Comments on a Substantive Application under section 53 of the Fast-track Approvals Act 2024: Hydrology

Fast-track project name	**Mt Welcome, Pukerua Bay, Porirua**
Fast-track application number	FTAA-2603-1181
GW file number	FTA260348

Technical area	**Hydrology (including Wetland Hydrology)**
Date	6 July 2026
Author	James Blyth
Statement of expertise	I am a Director and Water Scientist at Collaborations Limited (‘Collaborations’). I hold a Master of Science (MSc) Degree with first class honours from the University of Waikato, with a thesis completed on wetland eco-hydrology. I am also a Certified Environmental Practitioner (CEnvP) under the Environmental Institute of Australia and New Zealand (EIANZ). I have ~16 years of work experience, and have worked internationally in over six countries. This experience covers a range of water sciences, including water quality, water resources, hydrology, hydraulics and wetlands. I have provided evidence for hearings, Environment Court and High Court processes.
Code of conduct	I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. This technical memorandum has been prepared in accordance with that Code. Unless I state otherwise, the opinions I express are within my area of expertise, and I have not omitted to consider material facts that might alter or detract from the opinions that I express.
Documents considered	• Envelope Limited (2026). Stormwater Management Plan. (rev 3 dated 4 June 2026). Prepared for Pukerua Property Group LP “the updated stormwater plan” • Appendix 9. Envelope Limited (2025). Draft Earthworks and Construction Management Plan – Mt Welcome. • Appendix 11 Part A : Envelope Limited (2025). Stormwater Management Plan. Prepared for Pukerua Property Group LP “the stormwater plan” • Appendix 11: Envelope Limited (2025). Part B – Flood Risk Assessment and Model Build. Prepared for Pukerua Property Group LP

	• Appendix 18: Pattle Delamore Partners Ltd. (2025). Mount Welcome – Hydrology assessment (Report No. W027550001). Prepared for Pukerua Property Group LP - "the hydrology report". • Appendix 19 : Pattle Delamore Partners Ltd. (2026). Mount Welcome - Water Quality Assessment. • Appendix 30-26. Envelope Limited (2026). 1753-02-4300-R2-Drainage-Wetlands. Prepared for Pukerua Property Group LP. "Wetland design drawings". • Appendix 30-04. Envelope Limited (2026). 30-04 - 1753-02-1010-R2-Scheme-ProposedDevelopment. Prepared for Pukerua Property Group LP. "Proposed scheme plan". • M Dixon (6/7/2026). Mt Welcome, Pukerua Bay, Porirua – Wetland Ecology Comments on Section 53 Substantive Application. GW File FTA260348. • G Taylor (6/7/2026). Mt Welcome, Pukerua Bay, Porirua – Stream Ecology Comments on Section 53 Substantive Application. GW File FTA260348. • A Road (3/7/2026). Mt Welcome, Pukerua Bay, Porirua – Stream Ecology Comments on Section 53 Substantive Application. GW File FTA260348.

Comments

Summary

This review focusses primarily on catchment hydrological changes pre and post development at the Mount Welcome site, and its relationship to wetland and streams. The Hydrology Report (PDP 2025, Appendix 18) that supports assessments of the application's potential effects on streams and wetlands adopts good practices, and includes hydrological modelling of the changes in catchments and landuses under pre and post development conditions, over an extended period of historical climate data.

There are, however, some limitations in the modelling due to the lack of hydrological monitoring data available to inform calibration and thus reduces confidence in the modelling outputs. A significant component of the site's hydrology relates to four "retention wetlands" that will be constructed over natural inland wetlands and streams using earth bunds (up to 7.8m high), and used as stormwater attenuation devices for the duration of construction until offset and restoration planting works commence (the timing and staging of which is unknown).

The retention wetland designs indicate permanent water depths under *low flow/baseflow* conditions vary from 1.4m to 2.5m deep, and that 11-30% of the offset area for each wetland would have water

depths that would be challenging to establish marginal wetland plants, and could remain as open water. There remains a risk these retention wetlands could have a large ponded area lacking vegetation, which would influence water quality (i.e. dissolved oxygen and temperature). Modelling also indicates that all retention wetlands, except retention wetland B, are likely to have summer water levels decline below the outlet structure inverts on nearly an annual basis.

