Potential A F Thomas Park stormwater detention with integrated recreation outcomes - view looking south towards Takapuna and CBD

Wairau Blue-Green Network Stage 1 - A F Thomas Park

Concept Feasibility Report - Appendices C to G

Revision 1 | 06 August 2025

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Appendix C - Clarifications and Comparative Notes from TGC ‘Engagement Summary’

Clarifications and Comparative notes from TGC 'Engagement Summary' (provided 18th June):

On 18 June TGC provided a document titled "Engagement Summary", sections of which contain further clarifications of the TGC Proposal. Appendix C sets out those parts of the "Engagement Summary", together with comparative notes where relevant.

TGC clarifications in response to HWFR requests for clarification

TGC provided notes in response to requests for clarification by HWFR (numbered 1 to 10 below) set out in the agenda for the meeting between HWFR and TGC on 18 June. Where the TGC comments have been superseded in the final HWFR proposal (which was being developed in parallel to the TGC option) this is noted in red text.

(black = TGC commentary, red = HWFR clarifications)

The most recent requests made of TGC are as follows (taken from the agenda for this meeting of 18 June), to which responses are made to each following:

1. Are you proposing any Wastewater pipe bridges to connect the storage cells?

a. Our design will follow HWFRs as a common design feature, so is irrelevant for the purposes of concept selection. TGC has been of the opinion that HWFR has been unclear on the design assumption in relation to the build over requirements as different comments have been made by the HW team. Assume to be the same as HW.

2. Are you proposing any new stormwater pipes or culverts, or retaining any of the existing pipes?

a. Our design will follow HWFRs as a common design feature, so is irrelevant for the purposes of concept selection.

3. Can you clarify how a minimum of 9 holes will remain open at all times, given that Stage 1 contains only 4 complete holes and 2 partial holes, noting the requirement for laydown areas and fill. Providing the construction methodology you've referred to will help clarify this.

a. It is our understanding that golf is not being considered as part of the HW feasibility evaluation process as per your email dated 13 June 2025 and the following statement: "*and we can not include assessment of golf (or other recreation) benefits as these are yet to be confirmed, we do not anticipate the BCR being material to the decision regarding project feasibility*" Note this understanding is incorrect. The technical feasibility of golf operations is critical to the feasibility assessment of TGC's proposal. The statement above refers to the assessment of golf **benefits** in relation to the Benefit Cost Ratio. This distinction was clarified to TGC in the workshop on the 18th of June.

b. The TGC construction programme allows for operational continuity throughout the works over two construction seasons.

c. Our staging programme will overlap, and through smart and efficient planning, TGC would apply a flexible management approach to retaining a playable golf course throughout the project. TGC to date has developed an earthworks staging approach that enables nine holes to remain playable throughout construction following feedback from our experienced earthworks contractor. Further detail on potential earthworks staging can be found in the attached Takapuna Golf Course Design - Construction Methodology and Wetland Area, by CivilPlan dated 18 June 2025.

d. As noted at the 18 June meeting, this is shorter than the construction programme identified in HW's Strategic Business Case, which shows the main works occurring over a three-year period (Year 3: $14.6M; Year 4: $16.2M; Year 5: $14.5M; Year 6: $1M), implying a longer period of disruption and site unavailability. The HW Strategic Business Case referred to was an early conservative programme from the indicative business case. This is subject to refinement following concept design progression and optimisation, the current HWFR option is estimated to take 2 earthworks seasons.

4. Please provide more detail on how the fill for Stage 1 will be contained in the Stage 1 area, given there will need to be a temporary batter for the fill or retaining of the fill. Do you propose retaining the fill for Stage 1?

a. Batters as shown on the plans and cross section. Not relevant to concept selection with flood mitigation being the priority.

5. Will the driving range be closed for Stage 1 works?

a. Not relevant to concept selection with flood mitigation being the priority.

b. Yes, refer staging memo for more detail.

6. For the sake of the feasibility assessment, shall we assume that the wetland area that you refer to is the area at 11.1m RL? Do you have any further details on it?

a. Yes but it does not need standing water over the entire area as per HWFR design, so would be cheaper and easier to maintain than HWFRs design. Refer below and to letter 18 June 2025 for more detail on TGC proposal.

7. Can you please provide an annotated plan showing anticipated extent / location of wetland area.

a. Sizing of wetland will occur upon receipt of hydrological and groundwater reports and models, including an ecological assessment of any existing wetlands and loss of ecological areas. Waiting on this further information from HW, including consent assessment report. Our design will follow HWFRs as a common design feature.

b. The 11.1m RL storage area is outside any proposed golf holes and from a TGC perspective can be a fully wetted area of 66,883m^2 or a small wetted area of say 4,844m^2 (equivalent to approximately two times the area of the existing wetlands/ponds currently located on the site), or anything in between. The larger wetting area option will have higher costs but potentially greater ecological benefit.

c. Please advise and apply whatever is most favourable (cost and benefit) to the feasibility assessment and TGC will undertake to incorporate that in the next design iteration. Note for the sake of the technical assessment HWFR have assumed the larger wetland area (66,883m^2) and a permanent pool (4,822m^2) given the advice to follow HWFR as a common feature (noting the HWFR wetland is 111,000m^2) and apply the most favourable option.

8. What shall we assume with regards to planting, maintenance paths, footbridges, walkways or cycleways

a. Our design will follow HWFRs as a common design feature, so is irrelevant for the purposes of concept selection.

b. Overall planting area can be assumed to be the same as existing, just the location differs.

9. What holes are you referring to that would be the summer playable areas?

a. Holes 4, 5 and 6, but these could be replaced by holes at the driving range or through reconfiguration of the hole layout, use of more par 3's. There are too many options in relation to final hole layout that can be considered at this stage that is beyond the extent of the concept approval process.

10. Are you proposing any groundwater drains or subbase material (e.g. sand for greens)?

a. Our design will follow HWFRs as a common design feature, so is irrelevant for the purposes of concept selection.

b. Any sand material required will be repurposed from the existing greens.

Section of "Engagement Summary" headed "Preferred Option Assessment"

In the absence of a HWFR provided brief and objectives to allow for effective, timely and realizable concept comparisons, we suggest that a true unbiased assessment requires **analysing cost differences between designs**. To simplify the process, the following (not exhaustive) list identifies common and different elements that need to be considered when choosing the preferred design.

Commonalities = cost neutral, therefore, are irrelevant to provide details on for concept selection

1. Both designs achieve the required storage with the same inletting and outletting configurations. Both designs achieve the required storage, however there is a lack of information of the TGC design to confirm it does with the required golf contouring, and with the concerns and risks that have been identified (that may affect the storage capacity). The inletting and outletting configurations are assumed to be the same.

2. Both designs need to manage the existing utilities (ie vector cables) relocations and/or offsets from existing and future infrastructure. Both manage the existing vector cables the same through the agreed 10m setback. TGC's design will require extension of the existing stormwater pipes/outfalls in the reserve. For TGC's design, the wastewater trunk main will need significant protection (if the design is indeed acceptable by Watercare) from a maintenance, structural and settlement perspective.

3. Both designs require more than 1.5m – 2m filling over the WSL trunk WW lines therefore require the same upgrades. The fill height was a stated constraint which the HWFR design has accommodated and worked around. Significant filling above the WW pipes will likely require additional expense (e.g. pipe lining, bridging, and/or removal of fill) or significant rework of the TGC design to address. There is concern that the extent of fill that TGC propose over the pipes will not be acceptable by Watercare, as it could have significant maintenance and renewal implications.

4. Both designs require the same storage cell connectivity and therefore same culverts and pipeline bridging of the Watercare ww trunk mains. TGC have instructed to assume the same as HW scheme, however, note that HWFR have accounted for this in their earthwork volumes and fill location, whereas TGC have not. This is estimated to result in up to 5,000m^3 of additional cut and fill.

5. Both designs require the same foot bridges, culverts, and pathways. Agree, however note TGC claim this as a cost difference below.

6. Both designs need to deal with the same geotechnical, ground water, contamination, ecological existing conditions, Given current information available, HWFR have demonstrated how their earthworks will respond to the anticipated conditions and how any risks will be managed, TGC have not provided evidence of the same considerations (noting e.g. of intermittent stream). Ground levels in the TGC design for the dry detention areas are 200-500mm lower than the HWFR design which may be problematic from a groundwater drainage perspective (and maintenance).

7. Both designs have dry basins in the same locations meaning that subsoil drainage designs, water table levels, and designs for hydraulic gradients and lengths to free outlets are the same There are some slight differences in storage areas and ground level differences (200-500mm) in the dry basins which will impact cost and feasibility of golf activities. Frequency of inundation could also be an issue.

8. Both designs need to have the same construction cost contingencies applied

Differences = cost differences, ie what needs to be focussed on

HW need to work with TGC on what the differences are so we can determine:

1. Earthworks

1. Earthworks volumes are different due to the design.

a. The HWFR design requires at least an additional 500mm of excavation below the outlet level of 11.1m to create a wetland with standing water. Over the area of approximately 70,000m2 this generates an additional 35,000m3 of fill material or $350,000 (assuming this area is simply clay and not basalt which would add a significant additional cost to the project). TGC have allowed for a permanent pool of 4,844m^2 (twice the existing ponding area). The earthworks associated with this hasn't been allowed for (assumed 2,422m^3 at 0.5m deep). The 500mm deep excavation for the permanent pool for the HWFR design is circa 15,000m^3 not 35,000m^3 as claimed. This has been allowed for in the earthwork quantities and cost. The TGC design has 730,000m^3 of cut (different to what is stated on their plans due to the bulking factor), 120,000m^3 more than the HWFR design. The TGC design has assumed a bulking factor of 0.8, which has not been substantiated. To achieve this, it will likely result in significant costs relating to drying and compaction of the material.

2. HWFR has a wetland with associated features (ie more planting, more excavation potentially into rock, wetland standing water treatment, boardwalk features). Cost TBA. TGC have instructed us to also allow for a wetland of 66,000m^2 (which is 61% of the HWFR wetland footprint) and to also allow for the same walkway / pathway features. Excavation of basalt is not anticipated.

3. TGC has a golf course with associated features (ie greens, fairways,). Cost TBA.

a. Fairways are assumed to be similar to grassed areas of HW solution. Note the holes (especially greens) will require additional contouring (and raising from proposed ground levels) which hasn't been factored into. Any additional drainage, sub-base material etc because of golf activities will be priced separately.

b. Existing greens and sand will be repurposed where practical. Both schemes can re-use material once the recreation outcomes are known. However, this approach could complicate construction and incur additional costs.

c. TGC has expressed interest in participating in a Public-Private Partnership (PPP) model. The project team is actively preparing construction cost estimates and project management timelines related to works on the golf course site. TGC believes this approach can deliver both the required stormwater functionality **and golf course reinstatement within the project's budget and timeframe.** This model is expected to enable faster, more efficient delivery, with improved health and safety outcomes through a more joined-up and integrated construction approach. The proposal also aims to preserve as many existing trees as possible, as well as utilising the natural resources within the land including turf and soil life, in line with the core objective of retaining the Takapuna Golf Course as a vital public recreational asset. TGC will take a sustainability approach to the management of resources on site and re-purpose of material where practicable. Note that this would be subject to a commercial agreement between the Kaipātiki Local Board and TGC. The Kaipātiki Local Board are legally required to engage with community and seek wider guidance from the Sports and Rec, and Parks and Community Facilities teams to inform future land use. If HWFR wait to have this in place, it will result in a significant project delay.

Cost estimate to be undertaken by Alta. Retainment of trees will be similar between the schemes. Further to this – costings indicate provision of golf would incur a significant additional cost and we do not have approval to spend Government funding on golf course reinstatement. There are likely programme and cost implications due to the complexities of maintaining golf operations throughout construction (as noted in constructability memo).

4. Maintenance

a. HWFR will need to maintain the wetland with the HWFR design. They will not get income from the wetland area. This is positive for the TGC design to be selected. Note that TGC have instructed us to include a 66,000m^2 (at 11.1m RL) wetland in their option (61% of the HWFR wetland size). Maintenance approaches will be similar – with the only difference being the scale of wetland.

b. HWFR will not need to maintain the land with the TGC design (currently costing TGC $425k pa), and Council will also get income from the tenant for the entire land holdings (currently $310k pa). This is positive for the TGC design to be selected. Note that this will also apply to any tenanted recreation land on the future HWFR scheme (following future commercial negotiations)

Additional differences noted by HWFR:

1. Filling over WW pipe – as noted above, HW design has avoided going over the accepted 1.5-2m additional fill
2. Assumption around compaction, whilst they are saying 0.8 compaction factor there is no evidence of this as a valid assumption, and it was never agreed as an acceptable assumption with HWFR. If bulking/compaction factor should be 1, then the height of the fill/hill in the TGC option is estimated to be increased by another 5 to 10m.
3. There are two stormwater outfalls discharging to fill zones that are greater than 10m in height in the TGC design, whereas they have been accommodated in the HW design. They pipes/outfalls will need extending.
4. Overland flows from Northcote Road have not been adequately considered in the TGC design, raising flood levels by up to 300mm on Northcote Road. Flow paths have been modelled in the HWFR design, through the landform. If they are accommodated in the TGC option there will be cut and fill (and cost) implications.
5. The extent of groundwater drainage in the TGC design will be more extensive, if it is indeed feasible to drain the areas at 11.4m RL, given the lower ground levels.

Appendix D - Feasibility Assessment and Engagement Timeline

Feasibility Assessment and Engagement Timeline

Please see below for a summary of engagement between HWFR and the Takapuna golf course and the agreed feasibility assessment process:

1. 24th February: Initial meeting with Takapuna Golf Course to indicate that concept design work was being undertaken to consider stormwater detention in the park, with early indication of potential scale and impact outlined (noting that future stormwater works had previously been indicated as part of tenancy and Local Park Management Plan discussions in 2024).
2. 8th March: Engagement event undertaken at Takapuna Golf Course to update the tenant and golfing community on the flood mitigation works. Feedback from this engagement was included in the business case.
3. 21st March: Meeting with TGC to outline key design parameters. This included the 550,000m3 storage to 14mRL, peak flow rates and a request from TGC for HWFR to provide the HWFR draft flood model.
4. 12th March and 27 March: Requested information released to TGC
5. 3rd April: TGC present alternate option (TGC R0) at the TRIC committee and resolution is passed for HWFR to undertake a technical feasibility assessment.
6. 7th April: Flood model and ground model provided including clarification around assumptions and uncertainties associated. WSP noted ongoing design resolution required for fill and earthwork approach.
7. 10th April: 8 step feasibility assessment process agreed with TGC (via email) including confirmation of primary project parameters. Further clarifications requested by TGC on flood model.
8. 11th April: email sent with requested clarification on flood modelling, hydrology and hydraulics.

