BEFORE AN INDEPENDENT HEARING COMMISSIONER APPOINTED BY THE WAIPĀ DISTRICT COUNCIL

IN THE MATTER of the Resource Management Act 1991 (the **Act**)

AND

IN THE MATTER of Private Plan Change 35: Te Awamutu Large Format Retail Centre to the Waipā District Plan (**PPC 35**)

STATEMENT OF EVIDENCE OF CONSTANTINOS FOKIANOS ON BEHALF OF 638 LIMITED

(THREE WATERS)

Dated: 27 July 2026

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BROOKFIELDS
LAWYERS

1. SUMMARY OF EVIDENCE

1.1 My full name is Constantinos Fokianos. I am the Water Resource Engineering Manager at Bloxam Burnett & Oliver Ltd (**BBO**), a multidisciplinary consultancy based in Hamilton, specialising in stormwater engineering, flood hazard assessment, hydrological modelling, and urban drainage design.

1.2 My evidence is given on behalf of 638 Limited (the **Applicant**), which seeks Private Plan Change 35: Te Awamutu Large Format Retail Centre to the Waipā District Plan (**PPC 35**). My evidence relates to the three waters aspects of PPC 35.

1.3 In summary, I consider that there are no civil engineering or three waters impediments that would prevent the rezoning of Area B. The proposed finished floor level of RL 48.5 m provides approximately 770 mm freeboard above the updated 1% AEP flood level of RL 47.73 m, exceeding the District Plan minimum, while the supplementary modelling demonstrates no increase in flood levels across the broader Mangaohoi Stream floodplain and no material increase in downstream flows. The proposed stormwater treatment and attenuation system is feasible, with the remaining local grading, wetland and overland-flow matters appropriately addressed through resource consent and detailed design. Water and wastewater connections are also technically feasible, subject to confirmation of network capacity and the usual approvals. Although the current Te Awamutu water-supply constraint may affect timing, it does not prevent the rezoning.

2. INTRODUCTION

2.1 My evidence addresses the three waters aspects of PPC 35.

2.2 I am familiar with the PPC 35 area and its surrounds through my preparation of the civil and three waters assessments, my review of the relevant flood modelling, and my involvement in technical discussions with Waikato Regional Council (**WRC**). I undertook a site visit on 20 June 2023.

2.3 My evidence should be read in conjunction with the expert planning evidence of Rachelle Hui.

3. QUALIFICATIONS AND EXPERIENCE

3.1 I hold a Master of Civil Engineering from the Democritus University of Thrace, Greece (awarded in 2003). I also undertook post-graduate studies on Hydraulic Engineering at the same university.

3.2 I am a Member of Engineering New Zealand and a Member of Water New Zealand.

3.3 I have been working in the water resource engineering field since 2005, and have over 20 years of professional experience in the planning, design, and delivery of water infrastructure projects in New Zealand and overseas.

3.4 I have provided a wide range of consulting, design, and modelling services for infrastructure and development projects. I have also provided peer reviewing services for Waikato Regional Council and Waikato District Council.

3.5 My expertise includes:

(a) Catchment hydrology and hydraulic modelling, including advanced 1D/2D modelling using TUFLOW, HEC-RAS, and EPA-SWMM.

(b) Stormwater management planning and design, including integrated catchment management planning and compliance with regional and national guidelines.

(c) Flood hazard identification and mitigation, including model development, verification, and technical review for both regulatory and development purposes.

(d) Civil infrastructure design and consenting, balancing resilience, regulatory compliance, and development feasibility.

3.6 I currently hold the position of Water Resource Engineering Manager at BBO. I have been working for BBO since 2017.

4. CODE OF CONDUCT

4.1 I have read the Code of Conduct for Expert Witnesses outlined in the Environment Court's Practice Note 2023 (**Code**) and have complied with it in preparing this evidence. I also agree to follow the Code when presenting evidence at the Independent Commissioner Hearing. I confirm that the

issues addressed in this brief of evidence are within my area of expertise, except where I state that I rely upon the evidence of other expert witnesses. I also confirm that I have not omitted to consider material facts known to me that might alter or detract from my opinions.

5. SCOPE OF EVIDENCE

5.1 This statement of evidence covers the following:

(a) A summary of my evidence (see **Section 1** above);

(b) **Section 6:** Involvement in this project;

(c) **Section 7:** Site description and conditions;

(d) **Section 8:** Stormwater management;

(e) **Section 9:** Water supply servicing;

(f) **Section 10:** Wastewater servicing;

(g) **Section 11:** Matters raised in submissions;

(h) **Section 12:** Matters raised in the section 42A report;

(i) **Section 13**: Conclusion.

6. INVOLVEMENT IN THIS PROJECT

6.1 I prepared the *General Civils & Three Waters Report* for the Applicant dated September 2025 (**Report**).[1] My evidence focuses on the three waters matters addressed in the Report. I confirm the Report in relation to those aspects of PPC 35, subject to the further matters addressed in this statement of evidence.

6.2 The Report also considered general civil works, including earthworks and site formation, and the availability of utilities and services, including power, telecommunications and gas. I understand that no issues arise in relation to those matters, and accordingly I do not address them further in this evidence. However, I confirm the matters discussed in sections 6 and 7 of the Report in relation to those topics, including the Report's conclusions that standard civil works can be undertaken to develop the site, that the necessary utility

[1] Appendix F to the Private Plan Change Request – General Civils and Three Waters Report dated September 2025.

services can be provided subject to detailed design and the usual network provider approvals, and that there are no civil engineering impediments arising from those matters that would preclude the rezoning sought by PPC 35.

6.3 Following lodgement of WRC's submission, I reviewed flood information prepared by Te Miro Water attached as Appendix 1 to WRC's submission.

6.4 I subsequently prepared the Supplementary TUFLOW Floodplain Assessment dated June 2026 (**Supplementary Assessment**). This assessed the effects of developing Area B under the wider Mangaohoi Stream floodplain conditions identified by WRC.

6.5 The Supplementary Assessment was refined following discussions with WRC. The final model used time-varying upstream and downstream boundary conditions based on information provided by WRC and Te Miro Water, a 48-hour simulation, an expanded rain-on-grid area and a downstream flow check.

6.6 I have **attached** a copy of the Supplementary Assessment as **Annexure A**.

6.7 My evidence relies on that final effects assessment and WRC's subsequent response. I do not seek to revisit the merits of the wider Te Miro regional flood model.

6.8 BBO also prepared comparative water and wastewater calculations using RITS assumptions and water-meter information supplied by Waipā District Council. Those calculations are included in Appendix F of the Report.

7. SITE DESCRIPTION AND CONDITIONS

7.1 Area B comprises approximately 4.05 ha at 638 Cambridge Road. It adjoins the existing Te Awamutu Large Format Retail Centre and is proposed to accommodate a building improvement centre and associated café. Proposed Rule 6.4.2.22.a provides for a maximum aggregate gross floor area of 13,000 m² within Area B.

7.2 The land generally falls from approximately RL 48.5 m in the northeast to RL 46.0 m in the southwest. Surface runoff and overland flows travel toward the southern and western parts of the site and the Mangaohoi Stream floodplain.

7.3 Part of Area B is affected by the 1% AEP floodplain. Development therefore requires appropriate building levels, stormwater treatment and attenuation, management of overland flows, and careful grading where the development ties into surrounding land.

7.4 The Report referred to the site-focused flood level available when it was prepared. Following engagement with WRC, the concept plan was updated to show the Te Miro pre-development 1% AEP flood level of RL 47.73 m.

7.5 The proposed finished floor level remains RL 48.5 m. This is approximately 770 mm above the updated flood level.

7.6 The section 42A report records at paragraph 4.4.7 that operative Rule 15.4.2.14 requires building platforms within or adjoining a Flood Hazard Area identified on the Planning Maps to be capable of achieving at least 500 mm freeboard above the 1% AEP flood level. The proposed finished floor level exceeds that minimum by approximately 270 mm.

7.7 Final finished floor levels, ground levels and boundary grading will be confirmed through detailed survey and design. Based on the available information, the required freeboard can be achieved.

8. STORMWATER MANAGEMENT

8.1 Area B presently has limited formal stormwater infrastructure. Runoff generally travels as sheet flow across grassed land. The site is also affected by overland flows entering from the north and east.

8.2 The proposed stormwater concept includes roof-runoff retention, raingardens, a treatment swale, stormwater reticulation and a treatment wetland with detention storage.

8.3 The wetland concept provides approximately 4,400 m^3 of attenuation storage. It is intended to treat and control runoff generated by the development. Its final size, levels and outlet arrangement will be confirmed during detailed design.

8.4 The original site-focused modelling compared existing climate-adjusted and post-development peak discharges. For the 2-year, 10-year and 100-year events, the existing climate-adjusted discharges were 0.110 m^3/s, 0.219 m^3/s and 0.646 m^3/s respectively. The corresponding proposed development discharges were 0.077 m^3/s, 0.152 m^3/s and 0.413 m^3/s.

8.5 Those results demonstrate that the stormwater concept can limit post-development peak discharge below the corresponding pre-development climate-adjusted peak discharge for the assessed events.

8.6 WRC requested a wider assessment of floodplain effects. The Supplementary Assessment therefore included the wider Mangaohoi catchment, updated upstream and downstream boundary conditions, and the proposed filling and development of Area B.

8.7 The proposed and reference scenarios were assessed using the same boundary conditions. The model predicts less than 1 mm change in flood level across almost all of the wider floodplain, including at the western wetland interface.

8.8 At the downstream assessment line, the reference peak flow was approximately 121.72 m^3/s and the proposed development peak was approximately 121.52 m^3/s. The model therefore predicts no material increase in downstream peak flow.

8.9 Localised increases of up to approximately 20 mm are predicted near parts of the northern boundary and eastern access road. These arise where the planning level development surface ties into existing ground.

8.10 In my opinion, these local effects can be addressed through detailed survey, boundary grading and measures to intercept or convey external overland flows. They do not require a fundamental change to the proposed development.

8.11 During a major Mangaohoi Stream flood, the proposed wetland may be inundated from the wider floodplain. Its local treatment and attenuation functions may therefore be reduced during such an event. The wetland is intended to manage runoff generated by Area B and is not intended to attenuate the wider regional river flood.

8.12 At the resource consent stage, the wetland's initial water level, outlet configuration, downstream backwater effects, likely frequency of river inundation, maintenance requirements and the management of local runoff during a wider river flood should be refined.

8.13 These are detailed design matters. They do not alter my conclusion that the development can proceed without increasing flood levels across the broader floodplain or materially increasing downstream flows.

9. WATER SUPPLY SERVICING

9.1 An existing 200 mm public water main is located along Cambridge Road. It provides a practical connection point, subject to confirmation of network capacity and approval from the network operator.

9.2 Using the updated 13,000 m² building concept, the Report estimated an average daily potable demand of approximately 7.8 m³/day and a peak hourly domestic demand of approximately 1.63 m³/hour.

9.3 Earlier calculations prepared in March 2024 used the then-proposed GFA of 10,200 m². Those calculations estimated 7.956 m³/day using the RITS Business Zone method and 11.318 m³/day using an extrapolation from the existing store's maximum recorded daily use of 6.813 m³/day.

9.4 The earlier meter-based figure was a sensitivity estimate rather than a final design demand. The meter readings were not dated and the proposed nursery floor area had not been confirmed. Nursery irrigation may materially affect water use at a building improvement centre.

9.5 The earlier figures should not be directly applied to the updated 13,000 m² building without reconsidering the final building configuration and water uses. They nevertheless provide useful context for the plan-change assessment.

