MEMORANDUM

To: The Panel for the Sunfield Project
From: Will Moore, Director – Maven Associates Limited
Date: 10 October 2025

Subject: **Response to Comments in Healthy Water Memo – Sunfield Fast-track Application**

This memorandum responds to Healthy Waters and Flood Resilience (HWFR) Memo comments dated 4 August 2025, which were provided following the Applicant's Substantive Application under the Fast-track Approvals Act 2024 (the "Sunfield FTAA Application"). The response has been prepared by Maven Associates (Maven) to support the Sunfield FTAA Application by addressing the comments on stormwater raised by HWFR.

Executive Summary

This memorandum addresses the concerns raised by Auckland Council's HWFR team, demonstrating that they have been comprehensively addressed through detailed technical assessments, peer-reviewed modelling, and targeted design refinements.

The proposed stormwater management strategy for the Sunfield development is both feasible and resilient. It incorporates site-specific, performance-based solutions such as attenuation basins, wetlands designed in accordance with Auckland Council's Stormwater Management Devices in the Auckland Region guideline (GD01), and integrated overland flow paths.

Additional stormwater modelling has been undertaken, as requested, to assess sensitivity to short-duration storm events, spatial rainfall variability, and the selection of appropriate Curve Number (CN) values. The hydraulic modelling results contained in Maven's updated Stormwater Modelling Report (Rev H) confirm that the proposed strategy continues to achieve the required flood mitigation outcomes.

The strategy also integrates key transport corridors into the flood resilience design. Hamlin Road, located within the development site, has been strategically realigned and elevated above flood levels to function as the high point separating two primary catchments and to ensure continued operability during storm events. For Airfield Road, which lies outside the site and is subject to existing flooding issues, targeted upgrades have been proposed to improve conveyance and reduce flood risk for the 2-year ARI event, without increasing downstream impacts.

Importantly, the stormwater strategy has been developed in coordination with key stakeholders, including the New Zealand Transport Agency (NZTA), in response to the Notice of Requirement (NoR) for the Mill Road Stage 2 (Takanini Section) ("MRS2A") Project. The proposed stormwater infrastructure has been designed to be compatible with the MRS2A corridor and can support a coordinated, catchment-wide solution should this be progressed. This includes an internal perimeter diversion channel that aligns with the preliminary strategy outlined by Healthy Waters and integrates with the MRS2A proposal, ensuring long-term resilience and integration with future infrastructure.

The applicant remains committed to adaptive management and ongoing collaboration with Healthy Waters, NZTA, and other stakeholders to support integrated stormwater solutions and ensure downstream infrastructure is not adversely affected.

These responses confirm that the development can proceed without increasing flood risk or compromising environmental and infrastructure outcomes. The proposed stormwater infrastructure is technically robust, maintainable, and consistent with best practice.

RESPONSE:

HWFR comments raise concerns regarding flood risk mitigation, downstream effects, infrastructure capacity, and alignment with Auckland Council's strategic flood resilience objectives. The following sections present HWFR concerns in *italic*, followed by Maven's engineering responses in blue.

Only those points requiring clarification or technical response have been addressed in this document, with the intent of focusing on matters directly relevant to the feasibility, resilience, and implementation of the proposed stormwater and flood management strategy.

Healthy Water Memo:

Executive Summary

1.5 *This memorandum provides a technical assessment of the Application's proposed stormwater management strategy to service a master planned community to be known as "Sunfield" (the* ***Site****).*

1.6 *The Site is located in an area that is challenging to develop, subject to extensive floodplain (approximately 80% of the site), underlain by complex peat soils, with flat topography, and high groundwater levels. Most of the Site (188ha) is zoned Rural – Mixed Rural and drains north to the Papakura Stream catchment. The remainder of the site (56.5ha) is zoned Future Urban and drains south to the Pahurehure Inlet catchment.*

1.7 *To mitigate the effects of increased flooding caused by the proposed development, the Application proposes a complex scheme of stormwater attenuation ponds and catchment diversions. This includes diverting approximately 54.9 hectares of catchment from the Papakura Stream catchment to the Pahurehure Inlet catchment, as shown in Figure 1.*

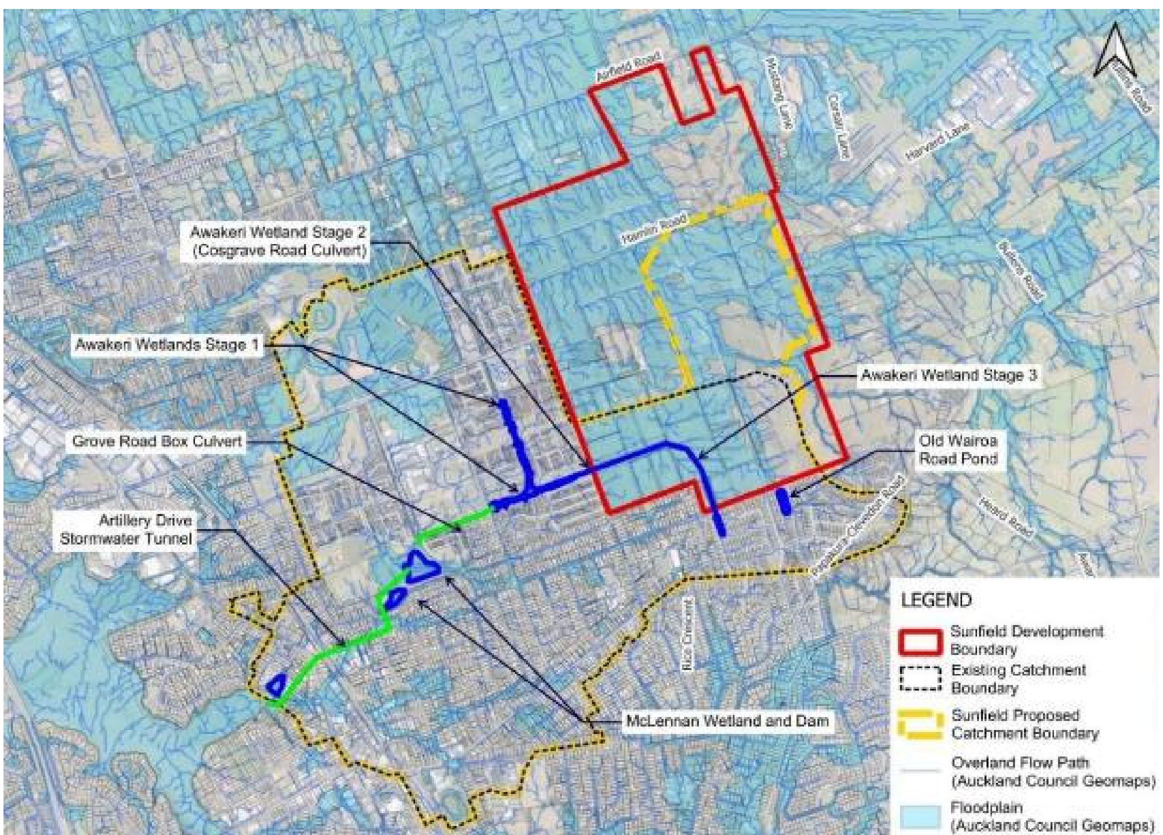


Figure 1. Catchments

1.8 *HWFR specialists have identified a number of significant concerns regarding the proposed development, particularly in relation to the feasibility of the stormwater infrastructure required to service the site and mitigate adverse effects on the downstream receiving environment. The key issues are summarised below:*

- ***Stormwater Management Plan (SMP) and Network Discharge Consent (NDC) Compliance.*** *It has been incorrectly asserted that the diversion and discharge from the proposed development can be authorised under Auckland Council's Network Discharge Consent (**NDC**). Condition 13 of the NDC outlines the process for adopting SMPs under the consent. For new greenfield developments that are not currently zoned for urban use, an SMP may only be adopted following a notified plan change, and only where the plan change is consistent with the SMP. This requirement has not been met.*

  New Discharge consent has been included in the Sunfield FTAA application.

- ***Dependence on Stormwater Basins.*** *Flood risk mitigation for both catchments is entirely reliant on four very large stormwater attenuation basins. These basins are expected to perform multiple functions, yet their design introduces significant vulnerabilities. They are located below the groundwater table, with flat bases and no internal gradients, benches, or low-flow channels. Critically, they lack redundancy and offer no resilience to blockage or operational failure. The feasibility of accommodating these basins within the allocated space has not been confirmed. Given the extreme flood sensitivity of the catchment, the assumptions underpinning the attenuation strategy are critical – any failure in design, construction, or operation could represent a fatal flaw in the overall flood management approach.*

  Terracing has been excluded from the attenuation basins due to geotechnical, hydraulic, and spatial efficiency constraints. The site's underlying peat soils present geotechnical constraints—terracing would introduce steep batters and differential loading, increasing the risk of instability, slumping, and long-term maintenance issues.

  From a hydraulic perspective, the flat-base geometry maximises flood storage volume within the constrained land area and ensures uniform settlement, which is critical for long-term operability in peat-based ground conditions. Introducing terraces would reduce effective storage capacity by up to 50% and require a substantially larger footprint, which is not desirable given competing land use demands across the master-planned development.

  Instead, the design incorporates alternative erosion control and flow management features—such as energy dissipation structures, flow spreaders, and sediment forebays—that achieve the same functional outcomes without compromising basin performance or resilience.

  The design of the attenuation basins reflects a performance-driven and pragmatic approach to flood management within a master-planned footprint. While terracing and low-flow channels have not been incorporated into the basins, proposed stormwater Pond 4 ("Pond 4") includes a low-flow channel to manage base flows and enhance hydraulic performance. The overall design remains fit for purpose and addresses key functional, environmental, and operational considerations.

1. Flood Attenuation as the Primary Objective

The basins are designed to provide critical flood storage for managing peak flows and protecting downstream infrastructure. The flat-base, rectangular geometry:

- Maximises storage volume within the available land area.
- Ensures compliance with hydraulic performance targets for design storm events.

2. Erosion and Flow Management (Without Low Flow Channels)

Although low flow channels are not proposed, at detail design alternative standard practice erosion control measures to manage flow paths and reduce channelisation risks will be provided such as:

- Energy dissipation structures at inlet points (such as stilling basins etc) to reduce velocity and turbulence.
- Rock armouring or geotextile lining in high-flow zones.
- Flow spreaders or baffles to distribute inflows evenly across the basin base.

These features will be incorporated into the basin design to enhance hydraulic stability and mitigate erosion risks.

3. Geotechnical Constraints of Peat Soils

Peat soils present challenges that directly influence basin design:

- Low shear strength and high compressibility make terracing and steep batters geotechnically risky, increasing the potential for slumping and instability.
- High water retention and poor drainage characteristics increase the risk of persistent ponding, which terracing would exacerbate by creating isolated depressions.
- The flat-base design allows for uniform settlement, reducing differential movement and long-term maintenance issues.

The current design is therefore a geotechnically appropriate solution for peat conditions.

4. Sediment Management and Water Quality

To address concerns around sediment deposition and water quality, at detailed design stage the following standard practices can be applied:

- Sediment forebays can be installed at key inflow locations to capture coarse material and reduce accumulation in the main basin.
- A review of basin geometry, to optimise flow paths and minimise dead zones and promote even flow distribution.
- Vegetation zones will be established around the basin perimeter to support nutrient uptake and enhance water quality.

These measures will reduce maintenance burden and support long-term functionality.

5. Ponding Mitigation

To ensure effective drainage and maintain basin functionality under varying groundwater conditions, subsoil drainage systems can be incorporated at detailed design. These systems will be installed in strategic areas and designed to discharge downstream of the basin at a lower invert level, promoting infiltration and preventing prolonged water retention.

6. Amenity and Ecological Enhancements

While terracing is not included, the design incorporates amenity and ecological features above frequent flood levels:

- Perimeter planting zones with native species to provide shading, habitat, and visual screening.
- Vegetated berms and buffer strips to enhance landscape integration.
- Maintenance access paths to support long-term operability and community safety.

These features will contribute to the basin's amenity value and ecological function without compromising flood storage.

7. Long-Term Operability and Risk Management

To ensure the basins remain fit for purpose over time:

- A maintenance plan will be developed in consultation with Council to guide sediment removal, vegetation management, and inspection protocols.
- Monitoring provisions will be included to assess basin performance and allow for an adaptive management strategy as needed.

The design team is committed to collaborative refinement during implementation to ensure Council's operational requirements are met.

8. Site Constraints and Land Efficiency

The development site is subject to tight spatial constraints, with land allocated across multiple competing uses. The current basin layout:

- Utilises the full extent of available space without compromising adjacent infrastructure.

The current basin design reflects a deliberate and technically justified approach to flood attenuation. While terracing and low flow channels offer additional benefits, they are not essential for the basin to be functional, resilient, and maintainable. The design incorporates alternative measures to address erosion, sedimentation, waterlogging, amenity, and long-term operability, and remains open to refinement where additional benefit can be established.

- ***Inadequate Conveyance via Informal Drainage Network.*** *The proposed drainage strategy in the Papakura Stream catchment relies on discharging stormwater through an informal network of farm drains and roadside table drains, which traverse private property and are known to be under capacity. These drains currently cannot convey a 2-year rainfall event without overtopping, resulting in flooding across both Airfield Road (Figure 2) and Hamlin Road (Figure 3). With the proposed development, these roads will become key collector routes serving residential areas and must remain passable during at least a 10-year event. Ensuring adequate stormwater conveyance to meet this service level is a critical safety requirement under the Auckland Code of Practice. The current reliance on informal, flood-prone infrastructure presents a serious risk to public safety and network reliability.*

  Hamlin Road is primarily located within the development site and will serve as the main collector road for the proposed development. It has been strategically designed to be realigned and upgraded to form part of the stormwater catchment boundary and functions as the high point separating two main catchments draining north and south. As part of the development, Hamlin Road will be elevated above flood levels to ensure it remains operational during storm events. Minor modifications to the existing catchment boundaries have been implemented to prevent flooding along this corridor.

  Airfield Road, located outside the development site, will provide an additional access point to the north of the development. It is acknowledged that existing flooding issues affect this area. The current flooding scenario is complex; however, the proposed development has addressed these issues to the extent practicable, ensuring no increase in flood risk to upstream or downstream properties. While there are limitations to the proposed flood mitigation achievable without causing adverse effects elsewhere, the design seeks to reduce catchment flood flows where possible and alleviate flooding on Airfield Road for the 2-year ARI event.

As part of the proposed MRS2A project, Airfield Road is expected to become a key collector route for traffic accessing and exiting MRS2A. At that stage, it is expected to that further flood mitigation measures would be implemented, including the diversion of upstream catchment flows away from Airfield Road. Preliminary investigations, undertaken in collaboration with NZTA and the Applicant, have identified a solution that redirects flows from the upstream western catchment northward to the Papakura Stream. This solution also addresses concerns with the downstream network, including stormwater flows conveyed through an informal system of farm drains that traverse private property and have been identified by HWFR as having insufficient capacity.

