

**BEFORE A PANEL OF INDEPENDENT HEARING COMMISSIONERS IN THE
WAIKATO REGION**

I MUA NGĀ KAIKŌMIHANA WHAKAWĀ MOTUHEKE WAIKATO

UNDER the Resource Management Act 1991 (RMA)

AND

IN THE MATTER of Proposed Variation 3 to the Waikato Proposed
District Plan (PDP)

**STATEMENT OF EVIDENCE OF ANDREW BOLDERO
(Stormwater and Flooding)**

Dated 20 June 2023

TOMPKINS | WAKE

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INTRODUCTION

1. My name is Andrew Stanley Boldero. I have 30 years' experience in the civil engineering industry with my most recent experience (10 years') in the stormwater sector.
2. I have a New Zealand Certificate in Civil Engineering (NZCE) and a Diploma of Environmental Studies (Open Polytechnic of New Zealand) and I am an affiliate member of Engineering NZ.
3. I currently hold the position of Principal Stormwater Engineer at Te Miro Water Consultants Ltd (1.5 years). Prior to this I held the following relevant positions relating to stormwater experience (in chronological order):
 - (a) Waikato District Stormwater Lead for Watercare Waikato (two years);
 - (b) Principal Stormwater Engineer and Workgroup Manager for WSP (two years);
 - (c) Senior Water Resources Engineer for Tonkin and Taylor (10 years combined); and
 - (d) AECOM Civil Engineer - Water/environmental (seven years across Australia and New Zealand).
4. Over the course of my career have completed numerous stormwater related tasks including:
 - (a) Completed the annual stormwater reports to Waikato Regional Council (WRC) for the Waikato District Council's (Council) stormwater discharge consents for the last 3 reporting periods (2019-2020, 2020-2021 and 2021-2022);

- (b) Supported the Land Development Engineers at Council by undertaking stormwater reviews and providing technical support for subdivision and land use consents applications;
- (c) Provided technical reviews and advice to the Council for the drafting and implementation of their Stormwater Bylaw;
- (d) Provided technical guidance documents for development in the Waikato District;
- (e) Authored and presented “Temporal Rainfall – A risk based approach” at the 2019 New Zealand Stormwater Conference, a paper that compared the Australian hydrology and hydraulic modelling procedures against New Zealand standard practices;
- (f) Scoped and project managed (for Watercare) the Raglan Stormwater Strategy (CMP and master planning assessment);
- (g) Scoped and advised on the Ngaaruawaahia and Te Kauwhata Stormwater Strategies (CMP and master planning assessments);
- (h) I have also delivered multiple stormwater design projects across Auckland, Waikato and internationally including:
 - (i) Design lead for the Cambridge (C1-C3) stormwater pipeline and outfall to the Waikato River;
 - (ii) Water sensitive stormwater design at Swimtastic in Auckland (Raingarden and detention tanks);
 - (iii) Bauerfield Airport extension stormwater design in Vanuatu;
 - (iv) Ellice Road, Wairau Valley stormwater strategy (optioneering) in Auckland;

- (v) Queen Street, Northcote flood mitigation design in Auckland's Northshore;
 - (vi) Burns Avenue, Northshore flood mitigation design in Auckland's Northshore; and
 - (vii) Stormwater prioritisation tool for Healthy Waters (Auckland Council).
5. The Council contracted Te Miro Water (TMW) to provide technical advice on the stormwater and flood hazard planning for Variation 3. I have undertaken or supervised the completion of this work and produced a report titled "Waikato District Council Variation 3 Technical Review: Stormwater; Tuakau, Pookeno, Huntly and Ngaaruawaahia", dated May 2023.

CODE OF CONDUCT

6. I have read the Environment Court Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023 and agree to comply with it. I confirm that the opinions expressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

SCOPE OF MY EVIDENCE

7. My evidence addresses the following:
- (a) Stormwater and urban environments;
 - (b) Key controls and rules in the Proposed District Plan (before the incorporation of the MDRS);

- (c) Potential for adverse stormwater effects to arise from the introduction of the MDRS;
- (d) Overview of the modelling work undertaken to support Variation 3, including a summary of the outcomes relating to stormwater network capacity, stormwater quality and stormwater flooding;
- (e) Stormwater controls supported as a result of the modelling work;
- (f) Response to submission points related to stormwater;
- (g) Recommended amendments to Variation 3.