9.6 By comparison, residential development of the full 4.05 ha site was estimated to require approximately 47.385 m³/day.[2] The available calculations therefore indicate that the proposed commercial activity would use materially less water than full residential development of Area B.

9.7 Firefighting demand will depend on the final fire-cell arrangement and fire-engineering design. Final hydrant flows, residual pressures and any on-site storage or pumping requirements will be confirmed during detailed design.

9.8 I acknowledge that damage to the Te Tahi Water Treatment Plant has resulted in a current water supply capacity constraint across Te Awamutu,

[2] This figure is an indicative, coarse comparison based on a notional residential yield across the full site, rather than a specific residential layout or design assessment.

Kihikihi and Pirongia. New connections are being managed until capacity is restored.

9.9 This constraint may affect the timing of the development. It does not create a site-specific engineering reason to decline the rezoning. The development cannot operate until an adequate and approved domestic and firefighting water supply is available.

10. WASTEWATER SERVICING

10.1 An existing 150 mm public gravity wastewater main is located near the northern boundary along Cambridge Road. It provides a practical connection point, subject to detailed design, capacity confirmation and network approval.

10.2 Using the updated occupancy and water use assumptions in the Report, the estimated average daily wastewater flow is approximately 6.24 m³/day. The corresponding peak hourly flow is approximately 0.65 m³/hour, or 0.18 L/s.

10.3 Appendix F contains earlier calculations for the then-proposed 10,200 m² building. Those calculations produced a RITS average daily flow of 8.42 m³/day and peak wet-weather flow of 0.78 L/s, and a meter-based average daily flow of 11.00 m³/day and peak wet weather flow of 1.00 L/s.

10.4 The different results arise from different occupancy, infiltration, peaking and meter extrapolation assumptions. They provide a reasonable range for the plan change assessment rather than a final design flow.

10.5 Residential development of the full site was estimated to generate an average daily wastewater flow of approximately 45.56 m³/day and a peak wet weather flow of approximately 2.70 L/s.[3] Even the higher commercial sensitivity estimate is materially below the corresponding residential flow.

10.6 The final wastewater flow, connection level, pipe gradients and downstream network capacity will be confirmed during detailed design. I have identified no wastewater constraint that would prevent the rezoning.

[3] As with the water demand comparison in paragraph 9.6, this figure is an indicative, coarse comparison based on a notional residential yield across the full site, rather than a specific residential layout or design assessment.

11. MATTERS RAISED IN SUBMISSIONS

11.1 WRC's submission sought clarification of the applicable 1% AEP flood level and climate change assumptions, the upstream and downstream model boundaries, the effects of filling Area B on the wider floodplain, and possible changes in downstream flow.

11.2 These matters were addressed through the Supplementary Assessment and subsequent technical engagement.

11.3 On 17 June 2026, WRC's senior engineer advised that the development would not increase flood levels across the broader floodplain or materially increase downstream flows. WRC also considered the modelling sufficiently robust for the plan change process.[4]

11.4 On 22 June 2026, WRC confirmed that the concerns raised in its submission had been addressed.[5]

11.5 The submission by Jay E L Limited and Park Road Holdings Limited sought management of stormwater and flooding effects with no upstream or downstream effect in any storm.

11.6 In my opinion, an absolute no-effect test for every possible event is not technically realistic. I agree with the reporting planner's comment in this regard at paragraph 4.4.7 of the section 42A report. The appropriate engineering objective is to avoid or mitigate adverse effects and prevent increases in flood level across the broader floodplain or material increases in downstream flow.

11.7 The Supplementary Assessment and proposed planning controls provide an appropriate basis for meeting that objective.

12. MATTERS RAISED IN THE SECTION 42A REPORT

12.1 The section 42A report recommends that PPC 35 be approved subject to amendments. In relation to flooding and stormwater, the relevant recommendations are:

(a) adding flood hazards as a matter of control under Rule 6.4.1.2.a;

[4] Appendix 5 to section 42A report.
[5] Ibid.

(b) adding a flood performance standard under Rule 6.4.2.22.f;

(c) adding a flood mitigation assessment criterion under Rule 21.1.6.1.g;

(d) replacing the Te Awamutu Large Format Retail Centre Plan in Appendix S6; and

(e) making the associated consequential amendment to Rule 15.4.2.69.e.

12.2 I support the purpose of these amendments.

12.3 The proposed flood hazard matter of control under Rule 6.4.1.2.a enables Council to consider whether filling, platform elevation and other mitigation measures could increase flood risk beyond Area B.

12.4 Proposed assessment criterion 21.1.6.1.g addresses flood mitigation measures used to manage flooding and flood hazard effects beyond the boundaries of Area B. This provides an appropriate mechanism for assessing final platform levels, grading, overland-flow management and off site effects at the resource consent stage.

12.5 Proposed Rule 6.4.2.22.f currently states: *"No development on Area B shall result in flood levels across the broader flood plain for the Mangaohoi Stream or result in a material increase in flows downstream of Area B"*.

12.6 It appears that Proposed Rule 6.4.2.22.f is intended to manage two matters: flood-level effects within the broader Mangaohoi Stream floodplain beyond Area B, and flow effects downstream of Area B. I recommend that the rule provide that:

> "*No development within Area B shall materially increase flood levels beyond the boundaries of Area B within the wider Mangaohoi Stream floodplain, or materially increase flows downstream of Area B".*

12.7 I prefer that formulation because:

(a) This applies a consistent test to both parts of the proposed provision; and

(b) the modelling does not support the need for an absolute zero-increase standard.

12.8 Picking up on item (b) above, very small modelled changes may arise from modelling tolerance, localised grading assumptions or later detailed design refinement, without causing any meaningful hydraulic effect. Applying "materially" to both flood levels and downstream flows therefore better reflects the effects-based purpose of the rule and avoids a standard that could be failed by trivial or immaterial modelled changes.

12.9 Rule 6.4.2.22.e refers to stormwater management being *"designed to pre-development levels"*. In hydrological terms, I understand this to mean that post-development peak discharge rates should not exceed the corresponding pre-development peak discharge rates for the relevant design events.

12.10 Operative Rule 15.4.2.14 separately addresses minimum freeboard for building platforms within or adjoining a mapped Flood Hazard Area. As discussed above, the proposed RL 48.5 m finished floor level can achieve the required 500 mm freeboard above the updated 1% AEP flood level.

12.11 The current water supply capacity constraint should be managed consistently with other development in Te Awamutu. Subject to capacity being restored and the necessary connection approvals being obtained, it does not prevent the rezoning.

13. CONCLUSION

13.1 The proposed development can achieve the required flood freeboard and can be designed without increasing flood levels across the broader Mangaohoi Stream floodplain or materially increasing downstream flows.

13.2 The proposed stormwater system provides a feasible basis for managing runoff, water quality and local stormwater effects. The remaining wetland, boundary-grading and overland-flow matters can be addressed through resource consent and detailed design.

13.3 Water and wastewater connections are technically feasible, subject to final design, confirmation of network capacity and the relevant approvals.

13.4 The current water supply constraint may affect timing, but it does not create a site-specific engineering impediment to the rezoning.

13.5 Overall, I consider that there are no civil engineering or three waters impediments that would preclude approval of PPC 35, subject to the

recommended planning controls and the wording clarifications identified above.

Constantinos Fokianos
Dated 27 July 2026

ANNEXURE A

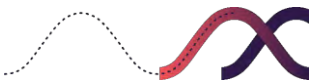
Supplementary TUFLOW Floodplain Assessment dated June 2026

638 Limited

638 Cambridge Road, Te Awamutu

Supplementary TUFLOW Floodplain Assessment

June 2026



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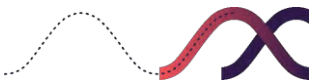

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1. Introduction

1.1 Purpose of this report

This report has been prepared by Bloxam Burnett & Olliver Ltd (BBO) to document the supplementary TUFLOW floodplain modelling undertaken for the proposed Mitre 10 Retail Centre at 638 Cambridge Road, Te Awamutu. The report has been prepared in response to the flood hazard matters raised by Waikato Regional Council (WRC) through its submission on Proposed Private Plan Change 35. WRC raised concern that the previous flood modelling information may not have fully represented the wider Mangaohoi floodplain condition, including the influence of the upstream Mangaohoi catchment and the potential for the proposed development to affect flood levels on neighbouring properties.

BBO has already prepared civil, three waters and flood modelling documentation for the proposed development. This report is not intended to repeat that previous assessment. The broader site description, stormwater design basis, local catchment assessment, drainage design and original modelling methodology are addressed in the earlier BBO documentation and are only referred to here where directly relevant to the supplementary modelling.

The purpose of this report is to describe the updated TUFLOW modelling undertaken to respond to WRC's flood hazard concerns and to assess the effect of the proposed development under a conservative regional floodplain test condition.

Following further discussion with WRC, the supplementary model has been further updated to include time-varying upstream and downstream boundary hydrographs, using the additional Te Miro model output information made available by WRC. The updated modelling has also been run over a 48-hour duration, consistent with the Te Miro model output period, and includes a downstream flow check line.

The focus of the assessment is the change caused by the proposed development. In particular, the report considers whether the proposed development results in material adverse changes to flood levels, flood depths, downstream flows or overland flow behaviour on neighbouring properties or within the wider Mangaohoi floodplain.

1.2 Context regarding the Te Miro Water model results

BBO has previously reviewed the available Te Miro Water model information and does not consider the reported results to reasonably represent local flood behaviour at the subject site. That position remains unchanged.

The reasons for BBO's position have been set out in previous correspondence and technical review material. They are not repeated in this report, as this report is not intended to be a further review of the Te Miro Water model.

For clarity, the supplementary modelling described in this report should not be interpreted as BBO accepting the Te Miro Water model results as the preferred or reasonable representation of local flooding at the site.

However, to respond constructively to WRC's submission, BBO has used the available WRC / Te Miro information as inputs to a supplementary TUFLOW floodplain assessment. This provides a practical way to test the proposed development under the floodplain condition referred to by WRC, while maintaining BBO's position regarding the reasonableness of the Te Miro Water model outputs.

1.3 Scope of the supplementary assessment

The scope of this report is limited to the supplementary TUFLOW modelling undertaken to test the proposed development under a regional floodplain condition based on the available WRC / Te Miro information.

The updated model includes a larger floodplain extent than the previous BBO site-focused model. It applies a time-varying upstream Mangaohoi inflow hydrograph, a time-varying downstream stage hydrograph based on the Te Miro model output provided by WRC near the downstream boundary of the BBO model, and a 48-hour simulation duration to better represent the timing and lag of the wider upstream catchment response. The model also includes the proposed development surface, local rain-on-grid rainfall over the relevant modelled area, and existing/reference and proposed development scenarios.

The report does not attempt to reproduce the full Te Miro Water model or remodel the full Mangapiko and Mangaohoi catchments. That would require the full Te Miro model files, model geometry, hydrology, full upstream and downstream time-series outputs, downstream structure information and other time-varying boundary condition data. These have not been provided to BBO for direct use in the site-specific TUFLOW model.

The assessment therefore focuses on the change caused by the proposed development under the adopted supplementary model setup. The main areas of interest are neighbouring properties, the lot boundaries, the western wetland/floodplain interface, the wider floodplain downstream and upstream of the site, and downstream flow change at the DS01 check line.

1.4 Report structure

The remainder of this report is structured as follows.

