

**BEFORE INDEPENDENT HEARING COMMISSIONERS APPOINTED BY THE
CENTRAL OTAGO DISTRICT COUNCIL**

IN THE MATTER OF

The Resource Management Act 1991 (**RMA** or
the Act)

AND

IN THE MATTER OF

Of the Central Otago Operative District Plan
(**CODP**) and Proposed Plan Change 19 to the
Central Otago District Plan (**PC19**)

AND

IN THE MATTER OF

Applications to the Central Otago District
Council (**CODC**) by **D. J Jones Family Trust**
and N.R Searell Family Trust for subdivision
and land use resource consents for residential
subdivision and development at 88 Terrace
Street, Bannockburn (**RC230398**)

**EVIDENCE OF THOMAS RICHARD JUSTICE
ON BEHALF OF D. J JONES FAMILY TRUST AND N.R SEARELL FAMILY TRUST**

Dated: 27 September 2024

Presented for filing by:
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INTRODUCTION

- 1 My name is Richard Justice.
- 2 I am a Principal Engineering Geologist with ENGEO. I have the following qualifications:
 - (a) I have a Master of Science (Engineering Geology) with 1st class Honors and a Bachelor of Science, both obtained from the University of Canterbury.
 - (b) I am an Engineering NZ Chartered Member (Professional Engineering Geologist; PEngGeol) number 211093 and an elected committee member of the New Zealand Geotechnical Society.
- 3 I have worked in the geotechnical/geohazard industry in both the public and private sectors for approximately 30 years. My work has had a particular focus on:
 - (a) Geological Hazard Evaluation
 - (b) Geotechnical Risk Assessment
 - (c) Landslide Investigations and Mitigation
 - (d) Rockfall Assessment and Mitigation
 - (e) Debris Flow Assessment
- 4 My role in relation to the application for resource consent (**Application**) to the Central Otago District Council (**CODC**) by D. J Jones Family Trust and N.R Searell Family Trust (**Trust** or **Applicant**), is as an independent expert witness to the Trust on geotechnical matters.
- 5 The Application was publicly notified and a number of submissions were received in support of, and in opposition to the Application. On 20 September 2024 the CODC released an Officer Report for prepared under section 42A of the RMA containing an analysis of the Application and a recommendation in response to the Application (**Officer Report**).
- 6 Although this is not an Environment Court proceeding, I have read the Environment Court's Code of Conduct and agree to comply with it. My qualifications as an expert are set out above. The matters addressed in my evidence are within my area of expertise, however where I make statements on issues that are not in my area of expertise, I will state whose evidence I
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have relied upon. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my evidence.

SCOPE OF EVIDENCE

- 7 In my evidence I address the following issues:
- (a) The geotechnical setting of the proposed subdivision and, the geohazards that are present at the site;
 - (b) The proposed mitigations for the identified geohazards;
 - (c) Those submissions in opposition that address matters within scope of my expertise, with particular emphasis on matters where there is a difference of view between myself and the submitter; and
 - (d) Those parts of the Officer Report that address matters within scope of my expertise. I note there are no differences of view between myself and the Officer Report.

CONTEXT

- 8 The Trust has applied for a subdivision and land use resource consent for a residential subdivision comprising residential 20 lots, including the construction of an internal access road and rights of way, recreation reserve and balance lots (**Proposal**) at 88 Terrace Street, Bannockburn, legally referred to as Lot 4 DP339137 (**Site**).
- 9 The Site is 17.6ha in area and is accessed from the eastern extent of Terrace Street and is characterised as a large undeveloped residential zone allotment located at the edge of the existing Bannockburn township. The site is bounded by Shepherd's Creek to the east, Revell's Gully to the north, undeveloped residential land to the west and existing residential land generally to the south.
- 10 The Site is zoned Residential Resource Area (4) (**RRA(4)**) in the CODP and is partially within a building line restriction overlay (**BLR**) identified on the CODP maps. A restricted discretionary activity resource consent is required under the CODP for subdivision in the RRA(4) zone and to locate buildings within the BLR.

SUMMARY OF MY INITIAL ASSESSMENT

- 11 I have earlier prepared a geotechnical assessment for the Proposal which was included in the Application¹. I note that the report included in the Application is a draft, dated 2 December 2021. A copy of my final report dated 24 May 2022 is appended to my evidence at **Appendix A**. I note that there are no significant changes between the draft and final versions, other than the correction of a cross-referencing error at page 10 of the draft.
- 12 The investigation completed under my report included a desktop review of existing geological data, historical aerial photographs, and a review of the Otago Regional Council hazard database. A site assessment was performed to map geomorphological features, and a series of shallow subsurface investigations were undertaken.
- 13 In this section I will provide a brief summary of my assessment.