Agreed feasibility review process (as approved by TGC in email dated 10th April):

1. Week beginning 14th April: TGC presentation on alternate design, WSP / Healthy Waters Flood Resilience (HWFR) to provide early feedback and areas for further clarification
2. By 22nd April: TGC to provide updated scheme following feedback, and response to any queries
3. 22nd April – 5th May: WSP to undertake preliminary technical review of proposed TGC design including costing (by Alta) and flood modelling
4. Week beginning 5th May: Workshop between TGC/WSP/HWFR to discuss TGC project feasibility including flood detention volume/benefits, project costs, constructability. HWFR to outline accepted Auckland Council benefit-cost ratio (BCR) methodology.
5. By 12th May: TGC to provide final proposal following feasibility testing / feedback and any required revisions
6. By 26th May: WSP / HWFR to complete and provide updated BCRs and summary of risk and constraints for proposed designs including TGC alternate design (as captured in the Draft Concept Design Report).
7. Week beginning 2nd June: Any final queries / clarifications / concerns / omissions to be addressed
8. 13th June: Concept design report updated / finalised setting out HWFR's preferred option to progress to preliminary and detailed design, with a copy provided to TGC.

Final feasibility review process (including additional engagement and extension to timeframes):

1. 15th April: TGC presentation on alternate design, WSP / Healthy Waters Flood Resilience (HWFR) to provided early feedback, assumptions around cost and flood benefits, and areas for further clarification.
2. 24th April: TGC provided updated scheme following feedback, and response to any queries.
3. 24th April – 7th May: WSP undertook preliminary technical review of proposed TGC design including costing (by Alta) and flood modelling
4. 7th May: Workshop between TGC/WSP/HWFR to discuss TGC project feasibility including flood detention volume/benefits, project costs, constructability. HWFR informed TGC that the proposed TGC R0 option was significantly over budget and had both significant constructability and maintenance risks.

   HWFR indicated intent to externally source benefit-cost ratio (BCR) work to ensure a fair and robust process. Noted this would cause a delay in finalising methodology.
5. 9th May – additional clarification meeting held between project engineers on request of TGC.
6. 12th May – extension requested by TGC to allow them to revise their proposal. Granted by HWFR.
7. 27th May: Additional phone call with TGC to share agreed assumption regarding acceptable fill over Watercare pipes (up to 2m total cover) following meeting with Watercare.
8. 30th May (agreed deadline): Letter received from TGC indicating a revised proposal was being prepared and requesting further information. HWFR granted an extension to 12th June to provide information on the revised scheme and noted that requested information was either already provided, unavailable, or not critical to the design development and would be subject to Local Government Official Information Act.

   BCR procurement was paused due to lack of final TGC proposal information and need to revise scope due to convergence of HWFR and TGC options.
9. 12th June: TGC provided final proposal drawing set and cover letter.
10. 12th June to 27th June: WSP, HWFR and technical experts completed technical feasibility review.
11. 18th June: Workshop held between technical reviewers and TGC and any final queries / clarifications / concerns / omissions were addressed. Noted that significant new material was provided by TGC at this stage.
12. 19th June: External economist briefed to provide updated BCR.
13. 4th July: Concept design report updated / finalised setting out HWFR's intent to progress to developed and detailed design based on the converged options, with a copy provided to TGC subsequently.

    Noted that the economist (Martin Jenkins Ltd.) was provided an extension to 31 July to provided final Cost Benefit Analysis reporting due to compressed timeframes. High-level guidance provided in this report notes that the BCR is anticipated to be the same for both options and is not material in agreeing a way forward for developed design.

Appendix E - Feasibility Review Memorandums

Memo

4th July 2025

To: Healthy Waters Flood Resilience – Blue-Green Network Team

cc:

From: Ross Roberts (Auckland Council Chief Engineer) and Nick Brown (HWFR Head of Intelligence)

Subject: AF Thomas Park Concept Options Technical Assessment

Background

The Transport, Resilience and Infrastructure Committee (TRIC) moved a resolution in April 2025 requesting that Healthy Waters and Flood Resilience (HWFR) undertake a technical assessment of Takapuna Golf Club's (TGC) proposal and its feasibility. Two key areas of the technical assessment include achievement of the required flooding benefits (and any associated stormwater considerations) and an assessment of the geotechnical and groundwater considerations and risks associated with the proposed landform.

These aspects and identified considerations and risks are outlined in the following assessment and include the HWFR's concept option design as a comparison. Conclusions from the assessment are outlined for both schemes.

Information Received

The technical review is based on the following information:

- HWFR's Concept Design Option Rev 0.0 dated 12 June 2025.
- TGC's alternative option (TGC-R1) dated 12 June 2025 including covering letter and associated sketches.
- Clarification meeting of the HWFR design on stormwater matters (e.g. hydrology, hydraulics and spillway) on 18 June 2025
- Clarification meeting of TGC's submission held on 18 June 2025 and subsequent additional information on assumptions, wetland and construction methodology provided on 18 June 2025.
- Wairau Creek Geotechnical Desktop Study dated 14 March 2025 by WSP
- Contaminated land desktop study (PSI) dated 14 April 2025 by WSP
- Publicly available geotechnical information in the New Zealand Geotechnical Database (NZGD)

It is assumed that all levels for both proposals are as Auckland Vertical Datum (AVD1946)

Technical Reviews

Stormwater

General

The attenuation scheme at AF Thomas Park is to achieve 550,000m^3 of storage up to 14m RL (AVD1946), to primarily reduce residential flooding downstream adjacent to the Wairau Creek.

A spillway to safely convey the flood flows into the reserve is proposed to be located immediately south-west of the Wairau substation. The proposed spillway is approximately 40m wide at 13.5m RL. This spillway is common to both concepts.

The governing hydraulic outlet of the reserve is based on the existing culvert, located at the northern corner of the park, at 11.1m RL. This sets the minimum ground levels that can provide active storage and the minimum level that groundwater drains can be designed to connect to.

Considerations

The following stormwater considerations have been identified with both schemes.

Consideration	HWFR's design	TGC's design
Storage	Meets the 550,000m^3 requirement	Currently meets the 550,000m^3 storage requirement but there is a lack of information about any additional contouring required for the golf course which may impact storage volumes.
Hydraulic performance	Aligns with the flood benefits outlined in the business case.	Aligns with the flood benefits outlined in the business case with the addition of wastewater pipe bridges (not shown in the plans but later clarified).
Frequency of inundation – Wetland	The wetland for both schemes will have a permanent pool and will be frequently inundated (once or twice a month) from flows backing up from the main Wairau Creek.	
Frequency of inundation – Dry detention areas	The dry detention areas are predicted to be inundated a few times a year.	The dry detention areas are predicted to be inundated many times a year (anticipated to be twice as frequent as the HWFR scheme due to the lower ground levels). The ground level of holes 3, 4, 5, 6, 11, 12, 13, 15, 16, 17 and 18 are at 11.4m RL and are 200-500mm lower than the HWFR design. As a reference, the level of 11.4m RL is approximately 700mm above base flows at the main Wairau Creek.
Dry detention drainage	Ground levels are between 11.6-11.9m RL. This allows 500-800mm of fall to the culvert's invert level of 11.1m RL (hydraulic outlet). These ground levels should sufficiently allow for any drainage required and recreational activities to occur in these areas.	Ground levels, where the 11 golf holes are proposed (holes 3, 4, 5, 6, 11, 12, 13, 15, 16, 17 and 18) are at 11.4m RL. This allows 300mm of fall to the culvert's invert level of 11.1m RL (hydraulic outlet). The ground at these levels will be difficult to drain and will likely be waterlogged for a large portion of the year (in addition to being frequently inundated).

Spillway	Assumed a 40m wide weir/channel at 13.5m RL.	
Overland flow paths	Adequately accounts for overland flow paths in their landform.	Has not adequately accounted for the overland flow entering from Northcote Road, raising flood levels on Northcote by up to 300mm. This would be a consenting issue. Accommodating the flow paths will affect earthworks and needs to be factored into the cost estimate.
Stormwater pipes	Retains the existing stormwater pipes, with minor extensions if required.	Although not shown on the plans, TGC have clarified that they will retain all existing stormwater infrastructure. Two of the stormwater outfalls discharge underneath a proposed 10m of fill, within a relatively steep slope. The pipes will need to be extended and drainage channels formed to cater for the flow. Erosion protection will be required where water is discharging to slopes. This needs to be factored into the cost estimate.
Connection between cells	Has adequate connection provided between cells to ensure all storage is being used effectively (through wastewater pipe bridges).	No wastewater pipe bridges provided in proposal. TGC has provided a clarification to assume the same as HWFR design. This would create an additional up to 5,000m^3 of cut and fill not currently allowed for in the earthworks design which needs to be factored into the cost estimate.

Conclusions

The following can be concluded from this technical assessment:

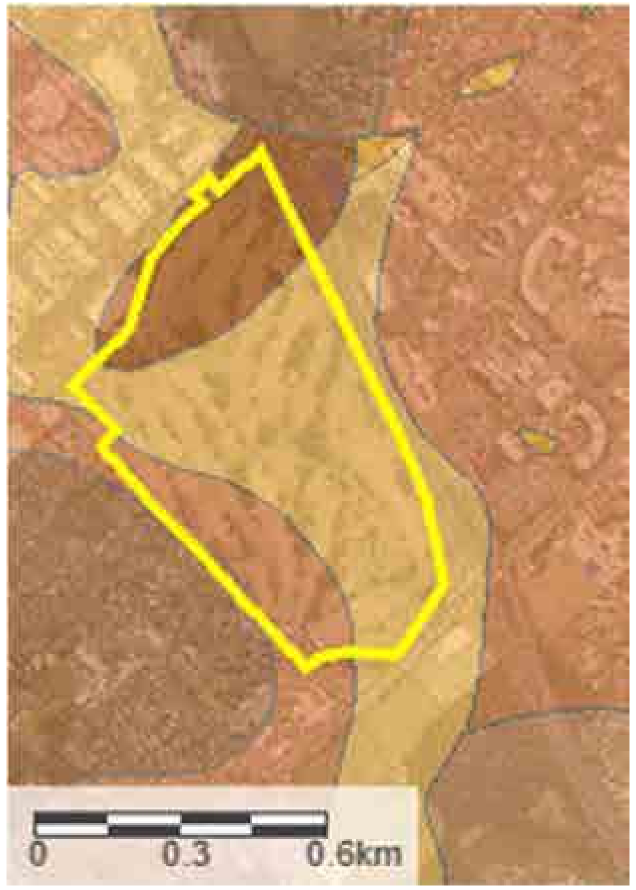
- Both concepts provide the storage requirements and therefore similar flooding benefits.
- Both are considered feasible from a stormwater perspective.
- Both designs are similar in their approach in terms of the main areas of flood storage and fill in the park, with the TGC proposal converging with the HWFR design.
- The wetland areas for both schemes will be frequently inundated, many times a year.
- The TGC design is predicted to have frequent inundation of the land on which 11 holes are located, likely impacting on feasibility of golf/recreation in these areas.
- The TGC proposal presents some additional unresolved issues and risks. While these may be addressed through design modifications, doing so is likely to result in additional time and cost implications.

Earthworks and Geotechnical

Site geological description

This geological summary has been predominately based on the WSP Geotechnical Desktop Study (14 March 2025), historical investigations recorded in New Zealand Geotechnical Database (NZGD) recorded in and around the vicinity of the park, and geological information available on Auckland Council GIS such as geological maps and aerial photographs.

Extracts from two key maps are shown below, with the site outlined in yellow.



Industrial series geological map (1:25,000) from 1966 a2 = Tauranga Group alluvium c = Peat t = Volcanic tuff (eastern portion of site)	IGNS Map 2 sheet R11 (1:50,000) from 1993 Peat (brown) is shown in the same approximate location Recent Tauranga Alluvium (yellow) is shown in the centre and the eastern portion of the site (instead of volcanic tuff) Older Tauranga Group alluvium (light red) is shown along the south west boundary of the site.

The geological maps are different at this site. This may represent increasing knowledge (for example, gained during the construction of the northern motorway). However, it is important to note that the earlier maps were drawn at a higher resolution, so may include some details missing from the later maps.

In general, the older industrial series map appears to align better with the available borehole data on the New Zealand Geotechnical Database and is, geomorphologically, more rational. As anticipated for low-lying areas, much of the site is shown as being underlain by alluvial deposits, with volcanic tuff in the south and east towards the Pupuke volcano.

Both maps show peat in the northern part of the site. This was likely deposited after the Pupuke eruption deposits blocked the natural flow paths in the area, which would have created a small lake or swamp. Pupuke is one of the oldest volcanoes in Auckland (about 250,000 years). It started as a thin shield volcano which caused a series of overlapping basaltic lava flows, which was followed by a more explosive stage which threw out tuff and ash.

Tuff over basalt was encountered in pits for the northern busway, so these materials may occur beneath the eastern margin of the park. Tuff was also found in borehole 68106 and 68107 in the centre of the southern half of the park.

Both deposits (alluvium and tuff) are likely to be variable across the site in depth and composition, and may be interbedded in areas. Adjacent boreholes suggest that the alluvial material is likely to be quite compressible (it includes peat, loose sands etc) and 10-15 m thickness. In general, the more compressible material appears to be present in the northern part of the site, with slightly less compressible tuff in the south. However, the tuff overlies alluvial deposits which may compress a little.

Basalt was identified in boreholes (e.g. 124753) at the Wairua Road substation (immediately north of the site, adjacent to the motorway) at shallow depth of 3 m. This would be about 11.5 mRL. This is above the maximum proposed excavation depth, so there is some potential for this to be encountered when excavating in the north east corner of the site. This basalt has alluvium below it. One positive aspect of this finding is that the basalt should protect the substation from settlement effects.

Beneath these more recent deposits, Waitemata Group rocks are present. The depth to rock is likely to vary a little across the site. In general, the soil/rock boundary is likely to be a gentle transition (rather than an abrupt boundary) because the surface materials will have weathered to silty clay. Borehole information suggests that a depth of 10-20 m to relatively unweathered rock is likely, so this material will be below any activities that could feasibly occur as part of this project and are unlikely to influence the outcome.

Geological maps generally omit fill (except where particularly thick), as is the case at this site. The potential presence (and thickness) of fill could be of significance to the project, particularly if contaminated or poorly compacted.

The WSP Geotechnical Desktop Study notes fill across parts of the site ("*The upper soil profile of across the golf course consists of FILL that generally becomes thicker to the south.*"), However, my review of the borehole logs was unable to confirm any significant thicknesses on the course itself. The WSP description appears to be based on the car park to the north of the site, and one borehole (69433) which is shown in the centre of the course. Borehole 69433 reports nearly 9 m of fill. This seems very unlikely, and a comment on the log about casing to prevent road cave in suggests that it has been inaccurately mapped and should have been shown in the busway about 250 m to the east. This should be disregarded.

Given the long-standing use of the site as a golf course, it is highly likely that landscaping over the years has been undertaken which would have resulted in some material being moved on site and placed as fill. It is not clear whether this fill would have been imported or redistributed within the site. The earliest photos in Retrolens are from 1940 and they are very similar to the 1959 images, so some filling, if it occurred, could pre-date 1940.

Option comparison and technical commentary

The following geotechnical considerations have been identified with the two options.