Section 2 summarises the basis for the supplementary assessment and the WRC / Te Miro information used. Section 3 describes the supplementary TUFLOW model configuration. Section 4 explains the sensitivity testing, conservative nature and limitations of the adopted floodplain test. Section 5 presents the updated model results, including the downstream flow hydrograph check at DS01. Section 6 discusses the implications for neighbouring properties and the wider floodplain. Section 7 provides the conclusions from the supplementary assessment.

2. Background and Basis for the Supplementary Assessment

2.1 WRC flood hazard matter

WRC's submission on Proposed Private Plan Change 35 raised concerns with the flood hazard assessment included in the plan change request. WRC's concern was not with the proposed rezoning itself, but with whether the flood hazard assessment adequately demonstrated that the site can be developed without increasing flood levels in the Mangaohoi floodplain or increasing flows downstream of the site.

WRC referred to the Te Miro Water Mangapiko and Mangaohoi flood model and identified reported flood levels at the site for the 1% AEP event under historic, RCP6.0 and RCP8.5 climate scenarios. The highest of those levels is RL 47.95 m Moturiki for the RCP8.5 scenario.

The supplementary modelling described in this report has therefore been undertaken to provide a more direct assessment of the proposed development within a wider Mangaohoi floodplain context.

2.2 Reason for updating the model

The previous BBO TUFLOW model was prepared as a site-specific stormwater and flood model for the proposed development. It represented local rainfall-runoff, the proposed stormwater management system, the proposed wetland and local overland flow behaviour through and around the site.

Following WRC's submission, BBO has updated the model to provide a more complete floodplain test. The updated model includes a larger and more representative floodplain area, a time-varying upstream Mangaohoi inflow hydrograph, a time-varying downstream stage hydrograph, a 48-hour simulation duration, a downstream flow check line, and an expanded rain-on-grid extent.

Following the meeting with WRC, BBO further refined the model boundary conditions using the additional Te Miro model output provided by WRC. This included using the Te Miro model output section located close to the downstream end of the BBO TUFLOW model to inform both the upstream flow hydrograph and the downstream stage hydrograph adopted in the supplementary model.

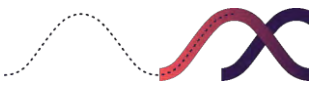
This update allows the proposed development to be assessed under a regional floodplain condition while still retaining the site-specific detail needed to assess development effects. The existing/reference and proposed development scenarios have been run under the same supplementary model setup, with the water level difference results used to identify the effect of the proposed development.

The updated model has also been used to compare pre- and post-development flow hydrographs at a downstream check line, DS01. This additional check directly responds to WRC's comments regarding potential downstream flow changes.

2.3 WRC / Te Miro information used

The supplementary model uses the available WRC / Te Miro information as model inputs.

An upstream Mangaohoi inflow hydrograph peaking at 112.3 m^3/s has been applied near Golf Road. This peak value has been taken from Table 20 of the Te Miro Water Model Report and represents the 100-year ARI, 24-hour RCP6.0 Mangaohoi peak flow used in that model. Following the meeting with WRC, additional Te Miro model output was made available for two floodplain sections. The first section is located close to the



downstream end of the BBO TUFLOW model and has been used to inform the timing and shape of the updated boundary hydrographs.

The upstream inflow hydrograph was developed from the available Section 1 Te Miro model flow output and adjusted so that its peak matches the reported 112.3 m^3/s Mangaohoi design flow. The adopted upstream hydrograph therefore reflects the timing and recession pattern of the available Te Miro model output, rather than applying the peak flow as a constant inflow.

The downstream water level hydrograph has also been taken from the available Section 1 Te Miro model output. The Section 1 stage hydrograph was converted from Moturiki datum to NZVD2016 and applied as the time-varying downstream stage boundary for the supplementary model. The converted hydrograph reaches a peak level of RL 47.71 m NZVD2016. WRC's submission also identifies lower reported Te Miro flood levels of RL 47.22 m Moturiki for the historic climate scenario and RL 47.69 m Moturiki for the RCP6.0 scenario.

The updated model has been run over a 48-hour duration to match the available Te Miro model output period and to better account for the lagged response of the wider upstream catchment.

The rain-on-grid extent has also been expanded from the earlier BBO site-focused setup. This allows rainfall-runoff from the wider relevant modelled area to be represented, rather than only runoff from the immediate site/local catchment area.

2.4 Information not available for direct model linkage

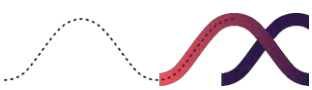
BBO has not been provided with the full Te Miro Water model files or the full set of time-varying outputs that would be required to dynamically link the Te Miro model to the BBO TUFLOW model.

In particular, BBO has not been provided with the full model geometry, the full boundary condition time-series, the full downstream structure data, or sufficient information to extend the BBO model further downstream in a reliable way. Without those outputs, it is not possible to reproduce the full timing and dynamic interaction of the Te Miro Water model within the BBO model.

However, following the meeting with WRC, selected Te Miro model output was made available for two floodplain sections, including one section located close to the downstream end of the BBO model. This information has been used to refine both the upstream flow hydrograph and downstream stage hydrograph adopted in the BBO model. The resulting boundary hydrographs therefore make use of the best available WRC / Te Miro information, while recognising that the BBO model remains a supplementary site-specific floodplain effects model, not a direct copy or dynamic link of the full Te Miro regional model.

For this reason, the available WRC / Te Miro information has been applied as representative time-varying boundary hydrographs and model inputs, rather than as a direct dynamic link to the full Te Miro model. The upstream boundary is represented by a flow hydrograph peaking at 112.3 m^3/s, the downstream boundary uses the converted Section 1 Te Miro stage hydrograph, and rainfall-runoff has been represented through the expanded rain-on-grid area.

This provides a practical way to use the available WRC / Te Miro information to test development effects, while recognising that the supplementary model is not a reproduction of the full Te Miro Water model.



2.5 Assessment focus

The assessment focuses on the change caused by the proposed development under the adopted supplementary model setup.

The key output is the difference in peak water surface level between the existing/reference and proposed development scenarios. This allows the effect of the proposed development to be isolated from the imposed regional floodplain condition.

The results have therefore been reviewed with particular focus on afflux around the lot boundaries, neighbouring properties, the western wetland/floodplain interface, and the wider Mangaohoi floodplain around and downstream of the site. Additional checks have also been undertaken to compare existing and proposed flow hydrographs at the DS01 downstream check line.

3. Supplementary TUFLOW Model Configuration

3.1 Model update overview

The supplementary TUFLOW model has been updated to provide a more representative floodplain assessment in response to the matters raised by WRC.

The model configuration adopted for this supplementary assessment includes an expanded Mangaohoi floodplain extent, time-varying upstream and downstream boundary hydrographs, an expanded rain-on-grid area, and comparison of existing/reference and proposed development scenarios under the same model setup. The model duration was also extended to 48 hours to match the available Te Miro output period.

Figure No. 3-1 Te Miro output sections and TUFLOW boundary / check line locations.

A downstream check line, DS01, was also added close to the downstream end of the model to allow the existing/reference and proposed development flow hydrographs to be compared.

The model has then been run for both the existing/reference and proposed development scenarios, using the same regional floodplain test setup. This allows the effect of the proposed development to be assessed from the water level difference results and the downstream flow hydrograph comparison.

3.2 Model extent

The updated model extent includes a larger area of the Mangaohoi floodplain than the previous BBO site-focused model. This was done so that the upstream inflow, downstream water level, and rainfall-runoff generated across the modelled area could interact through the wider floodplain before and around the proposed development.

The expanded model includes the subject site, adjacent lot boundaries, neighbouring properties, the western wetland/floodplain interface, and the floodplain area required to connect the upstream inflow boundary to the downstream water level boundary.

This broader extent is important because WRC's concern relates to floodplain effects, not only local drainage within the site. The updated model therefore provides a more appropriate basis for reviewing whether the proposed development changes water levels or overland flow behaviour outside the site.

The downstream boundary is approximately 380 m from the development lot in a direct line and approximately 600–620 m along the floodplain / hydraulic flow path. The separation distance, together with the time-varying downstream stage hydrograph, provides confidence that the model results are not simply being controlled by a boundary located immediately beside the site.

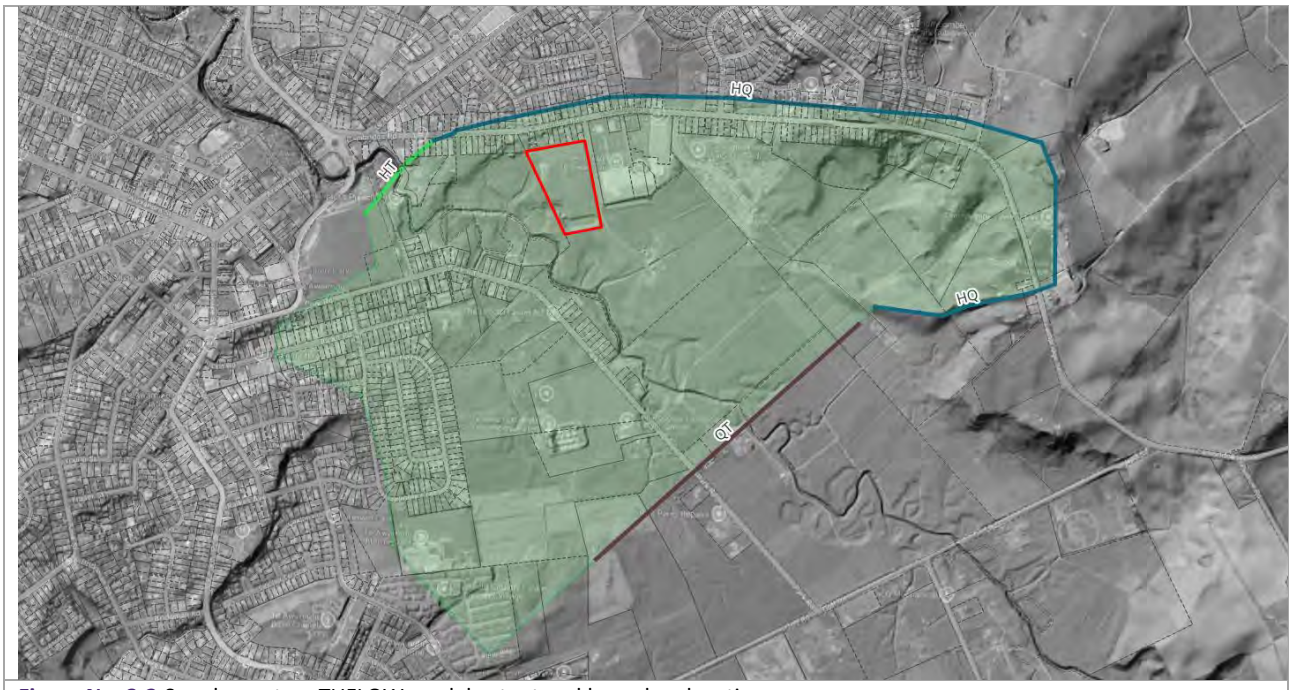


Figure No. 3-2 Supplementary TUFLOW model extent and boundary locations.

3.3 Terrain and development representation

The updated model retains the BBO proposed development terrain and stormwater arrangement used for the site-specific assessment. This includes the proposed development platform, the stormwater management area, the proposed wetland and the main overland flow paths through and around the site.

The surrounding floodplain has been represented using the available terrain information over the expanded model extent. This allows the model to route the imposed regional inflow and the rainfall-runoff generated within the model through the wider floodplain, while still retaining the site-specific representation of the proposed development.

