

IN THE MATTER of applications for resource consents by Gisborne District Council to upgrade the Waipaoa River Flood Control Scheme and construct a cycle way

STATEMENT OF SUPPLEMENTARY EVIDENCE: DAVID HENRY PEACOCK

Introduction:

1. My name is David Henry Peacock. My qualifications and experience are set out in my original evidence.
2. As with that evidence, although I believe I am qualified as an expert, I am giving this evidence in my personal capacity, in an endeavour to assist a robust decision being made on the Council's application. I have read the code of conduct for witnesses in the Environment Court Practice Note 2014, and agree to be bound by it. Note that I am also giving supplementary evidence separately for the Wi Pere Trust, in my role as their technical adviser.
3. This supplementary evidence should be read in conjunction with my submission, my original evidence, and the caucusing statement dated 8th August 2018.

Background:

4. In my submission and original evidence, I pointed out a number of errors in the calibration model and in the results of the Applicant's design model, which potentially could have an adverse impact on dwellings upstream of the Waipaoa River Flood Control Scheme and on the Wi Pere property at Tangihanga.
5. In the interim, the calibration model has been reconfigured as a coupled 1D/2D model, and agreement was subsequently reached in a caucusing session on 8th of August of this year, (clause 4.1), that the calibration accuracy of +/- 300mm from Bola levels was acceptable.
6. Following modelling difficulties with the design flood, the peak flood discharge has been altered from 6625 cumecs in the original application to 5625 cumecs; and following from an observation of mine (to the effect that the Cyclone Bola type hydrograph was likely

not the worst case scenario for buildings on the Wi Pere property at Tangihanga), the design flood hydrograph was subsequently changed to a shorter hydrograph of similar shape to the October 2005 flood. The results of the most recent coupled design flood model have since been accepted, (causing statement 4.7), including the flood level differences shown in the respective tables in version 5 of the design report prepared by the Hawkes Bay Regional Council; “WRFCS – Design Flood Hydrodynamic Analysis”.

The scope issue:

7. I understand that this is the subject up for discussion first. In my opinion it does appear to me that the scope has changed to a significant extent beyond the original, and it would appear likely that had the amended application been advertised and consulted on, other submissions would have been received. However, I will leave these arguments about scope for the planners and legal counsel to debate.

Issues Raised in my Submission:

8. In my submission, dated August 2017, I asked for detailed explanations on five questions as follows:

1.1 Upstream of the WRFCS:

- i) What is the potential increase in flood levels upstream of the Scheme due to the proposed raising of the WRFCS stopbanks, and the potential impact on houses and other buildings upstream of the Scheme?*
- ii) Have the owners/occupiers of houses and property owners upstream of the Scheme been consulted about potential increases in flood levels, and are any mitigation measures necessary and/or compensation offered?*

1.2 Upstream of the Whakaahu Return Banks:

- i) Is the intention to extend the stopbanks upstream along the Whakaahu Stream, or to install a large flap gated culvert/s in the stream at the upstream end of the raised stopbanks?*
- ii) If the stopbanks are to be extended upstream, what will be the potential impact of the raised flood levels, and have the property owners been consulted?*

1.3 Flood Hazard:

- i) *If no preferential overflow path is proposed by the applicant, has the applicant compared the impact of flooding on the eastern side of the Waipaoa with/without preferential overflow at Ford Road?*
- ii) *Does the applicant intend to consult with owners/occupiers of potentially affected properties on the eastern side of the river regarding item i)?*
- iii) *What changes if any does the applicant intend to make with respect to the GDC CRLDP Flood Hazard zone maps on the eastern side of the Waipaoa?*

1.4 Sequence of Construction Works:

- i) *Has the applicant considered the consequences of the impact of a super-design flood/s during the construction phase as part of the applicant's risk analysis?*
- ii) *If the answer to item i) is positive, can this risk be mitigated and/or those adversely affected compensated?*
- iii) *Have property owners/occupiers been consulted about this issue, and if so what is the outcome of this consultation?*

1.5 Stopbank Strength and Stability:

- i) *Has the applicant considered reducing the proposed stopbank top width to 3 metres and using the funding saved for remedial works for the prevention of lateral erosion, and if so what conclusions has the applicant come to?*

Outstanding Issues:

Potential increase in flood levels upstream of the Scheme:

9. With respect to issue 1.1 (i) of my original submission, the upstream design flood level is now accepted as RL 31.54m, (Table 2, p43 of the HBRC report; "WRFCS – Design Flood Hydrodynamic Analysis"); cf; 31.09m in the application and the HBRC Response to Submissions letter, dated 21/11/2017. This significant increase of 0.45m in design flood level answers the first part of 1.1 (i). Note also that the proposed stopbank level will be 1.78m above the existing stopbank level at the upstream end of the Scheme, (28M). As there is 600mm freeboard above design flood levels, future floods greater than the design flood have the potential to raise upstream flood levels even further.
10. Whilst I am comfortable with the base design model accuracy, I disagree with the Applicant's assessment of the potential impact on houses and buildings as described by

Mr Ruifrok in clause 249 page of the Applicant's "Further Report.....", dated August 2018, and in clause 41, page 9 of his supplementary evidence. There is no allowance for the 300mm modelling error for design flood levels around the dwellings upstream of the Scheme, nor any allowance for the error inherent in the measurement of floor levels from "general ground level". Nor is there any consideration of a lesser, but more critical flood than the design flood as recommended in clause 4.14 of the caucusing statement.

11. A "critical flood" in terms of impact on a dwelling or building is one where an existing building would not be flooded in the design flood with the Waipaoa Scheme stopbanks as they are at the present time, but could be flooded with the stopbanks raised as proposed. Three factors need to be taken into account, as follows:
 - Flood levels can vary by +/- 300mm from that modelled for any particular flood flow;
 - Floor levels can vary according to the measurement method/s used;
 - A range of flood peak levels must be considered, from the Bola flood magnitude, to the bank-full flood levels.
12. Considering each of the above bullet points in turn; the +/- 300mm error in design flood levels has been agreed in clause 4.7 of the caucusing statement. In the second bullet point, floor levels have been measured by the applicant by tape measure from nearby ground, and this height added to "general ground level" in the vicinity from the hydraulic model input data. This data is shown for every 10m x 10m grid in the model. However, even if the ground looks relatively flat, in my opinion it is likely to vary by up to +/- 150 mm or even more, over the 10x 10m area. In my supplementary evidence on behalf of the Wi Pere Trust, I compare measurements by this method with surveyed floor levels of a staff house carried out by Grant & Cooke, Registered Surveyors, in June of this year to illustrate my point.
13. The last bullet point is perhaps the most important of the three bullet points. Inclusion of the full range of floods is recommended in clause 4.14 of the caucusing statement. The best way to describe this is by considering an example at location "A" in table 4, page 38 of the Applicant's "Further Report.....", dated August 2018. The depth above floor level for the peak of the design flood is shown as 0.1m for the existing case, and 0.45m above floor level for the proposed case. The applicant then goes on to conclude (with the help of Riskscape analysis), that "there will be no discernible difference in flood damage between the two scenarios....". However, the flood level for the existing case could well have been just below floor level for any one of the reasons in the three bullet points in

clause 11. With respect to the third bullet point, if the flood had been marginally lower, say 200mms lower than the design flood level, and therefore 100mm below floor level for the existing case, I contend that for the proposed case the increase in flood level would be about the same, perhaps a centimetre or so less, so that the flood level would be about 250 mm above floor level. The damage to the house for the existing case would be nil, but for the proposed case would be substantial, and is described later in clause 18 of this supplementary evidence.

14. It should be noted that a smaller flood than the design flood will be a more frequent occurrence than the design flood, so by no means should it be ignored when assessing the flood risk to buildings.
15. The dwelling at location B upstream of the Scheme can also be damaged by a critical flood. In this case, if the flood level is at the lower end of the range (-300mm), and the critical flood say 200mm less in level than the design flood, then the resulting flood level would be 0.1 m below floor level in the existing case and about 0.25m above floor level for the proposed case. The house at location E could obviously be damaged by a critical flood; whereas the houses at locations C and D would not be flooded in either scenario.

Potential impact of increased flood levels upstream of the Scheme:

16. In the following clauses the method used by the Applicant to assess flood damages, “Riskscape” is queried. Note that clauses 17 to 19 apply also to buildings elsewhere including the Wi Pere land at Tangihanga, as described in my supplementary evidence for the Wi Pere Trust.
17. The Riskscape depth/damage curves shown in Fig. 9, p25 of the Applicant’s “Further Report.....” are intended for the macro-scale environment, to estimate losses for different flood heights for hundreds, if not thousands, of buildings in urban areas. Riskscape estimates Tangible Direct damages only, and does not include the Tangible Indirect damages or the Intangible damages; see the chart below, reproduced from the New South Wales Government Floodplain Development Manual, 2005.

