Before the Expert Panel
I mua i te roopu tohunga

FTAA-2512-1157

Under	the Fast-track Approvals Act 2024 ('**FTAA**')
In the matter of	a substantive application under the FTAA for an alteration to an existing designation, resource consents, a wildlife approval, archaeological authorities and a complex freshwater fisheries activity, to construct, maintain and operate the Belfast to Pegasus Project
By	**New Zealand Transport Agency Waka Kotahi** Applicant

Statement of Evidence of David Patrick Delegarza (stormwater and flooding)

Dated 15 May 2026

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Statement of evidence of David Patrick Delegarza

1 Introduction

1.1 My full name is David Patrick Delegarza.

1.2 I am an Associate Engineer at Aurecon. I have been in this position since 2023. I am responsible for stormwater design, flood modelling, hydraulics and scour analysis.

1.3 I hold the qualifications Bachelor of Science in Civil Engineering and Professional Engineer.

1.4 I have 23 years of experience in stormwater engineering, including flood modelling, bridge and culvert design, and stormwater facility design including water quality treatment.

1.5 I have been involved in the State Highway 1 North Canterbury – Woodend Bypass Project (Belfast to Pegasus) ('the **Project**') since June 2025. I am the principal author of the Stormwater and Flooding Assessment lodged with the Project's substantive application (Volume 3L).

1.6 My evidence has been prepared to support the New Zealand Transport Agency Waka Kotahi ('**NZTA**') response to comments from invited parties. This statement of evidence responds to comments from Environment Canterbury ('**ECan**') and specifically the comments in the document 'Appendix 7: s53(2)(a) Fast Track Approvals Act 2024, Technical Advice – Stormwater' (thereafter, 'the **ECan Report**'). This evidence also refers to matters raised by other parties, in particular where they have the same concerns as ECan.

2 Code of conduct

2.1 While the application is not before the Environment Court, I confirm that I have read and am familiar with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023, and agree to comply with it.

2.2 Unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

3 Scope of evidence

3.1 My evidence addresses the following:

a Flood modelling, including addressing concerns from ECan regarding the flood modelling used by Aurecon;

b Peer review for flood modelling;

c Stormwater modelling and design, including addressing concerns from ECan that information provided in relation to the proposed stormwater system is insufficient;

d Peer review for bridge and large culvert designs;

e Stormwater runoff across an existing HAIL site;

f Erosion and scour protection;

g Effects of flow in Waihora Stream.

4 Executive summary

4.1 The Project adopts a pragmatic stormwater and flood management approach that reflects the rural character of the surrounding catchments and the constraints of the existing designation corridor. The stormwater design has been developed in accordance with NZTA's P46 Stormwater Management and Minor Stream Diversion Design Specification (2025), NZTA's Stormwater Treatment Standard for State Highway Infrastructure (2010), and relevant Waimakariri District Council ('**WDC**') and Christchurch City Council guidance. Stormwater treatment devices have been sized to capture and treat the required rainfall and runoff volumes in accordance with these standards and accepted local practice.

4.2 A two-dimensional hydrodynamic flood model was developed using TuFlow software to assess the potential flooding effects of the Project. The model was derived from the WDC flood model and incorporates updated LiDAR terrain data, surveyed culverts and channels, and a higher-resolution grid. The modelling assessed pre-project, post-project, and mitigated scenarios using conservative assumptions, including climate change adjusted rainfall based on the RCP 8.5 scenario, high antecedent moisture conditions, and maximum probable future catchment development.

4.3 The modelling demonstrates that the Project generally provides beneficial flood outcomes across the wider catchment, including reductions in flooding levels and reduced roadway overtopping in several locations. While some localised increases in flood levels are identified, these are generally confined to existing flowpaths, are limited in extent, and do not adversely affect habitable buildings. In my opinion, the modelling approach and resulting assessment are robust and appropriately conservative for the purpose of identifying and assessing flood effects associated with the Project.

4.4 The concerns raised in the ECan Report regarding the flood modelling methodology, peer review requirements, stormwater design detail, erosion protection, and Waihora Stream flow effects have been carefully considered. For the reasons set out in my evidence, I consider the modelling methodology, stormwater design approach, and proposed mitigation measures to be appropriate and proportionate to the level of risk presented by the Project. In particular, the flood modelling has been developed using conservative assumptions and demonstrates that significant adverse flooding effects are not anticipated.

4.5 I agree, however, that several of the proposed consent conditions could more clearly capture the intended stormwater and flood management outcomes and ensure these are carried through detailed design and construction. Accordingly, I support amendments to a number of the proposed regional consent conditions relating to flood level limits, stormwater treatment performance, erosion and scour protection, and management of stormwater within HAIL areas.

4.6 Overall, it is my opinion that the Project's stormwater and flood management measures are appropriate for the scale and nature of the Project and that, with the proposed mitigation and conditions, the adverse effects of the Project on flooding, stormwater, erosion, and scour will be appropriately managed.

5 Design Approach

5.1 The stormwater design and flood management philosophy for the Project is intended to be a pragmatic approach that ensures that impacts from the Project are appropriately identified and mitigated while providing a design that reflects the rural nature of the area.

5.2 The stormwater design reflects the extent of the existing Project designation, which provides for a narrow corridor without allowance for large stormwater storage or attenuation facilities. The design approach reflects this through assessing discharge from the Project area and quantifying the resulting impacts rather than mitigating effects to no impact.

5.3 The overarching criteria applied to the stormwater management system is NZTA's P46 Stormwater management and minor stream diversion design specification 2025. This document establishes minimum criteria for conveyance, treatment, and operation of stormwater drainage and management systems on state highway infrastructure projects.

5.4 Stormwater treatment for the Project has been designed in general accordance with NZTA's Stormwater Treatment Standard for State Highway Infrastructure 2010. This document establishes design criteria for stormwater treatment systems to remove typical roadway contaminants, including suspended solids, heavy metals, and nutrients.

5.5 As appropriate, local criteria from the WDC Engineering Code of Practice and Christchurch City Council's ('**CCC'**) Waterways and Wetland Design Guide ('**WWDG'**) have been incorporated, especially for the establishment of design storms and design guidelines for non-NZTA owned assets.

5.6 Consistent with the P46 guideline, section 5.2, flood modelling has been undertaken using a model derived from the WDC model. This flood modelling was used to assess the impact of Project earthworks, modifications to waterways, culverts, and added impervious areas.

5.7 The results of the flood modelling were assessed in collaboration with WDC to identify practicable design solutions that minimise adverse flooding impacts to adjacent and downstream land areas. The primary targeted event for the assessment of flooding impacts is the 200-year ARI event. This assessment was not based on a single defined threshold, rather, it holistically considers the overall catchment and the impacts on a location-by-location basis.

5.8 Culverts and Bridges for the Project are designed in accordance with P46 and the NZTA Bridge manual, where appropriate. This includes an assessment of potential scour effects and scour mitigations (i.e. riprap).

6 Flood modelling

6.1 The ECan Report expresses concerns with Aurecon's flood modelling used for the Project. For the reasons explained below, I disagree with the matters raised, and consider that the flood modelling carried out is appropriate. However, I consider that the flooding and stormwater design objectives could be better captured in the proposed conditions. I have therefore suggested amendments to the proposed regional consent conditions.

6.2 To assess the potential flooding impacts of the Project, a two-dimensional (2D) hydrodynamic flood model was developed using TuFlow hydraulic modelling software ('**Tuflow model**'). This model is largely based on the WDC local flood model ('**WDC model**'). The Tuflow model was developed to inform a project-specific effects assessment and uses matched underlying conditions (pre- vs post- condition) across both models, ensuring that assumptions do not affect compared outcomes.

6.3 The WDC model was not directly utilised for the site assessment due to the extended processing times (several days to a week) and the complexities inherent with stabilising large-scale three way coupled models. As the nature of the design process requires running models repeatedly to assess impacts, this rendered the WDC model impractical for direct use for this application.

6.4 The Tuflow model incorporated elements from the WDC model including, upstream and downstream water flow and tailwater conditions, rainfall, initial and final soil infiltration parameters, catchment roughness, and land use parameters. Importantly, the Tuflow and WDC models incorporate extensive future land use changes (i.e. Maximum Probable Development), especially in the upper portions of the McIntosh Drain Catchment. The rainfall depths for both models have been adjusted for climate change by using a representative concentration pathway (RCP) 8.5 (maximum) scenario.

6.5 The Tuflow model incorporated updated LiDAR terrain, as well as terrestrially-surveyed culverts and channels within the model extent. Additionally, the Tuflow model has a significantly higher resolution (cell size) than the WDC model.

6.6 The Tuflow model was run for pre-project, post-project, and mitigated conditions. The mitigated condition model includes proposed culverts, channels, and cutoff drains to manage flood impacts from the Project.

6.7 The pre-project Tuflow model was compared against the WDC model, by visually examining flood extents, comparing flood depths at key locations, and by comparison of flow hydrographs. Whilst the flood extents and depths are largely similar to the WDC model, the Tuflow model results in higher runoff peak flows and volumes than the WDC model. This is due to a combination of factors, including:

a The higher resolution of the Tuflow model that channelises flow rather than allowing it to pond.

b Incorporation of existing culverts that pass flow downstream rather than allowing it to pond. These culverts are largely not represented in the WDC model.

c The infiltration method used in the Tuflow model represents a high antecedent moisture condition, resulting in reduced infiltration and higher runoff.

d Other site specific factors as discussed in table 2-2 of the updated flood modelling report[1] that was provided to ECan (completed after the Application documents were lodged), this table is shown in Appendix A.

6.8 In some locations, despite higher flows, the apparent flood extents in the Tuflow model are narrower when compared with the WDC model. This is generally due to the use of a finer 2D cell size that more accurately reflects channel detail.