The proposed development surface remains a planning-level ground model. It is suitable for assessing flood effects at this stage, but local refinements will be required during detailed design. This is particularly relevant along the northern boundary and near the eastern access road interface, where the final design will need to tie into surveyed existing ground and properly accommodate local off-site inflows.

3.4 Upstream Mangaohoi inflow boundary

A time-varying upstream Mangaohoi inflow hydrograph has been applied at the upstream end of the modelled floodplain, near Golf Road.

This hydrograph peaks at 112.3 m^3/s. The peak value has been adopted from Table 20 of the Te Miro Water Model Report and represents the 100-year ARI, 24-hour RCP6.0 Mangaohoi peak flow used in that model.

The upstream hydrograph was developed using the available Te Miro Section 1 model flow output and adjusted so that its peak matches the reported 112.3 m^3/s Mangaohoi design flow. This approach retains the timing and recession pattern of the available Te Miro model output, rather than applying the reported peak flow as a constant inflow.

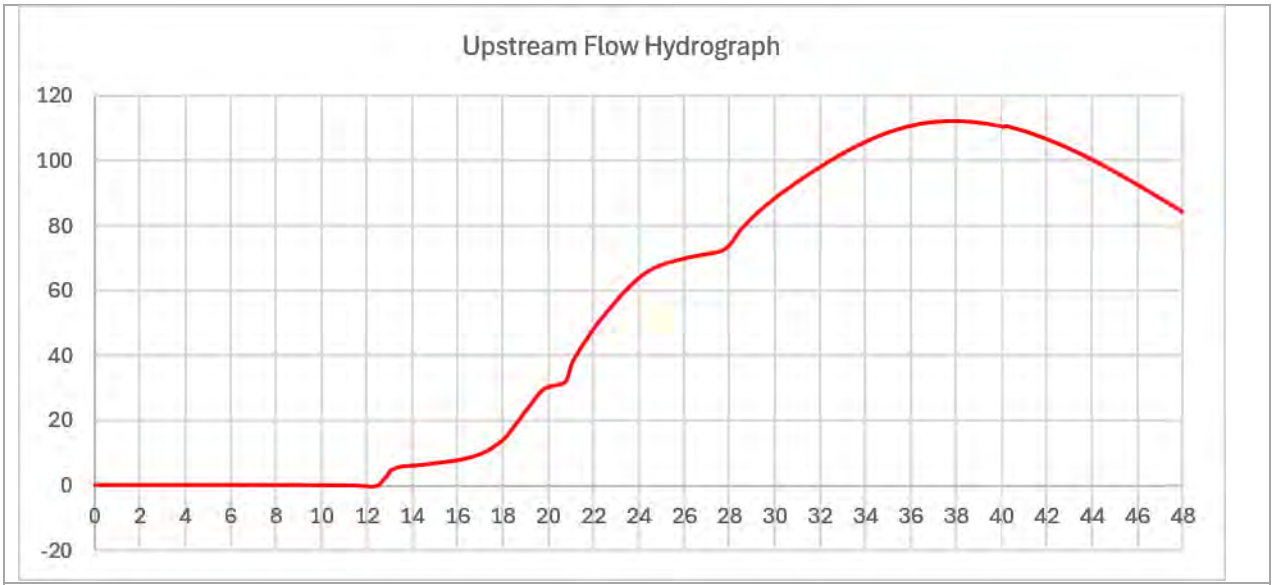


Figure No. 3-3 Adopted upstream Mangaohoi inflow hydrograph.

The model has been run over a 48-hour duration to match the available Te Miro model output period and to better represent the lagged response of the wider upstream catchment.

3.5 Downstream water level boundary

A time-varying downstream stage hydrograph has been applied in the updated model.

This stage hydrograph has been taken from the available Te Miro Section 1 model output, which is located close to the downstream end of the BBO model. The stage hydrograph was converted from Moturiki datum to NZVD2016 and applied as the downstream water level boundary for the supplementary model. The converted hydrograph reaches a peak level of RL 47.71 m NZVD2016.

This replaces the earlier fixed downstream water level approach and provides a more representative tailwater condition, as the downstream water level rises and falls through the 48-hour simulation rather than being held at the peak flood level for the full model duration.

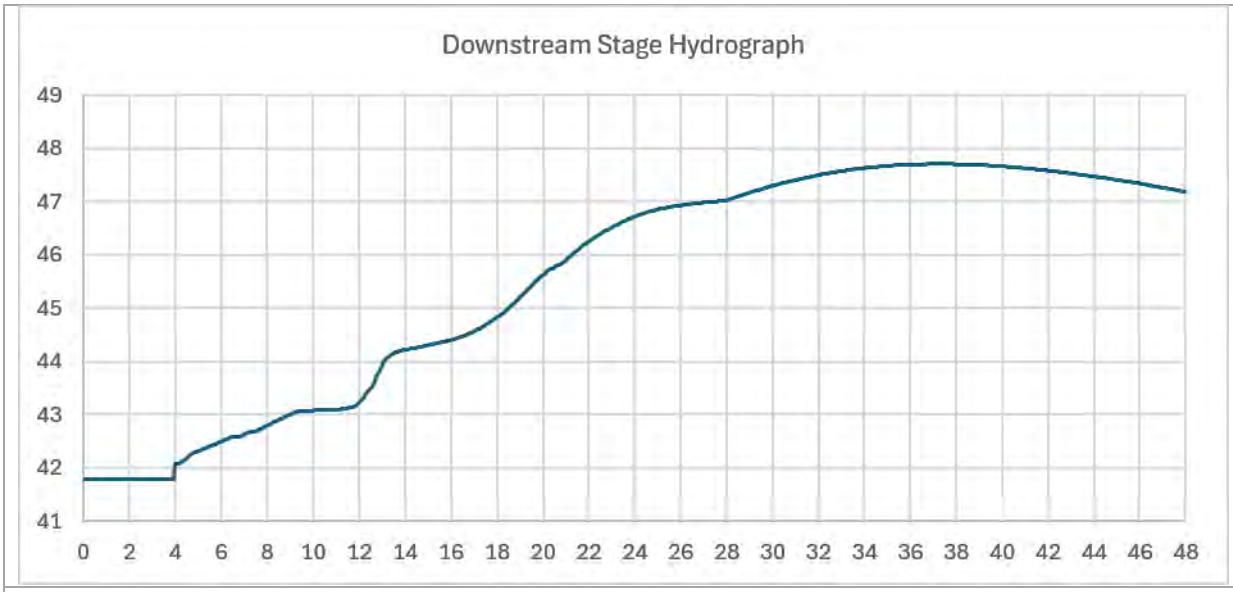


Figure No. 3-4 Adopted downstream stage hydrograph at TUFLOW boundary.

3.6 Local rain-on-grid rainfall

The rain-on-grid area has been expanded in the supplementary model to better represent rainfall-runoff from the wider relevant modelled area.

The earlier BBO model applied rain-on-grid rainfall over the site and local contributing catchment. For the updated supplementary model, the rain-on-grid extent has been increased so that runoff from the wider floodplain model area is represented in addition to the imposed upstream Mangaohoi inflow and time-varying downstream stage hydrograph.

This makes the model closer in approach to a regional floodplain assessment, while still retaining the site-specific detail needed to assess the proposed development. The expanded rain-on-grid extent has been applied consistently to both the existing/reference and proposed development scenarios, so the resulting water level difference outputs continue to isolate the effect of the proposed development.

3.7 Initial water level

The model Initial Water Level has been set to RL 41.8 m, consistent with the starting level of the adopted downstream stage hydrograph.

This means that the downstream floodplain condition is not fixed at the peak flood level at the start of the model simulation. Instead, the downstream stage rises through the event based on the adopted Te Miro Section 1 stage hydrograph, reaching a peak level of RL 47.71 m NZVD2016.

This directly addresses the concern that a high fixed initial water level could obscure or mask any floodplain displacement caused by the proposed development. The existing/reference and proposed development scenarios use the same initial and boundary conditions, so the model comparison continues to isolate the effect of the proposed development.

3.8 Scenario comparison

The supplementary assessment compares the existing/reference and proposed development model results under the same regional floodplain test setup.

This comparison is important because the main assessment question is whether the proposed development causes a change in water surface level, flood depth or flow behaviour on neighbouring properties or within the wider floodplain.

The model results have therefore been reviewed using water surface level difference outputs. These outputs identify the change in peak water level between the existing/reference and proposed development scenarios under the same upstream inflow, downstream water level, initial water level and expanded rain-on-grid extent. The resulting water level difference / afflux map is provided in **Appendix A**.

In addition to the peak water surface level difference outputs, the updated assessment also includes a downstream flow hydrograph comparison at the DS01 check line.

3.9 Summary of adopted model inputs

The key model inputs used for the supplementary TUFLOW assessment are summarised in Table 3-1.

Table No. 3-1

Key supplementary model inputs	
Model component	**Adopted approach**
Model extent	Expanded to include a larger and more representative area of the Mangaohoi floodplain
Simulation duration	48 hours, consistent with the available Te Miro model output period
Upstream inflow	Time-varying Mangaohoi inflow hydrograph near Golf Road, developed from available Te Miro Section 1 model flow output and adjusted to peak at 112.3 m^3/s
Downstream water level	Time-varying downstream stage hydrograph based on the available Te Miro Section 1 model output, converted from Moturiki datum to NZVD2016. The converted hydrograph reaches a peak level of RL 47.71 m NZVD2016.
Initial water level	RL 41.8 m, consistent with the starting level of the adopted downstream stage hydrograph
Rain-on-grid rainfall	100-year, 24-hour rainfall applied over an expanded model area to represent wider rainfall-runoff
Development representation	BBO proposed development terrain and stormwater arrangement
Scenario comparison	Existing/reference and proposed scenarios run with the same regional boundary and rain-on-grid setup
Downstream flow check	DS01 check line near the downstream end of the model, used to compare existing/reference and proposed development flow hydrographs
Assessment output	Proposed minus existing/reference peak water surface level difference and downstream flow hydrograph comparison

This model configuration provides the basis for testing the proposed development under the regional floodplain condition referred to by WRC, while retaining the site-specific detail needed to assess development effects.

4. Model Sensitivity, Conservatism and Limitations

4.1 Purpose of the adopted test condition

The supplementary model has been set up to test the proposed development under the regional floodplain condition referred to by WRC.

The purpose is not to reproduce the full Te Miro Water regional model or to redefine the regional flood hazard for the wider Mangapiko and Mangaohoi catchments. The purpose is to test whether the proposed development results in a material increase in flood levels, flood depths, downstream flows or overland flow effects when the wider Mangaohoi floodplain is represented using the available WRC / Te Miro information.

This distinction is important. The assessment is focused on the change caused by the proposed development, rather than on re-assessing the full regional flood model.

4.2 Use of time-varying boundary conditions

The updated model uses time-varying upstream and downstream boundary conditions, rather than the earlier peak-only boundary approach.

The upstream Mangaohoi inflow has been applied as a time-varying hydrograph peaking at 112.3 m^3/s. This represents the reported 100-year ARI, 24-hour RCP6.0 peak flow from the Te Miro Water Model Report. The hydrograph shape has been based on the available Te Miro Section 1 model flow output and adjusted to match the reported Mangaohoi design peak flow.

The downstream boundary has also been applied as a time-varying stage hydrograph derived from the available Te Miro Section 1 model output, converted to NZVD2016. The adopted stage hydrograph reaches a peak level of RL 47.71 m NZVD2016.