Earthwork volumes and bulking factor

The two designs have taken different approaches to presenting and calculating earthworks volumes:

HWFR's design	TGC's design (from SK08-3 notes)
One stage: 610,000 m^3 of cut 610,000 m^3 of fill	Two stages: 257,000 + 327,000 = 584,000 m^3 cut 292,000 + 321,000 = 613,000 m^3 fill

The quantities provided in Note 7 of SK08-3, and reproduced above, appear to include a 0.8 factor on the cut volumes (and presumably fill, although not explicitly stated). Cut volumes can't be factored in this way; the volume is fixed. Fill volumes can be factored if it is likely that the placed fill can be compacted to a higher density than existed in its natural condition before excavation. A bulking factor of 0.8 assumes the volume of excavated material will be reduced by 20% through compaction. It is a significant assumption that is considered unlikely to be valid. If the 20% reduction in volume could be achieved, it will require stringent quality control of the drying and fill compaction and will have programme and cost implications. Drying these materials is likely to be slow and would require a lot of working space. The HWFR design does not appear to include a bulking factor, so fill placement should be more easily achieved.

If a factor of 0.8 has been applied by TGC to their design in both the cut and fill portions, the volumes would instead be:

HWFR's design	TGC's design (my inference)
One stage: 610,000 m^3 of cut 610,000 m^3 of fill	Two stages: 321,250 + 408,750 = 730,000 m^3 cut 365,000 + 401,250 = 766,250 m^3 fill

Alternatively, if the bulking factor had been applied to only the cut, and not the fill, the volumes would instead be:

HWFR's design	TGC's design (my inference)
One stage: 610,000 m^3 of cut 610,000 m^3 of fill	Two stages: 321,250 + 408,750 = 730,000 m^3 cut 292,000 + 321,000 = 613,000 m^3 fill

I requested that WSP assess the 3D ground models provided for each scheme to identify which of the above scenarios aligned with the model provided, and they responded with the following information:

Design	Earthworks Comparison - TGC and HWFR design						
	Stage	Total Cut (m^3)	Total Fill once placed (m^3)	Cut volume with bulking (m^3)	Excess (m^3)	Excess Cut/Fill	Bulking / compaction factor
TGC	1	322,000	333,000	322,000	11,000	FILL	1.0
TGC	2	410,100	280,200	410,100	129,900	CUT	1.0
TGC	Total	732,100	613,200	732,100	118,900	CUT	1.0
TGC	1	322,000	333,000	257,600	75,400	FILL	0.8
TGC	2	410,100	280,200	328,080	47,880	CUT	0.8
TGC	Total	732,100	613,200	585,680	27,520	FILL	0.8
HWFR	N/A	610,000	610,000	610,000	0	N/A	1.0

Notes:

- *The earthworks quantities are outlined with and without the TGC assumed 0.8 compaction factor to understand any impacts.*
- *The 732,000m^3 of cut (and other numbers) differ from what is stated in SK-08-3 from TGC. That is because even if some kind of compaction factor is valid, the earthwork quantities that need to be moved around the reserve can't include this (from a cost perspective).*
- *The temporary bund (for TGC Stage 1) is estimated to be 42,000m^3 of volume (1:3 gradient). This has been included in the Stage 1 quantities and not included in the Stage 2 quantities.*
- *TGC earthwork quantities include some provision for the spillway earthworks (HWFR does not) – this is estimated in the order of 1,000m^3 and can be dealt with in the cost estimate.*

This suggests that the cut and fill volumes that I have inferred above in my final table match the 3D model provided by TGC, and that the note on the TGC drawing is incorrect. These discrepancies need to be clarified as the additional volumes would likely add significant cost to the project. There appears to be an additional ~117,000 m^3 of fill that has not been accounted for in the TGC design unless the bulking factor of 0.8 is correct (which I think is unlikely) and can be achieved without additional costs associated with drying and handling.

In addition, it appears that TGC has not accounted for the excavation required for the wetland permanent pool, wastewater pipe bridges or contouring associated with golf holes. These would further increase the cut and fill volumes and therefore cost. The HWFR design has also not accounted for future contouring associated with golf holes; whether this counts as a major difference between the proposals depends on the end use of the site. The missing volumes from the permanent pool and wastewater pipe bridges will need to be considered in the costs.

Slope stability

The slopes proposed in each design appear achievable and do not suggest cause for concern. Further investigations and design will be needed to confirm the stability of the slopes, but it isn't a significant difference between designs.

Fill over wastewater pipe and induced settlement

The two designs differ significantly in the amount of fill they place above the wastewater pipe. The HWFR design generally avoids filling above the pipe; the TGC design does not. This partially explains how the TGC design can place more fill in the southern part of the site.

Based on a rough assumption of 7 m of compressible material (see geology section above), with a stiffness of 12 MPa the settlement can be roughly calculated based on one dimensional consolidation

HWFR's design	TGC's design (my inference)
Fill up to 2.2 m over the trunk main	Fill up to 11.5 m over WW pipe.
Predicted to be approximately 50mm of settlement and 1:500 of differential settlement. According to Rankin (1988), the damage severity is slight based on the differential settlement.	Predicted to be approximately 250 mm of settlement and 1:100 of differential settlement. According to Rankin (1988), the damage severity is moderate based on the differential settlement.

The comments in the table above refer to potential damage classifications usually applied to buildings. I believe it is reasonable to apply these to the wastewater pipes in this case as they are concrete and in relatively poor condition.

Watercare have indicated that they would require the applicant to demonstrate through a structural assessment that the pipe would be undamaged; in my opinion a structural assessment would not be able to demonstrate this for the TGC design, but would for the HWFR design.

In addition, the placement of 11.5 m of fill over the pipe in the TGC design will likely be contested by Watercare due to complications for maintenance and renewal of the pipeline. Structural lining and/or bridging of the pipe will likely be required.

Contamination

Some contamination of material is expected due to pesticide use. It is expected that the vast majority of the material will be able to remain onsite. Given the very longstanding use of the site as a golf course (over 90 years), it is unlikely that other contaminated materials are present in significant volumes. There is no material difference between the proposals.

Liquefaction and lateral spread

The clays and tuff that underlie this site are unlikely to be susceptible to liquefaction, although cyclic softening and lateral spread is a possibility. This factor does not materially differ between the proposals.

Conclusions

The following can be concluded from this technical assessment:

- The total volumes for the TGC design is approximately 730,000m^3, significantly more than the reported values outlined in Sketch SK08-3. This will have a material impact on cost and programme.
- The bulking factor assumption of 0.8 (20% of the material volume is lost due to compaction) for the TGC design is considered unlikely to be valid and could have a major impact on the landform and costs. WSP's assessment of the 3D model provided by TGC suggests that an extra approximately 117,000 m^3 will need to be carted and disposed of offsite or will need to be added to the fill height of the hill, adding potentially another 5 to 10 m.
- Excessive filling over the wastewater pipe poses a risk to the wastewater infrastructure that serves a significant catchment in the region. Failure of the pipe could be detrimental for the people and the environment. Additional costs will be required for any significant level of filling, perhaps by installing a bridging structure. This would be expensive. In addition, the level of filling proposed by the TGC design is unlikely to be acceptable to Watercare from a maintenance and renewal perspective.
- No contouring of the existing site for golf greens, tees or fairways of the TGC design has been provided. This will result in additional earthworks and may have an impact on the available storage for flood protection and cut and fill slopes.

Groundwater

Site description

Land use, topography and nearby surface water

The Takapuna Golf Course is mainly grassed and has lines of trees in between the fairways, tees and greens. The current site has a gradual fall from about 25 m RL in the southwest to 12 m RL in the northeast, with localised highs of about 15 m RL and lows to 12 m RL.

A pond in the northeast of the site has a water level of about 11.9 m RL, as does the drain that runs along the northeastern perimeter of the golf course at the northern corner of the site. In addition, there are several open land drains visible on aerial photography in the northeast and north of the site. The Wairau Creek is estimated to have a base water level of about 10.7 m RL at the closest point, about 40 m to the north of site.

Groundwater levels and soil conditions

The golf course is generally underlain with sandy and silty clays which would be expected to have low hydraulic conductivity. The hydraulic conductivity governs the groundwater flow and thus the amount of groundwater mounding that occurs in response to rainfall recharge. No site-specific data on hydraulic conductivity of these materials is available. Based on literature, the hydraulic conductivity of the encountered sediments at the golf course can vary but are generally between 0.002 and 0.2 m/day (2E-08 m/s to 2E-06 m/s; see Table 1 below). A value of 0.01 m/day would appear to be the most likely for this site.

Limited groundwater level information is available from the bore logs. Groundwater levels appear to be about 2.5 m below ground level (m bgl) in the southwestern and southern part of the site, and about 1 m bgl at the northeastern and northern end of the site. The groundwater level is at the surface at several ponds and open land drains in the northeastern and northern parts of the site. Groundwater at the Wairua Road substation (immediately north of the site) appears to be slightly higher than in the ponds.

Considering the low permeability of the anticipated soils, outlined in Table 1, groundwater levels are likely to mound notably in between drainage features.

Geological unit	Permeability (m/s) assumed isotropic where not otherwise noted		
	Assessed minimum	Assessed mean	Assessed maximum
Basalt	$1x10^{-6}$	$1x10^{-4}$	$1x10^{-3}$
Tuff	$1x10^{-7}$	$1x10^{-5}$	$1x10^{-3}$
Estuarine Sediments	$1x10^{-9}$	$2x10^{-7}$	$1x10^{-6}$
Tauranga Group Alluvium /Upper Puketoka Formation	$2x10^{-8}$	$2x10^{-7}$	$2x10^{-6}$
Lower Puketoka Formation	$2x10^{-7}$	$2x10^{-6}$	$2x10^{-5}$
Kaawa Sands	$1x10^{-7}$	$1x10^{-6}$	$1x10^{-4}$
Weathered ECBF	$2x10^{-8}$	$2x10^{-7}$	$2x10^{-6}$
ECBF	$K_h = 2x10^{-8}$ $K_v/K_h=0.1$	$K_h = 2x10^{-7}$ $K_v/K_h=0.1$	$K_h = 2x10^{-6}$ $K_v/K_h=0.1$
Fractured ECBF	NA	$5x10^{-4}$	NA

Table 1: Summary of hydraulic conductivities per geological unit (T+T, 2012[1])

Considerations

The following groundwater considerations have been identified with the two options.

Efficiency of land drains

The ability for the site to be effectively used as a golf course is expected to be a function of whether land drains can realistically maintain a surface that isn't saturated. Both designs will require groundwater drains for dry detention areas for sports or recreation to maintain a useable surface that isn't saturated in normal conditions. The culvert outlet at 11.1m RL will control the downstream elevation of these drains, and the upstream elevation will be controlled by the design ground level.

HWFR's design	TGC's design
Dry detention areas at 11.6-11.9m RL.	Dry detention areas at 11.4m RL.

In my opinion the HWFR design should allow sufficient fall to for light recreation activity. If the drains are 100 mm deep at the upstream end, and have a 100 mm diameter, they should have a fall of 700 mm. I have some concern as to whether the ground levels in the TGC design allow for sufficient depth (for the groundwater drains) and fall to the culvert outlet as the proposed ground level is only 300 mm above the culvert outlet, meaning that using the same assumptions the fall would be only 100 mm over a distance of several hundred metres. Drains at such a shallow fall are unlikely to be fully effective and will be challenging to maintain.

Because the TGC drains will have to be shallower (driven by the outfall level), more will be needed. Calculations undertaken in accordance with Ritzema[2] by WSP suggest that to maintain groundwater generally below the surface in 'normal' conditions the TGC design would require approximately 40% more groundwater drains. The HWFR design would need drains every 19 m,

[1] https://promising-sparkle-d7f0c0cfc9.media.strapiapp.com/groundwater_settlement_report_041abaddc0.pdf

[2] Ritzema, H.P., 1994, Drainage Principles and Applications, ILRI Publication 16, 2nd Edition, ISBN 90 70754 3 39

while the TGC would need drains every 12 m (Figure 2). It is important to note that this assumes the drains are equally effective between designs. However, the shallow fall of the TGC drains means these might be less effective, meaning that even more will be needed.

It should be noted this assessment is, by necessity, a simplification. At the upstream end of each proposal it is likely that increased density of drains will be needed as they will be shallower in these areas.

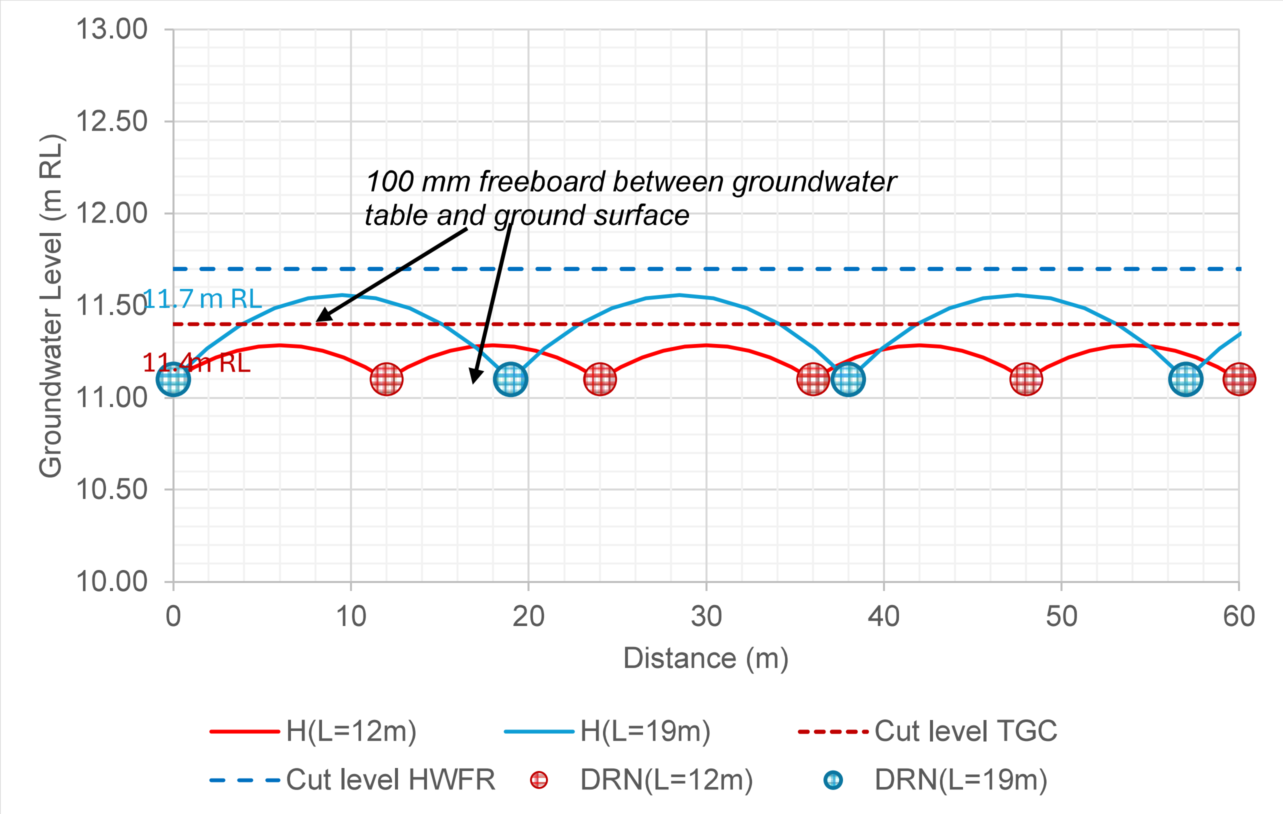


Figure 2: Output of mounding between drains calculation (by WSP)

Groundwater drawdown / settlement

The net groundwater drawdown is predicted to be up to 3 m locally and up to 2 m beyond the site. The settlement calculation in the geotechnical section considers the local drawdown. The settlement beyond the site is anticipated to be no more than 10 mm. This is not likely to differ significantly between the proposals.

