Before the Independent Hearings Panel
appointed by the Waimakariri District Council

under: the Resource Management Act 1991

in the matter of: Submissions and further submissions in relation to the proposed Waimakariri District Plan, Variation 1 and Variation 2

and: Hearing Stream 3: Natural Hazards

and: **MainPower New Zealand Limited**
Submitter 249

Statement of Evidence of Mark Appleman

Dated: 10 July 2023

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STATEMENT OF EVIDENCE OF MARK APPLEMAN

1 My full name is Mark Henry Appleman.

2 I am the General Manager of Network Strategy and Planning at MainPower New Zealand Limited (*MainPower*) (submitter number 249).

3 In this role I am responsible for developing the strategy for managing MainPower's network assets and then delivering the annual work plan to develop and maintain the MainPower network.

4 I am authorised to provide evidence on behalf of MainPower for the proposed Waimakariri District Plan (*proposed Plan*) review.

5 I have previously prepared a brief of evidence for Hearing Streams 1 and 4 of the proposed Plan. I adopt that evidence for the purposes of this hearing and provide supplementary detail relevant to the proposed Natural Hazards chapters below.

6 My qualifications and experience are set out in full in my Hearing Stream 1 evidence.

7 While I am an employee of MainPower, I have expertise in the field of electrical engineering and confirm that I have read and agree to comply with the "Code of Conduct for Expert Witnesses'" contained in the Environment Court Practice Note 2023. In particular, unless I state otherwise, the technical matters on which I give evidence are within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

8 This brief of evidence will address:

8.1 MainPower's existing network within natural hazard overlays; and

8.2 The importance of enabling the efficient maintenance, use, development and upgrade of electricity infrastructure in those overlays.

EVIDENCE

9 As explained in my Hearing Stream 1 evidence, MainPower is responsible for the establishment, operation, maintenance and upgrade of the electricity distribution network in North Canterbury. MainPower's work frequently involves installing, maintaining/repairing and upgrading of our electricity infrastructure

(including lines, towers, poles, cables, transformers and kiosks). In some instances, it is necessary for our infrastructure to be located, and therefore maintained and repaired, in areas susceptible to natural hazards.

10 MainPower seeks that the proposed Plan recognise that important infrastructure, such as that required for electricity distribution, may need to be located within natural hazard overlays due to locational, operational and technical requirements.

11 MainPower needs to position its assets in locations where its customers require electrical infrastructure throughout the Waimakariri District. As an asset manager MainPower, has to manage the risks to its assets from natural hazards. The rest of my evidence describes how we assess and manage the impact of natural hazards on our assets.

MainPower's Electrical Distribution Service

12 MainPower's electrical distribution service is vital for the wellbeing of our community, particularly in light of the national and global shift to renewable energy. As the North Canterbury community seeks to reduce its carbon footprint, MainPower's electrical distribution network services are going to be a key enabler, supplying a clean electricity energy source.

13 To ensure safe, reliable and resilient network services, MainPower needs to understand the impact of climate change on our infrastructure assets. Climate change means our community and our network will be exposed to extreme weather events. We need to adapt to this change to ensure the network remains resilient.

14 The effects of climate change (rising sea levels, wildfire, wind events, flooding) are driving MainPower to review our network services and to enable low carbon technology choices for our communities in order to mitigate the impacts of severe weather on the network. As outlined below, MainPower's Asset Management Plan sets out our approach to managing risks to the network.

15 Furthermore, it is anticipated that consumers' service level expectations will increase as we transition to a low carbon economy and as our community becomes more reliant on electrical energy. This emphasises the importance of MainPower's work in providing a resilient network.