6.9 Based on the high development assumptions and high antecedent moisture conditions in the Tuflow model, the resulting flow rates are considered conservative for the purpose of identifying potentially impacted areas.

6.10 Water level afflux mapping of the mitigation model compared with the pre-project model identifies areas of both positive afflux (i.e. increased water levels) and negative afflux (reduced water levels) in the 200-year ARI flood event. These outcomes are discussed in detail in the flood modelling reporting but are generally summarised below:

a Reduction in flood levels across adjacent portions of the site with habitable structures, including:

i Within and adjacent to the Parsonage Subdivision;

ii 179 Gladstone Road;

iii 171 Gladstone Road;

iv 10 Jelfs Road;

v North of the Taranaki River, where water currently overtops SH1.

b Increase in flood levels within channels and flowpaths in some locations. Where increases in flood levels occur, they do not affect habitable structures and are confined with minimal extent increase. Outside of the Project

[1] Flood Assessment Report 11320-AUR-0350-PWI-SW-RPT-0001[B]

boundary and NZTA owned land, these increases are generally less than 50mm, though there are isolated locations with higher afflux, up to 150mm, especially where culverts mitigate existing roadway overtopping. These locations are detailed in Table 2.5 and figures 2-18 to 2-19 of the updated Flood Assessment Report 11320-AUR-0350-PWI-SW-RPT-0001[B], which are included in **Appendix A** to this evidence.

6.11 On the balance, in my opinion, the beneficial flooding outcomes including reduction in flood levels and roadway overtopping exceed the negative impacts.

6.12 These impacts have been extensively discussed with WDC in multiple meetings. WDC has confirmed that it is satisfied with the modelling approach and final outcome (see the letter from WDC in **Appendix B**).

6.13 Due to the high flows generated by climate adjusted rainfall, high antecedent moisture condition, and Maximum Probable Development scenario, the results discussed above are likely conservative as they represent the confluence of multiple conservative assumptions.

6.14 The ECan Report suggests that the low lying portion of the alignment between Lineside Road and the Ruataniwha / Cam River should be included in the hydrodynamic model. This section was not included in the hydrodynamic modelling for the following reasons:

a Within this area, the Project does not propose to modify any waterway (e.g. Wilsons or Rossiter Drains) in any way that would reduce flood conveyance. The existing culvert sizes are maintained, providing the same conveyance capacity as the existing condition.

b The Project does not propose to change the vertical alignment of the existing roadway so as not to adversely impact impounded water from either side of the roadway.

c WDC flood mapping indicates that a large area of approximately 10 km^2 is inundated between Lineside and Cam Roads in a 200-year flood event. The Project proposes placement of fill adjacent to the existing roadway corridor across this zone. This proposed fill is not within an area of active conveyance, rather is within a zone of ponded water. Accordingly, the potential impact of this earthwork is limited to water displacement effects, which are distributed across the large ponded water area.

d These effects have been conservatively assessed for several different water levels and have been shown to result in only very minor impact on flooding levels, with 100 and 200 year ARI impacts, assessed at 2.1 and 1.5mm respectively. This impact is likely to be overstated as the flooding levels are largely driven by external hydraulic conditions, especially downstream tailwater levels.

e Due to the size of this ponded area, detailed hydrodynamic modelling of the overall flooding would require catchment scale modelling of numerous river systems, including breakouts from the Kaiapoi and Cam Rivers and portions of the Kaiapoi urban area. Such models require extensive setup and processing time that are considered unnecessary given the scope of work and minimal impacts indicated by the conservative displacement assessment.

f Compensatory storage (excavation offsetting fill) is sometimes utilised to mitigate potential displacement impacts. This is impractical at this location due to limited space available within the existing designation boundary and high groundwater levels, which would negate storage and introduce risks of groundwater take. Based on these factors and the negligible impact of the fill, provision of compensatory storage is considered not practicable.

g Although the Project proposes to add impervious area to this portion of the catchment, this impervious area is extremely small in relation to the scale of the overall Cam River catchment and is located at the downstream most portion of the overall catchment. This results in peak inflows from the added impervious area draining through well before the peak inflows from the greater Ruataniwha / Cam River catchment (approximately 12 hour time of concentration). An assessment of the flow increases resulting from the added impervious surfaces was undertaken, indicating that potential increases in peak flow to the Cam River are 0.10% to 0.20% across various ARI events, which is considered hydraulically negligible.

6.15 The ECan Report suggests incorporation of the 10 year ARI event in the modelling. The underlying WDC flood model has not been run for a 10-year event. As the WDC model is used as the basis for the Project flood mapping, there is insufficient data to establish boundary conditions (e.g. inflows and water levels) to assess the 10 year event. Based on the limited impacts of the 200-year flooding areas traversed by the Project and rural land use with limited area impacted by flooding, a flood assessment of the 10-year event would be unlikely to identify any significant flooding impact.

6.16 While I disagree with concerns raised regarding the Project flood modelling, I agree that the proposed consent conditions could better ensure that the flooding and stormwater design objectives for the Project are carried through into detailed design and construction. Accordingly, I support a range of changes to the proposed regional consent conditions.

6.17 New proposed consent condition O3.15 relates to maximum flood level impacts outside the Project boundary or NZTA owned land for the 200-year ARI flood event. The proposed limits have been established based on the modelled impact of the Project and reflect the impacts agreed with WDC (see the letter in Appendix B).

a There are several locations traversed by the Project where existing flooding results in overtopping of existing roadways. In some of these locations, overtopping occurs away from the location where the main flow path crosses the roadway, resulting in adverse downstream impacts. These locations include SH1 north of the Taranaki River, and along Waihora Stream at Gladstone Road and Woodend Beach Road. In these locations, proposed culverts have been sized to accommodate high flows, eliminating this overtopping. However, this results in increased water levels in the immediate downstream vicinity of the culverts, up to 150 mm, which is confined to existing channels and flowpaths. Recognising the overall benefit of eliminating roadway overtopping and subsequent positive downstream impacts, the proposed consent condition allows for up to 150mm of localised increase within the Taranaki River and Waihora Stream where the water levels remain confined to existing flowpaths, noting that there is no impact on habitable floor level flooding in this area.

b Within the Cam / Kaiapoi Basin discussed above (paragraph 6.14), the proposed flood level increases are limited to 5mm, in recognition of the negligible impact to this area.

c Within downstream receiving environments the proposed condition specifies that the Project may not change the number of habitable buildings at risk of flooding. This recognises that while development of any kind will inevitably result in some increase in downstream runoff volumes, the Project does not increase peak flow rates for the 200 year-ARI event. As a result, the associated changes in downstream flood behaviour are minor and the Project is not expected to materially increase flood risk or alter the number of habitable buildings at risk of flooding downstream. Flood depths at habitable buildings which already flood (in a no-Project scenario), are predicted to increase by no more than 10mm, using conservative volumetric methodology.

d The proposed condition does not include limits for the portion of the roadway south of the Kaiapoi River, as the work in this area is limited to a single lane widening with earthworks that do not affect any waterways or flood zones. The stormwater discharge for this area is intercepted and conveyed to the Kaiapoi River by the Kaiapoi stormwater network and WDC has agreed to this discharge.

e Elsewhere within the Project area, the proposed condition limits flood level increases to 50mm, provided no floor levels of habitable structures are affected. This recognises the rural, low risk nature of the catchment.

7 Peer Review of the Flood Model

7.1 The ECan Report suggests undertaking a peer review of the flooding model, and suggests a condition to this effect.

7.2 I am experienced in the independent peer review of stormwater models, having acted as a peer reviewer on numerous occasions. It is my experience that peer review is generally undertaken in conditions where considerable risk is present, including high risk of flooding habitable buildings or significant potential damaging erosive effects. Those conditions do not exist here. For this Project, the modelling results indicate that, even under the conservative 200-year modelled conditions, habitable structures are not negatively affected by impacted portions of the floodplain and elsewhere flood afflux levels are limited, the risk profile for this model is low. Any model changes or updates resulting from a peer review would be highly unlikely to change the assessed impacts of flooding.

7.3 Therefore, given the low-risk nature of the identified flood effects, together with the conservative modelling assumptions and existing quality assurance processes applied during model development, it is my opinion that a resource consent condition requiring independent peer review of the flood model is unnecessary.

8 Stormwater Design Elements

8.1 The ECan Report suggests that the substantive application for the Project contains insufficient information to assess the design of the proposed stormwater system, particularly with respect to the sizing of treatment devices and the level of treatment performance to be achieved.

8.2 All stormwater facilities, including treatment and conveyance devices, have been designed in accordance with the NZTA Stormwater management and minor stream diversion design (P46) and NZTA's Stormwater Treatment Standard. Treatment devices have been sized to capture 25mm of rain and/or treat 5mm / hr of runoff in accordance with this and local criteria.

8.3 I recommend that the proposed regional consent conditions are amended to refer to these capture and treatment outcomes, to provide comfort that the current design approach is carried through to final design and construction. Accordingly, I suggest these criteria are included in proposed condition O3.21.

9 Bridge and large culvert peer review

9.1 The ECan Report suggests that bridges and large culverts (as defined in the NZTA bridge manual) should be subject to independent peer review to confirm that scour protection and mitigation measures are appropriately designed to manage events up to the 100-year ARI. ECan suggests a condition to this effect.

9.2 Design was carried out as per the NZTA Highway structures design guide [2016]. This document assigns category level 3 and 4 to the culverts on the Project, indicating that design review can be undertaken as part of internal design review verification process and does not require independent peer review.