The model has been run for 48 hours, consistent with the available Te Miro output period. This allows the upstream flow hydrograph, downstream stage hydrograph and local rain-on-grid runoff to vary through time, rather than holding the model at a fixed peak water level or fixed peak inflow for the full simulation.

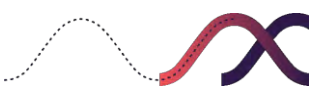
4.3 Timing of local runoff and regional flood response

The 48-hour simulation allows the timing of the local rainfall-runoff response and the wider Mangaohoi floodplain response to be represented in a more realistic way.

The smaller local contributing areas respond earlier than the wider upstream Mangaohoi catchment. The updated model therefore does not artificially force the local runoff peak and the wider regional floodplain peak to occur at exactly the same time.

This is important for interpreting the results. The model still tests the proposed development under a severe regional floodplain condition, but it does so using time-varying hydrographs that allow for the lagged response of the wider catchment.

The updated hydrograph-based run remains consistent with the previous assessment outcome. The proposed development does not result in a measurable increase in wider floodplain levels or downstream flows.



4.4 Downstream boundary sensitivity

The downstream boundary has been reviewed because WRC raised concern that the previous fixed water level boundary could mask the effect of the proposed development.

The downstream boundary is not immediately adjacent to the proposed development. It is approximately 380 m from the development lot in a direct line and approximately 600–620 m along the floodplain / hydraulic flow path. This provides separation between the proposed development and the adopted downstream stage boundary.

The revised model also replaces the fixed downstream level with a time-varying downstream stage hydrograph based on the available Te Miro Section 1 model output. The downstream water level therefore rises and falls through the model simulation and is not held at the peak flood level for the full duration.

The updated results remain effectively unchanged. This indicates that the conclusion of negligible wider floodplain effect is not dependent on the earlier fixed downstream boundary approach.

4.5 Model resolution sensitivity

The model has also been tested using a refined 2 m grid in the area of interest.

This did not result in any material change to the predicted afflux pattern or magnitude. The negligible floodplain effect result is therefore not considered to be a function of coarse model resolution.

The localised increases along the northern boundary and near the eastern access road remain associated with planning-level surface tie-in and boundary grading matters, rather than a wider floodplain capacity effect.

4.6 Limitations

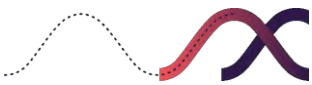
The supplementary model is not a reproduction of the full Te Miro Water model. BBO has not been provided with the full Te Miro model files, model geometry, full boundary condition time-series, downstream structure data, or other information required to directly link or reproduce that model.

The available WRC / Te Miro information has therefore been applied as representative model boundary information within the BBO TUFLOW model. This is appropriate for the purpose of testing development effects under the regional floodplain condition referred to by WRC, but it should not be interpreted as a dynamic recreation of the full Te Miro model.

The proposed development surface is also a planning-level surface. It is suitable for assessing floodplain effects at this stage, but local refinements will be required during detailed design, particularly at the northern boundary and near the eastern access road interface where the proposed surface ties into existing ground.

4.7 Interpretation

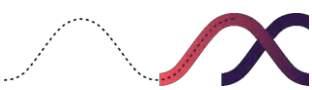
The supplementary model should be interpreted as a representative and conservative floodplain effects test based on the information currently available.



It does not rely on a free outfall, low downstream water level, inactive floodplain, or favourable downstream condition. It tests the proposed development using the available WRC / Te Miro floodplain information, while maintaining consistent existing/reference and proposed development model assumptions.

The latest 48-hour hydrograph-based simulation provides a more appropriate assessment than the earlier fixed boundary test, as it allows the upstream flow, downstream stage and local rainfall-runoff responses to vary through time. The results remain consistent with the previous assessment and continue to show negligible wider floodplain effects.

This provides a practical and proportionate basis for assessing whether the proposed development materially worsens flood behaviour on neighbouring properties or within the wider Mangaohoi floodplain at this stage of the process.



5. Supplementary Model Results

5.1 Overview of results

The updated supplementary TUFLOW results show that the proposed development has negligible effect across almost all of the modelled Mangaohoi floodplain under the adopted test condition.

The existing/reference and proposed development scenarios have been run using the same model setup, with the peak water surface level difference used to assess the effect of the proposed development.

The peak flood depth results for the existing/reference and proposed development scenarios are provided in Appendix A, Maps 0110 and 0111. The proposed minus existing water level difference / afflux result is provided in Appendix A, Map 0301.

The key result is that afflux is generally less than 1 mm across almost all of the modelled floodplain. This is negligible in practical hydraulic terms.

The only areas where a more noticeable increase is predicted are localised along the northern boundary of the proposed development and at a small number of locations along the eastern boundary near the access road. These localised increases are associated with the current planning-level proposed surface and the way it ties into the surrounding existing ground.

5.2 Floodplain extent and general flood behaviour

The updated model produces a floodplain response that is broadly comparable to the floodplain behaviour shown in the WRC submission figures for the Te Miro Water RCP6.0 and RCP8.5 scenarios.

This is useful for the supplementary assessment because it confirms that the updated BBO model is testing the proposed development under a severe floodplain condition, similar to the regional floodplain condition referred to by WRC.

This comparison should not be interpreted as BBO accepting the Te Miro Water model results as the preferred representation of local flooding at the site. Rather, it confirms that the supplementary BBO model provides an appropriate test condition for assessing development effects under the WRC-referenced floodplain scenario.

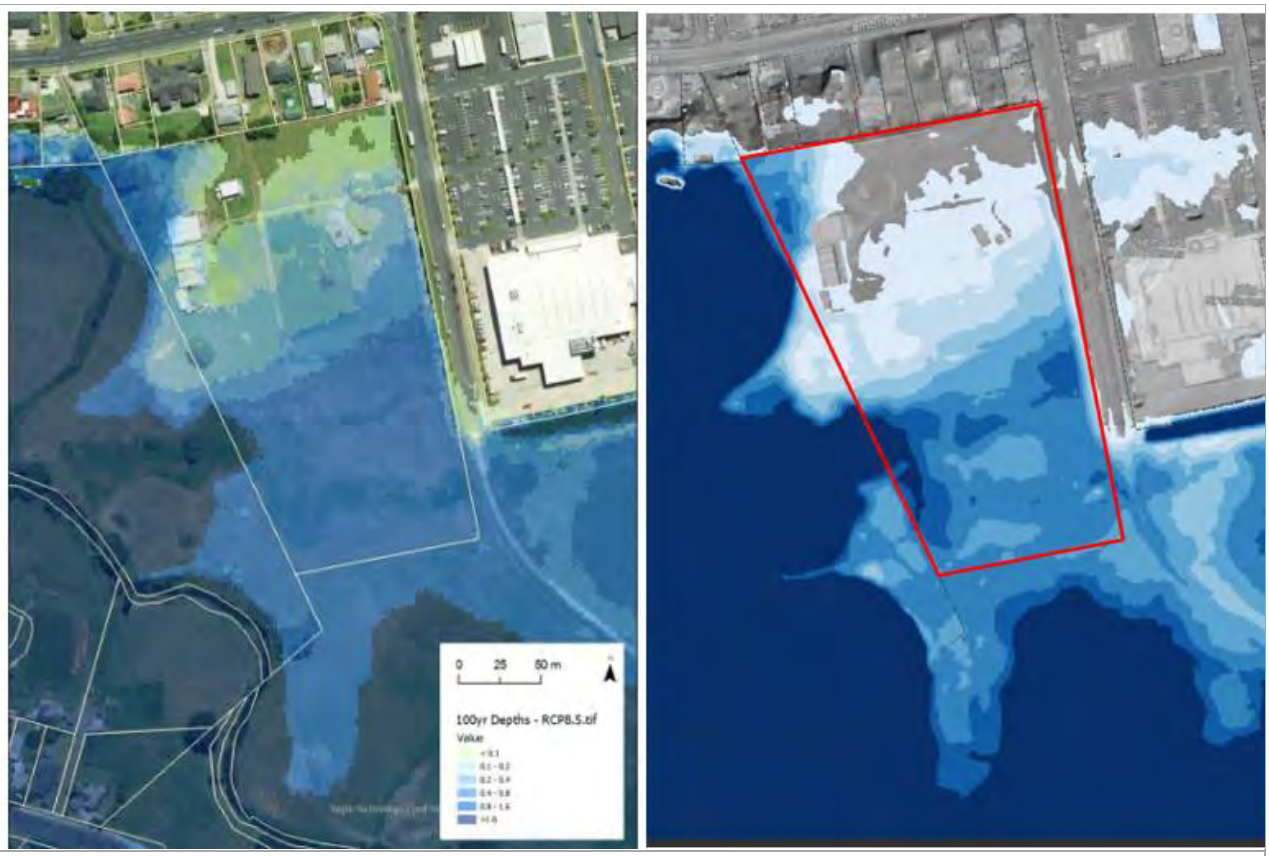


Figure No. 5-1 Comparison of WRC / Te Miro RCP8.5 1% AEP flood depth mapping with updated BBO supplementary TUFLOW result.

5.3 Water surface level difference results

The water surface level difference results show that the proposed development has negligible effect across almost all of the wider floodplain.

The predicted afflux across the wider model extent is generally less than 1 mm. This indicates that the proposed development is not materially displacing floodwater, reducing floodplain storage, or changing floodplain conveyance.

The only notable increases are localised around specific boundary interfaces. Along the northern boundary, and at a few locations near the eastern access road, the modelled increase reaches up to approximately 20 mm. These areas correspond with the interface between the current proposed development surface and the existing surrounding ground.

The difference results therefore indicate that the proposed development does not create a wider floodplain effect. The predicted changes are localised boundary treatment matters, not regional floodplain displacement effects.

Figure No. 5-2 Peak water surface level difference — proposed development minus existing/reference condition

