Before Independent Hearings Commissioners
At Wellington

Under	the Resource Management Act 1991
In the matter of	Applications for resource consents, and a Notice of Requirement for a Designation, by Wellington Water Limited ('**WWL**') on behalf of Upper Hutt City Council, for the construction, operation and maintenance of the structural flood mitigation works identified as the Pinehaven Stream Improvements Project

Joint Witness Statement – Flood Modelling

Dated 23 July 2020

Experts participating:

1 Peter Kinley engaged by the Applicant, Wellington Water Ltd (WWL)

2 Michael Law (Beca Ltd) engaged by Greater Wellington Regional Council (GWRC)

No facilitator was present

1 Introduction

1.1 All experts confirm that they have read and are familiar with Code of Conduct for Expert Witnesses in the current Environment Court Practice Note (2014) and agree to comply with it.

1.2 The experts meeting was conducted online on Tuesday, 21 July 2020, with subsequent discussions to refine and agree the contents of this documents.

1.3 The primary purpose of expert conferencing is to assist the Commissioners and to reduce hearing time.

1.4 The issues discussed by the witnesses were:

a Flood model design (inputs and assumptions), including:

i Hydrology for existing development in the catchment

ii Whether the model adequately accounts for climate change

iii Post-2015 model enhancements

iv Representation of local access bridges

b Whether the flood model is a suitable design tool;

c Whether the hydraulic neutrality provisions in UHCC Plan Change 42 (PC42) affect the are relevant to this application.

d Whether the flood model accurately reflects the project design;

e Whether the flood model assists with predicting the effects of the Project;

f Whether the flood modelling demonstrates that the Project will

i Improve capacity of the Pinehaven Stream to pass a 4% AEP (1 in 25 year return period) flood event;

ii Contribute to the management of flood risk to habitable floor levels up to the predicted peak 100 year flood level;

g 8 December 2019 flood event

1.5 The following drawings, data and published standards/ papers relied upon in coming to their opinion are attached to this statement:

a Evidence of Peter Kinley and Michael Law

b MIKE Flood model files

c Flood Hazard Assessment (FHA) prepared by Jacobs

d Correspondence between Applicant, GWRC and experts relating to flood modelling and the FHA

e Submissions on the application

f Technical Review of the flood modelling by Michael Law (Beca Ltd)

g Report to the Hearing Committee 'S42a report' of Josephine Burrows (GWRC)

h Statement of evidence of James Beban

Information predating the application

i Reference Guide for Design Storm Hydrology (WWL 2019), referred to as the WWL Hydrology Guidelines

j GWRC Flood Management Plan 2016

k MfE Climate Change Projections for New Zealand 2018

2 Issues which the witnesses discussed and areas of agreement and disagreement

2.1 Flood model design (inputs and assumptions), including:

a Hydrology for existing development in the catchment

We agreed that MWH decision in 2007-2008 to apply Initial and Constant losses to design rainfall is an accepted method and an appropriate approach in the absence of local hydrological modelling guidelines at the time. Mr Law expressed a preference that the catchment hydrology should be re-modelled using the WWL Hydrology Guidelines now that regional guidelines are available and that it is more than ten years since the MWH hydrology was developed.

Mr Kinley concurred that for future projects the hydrology should be revisited, and that it had been discussed by the Applicant following Beca's initial drafts of the Technical Review. However, to retain the benefits of the calibrated and validated hydrological model and due to the history of the flood management planning in the catchment, the decision had been made that the MWH hydrology for the existing level of development in the catchment was both appropriate and fit for use for this application.

In his evidence, Mr Law has explained that he has calculated peak flows using alternative methods and is satisfied that the design peak flows used in model are fit for use.

Therefore, ***we agree that the hydrology for existing development is fit for use for this application***.

b Whether the model adequately accounts for climate change

We agree that increasing flows by 20% above those for the current climate is a pragmatic and appropriate approach to representing the effects of climate change over the next hundred years, and that this figure has been informed by reference to HIRDSv4 rainfall estimates, WWL Hydrology Guidelines and MfE Climate Change Projections for New Zealand 2018.

c Post-2015 model enhancements

During the Technical Review process, Mr Kinley has explained the updates and refinements to the MIKE FLOOD hydraulic flood model. These have been reviewed and Mr Law considers them to be appropriate and provide increased definition to the model.