9.3 The overall catchment traversed by the Project consists of a low energy environment, characterized by low velocities, and an overall low erosive potential. The 100-year ARI culvert outlet velocities are in the 1.0m/s to 2.5m/s range and will all be protected with riprap aprons, following standard design guidance. This represents a low-risk erosive environment that is protected by significant proposed riprap revetment. As peer review is generally used for elements of elevated risk, a peer review of these elements is not considered necessary.

9.4 Abutment protection riprap is proposed at the Cam River Bridge to mitigate potential erosion at the bridge abutments. It is noted that the design of abutment riprap protection follows straightforward design guidelines (HEC-23, DG 14) so is highly unlikely to change as a result of peer review.

10 Stormwater runoff to HAIL sites

10.1 The ECan Report expresses concerns regarding potential stormwater discharges to the Gladstone Landfill HAIL site, noting the potential for mobilisation of contaminants within runoff. ECan suggest a condition to avoid or appropriately manage stormwater discharges to contaminated land.

10.2 There are a number of HAIL sites across the Project area which may or may not have contaminants that could be mobilised by stormwater. The extent to which contaminated soil is present, or will be retained across the Project site, is subject to ongoing investigation and geotechnical assessment. The risk of stormwater mobilising contaminants within HAIL areas can be mitigated either by removing contaminated soil or preventing stormwater infiltrating into or mobilising contaminated soil.

10.3 In response to the concerns raised by ECan, I support amendments to proposed consent condition O3.21(d) to ensure no discharge of stormwater to ground in HAIL areas where contamination is still present and to ensure that stormwater discharges do not mobilise contaminated soil in HAIL areas where contamination is still present.

11 Erosion and scour protection

11.1 The ECan Report raises issues regarding erosion and scour protection for waterways associated with stormwater infrastructure. ECan suggests a condition to require the implementation of appropriate erosion and scour protection measures.

11.2 In my view, erosion and scour of waterways can be appropriately managed, and nature-based design protection measures such as planting are standard practice for low energy waterways like those present across the Project. Waterways where planting or landscaping is provided will use organic fibre (wool or coconut) geotextile to stabilise soil as planting establishes where practicable.

11.3 The proposed channels in the catchment have mild longitudinal slopes and low velocities. The landscaping plan proposes vegetation for the channels. Extensive erosion protection is not required for vegetated channels as peak velocities do not exceed erosive thresholds for vegetated ground.

11.4 I agree with new proposed condition O3.13a, which requires that the Project not cause erosion, scour and instability within stormwater infrastructure or waterways impacted by the Project.

12 Effects of flow on Waihora Stream

12.1 Assessment of the catchments traversed by the Project has indicated in general, that increases in streamflow due to the Project are very low. However, within the Waihora Stream catchment, larger increases are possible.

12.2 The stormwater system proposed within the Waihora Stream catchment consists of a series of check dammed engineered bioinfiltration swales. These proposed swales aim to replicate the existing infiltration patterns to the greatest extent possible by capturing and infiltrating stormwater runoff from the roadway. The swales will store and infiltrate runoff for frequent events (25mm total rain / 5mm hr) but will begin to discharge runoff during larger events. The system does not utilise rapid infiltration devices in order to minimise the risk of transporting contaminants to groundwater. Where bioinfiltration swales are used, the construction testing program requires validation of infiltration rates.

12.3 Flood modelling (as discussed above) has indicated that under 200-year ARI flood events, the stormwater system effectively mitigates post development flows to the pre development level in the Waihora Catchment. The modelling furthermore indicates that under 200-year conditions that incorporate future climate rainfall with high antecedent moisture, no flooding impacts to floor levels of habitable structures occurs. Additionally, modelling indicates that by preventing the overtopping of Woodend Beach Road, the proposed stormwater system eliminates flooding at the building location at 10 Jelfs Road, localising floodwaters to the Waihora Stream portion of the site.

12.4 Increases in flow rates are expected to occur due to discharge from the Project in events larger than 25mm rainfall or 5mm/hr events, but smaller than the 200-year ARI flood. In the 5 year ARI event, this increase has been assessed as approximately 25%.

12.5 It is noted that there is insufficient space within the designation boundary for extensive attenuation that would be required to fully mitigate peak flow rates, and even with attenuation, volumetric increases would persist. This is true of any development that adds impervious surface to a catchment. Flow increases in Waihora Stream are due to a combination of added impervious surfaces and the provision of appropriately sized culverts at Woodend Beach Road and Gladstone Road that reduce impounded water at these locations.

12.6 The effects of this increased flow are expected to be a small increase in ponding frequency downstream of Woodend Beach Road and a potential increased frequency of overtopping of Jelfs Road during high rainfall events. These effects occur within rural land that is already subject to inundation as identified by WDC flood mapping and aerial photography showing impounded water, and reported overtopping of Jelfs Road in storm events. There are no significant flooding impacts as a result of this increased flow.

12.7 Modelling indicates that even under 200-year ARI flooding conditions, flow velocities do not exceed erosive thresholds within Waihora Stream. Accordingly, no erosion is expected within the channel due to increased flows.

12.8 Overall, while the Project results in some increase in runoff and intermediate event flow rates within the Waihora Stream catchment, the modelling demonstrates that these changes do not result in adverse flooding effects on habitable buildings, materially increase flood hazard, or create channel erosion effects. In my opinion, the proposed stormwater system represents a pragmatic and appropriate response to the constraints of the existing designation corridor and appropriately manages the hydrological effects of the Project.

13 Conclusion

13.1 In conclusion, it is my opinion that the stormwater and flood management approach adopted for the Project is technically appropriate, consistent with relevant NZTA and local authority standards, and proportionate to the scale and risk profile of the Project. The flood modelling has been developed using conservative assumptions and demonstrates that the Project will generally result in beneficial flooding outcomes, with any localised increases in flood levels being limited in extent and not adversely affecting habitable buildings. The proposed stormwater treatment, erosion protection, scour mitigation, and HAIL management measures are appropriate for the receiving environment and are capable of being effectively implemented through detailed design and construction. While I consider the concerns raised in the Environment Canterbury Report to have been appropriately addressed through the assessment undertaken, I support amendments to the proposed consent conditions to provide additional clarity and assurance regarding the intended flood management and stormwater outcomes for the Project.

David Delegarza
15 May 2026

Appendix A Table 2.5 and figures 2-18 to 2-19 of the updated Flood Assessment Report 11320-AUR-0350-PWI-SW-RPT-0001[B]

Table 2-5 Locations with Flood Level Differences

Locations	Afflux (mm)		Comments
	100-yr	200-yr	
1. Downstream Reach of Taranaki	3	10	Afflux maps show, at the downstream reach of the Taranaki Stream (after Mapleham Drive), minimal flood depth differences, both for the 100-year and 200-year storm events. It signifies that the additional flow, that was diverted from the original overland flow path along the golf course, was conserved and eventually discharged at the same location, maintaining both flow (Figure 2-21 and Figure 2-22) and flood levels
2. Mapleham Drive	10	70	Higher water levels were observed downstream along the Taranaki Stream, particularly near Mapleham Drive, similar to the pattern noted in item 1. However, these elevated levels remain confined within the stream channel and do not impact any nearby buildings. For example, the property at 61 Mapleham Drive, located midstream, has a floor level of approximately 6.0 meters RL. During the 200-year flood event, the pre-development flood level was 5.47 mRL, providing a freeboard of 530 mm; Under mitigation scenario flood level rises to 5.54 mRL , still maintaining a freeboard of 460 mm, ensuring that the property remains protected from flooding.
3. Taranaki Stream downstream of SH1	70	130	The increase in water depth is due to the upsizing of the Taranaki Stream culvert. However, the impacts remain within the channel and do not affect any buildings.
4. Golf Course bounded by SH1 and Mapleham Drive	0	-110	The original overland flow path for the 200-year flood event, caused by the overtopping of SH1 (see Appendix C Figures C-2 and C-4), no longer existed as the excess runoff is now conveyed into the Taranaki Stream via Culvert 16A. This change has resulted in a negative afflux within the golf course area bounded by SH1 and Mapleham Drive.
5. Taranaki Stream close to Harvey Norman (upstream of Bob Robertson Drive)	-200	60	The section of the Taranaki Stream upstream of Bob Robertson Drive exhibits a negative afflux during the 100-year flood event, while a positive afflux is observed under the 200-year event. Flows during the 100-year event are conveyed efficiently due to the increased capacity of the upsized Taranaki culvert. However, during the 200-year flood, the positive afflux occur because culvert 16A reaches its maximum capacity, inducing tailwater upstream of Waihora Creek.
6. Upstream section of Taranaki (upstream of Garlick Street)	-90	-40	For both the 100-year and 200-year ARIs, decreased flood levels were observed in the upstream section of Taranaki Stream, primarily due to improved conveyance of the Taranaki culvert. Any increase in flood depth within the stream extends only as far as Garlick Street (see Figure C-16), beyond which additional runoff is effectively redirected southward through Waihora Creek, continuing downstream to Woodend Beach Road.
7. Garlick Street and Basin within Ravenswood residential area	150	70	The designed Garlick Street extension has a sag elevation of 10.4m RL, which is 0.15m higher than the existing sag level but is consistent with the consented weir level. The sag point acts as an overflow weir that connects the basins

