Before Wellington City Council

Under	the Resource Management Act 1991
In the matter of	Plan Change 81: Rezoning 320 The Terrace and de-listing the Gordon Wilson Flats

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STATEMENT OF EVIDENCE OF DAVID WOOD
(STRUCTURAL ENGINEERING)

1 December 2015

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INTRODUCTION

1. My full name is David Reginald Wood.

Qualifications and Experience

2. I am a Technical Director of Structural Engineering in Beca's Wellington office.

3. I am a Chartered Professional Engineer of 23 years' experience, practicing mainly in the design of commercial building structures. I am experienced in the design of high rise structures, in particular reinforced concrete structures with piled foundations.

Code of Conduct

4. I confirm that I have read the Code of Conduct for expert witnesses in the Environment Court Practice Note 2014 and that I have complied with it when preparing this evidence. Other than when I state that I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

5. Beca Ltd was appointed at the end of November 2014 by Victoria University of Wellington ("VUW") to carry out a building condition assessment of the Gordon Wilson Flats, covering building services and structural condition. The latter included a Detailed Seismic Assessment (DSA). Beca's assessments and conclusions are reported in two documents which both formed part of the documentation lodged with the application for Plan Change 81:

   (a) 314 The Terrace – Building Structure Condition & Detailed Seismic Assessment, 28 May 2015 ("the Seismic Report")

   (b) 314 The Terrace – Building Services Condition Assessment – Services, 8 May 2015

6. I was not involved in the initial work or the preparation of either of those reports. I have reviewed the Seismic Report and the information

available to Beca at the time the Seismic Report was written, and I have discussed that report with some of my colleagues who undertook the initial assessment. I undertook a non-invasive site inspection on 9 November 2015. Except as discussed in this statement, I adopt the assessment and conclusions expressed in the Seismic Report as my own.

7. I have also been involved in the preparation of a specification for work to maintain the building façade, issued in draft form for costing purposes on 12 November.

8. I also arranged and supervised a physical inspection of part of one of the building piles on 23 November 2015, to attempt to resolve uncertainty in relation to the pile type.

9. I have read the Council officers' report dated 25 November 2015, which recommends a decision confirming the proposed Plan Change, and I agree with that recommendation and the reasons for it. I have been asked by VUW to provide this statement of evidence covering:

   (a) A summary of the Seismic Report and my subsequent work and

   (b) Responses to issues raised by submitters relevant to my area of expertise.

SUMMARY OF SEISMIC REPORT AND SUBSEQUENT WORK

10. From a structural engineering point of view, the Gordon Wilson Flats at 320 The Terrace is a reinforced concrete wall structure on concrete pile foundations.

11. The building has complete (over its plan) concrete floors at every second level, with intermediate timber floors accessed by lightweight stairs from the concrete floor level below. The front and rear edges of the timber floor levels are constructed in concrete, over the width of balcony soffit exposed to the outside.

12. In the long direction, the building is braced against seismic and wind induced lateral loading by a diagonally reinforced spine wall (as

shown on the construction drawings), placed slightly off centre and regularly punctured by door openings. The openings are organised to allow continuous diagonal bands of reinforcing. Our assessment of this wall is that it rates at least 50% of the New Building Standard (*%NBS*) in terms of seismic capacity and performance, on the basis that Importance Level 2 applies.

13. In the short (transverse) direction, the building is braced on the intertenancy lines by concrete walls with simpler vertical and horizontal reinforcing. The design of these walls is expected to achieve about 80*%NBS*.

14. The building is founded on piles thought to be of length 6-14m (based on tender drawings). The drawings show driven precast concrete piles, while other sources suggest that the piles were constructed by a dry grouted method. When the Seismic Report was prepared, it was concluded that a dry grouted method of construction might lack reliability.