The proposed stormwater management strategy includes attenuation ponds designed to reduce post-development peak flows to below pre-development levels for the SMAF, 2-year, 10-year, and 100-year rainfall events. This ensures that the development does not exacerbate existing flood conditions.

As noted by Healthy Waters, the existing drainage infrastructure beneath Airfield Road is currently very limited, with only a single 1200mmØ culvert located beneath 269 Airfield Road providing formal stormwater conveyance.

To address the existing 2-year ARI flooding on Airfield Road, a solution has been identified by the Applicant as part of the planned Airfield Road upgrade proposed by the Sunfield FTAA application. This involves the installation of a series of 300 mm stormwater pipes beneath Airfield Road. These pipes would be distributed across the corridor to replicate the current extent of surface flooding, thereby improving conveyance while maintaining existing flow patterns and minimising downstream hydraulic impacts.

For the 10-year ARI event, a more substantial upgrade would be required such as raising the road and installing larger culverts. Currently, Airfield Road acts as a weir, overtopping during storm events.

A solution whereby bypassing flows forward via culverts would reduce upstream flooding, it would result in increased flow rates and flood depths on downstream properties. This outcome is primarily due to the absence of a formal stormwater connection downstream capable of accommodating these redirected flows.

Although the applicant is willing to contribute to resolving flooding up to the 10-year event, this cannot be achieved without a formal stormwater connection or agreement from HWFR to allow the passing forward of flows.

The applicant acknowledges that a catchment-wide solution—such as that proposed by HWFR in collaboration with NZTA under the proposed MRS2A—would be the most effective long-term resolution. This is discussed in further detail in Sections 1.10–1.12 below.

Ground Settlement Risks from Earthworks and Groundwater Drawdown. *No assessment has been provided regarding the potential effects of approximately 1,000,000m³ of* *earthworks and associated groundwater drawdown on the settlement of peat soils. This poses a risk to both infrastructure and private property and must be addressed through geotechnical investigation and modelling.*

Please refer to Geotechnical Memo supplied by LDE which addresses this.

Unassessed Catchment Diversion Impacts. *The proposed diversion of a 54.9ha catchment into the existing McLennan Dam has not been evaluated. This dam currently provides flood protection and water quality treatment for the existing catchment. It is unclear how these functions may be affected by the additional inflows, and inadequate supporting analysis has been provided.*

Flood protection:

Pond 4 has been specifically engineered to attenuate flows from the additional 54.9-hectare catchment area that is proposed to be diverted from the eastern catchment prior to discharging into the Awakeri Wetlands, and subsequently into the McLennan Dam.

Pond 4 is approximately 750 metres long, 90 metres wide, and 1.7 metres deep, with a total volume of 94,000 cubic metres.

The pond temporarily stores runoff during storm events and releases it at a controlled rate. This ensures that peak flows entering the downstream system do not increase, thereby preventing any adverse flooding impacts on upstream or downstream properties.

Modelling confirms that, due to the pond's attenuation, peak flow levels within the already constructed Awakeri Wetlands either remain unchanged or are reduced as a result of the development.

To assess the effects of the development on the McLennan Wetland, stormwater modelling of the Western Catchment has been completed for the 2-year, 5-year, 10-year, 20-year, 50-year, and 100-year storm events, incorporating climate change allowances (+3.8 degrees Celsius) in accordance with the Auckland Council Stormwater Code of Practice (Version 4).

Pre-development modelling shows the spillway is activated only during the 100-year storm event with 3.8 degrees of climate change, during which the spillway operates for 60 minutes.

Post-development modelling indicates a reduction in peak flow across the spillway from 14.71 m^3/s to 13.10 m^3/s—a 10% decrease. This reduction demonstrates the effectiveness of the mitigation measures provided by Pond 4. As a result, there are no adverse flooding impacts on the McLennan Wetland in terms of flood protection. On the contrary, the outcome represents a positive improvement in downstream flood resilience.

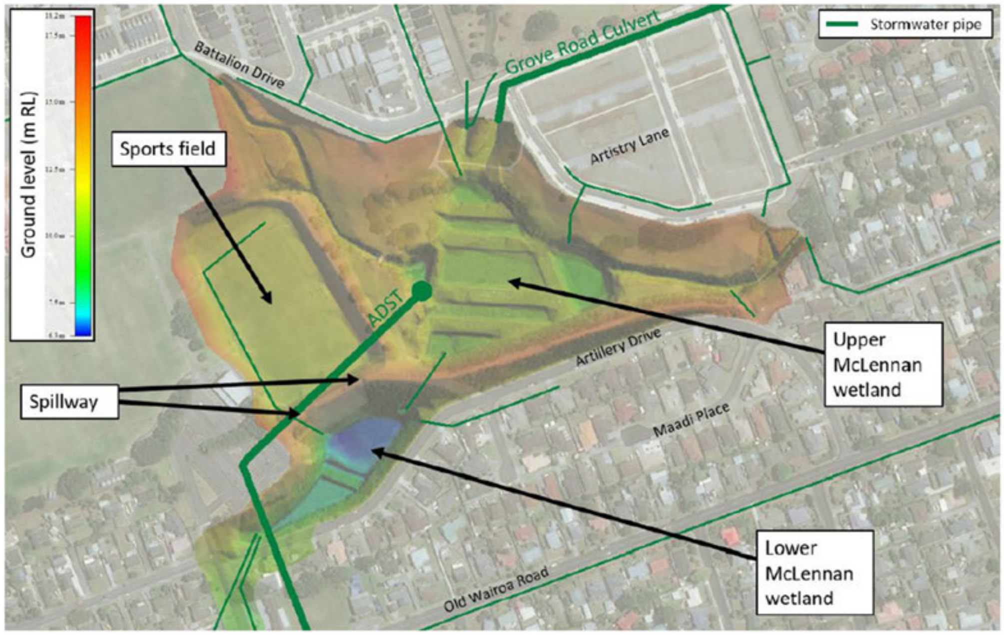


Figure: Location of McLennan Dam Spillway.

Water quality:

The existing McLennan Upper Wetland has been constructed to provide water quality treatment for a 326-hectare catchment, which includes 57.3 hectares of the proposed Sunfield development site located within the existing Future Urban Zone (FUZ) land. The development proposes to add an additional 54.9 hectares (Catchment A3) to the McLennan Upper Wetland.

To ensure water quality outcomes are maintained, Pond 4 is proposed to provide GD01-compliant water quality treatment for the additional 54.9-hectare catchment. Pond 4 will achieve GD01-compliant treatment by capturing the Water Quality Volume from the additional catchment and treating it through extended detention and sedimentation. The pond includes inlet forebays, vegetated wetland zones, and outlet structures designed to meet GD01 design criteria for residence time, flow control, and pollutant removal. These features are consistent with GD01 specifications for stormwater ponds and ensure the required performance standard of 75% Total Suspended Solids (TSS) removal on an annual average basis, in accordance with Auckland Council's GD01 guidelines.

As a result, the water discharged from this area into the McLennan Upper Wetland is considered clean and does not require further treatment by the wetland.

Importantly, Pond 4 has been designed with a minimum drain-down time of 24 hours for the SMAF (Stream Management Area Framework) volume, which introduces a delayed release of the additional volume into the McLennan Upper Wetland. This delay reduces the risk of coinciding peak flows and helps maintain the wetland's hydraulic and treatment performance.

Furthermore, the current proposed arrangement provides the following functional benefits:

No Increase in Pollutant Load

Since the flow rate of pollutant-bearing water remains unchanged, the total mass of contaminants entering the wetland does not increase. The wetland continues to treat the same pollutant load as originally designed, without exceeding the current treatment rate.

Enhanced Dilution and Lower Concentrations
The addition of clean water upstream results in lower pollutant concentrations entering the wetland. This improves treatment efficiency by:

- Enhancing biological processes such as microbial degradation and plant uptake.
- Supporting more effective sedimentation due to reduced particle density and improved flocculation.

Stable Hydraulic Retention Time (HRT)
Because the peak flow rate into the wetland remains unchanged, the hydraulic retention time is preserved. This is critical for effective treatment, allowing sufficient time for settling, biological uptake, and transformation processes.

No Hydraulic Overloading or Short-Circuiting
With no increase in peak inflow, there is no risk of bypassing, short-circuiting, or reduced residence time—all of which could otherwise compromise treatment performance.

The proposed arrangement ensures that the McLennan Upper Wetland continues to operate within its design parameters, treating the same pollutant load while benefiting from improved dilution and retention conditions. The delayed release from Pond 4 further supports this outcome by reducing the likelihood of hydraulic stress on the wetland system.

Structural integrity:

Assessment of Ultimate Loading: Based on current hydrological modelling, the peak flow rate into the dam has decreased, resulting in a lower maximum flood level. Provided these revised levels remain within the original design parameters, the dam's structural integrity under ultimate loading conditions is not expected to be affected.

Assessment of Duration: The duration of elevated water levels above the spillway crest has increased from 1 hour and 10 minutes to 1 hour and 15 minutes during the 100-year storm event. This observed increase—approximately five minutes—is minor and is not expected to compromise the structural integrity of the dam. The dam's spillway discharges into the Lower McLennan Wetland, which provides attenuation and energy dissipation before flow enters the downstream piped system. This configuration helps manage hydraulic forces during extended flow periods. Provided the spillway and downstream conveyance systems are functioning within their design parameters, the additional duration does not introduce significant structural stress or erosion risk to the dam. The volume is effectively managed without compromising dam safety, performance, or consent compliance.

Lack of Consideration for Overland Flow Paths. *Despite the extensive earthworks and flat topography of the site, local overland flow paths have not been considered. This omission could result in unmanaged surface water flows and increased flood risk to neighbouring roads and properties.*

Local overland flow paths have been considered in the modelling and layout of the site. The stormwater modelling provided in the application is based on finished ground levels that closely reflect the final design and has been developed with sufficient detail to demonstrate that the proposed stormwater management approach is both feasible and compliant with flood risk requirements.

The design ensures that surface water is directed away from critical infrastructure, habitable areas, and neighbouring properties, with overland flow paths integrated into the road corridor (primarily the road carriageway) and reserve layouts to safely convey excess runoff during extreme events.

The modelling confirms that the proposed basins and downstream infrastructure, including allowances for climate change, can accommodate the development's runoff volumes under a range of design storm scenarios.

The applicant acknowledges the importance of understanding flood risk at the individual lot and road corridor level and confirms that further refinement of overland flow path management will be undertaken during detailed design. Finished floor levels will be set in accordance with the Auckland Council Stormwater Code of Practice to ensure full compliance with flood protection and overland flow path requirements.

Further refinement of overland flow paths will be undertaken during detailed design, which is the appropriate stage for this work for the following reasons:

Level of Detail Required
Localised overland flow paths and lot-specific flood risk assessments require finalised, detailed finished ground levels and detailed civil design inputs (e.g., road cross-sections, lot grading, and stormwater infrastructure). These elements are not available at the consenting stage but are developed during detailed design when the site layout and engineering parameters are finalised.

Integration with Final Earthworks and Drainage Design
Overland flow path modelling is most effective when integrated with the final site levels and drainage design. This ensures that the modelling reflects actual site conditions, including berms, swales, road cambers, and lot contours—all of which are refined during detailed design.

Compliance with Auckland Council Standards
The detailed design stage will include a full assessment of overland flow paths in accordance with Auckland Council's Stormwater Code of Practice and relevant flood hazard mapping requirements. This will ensure that all lots and road corridors are appropriately assessed, and any residual flood risks are mitigated through design.

Consent Conditions and Engineering Approval Process
The engineering approval process provides a formal mechanism for Council to review and approve detailed flood risk assessments prior to construction. This ensures that HWFR's concerns are addressed through enforceable design outcomes.

Commitment to Flood Resilience
The applicant is committed to ensuring that all proposed lots and infrastructure are resilient to flooding. The detailed design stage provides the necessary resolution and flexibility to incorporate site-specific flood mitigation measures, including overland flow conveyance, lot grading, and secondary flow paths.

The modelling provides a sound basis for resource consent and allows for refinement during detailed design.

In summary, while the application-level modelling provides a strategic understanding of flood risk and confirms the viability of the attenuation basin and downstream flood mitigation, the detailed assessment of localised overland flow paths and lot-specific flood risk will be undertaken during detailed design. This ensures that the modelling is based on accurate site conditions and delivers robust, compliant flood resilience outcomes.

Incomplete Stormwater Quality Strategy. *The proposed use of existing downstream infrastructure as tertiary treatment devices is not supported by capacity assessments or hydraulic modelling.*

Detailed above in section 1.8.

1.9 *Based on the information provided in the Application, development of the catchment areas beyond the extent of the existing Future Urban Zone is not supported. The current stormwater infrastructure within the Pahurehure Inlet catchment was specifically designed to accommodate development within this zoned area. Expansion beyond this boundary, without comprehensive assessment and confirmation of infrastructure feasibility, poses unacceptable risks to flood management, water quality, and public safety.*

Please refer to the response to section 1.8, and;

The mitigation provided by proposed Pond 4 effectively addresses the impacts associated with development beyond the Future Urban Zone boundary (post development Catchment A3). A comprehensive stormwater assessment has been undertaken, confirming the feasibility of the proposed infrastructure. This includes detailed hydraulic modelling, water quality analysis, and flood risk evaluation, demonstrating that the proposed development does not pose unacceptable risks to flood management, water quality, or public safety.

Downstream Infrastructure

Post development Catchment A3 discharges to the Pahurehure Inlet via a fully engineered public stormwater system comprising Stage 1 of the Awakeri Wetlands, the Grove Road box culvert, the McLennan Wetland, and the Artillery Drive Tunnel. These are purpose-built, Council-managed infrastructure assets—constructed using engineered materials such as concrete—and do not traverse or rely on any private property. The McLennan Wetland is an engineered wetland designed specifically for stormwater treatment and attenuation.

Flood Risk & Structural Integrity of Downstream Infrastructure

Peak flows:

Pond 4 has been specifically engineered to attenuate peak flows from the additional 54.9-hectare catchment prior to discharging into the existing Awakeri Wetlands and subsequently into the remainder of the downstream network. Stormwater modelling confirms no increase in flood levels within downstream sections of the wetlands or the adjacent local stormwater network.

Duration:

While the expansion of the catchment and impervious surfaces will result in an increase in total runoff volume and duration, these changes are not expected to compromise the performance or integrity of the downstream stormwater network. The increased volume extends the duration of flow rather than increasing peak flow rates, which are actively managed through attenuation measures(Proposed Stormwater Pond 4). The downstream conveyance system—including the Grove Road box culvert and the Artillery Drive Tunnel—consists of engineered concrete infrastructure designed to operate under saturated conditions throughout their design life. As such, the increased flow duration poses negligible structural risk. Within the Awakeri Wetlands, erosion risk associated with prolonged flows is mitigated by permanent retention pools that regulate water levels and dissipate energy during storm events.

