

**Before the Proposed Te Tai o Poutini Plan - A Combined District Plan for the West Coast, Hearings Panel**

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Under the Resource Management Act 1991 (the Act)

In the matter of the Proposed Te Tai o Poutini Plan: A Combined District Plan for the West Coast – Hearing Topic 3

- **General District Wide Matters**

Between **Te Tai o Poutini Plan Committee**  
Comprising the Buller, Grey and Westland District Councils

And **Transpower New Zealand Limited**  
Submitter 229 and Further Submitter FS110

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**Statement of Evidence in Chief of Jordan Brett-Allen  
Shortland-Witehira**

**Dated 16 October 2023**

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## **Summary of Evidence**

1. Excavations and earthworks around and under National Grid structures and lines can impact the stability and strength of those structures, limit access to structures, or create unsafe electrical clearances.
2. My evidence provides a number of examples where tight controls were not in place and developments including excavations and earthworks were undertaken without regard to the National Grid. Such works are an example of how earthworks conducted close to the Grid can undermine Transpower's ability to operate and maintain the network effectively and efficiently.
3. Management and approvals for excavations and earthworks around National Grid assets can only safely occur within a robust planning framework, ensuring those developments are fully considered within the regulatory requirements before they commence.

## **Qualifications and Experience**

4. My full name is Jordan Brett-Allen Shortland-Witehira.
5. I am employed by Transpower as an Engineer – Lines within the Tactical Engineering Team.
6. I have a Bachelor of Engineering (Hons) in Mechanical Engineering from the University of Waikato. I am a member of Engineering New Zealand.
7. I have close to 5 years' experience in transmission line engineering. I currently work in the Grid Development Division of Transpower. My role involves providing transmission line engineering advice and support, writing, and reviewing standards and specifications for design, construction and procurement, supporting projects, reviewing design deliverables and ensuring construction quality.
8. I am familiar with the National Grid assets within the West Coast region.
9. I confirm that I am authorised to give this evidence on behalf of Transpower.
10. While this is a Council hearing, I confirm I have read the Code of Conduct for Expert Witnesses contained in Section 9 of the Environment Court Practice Note

2023. As I am employed by Transpower, I acknowledge I am not independent, however I have sought to comply with the Code. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that this evidence is within my area of expertise.

11. While I am employed by Transpower, I am providing this evidence in my capacity as an expert in transmission engineering and matters relating to the National Grid.
12. Where relevant, I have relied on the Hearing Topic 1 and 2 Evidence of **Ms Rebecca Eng**. This includes the description of National Grid assets in the West Coast region set out in Ms Eng's evidence.

### **Earthworks compromising the National Grid**

13. Transpower seeks controls on earthworks near the National Grid, as outlined in **Ms Whitney's** evidence. As a general matter, earthworks adjacent to towers or poles can significantly reduce the capacity and stability of the structure foundations, causing the structure to lean or, worse, collapse. Earthworks including filling or increasing the ground levels within the span can also increase risks of electrical flashover by reducing the clearance between the ground and conductors. Earthworks can also compromise physical access to transmission lines. Access is required for all maintenance and project work, and when a system fault occurs.
14. Sitting outside the District Plan is 'The New Zealand Electrical Code of Practice for Safe Electrical Distances 2001 ISSN 01140663' ("NZECP34"). NZECP34 is a code of practice that provides guidance on safe clearances. The scope and purpose of NZECP34 is confined to safety, setting minimum safe distances to primarily protect persons, property, vehicles and mobile plant from harm or damage from electrical hazards. It does not address the wider third-party effects that compromise the National Grid and therefore as outlined in the evidence of Ms Whitney, reliance on NZECP34 alone to manage earthworks does not give effect to the NPSET. However, I do support alignment of the provisions with NZECP34 with those in the District Plan, particularly in relation to the dispensations available within NZECP34 (i.e., where Transpower can give its written approval to waive the requirements within NZECP34).

15. NZECP34 Section 2, regulates excavation in proximity to the National Grid by stipulating allowable excavation depths, and Section 4 regulates the minimum distances from the conductor to ground.
16. Section 2 also provides for a number of exemptions and a “dispensation” pathway for certain earthworks that breach the specified excavation depths and distances. This pathway allows the owner of the line utility to assess the impact of the earthworks, risk to the structure and mitigations planned to be put in place prior to the works being undertaken. Section 4, governing minimum clearances to ground, has no such dispensation pathway.
17. In the following sections I elaborate on the effects of earthworks on the National Grid, including examples of situations where Transpower is not able to grant a dispensation for earthworks under NZECP34.