Wetland – groundwater recharge

The designs differ in wetland area. However, it is anticipated that groundwater will recharge the wetland in a similar manner in both proposals.

HWFR's design	TGC's design
Design includes a 11ha wetland area at 11.1m RL, with a 3.15ha permanent pool at 10.6m RL (0.5m deep).	Design includes a 6.6ha wetland area at 11.1m RL, with a 0.48ha permanent pool at 10.6m RL (0.5m deep).

Conclusions

- The site is characterised by a very shallow groundwater table and low permeability soils. The site is partially drained by existing land drains and wetlands/ponds to the northeast and north of the site.
- Permanent drainage of groundwater will be required beneath the proposed cut areas to avoid permanent water ponding on the surface. Subsoil drains can be used to control groundwater which would mitigate water ponding at the surface and allow for the areas to be used for various recreational purposes.

- Groundwater control under gravity (i.e., without pumping) is possible but limited by the drainage level of about 11.1 m RL at the northern outlet of the site to Wairau Creek. This limits the level to which areas can be cut for any groundwater drainage systems to work sufficiently, in particular for this site which is subject to notable groundwater mounding due to the low permeability of the soil materials. An extensive network of subsoil drains will be required to control groundwater levels at the site. Because subsoil drains can clog over time and require maintenance, it would be preferrable to have a design that reduces the amount of required drainage.
- I have some concerns that the TGC design will be costly and may not achieve a dry surface under normal conditions.

Nick Brown
Nick Brown (Jul 4, 2025 11:28 GMT+12)

Nick Brown
Head of Intelligence – HWFR

Ross Roberts
Ross Roberts (Jul 4, 2025 11:31 GMT+12)

Ross Roberts
Chief Engineer – Auckland Council

Memo

1 July 2025

To: HWFR – Blue Green Network Team

cc:

From: Chris Stumbles and Keith Snow

Subject: AF Thomas Park Concept Options Construction Review

After our meeting with the Takapuna Golf Club on the 18th June our construction concerns were largely eliminated by the declaration that they could effectively alter their design to suit the designs that HW comes up with and the golfing requirements would be modified to suit.

This statement was somewhat different to how we interpreted the documentation submitted as we thought it was intended to be undertaken in two distinct stages.

Our concerns for both proposals now remain the same with only a few risk items that need to be considered. More on these later.

In no particular order the risks for both schemes identified are (this is not exhaustive):

1. Protection and crossing points of the Watercare Wastewater mains will need to be identified and strengthened during construction.
2. Level of fill and compaction of fill over the Watercare Wastewater mains and what remedial actions (lining or bridging) may be required to protect the mains. Note that bridging and depth of fill over the WW mains will have a negative impact on the ability of Watercare to upgrade or renew these mains
3. Drying of the excavated material will require large areas to be open at a time to allow the works to proceed efficiently.
4. Soft saturated materials make moving of construction machinery slower and less efficient.
5. With the site being so flat it will make surface drainage difficult, and ponding of water could severely hamper progress. It maybe that the lower sections of work will need to be done with diggers and dumpers rather than scrappers to allow works to proceed efficiently. This will only be determined when more geotechnical data becomes available.

The Takapuna Golf Club proposal has an element of continuing operation of a golf course within an operating construction site and has the following additional risks to the Council:

1. Access routes will need to be well defined.
2. Excavation and drying sites will need to take into consideration areas set aside for golfing activities.
3. Completing areas as you proceed will become a greater requirement and a loss of flexibility in the work areas could constrain construction activities.
4. Compaction factors appear optimistic and will depend in part on the ability to dry the materials to or near optimum quality.
5. The constraints and sequencing issues associated with construction being carried out while a golf course remains in some form will necessarily add time to the overall duration of the works. There is considerable variability in productivity associated with working in soils that are likely to be damp to saturated and it will be tight to complete the works in two summer seasons. It will be a requirement for some areas of the works to be grassed and established to allow course relocation to occur when opening new areas. It is our opinion that the restrictions of having a public golf course in operation will add another season to the works.
6. The safety of construction staff working close to an operating golf course needs to be considered and will necessarily have an influence on the progress of the works at times.

While some of the above may be able to be managed, there will be an impact that will have an effect of driving the construction to take into account the operations in some form. The costs and/or delays that this will cause cannot be quantified at this stage, and while it is easy to say it will be managed it is necessarily more complicated than a clear site.

Purely from a construction perspective we believe that contractors will view the potential conflicts/restraints as a risk element and price it accordingly. Most contractors would prefer the site to be clear of ongoing operations. The cost risk will sit with the Council.
It is our recommendation that it is planned for the site to be cleared of other activities and when the final form and layout of the site is finalised it can be revisited to determine which activities, if any, can be accommodated with the construction rather than the other way around.

Chris Stumbles
Head of Design and Delivery

Keith Snow
Technical Advisor - Construction

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Memo

27 June 2025

To: Healthy Waters Flood Resilience – Blue-green Network Team

cc:

From: Frank Tian (Manager Northern Operations)

Subject: AF Thomas Park Maintenance and Operations Concept Options Review

The northern operations team reviewed the proposed concept designs from both Healthy Waters and the Takapuna Golf Club. Some of our questions were clarified during our meetings with Healthy Water's design team on the 9th of June and the Takapuna Golf Club team on the 18th of June.

The northern operation team supports the idea of creating a detention facility within the AF Thomas Park to reduce flooding risks to surrounding and downstream properties, and it appears that the AF Thomas Park is the only available space for providing a large detention facility.

We understand that the two options have converged significantly, and both include a wetland and a large dry attenuation basin. Hence, the maintenance activities are similar, including the assumption of shared maintenance responsibilities and costs between HWFR (for stormwater aspects), and future tenant / Parks and Community Facilities (for open space / recreation assets).

Generally speaking, from an operations perspective, our preferred approach is to maximise the dry detention for stormwater attenuation, similar to what council built at Sunnynook or Greenslade, due to the following considerations associated with the wetland:

1) infection of invasive weeds (Alligator weeds were found upstream, Parrot Feather weeds were also found in North Shore),
2) debris from the large contribution catchment,
3) silt build up and removal,
4) aquatic weed control
5) stagnant and possibly smelly water issue during dry and hot summers

We note that the above-mentioned concerns are typical concerns for any proposed wetland, particularly large-scale wetlands. However, we understand that construction of a wetland is unavoidable due to high groundwater levels in this area. A permanent wetland with a large surrounding area as detention basin is the best way to achieve the desired purposes: providing required detention volume and improving local ecological value and amenity.

1. **Healthy Water design**:

The northern operations team will work with the design team at later design stages to address the above-mentioned concerns. Furthermore, following the decision making regarding future recreation use of the dry detention areas, some sub-soil drains may have to be considered, resulting in additional maintenance activities.

2. **Takapuna Golf Club design (TGC Design R1):**

We noticed that the TGC design (TGC R1) proposed to have 10 Greenways within the required detention areas (three in Stage 1 area and seven in Stage 2 area). We also noticed that the proposed ground levels for the dry detention areas will be at RL11.4 m. This is 0.2 - 0.5 m lower than the proposed dry detention areas from Healthy Waters' design. The proposed lower dry detention areas increase the risk of having mal-functioning sub-soil drains resulting in (a) boggy ground; and (b) difficulties for future maintenance and renewal.

Signed:

Tian Fengming

Frank Tian
Manager Operations North

A F Thomas Park Options – Technical Assessment Consent-ability

Date: 3 July 2025
Project name: Blue-green Network Wairau
Project no: IZ072701.224
Attention: Blue Green Network Team
Company: Healthy Waters and Flood Resilience
Prepared by: Therese Wilson (Jacobs - Associate Environmental Planner)
Reviewed by: Roger McDonald (Jacobs – Technical Lead, Planning), Clarke McKinney (HWFR Manager Resource Management) and Connor Whitely (HWFR Ecologist and Manager Wai ora Partnerships)

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1. Introduction

Auckland Council Healthy Waters and Flood Resilience (Healthy Waters) have been requested to undertake a technical assessment of Takapuna Golf's proposal for the future of AF Thomas Park and ensure the feasibility and cost benefit ratio of the proposal are included as part of the delivery business case to the Transport Resilience and Infrastructure Committee in 2025. As part of the technical assessment, Jacobs New Zealand Limited have been engaged to provide consent-ability assessment for the two proposed concept designs for the future of A F Thomas Park, located at R21 Northcote Road, Wairau Valley. Connor Whitely (Manager Wai Ora Partnerships Urban) is an ecologist and has provided high-level ecological comments which have been incorporated into this assessment.

- The Takapuna Golf Course (TGC) Proposal, as described in the letter titled *'Takapuna Golf Course Flood Storage Submission'* and associated drawings, dated 12 June 2025. Additional information was provided in the letter titled *'Takapuna Golf Course Flood Storage Submission – Additional Information'* and associated memo titled *'Takapuna Golf Course Design – Construction Methodology and Wetland Area'*, both documents dated 18 June 2025.
- WSP Limited Proposal, as described in the document titled *'Wairau Blue-green Network A F Thomas Park Concept Design Option, Rev 0.0, For Discussion'*, dated 12 June 2025.

The scope provided by Healthy Waters is to prepare a memorandum outlining the following:

- Summary of high-level benefits
- Summary of high-level risks (including any programme impacts)
- Summary of high-level issues and constraints
- Conclusion re: concept level feasibility

The consent-ability assessment should be read in conjunction with the memos provided by iwi project partners. It is noted that in lieu of a memo, an email has been received by Ngāti Paoa in support of the letter provided by Te Kawarau ā Maki. As the concept proposals involve works to water bodies, the concept proposals need to take into account the relationship of Māori and their culture and traditions with their ancestral land, water, sites, wāhi tapu, valued flora and fauna, and other taonga. This is consistent with

Section 6 (Matters of national importance) of the RMA[1]. Further, Section 8 of the RMA also states that *"in achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi)."*

2. Consent-ability assessment

The consent-ability assessment covers the following key elements:

- Whether the proposal is consistent with the underlying land use zoning.
- Potential effects on the environment.
- Consistency with the objectives and policies in the statutory framework (Resource Management Act 1991, National Policy Statements, National Environmental Standards and Auckland Unitary Plan Operative in Part (AUP(OP)).

The consent-ability assessment is not a planning assessment nor a comprehensive assessment of effects on the environment.

The following key matters that inform consent-ability apply to both proposals, where there are differences between the proposals this is stated below. Overall, the TGC and WSP proposals are comparable in all but a few minor aspects. As the concept design process has progressed, the two solutions have converged significantly.

- The concept designs propose a mixture of dry detention and wet detention (constructed wetland) with a total flood storage of ~550,000m^3. Given the scale of the earthworks to provide for approx. ~550,000m^3 of flood storage, the potential effects from earthworks, construction noise and vibration and traffic on neighbours, business and road users are likely to be similar. Visual, landscape and amenity effects are likely to be similar. Although the flood storage is the same in the concept proposals, the TGC design has not adequately considered overland flows from Northcote Road which raises flood levels by up to 300mm on Northcote Road. The WSP design has modelled the overland flows, and this is allowed for in the design through the landform.
- Resource consents will likely be required for earthworks, vegetation removal, groundwater diversion, disturbance of contaminated land. Streamworks consents (are to be confirmed) during preliminary design.
- There are a number of identified hydrological features on the site that may meet the definition of permanent or intermittent streams under the Auckland Unitary Plan (AUP(OP).
- The concept designs do not change the existing land use (i.e., it will remain open space) and is consistent with the underlying zone – Open Space Sport and Active Recreation Zone.
- The concept designs are consistent and generally achieves the freshwater objectives and policies in the AUP, NPS-FM[2] and NES-F[3] as both designs include constructed wetlands. However, the WSP design retains the existing watercourse through the middle of the site, which may provide consenting advantages, in line with current direction around aquatic compensation. The Takapuna Golf Course (TGC) design has not retained the existing watercourse, it may be considered during preliminary design and upon receipt of ecological assessment for the site, however, how this will interact with an 18 hole golf

[1] Resource Management Act 1991
[2] National Policy Statement for Freshwater Management
[3] National Environmental Standard for Freshwater

course is unknown and may result in tension between the golf course and aquatic compensation requirements (or offsetting if compensation is not possible on-site).

- The TGC design presents a dry detention basin that is 400mm lower than the WSP design. Given the unknown levels of the water table, there is a potential risk that this lower basin may inadvertently evolve into a wetland ecosystem, which may further compromise future operations and maintenance. The WSP design may mitigate this risk as their dry detention basin is at a higher elevation. However, given the uncertainty and unknown levels of the water table this risk may equally apply to both concept designs dependent on the final elevations and should be considered further during preliminary design.
- A F Thomas Park also supports fragmented but potentially ecologically important terrestrial habitats (including lizards, potential bat roosting habitat and bird nesting). It is not clear in both concept proposals how potential effects on terrestrial ecology will be managed. Both designs propose a wetland which will provide some terrestrial ecology benefit however the exact quantum of gain for each fauna will vary between the proposals when also considering quantum of vegetation re-planting (WSP design proposes larger extent of replanting).
- The excavation design for both proposals has been setback from buildings to reduce the risk of settlement from groundwater drawdown and the WSP concept design notes that the risk of settlement on the wastewater pipes will be assessed and mitigated as required. Therefore, the risk of settlement on adjacent buildings and assets has been appropriately considered. The TGC design has not stated any consideration of the risk of settlement on assets however, TGC note that further information is required on groundwater levels. It is therefore considered that the groundwater settlement matters will likely be further refined during preliminary design.
- The ecological matters raised by the ecologist regarding nutrient and chemical inputs (e.g., fertilisers and herbicides) to maintain standard golf course quality, would apply to both proposals if golf is the preferred future land use. Any consents that may be required for discharge will need to be applied for in both the current and future scenario where the discharge does not comply with the permitted activity standards of the AUP(OP) and this matter is not considered to be a consent-ability matter.

3. Conclusion

On balance, given guidance from the TGC where there is an optimal solution to design towards the WSP proposal, the proposals are reasonably similar and the two proposals have converged significantly, resulting in two proposals that have a comparable scale and similar potential effects on the environment.

The sketches provided by TGC differ to the supporting information and need to be read in conjunction to understand the potential effects on the environment. Whereas the WSP proposal provides a greater level of resolution and understanding in the sketches provided.

The main differences in the proposals are in relation to potential effects on the environment which includes flood effects on Northcote Road, freshwater ecology, terrestrial ecology and groundwater settlement on assets. These matters can be managed through careful consideration during preliminary design.

