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**IN KAPITI COAST DISTRICT COUNCIL PROPOSED DISTRICT PLAN  
HEARINGS**

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**IN THE MATTER OF**

Proposed Kapiti Coast District Plan

**AND IN THE MATTER OF**

Natural Hazard identification at 8 Tangahoe  
Street Paekakariki

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**BRIEF OF EVIDENCE OF DARCY VAUGHAN BRITTLIFF ON BEHALF  
OF KERRY DALTON**

18 July 2016

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**OROGEN LIMITED**  
PO Box 56051 Tawa  
WELLINGTON 5249

I, Darcy Vaughan Brittliff of Porirua am a Chartered Professional Engineer and Company Director:

### **Introduction**

1. I hold a Bachelor of Engineering Degree (Natural Resources) with Honours from the University of Canterbury which I gained in 1999. I am a member of the Institute of Professional Engineers New Zealand and am recognised as a Chartered Professional Engineer in the area of Civil engineering with recognised expertise in civil and land development engineering. I am a member of WaterNZ and also ACENZ.
2. I have prepared and delivered evidence on civil engineering and land development matters to various Council hearings in Napier, Hastings, Wellington, and Christchurch. I have also delivered evidence on land development and civil engineering matters in the Environment Court in Christchurch which involved detailed Expert Witness Caucus over a number of months on technical stormwater matters in addition to presenting evidence to Court on separate hearing dates through that process.
3. I have recently formed my own company Orogen Limited in March 2016 to practice Engineering in my area of interest here in the Wellington Region. Previously I was Director and Manager for Cardno (NZ) Limited based in Wellington from April 2014 to March 2016 where my role was oversight of technical matters in my area of expertise, and business operational functions across New Zealand. Prior to that I was Engineering Manager of the Cardno Wellington office from 2011-2014, and prior to that Engineering Manager of the Cardno Christchurch office from 2007-2011. Prior to that position I worked for Truebridge Callender Beach Limited based in Johnsonville from 2003 and I practised from their newly formed Hastings office as a civil and land development engineer overseeing the central north island projects from 2004-2007. Before joining TCB I worked as a graduate engineer at the Wellington City Council.
4. From these various roles I have a wide range of experience and knowledge gained as a Chartered Professional Engineer consulting on land development and civil engineering matters across the wider central New Zealand region. I have fulfilled the roles of Project Director, Design and Planning Engineer, and

Contracts Manager across planning, design matters, construction, certification and compliance. As a way of recent background the following projects have been completed by me in the past 2 years that are located in the Wellington region:

- 4.1 Staithes Drive development project, Whitby – Project Director (planning, project cost reporting, design, construction management, payment and compliance certifications);
- 4.2 The Banks, Whitby – Peer reviewer (detailed design of stormwater management in and around Duck Creek, erosion and sediment control detailed design for earthworks);
- 4.3 Dommett Street extension, Bellevue – Project Director (planning, project cost reporting, concept design);
- 4.4 Kelson – Due diligence investigation and cost estimation for civil works for 150 lot housing development;
- 4.5 Woodridge – Design and lead engineer for 400 lot development proposed under HASA;
- 4.6 Churton Park – Engineering construction certifying engineer for compliance work with Wellington City Council;
- 4.7 Kapiti Coast – Design Engineering Director for civil engineering issues on the Waikanae River Recharge project for Kapiti Coast District Council.

Wider area and equally relevant projects include:

- 4.8 Hastings – Lyndhurst suburb infrastructure planning and design engineer for an area encompassing 700 new homes in Hastings for the Hastings District Council. Involving stormwater, sewer, water supply, and roading design.
- 4.9 Havelock North – Arataki suburb infrastructure planning and design engineer for an area encompassing 200 new homes in Havelock

North. Involving stormwater, sewer, water supply, and roading design.

- 4.10 Napier – Te Awa District Plan Change from rural to residential landuse. I represented landowners with respect to addressing an onsite stormwater management concept for their land in this hearing.
- 4.11 Christchurch – North West Belfast Living G Zone planning hearing. I represented landowners owning 90 hectares of land in this zone and developed a stormwater management proposal that then was progressed through the Environment Court. Beyond this hearing I led obtaining Resource Consents from Environment Canterbury for the system.
5. I received instruction to provide interpretation of the proposed District Plan hazard map and subsequent interpretation on 8 Tangahoe Street Paekakariki for Ms Dalton. I have also been instructed to then provide my opinion as to the level of risk and contributing factors established from my interpretation of that map and report and present those findings at this hearing.
6. I appreciate Council’s intent to create and publish maps to assist with planning matters in their authorities and I confirm that the request asked of me is within my area of professional competence.
7. I have read and agree to comply with the Code of conduct for expert witnesses. I also understand my obligations according to that Code of conduct including:
- 7.1 an expert witness has an overriding duty to assist the hearing impartially on relevant matters within the expert’s area of expertise;
- 7.2 an expert witness is not an advocate for the party who engages the witness.
8. I confirm that the statements made in this evidence are within my area of expertise (unless I state otherwise) and I also confirm that I have not omitted to consider material facts which might alter the opinions stated in this evidence.

