MEMO

To:	Dean Foote
From:	Greg Whyte
Date:	24th September 2026
Subject:	44802081 – Te Karaka Hearing Evidence Response

This memo responds to matters raised by Mr Ramon Strong concerning the Te Karaka Stopbank Upgrade modelling. It addresses the adopted design event and its hydrological basis, consistency with the wider Waipaoa Flood Control Scheme, the use of MIKE hydraulic modelling software and the perceived conflict of interest, mesh resolution, and the peer review process, including early reviewer involvement and independence.

Design Event and Hydrological Basis

Following Cyclone Gabrielle, NIWA undertook an updated flood frequency analysis for Tairāwhiti, including the Waipaoa River at Kanakanaia. The analysis incorporated the 2023 event and considered a range of statistical distributions, recognising the inherent uncertainty associated with estimating the frequency of large flood events from the available hydrological record. The results indicate that a flow of 5,625 m^3/s is reasonably consistent with a present-day 1% AEP event, having regard to the statistical uncertainty and the range of estimates produced by the different fitted distributions. The analysis also demonstrates that the estimated return period is sensitive to the distribution adopted and the available period of record, and that there remains inherent uncertainty in assigning a precise return period to an event of this magnitude.

Given that uncertainty, further flood frequency analysis was not considered likely to materially improve the precision with which the return period could be defined. It was therefore considered reasonable to adopt 5,625 m^3/s as representative of the present-day 1% AEP event for the purposes of the Te Karaka assessment.

Mr Strong expresses concern regarding the derivation of the adopted design flows and the absence of what he describes as a comprehensive stand-alone hydrology assessment for the Waipaoa River at Te Karaka. In responding to that concern, it is important to distinguish between the purpose of the Te Karaka Flood Resilience project and the broader hydrological investigations that established the design basis for the Waipaoa Flood Control Scheme.

The 5,625 m^3/s design event used in the Te Karaka modelling was not developed specifically for this project. It is the established design event adopted for the wider Waipaoa Flood Control Scheme upgrade programme. The event is based on the adopted scheme design discharge of 4,500 m^3/s, increased by 25 percent to allow for climate change effects to 2090. The Te Karaka investigation applied that existing scheme design basis rather than seeking to redefine it.

Once confirmed as described above, using the same design event was deliberate and necessary to maintain consistency with the downstream Waipaoa Scheme. It allowed Te Karaka to be assessed against the same level of service being progressively delivered elsewhere in the scheme, avoiding different design standards within the same river system.

The Te Karaka modelling therefore used the established scheme design event to compare alternative stopbank alignments on a common basis. The project was not intended to replace the hydrological analysis underpinning the wider scheme or establish a separate design standard for Te Karaka.

Hydraulic Modelling Platform and Perceived Conflict of Interest

Mr Strong refers to the use of MIKE hydraulic modelling software and raises a perceived conflict because DHI both supplies the software and uses it in consulting projects. He also acknowledges that accepted modelling platforms generally produce similar hydraulic outcomes when appropriately applied and that there is little to suggest the numerical modelling of the Te Karaka reach departed from accepted industry practice.

DHI's roles as software developer, supplier and modelling consultant do not, by themselves, determine whether the Te Karaka model is reliable. Reliability depends on the model's schematisation, data, calibration, sensitivity testing, numerical performance and fitness for purpose. These matters were addressed through model development, testing and independent review.

The model was calibrated against observations from Cyclone Gabrielle, subjected to iterative testing and independently peer reviewed. Mr Strong identifies no specific deficiency attributable to the MIKE computational platform or to DHI's role as software supplier.

Mesh Resolution and Appropriateness

Mr Strong comments on the model discretisation and the mesh size over the Coates property. The model uses an unstructured mesh rather than a uniform grid. This allows the element size and geometry to vary according to the physical feature being represented and the level of hydraulic detail required. The main river channels are aligned using quadrilateral elements, while finer elements are used for urban areas, buildings, roads, tributaries, streams and stopbanks. Larger elements are used in less hydraulically complex rural areas to maintain a practical balance between spatial detail, numerical stability and model run time.

This variable-resolution approach is appropriate for a catchment-scale model of this nature. Over the Coates property, the mesh elements are approximately 100 m^2 to 200 m^2 in area, equivalent to squares of about 10 m × 10 m to 14 m × 14 m. This resolution is suitable for representing wider floodplain behaviour and comparing the existing and proposed stopbank arrangements, but it should not be treated as providing survey-level precision at every point.

Peer Review Process, Early Involvement and Independence

Mr Strong raises concern about the peer reviewer's involvement during model development and suggests that engagement at the model schematisation stage was inadvisable. I respectfully disagree. The reviewer's early involvement was intentional and formed part of the project quality assurance process.

For substantial hydraulic modelling projects, early reviewer engagement allows key assumptions and decisions to be examined while they are being made. This improves review efficiency and reduces the risk that fundamental concerns are identified only after model construction and calibration are complete.

The meetings with the peer reviewer were used for familiarisation with the model, its data, structure and key decisions, and to resolve factual questions efficiently. They did not transfer responsibility for model development or decision-making. DHI remained responsible for the model build, calibration, assumptions and final modelling decisions, while the reviewer retained responsibility for forming and reporting his own conclusions through separate emails and formal review reports.

Mr Strong also raises a perceived independence issue because DHI and Land River Sea both work with MIKE software. Familiarity with the same modelling platform is necessary for an informed review and does not, of itself, compromise independence. The relevant point is that the reviewer retained control of his opinions and reporting, while DHI retained responsibility for the final model. Mr Strong acknowledges that the modeller and reviewer had qualifications and experience appropriate to their roles. He does not identify a specific modelling error, calibration failure, inappropriate parameter, mesh deficiency, hydraulic inconsistency or demonstrably incorrect result arising from the review arrangements.

Conclusions

- The 5,625 m^3/s event was the established future-climate design event for the wider Waipaoa Flood Control Scheme and was intentionally adopted at Te Karaka to provide a consistent river-wide design basis and equivalent level of service. NIWA's updated flood-frequency analysis also indicates that this flow is reasonably consistent with the present-day 1% AEP event, having regard to the statistical uncertainty.

- Applying a common design event and planning horizon supports engineering consistency, transparent comparison and equitable treatment of communities and landowners protected by different parts of the integrated scheme.

- DHI routinely applies the software it develops and supplies. This supports the high level of practitioner proficiency needed to assist users and undertake specialist modelling, and does not remove the need for each model to be calibrated, tested and independently reviewed.

- The variable-resolution unstructured mesh appropriately concentrates detail around hydraulic features while using larger elements in less complex rural areas. It is suitable for comparative assessment, although individual results should not be presented as having survey-level precision.

- The reviewer's early involvement was intentional and enabled efficient familiarisation with the model and early identification of issues. The review was not collaborative: DHI retained responsibility for the modelling, and the reviewer's independent opinions were communicated through emails and formal reports.

- Mr Strong identifies no specific software-related deficiency, modelling error or unreliable result arising from the peer review arrangements. The matters he raises warrant consideration as questions of process and perception, but they do not identify a technical consequence that materially undermines the modelling used to assess the Te Karaka Stopbank Upgrade.