Recharge pits are proposed throughout the development to provide enhanced hydrological mitigation, exceeding the minimum requirements of the Auckland Unitary Plan's SMAF framework. These pits enable retention of 15 mm runoff depth across all impervious areas—three times the required 5 mm minimum. By promoting infiltration and extending the detention of stormwater, the recharge pits reduce the frequency and intensity of flash flows, contributing to improved stream health and minimising hydraulic stress on downstream systems

Water Quality:

Please refer to the response to section 1.8

1.10 *In June 2025, the New Zealand Transport Agency (**NZTA**) lodged a Notice of Requirement (NoR) to designate land for the Mill Road Stage 2 (Takanini Section) Project. The proposed corridor intersects the eastern portion of the Sunfield development site, overlapping a critical area of the proposed stormwater system intended to capture and convey flows from eastern catchments northward to the Papakura Stream. This overlap necessitates a fundamental reconsideration of Sunfield's stormwater management approach.*

The applicant acknowledges the NoR lodged by the New Zealand Transport Agency (NZTA) for MRS2A Project, which intersects the eastern portion of the Sunfield development site and overlaps a key area of the proposed stormwater system.

In response, the applicant has undertaken detailed consultation and coordination with NZTA to ensure that the Sunfield stormwater management approach is compatible with the proposed MRS2A corridor. This process included a comprehensive review of the stormwater design, with specific attention to the affected eastern catchments and conveyance to the Papakura Stream.

Following this engagement, NZTA has reviewed the stormwater design and confirmed that at a high level the proposed stormwater channel geometry and the Mill Road alignment are compatible.

The applicant remains committed to collaborating with NZTA and other stakeholders to deliver integrated infrastructure outcomes and robust stormwater management across the Sunfield development.

1.11 *On 23 July 2025, representatives from HWFR, NZTA, and Winton Land Group met to discuss the challenges and opportunities associated with integrating the stormwater management strategies of the NoR and the Sunfield development. The meeting concluded with a shared intention to begin formalising a collaborative approach toward developing a coordinated, catchment-wide solution that could address existing infrastructure constraints and support resilient, future-proofed outcomes for both transport and urban development. Realising this opportunity may require additional downstream land acquisition to accommodate both the Mill Road corridor and the necessary stormwater infrastructure.*

The applicant supports HWFR's position and shares the commitment to developing a coordinated, catchment-wide stormwater solution. Within the Sunfield development, the applicant has proposed a perimeter diversion channel that is consistent with the preliminary strategy outlined by HWFR.

The applicant has proceeded with a stormwater solution that is fully functional and effective, while remaining compatible with potential downstream works possible within the MRS2A corridor. This ensures the timely progression of the Sunfield development, while supporting broader infrastructure integration.

The proposed catchment-wide solution involves diverting upstream flows via an engineered channel that bypasses the existing catchment area. By intercepting and redirecting these flows directly to the Papakura Stream, the volume of stormwater entering the current overland flow path—through private properties and public roads—will be significantly reduced. This strategic intervention will alleviate hydraulic loading on the existing network, mitigate flood risk to vulnerable properties, and improve overall system performance in accordance with sound stormwater engineering principles.

The perimeter channel proposed by the applicant constitutes a significant first step toward a comprehensive catchment-wide solution. This upstream component effectively addresses half of the required conveyance. Should NZTA adopt this approach, the remaining downstream works would complete the system, enabling full realisation of the flood mitigation benefits.

The Applicant remains committed to ongoing collaboration with NZTA and HWFR to develop a coordinated design. The current design has been developed with sufficient flexibility to integrate with a broader catchment-wide solution, should such an opportunity arise. In the meantime, the applicant's proposed solution ensures that Sunfield development is appropriately serviced and resilient, regardless of whether a wider collaborative approach is adopted.

1.12 *There are also other large-scale land development proposals at different stages of planning and consenting in the Papakura Stream catchment, in addition to the proposed Sunfield Development. Each of these developments proposes to manage stormwater and flooding effects on-site in different ways. To ensure the combined effects of development in the catchment are managed in a consistent and integrated manner, a catchment-scale approach to managing stormwater is necessary. Considering this need, HWFR has begun development of an adaptive management plan and integrated stormwater solution for the catchment, which considers necessary funding mechanisms to implement alongside the range of development scenarios planned to occur.*

Although the Applicant does not have any visibility on other proposals within the Papakura Stream catchment it is acknowledged that HWFR's observations regarding the multiple large-scale developments and supports the principle of a consistent and integrated approach to stormwater management across the catchment.

To that end, the Applicant has developed a stormwater management solution for Sunfield that is both effective and resilient on a standalone basis. This solution is designed to manage stormwater and flooding effects independently of other developments and downstream infrastructure, ensuring that the Sunfield development is appropriately serviced regardless of the timing or outcome of broader catchment-wide initiatives.

While the Applicant's solution is self-sufficient, it has also been designed with flexibility to integrate into a wider catchment-scale approach should such an opportunity arise. The Applicant remains open to future collaboration with HWFR, NZTA, and other stakeholders to support the development of an adaptive management plan and integrated stormwater solution for the catchment.

1.13 *It is recommended that the current stormwater management proposal be paused and re-evaluated in partnership with NZTA, Winton Land Group, and other adjacent landowners such as Ardmore Airport. A coordinated approach will be essential to deliver a robust, cost- effective, and sustainable stormwater system that meets the needs of all stakeholders.*

The Applicant has put the application on hold to enable further coordination and consultation with stakeholders including HWFR and NZTA. While the proposed stormwater solution has been designed to operate independently of external infrastructure, the applicant recognises the value of a collaborative approach and is actively working with these key stakeholders to explore integrated outcomes. This pause reflects the applicant's commitment to delivering a quality outcome that includes flood mitigation measures that align with broader infrastructure planning, while continuing to support the timely delivery of the Sunfield development.

1.14 *The key assessment issues and findings, addressed in more detail in Section 3 below, are as follows:*

(a) ***Flooding***

(b) ***Stormwater Assets***

(c) ***Water Quality***

(d) ***Stream Works***

(e) ***Vesting of Land***

3. ASSESSMENT OF STORMWATER ASPECTS OF APPLICATION

3.1. *The Site is located in an area that is challenging to develop given the flat nature of the catchment, existing flooding issues both downstream and within the site, soft compressible ground, high water tables, and nearby critical infrastructure (Waikato No.1 Watermain along Cosgrave Road which supplies approximately 60% of Auckland's water and a high-pressure transmission gas pipeline which runs through the Site). These issues present challenges for the Applicant and long-term risks to Council assets and infrastructure, as well as to existing residential development.*

3.2. *Most of the Site (188ha) is currently zoned Rural – Mixed Rural and drains north to the Papakura Stream catchment. The remainder of the site (56.5 ha) is zoned Future Urban and drains south to the Pahurehure Inlet catchment. Both catchments have existing flooding issues. During a 100-year Average Recurrence Interval (**ARI**) future climate storm event, downstream of the proposed Sunfield development there are approximately:*

- *442 properties in the Papakura Stream Catchment predicted to be exposed to moderate or higher Flood Hazard, including 263 habitable floors and commercial buildings.*
- *108 Properties in the Pahurehure Inlet Catchment predicted to be exposed to moderate or higher Flood Hazard, including 60 residential and commercial buildings.*

3.3. *If stormwater discharges from the proposed development, including associated residual risks, are not effectively mitigated, the flood risk and hazards to existing downstream properties and communities will also increase.*

Flooding

3.4. *The site and its surrounds are subject to significant flood hazards. Approximately 80% of the site is within the 1% Annual Exceedance Probability (**AEP**) flood plain (Figure 4). Flood depths are generally 200mm to 800mm deep across the site during this storm event.*

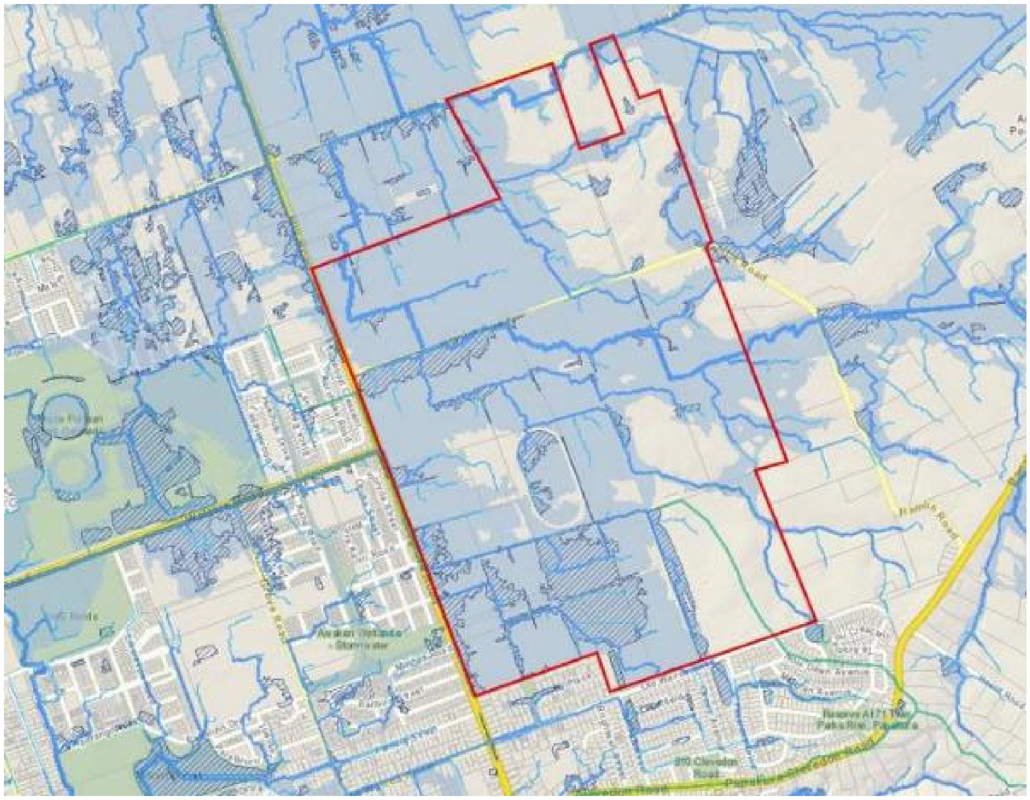


Figure 4. Sunfield development site (red) underlain by Auckland Council Geomaps OLFP, Flood-Prone and Floodplain layers

3.5. *In the Papakura Stream catchment, engineering consultancy WSP have undertaken work for Auckland Council to assess flood effects from development in the Takanini Future Urban Zone[3]. This work identifies "significant existing flood hazards downstream of the proposed development, including the predicted overtopping of key roads and flooding of a large number of private properties, including inundation of over 130 habitable floors, and 65 commercial floors during the future climate 100-year ARI event. Additionally, the predicted flooding downstream can occur in a variety of storm types, due to the complex interaction between the flows from rural and urban areas for different events."*

3.6. *Auckland Council's Future Development Strategy 2023-2053 identified a large area of land in the Papakura Catchment downstream of the site, that was previously identified as a Future Urban Area, as either 'red-flagged area' or 'area for removal'. The areas are considered to be inappropriate for future development due to being within the 1% AEP floodplain and underlain by peat soils. It was considered that flooding in these areas poses risks to life and property that cannot be feasibly mitigated. It is noted that the majority of the Sunfield Development was never considered as Future Urban Area (instead being zoned Rural – Mixed Rural) however, it is subject to the same flood hazards and underlain by the same peat soils as the Takanini 'red-flagged area' and 'area for removal' that was deemed inappropriate for future development.*

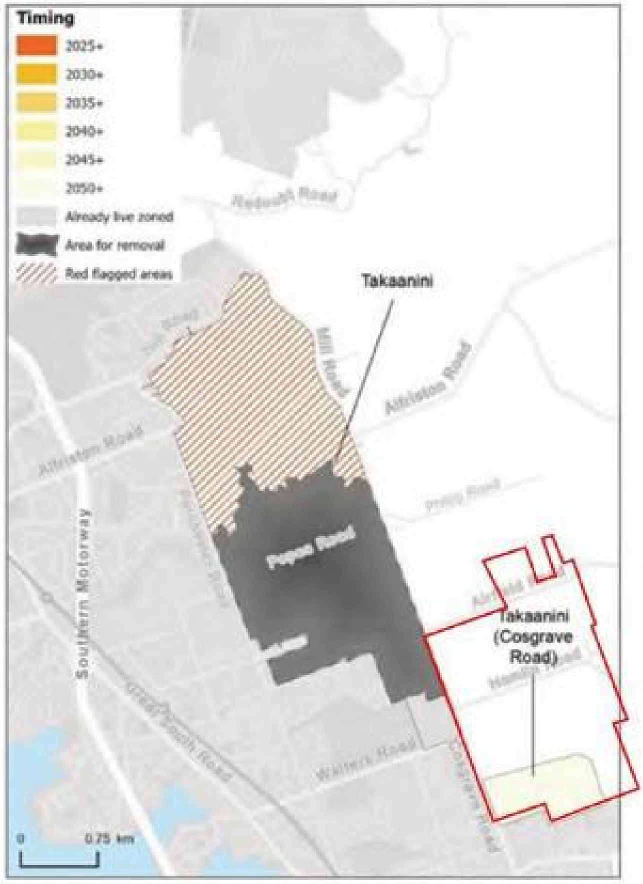


Figure 5. Extract from Auckland Future Development Strategy 2023 – 2053 showing land in the Papakura Stream Catchment to be removed from FUA – Sunfield overlain in red.

3.7. *In general, the development of the Sunfield site presents a high risk of creating significant adverse impacts, and worsening existing flood hazards in the downstream Papakura Stream catchment. The areas that drain to the Papakura Stream are generally considered unsuitable for further development.*

3.8. *Stormwater runoff in the Pahurehure Inlet catchment is managed by a series of significant infrastructure assets owned and managed by Auckland Council. This includes the Awakeri Wetlands and conveyance channels, the Grove Road Box Culvert, McLennan Dam, and the Artillery Drive Stormwater Tunnel. However, this infrastructure was designed to manage flooding for up to the 100-year ARI storm event with an allowance for 2.1 degree climate change, and only considers land currently zoned for future development. Development of rural land not zoned for future development has not been considered in the design of these assets, nor the development and diversion of an additional 54.9 hectares from the neighbouring catchment as proposed by this Application. If this infrastructure is overwhelmed, there is a significant risk of creating flood hazards to existing and recently developed land which relies on this infrastructure for mitigating hazards.*

3.9.