Locations	Afflux (mm)		Comments
	100-yr	200-yr	
			to Waihora Creek. Consequently, more water is detained in the basins with a higher weir level so that the basin storage can be better utilized. Less water is discharged to the Taranaki and Waihora streams and resulted to lower flood depths in the downstream areas. For 200 year events, basin flood level under post development is already as high as 10.41m RL, makes the raising of weir level less effective in storing water in the basins.
8. Downstream of Waihora Creek	110	130	Higher water levels at this location were primarily caused by the reduced channel storage due to the proposed SH1 cutting off Waihora Creek. The impacts remain contained within the channels and do not affect any buildings.
9. Floodplain North of Gladstone Road	-260	40	During the 100-year flood event, excess runoff was efficiently conveyed through the Gladstone Road culvert (10A), resulting in a negative afflux. For the 200-year event, the design intentionally impounds more water within the existing floodplain north of Gladstone Road to attenuate flows and reduce downstream impacts, particularly near Woodend Beach Road. The impacts remain contained within the floodplain and do not affect any properties.
10. East of Copper Beach Road	260	180	Water ponding is due to the motorway cutting off an existing overland flow path. The ponding is localised and does not impact any buildings.
11. Floodplain North of Woodend Beach Road	500	550	The Woodend Beach Road culvert (08A) was designed to impound and attenuate water before it discharges into Kairaki Creek, resulting in a positive afflux during both the 100-year and 200-year flood events. The adjacent floodplain effectively stores the excess water, ensuring that no buildings or properties are impacted.
12. Downstream of Woodend Beach Road	130	0	Higher flood levels were observed downstream of Woodend Beach Road during the 100-year ARI event, primarily due to more efficient conveyance in the upstream sections, including the culverts at Gladstone and Woodend Beach Road. Despite this increase, no buildings were affected, and all impacts remained contained within the proposed diversion channel. For the 200-year event, the Woodend Beach Road culvert (08A) was specifically designed to limit discharge toward Kairaki Creek so that the flood level remains. The storage capacity of the floodplain north of Woodend Beach Road is well utilized.
13. Upstream of McIntosh Drain	140	320	The increase in flood levels is caused by the proposed SH1 cutting off the existing Mcintosh Drain. The impact is largely confined to land owned by NZTA which does not include any residential properties.
14. Within the Quarry Lake.	0	90	The increase in water levels was primarily caused by the loss of storage resulting from the infilling of the lake for the proposed bypass road. The water levels in the ponds generally represent existing groundwater levels, and the model assumes no infiltration. However, since the quarry bottom is directly connected to the groundwater, flood afflux

Locations	Afflux (mm)		Comments
	100-yr	200-yr	
			is expected to be minimal due to the continuous exchange between surface water and groundwater

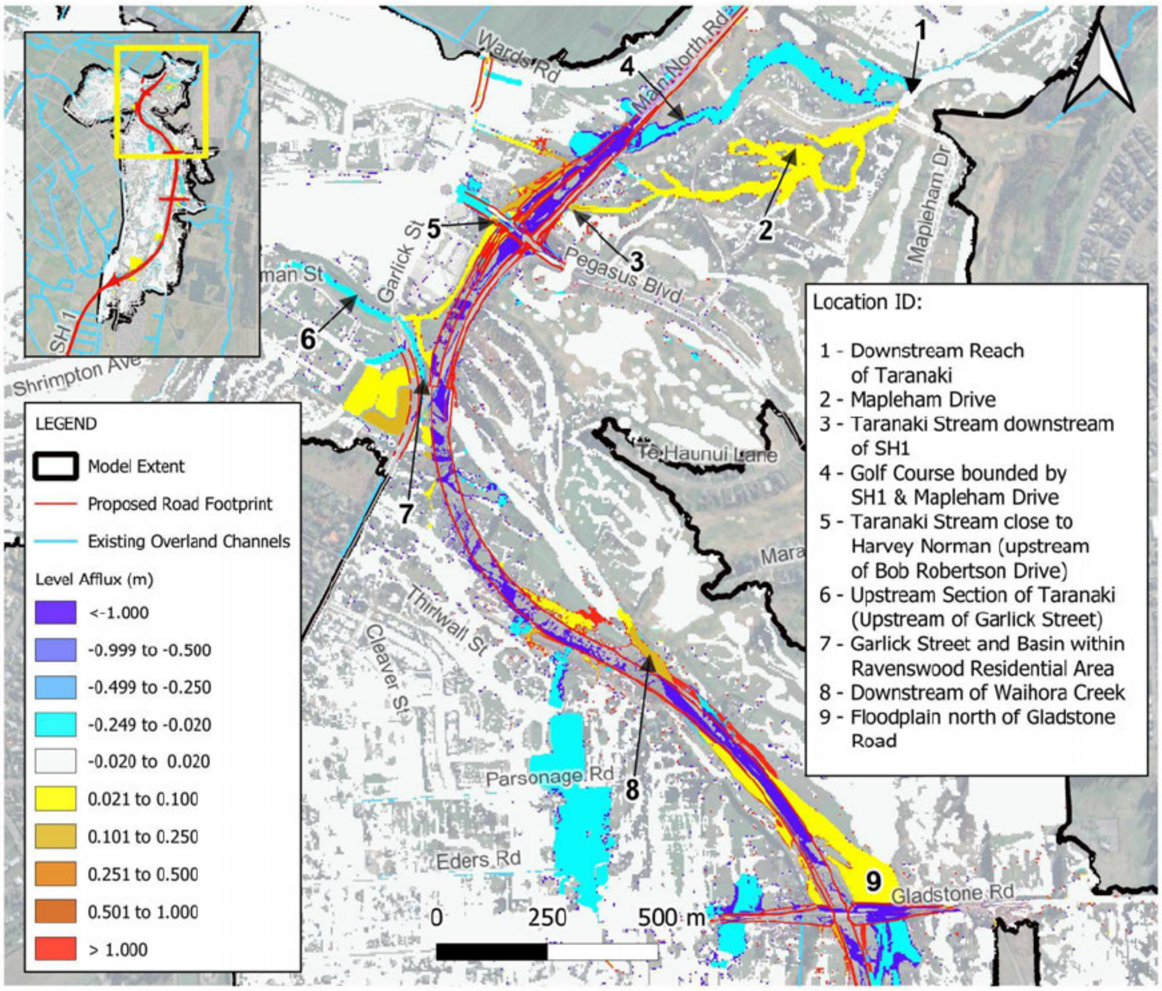


Figure 2-18 Residual impacts outside the designation (upper zone) but does not impact any property buildings (200 year ARI afflux level)

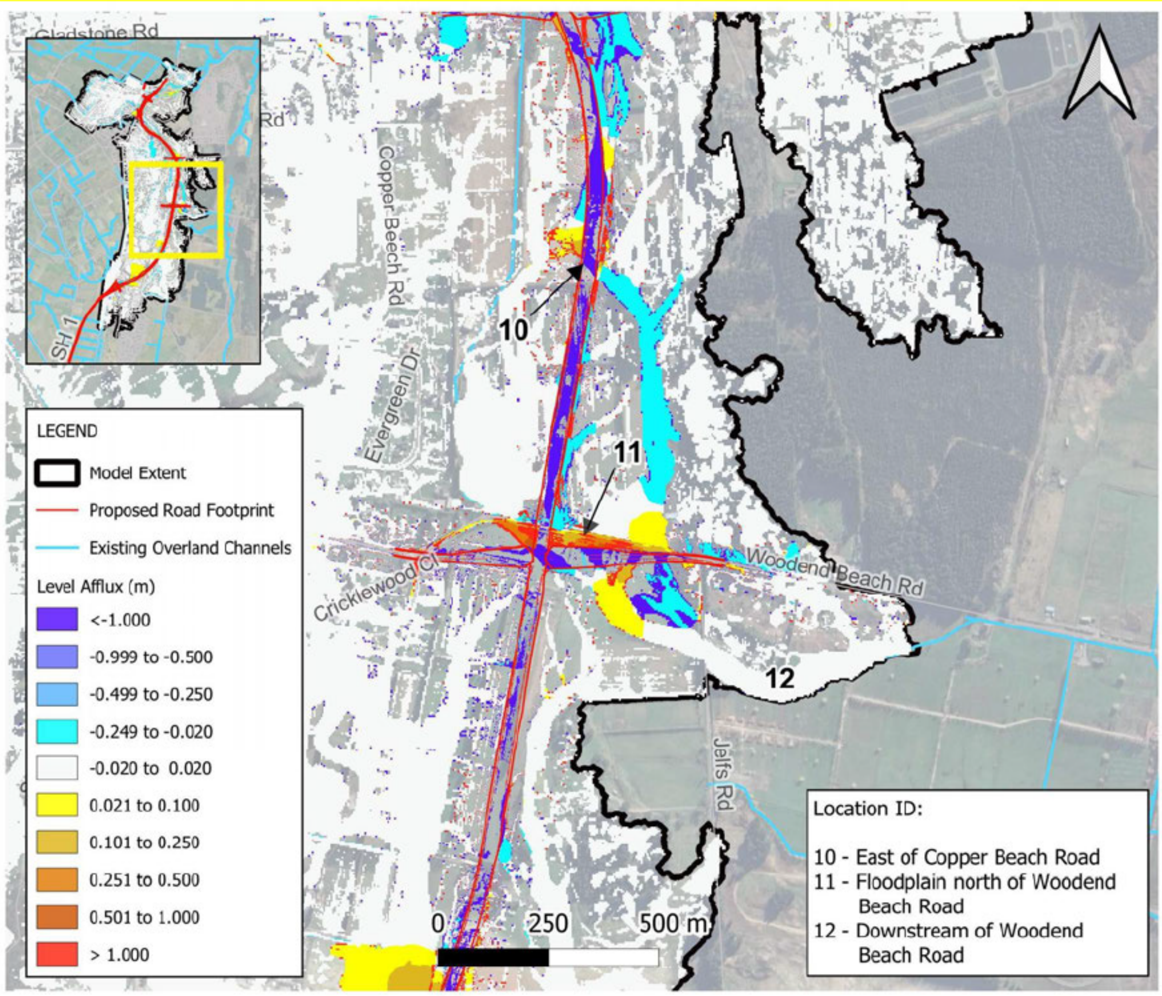


Figure 2-19 Residual impacts outside the designation (central zone) but does not impact any property buildings (200 year ARI afflux level)

