

In the Environment Court of New Zealand  
Auckland Registry

I Mua I Te Kōti Taiao O Aotearoa  
Ki Tāmaki Makaurau

**ENV-2023-AKL-160**

Under the Resource Management Act 1991

In the matter of An application for a direct referral to the Environment Court under section 87G of the Act for an order granting the applicant's resource consent applications to construct and operate a new asphalt plant at 54 Aerodrome Road, Mt Maunganui, together with an application for consent to authorise the continued operation of the existing asphalt plant on the site pending construction of the new plant

Between **Allied Asphalt Limited**

Applicant

And **Bay of Plenty Regional Council and Tauranga City Council**

Consent Authorities

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**Statement of Evidence of Nathan Paul McKenzie**

**(Geotechnical)**

29 February 2024

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**Counsel acting:**

Stephen Christensen

Project Barrister

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## Qualifications and experience

- 1 My full name is Nathan Paul McKenzie.
- 2 I hold a Bachelor of Engineering - Civil (1<sup>st</sup> Class Honours) and a Doctor of Philosophy completed in the field of geotechnical earthquake engineering. I am a member of Engineering New Zealand and the Geotechnical Society of New Zealand.
- 3 I am currently employed as a Technical Director of Beca Limited and have held that position since 2011.
- 4 I have worked as a consulting engineer for around 23 years, specialising in geotechnical and civil engineering. My previous work experience includes geotechnical and civil design for a wide range of civil infrastructure, industrial and building projects. I have completed geotechnical site appraisals and design for other similar proposed developments. My design experience includes liquefaction assessment, ground improvement design to mitigate liquefaction and geotechnical foundation design.
- 5 My role in relation to Allied Asphalt Limited's (**Allied**) application for resource consents for a new asphalt plant and the continued operation of an existing plant pending construction of the new plant at 54 Aerodrome Road, Mt Maunganui (**Application**) has been to provide advice in relation to Geotechnical Engineering. I drafted the Preliminary Geotechnical Appraisal report to the Assessment of Environment Effects (**AEE**) accompanying the Application, which appears at Appendix 15 of the AEE.
- 6 My assessment is based upon the project description provided in the planning evidence of Mr Craig Batchelar.
- 7 In preparing this statement of evidence I have considered the following documents:
  - (a) the AEE accompanying the Application;
  - (b) submissions relevant to my area of expertise;
  - (c) planning provisions relevant to my area of expertise;
  - (d) section 87F report.
- 8 I have not visited the Application Site.

### **Code of Conduct for Expert Witnesses**

9 I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state 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**

- 10 I have prepared evidence in relation to:
- (a) the existing environment of the Application Site as it is relevant to my area of expertise;
  - (b) the key findings of my assessment of effects;
  - (c) matters raised by submitters on the Application;
  - (d) matters raised in the Bay of Plenty Regional Council and Tauranga City Council s87F report; and
  - (e) Proposed conditions of consent.

### **The existing environment**

- 11 The site is at 54 Aerodrome Road, Mount Maunganui, Tauranga. The surrounding industrial area in Mount Maunganui is mainly used for light industry and transport logistics. Several existing structures in adjoining properties are located close to the site boundary.
- 12 The current site occupies a rectangular area of approximately 70m by 100m and comprises an existing asphalt plant, a small office, vehicle parking, and aggregate stockpile areas. The site is relatively flat. Disused concrete foundations/pads are present in the southern part of the site.
- 13 An adjoining site occupied by Fulton Hogan Limited is being redeveloped as shown on Drawing 20-1666 C-100 Rev A (dated 14 08 2023). The redevelopment of this adjoining site by Fulton Hogan Limited has no impact on my assessment for the Allied site.
- 14 The site is located at Mt Maunganui on a peninsula formed by marginal marine and alluvial deposition of sands and silts, which join the remnants of the Mount Maunganui Volcano to the mainland.

- 15 Some geotechnical testing information is available for the site, comprising two Cone Penetration Tests (CPTs) and eight hand augers within or close to the site. Five other existing CPTs from nearby sites were also used to characterise the ground conditions.
- 16 Ground conditions at the site, based on available information, are expected to comprise the following:
  - (a) Fill (0.9m to 1.5m thick) comprising pavement materials, gravels and sands.
  - (b) Topsoil (0.3m to 0.5m thick) comprising a silty sand with organic material.
  - (c) Tauranga Group Coastal Beach Deposits (15m to 18m thick) comprising loose to dense sands and sandy silts.
  - (d) Holocene Swamp Deposits (11m thick) comprising a firm to stiff clayey silt with organics.
  - (e) Matua Subgroup (thickness not confirmed) comprising medium dense to dense silts and sands.
- 17 Groundwater is expected to be encountered at 1.5m to 2.5m depth below ground level.
- 18 The ground conditions at the site encountered are consistent with the mapped site geology.

### **Geotechnical hazards and mitigation**

- 19 Geotechnical hazards identified for the site that are expected to influence the proposed re-development of the site include liquefaction in a moderate to large earthquake event, ground settlement and low bearing capacity for shallow foundations.