Should this consent be granted, I consider that the *hydrological effects* on wetlands and streams can be managed through robust consent conditions and adaptive management that requires:

- Ongoing baseline monitoring of streams and retained and retention wetlands
- Design approvals of retention wetlands that focus on reducing the extent of deep standing water (>0.5m deep), prioritising wetland plant establishment.
- Establishment of a plan (i.e. eco-hydrological monitoring and response plan) as a condition that requires ecological, water quality and hydrological monitoring, targets and reporting, and includes hydrological trigger levels in streams, existing retained wetlands and any offset wetlands.
    - This plan will establish 'environmental bottom lines' and outline water quality and hydrological targets (i.e. for the existing retained wetlands and retention wetlands). The plan would also detail actions and responsibilities should a trigger be breached during or post development, or offsetting targets are unable to be achieved. An integrated eco-hydrological plan that also establishes ecological condition requirements will streamline monitoring and reporting.

There remains the risk that responsibility of achieving suitable wetland conditions to achieve ecological offsetting requirements could lie with asset owners (PCC) who would be vested these retention wetlands, unless vesting was delayed until offsetting conditions relating to wetland vegetation establishment, hydrological and ecological conditions were met.

Agreement with the applicant

1. Conceptual models developed in the hydrology report of the wetlands on site generally align with my interpretation during the site visits. I agree that those wetlands in the southwest towards Taupo Swamp may intersect the regional groundwater table, and that the remaining site wetlands at typically higher elevations have hydrological characteristics of rainfall, surface water runoff and shallow groundwater throughflow/seepage most likely within the top 3m of the ground surface.

2. I support the continuous monitoring of water levels occurring in four wetlands across the site (in piezometers) and three surface water (stream) monitoring sites, which are also subject to turbidity monitoring and flow gauging. A number of these locations also include continuous turbidity monitoring and discrete water sample collections. There was, however,

delays in installation for a number of sites (August 2025) resulting in little information to inform the application.

3. I support the utilisation of a GoldSim daily timestep model in the hydrology report assessing catchment and wetland hydrology, utilising a 25 year climatic dataset for simulations under pre and post development scenarios. This model also includes the 'retention wetlands' and their stage/storage design volume calculations to help assess changes in flows out of the site. This is best practice, noting some areas of uncertainty (discussed later in these comments).

4. I support the inclusion of water level and flow duration curves in the hydrology report, which allow easy comparisons of pre and post development hydrology. Noting, some of these charts present a water depth below ground level, which is not particularly useful for the post development retention wetlands that will be permanently flooded.

5. I agree that the four stormwater retention wetlands will help mitigate peak flows off site post development.

6. I agree that towards the Taupo Swamp there will be increased runoff (annually) into the receiving environment due to the increased imperviousness of the site and the steep topography. Table B1 and B2 of the hydrology report shows the annual surface water runoff volume from the site catchments draining to Taupo Swamp will at least double post development, highlighting the significant importance of the retention wetlands to reduce peak flow effects and erosion/scour under larger floods.

7. I consider that with adequate stormwater infrastructure that manages water quantity (primarily relating to peak flow mitigation) and quality of runoff, and appropriate catchment and stream restoration works (planting and erosion mitigation), this additional flow to Taupo Swamp is likely to have a less than minor eco-hydrological effect.

Matters in contention and suggested response

Monitoring data and calibration

8. Approximately 1 month of continuous monitoring data was utilised in the hydrology report for stream, turbidity and wetland water levels. A single flow gauging was completed. This limited dataset has been used for streamflow calibration 'checks' and results in greater uncertainty in the results.

9. Due to limited site flow data, a synthetic stream record was developed from the Horokiri Stream at Snodgrass Road catchment (2,880 ha). This large catchment has greater time of concentration and catchment storage (i.e. less 'peaky') and more baseflow than the small stream and wetland catchments on site.

10. By using this synthetic record for calibration of the GoldSim Model in the hydrology report, it is likely to result in an underestimation of changes in catchment runoff dynamics, including lower peak flows and higher baseflows out of the small Mt Welcome catchments. This would have propagated through the pre/post development results. The effects of such an approach are challenging to 'untangle' from the post development hydrological changes driven by a greater extent of impervious surface that will increasing runoff and reduce infiltration.

11. Some of this uncertainty in the model outputs may be evident in Figure 33 of the hydrology report, reproduced in Figure 1 below. This chart shows over 20 storm events in a 25-year simulation led to wetland storages exceeding 8,000 m^3, and five events exceeding 10,000 m^3.