EXECUTIVE SUMMARY

- 8. The main contributing factor to adverse stormwater effects is the increase of infilling in the flood plain and overland flow paths from the increase in building footprints.
- 9. In my view, the MDRS (Variation 3) will push developers to utilise the maximum building footprints allowable (and impervious areas). Increased intensification will increase contamination loading and reliance of treatment devices.
- 10. Without a robust district plan framework, increased intensification may reduce available land area needed to ensure stormwater is managed to align with 'Te Ture Whaimana' and 'Te Mana o te Wai'.
- 11. Increased flooding can increase erosion and sediment mobilisation. Increase sedimentation decreases water quality in the receiving environments (Waikato and Waipā Rivers).
- 12. In my view the current permitted activity stormwater rule provides Council with limited ability to check compliance with their Stormwater

Discharge Consents conditions which include treatment, detention and extended detention requirements.

13. Outside of the flood plain and overland flow paths, increased intensification will have a limited effect on stormwater (flooding and water quality).
14. The use of the building coverage rules may be suitable for aspects of development outside of stormwater, however in my view, adoption of a national average does not take into account flood risk or property/environmental specifics allowing the Council to ascertain the effects of the development on stormwater and flooding.
15. Ideally, I would recommend that all permitted MDRS rules in Variation 3 are revised to exclude properties that are within the flood plain and overland flow paths as shown in the mapping we have completed. Properties within the flood plain can still be developed provided the consenting process and a robust assessment of effects is undertaken by a suitably qualified person.
16. I recommend that Council further consider the impact of urban development on the principles in 'Te Ture Whaimana' and 'Te Mana o te Wai' and how the principles of these will be given effect to (specifically the restoration of water quality in the receiving environment including the Waikato and Waipā rivers and their tributaries).
17. My preference would be for Variation 3 to avoid all development in the modelled high risk areas, and for a consent to be required for development or subdivisions in all other areas within the flood plain and/or overland flow paths. I understand however, that changes to existing plan rules, cannot be achieved through this process, so I have recommended a plan change is undertaken. In the absence of the ability to implement my preferred recommendations for Variation 3, I support the provisions proposed by Ms Huls and Ms Hill.

STORMWATER AND URBAN ENVIRONMENTS

18. Managing stormwater is a critical part of urban development. Below I set out the fundamental principles of stormwater management, these principles form part of the Waikato Regional Council Stormwater Guidelines and are key components of comprehensive stormwater discharge consents. In turn, these concepts should be reflected in the management of stormwater on a site-by-site basis in a district plan.
- (a) **Detention** – following development the level of runoff from a property should match the existing runoff rates. Capture and slow release of stormwater generally via a tank system can be used for both extended detention, flood detention and reuse.
 - (b) **Treatment** – of driveway or any contaminant loading surface. This is usually via a raingarden or treatment swale.
 - (c) **Conveyance** – usually via a piped network or swale. Swales are not common for small lot subdivisions as they require space, however they can double as a treatment device if vegetated.
 - (d) **Disposal** – can be either discharge to a piped network, waterway, open channel or soakage to ground (ground water recharge). Soakage is the preferred approach because this closer mimics the pre-development environment and reduces the increase in downstream flows and its effects, but soakage availability and implementation varies across the district.

Stormwater Quality

19. Treating stormwater is an important part of stormwater management for the district. The Council has comprehensive stormwater consents in place for each of the four towns in Variation 3, and each consent has conditions relating to the quality of stormwater discharges. In my view,

the district plan requirements for site specific development should be drafted to assist the Council to comply with these consent standards.