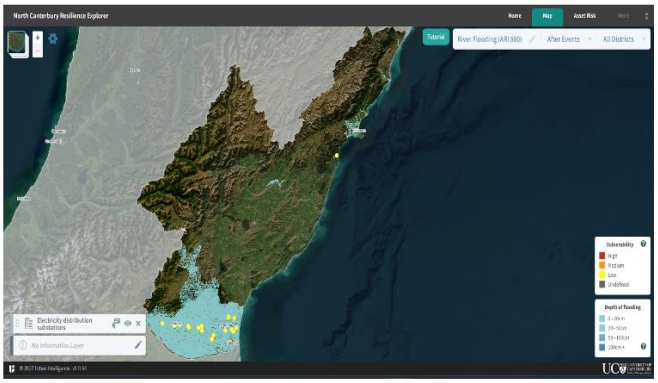
Strategy

		Risk Assessment	50 year Change	Impact	Treatment	Commitments
Physical	Vegetation	High	Increasing	Impacting continuity of supply, Network Performance, Event Resourcing The number of events are expected increase	Use of Coordinated Incident Management response (CIMs) Delivery of Vegetation Management as part of the annual work programme Employ public notifications and awareness	Improved Asset Management using Lidar technology for clearance management including tree identification and growth rates
	Severe Weather	High	Increasing	Damage to Overhead infrastructure from increased windspeed – beyond original design specification Damage to underground infrastructure from flooding	Review design criteria and designs standard Develop a digital twin model for the modelling of assets	Assess windspeed impacted to existing assets within digital twin model. Review replacement program based on assets impacted Partner with NIWA, Lifelines and Civil Defence for improved community sustainability modelling.
	Wildfire	Medium	Increasing	Dryer conditions leading to increased exposure and severity of fire, causing damage to assets Exposure to 3rd Party fire damage leading to reputational damage	Maintain clearances through vegetation management and fall zone reporting. Employ public notifications and awareness Review of areas susceptible to wildfires and assessed assets affected including loss of supply impact	Continued resource availability to support the management of fire risk to Network Assets.
	Sea Level Rise Tsunami	Low	Gradual	Impact to low lying areas of the Network, necessitating relocation of assets	Review of asset location when working in low lying and coastal areas	Review existing assets and their location as data around sea level rise changes Partner with Lifelines and Civil Defence enhancing community modelling

		Risk Assessment	50-year Change	Impact	Treatment	Commitments
Behavioural	New Technology	Low	Increasing	Increased demand on the network as consumers become more reliant on electricity Possible impacted to AMP forecasts and changes to work program as consumers become more reliant on electricity	Continued scenario based demand forecasting informing AMP expenditure programmes Continued consumer engagement and surveys to understand consumers future need for Network services	Continued review and understanding of demand changes including engagement with other Electrical Distribution Boards (EDBs).
	Regulation	Low	Increasing	Possible market changes Impacting the way the Network is used Carbon pricing affecting consumer Low Carbon Technology (LCT)decision making	Involvement in industry working groups to understand possible demand changes including the impact of change.	Continued review and understanding of demand changes including engagement with other Electrical Distribution Boards (EDBs).
	Pricing	Low	Increasing	Pricing signals to consumers leading to consumption behaviour changes that negatively impacts reliable power supply	Continued implement of pricing Roadmap. Awareness to other market participants about the impact of pricing signals (Hour of Free Power)	Continued review and understanding of demand changes including engagement with other Electrical Distribution Boards (EDBs). Introduction of price signals that enhance market efficiency and value of consumer LCT choice

16 The two summary tables above, from MainPower's Asset Management Plan for 2023-2033, show the physical and behavioural impacts of climate change, the risk assessment, impact and our treatment/commitments in response. MainPower continues to prioritise and undertake the work required to meet these commitments.

Risk and Vulnerability



Map: Explore the impacts of hazards on different assets, from roads, parks and pipes to walkways, community halls and everything in between. See what is most vulnerable and where these assets are located.
Asset Risk: Find a summary of the risk posed by hazards to each 'asset'.
Merit: Explore the economic impacts by hazards to each 'asset'.

17 The diagram above is taken from the North Canterbury Resilience explorer. MainPower uses this tool to understand where people, places, infrastructure and landscapes of value will be exposed to hazards, and just how vulnerable they will be. This helps us to future proof our assets and plan for extreme events more effectively.

18 Natural Hazards only pose a risk when assets we care about are impacted by a hazard. The level of risk is determined by the consequence, say if something of importance e.g. a substation was impacted by a hazard.

19 To understand the consequence, we also need to know how vulnerable our assets are to a hazard. This is achieved by looking at the sensitivity and adaptive capacity of an exposed asset.

19.1 Sensitivity – The degree to which an asset is affected by natural hazards.

19.2 Adaptive capacity – The ability an asset has to respond to a hazards.

20 MainPower's Asset Management Plan treats risks from natural hazards as high impact low probability events. The table below from Chapter 4 of the Asset Management Plan summarises high impact low probability events with likelihood and consequence.