#### **Exceeding depths around structures**

18. The foundations of structures on the National Grid are designed to obtain their strength, or ability to sustain their applied loads, by utilising the strength and weight of the soil that they are founded in. Significant reductions in the strength of the structure are likely to occur when excavations occur around these structures.
19. Figure 1 shows earthworks that occurred around a tower as part of development for an urban subdivision in Whitby, Porirua. The earthworks were well within 12 metres of the support structure and reduced the structural capacity of the tower. While NZECP34 provides a dispensation pathway for earthworks within 12 metres of a support structure, Transpower would not have given dispensation for these earthworks as proposed without mitigation being designed and put in place to ensure the structural capacity of the tower was maintained, and the potential erosion issues were addressed.



Figure 1. Earthworks in Porirua

20. As well as possibly undermining the stability of the tower structure, the earthworks in the photograph have also restricted vehicular access to the tower and the area where Transpower can place vehicles and machinery required to maintain the tower. This compromises Transpower's ability to maintain the existing transmission line. Typical maintenance activities include insulator replacement, climbing assessments, steel replacement and tower painting.
21. In this instance, Transpower worked with the developer retrospectively to ensure that the constraints on the line introduced by the developer were mitigated, and the long-term stability of the towers would be retained. This required the installation of a shotcrete surface on the cut batter and the strengthening of the grillage foundation.
22. Such works are an example of how earthworks conducted close to the Grid can undermine Transpower's ability to operate and maintain the network effectively and efficiently. Ultimately, the manner in which Transpower carries out maintenance at this tower needed to change to address the effects.

### **Compromising stability**

23. Another example of the impact of excavations near tower foundations is the relatively recent construction of the Transmission Gully highway. During the design and construction of this highway the builder approached Transpower to obtain approval to excavate within the NZECP34 distances. Given the national significance of this project, agreement was reached to monitor the stability of the slope, and if instability was found then the builder would be liable for the costs of

rectifying that instability. During construction, monitoring found that the slope did in fact begin to move and the builder was required to pay the extensive rectification work costs.



*Figure 2. Earthworks at Transmission Gully*

24. The rectification of the instability of the slope resulted in a delay of the project. In addition, new foundations needed to be installed to support the tower, to address the new terrain conditions.
25. In the above case it was possible to set responsibilities and liabilities before the work commenced. Transpower has experienced other situations such as in Figure 2 above where retrospective mitigation has been required. The period between identifying this non-compliance and being able to design and construct mitigation placed the security of the National Grid at risk.

**Risk of foundation structure failure:**

26. A structure prone to foundation failure due to close excavation earthworks, is a serious risk to the Grid, public safety and surrounding properties. If a single structure is compromised, it can collapse and pull down the adjacent structures

next to it causing a 'cascade failure' - structures continue to fall structure by structure until it reaches the next 'Stop Structure.' Stop structures are designed to withstand the cascade failure and stop the domino effect, but they can typically be situated from five to ten structures apart.

27. The failure described above can be a possible outcome of. excavation works by third parties that weaken foundations. Consideration needs to be taken for occasional weather events too.
28. The West Coast of the South Island is exposed to rainfall, high winds, and contains changing transmission line routes with structures at high elevation. This means that the assets in this region are susceptible to the elements therefore increasing the likelihood of cascade failure.



*Figure 3. Rangitata incident in 2019*

29. The example above depicts the end of a cascade failure, where the structures leading up to these in the photo in Figure 3 had collapsed. The Rangitata incident in 2019 caused nine towers to fail (under weather conditions.)



30. Structure or cascade failure can take between weeks and months to repair depending on the damage extent, location, access, grid criticality, construction resources and material resources. These are all relevant factors to consider for the West Coast. These effects on the Grid can equally occur due to inappropriate earthworks activities near the support structures.
31. In comparison to the rest of New Zealand and the National Grid, the West Coast does not have many high voltage transmission lines in the region. This means there are limited options for electricity supply to be transferred to alternative lines if a fault or failure occurs, and therefore the ongoing operation of the existing assets is crucial.