20. The water quality treatment requirements for stormwater are based on first flush principles where the initial storm event transports the highest contamination load and therefore is targeted for treatment (1/3 of the 2 year ARI rainfall events). Treatment is required to remove a percentage of suspended solids, heavy metals, hydrocarbons and provide a stable pH.
21. It is challenging finding balance between large single treatment devices like wetlands and multiple smaller devices like raingardens in terms of maintenance, health and safety and achieving the required treatment. In terms of infill development and intensification, onsite devices are the only practical solution as there are very few existing stormwater treatment systems designed (or space to retro-fit) to manage infilling and intensification across the district. However, these onsite systems have many challenges in terms of being maintained by private owners and the Council's ability to check they are operating as designed to ensure discharge consent compliance.

Stormwater Quantity

22. Flooding is managed by the principle of requiring stormwater flows from a site to match existing (pre-development) flows for certain design rainfall events.
23. Under the Waikato Regional Infrastructure Technical Specifications (RITS) this requirement is increased to 80% of predevelopment flows if there is existing flood issues in the area, which is common in the Waikato District. In some specific cases flood modelling has shown that additional flow reduction is required to manage flooding when physical conveyance controls are not possible or financially prohibitive (for example in Pookeno's upper catchment 70% of pre-development flow is required as outlined in the Catchment Management Plan).

KEY CONTROLS AND RULES IN THE PDP (BEFORE THE INCORPORATION OF THE MDRS)

24. As part of our technical review, I reviewed the existing provisions in the PDP to assess how effective these are at achieving the stormwater management principles set out above.

Building standards

25. Both the existing General residential zone (GRZ) and the Medium density Residential Zone (MRZ) contain building standards related to stormwater management. These include:
- (a) **Fences and walls:** Rules GRZ-S7 and MRZ-S4 outline the requirements/ restrictions for fences and walls between a GRZ site and road boundary or open space zone, or a MRZ site and a road boundary. While this standard is primary related to amenity, fence and wall positions and types can have a significant impact on flood effects. If a fence or wall is located within an overland flow it can reduce the conveyance of stormwater and cause additional flooding depth and flooded areas.
 - (b) **GRZ building coverage:** building coverage in the GRZ is limited to a maximum of 40%. Building coverage impacts are influenced by the property's location and whether it is inside or outside of the flood plain. Building coverage rules can enable filling to establish foundations. Filling within the flood plain offsets flood volumes which can increase the depth and the area of flooding on and around a development. The current level of 40% has resulted in flooding issues across the district. Increasing this percentage will increase the flooding (effects will vary based on location).

- (c) **MRZ building coverage:** building coverage in the MRZ is limited to a maximum of 45%. The impact of building coverage is explained above.

- (d) **Impervious areas:** Both the GRZ (S13) and MRZ (S10) limit impervious area coverage to 70%. Impervious areas directly affect the runoff volume and peak flows relating to a development. Additional paved/hardstand areas used for motor vehicles also capture and convey contaminants to the stormwater network/system. Paved and hardstand areas also result in a reduction in vegetation. Vegetation plays an important role in stormwater treatment. I support the 70% impervious area standard because it provides 30% of pervious areas that assists with stormwater management by;
 - (i) Slows down runoff flows;
 - (ii) Enables soakage;
 - (iii) Provides ground water recharge;
 - (iv) Provide vegetation for informal treatment, and
 - (v) Provides space to manage overland flow paths.

- (e) **Setbacks from boundaries (yards):** The GRZ (S17) and MRZ (S10) require setbacks of 3m from a road boundary and 1.5m and 1m respectively from every other boundary. While these standards generally relate to amenity and road safety the setbacks can provide space for stormwater conveyance but are only relevant if the development is within the flood plain and/or an overland flow path.

- (f) **Setbacks from water bodies:** the GRZ (S22) and MRZ (S13) require building setbacks from water bodies, these setbacks protect the riparian areas which assist with water quality outcomes in the water bodies.