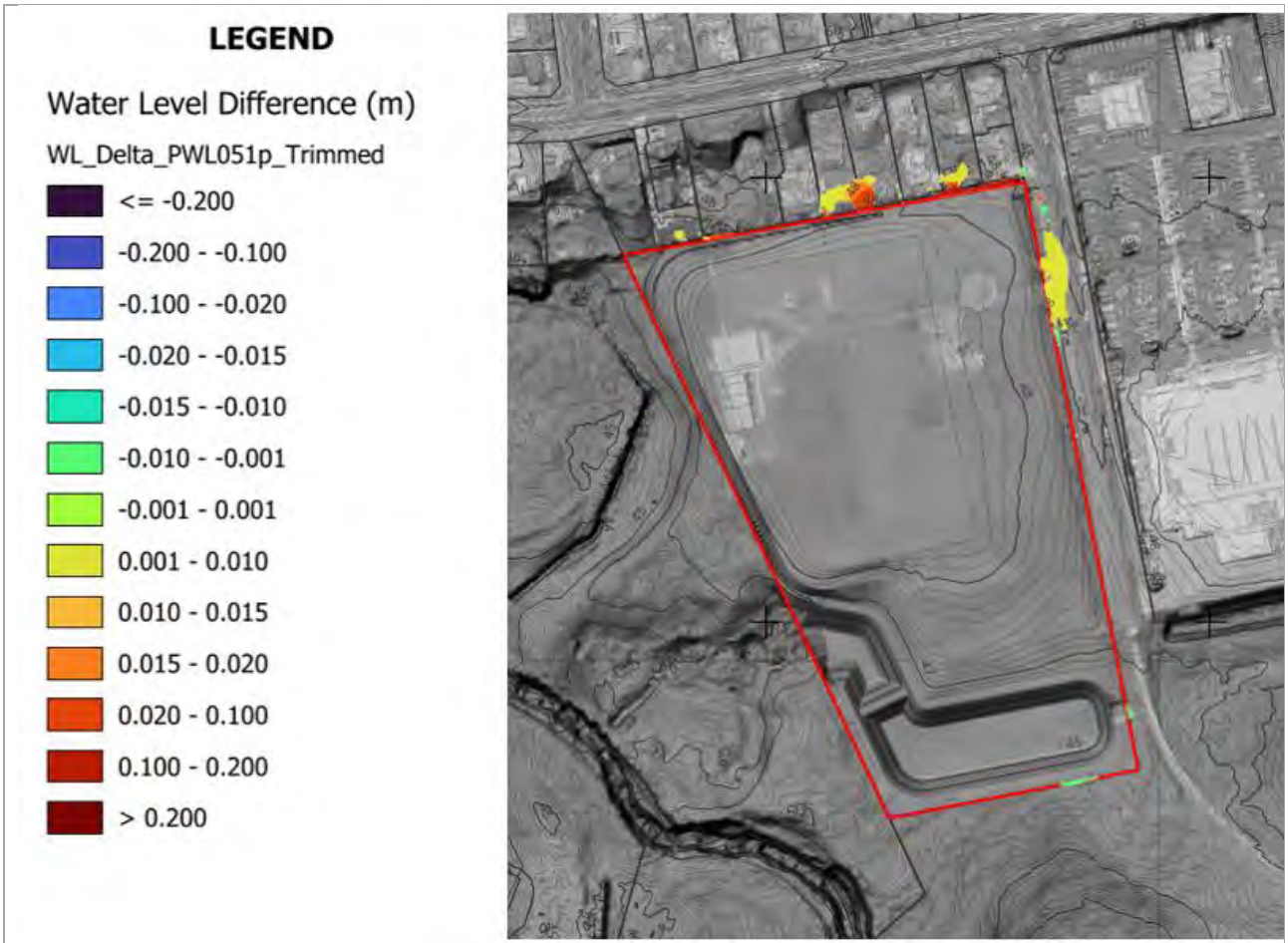


Figure No. 5-2 Peak water surface level difference — proposed development minus existing/reference condition.

5.4 Downstream flow hydrograph check at DS01

A downstream flow check line, DS01, was added near the downstream end of the model to compare the existing/reference and proposed development flow hydrographs.

The DS01 results show no increase in downstream peak flow. The existing/reference peak flow at DS01 is 121.7176 m^3/s, compared with 121.5208 m^3/s for the proposed development scenario. The proposed development peak is therefore slightly lower than the existing/reference peak.

The maximum positive difference through the event is 0.4623 m^3/s, equivalent to approximately 0.38% of the peak flow. The maximum negative difference is -0.6664 m^3/s, equivalent to approximately -0.55% of the peak flow. These differences are negligible in the context of a regional flood hydrograph of this magnitude.

The DS01 flow comparison therefore confirms that the proposed development does not cause a material increase in downstream flow under the adopted supplementary model setup.

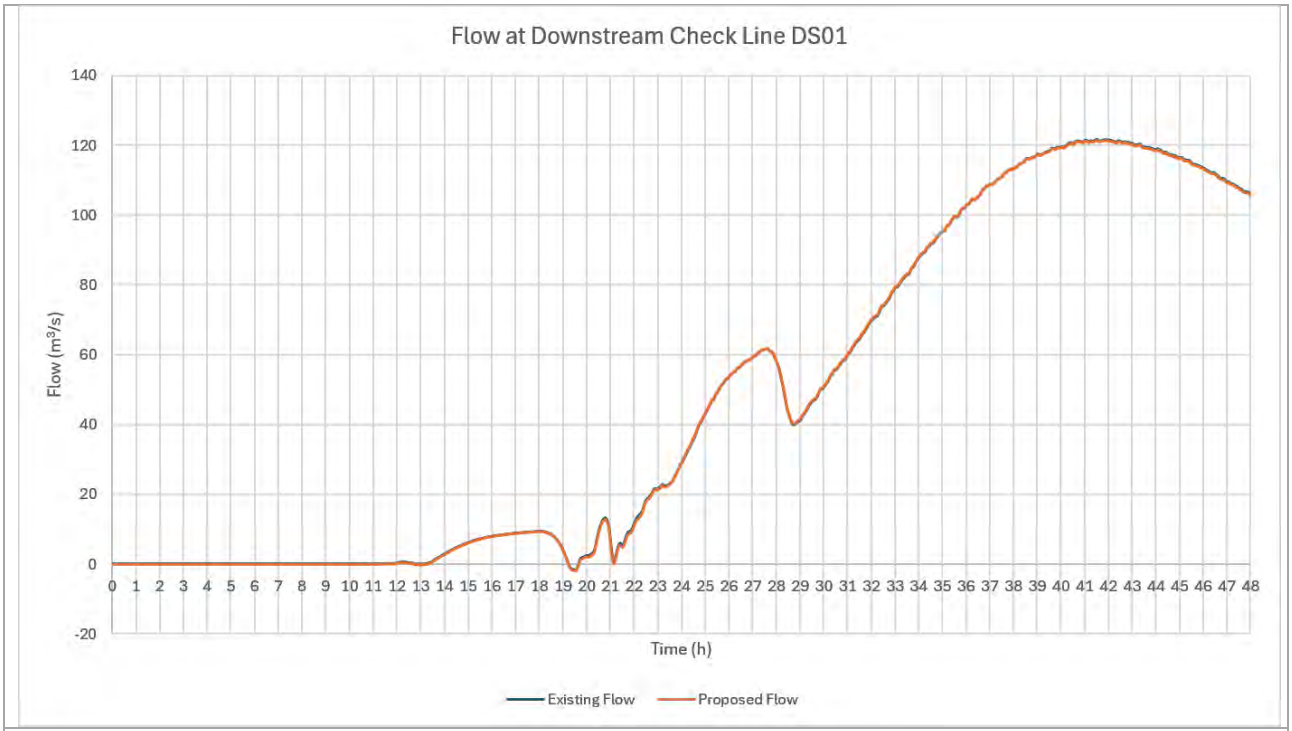


Figure No. 5-3 Existing and proposed flow hydrographs at downstream check line DS01.

5.5 Northern and eastern boundary localised increases

The most noticeable modelled increases occur along the northern boundary of the proposed development, with a smaller number of localised increases along the eastern boundary near the access road.

These increases appear to be associated with the current planning-level proposed surface. At this stage, the surface does not include the detailed boundary grading that will be developed during final design. As a result, some local ponding and localised water level increase is shown where the proposed surface ties into existing ground.

This will be addressed during detailed design. The final design will be based on detailed survey and will include proper tying into existing ground at the site boundaries. It will also confirm how off-site inflows from the north and east are collected, conveyed, or otherwise accommodated without creating adverse effects on neighbouring properties.

These localised increases are therefore not considered to represent a material floodplain effect of the proposal.

5.6 Western wetland and floodplain interface

The western boundary is a key area of interest because it is the interface between the proposed stormwater wetland and the existing wetland/floodplain area.

At this location, the updated results show negligible afflux, generally less than 1 mm. This indicates that the proposed development does not materially increase flood levels at the western wetland/floodplain interface, even under the adopted floodplain test condition.

This is an important result because this location is directly connected to the downstream receiving environment. The results indicate that the proposed stormwater wetland and site earthworks do not materially displace floodwater into the existing wetland/floodplain area.

5.7 Wider floodplain and neighbouring properties

Across almost all of the wider floodplain, the predicted afflux is generally less than 1 mm. The results do not show a meaningful increase propagating through the downstream floodplain.

The modelling also does not indicate that the proposed development transfers flood effects to neighbouring properties. The localised increases near the northern and eastern boundaries are limited to the immediate boundary interface and are able to be addressed through detailed design.

The results therefore indicate that the proposed development does not materially change flood levels, flood depths or overland flow behaviour across the wider Mangaohoi floodplain. The DS01 downstream flow check also confirms that the proposed development does not result in a material increase in flow leaving the modelled area.

5.8 Summary of key results

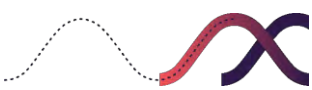
The key results from the supplementary model are summarised in Table 5-1.

Table No. 5-1

Summary of supplementary model results		
Area reviewed	**Modelled result**	**Interpretation**
Wider floodplain	Generally less than 1 mm afflux	Negligible change
Western wetland / floodplain interface	Generally less than 1 mm afflux	No material effect at key receiving environment interface
Northern boundary	Localised increases up to approximately 20 mm	Detailed grading and boundary tie-in matter
Eastern boundary near access road	Localised increases up to approximately 20 mm	Local access road / surface tie-in matter
Neighbouring properties	No material increase identified	Proposed development does not materially worsen flood levels
Downstream floodplain	No meaningful afflux propagation	No material floodplain displacement effect
DS01 downstream flow check	Proposed peak flow is slightly lower than the existing/reference peak flow. Maximum positive difference is approximately 0.38% of peak flow	No material increase in downstream flow

Overall, the updated results show that the proposed development has negligible effect across all of the modelled floodplain. The only notable increases are localised at site boundary interfaces and can be

addressed through detailed design. The downstream flow check provides further confirmation that the proposed development does not materially increase downstream flow.



6. Discussion and Interpretation

6.1 Interpretation of floodplain effects

The supplementary modelling provides a clear indication of the effect of the proposed development under the adopted regional floodplain test condition.

The main point from the results is that the proposed development does not create a measurable change across the wider Mangaohoi floodplain. The predicted differences in peak water surface level are generally less than 1 mm across the wider model extent. This is negligible in practical hydraulic terms and indicates that the proposed development is not materially reducing floodplain storage, blocking floodplain conveyance, or transferring flood effects downstream.

The assessment is based on the difference between the existing/reference and proposed development scenarios under the same model setup. The results therefore identify the change caused by the proposed development, rather than the wider regional flood condition itself.

6.2 Boundary interface effects

The only more noticeable increases are localised along the northern boundary of the proposed development and at a small number of locations near the eastern access road.

These increases appear to be associated with the current planning-level proposed surface and the way it ties into the surrounding existing ground. This is expected to be a local grading and boundary interface issue rather than a wider floodplain effect.

These areas will need to be refined during detailed design. The final ground model should be based on detailed survey and should include proper tying into existing ground along the site boundaries. The design should also confirm how local off-site inflows from the north and east are intercepted, conveyed, or otherwise accommodated by the final landform and stormwater design.

On this basis, the localised northern and eastern boundary increases are considered detailed design matters. They do not change the overall model outcome that the proposed development has negligible effect across the wider floodplain.

6.3 Western wetland and receiving environment interface

The western boundary is a key location for interpreting the results, as it is the interface between the proposed stormwater wetland and the existing wetland/floodplain area.

The updated results show negligible afflux at this location, generally less than 1 mm. This indicates that the proposed development and wetland arrangement do not materially increase flood levels at the key receiving environment interface.

This is an important outcome because the proposed stormwater wetland is located on the western side of the site and discharges toward the existing wetland/floodplain system. The results indicate that, under the adopted floodplain test condition, the proposed development does not materially displace floodwater into this area.

The stormwater wetland is also not intended to provide water quality treatment or peak flow attenuation during the 100-year RCP8.5 regional floodplain condition represented by the Te Miro model output. The wetland is intended to manage site-generated runoff and provide treatment for the relevant local stormwater design events.