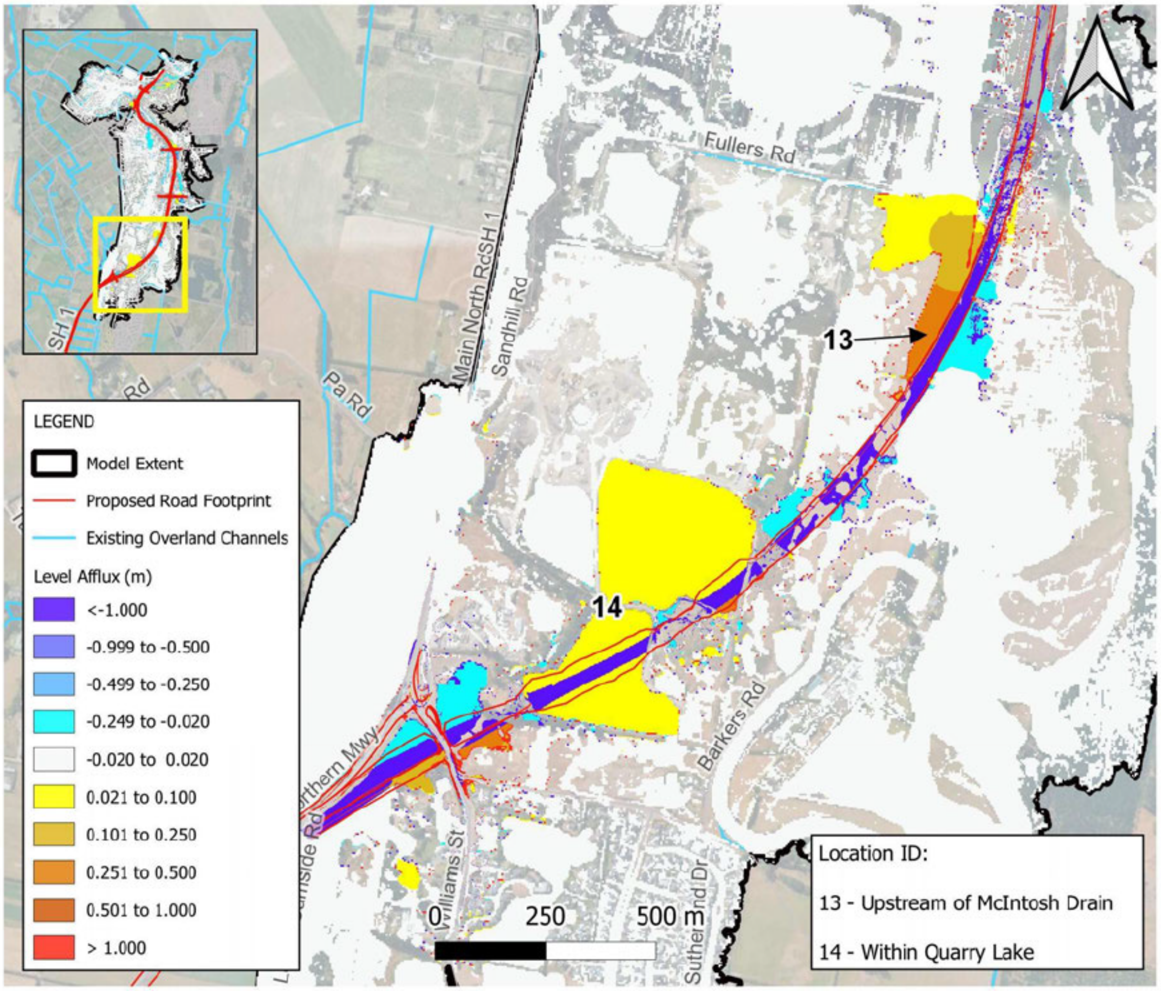


Figure 2-20 Residual impacts outside the designation (lower zone) but does not impact any property buildings (200 year ARI afflux level)

Appendix B Letter from WDC

Waimakariri District Council
215 High Street
Private Bag 1005
Rangiora 7440, New Zealand
Phone 0800 965 468

Our Reference: RDG-32-138-03 / 260408092074

8 April 2026

To whom it may concern

Belfast to Pegasus (B2P) Motorway and Woodend Bypass - Flood Assessment Report – Commentary on work carried out by Aurecon

1.0 Purpose

The purpose of this letter is to provide comment regarding the Waimakariri District Council (WDC) view on the approach that has been taken by Aurecon with regards to assessing flood impacts from the proposed B2P Woodend Bypass.

2.0 Executive Summary

The Council received a draft Flood Assessment Report (dated 20 August 2026, Trim 260127013528) from Aurecon, for its consideration. To assist in preparing a considered response, the Council prepared a table of comments, with some separate assessment of the consequence of the issue raised.

The Council then went through a series of internal reviews and workshops with Aurecon to discuss the issues, and possible physical mitigation works and modelling amendments.

After each round the table of comments was revised, and each was either noted as being accepted, or requiring further consideration.

The series of tables included in Sections 3.0, 4.0 and 5.0 below follow that process in a chronological order. Note the tables include commentary written in the first person by the Network Planning Team Leader. However, they were subsequently discussed and agreed by the wider Council team and accurately reflect that wider view. For the purposes of accuracy, they have not been amended for this memo.

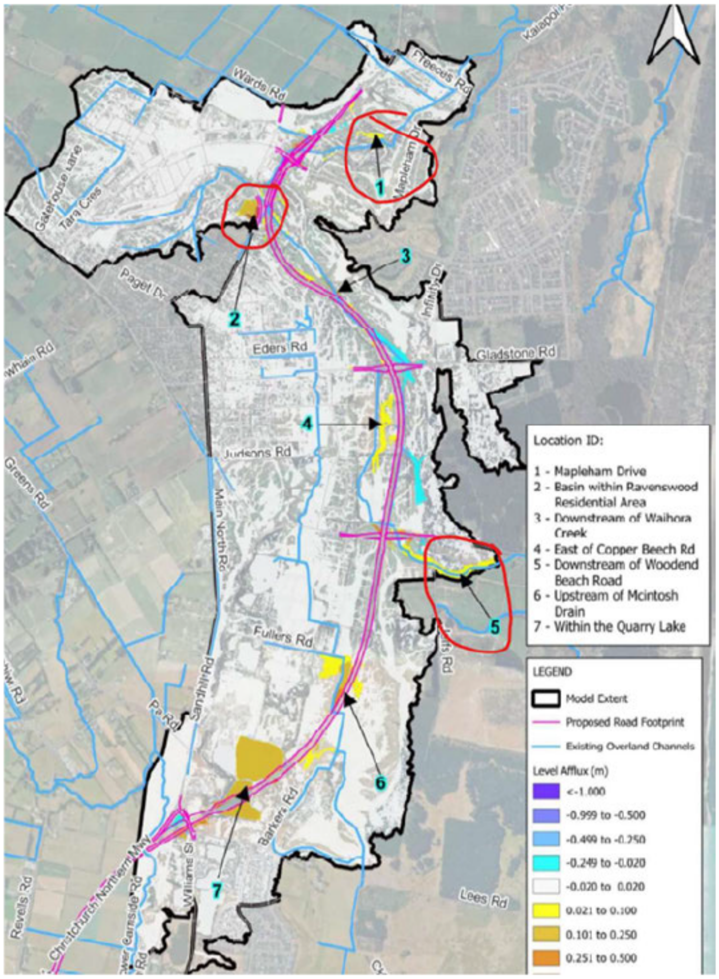
Section 6.0 concludes that the Council is satisfied with the final outcome, in terms of accurately modelling the situation, and appropriately considering the effects.

3.0 Draft Flood Assessment Report

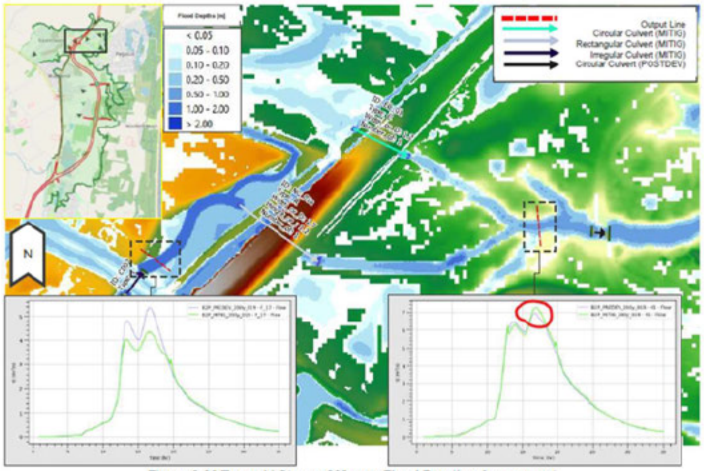
Aurecon provided a draft Flood Assessment Report to the Council on the 20th August 2025 for consideration. Council subsequently identified a number of potential issues as summarised below in Table 1. Note the Table is supplied here verbatim in terms of recording the comments made by the Network Planning team Leader, but they capture the view of the Council.