Site Description and Background

- 14 The proposed subdivision comprises an area of land approximately 17.6 hectares. Over the majority of the area of the subdivision, the ground surface comprises an undulating terrace between 270 m and 275 m approximately, before dropping steeply to the north towards Revell's Gully, east towards Bannockburn inlet and south towards Shepherds Creek. Slope angles are typically less than 10° over the majority of the subdivision, however slopes of between 25 and 37.5° are apparent on the lower parts of proposed Lots 15 to 20 above Shepherd's Creek. Very steep to subvertical slopes are apparent in close proximity to proposed Lots 1 and 9.
- 15 The site shows evidence of former gold mining works dating back to (I assume) pre-1900's. This is identified by a network of historic water races and deeply incised gullies to the northwest of the area of the proposed subdivision. The steep slopes mentioned at Paragraph 13 above are related to these historical sluicings.

¹ Appendix [x] to the Original Application for a resource consent
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dated 27 September 2024

Desktop Review

Geological Setting

16 The subject site is geologically mapped as being partly underlain by lake clays, silts, oil shales and lignite of the Bannockburn and Dunstan Formations of the Manuherikia Group. These sediments are in turn underlain by Otago Schist, which forms the bedrock for the large majority of the Otago region. Alluvial Gravels, derived from erosion of the nearby Carrick Range, have been mapped in close vicinity to the site. All of these materials are mantled by a thin and discontinuous layer of Colluvium, likely formed from remobilised lacustrine sediments and / or alluvial gravels.

Geohazards

17 No active fault traces were observed in the field nor have been reported in the vicinity of the site. The only known active faults within the 20 km of the site are the Dunstan Fault which is approximately 15 km to the east and the Pisa Fault which is approximately 5 km to the west.

18 As the site is elevated, groundwater is expected to be at significant depth such that liquefaction is most unlikely to occur.

19 The site is not subject to rockfall or rapid landslide inundation hazards.

Site Specific Investigations

20 Field investigations comprised;

- (a) Engineering geological mapping of the site
- (b) Logging of 11 test pits and two soil exposures to assess subsurface conditions.

21 Four Hand Auger investigations, with Scala Penetrometer testing on Lot 18, located on the southeastern side of the proposed subdivision, where a shallow landslide was identified during the initial site walkover assessment.

Engineering Geological Mapping

22 There is some evidence of land instability at within the area of the proposed subdivision. Two forms of potential land instability are apparent;

- (a) Soil Topping/Cliff collapse from the steep to subvertical slopes formed from sluicing

- (b) There is some evidence of shallow seated landsliding on Lot 18. Based on its surface expression and the investigations undertaken on this lot (described in Paragraph 21), I expect that this landslide is shallow and involves the displacement of colluvial soil over rock.

Subsurface Conditions

- 23 Investigations located in the western extent of the site intercepted between 0.3 to 0.8 m of weathered alluvium, comprising medium dense to dense fine sand with some silt and minor gravels.
- 24 Fine grained, lacustrine (lake sediment) material was encountered in Lot 9 down to a target depth of 2.5 m. Over the majority of the remainder of proposed subdivision, up to approximately 0.9m of lacustrine material, typically recovered as medium dense to dense silty fine sand, was encountered. Highly to slightly weathered, extremely weak to moderately strong Schist was interpreted below lacustrine material.
- 25 The orientation of foliation within the Schist was measured as generally between 18° – 22° dip to the southeast, consistent with measurements taken from surrounding schist outcrops.
- 26 Handheld investigations on proposed Lot 18 intercepted colluvium overlying shallow bedrock to depths between 0.3 m and 1 m. The colluvium typically comprised remobilized lacustrine sediments and was recorded as silty fine sand, light brown, medium dense, dry and poorly graded.
- 27 Groundwater was not encountered in any of the investigations.

Assessment

- 28 To provide guidance for future development, a constraints map was developed outlining potential risk to the proposed subdivision by combining our knowledge of past and present site conditions to guide future works. The constraints map considers interactions between the following:
- (a) Site geology;
- (b) Geomorphological conditions, in particular the locations of observed landslides; and
- (c) Site steepness.
- 29 The risk classes are categorized as follows:

- (a) Class 1: Low slope gradients with no evidence of instability; minimal limitations for residential development.
- (b) Class 2: Moderate slope gradients with potential instability after heavy rainfall; may require shallow earthworks.
- (c) Class 3: Moderate to steep slopes with likely instability under adverse conditions; specific engineering design needed.
- (d) Class 4: Steep slopes with evidence of instability; substantial engineering works required.
- (e) Class 5: Very steep slopes with active instability; complex engineering solutions necessary.