#### **Liquefaction**

- 20 Liquefaction occurs when loose, saturated cohesionless soils lose strength under earthquake or other applied cyclic loading. The earthquake loading will cause the loose soil particles to densify. When the soils are saturated, the relatively incompressible pore water around the soil particles does not allow for densification to occur in the short-term. This causes the pore water pressure to increase significantly and the effective stress within the affected soil to correspondingly decrease. When the effective stress approaches or equals zero, the soil loses most of its shear strength and behaves as a

liquid, hence the term “liquefaction”. This condition will persist until excess pore water pressures dissipate and the soil strength increases. Excess pore water pressures within liquefied soils can continue to exist after the earthquake shaking has stopped.

- 21 Liquefaction in a moderate to large earthquake event is expected to affect the sandy soils underlying the site, including the Tauranga Group Coastal Beach Deposits, resulting in temporary strength loss and post-earthquake settlement occurring. This hazard is common to the wider Mt Maunganui area and many coastal areas around New Zealand.
- 22 The foundation design for the proposed redevelopment of the site will need to take account of the liquefaction hazard. There are a range of potential solutions that may be adopted, including designing shallow foundations to accommodate the reduced soil strength, creating a strengthened soil block below new shallow foundations, or using deeper pile foundations. Ground strengthening options include excavating loose soils and replacing with engineered fill, or in situ mixing of soils with cement to create a stabilised block. Other ground strengthening options could also be considered. These foundation options are commonly adopted in similar ground conditions and are suitable for this site. Further geotechnical site investigation and design will be needed to confirm a preferred solution.

### **High Ground Settlement and Low Bearing Capacity**

- 23 The buried topsoil layer expected below the site could potentially cause high and variable static ground settlement under new structures or fill loads. Additional ground settlement of widespread loads could potentially occur due to the compression of the deeper swamp deposits, although this seems unlikely to be significant for the expected depth of these soils. (approximately 18m to the top of this layer based on available information).
- 24 The buried topsoil layer could also limit the bearing capacity of shallow founded structures.
- 25 The geotechnical hazards associated with the buried topsoil layer can be mitigated by either excavating these weak soils and replacing with engineered fill, or by accommodating the low strength and high compressibility into the foundation design for the proposed redevelopment.
- 26 Proposed aggregate storage bins around the perimeter of the site may potentially cause ground settlement affecting existing structures in adjoining sites, with a risk of damage to these structures. This potential adverse effect can be managed by designing the aggregate bin foundations to reduce ground settlement, although some settlement affecting adjoining

sites will still occur. Managing this settlement hazard for the proposed aggregate storage bins will likely require condition assessment surveys for nearby structures, settlement monitoring of at-risk structures during and following construction to measure actual settlements, and with provision to repair any damage that is caused by the ground settlement associated with the proposed redevelopment. This is a commonly adopted approach to manage ground settlement effects and is suitable here.

### **Matters raised by submitters**

- 27 No geotechnical matters were raised by submitters, based on my review of the Summary of Submissions (as set out in Appendix B of the S87F report).

### **Matters raised by s87F report**

- 28 Section 7.11 of the s87F report summarises a review of the geotechnical assessment undertaken. Review queries were responded to and resolved for the resource consent application. The reviewer noted the need for additional ground investigation and geotechnical design to manage geotechnical site risks, consistent with recommendations given in the Beca Preliminary Geotechnical Appraisal (Beca 2022).

### **Proposed consent conditions**

- 29 I have seen the proposed conditions and support them as being appropriate.
- 30 The potential for ground settlement to affect structures in adjoining properties is proposed to be addressed during the building consent stage once the proposed settlement effects are quantified. I consider that approach to be reasonable.

### **Conclusion**

- 31 The identified geotechnical hazards identified at the proposed Mount Maunganui site include liquefaction in a moderate to large earthquake event, and soil layers of high compressibility and low bearing capacity. These geotechnical hazards are commonly encountered within the area. The identified potential foundation mitigation options to manage these hazards are commonly used and are suitable for this site.
- 32 Foundations for new structures are expected to be influenced by seismic liquefaction effects and may require ground improvements, potentially comprising excavation and replacement of near surface soils or ground strengthening options, to achieve an adequate bearing capacity and limit

ground movements. This treatment may also be required to remove an old buried topsoil layer that appears to be present across the site.

- 33 Deeper ground improvements (e.g. excavate and replace weak soils or in situ strengthen soils) or pile foundations may be considered where the performance of shallow foundations were insufficient for the proposed redevelopment.
- 34 Potential settlement effects of proposed aggregate storage bins on existing buildings in adjoining properties will require assessment as part of future design stages. Future design work will quantify expected settlements. Construction settlement monitoring and building condition assessments of structures at risk are recommended to be completed to confirm actual effects, with provision to undertake repairs if needed.
- 35 The available information is considered adequate to understand geotechnical constraints in support of the resource consent but are not sufficient for the detailed design of the new asphalt plant. Site specific geotechnical investigations and design will be required to develop appropriate foundations for the proposed redevelopment.



**Nathan Paul McKenzie**

Dated this 29<sup>th</sup> day of February 2024