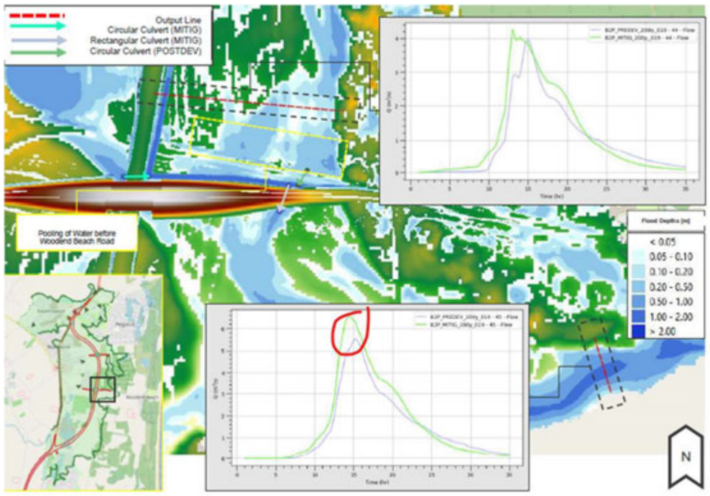
Table 1 - Draft Report Comments

Item	Comments	Consequence/Actions
Model Validation	The model validation against the WDC district model is generally ok. There are some areas where there is a discrepancy which have been noted by Aurecon in their report. I'm generally comfortable with the explanations provided noting that for the most part these are down to a different LIDAR dataset being used by Aurecon. The additional flow in the Waihora catchment appears to be due to how the culvert was modelled in the WDC model vs the Aurecon model and the explanation for this appears reasonable. The report states that the WDC model did not allow for development of Ravenswood and this is the reason for the discrepancy in flood levels here. This is incorrect as the WDC model adopted a design surface for Ravenswood whereas the 2020 LIDAR used by Aurecon features a partial development of the subdivision which was available with the 2020 LIDAR. However I'm comfortable this should not make a material difference to the model results.	Minor – No actions
Model Build	The Aurecon model was built in Tuflow and the assumptions used for the modelling appear reasonable. I do note that the Aurecon model has been based on 2020 LIDAR and has assumed a current state (2025) of development. Where development has occurred between 2020 and 2025 this may not have been captured in the model. Furthermore, modelling a current state model may not reflect the future state of developments around the Woodend area once the motorway opens in approximately 2030. On balance I think these issues are relatively minor as any new developments are designed to manage flows through their developments and so any discrepancies between the level of development in the model and real world is probably not going to make a significant difference.	Minor – No actions
Model Results	Aurecon have produced three versions of the model • Predevelopment (current state, no motorway) • No Mitigation (future state with motorway but no additional mitigation measures) • Mitigation (future state with motorway and mitigation measures to address issues identified in the 100 and 200 year simulations For this section I'm going to comment on the final 'Mitigation' model as this represents the model simulation that should address and mitigate any effects of the motorway. The flood level difference for the 200 year event is shown below with the areas of concern highlighted	



	Flood levels and flows have increased along Taranaki Creek which is evident both in increased flood levels along Mapleham Drive and the flow hydrographs provided for the Taranaki Creek east of the new motorway. I'm generally comfortable with the increased flood levels at Mapleham Drive and the nearest house (61 Mapleham Drive) appears to be clear of the increased flood depth. However, it would be good for Aurecon to confirm this as it is a little difficult to tell from the pdf maps. The increase in flooding along the Taranaki may be more concerning. It is not clear whether the increase in flow here will result in issues further downstream on the Taranaki channel down to Waikuku Beach. It would be useful to see the flow hydrograph on the Taranaki near the boundary of the model to confirm whether this increase in flow is being felt further downstream or natural attenuation in the channel is offsetting the effects. If there is still a significant increase at this point then further work may be required to assess effects at Waikuku Beach.	Moderate – needs further assessment Need to confirm the property at 61 Mapleham Drive is not affected by flooding increases. Confirm the increase in flow (if any) nearer the boundary of the model to determine whether the effect is likely to be significant further downstream towards Waikuku Beach.

	 Figure 2-20 Taranaki Stream 200-year Flood Duration Assessment	Further work may be needed to confirm the additional flows will have no significant effects on the Taranaki Creek downstream to Waikuku Beach
	Flood levels at the Garlick Street SMA (Ravenswood) have increased. This has been explained by the need to effectively block the existing overflow weir and construct the road at grade. This raises a number of issues: 1. What impact does this have on the operation of the SMA now that the emergency overflow has been blocked? 2. Does there need to be some additional mitigation required at the SMA to replicate the performance of the overflow weir once the new road is built? 3. For the purposes of assessing offsite flood effects should this weir be left in place assuming that whatever mitigation is put in place it should mimic the effect of the existing weir?  	Moderate – needs consideration. Recommendation would be to reinstate the weir in the model for purposes of assessing off-site effects and to size any downstream culverts or stormwater infrastructure with this additional flow in mind.
	Flood levels and flows have increase on the Waihora Creek downstream of the	Moderate – needs

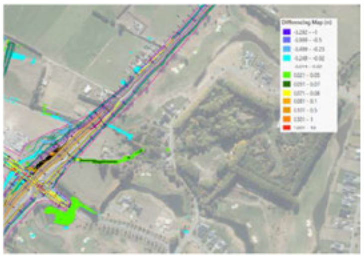
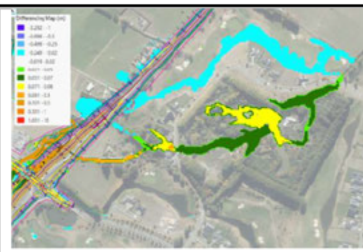
	study area. The report notes the additional flow but discounts the effects as there are no houses affected by the increased flooding within the model study area. However this takes no account of properties further downstream outside of the model study area.  Figure 2-24 Woodend Beach Road 200-year Flood Duration Assessment	consideration. Need to consider the effects of the increased flows in the Waihora Creek downstream of the study area to determine whether the effects are significant or not.

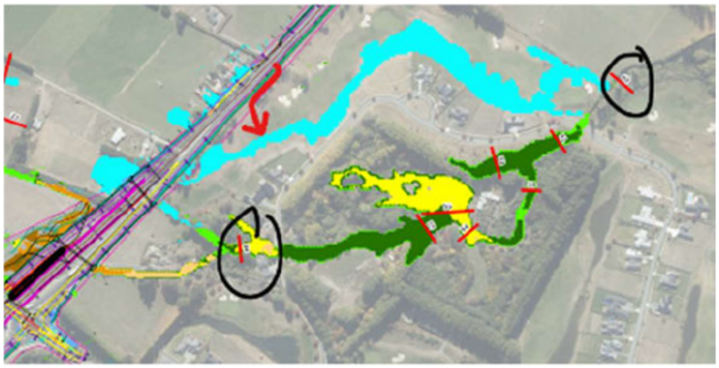
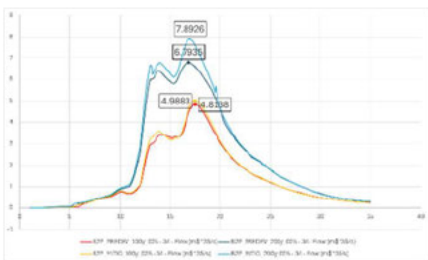
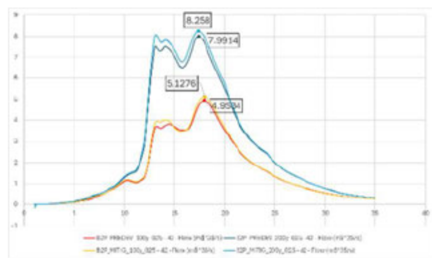
4.0 Revised Modelling

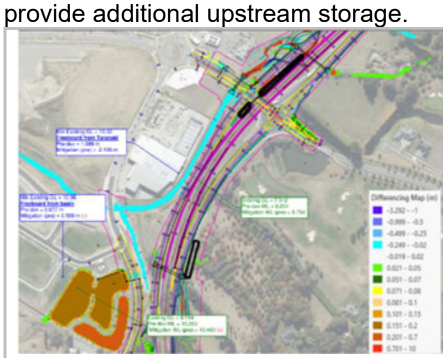
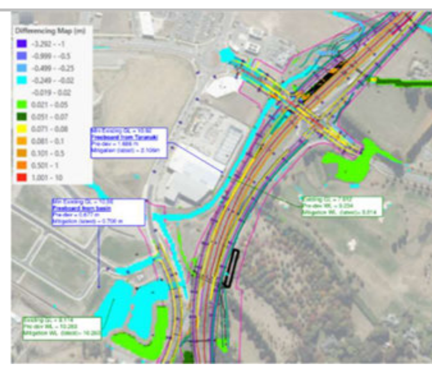
Following the Council's response to the draft Flood Assessment Report Aurecon undertook additional modelling and updated their draft report. Aurecon provided the responses as recorded in Table 2 to the issues raised by the Council (Trim 251028203671).