3.10. *The Application does not include sufficient information for Auckland Council to undertake a technical review of the Applicant's flood modelling to assess downstream effects of the Sunfield Development. Following the provision of further information requested in Auckland Council's*

Section 67 request, the Applicant's flood modelling was provided. However, there has been insufficient time for Auckland Council to conduct a detailed review of this flood modelling. Auckland Council has undertaken its own flood hazard assessment of the potential effects of the development, and the proposed infrastructure required to mitigate adverse effects. For the Papakura Stream catchment, WSP have updated the Papakura Stream catchment model to represent the Sunfield Development. A technical report has been prepared by WSP (Papakura Stream Flood Hazard Modelling – Sunfield Development DRAFT dated 11 July 2025) and is ***attached*** *to this memo, which summarises the flood hazard modelling undertaken. For the Pahurehure Inlet catchment, GHD have updated the Pahurehure Inlet catchment model to represent the Sunfield development. This modelling is currently in draft, and is not yet completed at the time of writing this memo. However, some preliminary findings were able to drawn.*

The Applicant considers that sufficient information including Applicant's flood modelling and associated report and plans has been provided to enable Auckland Council to undertake a technical review of the flood modelling. The flood model has been further refined to address specific feedback raised by Councils advisors (WSP) and reflect the most current understanding of the Sunfield development and its potential effects.

Importantly, the modelling has undergone independent peer review (by CKL Consultants Limited) to ensure its technical robustness and reliability. The Applicant remains open to working collaboratively with Healthy Waters to reach agreement on the modelling approach and outcomes. The Applicant welcomes any further engagement to support this process.

Please refer to:

1. Updated Maven Stormwater Modelling Report Rev H
2. CKL Peer Review of the Stormwater Modelling

The WSP technical report makes the following conclusions relating to the Papakura Stream Catchment:

- *The existing farm drains and road culverts to the north of the proposed development do not have capacity to convey 10-year ARI storms. WSP's modelling predicts localised flood hazard impacts within the open drains downstream of the Sunfield site due to a concentration of flows from the development discharged into a single location. Of the scenarios modelled, the most significant effects are observed during the relatively frequent 2-year ARI storm event.*

  While the existing downstream network—including farm drains and culverts—is known to have limited capacity under current conditions, the proposed stormwater management devices for the Sunfield development reduce post-development flow rates below pre-development levels for the 2-year, 10-year, and 100-year ARI events (24-hour duration).

  The concentration of flows from consolidating previously diffused rural runoff into a managed and controlled outlet of the proposed development is a standard and acceptable practice in urban stormwater design.

  Importantly, the concentrated discharge is directed into an existing farm drain, where it disperses and mimics pre-development flow conditions. This approach not only maintains hydraulic consistency with the existing downstream environment but also facilitates future integration with any formalised downstream stormwater infrastructure, should it be implemented.

It is acknowledged that WSP's modelling identifies the most significant localised flood hazard impacts during the relatively frequent 2-year ARI event, primarily due to the concentration of flows discharged into a single location. However, while the 2-year event produces concentrated flows, the overall flow volumes and hydraulic energy are significantly lower than those associated with the 10-year and 100-year ARI events.

In contrast, the 10-year and 100-year ARI events generate higher total runoff volumes that are distributed more broadly across the network, resulting in less concentrated discharge at any single point. Consequently, the potential adverse effects from the 2-year event are mitigated by its lower magnitude.

Flooding in the downstream catchment is sensitive to the assumed ability of the peat soils to infiltrate rainfall and surface water. The Application makes optimistic assumptions of infiltration rates in the peat soils through selection of a Curve Number of 74 to represent the existing (undeveloped condition) in their hydraulic analysis. Use of this curve number is expected to underpredict the relative increase in runoff volume due to development during dry conditions (i.e. low ground water levels), and may lead to under sizing of attenuation devices. In reality the infiltration rates will vary based on antecedent soil saturation and seasonally variable ground water levels.

A Curve Number (CN) value of 74 has been adopted in the flood modelling to ensure consistency with design parameters previously applied in the Awakeri Wetlands Stage 1 and the Papakura Integrated Catchment Management Plan (ICMP). This value also appropriately reflects the hydrological behaviour of the underlying peat soils within the catchment.

We don't believe that CN values of 39 and 98 are appropriate for sensitivity analysis in flood modelling using TP108, particularly in catchments underlain by peat soils. Peat exhibits complex hydrologic behaviour—characterised by high initial infiltration capacity followed by rapid saturation—which is not accurately represented by either of these extreme CN values. A CN of 39 reflects exceptionally low runoff potential typical of dry, well-drained forest soils, which is inconsistent with the moisture-retentive and seasonally saturated nature of peat. Conversely, a CN of 98 assumes near-total imperviousness, significantly overestimating runoff from peatlands that still allow infiltration and storage. Including these extremes introduces unrealistic boundary conditions that can distort model outputs and misrepresent flood risk.

CN values of 61 and 74 have been adopted for modelling, consistent with TP108 classifications for Group B and Group C soils respectively. These values are considered more representative of the hydrologic behaviour of peat soils, which exhibit a transitional response—initially allowing infiltration but quickly reaching saturation, resulting in increased surface runoff. A CN value of 74, in particular, reflects this dual nature and has been specifically selected to maintain alignment with design parameters previously applied in the Awakeri Wetlands Stage 1 and the Papakura Integrated Catchment Management Plan (ICMP). As stated in the Awakeri Wetlands Stage 1 Design Report, geotechnical investigations indicated that the upper layer of peat tends to harden upon exposure to oxygen, reducing infiltration capacity and increasing surface runoff. This characteristic supports the use of a relatively high CN value, as it accounts for the soil's tendency to shed water rather than absorb it.

As outlined in the geotechnical advice provided by LDE (Kyle Meffan, 2025; see Appendix A), the classification of Takanini peat soils as Class B or C is supported by both desktop review (Auckland Council Technical Report 2013/040) and prior site-specific testing. While one soakage test indicated Class D characteristics, this result is considered an outlier due to natural variability across the site. Accordingly, the curve number assumptions used in the stormwater modelling are consistent with regional precedent and geotechnical interpretation.

The CN 74 value is based on calibrated modelling inputs that have been previously accepted by Auckland Council and other regulatory authorities. These inputs were derived from local land use, soil characteristics, and observed hydrologic responses. Its application in existing infrastructure, such as the Awakeri Wetlands Stage 1, has demonstrated reliable performance across a range of storm events.

Maintaining this CN value ensures alignment with catchment-wide planning assumptions and provides a realistic, conservative basis for estimating runoff volumes in the context of flood hazard modelling.

Snippet from Papakura Integrated Catchment Management Plan (ICMP) below:

Runoff Curve Numbers

Typical runoff curve numbers were provided in TP108 for a range of land cover types and typical soils in the Auckland Region. At Central Papakura, typical surficial soil types include the Puketoka Formation and the Takanini Black Swampy Peat. The Puketoka formation is of alluvium including volcanic ash, sands, gravel and East Coast Bays Formation soils. The Takanini Black Swampy Peat is known to have the characteristics of typical silty clay soil, with typical hydraulic conductivity K values ranging from 1×10^{-8} to 1×10^{-9} m/s from on site tests undertaken recently. A runoff curve number of **61** was selected for the Puketoka Formation soils and **74** for the Peat soils. A runoff curve number of **98** was chosen for all impervious surfaces.

In the TP108 runoff model, the runoff hydrograph is calculated using the standard SCS synthetic unit hydrograph as in the original TR55.

Snippet from Auckland Council's Awakeri Wetlands Stage 1 Design report below

Design curve numbers

An SCS Curve Number (CN) of 74 has been used for peat soils for the predevelopment scenario as per the Papakura ICMP, as per TP108. The post-developed scenario also uses a CN of 74 for pervious areas based on likely imported fill characteristics or existing peat soils as per above.

This aligns with the curve numbers being used by developers in the catchment.

Geotechnical observations indicate that the top crust of the soil can harden when exposed to oxygen and sheds water. This gives further support to using a curve number of 74.

- *The open drains downstream of the development, both public and private, are subject to existing capacity constraints and are highly sensitive to increased runoff, particularly during relatively frequent storm events (e.g. 2-year ARI). Due to the flat topography of both the development site and the adjacent downstream properties, elevated water levels in these drains can result in backflow into the proposed attenuation ponds. This backflow reduces the available attenuation volume within the ponds, thereby compromising their ability to effectively mitigate flooding effects. Hydraulic modelling indicates that during a 100-year ARI event, floodwaters backflow into Sunfield's proposed Pond 2, highlighting a* *critical vulnerability in the stormwater design. Without measures to prevent or manage this backflow, the attenuation system may fail to perform as intended during high-flow events.*

The design of Pond 2 has been updated to include a flow flap gate located on the pond outlet and downstream tail water effects in the hydraulic modelling. Modelling shows effective attenuation functionality of the pond for the design storm event up to 100yr ARI rainfall with climate change effect.

The proposed diversion of the 54.9-hectare catchment away from the Papakura Stream catchment to the Pahurehure Inlet catchment (along with the proposed attenuation) has the potential to mitigate increases in downstream flood hazards further afield within the Papakura Stream main channel, provided the attenuation volumes are available when required and have not been depleted from backwater flow or ground water ingress.

Please refer to the response to section 1.8

3.11. *The modelling undertaken by WSP clearly shows that diverting flows from the Papakura Stream to the Pahurehure Inlet catchments is essential to mitigating flood effects within the Papakura Stream catchment. Therefore, demonstrating engineering feasibility of both the diversion and the receiving infrastructure is a critical requirement.*

Noted and agreed.

3.12. *Analysis undertaken by HWFR, supported by draft modelling undertaken by GHD for the Pahurehure Inlet catchment, shows the proposed 94,000m^3 attenuation basin (Pond 4) has the potential to avoid increases in flood levels downstream of the site in the 2-year, 10-year and 100-year ARI scenarios, for the Maximum Probable Development scenario, provided the attenuation volumes are available when required and have not been depleted from backwater flow or ground water ingress. This storage volume is therefore critical for managing downstream flood effects in the Pahurehure Inlet catchment from the development and diversion of the additional catchment.*

The basin has been designed and modelled to address all identified conditions necessary for its effective operation, specifically:

1. **Attenuation Volume Availability**
   The basin has been designed to ensure that the full attenuation volume remains available during critical storm events. Groundwater ingress is not expected at the basin level, as the surrounding groundwater table will be controlled by the basin's outlet level. This design approach effectively mitigates the risk of volume depletion from subsurface inflows or backwater effects, ensuring reliable performance during peak flow conditions.

2. **Hydraulic Performance**
   The basin has already been modelled to perform effectively under a range of tailwater and storm scenarios. Outlet structures and flow control devices have been designed to manage discharge rates and maintain attenuation capacity during peak flows, ensuring compliance with flood mitigation objectives.

3. **Monitoring and Maintenance**
   A comprehensive operations and maintenance plan will be implemented to ensure long-term performance. This includes scheduled inspections, sediment and vegetation management,

and performance monitoring to ensure the basin continues to operate as designed.

4. **Integration with Catchment-Wide Stormwater Strategy**
   Pond 4 is part of a broader integrated stormwater management approach that includes upstream controls, diversion structures, and water quality treatment. This ensures that flood mitigation is achieved in conjunction with broader environmental and urban development objectives.

5. **Compliance and Adaptive Management**
   We are committed to meeting all relevant consent conditions and to working collaboratively with Council and stakeholders to adaptively manage the basin's performance over time.

3.13. *Draft modelling undertaken by GHD for the Pahurehure Inlet catchment also indicates that the proposed earthworks on the site may result in an increase in floodwater that is directed via overland flows to Old Wairoa Road during the 100-year ARI 3.8-degree climate change adjusted storm event. Without mitigation, this increase in flooding will result in a worsening of flood hazards to vehicles, pedestrians, and adverse flooding effects to property in the downstream catchment. Engineering solutions may be available to address these effects; however they have not been identified in the Application.*

Additional modelling has been completed along Old Wairoa Road during the 100-year ARI 3.8-degree climate change adjusted storm event. Modelling confirms increase in flood water within Old Wairoa Road as a result of change in ground level within the site. Modelling also shows these increases can be mitigated and managed by increasing the capacity of drainage within the road carriageway. Upgrade of the existing stormwater catchpits within Old Wairoa Road to a series of mega pits with the flows then being conveyed to the Awakeri Wetland eliminate any adverse effects within Old Wairoa Road.

The Applicant is committed to doing the proposed upgrade of the road catchpits as part of the wider Old Wairoa Road upgrade works.

3.14. *Based on the preceding points, it is evident that effective flood mitigation across both the Papakura Stream and Pahurehure Inlet catchments is contingent upon the successful implementation of the proposed 94,000m³ attenuation basin. This basin represents a key hydraulic control structure within the broader stormwater management system for the development, to regulate peak flows and avoid increases in downstream flood risk. Its engineering feasibility, including its size, shape, location, and integration with wider development, is therefore a critical determinant of the overall viability of the flood mitigation strategy. Further assessment on engineering feasibility is provided in the 'Stormwater Assets' section of this memo.*

Noted.

3.15. *The flood modelling described in the Application is inadequate to enable an understanding of flood risk within the site. The modelling methodology does not account for local overland flow paths within the site, and instead all floodwater is loaded directly into the downstream channels or detention basins. This approach creates a misleading impression that all of the proposed lots and road corridors will be flood free, which does not reflect the actual conditions. Consequentially, the modelling approach undertaken is not suitable for evaluating flood risk to the individual proposed lots to be created by the development.*

Local overland flow paths (OLFPs) identified have been considered in the flood modelling with reflection of the layout of the proposed site. The stormwater flood modelling provided in the application is based on finished ground levels that will closely reflect the final design and has been developed with sufficient detail to demonstrate that the proposed stormwater management approach is both feasible and compliant with flood risk requirements.

The design ensures that surface water is directed away from critical infrastructure, habitable activities and neighbouring properties, with OLFPs integrated into the road corridor and reserve layouts to safely convey excess runoff during extreme events.

The flood modelling also confirms that the proposed basins and downstream infrastructure, including allowances for climate change, can accommodate the development's runoff volumes under a range of design storm scenarios.

The applicant acknowledges the importance of understanding flood risk at the individual lot and road corridor level and confirms that further refinement of OLFP management will be undertaken during a detailed design phase of the project. Finished floor levels will be set in accordance with Auckland Council Stormwater Code of Practice and relevant NZ Building Code (E1) requirements to ensure full compliance with flood protection and OLFP requirements.

Further refinement of OLFP design will be undertaken during a detailed design phase of the project.**1.**

In summary, while the application-level modelling provides a strategic understanding of flood risk and confirms the viability of the attenuation basin and downstream flood mitigation, the detailed assessment of localised overland flow paths and lot-specific flood risk will be undertaken during detailed design. This ensures that the modelling is based on accurate site conditions and delivers robust, compliant flood resilience outcomes.