Therefore, ***we agree that the post-2015 model enhancements are appropriate***

d Representation of local access bridges

Mr Law had expected that local access bridges would be modelled explicitly, rather than represented by increased channel roughness along the stream reach, as this would allow local changes in water due to removal or raising of bridges to be assessed. Mr Kinley was sympathetic to this view, but noted that increasing roughness is a valid method of representing smaller structures.

We agreed that as bridges are to be removed or raised, then the effects will be to decrease flood levels and the effects will be limited to the area immediately adjacent to the bridges. And so, while explicitly modelling the bridges would have quantified the reduction in flood levels, the approach used will not over-estimate the beneficial effects of the application.

Mr Law suggested that Mr Kinley should provide (for the Hearing) a simple map or plan showing the location of all local access, and indicating which are to remain, be removed, or raised. We agreed this action.

2.2 Whether the flood model is a suitable design tool

We agreed that the flood model is a useful tool for informing the design, rather than a design tool itself. The design can be reflected in the model, and the model used to assess the effects of the design.

2.3 Whether the hydraulic neutrality provisions in UHCC Plan Change 42 (PC42) affect the are relevant to this application.

We agree that the effects of future development on catchment flood flows will be addressed by the hydraulic neutrality provisions of PC42 under which there will be no increase in peak flows at the site of the works covered by the application. As such, we do not consider that future development in the catchment will alter design flows at the works site.

2.4 Whether the flood model accurately reflects the project design

Mr Law noted that he has not seen the design drawings. Mr Kinley has seen the design drawings and carried out spot checks to confirm that the flood model reflects the details in the drawings. He also noted that Jacobs drawing drafter is also the flood modeller. Mr Kinleys checks did not flag any issues or discrepancies between the project design and the flood model representation. Mr Law accepted this explanation.

We agree that the project design may be refined at the detailed design stage and that the detailed design will be incorporated into the flood model, checked and re-run.

2.5 Whether the flood model assists with predicting the effects of the Project

We agree that the flood model is a useful tool for quantifying the effects of the works for the purposed of this application

2.6 Whether the flood modelling demonstrates that the Project will

a Improve capacity of the Pinehaven Stream to pass a 4% AEP (1 in 25 year return period) flood event;

b Contribute to the management of flood risk to habitable floor levels up to the predicted peak 100 year flood level;

We agree that the outputs for the for the two events modelled demonstrate a decrease in flood risk for a significant number of properties in the catchment. Mr Kinley described the issues associated with attaining surveyed floor levels for properties, but explained the information used to confirm that habitable floors would not be adversely affected at those isolated locations where there were small increases in water level. Mr Law accepted this explanation.

2.7 8 December 2019 flood event

Mr Law expressed his disappointment that the opportunity was not taken by the Councils to collect flood information and post-flood surveys in the immediate aftermath of the 8 December 2019 flood event, as this would have provided good information against which to calibrate or validate the flood model.

Mr Law accepted that the timeframes for this application meant that it would have been difficult to perform a full calibration model run and that comparing the limited flood information received against model results for the 10% AEP+CC (plus climate change) event was a pragmatic approach for informing this application process. However, he maintains that the information provided about the 10%AEP+CC model run in the Flood Hazard Assessment is of no value; providing no additional assurance as to the validity of the model. He considers this a lost opportunity.

Mr Kinley believes the event of 8 December 2019 has provided additional validation of the model because the flooding observed during and after the event occurred at locations where the model predicts flooding to occur. He also believes that the model was fit for purpose before the event of 8 December 2019 and because the event provided additional validation, undertaking further more detailed work on the event was unnecessary for this application. Mr Kinley concurred that the event could be useful for informing future studies in the catchment.

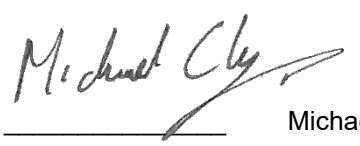
3 Issues which the witnesses do not agree upon

a There are no areas of disagreement between the witnesses. However, as described above, there are areas where one, or both, of the witnesses consider that the approach taken has not been optimal. Despite that, ***we agree that the flood modelling is fit for use for the purposes of this application.***

Date: 23 July 2020

Signed

Peter Kinley



Michael Law