12. The wetland design drawings (Appendix 30-26) state the 1% Annual Exceedance Probability (AEP) design storm for retention wetland E resulted in a stored volume of 8,150 m^3. The numerous events in the GoldSim model (at nearly an annual frequency) that reach similar volumes to the 1% AEP, 12 hour design storm may be due to the utilisation of daily (24 hour) rainfall totals, however, it does appear to indicate the long term hydrological model (for this catchment at least) may overestimate the runoff out of the post development catchments.

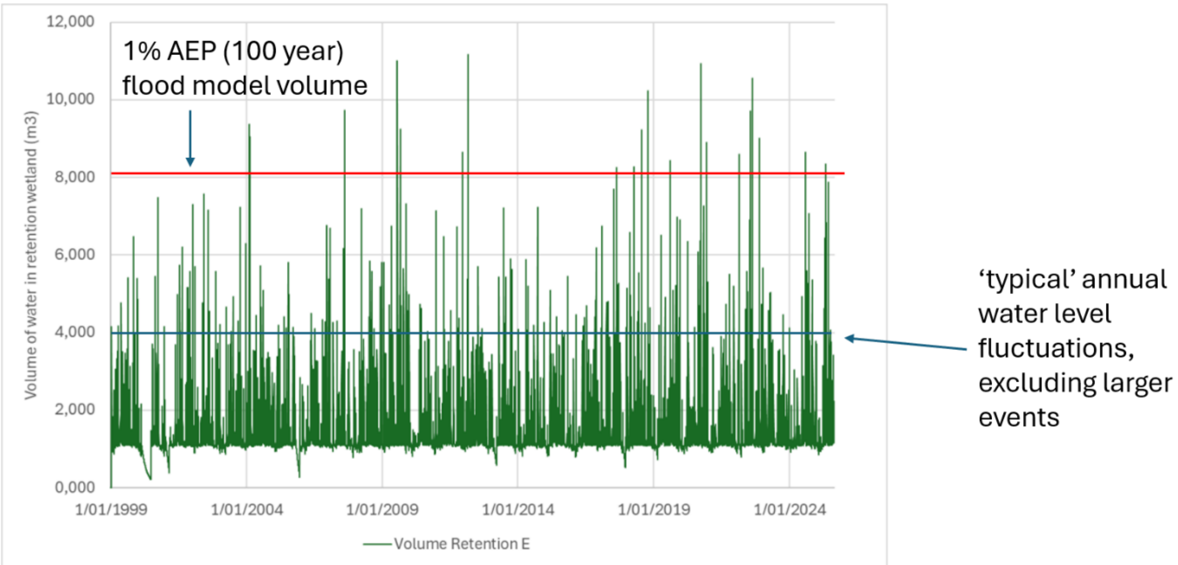

Figure 1. Daily volume changes over 25 years for Retention Wetland E in Kakaho Stream catchment (reproduced from Figure 33 in hydrology report). I have added the red line to indicate where a separate flood model for a 1%AEP 12 hour design storm predicted a volume of 8,150 m^3, which has been exceeded over 20 times in this simulation. In addition, I have identified an approximate annual range for wetland water levels, excluding larger events.

13. The application does address peak flow attenuation for larger design storms, assessing hydraulic neutrality and flooding (i.e. 10% and 1% AEP events) through the stormwater plan and flood modelling, and discrete storm scenarios in GoldSim (where the design storm from the flood modelling were simulated on a shorter timestep).

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14. While there is uncertainty in the monitoring and hydrological modelling, I consider the risk of the lower baseflows to retained wetlands (natural wetlands that will not be drained or buried), retention wetlands and stream hydrology could be managed through robust conditions requiring ongoing hydrological monitoring and establishment of environmental bottom lines, trigger levels and appropriate adaptive management responses.

15. However, the above statement is made independent of a larger issue about the suitability of these retention wetlands to achieve ecological and stormwater outcomes, which is covered in the following section.

Retention Wetlands and Stormwater Management Functions

16. There remains some uncertainty around the four retention wetlands proposed, which are serving a dual purpose as stormwater attenuation devices (to reduce peak flows) and also as ecological offsetting/remediation areas. Revisions to the stormwater plan in 2026 ("the updated stormwater plan", section 8.3) describe these as assets that will be vested to Porirua City Council (PCC) and managed by Wellington Water with Operation and Maintenance manuals. The wetland area will generally be classified as a drainage reserve, with the four retention wetlands being covenanted (see the proposed scheme plan, Appendix 30-04).