Given the scale of the development, the flat topography, and extensive earthworks required, a more detailed flood modelling assessment is required. This needs to consider how rainfall-runoff will interact with the proposed topography of the site and interact with local overland flow paths. Without this assessment, it is not possible to assess or understand the flood risk posed to individual lots within the development, set finished floor levels to an appropriate height to meet Building Code and Stormwater Code of Practice Requirements, or to understand the risk of local overland flow paths in terms of vehicle and pedestrian safety.

Refer to Applicant's response provided under item 3.14 above.

Stormwater Assets

3.16. *The Application's documented approach to flood mitigation and stormwater management provides a high-level, conceptual strategy for managing stormwater effects. The infrastructure and works proposed are significant in both scale and extent. The Site is subject to significant natural hazards, complex geology, and flat topography, each of which makes the site difficult to develop. The high-level and conceptual nature of the infrastructure design has not been developed to a level of detail commensurate to these challenges. The Application therefore risks significantly under-estimating the scale of mitigation works that maybe required in practice to service the development, and mitigate the adverse effects associated with developing the land, including the necessary land/footprints required for infrastructure.*

Many major concerns have been identified with the Application, which indicates that the feasibility of the infrastructure has not been adequately considered. There is a significant risk that engineering challenges are identified during later design stages that have not been adequately considered or allowed for, which may either inhibit the ability of the Application to adequately mitigate the effects, or otherwise may result in the vesting of assets to Auckland Council which are unfit-for-purpose and costly, difficult, and unsafe to maintain.

The Application proposes four very large attenuation basins for flood detention purposes across the site; however, the conceptual design of these basins are oversimplified, being generally rectangular in shape, proposed to take all the available space up to the boundary with neighbouring lots, assume flat bases, and do not incorporate any benches or terracing to incorporate planting, shading or any amenity infrastructure above frequent flooding levels. These are critical features required for the infrastructure to function acceptably.

The Applicant considers that the level of detail provided in the application is appropriate and consistent with what is typically expected at the resource consent stage for developments of this scale and complexity.

This application has been lodged under the Fast-track Consenting Act, which is specifically designed to enable large-scale projects to proceed efficiently while still meeting environmental and planning requirements. The project is significant in both scale and strategic importance, and the application reflects a proportionate level of detail that balances feasibility assessment with the need for timely progression through the consenting process.

The application includes a comprehensive assessment of stormwater effects, supported by preliminary hydrological modelling and engineering inputs. Importantly, the flood modelling has been peer reviewed, providing additional assurance regarding the robustness and reliability of the assessment. These technical inputs demonstrate that the proposed infrastructure is feasible and capable of achieving the required performance outcomes.

It is standard practice for detailed engineering design to be undertaken post resource consent consideration , including engineering plan approval design and application. The initial design has been developed using conservative assumptions and with sufficient flexibility to accommodate refinement as further site-specific investigations are completed. This approach ensures that infrastructure solutions can be appropriately scaled and adapted to address any refinement that may be required.

The applicant does not seek to vest infrastructure assets prematurely. Any assets proposed for vesting to Auckland Council will be subject to further design, review, and approval processes to ensure they meet Council's standards and are fit-for-purpose. The applicant is committed to working closely with HWFR and Auckland Council throughout the detailed design phase to ensure that infrastructure is safe, maintainable, and resilient.

In summary, while the applicant acknowledges that detailed engineering maybe required during later stages, the application demonstrates a feasible and adaptable infrastructure strategy, supported by peer-reviewed technical inputs and a commitment to ongoing collaboration with Council.

3.17. *The lack of these features will result in large devices that are at risk of erosion due to unmanaged channelisation, deposition of sediment in 'dead zones' that will form, waterlogging of soils, frequent shallow ponding during day-to-day rainfall for extended periods, and a lack of shading. These devices will be unfit for purpose and may become significant liability for Auckland Council to operate and maintain, generate significant residual risks, as well as present adverse water quality and associated odour, aesthetic and pest issues.*

Refer to the Applicant's response provided under item 3.19 below.

3.18. *To incorporate features into these attenuation basins to provide well-functioning stormwater devices will require the formation of low flow channels and benches/terraces above the frequent flood level. This in turn will significantly reduce the available volume for flood storage and will either necessitate a much larger area to be made available for the basins or will result in the basins not achieving the required attenuation. As noted however, due to the simplified nature of the concept design, it is not clear that there will be any space available to incorporate these features without encroaching upon land allocated for other infrastructure and property. Further information provided in the Applicant's Section 67 response does not clarify these matters.*

Refer to the Applicant's response provided under item 3.19 below.

3.19. *Pond 4 is a major component of the Application's overall flood management strategy. This pond is proposed to comprise 94,000m^3 of storage for attenuation covering an area of approximately 70,000m^2. However, the contour plans show this pond to have a flat base, approximately 80m wide and 700m long. The above-described features have not been allowed for within the design.*

Refer to the Applicant's response provided under item 3.19 below.

3.20. *An indicative cross section for a more suitable channel design is shown below compared to the current Sunfield Pond 4 design. However, this cross section provides less than 50% volume compared to the current pond design, which would necessitate more than double the area currently allocated to this basin to provide the same volume. HWFR are concerned that the sizing of this pond lacks consideration of aspects beyond water storage, and that there are insufficient factors of safety allowed in the conceptual design to provide sufficient space for a well-functioning and fit for purpose attenuation basin. The other basins across the site present similar concerns.*

Figure 6. Sunfield Pond 4 cross-section (left) vs a more feasible pond cross section (right).

Please refer to the response to section 1.8

3.21. *Pond 4 is proposed over the Vector Gas Transmission pipeline and designation, however the applicant has not provided any details about the gas pipeline such as its depth and location (other than the designation area). Effects associated with the gas pipeline have also not been considered, such as whether it clashes with the pond, how the asset owner will access the gas pipeline within the pond, what the effects of the pond could be on the gas main (i.e. potential settlement or ground heave) or effects of the gas pipeline on the pond (loss of flood storage if the pond can't be excavated to the proposed depth over the gas pipeline due to cover restrictions or access requirements).*

The Applicant notes that the asset referenced is owned and managed by First Gas, who are also a party to this Fast-track consenting application. Any matters relating to this asset, including potential impacts, access requirements, or coordination issues, are being addressed as part of the current application process. The applicant is working collaboratively with First Gas to ensure that any concerns are appropriately resolved and that the proposed development does not adversely affect the asset or its ongoing operation.

3.22. *The attenuation basins are also proposed to provide a range of other stormwater management functions. In particular, Pond 1 is proposed to manage runoff from a 415-hectare catchment, however other than a conceptual layout indicating a relatively complicated arrangement of overflow basins, low flow culverts, check valves and other hydraulic controls, there is limited information provided for how this very significant structure would be proposed to function.*

Please refer to Maven's M-C4600 series plans that demonstrate this detail.

3.23. *Pond 1 is shown to include a constructed treatment wetland; however, it appears that this wetland is proposed to have flows diverted to it from the entirety of the 415-hectare catchment. Treatment wetlands are typically conceptually sized at 5% of their upstream receiving catchment, however this would make the minimum wetland 20.75 hectares in area, which there is very clearly insufficient space for.*

Proposed Pond 1 has been designed to serve a dual function: providing water quality treatment for site runoff and attenuating peak flows during larger storm events.

Function A: Water Quality Treatment (Frequent Storm Events up to the WQF)

Runoff from the Sunfield development site is conveyed via a network of stormwater pipes and swales. A bund within sections of the main eastern diversion swale ensures separation between upstream off-site flows and the Sunfield site-derived water quality flows (WQF). Site WQF flows enter the wetland through a dedicated low-level culvert.

During these frequent, smaller events, upstream overland flows are contained within their own channel and bypass the proposed wetland entirely. High-level overflow weirs and culverts remain inactive during these conditions.

The wetland inlet is designed to dissipate energy and direct flow into a sediment forebay at low velocity, allowing coarse particles to settle. Flow then passes through macrophyte zones at velocities below 0.5 m/s, providing sufficient residence time for pollutant removal in accordance with Auckland Council's *Guideline Document GD01 (2017/001)*.

Function B: Peak Flow Attenuation (Large, Infrequent Storm Events)

During larger storm events exceeding the WQF threshold, overland flow from the wider 415-ha catchment spills over high-level weirs and culverts specifically designed for this purpose. Given the flat topography adjacent to the pond, high velocities are not expected; however, energy dissipation measures will be incorporated into the detailed design.

These high-flow inlets discharge into a protected zone within the pond, separate from the wetland treatment area. The attenuation volume is designed to fill the pond gradually—like a bathtub—rather than through high-velocity flows, thereby protecting wetland vegetation.

Importantly, the sediment forebay for the WQF inlet is located away from high-flow entry points, ensuring that pollutants captured during frequent events are not remobilised during major storm events.

3.24. *The wetland will either need to be relocated to a location where it only receives runoff from its intended treatment catchment, or redesigned, otherwise the device will not achieve its treatment objectives and will become an operational and maintenance liability for HWFR. Similar to Pond 4, we consider that this matter is not a detail that can be left for another stage, as due to the current concept design there is no space for any changes to be made without encroaching neighbouring property.*

Refer to the applicant's response provided under item 3.22 above.

3.25. *No sensitivity analysis or risk assessment has been undertaken to assess the potential effects in the event of blockages on the stormwater basins. There are significant concerns in relation to the risks associated with vesting infrastructure required to service a development of this scale, which will be reliant on only six very large, complex devices to manage runoff from a wide range of storm events. Something as simple and frequent as a minor blockage of an outlet pipe could have significant adverse consequences downstream from a water quality, stream erosion, and flooding impact perspective.*

The Applicant acknowledges the importance of assessing operational risks, including outlet blockages, particularly for large-scale infrastructure servicing extensive catchments. The proposed stormwater management system includes three large wetland ponds, each designed with multi-stage outlet structures (orifices and weirs) to manage a range of storm events, from frequent rainfall to extreme events. The proposed arrangement is standard practice.

Key Design Features Addressing Risk:

1. **Multi-Stage Outlet Structures**

Each wetland pond includes multiple orifices and overflow weirs sized to manage different storm events (e.g., 2-year, 10-year, and 100-year AEP). This multi-stage configuration provides redundancy, ensuring that if one outlet becomes partially blocked, other outlets can continue to convey flows, reducing the risk of overtopping or uncontrolled discharge.

2. **Extended Drain down Times and Attenuation**

The ponds are designed with extended drain down times, particularly for SMAF volumes (e.g., Pond 4 has a minimum 24-hour drain down time). This controlled release delays peak flows and reduces pressure on downstream infrastructure.

3. **Freeboard and Emergency Overflow Capacity**

All ponds include freeboard and emergency overflow structures to safely convey excess water in the event of outlet blockage or extreme rainfall. These features are designed to prevent flooding and minimise downstream impacts.

4. **Maintenance and Accessibility**

Outlet structures are designed to be accessible for inspection and maintenance, with clear access paths and sediment forebays to reduce clogging risk. The applicant will provide detailed operation and maintenance plans at the engineering approval stage to support long-term performance and vesting suitability.

5. **Inherent Risk Mitigation in Design**

While a formal sensitivity analysis is not included at this stage, the design approach inherently incorporates risk mitigation through:

- Redundant outlet pathways
- Passive overflow systems
- Controlled release strategies
- Robust sizing based on Auckland Council standards

The proposed wetland ponds are not reliant on single-point outlets, and their design includes multiple layers of protection against blockage-related risks. The applicant will provide detailed design documentation and maintenance protocols during the engineering approval phase to ensure the infrastructure is suitable for vesting and long-term operation.

3.26. *Without an understanding of the effect of blockage, it is not feasible to understand the necessary operation and maintenance regime that will need to be implemented to manage this risk. It is also not considered appropriate to leave this matter to a later detailed design stage, noting that there is limited to no space available for the design of these structures to be modified once consent is granted.*

Refer to the Applicant's response provided under item 3.24 above.

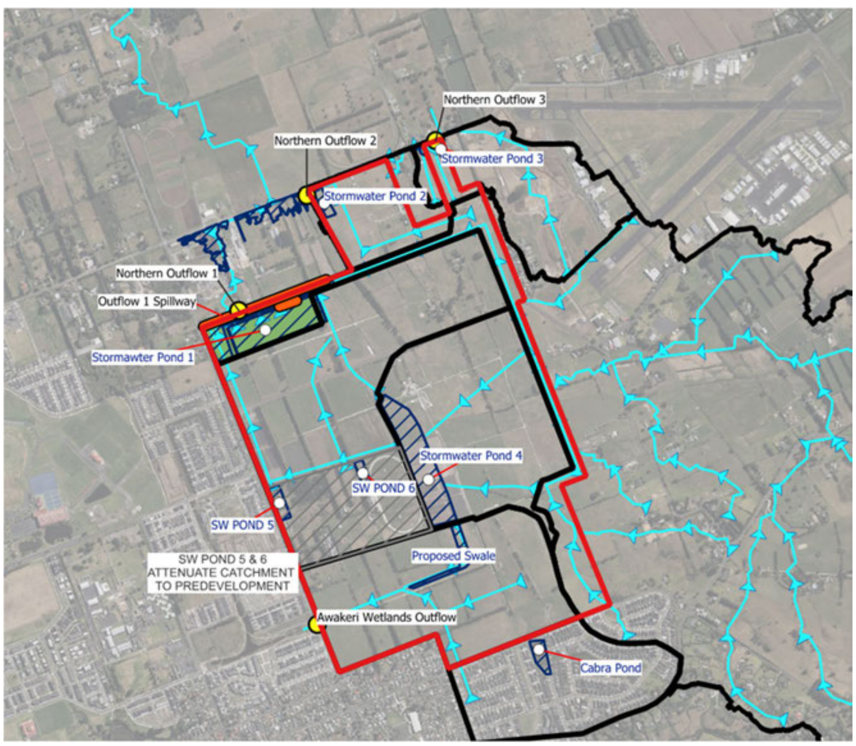
3.27. *It is proposed that the development site discharge its stormwater to a series of farm drains within private property downstream of the site in the Papakura Stream Catchment. These farms drains are well understood to lack capacity to manage even a 2-year ARI storm event without flooding (recent rainfall in the catchment, understood to be approximately 1.25 year ARI event resulted in widespread flooding within these farm drains). In the existing pre-development state, runoff generated from the site during low-intensity, frequent events is likely to pond within the site and infiltrate to ground where soil conditions allow. However, post development, with an increase in impervious coverage, even in these small intensity frequent storms, a significant volume of runoff will be directed to these farm drains which may create significant adverse impacts. The Application has provided no assessment into the capacity of these drains, or on the potential for an increase in both frequency and duration of flooding, during small intensity, frequent rainfall events.*

Detailed flood modelling has been undertaken as part of the development assessment, demonstrating that post-development peak flow rates are maintained at or below pre-development conditions through the implementation of attenuation ponds. These ponds temporarily store stormwater runoff during peak rainfall events and release it at a controlled rate, preventing surges that could overwhelm downstream infrastructure.