Signed:

Therese Wilson – Associate Environmental Planner (Jacobs)

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25 June 2025

Healthy Waters Flood Resilience
Auckland Council

RE: AF Thomas Park Flood Detention Options

Tēna koe

I write on behalf of Te Kawerau ā Maki in relation to options to develop flood retention at AF Thomas Park as part of the wider Wairau Blue-Green project. We have reviewed at a high-level sets of designs and documentation from both Council's Healthy Waters team (Council option) and an alternative design from the Takapuna Golf Course (TGC option).

Te Kawerau Position

Our rights and interests in the Wairau catchment and our cultural values and outcomes sought in relation to the AF Thomas Park project and the wider Wairau Blue-Green Network are set out in this memo.

We believe the kaupapa should be held by a whakatauki:

WAIHŌ MĀ TE WAI E RERE KI TŌNA TAUNGA

Roughly translated this refers to the memory of water and that eventually it will find its path home again. It also captures the importance of reconnecting the natural systems of the catchment as a means of healing both land and community.

We believe the kaupapa should be framed by four guiding values:

- Rangatiratanga – embodying partnership, identity, and outcomes for our people
- Kaitiakitanga – embodying protection and restoration of the mauri of the land
- Manaakitanga – embodying lifting the mana and wellbeing of the community
- Tauritetanga – embodying cooperating for a solution that balances both world views

We seek the following key outcomes:

1. Te Kawerau ā Maki are project partners meaning we make decisions together
2. The mauri and wairua of Wairau is healed meaning the manga, wetlands, and awa are restored with meaningful urban setbacks, revegetation, and clean flowing waters running their natural course
3. That the waters are rejuvenated such that they can be used for ceremony, swimming, and can sustain kākihi and other key tohu mauri o te awa
4. That the revegetation creates habitat that supports an abundance of manu as key tohu mauri o te whenua
5. That the restoration of Wairau keeps people and property safe from the risk of flooding and climate change
6. That the restoration of Wairau creates high amenity for the community
7. That the project is delivered in such a way that it fits within a programme that captures the scope of the issue and its solution in a full and holistic manner, being both strategic and long-term via a 100-year Wairau Plan
8. That the business case for the current project references the Wairau Plan and incorporates our values into it including through calculating biodiversity services, carbon

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sequestration, risk to life, financial liability (insurance or future buy-outs), health outcomes, and amenity against the future-state

9. That opportunities for iwi place-naming, identity, and activation are identified
10. That procurement opportunities for iwi members to participate in the works are identified

Appraisal of Options

The following is a high-level appraisal of the two options provided to us for comment. We note that our appraisal does not constitute a formal cultural impact analysis of the options due to time and resource constraints. Our appraisal is therefore provided here in good faith, the documentation provided, and based upon a Te Kawerau cultural lens, reflective of the wider outcomes we have identified.

ISSUE	COUNCIL OPTION	TGC OPTION	COMMENT
Storage Capacity	550,000m3	550,000m3	No preference
Earthworks	Cut-Fill Neutrality 610,000m3 total earthworks	Stage 1 Imported Fill 34,000m3 Stage 2 Exported Fill 5,000m3 730,000m3 total earthworks	Council option preferred as has less bulk earthworks
Flood Risk Reduction to People	Reduces the exposure to 'high danger flood risk' for 19 dwellings, 5 commercial buildings and reduces flood risk for 200 other homes and 10ha of residential properties as well as road flooding to Nile Road, Waterloo and Alma Road.	Reduces the exposure to 'high danger flood risk' for 19 dwellings, 5 commercial buildings and reduces flood risk for 200 other homes and 10ha of residential properties as well as road flooding to Nile Road, Waterloo and Alma Road.	No preference
Flood Risk Reduction to Infrastructure	Significantly reduces the frequency and severity of flooding to critical infrastructure including Wairau Road Transpower Substation which services North Shore hospital and other key infrastructure, and Alma Road Watercare wastewater pump station	Significantly reduces the frequency and severity of flooding to critical infrastructure including Wairau Road Transpower Substation which services North Shore hospital and other key infrastructure, and Alma Road Watercare wastewater pump station	Noted that safeguarding wastewater infrastructure during flood events is culturally significant
Mauri / Environmental Performance	Restored and diverse 14.9ha wetland of regional significance, 70,000m2 permanent pool, given only 0.5%, establishment of ecological reserve, net increase in trees, and potential to improve water quality, treating road runoff from surrounding areas.	6.6ha wetland, and 4,844m2 permanent pool.	Council option preferred as there is a large delta between the options in terms of wetland size and quality and thus ecological and water quality
Amenity	Improved pedestrian and cycling accessibility, provides 30.7ha area available for additional recreation activities/urban parkland including likely potential for a reduced 9-hole golf-course	18-hole golf course and inclusion of walking and cycling network	Council option preferred based on available info. It is unclear what the TGC recreation and amenity offering is for the wider (non-golfing) community in terms of accessibility and connectivity.

Based on the high-level appraisal we conclude a preference for the Council Option. The TGC Option, based on available information, does not outperform the Council Option on any of the key issues above and has a greater level of risk as noted in the feasibility assessments.

It appears that the TGC option also prioritizes maintaining golfing provision over reducing immediate flood risk and wider environmental outcomes, which is not supported through our stated key outcomes.
It is important to note that in any option, or variation of any option, that we seek that our values and outcomes identified in this memo are realised and that further work is required.

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Ngā Mihi,

Edward Ashby
CEO
Te Kawerau Iwi Tiaki Trust

Email reveived from Tipa Compain of Ngāti Paoa (02/07/2025) in support of this statement from Te Kawerau ā Maki.

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Council Option

TGC Option

Appendix F - Cost Estimate

Memorandum

To	Healthy Waters Flood Resilience – Blue-Green Networks Team
From	Tom Barlow
Date	3 July 2025
Reference	J000814
Subject	Wairau Blue-Green Network - AF Thomas Park Concept Design Cost Estimates

In Brief

Healthy Waters Flood Resilience (HWFR) has engaged Alta to prepare developed design budget estimates for the proposed AF Thomas Park flood mitigation project in Takapuna, Auckland.

Two design options have been developed at this stage, with comparative cost estimates developed to assist with option selection. This memorandum summarises the outcome of the cost estimates and key assumptions.

These estimates include flood resilience works and reinstatement costs as detailed in the associated business case. They do not include any allowance for implementation of any future recreational outcomes as these are subject to further decision making. Some indicative recreational costs have been provided for context.

The comparative project business case estimates are as follows:

Option	Project Base Estimate	Project Expected Estimate (P50)	95th Percentile Project Estimate
ACHW Concept Design	$ 42.51 m	$ 55.26 m	$ 74.39 m
TGC Alternative Design	$ 49.13 m	$ 63.87 m	$ 85.98 m

Project Description

The Auckland Anniversary rainfall event in early 2023 caused significant flooding throughout the Wairau catchment. The proposed works at AF Thomas Park form part of Stage 1 of the flood mitigation response to significantly reduce flood risk to the community, improve resilience to future storm events, and provide greenway and open spaces.

Two concept design options have been developed for comparison at this stage;

- HWFR have engaged WSP to develop a concept design.
- Takapuna Golf Course (TGC) have developed an alternative concept design with the intention to retain an 18-hole golf course as the end land use.

This memorandum outlines the values of the cost estimates, the information provided, the estimate process, and the main assumptions made in developing the estimates. Attached to this memorandum are the estimate summaries – refer to Appendix A.

Cost Estimates

A summarised breakdown of the construction cost estimates for both options is provided below:

Blue Green Networks - Wairau Catchment - AF Thomas Park Cost Estimates		ACHW Concept Design		TGC Alternative Design	
Item	Description	Amount		Amount	
1	On-site overheads (P&G)	$	3,160,000	$	4,460,000
2	Temporary Works	$	1,514,000	$	2,073,500
3	General	$	3,273,075	$	5,161,213
4	Site Clearance and Demolition	$	995,000	$	995,000
5	Earthworks	$	10,561,490	$	12,103,490
6	Drainage	$	440,000	$	969,600
7	Structures	$	140,250	$	140,250
8	Reinstatement	$	8,817,230	$	8,759,282
	Sub total including on site overheads	$	28,901,045	$	34,662,335
	Allowance for off site overheads	$	4,335,156.8	$	5,199,350.3
	Total Base Construction Estimate	$	33,236,202	$	39,861,685
	Indirect Client-Side Costs	$	9,272,000	$	9,272,000
	Total Base Cost	$	42,508,202	$	49,133,685
	Contingency	$	12,752,461	$	14,740,106
	P50 Expected Estimate	$	55,260,662	$	63,873,791
	Funding Risk	$	19,128,691	$	22,110,158
	95th Percentile Estimate	$	74,389,353	$	85,983,949

The estimates are based on the designs and supporting information provided by HWFR and Takapuna Golf Club (TGC).

Information Provided

The following information was provided to inform the development of the cost estimates:

- A F Thomas Park Concept Design Option – Rev 0.0 – 12 June 2025
- TGC final submission to HWFR dated 12th June 2025, and associated additional supporting information provided on 18th June 2025.
- Technical feasibility reviews to validate design assumptions.

Key Differences

The two design philosophies are fundamentally similar, applying a cut to fill bulk earthworks approach to achieving the required flood storage volume.

The overall difference between the P50 estimate for both options is $8.6m. Key differences between the two options are outlined in the table below.

Cost Element	Difference in P50 cost	Commentary
Time related costs	$3.2m	The TGC option is proposed to be undertaken in two stages to maintain an operational golf course throughout the construction period. This results in an increased programme duration and increases in cost to the following elements; • Indirect time related construction costs • Erosion and sediment control and associated dewatering requirements • Ongoing site maintenance

Watercare wastewater transmission pipeline	$2.6m	The TGC design contours indicate placement of significant overburden fill over the Watercare pipeline, and additional cost has been included to allow for structural lining or bridging of the pipe. The HWFR design minimises the fill placed over the pipe avoiding the risk of excessive surcharge and the need for potential mitigation measures.
Earthworks volumes	$2.3m	The TGC option has an additional ~20% of cut / fill volume compared to the HWFR option. This results in an associated increase in earthmoving costs.
Drainage elements	$0.8m	The TGC fill extents require extension of several existing stormwater pipelines and raising of several existing wastewater manholes, resulting in a higher overall drainage cost.

One additional potential cost difference occurs due to the TGC cut/fill earthworks design having assumed a compaction factor of 0.8. No compaction factor has been applied within the estimate to either design scenario at this stage due to uncertainty and risk associated with the properties of the in-situ material.

The estimated cost for the TGC option assumes that the additional fill generated by removal of this compaction assumption can still be retained on site as a cut/fill balance.

If the current design landform must be retained to enable the golf course layout to function, the indicative additional P50 cost for carting excess spoil to waste would be in the order of $10.3m.

Additional recreational outcomes options

The estimates have been developed as an indication of the base flood resilience works costs. They do not include any allowance for implementation of any future recreational outcomes as these are subject to further decision making. Some indicative high level P50 costs for various recreational outcomes have been provided below for context.

The final land use has not yet been determined for this project. The figures below provide an initial estimate of the P50 costs associated with including additional recreational outcomes in this scheme:

- Approximately $7m for addition of approximately 8 sports fields.
- Approximately $10m for addition of a 9-hole golf course and driving range.
- Approximately $17m for addition of an 18-hole golf course and driving range. Note that there has been no feasibility review of incorporating a full 18-hole golf course into the finished contours of the current earthwork designs.

Estimate Assumptions

The following assumptions have been used in the preparation of the cost estimate and should be used to inform any future decision making.

The estimate base date is July 2025, and no allowance for escalation has been included in the base estimate or contingency.

PROFESSIONAL SERVICES COSTS

Estimated costs for professional services have been developed by HWFR. These have been advised as $9,272,000 of base cost for inclusion within the business case estimate summary.

These costs include design fees, consenting, survey & investigations, quantity surveying, legal fees, comms and engagement, and internal HWFR personnel costs.

CONSTRUCTION COSTS

Construction costs have been developed by Alta utilising a combination of first principles and benchmarking against similar projects.

The schedule of prices and quantities have been developed based on the designs provided by HWFR and TGC and using the quantities validated by the technical memorandums.

The overall cost is sensitive to several key rates and assumed productivities in particular due to the large portion of cost attributed to the bulk earthworks operation.

No allowance has been included for any property acquisition or demolition.

The cost estimate has been developed using the following key assumptions:

- Existing services
  - Substation power cables - A benchmarked allowance has been included for lowering or nearby relocation of the power cables adjacent to the substation at the basin inlet. Additional detail and confidence in this item will be developed through upcoming further design phases and coordination with Vector.
  - Watercare wastewater transmission line – an allowance has been included for construction and diversion into three new pipe bridges to replace the sections of pipeline which require undermining for the new proposed ground contours. Additional detail and confidence in this item will be developed through upcoming further design phases and coordination with Watercare.
- Earthworks
  - The in-situ material is assumed to be rippable by a 20t+ excavator. No allowance has been included for hard rock, since there is currently no evidence suggesting rock is present at the site.
  - An allowance for disposal of 500m³ of medium-level contaminated material has been included at this stage. This will be further informed by future ground investigations during later design phases.
  - The TGC cut/fill earthworks design has assumed a compaction factor of 0.8. No compaction factor has been applied within the estimate to either design scenario at this stage due to uncertainty and risk associated with the properties of the in-situ material.
    The estimated cost for the TGC option assumes that the additional fill generated by removal of this compaction assumption can still be retained on site as a cut/fill balance.
    If the current design landform must be retained to enable the golf course layout to function, the indicative additional P50 cost for carting excess spoil to waste would be in the order of $10.3m.
- Reinstatement
  - Vegetation reinstatement is assumed as a mixture of plants from 1.5L seedlings up to 60L specimen trees. No allowance has been included for relocation of existing trees or importing any larger specimen trees to site. All existing trees have been assumed to be removed during initial site clearance.
  - Reinstated areas have assumed reuse of the existing topsoil recovered from site. No allowance has been included for importing additional topsoil.

PRELIMINARY AND GENERAL

- Time-related On-site overheads have been developed from first principles based on the anticipated supervision and overhead equipment costs for each option. These range between 11% to 13% of the direct construction costs. This aligns with benchmarked market expectations for a project of this scale and type.
- Off-site overheads have been applied as 15% of the physical works cost in line with market expectations for a project of this scale.

CONTINGENCY AND RISK

- A contingency of 30% has been applied to the base estimate to derive the expected estimate (P50) based on the current status of design certainty, risk of design change, and variability in the work method.
- P95 funding risk has been calculated as 1.5 times the contingency in line with the HWFR cost estimation manual.

Please contact the undersigned if you have any queries concerning the estimate or the assumptions presented in this memorandum.