9. In preparing my evidence I have read the following documents:
- 9.1 The Beca report *“Stormwater Submission Review Number 176- K Dalton”* dated 26 May 2015;
  - 9.2 The KCDC Amended Ponding Extents Map – Appendix C of the Beca report;
  - 9.3 Hutt County Council - Tangahoe Street roading and drainage improvement plans – Drawing R66 1965;
  - 9.4 KCDC – GIS – Tangahoe Street.
10. I also confirm that I have visited 8 Tangahoe Street and walked across the stormwater catchment contributing to the Tangahoe Street stormwater drain.

### **BECA REPORT**

11. The Beca report considers the modelling applied by Council to essentially “draw a natural hazard map” to illustrate areas of supposed ponding. There are key points in this report that need to be highlighted and justify a comment from me to enable an opinion on the proposed planning map to be made. These are:
- 11.1 In Section 3 it is speculated that *“If the overland flow was deep enough it would eventually spill west towards the property and into the basin area, as it is lower than the road”* From my observations onsite such an overland flow in Tangahoe Street would need to be greater than 100mm in flow depth to start to overtop the existing vertical kerb on the southern side of the street by number 8 Tangahoe Street. To the west a lower flow depth would be required of around 80mm at the vehicle crossing to 4 Tangahoe Street for this to occur as this is the lowest point in the road.  
  
and
  - 11.2 *“It also appears there is no primary stormwater system along Aperahama Street. Therefore any rainfall that does not soak into the soil will flow down the street towards Tanahoe Street.”* No reticulation is provided in Aperahama Street nor is there a primary system consisting of pipeline and intake

sumps in Tangahoe Street that meets the Council design Code of Practice for a minimum level of service in both Aperahama and Tangahoe Streets.

- 11.3 Section 4 Proposed District Plan describes the ponding flood hazard category as “*These are floodplain areas where slower-moving flood waters could pond either during or after a flood event*”. By definition:

**A floodplain is a flat area along the course of a waterway that is naturally subject to flood.**

By definition alone the proposed map is not illustrating a flood plain as the subject land is not along the course of a waterway nor is it naturally subject to flood. I will outline this opinion later in my statement in Section 12 where I assess runoff in the Tangahoe Street stormwater catchment.

- 11.4 Section 8 then describes the Flood modelling applied with statements that are “*The modelling does not include any allowance for infiltration to ground of water that runs off impervious areas and is ponded in the low area.*”

and

- 11.5 “*The modelled ponding level at the property is 3.4mRL. This is also the recommended building level*”.

and

- 11.6 “*The model indicates that there is potential for flow down Tangahoe Street and spilling south into the low lying area. The model shows flow on the steep street is shallow, typically less than 100mm.*”

- 11.7 Section 9.1 Flood level and Extent “*The 1% AEP ponding level identified in the modelling is 3.4mRL. This compares with a lowest ground level of just over 3.0mRL. Note that this level includes an allowance of 300mm for freeboard in addition to the modelled level, so relates to relatively shallow ponding. However, identification of ponding in this area is considered appropriate to allow for blockage in the piped network and other unaccounted-for obstructions in the*

*overland flow path, which could lead to surface inflows, as well as recognising the potential effects of future sea level rise on groundwater levels and infiltration.”*