- (g) **MRZ three residential units:** The MRZ allows 3 residential units per site as a permitted activity. In my view this rule encourages the use of the maximum allowable building coverage of a site (45%) and impervious surface area (70%). If a site is located within a flood plain or contains an overland flow path, infilling for construction for three units could have adverse effects through increased flood levels and increased flood extent. Earthworks within 1.5m of overland flow path would trigger the need for a resource consent, and the definition of overland flow path would capture areas within a flood plain.

Stormwater rule WWS-R1

- 26. The PDP contains a permitted activity rule (WWS-R1) for stormwater systems for new development or subdivision. My advice to Council as set out in my report has been that many of the standards within this permitted activity rule are difficult to show compliance with and therefore enforce. While a permitted activity rule may be appropriate for areas outside identified flood plains, my recommendation is to exclude activities that have potential to have adverse effects on stormwater (quality and quantity) from the permitted activity rule. This recommendation would ensure that an assessment of effects can be undertaken and decisions made that prioritise fresh water (as per Te Mana o te Wai objectives). This assessment can occur through a consenting process at Council.

- 27. In my view, while the rule refers to the stormwater principles I identified above, I have concerns about:

- (a) **Soakage Techniques** – the rule outlines soakage criteria and references the building code. The building code method for determining the design soakage rate is known to over-estimate design soakage rates by up to 10 times and is considered not fit for purpose. Many Councils across NZ have issued engineering standards to remedy this. The impact of over estimating infiltration rates is undersized soakage basins/chambers which are unable to dispose of stormwater to meet the required levels of service. This can create flooding and increase surface flows.
- (b) **Stormwater management** – the requirement for treatment, downstream effects, and management of scour and cumulative effects are not worded correctly and does not adequately cover the requirements of the stormwater discharge consents across the district.

Site-specific rule – Huntly north

- 28. There is site specific rule (GRZ-R14) related to a wetland in Huntly north, the rule restricts building within the wetland footprint. This rule protects the wetland and its function (detention and treatment of stormwater) from future development, and I understand these protections will continue to apply in Variation 3.

Summary

- 29. As set out above, I have concerns about the way in which the PDP (before the introduction of Variation 3) manages stormwater in flood plain and overland flow path areas. In particular, I consider that development or subdivision within a flood plain or overland flow path should require a technical assessment (as per the current land use/subdivision consenting process). I understand that there is limited ability to address these concerns through the Variation 3 process, but have made recommendations to Council, nevertheless.

POTENTIAL FOR ADVERSE STORMWATER EFFECTS TO ARISE FROM THE INTRODUCTION OF THE MDRS

30. The main contributing factor to adverse stormwater effects is the increase of infilling in the flood plain and overland flow paths from the increase in building footprints. Infilling within the flood plain and/or overland flow paths will offset available flood storage which increases flooding levels and extent (therefore increasing flood risk).
31. Infilling of flood plains and overland flow paths results in cumulative effects as there may only be a small impact if one lot infills within the flood plain, however when multiplied over large urban areas, the results become significant.
32. The MDRS includes the following standards that can impact on stormwater:
 - (a) Maximum building coverage of 50%
 - (b) Three units per site; and
 - (c) No minimum lot size for subdivision undertaken with the development of three units.
33. The MDRS also provides the potential for more people and property to be located within flood hazard areas. In my opinion it is not appropriate for development to be located within a high risk flood hazard areas.

Building coverage

34. The MDRS will push developers to utilise the maximum building footprints allowable (and impervious areas), to obtain three residential units on existing sites. I understand that the 50% building coverage control was selected because it is used in a number of medium density zones in New Zealand, however I have not been able to locate any

assessment of whether 50% building coverage is appropriate in an identified flood plain. I accept as a general standard 50% is likely to be appropriate for large areas of residential zones throughout the country but in my view, no justification has been provided for the appropriateness of the 50% building coverage in a flood plain.¹

35. The use of the building coverage rules may be suitable for aspects of development not related to stormwater, however in my opinion, the adoption of 50% is not suitable for assessing and managing stormwater effects, as this is a national average and does not take into account flood risk or property and environmental context. For example, two neighbouring properties can have completely different impacts on flooding depending on their location and proximity to the flood plain. A rule that assigns the same level of risk for both properties without a detailed assessment is not suitable, in my view, or representative of impact or effects. I do not consider this aligns with the sustainable management purpose of the RMA.