Yours sincerely,

Tom Barlow
Alta Consulting Ltd

Reviewed by: Rory Bishop

Auckland Council

BGN Wairau - AF Thomas Park — Sentient ID: 0

Project Cost Estimate - ACHW Concept Design

Date: 3-Jul-25
Estimator: Alta
Project Manager: HWFR - Blue-Green Networks Team

Item No.	Description	Base Estimate ($)	P50 Estimate ($)	P95 Estimate ($)
	Construction Costs			
1	On-site Overheads (P&G)	3,634,000.00	4,724,200.00	6,359,500.00
2	Temporary Works	1,741,100.00	2,263,430.00	3,046,925.00
3	General	3,764,036.25	4,893,247.13	6,587,063.44
4	Site Clearance and Demolition	1,144,250.00	1,487,525.00	2,002,437.50
5	Earthworks	12,145,713.50	15,789,427.55	21,254,998.63
6	Drainage	506,000.00	657,800.00	885,500.00
7	Structures	161,287.50	209,673.75	282,253.13
8	Reinstatement	10,139,814.50	13,181,758.85	17,744,675.38
9		-	-	-
10		-	-	-
11		-	-	-
12		-	-	-
13		-	-	-
14		-	-	-
15		-	-	-
16		-	-	-
	Construction Phase Professional Services	1,769,000.00	2,299,700.00	3,095,750.00
	Total Construction Phase Cost	**35,005,201.75**	**45,506,762.28**	**61,259,103.06**
	Contingency (P50) - 30%		10,501,560.53	
	Funding Risk (P95) - 35%			15,752,340.79
	Design & Consenting			
	Concept Design	945,500.00	1,229,150.00	1,654,625.00
	Design & Tender Documentation	6,557,500.00	8,524,750.00	11,475,625.00
	Total Design & Consenting Cost	**7,503,000.00**	**9,753,900.00**	**13,130,250.00**
	Contingency (P50) - 30%		2,250,900.00	
	Funding Risk (P95) - 35%			3,376,350.00
	Total Capital Expenditure	**42,508,201.75**	**55,260,662.28**	**74,389,353.06**
	Contingency (P50) - 30%		12,752,460.53	
	Funding Risk (P95) - 35%			19,128,690.79
	Professional Services Costs as a percentage of Construction Costs	**28%**	**28%**	**28%**

Auckland Council

BGN Wairau - AF Thomas Park — Sentient ID: 0

Project Cost Estimate - TGC Alternative Design

Date: 3-Jul-25
Estimator: Alta
Project Manager: HWFR - Blue-Green Networks Team

Item No.	Description	Base Estimate ($)	P50 Estimate ($)	P95 Estimate ($)
	Construction Costs			
1	On-site Overheads (P&G)	5,129,000.00	6,667,700.00	8,975,750.00
2	Temporary Works	2,384,525.00	3,099,882.50	4,172,918.75
3	General	5,935,394.72	7,716,013.14	10,386,940.76
4	Site Clearance and Demolition	1,144,250.00	1,487,525.00	2,002,437.50
5	Earthworks	13,919,013.50	18,094,717.55	24,358,273.63
6	Drainage	1,115,040.00	1,449,552.00	1,951,320.00
7	Structures	161,287.50	209,673.75	282,253.13
8	Reinstatement	10,073,174.53	13,095,126.89	17,628,055.43
9		-	-	-
10		-	-	-
11		-	-	-
12		-	-	-
13		-	-	-
14		-	-	-
15		-	-	-
16		-	-	-
	Construction Phase Professional Services	1,769,000.00	2,299,700.00	3,095,750.00
	Total Construction Phase Cost	**41,630,685.25**	**54,119,890.83**	**72,853,699.19**
	Contingency (P50) - 30%		12,489,205.58	
	Funding Risk (P95) - 35%			18,733,808.36
	Design & Consenting			
	Concept Design	945,500.00	1,229,150.00	1,654,625.00
	Design & Tender Documentation	6,557,500.00	8,524,750.00	11,475,625.00
	Total Design & Consenting Cost	**7,503,000.00**	**9,753,900.00**	**13,130,250.00**
	Contingency (P50) - 30%		2,250,900.00	
	Funding Risk (P95) - 35%			3,376,350.00
	Total Capital Expenditure	**49,133,685.25**	**63,873,790.83**	**85,983,949.19**
	Contingency (P50) - 30%		14,740,105.58	
	Funding Risk (P95) - 35%			22,110,158.36
	Professional Services Costs as a percentage of Construction Costs	**23%**	**23%**	**23%**

Appendix G - Cost Benefit Analysis

Wairau Blue-green Network - Stage 1 AF Thomas Park

Cost Benefit Analysis
Final Report

MARTIN JENKINS

01 August 2025
Commercial in Confidence

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Contents

Preface

This report has been prepared for Te Kaunihera o Tāmaki Makaurau | Auckland Council by Nick Carlaw and Ana Rodriguez from MartinJenkins (Martin, Jenkins & Associates Ltd).

For over 30 years MartinJenkins has been a trusted adviser to clients in the government, private, and non-profit sectors in Aotearoa New Zealand and internationally. Our services include organisational performance, employment relations, financial and economic analysis, economic development, research and evaluation, data analytics, engagement, and public policy and regulatory systems.

We are recognised as experts in the business of government. We have worked for a wide range of public-sector organisations from both central and local government, and we also advise business and non-profit clients on engaging with government.

Kei te āwhina mātau ki te whakapai ake i a Aotearoa. We are a values-based organisation, driven by a clear purpose of helping make Aotearoa New Zealand a better place. Our firm is made up of people who are highly motivated to serve the New Zealand public, and to work on projects that make a difference.

Established in 1993, we are a privately owned New Zealand limited liability company, with offices in Wellington and Auckland. Our firm is governed by a Board made up of Executive Partners and Independent Directors. Our Independent Directors are Jenn Bestwick and Chair David Prentice. Our Executive Partners are Sarah Baddeley, Nick Carlaw, Allana Coulon, Nick Davis, and Richard Tait. Michael Mills is also a non-shareholding Partner of our firm.

Key findings

This report presents a cost benefit analysis (CBA) of Stage 1 flood mitigation works at AF Thomas Park.

Scope

The CBA assesses the impact of flood-protection wetlands, dry detention, and associated amenity at the park, comparing it to a counterfactual scenario where no flood mitigation is implemented.

Future recreation use of AF Thomas Park is subject to separate decision making by the Kaipātiki Local Board and will be assessed separately.

Approach

The analysis adopts a societal perspective, taking into account the impacts both on individuals and on wider society, and it uses a 100-year timeframe. Sensitivity testing is done across key variables such as discount rate, construction costs, and the growth of future construction prices.

The analysis explores alternative scenarios involving Takapuna Golf Course to gain an understanding of the impact on the benefit cost ratio (BCR).

Benefit cost ratio

The BCR ranges from 0.5 to 1.4. It is presented using a range to avoid overstating certainty.

This range is:

- different to the 0.72 – 1.59 in the Concept Feasibility report on 4 July 2025 because, after completing our analysis, we consider it prudent to extend the lower end of the range and use more conservative design and build costs to estimate the upper end of the range
- marginally higher than the upper end of the benefit cost ratio in the business case approval paper of 0.5 – 1.36, presented to TRIC on 3 April 2025.

Avoided property damage is the largest benefit, comprising up to 87% of total benefits, estimated using flood modelling and Auckland Council's Flood Damage Assessment tool.

The biggest cost is the design and build, which makes up 62% to 80% of total costs depending on the assumptions used.

Unquantified benefits

Several benefits were not monetised (but could be included in future analyses). All else being equal, these benefits could increase the BCR. The unquantified benefits include:

- flood-protection benefits from future stages of the project
- avoided damage to public infrastructure and utilities
- recreational benefits from future park uses
- urban density impacts.

Next steps

A comprehensive CBA will be developed for the detailed business case in 2026, incorporating refined assumptions, broader benefit categories, and more detailed modelling.

That comprehensive CBA should result in a narrower BCR range because of a higher level of certainty about the inputs.

Introduction

The Wairau catchment experienced severe flooding during the Auckland Anniversary floods in January 2023. The event caused widespread damage in the area, including loss of life.

In response, the catchment was identified as a priority Blue-Green Network focus area in the Making Space for Water programme.[1]

Planning for the Wairau catchment project is grouped into three stages (shown in Figure 1 to the right).

Stage 1 would see AF Thomas Park upgraded to hold more stormwater, including wetlands and dry detention areas. In stage 2, improvements would be made across the wider catchment, including upgrading ponds, widening streams, and improving stormwater pipes. In stage 3, the system would be connected and expanded so that it works together as a whole flood-protection system.

Purpose

To inform its Concept Feasibility report for stage 1, Auckland Council assessed the economic implications of integrating flood storage with recreational facilities at AF Thomas Park.[2]

As part of that assessment, the Council asked MartinJenkins to peer-review and augment a cost benefit analysis (CBA) done by engineering firm WSP.

The work will be followed by a comprehensive CBA prepared in partnership with the Chief Economist as part of a detailed business case due in 2026.

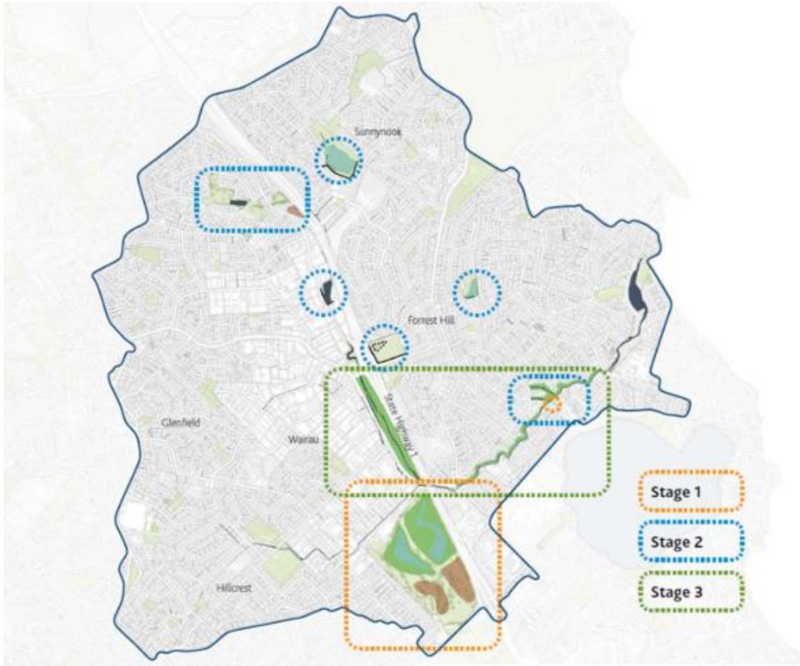
Scope

The scope of this analysis was confined to the stage 1 works described in the Concept Feasibility report

Figure 2 shows an artist's impression of AF Thomas Park with flood-protection wetlands, dry storage, and associated amenity.

We did not consider any costs or benefits associated with removing Woodbridge Lane Bridge or any subsequent stage 2 or 3 works.

Figure 1: Wairau catchment showing stage 1, 2, and 3 works



1 Making Space for Water

2 https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/Documents/a-f-thomas-park-concept-feasibility-report.pdf. Accessed July 2025.

Figure 2: Artist impression of stage 1 at AF Thomas Park

Future recreation use at AF Thomas Park was not considered

Golf is currently the primary activity at the park, and the implementation of flood protection measures will either reduce or stop this activity.

When stage 1 is complete, parts of the park could be developed for different types of recreation use – for example, open spaces, sports fields, and golf.

Future recreation use is a decision for the Kaipātiki Local Board, to be made in consultation with mana whenua and the local community, and would depend on factors such as community need, feasibility, funding and commercial viability.

The CBA compared the current AF Thomas Park (the counterfactual) to a future scenario involving flood storage wetland, dry detention, and associated amenity[3]

Variations on this scenario were also explored – all of which were assumed to meet the flood storage requirements (>550,000m³).

Approach

Our approach was shaped by the relatively short time available to do the analysis

We prioritised the most significant costs and benefits that could be monetised.

We took a societal perspective – that is, we considered the costs and benefits both to individuals and to wider society.

Our approach included the following steps:

- Reviewing the CBA done by WSP and its supporting models.
- Reviewing the existing literature about CBAs of pluvial flood protection systems to identify typical costs and benefits, and any additional costs and benefits that could augment the WSP CBA. We took note of costs and benefits that could be considered in the comprehensive CBA that would be part of the detailed business case.
- Re-creating the WSP CBA in our own model and augmenting the analysis with some additional costs and benefits. As part of this step, we modified a model that MartinJenkins developed for Auckland Council in 2019 to assess the Takapuna golf course.[4,5]
- Testing the model outputs through a sensitivity analysis, and identifying the variables that had the biggest impact on the benefit cost ratio (BCR).
- Estimating the lower and upper bounds of the benefit cost ratio using a scenario-based approach.

3 Consistent with our terms of reference.

4 https://ourauckland.aucklandcouncil.govt.nz/media/qp0d0do1/2018_golf_cba-model-and-methodology.pdf. Accessed July 2025.

5 https://ourauckland.aucklandcouncil.govt.nz/media/3x0lrbto/cbas-may-2018-remaining-courses_status-quo-scenarios-final_-not-a-policy.pdf Accessed July 2025.

Interpreting the results

The benefit cost ratio is the present value of the quantified benefits divided by the present value of costs

A BCR of 1 is the point where quantified benefits equal the costs. A BCR higher than 1 indicates more quantified benefits than costs (and vice versa).

The BCR in this report does not include all costs and benefits

It includes those that could be quantified and monetised at this stage. There are qualitative benefits that should also be considered as part of the investment decision, for example community resilience and environmental benefits, flood-protection benefits from subsequent stages of work, and future recreation use of the park.

There is no ideal benefit cost ratio for pluvial flood protection – it depends on the characteristics of each investment

The BCR for pluvial flooding protection can be lower than for river or coastal flood protection because it is usually more localised, and with lower per-event damages (even if the events are more frequent).

This report presents the BCR in the form of a range because the design is at the concept stage and there is uncertainty about the underlying assumptions and inputs

Our use of a range avoids overstating certainty and allows decision makers to identify risks. This approach ensures that multiple possibilities are considered in the analysis and it shows how particular assumptions and inputs could affect the project's outcome.

Data sources

The BCR is based on information that is subject to change and will be developed further in the detailed business case

Much of the information we used in this analysis was prepared during the Concept Feasibility stage and is at a level of detail necessary to assess the viability of concept options and their potential for success.

We relied on outputs from other models

As we discuss in the report, avoided property damage is the biggest monetised benefit in the analysis. To estimate the value of this benefit, we relied on the outputs from two models:

- WSP provided flood-modelling projections, and
- Auckland Council's Flood Damage Assessment (FDA) tool was used to estimate the cost of flood damage.

We relied on cost estimates provided by Alta Consulting.

Overarching assumptions

We estimated the upper and lower bounds of the benefit cost ratio using a range of assumptions. We discuss assumptions about the timeframe and discount rate below. Other assumptions are set out in following sections of the report.

Timeframe used in the analysis

We estimated the benefit cost ratio over a 100-year timeframe and tested the impact on the BCR using shorter timeframes (25, 50, and 75 years)

The New Zealand Treasury and overseas jurisdictions provide different guidance about how to determine the timeframe for analysis. For example, the UK's flood-appraisal guidance recommends a default 100-year timeframe.[6] In contrast, US FEMA guidance ties the timeframe to the project's useful life (for example 35–100 years for major infrastructure like dams and levees).[7]

The appropriate timeframe is a matter of judgement. Shorter timeframes (50 years for example) may omit significant future damage avoidance and climate-change impacts, and so may under-report the BCR. On the other hand, a 100-year timeframe introduces more uncertainty because there are so many more unknowns, and projects could appear to be more beneficial due to accumulated future gains.