This approach is consistent with best practice in urban stormwater management and aligns with the Auckland Council Stormwater Code of Practice 2025 (Version 4) and the NIWA Stormwater Management Devices Design Guidelines (2003). Although total runoff volume may increase due to urbanisation, the controlled release ensures that downstream private farm drains and culverts are not subjected to higher peak flows or velocities that could result in erosion, flooding, or structural damage.

Hydraulic modelling has been undertaken for the 2-year, 10-year & 100-year ARI storm events, providing a comprehensive understanding of stormwater behavior across a range of rainfall intensities. In addition, mitigation for storm events with shorter durations such as 30-minute and 60-minute duration periods has also been incorporated into the assessment. Please refer to Maven's updated Stormwater Modelling Report Rev H that specifies basin sizes, location of pond and discharge point.

Snippet from Maven flood modelling report showing Pond 1 location and discharge point below:



The Applicant acknowledges the importance of assessing the development's potential effects on downstream flood hazards, including backyard flooding, road overtopping, and potential inundation of building footprints. While peak flows are controlled, it is recognised that the total volume of runoff will increase, potentially extending the duration of flows downstream. However, this extended duration occurs at a lower, controlled rate, resulting in a flatter hydrograph that does not increase flood depth or hazard. This outcome is well understood in open-channel and rural drainage environments and is not expected to cause adverse effects, provided current peak capacity is maintained.

With respect to stormwater discharges from Ardmore Airport, the current modelling has accounted for existing catchment conditions and downstream capacity. Should additional data become available, it can be incorporated to refine the assessment as required.

Overall, the proposed stormwater management strategy provides effective mitigation of downstream flood risks and complies with all relevant regulatory frameworks. The applicant remains open to undertaking supplementary modelling or analysis, if required, to confirm that the development will not increase the frequency, severity, or material duration of flooding to downstream properties.

3.28. *The proposed development will significantly increase traffic volumes—including vehicles, cyclists, pedestrians, and public transport—on roads already prone to flooding, such as Hamlin Road, Mill Road, and Airfield Road. While attenuation may help maintain peak flow rates, it also prolongs flood duration, increasing the time these key routes remain impassable. This raises serious concerns about exposing more people to existing flood hazards, particularly as Airfield Road currently overtops in events less frequent than the 2-year ARI. It is recommended that flood hazard exposure be addressed through integrated planning and infrastructure upgrades to ensure safe and reliable access for all transport modes.*

Please refer to the response to section 1.8

3.29. *There are significant concerns about the feasibility of the 700m long weir on Pond 1, that is proposed to activate in relatively frequent flood events, discharging into farm drains on private property downstream. This structure is shown to be parallel to the direction of flow in the diversion channel, and the assumption that there will be uniform flow across a parallel, broad grassed weir is unrealistic. In practice, it is likely that minor variations in the level (from construction tolerances, settlement over time and vegetation growth) will lead to this structure being subject to preferential flow paths, which could lead to erosion and subsequent failure of the structure. Given it manages flows from a 450-hectare catchment, and impounds up to 141,000m^3 of floodwater, this may have significant hazardous effects on downstream persons and property in the event of a breach of the embankment.*

The proposed 700 m long weir within Pond 1 has been preliminarily designed to manage frequent flood events through controlled discharge into downstream farm drains, with hydraulic modelling accounting for non-uniform flow and potential preferential pathways. While minor level variations are acknowledged, the final structural design—including erosion protection, embankment stability, and flow control measures—will be fully resolved at the detailed design stage, in accordance with relevant standards and best practice.

During detailed design a combination of ground improvements to the weir bund can be implemented to provide a robust, multi-layered defense strategy for the weir structure.

Preliminary assessments confirm that downstream flood risks remain within acceptable thresholds, and the applicant is committed to implementing monitoring and adaptive management to ensure long-term performance and safety. Further refinement, including breach analysis and structural detailing, will be undertaken in consultation with Council as part of the detailed design process.

3.30. *Each of the proposed attenuation basins are shown to include constructed stormwater treatment wetlands within their bases, however noting the assumptions for the attenuation basins (flat wide bases, no gradient), it is not clear how the treatment wetlands will be able to function. There is a concern that these devices are not well integrated into the wider stormwater management areas, and that water quality will be compromised.*

Maven plans M4603, M4607, and M4613 demonstrate that the constructed stormwater treatment wetlands are located below the base level of the attenuation basins and are designed to retain a permanent water level. This configuration enables the wetlands to function independently of the flood attenuation volume, despite the flat base and lack of internal gradient.

The separation of treatment and attenuation functions ensures that the wetlands are integrated into the wider stormwater management system and are capable of achieving water quality objectives.

3.31. *There are discrepancies between the visuals shown in the Masterplan compared to the Engineering drawings which are misleading. The masterplan shows a meandering stream-like feature running through the centre of the development, whereas the engineering drawings show this as a long, flat, wide area utilised for stormwater attenuation. The Sunfield Open Space Strategy also shows the ponds with large, grassed areas provided as 'flood basin parkland', however based on the engineering design, most if not all this land will be inundated in frequent storm events and is unlikely to be suitable for public use and amenity without significant redesign, which as stated previously would result in a significant reduction in the available flood storage.*

The proposed low-flow channel is intended to be located below the invert level of the main channel and therefore it is expected to retain stormwater, except where infiltration occurs prior to discharge.

As the low-flow channel sits below the main channel's invert, the overall conveyance capacity or hydraulic performance of the main channel will not be affected.

3.32. *Ponds 5 and 6 referenced in the Application have no design documentation provided whatsoever. These ponds are stated to be necessary to attenuate peak flows from their receiving catchment, however their feasibility and connections are completely unknown. These ponds are omitted from many relevant plans, including the engineering plans and masterplan documents.*

These ponds where not detailed in the application as they do not sit within or provision for the Applicants land. Indicative sizing has been provided based on catchment area-to-pond volume ratios for those ponds located within the Applicant's land.

3.33. *There is inadequate information or assessment included in the Application on the impact of the proposed development and diversion of the additional 54.6ha catchment on the existing McLennan Dam, except for modelling results suggesting that the maximum flood level within the dam will not increase and the duration of spilling is increased by 5 minutes (from 1hr 10min to 1hr 15min). This dam is a High Potential Impact Classification (**PIC**) dam, which has been designed to manage specific flows and volumes from its upstream catchment in accordance with its associated resource consents.*

Please refer to the response to section 1.8

3.34. *Assessment of High PIC dams generally requires consideration of a higher than 100-year ARI storm event. It is noted that even if the infrastructure proposed as part of the application is able to mitigate effects for the 100-year ARI event, it is not understood to provide for any flood mitigation beyond this event. For larger events, it can be assumed that there will be limited or no attenuation, leading to an increase in peak flows and volumes that will need to be managed* *by the dam. It is unclear what the impact of this will be on the performance, or structural stability of the dam, and the residual risk to downstream persons and property.*

Discharges from the Sunfield site are conveyed into the Awakeri Wetlands and subsequently through the Grove Road box culvert before reaching the McLennan Dam. The maximum flow from the site is hydraulically throttled by the capacity of these downstream conveyance assets, which have been designed to accommodate flows from a 100-year ARI storm event.

As a result, even in storm events exceeding the 100-year ARI, the flow rate entering the McLennan Dam cannot exceed the maximum conveyance capacity of the Awakeri Wetlands and Grove Road culvert. This physical constraint ensures that the additional catchment introduced by the development does not increase peak flow rates to the dam under ultimate loading conditions.

While attenuation effectiveness may reduce for events beyond the 100-year ARI, the downstream infrastructure imposes a definitive upper limit on flow rates. Therefore, the proposed development does not exacerbate flood risk or compromise the structural integrity of the McLennan Dam for events beyond the 100-year ARI.

Other Key Considerations:

Design Intent of Stormwater Pond 4
Proposed Stormwater Pond 4 has been designed to attenuate post-development flows to match pre-development peak flow rates for the 100-year ARI event. This ensures that under design conditions, McLennan Dam continues to operate within its existing flood management envelope.

Performance Under Larger Events
For events exceeding the 100-year ARI, attenuation effectiveness of Stormwater Pond 4 is expected to reduce, and peak flows and volumes may increase. This behaviour is consistent with both natural and engineered systems under extreme conditions and is not unique to this development.

No Increase in Peak Flow for 100-Year ARI
Hydraulic modelling confirms that peak flows entering McLennan Dam remain unchanged for the 100-year ARI event. This is a critical parameter for dam safety, as the dam's structural and hydraulic design is primarily governed by peak inflow rates and flood levels.

Residual Risk and Dam Safety
The McLennan Dam, as a High PIC structure, is expected to have been designed with sufficient freeboard and spillway capacity to accommodate inflows from events beyond the 100-year ARI. The proposed development does not alter the dam's catchment characteristics in a way that would compromise its structural integrity or increase residual risk to downstream persons or property.

Consistency with Industry Practice
It is standard practice for upstream developments to demonstrate no increase in peak flows for the 100-year ARI. While PMP-level assessments are typically reserved for dam design and safety reviews, the proposed development does not trigger a reclassification or redesign of the dam, as

it does not increase peak inflows under the design event.

Conclusion:

Given that:

- Maximum flows from the site are hydraulically throttled by the capacity of downstream conveyance infrastructure—specifically the Awakeri Wetlands and Grove Road box culvert—which have been designed to accommodate 100-year ARI events,
- Peak flows remain unchanged for the 100-year ARI event,
- Flood levels within the dam do not increase,
- The increase in spill duration is negligible, and
- The dam is already designed to manage extreme events.

it is our view that no additional structural or performance assessment of the McLennan Dam is required as a result of this development. The applicant's commitment to supporting a future dam safety review provides an additional layer of assurance and aligns with best practice in long-term infrastructure risk management.

There is inadequate information or assessment included demonstrating the feasibility of stormwater drainage for the site. Buried stormwater networks are proposed to drain into the stormwater channels and ponds across the site, however, there has been no stormwater capacity analysis provided demonstrating these networks can provide the minimum level of service required to be vested to Aucklan Council. Given the flat topography of the site, and the use of storage basins to provide for attenuation of stormwater runoff, we are concerned that tailwater impacts on the stormwater networks may present challenges in providing adequate drainage to the site to avoid nuisance effects and property damage.

The engineering plans submitted as part of the application demonstrate stormwater drainage feasibility to a resource consent level. These plans detail the proposed buried stormwater networks, which are designed to discharge into the site's stormwater channels and ponds.

Given the large size of the site and its predominantly flat topography, site levels in some areas have been set based on achieving the minimum pipe cover requirements outlined in the Auckland Council Stormwater Code of Practice (SWCoP). The current network design does not surcharge under the modelled 10% AEP event, confirming that the system meets the minimum level of service required for vesting.

However, the use of controlled surcharging is considered a viable design option during detailed design. This approach could minimise the environmental impacts and improving overall constructability.

The importance of managing overflow and minimising flood risk in urban areas is acknowledged. Should surcharging be incorporated, appropriate mitigation measures—including stormwater detention, floodable open spaces, and clearly defined overland flow paths—will be integrated into the design to safely convey excess runoff and protect public and private assets.

The applicant will provide additional supporting documentation and modelling outputs at the detailed design stage, to demonstrate compliance with Auckland Council's stormwater performance and vesting requirements.

3.35. *Both the Infrastructure Design Report and the Geotechnical Design Report are ambiguous as* *to how groundwater will be managed in relation to the ponds and conveyance channels, noting that they are currently shown to be cut to below existing groundwater levels measured and observed across the site. However, the stability analysis included in the Geotechnical Assessment Report appendices appears to be based on the assumption that the groundwater level will be lowered to the permanent long term, low water level in the channel. This approach will require careful consideration of the area affected by this drawdown and the implications of settlement effects on the proposed development and associated infrastructure. As shown in Figure 8, within the basins and channels, earthworks are proposed well below the existing groundwater table.*

Please refer to Geotechnical Memo supplied by LDE which addresses this.

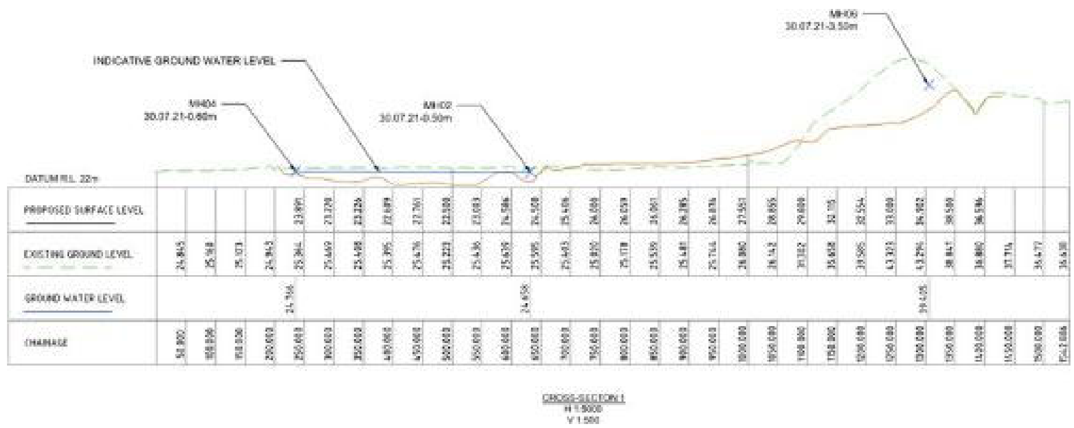


Figure 8. Profile through the site showing proposed earthworks topography (orange line), compared to existing (green dash), the blue line shows the measured groundwater levels.

3.36. *The Geotechnical Design Report presents a discussion on the consolidation settlements of compressible soils; however, this is limited to a theoretical analysis of the one, two and three storey building loads. However, these values presented are highly optimistic, in that they do not address or consider any of the effects of bulk earthworks, change in landform, the import and placement of fill materials, or the effect of groundwater drawdown.*

Please refer to Geotechnical Memo supplied by LDE which addresses this.

3.37. *The geotechnical engineering implications of the ground conditions have been poorly presented by the Application and masks the challenges that the extensive development proposal will have to address. We consider this to be a critical omission given the likely impact and effect that short-term and long-term ground settlements can have on:*

- *Proposed bulk earthworks programme, cut / fill balance, staging and stockpiling*
- *Bulk material import for pre-load / ground improvement / engineered fill*
- *Bulk material export of unsuitable spoil / availability of landscape fill*
- *Building foundation design, serviceability, and maintenance of building platform flood protection levels*
- *Roads and pavements, drainage channels and overland flow paths*

- *Buried infrastructure, pipelines and services*

Please refer to Geotechnical Memo supplied by LDE which addresses this.

3.38. *Bulk earthworks and dewatering in peat soils can present a risk of oxidation of acid sulphate soils. This can release low pH, acidic leachate which can cause rapid corrosion, damage to underground assets and harmful effects on the environment and ecology. This risk has not been considered in the application.*

Please refer to Geotechnical Memo supplied by LDE which addresses this.