17. Ongoing sediment removal (through maintenance works) from the retention wetlands <u>*after they have been planted and restored*</u> has been removed from the updated stormwater plan, with the plan now indicating maintenance activities would be limited to maintaining 80% or greater plant cover and debris/sediment removal at inlet and outlet structures. This supports the intent of allowing these wetlands to naturalise, however, I note the wetland design drawings have not identified inlet structures or sediment forebays where this maintenance work could occur.

18. The application is intending to establish retention wetlands early in the project, as described in Section 8.4 of the updated Envelope (2026) stormwater plan "*Because the wetland retention ponds will service large upstream catchments, they will need to be operational and functional while adjacent earthworks and civil staging are still underway*".

19. These retention wetlands will be developed over gullies containing natural inland wetlands and streams through the use of earth fill bunds as a downstream flow control, with bund heights varying from 4.3 to 7.8m (excluding Wetland D, which is primarily designed as a retention pond[1]). This is detailed in Appendix 30-26. This approach appears to be driven by the need to achieve hydraulic neutrality and mitigate peak flows, rather than restoration of the existing natural inland wetlands at these locations. The resulting high bunds subsequently

[1] It is unclear the purpose of maintaining a permanent water level in 'Wetland D', rather than designing this as a dry attenuation basin. If it is to be planted and treated as a constructed wetland for secondary treatment and attenuation purposes, then this needs greater stormwater design considerations and likely, maintenance.

require long culverts (28 to 61m long across the four retention wetlands) of generally steep grades (up to 25%). These culverts are also required to provide fish passage which may be challenging (see Table 10 in the updated stormwater plan). This is covered further by my colleague Dr Gareth Taylor.

20. Based on the information presented above, it appears there will be a prolonged period of up to 15 years (depending on staging of the project, which remains unclear) where these retention wetlands will effectively replace natural inland wetlands and streams, and function as large downstream detainment ponds. While erosion and sediment control devices such as sediment retention ponds and flocculants will remove the majority of sediment, it is likely that sediment deposition will still occur in the retention wetlands over the development period during larger events and unplanned discharges.

21. Envelope has accounted for this; "*To de-risk sediment and debris entering these devices during construction, it is proposed that the developer extend the maintenance period for these assets beyond the initial 1-year establishment phase, until the majority of the contributing catchment is fully stabilised and civil works completed. This approach will allow any required cleaning, sediment removal, or replanting to be undertaken prior to final vesting, ensuring the ponds are handed over in good operational condition*".

22. Subsequently, natural inland wetland and streams will be lost under these devices for a period of time. Whether the time lag for the restoration and offsetting of these sites is appropriate has been covered by my colleague's Melanie Dixon and Dr Gareth Taylor.

23. Appendix 30-26 wetland design drawings also show the planned permanent water levels in each of the retention wetlands. When this is compared against the depth/area/volume tables in the Appendix 11 stormwater plan, the deepest part of the permanent water under <u>*baseflow conditions*</u> for retention Wetlands A, B, C and E are 2.2m, 1.4m, 2.5m and 2.4m, respectively. Following every rainfall event, water levels would exceed these depths.

24. While standing water is common in wetland environments, these water depths may increase the risk of stagnation, higher temperatures and lower dissolved oxygen (DO) conditions. Appendix 19 assesses the likely change in water quality as a result of the development, but does not specifically address the retention wetlands. Figure 1 shows that on an annual basis, modelling predicts permanent water levels in the largest wetland catchment (retention wetland E) will drop below the invert on nearly an annual basis, indicating no fish passage would be possible during these periods. All wetlands except retention Wetland B indicate a similar trend of water levels dropping below the outlet during summer.

25. Establishment of vegetation would be critical in the permanent water bodies to increase shading, secondary water treatment and help reduce the risk of water becoming stagnant and impacting downstream water quality.