The permanent water level of the wetland has been set approximately 2.5 m above the Mangaohoi Stream water level at the time of the LiDAR survey. It is therefore not sitting at normal stream level and is not expected to be drowned under normal or more frequent stream conditions. During an extreme regional floodplain condition, the local treatment function of the wetland would be temporarily overridden by the wider floodplain behaviour. This is not considered unusual or unreasonable for a local stormwater treatment device under a regional river flood event of this magnitude.

6.4 Downstream flow interpretation

The DS01 downstream flow comparison provides a direct check of whether the proposed development changes the flow leaving the modelled floodplain area.

The results show no material increase in downstream flow. The proposed peak flow is slightly lower than the existing/reference peak flow, and the small positive and negative differences through the event are negligible in the context of the regional flood hydrograph. This supports the water level difference results and confirms that the proposed development is not producing a material downstream flow effect.

6.5 Wider floodplain and neighbouring property effects

Across the wider model extent, the predicted afflux is generally less than 1 mm. The results do not show a meaningful increase propagating through the downstream floodplain.

The model also does not indicate a material transfer of flood effects to neighbouring properties. The only more noticeable changes are localised at the immediate site boundary interfaces, where detailed grading and surface tie-ins will be refined during detailed design.

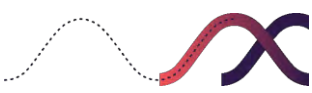
This directly responds to WRC's concern regarding potential increases in flood levels in the floodplain and potential effects on surrounding properties. For this site, the supplementary modelling indicates that the proposed development does not create a material increase in flood levels across the wider Mangaohoi floodplain.

6.6 Detailed design implications

The modelling identifies localised boundary interface matters that should be addressed during detailed design.

The northern boundary and parts of the eastern access road interface should be refined using detailed survey and a more resolved proposed ground model. The design should avoid local ponding at the site boundary and should make sure that external overland flows are properly managed. This may include local grading adjustments, swales, kerb lines, inlet locations, or other minor stormwater and earthworks refinements.

These are normal detailed design matters and are not considered to represent a constraint to the proposed development. They can be addressed without changing the overall floodplain assessment conclusion.

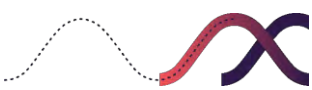


6.7 Overall interpretation

The supplementary model provides a practical and proportionate test of the proposed development under the regional floodplain condition referred to by WRC.

The results show that the proposed development does not materially increase flood levels, does not materially increase downstream flow, and does not materially reduce the practical floodplain function of the site. The only more noticeable increases are localised along the northern boundary and near the eastern access road, where the results are associated with planning-level surface tie-in matters.

Overall, the modelling indicates that the proposed development does not materially worsen flood behaviour on neighbouring properties or within the wider Mangaohoi floodplain under the adopted floodplain test condition.



7. Conclusions

The supplementary TUFLOW floodplain modelling has been undertaken to respond to the flood hazard matters raised by WRC for the proposed Mitre 10 Retail Centre at 638 Cambridge Road, Te Awamutu.

BBO's position remains that the Te Miro Water model results do not reasonably represent local flood behaviour at the subject site. However, BBO has undertaken this supplementary assessment to test the proposed development under a regional floodplain condition based on the available WRC / Te Miro information.

The model has been updated following further discussion with WRC and now includes a time-varying upstream Mangaohoi inflow hydrograph, a time-varying downstream stage hydrograph, a 48-hour simulation duration, expanded rain-on-grid rainfall, and a DS01 downstream flow check line. The existing/reference and proposed development scenarios have been assessed using the same model setup, with the water surface level difference results used to identify the effect of the proposed development.

The updated results show that afflux is generally less than 1 mm across almost all of the modelled floodplain. This is negligible in practical hydraulic terms and indicates that the proposed development does not materially affect floodplain storage, conveyance, or flood levels across the wider Mangaohoi floodplain.

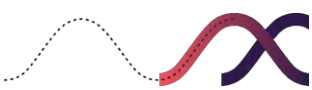
The only areas of more noticeable afflux are localised along the northern boundary and at a small number of locations near the eastern access road. These localised increases are associated with the planning-level proposed surface and boundary tie-in and can be addressed during detailed design through refined grading and proper management of off-site inflows.

At the western wetland / floodplain interface, the results show negligible afflux. This confirms that the proposed development does not materially increase flood levels at the key receiving environment interface.

The DS01 downstream flow check shows no material increase in downstream flow. The proposed development peak flow at DS01 is slightly lower than the existing/reference peak flow, and the maximum positive and negative differences through the event are negligible in the context of the regional flood hydrograph.

The proposed stormwater wetland is not intended to provide water quality treatment or peak flow attenuation during the 100-year RCP8.5 regional floodplain condition represented by the Te Miro model output. It is intended to manage site-generated runoff and provide treatment for the relevant local stormwater design events. During an extreme regional floodplain event, the local wetland function would be temporarily overridden by the wider floodplain behaviour.

Overall, the supplementary modelling indicates that the proposed development does not materially worsen flood behaviour on neighbouring properties or within the wider Mangaohoi floodplain under the adopted floodplain test condition. The remaining localised boundary effects are detailed design matters and are not considered to represent a constraint to the proposed development.



Appendix A – Maps

LEGEND

Depths (m)

M10_TA_RCP6_EX_PWL051p_d_HR_Max

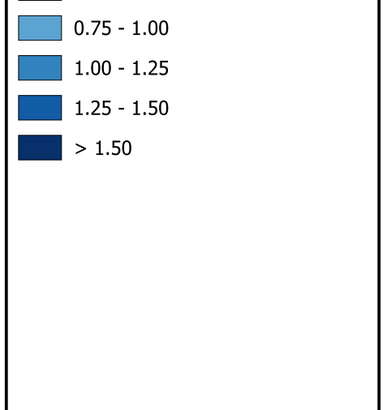
- <= 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 1.25
- 1.25 - 1.50
- > 1.50

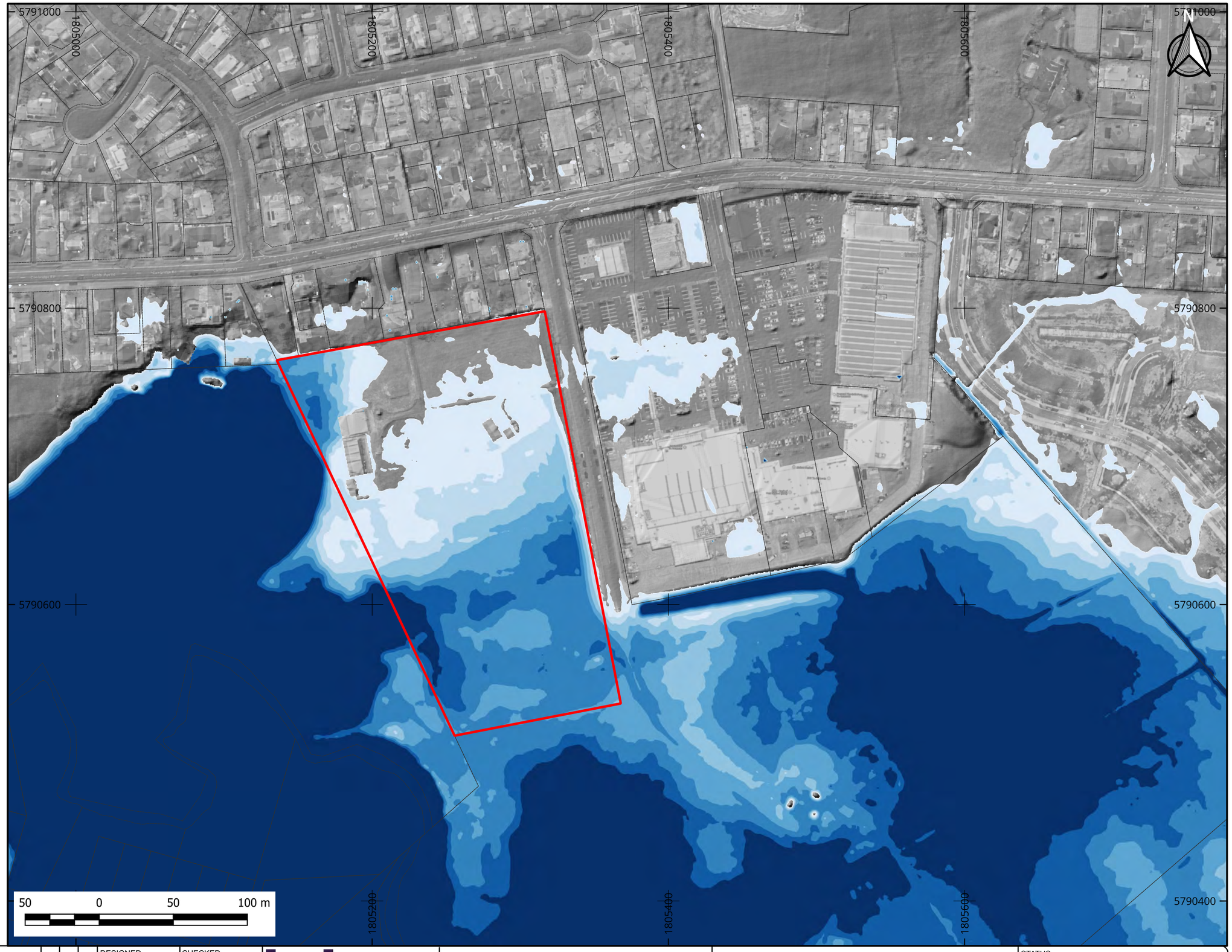
MODEL PARAMETERS

Model Used: TUFLOW HPC
Model Version: 2023-03-AF
Sub-Grid Sampling: Yes
Grid Size: 8m
Quadtree Configuration: 8m/4m/2m/1m
Model Elevation Grid: 1m 2021 Waikato LIDAR
Vertical Datum: NZVD2016

NOTE:
Depths under 100mm have been excluded from the map as per standard practise

OVERVIEW MAP





C	02/06/2026	UPDATED BASED ON WRC FEEDBACK	CF	-	-
B	27/05/2026	UPDATED BOUNDARY CONDITIONS	CF	-	-
A	20/12/2024	FIRST ISSUE	CF	-	-
	DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR

DESIGNED | CHECKED
DRAWN | APPROVED
mx model version

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MITRE 10 TE AWAMUTU
EXISTING CONDITIONS
100-YEAR ARI (1% AEP) FLOOD DEPTHS
RCP6 FOR THE YEAR 2100
1% AEP BOUNDARY CONDITIONS

STATUS: FOR INFORMATION
DATE: 02/06/2026
SCALE (ORIGINAL SIZE A3): 1:2,500
MAP NUMBER: 148140-FM-0110
REVISION: C

D:\12ds\data\10.7.120.14\148140_5397\07 Water Resources\TUFLOW\M10_TA.qgz EX_100_ARI_RCP6_PWL_D CRS: NZGD2000 / New Zealand Transverse Mercator 2000 cfokianos 02/06/2026 02:46 PM

LEGEND

Depths (m)

M10_TA_RCP6_PROP_PWL051p_d_HR_M

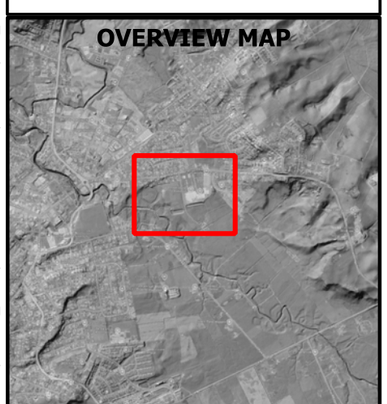
- <= 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 1.25
- 1.25 - 1.50
- > 1.50