3.39. *In summary, the infrastructure proposed to manage stormwater is considered too heavily reliant on unrealistic assumptions, including the scale and extent of infrastructure required. There is significant uncertainty as to whether the space allocated for infrastructure is sufficient to provide for an integrated stormwater management design whilst mitigating downstream effects. At a conceptual design stage, where significant uncertainty is present, it is engineering best practice to allow for factors of safety to be allowed for within designs. No such factors of safety have been included in the design presented in this Application.*

We believe there is sufficient design and analysis provided to confirm a suitable and robust proposal to manage the stormwater issues associated with the proposed development.

Water Quality

3.40. *The proposed stormwater management strategy for Sunfield includes a treatment train approach including at-source, mid-catchment, and end-of-line treatment devices.*

3.41. *There are specific concerns relating to the reliance on downstream devices for water quality treatment without clear evidence that they can accommodate the additional runoff from the Sunfield development. The McLennan Wetland, identified as a tertiary treatment device for Catchment A, was not designed to service the increased contributing area proposed in the application. Without a full assessment of how the additional 54.9 hectares of catchment will affect the wetland's performance, including the risk of reduced residence time and re-suspension of contaminants during high-flow events, its use as a tertiary treatment device for the Sunfield development cannot be supported.*

Please refer to the response to section 1.8

3.42. *The proposed stormwater management strategy for the Sunfield development includes integration of water quality treatment with groundwater recharge where maintaining existing groundwater levels in peaty soils is critical to avoid consolidation and settlement. Geological assessments emphasise the importance of stormwater recharge pits to sustain groundwater levels, while the Three Waters Strategy Report outlines a treatment train approach to stormwater quality. This includes source control measures such as low-contaminating building materials, grated catchpits, and proprietary gross pollutant filters (e.g. tetra traps) to ensure high-quality recharge into underlying soils.*

Contained in the Three Waters Strategy Report submitted in support of the Fast Track Application is Section 3.3.8- 'Proposed Ground Water Recharge' that states the importance of stormwater recharge for ground water recharge and not just for the purpose of water quality treatment.

While the use of low-contaminant building materials and the integration of water quality and *recharge objectives is supported, the widespread use of small-scale treatment devices—such as roadside raingardens and tetra trap catchpit inserts— is not supported where these are intended to be vested to Auckland Council or Auckland Transport. These devices carry high long-term maintenance costs and are generally not supported by Auckland Transport. Instead, it is recommended consolidating treatment infrastructure into a small number of larger, more efficient devices that can be feasibly maintained over time.*

Tetra traps are generally not expected to be required, as the catchments are treated via constructed wetlands. However, the applicant proposes to retain this provision to accommodate any infrequent or exceptional instances where tetra traps are identified as being the best practicable option during the detailed design phase.

Stream Works and Watercourse Diversions

3.43. *The Sunfield development proposal includes the diversion and reclamation of sections of two permanent streams. These works are detailed in the Sunfield Wai Mauri Stream Remediation Design Report, which outlines a range of mitigation measures for restoring existing stream environments and design elements for newly created watercourses resulting from the proposed diversions.*

3.44. *A significant portion of the proposed stream diversion overlaps with the land identified in the NZTA's NoR for the Mill Road Stage 2 (Takanini Section) Project, lodged in June 2025. This overlap necessitates a fundamental reconsideration of Sunfield's stormwater and stream management strategy. However, it also presents a strategic opportunity to address long-standing issues associated with under-capacity land drains through an integrated solution developed in collaboration with NZTA.*

Refer to the applicant's response provided under items 1.10-1.12

3.45. *The ecological and hydraulic outcomes sought in the Wai Mauri Stream Remediation Design Report are supported. With the NoR now in place, there is an opportunity to revisit the extent of stream diversions and explore alternative approaches that may enhance both environmental and flood resilience outcomes. Noted and agreed.*

3.46. *There is a contradiction between the Wai Mauri Stream Remediation Design Report which shows the Wai Mauri stream flowing to the Pahurehure Inlet catchment and the engineering plans which show it flowing to the Papakura Stream catchment via the trapezoidal diversion channel with subsoil pipes. The feasibility of the development relies on this catchment discharging to the Papakura Stream as the flood modelling has not allowed for this flow discharging to the Pahurehure Inlet catchment.*

The ecological reporting has not yet been updated to align with the engineering documentation. Please refer to the updated ecological report prepared by Bioresearches.

3.47. *An integrated approach to stream and stormwater management—coordinated with NZTA and other adjacent landowners such as Ardmore Airport—will be essential to ensure the long-term resilience, ecological integrity, and cost-efficiency of the stormwater system.*

Refer to the applicant's response provided under items 1.10-1.12

Vesting of Land (HWFR)

3.48. *The Application proposes to vest land containing stormwater channels as Local Purpose*

Reserve (Drainage). However, the supporting documents do not sufficiently demonstrate whether the extent of the proposed land to vest is appropriate and will deliver additional public benefit that cannot otherwise be achieved through private ownership and maintenance.

The applicant confirms that the land containing the proposed stormwater channels is intended to be vested as Local Purpose Reserve (Drainage). This approach is appropriate and justified for the following reasons:

Public Benefit and Long-Term Management
Vesting the land as reserve ensures that the stormwater channels are managed as public assets, providing long-term certainty around access, maintenance, and operational responsibility. This supports integrated catchment management and aligns with Auckland Council's preference for public ownership of strategic stormwater infrastructure.

Hydraulic Function and Network Integration
The channels form part of the primary stormwater network and serve a broader hydraulic function beyond the boundaries of individual lots. Public ownership ensures that these assets can be maintained and upgraded in response to future catchment changes, climate impacts, or network demands.

Avoidance of Fragmented Ownership and Access Issues
Retaining these assets in private ownership could result in fragmented responsibilities, access constraints, and inconsistent maintenance outcomes. Vesting avoids these risks and ensures that the assets remain accessible for inspection, renewal, and emergency response.

Alignment with Planning Objectives
The proposed reserves contribute to the overall open space and green infrastructure network within the development. While primarily serving a drainage function, they also provide visual amenity, ecological connectivity, and potential for passive recreation, thereby delivering additional public benefit that would not be realised under private ownership.

Coordination with Council Asset Management
The applicant is committed to working with Council to confirm the extent and specifications of the land to be vested, ensuring that it meets operational and asset management requirements. This will be addressed through the engineering approval and vesting process.

In summary, vesting the land containing stormwater channels as Local Purpose Reserve (Drainage) is a strategic and appropriate approach that supports long-term public benefit, effective stormwater management, and alignment with Council's infrastructure planning objectives.

3.49. *While the proposal identifies areas of open space associated with the stormwater network, it is unclear how these areas function beyond a stormwater purpose. Vesting of land for stormwater management to Council must be limited to only what is essential for ongoing network performance, maintenance, and resilience. In general, HWFR does not support vesting of wider floodplain or overland flowpath land where that land does not contribute meaningfully to stormwater function or deliver additional recreational, ecological, or amenity value.*

The applicant confirms that the areas of open space associated with the stormwater network have been designed to deliver multiple public benefits beyond stormwater function. These areas include significant open space, pedestrian pathways and native planting, which contribute to recreational use, ecological enhancement, and visual amenity. In addition to supporting network performance and maintenance, the proposed reserves provide meaningful value to the community and are therefore appropriate for vesting as Local Purpose Reserve (Drainage). This replicates the approach taken by Auckland Council with the design and implementation of the Awakeri Wetlands project.

3.50. *In the absence of clear justification, including an assessment of how the land supports stormwater outcomes and broader public benefit, HWFR cannot support the extent of land proposed for vesting. Clarification is required to ensure that the areas to be vested are functionally necessary and represent an efficient and appropriate use of public land ownership.*

Please refer to the response to section 3.48

3.51. In addition, the land proposed for vesting is referred to on Application Plans as '*Local Purpose Reserve (Drainage)',* which is not an accepted mechanism for vesting. Where vesting of land is proposed, it must be offered as '*Land in Lieu of Reserve – for Drainage Purposes*' to align with HWFR acquisition processes.

The scheme plan has now been updated in accordance with the above request. Refer to revised scheme plans submitted as part of this submission where land proposed for vesting has been offered as 'Land in Lieu of Reserve – for Drainage Purposes' to align with HWFR acquisition processes.

4. RECOMMENDATIONS

Key recommendations for the Applicant to address the issues and concerns outlined in the above assessment are summarised below. It is considered that these recommendations are critical to understanding effects and feasibility of the development. It is not considered that these can deferred to later stages, due to the impact they may have on the overall viability of the development.

a. Flooding

i. Provide more detailed flood modelling and an updated hazard analysis that more accurately considers the necessary design updates for well-functioning stormwater management devices (more detail is described below "Stormwater Assets"), including factors of safety that are commensurate with the degree of risk and uncertainty associated with the development.

Refer to the applicant's response provided under Item 3.38

ii. Undertake a sensitivity analysis of the effect of key assumptions and uncertainties on flood risk, such as soil infiltration, antecedent conditions, and blockage risk of critical infrastructure.

Refer to the applicant's response provided under Item 3.24

iii. It is recommended that the Applicant liaise and work with HWFR to ensure the flood mitigation strategy is integrated with HWFR infrastructure and existing assets. To this extent, the Applicant providing HWFR with further information on the proposed landforms and infrastructure within the site, to be incorporated into HWFR existing catchment wide flood models would allow for a better understanding of the effects of the development on downstream flood risk. Information provided by the Application in response to HWFR

Section 67 request to the FTAA may be sufficient to undertake this modelling, however there has been insufficient time to do so between receiving the information and this memo being due.

The applicant agrees with the recommendation to collaborate with HWFR to ensure integration of the flood mitigation strategy with existing infrastructure. We acknowledge the value of providing detailed landform and infrastructure information to support HWFR's catchment-wide modelling and remain committed to ongoing engagement to facilitate this.

b. Stormwater Assets

i. Provide an updated engineering design and analysis of the flood detention basins to incorporate the necessary features to make for well-functioning, fit-for-purpose assets, and confirm the land area required to integrate these devices into the wider development. This should include consideration of low flow channels, water quality treatment devices, and benches/terraces for planting and amenity use above the 2-year ARI level, all of which are shown in the Masterplan document.

Refer to the applicant's response provided under item 3.16-3.20.

ii. Provide a risk assessment of blockage within the flood attenuation basins to understand the freeboard requirements and operation maintenance regime that will be necessary to ensure the devices achieve their intended objectives.

Refer to the applicant's response provided under item 3.24.

iii. Provide a feasibility assessment from a Dam Safety Perspective from a suitably qualified Dam Safety Engineer on the diversion of an additional 54.9 hectare catchment into the McLennan Dam

Refer to the applicant's response provided under items 3.30-3.35.

iv. Provide more detailed information on the feasibility of the farm drains downstream of the site, within the Papakura Stream Catchment to accept the additional runoff flows and volumes on the site, and the effects in terms of flood frequency and duration of flooding.

The development proposes to maintain peak flow rates and flow levels at pre-development conditions through the use of attenuation ponds—an established and widely accepted practice in urban stormwater management across Auckland and New Zealand. These ponds temporarily store stormwater runoff during peak rainfall events and release it at a controlled rate, preventing surges that could overwhelm downstream infrastructure.

For the Papakura Stream Catchment, this approach effectively safeguards downstream private farm drains and culverts. While the total runoff volume may increase due to urbanisation, controlling the discharge rate ensures that peak flow velocities and loads remain consistent with pre-development conditions, mitigating risks of erosion, flooding, and structural damage.

This design approach aligns with the Auckland Council Stormwater Code of Practice 2025 (Version 4) and is supported by the NIWA Stormwater Management Devices Design Guidelines (2003), both of which identify peak flow control as a critical measure to prevent adverse downstream effects. Given that post-development discharge rates are controlled to match pre-development peak flows through attenuation, the existing downstream infrastructure is not expected to experience any increase in flow rate or velocity. As such, further detailed assessment of private farm drains and culverts is not considered necessary.

Hydrological modelling has been undertaken for the 2-year, 10-year, and 100-year storm events, providing a comprehensive understanding of stormwater behaviour across a range of rainfall intensities. In addition, mitigation for shorter-duration storm events (30-minute and 60-minute durations) has now been incorporated into the assessment. Please refer to Maven's updated Stormwater Modelling Report Rev H.

v. *It is recommended that the Applicant liaise and work with HWFR on identifying more appropriate discharge methods for managing stormwater runoff from the Papakura Stream Catchment rather than utilise the downstream network of private farm drains.*

The proposed stormwater discharge method for the development has been designed in accordance with established engineering standards and current statutory requirements. The applicant is confident that the solution is compliant and appropriate for the site context.

However, the applicant acknowledges HWFR' interest in exploring alternative discharge options for the Papakura Stream Catchment. Accordingly, the applicant is open to engaging collaboratively with HWFR to assess and consider any alternative discharge methods they may propose, provided such options are feasible for the applicant.

vi. Further clarity is required on the strategy for managing groundwater, and the effect of groundwater management on infrastructure and property in terms of ground settlement, both short and long-term.

Please refer to Geotechnical Memo supplied by LDE which addresses this.

c. Water Quality

i. *An options assessment must be provided to demonstrate how the proposed stormwater treatment approach represents the BPO for each catchment, including evaluation of alternative device types, sensitivity to site constraints (e.g. peat soils, groundwater), and 100-year lifecycle costs (capital, maintenance, and renewal).*

Stormwater treatment across all catchments within the proposed development is provided via the proposed wetlands, designed to meet the GD01 water quality treatment standard. This approach has been selected as the Best Practicable Option (BPO) based on site-specific constraints, treatment performance, and long-term cost-effectiveness.

Wetlands are proposed as the primary stormwater treatment solution due to their proven effectiveness in removing contaminants and their alignment with Auckland Council's GD01 – Stormwater Management Devices in the Auckland Region (2017/001). The wetlands will provide GD01-compliant treatment by capturing the Water Quality Volume and treating it through extended detention and sedimentation. Design features include inlet forebays, vegetated wetland zones, and outlet structures that meet GD01 criteria for residence time, flow control, and pollutant removal. These systems are expected to achieve at least 75% Total Suspended Solids (TSS) removal on an annual average basis. The wetlands offer robust water quality treatment, are cost-effective over the long term, and support

Auckland Council's Water Sensitive Design principles. The applicant considers this approach to be the BPO for each catchment.

Please see below evaluation of the proposed stormwater management and an assessment of the lifecycle costs of each option, including capital, maintenance, and rehabilitation costs over a 100-year period.