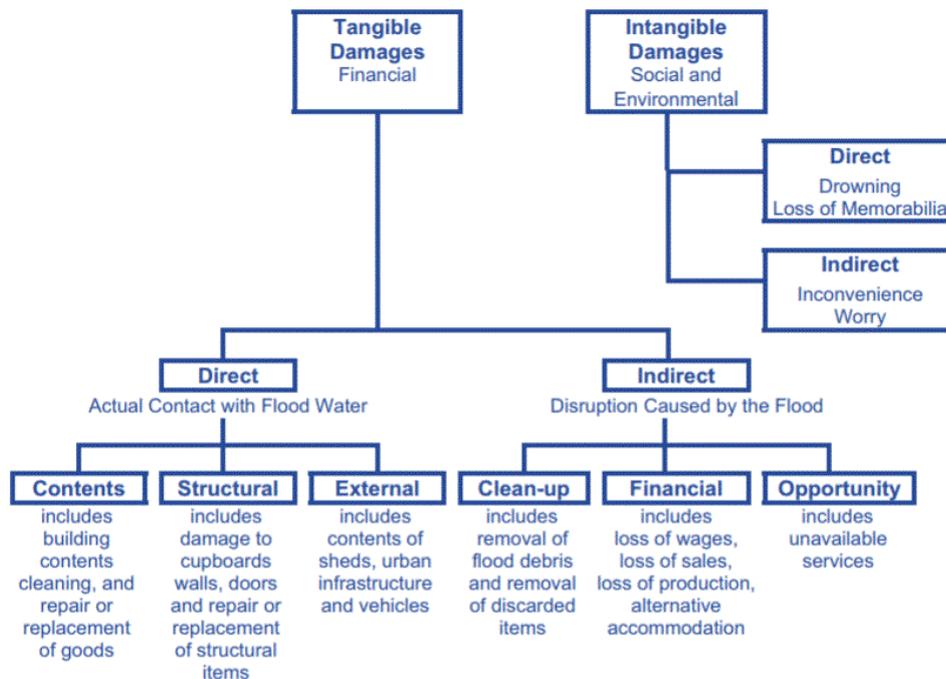


FIGURE M1 - Types of Flood Damage

18. Most importantly however, the Riskscape curves do not show the large difference in flood losses for a flood peak which is centimetres below floor level compared to a flood peak which may be only centimetres above floor level. There are normally no damages for a flood peak just below floor level, whereas a flood only centimetres above floor level causes substantial damage. This is because water gets drawn up into the room linings and insulation (such as fibreglass batts), so that the lower wall linings have to be stripped to allow drying. Also carpets or floor mats will be saturated and impregnated with silty water, and have to be discarded. If the flood happens in the winter (as it often will) it will take weeks, if not months, to dry the floor and walls, so that the residents will be in emergency or alternative accommodation during this time. From past discussions with insurance companies, I understand that the tangible-direct flood losses to a typical timber framed house are in the order of \$30,000. Added to that are the tangible-indirect and intangible losses.

19. In my opinion, clause 152, p25 of the Applicant's "Further Report.....", concerning insurance, is not only irrelevant but shows no empathy for residents who potentially could lose their home for a matter of weeks, if not months. That "the insurer takes on the risk of flood damage to an insured property" may be strictly correct, but house insurance typically does not include tangible-indirect and intangible losses. There is also the matter

of the insurance excess and the premium increasing as a result of an insurance claim, or cover simply becoming unavailable. I note commentary in the media regarding some insurers taking a “*risk-based*” approach to earthquake risks following the huge insurance claims made as a result of the Christchurch and Kaikoura earthquakes. Recognition of flood risks cannot be far behind.

20. The Riskscape analysis described by the Applicant in clauses 147 and 148 of the Applicant’s “Further Report.....”, is therefore totally irrelevant, and the conclusions drawn from the analysis for the upstream dwellings (cl. 248), and for the Wi Pere dwellings (cl. 150) are flawed. Contrary to what the applicant states in clause 249, I believe the applicant must accept that dwellings at locations A, B and E will be adversely affected by the stopbank raising proposal, and the potential effects must be mitigated.