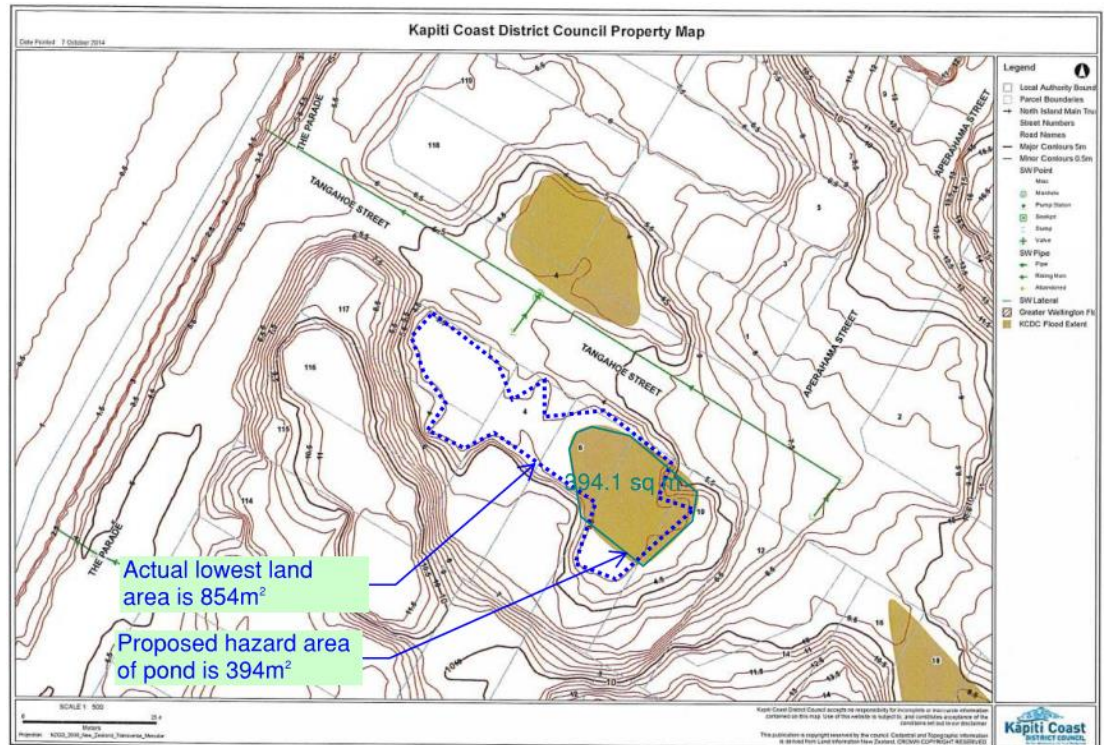
11.8 Section 9.1 Flood level and Extent *“There appears to be some discrepancy between the flooding extent and contours shown. Areas such as the elevated carpark are not reflected in the ponding extent. In addition, the LiDAR indicates the western part of 6 Tangahoe Street is at the same ground level as the pond area, and possible areas on 4 Tangahoe Street, as well as 116 and 117 The Parade. It would be appropriate to better reconcile the mapped extent of ponding in this low-lying area with the latest topographic data.”*

11.9 Based on these statements the pond modelled includes an added freeboard depth of 300mm meaning that we are talking about a pond that is 100mm in depth based on:

Pond height = 3.4m (modelled pond surface level)  
 = 3.4 - 0.3m (minus freeboard)  
 = 3.1m

Depth of pond = 3.1m – 3.0m (Pond height – ground level)  
 = 0.1m or 100mm

11.10 Evaluation of the area of the proposed ponding shown in the appendix of the Beca report is shown in the following figure. The area of the supposed ponding is around 394m<sup>2</sup>. At a 0.1m depth this equates to 39m<sup>3</sup> of water without any soakage or loss to ground.



11.11 As stated in the Beca report and observed by me on the ground the lower land is actually larger than depicted in the model and is indicated by the dotted area on the figure which I estimate at 854m<sup>2</sup>. For the same 39m<sup>3</sup> volume of water to sit on this land the depth would be reduced as the area is larger and mathematically this is a depth of 45mm.

11.12 A synopsis can then be made from the Beca report that essentially summates that inflow to the low land may occur if the current kerb and channel is overtopped (by whatever means) in Tangahoe Street. But that occurrence is likely to be low as the flow in Tangahoe Street during the design event is expected to be lower than a 100mm depth being the height of the current kerb. The low land shown in the KCDC PDP is incorrectly illustrated and should include other adjoining land and that land too would potentially pond water if it was received from Tangahoe Street (or its own land) if that did not drain via soakage.

11.13 We can conclude from that information that if water was to overtop the kerb and enter the land, and that conservatively allowing for climate change and nil disposal via soakage, from the model an anticipated pond in the order of 39m<sup>3</sup> would form. Which I assess as



around a 45mm water depth across the low land. In reality soakage would occur at some rate which would mean that this water depth would be less than this assessment.