In this analysis, we use a 100-year period to fully capture the long-term benefits of the pluvial flood protection, especially for rare but severe events like 1-in-100-year floods and for evaluating resilience from climate change. Also, the flood mitigation is wetland and dry detention and will have a much longer useful life than a mechanical flood-protection system.

Discount rate

We estimated the BCR range using scenarios that applied discount rates of 1.5%, 2%, 4%, and 8%

The discount rate represents the diminishing value of costs and benefits over time. The choice of discount rate significantly affects the present value of future costs and benefits and, therefore, the benefit cost ratio.

Lower discount rates give greater weight to benefits occurring in later decades, supporting the use of extended analysis timeframes for projects.

In cost benefit analysis for public infrastructure, Auckland Council recommends a standard real discount rate of 4%. The Treasury recommends a real discount rate of 2% for analysing social or non-commercial investments that have a useful life of 1–30 years, and a lower rate of 1.5% for assessing investments over longer periods (31 – 100 years). The Treasury also advises testing a higher discount rate of 8%.

6 https://assets.publishing.service.gov.uk/media/613205c1d3bf7f05b9705049/The_full_technical_FCERM_appraisal_guidance.pdf. Accessed July 2025.

7 https://www.fema.gov/sites/default/files/2020-04/fema_bca_reference-guide.pdf. Accessed July 2025.

The current state

In this section, we describe the main assumptions used to define the "current state" – that is, the scenario that would exist if Auckland Council left AF Thomas Park as is, without any flood storage wetland and dry detention.

The current state scenario has an important role in the cost benefit analyses – it is what we compare the alternative scenario to (the one with flood storage wetland and dry detention).

Flood risk

We assumed that no alternative flood-protection measures would be put in place beyond what exists now

This assumption means that existing houses would be prone to the same level of flood risk as they are now (all else being equal).

The assumptions about whether flood-protection mechanisms would be implemented in the current state is important because it has an impact on the damages-avoided benefit. For example, if some form of flood protection is implemented in the current state, the size of the avoided-damages benefit may be smaller.

Climate change

We assumed that flooding would become more intense over the 100-year timeframe

We assumed that the impact of climate change would result in higher levels of flooding and therefore more properties would be damaged and the damage would be more severe. We describe the approach to flood modelling later in this report.

Future land use

We assumed no significant changes in land use

AF Thomas Park would continue to exist for recreation use.

Housing stock

For simplicity, we assumed no change to the level of building density or improvements to existing buildings

This assumption impacts benefits in a number of ways. First, if a property inside the catchment area is subdivided, then more properties would be at risk of flood damage, and benefits such as avoided damage would be greater.

Similarly, if an existing property is upgraded then the avoided cost to repair it would be greater.

Greater urban density upstream of the catchment area also has an impact. It means more hard surfaces for water run-off and greater flooding impacts – resulting in more avoided property damage.

However, we could not meaningfully forecast any changes to housing density or property values in the time available and so left this out of the analysis (we recommend examining this in the comprehensive CBA).

Category 3 properties

We assumed no change to the number of properties currently rated category 3, as the process has finished

Properties assessed as Category 3 pose an intolerable risk to life, with no practical way to reduce that risk. They were eligible for a voluntary government buy-out.

Assumptions about the number of category 3 properties would have an impact on the avoided property damages benefit. For example, if – under the current state – additional properties were rated category 3 then, all else being equal, this benefit would be smaller.

Existing golf course

We assumed North Shore Takapuna Golf would continue to operate an 18-hole course at AF Thomas Park

It currently operates on a month-by-month lease (the previous lease was for 33 years and expired in February 2025). Under the current state, we assumed that the lease would continue to be renewed.

Areas for further analysis

As we noted earlier, the time available for our analysis was relatively short, and a more comprehensive CBA will inform the detailed business case.

Throughout the report, we recommend areas to explore in further analysis. In relation to the current-state assumptions, we recommend:

- Confirming whether any additional flood-protection mechanisms would be put in place, beyond what is there now.
- Confirming North Shore Takapuna Golf's operating costs, membership numbers, and quantifiable benefits.
- Confirming assumptions about whether any additional properties in the catchment area would be rated as category 3 over the 100-year term.
- Confirming whether there would be any changes to housing density or the value of the existing commercial and residential stock.

The alternative scenario

In this section, we describe the main assumptions used to define the "alternative scenario" involving flood storage wetland, dry detention, and associated amenity at AF Thomas Park.

We also describe the variations to this scenario that we used to determine the upper and lower bounds of the benefit cost ratio.

Flood mitigation

We assumed that this scenario delivered the necessary flood-storage capacity, and all variations on this scenario provided the same level of flood protection

The Healthy Waters concept design and North Shore Takapuna Golf's concept design involve different amounts of wetland and dry detention, but both meet the flood water storage requirements (>550,000 m^3).

This assumption means that flood-related benefits such as avoided property damage (which is the largest benefit) would be the same under all variations of the alternative scenario.

Housing stock

We assumed no change to the level of building density and no improvements to existing buildings over time

As noted in the previous section, we could not meaningfully forecast any changes to density or property value in the time available and so left this out of our analysis.

This approach potentially undercounts the benefits because:

- property owners would possibly be more likely to invest in new buildings or upgrades if their property is less likely to be flooded, and
- greater housing density upstream will increase flood impacts around AF Thomas Park – which would be avoided under the alternative scenario.

Recreation use

Golf

We explored two alternative golfing scenarios to test the impact on the BCR

Golf is currently the primary activity at AF Thomas Park. Implementing the flood-protection measures will either reduce or stop this activity.

As we noted above, decisions about future recreation use are for the Kaipātiki Local Board and any impacts resulting from these decisions are outside the scope of our analysis.

However, we explored two alternative scenarios to test the impact of different levels of golfing activity on the BCR:

1. Takapuna Golf Course stops operating altogether. Construction of the wetland, dry detention, and amenity would take two years, beginning in 2027.
2. The other scenario is North Shore Takapuna Golf continuing to operate a smaller nine-hole course (without any further investment) during the timeframe of the construction.

Under this scenario, Council advises development would start at the same time but take one year longer to accommodate golf and construction happening side by side.

For each option, we made assumptions about the displacement of golfing activity – how many people who played at Takapuna Golf Course would shift to other clubs, and how many would stop playing golf altogether. This is discussed further in the section on benefits.

Cycle and walkways

We assumed that new walkways would result in more walking and cycling

The proposed Healthy Waters design includes approximately 1.5 km of new walkways, similar to the North Shore Takapuna Golf design. We assumed this walkway would exist whether or not there is golf at the park or other types of recreation use.

Other assumptions

All other assumptions are the same as under the "current state"

- We assumed that climate change would mean flooding would become more intense over the 100-year timeframe.
- We assumed AF Thomas Park would continue to exist for recreation use.
- We assumed no change to the number of properties currently rated category 3.

Areas for further analysis

Future work to inform the comprehensive CBA should:

- Examine whether the level of building density, improvements to the value of existing commercial and residential stock, and the number of category 3-rated properties would change over time because of the existence of flood-protection measures.
- Confirm whether it is feasible for North Shore Takapuna Golf to continue operating in a reduced capacity during the construction phase and without any further investment (this will inform whether the comprehensive CBA should assess this scenario or not).
- Determine whether future recreation uses should be included in the analysis (for example developing a new golf course or other recreational facilities).

Monetised benefits

This section describes the benefits used to determine the lower and upper bounds of the BCR.

Consistent with the scope of work, we have sought to monetise the most significant benefits within the time available to do the analysis. We have identified where further effort could be directed for the comprehensive CBA.

There are other benefits that aren't quantified in this analysis, like the avoided damage to public infrastructure. These are discussed further in the section on qualitative benefits (and could also be a focus of the comprehensive CBA to see if they can be monetised).

Avoided property damage

By far, this is the biggest benefit, making up 27% to 87% of the total benefits, depending on the assumptions used.

Methodology

Natural hazards, such as flooding events, involve high levels of uncertainty around timing, frequency, and severity

To estimate the value of this benefit, a method called Annual Average Damage (AAD) was used. This approach estimated the present value cost of flood damage to buildings in the catchment area over the 100-year timeframe.

It considered a range of possible flood events, from frequent minor floods (for example 1-in-2-year flood events) to rare, major ones (such as 1-in-100-year floods), and calculated the expected damage for each based on how likely they are to occur.

By comparing the AAD before and after implementing the flood protection measures at AF Thomas Park, we estimated how much property damage would be avoided.

The calculation relied on the outputs from two models

We took the outputs from both models at face value:

- WSP provided flood-modelling projections for different types of flood event severities inside the catchment area.
- We used Auckland Council's Flood Damage Assessment (FDA) tool to estimate the cost of flood damage to individual commercial and residential buildings and their contents, based on the flood-modelling projections.

The approach to estimating the avoided property damage benefit involved the following steps

1. WSP modelled three flood events (a 2-year, 10-year, and 100-year event) for different scenarios – a current and a future climate scenario, and pre- and post-flood protection measures at the park.
2. We used Auckland Council's FDA tool to estimate damage costs for residential and commercial buildings and their contents for each flood event and scenario.
3. We calculated the value of the benefit by comparing the pre- and post-flood protection measures. The impact of climate change was linearly interpolated to reach the climate change AAD by year 100. Avoided damages were not counted until the flood-protection measures were built.
4. We repeated the calculation using three slightly different methods to see if there was a material difference in the value of the benefits (the results were similar).
   - We followed the method used by WSP, which annualised the avoided damages.

- We tested this against the Council's FDA tool, which calculated the total net present value but did not annualise.
- We used the New South Wales flood tool method, which also annualised damages.[8]

The value of the avoided property damage was very sensitive to three assumptions in the CBA

Discount rate. The benefits are realised over a long timeframe and the higher the discount rate used in the CBA, the lower the benefit (and vice versa).

Timeframe for the analysis. The same applies to the timeframe – if the analysis is conducted over a shorter timeframe, the accumulated benefits are smaller.

Assumptions about the future cost of construction and materials. Both the New South Wales tool and the approach taken by WSP can be adjusted for construction costs rising above general inflation over time. All else being equal, if an inflator is applied to construction costs, the avoided property damage benefit would be greater.

We looked at different construction indices over the last 25 years, which showed construction-related costs had been 1% to 1.5% higher than general inflation over the last 10 years and the last 25 years.[9]

We tested scenarios that involved 0% (that is, assuming construction costs would grow in line with general inflation only) and growth in construction costs above inflation by 1%, 1.5%, and 2.5% per year – in some cases this was year-on-year growth over the 100 years. In other scenarios, we increased construction costs above inflation for the first 50 years only.

The result of this analysis is summarised in the section on the BCR range.

Reduction in golf expenditure

Under the alternative scenario, we assumed the North Shore Takapuna Golf's operating costs would decrease. If it stopped operating altogether, there would be no ongoing costs. If it continued with a smaller nine-hole course, costs would be less than the 18-hole course.

In the cost benefit analysis, we treat this cost reduction as a benefit, and in the same way we treat the reduction in golfing-related benefits as a cost. It comprises 0% to 36% of the total benefits ($0 – $36.7 million in present value terms) depending on the assumptions used.

Assumptions

The value of the benefit is sensitive to two interrelated assumptions. The first is displacement – that is, the net amount of golfing activity that continues across all clubs after Takapuna Golf Course either ceases to operate or reduces its course size.

The second assumption relates to the net impact on costs associated with operating golf courses.

For this CBA, we used simplified assumptions to explore the impact of different golf scenarios on the upper and lower bounds of the benefit cost ratio.

At the end of this section, we identify further work for the comprehensive CBA, including confirming that there is capacity at nearby golf courses to take the Takapuna Golf Course players.

These assumptions are discussed further below.

Displacement

Displacement of golfing activity is a function of several factors. For example:

- If Takapuna Golf Course reduces its size to a nine-hole course, new golfers might play because they prefer a smaller course.

8 NSW Treasury Disaster Cost-Benefit Framework | NSW Government

9 For example, the average annual growth rate for the capital goods price index over the last 25 years was 1.4% higher than general CPI, and 2.5% higher over the last 10 years.

Existing members might play more or fewer rounds.

- Some regular golfers might stop playing altogether because they only want to play at an 18-hole course at Takapuna Golf Course.

  Of those golfers, some might take up other physical activity (which offsets lost health and other benefits), or they might not do any physical activity and so the benefits decrease.

- We assumed that most of the current golfers at the Takapuna Golf Course would continue to play but at other courses, to a greater or lesser extent.

Displacement assumptions also result in other impacts such as changes in travel emissions or out-of-town visitor expenditure.

For the purposes of this CBA, we applied a simplified assumption that 80% of existing golf played at Takapuna Golf Course would be displaced to other golf courses.

This assumption was based on a literature review of publicly available information and the number and location of other golf courses in the region. We tested the impact on the BCR if 50% of the golfers stopped playing altogether.

Golf operating costs

We also used simplified assumptions about changes to golf operating costs. The assumption is a function of:

- a reduction in North Shore Takapuna Golf's costs, and
- an increase in other clubs' costs as they take on additional players from North Shore Takapuna Golf.

Based on a literature review and previous work for the Council,[10] we assumed that, although there is a direct relationship between displacement of golfing activity and operating costs, this relationship is not linear. This is because a golf course has fixed costs that are less sensitive to the number of golfers or rounds played.

On this basis, we assumed that:

- if Takapuna Golf Course stopped operating, 80% of its golfers would play at other courses (a net reduction in golfing activity of 20%) and the operating costs of other golf courses would increase by a smaller proportion (50%) – which is an increase to the variable costs only.
- if Takapuna Golf Course continued with fewer holes, total operating costs (across all courses) would still decrease but not by as much (15% compared to 50%) because Takapuna's fixed costs would continue.

We tested the impact on the BCR by varying the assumptions about reduced cost, using a cost reduction of 0% (no change in overall cost), and a 15%, 50%, and 75% reduction in cost.

Other benefits

We assessed the other benefits that were included in WSP's CBA. We supplemented this with a literature review to see if any other benefit types could be included (either now, or as part of the comprehensive CBA). We also did a benefit mapping exercise to make sure there was no double counting.

As a result, we incorporated most of WSP's benefits into the CBA and added a health benefit to account for additional walking and cycling activity around the park.

The value of each individual benefit was relatively small compared to the avoided property damage. Together, they made up 5% to 53% of the total benefits, depending on the assumptions used.

The benefits are summarised below.

[10] https://ourauckland.aucklandcouncil.govt.nz/media/3x0lrbto/cbas-may-2018-remaining-courses_status-quo-scenarios-final_-not-a-policy.pdf Accessed July 2025.

Creation of open space – the value that households get from interacting with parks; measured using the annual use-value for households near neighbourhood parks.

Avoided flood-related fatalities and injuries – based on a 1-in-100-year flood event and measured using the Value of Statistical Life (VoSL) lost and cost of serious injury values.