Table 2 - Revised Modelling and Investigation Comments

Issue	**Aurecon Response**	**Council Response**
Taranaki Creek Flooding		
1. Some small increases are shown on Taranaki Creek downstream of the project, however the impacts of the downstream impacts have not been assessed.	Some minor increases in flood levels are observed downstream of the project along Taranaki Creek. However, the overall downstream impacts are considered negligible. Figures 1 and 2 show the afflux mapping results for the 100-year and 200-year ARI events. Under the 100-year ARI event, the extent of afflux is limited to the immediate downstream of the Taranaki culvert, with a maximum rise of less than 60 mm. For the 200-year ARI event, the afflux remains contained within the defined overland flow path, with a maximum increase of less than 80 mm.	Accepted

	 Figure 1: 100 year afflux map at downstream of Taranaki Stream  Figure 2: 200 year afflux map at downstream of Taranaki Stream	
2. Report to be updated to include commentary on effects at 61 Mapleham (floor level vs flood level)	There is an increase up to 70mm closed to 61 Mapleham Drive as shown in Figure 2, however, it is still within the existing flood plain area. The ground level immediately around the dwelling at 61 Mapleham is at 6.00mRL, with maximum water level sitting at 5.54mRL under 200-year ARI event. The available freeboard at the property is at least 460 mm (noting that the floor level will be higher than the surrounding ground level). • 100-year ARI Pre-dev flood level = 5.32m • 100-year ARI Mitigation flood level = 5.33m • 200-year ARI Pre-dev flood level = 5.47m • 200-year ARI Mitigation flood level = 5.54m	Agreed that there are no significant impacts on the existing property.
3. Report to be updated to include a downstream hydrograph, hopefully showing less than minor impact at downstream limits of Taranki Creek, discuss any potential impacts of increases with WDC	To further assess the potential downstream effects, hydrographs were extracted at two locations within the overland flow path (Lines 34 and 42, as shown in Figure 3). As illustrated in Figures 4 and 5, the differences in discharge between the pre-development and mitigation scenarios under the 100-year ARI event are only marginal, which is consistent with the afflux map as shown in Figure 1 (with no impacts shown further downstream). Under the 200-year ARI event, the peak discharge at Line 34 increases by approximately 1 m^3/s due to additional flow being diverted from the north (overland flowpath within golf course) toward the Taranaki culverts. However, at Line 42, where the northern overland flow branch merges with the main Taranaki flow path at the downstream, the difference becomes less significant, at around 0.25 m^3/s or 3%.	The modelling is showing both an increase in peak flow and volume downstream on the Taranaki. Noting that this ultimately discharges downstream to Waikuku Beach Needs further consideration

	 Figure 3 Hydrograph extraction at the downstream of Taranaki Stream.  Figure 4: Hydrographs extraction at Line 34  Figure 5: Hydrographs extraction at Line 42	
Garlick Street / Ravenswood SMA		
1. The current modelling includes a roadway level with an increased level (RL) relative to the existing roadway. This results in an increase in the flood levels, confined to the SMA within the pond.	See response under Question 2 below.	N/A
2. Aurecon has been working with	The previous model, submitted as part of the 50% design stage, adopted a proposed weir level of 10.40 m.	Accepted

WDC to determine the appropriate of the pond overflow. WDC will be advising Aurecon on the decided outcome	Since then, the proposed road surface levels have been updated to match the existing weir level of 10.20 m. Figures 6 and 8 present the afflux maps (both 100 year and 200 year ARI) from the previously submitted model, while Figures 7 and 9 (both 100 year and 200 year ARI) show the results from the latest model incorporating the updated road surface levels. The previous submitted model generally shows higher water levels within the basin and wetland, which is mainly due to the higher weir level (10.40 m) previously proposed along Garlick Street. For the 100-year ARI event, both the previous submitted and latest models indicate a slight decrease in flood levels downstream. Under the 200-year ARI event, both models show a minor increase in downstream flood levels, with the previous submitted model showing slightly higher afflux overall. In the latest model, the downstream afflux is lower even though the basin stores less water. This occurs because the Taranaki culvert invert level has been lowered, allowing runoff to discharge downstream earlier. As a result, the latest model shows a slightly higher local afflux immediately downstream of the culvert compared with the earlier model. However, if the previous submitted model had used the same lower culvert invert, it would likely have shown a lower downstream afflux because more water would be retained in the basin. It may be worth considering whether the existing basin volume could be more effectively utilised by raising the proposed Garlick Street weir level to 10.40 m to provide additional upstream storage.  Figure 6: 100 year afflux map at Ravenswood basin (previous submitted model result)  Figure 7: 100 year afflux map at Ravenswood basin (latest model result)	

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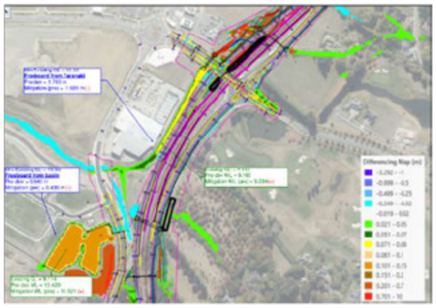
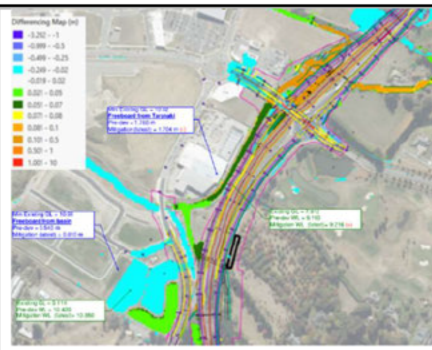
<td>
Figure 8: 200 year afflux map at Ravenswood basin (previous submitted model result)</td>
<td>
Figure 9: 200 year afflux map at Ravenswood basin (latest model result)</td>
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<td>3. Updated report to include RL on the pond level vs surrounding roadways and houses to assess freeboard, etc</td>
<td>Figures 6 and 8 present the afflux maps (both 100 year and 200 year ARI) from the previously submitted model, while Figures 7 and 9 (both 100 year and 200 year ARI) show the results from the latest model incorporating the updated road surface levels. Results labelled (pre) refers to outputs from the previously submitted model, while (latest) are taken from the most recent model.

In the latest model, the building near the Ravenswood basin shows an improvement, with freeboard increasing to 0.70 m under the 100-year ARI event and 0.610 m under the 200-year ARI event.

The Harvey Norman building maintains a minimum freeboard of 2.106 m under the 100-year ARI event and 1.704 m under the 200-year ARI event, both well above the required minimum.

In the previous model, the building adjacent to the existing Ravenswood basin showed a reduction in freeboard. However, it still maintained a minimum of 0.50 m under the 100-year ARI event and 0.439 m under the 200-year ARI event.

To make better use of the available basin storage while maintaining the minimum freeboard to nearby buildings, the weir level could potentially be increased.</td>
<td>Accepted</td>
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<td>4. WDC has requested some information around the weir levels (consented, existing, modelled) - to be emailed to Don / WDC</td>
<td>
<table>
<tr><th>Scenario</th><th>Weir Level</th><th>Weir Length</th><th>Modelled Flood depth (100 year ARI)</th><th>Modelled Flood depth (200 year ARI)</th></tr>
<tr><td>Approved design level</td><td>10.45 m</td><td>9.75 m</td><td></td><td></td></tr>
<tr><td>Constructed weir Level</td><td>10.19 m</td><td>8.0 m</td><td>0.076</td><td>0.193</td></tr>
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<tr><td>Proposed weir level (latest model)</td><td>10.20 m</td><td>10.0 m</td><td>0.030</td><td>0.102</td></tr>
<tr><td>Proposed weir level (previous model)</td><td>10.40 m</td><td>10.0 m</td><td>0.054</td><td>0.104</td></tr>
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Note that for all modelled scenarios, the piped outlet structure from the SMA is assumed to be blocked.
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<tr>
<td colspan="3">Waihora Creek</td>
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<td>1. The modelling indicates some increases are shown on Waihora Creek downstream of the project, however the impacts of the downstream increases have not been assessed.</td>
<td>Model results indicate minor increases in flood levels along Waihora Creek downstream of the project area. Figures 12 and 13 illustrate the afflux maps at the downstream of Woodend Beach Road. Under the 100-year ARI event, a maximum flood level increase of approximately 130 mm is observed downstream of Woodend Beach Road, primarily due to the upsizing of the Gladstone and Woodend Beach Road culverts. However, these increases remain well contained within the existing overland flowpath. For the 200-year ARI event, only a slight rise in flood level is observed (up to 61 mm) immediately downstream of Woodend Beach Road, with no noticeable afflux further downstream.
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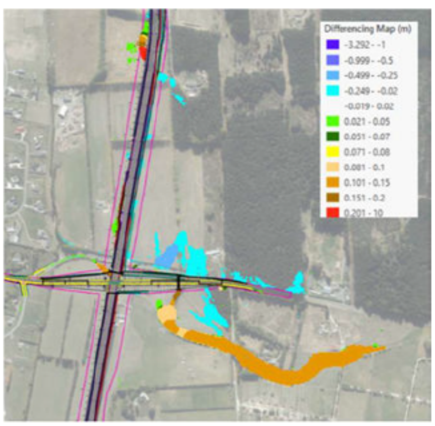

Figure 12: 100 year afflux map at downstream of Woodend Beach Road
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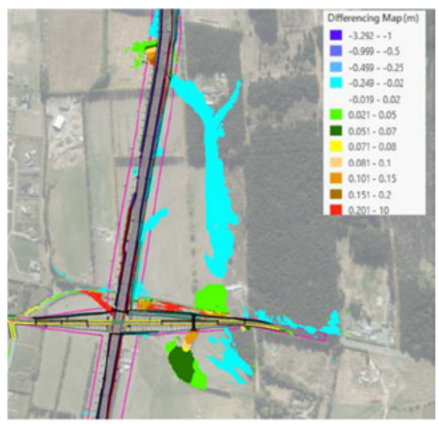