Three units per site

36. As I set out above, in my view allowing three units per site encourages the use of the maximum allowable building coverage of a site (50%) and impervious surface area (70%). If a site is located within a flood plain or contains an overland flow path, infilling for construction for three units could have adverse effects through increased flood levels and increased flood extent.

No minimum lot size

37. I understand that the MDRS allows for subdivision around existing units or in conjunction with three units without a minimum lot size. As set out in my report, smaller sites with intensified development can result in:

¹ [DepartmentalReport \(www.parliament.nz\)](http://www.parliament.nz) See page 45 of the Departmental Report on the Resource Management (Enabling Housing Supply and Other Matters) Amendment Bill.

- (a) No room to manage significant overland flow paths (>2m wide);
- (b) Specific designs being required to fit water tanks and raingardens;
- (c) No space for disposal via soakage unless driveways are used (and this makes maintenance difficult).
- (d) Requires on lot mitigation which has common issues including;
 - (i) Limited maintenance undertaken by land owner;
 - (ii) Difficult for Council to check if management systems are still working as required;
 - (iii) Encourages the use of systems that are difficult to access, maintain and replace (i.e. under house or driveway tanks or soakage);
- (e) Utilises most of the site for building requiring more earthworks (increases likelihood of infilling);
- (f) Increases driveway areas requiring treatment and vehicles per day on shared driveways (not relevant for pedestrian only developments/no on lot parking).
- (g) Decreases the vegetation and impervious areas.
- (h) Increases runoff for larger storm events than designed for (i.e. >100 year ARI); and
- (i) Places more people in flood risk areas and increases additional people and vehicular movements during extreme rainfall events.

Water quality and quantity

38. Increased intensification will increase contamination loading and reliance on treatment devices. Increased flooding can increase erosion and sediment mobilisation. Increase sedimentation decreases water quality in the receiving environments (Waikato and Waipā Rivers).
39. The current permitted activity stormwater rule provides Council with limited ability to require outcomes that assist with compliance of Council's Stormwater Discharge Consent conditions which include treatment, detention and extended detention requirements. With the MDRS in place, this will increase the permitted activities and further reduce Council's ability to ensure developments comply.
40. Development within the flood plain and overland flow paths, can be delivered successfully, but it requires a suitably qualified person to assess the effects and check mitigation of effects (if any) is achievable. This is a complex assessment that may require a detailed flood model using specialised software. My concern is that any permitted activity will not provide the mechanism for the Council to adequately check compliance and control infilling of the flood plain. This has the potential to result in significant increases in flood risk for people and property.

Outside flood plain and overland flow paths

41. Outside of the flood plain and overland flow paths, intensification under MDRS will have a limited effect on stormwater (flooding and water quality).

ADDITIONAL STORMWATER MODELLING

42. As stormwater flood hazard maps are not included in the PDP for Tuakau, Pookeno, Huntly or Ngaaruawaahia, the Council commissioned TMW to undertake rapid flood hazard modelling for each of these towns. Some existing models were available, however these did not utilise the most up

to date LIDAR (ground surface) or hydrological data (climate change predictions). Also, most of the existing models did not cover the urban areas as they concentrated on the main watercourses.

43. Each new rapid flood hazard model utilised the 2022 LIDAR and the latest climate change predictions available from HIRDS version 4 (High Intensity Rainfall Design System) utilising RCP 6.0 climate change factor.
44. Sections of the existing stormwater network were also inputted into the model to represent the piped conveyance. This was undertaken for areas where the pipe network was likely to affect flooding to more accurately represent the actual flood risk. This was limited to pipes greater than 300mm in diameter.
45. The results of the flood hazard mapping are provided in Appendix A of the Te Miro Water: Waikato District Council Variation 3 - Technical review Stormwater. The results show the extent of flooding in the four towns modelled. This shows the following;
 - (a) There are existing flood issues in all towns in terms of flood affected properties and roads; and
 - (b) Some developments have encroached on the natural waterway systems and increased the flood extents in adjacent areas.
46. Additional refinement is still being undertaken on the flood models. This refinement includes: infilling of artificial ponding areas caused by the LIDAR processing, additional checks on the pipe network utilised, and analysis of 'high risk' flood hazards. This work is currently being undertaken and expected to be completed by the end of July 2023.