26. Relevant water quality targets could be set for the retention wetlands. These could include targets for dissolved oxygen (DO), temperature, *E. coli* and dissolved zinc and copper, aligning with the National Policy Statement for Freshwater Management (NPS-FM 2020) and Table 9.2 in the Proposed Change 1 (PC1) to the Natural Resources Plan, of which the notified version remains operative[2]. Due to data limitations at notification of PC1 for Taupo Stream catchment, characterisation of targets for DO concentrations in (and out of) retention wetlands would require an updated assessment of GWRC's monitoring data to determine an appropriate current state for Taupo Stream catchment and consideration of the baseline DO concentration expected to be maintained.

27. In the following paragraphs, I have attempted to expand on the water depth in each retention wetland and suitability for plant establishment.

28. Utilising the GoldSim modelling in the hydrology report (see Figure 1 above), I considered the volumetric fluctuations that would typically occur over a year (i.e. excluding larger infrequent events) against the depth/area/volume tables. Generally, retention wetlands A, B and C would typically have an increase of up to 0.5m *above the permanent water levels*, with greater increases during larger storms (the exact water level increase corresponding to rainfall was unable to be assessed). Retention wetland E had a larger 'typical' annual variation, of up to 1m above permanent levels, driven by its larger catchment.

29. This assessment is useful to identify a zone of influence (ZOI) where standing water levels will fluctuate throughout the year, typically between 0.5m to 1m deep, a depth I consider would be possible, but challenging to establish and maintain permanent cover of aquatic plants (such as *Eleocharis* and *Machaerina*) to achieve appropriate ecological conditions and offsetting requirements. An example of this is provided below for Retention Wetland A, utilising the 0.5m contours and wetland design drawings (Figure 2).

[2] gw.govt.nz/assets/Plans-policies-bylaws/PNRP/PC1-home-page-content/NRP-PC1-Full-Plan-Change-Variation-1.pdf

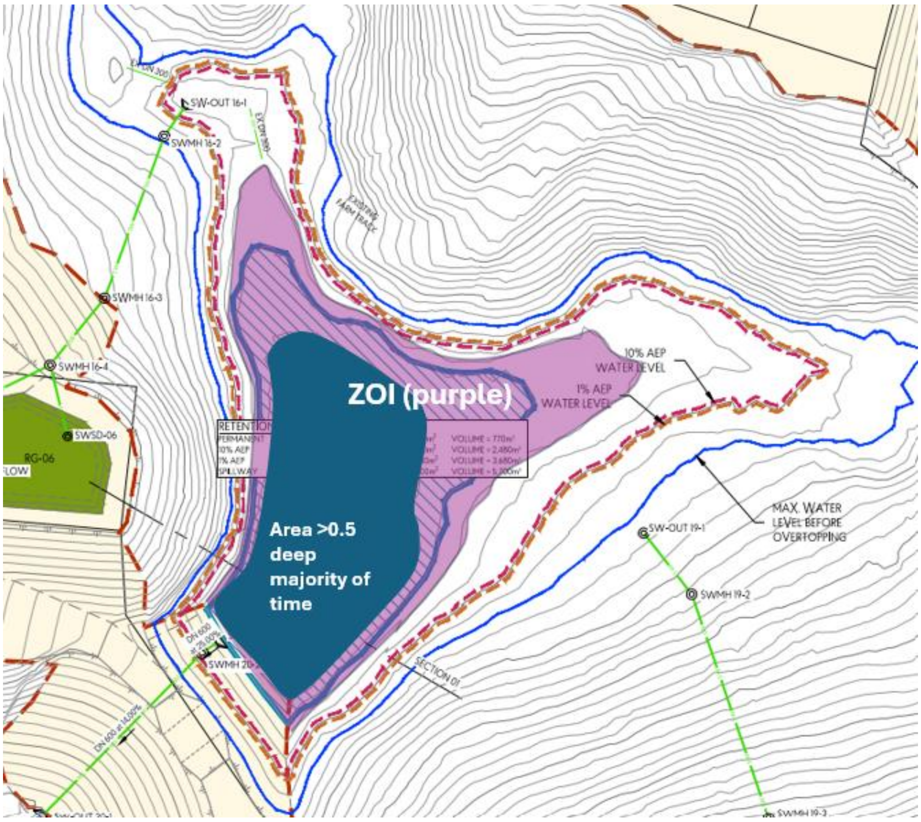

Figure 2. Water depth assessment for retention Wetland A to estimate the approximate depth and area of permanent standing water. This adapts figures from the wetland design drawings (Appendix 30-26).