Walking- and cycling-related health benefits – physical activity resulting from the new walkways (roughly 1.5 kms long), measured by distance travelled and health value per kilometre. We assumed this activity would happen whether or not there was golf at the park.

To avoid any double counting with the use value from the creation of open space, walking and cycling benefits were reduced by the proportion of users that are located nearby.

Avoided income loss from displacement – accounts for preserved income when individuals do not have to relocate because of flooding; based on a 1 in 100-year flood event and measured using values derived from the 2011 Christchurch earthquakes.

Property value uplift – compares the increase in property values within the catchment (after flood mitigation) with properties outside the catchment; measured using analysis by WSP.

Emergency services cost avoided – based on a1 in 100-year flood event and a small percentage of property damage.

Avoided trauma from flooding events – based on a 1 in 100-year flood event and measured using the cost of trauma (intolerable and habitable).

Additional carbon sequestration from the wetlands – the benefits were assumed to be the same whether or not a golf course continued at AF Thomas Park.

Benefit summary

The table below lists the economic benefits. Our scenario analysis used values within the ranges set out in column 2 of the table.

Benefit type	**Present value amount** (millions) Lower and upper values, and median	Proportion of total benefit	Comment
Avoided property damage	$6.1-$168.8 Median $41.3	27%-87%	Relied on outputs from WSP and Auckland Council models. Sensitive to discount rate and growth of future construction costs.
Reduction in golf operating expenditure	$0-$36.7 Median $24.4	0%-36%	Sensitive to assumptions about displacement of golfing activity.
Creation of open space	$4.6-$5.6 Median $5.5	3%-26%	
Avoided flood-related fatalities and injuries	$2.2-$2.6 Median $2.6	1%-9%	
Walking- and cycling-related health benefits	$0.2-$1.0 Median $0.8	<1%-5%	
Avoided income loss from displacement	$0.5-$0.6 Median $0.6	<1%-3%	
Property value uplift	$0.5-$0.6 Median $0.5	<1%-3%	
Emergency services cost avoided	$0.4-$0.5 Median $0.5	<1%-2%	
Avoided trauma from flooding events	$0.2-$0.2 Median $0.2	<1%-1%	
Additional carbon sequestration	$0.1-$0.1 Median $0.1	<1%	

Areas for further analysis

Further work to inform the comprehensive CBA should:

- Use the Council's i-Tree model to value benefits associated with different types of vegetation, including carbon sequestration, removal of pollution, and avoided run-off costs. The i-Tree model will probably replace some benefits in this report to avoid double counting.
- further, more detailed analysis to confirm the displacement assumptions about golf activity, including: whether other clubs can accommodate the North Shore Takapuna Golf's members; resulting revenue and cost impacts on those clubs; the impact on out-of-town visitors coming to play golf; and the impact of additional travel.
- Consider what other benefits should be included in the analysis (the final section of the report contains a list of ideas).

Quantified costs

This section summarises the economic costs that we used to estimate the benefit cost ratio.

One-off cost

Design and build

By far the biggest cost is the implementation of the flood storage wetland, dry detention, and associated amenity (making up 62% to 80% of total economic costs, depending on the assumptions used).

Given this, we explored the impact on the benefit cost ratio by using base, P50, and P95 cost estimates by Alto Consulting.[11]

	Base cost	P50 cost	P95 cost	Timing
Healthy Waters design	$42.51m	$55.26m	$74.39m	Incurred in yrs 1 & 2
North Shore Takapuna Golf design	$49.13m	$63.87m	$85.98m	Incurred in yrs 1-3

We also tested what the impact would be if construction costs were to increase materially higher than general inflation between now and the start of construction (by adding 1.5% per year to the development cost).

We applied a deadweight cost of taxation of 20% to Crown and Council funding portions, and on the Council's advice, tested a lower deadweight cost (10%) for the local funding portion.

Ongoing costs

Maintenance

Annual maintenance makes up the smallest proportion of total cost. It covers activities like removing rubbish after extreme events, controlling invasive weeds and pests (community groups may provide volunteer support), minor desilting, and general maintenance. We estimated a present value cost of $0.2 – $1.7 million (up to 3% of total costs).

We tested the impact on the BCR should some of the built assets need renewing, using an arbitrary value of $10 million incurred at year 50 – with and without the impact of rising construction costs (about $4.8 to $9.0 million in present-value terms).

Reduction in recreational and health benefits for golfers

We looked at the impact of:

- lower recreation benefits from individuals enjoying a round of golf, and
- lower health benefits from golfers taking part in physical exercise while being outdoors.

We estimated the present value of this cost using the CBA model and methodology developed previously for the Council.[12]

Health benefits are a function of distance walked on the golf course and a health value per kilometre. The recreational benefit is equal to the cost to those golfers of playing.

The values were most sensitive to assumptions about whether Takapuna Golf Course stopped operating or not, and the resulting displacement.

11 P50 and P95 cost estimates represent probabilistic forecasts where P50 is the cost with a 50% chance of being exceeded, and P95 is the cost with only a 5% chance of being exceeded (a conservative, high-confidence estimate).

12 https://ourauckland.aucklandcouncil.govt.nz/media/gp0d0do1/2018_golf_cba-model-and-methodology.pdf and https://ourauckland.aucklandcouncil.govt.nz/media/3x0lrbto/cbas-may-2018-remaining-courses_status-quo-scenarios-final_-not-a-policy.pdf Accessed July 2025.

Given this, we explored the impact on the benefit cost ratio by testing several alternative inputs.

Our estimate of the economic cost from reduced recreational and health benefits for golfers varied widely, from $2.7 million to $25.3 million in present-value terms (between 3% and 28% of the total economic cost).

Cost summary

The table below lists the main economic costs. Our scenario analysis used values within the ranges set out in column 3 of the table.

Cost item	Frequency	Present value amount (millions) Lower and upper values, and median	Proportion of total cost	Comment
Design and build of wetland, dry detention and amenity	One-off	$41.3-$73.9 Median $54.9	62%-80%	Based on estimates provided by Alta Consulting
Reduction in benefits to golfers	Annual	$2.7-$25.3 Median $10.3m	3%-28%	Depends on whether Takapuna Golf Course continues to operate and how much golfing activities are transferred to other golf clubs
Deadweight cost of taxation for central and local government funding	One-off	$8.3-$14.8 Median $9.7	10%-16%	
Maintenance (above current levels)	Annual	$0.2-$9.0 Median $1.4	<1%-11%	Upper end of range assumes some asset renewal at year 50

Areas for further analysis

Future work to inform the comprehensive CBA should:

- Confirm what the costs associated with maintaining AF Thomas Park are.
- Confirm the volume assumptions used to estimate the reduction in golf-related benefits (for example, the number and type of members, rounds played, and distance walked).
- Consider what other costs should be included in the analysis (the final section of the report contains a list of ideas).

BCR range

Summary

The analysis produced a benefit cost ratio between 0.5 and 1.4

We have presented the BCR using a range because the design is at concept stage and there is uncertainty about the underlying assumptions and inputs.

This range is:

- different to the 0.72 – 1.59 in the Concept Feasibility report on 4 July 2025 because, after completing our analysis, we consider it prudent to extend the lower end of the range and use more conservative design and build costs to estimate the upper end of the range
- marginally higher than the upper end of the benefit cost ratio in the business case approval paper of 0.5 – 1.36, presented to TRIC on 3 April 2025.

The comprehensive CBA to be completed for the detailed business case should result in a narrower BCR range because of certainty about the inputs.

Testing

We did sensitivity analysis to identify the assumptions that had the biggest impact on the benefit cost ratio

Then we developed a range of scenarios to identify the lower and upper bounds of the BCR range.

The scenarios were developed using different combinations of the following variables:

- Discount rate – using 1.5%, 2%, 4%, and 8%.
- The extent to which future construction costs rise – using 0% (no growth), 1%, 1.5%, and 2.5% annual growth rates. This was applied over 100 years and an alternative scenario of the first 50 years only.
- Design and build costs of the wetland, dry detention, and associated amenity using the base, P50, and p95 cost estimates, with and without an annual growth rate of 1.5% to account for rising construction costs between now and the start date.
- A lower deadweight cost of taxation for the local-government funding portion – we applied 10% as well as 20% (the same as for central-government funding).
- Significant investment in asset renewal in year 50 of $10 million, with and without the impact of construction costs rising 1.5% per year above general inflation.
- Alternative golf scenarios where Takapuna Golf Course stopped operating altogether, and a hypothetical scenario where it continued to operate a smaller nine-hole course (but without any further investment). As a result, the main assumptions we varied were:
  - reducing the amount of golf played at Takapuna Golf Course by 20% and 50% (accounting for displacement to other clubs), and
  - reducing the amount of North Shore Takapuna Golf's operating costs by 15%, 50%, and 75%, and a scenario of no change.

We also removed all golfing-related costs and benefits from the analysis to test whether the BCR range was appropriate.

We tested the impact on the BCR by shortening the timeframe for the analysis

We used a 100-year scenario that had a benefit cost ratio of close to 1 (0.98). Shortening the timeframe to 75 years had a relatively minor impact on the BCR (reducing it from 0.98 to 0.92).

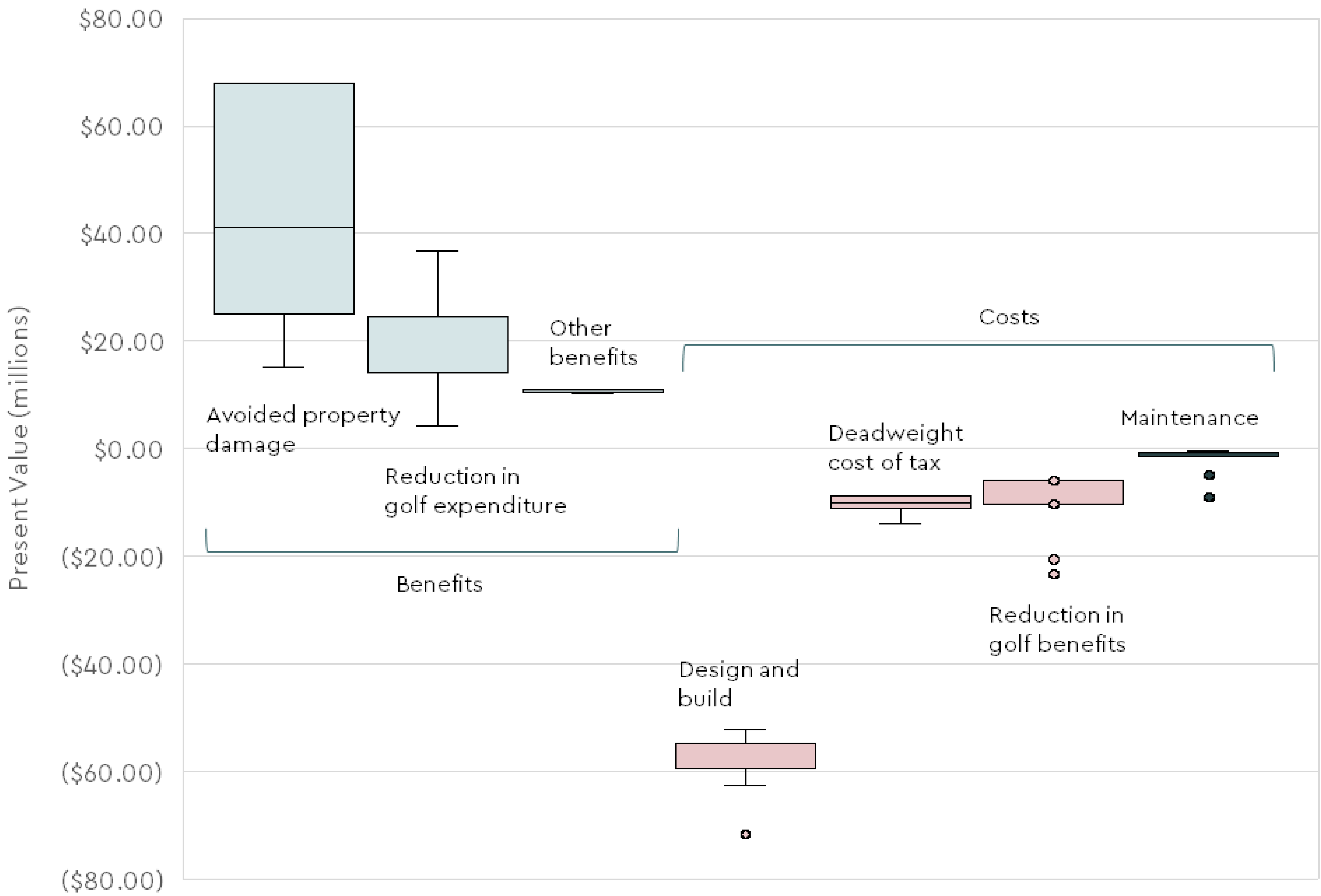
However, the impact on the BCR was greater when the timeframe was reduced to 50 years and 25 years (0.78 and 0.62 respectively).

BCR inputs

The box and whiskers graph shows the spread of the costs and benefits that were used to determine the upper and lower bounds of the BCR.

The avoided property damage benefit has the biggest spread because the scenarios tested a range of different assumptions about the growth of future construction costs – these had a large impact on the value of the benefit.

By contrast, the maintenance costs were not varied much in the scenarios except for a large asset renewal in year 50 (represented by the two outlier dots in the graph).



Reading the graph: The line within the box represents the median. The box goes from the first quartile to the third quartile. Whiskers extend from the box to the minimum and maximum values (1.5 times the height of the box). Any data points beyond the whiskers are considered to be outliers and plotted as individual dots.

Unquantified costs and benefits

This section lists costs and benefits that aren't quantified in this analysis and therefore don't contribute to the benefit cost ratio.

The reasons for not including them in the analysis are due to factors like the additional time it would take to monetise them – not because of their importance or significance.

Although they are not included in the analysis, these costs and benefits should still be considered as part of the investment decision-making process.

They can also be a focus of the comprehensive CBA, to see if they can be monetised and included in future benefit cost ratios.

Unquantified costs

- Government spending on flood response and accelerating recovery of economic activity
- Injuries sustained while at the park
- Less spending from out-of-region visitors

Unquantified benefits

- Flood-protection benefits from stages 2 and 3 of the project that are unlocked by stage 1 works
- Avoided damage to public infrastructure such as schools and roads
- Avoided damage to utilities (including critical infrastructure like power substations and wastewater systems), meaning less interruption to other parts of Auckland, and less cost to fix
- Recreational benefits from new facilities at AF Thomas Park (for example, sport fields or golf facilities)
- Greater urban density upstream of the catchment area meaning more hard surfaces for water to run off and greater flooding impacts – which are avoided
- Ability to make use of category 3 land (after flood-protection measures are in place)
- Benefits arising from additional properties in the catchment area (for example, if an existing property was subdivided) and upgrades to existing property
- Improved water quality from avoiding overflow at Alma Road pump station during significant flood events and potential for wetlands to remove pollutants from water
- Avoided loss in business productivity
- Non-use benefits of the park
- Reduction in pesticide run-off for different recreation uses
- Benefits from social connection and volunteering.

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