AMENDMENT TO VARIATION 3 TO ADDRESS STORMWATER

47. I understand that as a result of the TMW report Ms Huls and Ms Hill propose the following amendments as part of Variation 3 to assist with stormwater and flood hazard management:

- (a) In the high risk flood areas identified by TMW, two or more residential units will be a non-complying activity;
- (b) In the flood areas identified (but outside the high risk areas), the following standards will apply:
 - (i) Only one residential unit will be permitted, with two or more requiring resource consent;
 - (ii) all residential units to comply with a minimum freeboard requirement of 0.5m above the 1% AEP;
 - (iii) Building coverage will be limited to 40%;
 - (iv) Setbacks are proposed to be 3m for frontage and 1.5m for all other boundaries; and
 - (v) Minimum lot size of 450m².

48. I support these amendments.

High risk hazard areas

49. In my opinion all development within a high risk flood area would be limited, not just two or more residential units. I accept that there are legal hurdles to achieving this outcome through Variation 3.

50. In the PDP and in accordance with the Waikato Regional Policy Statement, high risk flood areas are defined as areas where the depth of flooding (metres) and velocity of the flood waters (metres per second)

multiplied together are greater than one. This means that flood depths of 0.9m in depth with a velocity of 0.9m/s would not be classified as high risk. This is concerning to me, as this depth and velocity will cause an extreme hazard to pedestrians (especially children) and to some vehicles. This type of flooding does not enable easy passage or movement of people within these areas (including emergency services access). A commonly used international standard (as adopted recently by Tauranga City Council) for assessing flood risk places a high flood hazard rating at significantly less depth and velocity than specified (refer to the stormwater technical report).

51. For this reason, I support a more conservative approach being taken to allowing development to occur within the identified flood plains.

Development in other areas of the identified flood plain

52. Given my concerns about the current permitted activity rules for stormwater management, my preference would be to require a consent for all residential development within the flood plain or overland flow paths. Development of these properties can still occur, with the consenting process ensuring a robust assessment of effects by a suitably qualified person.
53. In the absence of a full consented process (or similar that enables actual effects to be managed), I agree that the proposed controls will assist with stormwater management as these reduce the need for developments to maximise the building coverage and impervious areas. This will reduce the effects these rules will have on flood risk. My reasons for supporting the standards are:
 - (a) Only one residential unit being permitted, with two or more requiring consent, will reduce the need to utilise the full building coverage area. Additional units will trigger the consent process which will require an assessment of effects.

- (b) All residential units to comply with a minimum freeboard requirement of 0.5m above the 1% AEP. This rule aligns with the existing level of services provisions in the WRC guidelines and the RITS. It should apply to all housing developments and hence including this in the Variation 3 rule will assist with compliance.
- (c) Building coverage will be limited to 40%; as above this enables room to manage flooding and overland flow paths.
- (d) Setbacks are proposed to be 3m for frontage and 1.5m for all other boundaries will assist by leaving room to manage flood plains and overland flow paths along the frontage and road reserves.
- (e) Minimum lot size of 450m². This assists to provide room to manage (offset) infilling of the flood plain and manage overland flow paths.

RESPONSE TO SUBMISSIONS

54. I have read all the submissions on Variation 3. A number of the submissions mentioned below discuss the importance of stormwater management and giving effect to Te Ture Whaimana and Te Mana o te Wai. I generally agree with the reasoning provided in these submissions. Below I respond to the specific relief being sought in the submissions raising stormwater concerns.