30. This assessment found that for retention wetlands A, B and C, ~20-30% of the area considered for ecological offsetting (the 10 year, or 10% AEP extent) would have permanent water depths exceeding 0.5m (under low flow/baseflow conditions), indicated by the *dark blue extent* in Figure 2. This area would be challenging to establish permanent aquatic plants and may remain as open water.

31. When considering retention wetland E (on Kakaho Stream), due the larger catchment and correspondingly larger 10% AEP event, this decreases to ~11% of the ecological offsetting extent.

32. As these retention wetlands are to be vested to PCC and managed by Wellington Water, the onus would fall on the asset owner and subsequently, the rate payer, to achieve the ecological and hydrological conditions for each of these wetlands (should the consent be granted). The above assessment, while simple, indicates establishing wetland plant cover may be challenging in parts of these wetlands due to the bund heights proposed and corresponding water depths.

33. One of the largest retention wetlands (Wetland E) is situated on a tributary of the Kakaho Stream (**Error! Reference source not found.**), and will receive runoff from the Muri Block outside of the development site. Establishment of this constructed wetland early on in the project may result in adverse water quality effects downstream (such as warmer stream temperatures and lower dissolved oxygen concentrations), as it would be unlikely to be planted during construction/development phase and instead will act as an attenuation device.

Figure 3. Kakaho Stream tributary, looking upstream to where Retention Wetland E will be located.

34. In addition, retention wetland E will remain 'online' at completion of the development, offsetting and restoration planting. As discussed in Appendix 19 (the water quality assessment) sediment and nutrients from the completed site (post restoration) are likely to be low (due to planting and removal of deer and cattle), however, there remains the inputs of sediment outside of the site which will deposit in this wetland over time and could diminish its hydraulic performance (for mitigating peak flows) or affect plant survival. This long-term risk of sediment deposition has not been assessed.

35. In summary, the retention wetlands proposed for the site appear to have been developed around suitable locations to achieve hydraulic neutrality through the use of large earth bunds. These bunds will be established early on in the project for an unknown duration, acting as attenuation ponds. The loss of stream and natural inland wetlands under these retention wetlands is proposed to be offset towards the end of development. The current retention wetland designs indicate permanent water depths under *low flow/baseflow conditions* could be up to 1.4 to 2.5m deep, and that 11-30% of the offset area would have water depths that would be challenging to establish wetland plants, and could remain as open water.

Responsibility of achieving suitable wetland conditions would likely lie with asset owners (PCC) who would be vested these retention wetlands, unless vesting was delayed until offsetting conditions relating to vegetation establishment, hydrological and ecological conditions were met.

Water balance and groundwater

36. The PDP 2025 hydrology report presents a post development water balance for the site, which shows an increase in groundwater inputs to wetlands in Taupo Swamp (Table B1 to B2) and a reduction in groundwater in Kakaho West (Table B3 and B4). The hydrology report indicates increases in groundwater inputs is due to greater runoff being transmitted as interflow/throughflow and also permanently higher water levels in retained wetlands contributing to downstream groundwater seepage.

37. On steep sites with greater imperviousness, typically a reduction in shallow groundwater (throughflow/interflow) would be expected, although seepage out of the retention wetlands is likely if they are unlined, which needs to be confirmed. For the western catchments seepage wetlands (i.e. Kakaho West catchments, section 5.2 of report) that are not reclaimed, the reduced groundwater inputs of ~20% may have greater effects than anticipated as they sit at higher elevations and have smaller catchments than the ‘retention wetlands’. Increases in surface runoff may help to mitigate some of these effects, but this may be hard to quantify.

38. Should the consent be granted, I recommend conditions are included that require ongoing hydrological monitoring of some of the retained wetlands and all four of the retention wetlands across the site during and post development, to account for the uncertainties in the modelling results and in confirming the suitability of retention wetlands for offsetting.

39. These conditions should require continuous water level monitoring (utilising and building on what is already established at site) to develop hydrological triggers of low water levels that would provide an alert and alarm level that when triggered, would indicate conditions approaching or exceeding the monitored (or targeted) natural range suitable for maintaining wetland hydrology. An appropriate response plan should then be required, which would involve a staged investigation that could lead to modification or ceasing of site activities, mitigations, remediation or additional offsetting and compensation.

40. Hydrological monitoring conditions should also be coupled with ecological condition assessments and targets.