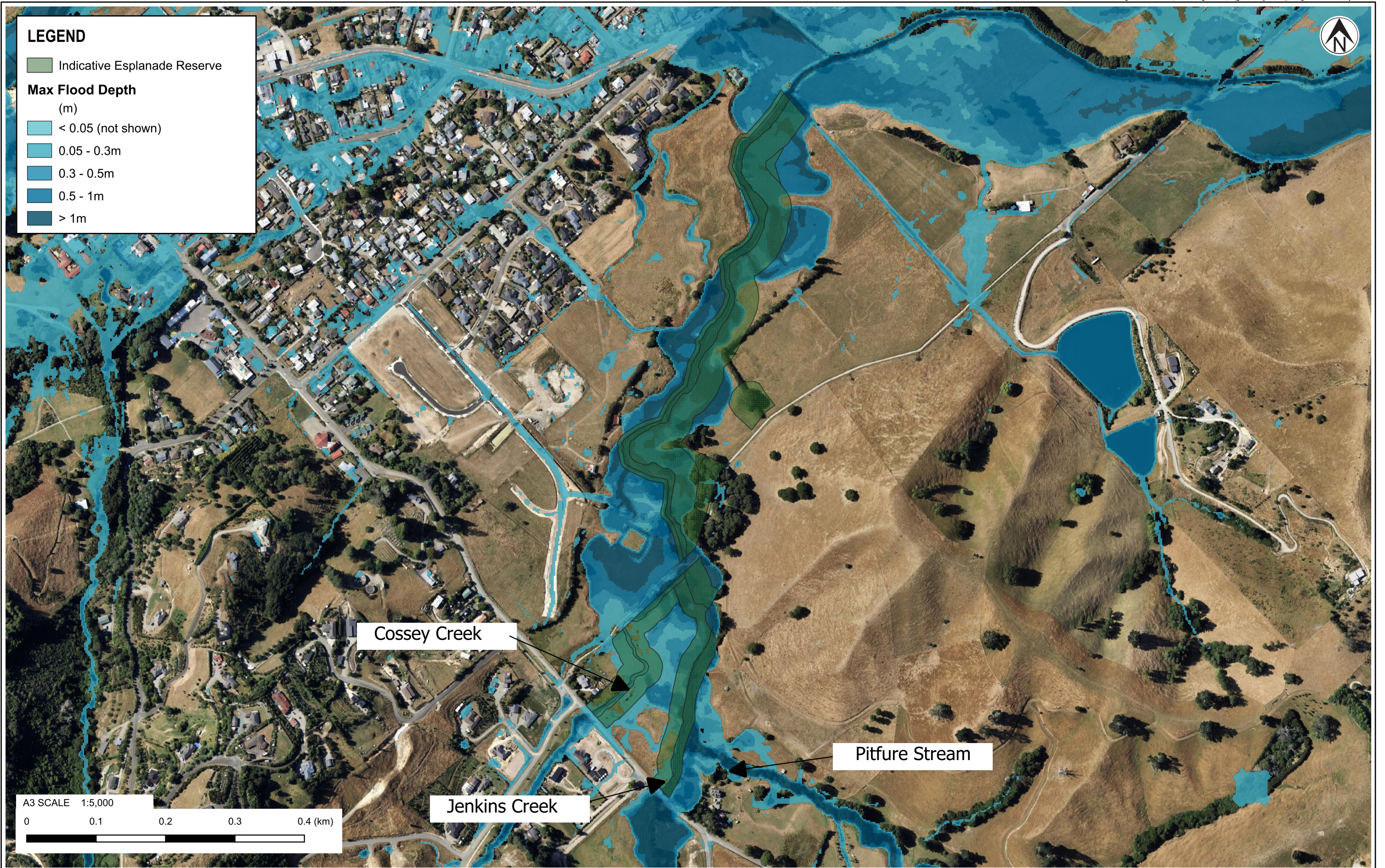


Wouter Woortman

20 May 2024

Appendix A:

- Figure 1: Max Flood Depth (m) – 1% AEP event – 6hr Duration – RCP8.5 2090



NOTES:
 Figure 1 of Statement of Evidence

0	First version	MAXG	WOWO	16/05/24
REV	DESCRIPTION	GIS	CHK	DATE

PROJECT No. 1004808.4300		
DESIGNED	MAXG	MAY.24
DRAWN	MAXG	MAY.24
CHECKED		
LOCATION PLAN		
APPROVED	DATE	

CLIENT	TASMAN DISTRICT COUNCIL
PROJECT	WAKEFIELD PC 76
TITLE	Max Flood Depth (m) 1% AEP event - 6hr duration - RCP8.5 2090
SCALE (A3)	1:5,000
FIG No.	FIGURE 1.
REV	0

Photograph 1 – Jenkins Creek – looking downstream from bridge across Edward Street (Source: Google Street View)



Photograph 2 – Gossey Creek looking downstream from the bridge across Edward Street (Source: Google Street View)



Appendix B – Hydraulic Flood Modelling

T+T was engaged in 2023 by TDC to update the existing hydraulic stormwater flood model for Brightwater and Wakefield¹ which was completed in March 2024. Results from this model as well as assumptions and limitations are reported in *Updates to Brightwater and Wakefield stormwater flood model report, T+T, Date March 2024*. The purpose of this model was to identify existing local stormwater flood issues. The model boundary runs through the Wakefield Development Area and largely excludes the area between Edward Street, Cossey Creek and Jenkins Creek. Hydrological inputs were assumed to represent flow coming from the catchments above the model boundary.

In order to further understand Plan Change 76 TDC requested T+T to extend the model boundary of the existing model to include the entire upper catchments of the Pitfure Stream, Jenkins Creek and Cossey Creek so that flood risks within the Wakefield Development Area would be better represented, and in particular the area between Edward Street, Gossey Creek and Jenkins Creek, which were previously upstream of the model extent. The modelled flows in this catchment have now been calculated from a rain-on-grid approach as opposed to the original lumped catchment approach. The infiltration value (continues loss rate) for this additional catchment has been assumed as 0.5 mm/hour.

The updated flood modelling indicates that the area between Edward Street, Jenkins Creek and Gossey Creek could get inundated in a future² 1% AEP flood event with flood depths varying between 0.05 m and 1 m as shown in Appendix A, Figure 1 (Max Flood Depth – 1% AEP event – 6hr duration- RCP8.5 2090).

The updated model indicates that the flood extent throughout the Wakefield Development Area is similar to the results from the 2020 model even though modelled flows from the upper Pitfure, Jenkins and Cossey Catchments are significantly higher than previously modelled. The flood extent does not change as result of higher flows due to how the river is confined within the higher terraces. Higher flows do result in higher flood depths and flood risk throughout the flood plain.

The model results are sensitive to infiltration losses in the catchment. As part of the model update in 2023/24 and a model validation against flooding from the Mount Heslington Stream in Brightwater it was agreed with TDC to assume lower infiltration rates than the standard values obtained from Landcare Soil Permeability Classification and apply these across the entire model domain. To remain consistent with the wider model, the same assumptions for infiltration losses were applied to the area that the model has now been extended with. It is important to note that there is no flow monitoring data or soil infiltration data available to calibrate the model against, which leaves a level of uncertainty around these critical model parameters.

Considering the above, the most recent flood modelling results in appendix A, Figure 1 can be considered a reasonable representation of a future 1% AEP event (6 hour duration, climate change RCP8.5 2090) based on the currently available information. It is recommended to consider flows and associated flood depths within a range, rather than absolute numbers until more certainty is obtained through validation and calibration exercises.

¹ Between 23018 and 2020 T+T developed a stormwater flood model. See the following report for more information Brightwater & Wakefield – TUFLOW Model Build Report, Tonkin & Taylor Ltd. March 2020, T+T ref: 1004543.3000.v1

² Note that this does not include any changes to land use or land form.