Figure 13: 200 year afflux map at downstream of Woodend Beach Road
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<td>Accepted</td>
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<td>2. Updated terrain modelling will include actual landform design, which will allow for more in channel flood storage and overflow to adjacent storage areas, reclaiming</td>
<td>Terrain has been updated in the latest model run to better represent the landform design.</td>
<td>Accepted</td>
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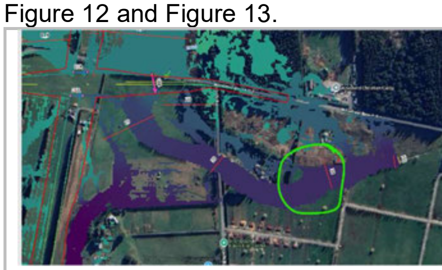
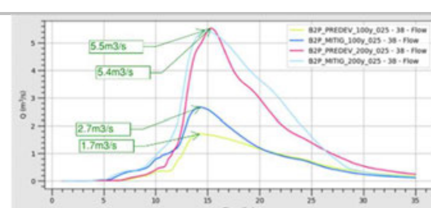
existing flood storage		
3. Don suggests holding off on final assessment of Waihora until final modelling of the proposed landform has been completed	No response required.	N/A
4. WDC supports maintaining existing natural channel storage to the greatest extent possible	No response required.	N/A
5. WDC notes there has been some complaints from the Stalkers Road subdivision area around flooding behind the houses	See response under Question 6 below	N/A
6. If there is still an increase in flood depths / volumes within Waihora Creek, Aurecon will generate a hydrograph at D/S boundary and conduct an assessment	To better understand the downstream impacts, a hydrograph was extracted at Line 38 (downstream of Woodend Beach Road). As shown in Figure 15, peak flow under the 100-year ARI event increased by approximately 1 m^3/s, while the 200-year ARI event shows negligible change, which aligns with the afflux mapping results in Figure 12 and Figure 13.  Figure 14 Line 39 hydrograph extraction  Figure 15: Hydrograph at the downstream of Waihora Stream (Line 38)	Using a bathtub analysis Aurecon have estimated that the 200 year flood level will increase in the order of 29mm down at Woodend Beach based on increased flows along the Waihora. Whilst 29mm is not a

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<td>on the downstream areas, especially the Stalkers Road area.</td>
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Further assessment was undertaken to estimate the potential change in flood level downstream of the model extent using a volumetric approach. Based on the hydrograph analysis, the increase in flow volume was estimated at

- 21,200 m³ for the 100-year ARI event
- 31,180 m³ for the 200-year ARI event.

Assuming a conservative “bathtub” storage extent as shown in Figure 16, with an existing ponding area of 1,062,837 m² at RL 1.165 m, the increment in water level was calculated to be approximately 0.029 m under 200 year event, resulting in a post-development water level of RL 1.194 m. Under 100 year event, the increment in water level was calculated to be approximately 0.020 m, resulting in post-development water level of 1.185 m

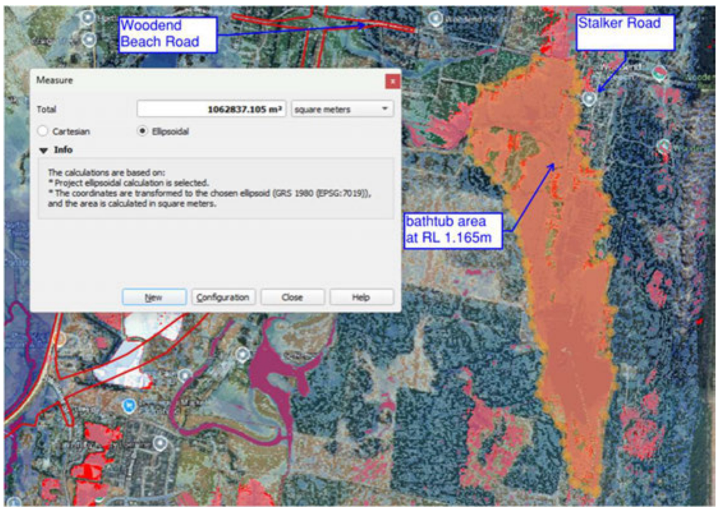

Figure 16: Bathtub extent at RL 1.165m closed to Stalker Road (Line 38)

As shown in Figure 17, the resulting flood extent from this volumetric assessment shows negligible differences compared to the pre-development condition. These changes are minor and do not affect any additional properties. The assessment is considered conservative, as it assumes no outflow from the ponding area while, in reality, with flow movement, the actual increase in flood level and extent would likely be lower.
</td>
<td>major increase in flood level and the bathtub analysis used is conservative it does however exceed our usual limit of 20mm where we would normally consider the effects to be less than minor. Of concern is the fact that under the 200 year event it appears some dwellings in Woodend Beach may be affected</td>
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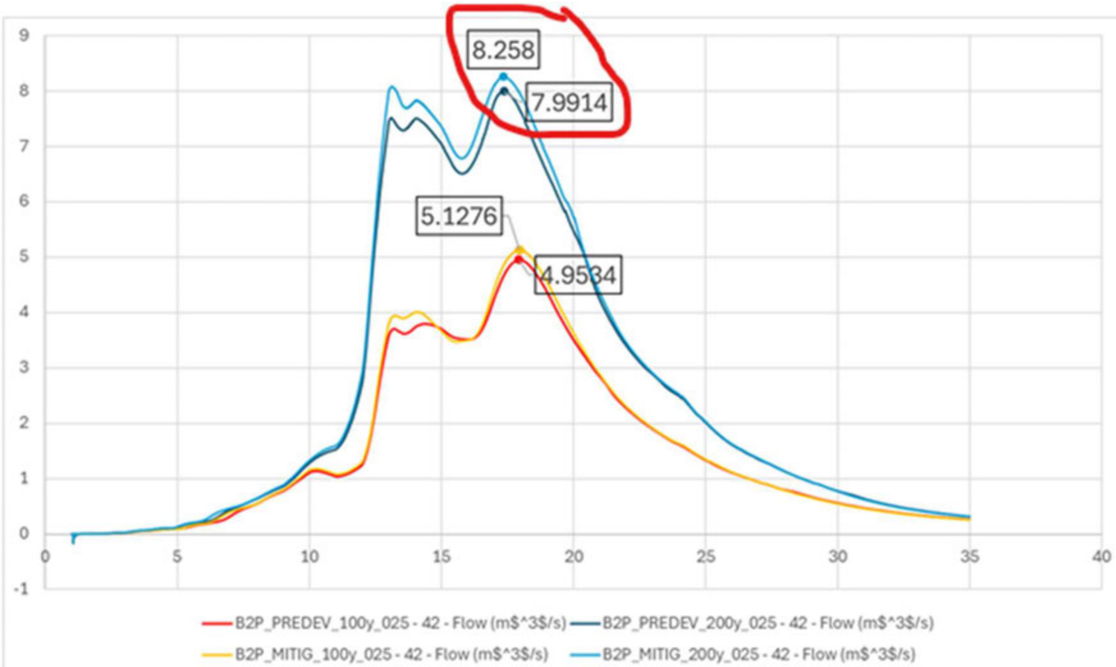
	 Figure 17: Flood Extents results from the Volumetric Assessment (Brown– Pre-development Scenario; Green – Mitigation Scenario)	

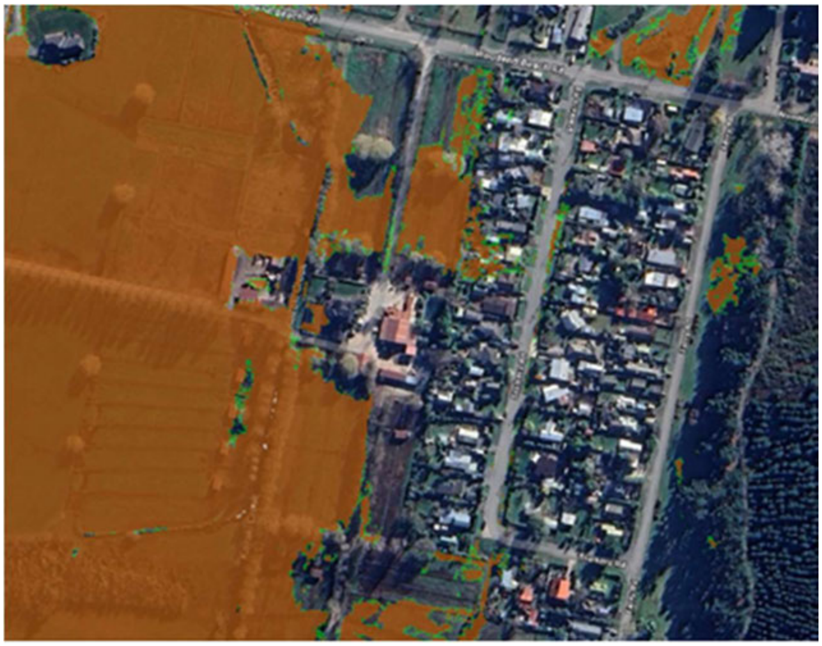
5.0 Final Outstanding Issues

Following receipt of the comments provided in Table 3 above, Council identified two outstanding issues namely:

1. The modelling is showing both an increase in peak flow and volume downstream on the Taranaki Stream. Noting that this ultimately discharges downstream to Waikuku Beach.



2. Using a bathtub analysis Aurecon have estimated that the 200-year flood level will increase in the order of 29mm down at Woodend Beach based on increased flows along the Waihora. 29mm is not a major increase in flood level and the bathtub analysis used is conservative it does however exceed our usual limit of 20mm where we would normally consider the effects to be less than minor. Of concern is the fact that under the 200-year event it appears some dwellings in Woodend Beach may be affected (see diagram below).



Following further meetings with Aurecon on the 24th October and the 7th November Council was satisfied that the two outstanding issues did not present a significant issue, for the following reasons:

- *The increased peak flow and volume shown in the model results on the Taranaki Stream are due to changes being made to the upstream flow paths across SH1 and the total volume of water passing across the SH1 corridor is effectively the same as existing and therefore doesn't present a significant issue to downstream flood levels in Waikuku Beach.*

- *The flood events shown using the bathtub analysis in Woodend Beach misrepresented the actual effects as the bathtub analysis did not delineate the floodplain directly affected by increased volumes in the Waihora Creek catchment and instead presented the showed the increase in flood depth across all of Woodend Beach.*

6.0 Conclusion

Following further work undertaken by Aurecon and submitted to the Council on 20th October 2025 we are now satisfied that the modelling approach is appropriate to assess any flooding effects from the proposed works.

Yours sincerely

Don Young

Senior Engineering Advisor