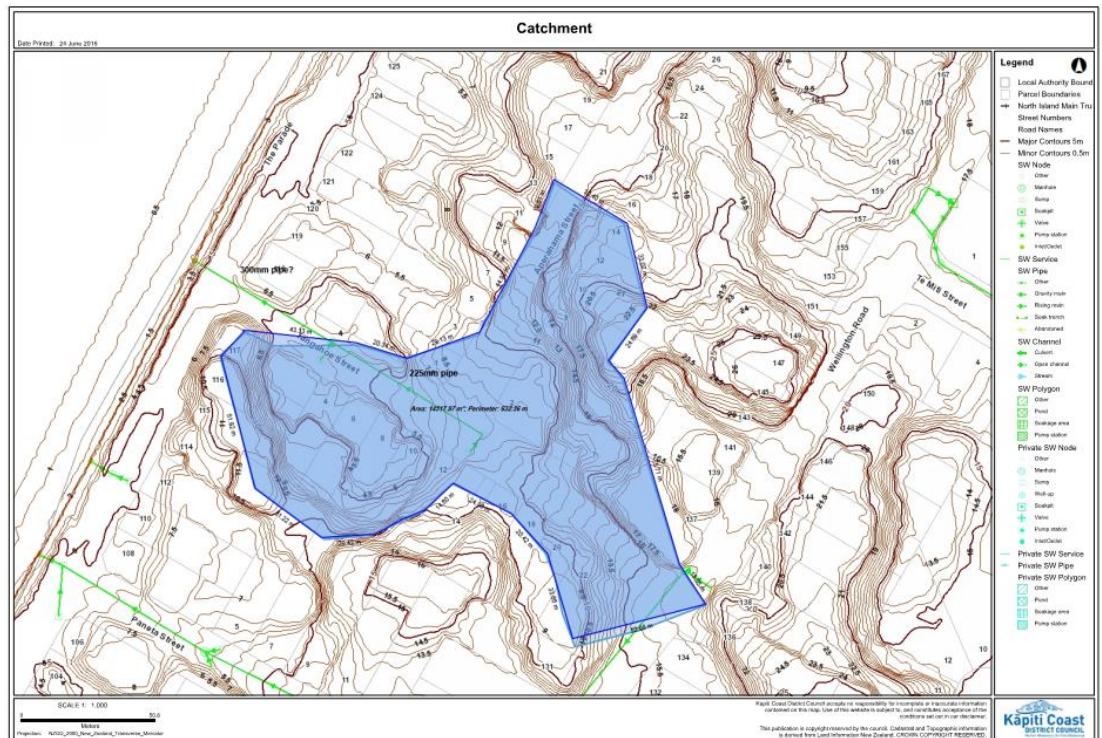
11.14 In my view with knowledge of the scale and potential source of ponding water the question needs to be tested on the fundamental application of the hazard map and this lies in its definition. Two flaws in application of the term “flood plain” exist in relation to the subject land and these are:

11.14.1 The land is not adjacent to a natural water course that periodically occupies part of the land as a function of the water course itself.

11.14.2 The perception is that the runoff might enter the land and the primary source of that water is from the drainage of Tangahoe and Aperahama Streets and that runoff is in my view not a natural occurrence as the water is the direct result of development of these streets and it therefore should be managed within those road corridors as would occur in any other development in the District.

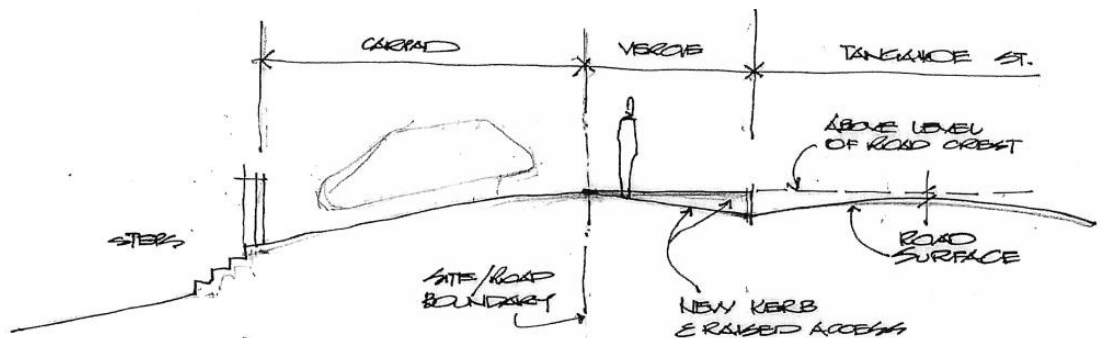
#### **Review of the Catchment and opinion on anticipated runoff behaviour**

12. I have walked the catchment to review the current location of intakes to the primary stormwater system and to consider any potential cross catchment runoff routes and secondary overland flow routes. With that information I can then form an opinion on potential mitigation options and provide an opinion on risk.
13. The catchment that I have identified is shown on the following figure which is a total of 1.45 hectares.