The Whakaahu Return Banks:

21. With respect to item 5.2 of my original submission, in the 25th September 2017 response from HBRC, and in clause 73, page 13 of the Applicant’s “Further Report.....”, the Applicant has advised that it intends to extend the Whakaahu Stream stopbanks upstream of the existing Scheme banks to tie into higher ground. The latest modelling shows that the return banks will be raised about 0.4m above the levels shown in the original application, to acceptable levels for the design flood in the Waipaoa River together with a 10 year event in the Whakaahu stream.
22. Provided that appropriate consultation with landowners takes place, then I have no further concerns on this item.

Flood hazard; designated overflow vs equal level of protection philosophy:

23. With respect to item 1.3 of my submission, it appears that the Applicant is not proposing to adopt a designated overflow path, at least at this stage. In a letter from GDC dated 24th October 2017 there is further explanation as follows:

“Separate to this resource consent, we will be undertaking, in conjunction with other teams in council, flood hazard mapping and modelling that will include risk based stopbank breach scenarios. From this modelling work, it’s possible that preferential spillway or ponding areas may be identified and a process followed to formalise these designations in the District Plan. This work may result in identifying sections of stopbank to mechanically/artificially breach in order to protect specific areas or communities”.

24. In my opinion, this is impractical, as explained in section 6.3 of my original evidence. It should also be noted that there is already a designated overflow upstream of Ford Road that could be used, but raised to operate at a higher level. A section of stopbank opposite Ford Road on the true right bank was also constructed 300mms lower than the design stopbank crest level in the 1992 minor stopbank raising works.

25. Following the 24th October letter, a Technical Memo from GDC dated 7th November 2017 states that:

“It must be pointed out that the ‘equal level of protection’ design approach philosophy is theoretical only. The modelling assumptions used and applied related to super-elevation, velocity, surface roughness, freeboard and so-on all have an impact on design levels.

All endeavours will be made to try to design and construct an equal level of protection throughout the scheme. However all major flood events are not created equal, so there will always be a level of uncertainty for these extreme events”.

26. I agree with the point made in this quote with for floods up to the design standard. However, for super design floods in excess of the design flow, there is no certainty about where floods may overtop and therefore the “equal level of protection” ethos is no longer relevant.

27. The philosophy about how to accommodate super design floods has been discussed in the caucusing on the 8th August (see item 4.10 of the caucusing statement); with some disagreement between the parties. My present position is that I would prefer to see designated overflows on both banks of the river so that both sides are treated equally, and potential overflows over high stopbanks are avoided.

28. Following the Edgecumbe disaster, and the very likely impact of an increased magnitude and frequency of flooding due to climate change, there is a realisation nowadays that investigations for spillways for super design floods should be pursued, as outlined in clauses 41 to 44 in the “Statement of Supplementary Evidence of C. Goodier”. In clause 38 of his evidence, Mr Goodier states that a decision whether to adopt an equal protection philosophy vs designated spillway/s “needs consideration of external factors, such as the impacts on the land and infrastructure in the area covered by the flow path leading from the spill location, and that such a decision was outside the scope of the current application”. I would agree with this assessment, but in my opinion, it should

have been thoroughly investigated and consulted on as part of the upgrade proposal, and included in the original Application.

29. Now that it is considered to be outside the current application (clause 4.10 of the caucusing statement), it runs the risk of being forgotten or ignored in the future, which would be regrettable. Major flood control schemes such as the Waipaoa River FCS are only upgraded about every 50 or 60 years, so the opportunity to consider the merits of alternative flood hazard reduction measures and to adopt the most effective one at the concept stage, viz; before application for a resource consent, is very rare indeed.

Sequence of construction works:

30. In clause 4.11 of the caucusing statement it was agreed that: *“berm reinforcement should be considered as a high priority item in the programme of works”*. Given that Council policy for funding of WRFCS works is to give the highest priority to maintaining and improving the integrity of the existing scheme, I not only agree with this statement, but strongly recommend, for the reasons detailed in section 6.4 of my original evidence. that this should be one of the first, if not the first item to be carried out in the construction programme.

Stopbank strength and stability:

31. As stated in section. 6.5 of my original evidence, in my opinion, a 3 metre top width instead of 4 metres would result in a significant cost saving for the upgrade with little, if any, measurable increase in risk, freeing up money that might be better spent elsewhere. However, a 4 metre top width is certainly desirable and would better facilitate a cycle track, so I would not oppose it. In my opinion a much greater risk to stopbank foundations would be from lateral erosion, which has been already been discussed in relation to clause 30.

Prepared by:

D Peacock

11 Sept. 2018.