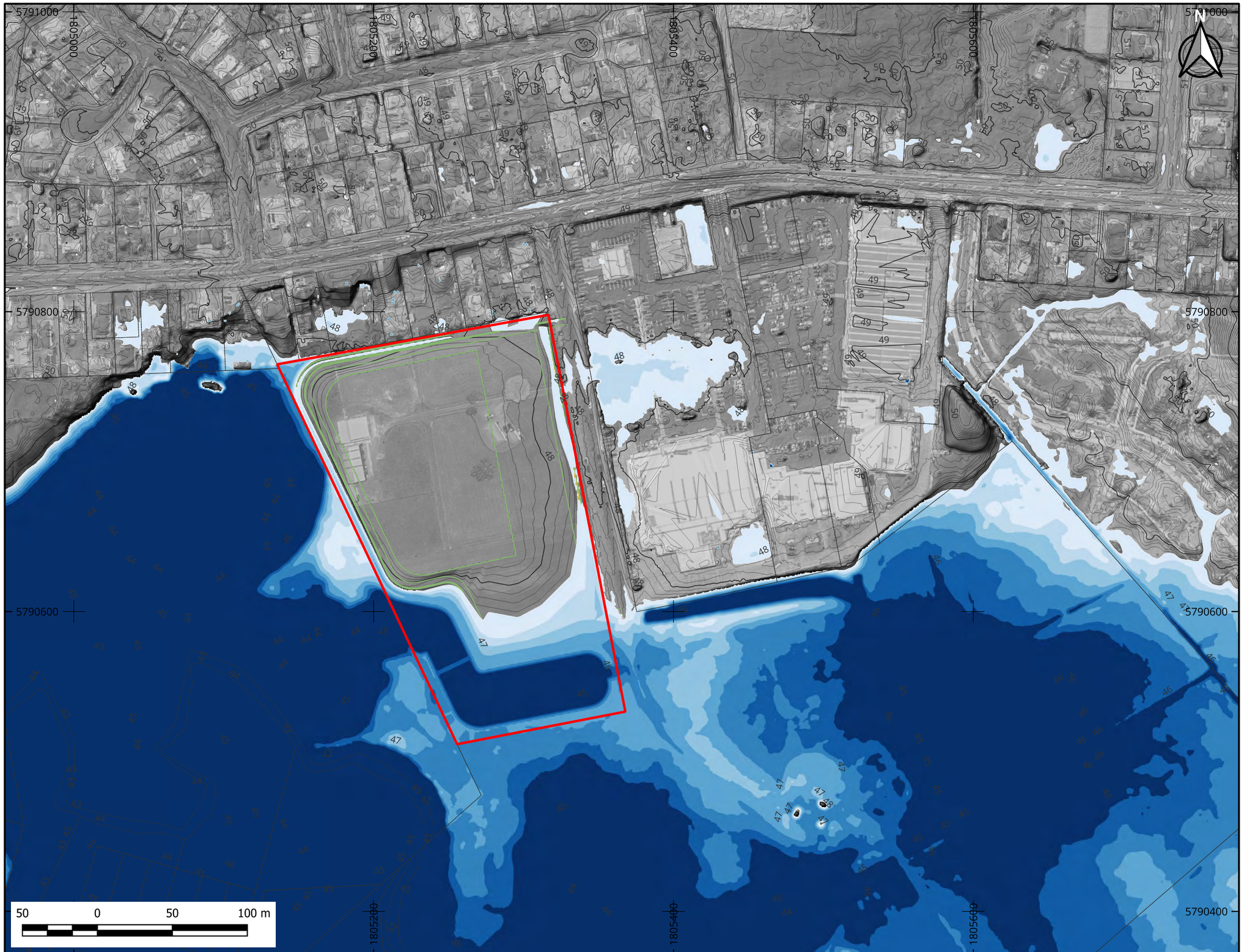
MODEL PARAMETERS

Model Used: TUFLOW HPC
Model Version: 2023-03-AF
Sub-Grid Sampling: Yes
Grid Size: 8m
Quadtree Configuration: 8m/4m/2m/1m
Model Elevation Grid: 1m 2021 Waikato LIDAR
Vertical Datum: NZVD2016

NOTE:
Depths under 100mm have been excluded from the map as per standard practise

OVERVIEW MAP





	DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR
C	02/06/2026	UPDATED BASED ON WRC FEEDBACK	CF	-	-
B	27/05/2026	UPDATED BOUNDARY CONDITIONS	CF	-	-
A	20/12/2024	FIRST ISSUE	CF	-	-

DESIGNED | CHECKED
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MITRE 10 TE AWAMUTU

PROPOSED CONDITIONS
100-YEAR ARI (1% AEP) FLOOD DEPTHS
RCP6 FOR THE YEAR 2100
1% AEP BOUNDARY CONDITIONS

STATUS: FOR INFORMATION
DATE: 02/06/2026
SCALE (ORIGINAL SIZE A3): 1:2,500
MAP NUMBER: 148140-FM-0111
REVISION: C

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LEGEND

Water Level Difference (m)

WL_Delta_PWL051p_Trimmed

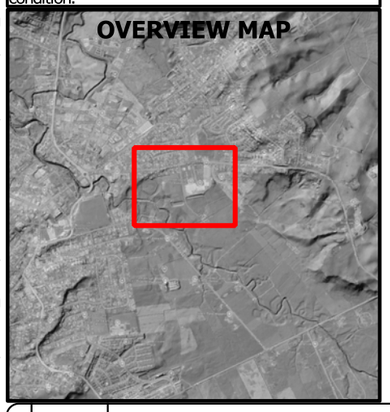
- <= -0.200
- -0.200 - -0.100
- -0.100 - -0.020
- -0.020 - -0.015
- -0.015 - -0.010
- -0.010 - -0.001
- -0.001 - 0.001
- 0.001 - 0.010
- 0.010 - 0.015
- 0.015 - 0.020
- 0.020 - 0.100
- 0.100 - 0.200
- > 0.200

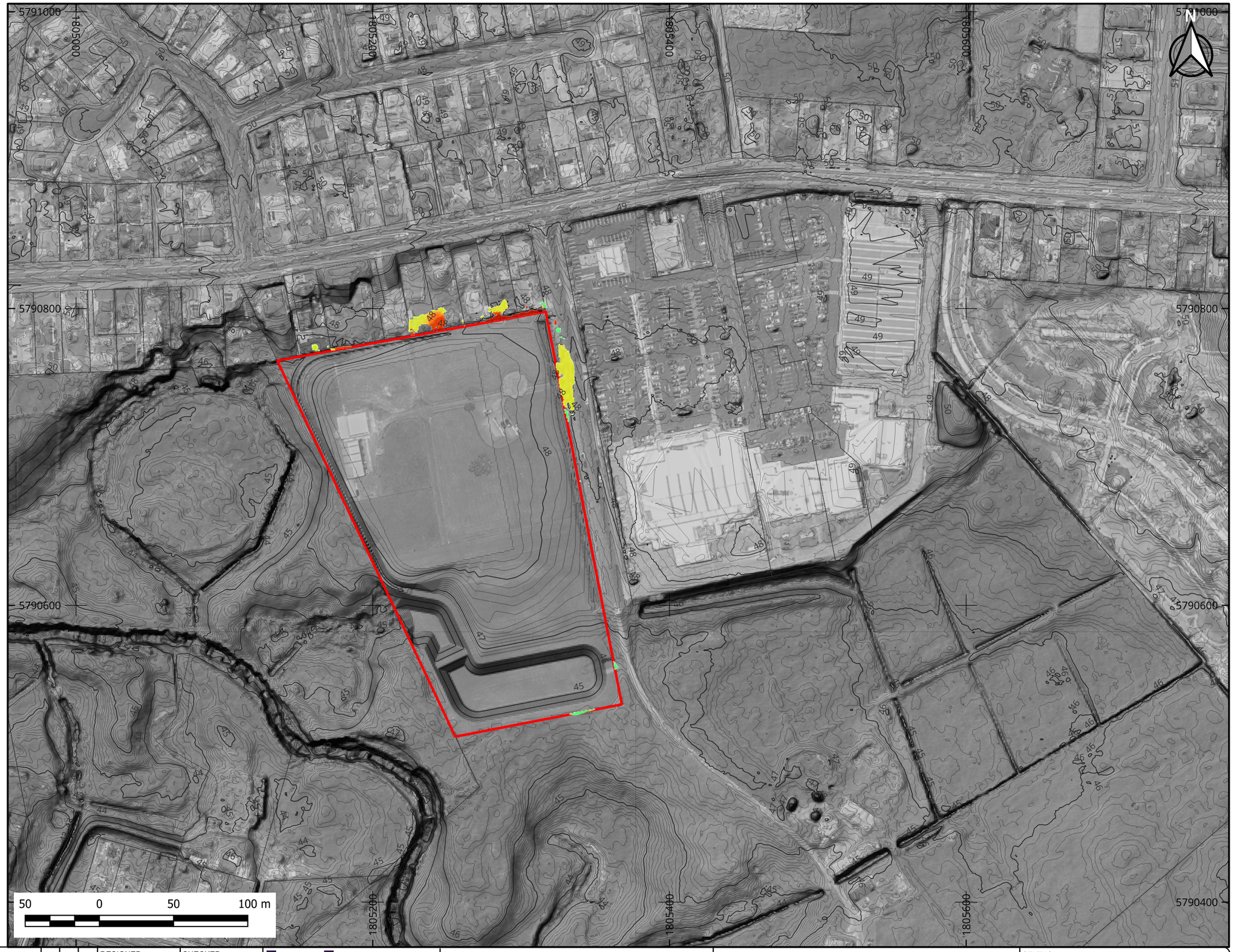
MODEL PARAMETERS

Model: TUFLOW HPC
Version: 2023-03-AF
Solver: HPC with Sub-Grid Sampling
Grid: 8 m base grid
Quadtree: 8 m / 4 m / 2 m / 1 m
Model elevation grid: 1 m, 2021 Waikato LiDAR
Vertical datum: NZVD2016
Scenario: 100-year ARI 24-hour RCP6.0 to 2100
Difference: Proposed minus existing/reference

NOTES:
1. Difference = proposed development minus existing/reference condition.
2. Positive values indicate afflux; negative values indicate reduced peak water level.
3. Differences between -0.001 m and +0.001 m are not shown.
4. Results are for the supplementary floodplain test condition.

OVERVIEW MAP





B	02/06/2026	UPDATED BASED ON WRC FEEDBACK	CF	-	-
A	27/05/2026	FIRST ISSUE	CF	-	-
	DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR

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mx model version

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MITRE 10 TE AWAMUTU

WATER LEVEL DIFFERENCE / AFFLUX MAP
PROPOSED MINUS EXISTING CONDITIONS
100-YEAR ARI 24-HOUR RCP6.0 TO 2100

STATUS: FOR INFORMATION
DATE: 02/06/2026
SCALE (ORIGINAL SIZE A3): 1:2,500
MAP NUMBER: 148140-FM-0301
REVISION: B

D:\12ds\data\10.7.120.14\148140_5397\07 Water Resources\TUFLOW\M10_TA.qgz PROP_100_ARI_PWL_WL_DIFF CRS: NZGD2000 / New Zealand Transverse Mercator 2000 cfokianos 02/06/2026 02:46 PM