14. The catchment includes approximately a mix of 1/3 residential land and 2/3 Council road. All of which directs to Tangahoe Street where it is collected in 4 intake sumps before discharge to the sea on The Parade.
15. The primary stormwater system was installed in 1965 and is a 225mm and 300mm pipe connecting the 4 sumps in Tangahoe Street. There is no doubt that in a modern design assessment this primary system would be under capacity in the sense of number of intakes and also potentially pipe size based on today's consideration of design rainfall and outlet water level conditions that accommodate for climate change.
16. In saying that the system does have a capacity and would provide drainage from Tangahoe Street to the outlet in any event. I estimate this capacity to be around the 100L/s value considering a hydraulic slope of approximately 1%. The question is what is the overland flow beyond that capacity, and where is that likely to be, to then provide an evaluation of risk.
17. Without the results of the Council model I can prepare simplified rational method calculation of the runoff during the design event which I estimate is in the order of 300L/s for a 1% AEP event accommodating for climate change effects.

18. Of that flow 220L/s is conveyed through Tangahoe Street. Using my values this means that 100L/s would enter the primary system level leaving something like 120L/s of peak sheet flow on the road as surface flow, or 60L/s either side of the road, in a 1% AEP event.
19. By my assessment a flow in the order of 60L/s results in a kerb water depth of around 70-80mm based on a 2.4% longitudinal kerb gradient.
20. The scale of this sheet flow aligns to the statements made in the Beca report where they say that flow is likely to be less than 100mm (refer my clause 11.6 above).
21. It would therefore stand to reason that if the sheet flows are in the order of those anticipated and they can be contained within the kerb then in fact the risk of direct runoff entering the lower land below the road at RL 3.5m is very low if not entirely eliminated.
22. Using my values you can consider a broad assessment that Beca are correct and that the flow depth is unlikely to overtop the kerb as the flow is expected to be around 60L/s and the kerb can contain around 70-80L/s. The issue is direct routes from the kerb to the low area and these exist in the form of vehicle crossings and driveways particularly that at 117 The Parade.
23. On inspections of the kerb and berm detail, a simplified improvement could be made in the absence of upgrading any stormwater reticulation. The improvement consists of establishing a defined berm through cutting the road along the southern kerb to create high entry points to the low land relative to any flow by reforming the berm and kerb as per the below figure:



Potential Tangahoe Street improvement  
Not to Scale

24. The work required to create this formation is minimal and only needs to occur from 8 Tangahoe Street through and beyond the driveway to 117 The Parade which is on Tangahoe Street, some 50 metres.
25. Therefore, it is my opinion that the catchment currently conveys water via a stormwater system in Tangahoe Street that does not pose a direct risk to property and certainly not dwellings if it can be contained within Tangahoe Street.
26. The proposed hazard map does not reflect the result of a natural flood plain situation nor can it be appropriately quantified by Council's consultants and myself as it relies on overtopping of kerb in a street that when assessed indicates capacity of conveyance.
27. The catchment does however exhibit a low driveway at 4 Tangahoe Street that could be improved by way of a 50 metre berm improvement to further eliminate the risk of direct road runoff entering these properties.

#### **Suggested Natural Hazard Map**

28. The proposed natural hazard map with respect to 8 Tangahoe Street is erroneous and for the purposes of future land planning does not record the natural flood plain events of a waterway.
29. Upon my review of the catchment and its flow paths, I am of the opinion that any potential runoff from the catchment to the low area, not generated on the land itself, can be eliminated from running into that land if it was purported to occur.
30. Based upon the information that I have reviewed I do not see any value in including a Hazard Map that highlights the land as being subject to a flood plain when there is no waterway present and the perceived risk once quantified is minute and actually able to be completely mitigated through simple improvements to a road berm and kerb detail for 50 metres of road.
31. Outside of my professional expertise is an area of property valuation. But within my area of expertise is civil construction. Comparing the potential valuation impacts on the properties on Tangahoe Street from the imposition of such a Natural Hazard map against the civil costs for berm reconstruction that

I estimate to be in the order of \$20,000 including design and compliance costs is one that is a fraction of what I presume would be the impact on property valuations should the map be imposed.

### **Conclusion**

32. Based on the information I have reviewed I am of the opinion that the proposed flooding area by the PDP is not one based on reliable information that reflects a natural process as the result of a water way. My view is that the actual overland flow supposedly generating the depicted flood area is one that can be contained within Tangahoe Street and therefore should not be illustrated on a planning map for the street. Irrespective of the source of the water the quantity is also one that does not pose a risk to dwellings at this location.

Signed:



Darcy Vaughan Brittliff B.Eng (Nat.Res)(Hons.) CPEng (Civil) IntPE

Date: 18<sup>th</sup> July 2016