Hazard	Observations	Likelihood/Consequence
Flood	• The risk to overhead lines from flood hazard is limited, even in a 100-year flood event. • Damage is isolated, resulting from landslips and/or subsidence or damage to individual poles sited within the normal course of a river. • A 500-year flood event would result in extensive flooding of some urban areas and subsequent damage to ground-mounted distribution equipment.	Likelihood: Possible Consequences: Moderate
Windstorm	• Damage to overhead lines is routinely caused by high winds. • Historically, this has resulted in minor and isolated damage. • Our design criteria meet or exceed the requirements for a 50-year return period event, as set out in AS/NZS 7000:2016. • The most severe winds are winds from the north-west (these occurred in 1945, 1964, 1975, 1988 and 2013). • The peak wind speed of 193 km/hr recorded in August 1975 exceeded the 100-year recurrence interval. • Average recorded wind speeds in Christchurch approach 45% of design speed on 54 days a year and 66% on 3 days a year. • Canterbury has recorded 4 significant tornado events in the last 25 years, none of them located in our distribution area.	Likelihood: Possible Consequences: Major
Electrical storm	• Most parts of Canterbury have few electrical storms. • Over the plains, fewer than 5 thunder days, on average, occur each year, with the highest frequencies occurring between September and March. • Near the Southern Alps, 20 thunder days, on average, occur each year, with the highest frequencies during April and May. • Zone substations, transformers and communications equipment are protected with lightning arrestors.	Likelihood: Moderate Consequences: Unlikely
Snowstorm	• Canterbury occasionally experiences weather events that deposit heavy, wet snow on overhead lines. • Higher inland areas can be subject to ice build-up with coincident wind loading, which places high loads on overhead infrastructure. • Isolated sections of overhead lines may be exposed to a risk of avalanche.	Likelihood: Unlikely Consequences: Major
Wildfire	• This can cause damage and destruction to the overhead network infrastructure. • Particulate accumulation on power lines and insulators.	Likelihood: Rare Consequences: Catastrophic
Earthquake	• Liquefaction can cause equipment foundations to fail. • Power line foundations can fail, causing loss of supply. • Underground conductor failures can cause loss of supply. • Repairs can be hampered by access restrictions. • Stock resupply limitations can occur because of transport issues.	Likelihood: Unlikely Consequences: Catastrophic
Landslip	• Remote sections of sub-transmission networks may be exposed to landslip, causing loss of supply.	Likelihood: Unlikely Consequences: Major
Tsunami	• While the occurrence of a tsunami is uncertain, this hazard is a realistic possibility for Canterbury, particularly at the mouth of the Waimakariri and Ashley Rivers, at Leithfield Beach, Motunau, and at Kaikōura where the narrow continental shelf and presence of submarine canyons makes this area particularly susceptible, especially Goose Bay and Oaro. • Most overhead lines are not generally exposed to this hazard.	Likelihood: Rare Consequences: Minor

Hazards

21 The most common natural hazard in Canterbury is flooding, which is usually caused by heavy rainfall. River flooding is common, and happens when water spills from a river channel onto land that is normally dry.

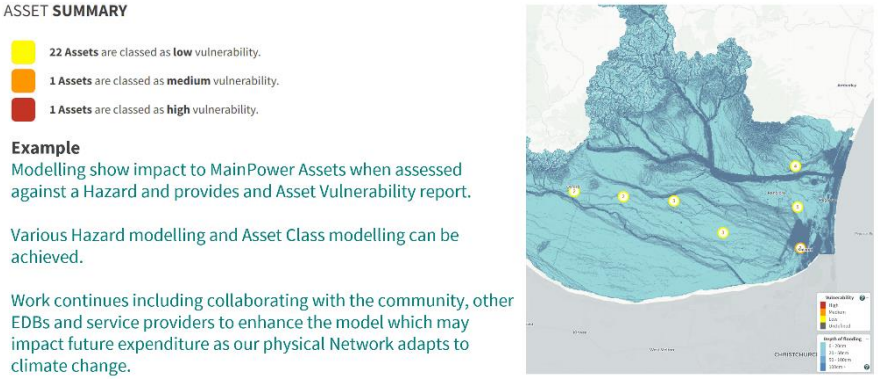
22 Tsunamis are usually caused by an earthquake under the seafloor. Other triggers include landslides, undersea volcanic eruptions, and meteorite impacts. These sudden disturbances cause the ocean to flow away from the disturbance, creating large tsunami waves at the shoreline. Some parts of coastal North Canterbury have been identified as being vulnerable to Tsunami.

23 Rising groundwater can bring the water table close to the ground surface. This wet ground can impact people's health, buildings, infrastructure and how the land can be used. In some cases,

groundwater could rise above ground level and cause temporary or permanent ponding of water.

24 The diagram below demonstrates the modelled vulnerability of MainPower's assets to flooding related hazards.

Modelled Vulnerability



25 This modelling suggests MainPower's greatest risk exposure in the Waimakariri District relates to assets situated in the Kaiapoi region, the most critical to the community being the Kaiapoi Grid Exit Point. As part of MainPower's work in hazard assessment and mitigation, the infrastructure assets at this location are programmed for replacement in FY25. The other risks posed to MainPower's infrastructure assets include earthquake (Alpine Fault) and resulting liquefaction, windstorms and snowstorms.

26 We are working to further understand other asset vulnerabilities and proposed remediation plans, however the assets identified to date pose a much lesser risk than those already mapped and addressed.

27 This work already forms part of MainPower's Asset Management systems and processes.

CONCLUSION

28 MainPower, through its Asset Management Plan and processes, has a good understanding of the risks posed to its assets from natural hazards. It is important that we are able to do maintenance, repair and upgrade works to the network in order to implement MainPower's management plans and to ensure the network is reliable and resilient into the future.

10 July 2023

Mark Appleman