30 The constraints map developed for the proposed subdivision is shown in Appendix 5 of my report. I summarise this map as follows:

- (a) The majority of the proposed lots are assessed as development risk Class 1. I do not expect that these areas will be subject to any significant natural hazard risk.
- (b) Lot 1 and 9 are in close proximity to areas assessed as Class 5. This class represents the very steep slopes associated with the historical sluicing.
- (c) The lower parts of proposed Lots 13, 14 and 20 are within areas assessed to be Class 2 or 3. However, I would expect that any houses developed would be in the upper part of these lots which is assessed as Class 1.
- (d) Lots 15, 16, 17 and 19 are indicated to be Class 2, principally due to the relative steepness of these lots.
- (e) Lot 18 is assessed to be Class 3, as a result of the relative steepness of the topography, and the presence of a shallow landslide as described at 22(b) of my statement of evidence.

Recommendations for Subdivision Development

31 I consider that the subdivision is suitable for development subject to the following recommendations:

- (a) The identified constraints in Lots 15 to 19 require that good engineering practices for hillslope development are followed. Typical examples are shown graphically in Appendix 6 of my report and include elements such as:
- (i) Subsoil drainage
 - (ii) Minimal cutting and filling
 - (iii) Stormwater, grey and black water disposal that does not involve discharge to slope
 - (iv) Appropriately engineered retaining walls, where these are required.
- (b) At proposed Lot 18, I consider that specific engineering design will be required for the foundations of any house, in addition to the good engineering practices outlined at 31(a) above.
- (c) I consider that a foundation setback zone is required along the western side of Lots 1 and 9, as described at Section 6.3 of my report.

RESPONSE TO SUBMISSIONS

- 32 Some of the submissions are opposed to the Application. A range of reasons are given for their opposition, some of which relate to my area of expertise.
- 33 The approach I have adopted in this statement of evidence is to identify those parts of the submission in opposition with which I disagree and to explain my reasons for disagreement.
- 34 At paragraph 8(d), the submission in opposition by Mr James² states:
- The report indicates building sites on Lot 15-19 range from Risk Class 2-3, with building slopes 1: 6 to 1:1.5 with the majority of the sites being 1:3 to 1:2 on challenging geology. This is an extreme grade to construct dwellings.*
- 35 In my response, I have assumed that Mr James is referring to slope gradients as vertical (V) to horizontal (H) ratio. By way of example, 1V:1.5H approximates to 34°; 1V:3H to 18°.

² Submission number 06

- 36 With this assumption, I agree that there are areas of Lots 15 to 19 that approach or exceed 1V:1.5H, particularly in their lower parts, closest to Shepherds Creek. However, I expect that any houses on these lots will be constructed at the higher elevations, adjacent to the ROW. In these areas, slope gradients are typically lower and less than 25° (approximately 1V:2.15H).
- 37 I do not agree with Mr James as I do not consider that these grades are 'extreme'. There are many examples in New Zealand of houses being constructed on these grades. However, to do so does rely on good engineering practices to be followed, as outlined at Paragraph 31(a) and (b) of my statement of evidence.
- 38 In addition, I do not consider the geology to be particularly challenging as I expect that these lots are underlain by a shallow depth of colluvial soil over Schist rock, which extends to depth. This is a very common situation in the wider Otago region.
- 39 Also at paragraph 8(d), Mr James states: *I request that Council seek a peer review comment on if such sites are practical and appropriate in this location.*
- 40 I neither agree nor disagree with Mr James' request. While I do not consider that a peer review is required for the reasons outlined above, peer reviews occur quite frequently in my industry and I would welcome one, should it be deemed necessary.

RESPONSE TO OFFICER REPORT

- 41 The Officer Report recommends acceptance of the Application. A range of reasons are given for their recommendation, some of which relate to my area of expertise.
- 42 I find that there are no areas of disagreement between myself and the Officer Report.

CONCLUSION

43 A summary of my evidence is provided above.

44 Thank you for the opportunity to present my evidence.

Thomas Richard Justice
27 September 2024

APPENDIX A

Final Geotechnical Assessment Report dated 24 May 2024