Waikato Regional Council

55. I have reviewed and agree with the following statements:

"Clarify whether the need for additional provisions to restore and protect the health and wellbeing of the Waikato River has been investigated given the additional intensification enabled by the variation. Amend objectives, policies, and rules to better give effect to Te Ture Whaimana, if required".

SUB-R153 "We query whether further amendments to SUB-R153, including matters of discretion, are needed to give effect to Te Ture Whaimana in relation to managing stormwater effects associated with intensification." - "Consider adding a new matter of discretion relating to stormwater management." I understand that additional matters of discretion have been recommended in the s42A report.

MRZ2-S10 "We support the retention of the maximum impervious surface standard to reduce adverse effects of additional stormwater run-off associated with intensification" - "Add new matter of discretion to MRZ2-S10(2) relating to effects on waterways and/or the use of low-impact design technologies." I agree, and this standard is proposed to remain.

"If the variation is approved it is appropriate to include additional matters including matters of discretion to reduce the adverse effects of additional stormwater run-off associated with intensification." I agree with this submission point and it is included as one of my recommendations and in the s42A report.

"If the Variation is approved it is appropriate to include additional provisions relating to infrastructure capacity constraints to address the effects of urban intensification." I agree with this statement and in relation to stormwater, this is included in my recommendations.

Anna Noakes and MSBCA Fruhling Trustee's Company Ltd

"If the Variation is approved then the stormwater management provisions throughout the PDP ought to be amended to ensure that such adverse stormwater effects on properties downstream of proposed development are appropriately, avoided remedied or mitigated" I agree and recommend the District Plan is updated, and if this cannot be achieved through the Variation 3 process, that a separate plan change is pursued.

"The PDP should take a consistent approach to stormwater management across the entire plan and that the stormwater management provisions in all chapters should be amended accordingly." I agree with this statement which aligns with my recommendations.

Waikato District Council

56. I have reviewed this submission and agree with the following statement *"Infrastructure within the district has not been specifically planned for the level of intensification that would be enabled by Variation 3."* In terms of stormwater the historic design standards (2 and 5 year ARI rainfall scenarios for network sizing) did not enable the current level of service (10 year ARI rainfall). Refer to the network analysis outlined in the stormwater technical report – Appendix A network maps.

Ngati Naho Trust

57. I have reviewed this submission which outlines the requirements of Te Mana o te Wai principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater, and these principles inform this National Policy Statement and its implementation. As set out in my report and this statement of evidence, I agree with the submission that the PDP and Variation 3 do not adequately align with the NPS-FM and the concept of Te Mana o te Wai.

Te Whakakitenga o Waikato Incorporated

58. I have reviewed this submission and its comments relating to stormwater are around the alignment with 'Te Mana o te Wai' and are covered by the previous submitter's comments.

CONCLUSION

59. My preference would be for Variation 3 to avoid development in the modelled high risk areas, and for a consent to be required for development or subdivisions in all other areas within the flood plain and/or overland flow paths. I understand however, that changes to existing plan rules, along with amendments, cannot be achieved through this process, so have recommended a plan change is undertaken along with the above recommended changes to the Variation 3 rules. In the alternative, if Variation 3 is to be accepted without my recommendations, I support the provisions proposed by Ms Huls and Ms Hill.
60. I also recommend that the Council consider the following outside of Variation 3:
- (a) Regular updates to the flood hazard maps (ideally without having to undertake a plan change) would be advantageous as this would enable the maps to be updated when new data (LIDAR, hydrological, climate change, routing/network) is available;
 - (b) As set out in my report, whether additional amendments are required to give effect to 'Te Ture Whaimana' and 'Te Mana o te Wai' and how the principles of these will be implemented through urban development (specifically the restoration of water quality in the receiving environment, including the Waikato and Waipā rivers and their tributaries).
 - (c) Depending on the outcome of the PDP appeals process, better alignment between the PDP with the Council's Stormwater Discharge Consent conditions and to reduce ambiguity and make the rules easier to understand and comply with.

Andrew Boldero
20 June 2023