**Earthworks causing ground to conductor clearance violations:**

32. Another example of earthworks adversely impacting the operation of existing National Grid assets is earthworks undertaken in Hastings (Figure 4 and Figure 5 below). Transpower investigated the clearances from the conductor to ground for two Hastings properties and found the minimum clearance was only 5.3m from the ground to conductor at everyday conditions (instead of 6.5m at maximum operating conditions required under NZECP34). In this case there was a significant risk of electrical flashover to vehicles passing underneath and people moving tall objects.
33. Transpower needed to arrange temporary fencing of the two earthworks sites to prevent any further access under the conductors until rectification works were completed. Mitigation included installing a new set of cross arms on the poles. The top and bottom crossarms were changed to shorter steel crossarms with new Horizontal Line Posts (HLPs) attached. This lifts the conductor into a clamp on the end of the HLPs on the same pole by approximately 1200mm and prevented the need to replace the poles. Transpower then carried out ground works to cut the edge of the bench/track back to ensure the regulation 6.5m ground clearance at maximum operating temperature was complied with i.e., remediating the site back to original ground level and achieving compliance with NZECP34.
34. Transpower is not able to grant a dispensation under NZECP34 for earthworks that exceed the clearance distances. Electrical clearance distances are set by NZECP34 to ensure that any person traversing under the conductors can do so safely. Any earthworks that create a conductor clearance violation put that person at risk, so the earthworks need to be either reversed, relocated or mitigated to



maintain the conductor clearance. This is consistent with that recommended by Ms Whitney in her evidence.



*Figure 4. Hastings ground clearance violations*



*Figure 5. Hastings ground clearance violations*

### **Earthworks compromising access to the National Grid**

30. The Porirua subdivision situation described earlier provides a good example of earthworks potentially de-stabilising adjacent support structures and permanently impeding vehicular access to the National Grid.
31. Physical access to transmission lines is required for all maintenance and project work, and when a system fault occurs. Transpower has statutory rights to access its assets on private land under the Electricity Act 1992 (Electricity Act). The

Electricity Act provides for access to maintain, inspect and operate the National Grid.

32. In an ideal situation, Transpower would have unimpeded physical access to all transmission line structures. In practice, this is not always possible. Physical barriers and natural obstacles, such as waterways, valleys, and undulating ground and including through earthworks, require Transpower to use alternative access options, for example helicopters and/or walking in are sometimes required.
33. The quality of access is important as some construction plant, for example cranes and concrete trucks, require wider and lower gradient tracks than what is traversable by smaller vehicles. The existing access is usually the most suitable as it was generally used to construct the line and for ongoing maintenance. If the landowner decides that they wish to change the access Transpower should be consulted to ensure that the new route will not impede future works on the Grid.
34. If the planning regime ensures continuation of existing access, this will avoid the need (and associated costs and delays) to dismantle fences and other structures, temporarily bridge waterways, carry out excavation or vegetation removal, just to access the National Grid.
35. Another important reason for unobstructed access is for emergency works. In the event of a fault, Transpower must always be able to quickly access its lines to find and fix the fault. Businesses and communities are heavily reliant on electricity, so it is crucial that faults are identified and fixed as soon as possible.
36. While Transpower's assets perform well in storm events or natural disasters, excessive winds and rivers changing course do at times break or collapse National Grid infrastructure and emergency repairs need to be carried out to get these back into operation. During these times there is often a heightened requirement for electricity. The National Grid is a lifeline utility.

### **West Coast Context**

37. Although the above examples are in other parts of New Zealand, they are common to National Grid assets in the West Coast Region (as described in Ms Eng's

Hearing Topic 1 and 2 evidence) In all cases earthworks needs to be carefully managed to protect the Grid.

## **Conclusions**

38. Earthworks involving both excavation around National Grid structures and building up of ground levels within spans needs to be tightly controlled to ensure structural stability of those structures are maintained, access to the structures is not closed off and safe clearances are provided between the conductors and the ground. Where the effects of earthworks are such that the Grid will be compromised and health and safety risks may eventuate, consenting approval is not appropriate and would not be supported by Transpower.

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Jordan Brett-Allen Shortland-Witehira

16 October 2023