15. Since the Seismic Report was prepared, exposure of one pile near the head confirmed a bored pile, rather than a driven octagonal pile as shown in the drawings. We ran a reinforcing cover meter over the pile from which it seems there are perhaps 6 vertical bars and some hoops in the pile. The surface of the pile was very hard, with not very much aggregate evident. No reliable integrity test was possible within the scale of this investigation.

16. Although the quality of the foundations has not been investigated at depth, the foundations are considered likely to be adequate to develop the seismic capacities stated above. We have not seen evidence of building settlement which might be attributable to poor pile condition or foundation failure.

17. The building façade has many areas of damage, and these appear to be due to lost durability after 55 years of life. In particular, exposed concrete slab and wall edges and precast concrete mullions exhibit concrete spalling, where reinforcing has had low amounts of concrete cover. The façade damage implies an overall building seismic rating of less than 34%NBS. The building must therefore be

considered Earthquake Prone until any façade remedial work is undertaken and completed.

18. We have undertaken a brief inspection of the Eastern (front) and Western (rear) facades. We consider that full reinstatement of the critical concrete edges would be required to reliably retain the façade features. Our further inspection suggests that a curtain wall "covering" of the existing façade would be difficult and expensive to implement.

19. We have prepared a draft specification for potential façade maintenance, and have conferred with Adam Wild of Archifact in relation to the heritage values relevant to this.

MATTERS RAISED IN SUBMISSIONS

Submission No. 3 – The Architectural Centre.

20. The submitter raises the possibility of replacing the façade (paragraph 2(g)). We do not address the possibility of a new curtain wall, as the advice obtained from Mr Wild is that it would materially diminish the heritage significance of the building.

21. We consider that a "like for like" replacement of damaged or susceptible façade features could generally provide a suitable solution to address the loss of strength and integrity that has occurred as a result of deterioration due to weathering. The original drawings suggest that some asbestos sheeting was used in the balcony balustrade systems. Modern alternatives could be used to replace elements of the balustrades.

22. The submitter also queries whether there has been sufficient research to ascertain the pile type (paragraph 3(e)). Archival research has now been conducted. Further information on the piled foundations was indicated by a summary listing of held information, obtained from Opus. However, retrieval at Archives NZ did not yield this information. Accordingly, as described above, we undertook an excavation on site to expose and examine the head of one pile. In my view, while the upper section of the pile may not be fully representative of the

pile condition at depth, it does confirm the pile type, and it is reasonable to assume uniformity of type.

Submission No. 26 – Schrader, Kelly & Cochran.

23. These submitters state the piling system 'ensured a better key with the sloping rock beds', relying on an article form the February, 1961 *Journal of the New Zealand Institute of Architects.* This may imply that the pile type guarantees superior performance, which is not the case. The dry grout method of concrete pile construction is not used in large scale construction today, to my knowledge. The information that I have gathered would suggest that this method was used for this building because of potential difficulties in achieving the key with the sloping rock beds using the originally specified driven piles. It would also have been advantageous to minimise the time that a bored pile would need to be left open before it could be concreted. Although the uniformity of the grouting over the full depth of the pile cannot be confirmed, I would be surprised if the aggregate did not extend uniformly over the full depth.

24. These submitters also assert that the building's technological value is enhanced because it is said to have included equipment to measure seismic movements, which was not a common practice in New Zealand at the time. From a structural engineering point of view, we consider that the technological value of equipment placed in the building to measure building movements and material strains rests in the results obtained and their interpretation, unless the equipment survives as an historical example of science and ingenuity. To my knowledge, neither results, nor any interpretation of results, nor any equipment itself has been revealed by us or any others involved with the building.

OFFICERS' REPORT

25. I concur with the officer's report at paragraph 23, where it is noted that the building is considered unsafe. This is due to degradation of the façade elements over time, rather than any concern that the building structure is at risk of overall collapse.

26. At Attachment I, the council's engineer concurs with Beca's assessment that the building is Earthquake Prone on account of the condition of the façade elements.

DAVID WOOD
1 December 2015