Evaluation of Stormwater Management Device and Strategies

Water quality treatment for Papakura Stream – Eastern Catchment

Stormwater Devices Toolbox for Water Quality		
Activity	*Water quality treatment target*	*Recommended devices*
Residential communal car park or COAL	• *Heavy metal, grease and oil* • *Suspended solids* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*
Residential and commercial / industrial roof area	• *Metal from roofing material* • *Organic debris from natural sources*	*Catchment wide stormwater management device* ➢ *Wetland*
High contaminant generating car park (high-traffic industrial / commercial)	• *Heavy metal, grease, and oil* • *Suspended solids* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*
Public local Road	• *Heavy metal, grease and oil* • *Suspended solid removal* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*
High use road	• *Heavy metal, grease and oil* • *Suspended solid removal* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*

Water quality treatment for Pahurehure Stream catchment – Western Catchment

Stormwater Devices Toolbox for Water Quality		
Activity	*Water quality treatment target*	*Recommended devices*
Residential communal car park or COAL	• *Heavy metal, grease and oil* • *Suspended solids* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*
Residential and commercial / industrial roof area	• *Metal from roofing material* • *Organic debris from natural sources*	*Catchment wide stormwater management device* ➢ *Wetland*
High contaminant generating car park (high-traffic industrial / commercial)	• *Heavy metal, grease, and oil* • *Suspended solids* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*
Public local Road	• *Heavy metal, grease and oil* • *Suspended solid removal* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*
High use road	• *Heavy metal, grease and oil* • *Suspended solid removal* • *Water Temperature*	*Catchment wide stormwater management device* ➢ *Wetland*

Lifecycle Cost

Raingarden (Bioretention Device)

Cost Category	Frequency	Cost Estimate (NZD)	Notes

Capital	Once	$450–$750/m²	Includes design and construction
Maintenance	Annual	$15–$30/m²/year	Weeding, replanting, sediment removal, inspection
Rehabilitation	Every ~30 years	$250–$400/m²	Media replacement, pipe rehab, replanting

Wetland

Cost Category	Frequency	Cost Estimate (NZD)	Notes
Capital	Once	$200–$400/m²	Includes design and construction
Maintenance	Annual	$3–$10/m²/year	Sediment removal, vegetation management, inspections
Rehabilitation	Every ~30 years	$100–$200/m²	Dredging, replanting, bank stabilization

Vegetated Swale

Cost Category	Frequency	Cost Estimate (NZD)	Notes
Capital	Once	$100–$250/m²	Includes design and construction
Maintenance	Annual	$3–$8/m²/year	Mowing, weed control, sediment removal
Rehabilitation	Every ~ 30 years	$50–$100/m²	Soil restoration, replanting, sediment removal

Stormwater Filtration Systems

Cost Category	Frequency	Cost Estimate (NZD)	Notes
Capital	Once	$20,000–$35,000 per unit	Includes Design and Construction
Maintenance	Annual	$1,500–$2,500 per unit/year	Cartridge replacement, sediment removal, inspection, cleaning, traffic control
Rehabilitation	Every ~50 years	$20,000–$30,000 per unit	Vault replacement or major refurbishment (structural + system components)

Cost Summary

Device Type	Capital	Maintenance (100 yrs)	Rehab	Total (100 yrs)
Raingarden (per m²)	$450 – $750	$1,500 – $3,000	$750 – $1,200	**$2,700 – $4,950**
Wetland (per m²)	$200 – $400	$300 – $1,000	$300 – $600	**$800 – $2,000**
Vegetated Swale (per m²)	$100 – $250	$300 – $800	$150 – $300	**$550 – $1,350**
Stormwater Filter System (per unit)	$20,000–$35,000	$150,000–$250,000	$40,000–$60,000	**$210,000 – $345,000**

Additional Commentary on High Contaminant generating car-parks

Any car park within the development exceeding 5,000 m² is classified as a high contaminant generating surface under the Auckland Unitary Plan. Stormwater treatment devices associated with these areas will be designed to comply with GD01 – Stormwater Management Devices in the Auckland Region (2017/001) or demonstrate equivalent contaminant removal performance.

Key points:

- Devices will be designed in accordance with GD01 or demonstrate equivalent performance.
- Treatment will achieve a minimum of 75% Total Suspended Solids (TSS) removal from first flush runoff.
- A maintenance plan will be implemented to ensure ongoing effectiveness.
- Monitoring and reporting will be undertaken to demonstrate compliance.
- Consent duration and review conditions will align with Council's expectations.

ii. *A full assessment of the McLennan Wetland's capacity is required to confirm whether it can provide adequate tertiary treatment for the additional 54.9 ha of contributing catchment. This should include modelling of flow, detention time, and treatment performance under increased load.*

Refer to the applicant's response provided under item 3.40.

iii. *Further information should be provided on the function and design intent of the Northern Wetland and Takanini Stormwater Conveyance Channel, including whether they are 'online' or 'offline' devices, how high flows will be managed, and how water quality objectives will be achieved without compromising flood performance or vegetation stability.*

It is not immediately clear what is being requested here. Proposed Stormwater Pond 1 is offline to the perimeter swale. Proposed Stormwater Pond 4 is offline to Stage 1 of the existing Awakeri Wetlands. The Applicant's response to item 3.19 details how high flows will be managed, and how water quality objectives will be achieved without compromising flood performance or vegetation stability.

iv. *Further information should be provided on water quality treatment proposed for Catchments D1 and D2, including swale and wetland design parameters, expected contaminant loads, and how GD01 compliance will be achieved in these high-risk industrial/employment areas.*

As per the revised Sunfield site layout, Catchment D2 no longer exists, as this area is fully encompassed within NZTA's NoR for Mill Road Stage 2. Water quality treatment for Catchment D1 will be provided by the proposed Stormwater Pond 2. Design details are outlined in Maven's Pond 2 Design Memo for the Proposed Sunfield FTAA Application and are shown on plan M-C4606 D2. The wetland has been designed in accordance with GD01 and is appropriate for its contributing catchment and intended land use.

v. *Confirm ownership of all proposed treatment devices. For assets intended for vesting to Auckland Council, provide operation and maintenance plans, safe maintenance access and sediment drying areas, and full lifecycle costings. Acceptance of assets for vesting will be subject to these details and HWFR review.*

The proposed detention basins, conveyance channels, wetlands and swales are intended to be vested to Auckland Council and are located within parcels identified for vesting in the scheme plan. In line with standard consenting procedures, the applicant is agreeable to a consent condition requiring the provision of operation and maintenance plan subject to HWFR review.

vi. *Swales are proposed as providing secondary treatment for catchments A, B and D. Primary treatment of these catchments is proposed via non-contaminant generating materials, grated catchpits and inlets to stormwater. The feasibility of how stormwater will get from catch pits to the swales needs to be made clear.*

As shown in the engineering plans, Stormwater collected via grated catchpits and inlets will be conveyed to the proposed swales through the public stormwater pipe network. This approach reflects standard engineering practice and complies with the Auckland Council Stormwater Code of Practice (SWCoP) and relevant regulatory requirements.

d. Vesting of Land (HWFR)

i. *The Applicant should provide justification for the extent and location of land proposed for vesting, including evidence that the land delivers essential stormwater function as well as wider public benefit. Areas proposed for vesting must be offered as 'Land in Lieu of Reserve – for Drainage Purposes' and will remain subject to Auckland Council's standard asset acceptance and acquisition processes.*

Refer to the applicant's response provided under items 3.49-3.51.

5. PROPOSED CONDITIONS

a. *Initial comments on the Applicant's proposed stormwater related conditions,*[4] *as well as on additional conditions sought, if the Panel is minded to grant approval, are provided as* ***Appendix A*** *and* ***Appendix B*** *respectively.*

b. *These initial suggestions are provided to assist the Panel, but are offered without prejudice to the Council's ability to make more comprehensive comments on any draft conditions under section 70 of the Fast-track Approvals Act 2024, should the Panel decide to grant approval.*

Please refer to the proposed conditions of consent for Sunfield included with this submission for details of the conditions proposed by the Applicant.

Auckland Council's Strategic and Planning Memorandum

Council has identified information gaps in the Auckland Council Strategic and Planning Memorandum on the Sunfield Fast-track Application (dated 4 August 2025). Maven's response below addresses the gaps specifically related to stormwater.

Information gap	*Nature of deficiency*	Maven's Response
6. Transport/ Stormwater: Road runoff treatment meeting requirements not demonstrated (Refer to Awa report attached to Annexure 7).	*Catchpit inserts for all proposed public catchments as a means of providing stormwater treatment are not acceptable, and these do not meet stormwater mitigation requirements.*	All public roads are designed to drain to a proposed wetland. The wetlands are proposed as the primary stormwater treatment solution due to their proven effectiveness in removing contaminants and their alignment with Auckland Council's GD01 – Stormwater Management Devices in the Auckland Region (2017/001). The wetlands will provide GD01-compliant treatment by capturing the Water Quality Volume and treating it through extended detention and sedimentation. Design features include inlet forebays, vegetated wetland zones, and outlet structures that meet GD01 criteria for residence time, flow control, and pollutant removal. These systems are expected to achieve at least 75% Total Suspended Solids (TSS) removal on an annual average basis. The wetlands offer robust water quality treatment, are cost-effective over the long term, and support Auckland Council's Water Sensitive Design principles. The applicant considers this approach to be the BPO for each catchment.
7. Transport/ Stormwater: Major culverts do not meet engineering standards (Refer to Awa report attached to Annexure 7).	*Major culverts under primary or secondary collector roads (such as Road 1) need to comply with Section 2.3.4(e) of the NZTA Bridge Manual. The current design does not meet these requirements, and would likely require a much larger culvert.*	The Maven M-C4400 Series plans include detailed culvert layouts and dimensions. These demonstrate that sufficient spatial allowance has been provided to accommodate larger culvert sizes if required during the detailed design phase, ensuring flexibility for hydraulic performance optimisation and compliance with council standards.

8. Transport/ Stormwater: Fish passage assessments not provided (Refer to Awa report attached to Annexure 7).	*Similar to the item above, if fish passage measures are not appropriately designed for, proposed culverts may have insufficient capacity and may require redesign*	Fish passage to be provided at detail design. Culverts are typically buried by 200mm, this has minor impact on size of culvert. As per comment spatial allowance has been provided to accommodate larger culvert sizes if required during the detailed design phase.
9. Transport/ Stormwater: Culvert blockage assessment not provided (Refer to Awa report attached to Annexure 7).	*No culvert blockage assessment has been provided, and design changes may be required to meet engineering requirements.*	The proposed culverts are located between two public swales and are situated exclusively beneath road corridors. In the event of a blockage, stormwater would surcharge and overtop the road surface, subsequently discharging into the downstream swale. This configuration ensures that overland flow paths remain functional and contained within the designated stormwater network. A comprehensive culvert blockage risk assessment, including hydraulic performance and debris management considerations, will be undertaken during the detailed design phase to confirm resilience and compliance with Auckland Council's Stormwater Code of Practice
10. Transport/ Stormwater: Culvert and bridge access space not allowed for (Refer to Awa report attached to Annexure 7).	*Culverts and bridges require access for operation, maintenance and repairs. The current design down not allow for this and may require redesign.*	All proposed culverts are accessible via public road reserve, ensuring adequate access for inspection, maintenance, and future upgrades.
11. Transport/ Stormwater: Detail of overland flowpaths within proposed roads not provided (Refer to Awa report attached to Annexure 7).	*Roads to be vested to Auckland Transport that have overland flowpaths are to meet the hazard requirements set out in Table 3 of the Road Drainage chapter of the TDM. The current Application material does not provide this information which is necessary to demonstrate that overland flows can be safely managed and integrated within the development's stormwater strategy.*	This will be provided at detail design stage. OLFP's will be designed to meet ATCOP & SWCOP requirements.

Appendices

Appendix A – Soil Classification Geotechnical Advice

Kind Regards,

Will Moore
DIRECTOR
BE (Civil), MIPENZ, CPEng, IntPE(NZ)
MAVEN ASSOCIATES LIMITED

Appendix A – Soil Classification Geotechnical Advice

Jignesh Patel

From: Kyle Meffan [redacted]
Sent: Tuesday, 30 September 2025 1:07 pm
To: David Osborne
Cc: Will Moore; Jignesh Patel; Joseph Mattocks; Shane Lander; Simon Ash
Subject: RE: Sunfield/MR2 Integration

Hi David,

Thanks for your time on the phone earlier.

As discussed, a desktop review (Auckland Council Technical Report 2013/040) indicates that Class B or C soils can generally be assumed for Takanini peats. This aligns with previous testing that we have completed in similar soils. We have completed one soakage test which did indicate Class D soils, however, given this is one test across a very large area it is likely an outlier demonstrating natural variability in soils. We recommend that the curve number is confirmed by the stormwater designer accounting for the Class B or C soils.

Please let me know if you have any questions or if there is anything further you require from us.

Ngā Mihi | Kind regards,

Kyle Meffan
Associate Engineering Geologist
+64 27 561 8097

From: David Osborne [redacted]
Sent: Monday, 29 September 2025 4:43 pm
To: Kyle Meffan <k.meffan@lde.co.nz>
Cc: [redacted]; Joseph Mattocks [redacted]; Shane Lander [redacted]; Simon Ash [redacted]
Subject: RE: Sunfield/MR2 Integration

Hi Kyle,

Another query for you on Sunfield.

With the stormwater modelling we are after some validation as to the runoff assumptions with respect to the peat geology. Not sure if you have done this analysis on other projects but what we are after is a statement verifying that the geotechnical characteristics of the peat within the site are consistent with those typically associated with CN (curve number) values of 61 and 74 (Group B and C soils) this would provide independent confirmation of the hydrologic assumptions and reinforce the appropriateness of the modelling approach.

For reference the following is from TP 108

Hydrological Soil Groups

The SCS hydrological soil groups are described as:

***Group A** soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (greater than 8 mm/hr).*
***Group B** soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (4 to 8 mm/hr).*
***Group C** soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (1 to 4 mm/hr).*
***Group D** soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0 to 1 mm/hr).*

On the basis of validation against gauged catchments in the Region, the following Hydrological Soil Groups should be used:

Table 3.2 - Hydrological Soil Classifications for prevalent Auckland Soils

Auckland Soil	SCS Hydrological Soil Group
Weathered mudstone and sandstone (Waitemata and Onerahi Series)	Group C
Alluvial sediments	Group B
Granular volcanic loam (ash, tuff, scoria)	Group A
Granular volcanic loam underlain by free-draining basalt	use CN = 17 for all pervious areas

Table 3.3 - Curve numbers for typical Auckland conditions

Land use	Group A Soil (volcanic granular loam)	Group B Soil (alluvial)	Group C Soil (mudstone/sandstone)
Bush, humid-climate, not-grazed	30	55	70
Pasture, lightly grazed, good grass cover	39	61	74
Urban lawns	39	61	74
Crops, straight rows, minimal vegetative cover	72	81	88
Sealed roads, roofs	98	98	98

Feel free to give me a call to discuss if need be.

Cheers,

David Osborne
Head of Land Development

WINTON

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[redacted]